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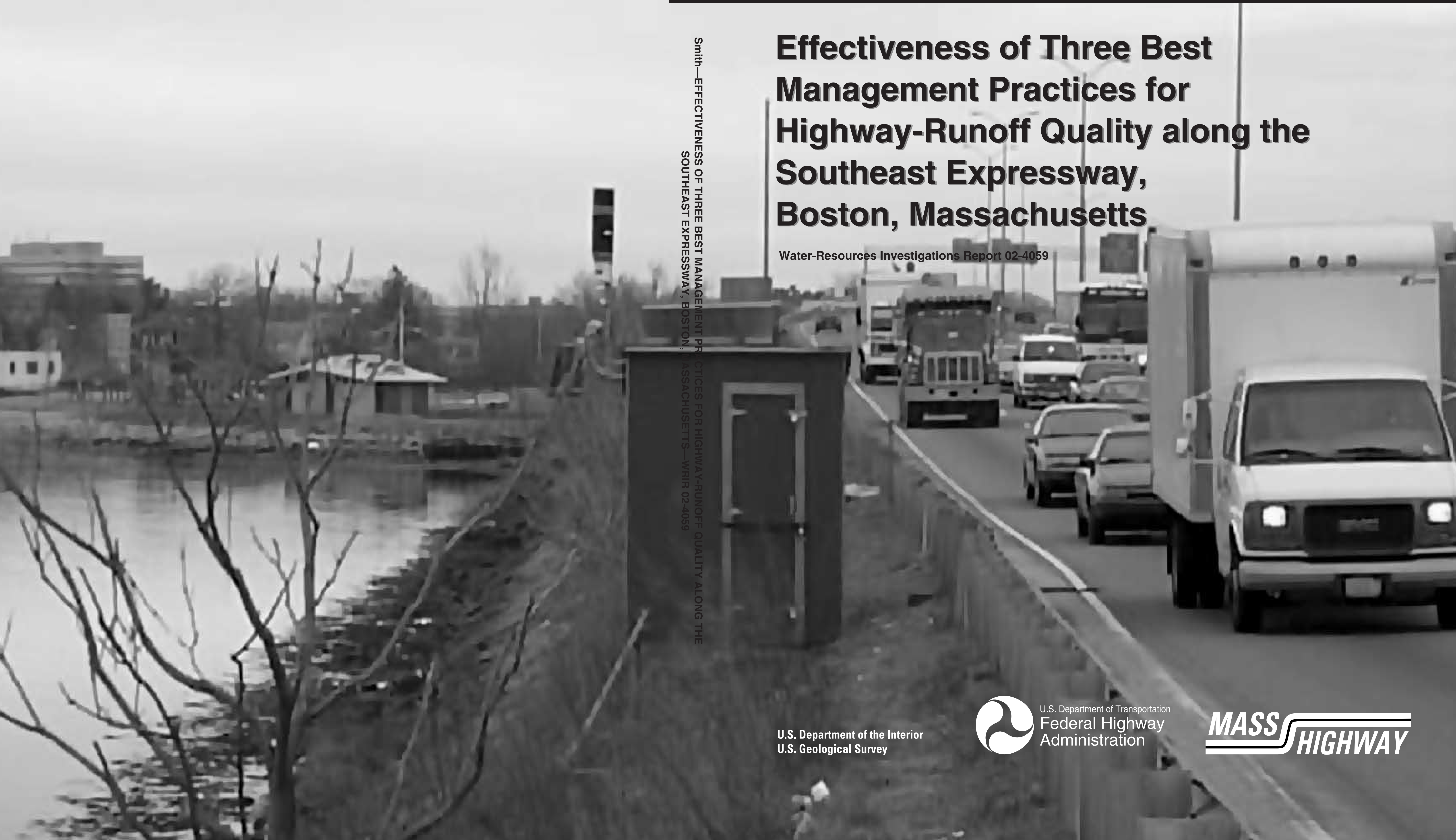
Effectiveness of Three Best Management Practices for Highway-Runoff Quality along the Southeast Expressway, Boston, Massachusetts

Water-Resources Investigations Report 02-4059



U.S. Department of the Interior
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Smith—EFFECTIVENESS OF THREE BEST MANAGEMENT PRACTICES FOR HIGHWAY-RUNOFF QUALITY ALONG THE SOUTHEAST EXPRESSWAY, BOSTON, MASSACHUSETTS—WRIR 02-4059

U.S. Department of the Interior
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Effectiveness of Three Best Management Practices for Highway-Runoff Quality along the Southeast Expressway, Boston, Massachusetts

By KIRK P. SMITH

Water-Resources Investigations Report 02-4059

In cooperation with the
FEDERAL HIGHWAY ADMINISTRATION, and the
MASSACHUSETTS HIGHWAY DEPARTMENT

Northborough, Massachusetts
2002

U.S. DEPARTMENT OF THE INTERIOR
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PREFACE

Knowledge of the characteristics of highway runoff (concentrations and loads of constituents and the physical and chemical processes which produce this runoff) and the performance of best management practices are important for decision makers, planners, and highway engineers to assess and mitigate possible adverse impacts of highway runoff on the Nation's receiving waters. In November 1998, the Federal Highway Administration, the Massachusetts Highway Department, and the U.S. Geological Survey began an investigation to determine the effectiveness of three best management practices in reducing suspended-solid loads and related constituents along the Southeast Expressway (Interstate Route 93) in Boston, Massachusetts.

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CONVERSION FACTORS, WATER-QUALITY UNITS, AND ABBREVIATIONS

CONVERSION FACTORS

Multiply	By	To obtain
cubic feet per second (ft^3/s)	0.02832	cubic meters per second
foot (ft)	0.3048	meter
foot per hour (ft/h)	0.3048	meter per hour
gallon (gal)	3.785	liter
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
inch (in.)	25,400	micron (mm)
mile (mi)	1.606	kilometers
square feet (ft^2)	0.0929	square meters
ton	907.2	kilogram (kg)

Temperature in degrees Celsius (˚C) can be converted to degrees Fahrenheit (˚F) as follows: ˚F=1.8˚C+32

WATER-QUALITY UNITS

Abbreviated water-quality units used in this report: Chemical concentrations, water temperature, and specific conductance are given in metric units. Chemical concentration of constituents in solution or suspension is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit of volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. Concentrations of sediment-quality constituents are expressed in parts per million (ppm) by weight. Bacteria densities are expressed as number of colonies per 100 milliliters of water (col/100 ml).

ABBREVIATIONS

BMP	Best management practice
EMC	Event mean concentration
SSC	Suspended-sediment concentration
PZF	Point of zero flow
RPD	Relative percent difference
MRL	Minimum reporting level
NTU	Nephelometric turbidity units
µS/cm	Microsiemens per centimeter

Effectiveness of Three Best Management Practices for Highway-Runoff Quality along the Southeast Expressway, Boston, Massachusetts

By Kirk P. Smith

Abstract

Best management practices (BMPs) near highways are designed to reduce the amount of suspended sediment and associated constituents, including debris and litter, discharged from the roadway surface. The effectiveness of a deep-sumped hooded catch basin, three 2-chambered 1,500-gallon oil-grit separators, and mechanized street sweeping in reducing sediment and associated constituents was examined along the Southeast Expressway (Interstate Route 93) in Boston, Massachusetts. Repeated observations of the volume and distribution of bottom material in the oil-grit separators, including data on particle-size distributions, were compared to data from bottom material deposited during the initial 3 years of operation. The performance of catch-basin hoods and the oil-grit separators in reducing floating debris was assessed by examining the quantity of material retained by each structural BMP compared to the quantity of material retained by and discharged from the oil-grit separators, which received flow from the catch basins. The ability of each structural BMP to reduce suspended-sediment loads was assessed by examining (a) the difference in the concentrations of suspended sediment in samples collected simultaneously from the inlet and outlet of each BMP, and (b) the difference between inlet loads and outlet loads during a 14-month monitoring period for the catch basin and one separator, and a 10-month monitoring period for the second separator. The third separator was not monitored continuously; instead, samples were collected from it during three visits separated in time by several months. Suspended-sediment loads for the entire study area were estimated on the basis of the long-term average annual precipitation and the estimated inlet and outlet loads of two of the separators. The effects of mechanized street sweeping were assessed by evaluating the differences between suspended-sediment loads before and after street sweeping, relative to storm precipitation totals, and by comparing the particle-size distributions of sediment samples collected from the sweepers to bottom-material samples collected from the structural BMPs. A mass-balance calculation was used to quantify the accuracy of the estimated sediment-removal efficiency for each structural BMP. The ability of each structural

BMP to reduce concentrations of inorganic and organic constituents was assessed by determining the differences in concentrations between the inlets and outlets of the BMPs for four storms. The inlet flows of the separators were sampled during five storms for analysis of fecal-indicator bacteria.

The particle-size distribution of bottom material found in the first and second chambers of the separators was similar for all three separators. Consistent collection of floatable debris at the outlet of one separator during 12 storms suggests that floatable debris were not indefinitely retained.

Concentrations of suspended sediment in discrete samples of runoff collected from the inlets of the two separators ranged from 8.5 to 7,110 mg/L. Concentrations of suspended sediment in discrete samples of runoff collected from the outlets of the separators ranged from 5 to 2,170 mg/L. The 14-month sediment-removal efficiency was 35 percent for one separator, and 28 percent for the second separator. In the combined-treatment system in this study, where catch basins provided primary suspended-sediment treatment, the separators reduced the mass of the suspended sediment from the pavement by about an additional 18 percent. The concentrations of suspended sediment in discrete samples of runoff collected from the inlet of the catch basin ranged from 32 to 13,600 mg/L. Concentrations of suspended sediment in discrete samples of runoff collected from the outlet of the catch basin ranged from 25.7 to 7,030 mg/L. The sediment-removal efficiency for individual storms during the 14-month monitoring period for the deep-sumped hooded catch basin was 39 percent.

The concentrations of 29 inorganic constituents in bottom sediments were typically higher for the size fraction less than 0.062 mm in diameter. Concentrations of total organic carbon (TOC) were similar for the size fraction less than 0.062 mm in diameter and the fraction greater than 2.00 mm in diameter. Concentrations of total polyaromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) were larger in the fraction greater than 2.00 mm in diameter than in the size fractions less than 2.00 mm in diameter. Since PAHs and PCBs are commonly associated with TOC (including organically coated sediment), it is believed that the PCB and PAH concentrations in the solid fraction less than 0.062 mm in diameter were similar to the concentrations in the solid fraction greater than 2.00 mm in diameter, if not greater because of the effects of the surface area.

The estimated annual suspended-sediment load for the entire study area was about 29,000 kg. Approximately 24,000 kg discharged directly to Malibu Beach and Tenean Beach embayments, and the remaining 5,000 kg discharged to the land surface. These loads do not include an estimated 2,000 kg of suspended sediment retained by the five oil-grit separators in the area.

Mechanized street sweepers were used on the pavement three times during the study. Samples of sweepings were collected each time for the analysis of particle size. The first mechanized street sweeping had no observable effect on subsequent storm loads of suspended sediment. Following the second sweeping, a net increase of the suspended-sediment load was observed at one station and a net decrease of the suspended-sediment load was observed at the second station. These effects, however, were only temporary. The third time the highway was swept was after continuous monitoring was terminated. The particle-size distribution in sweeper samples for the size fraction less than 4 mm in diameter was similar to the particle-size distribution in bottom sediment in the catch basin. The concentration of particles greater than 0.5 mm in diameter was higher in sweeper samples than in samples from the separators, so the sweepers were successful in removing the larger particles. Because the highway lacks curbing that would provide a physical boundary to trap debris and sediment, and the equipment was inefficient in trapping particles less than 0.062 mm in diameter, pavement sweeping provided few water-quality benefits for the Southeast Expressway.

The primary factor controlling the efficiency of each structural BMP in removing suspended sediment was retention time. Examination of constituent-sediment relations suggests that the retention time for many highway-related constituents was short; these constituents either were dissolved and not subject to treatment by simple gravity separation, or were associated with particles less than 0.062 mm in diameter, which commonly passed through the BMPs. Thus, the potential effectiveness of the separators and the catch basins to reduce loads of inorganic and organic constituents was much less than their ability to reduce loads of suspended sediment.

The average relative percent difference (RPD) between concentrations of trace metals in stormwater samples from the inlets and the outlets of the separators ranged from 15 to 30 percent. The average RPD for concentrations of organic constituents was commonly less than about 10 percent and negative in several cases. The separators did not affect the concentrations of dissolved solids as they passed through their chambers. The average RPD between the event mean concentrations for trace metals in samples collected from the inlet and outlet of the catch basin during storms was about 25 percent. The average RPD for concentrations of organic constituents was typically less than 20 percent and even negative in several cases, except for oil and grease, which was near 30 percent. The observed ranges of the RPDs for both types of BMPs were probably larger than the actual ranges because the particle-size and concentration of suspended sediment sampled in the BMP inflows during the four storms introduced a bias in favor of higher concentrations.

Concentrations of fecal and *Enterococci* bacteria were found throughout the storms at the inlets of the two continuously monitored separators; this result indicated that the pavement washoff process was inefficient or that there was a continuous source of bacteria in the drainage area. The efficiency of the structural BMPs tested in this study in reducing fecal-indicator bacteria concentrations was not quantified; each BMP chamber is likely to retain a quantity of fecal-indicator bacteria proportional to its storage volume after a storm. Removal of bacteria from the BMP is dependent on how well the bacteria survive until the next storm and the potential for bacterial export during the next storm.

INTRODUCTION

Suspended particulate matter transported from roadway surfaces represents one of the most substantial sources of non-point source pollution in highway runoff (Young and others, 1996). In addition to increasing turbidity and depositional loading, suspended sediment can retain and transport other pollutants to receiving water bodies. Roadway suspended-solid loads may be reduced by diverting storm flows through various structural end-of-pipe devices or by removing particulate matter from roadway surfaces prior to runoff transport (for example, source control). The effectiveness of these best management practices (BMPs) is limited by the general lack of information about the site-specific size distribution and quantity of the source material.

The U.S. Geological Survey (USGS), in cooperation with the Federal Highway Administration and the Massachusetts Highway Department (MassHighway), began a study in November 1998 to determine the effectiveness of current BMPs in reducing suspended-solid loads and related constituents along the Southeast Expressway (Interstate Route 93) in Boston, Massachusetts. The Southeast Expressway is typical of heavily used highways within urban and industrialized areas, although it passes through the coastal zone watersheds of Dorchester Bay in Boston. In 1994, the Expressway was modified to provide a moveable “zipper barrier” to increase traffic flow in the peak direction. This zipper barrier consisted of cast-concrete barriers connected to one another and mechanically moved by a specialized machine to create an additional travel lane. During this time, in an effort to remove oils and grit (sand- and gravel-size particles) from highway runoff, five off-line oil-grit separators (commonly referred to as water-quality inlets) were integrated into the primary drainage system of the highway adjacent to Dorchester Bay.

The BMPs examined in this study include a deep-sumped hooded catch basin, three 1,500-gal off-line oil-grit separators, and mechanized sweeping. The effectiveness of each structural BMP was estimated by monitoring the quality and quantity of stormwater at the inlet and outlet of each device. At the end of the monitoring period, each device was drained and the captured material was measured and quantified. Street-sweeping effectiveness was evaluated by examining the differences in suspended-sediment loads in highway runoff before and after storms relative to precipitation amounts and antecedent periods, and by comparing the size distribution of sediment collected from the street sweeper to bottom sediments collected in the catch basin and the separators. These monitoring results will provide state and local highway planners with specific information regarding the current quality and quantity of highway runoff from major urban highways in the northeastern United States, and the scientific basis for future consideration and application of these BMPs. Monitoring methods developed during this study may be useful for assessing the effectiveness of new BMPs.

This report describes the effectiveness of each BMP along the Southeast Expressway in reducing suspended-sediment loads, debris loads, and chemical and biological loads in highway runoff. It also describes the physiochemical characteristics of structural BMP bottom materials, the estimated suspended-solid loads for the study area, and documents the monitoring methods by which the effectiveness of each BMP was estimated. These results are based on highway-runoff data collected from November 1998 through June 2000.

Description of Study Area and Highway-Drainage Systems

The study area comprised 2.2 mi of Interstate 93 from the Neponset River to Savin Hill in Boston (fig. 1). This section of highway, including ramps, covers about 35 acres. About 1.5 mi of this eight-lane highway crosses the Neponset drainage basin and 0.7 mi crosses the Boston Harbor Coastal subbasin. Within the study area, 209 catch basins provide primary treatment for highway stormwater runoff; also included is one 3-chamber 4,500-gal off-line oil-grit separator and four 2-chamber 1,500-gal off-line oil-grit separators. Highway runoff collected by the catch basins is either discharged to the local land surface or to a separator through a concrete or steel drainage pipe. Highway runoff from 26.4 acres discharges through the structural BMPs to the embankment along the Malibu Beach and Tenean Beach embayments. Runoff from the remaining 8.2 acres infiltrates into the ground.

Catch basins are circular concrete containers below the highway with steel grates at the pavement surface. The sumps (that is, storage area below the outlet pipe) of 184 catch basins are 4 ft deep, and the remaining 25 are 3 ft deep. Hinged cast-iron hoods, intended to retain floatable debris at the water surface, are loosely fitted over the sump outlet of most catch basins. The hoods encapsulate the entire outlet opening and extend about 0.5 ft below the bottom of the outlet.

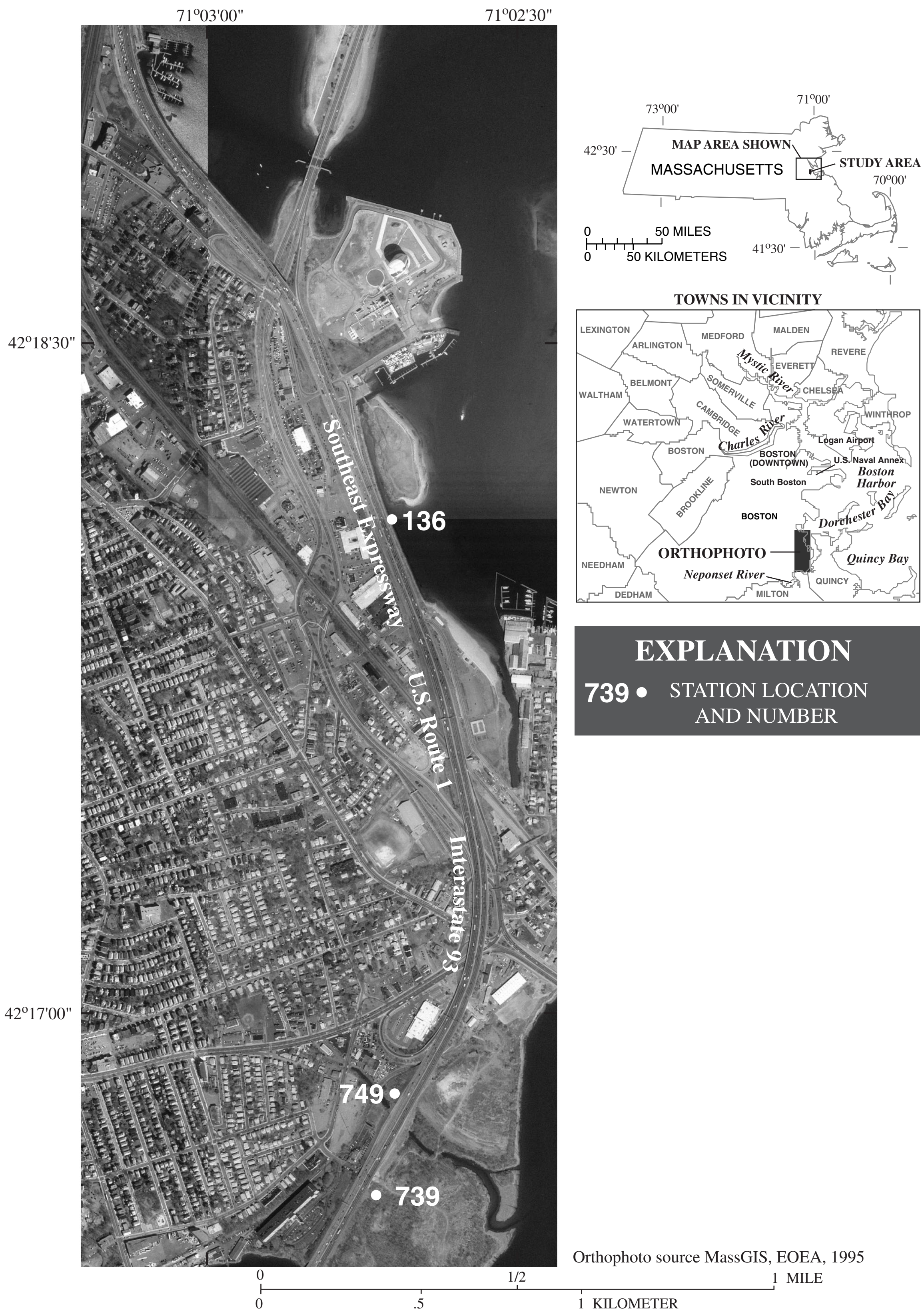

Figure 1. Study area where best management practices were tested, Southeast Expressway, Boston, Massachusetts.

Oil-grit separators, large cast-concrete containers subdivided by one or more baffles, are buried next to the highway. They provide additional treatment of stormwater runoff by capturing suspended particulate matter, oil and grease, and floatable debris (fig. 2). A hood or an inverted elbow was not installed over the outlet of the second chamber of the separators. A baffle separated the primary chamber from the secondary chamber, and contained three circular 12-in. outlets 1.5 ft from the chamber floor. Each separator included a bypass pipe that carried flow past the device during intense runoff by use of a diversion weir placed near the inlet of the separator. Although this design feature allows untreated stormwater to bypass the separator, it theoretically prevents extreme flows from flushing captured materials from the separator. Stormwater runoff from as many as 6 to 26 catch basins was diverted through the five separators. Highway runoff diverted through the 3-chamber 4,500-gal separator and two 2-chamber 1,500-gal separators is discharged to the embankments of Malibu Beach and Tenean Beach embayments, and runoff from the other two 2-chamber 1,500-gal separators is discharged to land near a small tributary of the Neponset River.

The highway does not have a breakdown lane; however, it does have three emergency pull-off areas. Beyond the edge of pavement, which begins beneath the guard rail, the ground consists of loosely packed sandy-loam with sparse vegetation cover. Granite curbstone lines the ramps; but in most cases, there is either no curb along the highway, or the curb is buried and the material at the edge of the pavement is able to erode onto the roadway during storms. Concrete barrier walls are installed on overpasses and separate the pavement from the areas with steep embankments and curves.

The three 1,500-gal separators evaluated during the study were designated sites 136-01, 739-01, and 749-01 (fig. 3). The first three digits refer to the surveyed highway reference points (stations). The outflow and inflow monitoring and sampling point designations of each separator consisted of the same prefix followed by –02 and –03, respectively. The deep-sumped hooded catch basin is within the drainage area of the separator 136-01 and was designated as site 136-06. The outflow and inflow monitoring and sampling point designations of the catch basin consisted of the same prefix followed by –04 and –05, respectively. All drainage pipes are 1 ft in diameter and accessible through manholes. The three separators are located about 5 ft from the right edge of pavement. Site-specific details for each structural BMP are listed in table 1. The greatest difference between the drainage areas of the five separators is the size and the number of catch basins. Only the separators at monitoring sites 136 and 739 were selected for continuous monitoring because the inlet manhole for the oil-grit separator at station 749 is in a travel lane, and the remaining two are periodically subjected to tidal action from Dorchester Bay. The catch basin at site 136 was selected for evaluation because the outlet pipe is isolated from the combined drainage infrastructure. Thus, the data from samples at this outlet could be compared to data from samples collected from the separator inlet.

Acknowledgments

Henry L. Barbaro of the Environmental Division and Thomas R. Lemisz of the Granite Avenue Maintenance Office provided planning and logistical support for MassHighway during this study, including periodic traffic control, structural BMP cleaning, and street sweeper sample collection. Paul D. Capel of the USGS developed a feasible and cost-effective sample-processing method for trace organic and inorganic constituents that was adapted for automatically collected highway runoff samples.

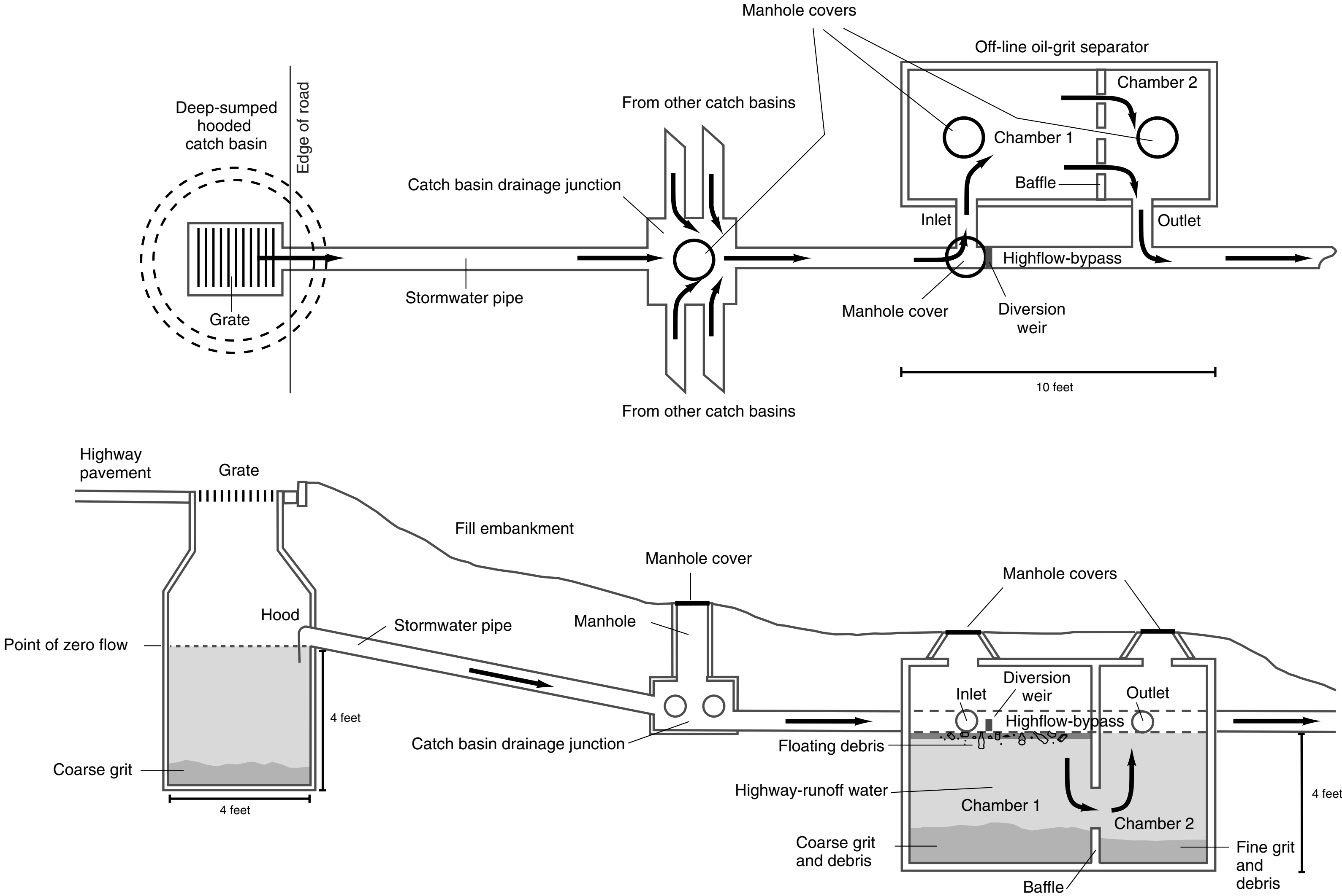

Figure 2. Schematic section of a deep-sumped hooded catch basin and a 1,500-gallon off-line oil-grit separator.

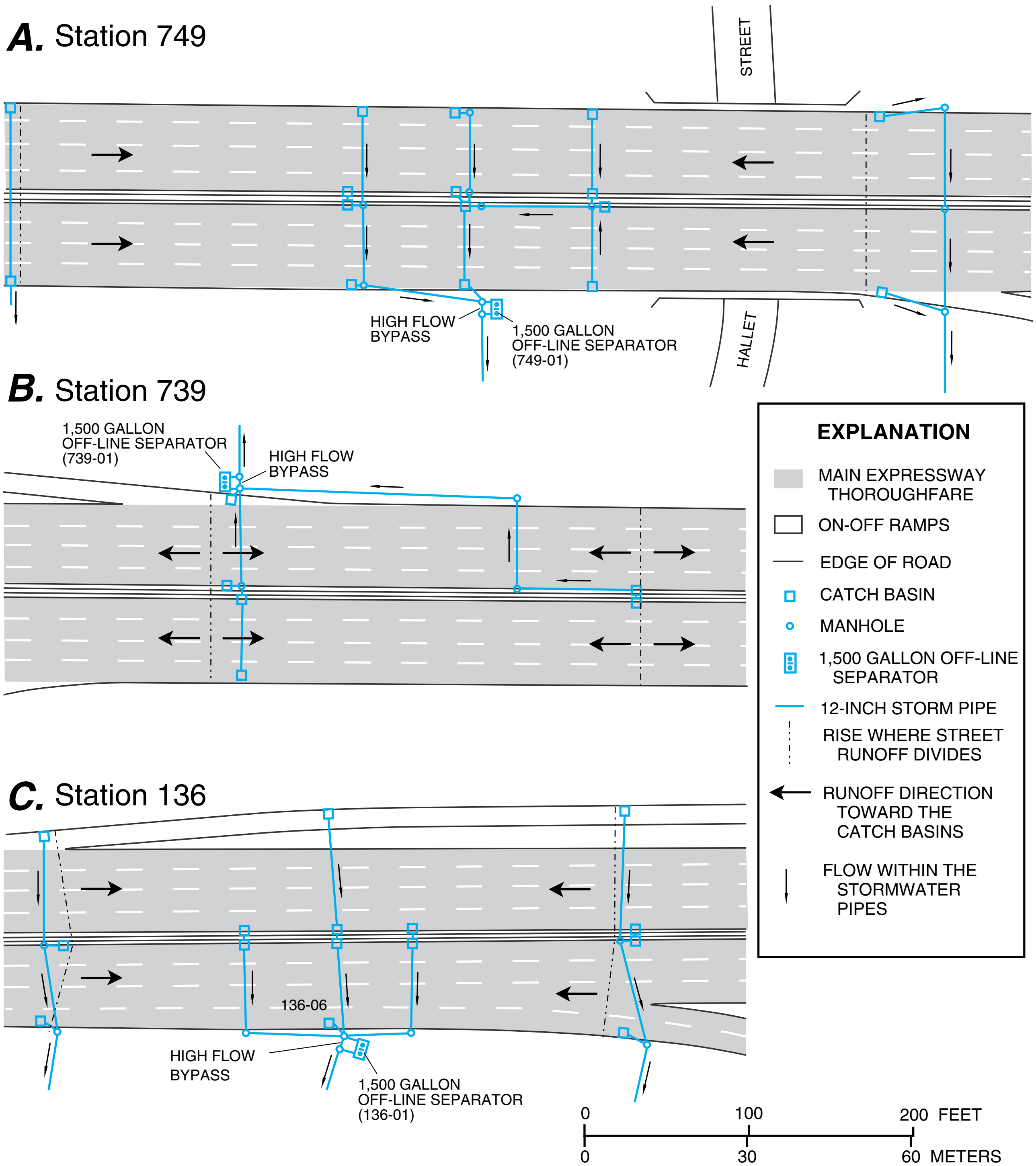

Figure 3. Actual drainage area of stations (*A*) 749, (*B*) 739, and (*C*) 136, along the Southeast Expressway, Boston, Massachusetts.

Table 1. Location and construction properties of selected structural best management practices, Southeast Expressway, Boston, Massachusetts

[**Latitude and longitude**: In degrees, minutes, and seconds. BMP, best management practice; ft, foot; na, not applicable; --,no data]

Station identifier	Latitude ° ′ ″	Longitude ° ′ ″	Total drainage area (acres)	Isolated shoulder perimeter (percent)	Number of catch basins	Median catch basin drainage area (acres)	Diversion weir height (ft)	Type of BMP
739-01	42 16 47	71 02 47	1.48	22	12	0.12	0.7	oil-grit separator
749-01	42 16 56	71 02 42	.73	6	6	.12	--	oil-grit separator
136-01	42 17 45	71 02 45	1.11	10	8	.10	.5	oil-grit separator
136-06	42 17 45	71 02 45	.23	6	1	na	na	deep-sumped hooded catch basin

METHODS FOR CONTINUOUS MONITORING OF HIGHWAY DRAINAGE

Automatic-monitoring techniques were used to characterize the temporal and spatial variability in water quality through two 1,500-gal separators and one deep-sumped hooded catch basin. Monitoring sites 136 and 739 were continuously monitored from April 1999 through June 2000, and August 1999 through June 2000, respectively. At each site, instruments automatically collected water samples and measured precipitation, air temperature, water level, flow velocity, turbidity, specific conductance, and water temperature in the structural BMP. Flow-proportional samples, which represent equal volumes of runoff, were collected for the analysis of suspended-sediment concentrations from the inlet and the outlet of each structural BMP at stations 136 and 739 during their respective monitoring periods. Flow-proportional composites were collected from the inlet and the outlet of each structural BMP during four storms and were analyzed for the event mean concentration (EMC) of chemical constituents. Discrete and EMC samples analyzed for concentrations of suspended sediment were used to estimate suspended-sediment loads and determine the effectiveness of each BMP in reducing suspended sediment and chemical concentrations. The frequency and spatial occurrence of fecal-indicator bacteria in highway runoff was determined by analyzing flow-proportional samples collected at the inlets of the two separators. Particles greater than 6 mm in diameter were collected at the outlet of station 739 during 12 storms to determine how effectively the separators were retaining large particles, particularly floatable debris. Precipitation was measured to estimate the total runoff of the drainage area for each station. Air temperature was measured to determine whether the precipitation was rain or snow. Water-level and flow-velocity data were used to estimate discharge to and from the structural BMPs. Turbidity was investigated as a surrogate for the concentration of suspended sediment. Water temperature was measured to correct conductivity values to 25°C. Small saline flows containing high concentrations of dissolved solids associated with deicing compounds commonly used during the winter maintenance period caused large changes in the specific conductance of the water in each separator. The increase in the concentration of dissolved solids increased the density of the water and introduced errors to the measured water levels. A linear correction, estimated from measurements of specific conductance, was used to correct the water-level measurements.

Just prior to the monitoring period, each structural BMP was drained and cleaned with a vacuum truck, and visually inspected to ensure that the chambers were clean enough for an accurate mass balance calculation at the end of the study. The quantity of bottom material retained in separators 136-01 and 749-01 was assessed three times, and the quantity of bottom material retained in separator 739-01 was assessed four times during the project. Because the catch basin 136-06 was in a highway travel lane, it was not practical to routinely measure the quantity of bottom material. This BMP was assessed just once, at the end of the monitoring period. Samples for particle size and visual analysis were collected twice from each of the three separators and once from the catch basin to compare with water-quality samples and street-sweeper samples. Samples of bottom material were collected and analyzed for concentrations of chemical constituents twice at each of the three separators to determine chemical-sediment relations. Street-sweeper samples were collected and analyzed for particle size three times during the project. The quantity and type of samples collected are summarized in table 2.

Table 2. Quantity and type of samples collected, and location of water level, water-velocity, water-quality, meteorology, and physical measurements made at each structural best management practice, Southeast Expressway, Boston, Massachusetts

[Sample quantities do not include quality-assurance samples; C, continously monitored; (x), number of months]

Measurement or sample location	Water level	Velocity	Water temper-ature	Air temper-ature	Specific conductance	Turbidity	Precip-itation
Station 136	--	--	--	C(14)	--	--	C(14)
Oil-grit separator 136-01 (storage)	C(14)	--	C(14)	--	C(14)	--	--
Oil-grit separator 136-02 (outlet)	C(14)	C(14)	C(14)	--	C(14)	C(14)	--
Oil-grit separator 136-03 (inlet)	--	--	C(14)	--	C(14)	C(14)	--
Oil-grit separator 739 (bypass)	C(14)	C(14)	--	--	--	--	--
Catch basin 136-04 (outlet)	--	--	--	--	--	--	--
Catch basin 136-05 (inlet)	--	--	--	--	--	--	--
Catch basin 136-06 (sump)	C(14)	--	--	--	--	--	--
Station 739	--	--	--	--	--	--	C(10)
Oil-grit separator 739-01 (storage)	C(10)	--	C(10)	--	C(10)	--	--
Oil-grit separator 739-02 (outlet)	--	--	C(10)	--	C(10)	C(10)	--
Oil-grit separator 739-03 (inlet)	C(10)	C(10)	C(10)	--	C(10)	C(10)	--
Oil-grit separator 739 (bypass)	C(10)	C(10)	--	--	--	--	--
Oil-grit separator 749-01 (storage)	--	--	--	--	--	--	--

Measurement or sample location	Suspended sediment	Water quality	Bacteria	Bottom-material quantity	Bottom-material particle size	Bottom-material quality	Debris collection
Station 136	--	--	--	--	--	--	--
Oil-grit separator 136-01 (storage)	--	--	--	3	2	[1]2	--
Oil-grit separator 136-02 (outlet)	379	4	--	--	--	--	--
Oil-grit separator 136-03 (inlet)	379	4	4	--	--	--	--
Oil-grit separator 739 (bypass)	--	--	--	--	--	--	--
Catch basin 136-04 (outlet)	314	4	--	--	--	--	--
Catch basin 136-05 (inlet)	243	4	--	--	--	--	--
Catch basin 136-06 (sump)	--	--	--	1	1	--	--
Station 739	--	--	--	--	--	--	--
Oil-grit separator 739-01 (storage)	--	--	--	4	2	[1]2	--
Oil-grit separator 739-02 (outlet)	369	4	--	--	--	--	12
Oil-grit separator 739-03 (inlet)	465	4	5	--	--	--	--
Oil-grit separator 739 (bypass)	--	--	--	--	--	--	--
Oil-grit separator 749-01 (storage)	--	--	--	3	2	[1]2	--

[1]Two or more particle size ranges analyzed.

Design of Highway-Drainage Monitoring Stations

Instrumentation shelters with trap doors were installed over the distribution manhole next to each separator. Trap doors provided protective entry to the drainage-distribution system for probe and sample-line maintenance. Sites 136-01 and 136-06 were monitored from the same location and instrument bank. The instrumentation consisted of a Campbell Scientific Inc. (CSI) 23X datalogger as the measurement, control, and data-storage module. Because electric and phone lines were not readily available, two 60-amp hour batteries recharged by 30-watt solar panels were used to power the controller and other instruments. A CSI VS1 voice-data telephone modem and a cellular phone were used for telecommunications. The datalogger measured precipitation from an 8-in. Texas Electronics, Inc. tipping bucket rain gage and air temperature from a CSI 107 probe mounted at a height of 9 ft above ground surface. A CSI precipitation adapter was installed on each rain gage during the winter months to measure snow and ice quantities, as well as rainfall. Water level was measured by a KPSI series 173 submersible pressure transducer mounted within each structural BMP near the outlet and 2 ft below the point of zero flow (PZF). The PZF water level was controlled by the height of the outlet pipes (fig. 2). Two Marsh McBirney, Inc., submersible electromagnetic pressure sensors measured water velocity and level within each separator bypass pipe and the inlet of station 739 and the outlet pipe of station 136.

Water level, air temperature, and precipitation were measured at 1-minute intervals. Water-level measurements were used to determine whether to activate sensors for flow and water quality. During periods of little or no flow, when water level in the separator or catch basin was less than 0.02 ft above the PZF and there was no precipitation, all sensors were activated, measured, and recorded on a two-hour basis; during storms, however, the frequency of data recording and instrument activation for all sensors increased to 1-minute intervals. The dataloggers were programmed with these intervals to maximize the information about changes in stage, velocity, precipitation intensity, and water quality, and for the collection of water samples, while preventing collection of excess data at times of little or no flow. Data were usually retrieved via modem every two days.

Measurement of Discharge

Discharge measurements did not alter the capacity of the structural BMPs, or create artificial backwater conditions that could prevent suspended solids or bed-load materials from either entering or discharging from the structural BMPs. Continuous measurements of water level in each structural BMP indicated that the water level generally remained at or near the PZF; thus, it was assumed that any amount of inflow (not including bypass flow) displaced an equal amount of outflow.

Instantaneous discharge to and from the associated separators was calculated by one of two methods. During higher flows, an integrated electromagnetic velocity and level sensor measured pipe-flow velocity and water level. Using the velocity and level measurements and the physical dimensions of the measurement location, a flowmeter calculated discharge on the basis of the cross-sectional area of runoff at a given section of pipe and the associated mean velocity. Flowmeter measurements and flow calculations were transmitted to, and recorded by, the datalogger. An integrated electromagnetic velocity and level sensor was installed in the bypass pipe of each separator and in the inlet of station 739 and in the outlet pipe of station 136. Sensor placement differed between the two sites because of differences in the drainage-system construction. After installation, each flowmeter was calibrated to site-specific conditions on the basis of a known quantity of flow. Calibrated flow, created by pumping water with a 9,600-gal/hr centrifugal pump, was discharged upstream of the sensor location. Pump flow was measured by a Data Industrial flow sensor (series 200) inserted into an 8-ft long, 4-in.-diameter polyvinylchloride (PVC) pipe connected to the pump discharge. In addition to this calibration method and prior to the monitoring period, instantaneous stormwater flowmeter measurements were compared to flow measurements made simultaneously from a 12-in. Thelmar volumetric weir in conjunction with a WaterLog (H350-Lite) pressure transducer and a pneumatic bubble regulator upstream of the integrated sensor. The maximum difference between the two methods in the flow range of 0.1 to 0.45 ft^3/s was 0.04 ft^3/s. When the water depth at the flow sensor was less than 0.1 ft, flow values calculated by the flowmeter were not considered reliable because the velocity sensor was not fully submersed.

A second method to measure flow was needed during low flows because the flowmeter was not capable of calculating discharge when the integrated sensor lost contact with the water surface. Therefore, a stage/discharge relation based on the water level within the second chamber of the separator was used to compute flows. Each stage/discharge relation was developed during the pre-monitoring period by monitoring water levels in each separator while simultaneously monitoring flow with the volumetric weir and associated equipment. Volumetric measurements made from the separator outlet pipe were also used to develop and test the low-end stage/discharge rating.

Inflow to the catch basin was calculated by applying a stage/discharge relation to continuous water-level measurements made in the sump of the catch basin. This relation was developed by simultaneously measuring pump flow from the two 9,600-gal/hr centrifugal pumps, measuring flow from a 12-in. weir located downstream of the catch basin, and measuring catch-basin-sump level. Paired stage and discharge values were produced from a series of water-level measurements made after pump flow, weir flow, and catch-basin-sump level stabilized at multiple pumping rates over the range of the pumps. This process was repeated until both pumps were at the maximum setting. After stabilization occurred at the maximum setting, the process was repeated to the start point. The stage/discharge relation was based on 21 discrete discharge measurements and mathematically extended above the greatest flow rate (about 0.25 ft^3/s). The resultant stage/discharge relation sufficiently covered 83 percent of the peak discharges during the monitoring period.

Measurements of Turbidity, Specific Conductance, and Water Temperature

To reduce systematic error (error associated with sensor drift and fouling) and increase the ability to make measurements at water levels less than the physical submersion limit of the probes, a single Global (model WQ 700) turbidity sensor, and a single CSI (model 247) integrated specific conductance and water-temperature probe were used to measure alternating pump-activated streams of water from the inflow and outflow of each structural BMP. The respective sensors were installed in a self-draining-flow cell equipped with a debubbler pipe. A pipe tee combined the peristaltic-pump discharge tubes; mechanical closure of the silicon tubing in the pump head prevented back flow through the quiescent pump. A Data Industrial flow sensor (series 4000) was used to measure intermittent flow from the two peristaltic pumps (ISCO model 110). Pump intakes were mounted next to the automatic sampler intakes for sample uniformity. Pump-transport velocities were similar to those in the automatic samplers; therefore, in situ turbidity measurements in pumped water were technically similar to those in water samples collected by the automatic samplers.

During the first 2 hours of a runoff event, if flow was greater than or equal to 0.02 ft^3/s, the datalogger was programmed to start a 2-minute cycle: the inflow peristaltic pump was activated for a period of one and a half minutes, pump flow was measured and recorded by the inline flow meter, and specific conductance, water temperature, and turbidity were measured and recorded at the end of the pumping interval. The pumping interval provided enough time to exchange the volume of water within the flow cell several times. The flow cell was allowed to drain during the final 30 seconds of the 2-minute cycle. The cycle was then repeated by the use of the outlet peristaltic pump. Alternating 2-minute cycles of measurements of specific conductance, water temperature, and turbidity were made for a period of 2 hours; thereafter, cycles of measurement were made less frequently and proportional to flow to reduce battery-power consumption during extended operations. An example of water quality and stage data collected from this system for a separator at station 739 is shown in figure 4.

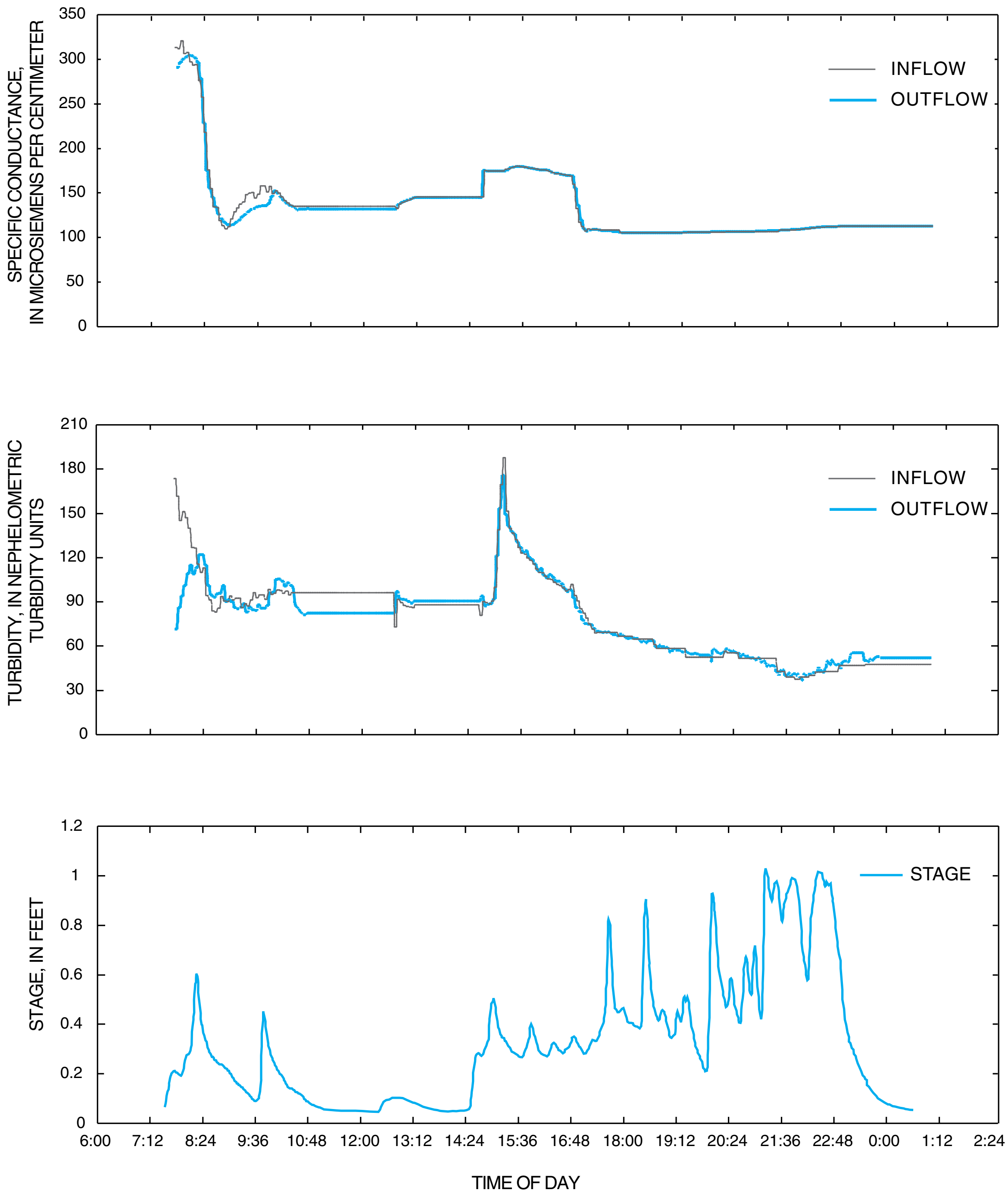

Figure 4. Specific conductance, turbidity, and stage measured at highway runoff monitoring station 739, September 10–11, 1999, Southeast Expressway, Boston, Massachusetts.

COLLECTION AND ANALYSIS OF SAMPLES

Highway-runoff samples for the analysis of suspended-sediment concentration, water chemistry, and bacteria were collected automatically with flow-proportional methods at each structural BMP. Sampling-equipment setup, however, varied with respect to the constituent sampled. Large debris entrained in highway runoff was composited in a collection structure at the outlet of a separator. Bottom material retained in the structural BMPs was volumetrically assessed and sampled several times during the study. Samples of bottom material were analyzed for particle size, density, and chemical concentrations. Samples of sediment collected from street sweepers in the vicinity of the highway test sites were analyzed for particle size. The contents of the bottom material, street sweeper, and debris samples were quantified in identifiable categories.

Automatic Sample Collection

Highway-runoff samples for the analysis of suspended-sediment concentration and water chemistry were collected at the inlet and outlet of each structural BMP by an automatic sampler (ISCO model 6700) controlled by a datalogger. The first sample was collected when flow exceeded 0.02 ft^3/s and subsequent samples were collected at flow-proportional intervals. Maximum vertical-sampling distance from the sampler-pump head to any fixed sampling point was about 10 ft. All sampler lines were mounted in a sloping manner when possible to allow for the complete purging and draining of sample water between samples. The lengths of the sampler lines ranged from 12 to 30 ft for the separators, and were 24 and 59 ft long for the inlet and the outlet of the catch basin, respectively.

Sampler intakes were fixed to static mixers at each sampling point for all sampling locations, except for the catch-basin inflow (fig. 5). The purpose of the static mixer was to provide a secure and consistent mount for the sampler intake, reduce transport velocity, and to provide agitation to produce a sample that represented the average concentration of suspended sediment. Sampler intakes were oriented in a horizontal and downstream direction. This configuration minimizes debris accumulation by forming a small eddy that captures sand particles at the intake, and thus, allows the sampler to collect a more representative sample of the coarse load (Edwards and Glysson, 1999). The static mixers were constructed from a 0.5-in. marine-grade homogenous polymer sheet and consisted of two semicircular plates 1.2 in. high at the center. Two polyvinylidenefluoride (PVDF) 0.5-in. bulkhead-compression fittings were attached to each side of the first plate 1.2 in. from the center and 0.6 in. from the bottom. The second plate had two semi-circular 0.7-in. holes in parallel with the bulkhead fitting to prevent sediment accumulation between the two plates and was mounted about 4 in. behind the primary plate.

The structure for stormwater sample collection was mounted below the grate in the catch basin and was designed to concentrate stormwater through a common point from which the sample was collected. The structure was constructed from a 0.5-in. marine-grade homogenous polymer sheet and was designed similar to the collection box described by Spangberg and Niemczynowicz (1992). A 1.25-in. PVDF tee was located at a common drainage point on the bottom of the structure. A free-swinging flapper valve was attached to one end of the tee. The sampler line was inserted through a compression fitting at the opposite end of the tee and parallel to the direction of flow. The end of the sampler tube was positioned approximately midway between the tee and the flapper valve. The flapper valve created a small amount of backpressure enabling sample collection at flows as low as 0.02 ft^3/s.

Suspended Sediment

Automatic samplers to collect suspended sediment held 24 1-L plastic bottles attached to sample lines made of 0.5-in. polyethylene tubing. Discrete samples were generally collected on one of three flow-proportional thresholds based on the volume of the structural BMP. Once the accumulated flow was equal to or greater than the threshold, the automatic sampler collected a water sample, and the accumulated flow was zeroed. In general, the threshold for the second, third, and fourth sample collected from the inlet and outlet of the separator was 100 ft^3 (1/2 the volume of the device), the threshold for the next 16 samples was 200 ft^3, and the threshold for the last four samples was 400 ft^3. The dataloggers were programmed in this way to maximize the information obtained about the initial

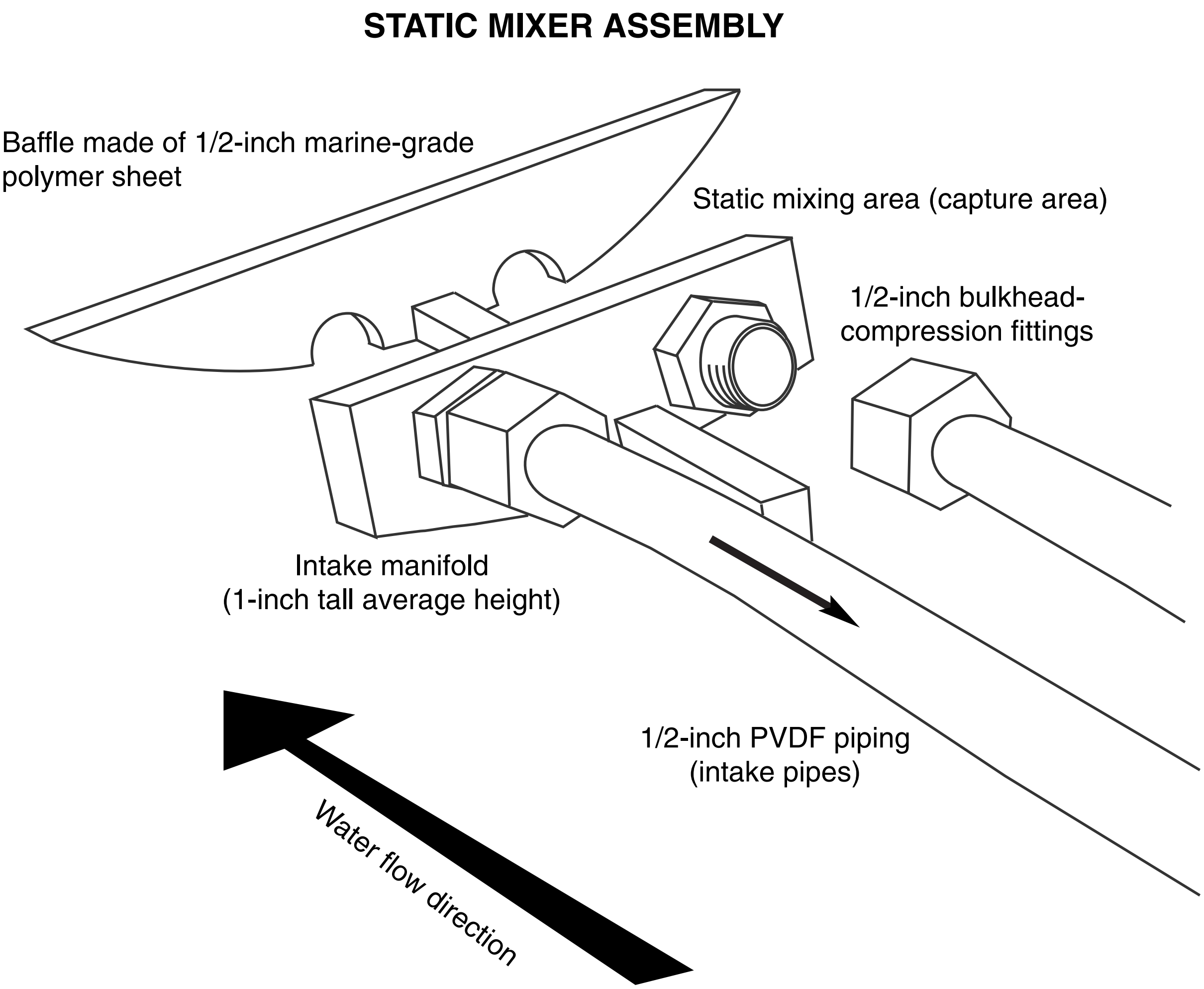

Figure 5. Schematic diagram of a static mixer used in conjunction with the automatic samplers.

runoff period and to ensure that samples for the analysis of suspended-sediment concentration were collected throughout the entire storm. During large storms, sample bottles were retrieved and replaced as needed to characterize the entire storm. The date, time, water level, sample number, and sampler response was recorded by the datalogger each time a sample was triggered.

Solid-phase concentration values may be determined by the suspended-sediment concentration (SSC) or the total suspended solids (TSS) method. Although SSC and TSS are often cited interchangeably in the literature to describe the total concentration of suspended solid-phase material, the analytical methods differ and can produce substantially different results (Bent and others, 2000). The SSC method (ASTM, 2000) uses standardized procedures and equipment to measure all of the sediment and the net weight of the water-sediment mixture to calculate concentration. The TSS method (American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1995) requires analysis of a subsample extracted from the original sample. Contrary to the literal description, SSC includes clays, silts, sands, gravels, asphalt particles and other road-surface debris, and organic and synthetic materials. Although analytical uncertainties for the two methods are similar, larger errors can occur during processing of TSS samples because agitation of a sample containing sand-size materials can produce aliquots which under-represent the true sediment concentration (Gray and others, 2000). Therefore, the SSC method was chosen to measure the solid-phase concentrations to provide the most accurate assessment of BMP efficiencies. Samples were analyzed for SSC and particle size at the USGS Kentucky District Sediment Lab (Guy, 1970; Sholar and Shreve, 1998).

Water Chemistry

Several changes were made in the sampling equipment and programming for the automatic collection of water samples for analysis of inorganic and organic constituents. Each automatic sampler was configured to hold one 20-L Teflon-lined plastic bottle. The Teflon lining consisted of a double wall Teflon pouch manufactured by NOW Technologies and constructed in a clean room without the use of glue or adhesives. Automatic sample lines were replaced with pre-cleaned 0.5-in. Teflon tubing. The pump-head tubing was also exchanged with a pre-cleaned replacement and a Teflon discharge tube. Samples were collected on a single flow-proportional threshold on the basis of the expected volume of runoff, volume of individual samples, and maximum number of sample volumes relative to bottle size. The empty space around the sample bottle was packed with ice prior to each storm to preserve sample integrity.

A multi-step process was used to clean all wetted parts associated with the automatic sampler and the processing equipment before collecting trace inorganic and organic constituents. The initial cleaning consisted of washing the interior and exterior with a phosphate-free laboratory grade soap and tap water, scrubbing surfaces with a plastic brush, rinsing with tap water, and a final rinse with deionized water. Circulating the solution through the tubing with a peristaltic pump cleaned the interior of the sampler tubing. Cotton balls were forced hydraulically through the tubing to remove internal deposits or films that were difficult to remove by circulating solution alone. All components were dried in a laboratory-circulating oven for a minimum of 12 hours at 105˚C. After the water evaporated and the components cooled, they were placed in a large stainless steel pan in a fume hood and immersed in a 1-to-1 hexane-to-acetone solution. A Teflon diaphragm pump was used to circulate the solution through the sampler tubing. The components were allowed to soak, with occasional agitation, for a period of six hours. After appropriately dispensing the waste solution, all components except the tubing were rinsed with a 1-to-1 hexane-to-acetone solution from a Teflon squeeze bottle, air-dried in a fume hood over night, and dried in a laboratory circulating oven for a minimum of 12 hours at 60˚C. Because the rate of cleaning-solution volatilization was limited within the sampler tubing, the tubing was purged with purified nitrogen gas for approximately 20 minutes and then thoroughly rinsed with copious amounts of deionized water. The final steps involved immersing the components in a 5-percent solution of hydrochloric acid for a period of 6 hours. The same solution was slowly circulated through each sampler tube for 6 hours. All components were thoroughly rinsed with deionized water until the specific conductance of the waste rinse water was less that 1 μS/cm. Sample bottles, Teflon lines, pump-head tubes, discharge tubes and processing components were double-bagged to maintain clean techniques. Bags were left on the bottles during installation for subsequent transport.

Samples were collected and processed according to “clean hands-dirty hands” techniques (Wilde and Radtke, 1999). Samples were processed in the USGS Massachusetts District laboratory clean room, usually within 24 hours of the time that collection of the first sample was triggered by the automatic sampler. Subsamples for the analysis of suspended sediment, and inorganic and organic constituents were split directly from the Teflon-lined bottle. This method eliminated sample contact with additional processing equipment and reduced the potential for contamination. Subsamples were dispensed under low pressure directly from the sample bottle with a specialized cap, which included a 3.1-mm (inner diameter) Teflon dispensing tube, a pressure port, and a relief valve. Compressed nitrogen gas applied to the pressure port filled the interior area between the bottle wall and the pouch, compressing the pouch and dispensing the sample. Homogenization of the sample was accomplished by fastening the bottle to a cradle assembly capable of rotating 210 degrees. The sample bottle was rocked the full 210 degrees at least 20 times at a frequency of one cycle per second prior to dispensing. The rocking motion was continued throughout dispensing for all samples except for samples analyzed for dissolved constituents. Dissolved inorganic constituents were filtered through a 600-cm Gelman capsule filter with a 0.45-mm pore size. Dissolved organic carbon was filtered through an inline Teflon filter holder with a 47-mm silver membrane filter with a 0.45-mm pore size. All samples were double bagged and stored on ice for overnight delivery to the USGS National Water Quality Laboratory in Lakewood, Colorado, for chemical analysis (Wershaw and others, 1987; Fishman and Friedman, 1989; Fishman, 1993; Fishman and others, 1994).

Bacteria

Flow-proportional, discrete water samples for the analysis of bacteria were collected from a second dedicated automatic sampler at the inlet of each separator. Each automatic sampler was configured to hold twenty-four 350-mL glass bottles. Sample lines consisted of sterile 0.5-in. silicon tubing. The pump head and discharge tubing were pre-cleaned and sterilized. Sample bottles were autoclaved and treated with a 15-percent solution of ethylenediaminetetraacetic acid (EDTA) to chelate sample trace-metal concentrations that would be potentially toxic to bacteria (American Public Health Association and others, 1992). The sampler base was packed with bagged ice prior to each storm. Samples for analysis of bacteria were collected automatically along with the samples collected for analysis of inorganic and organic constituents.

Sequential discrete samples for analysis of fecal and *Enterococci* bacteria were periodically composited because the amount of equipment and personnel limited the number of analyses that could be completed within the method holding time. The entire aliquot of two or more sequential discrete samples was composited into a sterile 2-L bottle. The samples for bacteria analysis were processed on the basis of the methods described by Myers and Sylvester (1997) and the U.S. Environmental Protection Agency (USEPA) method 1600 (1997) on-site and placed in portable incubators in a mobile field laboratory. Figure 6 illustrates an example of flow-proportional automated collection of samples for analysis of chemical and bacterial constituents. EMCs for analysis of fecal-indicator bacteria were mathematically determined by calculating the average value for flow-weighted concentrations of sub-composites.

Miscellaneous Debris Samples

The automatic samplers used at the inlet and outlet of each structural BMP limited the particle sizes of suspended sediment collected to less than 9.5 mm in diameter; this limitation excluded large organic particles and debris such as litter and leaves. Thus, large buoyant and neutral buoyant (particles that neither settle or float) particles were sampled by attaching a debris-collection device (fig. 7) to the outlet headwall of station 739. Sampling the inflow for debris was not practicable during this study because the sampling process could adversely affect the flow to the oil-grit separator. The device consisted of a 1.5- by 1.5- by 2-ft wood frame covered on 5 sides with a 6- by 6-mm galvanized-steel screen. The captured material was retrieved, through an access door on the top of the device at the end of each storm or series of storms. The quantity of captured material was determined by drying the contents at 105˚C to a constant weight, and the debris was identified by visual inspection of each dried sample. Identifiable materials were placed in general categories, such as gravel, cigarette butts, plastics (wrappers, Styrofoam, and other plastics), and vegetative matter. The net weight of each category for each sample was measured and recorded to the nearest milligram.

Measurement of Volume and Mass of Bottom Material in the Oil-Grit Separators and the Catch Basin

Bottom material is a mixture of sediment, natural organic material (leaves and sticks), roadway materials, and litter remaining on the bottom of structural BMPs between storms (Bent and others, 2000). For the purpose of this report, bottom sediment is bottom material that does not contain litter or other identifiable materials, such as metal objects. Two methods were used to measure the volume of bottom material in each BMP. During site assessments in November 1998 and during active monitoring in December 1999 and January 2000, measurements of depth (from the water surface to the top of the accumulated bottom material) were made with a calibrated staff at a minimum areal density of 1 measurement per square foot. During the site assessment of separator 739-01 in August 1999, prior to the monitoring period, and also in June 2000 during subsequent assessments of all three separators and the catch basin at the end of the monitoring period, at least four depth measurements were made with an engineer's rule per square foot after each BMP was drained.

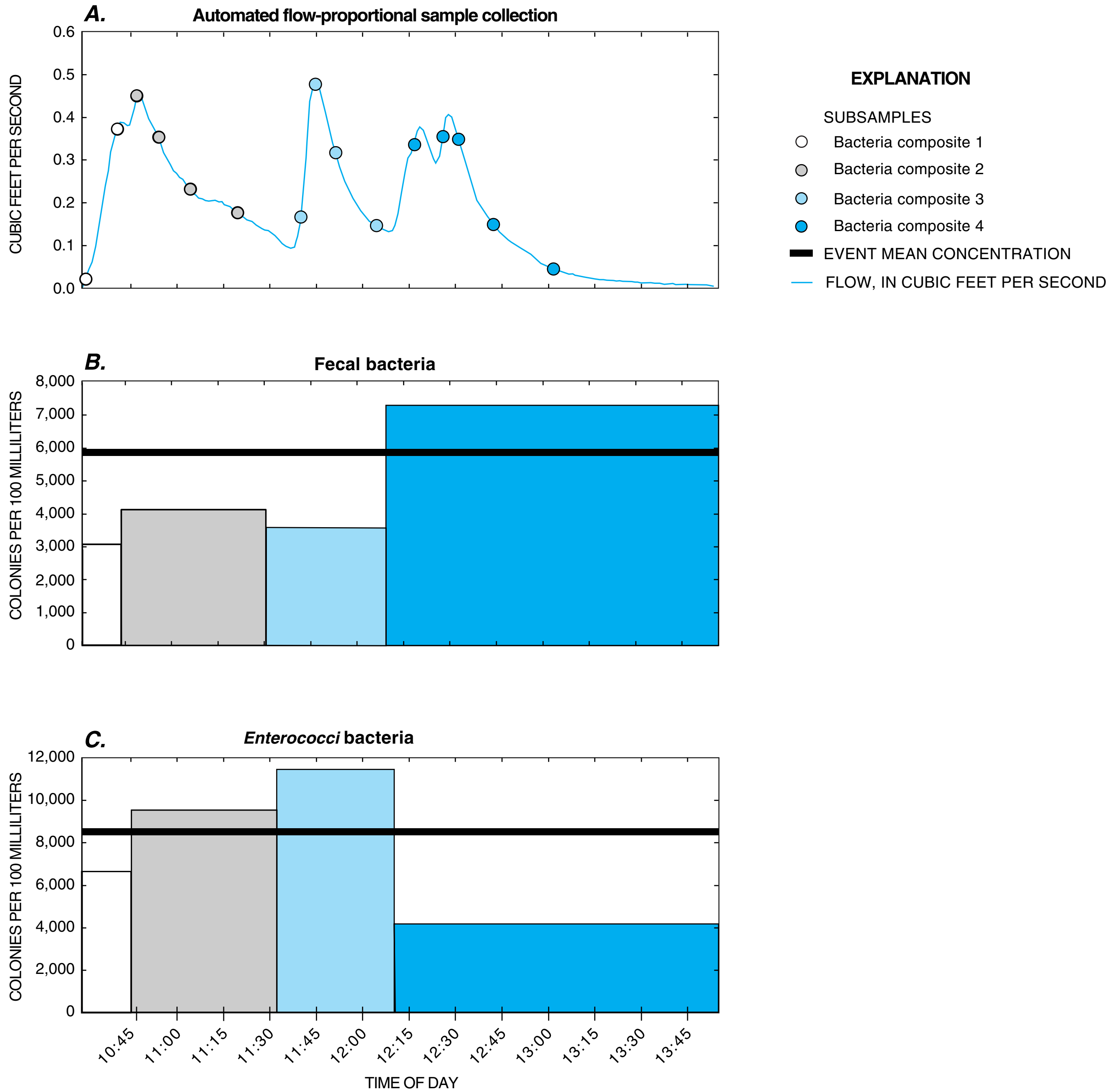

Figure 6. Example of automated flow-proportional collection of stormwater samples at station 739, along the Southeast Expressway, Boston, Massachusetts.

Figure 7. Debris-collection structure at the outlet of an oil-grit separator during a rainstorm on May 25, 2000, station 739, Southeast Expressway, Boston, Massachusetts.

A centrifugal pump with a transparent discharge line was used to drain each device. The pump intake was fitted with a strainer that had a 1-ft^2 plate mounted on the bottom to reduce direct vertical drafting near the sediment interface. The pump intake was placed just below the water surface in the first chamber of the separators to avoid drawing floating debris into the second chamber, and was lowered as the water level decreased until the BMP was nearly empty. The discharge hose was continually monitored for visual changes in turbidity as the intake lowered. The volume of bottom material was estimated by iterative averaging between volumetric measurement points at an areal density of 16 points per square foot.

Bottom-material cores were collected in the catch basin and the first chamber of the separators with a 2-in.-diameter acrylic tube. A thin flexible spatula was used to seal the core in the tube prior to removal. The length of the core was recorded and the contents stored in a resealable bag. Cores were not collected in the second chamber of the separators because the core tube could not penetrate the large amount of decaying vegetation and other debris in the bottom material. Instead, grab samples were collected at several locations and composited into a resealable bag. The volume of the grab samples was estimated by measuring the depth of bottom material after allowing it to settle over several days in a vessel of known size. Several cores and samples were collected in each structural BMP (and chamber, where possible) for particle-size and density analysis. Particle-size analysis was performed at the USGS Iowa Sediment Laboratory (Guy, 1969). Density was determined in the USGS Massachusetts District laboratory by drying known volumes of sediment to a constant weight. The bottom-material mass in each structural BMP was estimated by multiplying the total volume of bottom material contained in each chamber by the associated density.

The contents of the bottom material were identified by visual inspection of each dried sample. Identifiable materials were placed in general categories, such as glass, metal (tin foil, bottle caps, and other metal objects), cigarette butts, plastics (wrappers, Styrofoam, and other plastics), and vegetation. The net weight of each category for each sample was measured and recorded to the nearest milligram.

Collection of Bottom-Material Samples from the Oil-Grit Separators

Samples of bottom material were collected from three 1,500-gal oil-grit separators in November 1998 and from December 1999 through January 2000 with the use of a stainless steel Eckman dredge (Wildco). The Eckman dredge can be used to collect clay, silt, and sand-sized particles (Mudroch and MacKnight, 1994). The dredge was deployed several times at different locations from each manhole to provide adequate sample volume and a representative sample. Samples of bottom material from each chamber were removed from the dredge and placed in a pre-cleaned, stainless steel bowl and homogenized with a stainless steel spatula. Samples were collected and placed in pre-cleaned containers and preserved on ice for subsequent processing of bottom sediment in the USGS Massachusetts District laboratory and for particle-size analysis at USGS Iowa Sediment Laboratory. Grab samples of native water were also collected and placed in pre-cleaned, Teflon-lined bottles. The Eckman dredge, stainless steel bowl, and stainless steel spatula were cleaned in the field between sites by washing the interior and exterior with a phosphate-free laboratory-grade soap and tap water, scrubbing the surfaces with a plastic brush, and rinsing with deionized water.

Samples of bottom material collected from three separators in November 1998 were composited in proportion to the estimated volume of retained material in each separator. Composites of bottom material collected from each separator from December 1999 through January 2000 were processed individually for chemical analysis relative to three particle sizes, in part, by using the methods described by Shelton and Capel (1994). The contents of the bottom material were visually inspected and nonhomologous materials (for example, plastic and foil wrappers) that could bias chemical analysis were removed. With a Teflon squeeze bottle and native water, the original sample was wet-sieved through a pre-cleaned 2.00-mm sieve. A subsample of the sieved material was wet-sieved a second time with a pre-cleaned 0.062-mm nylon-mesh sieve and plastic-sieve frame. Native water and sediment particles less than 0.062 mm in diameter were collected in a pre-cleaned bottle and allowed to settle for several days. The supernatant was decanted and the sediment retained for chemical analysis. Particles (consisting of gravel, asphalt, leaves, and woody debris greater than 2.00 mm in diameter) were reduced to less than 2.00 mm in diameter and homogenized in a laboratory blender made of stainless steel and borosilicate glass to ensure a representative sample.

Samples of bottom sediment consisting of particles less than 0.062 mm in diameter, between 0.062 mm and 2.00 mm in diameter, and particles originally greater than 2.00 mm in diameter were submitted to XRAL Laboratory for analysis of 32 inorganic elements and total organic carbon (TOC). Concentrations of inorganic constituents were determined with the use of ICP emission spectroscopy and two different digestion methods for size fractions less than 0.062 mm in diameter and between 0.062 mm and 2.00 mm in diameter (site 136 did not include both digestion methods for particles less than 0.062 mm because of a lack of available sample volume). Two analytical methods were used to compare the differences in digestion procedures that can affect measured trace-element concentrations and to provide greater transferability to other studies. The primary method, USEPA method 3050B (U.S. Environmental Protection Agency, 2000), digested samples with repeated additions of nitric acid and hydrogen peroxide. The secondary method, XRAL method ICP70 (Société Générale de Surveillance, 2001), digested samples with aqua regia acid. Digestion procedures for total recoverable trace elements, such as the two methods discussed, have been previously considered by the USEPA as a method that could provide an indication of the bioavailability of trace elements (U.S. Environmental Protection Agency, 1986); however, concentrations of total recoverable trace elements do not necessarily relate to ecosystem effects and should be considered as one of many explanatory variables to be measured in addition to more direct measurements of the ecological effects on aquatic biota (Breault and Granato, 2000; Buckler and Granato, 1999). TOC was determined by infrared spectroscopy. Samples of bottom sediment consisting of particles less than 2.00 mm in diameter and particles originally greater than 2.00 mm in diameter were submitted to the USGS National Water Quality Laboratory in Lakewood, Colorado, for analysis of polyaromatic hydrocarbons (PAHs) and total polychlorinated biphenyls (PCBs) (Foreman and others, 1995). Particle-size analysis excluded all identifiable debris, such as leaves, sticks, cigarette butts, wrappers, and other plastic items.

Sediment Samples from Mechanical Street Sweepers

Mechanical street sweepers were used on the pavement three times during the study period (November 1998 through June 2000). Mechanical sweepers use revolving brushes to move particulates into the path of a horizontal cylindrical brush that pushes material onto a conveyer belt leading to a storage hopper. The street was swept during the late evening hours to reduce traffic disruptions. MassHighway personnel collected grab samples from the center of the hopper when the street sweeper was in the vicinity of the highway test sites. Samples were processed for particle-size analysis at USGS Iowa Sediment Laboratory as described previously.

QUALITY ASSURANCE/ QUALITY CONTROL

The reliability of the real-time measurements and suspended sediment, chemical, and biological data was ensured by the preparation and analysis of many types of quality-control samples. These data were summarized to assess the potential for sample contamination and the accuracy and precision of various types of sample analysis and sampling methods. These analyses provided the basis for the interpretation of the efficiency of each BMP.

Quality-Control Samples

The reliability of the data collected as part of this study was ensured by the preparation and analysis of concurrent field replicates, replicate splits, sequential replicates, equipment blanks, field blanks, source-solution blanks, material blanks, and ambient-atmospheric blank samples. In addition to the collection of quality-control samples, numerous other tests were done to ensure the reliability and representativeness of the data. Replicate samples provide a measure of any variability introduced during sample collection, processing, and analysis. In this study, concurrent field replicates were samples collected at the same time by comparable methods; split replicates were subsamples from a single sample; and sequential replicates were two or more samples collected at the same location, but at slightly different times. Replicate samples were analyzed by comparing the relative percent differences (RPD) of the results. Equipment blank samples were used to test for positive bias that could have resulted from contamination from any stage of the collection or analytical process. A processing blank was similar to an equipment blank, but sample water was exposed only to sample-processing equipment, not sampling equipment. Source-solution blanks were prepared from deionized water produced by a Millipore purification system that uses reverse osmosis and electrodeionization. Deionized water was also used to clean equipment. The material blank consisted of source solution in which a material fragment was soaked. Ambient-atmospheric blanks consisted of source solution exposed to ambient and atmospheric conditions that prevailed when the sampling equipment was cleaned and when environmental samples and equipment blanks were processed. Quality-control samples are summarized in table 3.

Table 3. Summary of quality-control samples collected in the structural best management practices along the Southeast Expressway, in the U.S. Geological Survey, Massachusetts District laboratory, and by the U.S. Geological Survey, Office of Water Quality, Branch of Quality Systems

[--, no data]

Sample type	Number of quality-control samples collected			
	Suspended-sediment concentrations	Bottom-sediment quality	Water quality	Fecal-indicator bacteria
Field blank	--	--	--	4
Equipment blank	16	--	[1]1	2
Replicate split	4	3	5	2
Lab duplicate	--	2	--	--
Sequential replicate	27	--	--	--
Concurrent replicate	30	--	--	--
Single blind	3	--	--	--
Double blind	6	--	--	--
Particle size	--	3	--	--
Source-solution blank	--	--	2	1
Ambient-atmospheric blank	--	--	2	--
Material blank	--	--	1	--
Data location (this report)	Appendix 1, Table 1B, 1C, 1D, 1H	Appendix 1, Table 1G	Appendix 1, Table 1H	Appendix 1, Table 1I

[1]Two equipment blanks collected for dissolved organic carbon.

All continuous-monitoring equipment was tested under controlled conditions prior to installation and met or exceeded the manufacturer's specifications. Site visits were generally conducted at a minimum frequency of once per week. During each site visit, an independent measurement of the water level of the oil-grit separator was compared to the current datalogger measurement, and debris accumulation was noted and removed from the inlet, outlet, and bypass pipe of each oil-grit separator and from the stormwater-collection structure installed in the deep-sumped hooded catch basin. Probes were inspected, cleaned, and calibrated as necessary, and the sample and pumping system tubes were inspected for wear and debris accumulation. On a less frequent schedule, the precipitation gage was inspected and tested. In general, continuous water-level measurements were within 0.02 ft, temperatures were within 0.5˚C, and specific conductance was within 10 percent of check measurements. Error associated with turbidity sensor fouling was minor, but sensors exhibited a large amount of drift and became inoperative when temperatures were near freezing. The water-quality pumping system that operated semi-continuously performed satisfactorily; however, coarse debris and glass particles periodically deteriorated the pump-head tubing, which caused the pump to malfunction.

About 3 percent of all samples for the analysis of suspended-sediment concentration from the structural BMPs were quality-control samples. These included equipment blanks, field replicate and sequential replicate samples, composite split replicates, and double-blind samples. These data are tabulated in appendix 1, tables 1*B*, 1*C*, and 1*D*. Equipment blanks were collected with the use of deionized water. Blank water was processed through the automatic-sample collection system, collected, and analyzed by the sediment laboratory, in a manner similar to the processing of environmental samples. Equipment blank samples were compared to the most recently collected environmental samples to determine the amount and extent of any cross-contamination between samples. Concurrent field replicates were collected by several different methods to assess sampling variability. Grab replicate samples were collected simultaneously with environmental samples collected automatically. Grab samples were limited to intake locations where highway runoff discharged from elevated pipes. Automatic replicate samples were collected simultaneously with a second automatic sampler with the intake mounted on the static mixer adjacent to the primary sampler intake. Concurrent replicate automatic samples were collected over the duration of the entire storm for four runoff events. In order to determine the average particle-size distribution, concurrent and sequential replicate samples of suspended sediment were collected with three automatic samplers that had intake tubes vertically distributed throughout the water column. The lowest tube was fixed to the static mixer. Samples of suspended sediment were collected at three different depths simultaneously at flows of 0.13, 0.22, and 0.45 ft^3/s. Composite-split replicates were prepared from the samples in the Teflon-lined 20-L bottles with the processing methods described earlier.

In addition to other quality-control samples, single-blind and double-blind samples were submitted to the sediment laboratory during 1999 and 2000. Single-blind samples were samples of known concentrations and particle-size distribution values that were submitted to the sediment lab for analysis and identified as quality-control samples. Laboratory results were compared to the known values to measure the bias and variance of suspended-sediment data. In addition, double-blind samples were identified as environmental samples and submitted to the laboratory to measure the bias and variance of suspended-sediment data. Quality-assurance procedures for the USGS Kentucky District Sediment Laboratory are described in Sholar and Shreve (1998).

Replicate samples for chemical analysis were random subsamples of processed homogenized bottom sediment from the separators. Quality-control samples for particle size consisted of subsamples of processed homogenized bottom sediment in the size range of 0.062 mm to 2.00 mm in diameter from each separator. These samples were mixed with deionized water and analyzed for particle size at the 0.062-mm break to determine the composition of the size fraction. Examination of the 0.062-mm sieves subsequent to processing indicated that there was no observable distortion to the screen.

About 20 percent of all water-quality samples collected from the structural BMPs were replicate composite splits. In addition, one equipment blank, one material blank, two ambient-atmospheric blanks, and two source-solution blanks, which were used for sample-equipment cleaning and equipment blanks, were collected. The material blank was collected on a small piece (about 54 cm^2) of the polymer that was used to construct the static mixers and the stormwater-collection structure. Preparation of the polymer piece was consistent with the procedures for cleaning the water-quality-sampling equipment outlined earlier. Sample preparation for metal analysis included soaking the polymer piece in inorganic blank water acidified to a pH less than 2 with hydrochloric acid for 48 hours. Sample preparation for PCB and PAH analysis included soaking the polymer piece in organic blank water for a period of 48 hours.

Replicate split samples for analysis of fecal-indicator bacteria were collected from composites of two or more discrete samples. Processing blanks were collected for analysis of fecal and *Enterococci* bacteria during each sampled storm. Equipment blanks and source-solution blanks also were analyzed.

Quality-Control Data

Quality-control data were summarized to assess the potential for contamination, and to assess the accuracy and precision of the data. The quality-control data indicated that continuous records of water level, flow, and precipitation were within the measurement uncertainties of the individual sensors. About 90 percent of the estimated precipitation, determined on the basis of the drainage area of each monitoring site, was accounted for in stormwater flows at each site. These relations of total flows to total precipitation for each storm compared favorably with runoff coefficients developed in other highway studies (Driscoll and others, 1990). The mean RPD between the concentration of suspended sediment in samples collected by the automatic sampler and in replicate grab samples collected concurrently was 4 percent over a range of flows from about 0.03 to 0.41 ft^3/s. The mean RPD between the concentrations of suspended sediment in pairs of replicate suspended-sediment samples collected concurrently by automatic samplers was about 8 percent over a range of flows from about 0.01 to 0.10 ft^3/s. The aforementioned flow ranges span the average storm flows for the monitoring period at each BMP. The average cross-contamination among equipment blanks for samples of suspended sediment for the six sites is estimated to be about 5 percent. Replicate samples for the analysis of suspended-sediment concentration collected automatically across the water column within the inlet of a separator, collected concurrently and sequentially, indicated that particles less than 0.062 mm in diameter were evenly distributed throughout the water column. Concentrations of particles greater than 0.062 mm in diameter, however, tend to be higher near the bottom of the pipe despite the turbulence created by the static mixers. Flow-weighted vertical concentration trends relative to three flow rates are illustrated in figure 8. This concentration distribution compared favorably with patterns in data from natural fluvial systems (Guy, 1970) and described in other highway systems (Bent and others, 2000). Figure 9 illustrates the range of runoff flows at stations where samples for the analysis of suspended-sediment concentration were collected through the study period. The maximum rate of flow and the median of average rate of flows for the monitoring periods for the separators were 2.85 and 0.06 ft^3/s, respectively, at station 739; and 1.72 and 0.05 ft^3/s, respectively, at station 136. The maximum rate of flow and the median of average rate of flows for the monitoring period for the catch basin were 1.37 and 0.01 ft^3/s, respectively. The differences between the median and interquartile ranges of the separators were the result of how long and when each station was monitored. Station 136 was operated for four months longer than station 739, and the monitoring period included the entire spring and early summer of 1999. During the summer, storms were short and intense; thus, the flows were typically greater than storms later in the study.

The results of the USGS Kentucky District Sediment Laboratory participation in the USGS Branch of Quality Systems (BQS) single-blind reference project indicated that sample bias for concentrations of suspended sediment-size fractions less than 0.062 mm and greater than 0.062 mm in diameter during the study period was minimal, typically less than 5 percent (Shreve, E.A., U.S. Geological Survey, written commun., 2001). The median difference between concentrations of double-blind suspended sediment samples and known sample concentrations was less than 4 percent (appendix 1, table 1*C*).

Quality-control data indicated that the results of the analyses of most bottom-sediment samples for inorganic elements and organic compounds were accurate and reproducible (figs. 10 and 11, appendix 1,

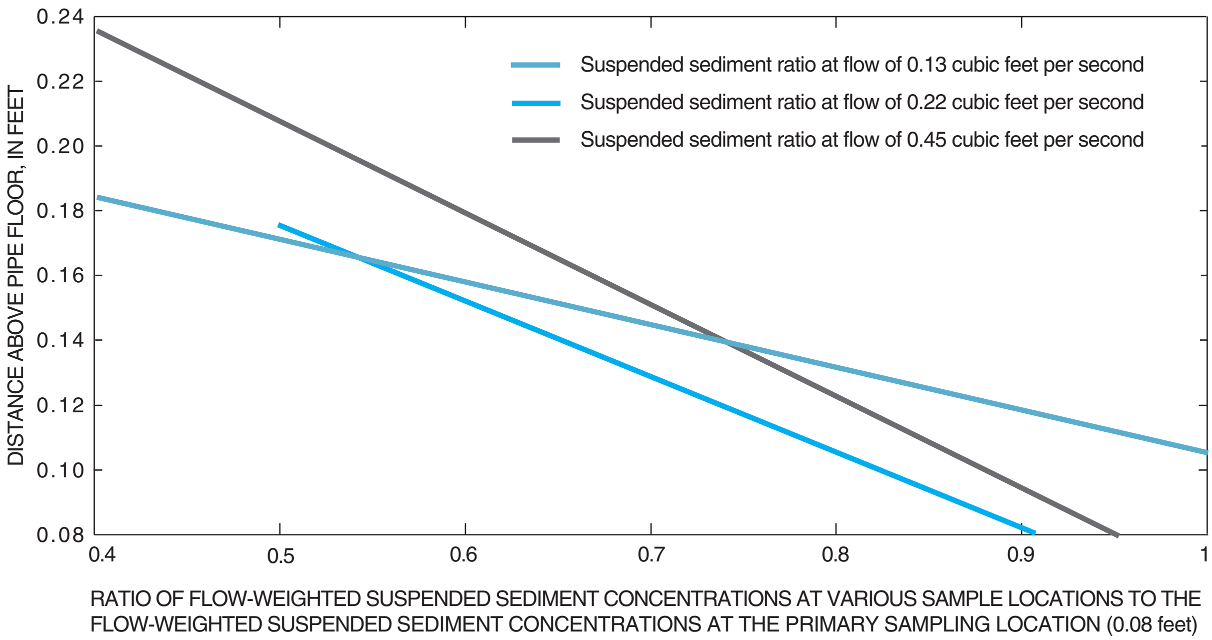

Figure 8. General trend for flow-weighted suspended-sediment concentrations relative to the sample location in the water column of a 12-inch pipe at the inlet of the oil-grit separator at station 136, along the Southeast Expressway, Boston, Massachusetts.

table 1*G*). Field and laboratory replicate samples were analyzed by comparing the RPDs of the results. The RPD was typically less than 25 percent for most pairs of samples; an RPD of less than 50 percent between measurements from replicate bottom-sediment samples is considered to be acceptable (Breault and others, 2000). RPDs exceeded 50 percent for only two replicate samples for TOC, two samples for barium (Ba), one sample for cadmium (Cd), and one sample for lead (Pb). The large RPD for the Cd sample was a result of one concentration near the detection limit and the other concentration below the detection limit. Particles less than 0.062 mm in diameter (about 0.5 percent) were virtually absent in samples of bottom sediment in the size range of 0.062 to 2.00 mm indicating that the particle-size composition of these samples was relatively pure. This is important because particles less than 0.062 mm in diameter contained higher concentrations of selected constituents compared to other size ranges; thus, the presence of even small quantities (as low as 5 percent) of particles less than 0.062 mm in diameter could have increased the concentrations of selected constituents in the size range of 0.062 to 2.00 mm in diameter.

Quality-control data indicated that most of the results of analysis for water samples were accurate and reproducible (appendix 1, table 1*H*). The median RPD between replicate composite splits for dissolved major ions, dissolved organic carbon (DOC), oil and grease (O&G), and nutrients—except for total phosphorus (P), orthophosphorus (PO_4), and total organic ammonia (NH_3), were less than 4 percent. The median RPDs between replicate composite splits for total P, PO_4, and total organic NH_3 were about 16, 9, and 9 percent, respectively. The median RPDs between replicate splits for suspended organic carbon (SOC) and total petroleum hydrocarbons (TPH) were 25 and 12 percent, respectively. The median RPDs between replicate splits for chemical oxygen demand (COD), total PAHs, and total PCBs were all less than about 8 percent. The median RPDs between replicate splits for total Cd, chromium (Cr), copper (Cu), iron (Fe), manganese (Mn), Pb, and zinc (Zn) were all less than 5 percent.

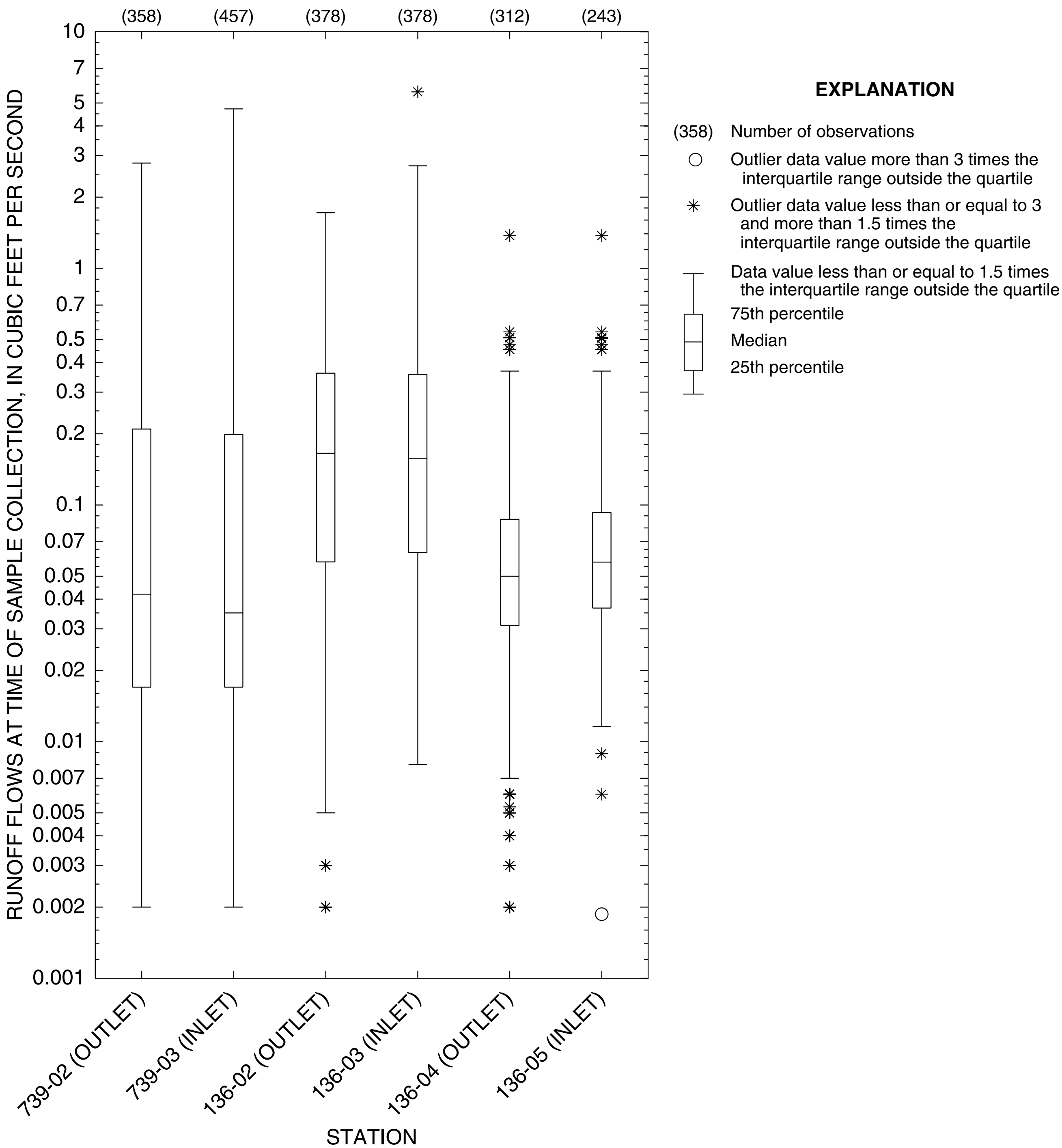

Figure 9. Distribution of runoff flows at time of sample collection for the inlet and outlet of each structural best management practice, along the Southeast Expressway, Boston, Massachusetts.

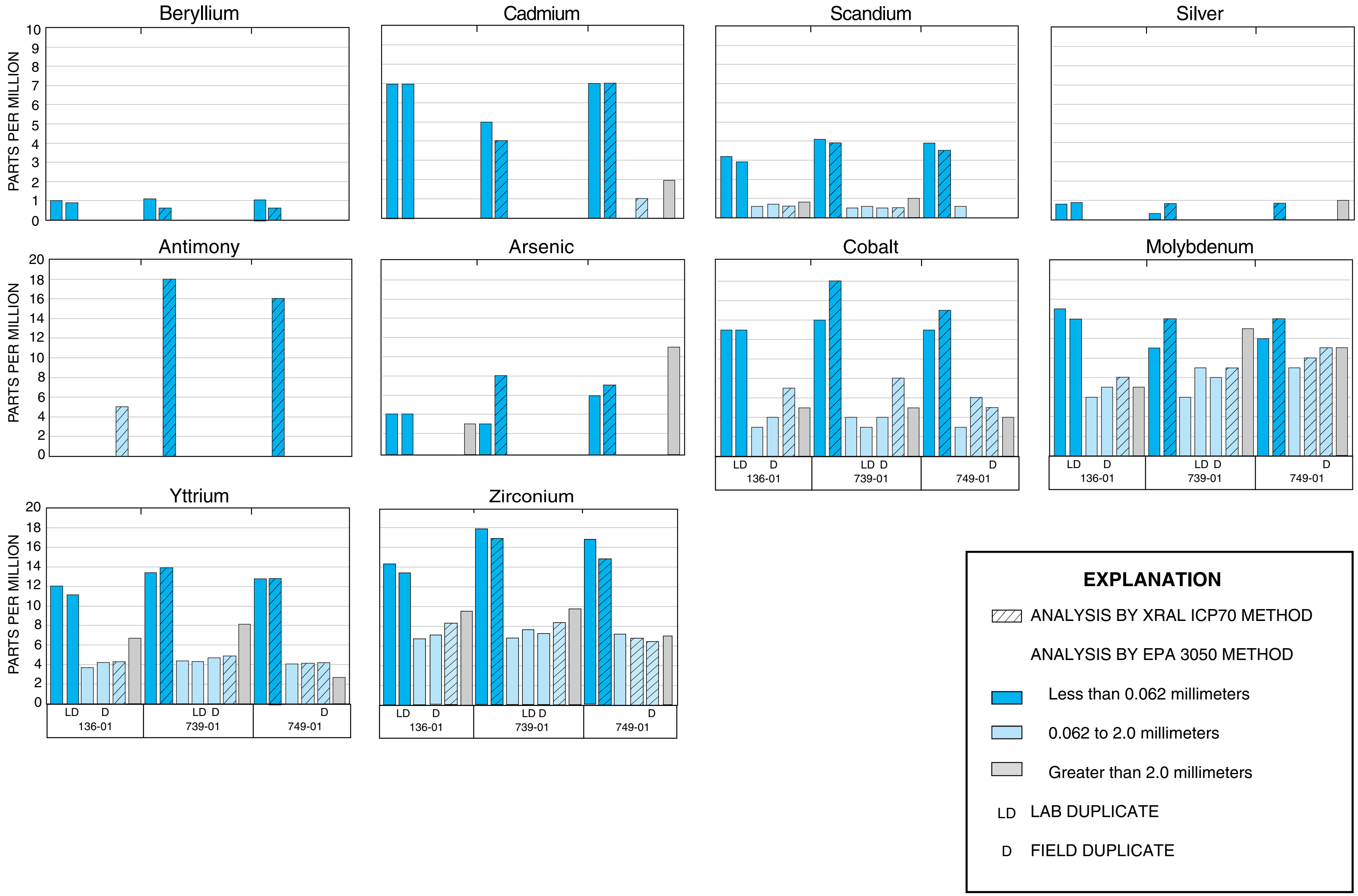

Figure 10. Distribution of inorganic elements by particle size in sediment samples collected from oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

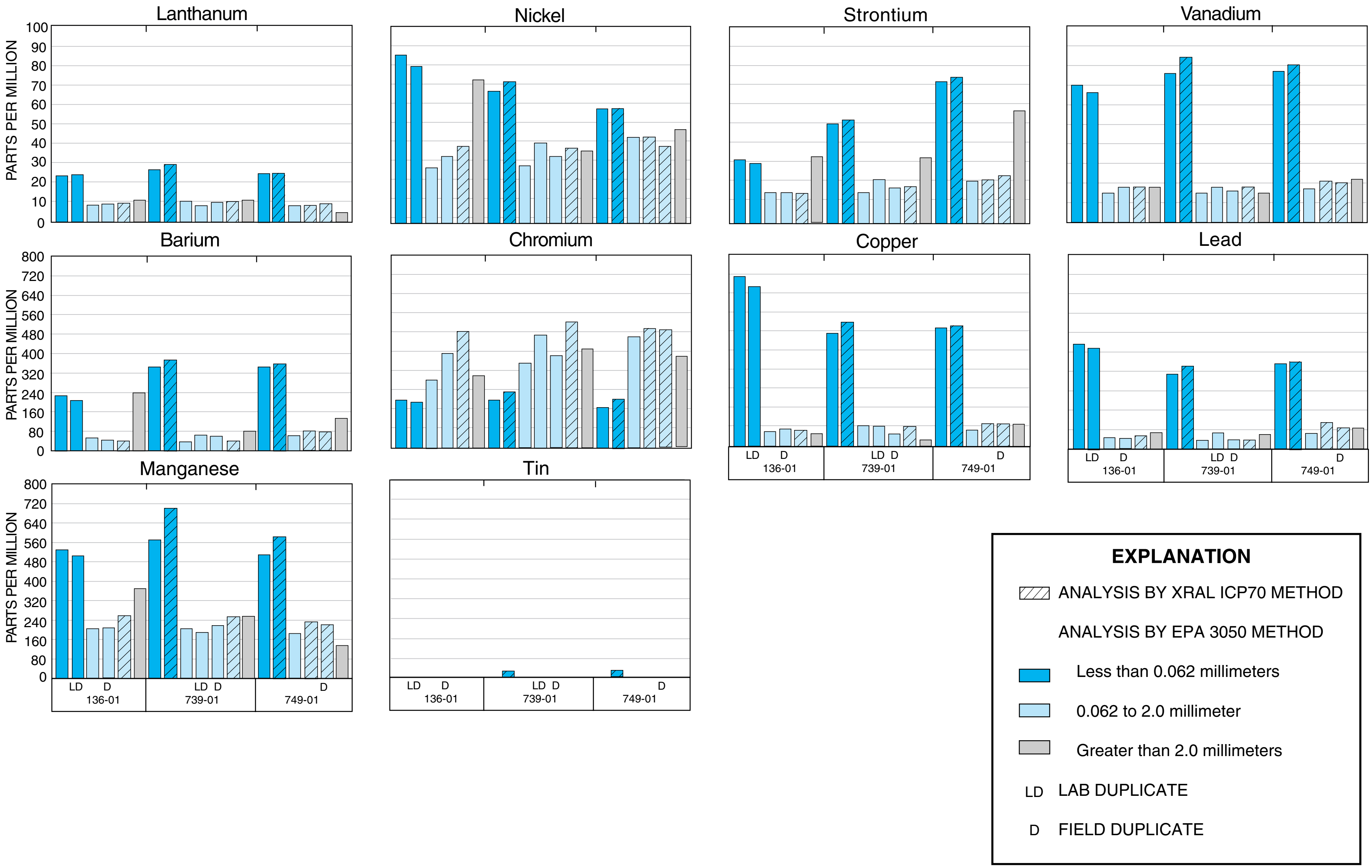

Figure 10. Distribution of inorganic elements by particle size in sediment samples collected from oil-grit separators located along the Southeast Expressway, Boston, Massachusetts—*Continued*.

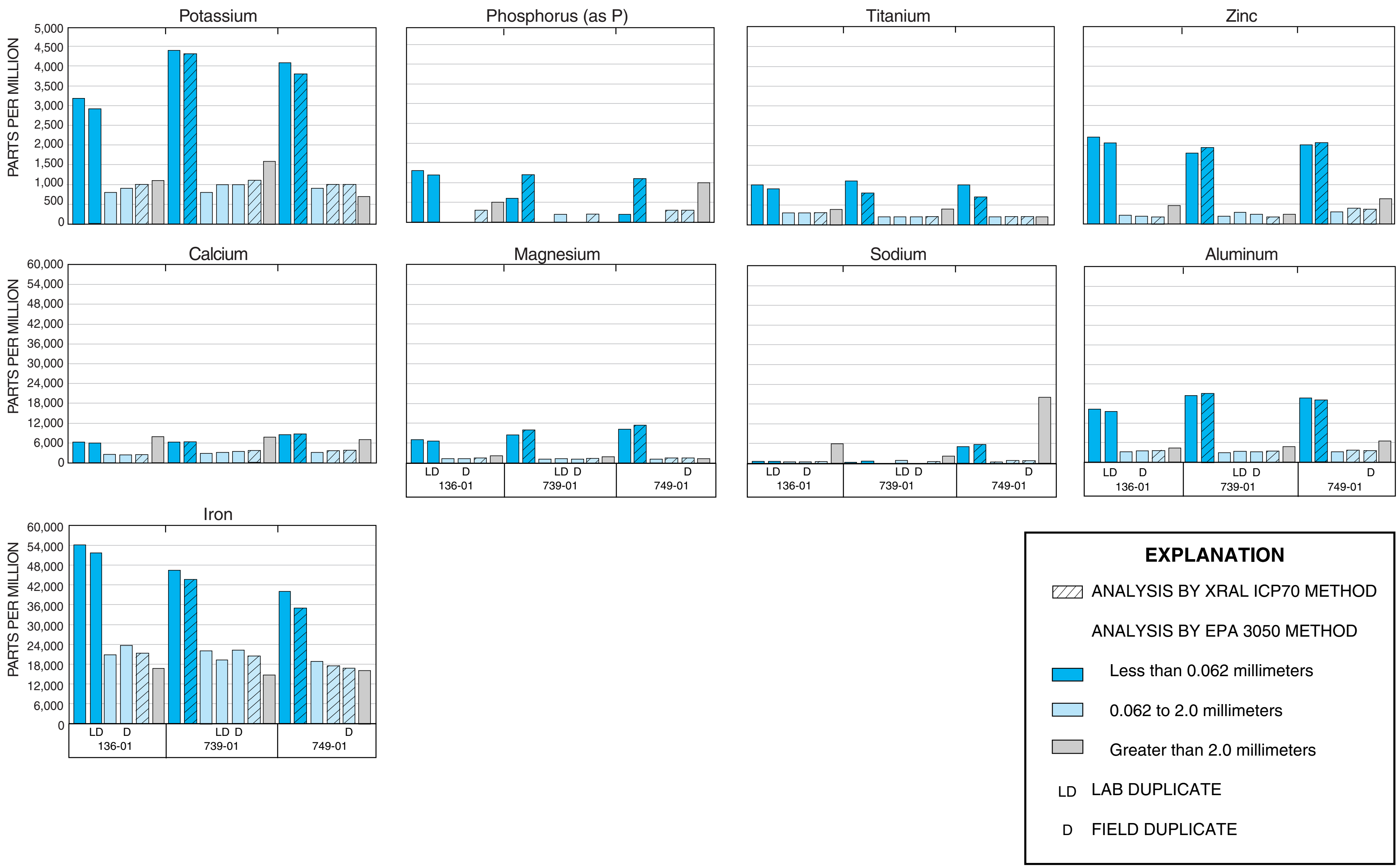

Figure 10. Distribution of inorganic elements by particle size in sediment samples collected from oil-grit separators located along the Southeast Expressway, Boston, Massachusetts—*Continued.*

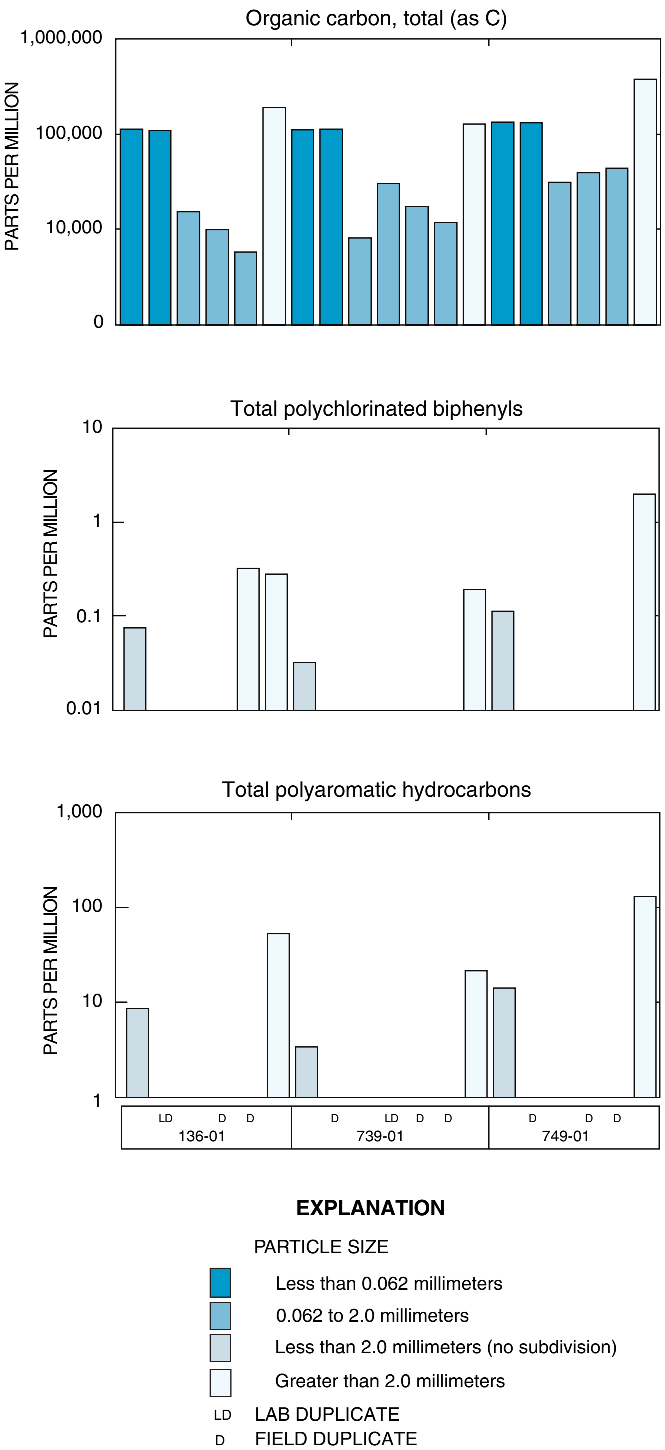

Figure 11. Distribution of organic constituents by particle size in sediment samples collected from oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

The median RPDs between replicate splits for total arsenic (As) and nickel (Ni) were 14 and 8 percent, respectively. In general, the largest RPDs were found in samples that contained high concentrations of coarse particles (in excess of 0.250 mm). The median RPD for concentrations of suspended sediment in replicate splits was about 13 percent. The RPD between samples with a majority of particles less than 0.062 mm in diameter, however, was about 4 percent. Particles found in composite samples were as large as 4 by 7 mm and weighed as much as 180 mg; thus, the low precision of the analysis of suspended-sediment samples containing coarse material was likely caused by one sample with only a few additional particles.

Source-solution blanks prepared from deionized water for the analyses of water and bacteria were free from contaminants with respect to the minimum reporting limit (MRL) used for sample analyses, with the exception of trace amounts of silica, and a single detection of ammonia (NH_4-N) and benzo-[GHI] perylene. Ambient-atmospheric blanks prepared from source water were free from contaminants. The material blank was free from contaminants, with the exception of trace amounts of Ni and aluminum (Al). The equipment blank contained trace amounts of NH_4-N and DOC, but analysis of this blank indicated no substantial contamination from the wetted parts of the equipment, the cleaning procedure, or any stage of the sample collection. A subsequent analysis of the equipment blank indicated that DOC was below the MRL.

Equipment and source-solution blanks analyzed for bacteria indicated that the cleaning and sterilization process was satisfactory. A single processing blank suggested that contamination occurred once in the field. The contamination, which may have been the result of an airborne particle in the mobile laboratory, occurred prior to any sample collection and was several orders of magnitude below sample concentrations. The RPDs between all pairs of replicate split samples for fecal-indicator bacteria were less than 21 percent.

ANALYSIS OF DATA

Concentrations of suspended sediment were combined with continuous records of flow and quality-control data to estimate suspended-sediment loads for each monitoring location. A mass-balance calculation was used to assess the effectiveness of each structural BMP in reducing suspended-sediment loads. An annual suspended-sediment load was estimated for the entire highway surface for the study area, on the basis of the long-term average annual precipitation and the suspended-sediment loads estimated during this study.

Suspended-Sediment Loads

Suspended-sediment loads for the inlet, outlet, and bypass (oil-grit separator only) of each structural BMP were estimated by multiplying the concentration of suspended sediment in discrete samples by the discharge represented by the samples. The discharge applied to a particular sample (the "sample discharge") was computed as the sum of half the flow that occurred since the collection of the preceding sample and half the flow that occurred before the collection of the subsequent sample. In the case of the first sample, the sample discharge was computed as the sum of the entire flow that preceded the collection of the sample and half the flow that occurred before the collection of the subsequent sample. In the case of the last sample, the sample discharge was computed as the sum of half the flow that occurred since the collection of the preceding sample and the entire volume of flow that occurred after the collection of the sample. In most cases, samples were collected in proportion to flow, so that in effect all sample discharges were equivalent. Storm loads were estimated from the summed sequential sample loads. During four storms, the automatic samplers were configured to collect composite samples; storm loads were estimated by multiplying the EMC of suspended sediment by the total storm discharge.

Bypass loads were estimated on the basis of the concentration of suspended sediment in the inflow samples because no bypass samples were collected. In other words, the suspended-sediment concentration in the separator bypass and inlet pipe was assumed to be the same. This assumption may not necessarily be correct because quality-control data indicated that particles greater than 0.062 mm were not evenly distributed vertically at comparable flows. Conversely, bypass flow was believed to have been thoroughly mixed because the inflow impacted the diversion weir at a 90-degree angle. In fact, small gravel (greater than 6 mm in diameter) was found in the debris-collection structure at station 739 after bypass flow occurred, which indicates a high degree of mixing.

An adjustment factor was applied to inlet loads of suspended-sediment because quality-control data indicated that suspended-sediment concentrations were not evenly distributed throughout the water column. Inlet loads would have been overestimated without this adjustment, because the sampler intake was at the bottom of the water column. No adjustment was necessary for the separator outlet loads because samples of suspended sediment from the outlet had few particles greater than 0.062 mm in diameter (fig. 12). No adjustment was made in the suspended-sediment loads of the inlet or outlet of the catch basin because stormwater flows and the resultant water-column depths were substantially smaller than those for the separator. A regression equation was developed to normalize the mean suspended-sediment concentration to the primary sample location for samples from the separator inlets. This equation was based on the analysis of experimental samples of suspended sediment categorized by a particle-size break at 0.062 mm and collected at flows characteristic of observed field conditions. The mass of sediment particles greater than 0.062 mm in diameter in experimental samples ranged from 63 to 96 percent of the mass of the total suspended sediment. This particle-size distribution was similar to observed particle-size distributions at the separator inlets at each station (fig. 12). The following adjustment equation was used to normalize the mean concentration of suspended sediment to the primary sample location for samples from the oil-grit separator inlets:

$$C_A = C \times 10\text{^}\,^{(-0.265\ \mathrm{Log}_{10}(Q)\ -0.369)},$$

where

C_A is the adjusted SSC,

C is the initial suspended-sediment concentration, and

Q is the instantaneous discharge in cubic feet per second.

No adjustment was made to the concentration of suspended sediment for samples collected at discharges less than 0.09 ft^3/s because the position of the sampler intake was centered approximately in the water column and the suspended sediment was generally dominated by particles less than 0.062 mm in diameter. The equation provided a correction to the experimental data to within 24 percent of the flow-weighted suspended-sediment concentration. The accuracy of the adjustment was dependent on the size and concentration of particles present; these quantities varied with storm intensity, duration, antecedent conditions, and season. Although adjustment of only that size fraction greater than 0.062 mm in diameter was ideal, particle-size information was not available for every storm. The average difference, however, between the adjustments for nine storms for which particle-size information was

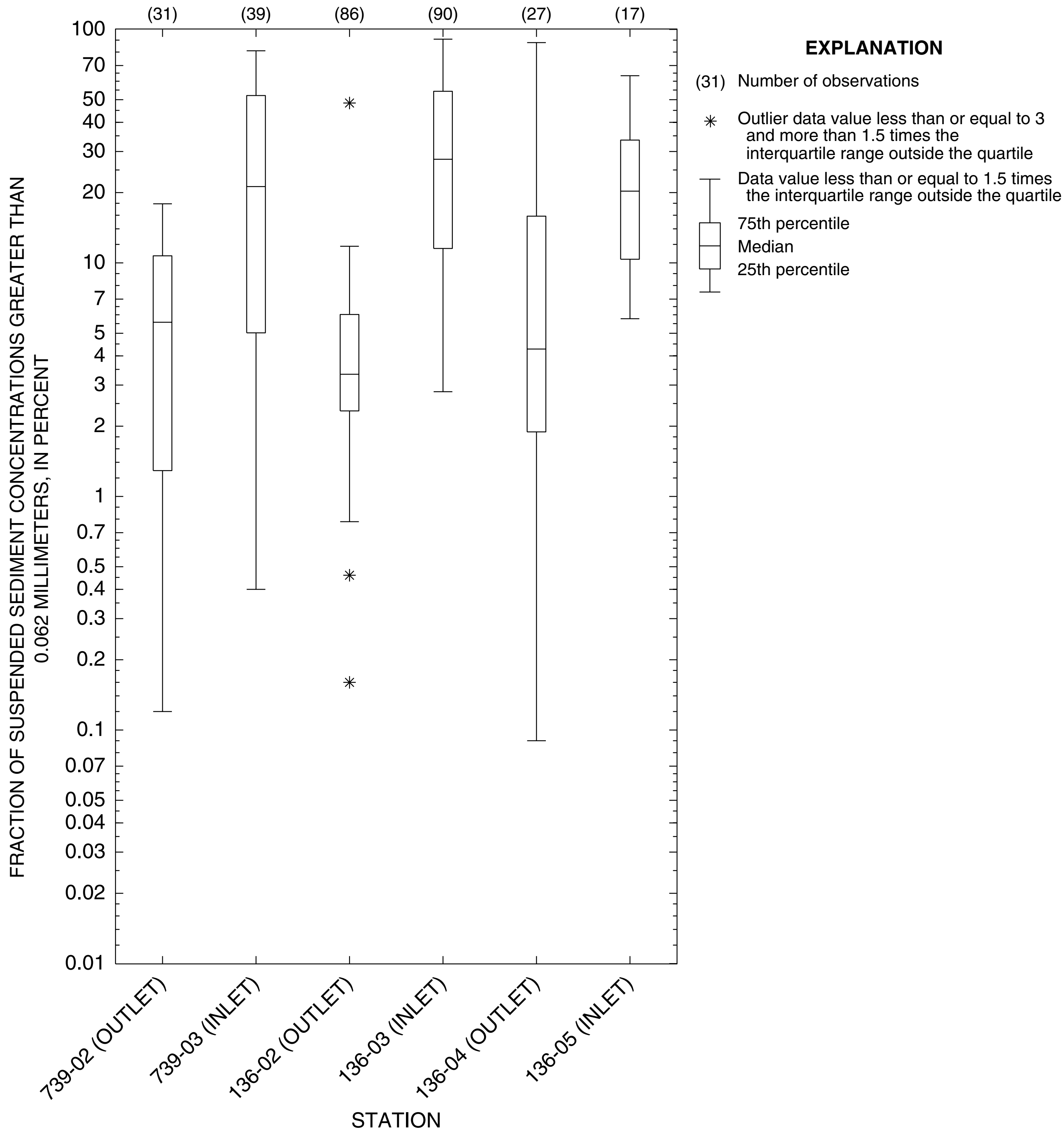

Figure 12. Particle-size distribution for samples of suspended sediment collected from the inlet and outlet of a deep-sumped hooded catch basin and two oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

available and for which total suspended-sediment loads and suspended-sediment loads greater than 0.062 mm in diameter were adjusted separately, was 16 percent. The small difference between the adjustment techniques suggested that the greatest correction was necessary during peak flows, which was generally when the largest suspended-sediment loads occurred and coarse materials were mobilized.

During the monitoring period of this study, 74 storms produced measurable runoff at station 136, and 59 storms produced measurable runoff at station 739. Samples for analysis of suspended sediment were not collected for 17 percent of the storms for the separator at station 739, for 28 percent of the storms for the separator at station 136, and for 43 percent of the storms at the catch basin at station 136. No bypass flows occurred during any of the unsampled storms. Typically, samples were not collected because of equipment malfunctions. Water levels in the outlet pipe and in the collection structure of the catch basin were lower than the sampler intakes during low-intensity storms, so more storms were not sampled for the catch basins than for the separators. Runoff events were sampled at a higher frequency for the oil-grit separators because they received the combined flows from several catch basins. To complete a mass-balance analysis, suspended-sediment loads were estimated for unsampled storms by multiplying the median EMC for suspended sediment at the inlet and outlet of each respective structural BMP by the total recorded flow.

Efficiencies of Structural BMPs

A mass-balance approach was used to assess the effectiveness of each structural BMP in reducing suspended-sediment loads. For each sampled storm, the efficiency of each device was estimated by subtracting the outlet load from the inlet load and dividing that difference by the inlet load ((IN-OUT)/IN). Similarly, the efficiency of each device for the entire monitoring period was estimated by subtracting the sum of all of the outlet loads from the sum of all of the inlet loads and dividing that difference by the sum of all of the inlet loads (($\sum$IN-$\sum$OUT)/$\sum$IN). In this case, the load sums included loads estimated from unsampled storms. The overall difference between the inlet and outlet loads was compared to the estimate of bottom material retained at the conclusion of the monitoring period in each structural BMP ($\sum$IN-$\sum$OUT=$\sum$RETAINED).

Annual Suspended-Sediment Loads

An annual suspended-sediment load was estimated for the study area by multiplying the annual highway discharge by normalized suspended-sediment loads measured during this study. The annual highway discharge was estimated by multiplying the estimated pavement runoff—relative to the long-term average annual precipitation measured by the National Oceanic and Atmospheric Administration (NOAA) in Boston, Massachusetts—by the total highway area. The sum of the monthly precipitation values at station 136 was about 2 in. less than the sum of the average monthly precipitation values measured by NOAA for 127 years. The inlet and outlet suspended-sediment loads estimated for similar time periods for the separators at stations 136 and 739 were respectively summed and normalized to the sum of the respective contributing areas. The pavement area of the two separator drainage basins represented about 9 percent of the total study area. Normalized inlet loads represented catch-basin discharge and normalized outlet loads represented separator discharges. The average effectiveness of each structural BMP and load was assumed to be similar throughout the study area. An annual mass of sediment retained by the five separators was estimated by normalizing the retained mass of bottom material for the separators at stations 136, 739, and 749 to the respective periods of operation during the study.

Predictors for Unsampled Suspended-Sediment Loads

Continuous measurements of turbidity were examined as a possible predictor for suspended-sediment concentrations. Turbidity is a measure of the light scatter caused by interference from suspended materials (such as silt, clay, and fine organic particles) and dissolved materials that produce color. Turbidity has been used in other studies to estimate suspended-sediment concentrations in fluvial systems (Brown and Ritter, 1971; Brown, 1973; Reed, 1978; Beschta, 1980; Smith, 1986; Gippel, 1995; and Lewis, 1996) and in many urban- and highway-runoff studies, including Irwin and Losey (1978), Cramer and Hopkins (1981), McKenzie and Irwin (1983); Dupuis and others (1985), Schiffer (1989); Spangberg and Niemczynowicz (1992); and Barrett and others (1996). Laboratory analysis of turbidity and suspended-sediment concentrations for 1,135 runoff samples collected from the inlet of each oil-grit separator and the outlet of the deep-sumped hooded catch basin indicates that the relation between measured values was qualitative (that is, it represents a range of values rather than an exact number) over the full range of measured sediment concentrations. For example, at a measured turbidity of 100 nephelometric turbidity units (NTU), the suspended-sediment concentrations ranged from about 70 to 2,000 mg/L and at a turbidity of 1,000 NTU, the suspended-sediment concentrations ranged from about 700 to 3,000 mg/L (fig. 13). The variability in the measurements was caused by larger particles that disproportionally influenced the turbidity in the small field of view of the instrument. Thus, the variability in turbidity measurements relative to suspended-sediment concentrations became smaller for samples with fewer particles greater than 0.062 mm in diameter. Therefore, the measurement of turbidity is an unreliable surrogate for suspended-sediment concentrations when the water sample contains particles greater than 0.062 mm in diameter, such as in highway runoff.

The relation of the EMCs for suspended sediment and load estimated from samples at each structural BMP inlet and outlet to measured storm precipitation and duration were investigated as a potential predictors for unsampled storm loads. Other potential predictors were 5-minute and 60-minute precipitation intensities, antecedent dry period, runoff duration, and average, peak, and total storm flow. Simple and multiple regression models with EMCs for suspended sediment and suspended-sediment loads from individual storms, however, indicated that no measured predictor could explain the variability in the EMCs for suspended sediment; the significant relations that were found between some of the potential predictors and the suspended-sediment loads resulted from the relations with rainfall or runoff characteristics that quantified flow per storm and the flow component (total discharge) of the suspended-sediment loads value. Therefore, because the EMCs for suspended sediment were characterized as log-normal, the median EMC value for suspended sediment for the monitoring period for each structural BMP was used with the measured flows to estimate unsampled storms. Consequently, the percentage of the suspended-sediment load estimated for the inlet and outlet of each structural BMP during the entire monitoring period was: about 11 percent and 18 percent, respectively, at the separator at station 739; and 17 percent and 20 percent, respectively, at the separator at station 136; and 23 percent and 17 percent for the catch basin at station 136. Suspended-sediment loads (including estimated loads) at the inlets and outlets of the BMPs, relative to storm precipitation measured at station 136, are shown for each structural BMP in figure 14.

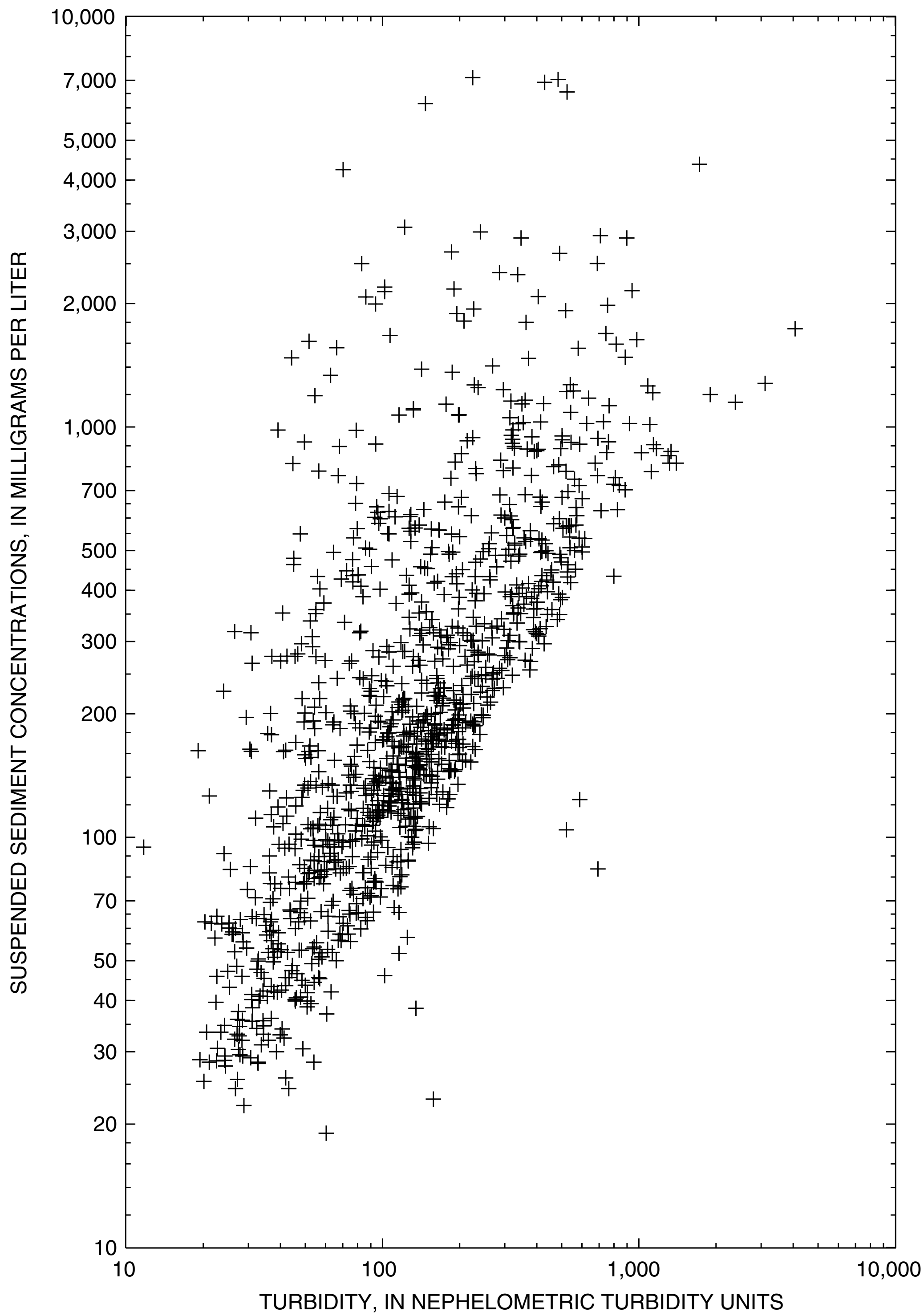

Figure 13. Relation of suspended-sediment concentrations to laboratory measurements of turbidity in samples collected from the outlet of a deep-sumped hooded catch basin and the inlet of two oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

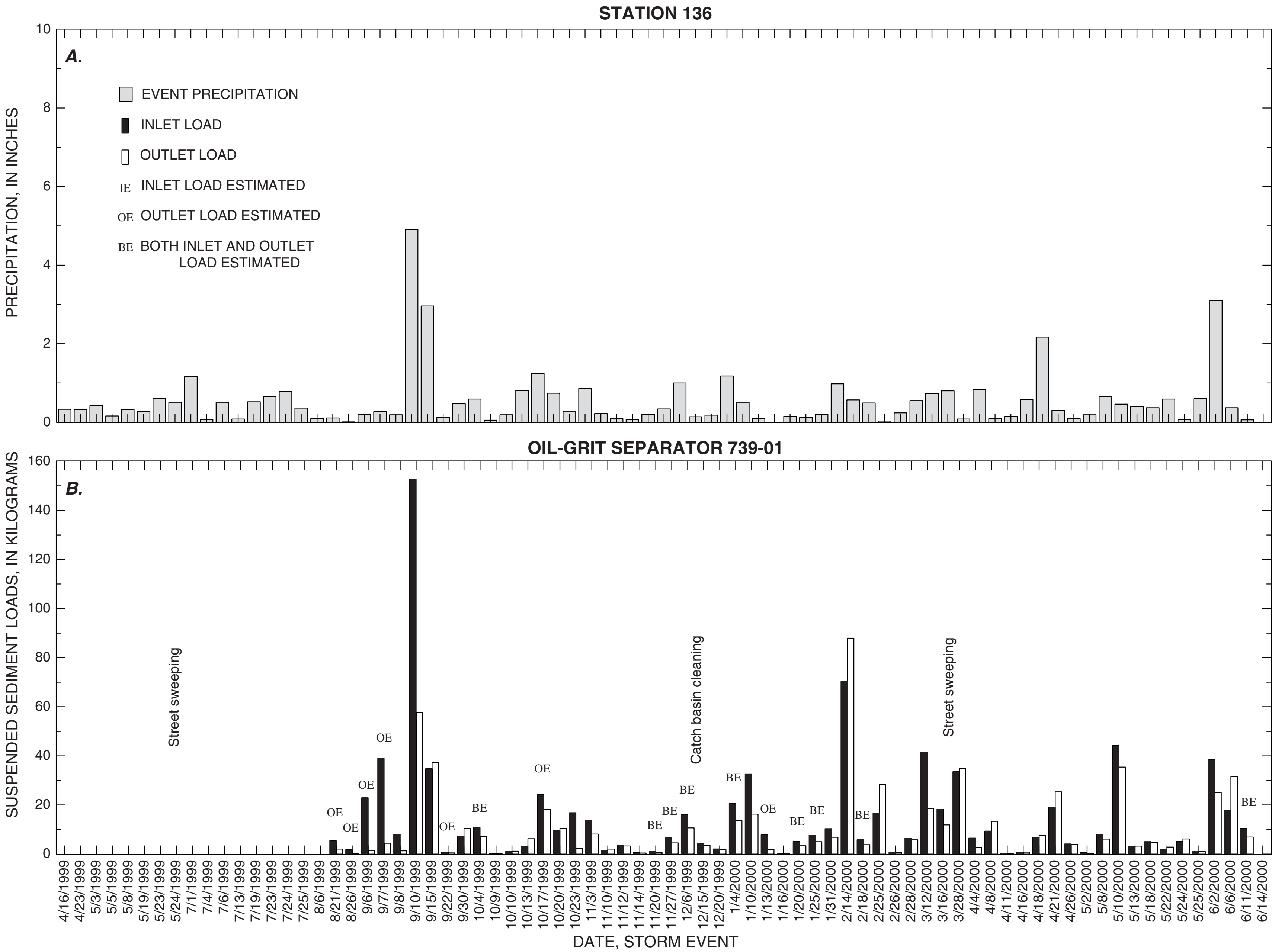

Figure 14. Total precipitation measured at station 136 for each runoff event and suspended-sediment loads for the inlet and the outlet of a deep-sumped hooded catch basin and the inlet and outlet of two oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

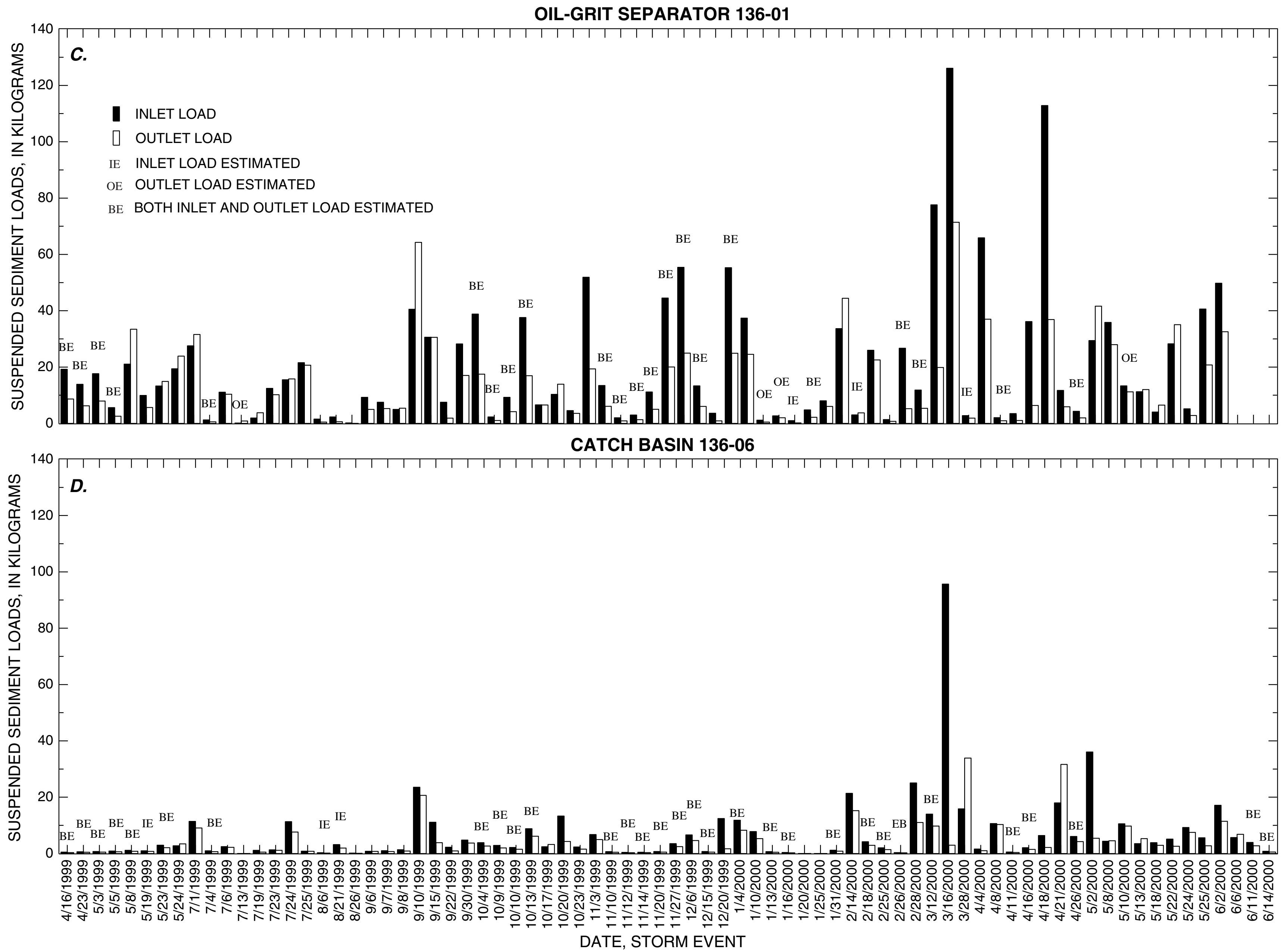

Figure 14. Total precipitation measured at station 136 for each runoff event and suspended-sediment loads for the inlet and the outlet of a deep-sumped hooded catch basin and the inlet and outlet of two oil-grit separators located along the Southeast Expressway, Boston, Massachusetts—*Continued.*

ASSESSMENT OF BEST MANAGEMENT PRACTICES

The principal purpose of most highway BMPS is to reduce the amount of sediment and sediment-associated constituents discharged from the roadway surfaces. The advertised effectiveness of many BMPs, in many cases, was determined theoretically, or the effectiveness was estimated on the basis of a few artificial storms where flow rate and particle size was controlled. In this study, structural BMPs were tested under real highway operating conditions for as long as 18 months. Automatic-monitoring and -sampling techniques were used to characterize the temporal and spatial variability in suspended-sediment loads and selected chemical concentrations transported through each structural BMP. A mass-balance calculation was used to quantify the accuracy of the estimated sediment removal-efficiency for each structural BMP. Thorough estimates of BMP efficiencies, such as these, are necessary to guide, substantiate, and defend highway BMP selection and planning decisions.

Temporal Variability of Retained Bottom Material

The volume of bottom material in the separators was estimated three times at stations 136 and 749, four times at station 739, and once in the catch basin at the conclusion of the monitoring period. Additional assessments of the bottom material in the catch basin were not practicable because the device was located beneath the travel lane of the highway. The volume of retained bottom material estimated during the initial assessment of each separator in November 1998 represented sediment accumulation from about three years of operation. Subsequent assessments were done in December 1999, January 2000, and in June 2000, when data collection was completed. Prior to cleaning the separator at station 739, one additional assessment was made in August 1999.

The physical distributions of bottom material in the separators were similar. In general, coarse material was deposited near the inlet of the primary chamber (fig. 2). A lateral deposit of less coarse material extended to each of the three baffle openings, with the greatest amount of material deposited near the baffle in the primary chamber. The corner opposite to the inlet and to the baffle of the primary chamber was generally free of deposition. The depth of bottom material in the second chamber of each separator was greatest near the baffle outlets and decreased near the chamber outlet. As the volume of material in the second chamber increased over time, the distribution of the bottom material became more uniform. The estimated total volume of retained bottom material in the separators at the conclusion of the study, in contrast to the estimated volume of retained bottom material in the separators after three-years of operation without any maintenance, was about 25 percent less at station 136 after a 14-month period, about 46 percent less at station 739 after a 10-month period, and about 108 percent greater at station 749 after a 18-month period (fig. 15). The depth of the bottom material in each chamber of the separators at stations 136 and 739 was not more than

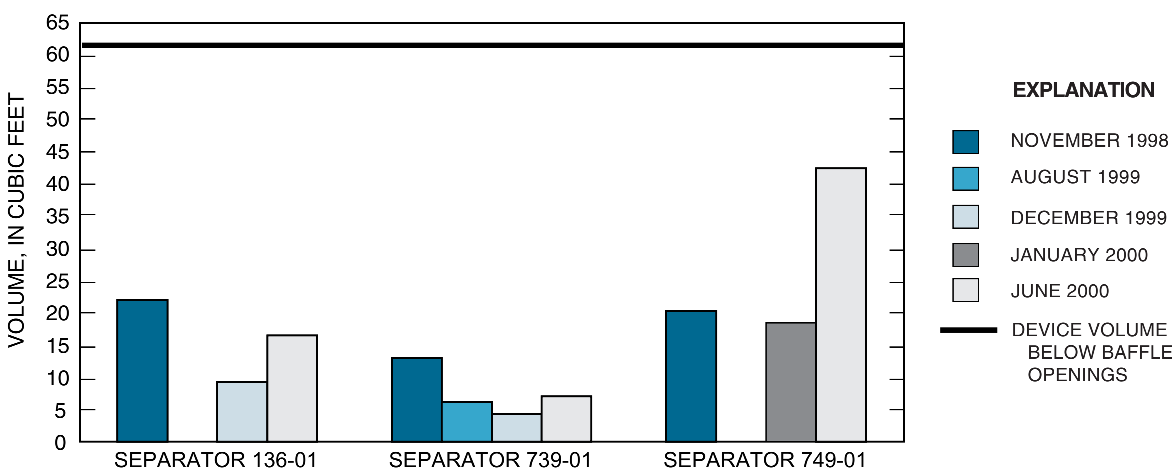

Figure 15. Temporal variability of the volume of bottom material in three oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

about 5 in.; the surface of the bottom material was located at about 72 percent of the distance to the bottom of the baffle outlets. The depth of the bottom material in each chamber of the separator at station 749, however, was about 14 in.; the surface of the bottom material was located at about 22 percent of the distance to the bottom of the baffle outlets. The difference between the volume of bottom material measured in each separator after three years of operation without any maintenance and at the end of the study periods indicate that the estimated rate of bottom-material accumulation was about two times greater during the study period at stations 136 and 739, and about seven times greater at station 749. The increase in the estimated rate of bottom-material accumulation is uncertain because the density of the bottom material for the first three years of operation was unknown and suspended-sediment data was not available prior to this study. One possible explanation for the increase in the rate of bottom-material accumulation during the study, or perhaps more specifically, the lack of accumulation during the first three years of operation, is that a single (or multiple) storm(s) resuspended a portion of the bottom material retained in the separators during the first three years of operation and flushed the suspended materials from the device. Thus, the rate of accumulation would have been distorted by the loss of retained bottom material. The lack of bottom-material accumulations in separators due to resuspension was noted by Schueler and Shepp (1993), who monitored 17 separators on a monthly basis. They found that sediment depths changed frequently, but that the mass of accumulated bottom material did not increase from year to year. In this study, the small increase of retained materials in the second chamber of the separator at station 749 between January 2000 and June 2000 indicated that small particles were easily resuspended as the level of sediment approached the bottom of the baffle openings.

Particle-Size Distribution and Contents of Retained Bottom Material

Samples of bottom material collected from each structural BMP and analyzed for particle size when data monitoring was completed represented a temporal composite of sediment and debris deposition for each structural BMP. Particle-size data for samples of bottom material are listed in appendix 1, table 1*F*. Most sediment in the catch basin (about 83 percent) and in the primary chamber of the three separators (a weighted average of 85 percent) was coarse-grained (greater than 0.25 mm in diameter), whereas a greater amount of sediment in the secondary chamber of the three separators was fine-grained (a weighted average of about 50 percent was less than 0.25 mm in diameter) (fig. 16). The percentage of particles found in each size class, for classes less than 0.062 mm in diameter and greater than 0.5 mm in diameter, was substantially

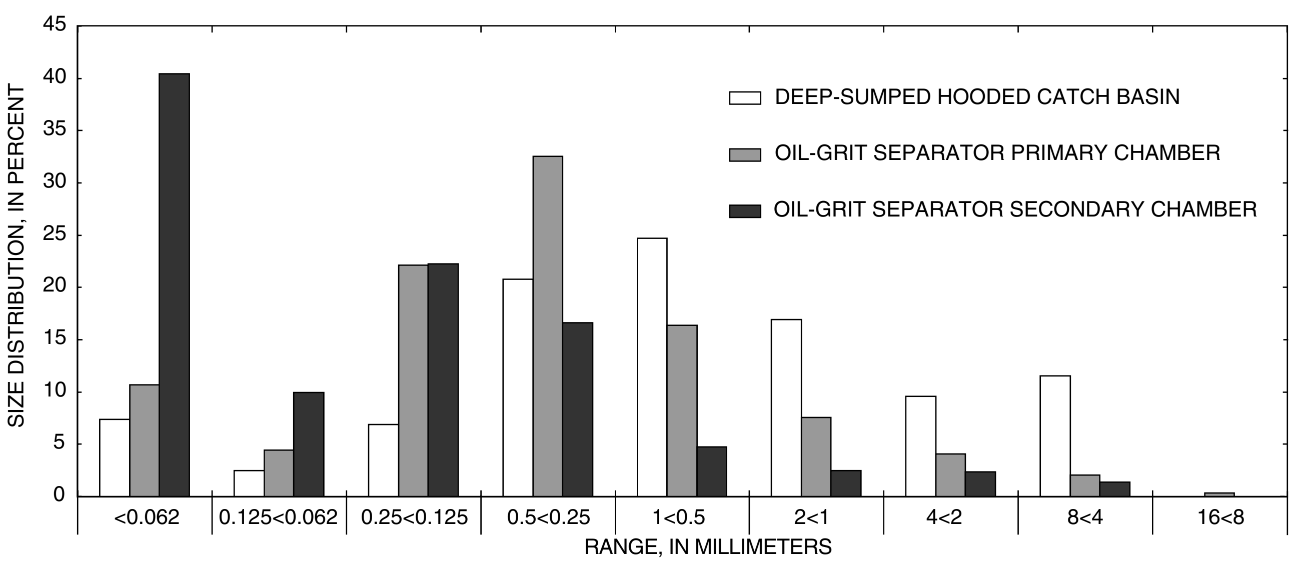

Figure 16. Particle-size distribution of a sample of bottom sediment collected from a deep-sumped hooded catch basin and the weighted-average particle-size distribution of samples of bottom sediment collected from three oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

different for the two chambers of the separators. Otherwise, the percentage of bottom material particles in each size class was similar, with respect to sample location, for each separator.

About 17 percent of the material in each separator and about 7 percent of the material in the catch basin was less than 0.062 mm in diameter. These percentages were larger than expected because the retention times of the structural BMPs were short. For example, the estimated time to exchange one complete volume of water in the catch basin, based on the median of the maximum storm flows, was approximately 7 minutes; the exchange rate for the separators was about 11 minutes. Maximum instantaneous flows measured during the monitoring period for the catch basin and the separator would have exchanged the volume of water in a minute or less for each device. It was unlikely that particles less than 0.062 mm in diameter were deposited during flow through the BMPs, because it can take a time interval from an hour to several days for particles in this size class to settle, even under static conditions. Thus, the occurrence of bottom-material particles in this size range was likely a result of static settling subsequent to each storm. Furthermore, the proportion of particles less than 0.062 mm in diameter was larger in the second chamber; this result indicates that particles in this size range in the first chamber were more often resuspended during runoff events.

Each chamber of the three separators was periodically inspected throughout the monitoring period for floating debris. Within 6 months of the separator cleaning, about 70 percent of the surface area of each primary chamber was covered with nondescript floating debris. The secondary chamber of each separator very rarely contained floating debris. Despite the visual appearance of the surface of the primary chamber, samples of bottom material collected in the secondary chamber contained nearly an order of magnitude more debris than samples collected in the primary chamber. Over time, some floatable debris could become neutrally buoyant and pass through the baffle during flow. Such materials were commonly retained in the second chamber below the baffle, where they were out of the path of direct flow. The floatable and nondescript debris found in samples of bottom material for each structural BMP is listed in table 4. Most of the floatable debris found in the samples consisted of natural organic material (leaves and sticks), followed by cigarette butts and plastic materials. Even with the use of hoods, which are intended to prevent floatable debris from leaving the catch basin, no debris was found floating in the catch basin at the conclusion of the monitoring period, and less than 1 percent by mass of samples of bottom material collected from the catch basin was identified as debris. This is likely the result of floatable debris circumventing the hoods during peak flows. It is important to note that the catch basin (136-06) had twice the average drainage area of other catch basins within the study area, thus, the peak flows at the catch basin (136-06) were probably greater than flows from typical catch basins in the area. The presence of floating debris noted at the water surface of the primary

Table 4. Composition of bottom material collected from a deep-sumped hooded catch basin and each chamber of three oil-grit separtors located along the Southeast Expressway, Boston, Massachusetts

[Values, except as noted, are in percent, by weight. kg, kilogram]

Material	Catch basin 136-06	Oil-grit separator 136-01 Chamber One	136-01 Chamber Two	739-01 Chamber One	739-01 Chamber Two	749-01 Chamber One	749-01 Chamber Two	Average Chamber One	Average Chamber Two
Cigarette butts	0.0	0.1	1.4	0.1	2.6	0.6	2.5	0.2	2.2
Glass	.1	.1	.0	.1	.0	.0	.0	.1	.0
Plastic	.5	2.0	2.1	.8	.1	.3	1.4	1.1	1.2
Natural organics	.1	.5	8.4	1.2	7.1	1.0	1.8	.9	5.2
Metal	.0	.1	.0	.0	.0	.0	.0	.0	.0
Paper	.0	.0	.0	.0	.7	.0	.0	.0	.2
Sediment	99.2	97.2	88.2	97.8	89.5	98.0	90.4	97.6	89.5
Total amount of debris (kg)	234	343	134	159	31	397	385	300	183

chamber of all of the separators, however, suggests that the hoods do not effectively prevent floatable debris from leaving the catch basins.

Reduction of Debris and Litter

To document the relative ability of an oil-grit separator to retain large floatable particles, a debris-collection device was attached to the headwall outlet of the drainage system at station 739. Composites from 12 runoff events were collected from April through June 2000, when the monitoring period ended (fig. 17). A total of about 1.8 kg of material was retrieved from the collection structure for the twelve storms. The quantity of material collected for each storm increased with an increase in peak discharge. Gravel was removed from the collection structure twice, and both times bypass flow was recorded. About 71 percent (by mass) of total debris collected was associated with these two high runoff events. The bypass flow represented 7 percent and 1 percent of the total flow, respectively, for the two storms during this period. The quantity of material contained in the bypass flow, as opposed to the quantity of material passing through the separator, was not determined. The quantity of floatable debris retrieved from the collection structure from April through June 2000 represented about 23 percent of the total estimate of floatable debris retained in the separator after 10 months of operation. The percent of the total estimate of floatable debris was reduced to about 8 percent, assuming the entire loads associated with the two storms were carried in bypass flow and did not pass through the separator or originate as a result of resuspension of previously retained debris in the separator. Thus, even under typical operating conditions, the separators were not effective at retaining floatable debris.

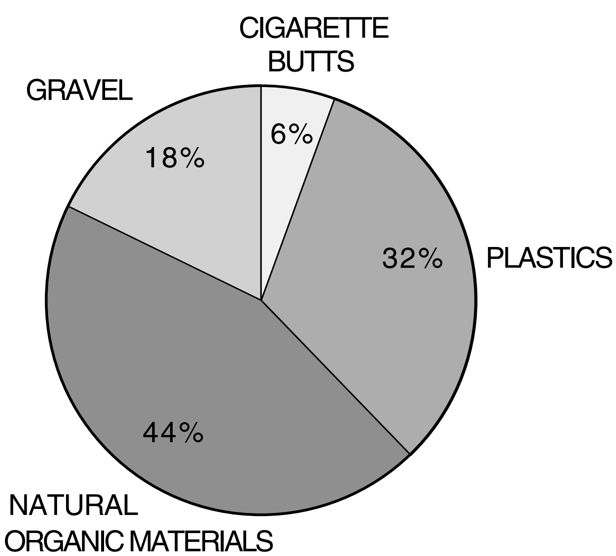

Figure 17. Relative quantity and type of debris retained from April 2000 through June 2000 in a collection structure mounted on a outlet of an oil-grit separator located along the Southeast Expressway, Boston, Massachusetts.

Variability in Suspended-Sediment Concentration Samples

The concentrations of suspended sediment in discrete samples of runoff collected from the inlets of the separators ranged from 8.5 to 7,110 mg/L, and concentrations of suspended sediment in discrete samples of runoff collected from the inlet of the catch basin ranged from 32 to 13,600 mg/L. The concentrations of suspended sediment in discrete samples of runoff collected from the outlets of the separators ranged from 5 to 2,170 mg/L, and concentrations of suspended sediment in discrete samples of runoff collected from the outlet of the catch basin ranged from 25.7 to 7,030 mg/L. Results of analysis of the inlet and outlet samples for each structural BMP are presented in appendix 1, table 1*A*. The median EMCs for suspended sediment at the inlet and the outlet for the separator at station 136 were estimated to be 333 and 150 mg/L, and 145 and 96 mg/L at station 739. The interquartile range (25^{th} percentile minus 75^{th} percentile) of the EMCs for suspended sediment for the inlet and the outlet of the separator at station 136 was estimated to be 362 and 180 mg/L, and 314 and 125 mg/L at station 739. The lower EMCs for suspended sediment at station 739 are likely due to the fact that a smaller portion of the drainage-area perimeter (outer edge of the highway) included an earth shoulder, which therefore produced less eroded soil on the pavement. The median EMCs for suspended sediment at the inlet and outlet for the catch basin were estimated to be 280 and 195 mg/L, respectively. The interquartile range for EMCs for suspended sediment at the inlet and the outlet of the catch basin was estimated to be 340 and 196 mg/L, respectively.

The results of the particle-size analysis of samples collected from the inlet of each structural BMP indicated that, generally, 50 percent or more of the suspended sediment in highway runoff consisted of material less than 0.062 mm in diameter (fig. 12), which is consistent with the findings in other studies. Yousef and others (1991) reported that 70 to 80 percent of the particles in highway runoff were less than 0.088 mm in diameter. Prych and Ebbert (1986) noted that most of the suspended material was less than 0.062 mm in diameter for many urban-runoff conditions. In the Southeast Expressway BMP study, more than 90 percent (by mass) of the particles in typical oil-grit separator outlet samples were less than 0.062 mm in diameter. The variability in the fraction of suspended sediment greater than 0.062 mm in diameter for samples collected from the outlet of the catch basin was substantial compared to samples from the catch basin inlet. This variability was an indication of device performance under different flow regimes. For example, the concentration of particles greater than 0.062 mm in diameter tended to increase during higher catch-basin outlet flows.

Effectiveness of Oil-Grit Separators in Reducing Suspended-Sediment Concentrations

The efficiency of the two 1,500-gal oil-grit separators in reducing suspended-sediment concentrations varied considerably. For example, the range of suspended-sediment removal efficiencies for individual storms was between -98 percent to +95 percent at station 136, and between -94 percent to +90 percent at station 739. Shepp (1995) reported a mean individual storm efficiency of -21.2 percent and a mean group storm efficiency of -7.5 percent from an oil-grit separator installed on a 1-acre parking lot. Other than Shepp's experiments, this author is not aware of any extensive testing of separators.

The principal factor affecting the efficiency of each device was retention time. Intense flows also affected the efficiency, but to a lesser extent. The ability of the separators to reduce suspended sediments characteristic of those along the Southeast Expressway was limited because the average particle size was less than 0.062 mm in diameter, and the average retention time in the separators ranged from about one hour to less than a minute. Although the separator volume was greater than that of a single catch basin, combined flows from multiple catch basins fed each separator, thereby increasing flow, reducing settling time, and inhibiting capture of fine material (fig. 18*C-D*). Settling velocities for urban and highway sediments can range from 0.03 to 65 ft/h (Dorman and others, 1996); thus, fine-grain sediment requires several days under static conditions to completely settle out. This effect becomes clear when examining the data from this study. For example, the average removal efficiency associated with storms less than 0.2 in. was 43 percent. Individual removal efficiencies greater than 43 percent for suspended sediment were observed in less than 37 percent of the storms at station 136 and less than 22 percent of the storms at station 739. This increase in device efficiency is a function of retention time and not a function of active treatment of the stormwater. Flows from small storms displaced previously retained stormwater in which the suspended sediments were reduced by settling during the static antecedent period. Consequently, the average efficiency ranged from about 32 to 81 percent when the same storms were sorted according to the antecedent period that ranged from less than a day to nearly six days (fig. 19). During this study, the median antecedent dry period was about 4.5 days.

In a few cases, outflow loads of suspended sediment from the separators exceeded inflow loads. This was likely the result of fine-grained bottom sediments that were previously captured becoming resuspended and discharged from the separators. These cases were marked by periods of high-intensity rainfall and high storm flows. The detection and quantity of resuspended sediment was difficult to determine because the amount of resuspended sediment may be small in comparison to the overall load. The relative retention time of the separators also affects the ability to detect and quantify resuspended sediment because a change in the inflow suspended-sediment concentrations is not immediately reflected in the outflow suspended-sediment concentrations. In fact, following high inflow suspended-sediment concentrations, it is not uncommon for discrete outflow suspended-sediment concentrations to be slightly higher than inflow suspended-sediment concentrations because a large concentration of the smaller size fraction of sediment remains in suspension and disperses throughout the device. The quantity of resuspended sediment may differ from storm to storm, due to the differences in prior storm characteristics. For example, a high-intensity storm may mobilize the fine-grained sediment retained in the separator over several small low-intensity storms, but subsequent high-intensity storms may cause no resuspension because little fine-grained sediment was available. Therefore, the absolute detection of resuspended sediment was limited to storms in which the suspended-sediment load discharged from the separator exceeded the suspended-sediment load entering the separator.

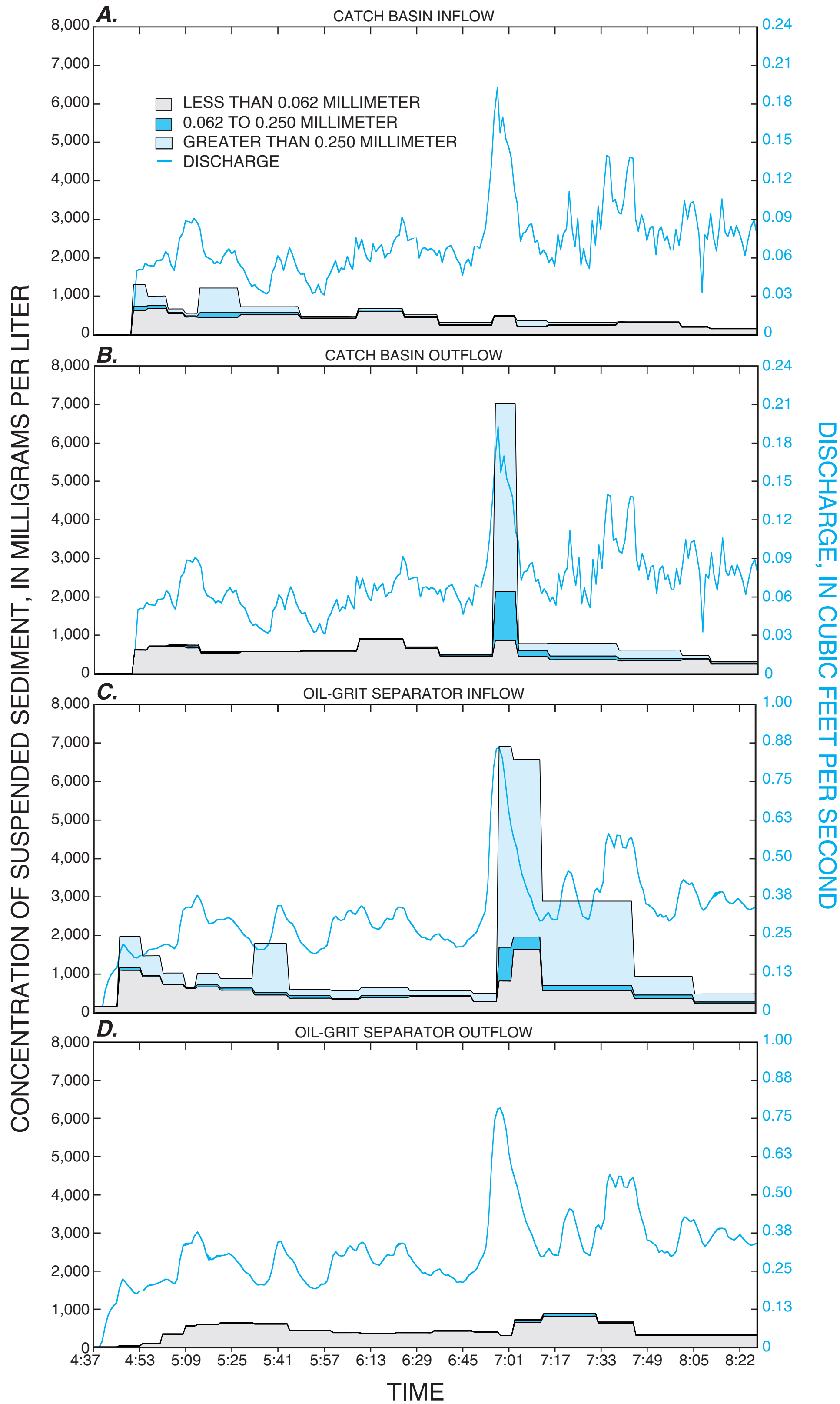

Figure 18. Suspended-sediment concentration and associated particle-size distribution in water moving through a deep-sumped hooded catch basin and a 1,500-gallon oil-grit separator located along the Southeast Expressway, Boston, Massachusetts.

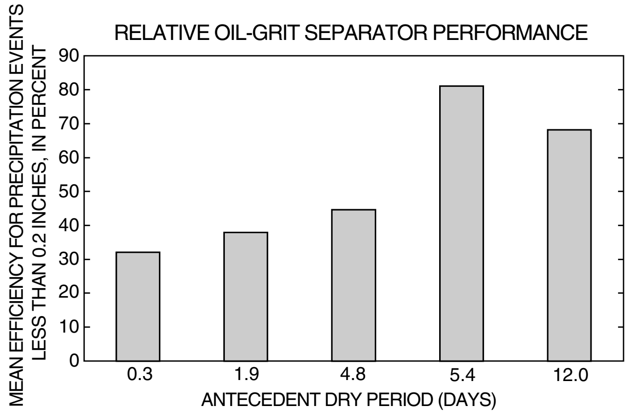

Figure 19. The relation of antecedent dry period to mean efficiency of oil-grit separators for precipitation events less than 0.2 inches, along the Southeast Expressway, Boston, Massachusetts.

The suspended-sediment load for the separator outlet exceeded the suspended-sediment load for the separator inlet, calculated directly from samples of suspended sediment without any water-column normalization, three times at each separator. The suspended-sediment load for the separator outlet, however, exceeded the normalized inlet load 14 and 13 times for separators 136 and 739, respectively. Because the normalization technique may be in error by as much as 24 percent, the suspended-sediment load for the separator outlet exceeded the normalized suspended-sediment load for the separator inlet (with respect to the potential error) nine and seven times for separators 136 and 739, respectively. The suspended-sediment load for the outlet of separator 136 exceeded the normalized inlet load six times during the operating period for station 739. The range of 5-minute rainfall intensities and separator flows during these storms was 0.04 to 0.23 in. and 0.46 to 0.97 ft^3/s, respectively, at station 136; and 0.04 to 0.18 in. and 0.48 to 2.81 ft^3/s, respectively, at station 739. During the monitoring period, storm flows in the separator at station 136 exceeded 0.46 ft^3/s 33 times, and storm flows in the separator at station 739 exceeded 0.48 ft^3/s 22 times. The flows from separator 136 exceeded 0.46 ft^3/s 24 times during the operating period for station 739. The greater maximum flows through separator 739 were the result of a higher diversion-weir elevation and a larger drainage area. The amount of resuspended sediment estimated for separators 136 and 739 represented about 8 percent of the final retained loads of suspended sediment. The frequency of instances in which outflow loads of suspended sediment exceeded inflow loads did not increase with the increase in captured sediment in either separator. The level of captured sediment in the second chamber of each separator, however, was several inches below the baffle, which would be out of the flow path.

Previous studies found resuspension of sediment to be a common problem in separators that were not located off-line (Schueler and Shepp, 1993). Untreated stormwater can bypass the separator during high flows, and the potential for flushing captured materials is reduced if the separator is off-line. In this study, bypass loads accounted for about 3 percent of the total load of suspended sediment for each separator. Bypass flow began when flows neared 0.4 and 1.9 ft^3/s at stations 136 and 739, respectively. The difference between the points at which bypass flow began to occur at each station was attributed to the differences in the diversion-weir height. Although the weir diverted a portion of stormwater to the bypass pipe, the flow through the separator was not limited and the flow through the device continued to increase with total flow. A decrease in weir height would increase the volume of bypass flow and reduce the frequency of resuspension of sediments; however, a reduction in weir height does not necessarily eliminate the potential for resuspension of sediments. Sediments (less than 0.062 mm in diameter), which settle under static conditions between each storm, will accumulate in the separators as long as flows are reduced to the point where no resuspension occurs. During most storms, a reduction in diversion-weir height may satisfy this condition. However, since the diversion weir does not limit flow through the separators, previously retained sediments (less than 0.062 mm in diameter) could become resuspended during the peak flow of a subsequent high intensity storm. Thus, the long-term operating efficiency of the separator would be reduced to a level similar to a separator with a greater weir height. Furthermore, an increase in bypass frequency will reduce overall device performance because a portion of the coarse-grained suspended sediment, typically mobilized during peak flows and easily retained by the separator, will bypass the structure completely. In this study, coarse-grained suspended sediment was not observed in samples from separator outflow during any hydrologic condition.

The estimated quantity of retained suspended sediment less than 0.062 mm in diameter relative to the total outlet load of suspended sediment for the separators at station 136 and 739, presumably consisting of suspended sediment less than 0.062 mm in diameter and larger low-density particles, was 9 and 6 percent, respectively. Because the particle-size distribution of suspended sediment was similar for the two stations, the smaller retained percentage of bottom sediment less than 0.062 mm in diameter measured at station 739 indicated that a greater amount of resuspension occurred at this station. This resuspension was likely attributed to greater flows caused by the higher diversion weir. The estimated quantity of suspended sediment that bypassed the separators compared to the amount of sediment resuspended at each station was about 20 percent higher at station 136 and about 16 percent lower at station 739. Bypass flow occurred more frequently at the separator at station 136. If the separators were not located off-line, and if all sediments less than 0.062 mm in diameter were resuspended and discharged between storms, the efficiency of each device would have been reduced additionally by about 5 percent. Conversely, decreasing the diversion weir height to a point at which no resuspension occurred would cause an exponential increase in untreated bypass load and would have reduced the overall efficiency for each separator substantially more than 5 percent. Thus, without the ability to limit flow to less than 0.46 ft^3/s through the device, changes in weir height will not cause a substantial benefit. Resuspension could be drastically eliminated by reducing the drainage area of the device by a factor of about five or by maintaining (cleaning) the device between storms. Neither option is cost effective or practical.

The absolute difference between all of the inlet and outlet loads of suspended sediment for the separators was 35 percent for station 136 and 28 percent for station 739. The separators retained 477 kg of solids (after 14 months) at station 136 and 190 kg (after 10 months) of solids at station 739, on the basis of volumetric assessments. The relative mass balance error ((∑SUSPENDED SEDIMENT IN-∑SUSPENDED SEDIMENT OUT)=∑RETAINED BOTTOM MATERIAL) for the separators was about 12 percent at station 136, and 25 percent at station 739. The efficiency computed from the estimated mass of material retained in each separator at the conclusion of the monitoring period and from the total outflow load was 32 percent at station 136 and 24 percent at station 739. The small difference between these results from the two methods used to estimate the efficiency of the separators indicates that the normalization of the inflow loads was reasonable. The estimated difference between the mass-balance approaches was within the cumulative uncertainties of the various measurement processes. In the combined-treatment system evaluated in this study, if catch basins that provided primary suspended-sediment treatment are assumed to have an average efficiency of about 41 percent, the separators reduced the suspended-sediment load by an additional 18 percent with respect to the initial load on the pavement.

Effectiveness of Deep-Sumped Hooded Catch Basins in Reducing Suspended-Sediment Concentrations

The efficiency of the deep-sumped hooded catch basin in removing suspended sediment for individual storms ranged from -114 to +97 percent. In simulated tests, where particle size, density, and concentrations were controlled, Lager and others (1977) found suspended-sediment removal efficiencies of 35 to 90 percent over a flow range of 0.25 to 6.3 ft^3/s for catch basins with 4-ft sumps. Catch basins with sumps ranging from 0.5 to 5 ft in an urban area were found to have suspended-sediment removal efficiencies ranging from -10 to +97 percent (Aronson and others, 1983).

Storm characteristics affected the hydraulic retention time, catch-basin turbulence, and the mobilization of sediment on the roadway. The average catch-basin retention time was about 1 hour; however, retention times were as low as 37 seconds during brief periods of peak flow. The catch basin lacked sufficient retention time, even during flows as low as 0.03 ft^3/s, to retain suspended sediment less than 0.062 mm in diameter. Particles less than 0.062 mm in diameter in the catch basin have been retained as the result of static settling. In general, the catch basin retained high-density, medium- and coarse-grained particles. Thus, the performance of the catch basin improved when these respective particle sizes were mobilized in storm flows. Catch-basin performance declined as flow increased, catch-basin turbulence increased, and retention time decreased. Lager and others (1977) found a 93-percent reduction in catch-basin performance with respect to small particles (0.250 to 0.100 mm in diameter) over a flow range of 0.25 to 6.3 ft^3/s in a clean catch basin, but only a 60-percent reduction in performance with respect to heavy solids (greater than 0.250 mm in diameter).

Resuspension of bottom sediments was caused by excessive turbulence within the catch basin during peak flows. The literature suggests that when the level of retained material approaches or exceeds 50 percent of the catch-basin sump depth, sediments are resuspended. In simulated tests, sediment that accumulated in catch basins did not affect removal efficiencies of suspended sediment until 40 to 50 percent of the storage depth was filled (Lager and others, 1977). In the Southeast Expressway BMP study, resuspension was detected during several storms, although the volume of sediment retained in the catch basin was less than 25 percent of the sump depth at the conclusion of the monitoring period. Sequential suspended-sediment concentrations of discrete outflow samples were frequently found to be substantially greater than respective inflow concentrations during flows greater than 0.14 ft^3/s. At this flow rate, the retention time of the catch basin was less than 6 minutes. Further increases in discharge during peak flow often diminished the retention time and caused sediments larger than 0.250 mm in diameter to become resuspended as illustrated in figure 18*A-B*. During seven storms, outflow loads of suspended sediment exceeded inflow loads because previously retained sediments were resuspended, mixed with suspended sediment from the inflow, and discharged from the catch basin. The range of 5-minute rainfall intensities and storm flows was 0.04 to 0.17 in., and 0.14 to 0.69 ft^3/s, respectively. Storm flows exceeded 0.14 ft^3/s 30 times during the monitoring period. The estimated amount of resuspended sediment represented 18 percent of the final retained load of suspended sediment. The frequency of cases where outflow loads of suspended sediment exceeded inflow loads did not increase with an increase in captured sediment volume in the catch-basin sump.

The total difference between the inlet and outlet loads for the catch basin was 39 percent. An estimated 234 kg of solids was retained by the catch basin. The relative mass-balance error for the catch basin was -14 percent. The efficiency computed from the estimated quantity of material retained at the conclusion of the monitoring period and from the total outflow load was 43 percent. The primary factor controlling the suspended-sediment removal efficiency of the catch basin was retention time. The efficiency for catch basins along roadways can vary depending on the drainage area, the particle-size distribution for suspended sediment, and device maintenance.

The particle-size distribution of suspended sediment measured in samples collected from the outlet of the catch basin was different from the particle sizes of suspended sediment measured in samples from the separator inflow at station 136 (fig. 18*B-C*), which collected outflows from eight catch basins. Higher sustained concentrations of particles greater than 0.062 mm in diameter in the combined catch-basin outlet flows indicated a reduction in suspended sediment removal efficiency in one or more of the catch basins within the separator drainage area. The performances of the catch basins could have been different from one another because the individual contributing areas affected the quantity and rate of flow for each catch basin. The contributing areas of the other catch basins were 50 percent less than the area of the monitored catch basin, except for one area, which was about 50 percent larger and represented about 31 percent of the separator drainage area. The catch basin in this larger area was located on a southbound emergency pull-off lane. The entire right-side shoulder did not have a curb and was subject to soil erosion during runoff events. In this location, the quantity of suspended sediment and the particle-size distribution could have been substantially different. The higher flow, increased turbulence, and reduced retention time would have negatively affected the performance of the single catch basin in removing suspended sediment in runoff from the larger contributing area. Therefore, the suspended sediment discharged from this single catch basin may have affected the particle-size distribution in the combined flows. Conversely, the performance of most catch basins within the separator drainage area in removing suspended sediment should have been equal to or higher than that of the monitored catch basin, because most of their contributing areas were smaller.

Annual catch-basin cleaning was accomplished with a mechanical bucket truck in the late fall of 1999. This crane-mounted cleaning mechanism, also known as an orange-peel excavator, consisted of four movable opposing jaws to remove retained bottom materials without sump water. This method did not remove all of the bottom material. In fact, fine material was lost from the bucket when it was raised from the sump. The combined suspended-sediment load from the catch-basin outlet, as estimated from the separator inflow, was not substantially different before and after annual catch-basin cleaning. This finding indicated that the differences in the amount of retained bottom material in the catch basins located within the drainage areas of stations 136 and 739 did not substantially affect catch-basin performance. Late winter or spring catch-basin maintenance may provide a greater benefit than fall maintenance because high-intensity rainfall, during summer thunderstorms can cause resuspension of bottom sediments in the catch basins, even when the volume of bottom material represents less than 25 percent of the catch-basin sump.

Estimated Loads of Suspended Sediment in the Study Area

The estimated annual load of suspended sediment for the entire study area of highway pavement is about 29,000 kg. About 24,000 kg is discharged near the Malibu Beach and Tenean Beach embayments and the remaining 5,000 kg is discharged to the land surface where it infiltrates into the ground. These loads do not include an estimated 2,000 kg of sediment and other materials, retained annually by the five separators, which are assumed to be cleaned annually.

Mechanized Street Sweeping

Mechanized street sweeping is an effective alternative to structural BMPs for reducing sediment and debris in commercial and urban areas (Young and others, 1996). Many variables can affect sweeping performance, such as, the number of passes made, road surface and curb condition, particle-size distribution, quantity of material on the road surface, interval between treatments, and the type of equipment used. Shoemaker and others (2000) noted that the total solid-removal efficiency for mechanical sweepers was 55 percent between storms and as high as 93 percent for vacuum-assisted sweepers. However, sweeping between storms and multiple passes were necessary to attain efficiencies this high. Despite poorer overall performance, mechanical sweepers are more effective at picking up larger debris (greater than 0.40 mm in diameter) than vacuum-assisted sweepers. In addition, vacuum-assisted sweepers have the disadvantage of low operation speeds which make them impractical for highway applications (Young and others, 1996).

The effectiveness of sweeping was assessed by evaluating the differences between suspended-sediment loads for each BMP inlet for storms before and after sweeping relative to storm precipitation totals. The highway was swept three times during the study period. The first sweeping occurred in June 1999 prior to the activation of station 739 and during a 6-week dry period. The second sweeping was done on March 16, 2000, and all stations were operating. Data collection at each station was discontinued before the final scheduled sweeping. The particle-size distribution of sweeping samples is presented in appendix 1, table 1*E*. Figure 14*B-D* illustrates the effects of each sweeping on suspended-sediment loads for each structural BMP. No substantial differences were observed between the pre-sweeping and post-sweeping inlet loads of the catch basin and the inlet loads of the separator at station 136 for the initial June 1999 sweeping. Substantial increases in inlet loads for both BMPs at station 136 were observed after the March 16, 2000, sweeping. Visual observations of the northbound highway shoulder in the vicinity of this station prior to the subsequent storm indicated that the sweeper's rotary brushes contacted and destabilized the soil near the edge of the pavement, from which large amounts of sediment were released and mobilized during the subsequent storms. Conversely, the suspended-sediment load measured in samples from the separator inlet at station 749 was reduced relative to previous storms of similar size. Furthermore, inlet and outlet suspended-sediment loads for station 749 were similar for the next two storms, which indicated that coarse material was absent. Sweeping-equipment limitations precluded the reduction of fine-grained sediment loads, which typically dominated the suspended-sediment load.

The effectiveness of street sweeping was qualitatively assessed by evaluating the differences among the particle-size distribution of sweeper samples, bottom-sediment samples collected in the catch basin and the weighted average of bottom-sediment samples collected from the three separators (fig. 20). The particle-size distribution of pavement sweepings closely resembled the particle-size distribution of the catch-basin sediments in all size classes less than 4 mm in diameter. Pavement sweepings had a lower concentration of particles greater than 0.5 mm in diameter than that of bottom sediment collected from the separators.

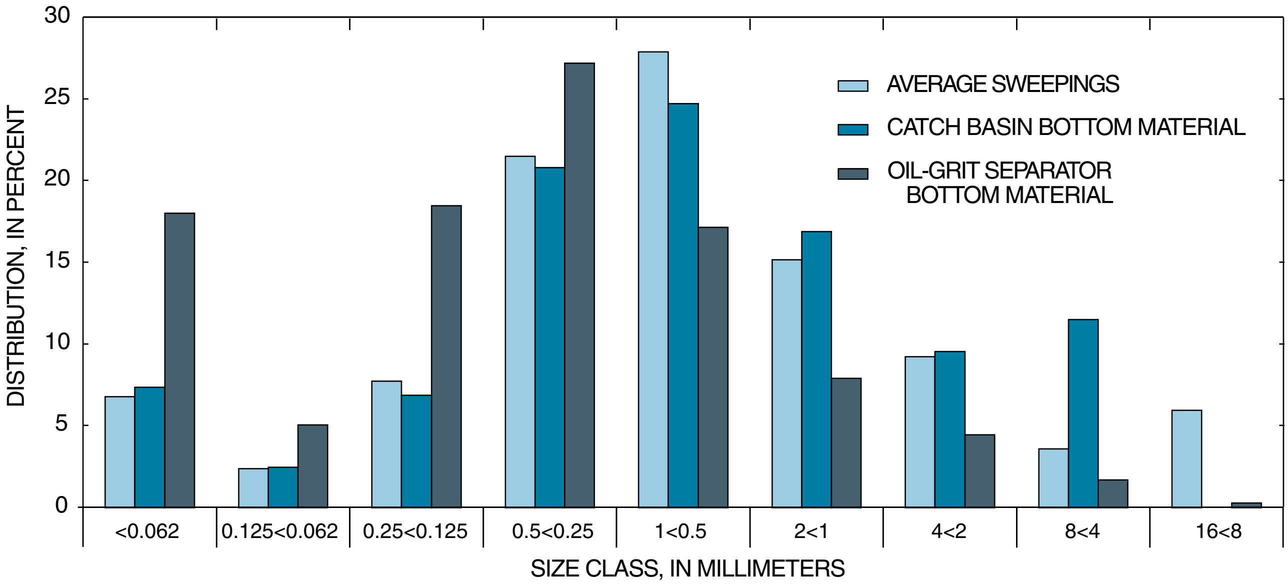

Figure 20. Average size distribution of pavement sweepings collected from a mechanical sweeper in contrast to the size distribution of a bottom-sediment sample collected from a deep-sumped hooded catch basin and the weighted-average particle-size distribution of samples collected from three 1,500-gallon oil-grit separators along the Southeast Expressway, Boston, Massachusetts.

On the basis on these data, the greatest benefit of annual street sweeping was the removal of particles greater than 8 mm in diameter that were not routinely mobilized during storm flows. Except for reducing the clean-out frequency for the catch basins and separators, frequent sweeping (several times a month) would provide little water-quality benefit beyond that offered by the existing structural BMPs along the Southeast Expressway. Sweeping provided little water-quality benefit for the Southeast Expressway because the highway lacks curbing that would provide a physical boundary to trap debris and sediment, and because the equipment did not remove the dominant particles (that is, particles less than 0.062 mm in diameter), efficiently.

Variability of Concentrations of Chemical Constituents in Sediment

Sieved bottom sediments from the three 1,500-gal oil-grit separators were analyzed for highway-related inorganic and organic constituents. Concentrations of inorganic constituents were determined by the EPA 3050 analytical method; a second method, XRAL analytical method ICP70, was used for analysis of selected samples. Constituent-concentration data are listed in appendix 1, table 1*G*. Bismuth (Bi) and Tungsten (W) were the only constituents not found in any of the samples at a detection limit of less than 10 ppm by either analytical method. Mercury (Hg) was not found in any of the samples at a detection limit of 1 ppm by the EPA 3050 analytical method; the XRAL method did not analyze for Hg. Antimony (Sb) was the only constituent not detected by the EPA 3050 analytical method, but it was detected by the XRAL method. In some cases, tin (Sn), and silver (Ag), and phosphorus (P) were not detected by the EPA 3050 analytical method, although they were detected by the XRAL method.

In general, concentrations of inorganic constituents generated by each method were similar. With the use of these digestive techniques, the constituents that are weakly sorbed with the solid phase and are not part of the mineral matrix are measured. Many environmental factors, such as low pH, low redox, low dissolved oxygen, or high ionic strength may consequently cause these weakly bound elements to repartition into the dissolved phase (Breault and others, 2000). Measurements of low dissolved oxygen in the water column of the separators during the summer and measurements of high specific conductance (an indicator of ionic strength) during winter maintenance periods were common. Therefore, high concentrations of trace elements measured in samples of bottom sediments indicate that, under favorable conditions (that is, in some state of equilibrium with the bottom sediments), the overlying water column may have become enriched with trace elements. These constituents would then be easily transported from the separators once they were redistributed to the dissolved phase.

Concentrations for all inorganic constituents were typically higher for the sediment fraction less than 0.062 mm in diameter, except for Cr and Na in all samples, and As and Sn in one sample. Beryllium (Be) was the only constituent not detected in sediment fractions greater than 0.062 mm in diameter. With a few exceptions, concentrations of Sb, As, Cd, and Ag were only found in the sediment fraction of less than 0.062 mm in diameter. Results of chemical analysis for inorganic elements in bottom sediment relative to particle size are illustrated in figure 10. The disproportional differences between concentrations of inorganic constituents relative to grain size are well documented (Forstner and Wittmann, 1981; Salomons and Forstner, 1984; Horowitz and Elrick, 1987, 1988; Horowitz, 1991). In general, sediment surface area and trace-element concentrations tend to increase with a decrease in sediment-grain size. Furthermore, the silt- and clay-sized particle group contains more clay minerals, which typically have higher sorptive capacities. The potential effectiveness of the separators in reducing loads of inorganic constituents was several times less (as much as an order of magnitude depending on the constituent relation to grain size) than its effectiveness in reducing suspended sediment (consisting of fine- and coarse-grained material); most of the suspended sediment entering the separators was less than 0.062 mm in diameter, and the concentrations of inorganic constituents in the sediments less than 0.062 mm in diameter were about 2 to 10 times higher than the concentrations of inorganic constituents in sediments greater than 0.062 mm in diameter.

Concentrations of TOC, PCBs, and PAHs were detected in all sediment samples and size fractions. Concentrations of organic constituents did not follow the same pattern as the inorganic constituents. Results of chemical analysis of organic compounds in bottom sediments relative to particle size are presented in figure 11. Concentrations of TOC were similar for the solid fraction less than 0.062 mm in diameter and greater than 2.00 mm in diameter. However, estimated concentrations of TOC for the entire solid fraction less than 2.00 mm in diameter were as much as one order of magnitude lower than for the fraction greater than 2.00 mm in diameter. The greater amount of TOC in the solid fraction greater than 2.00 mm in diameter was mainly attributed to natural organic particles (leaves) and asphalt particles. Total PAH and PCB compounds were found in larger concentrations in the solid fraction greater than 2.00 mm in diameter than in the solid fraction less than 2.00 mm in diameter. The greatest factor affecting concentrations of semivolatile organic compound (SVOCs) in the solid phase is the content of organic carbon (Lopes and Dionne, 1998). The grain size of mineral particles, unless they have an organic coating, is not a significant factor affecting SVOC concentrations (Witkowski and others, 1987). Thus, substantial differences in the TOC content of the size fractions less than 2.00 mm and greater than 2.00 mm in diameter may explain the PCB and PAH distribution. Furthermore, this would indicate that the PCB and PAH concentrations in the solid fraction less than 0.062 mm in diameter would be similar to the concentrations in the solid fraction greater than 2.00 mm in diameter; they might be greater in the smaller size fraction because of the effects of the increased surface area. Therefore, the potential effectiveness of the separators to reduce loads of organic constituents was several times less (as much as an order of magnitude) than its ability to reduce suspended sediment because (a) most of the suspended sediment entering the separators was less than 0.062 mm in diameter, (b) only about 6 percent of the bottom material retained in the separators was greater than 2 mm in diameter, and (c) the separators did not indefinitely retain floatable debris, which may contain concentrated levels of organic compounds.

Local soils can generate as much as 30 percent of suspended sediment entrained in highway runoff (Gupta, 1981). Local soils are deposited on the highway between storms by wind erosion or hydraulic erosion of the roadway shoulder and adjacent areas subject to similar forces, or directly deposited on the road from automobiles. Average constituent concentrations for bottom sediments in the three separators and weighted on the basis of the distribution for the three particle-size fractions were estimated from constituent concentrations of sieved samples. These data are contrasted to background soil samples representing coastal Massachusetts (Shacklette and Boerngen, 1984) in figure 21. Concentrations of Cr, Cu, Pb, Ni, and Zn, typical constituents of highway runoff (Young and

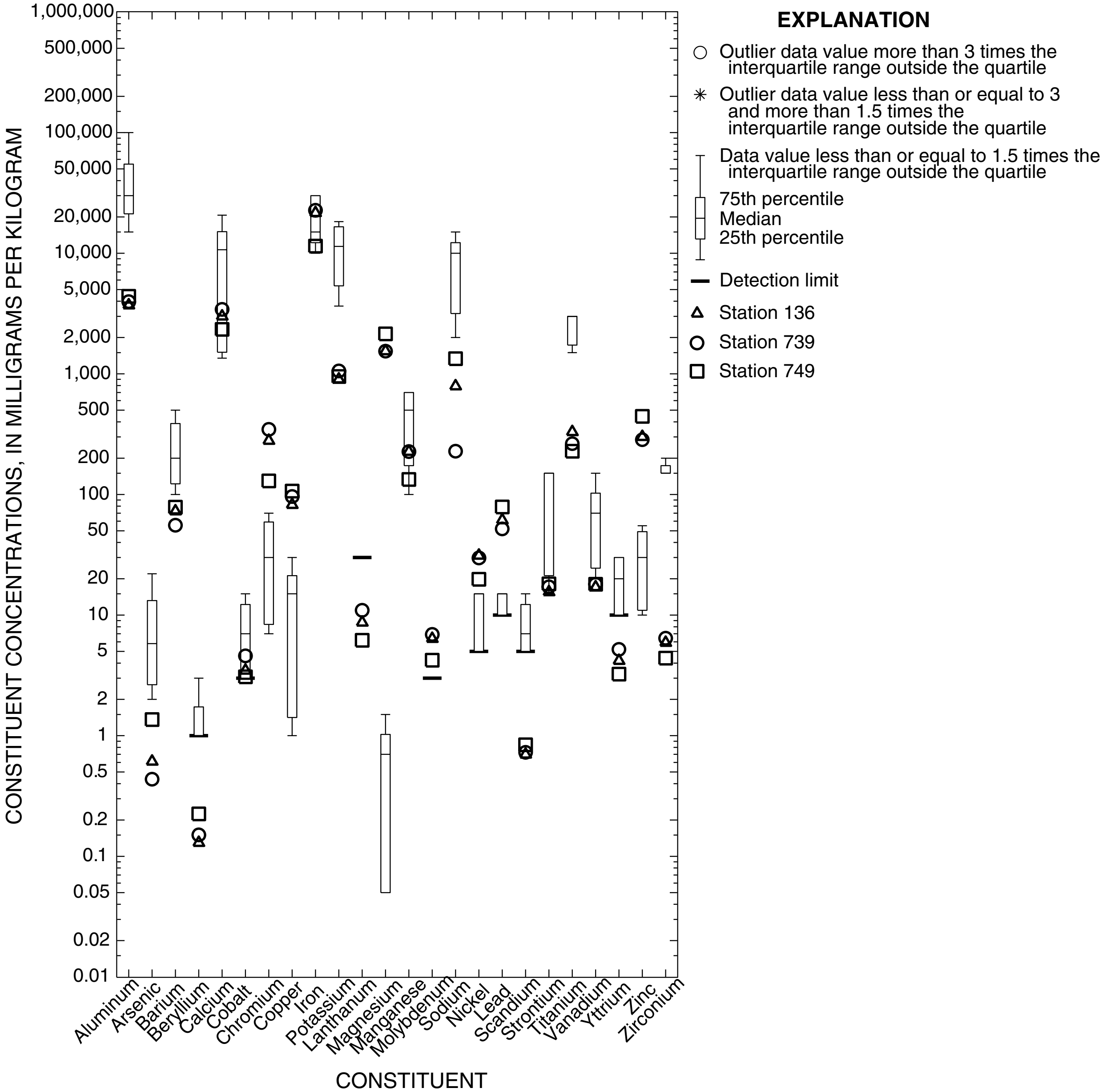

Figure 21. Comparison of local soil chemistry to samples collected from oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

others, 1996), were as much as one order of magnitude greater in the bottom sediments from the separators than in local soils. Magnesium (Mg) concentrations in bottom sediment were about 2,000 times greater than in local soils. Concentrations of other constituents were either within their ranges in the soil or were less than in the soil. These data indicate that about 15 percent of the highway-affiliated metals could be attributed to local soils.

Reduction of Chemical Constituent Loads Discharged in Storm Flows

Samples for the analysis of concentrations of inorganic and organic constituents were collected at the inlet and the outlet of each structural BMP during four runoff events that reflected most seasonal variations during the monitoring period. EMCs of chemical and biological constituents are presented in appendix 1, table 1*H*. Total precipitation for the storms ranged from 0.34 to 0.74 in.; most of the storms produced more precipitation than the average for all storms during the monitoring period. The individual and average RPDs between the inlet and the outlet (inlet minus outlet) concentrations for selected constituents for each structural BMP for four storms is illustrated in figure 22. The average RPD for concentrations of sediment-associated constituents for the catch basin ranged from -29 to +42 percent. The average RPD for concentrations of trace metals was about 25 percent. The average RPD for concentrations of organic constituents was typically less than 20 percent and even negative in several cases, except for oil and grease, which was near 30 percent. The average RPD for concentrations of sediment-associated constituents for the separators ranged from -129 to +44 percent at station 136, and -47 to +21 percent at station 739. The average RPD for concentrations of trace metals was about 30 percent at station 136, and about 15 percent at station 739. The average RPD for concentrations of organic constituents for both separators was commonly less than about 10 percent and negative in several cases.

Under ideal conditions, the RPD could be considered the main measure of efficiency of each structural BMP; however, the RPD does not represent the efficiency for the BMPs because the initial samples collected at the outlet do not represent water from the sampled storm, but water from the previous storm. Furthermore, the final inlet samples were not represented in the final outlet samples. For example, if we assume the following circumstances:

(a) the frequency of sampling was proportional to flow;

(b) each pair of samples represented one device volume; and

(c) the device exchanged its volume 20 times over the course of a storm,

Then the initial outlet sample would not be represented in the initial inflow sample and the final inflow sample would not be represented in the final outlet sample. Thus, as much as a 10 percent error (2 samples divided by 20) could be expected in the RPD. Furthermore, the total dissolved solid concentrations for the storm, which included all of the material that would never settle out of solution by gravity, should be similar for the inlet and outlet samples for each device under ideal sampling conditions. EMCs of total dissolved solids collected from the inlet and outlet at the separators, however, were commonly within 14 percent, and the EMCs of total dissolved solids collected from the inlet and outlet of the catch basin were as high as 57 percent; these large differences indicate that the samples represented different sources of water. This was further demonstrated during the March 17, 2000, storm, during which the rain turned to snow in the final hours of the storm and deicing compounds were applied to the roadway surface. The last two inlet samples at the separator at station 739 contained high concentrations of total dissolved solids which were not in the outlet samples; thus, the RPD for EMCs of total dissolved solids increased to nearly 80 percent.

The calculated RPD between inlet and outlet EMCs for sediment-associated constituents for each structural BMP was probably too large, because the concentration of suspended sediment in all four storms was greater than the median EMC of suspended sediment. The March storm accounted for about 18 percent of the total inlet load of suspended sediment for the catch basin for the 14-month monitoring period. The EMCs for suspended sediment for each BMP for these four storms accounted for 9 to 23 percent of the total load of suspended sediment measured during the monitoring period. Furthermore, the RPD for concentrations of each constituent for the separators does not include the effects of the primary stormwater treatment provided by the catch basins. For example, if the RPD between inflow and outflow EMCs of Pb for the catch basins within the drainage area of a separator is 30 percent, and the RPD between inflow and outflow EMCs of Pb for the separator itself is 20 percent, the actual reduction of initial highway concentrations of Pb by the separator is actually only 14 percent. Therefore, the RPDs between the inflow and the outflow EMCs of constituents sampled in this study should not be considered as the actual reduction of constituent concentrations by the separators.

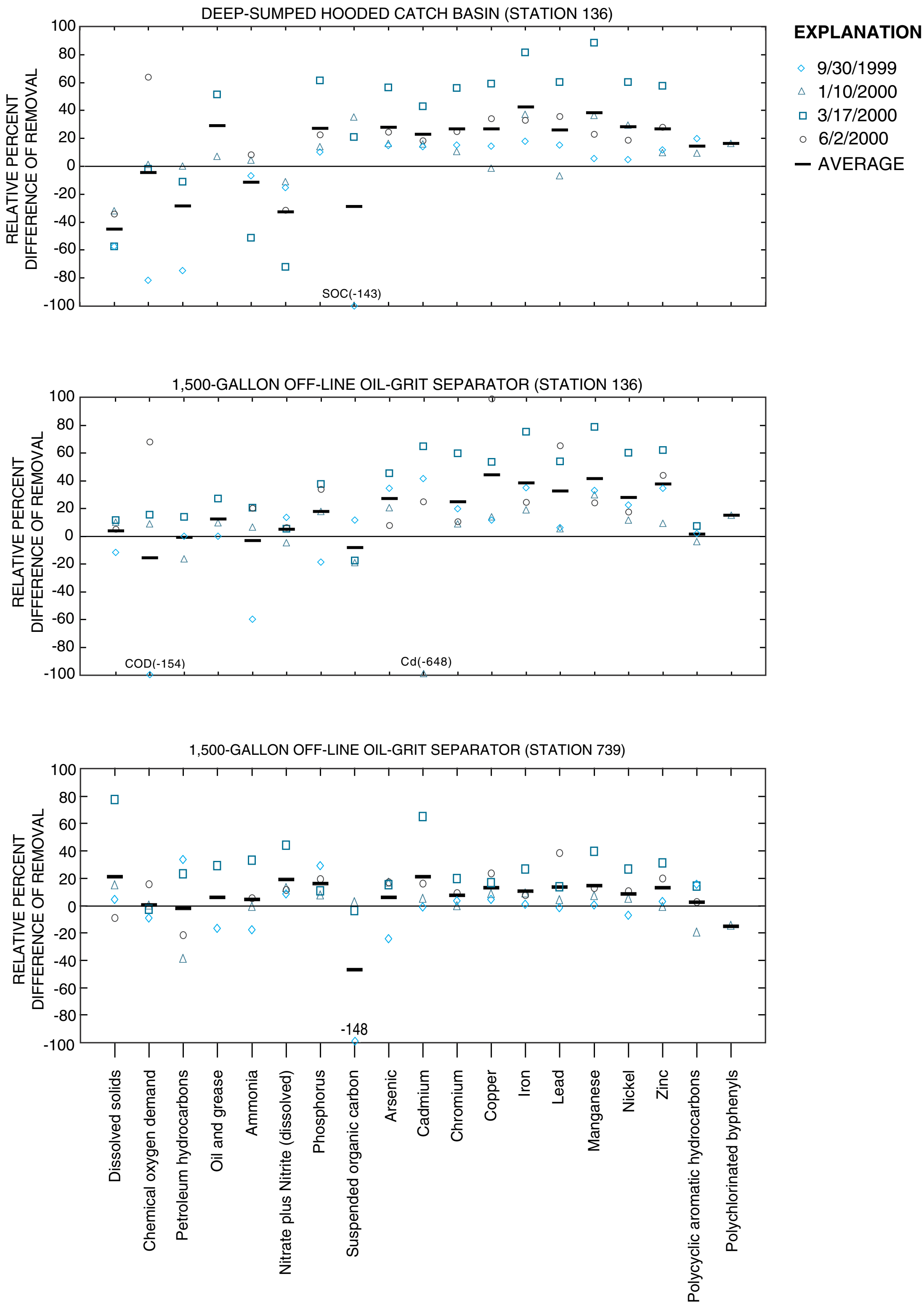

Figure 22. Relative percent differences between inlet and outlet event mean concentrations of selected highway runoff constituents for a deep-sumped hooded catch basin and two 1,500-gallon oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

Additionally, the RPD for EMCs of sediment-associated constituents for the separators was probably too large, because the sediment-associated constituent concentrations were not normalized (that is, they were not normalized to the average solid-phase constituent concentration in the water column); thus, sediment-associated constituents in the size fractions greater than 0.062 mm in diameter were not sampled in proportion to their average concentration. As discussed earlier, inlet loads of suspended sediment that were not normalized would be overestimated. This discrepancy is important because several of the storms produced above-average concentrations of suspended sediment containing large concentrations of coarse-grained particles. Although the size-fraction analysis of bottom sediment indicated that sediment-associated constituents had less affinity for the sediment-size fraction greater than 0.062 mm in diameter, coarse-grained sediments were readily retained by the separators; thus, overestimating the sediment-associated constituents related to the coarse-grained fraction creates a positive bias in the device efficiency.

The following example, which assumes the respective trace elements are sorbed entirely on the solid phase, explains these potential effects. Theoretical inlet EMCs of Cu, Pb, Mn, and Zn were estimated from sieved bottom-sediment concentrations collected from the separators, and from the EMCs of suspended sediment and from information about the particle-size distributions. The average RPDs for the theoretical and the observed concentrations at the inlet of the separator were 37 percent for Cu, 22 percent for Pb, 32 percent for Mn, and 18 percent for Zn for four storms. The average percent of each constituent estimated for the size fraction greater than 0.062 mm relative to the total solid-phase concentration would be about 13 percent for Cu, 13 percent for Pb, 30 percent for Mn, and 12 percent for Zn. During the January and March storms, the suspended-sediment concentrations and particle-size distributions were substantially different; the concentrations of each constituent estimated for the size fraction greater than 0.062 mm in diameter relative to the total solid-phase concentration were as high as 29 percent for Cu, 30 percent for Pb, 61 percent for Mn, and 29 percent for Zn. Normalizing the suspended-sediment fraction greater than 0.062 mm in diameter to the sampling point for each storm by using experimental water-column data, reduced the concentrations by up to 65 percent. Thus, the inlet concentrations of each constituent associated with particles greater than 0.062 mm normally retained by the device were overestimated. Consequently, the normalized RPD between the theoretical concentrations for the inlet of the separator and observed concentrations for the outlet of the separator for the January and March storms should theoretically be reduced by as much as an additional 15 percent for Cu, 11 percent for Pb, 10 percent for Mn, and 9 percent for Zn. The effect on the RPD for a given constituent depended upon the particle-size distribution of the sample and that constituent's association with particle size.

The removal of inorganic and organic constituents was impaired by the same factors that affected the removal of suspended sediment by the structural BMPs in this study. The removal efficiency for inorganic and organic constituents was probably less than the overall suspended-sediment removal efficiency, because the sediment fraction (less than 0.062 mm in diameter) onto which these constituents generally sorbed was not removed during flowing conditions in either device. Although higher concentrations of PCBs and PAHs were detected in the size fraction greater than 2.00 mm in diameter, concentrations of PCBs and PAHs are believed to be similar in the sediment fraction less than 0.062 mm in diameter due to the effects of increased available surface area. Because the retained particles greater than 2.00 mm in diameter represent about 21 percent of the total bottom material in the catch basin and about 6 percent of the total bottom material in the separators, and because both devices were not capable of retaining low-density floatables that contained high concentrations of TOC, the removal efficiency for organic constituents could have been an order of magnitude less than the overall suspended-sediment removal efficiency. Furthermore, given that specific conductance is a general measure of the total dissolved solids in solution, the lack of difference between the median and interquartile ranges of specific conductance values measured in samples of collected from the inlet and outlet of each structural BMP indicates that the devices were not effective at reducing dissolved constituents (fig. 23). It should be noted that other studies have found that a high proportion of trace metals in highway runoff are dissolved (Dupuis and others, 1985). In this study, about 35 percent of the Cr, 17 percent of the Ni, 15 percent of the Mg, 10 percent of the Cu, and 8 percent of the Zn as measured in EMCs from samples collected in January 2000 and processed

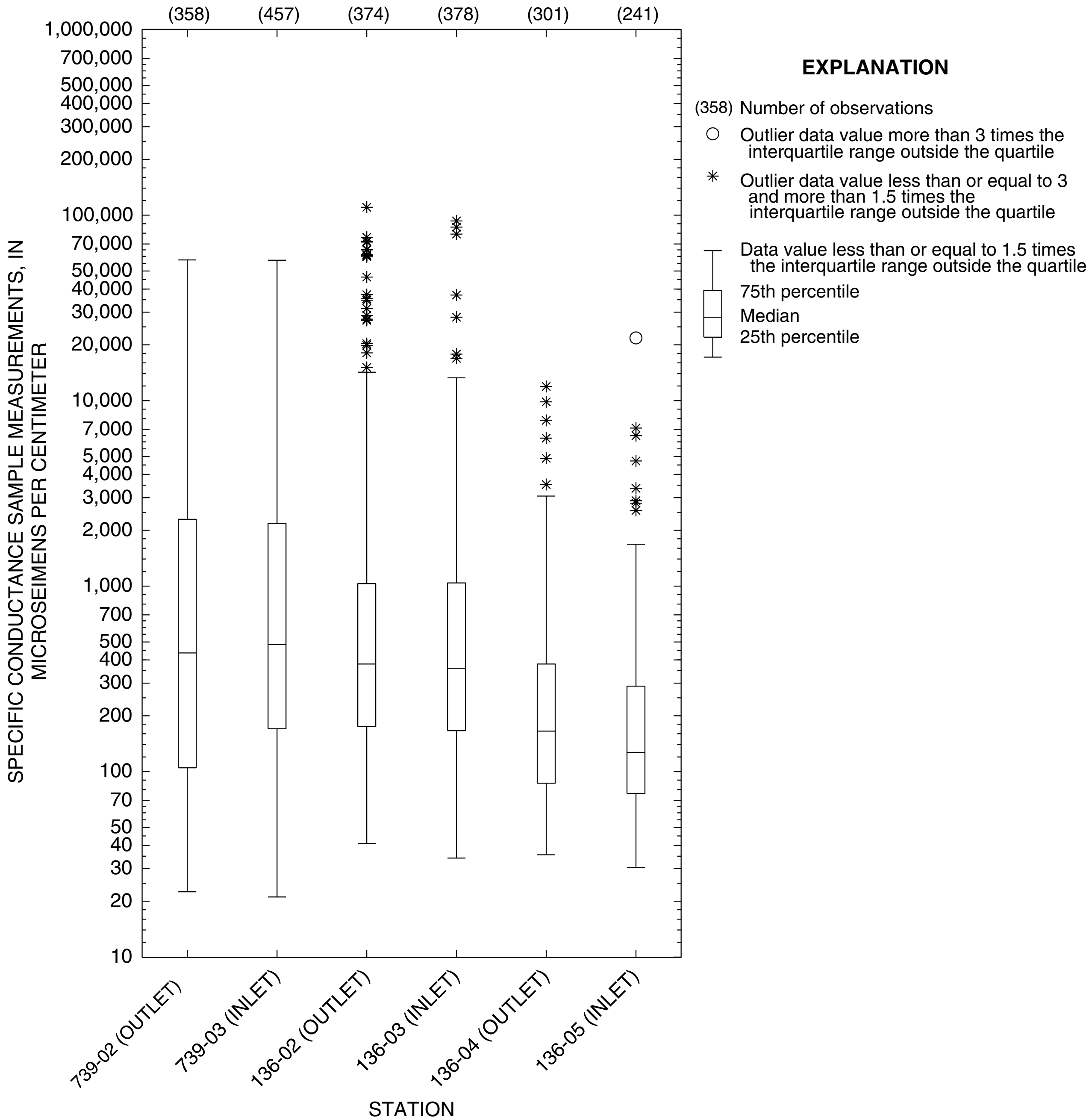

Figure 23. Specific conductance of suspended-sediment concentration samples collected from a deep-sumped hooded catch basin and two oil-grit separators located along the Southeast Expressway, Boston, Massachusetts.

within 24 hours of the initial sample collection were dissolved. In addition, the distribution of trace elements within the bottom sediment of the structural BMPs depends partly upon biochemical and geochemical conditions that increase concentrations of dissolved trace elements. For example, both Ellis and others (1987) and Morrison and others (1990) measured increases in dissolved concentrations of Cd, Cu, Pb, and Zn in catch-basin water caused by conditions resulting from decomposition of organic matter in the sump sediment.

Loads for chemical and biological constituents were not estimated because insufficient data were collected to accurately characterize the temporal and spatial variability in the runoff. For example, the suspended-sediment concentrations for the four storms, which were also sampled for chemical and biological constituents, represented about 5 percent of the storms that occurred during the monitoring period, but as much as 21 percent of the overall suspended-sediment load during the monitoring period. Because the ratio of chemical loads to suspended-sediment loads, however, was likely similar to the ratio of chemical concentrations to suspended-sediment concentrations, use of the limited chemical data would overestimate the chemical loads.

Reduction of Fecal-Indicator Bacteria

Concentrations of fecal and *Enterococci* bacteria were found throughout the storms at the inlet of each oil-grit separator. This result indicates that the pavement washoff process was inefficient or that there was continuous source of bacteria in the drainage area. Discrete concentrations of fecal and *Enterococci* bacteria collected during five storms are presented in appendix 1, table 1*I*. EMCs of *Enterococci* bacteria for samples collected during individual storms were within 36 percent of each other, and EMCs of fecal bacteria were within 90 percent of each other. In general, subcomposites of *Enterococci* bacteria for samples collected during individual storms varied from each other by as much as 500 percent and subcomposites of fecal bacteria varied from each other by 200 percent to more than an order of magnitude.

Concentrations of fecal-indicator bacteria were greatest in the fall and the early winter. An abrupt decrease in fecal and *Enterococci* bacteria concentrations in samples collected in March coincided with winter applications of deicing compounds. EMCs of fecal and *Enterococci* bacteria for samples collected in March were as much as an order of magnitude and 95 percent lower than EMCs of fecal and *Enterococci* bacteria collected in the fall, respectively. Since deicing applications ceased around April, warmer and longer antecedent conditions may have affected June bacteria concentrations. This temporal distribution of fecal-indicator bacteria is similar to that found in other highway runoff studies (Kobriger and Geinopolos, 1984). In about half of the storms, concentrations of fecal-indicator bacteria were lower in initial first-flush samples. One possible explanation is the initial water entering the separators was essentially the supernatant of the catch basins, and sediment-affiliated bacteria may have settled during the antecedent period. Subsequent bacteria concentrations increased because pavement water mixed with the catch-basin water, and possibly disturbed bottom sediments. The catch basin, and the separator particularly provide an environment that is thermally stable, free from ultraviolet light, and enriched in TOC and nutrients—factors that normally enhance bacteria survivability. Bacteria have been found to survive in storm sewers for at least 13 days and in sediment exposed to air for up to 49 days (Kobriger and Geinopolos, 1984). Thus, the potential for resuspension of sediments in each device and mobilization of roadside sediment may provide a continuous source of bacteria.

The efficiency of the structural BMPs tested in this study to reduce fecal-indicator bacteria concentrations was not quantified; however, these devices are most likely ineffective for this purpose. Bacterial removal efficiency is affected by the BMPs' short retention time and inability to remove suspended sediment less than 0.062 mm in diameter. Individual fecal coliform bacteria cells are less than 0.002 mm in diameter (Schueler, 1999) and have settling characteristics similar to clay particles (Coyne and others, 1995). Schillinger and Gannon (1982) reported that 50 percent of the bacteria in stormwater were not associated with sediments, and about 70 to 85 percent of associated bacterial cells adhered to sediment particles less than 0.030 mm in diameter. Consequently, each BMP is likely to retain a quantity of fecal-indicator bacteria proportional to its volume after a storm. Absolute removal is dependent on the survivability of fecal-indicator bacteria prior to the subsequent storm and potential for export during the subsequent storm.

SUMMARY

The USGS, in cooperation with the Federal Highway Administration and the Massachusetts Highway Department (MassHighway), began a study in November 1998 to determine the effectiveness of three best management practices (BMPs) in reducing suspended-sediment loads and related constituents along the Southeast Expressway in Boston, Massachusetts. The study area included about 2 mi of the Southeast Expressway, which represents about 0.06 percent of the total area of the Neponset drainage basin and the Boston Harbor Coastal Subbasin. Primary treatment for highway stormwater runoff was provided by 209 catch basins. One 3-chambered 4,500-gal off-line oil-grit separator, and four 2-chambered 1,500-gal off-line oil-grit separators provided additional stormwater treatment. Each separator includes a diversion weir positioned near the inlet of the separator that directs a portion of the flow to a bypass pipe during high flows. Mechanized street sweeping is conducted annually following the winter maintenance period. The BMPs examined in this study included a single catch basin, three 1,500-gal oil-grit separators, and mechanical street sweeping.

Automatic-monitoring techniques were used to characterize the temporal and spatial variability in suspended-sediment transport through each structural BMP. Water samples were collected, and continuous measurements of selected hydrologic, water-quality, and meteorology parameters were made from April 1999 through June 2000 for the catch basin and one of the separators (station 136), and from August 1999 through June 2000 for the second separator (station 739). The third separator was not continuously monitored. Samples for the analysis of suspended sediment and water quality were collected flow-proportionally at the inlet and outlet of each structural BMP automatically. The inlet and outlet flows for each device were sampled during four storms for analysis of chemical constituents. Discrete samples for the analysis of bacteria were collected flow-proportionally from a second dedicated automatic sampler at the inlet of each separator during five storms. Samples of large buoyant particles and other debris (greater than 6 mm in diameter) were collected at the outlet of a separator (station 739) during 12 storms.

Samples of bottom material were collected from three separators in November 1998, and from December 1999 through January 2000. The depth of bottom material was assessed in each structural BMP prior to the first scheduled cleaning, during the collection of bottom material, and at the conclusion of the monitoring period. Samples of bottom material for determinations of density were collected in the catch basin and each chamber of the separators. Samples of bottom sediment collected for chemical analysis from each separator in November 1998 were composited in proportion to the estimated volume of retained material in each separator. Samples of bottom sediment (excluding litter and identifiable metal objects) collected for chemical analysis in December 1999 through January 2000 were wet-sieved into size classes of less than 0.062 mm in diameter, between 0.062 mm and 2.00 mm in diameter, and greater than 2.00 mm in diameter. The contents of the bottom material were visually identified and placed in general categories. Samples of street sweepings were collected from mechanical sweepers while in the vicinity of the monitoring stations.

Quality-control data indicated that most data were within the accumulative uncertainties of the various measurement, sampling, and analytical processes. Those data also indicated that particles greater than 0.062 mm in diameter were not evenly distributed throughout the water column at the inlet of the separators. Loads of suspended sediment at the inlets of the separators would have been overestimated without an adjustment in concentration. Therefore, an adjustment equation was developed to normalize the mean concentration of suspended sediment in water samples collected at the fixed sampling location at the inlet of the separators. This equation was based on concentration and particle-size distribution of suspended sediment collected in the water column of the drainage pipe at flows characteristic of observed field conditions.

A distinct pattern of bottom-material deposition was initially observed for each separator; however, as the volume of material in each chamber increased over

time, the distribution of the bottom material became more uniform. The estimated volume of retained bottom material in the separators at the conclusion of the study in contrast to the estimated volume of retained bottom material in the separators after three-years of operation without any maintenance indicate that the estimated rate of bottom-material accumulation was about two times greater during the study period at station 136 and at station 739 and about seven times greater at station 749, than during the first three years of operation. The actual increase in the estimated rate of bottom-material accumulation is uncertain because the density of the bottom material for the first three years of operation was unknown and suspended-sediment data were not available prior to this study. One possible explanation for the increase in the rate of bottom-material accumulation during the study, or perhaps more specifically, the lack of accumulation during the first three years of operation, is that a single (or multiple) storm(s) resuspended a portion of the bottom material retained in the separators during the first three years of operation and flushed the suspended materials from the device; thus, the rate of accumulation would have been distorted by the loss of retained bottom material.

The particle-size distribution of bottom material varied substantially between the catch basin and the separators. Most bottom material in the catch basin (about 83 percent) and in the primary chamber of the separators (a weighted average of 85 percent) was coarse-grained (greater than 0.25 mm in diameter), whereas a greater amount of sediment in the secondary chamber of the separators was fine-grained (a weighted average of about 50 percent was less than 0.25 mm in diameter). The percentages of sediment particles found in each size class were similar, with respect to sample location, for each separator. In contrast, the percentages of particles found in each size class, for classes less than 0.062 mm in diameter and greater than 0.5 mm in diameter, were substantially different for the two chambers of the separators. In general, the primary chamber of the separators contained higher percentages of coarse material, whereas finer and less dense particles were found in the second chamber. About 17 percent of the material found in the separators and about 7 percent of the material found in the catch basin was less than 0.062 mm in diameter.

Visual observations suggested that the separators were effective in removing floatable debris; however, the distribution of potentially floatable debris in bottom materials relative to each chamber, and the quantity of debris collected at the outlet of a separator, indicated that the devices can be effective only if they are cleaned regularly. The absence of debris in the catch basin at the conclusion of the monitoring period and the presence of floatable debris found in each separator indicated that the catch-basin hoods were not effective in reducing floatable debris.

The concentrations of suspended sediment in discrete samples of runoff collected from the inlets of the separators ranged from 8.5 to 7,110 mg/L, and concentrations of suspended sediment in discrete samples of runoff collected from the inlet of the catch basin ranged from 32 to 13,600 mg/L. The concentrations of suspended sediment in discrete samples of runoff collected from the outlets of the separators ranged from 5 to 2,170 mg/L, and concentrations of suspended sediment in discrete samples of runoff collected from the outlet of the catch basin ranged from 25.7 to 7,030 mg/L. The particle-size distribution of samples collected from the inlet of each structural BMP indicated that more than half of the suspended sediment consisted of particles less than 0.062 mm in diameter.

The two separators treated about 98 percent of the stormwater within their contributing area. The individual suspended-sediment removal efficiencies ranged from between -98 to +95 percent at station 136, and -94 percent to +90 percent at station 739. The operating efficiencies for the respective monitoring periods for the separators were 35 percent at station 136 and 28 percent at station 739. The average removal-efficiency associated with storms less than 0.2 in., however, ranged from about 32 to 81 percent. This increase in efficiency was a function of retention time rather than active treatment of the stormwater. The separator at station 136 retained 477 kg and the separator at station at 739 retained 190 kg of solids. The efficiency computed from the measured mass of material retained in the separators at the conclusion of the monitoring period and from the total outflow load of suspended sediment was 32 percent at station 136 and 24 percent at station 739. The small difference between the two methods used to estimate the efficiency of the separators indicated that the flow-weighted normalization of the inflow loads was a reasonable approach. The estimated mass-balance difference was within the cumulative uncertainties of the various measurement processes. The primary factor controlling the suspended-sediment-removal efficiency of each structural BMP was retention time. In the combined treatment system in this study, where catch basins provided primary suspended-sediment treatment, the separators reduced the mass of the suspended sediment from the pavement by about an additional 18 percent (with an assumed average catch-basin efficiency of about 41 percent).

Despite the presence of a bypass pipe at the inflow to the separator, previously captured sediments were resuspended and discharged from the separators nine times at station 136 and seven times at station 739. Resuspension of sediments was detected at and above rainfall intensities of 0.04 in. per 5-minute interval and flows greater than about 0.46 ft^3/s at each station. Stormflows from the separator at station 136 exceeded 0.46 ft^3/s 33 times compared to 22 times for station 739 during the monitoring period. The stormflows from separator 136 exceeded 0.46 ft^3/s 24 times during the same 10-month operating period. The amount of resuspended sediment estimated for both separators represented about 8 percent of the suspended-sediment loads retained at the end of the monitoring period. The estimated quantity of suspended sediment that bypassed the separators at station 136, where bypass flow occurred more frequently, and station 739 was about 20 percent higher and about 16 percent lower, respectively, than the amount of sediment (less than 0.062 mm in diameter) resuspended. Without the ability to limit flows through the device to 0.46 ft^3/s or less, changes in the diversion-weir height would not substantially affect the device performance. Sediments subject to resuspension represented a small fraction of the retained bottom-material composition, and a portion of coarse-grained sediments, readily retained by the separator and mobilized during peak flows, would bypass the device. Resuspension could be virtually eliminated by reducing the device drainage area by a factor of about five or performing maintenance (cleaning) between storms, but neither option is cost effective or practical.

The individual removal efficiencies for the catch basin ranged from -114 to +97 percent. The average catch-basin retention time was about 1 hour; however, retention times were as low as 37 seconds during brief periods of flow. Resuspension of bottom sediments was detected during several storms, although the depth of bottom sediment retained in the catch basin was less than 25 percent of the sump depth at the conclusion of the monitoring period. The frequency of cases in which resuspension was detected did not increase with an increase in captured sediment. The estimated amount of resuspended sediment represented 18 percent of the final mass of retained sediment.

The operating efficiency for the 14-month monitoring period for the catch basin was 39 percent, and the catch basin retained an estimated 234 kg of solids. The relative mass-balance error for the catch basin was -14 percent. There was no substantial difference between combined loads of suspended sediment from the catch-basin discharges, estimated from the separator inflows, several weeks before and after annual catch-basin cleaning. This finding indicated that the volumes of retained bottom material in the catch basins within the drainage areas of station 136 and 739 were not sufficient to substantially affect catch-basin performance. Removal of bottom sediments in the late winter or spring may be more beneficial than at other times because high intensity rainfall, characteristic of summer thunderstorms, can cause resuspension of bottom sediments in catch basins, even when the volume of bottom material represents less than 25 percent of the catch-basin sump.

In this combined system, the efficiencies of the catch basin and separator were inversely related. The suspended-sediment removal efficiency of the catch basin decreased with an increase in discharge, which decreased retention time. Conversely, the separator performance improved with an increase in discharge in spite of a decrease in retention time. This was due, in part, to a change in the particle-size distribution during periods of greater flows. During low flow, larger particles settled in the catch basins while finer material entered the separator. While the separator volume was greater than that of a single catch basin, the combined flow from multiple catch basins discharged to each separator, which reduced the retention time and inhibited the capture of fine material. As flow increased, however, sediment from roadway and particle size tended to increase as coarse-grained material was discharged from the catch basin, which subsequently improved the separator performance.

Suspended-sediment loads for the entire study area were estimated on the basis of the long-term average annual precipitation and the estimated inlet and outlet loads of the two separators. The estimated annual suspended-sediment load for the entire study area was about 29,000 kg. About 24,000 kg of this total discharged near Malibu Beach and Tenean Beach embayments, and the remaining 5,000 kg discharged to the land surface, where it infiltrated into the ground. These loads do not include an estimated 2,000 kg of sediment retained by the five separators.

The effectiveness of mechanical street sweeping was assessed by evaluating the differences between suspended-sediment loads of structural BMPs before sweeping and after sweeping relative to storm precipitation totals. The effectiveness was also assessed by evaluating the differences between the particle-size distribution of sweeper samples and bottom-sediment samples collected in the catch basin and the weighted average of bottom-sediment samples collected from the three separators. The particle-size distribution of sweeping samples closely resembled the particle-size distribution of the catch-basin sediments in all size classes below 4 mm in diameter. The concentration of particle sizes greater than 0.5 mm in diameter in sweeper samples was higher than averaged concentrations of bottom sediment collected from the separators. On the basis of these data, the greatest benefit of annual street sweeping was the removal of particles greater than 8 mm in diameter that were not mobilized routinely during storm flows. Except for reducing the frequency of cleaning of catch basins and separators, frequent pavement sweeping (several times a month) would probably provide little additional water-quality benefit beyond those of the existing structural BMPs along the Southeast Expressway, due in part to the lack of curbing at the highway edge that would provide a physical boundary to trap debris and sediment. Also the sweeper was not effective at removing particles less than 0.062 mm in diameter, which composed the dominant particle-size group on the roadway surface.

Concentrations of inorganic constituents in sieved bottom sediments from three separators were typically higher for sediments less than 0.062 mm in diameter. Concentrations of total organic carbon (TOC) in sieved bottom sediments were similar for sediments less than 0.062 mm in diameter and sediments greater than 2.00 mm in diameter. Conversely, concentrations of polychlorinated biphenyls (PCB) and polyaromatic hydrocarbons (PAH) were typically higher for sediments greater than 2.00 mm in diameter. A substantial difference in the TOC content of sediments greater than 2.00 mm in diameter and less than 2.00 mm in diameter may explain the PCB and PAH distribution and further indicate that the PCB and PAH concentrations in bottom sediments less than 0.062 mm in diameter are similar to the concentrations in the bottom sediments greater than 2.00 mm in diameter, if not greater because of the effects of the surface area. Therefore, the potential effectiveness of the catch basins and the separators to reduce loads of inorganic and organic constituents was several times less (as much as an order of magnitude) than their ability to reduce loads of suspended sediment (consisting of natural organics, and fine- and coarse-grained material) because (a) most of the suspended sediment entering the structural BMPs was less than 0.062 mm in diameter, (b) only about 21 percent of the retained bottom material in the catch basin and 6 percent of the retained bottom material in the separators was greater than 2 mm in diameter, and (c) neither type of device was completely capable of retaining low-density floatable debris that contained concentrated levels of TOC and organic compounds.

The average relative percent difference (RPD) for concentrations of trace metals and organic constituents between the inlet and the outlet (inlet minus outlet) of the catch basin ranged from -29 to +42 percent. The average RPD for concentrations of sediment-associated constituents for the inlet and the outlet of the separators ranged from -129 to +44 percent at station 136, and -47 to +21 percent at station 739. The average RPD for concentrations of trace metals was about 30 percent at station 136, and about 15 percent at station 739. The average RPD for concentrations of organic constituents for both separators was commonly less than about 10 percent and negative in several cases. These RPDs were probably larger than normal because the precipitation totals for the four storms were greater than the average precipitation total for storms during the monitoring period, and likewise, the EMCs of suspended sediment for each structural BMP in all four storms were greater than the median EMCs of suspended sediment for each BMP during the monitoring period. In fact, the quantity of suspended sediment during the four storms accounted for 9 to 23 percent of the overall suspended-sediment load for each BMP during the monitoring period. Additionally, because sediment-associated constituents collected from the inlet of the separators were not normalized to the water column, the portion of constituents associated with sediments greater than 0.062 mm in diameter was not sampled in proportion to the mean concentration. Examination of constituent-sediment relations suggests that a substantial amount of highway-related constituents was either in the dissolved form and not subject to treatment by simple gravity separation, or was associated with particles less than 0.062 mm in diameter, which commonly passed through these structural BMPs. Loads for chemical and biological constituents were not estimated because insufficient data were collected to characterize the temporal and spatial variability accurately; however, the ratio of chemical loads to suspended-sediment loads was likely similar to the ratio of chemical concentrations to suspended-sediment concentrations.

The efficiency of the structural BMPs tested in this study to reduce concentrations of fecal-indicator bacteria was not quantified; however, the structural BMPs are probably ineffective in reducing fecal-indicator bacteria concentrations because bacteria share the same settling characteristics as particles less than 0.062 mm in diameter. Absolute bacteria removal in each device is dependent on the fecal-indicator bacteria survivability prior to the storm and the potential for exportation during the storm. Fecal and *Enterococci* bacteria were found throughout the entire storm at the inlet of each separator; this finding indicated that the pavement-washoff process was inefficient or that there was continuous source of bacteria in the drainage area.

The findings of this study on the effectiveness of deep-sumped hooded catch basins, 1,500-gal off-line oil-grit separators, and mechanized street sweeping were based on the physical and environmental conditions during the study. Many of the conditions at this site were unique in Massachusetts, specifically the movable zipper barrier and the substantial average daily traffic volume. Studies of other highways that have lower traffic volumes, different particle-size distributions, and different concentrations of suspended sediment may produce other results.

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Appendix 1. Summary Statistics and Analytical Results from the Evaluations of Effectiveness for Three Best Management Practices for Highway-Runoff Quality along the Southeast Expressway, Boston, Massachusetts

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts

[ntu, nephelometric turbidity units; ˚C, degrees Celsius; ft^3/s, cubic feet per second; mg/L, milligrams per liter; mm, millimeters; µS/cm, microsiemen per centimeter at 25˚C; %, percent; >, actual value is greater than value shown; --, no data]

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)								
5-08-1999	1702	1,310	9	--	--	1,080	650	0.73
5-08-1999	1706	1,990	5	--	--	962	1,200	.68
5-08-1999	1710	1,660	3	--	--	923	900	.34
5-08-1999	1716	1,180	2	--	--	880	700	.19
5-08-1999	1722	848	2	--	--	826	500	.24
5-08-1999	1726	644	2	--	--	761	370	.36
5-19-1999	2246	--	--	--	--	--	--	.01
5-19-1999	2340	102	11	--	--	1,700	75	.03
5-20-1999	0132	128	10	--	--	2,050	120	.09
5-20-1999	0138	177	4	--	--	1,760	160	.21
5-20-1999	0146	244	2	--	--	1,330	200	.18
5-20-1999	0156	221	2	--	--	962	200	.13
5-20-1999	0204	182	3	--	--	728	190	.15
5-20-1999	0220	176	0	--	--	577	160	.11
5-20-1999	0640	--	--	--	--	--	--	.06
5-20-1999	0848	131	2	--	--	855	130	.08
5-20-1999	0912	167	1	--	--	920	150	.05
5-23-1999	2116	89	2	--	--	1,020	50	.03
5-23-1999	2118	81	1	--	--	1,030	50	.04
5-23-1999	2148	147	3	--	--	1,000	110	.18
5-23-1999	2156	185	3	--	--	837	180	.15
5-23-1999	2210	207	4	--	--	606	180	.17
5-23-1999	2216	279	7	--	--	409	200	.42
5-23-1999	2220	374	10	--	--	289	220	.64
5-23-1999	2222	405	12	--	--	252	220	.69
5-23-1999	2224	417	12	--	--	229	210	.75
5-23-1999	2226	404	11	--	--	211	200	.75
5-23-1999	2228	374	10	--	--	207	190	.64
5-23-1999	2232	282	7	--	--	203	150	.58
5-23-1999	2236	271	7	--	--	195	140	.6
5-23-1999	2240	696	5	--	--	196	130	.41
5-23-1999	2244	214	6	--	--	191	120	.39
5-23-1999	2254	178	2	--	--	185	110	.11
5-23-1999	2312	129	1	--	--	180	90	.05
5-24-1999	0308	58	3	--	--	376	55	.26

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
5-24-1999	0314	84	3	--	--	370	70	0.29
5-24-1999	0320	69	4	--	--	298	60	.31
5-24-1999	0330	63	2	--	--	238	50	.11
5-24-1999	1422	251	3	--	--	440	170	.20
5-24-1999	1416	--	--	--	--	--	--	.19
5-24-1999	1520	241	1	--	--	635	220	.04
5-24-1999	1522	246	5	--	--	644	230	.04
5-24-1999	1636	716	10	--	--	472	360	.96
5-24-1999	1640	748	6	--	--	268	350	.53
5-24-1999	1648	490	3	--	--	205	260	.28
5-24-1999	1730	187	1	--	--	210	150	.14
5-24-1999	1830	106	2	--	--	254	100	.06
5-24-1999	1858	145	3	--	--	272	130	.34
5-24-1999	1920	136	3	--	--	220	120	.07
7-01-1999	0236	97	--	--	--	633	50	.16
7-01-1999	0238	131	--	--	--	734	50	.15
7-01-1999	0258	229	--	--	--	814	150	.31
7-01-1999	0304	319	--	--	--	507	140	.69
7-01-1999	0310	289	--	--	--	408	170	.65
7-01-1999	0318	263	--	--	--	415	180	.30
7-01-1999	0344	208	--	--	--	406	160	.05
7-01-1999	0404	170	--	--	--	455	130	.29
7-01-1999	0602	373	--	--	--	429	150	.78
7-01-1999	0606	639	--	--	--	268	170	1.05
7-01-1999	0610	543	--	--	--	176	140	.95
7-01-1999	0612	448	--	--	--	151	120	.98
7-01-1999	0620	264	--	--	--	148	120	.38
7-01-1999	0628	188	--	--	--	145	110	.30
7-01-1999	0642	128	--	--	--	168	85	.19
7-01-1999	0710	95	--	--	--	208	70	.04
7-01-1999	1014	85	--	--	--	299	70	.12
7-01-1999	1104	171	--	--	--	491	130	.27
7-01-1999	1112	193	--	--	--	385	150	.33
7-01-1999	1126	177	--	--	--	308	150	.18
7-01-1999	1154	136	--	--	--	277	130	.08
7-06-1999	1704	127	--	--	--	670	110	.36
7-06-1999	1708	336	--	--	--	622	180	.91
7-06-1999	1716	204	--	--	--	538	130	.40
7-06-1999	1738	147	--	--	--	545	100	.07
7-06-1999	1844	82	--	--	--	614	55	.05

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
7-06-1999	2136	83	--	--	--	621	60	0.26
7-06-1999	2210	77	--	--	--	640	60	.05
7-13-1999	0656	--	--	--	--	--	--	.02
7-13-1999	0658	--	--	--	--	--	--	.03
7-19-1999	1654	165	--	--	--	732	90	.22
7-19-1999	1706	146	--	--	--	443	100	.28
7-19-1999	1720	64	--	--	--	299	75	.25
7-19-1999	1728	107	--	--	--	206	85	.37
7-19-1999	1754	60	--	--	--	211	60	.08
7-19-1999	1818	31	--	--	--	219	65	.05
7-19-1999	1910	--	--	--	--	241	55	.04
7-19-1999	1920	--	--	--	--	--	--	.03
7-20-1999	1319	255	--	--	--	330	29	<.01
7-23-1999	0100	197	--	--	--	541	10	.55
7-23-1999	0102	515	--	--	--	563	200	.9
7-23-1999	0106	429	--	--	--	356	180	.96
7-23-1999	0108	321	--	--	--	290	150	.98
7-23-1999	0112	211	--	--	--	245	100	.72
7-23-1999	0120	138	--	--	--	200	75	.34
7-23-1999	0130	65	--	--	--	188	65	.30
7-23-1999	0142	49	--	--	--	190	55	.39
7-23-1999	0150	43	--	--	--	177	40	.36
7-23-1999	0158	47	--	--	--	156	40	.45
7-23-1999	0208	52	--	--	--	139	45	.17
7-24-1999	2026	467	--	--	--	253	90	1.14
7-24-1999	2028	405	--	--	--	190	120	1.72
7-24-1999	2030	425	--	--	--	155	110	1.39
7-24-1999	2032	335	--	--	--	140	110	.96
7-24-1999	2036	217	--	--	--	139	90	1.00
7-24-1999	2042	136	--	--	--	129	75	.60
7-24-1999	2108	216	--	--	--	127	70	.94
7-24-1999	2112	143	--	--	--	154	60	1.05
7-24-1999	2116	151	--	--	--	100	100	.95
7-24-1999	2122	104	--	--	--	96	60	.43
7-24-1999	2146	62	--	--	--	102	39	.06
7-25-1999	1358	35	--	--	--	159	31	.23
7-25-1999	1640	81	--	--	--	392	50	.32
7-25-1999	1644	206	--	--	--	281	85	1.00
7-25-1999	1648	173	--	--	--	187	80	.83
7-25-1999	1654	119	--	--	--	155	55	.46

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
7-25-1999	1706	65	--	--	--	116	55	0.21
7-27-1999	1254	16	--	--	--	--	--	<.01
8-06-1999	2126	10	--	--	--	200	14	.06
8-06-1999	2128	12	--	--	--	203	9	.06
8-06-1999	2204	--	--	--	--	--	--	.03
8-14-1999	2136	119	--	--	--	642	25	.31
8-14-1999	2138	190	--	--	--	624	85	.58
8-14-1999	2140	236	--	--	--	558	120	.50
8-14-1999	2142	260	--	--	--	508	140	.41
8-14-1999	2144	255	--	--	--	462	165	.33
8-14-1999	2146	252	--	--	--	428	170	.25
8-14-1999	2148	262	--	--	--	411	150	.18
8-14-1999	2150	242	--	--	--	400	160	.13
8-14-1999	2152	328	--	--	--	383	170	.09
8-14-1999	2154	238	--	--	--	381	150	.07
8-14-1999	2156	217	--	--	--	378	160	.06
8-14-1999	2158	208	--	--	--	374	160	.05
8-14-1999	2200	210	--	--	--	366	160	.05
8-21-1999	2006	--	--	--	--	--	--	.02
8-21-1999	2118	30	--	--	--	659	29	.04
8-22-1999	0652	32	--	--	--	475	28	.03
8-26-1999	1724	11	--	--	--	430	17	.03
8-26-1999	1726	7	--	--	--	432	22	.03
9-06-1999	1136	91	--	--	--	714	110	.05
9-06-1999	1152	288	--	--	--	533	170	.76
9-06-1999	1206	237	--	--	--	319	180	.09
9-07-1999	0238	120	--	--	--	345	90	.30
9-07-1999	0404	103	--	--	--	272	70	.42
9-07-1999	0410	244	--	--	--	188	120	.76
9-07-1999	0416	190	--	--	--	177	120	.35
9-07-1999	0446	103	--	--	--	154	100	.09
9-07-1999	0518	67	--	--	--	174	60	.04
9-08-1999	0922	116	--	--	--	296	90	.26
9-08-1999	0938	153	--	--	--	284	140	.15
9-08-1999	1002	127	--	--	--	260	130	.10
9-08-1999	1014	87	--	--	--	855	95	.05
9-08-1999	1058	112	--	--	--	262	110	.05
9-10-1999	0752	178	--	--	--	323	160	.21
9-10-1999	0814	157	--	--	--	260	160	.24
9-10-1999	0822	360	--	--	--	163	170	.88

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
9-10-1999	0826	407	--	--	--	125	220	0.76
9-10-1999	0838	227	--	--	--	107	150	.19
9-10-1999	0906	98	--	--	--	121	90	.13
9-10-1999	0954	130	--	--	--	162	100	.63
9-10-1999	1004	172	--	--	--	137	140	.19
9-10-1999	1148	--	--	--	--	--	--	.02
9-10-1999	1442	70	--	--	--	200	80	.32
9-10-1999	1450	139	--	--	--	196	120	.37
9-10-1999	1500	132	--	--	--	155	120	.34
9-10-1999	1508	158	--	--	--	98	95	.73
9-10-1999	1520	106	--	--	--	76	75	.24
9-15-1999	1850	--	--	--	--	--	--	.02
9-15-1999	1936	55	--	--	--	332	65	.07
9-15-1999	2004	78	--	--	--	301	95	.13
9-15-1999	2026	90	--	--	--	209	100	.11
9-15-1999	2052	73	--	--	--	160	80	.14
9-15-1999	2112	57	--	--	--	135	65	.15
9-15-1999	2136	46	--	--	--	119	60	.10
9-15-1999	2220	37	--	--	--	119	50	.03
9-15-1999	2320	34	--	--	--	146	50	.11
9-15-1999	2346	43	--	--	--	122	55	.08
9-16-1999	0006	48	--	--	--	95	50	.20
9-16-1999	0020	44	--	--	--	75	45	.24
9-16-1999	0038	36	--	--	--	62	39	.13
9-16-1999	0052	31	--	--	--	59	34	.12
9-16-1999	0948	145	--	--	--	53	80	.78
9-16-1999	1016	71	--	--	--	51	55	.55
9-16-1999	1228	47	--	--	--	124	65	.10
9-16-1999	1412	101	--	--	--	105	65	.38
9-16-1999	1520	182	--	--	--	97	60	.86
9-16-1999	1536	83	--	--	--	69	40	.42
9-16-1999	1604	50	--	--	--	68	26	.78
9-16-1999	1634	32	--	--	--	66	18	.12
9-16-1999	1654	139	--	--	--	41	45	.93
9-16-1999	1822	50	--	--	--	85	30	.06
9-22-1999	2334	36	--	--	--	352	20	.03
9-22-1999	2336	36	--	--	--	353	21	.04
10-06-1999	1426	12	--	--	--	158	1.8	<.01
10-18-1999	0712	31	--	--	--	63	31	.07
10-18-1999	0714	31	--	--	--	62	30	.06

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
10-20-1999	0820	152	--	--	--	159	50	0.09
10-20-1999	0854	131	--	--	--	205	130	.22
10-20-1999	0908	155	--	--	--	174	160	.13
10-20-1999	1204	113	--	--	--	172	130	.36
10-20-1999	1216	163	--	--	--	104	140	.38
10-20-1999	1234	136	--	--	--	78	120	.27
10-23-1999	0208		--	--	--	190	75	.17
10-23-1999	0240	99	--	--	--	179	80	.07
10-23-1999	0302	77	--	--	--	176	60	.12
10-23-1999	0330	53	--	--	--	142	45	.19
10-23-1999	0346	50	--	--	--	102	39	.27
10-23-1999	0404	48	--	--	--	77	32	.19
10-23-1999	0418	44	--	--	--	65	33	.2
10-23-1999	0444	36	--	--	--	62	28	.07
10-26-1999	1530	16	--	--	--	116	10	<.01
11-02-1999	2340	149	1	--	--	380	160	.18
11-02-1999	2358	152	2	--	--	334	180	.13
11-03-1999	0020	119	2	--	--	273	140	.18
11-03-1999	0042	96	4	--	--	238	110	.17
11-03-1999	0106	81	3	--	--	202	95	.16
11-03-1999	0122	83	5	--	--	152	80	.22
11-03-1999	0136	75	6	--	--	121	70	.33
11-03-1999	0146	65	4	--	--	100	60	.40
11-03-1999	0158	52	10	--	--	90	50	.34
11-03-1999	0208	46	4	--	--	79	40	.35
11-03-1999	0218	36	2	--	--	79	35	.31
11-03-1999	0234	38	3	--	--	75	35	.34
11-03-1999	0244	37	3	--	--	76	32	.25
11-03-1999	0256	50	3	--	--	278	50	.34
12-20-1999	2307	44	--	--	--	61	36	.02
12-20-1999	2330	--	--	--	--	--	--	.10
12-20-1999	2344	--	--	--	--	--	--	.06
12-21-1999	0019	--	--	--	--	--	--	.02
12-21-1999	0047	--	--	--	--	--	--	.09
12-21-1999	0058	--	--	--	--	--	--	.16
12-21-1999	0118	--	--	--	--	--	--	.04
12-21-1999	0300	--	--	--	--	--	--	.01
12-21-1999	0332	--	--	--	--	--	--	.03
1-10-2000	1956	--	--	--	--	--	--	.10
1-10-2000	2012	--	--	--	--	--	--	.06

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
1-10-2000	2032	--	--	--	--	--	--	0.05
1-10-2000	2057	--	--	--	--	--	--	.04
1-10-2000	2158	--	--	--	--	--	--	.02
1-13-2000	0922	--	--	--	--	--	--	.05
1-13-2000	0951	--	--	--	--	--	--	.06
1-13-2000	1007	--	--	--	--	--	--	.09
1-16-2000	1002	--	--	--	--	--	--	.05
1-16-2000	1039	--	--	--	--	--	--	.03
1-20-2000	1930	66	--	--	--	110,000	85	.01
1-27-2000	1530	65	--	--	--	71,600	58	<.01
1-31-2000	0348	--	--	--	--	--	--	.02
1-31-2000	0406	30	--	--	--	72,400	21	.05
1-31-2000	0428	--	--	--	--	--	--	.08
1-31-2000	0429	46	--	--	--	76,000	40	.10
1-31-2000	0445	562	--	--	--	65,500	600	.10
1-31-2000	0521	--	--	--	--	--	--	.02
1-31-2000	0524	405	--	--	--	27,500	400	.03
1-31-2000	0543	--	--	--	--	--	--	.08
1-31-2000	0558	379	--	--	--	18,100	390	.08
1-31-2000	0618	--	--	--	--	--	--	.05
2-14-2000	0753	363	--	--	--	880	280	.04
2-14-2000	0813	265	--	--	--	2,230	250	.03
2-14-2000	0838	247	--	--	--	2,420	260	.02
2-14-2000	0857	269	--	--	--	2,550	260	.01
2-14-2000	0924	285	0	--	--	3,030	290	.07
2-14-2000	0932	451	5	--	--	2,800	380	.26
2-14-2000	0935	935	8	--	--	2,810	550	.70
2-14-2000	0938	1,050	--	--	--	2,450	700	.46
2-14-2000	0948	979	--	--	--	2,140	700	.07
2-14-2000	1018	643	--	--	--	1,917	500	.13
2-14-2000	1029	467	--	--	--	1,784	380	.08
2-14-2000	1104	373	--	--	--	1,851	360	.11
2-14-2000	1122	351	--	--	--	1,850	360	.07
2-14-2000	1140	340	--	--	--	1,817	360	.1
2-14-2000	1152	423	--	--	--	1,786	380	.24
2-14-2000	1156	583	--	--	--	1,826	450	.43
2-14-2000	1201	654	--	--	--	1,533	500	.31
2-14-2000	1212	629	--	--	--	1,484	500	.09
2-18-2000	1455	97	--	--	--	4,550	160	.03
2-18-2000	2138	588	--	--	--	61,300	450	.13

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
2-18-2000	2142	--	--	--	--	--	--	0.11
2-18-2000	2145	441	--	--	--	59,700	400	.11
2-18-2000	2148	377	--	--	--	60,500	310	.11
2-18-2000	2218	532	--	--	--	65,000	450	.11
2-25-2000	1440	46	--	--	--	46,400	70	.03
2-25-2000	1507	643	--	--	--	31,400	950	.05
2-25-2000	1524	1,090	--	--	--	20,300	2,000	.08
2-25-2000	1544	1,020	--	--	--	15,110	1,800	.06
2-25-2000	1604	854	--	--	--	13,420	1,300	.07
2-25-2000	1619	707	--	--	--	11,780	1,000	.07
2-25-2000	1639	599	--	--	--	10,820	750	.10
2-25-2000	1659	537	--	--	--	6,820	600	.08
2-25-2000	1713	499	--	--	--	6,550	600	.08
2-25-2000	1727	422	--	--	--	6,850	450	.08
2-25-2000	1744	399	--	--	--	6,720	450	.06
2-25-2000	1927	271	--	--	--	6,060	320	.05
2-25-2000	1948	250	--	--	--	7,210	320	.11
2-25-2000	2008	292	--	--	--	7,180	320	.05
2-25-2000	2100	273	--	--	--	5,990	320	.04
2-25-2000	2122	239	--	--	--	5,640	300	.04
2-25-2000	2201	207	--	--	--	5,240	260	.05
2-25-2000	2219	188	--	--	--	4,940	230	.07
2-25-2000	2243	172	--	--	--	4,910	220	.01
2-26-2000	0711	105	--	--	--	782	150	.08
2-26-2000	0728	--	--	--	--	5,380	220	.06
2-27-2000	0810	--	--	--	--	2,120	190	.09
2-27-2000	0827	--	--	--	--	5,420	650	.18
2-27-2000	0848	--	--	--	--	5,560	850	.08
3-28-2000	0439	103	3	1.17	1.76	28,800	110	.01
3-28-2000	0449	36	9	6.11	3.05	34,800	45	.24
3-28-2000	0457	9	48	22.58	25.81	35,500	10	.25
3-28-2000	0505	358	5	2.82	1.87	37,300	310	.25
3-28-2000	0510	564	3	1.14	1.47	27,100	500	.39
3-28-2000	0515	594	2	1.14	0.59	19,860	550	.39
3-28-2000	0525	650	3	1.49	1.11	14,230	650	.35
3-28-2000	0539	625	4	2.12	1.79	7,910	550	.31
3-28-2000	0551	452	3	1.64	1.46	5,640	400	.25
3-28-2000	0605	392	3	0.78	2.08	4,610	340	.37
3-28-2000	0615	362	3	1.42	1.27	3,540	310	.32
3-28-2000	0627	385	3	2.29	0.63	2,910	320	.34

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
3-28-2000	0641	433	2	1.21	.40	2,470	350	0.27
3-28-2000	0654	408	2	1.66	.33	2,080	328	.47
3-28-2000	0659	313	2	.78	1.18	1,809	260	.84
3-28-2000	0705	727	11	8.58	2.62	1,908	380	.54
3-28-2000	0722	880	7	5.26	1.35	1,296	500	.51
3-28-2000	0738	666	5	4.03	.99	1,213	390	.59
3-28-2000	0754	330	6	4.62	1.33	1,027	230	.37
3-28-2000	0817	335	7	4.48	2.05	870	210	.44
3-28-2000	0921	283	3	2.09	.53	849	190	.08
3-28-2000	1106	189	6	5.24	.81	787	140	.07
3-28-2000	1453	141	2	1.47	.53	969	130	.02
3-28-2000	2136	123	6	4.80	1.20	1,989	160	.01
4-04-2000	0338	52	--	--	--	1,782	75	.01
4-04-2000	0402	292	--	--	--	2,080	280	.05
4-04-2000	1453	132	--	--	--	1,919	200	.01
4-04-2000	1525	205	--	--	--	2,120	250	.05
4-04-2000	1600	251	--	--	--	2,300	320	.05
4-04-2000	1633	330	--	--	--	2,220	440	.06
4-04-2000	1808	--	--	--	--	--	--	.02
4-04-2000	2153	--	--	--	--	--	--	.02
4-04-2000	0225	--	--	--	--	--	--	.01
4-08-2000	2317	60	--	--	--	2,350	130	.01
4-08-2000	2341	519	--	--	--	2,630	440	.05
4-09-2000	0035	--	--	--	--	--	--	.05
4-09-2000	0148	--	--	--	--	--	--	.17
4-09-2000	0150	341	--	--	--	2,250	330	.16
4-09-2000	0219	--	--	--	--	--	--	.07
4-09-2000	0222	262	--	--	--	1,621	230	.06
4-09-2000	0304	--	--	--	--	--	--	.14
4-09-2000	0341	151	--	--	--	1,035	160	.16
4-09-2000	0426	--	--	--	--	--	--	.08
4-09-2000	0452	523	--	--	--	634	310	.78
4-09-2000	0502	--	--	--	--	--	--	.18
4-09-2000	0518	268	--	--	--	382	170	.30
4-09-2000	0533	--	--	--	--	--	--	.16
4-09-2000	0600	131	--	--	--	345	95	.38
4-09-2000	0609	--	--	--	--	--	--	.24
4-09-2000	0632	131	--	--	--	304	100	.17
4-09-2000	0658	--	--	--	--	--	--	.05
4-09-2000	0725	190	--	--	--	310	120	.55

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
4-09-2000	0729	--	--	--	--	--	--	0.81
4-09-2000	0735	338	--	--	--	235	170	.47
4-09-2000	0741	--	--	--	--	--	--	.42
4-09-2000	0757	146	--	--	--	213	95	.19
4-09-2000	0821	--	--	--	--	--	--	.06
4-16-2000	0649	82	--	--	--	1,474	90	.05
4-16-2000	0754	82	--	--	--	1,128	100	.04
4-18-2000	1828	33	--	--	--	1,090	50	.01
4-18-2000	1901	164	--	--	--	1,415	180	.11
4-18-2000	1939	186	--	--	--	1,040	200	.05
4-18-2000	2011	--	--	--	--	807	180	.08
4-18-2000	2012	158	--	--	--	807	180	.08
4-18-2000	2041	--	--	--	--	--	--	.08
4-18-2000	2042	136	--	--	--	604	140	.09
4-18-2000	2105	--	--	--	--	--	--	.09
4-18-2000	2140	104	--	--	--	394	110	.05
4-18-2000	2207	--	--	--	--	--	--	.10
4-18-2000	2239	74	--	--	--	331	80	.05
4-18-2000	2342	--	--	--	--	--	--	.07
4-19-2000	0013	50	--	--	--	324	60	.05
4-19-2000	0142	--	--	--	--	--	--	.02
4-19-2000	0432	27	--	--	--	386	40	.02
4-19-2000	0601	--	--	--	--	--	--	.03
4-19-2000	0730	103	--	--	--	483	140	.05
4-19-2000	0814	--	--	--	--	--	--	.04
4-21-2000	1252	52	--	--	--	509	90	.02
4-21-2000	1543	--	--	--	--	--	--	.04
4-21-2000	1545	247	--	--	--	1,231	310	.04
4-21-2000	1717	--	--	--	--	--	--	.04
4-21-2000	1719	243	--	--	--	1,031	310	.04
4-21-2000	1833	--	--	--	--	--	--	.06
4-21-2000	1835	182	--	--	--	725	240	.06
4-21-2000	1938	--	--	--	--	--	--	.11
4-21-2000	1939	134	--	--	--	552	180	.12
4-21-2000	1953	--	--	--	--	--	--	.30
4-21-2000	2002	322	--	--	--	263	230	.28
4-21-2000	2024	--	--	--	--	--	--	.12
4-21-2000	2117	116	--	--	--	207	110	.23
4-21-2000	2124	--	--	--	--	--	--	.36
4-21-2000	2135	159	--	--	--	175	120	.28

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
4-21-2000	2143	--	--	--	--	--	--	0.30
4-21-2000	2217	105	--	--	--	146	85	.06
4-21-2000	2234	--	--	--	--	--	--	.32
4-21-2000	2240	178	--	--	--	131	100	.53
4-21-2000	2247	--	--	--	--	--	--	.39
4-21-2000	2259	121	--	--	--	112	85	.13
4-21-2000	2313	--	--	--	--	--	--	.17
4-21-2000	2347	48	--	--	--	115	40	.14
4-22-2000	0007	--	--	--	--	--	--	.13
4-22-2000	0021	66	--	--	--	107	50	.28
4-22-2000	0031	--	--	--	--	--	--	.27
4-22-2000	0042	78	--	--	--	93	60	.27
4-22-2000	0052	--	--	--	--	--	--	.30
4-22-2000	0101	90	--	--	--	89	60	.34
4-22-2000	0109	--	--	--	--	--	--	.39
4-22-2000	0115	199	--	--	--	83	100	.64
4-22-2000	0132	--	--	--	--	--	--	.43
4-22-2000	0140	115	--	--	--	106	75	.39
4-22-2000	0157	--	--	--	--	--	--	.71
4-22-2000	0203	159	--	--	--	93	80	.45
4-22-2000	0226	--	--	--	--	--	--	.39
4-22-2000	0233	86	--	--	--	87	55	.44
4-22-2000	0251	--	--	--	--	--	--	.49
4-22-2000	0259	77	--	--	--	85	50	.42
4-22-2000	0319	--	--	--	--	--	--	.32
4-22-2000	0355	56	--	--	--	111	50	.03
4-22-2000	0603	--	--	--	--	--	--	.12
4-22-2000	0738	87	--	--	--	218	80	.02
4-22-2000	1240	--	--	--	--	--	--	.11
4-22-2000	1241	39	--	--	--	189	40	.11
4-22-2000	1647	--	--	--	--	--	--	.05
4-26-2000	0316	31	--	--	--	347	32	.01
4-26-2000	0416	44	--	--	--	673	55	.05
4-26-2000	0457	102	--	--	--	943	120	.08
4-26-2000	0525	181	--	--	--	789	200	.10
4-26-2000	0554	192	--	--	--	554	190	.05
4-26-2000	0646	--	--	--	--	--	--	.04
4-26-2000	0814	112	--	--	--	484	160	.02
4-26-2000	0932	--	--	--	--	--	--	.03
4-26-2000	1919	109	--	--	--	503	170	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
5-02-2000	0559	117	--	--	--	1,166	80	0.01
5-02-2000	0719	184	--	--	--	816	72	.02
5-02-2000	0806	57	--	--	--	1,280	190	.10
5-02-2000	0842	161	--	--	--	1,043	220	.03
5-08-2000	1711	413	--	--	--	1,143	180	.12
5-08-2000	1718	1,270	--	--	--	1,220	600	.83
5-08-2000	1726	916	--	--	--	953	450	.42
5-10-2000	1328	582	--	--	--	892	350	.5
5-10-2000	1502	--	--	--	--	655	180	.04
5-10-2000	2027	312	--	--	--	655	180	.04
5-10-2000	2034	--	--	--	--	--	--	1.18
5-10-2000	2202	185	--	--	--	282	130	.05
5-10-2000	2229	--	--	--	--	--	--	.86
5-10-2000	2258	128	--	--	--	118	75	.17
5-10-2000	2325	--	--	--	--	--	--	.08
5-13-2000	2257	--	--	--	--	--	--	.87
5-18-2000	1847	61	--	--	--	241	11	.01
5-18-2000	1916	196	--	--	--	660	110	.24
5-18-2000	1954	178	--	--	--	550	120	.07
5-19-2000	0646	--	--	--	--	--	--	.16
5-19-2000	0717	234	--	--	--	490	160	.29
5-19-2000	0731	--	--	--	--	--	--	.13
5-19-2000	0854	155	--	--	--	362	120	.05
5-19-2000	0928	--	--	--	--	--	--	.03
5-19-2000	1146	130	--	--	--	427	100	.03
5-19-2000	1216	--	--	--	--	--	--	.06
5-19-2000	1310	117	--	--	--	527	100	.04
5-19-2000	1331	--	--	--	--	--	--	.05
5-19-2000	1445	119	--	--	--	464	120	.05
5-19-2000	1505	--	--	--	--	--	--	.05
5-19-2000	1639	103	--	--	--	420	110	.04
5-19-2000	1720	--	--	--	--	--	--	.02
5-23-2000	0021	181	--	--	--	360	110	.34
5-23-2000	0039	146	--	--	--	168	85	.35
5-23-2000	0135	--	--	--	--	--	--	.05
5-23-2000	0136	63	--	--	--	147	50	.05
5-23-2000	0308	54	--	--	--	245	37	.06
5-24-2000	0643	628	--	--	--	305	260	.94
5-24-2000	0706	--	--	--	--	--	--	.41
5-24-2000	0710	184	--	--	--	109	100	.40

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-02 (oil-grit separator outflow)—*Continued*								
5-24-2000	0826	--	--	--	--	--	--	0.26
5-24-2000	0833	100	--	--	--	129	85	.21
5-24-2000	0938	58	--	--	--	148	55	.07
5-24-2000	1006	131	--	--	--	144	120	.32
5-24-2000	1039	85	--	--	--	156	95	.07
5-24-2000	2047	234	--	--	--	518	140	.01
5-25-2000	0943	301	--	--	--	429	170	.41
6-06-2000	[1]1006	119	--	--	--	400	--	--
6-06-2000	[1]1314	100	--	--	--	204	--	--
6-06-2000	[1]1454	100	--	--	--	95	--	--
6-06-2000	[1]2005	56	--	--	--	122	--	--
6-07-2000	[1]0810	59	--	--	--	262	--	--
6-07-2000	1000	53	--	--	--	277	--	--
Monitoring location 136-03 (oil-grit separator inflow)								
5-08-1999	1702	4,370	36	--	--	944	1,700	0.80
5-08-1999	1706	2,150	26	--	--	925	950	.72
5-08-1999	1710	931	12	--	--	831	500	.34
5-08-1999	1716	487	4	--	--	766	300	.19
5-08-1999	1722	432	9	--	--	699	260	.24
5-08-1999	1726	552	22	--	--	642	270	.36
5-19-1999	2246	191	8	--	--	2,780	65	.01
5-19-1999	2340	612	73	--	--	2,650	130	.03
5-20-1999	0132	249	23	--	--	1,440	245	.09
5-20-1999	0138	315	5	--	--	819	210	.21
5-20-1999	0146	223	5	--	--	534	210	.18
5-20-1999	0156	23	16	--	--	413	160	.13
5-20-1999	0204	112	4	--	--	359	130	.15
5-20-1999	0220	84	6	--	--	361	90	.11
5-20-1999	0640	146	23	--	--	1,040	140	.06
5-20-1999	0848	861	69	--	--	1,020	200	.08
5-20-1999	0912	327	8	--	--	987	230	.04
5-23-1999	2116	275	34	--	--	1,350	100	.03
5-23-1999	2118	532	7	--	--	668	380	.04
5-23-1999	2148	268	7	--	--	672	230	.18
5-23-1999	2156	244	3	--	--	495	220	.15
5-23-1999	2210	162	5	--	--	342	150	.17
5-23-1999	2216	449	34	--	--	254	200	.42
5-23-1999	2220	821	59	--	--	215	190	.67
5-23-1999	2222	1,070	68	--	--	213	200	.73

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
5-23-1999	2224	1,360	72	--	--	200	190	0.83
5-23-1999	2226	656	51	--	--	199	180	.82
5-23-1999	2228	452	41	--	--	205	150	.67
5-23-1999	2232	605	61	--	--	187	130	.59
5-23-1999	2236	322	32	--	--	199	130	.62
5-23-1999	2240	261	28	--	--	187	110	.41
5-23-1999	2244	207	12	--	--	181	120	.4
5-23-1999	2254	98	5	--	--	171	75	.11
5-23-1999	2312	191	73	--	--	184	50	.05
5-24-1999	0308	107	28	--	--	383	65	.26
5-24-1999	0314	83	14	--	--	268	55	.29
5-24-1999	0320	84	24	--	--	202	50	.31
5-24-1999	0330	42	15	--	--	181	38	.11
5-24-1999	1422	204	18	--	--	1,330	120	.20
5-24-1999	1416	55	9	--	--	308	39	.19
5-24-1999	1520	181	13	--	--	850	200	.04
5-24-1999	1522	194	4	--	--	854	190	.04
5-24-1999	1636	2,080	58	--	--	263	400	1.16
5-24-1999	1640	830	36	--	--	207	290	.54
5-24-1999	1648	271	8	--	--	186	310	.28
5-24-1999	1730	130	24	--	--	252	110	.14
5-24-1999	1830	82	17	--	--	351	85	.06
5-24-1999	1858	162	7	--	--	217	120	.34
5-24-1999	1920	73	7	--	--	206	90	.07
7-01-1999	0236	516	--	--	--	1,440	330	.16
7-01-1999	0238	424	--	--	--	1,170	260	.15
7-01-1999	0258	391	--	--	--	542	170	.31
7-01-1999	0304	495	--	--	--	374	190	.74
7-01-1999	0310	320	--	--	--	519	170	.68
7-01-1999	0318	261	--	--	--	361	190	.30
7-01-1999	0344	147	--	--	--	794	100	.05
7-01-1999	0404	158	--	--	--	456	140	.29
7-01-1999	0602	1,810	--	--	--	331	210	.85
7-01-1999	0606	1,100	--	--	--	190	130	1.38
7-01-1999	0610	567	--	--	--	138	130	1.14
7-01-1999	0612	394	--	--	--	146	130	1.21
7-01-1999	0620	193	--	--	--	140	110	.38
7-01-1999	0628	138	--	--	--	162	95	.30
7-01-1999	0642	88	--	--	--	209	65	.19
7-01-1999	0710	90	--	--	--	300	60	.04

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
7-01-1999	1014	180	--	--	--	612	100	0.12
7-01-1999	1104	220	--	--	--	385	170	.27
7-01-1999	1112	193	--	--	--	283	140	.33
7-01-1999	1126	151	--	--	--	255	120	.18
7-01-1999	1154	127	--	--	--	300	140	.08
7-06-1999	1704	677	--	--	--	899	110	.36
7-06-1999	1708	639	--	--	--	523	95	1.06
7-06-1999	1716	197	--	--	--	519	95	.40
7-06-1999	1738	90	--	--	--	764	55	.07
7-06-1999	1844	67	--	--	--	812	50	.05
7-06-1999	2136	108	--	--	--	575	55	.26
7-06-1999	2210	111	--	--	--	831	80	.05
7-13-1999	0656	37	--	--	--	1,400	60	.02
7-13-1999	0658	19	--	--	--	1,450	60	.03
7-19-1999	1654	128	--	--	--	399	90	.22
7-19-1999	1706	84	--	--	--	256	700	.28
7-19-1999	1720	105	--	--	--	211	60	.25
7-19-1999	1728	84	--	--	--	195	65	.37
7-19-1999	1754	45	--	--	--	276	50	.08
7-19-1999	1818	31	--	--	--	387	50	.05
7-19-1999	1910	--	--	--	--	--	--	.04
7-19-1999	1920	9	--	--	--	401	50	.03
7-20-1999	1319	--	--	--	--	--	--	<.01
7-23-1999	0100	1,233	--	--	--	682	300	.56
7-23-1999	0102	2,989	--	--	--	445	240	1.06
7-23-1999	0106	526	--	--	--	242	130	1.18
7-23-1999	0108	403	--	--	--	255	100	1.2
7-23-1999	0112	566	--	--	--	199	80	.77
7-23-1999	0120	94	--	--	--	182	45	.34
7-23-1999	0130	59	--	--	--	188	38	.30
7-23-1999	0142	75	--	--	--	178	40	.39
7-23-1999	0150	62	--	--	--	159	37	.36
7-23-1999	0158	113	--	--	--	141	40	.46
7-23-1999	0208	42	--	--	--	139	34	.17
7-24-1999	2026	1,070	--	--	--	178	120	1.62
7-24-1999	2028	689	--	--	--	136	110	5.57
7-24-1999	2030	2,502	--	--	--	134	85	2.72
7-24-1999	2032	446	--	--	--	131	70	1.17
7-24-1999	2036	265	--	--	--	129	75	1.26
7-24-1999	2042	218	--	--	--	132	55	.62

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
7-24-1999	2108	651	--	--	--	152	80	1.13
7-24-1999	2112	351	--	--	--	99	55	1.37
7-24-1999	2116	167	--	--	--	96	50	1.14
7-24-1999	2122	134	--	--	--	93	50	.44
7-24-1999	2146	31	--	--	--	160	23	.06
7-25-1999	1358	189	--	--	--	460	80	.23
7-25-1999	1640	435	--	--	--	393	75	.32
7-25-1999	1644	409	--	--	--	182	80	1.25
7-25-1999	1648	184	--	--	--	141	55	.93
7-25-1999	1654	118	--	--	--	113	60	.47
7-25-1999	1706	53	--	--	--	111	40	.21
7-27-1999	1254	--	--	--	--	--	--	<.01
8-06-1999	2126	2,138	--	--	--	1,380	100	.06
8-06-1999	2128	241	--	--	--	1,340	100	.06
8-06-1999	2204	181	--	--	--	1,060	90	.03
8-14-1999	2136	--	--	--	--	--	--	.31
8-14-1999	2138	--	--	--	--	--	--	.60
8-14-1999	2140	--	--	--	--	--	--	.51
8-14-1999	2142	--	--	--	--	--	--	.42
8-14-1999	2144	--	--	--	--	--	--	.33
8-14-1999	2146	--	--	--	--	--	--	.25
8-14-1999	2148	--	--	--	--	--	--	.18
8-14-1999	2150	--	--	--	--	--	--	.13
8-14-1999	2152	--	--	--	--	--	--	.09
8-14-1999	2154	--	--	--	--	--	--	.07
8-14-1999	2156	--	--	--	--	--	--	.06
8-14-1999	2158	--	--	--	--	--	--	.05
8-14-1999	2200	--	--	--	--	--	--	.05
8-21-1999	2006	64	--	--	--	1,070	50	.02
8-21-1999	2118	462	--	--	--	523	45	.04
8-22-1999	0652	29	--	--	--	375	23	.03
8-26-1999	1724	98	--	--	--	853	60	.03
8-26-1999	1726	145	--	--	--	798	55	.03
9-06-1999	1136	604	--	--	--	645	110	.05
9-06-1999	1152	560	--	--	--	279	170	.82
9-06-1999	1206	201	--	--	--	272	85	.09
9-07-1999	0238	105	--	--	--	252	55	.30
9-07-1999	0404	503	--	--	--	237	90	.42
9-07-1999	0410	549	--	--	--	158	110	.82
9-07-1999	0416	200	--	--	--	148	80	.35

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
9-07-1999	0446	162	--	--	--	182	40	0.09
9-07-1999	0518	276	--	--	--	220	37	.04
9-08-1999	0922	211	--	--	--	312	120	.26
9-08-1999	0938	122	--	--	--	252	110	.15
9-08-1999	1002	113	--	--	--	252	120	.10
9-08-1999	1014	--	--	--	--	--	--	.05
9-08-1999	1058	112	--	--	--	309	90	.05
9-10-1999	0752	215	--	--	--	271	160	.21
9-10-1999	0814	284	--	--	--	204	120	.24
9-10-1999	0822	2,170	--	--	--	124	190	1.02
9-10-1999	0826	540	--	--	--	116	200	.82
9-10-1999	0838	126	--	--	--	105	85	.19
9-10-1999	0906	68	--	--	--	135	65	.13
9-10-1999	0954	508	--	--	--	149	160	.66
9-10-1999	1004	137	--	--	--	128	95	.19
9-10-1999	1148	49	--	--	--	180	55	.02
9-10-1999	1442	214	--	--	--	231	120	.32
9-10-1999	1450	165	--	--	--	154	120	.37
9-10-1999	1500	135	--	--	--	120	95	.35
9-10-1999	1508	386	--	--	--	77	85	.78
9-10-1999	1520	82	--	--	--	78	50	.24
9-15-1999	1850	47	--	--	--	459	45	.02
9-15-1999	1936	176	--	--	--	348	150	.07
9-15-1999	2004	116	--	--	--	219	100	.13
9-15-1999	2026	92	--	--	--	150	95	.11
9-15-1999	2052	62	--	--	--	137	70	.14
9-15-1999	2112	53	--	--	--	118	60	.15
9-15-1999	2136	44	--	--	--	112	50	.10
9-15-1999	2220	32	--	--	--	139	40	.03
9-15-1999	2320	46	--	--	--	145	55	.11
9-15-1999	2346	41	--	--	--	104	50	.08
9-16-1999	0006	50	--	--	--	79	55	.20
9-16-1999	0020	53	--	--	--	65	45	.24
9-16-1999	0038	31	--	--	--	59	34	.13
9-16-1999	0052	24	--	--	--	57	27	.12
9-16-1999	0948	318	--	--	--	51	80	.86
9-16-1999	1016	83	--	--	--	49	60	.56
9-16-1999	1228	56	--	--	--	120	70	.10
9-16-1999	1412	140	--	--	--	92	75	.38
9-16-1999	1520	457	--	--	--	81	90	.99

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
9-16-1999	1536	96	--	--	--	76	40	0.42
9-16-1999	1604	196	--	--	--	60	29	.85
9-16-1999	1634	29	--	--	--	72	19	.12
9-16-1999	1654	296	--	--	--	34	50	1.11
9-16-1999	1822	43	--	--	--	82	25	.06
9-22-1999	2334	189	--	--	--	507	110	.03
9-22-1999	2336	145	--	--	--	542	110	.04
10-06-1999	1426	--	--	--	--	--	--	<.01
10-18-1999	0712	52	--	--	--	85	36	.07
10-18-1999	0714	29	--	--	--	81	31	.06
10-20-1999	0820	52	--	--	--	243	120	.09
10-20-1999	0854	218	--	--	--	169	170	.22
10-20-1999	0908	141	--	--	--	138	160	.13
10-20-1999	1204	192	--	--	--	156	140	.36
10-20-1999	1216	197	--	--	--	86	130	.38
10-20-1999	1234	120	--	--	--	66	90	.27
10-23-1999	0208	248	--	--	--	177	90	.17
10-23-1999	0240	208	--	--	--	176	55	.07
10-23-1999	0302	67	--	--	--	167	45	.12
10-23-1999	0330	56	--	--	--	113	37	.19
10-23-1999	0346	77	--	--	--	78	38	.27
10-23-1999	0404	59	--	--	--	65	36	.19
10-23-1999	0418	53	--	--	--	61	27	.2
10-23-1999	0444	49	--	--	--	62	27	.07
10-26-1999	1530	--	--	--	--	--	--	<.01
11-02-1999	2340	377	54	--	--	320	230	.18
11-02-1999	2358	352	67	--	--	264	140	.13
11-03-1999	0020	186	25	--	--	216	110	.18
11-03-1999	0042	227	65	--	--	200	90	.17
11-03-1999	0106	203	56	--	--	166	75	.16
11-03-1999	0122	84	7	--	--	122	70	.22
11-03-1999	0136	77	16	--	--	95	60	.33
11-03-1999	0146	53	11	--	--	86	50	.41
11-03-1999	0158	51	16	--	--	80	38	.34
11-03-1999	0208	40	14	--	--	76	33	.36
11-03-1999	0218	32	16	--	--	77	36	.31
11-03-1999	0234	162	73	--	--	77	31	.34
11-03-1999	0244	36	16	--	--	75	27	.25
11-03-1999	0256	435	76	--	--	423	120	.34
12-20-1999	2307	128	--	--	--	94	70	.02

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
12-20-1999	2330	173	--	--	--	451	100	0.10
12-20-1999	2344	288	--	--	--	448	180	.06
12-21-1999	0019	230	--	--	--	360	170	.02
12-21-1999	0047	200	--	--	--	315	160	.09
12-21-1999	0058	248	--	--	--	285	160	.16
12-21-1999	0118	182	--	--	--	214	150	.04
12-21-1999	0300	150	--	--	--	171	120	.01
12-21-1999	0332	--	--	--	--	199	100	.03
1-10-2000	1956	63	--	--	--	729	28	.10
1-10-2000	2012	56	--	--	--	818	29	.06
1-10-2000	2032	58	--	--	--	890	26	.05
1-10-2000	2057	51	--	--	--	1,020	33	.04
1-10-2000	2158	85	--	--	--	1,220	31	.02
1-13-2000	0922	178	--	--	--	4,130	120	.05
1-13-2000	0951	200	--	--	--	7,830	150	.06
1-13-2000	1007	301	--	--	--	6,580	220	.09
1-16-2000	1002	252	--	--	--	12,300	270	.05
1-16-2000	1039	187	--	--	--	13,300	230	.03
1-20-2000	1930	--	--	--	--	--	--	.01
1-27-2000	1530	--	--	--	--	--	--	<.01
1-31-2000	0348	158	--	--	--	79,100	110	.02
1-31-2000	0406	118	--	--	--	93,100	130	.05
1-31-2000	0428	332	--	--	--	86,200	250	.08
1-31-2000	0429	--	--	--	--	--	--	.10
1-31-2000	0445	1,212	--	--	--	37,100	1,100	.10
1-31-2000	0521	397	--	--	--	16,900	450	.02
1-31-2000	0524	--	--	--	--	--	--	.03
1-31-2000	0543	441	--	--	--	10,600	450	.08
1-31-2000	0558	--	--	--	--	--	--	.08
1-31-2000	0618	374	--	--	--	7,840	400	.05
2-14-2000	0753	247	--	--	--	2,510	220	.04
2-14-2000	0813	324	--	--	--	2,710	270	.03
2-14-2000	0838	274	--	--	--	3,380	310	.02
2-14-2000	0857	--	--	--	--	--	--	.01
2-14-2000	0924	526	28	--	--	2,950	360	.07
2-14-2000	0932	2,650	70	--	--	2,050	500	.26
2-14-2000	0935	1,690	30	--	--	2,270	750	.74
2-14-2000	0938	1,127	--	--	--	2,050	750	.46
2-14-2000	0948	746	--	--	--	1,700	550	.07
2-14-2000	1018	544	--	--	--	1,640	310	.13

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
2-14-2000	1029	327	--	--	--	1,710	280	0.08
2-14-2000	1104	415	--	--	--	1,810	370	.11
2-14-2000	1122	412	--	--	--	1,750	330	.07
2-14-2000	1140	559	--	--	--	1,780	380	.1
2-14-2000	1152	809	--	--	--	1,490	500	.24
2-14-2000	1156	780	--	--	--	1,430	500	.43
2-14-2000	1201	674	--	--	--	1,400	500	.31
2-14-2000	1212	497	--	--	--	1,540	400	.09
2-18-2000	1455	--	--	--	--	--	--	.03
2-18-2000	2138	--	--	--	--	--	--	.13
2-18-2000	2142	--	--	--	--	--	--	.11
2-18-2000	2145	--	--	--	--	--	--	.11
2-18-2000	2148	--	--	--	--	--	--	.11
2-18-2000	2218	--	--	--	--	--	--	.11
2-25-2000	1440	520	--	--	--	28,200	260	.03
2-25-2000	1507	1,280	--	--	--	13,000	3,100	.05
2-25-2000	1524	1,740	--	--	--	9,450	4,100	.08
2-25-2000	1544	1,150	--	--	--	6,420	2,400	.06
2-25-2000	1604	817	--	--	--	4,950	1,300	.07
2-25-2000	1619	629	--	--	--	4,200	830	.07
2-25-2000	1639	817	--	--	--	3,570	680	.10
2-25-2000	1659	539	--	--	--	3,090	540	.08
2-25-2000	1713	495	--	--	--	2,800	410	.08
2-25-2000	1727	382	--	--	--	2,640	380	.08
2-25-2000	1744	300	--	--	--	2,760	340	.06
2-25-2000	1927	198	--	--	--	3,250	250	.05
2-25-2000	1948	360	--	--	--	2,580	390	.11
2-25-2000	2008	300	--	--	--	2,690	340	.05
2-25-2000	2100	210	--	--	--	2,540	260	.04
2-25-2000	2122	--	--	--	--	--	--	.04
2-25-2000	2201	190	--	--	--	2,400	210	.05
2-25-2000	2219	144	--	--	--	2,250	180	.07
2-25-2000	2243	145	--	--	--	2,250	180	.01
2-26-2000	0711	223	--	--	--	2,700	220	.08
2-26-2000	0728	191	--	--	--	2,120	230	.06
2-27-2000	0810	1,260	--	--	--	4,960	1,100	.09
2-27-2000	0827	1,630	--	--	--	5,470	980	.18
2-27-2000	0848	703	--	--	--	4,190	880	.08
3-28-2000	0439	153	4	2.13	1.85	4,330	150	.01
3-28-2000	0449	1,980	45	3.35	41.15	4,630	760	.24

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
3-28-2000	0457	1,480	37	1.97	35.09	17,800	890	0.25
3-28-2000	0505	1,030	30	1.60	28.35	11,700	730	.25
3-28-2000	0510	669	6	3.79	2.03	8,250	600	.40
3-28-2000	0515	1,020	35	5.63	29.09	6,380	630	.39
3-28-2000	0525	886	34	6.33	27.30	5,050	500	.35
3-28-2000	0539	1,800	75	3.82	70.79	3,910	360	.31
3-28-2000	0551	600	38	12.86	25.10	3,690	300	.25
3-28-2000	0605	566	38	3.07	35.38	2,940	320	.38
3-28-2000	0615	647	39	8.44	30.37	2,490	310	.32
3-28-2000	0627	--	--	--	--	--	--	.34
3-28-2000	0641	569	26	4.57	21.89	1,910	320	.27
3-28-2000	0654	497	41	1.34	40.01	1,690	250	.48
3-28-2000	0659	6,920	88	12.81	75.41	1,280	430	.94
3-28-2000	0705	6,560	75	4.98	70.01	1,160	530	.55
3-28-2000	0722	2,890	80	5.10	75.35	1,220	350	.52
3-28-2000	0738	--	--	--	--	--	--	.61
3-28-2000	0754	942	62	11.28	50.84	816	230	.37
3-28-2000	0817	490	49	5.53	43.67	807	180	.45
3-28-2000	0921	320	43	5.45	37.82	783	140	.08
3-28-2000	1106	208	46	3.07	43.02	1,830	120	.07
3-28-2000	1453	147	20	1.96	17.74	3,240	180	.02
3-28-2000	2136	--	--	--	--	--	--	.01
4-04-2000	0338	--	--	--	--	--	--	.01
4-04-2000	0402	--	--	--	--	--	--	.05
4-04-2000	1453	--	--	--	--	--	--	.01
4-04-2000	1525	--	--	--	--	--	--	.05
4-04-2000	1600	--	--	--	--	--	--	.05
4-04-2000	1633	--	--	--	--	--	--	.06
4-04-2000	1808	--	--	--	--	--	--	.02
4-04-2000	2153	--	--	--	--	--	--	.02
4-04-2000	0225	--	--	--	--	--	--	.01
4-08-2000	2317	7,110	--	--	--	3,660	230	.01
4-08-2000	2341	951	--	--	--	1,970	500	.05
4-09-2000	0035	311	--	--	--	1,860	310	.05
4-09-2000	0148	306	--	--	--	1,670	270	.17
4-09-2000	0150	--	--	--	--	--	--	0.16
4-09-2000	0219	159	--	--	--	993	160	.07
4-09-2000	0222	--	--	--	--	--	--	.06
4-09-2000	0304	577	--	--	--	886	140	.14
4-09-2000	0341	--	--	--	--	--	--	.16

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
4-09-2000	0426	315	--	--	--	520	80	0.08
4-09-2000	0452	--	--	--	--	--	--	.86
4-09-2000	0502	750	--	--	--	437	190	.18
4-09-2000	0518	--	--	--	--	--	--	.30
4-09-2000	0533	507	--	--	--	359	85	.16
4-09-2000	0600	--	--	--	--	--	--	.38
4-09-2000	0609	2,190	--	--	--	338	100	.24
4-09-2000	0632	--	--	--	--	--	--	.17
4-09-2000	0658	112	--	--	--	377	65	.05
4-09-2000	0725	--	--	--	--	--	--	.56
4-09-2000	0729	1,890	--	--	--	234	200	.90
4-09-2000	0735	--	--	--	--	--	--	.48
4-09-2000	0741	292	--	--	--	224	100	.43
4-09-2000	0757	--	--	--	--	--	--	.19
4-09-2000	0821	291	--	--	--	257	55	.06
4-16-2000	0649	284	--	--	--	921	120	.05
4-16-2000	0754	--	--	--	--	--	--	.04
4-18-2000	1828	602	--	--	--	1,610	95	.01
4-18-2000	1901	1,940	--	--	--	1,040	230	.11
4-18-2000	1939	2,670	--	--	--	778	190	.05
4-18-2000	2011	421	--	--	--	578	160	.08
4-18-2000	2012	--	--	--	--	--	--	.08
4-18-2000	2041	1,380	--	--	--	477	140	.08
4-18-2000	2042	--	--	--	--	--	--	.09
4-18-2000	2105	372	--	--	--	374	110	.09
4-18-2000	2140	--	--	--	--	--	--	.05
4-18-2000	2207	230	--	--	--	331	90	.10
4-18-2000	2239	--	--	--	--	--	--	.05
4-18-2000	2342	188	--	--	--	349	65	.07
4-19-2000	0013	--	--	--	--	--	--	.05
4-19-2000	0142	63	--	--	--	343	45	.02
4-19-2000	0432	--	--	--	--	--	--	.02
4-19-2000	0601	298	--	--	--	482	120	.03
4-19-2000	0730	--	--	--	--	--	--	.05
4-19-2000	0814	314	--	--	--	415	140	.04
4-21-2000	1252	139	--	--	--	1,230	160	.02
4-21-2000	1543	317	--	--	--	1,100	400	.04
4-21-2000	1545	--	--	--	--	--	--	.04
4-21-2000	1717	302	--	--	--	715	230	.04
4-21-2000	1719	--	--	--	--	--	--	.04

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
4-21-2000	1833	310	--	--	--	541	170	0.06
4-21-2000	1835	--	--	--	--	--	--	.06
4-21-2000	1938	172	--	--	--	401	160	.11
4-21-2000	1939	--	--	--	--	--	--	.12
4-21-2000	1953	1,270	--	--	--	264	230	.30
4-21-2000	2002	--	--	--	--	--	--	.29
4-21-2000	2024	391	--	--	--	189	130	.12
4-21-2000	2117	--	--	--	--	--	--	.23
4-21-2000	2124	630	--	--	--	186	150	.37
4-21-2000	2135	--	--	--	--	--	--	.28
4-21-2000	2143	283	--	--	--	142	110	.30
4-21-2000	2217	--	--	--	--	--	--	.06
4-21-2000	2234	909	--	--	--	135	95	.32
4-21-2000	2240	--	--	--	--	--	--	.54
4-21-2000	2247	582	--	--	--	108	95	.39
4-21-2000	2259	--	--	--	--	--	--	.13
4-21-2000	2313	337	--	--	--	108	50	.17
4-21-2000	2347	--	--	--	--	--	--	.14
4-22-2000	0007	108	--	--	--	111	40	.13
4-22-2000	0021	--	--	--	--	--	--	.28
4-22-2000	0031	192	--	--	--	92	55	.27
4-22-2000	0042	--	--	--	--	--	--	.27
4-22-2000	0052	184	--	--	--	89	70	.30
4-22-2000	0101	--	--	--	--	--	--	.34
4-22-2000	0109	981	--	--	--	86	80	.39
4-22-2000	0115	--	--	--	--	--	--	.67
4-22-2000	0132	426	--	--	--	108	70	.44
4-22-2000	0140	--	--	--	--	--	--	.39
4-22-2000	0157	1,995	--	--	--	91	95	.75
4-22-2000	0203	--	--	--	--	--	--	.46
4-22-2000	0226	372	--	--	--	85	60	.39
4-22-2000	0233	--	--	--	--	--	--	.45
4-22-2000	0251	308	--	--	--	83	55	.49
4-22-2000	0259	--	--	--	--	--	--	.42
4-22-2000	0319	137	--	--	--	102	50	.32
4-22-2000	0355	--	--	--	--	--	--	.03
4-22-2000	0603	549	91	--	--	151	50	.12
4-22-2000	0738	--	--	--	--	--	--	.02
4-22-2000	1240	244	70	--	--	181	65	.11
4-22-2000	1241	--	--	--	--	--	--	.11

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
4-22-2000	1647	352	91	--	--	191	40	0.05
4-26-2000	0316	276	--	--	--	750	40	.01
4-26-2000	0416	564	--	--	--	1,190	160	.05
4-26-2000	0457	432	--	--	--	892	190	.08
4-26-2000	0525	439	--	--	--	537	190	.10
4-26-2000	0554	307	--	--	--	440	180	.05
4-26-2000	0646	294	--	--	--	462	140	.04
4-26-2000	0814	--	--	--	--	--	--	.02
4-26-2000	0932	138	--	--	--	511	130	.03
4-26-2000	1919	111	--	--	--	359	130	.02
5-02-2000	0559	--	--	--	--	--	--	.01
5-02-2000	0719	--	--	--	--	--	--	.02
5-02-2000	0806	595	--	--	--	374	320	.10
5-02-2000	0842	770	--	--	--	721	230	.03
5-08-2000	1711	2,890	--	--	--	1,630	900	.12
5-08-2000	1718	1,920	--	--	--	963	500	.93
5-08-2000	1726	610	--	--	--	808	290	.43
5-10-2000	1328	--	--	--	--	--	--	.51
5-10-2000	1502	166	--	--	--	675	120	.04
5-10-2000	2027	864	--	--	--		0	.04
5-10-2000	2034	--	--	--	--	291	310	1.75
5-10-2000	2202	--	--	--	--	--	--	.05
5-10-2000	2229	1,070	--	--	--	163	200	.97
5-10-2000	2258	--	--	--	--	--	--	.17
5-10-2000	2325	125	--	--	--	145	40	.08
5-13-2000	2257	550	--	--	--	244	110	1.00
5-18-2000	1847	269	--	--	--	987	75	.01
5-18-2000	1916	225	--	--	--	520	140	.24
5-18-2000	1954	126	--	--	--	488	21	.07
5-19-2000	0646	276	--	--	--	845	130	.16
5-19-2000	0717	--	--	--	--	--	--	.29
5-19-2000	0731	218	--	--	--	339	120	.13
5-19-2000	0854	--	--	--	--	--	--	.05
5-19-2000	0928	148	--	--	--	482	95	.03
5-19-2000	1146	--	--	--	--	--	--	.03
5-19-2000	1216	140	--	--	--	630	120	.06
5-19-2000	1310	--	--	--	--	--	--	.04
5-19-2000	1331	129	--	--	--	444	130	.05
5-19-2000	1445	--	--	--	--	--	--	.05
5-19-2000	1505	121	--	--	--	389	120	.05

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-03 (oil-grit separator inflow)—*Continued*								
5-19-2000	1639	--	--	--	--	--	--	0.04
5-19-2000	1720	129	--	--	--	398	75	.02
5-23-2000	0021	185	--	--	--	229	90	.34
5-23-2000	0039	126	--	--	--	141	67	.35
5-23-2000	0135	50	--	--	--	182	38	.05
5-23-2000	0136	--	--	--	--	--	--	.05
5-23-2000	0308	--	--	--	--	--	--	.06
5-24-2000	0643	1,409	--	--	--	214	270	1.12
5-24-2000	0706	243	--	--	--	104	85	.42
5-24-2000	0710	--	--	--	--	--	--	.40
5-24-2000	0826	118	--	--	--	120	85	.27
5-24-2000	0833	--	--	--	--	--	--	.21
5-24-2000	0938	60	--	--	--	195	45	.07
5-24-2000	1006	134	--	--	--	349	75	.32
5-24-2000	1039	98	--	--	--	145	100	.07
5-24-2000	2047	477	--	--	--	404	240	.01
5-25-2000	0943	--	--	--	--	--	--	.41
6-06-2000	[1]1006	872	--	--	--	503	--	--
6-06-2000	[1]1314	114	--	--	--	236	--	--
6-06-2000	[1]1454	132	--	--	--	97	--	--
6-06-2000	[1]2005	144	--	--	--	114	--	--
6-07-2000	[1]0810	94	--	--	--	262	--	--
6-07-2000	1000	--	--	--	--	--	--	--
Monitoring location 136-04 (catch basin outflow)								
5-20-1999	0138	318	16	--	--	635	290	0.03
5-20-1999	0140	244	3	--	--	626	260	.03
5-20-1999	0144	237	4	--	--	593	270	.03
5-20-1999	0146	224	1	--	--	593	270	.02
5-20-1999	0148	230	1	--	--	539	250	.02
5-20-1999	0150	214	2	--	--	530	230	.02
5-20-1999	0858	229	12	--	--	470	300	.01
5-24-1999	1520	166	4	--	--	476	200	.01
5-24-1999	1730	625	0	--	--	--	--	.02
5-24-1999	1858	179	4	--	--	--	--	.04
5-24-1999	1920	113	4	--	--	--	--	.01
7-01-1999	0258	344	--	--	--	479	230	.01
7-01-1999	0304	384	--	--	--	365	200	.09
7-01-1999	0310	263	--	--	--	261	140	.06
7-01-1999	0354	189	--	--	--	276	130	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
7-01-1999	0408	159	--	--	--	255	140	0.02
7-01-1999	0602	498	--	--	--	198	180	.37
7-01-1999	0606	639	--	--	--	139	200	.45
7-01-1999	0608	--	--	--	--	100	210	.51
7-01-1999	0610	1,140	--	--	--	77	350	.33
7-01-1999	0614	897	--	--	--	73	330	.09
7-01-1999	0616	505	--	--	--	87	260	.05
7-01-1999	0626	298	--	--	--	72	180	.04
7-01-1999	0650	188	--	--	--	126	160	.01
7-01-1999	1056	286	--	--	--	195	230	.01
7-01-1999	1104	301	--	--	--	183	250	.05
7-01-1999	1114	279	--	--	--	163	240	.03
7-06-1999	1704	375	--	--	--	501	140	.23
7-06-1999	1708	412	--	--	--	318	130	.29
7-06-1999	1710	310	--	--	--	259	140	.14
7-06-1999	1712	237	--	--	--	254	120	.09
7-06-1999	1724	135	--	--	--	247	60	.01
7-06-1999	2130	179	--	--	--	362	130	.05
7-06-1999	2140	144	--	--	--	332	120	.03
7-19-1999	1646	38	--	--	--	386	140	.12
7-19-1999	1652	111	--	--	--	285	130	.06
7-19-1999	1654	--	--	--	--	--	#VALUE!	.05
7-19-1999	1700	72	--	--	--	225	100	.07
7-19-1999	1708	66	--	--	--	189	120	.05
7-19-1999	1720	46	--	--	--	165	100	.06
7-19-1999	1724	149	--	--	--	138	75	.12
7-19-1999	1732	97	--	--	--	112	70	.05
7-19-1999	1750	28	--	--	--	109	55	.01
7-23-1999	0100	209	--	--	--	182	130	.10
7-23-1999	0104	192	--	--	--	118	95	.33
7-23-1999	0108	126	--	--	--	86	65	.17
7-23-1999	0110	125	--	--	--	86	50	.09
7-23-1999	0112	110	--	--	--	87	65	.11
7-23-1999	0116	95	--	--	--	92	60	.07
7-23-1999	0124	132	--	--	--	124	50	.03
7-23-1999	0136	62	--	--	--	120	45	.04
7-23-1999	0146	48	--	--	--	93	32	.04
7-23-1999	0156	59	--	--	--	68	39	.07
7-23-1999	0204	47	--	--	--	78	34	.04
7-24-1999	2026	557	--	--	--	85	130	1.38

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
7-24-1999	2030	453	--	--	--	84	150	0.51
7-24-1999	2032	163	--	--	--	82	55	.36
7-24-1999	2034	119	--	--	--	92	45	.23
7-24-1999	2036	50	--	--	--	92	33	.14
7-24-1999	2040	35	--	--	--	117	34	.07
7-24-1999	2050	--	--	--	--	--	--	.02
7-24-1999	2108	456	--	--	--	91	140	.54
7-24-1999	2112	162	--	--	--	59	50	.34
7-24-1999	2114	218	--	--	--	58	50	.29
7-24-1999	2116	64	--	--	--	63	31	.14
7-24-1999	2120	84	--	--	--	71	26	.05
7-25-1999	1642	159	--	--	--	94	50	.27
7-25-1999	1646	119	--	--	--	78	39	.16
7-25-1999	1648	--	--	--	--	70	40	.12
7-25-1999	1656	--	--	--	--	--	--	.03
8-06-1999	2144	168	--	--	--	638	80	.01
8-14-1999	2136	222	--	--	--	429	90	.18
8-14-1999	2140	171	--	--	--	338	110	.13
8-21-1999	2058	36	--	--	--	328	34	.01
8-21-1999	2100	26	--	--	--	326	27	.02
8-21-1999	2132	30	--	--	--	297	27	.01
8-21-1999	2232	35	--	--	--	281	24	.01
8-21-1999	2336	34	--	--	--	270	40	<.01
8-22-1999	0116	33	--	--	--	271	27	.01
8-22-1999	0212	102	--	--	--	294	46	<.01
8-22-1999	0606	29	--	--	--	256	29	.01
8-22-1999	0640	32	--	--	--	241	28	.02
8-22-1999	0706	30	--	--	--	223	28	.02
8-22-1999	0746	28	--	--	--	205	24	.01
8-26-1999	1724	102	--	--	--	443	65	<.01
8-26-1999	1838	90	--	--	--	403	75	<.01
9-06-1999	1124	240	--	--	--	298	100	.08
9-06-1999	1136	140	--	--	--	223	120	.02
9-06-1999	1150	85	--	--	--	171	100	.21
9-06-1999	1154	101	--	--	--	196	85	.13
9-06-1999	1204	95	--	--	--	177	12	.02
9-07-1999	0232	71	--	--	--	154	85	.12
9-07-1999	0236	33	--	--	--	167	40	.10
9-07-1999	0246	123	--	--	--	122	110	.03
9-07-1999	0356	127	--	--	--	97	100	<.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
9-07-1999	0406	112	--	--	--	84	100	0.19
9-07-1999	0410	82	--	--	--	87	85	.16
9-07-1999	0416	90	--	--	--	101	110	.06
9-07-1999	0440	67	--	--	--	113	110	.01
9-07-1999	0456	136	--	--	--	817	160	.03
9-08-1999	0914	151	--	--	--	208	170	.05
9-08-1999	0922	171	--	--	--	189	180	.05
9-08-1999	0932	173	--	--	--	185	200	.04
9-08-1999	0950	159	--	--	--	183	200	.03
9-08-1999	1008	145	--	--	--	192	190	.01
9-08-1999	1058	153	--	--	--	207	220	.01
9-10-1999	0742	278	--	--	--	248	260	.05
9-10-1999	0754	280	--	--	--	223	260	.04
9-10-1999	0810	260	--	--	--	200	250	.04
9-10-1999	0820	278	--	--	--	168	240	.17
9-10-1999	0824	327	--	--	--	107	190	.20
9-10-1999	0828	238	--	--	--	82	170	.09
9-10-1999	0836	185	--	--	--	75	140	.04
9-10-1999	0850	160	--	--	--	78	140	.03
9-10-1999	0904	155	--	--	--	84	140	.03
9-10-1999	0930	121	--	--	--	92	130	.01
9-10-1999	0956	231	--	--	--	95	170	.07
9-10-1999	1004	145	--	--	--	89	160	.03
9-10-1999	1042	121	--	--	--	101	140	.01
9-10-1999	1222	76	--	--	--	122	110	<.01
9-10-1999	1300	125	--	--	--	122	150	.01
9-10-1999	1426	80	--	--	--	141	120	.01
9-10-1999	1444	172	--	--	--	136	190	.07
9-10-1999	1452	177	--	--	--	113	170	.05
9-10-1999	1500	155	--	--	--	101	150	.06
9-10-1999	1506	169	--	--	--	86	140	.11
9-10-1999	1510	167	--	--	--	68	120	.13
9-10-1999	1514	136	--	--	--	61	110	.07
9-10-1999	1522	115	--	--	--	59	94	.04
9-15-1999	1846	--	--	--	--	--	--	.02
9-15-1999	1908	114	--	--	--	243	120	.03
9-15-1999	1928	112	--	--	--	233	140	.02
9-15-1999	1946	106	--	--	--	199	130	.03
9-15-1999	2000	106	--	--	--	173	120	.04
9-15-1999	2010	106	--	--	--	147	120	.04

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
9-15-1999	2022	95	--	--	--	122	110	0.03
9-15-1999	2038	78	--	--	--	105	90	.03
9-15-1999	2052	78	--	--	--	96	95	.03
9-15-1999	2104	78	--	--	--	86	95	.04
9-15-1999	2116	72	--	--	--	79	90	.03
9-15-1999	2130	66	--	--	--	74	80	.04
9-15-1999	2156	56	--	--	--	73	75	.01
9-15-1999	2256	58	--	--	--	85	75	.01
9-15-1999	2320	63	--	--	--	88	85	.03
9-15-1999	2332	66	--	--	--	79	90	.05
9-15-1999	2348	60	--	--	--	70	82	.02
9-16-1999	0000	65	--	--	--	63	80	.07
9-16-1999	0010	58	--	--	--	53	70	.04
9-16-1999	0020	66	--	--	--	47	75	.05
9-16-1999	0028	56	--	--	--	41	65	.04
9-16-1999	0042	55	--	--	--	38	55	.06
9-16-1999	0054	40	--	--	--	36	45	.02
9-16-1999	0142	30	--	--	--	40	40	<.01
9-22-1999	2336	--	--	--	--	--	--	.05
9-22-1999	2354	157	--	--	--	--	--	.02
9-23-1999	0204	163	--	--	--	--	--	.02
10-18-1999	0712	70	--	--	--	55	65	.01
10-20-1999	0756	117	--	--	--	119	120	.02
10-20-1999	0818	135	--	--	--	142	200	.02
10-20-1999	0842	189	--	--	--	145	230	.02
10-20-1999	0856	233	--	--	--	132	250	.04
10-20-1999	0912	227	--	--	--	117	240	.02
10-20-1999	0944	212	--	--	--	112	230	.01
10-20-1999	1100	--	--	--	--	--	--	.01
10-20-1999	1204	244	--	--	--	99	230	.12
10-20-1999	1210	293	--	--	--	69	200	.18
10-20-1999	1218	190	--	--	--	51	140	.07
10-20-1999	1230	151	--	--	--	46	110	.07
10-20-1999	1244	117	--	--	--	44	100	.06
10-23-1999	0202	--	--	--	--	--	--	.05
10-23-1999	0228	121	--	--	--	142	110	.02
10-23-1999	0256	121	--	--	--	132	110	.05
10-23-1999	0318	97	--	--	--	108	95	.05
10-23-1999	0334	107	--	--	--	80	90	.07
10-23-1999	0346	99	--	--	--	57	80	.09

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
10-23-1999	0402	98	--	--	--	48	75	0.04
10-23-1999	0414	95	--	--	--	42	65	.07
10-23-1999	0446	54	--	--	--	41	55	.01
10-23-1999	0640	51	--	--	--	53	60	.01
10-23-1999	0908	--	--	--	--	--	--	<.01
11-02-1999	2354	164	--	--	--	205	150	.02
11-03-1999	0038	166	--	--	--	150	170	.03
11-03-1999	0118	142	--	--	--	109	150	.03
11-03-1999	0138	131	--	--	--	70	110	.06
11-03-1999	0152	104	--	--	--	47	80	.06
11-03-1999	0210	80	--	--	--	38	55	.06
11-03-1999	0234	96	--	--	--	39	60	.06
11-03-1999	0254	70	--	--	--	40	50	.06
12-20-1999	2325	244	--	--	--	68	240	.05
2-14-2000	0753	485	--	--	--	1,530	340	.04
2-14-2000	0813	535	--	--	--	1,850	600	.03
2-14-2000	0838	779	--	--	--	1,890	1,100	.01
2-14-2000	0924	816	--	--	--	1,940	1,400	.03
2-14-2000	0925	851	--	--	--	2,120	1,300	.03
2-14-2000	0933	1,590	--	--	--	2,420	800	.12
2-14-2000	0938	938	--	--	--	1,980	700	.07
2-14-2000	1016	575	--	--	--	1,690	550	.03
2-14-2000	1057	424	--	--	--	1,680	450	.03
2-14-2000	1125	410	--	--	--	1,570	400	.03
2-14-2000	1138	571	--	--	--	1,510	500	.03
2-14-2000	1150	637	--	--	--	1,460	550	.07
2-14-2000	1155	918	--	--	--	1,590	550	.11
2-14-2000	1159	908	--	--	--	1,730	600	.09
2-14-2000	1209	720	--	--	--	1,520	600	.03
2-28-2000	0753	490	--	--	--	3,060	500	.03
2-28-2000	0804	725	--	--	--	2,880	800	.04
2-28-2000	0814	886	--	--	--	2,530	1,200	.05
2-28-2000	0823	906	--	--	--	1,990	1,100	.05
2-28-2000	0831	1,010	--	--	--	1,800	1,100	.04
2-28-2000	0843	866	--	--	--	1,590	1,000	.03
3-28-2000	0451	625	2	1	1	11,900	700	.05
3-28-2000	0459	720	2	1	1	9,850	850	.05
3-28-2000	0506	753	5	4	2	7,830	800	.08
3-28-2000	0511	761	12	7	5	6,280	700	.09
3-28-2000	0517	575	7	4	2	4,890	550	.06

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
3-28-2000	0541	577	2	1	0	3,530	550	0.06
3-28-2000	0559	608	3	2	1	2,970	550	.05
3-28-2000	0618	920	3	2	1	2,340	750	.06
3-28-2000	0630	696	6	3	3	2,000	550	.06
3-28-2000	0643	490	8	7	1	1,700	340	.06
3-28-2000	0700	7,030	88	18	70	1,340	500	.14
3-28-2000	0708	783	43	19	24	1,160	300	.10
3-28-2000	0721	792	55	12	43	1,170	230	.09
3-28-2000	0754	608	46	10	35	943	220	.07
3-28-2000	0804	468	21	5	16	1,060	230	.12
3-28-2000	0816	315	19	7	13	1,080	160	.08
4-04-2000	0342	598	--	--	--	1,530	500	.06
4-08-2000	2319	1,110	--	--	--	2,310	130	.08
4-08-2000	2323	801	--	--	--	2,590	450	.11
4-08-2000	2329	567	--	--	--	1,360	500	.05
4-09-2000	0149	321	--	--	--	1,060	300	.07
4-09-2000	0156	283	--	--	--	921	240	.05
4-09-2000	0214	173	--	--	--	717	200	.03
4-09-2000	0304	193	--	--	--	659	200	.07
4-09-2000	0323	133	--	--	--	549	130	.04
4-09-2000	0428	90	--	--	--	387	90	.03
4-09-2000	0450	561	--	--	--	389	170	.15
4-09-2000	0508	269	--	--	--	282	160	.07
4-09-2000	0517	209	--	--	--	212	140	.11
4-09-2000	0529	146	--	--	--	172	110	.05
4-09-2000	0549	120	--	--	--	171	95	.03
4-09-2000	0611	146	--	--	--	151	110	.06
4-09-2000	0625	136	--	--	--	148	95	.06
4-09-2000	0721	344	--	--	--	189	130	.12
4-09-2000	0743	185	--	--	--	89	80	.1
4-18-2000	1849	104	--	--	--	2,070	520	.08
4-18-2000	1900	124	--	--	--	1,600	590	.11
4-21-2000	1939	146	--	--	--	460	190	.03
4-21-2000	1949	154	--	--	--	361	180	.05
4-21-2000	1956	1,250	--	--	--	271	240	.07
4-21-2000	2002	295	--	--	--	192	180	.06
4-21-2000	2017	189	--	--	--	155	160	.03
4-21-2000	2113	127	--	--	--	152	130	.03
4-21-2000	2126	270	--	--	--	133	140	.08
4-21-2000	2147	173	--	--	--	89	100	.05

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
4-21-2000	2236	567	--	--	--	99	130	0.11
4-21-2000	2253	142	--	--	--	66	80	.06
4-21-2000	2311	91	--	--	--	64	65	.05
4-21-2000	2341	54	--	--	--	70	55	.03
4-22-2000	0002	64	--	--	--	78	60	.04
4-22-2000	0019	96	--	--	--	73	55	.06
4-22-2000	0033	98	--	--	--	64	55	.07
4-22-2000	0056	87	--	--	--	59	60	.08
4-22-2000	0114	359	--	--	--	50	55	.13
4-22-2000	0129	432	--	--	--	43	55	.09
4-22-2000	0227	1,470	--	--	--	60	45	.09
4-22-2000	0327	115	--	--	--	76	55	.05
4-23-2000	1648	88	--	--	--	184	55	.03
5-02-2000	0642	434	--	--	--	708	400	.03
5-02-2000	0806	536	--	--	--	590	600	.05
5-02-2000	0817	508	--	--	--	532	550	.04
5-02-2000	0830	443	--	--	--	512	550	.03
5-08-2000	1712	872	--	--	--	822	400	.11
5-08-2000	1714	1,140	--	--	--	775	450	.15
5-08-2000	1717	883	--	--	--	644	410	.16
5-08-2000	1720	684	--	--	--	593	360	.15
5-08-2000	1724	471	--	--	--	567	320	.11
5-08-2000	1736	310	--	--	--	552	210	.06
5-10-2000	1330	263	--	--	--	478	210	.08
5-10-2000	2029	884	--	--	--	211	370	.48
5-10-2000	2031	876	--	--	--	143	400	.51
5-10-2000	2033	762	--	--	--	120	380	.35
5-10-2000	2037	503	--	--	--	106	310	.09
5-10-2000	2055	302	--	--	--	107	220	.03
5-10-2000	2117	234	--	--	--	119	200	.03
5-10-2000	2202	185	--	--	--	134	190	.03
5-10-2000	2221	185	--	--	--	143	210	.04
5-10-2000	2229	232	--	--	--	100	170	.30
5-10-2000	2237	140	--	--	--	56	100	.11
5-11-2000	0008	75	--	--	--	76	75	.03
5-13-2000	2249	490	--	--	--	212	150	.45
5-13-2000	2253	417	--	--	--	156	160	.25
5-13-2000	2309	191	--	--	--	142	100	.04
5-18-2000	1850	291	--	--	--	601	160	.05
5-18-2000	1857	324	--	--	--	569	200	.07

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-04 (catch basin outflow)—*Continued*								
5-18-2000	1903	311	--	--	--	496	180	0.07
5-18-2000	1909	288	--	--	--	433	170	.07
5-18-2000	1914	272	--	--	--	382	170	.08
5-18-2000	1931	226	--	--	--	340	160	.04
5-18-2000	0647	202	--	--	--	365	120	.04
5-19-2000	0707	202	--	--	--	370	170	.04
5-19-2000	0005	180	--	--	--	379	120	.08
5-23-2000	0015	177	--	--	--	254	120	.09
5-23-2000	0024	156	--	--	--	165	100	.11
5-23-2000	0031	163	--	--	--	108	90	.12
5-23-2000	0040	134	--	--	--	81	95	.09
5-23-2000	0054	106	--	--	--	77	85	.05
5-23-2000	0113	84	--	--	--	83	70	.04
5-23-2000	0117	132	--	--	--	306	110	.05
5-24-2000	0155	150	--	--	--	313	140	.04
5-24-2000	0709	237	--	--	--	83	150	.10
5-24-2000	0735	169	--	--	--	67	130	.05
5-24-2000	0805	147	--	--	--	81	140	.06
5-24-2000	0832	148	--	--	--	85	130	.06
5-24-2000	0911	197	--	--	--	163	150	.04
5-24-2000	0949	228	--	--	--	125	190	.02
5-24-2000	1006	216	--	--	--	123	190	.09
5-24-2000	1028	154	--	--	--	237	130	.05
5-24-2000	2103	119	--	--	--	265	110	.07
5-25-2000	0715	392	--	--	--	282	250	.04
5-25-2000	0937	396	--	--	--	282	300	.04
5-25-2000	0948	390	--	--	--	284	320	.05
5-25-2000	0956	341	--	--	--	288	290	.10
5-25-2000	1145	367	--	--	--	340	320	<.01
6-06-2000	[1]0829	216	--	--	--	--	--	--
6-06-2000	[1]1203	165	--	--	--	227	--	--
6-06-2000	[1]1359	119	--	--	--	82	--	--
6-06-2000	[1]1524	71	--	--	--	85	--	--
6-06-2000	[1]2038	62	--	--	--	119	--	--
6-07-2000	0837	109	--	--	--	174	--	--

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)								
5-20-1999	0138	--	--	--	--	--	--	0.03
5-20-1999	0140	--	--	--	--	--	--	.03
5-20-1999	0144	--	--	--	--	--	--	.03
5-20-1999	0146	--	--	--	--	--	--	.02
5-20-1999	0148	--	--	--	--	--	--	.02
5-20-1999	0150	--	--	--	--	--	--	.02
5-20-1999	0858	--	--	--	--	--	--	.01
5-24-1999	1520	--	--	--	--	--	--	.01
5-24-1999	1730	--	--	--	--	--	--	.02
5-24-1999	1858	269	36	--	--	--	--	.04
5-24-1999	1920	--	--	--	--	--	--	.01
7-01-1999	0258	669	--	--	--	190	170	.01
7-01-1999	0304	297	--	--	--	104	130	.09
7-01-1999	0310	95	--	--	--	87	45	.06
7-01-1999	0354	735	--	--	--	240	120	.02
7-01-1999	0408	--	--	--	--	--	--	.02
7-01-1999	0602	441	--	--	--	101	130	.37
7-01-1999	0606	841	--	--	--	65	260	.45
7-01-1999	0608	1,140	--	--	--	74	340	.51
7-01-1999	0610	347	--	--	--	69	240	.33
7-01-1999	0614	184	--	--	--	62	160	.09
7-01-1999	0616	1,080	--	--	--	83	120	.05
7-01-1999	0626	814	--	--	--	97	110	.04
7-01-1999	0650	--	--	--	--	--	--	.01
7-01-1999	1056	923	--	--	--	217	330	.01
7-01-1999	1104	547	--	--	--	143	230	.05
7-01-1999	1114	--	--	--	--	--	--	.03
7-06-1999	1704	431	--	--	--	274	110	.23
7-06-1999	1708	303	--	--	--	202	100	.29
7-06-1999	1710	298	--	--	--	175	130	.14
7-06-1999	1712	209	--	--	--	181	820	.09
7-06-1999	1724	--	--	--	--	--	--	.01
7-06-1999	2130	260	--	--	--	285	150	.05
7-06-1999	2140	--	--	--	--	--	--	.03
7-19-1999	1646	301	--	--	--	142	110	.12
7-19-1999	1652	169	--	--	--	106	80	.06
7-19-1999	1654	301	--	--	--	--	--	.05
7-19-1999	1700	203	--	--	--	83	65	.07
7-19-1999	1708	122	--	--	--	83	85	.05
7-19-1999	1720	134	--	--	--	67	70	.06

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
7-19-1999	1724	111	--	--	--	54	70	0.12
7-19-1999	1732	51	--	--	--	64	45	.05
7-19-1999	1750	238	--	--	--	294	130	.01
7-23-1999	0100	253	--	--	--	257	140	.10
7-23-1999	0104	224	--	--	--	192	130	.33
7-23-1999	0108	195	--	--	--	166	120	.17
7-23-1999	0110	147	--	--	--	139	85	.09
7-23-1999	0112	133	--	--	--	124	80	.11
7-23-1999	0116	95	--	--	--	121	65	.07
7-23-1999	0124	80	--	--	--	124	75	.03
7-23-1999	0136	56	--	--	--	119	55	.04
7-23-1999	0146	72	--	--	--	104	50	.04
7-23-1999	0156	56	--	--	--	93	45	.07
7-23-1999	0204	38	--	--	--	107	27	.04
7-24-1999	2026	634	--	--	--	143	170	1.38
7-24-1999	2030	790	--	--	--	100	200	.51
7-24-1999	2032	709	--	--	--	92	230	.36
7-24-1999	2034	480	--	--	--	98	180	.23
7-24-1999	2036	317	--	--	--	89	140	.14
7-24-1999	2040	198	--	--	--	87	110	.07
7-24-1999	2050	113	--	--	--	106	75	.02
7-24-1999	2108	377	--	--	--	101	140	.54
7-24-1999	2112	432	--	--	--	90	160	.34
7-24-1999	2114	301	--	--	--	75	110	.29
7-24-1999	2116	212	--	--	--	67	95	.14
7-24-1999	2120	173	--	--	--	66	85	.05
7-25-1999	1642	167	--	--	--	153	80	.27
7-25-1999	1646	191	--	--	--	132	85	.16
7-25-1999	1648	115	--	--	--	111	75	.12
7-25-1999	1656	77	--	--	--	100	50	.03
8-06-1999	2144	--	--	--	--	--	--	.01
8-14-1999	2136	--	--	--	--	--	--	.18
8-14-1999	2140	--	--	--	--	--	--	.13
8-21-1999	2058	--	--	--	--	--	--	.01
8-21-1999	2100	--	--	--	--	--	--	.02
8-21-1999	2132	--	--	--	--	--	--	.01
8-21-1999	2232	--	--	--	--	--	--	.01
8-21-1999	2336	--	--	--	--	--	--	<.01
8-22-1999	0116	--	--	--	--	--	--	.01
8-22-1999	0212	--	--	--	--	--	--	<.01

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
8-22-1999	0606	--	--	--	--	--	--	0.01
8-22-1999	0640	--	--	--	--	--	--	.02
8-22-1999	0706	--	--	--	--	--	--	.02
8-22-1999	0746	--	--	--	--	--	--	.01
8-26-1999	1724	183	--	--	--	293	110	<.01
8-26-1999	1838	--	--	--	--	--	--	<.01
9-06-1999	1124	--	--	--	--	--	--	.08
9-06-1999	1136	144	--	--	--	140	250	.02
9-06-1999	1150	--	--	--	--	--	--	.21
9-06-1999	1154	--	--	--	--	--	--	.13
9-06-1999	1204	--	--	--	--	--	--	.02
9-07-1999	0232	--	--	--	--	--	--	.12
9-07-1999	0236	--	--	--	--	--	--	.10
9-07-1999	0246	--	--	--	--	--	--	.03
9-07-1999	0356	--	--	--	--	--	--	<.01
9-07-1999	0406	109	--	--	--	71	75	.19
9-07-1999	0410	--	--	--	--	--	--	.16
9-07-1999	0416	--	--	--	--	--	--	.06
9-07-1999	0440	--	--	--	--	--	--	.01
9-07-1999	0456	--	--	--	--	--	--	.03
9-08-1999	0914	203	--	--	--	173	230	.05
9-08-1999	0922	246	--	--	--	166	240	.05
9-08-1999	0932	--	--	--	--	--	--	.04
9-08-1999	0950	--	--	--	--	--	--	.03
9-08-1999	1008	--	--	--	--	--	--	.01
9-08-1999	1058	--	--	--	--	--	--	.01
9-10-1999	0742	--	--	--	--	--	--	.05
9-10-1999	0754	--	--	--	--	--	--	.04
9-10-1999	0810	--	--	--	--	--	--	.04
9-10-1999	0820	--	--	--	--	--	--	.17
9-10-1999	0824	183	--	--	--	53	95	.20
9-10-1999	0828	--	--	--	--	50	110	.09
9-10-1999	0836	142	--	--	--	70	110	.04
9-10-1999	0850	169	--	--	--	86	140	.03
9-10-1999	0904	--	--	--	--	191	27	.03
9-10-1999	0930	--	--	--	--	--	--	.01
9-10-1999	0956	180	--	--	--	70	130	.07
9-10-1999	1004	153	--	--	--	84	130	.03
9-10-1999	1042	--	--	--	--	--	--	.01
9-10-1999	1222	--	--	--	--	--	--	<.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
9-10-1999	1300	--	--	--	--	--	--	0.01
9-10-1999	1426	--	--	--	--	--	--	.01
9-10-1999	1444	--	--	--	--	90	90	.07
9-10-1999	1452	180	--	--	--	72	130	.05
9-10-1999	1500	144	--	--	--	70	95	.06
9-10-1999	1506	124	--	--	--	43	75	.11
9-10-1999	1510	90	--	--	--	41	65	.13
9-10-1999	1514	--	--	--	--	41	55	.07
9-10-1999	1522	139	--	--	--	62	50	.04
9-15-1999	1846	13,600	--	--	--	430	300	.02
9-15-1999	1908	1,610	--	--	--	263	210	.03
9-15-1999	1928	278	--	--	--	173	150	.02
9-15-1999	1946	175	--	--	--	122	90	.03
9-15-1999	2000	236	--	--	--	100	130	.04
9-15-1999	2010	141	--	--	--	88	100	.04
9-15-1999	2022	78	--	--	--	76	85	.03
9-15-1999	2038	77	--	--	--	78	75	.03
9-15-1999	2052	108	--	--	--	76	110	.03
9-15-1999	2104	96	--	--	--	69	90	.04
9-15-1999	2116	63	--	--	--	65	75	.03
9-15-1999	2130	63	--	--	--	63	65	.04
9-15-1999	2156	--	--	--	--	70	60	.01
9-15-1999	2256	--	--	--	--	--	--	.01
9-15-1999	2320	86	--	--	--	76	95	.03
9-15-1999	2332	92	--	--	--	54	85	.05
9-15-1999	2348	104	--	--	--	219	70	.02
9-16-1999	0000	70	--	--	--	43	65	.07
9-16-1999	0010	90	--	--	--	38	65	.04
9-16-1999	0020	81	--	--	--	36	70	.05
9-16-1999	0028	44	--	--	--	32	40	.04
9-16-1999	0042	32	--	--	--	30	34	.06
9-16-1999	0054	32	--	--	--	37	31	.02
9-16-1999	0142	--	--	--	--	--	--	<.01
9-22-1999	2336	393	--	--	--	152	210	.05
9-22-1999	2354	--	--	--	--	--	--	.02
9-23-1999	0204	--	--	--	--	--	--	.02
10-18-1999	0712	--	--	--	--	--	--	.01
10-20-1999	0756	5,600	--	--	--	195	480	.02
10-20-1999	0818	2,030	--	--	--	165	350	.02
10-20-1999	0842	2,570	--	--	--	129	330	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
10-20-1999	0856	660	--	--	--	88	260	0.04
10-20-1999	0912	344	--	--	--	90	230	.02
10-20-1999	0944	294	--	--	--	112	220	.01
10-20-1999	1100	323	--	--	--	142	230	.01
10-20-1999	1204	394	--	--	--	65	200	.12
10-20-1999	1210	259	--	--	--	48	150	.18
10-20-1999	1218	152	--	--	--	38	95	.07
10-20-1999	1230	148	--	--	--	39	85	.07
10-20-1999	1244	94	--	--	--	40	80	.06
10-23-1999	0202	125	--	--	--	117	95	.05
10-23-1999	0228	170	--	--	--	134	80	.02
10-23-1999	0256	104	--	--	--	103	95	.05
10-23-1999	0318	167	--	--	--	68	120	.05
10-23-1999	0334	120	--	--	--	47	85	.07
10-23-1999	0346	149	--	--	--	35	75	.09
10-23-1999	0402	186	--	--	--	39	80	.04
10-23-1999	0414	89	--	--	--	36	55	.07
10-23-1999	0446	--	--	--	--	--	--	.01
10-23-1999	0640	169	--	--	--	136	180	.01
10-23-1999	0908	--	--	--	--	--	--	<.01
11-02-1999	2354	163	--	--	--	153	110	.02
11-03-1999	0038	145	--	--	--	97	150	.03
11-03-1999	0118	112	--	--	--	71	95	.03
11-03-1999	0138	80	--	--	--	46	60	.06
11-03-1999	0152	93	--	--	--	34	60	.06
11-03-1999	0210	336	--	--	--	38	110	.06
11-03-1999	0234	243	--	--	--	41	70	.06
11-03-1999	0254	58	--	--	--	39	34	.06
12-20-1999	2325	1,800	--	--	--	53	760	.05
2-14-2000	0753	429	--	--	--	1,650	310	.04
2-14-2000	0813	467	--	--	--	1,560	450	.03
2-14-2000	0838	--	--	--	--	--	--	.01
2-14-2000	0924	--	--	--	--	--	--	.03
2-14-2000	0925	1,520	--	--	--	1,570	1,000	.03
2-14-2000	0933	--	--	--	--	--	--	.12
2-14-2000	0938	1,070	--	--	--	1,080	750	.07
2-14-2000	1016	835	--	--	--	1,090	550	.03
2-14-2000	1057	685	--	--	--	1,580	500	.03
2-14-2000	1125	1,930	--	--	--	1,260	750	.03
2-14-2000	1138	883	--	--	--	1,200	500	.03

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
2-14-2000	1150	2,750	--	--	--	884	600	0.07
2-14-2000	1155	2,880	--	--	--	574	750	.11
2-14-2000	1159	1,790	--	--	--	562	600	.09
2-14-2000	1209	1,100	--	--	--	932	600	.03
2-28-2000	0753	1,870	--	--	--	21,800	1,100	.03
2-28-2000	0804	--	--	--	--	--	--	.04
2-28-2000	0814	--	--	--	--	--	--	.05
2-28-2000	0823	1,960	--	--	--	1,170	1,100	.05
2-28-2000	0831	--	--	--	--	--	--	.04
2-28-2000	0843	--	--	--	--	--	--	.03
3-28-2000	0451	1,290	52	9	42	7,120	700	.05
3-28-2000	0459	999	31	7	24	6,480	800	.05
3-28-2000	0506	675	20	5	15	4,730	650	.08
3-28-2000	0511	558	16	5	12	3,370	500	.09
3-28-2000	0517	1,210	63	10	53	2,800	450	.06
3-28-2000	0541	731	30	8	22	2,890	500	.06
3-28-2000	0559	477	13	3	10	2,560	450	.05
3-28-2000	0618	685	12	5	7	1,680	600	.06
3-28-2000	0630	509	12	4	8	1,170	400	.06
3-28-2000	0643	320	25	9	16	1,040	220	.06
3-28-2000	0700	505	9	4	5	638	350	.14
3-28-2000	0708	367	44	6	38	603	180	.10
3-28-2000	0721	322	28	10	19	570	180	.09
3-28-2000	0754	332	9	5	4	472	220	.07
3-28-2000	0804	213	6	2	3	451	160	.12
3-28-2000	0816	162	7	3	4	460	120	.08
4-04-2000	0342	960	--	--	--	925	750	.06
4-08-2000	2319	1,670	--	--	--	827	750	.08
4-08-2000	2323	791	--	--	--	820	600	.11
4-08-2000	2329	609	--	--	--	783	270	.05
4-09-2000	0149	366	--	--	--	534	170	.07
4-09-2000	0156	319	--	--	--	468	160	.05
4-09-2000	0214	225	--	--	--	460	170	.03
4-09-2000	0304	210	--	--	--	301	100	.07
4-09-2000	0323	72	--	--	--	290	70	.04
4-09-2000	0428	64	--	--	--	288	60	.03
4-09-2000	0450	487	--	--	--	182	220	.15
4-09-2000	0508	362	--	--	--	133	130	.07
4-09-2000	0517	165	--	--	--	110	110	.11
4-09-2000	0529	98	--	--	--	134	60	.05

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
4-09-2000	0549	188	--	--	--	218	110	0.03
4-09-2000	0611	363	--	--	--	153	65	.06
4-09-2000	0625	117	--	--	--	133	65	.06
4-09-2000	0721	289	--	--	--	238	150	.12
4-09-2000	0743	149	--	--	--	127	75	.1
4-18-2000	1849	317	--	--	--	596	160	.08
4-18-2000	1900	366	--	--	--	467	180	.11
4-21-2000	1939	508	--	--	--	308	160	.03
4-21-2000	1949	510	--	--	--	173	160	.05
4-21-2000	1956	359	--	--	--	114	190	.07
4-21-2000	2002	517	--	--	--	99	140	.06
4-21-2000	2017	670	--	--	--	125	110	.03
4-21-2000	2113	574	--	--	--	190	120	.03
4-21-2000	2126	212	--	--	--	112	130	.08
4-21-2000	2147	120	--	--	--	82	90	.05
4-21-2000	2236	224	--	--	--	81	95	.11
4-21-2000	2253	156	--	--	--	63	60	.06
4-21-2000	2311	61	--	--	--	68	50	.05
4-21-2000	2341	57	--	--	--	96	60	.03
4-22-2000	0002	66	--	--	--	82	60	.04
4-22-2000	0019	79	--	--	--	69	60	.06
4-22-2000	0033	69	--	--	--	61	55	.07
4-22-2000	0056	64	--	--	--	60	50	.08
4-22-2000	0114	74	--	--	--	46	51	.13
4-22-2000	0129	77	--	--	--	44	50	.09
4-22-2000	0227	74	--	--	--	69	40	.09
4-22-2000	0327	111	--	--	--	146	60	.05
4-23-2000	1648	--	--	--	--	--	--	.03
5-02-2000	0642	9,920	--	--	--	679	500	.03
5-02-2000	0806	1,970	--	--	--	390	380	.05
5-02-2000	0817	1,070	--	--	--	348	350	.04
5-02-2000	0830	--	--	--	--	--	6	.03
5-08-2000	1712	1,090	--	--	--	621	380	.11
5-08-2000	1714	1,310	--	--	--	565	500	.15
5-08-2000	1717	677	--	--	--	431	360	.16
5-08-2000	1720	530	--	--	--	452	260	.15
5-08-2000	1724	471	--	--	--	415	230	.11
5-08-2000	1736	300	--	--	--	490	170	.06
5-10-2000	1330	402	--	--	--	258	220	.08
5-10-2000	2029	820	--	--	--	141	350	.48

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
5-10-2000	2031	891	--	--	--	103	400	0.51
5-10-2000	2033	643	--	--	--	89	340	.35
5-10-2000	2037	471	--	--	--	78	160	.09
5-10-2000	2055	306	--	--	--	117	170	.03
5-10-2000	2117	221	--	--	--	157	180	.03
5-10-2000	2202	247	--	--	--	175	210	.03
5-10-2000	2221	246	--	--	--	159	200	.04
5-10-2000	2229	229	--	--	--	71	140	.30
5-10-2000	2237	107	--	--	--	40	65	.11
5-11-2000	0008	115	--	--	--	101	100	.03
5-13-2000	2249	366	--	--	--	174	120	.45
5-13-2000	2253	284	--	--	--	141	120	.25
5-13-2000	2309	82	--	--	--	190	40	.04
5-18-2000	1850	756	--	--	--	424	220	.05
5-18-2000	1857	558	--	--	--	410	250	.07
5-18-2000	1903	302	--	--	--	331	210	.07
5-18-2000	1909	471	--	--	--	269	220	.07
5-18-2000	1914	303	--	--	--	244	170	.08
5-18-2000	1931	226	--	--	--	286	170	.04
5-18-2000	0647	323	--	--	--	431	230	.04
5-19-2000	0707	271	--	--	--	254	190	.04
5-19-2000	0005	426	--	--	--	189	130	.08
5-23-2000	0015	263	--	--	--	116	110	.09
5-23-2000	0024	241	--	--	--	79	85	.11
5-23-2000	0031	256	--	--	--	62	95	.12
5-23-2000	0040	171	--	--	--	63	110	.09
5-23-2000	0054	100	--	--	--	79	70	.05
5-23-2000	0113	64	--	--	--	99	50	.04
5-23-2000	0117	343	--	--	--	255	230	.05
5-24-2000	0155	367	--	--	--	278	210	.04
5-24-2000	0709	162	--	--	--	89	95	.10
5-24-2000	0735	105	--	--	--	84	95	.05
5-24-2000	0805	163	--	--	--	94	150	.06
5-24-2000	0832	135	--	--	--	86	130	.06
5-24-2000	0911	278	--	--	--	310	140	.04
5-24-2000	0949	264	--	--	--	148	230	.02
5-24-2000	1006	300	--	--	--	139	230	.09
5-24-2000	1028	117	--	--	--	221	80	.05
5-24-2000	2103	769	--	--	--	390	620	.07
5-25-2000	0715	--	--	--	--	--	--	.04

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 136-05 (catch basin inflow)—*Continued*								
5-25-2000	0937	--	--	--	--	--	--	0.04
5-25-2000	0948	--	--	--	--	--	--	.05
5-25-2000	0956	--	--	--	--	--	--	.10
5-25-2000	1145	--	--	--	--	--	--	<.01
6-06-2000	[1]0829	347	--	--	--	16	--	--
6-06-2000	[1]1203	142	--	--	--	152	--	--
6-06-2000	[1]1359	135	--	--	--	92	--	--
6-06-2000	[1]1524	86	--	--	--	75	--	--
6-06-2000	[1]2038	34	--	--	--	111	--	--
6-07-2000	0837	--	--	--	--	--	--	--
Monitoring location 739-02 (oil-grit separator outflow)								
8-21-1999	2203	--	--	--	--	--	--	0.03
8-21-1999	2210	--	--	--	--	--	--	.03
8-21-1999	2216	--	--	--	--	--	--	.03
8-21-1999	2223	--	--	--	--	--	--	.03
8-21-1999	2229	--	--	--	--	--	--	.03
8-21-1999	2236	--	--	--	--	--	--	.03
8-21-1999	2249	--	--	--	--	--	--	.03
8-21-1999	2302	--	--	--	--	--	--	.03
8-21-1999	2315	--	--	--	--	--	--	.03
8-21-1999	2328	--	--	--	--	--	--	.03
8-21-1999	2341	--	--	--	--	--	--	.02
8-21-1999	2354	--	--	--	--	--	--	.02
8-22-1999	0212	--	--	--	--	--	--	.02
8-22-1999	0235	--	--	--	--	--	--	.01
8-22-1999	0257	--	--	--	--	--	--	.01
8-22-1999	0824	--	--	--	--	--	--	.02
8-27-1999	1600	--	--	--	--	--	--	.02
8-27-1999	1647	--	--	--	--	--	--	.02
9-06-1999	1149	--	--	--	--	--	--	.48
9-06-1999	1206	--	--	--	--	--	--	.13
9-07-1999	0228	--	--	--	--	--	--	.96
9-07-1999	0237	--	--	--	--	--	--	.32
9-07-1999	0401	--	--	--	--	--	--	.37
9-07-1999	0415	--	--	--	--	--	--	.32
9-08-1999	1014	87	--	--	--	--	--	.05

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
9-08-1999	1021	--	--	--	--	--	--	0.04
9-08-1999	1056	87	--	--	--	248	95	2.23
9-10-1999	0815	100	--	--	--	278	100	.25
9-10-1999	0816	--	--	--	--	--	--	.30
9-10-1999	0822	158	--	--	--	197	120	.89
9-10-1999	0823	--	--	--	--	--	--	.99
9-10-1999	0838	120	--	--	--	132	85	.25
9-10-1999	0851	--	--	--	--	--	--	.16
9-10-1999	0941	--	--	--	--	--	--	.02
9-10-1999	0956	101	--	--	--	148	90	.46
9-10-1999	1504	109	--	--	--	170	110	.50
9-10-1999	1535	95	--	--	--	99	85	.22
9-10-1999	1536	--	--	--	--	--	--	.22
9-10-1999	1629	55	--	--	--	87	55	.27
9-10-1999	1631	--	--	--	--	--	--	.28
9-10-1999	1726	37	--	--	--	77	36	.30
9-10-1999	1736	--	--	--	--	--	--	.40
9-10-1999	1744	124	--	--	--	67	60	1.01
9-10-1999	1805	80	--	--	--	46	45	.57
9-10-1999	1833	85	--	--	--	50	45	.91
9-10-1999	1837	190	--	--	--	46	75	2.21
9-10-1999	1844	--	--	--	--	--	--	.91
9-10-1999	1855	71	--	--	--	36	45	.45
9-10-1999	1905	--	--	--	--	--	--	.49
9-10-1999	1939	--	--	--	--	--	--	.47
9-10-1999	1950	37	--	--	--	41	32	.20
9-10-1999	2010	145	--	--	--	44	55	2.16
9-10-1999	2012	--	--	--	--	--	--	1.9
9-10-1999	2021	70	--	--	--	33	39	.84
9-10-1999	2034	--	--	--	--	--	--	.90
9-10-1999	2052	29	--	--	--	35	22	1.04
9-10-1999	2100	--	--	--	--	--	--	.78
9-10-1999	2119	--	--	--	--	--	--	2.13
9-10-1999	2137	--	--	--	--	--	--	2.55
9-10-1999	2138	--	--	--	--	--	--	2.51
9-10-1999	2144	--	--	--	--	--	--	1.77
9-10-1999	2145	52	--	--	--	23	25	1.85
9-10-1999	2153	--	--	--	--	--	--	2.39
9-10-1999	2159	--	--	--	--	--	--	2.65
9-15-1999	1910	57	--	--	--	282	65	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
9-15-1999	1946	--	--	--	--	--	--	0.14
9-15-1999	1947	81	--	--	--	243	85	.14
9-15-1999	2009	--	--	--	--	--	--	.18
9-15-1999	2011	81	--	--	--	174	85	.18
9-15-1999	2040	--	--	--	--	--	--	.14
9-15-1999	2041	79	--	--	--	141	80	.15
9-15-1999	2102	--	--	--	--	--	--	.20
9-15-1999	2111	60	--	--	--	109	65	.21
9-15-1999	2136	--	--	--	--	--	--	.17
9-15-1999	2139	51	--	--	--	105	60	.15
9-15-1999	2211	--	--	--	--	--	--	.05
9-15-1999	2316	44	--	--	--	115	55	.12
9-15-1999	2331	--	--	--	--	--	--	.21
9-15-1999	2355	47	--	--	--	86	50	.17
9-16-1999	0008	--	--	--	--	--	--	.23
9-16-1999	0026	44	--	--	--	66	50	.26
9-16-1999	0032	--	--	--	--	--	--	.19
9-16-1999	0045	38	--	--	--	56	39	.31
9-16-1999	0049	--	--	--	--	--	--	.28
9-16-1999	0103	29	--	--	--	51	34	.15
9-16-1999	0111	--	--	--	--	--	--	.10
9-16-1999	0635	38	--	--	--	140	50	.05
9-16-1999	0658	--	--	--	--	--	--	.11
9-16-1999	0826	49	--	--	--	154	65	.04
9-16-1999	0837	--	--	--	--	--	--	.08
9-16-1999	0859	81	--	--	--	114	80	.36
9-16-1999	0906	--	--	--	--	--	--	.27
9-16-1999	0928	88	--	--	--	82	75	.5
9-16-1999	0929	--	--	--	--	--	--	.49
9-16-1999	0939	99	--	--	--	62	70	.79
9-16-1999	1013	80	--	--	--	39	60	1.16
9-16-1999	1158	--	--	--	--	--	--	.04
9-16-1999	1204	37	--	--	--	71	45	.04
9-16-1999	1414	--	--	--	--	--	--	.38
9-16-1999	1417	55	--	--	--	85	50	.34
9-16-1999	1519	110	--	--	--	68	50	1.63
9-16-1999	1532	--	--	--	--	--	--	1.04
9-16-1999	1538	80	--	--	--	42	26	.48
9-16-1999	1550	--	--	--	--	--	--	1.04
9-16-1999	1556	66	--	--	--	41	32	1.04

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
9-16-1999	1605	--	--	--	--	--	--	2.02
9-16-1999	1612	81	--	--	--	40	32	1.21
9-16-1999	1639	--	--	--	--	--	--	.22
9-16-1999	1651	28	--	--	--	44	18	2.36
9-22-1999	2332	77	--	--	--	401	50	.01
9-22-1999	2333	--	--	--	--	--	--	.01
9-22-1999	2335	--	--	--	--	--	--	.03
9-22-1999	2336	--	--	--	--	--	--	.04
9-22-1999	2338	--	--	--	--	--	--	.04
9-22-1999	2339	--	--	--	--	--	--	.05
9-22-1999	2340	--	--	--	--	--	--	.04
9-22-1999	2341	--	--	--	--	--	--	.04
9-22-1999	2342	--	--	--	--	--	--	.04
9-22-1999	2344	--	--	--	--	--	--	.04
9-22-1999	2345	--	--	--	--	--	--	.04
9-22-1999	2346	--	--	--	--	--	--	.04
9-22-1999	2347	--	--	--	--	--	--	.04
9-22-1999	2348	--	--	--	--	--	--	.04
9-22-1999	2349	--	--	--	--	--	--	.04
9-22-1999	2350	--	--	--	--	--	--	.04
9-22-1999	2352	--	--	--	--	--	--	.03
9-22-1999	2353	--	--	--	--	--	--	.03
9-22-1999	2354	--	--	--	--	--	--	.03
9-22-1999	2355	--	--	--	--	--	--	.03
9-22-1999	2356	--	--	--	--	--	--	.03
9-22-1999	2357	--	--	--	--	--	--	.03
9-22-1999	2358	--	--	--	--	--	--	.03
9-22-1999	2359	--	--	--	--	--	--	.03
9-23-1999	0001	--	--	--	--	--	--	.03
10-09-1999	0800	50	--	--	--	195	37	<.01
10-10-1999	1415	--	--	--	--	--	--	.06
10-10-1999	1423	64	--	--	--	297	36	.07
10-10-1999	1449	--	--	--	--	--	--	.06
10-10-1999	1458	56	--	--	--	270	37	.08
10-10-1999	1524	--	--	--	--	--	--	.03
10-10-1999	1544	50	--	--	--	231	37	.02
10-10-1999	1603	37	--	--	--	206	27	.01
10-10-1999	1612	227	--	--	--	164	110	.01
10-10-1999	1621	295	--	--	--	104	150	.01
10-10-1999	1630	316	--	--	--	74	120	.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
10-10-1999	1639	280	--	--	--	60	110	0.01
10-10-1999	1648	273	--	--	--	49	90	.01
10-10-1999	1657	286	--	--	--	45	80	.01
10-10-1999	1706	250	--	--	--	41	60	.01
10-10-1999	1715	188	--	--	--	40	65	.01
10-10-1999	1724	159	--	--	--	40	60	.02
10-10-1999	1733	137	--	--	--	38	60	.02
10-10-1999	1742	121	--	--	--	38	55	.02
10-10-1999	1800	--	--	--	--	--	--	.01
10-10-1999	1801	115	--	--	--	37	55	.01
10-13-1999	2255	--	--	--	--	--	--	.99
10-13-1999	2258	109	--	--	--	48	60	1.5
10-13-1999	2300	--	--	--	--	--	--	1.99
10-13-1999	2302	--	--	--	--	--	--	2.39
10-13-1999	2303	--	--	--	--	--	--	2.6
10-13-1999	2304	87	--	--	--	108	60	2.74
10-13-1999	2306	71	--	--	--	68	50	2.79
10-13-1999	2308	--	--	--	--	--	--	1.74
10-13-1999	2310	47	--	--	--	50	31	1.73
10-13-1999	2312	--	--	--	--	--	--	.99
10-13-1999	2324	28	--	--	--	52	22	.19
10-14-1999	0702	24	--	--	--	47	19	.01
10-14-1999	1102	23	--	--	--	43	18	.01
10-18-1999	0042	--	--	--	--	--	--	.77
10-18-1999	0054	--	--	--	--	--	--	.45
10-18-1999	0117	--	--	--	--	--	--	.20
10-18-1999	0150	--	--	--	--	--	--	.25
10-18-1999	0219	--	--	--	--	--	--	.26
10-18-1999	0248	--	--	--	--	--	--	.24
10-20-1999	0809	27	--	--	--	74	25	.02
10-20-1999	0843	63	--	--	--	127	65	.07
10-20-1999	0856	90	--	--	--	162	95	.15
10-20-1999	0909	106	--	--	--	161	120	.10
10-20-1999	0928	--	--	--	--	--	--	.06
10-20-1999	0929	118	--	--	--	151	120	.05
10-20-1999	1107	106	--	--	--	152	130	.04
10-20-1999	1201	--	--	--	--	--	--	.18
10-20-1999	1205	122	--	--	--	152	140	.45
10-20-1999	1208	--	--	--	--	--	--	.49
10-20-1999	1211	168	--	--	--	124	150	.48

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
10-20-1999	1216	--	--	--	--	--	--	0.39
10-20-1999	1220	168	--	--	--	97	150	.38
10-20-1999	1226	--	--	--	--	--	--	.34
10-20-1999	1231	144	--	--	--	80	20	.33
10-20-1999	1236	--	--	--	--	--	--	.36
10-20-1999	1240	128	--	--	--	69	120	.36
10-20-1999	1245	--	--	--	--	--	--	.34
10-20-1999	1250	112	--	--	--	63	110	.28
10-20-1999	1256	--	--	--	--	--	--	.27
10-20-1999	1303	101	--	--	--	57	95	.23
10-20-1999	1311	--	--	--	--	--	--	.19
10-20-1999	1319	92	--	--	--	58	90	.26
10-20-1999	1325	--	--	--	--	--	--	.31
10-20-1999	1331	100	--	--	--	57	85	.30
10-20-1999	1336	--	--	--	--	--	--	.26
10-20-1999	1344	85	--	--	--	55	85	.23
10-20-1999	1407	--	--	--	--	--	--	.15
10-20-1999	1420	64	--	--	--	53	60	.11
10-20-1999	1504	--	--	--	--	--	--	.10
10-20-1999	1523	58	--	--	--	74	65	.07
10-20-1999	1649	--	--	--	--	--	--	.02
10-20-1999	1801	46	--	--	--	104	55	.02
10-20-1999	1805	--	--	--	--	--	--	.02
10-20-1999	1817	--	--	--	--	--	--	.01
10-20-1999	1829	--	--	--	--	--	--	.01
10-20-1999	1841	--	--	--	--	--	--	.01
10-23-1999	0152	34	--	--	--	128	45	.01
10-23-1999	0207	41	--	--	--	145	50	.15
10-23-1999	0220	54	--	--	--	160	60	.10
10-23-1999	0239	54	--	--	--	165	55	.07
10-23-1999	0257	52	--	--	--	163	55	.11
10-23-1999	0325	46	--	--	--	146	55	.18
10-23-1999	0342	52	--	--	--	119	55	.23
10-23-1999	0354	56	--	--	--	94	55	.25
10-23-1999	0411	48	--	--	--	75	45	.27
10-23-1999	0427	46	--	--	--	63	45	.15
10-23-1999	0502	38	--	--	--	57	37	.04
10-23-1999	0528	34	--	--	--	58	35	.02
10-23-1999	0535	32	--	--	--	59	34	.02
10-23-1999	0544	33	--	--	--	60	34	.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
10-23-1999	0556	30	--	--	--	60	34	0.01
10-23-1999	0628	32	--	--	--	61	33	.01
10-23-1999	0644	30	--	--	--	62	33	.02
10-23-1999	0657	29	--	--	--	63	34	.02
10-23-1999	0711	29	--	--	--	65	34	.02
10-23-1999	0730	28	--	--	--	69	35	.01
11-02-1999	2343	--	--	--	--	--	--	.10
11-03-1999	0001	25	12	88	--	149	31	.08
11-03-1999	0020	60	5	95	--	253	75	.12
11-03-1999	0036	92	7	93	--	291	110	.14
11-03-1999	0112	107	18	82	--	287	130	.15
11-03-1999	0131	102	6	94	--	235	130	.34
11-03-1999	0142	90	7	93	--	183	110	.32
11-03-1999	0152	92	6	94	--	146	100	.4
11-03-1999	0203	84	11	89	--	114	85	.35
11-03-1999	0213	75	9	91	--	93	75	.36
11-03-1999	0224	64	2	98	--	80	65	.24
11-03-1999	0239	69	12	88	--	72	60	.29
11-03-1999	0255	68	6	94	--	66	50	.24
11-03-1999	0309	42	8	92	--	66	50	.25
11-03-1999	0325	48	11	89	--	68	45	.21
11-03-1999	0359	39	1	99	--	69	40	.49
11-03-1999	0418	36	12	88	--	74	38	.24
11-03-1999	0455	46	13	87	--	64	37	.13
11-03-1999	0613	32	4	96	--	56	31	.06
11-03-1999	0737	35	3	97	--	68	36	.04
11-03-1999	0810	59	1	99	--	91	70	.02
11-03-1999	0829	52	17	83	--	94	70	.01
11-10-1999	2314	67	--	--	--	96	70	.10
11-12-1999	2318	62	--	--	--	169	70	.02
11-12-1999	2343	94	--	--	--	200	100	.08
11-14-1999	1743	74	--	--	--	254	75	.03
12-15-1999	0310	--	--	--	--	--	--	.09
12-15-1999	0504	--	--	--	--	--	--	.10
12-15-1999	0550	--	--	--	--	--	--	.08
12-21-1999	[1]0057	130	--	--	--	305	120	.20
1-10-2000	1900	--	--	--	--	--	--	.10
1-10-2000	1919	--	--	--	--	--	--	.06
1-10-2000	1959	--	--	--	--	--	--	.04
1-10-2000	2028	--	--	--	--	--	--	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
1-10-2000	2031	--	--	--	--	--	--	0.02
1-10-2000	2034	--	--	--	--	--	--	.02
1-10-2000	2038	--	--	--	--	--	--	.02
1-10-2000	2041	--	--	--	--	--	--	.02
1-10-2000	2045	--	--	--	--	--	--	.02
1-10-2000	2049	--	--	--	--	--	--	.02
1-10-2000	2054	--	--	--	--	--	--	.01
1-10-2000	2058	--	--	--	--	--	--	.01
1-10-2000	2103	--	--	--	--	--	--	.01
1-10-2000	2109	--	--	--	--	--	--	.01
1-10-2000	2115	--	--	--	--	--	--	.01
1-10-2000	2122	--	--	--	--	--	--	.01
1-10-2000	2130	--	--	--	--	--	--	.01
1-13-2000	1023	--	--	--	--	--	--	.01
1-31-2000	0416	--	--	--	--	--	--	.01
1-31-2000	0432	38	--	--	--	53,300	32	.07
1-31-2000	0444	259	--	--	--	57,400	260	.17
1-31-2000	0457	362	--	--	--	50,900	400	.08
1-31-2000	0515	384	--	--	--	39,500	450	.07
1-31-2000	0532	--	--	--	--	--	--	.09
1-31-2000	0547	404	--	--	--	24,100	380	.10
1-31-2000	0601	--	--	--	--	--	--	.08
1-31-2000	0618	322	--	--	--	15,900	350	.08
1-31-2000	0656	--	--	--	--	--	--	.02
1-31-2000	0701	420	--	--	--	12,800	500	.02
1-31-2000	0705	--	--	--	--	--	--	.02
1-31-2000	0708	429	--	--	--	12,500	500	.02
1-31-2000	0712	--	--	--	--	--	--	.02
1-31-2000	0716	435	--	--	--	12,400	550	.01
1-31-2000	0717	--	--	--	--	--	--	.01
1-31-2000	0722	--	--	--	--	--	--	.01
1-31-2000	0726	421	--	--	--	12,300	500	.01
1-31-2000	0727	--	--	--	--	--	--	.01
1-31-2000	0734	--	--	--	--	--	--	.01
1-31-2000	0740	410	--	--	--	12,300	500	.01
2-14-2000	0204	1,000	--	--	--	13,600	22	.01
2-14-2000	0210	5	--	--	--	14,800	8	.01
2-14-2000	0222	763	--	--	--	16,400	550	.08
2-14-2000	0234	--	--	--	--	24,800	100	.14
2-14-2000	0243	--	--	--	--	--	--	.16

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
2-14-2000	0259	995	--	--	--	11,000	450	.07
2-14-2000	0335	765	0	100	--	10,500	450	.02
2-14-2000	0338	1,220	--	--	--	10,100	390	.02
2-14-2000	0349	1,200	--	--	--	9,600	380	.03
2-14-2000	0400	966	--	--	--	--	--	.02
2-14-2000	0404	906	--	--	--	9,490	390	.02
2-14-2000	0407	--	--	--	--	9,360	360	.02
2-14-2000	0411	1,120	--	--	--	9,210	350	.02
2-14-2000	0415	907	--	--	--	9,060	340	.02
2-14-2000	0420	903	--	--	--	8,660	340	.01
2-14-2000	0425	351	1	99	--	8,840	380	.01
2-14-2000	0430	972	--	--	--	8,730	330	.01
2-14-2000	0434	896	--	--	--	8,630	340	.02
2-14-2000	0438	791	--	--	--	8,620	330	.02
2-14-2000	0449	1,100	--	--	--	8,400	370	.05
2-14-2000	0526	944	--	--	--	7,130	400	.04
2-14-2000	0552	962	--	--	--	6,290	500	.08
2-14-2000	0602	852	--	--	--	5,900	600	.17
2-14-2000	0608	1,040	0	100	--	5,610	650	.22
2-14-2000	1152	666	2	98	--	4,960	550	.25
2-14-2000	1157	--	--	--	--	--	--	.31
2-14-2000	1206	545	--	--	--	1,800	400	.16
2-14-2000	1222	591	--	--	--	2,120	380	.06
2-14-2000	1250	562	--	--	--	1,890	390	.02
2-14-2000	1309	484	--	--	--	--	--	.01
2-25-2000	1506	--	--	--	--	--	--	.01
2-25-2000	1525	2,090	--	--	--	42,200	550	.09
2-25-2000	1557	2,170	--	--	--	18,500	1,100	.09
2-25-2000	1631	323	--	--	--	11,200	900	.10
2-25-2000	1702	555	--	--	--	8,580	650	.08
2-25-2000	1734	425	--	--	--	6,920	550	.08
2-25-2000	1821	321	2	98	--	5,950	350	.02
2-25-2000	1827	297	0	100	--	5,840	340	.02
2-25-2000	1835	274	--	--	--	5,720	330	.01
2-25-2000	1846	267	--	--	--	5,610	320	.01
2-25-2000	1854	261	--	--	--	5,720	310	.02
2-25-2000	1941	215	--	--	--	6,290	260	.08
2-25-2000	2040	241	--	--	--	4,220	300	.02
2-25-2000	2125	201	--	--	--	3,730	290	.02
2-25-2000	2205	165	--	--	--	3,600	230	.04

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
2-25-2000	2305	110	--	--	--	3,160	190	0.02
2-25-2000	2319	113	7	93	--	3,060	170	.02
2-26-2000	0214	--	--	--	--	3,870	--	.02
2-26-2000	0232	104	1	99	--	4,130	150	.01
2-26-2000	0723	93	--	--	--	4,730	130	.05
2-26-2000	0800	106	--	--	--	3,770	150	.01
2-26-2000	0822	108	3	97	--	6,010	150	.01
2-28-2000	0906	450	--	--	--	5,260	500	.02
2-28-2000	1010	412	0	100	--	4,030	520	.03
2-28-2000	1132	343	--	--	--	2,860	440	.02
2-28-2000	1149	336	--	--	--	2,760	400	.01
2-28-2000	1209	303	--	--	--	2,700	400	.01
2-28-2000	1223	308	--	--	--	2,660	420	.02
2-28-2000	1240	297	--	--	--	2,630	400	.01
3-11-2000	1516	312	--	--	--	2,750	410	.01
3-11-2000	1536	29	--	--	--	2,990	50	.05
3-11-2000	1603	40	--	--	--	3,540	75	.02
3-11-2000	1610	144	--	--	--	5,170	180	.02
3-11-2000	1618	242	--	--	--	5,090	300	.02
3-11-2000	1625	259	--	--	--	4,980	340	.02
3-11-2000	1631	262	--	--	--	4,820	350	.02
3-11-2000	1637	269	--	--	--	4,730	360	.02
3-11-2000	1715	271	--	--	--	4,630	370	.04
3-11-2000	1830	268	--	--	--	4,510	360	.14
3-11-2000	1846	237	--	--	--	3,700	340	.21
3-11-2000	1859	177	--	--	--	2,760	210	.27
3-11-2000	1914	232	--	--	--	2,600	240	.21
3-11-2000	1934	247	--	--	--	2,160	240	.14
3-11-2000	2020	214	--	--	--	1,650	190	.09
3-11-2000	2202	179	--	--	--	1,100	180	.07
3-11-2000	2306	120	--	--	--	731	130	.02
3-12-2000	0027	66	--	--	--	744	90	.19
3-12-2000	0046	56	--	--	--	734	80	.26
3-12-2000	0138	68	--	--	--	822	70	.27
3-12-2000	0236	127	--	--	--	1,420	85	.02
3-12-2000	0822	83	--	--	--	841	70	.64
3-28-2000	0446	6	--	--	--	41,500	10	.01
3-28-2000	0512	--	--	--	--	--	--	.27
3-28-2000	0520	--	--	--	--	--	--	.26
3-28-2000	0537	378	--	--	--	7,390	360	.22

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
3-28-2000	0554	326	--	--	--	4,300	280	0.18
3-28-2000	0609	330	--	--	--	3,740	310	.26
3-28-2000	0622	353	--	--	--	3,140	300	.29
3-28-2000	0636	304	--	--	--	2,610	250	.24
3-28-2000	0651	--	--	--	--	--	--	.28
3-28-2000	0655	--	--	--	--	--	--	.96
3-28-2000	0659	--	--	--	--	--	--	.73
3-28-2000	0706	386	--	--	--	2,420	260	.38
3-28-2000	0719	282	--	--	--	1,790	220	.32
3-28-2000	0732	231	--	--	--	1,520	190	.33
3-28-2000	0747	186	--	--	--	1,090	160	.33
3-28-2000	0831	121	--	--	--	873	110	.23
3-28-2000	1059	111	--	--	--	1,550	130	.02
3-28-2000	1122	105	--	--	--	1,640	120	.01
3-28-2000	1155	--	--	--	--	--	--	.01
3-29-2000	0332	--	--	--	--	2,160	110	.01
3-29-2000	0355	--	--	--	--	2,320	110	.01
3-29-2000	0434	--	--	--	--	--	--	.01
3-29-2000	0332	70	--	--	--	--	--	.01
3-29-2000	0355	77	--	--	--	--	--	.01
4-04-2000	0345	--	--	--	--	--	--	.01
4-04-2000	0359	35	--	--	--	2,050	60	.02
4-04-2000	0406	38	--	--	--	2,140	70	.02
4-04-2000	0417	46	--	--	--	2,250	70	.01
4-04-2000	1523	85	--	--	--	2,660	120	.02
4-04-2000	1608	199	--	--	--	2,860	280	.08
4-04-2000	1729	369	--	--	--	2,710	460	.02
4-04-2000	1749	--	--	--	--	--	--	.01
4-04-2000	1816	--	--	--	--	--	--	.01
4-08-2000	2358	186	--	--	--	2,800	210	.02
4-09-2000	0005	187	--	--	--	2,810	190	.02
4-09-2000	0013	188	--	--	--	2,820	190	.01
4-09-2000	0022	197	--	--	--	2,880	230	.02
4-09-2000	0056	245	--	--	--	3,180	210	.01
4-09-2000	0119	--	--	--	--	--	--	.01
4-09-2000	0146	214	--	--	--	3,230	250	.01
4-09-2000	0256	157	--	--	--	2,750	170	.02
4-09-2000	0406	90	--	--	--	1,680	120	.07
4-09-2000	0458	202	--	--	--	1,210	190	.22
4-09-2000	0533	144	--	--	--	781	120	.16

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
4-09-2000	0610	105	--	--	--	476	85	0.20
4-09-2000	0653	95	--	--	--	376	80	.08
4-09-2000	0731	--	--	--	--	--	--	.51
4-09-2000	0751	115	--	--	--	472	65	.23
4-09-2000	0918	71	--	--	--	354	55	.02
4-09-2000	0944	68	--	--	--	362	60	.01
4-09-2000	1019	--	--	--	--	--	--	.01
4-11-2000	2043	16	--	--	--	427	30	.02
4-11-2000	2113	21	--	--	--	648	32	.01
4-11-2000	2149	31	--	--	--	586	39	.01
4-16-2000	0817	79	--	--	--	1,280	100	.02
4-16-2000	0849	77	--	--	--	1,317	130	.01
4-18-2000	1834	--	--	--	--	--	--	.01
4-18-2000	1909	120	--	--	--	1,430	120	.09
4-18-2000	1957	146	--	--	--	1,270	200	.12
4-18-2000	2031	147	--	--	--	900	150	.12
4-18-2000	2103	129	--	--	--	663	140	.13
4-18-2000	2222	83	--	--	--	425	100	.09
4-19-2000	0000	57	--	--	--	400	70	.08
4-19-2000	0233	33	--	--	--	378	50	.03
4-19-2000	0418	24	--	--	--	429	45	.02
4-19-2000	0452	25	--	--	--	448	40	.03
4-19-2000	0825	83	--	--	--	529	110	.04
4-19-2000	0947	84	--	--	--	524	140	.02
4-19-2000	1000	103	--	--	--	523	140	.02
4-19-2000	1022	105	--	--	--	527	110	.01
4-21-2000	1447	--	--	--	--	--	--	.01
4-21-2000	1501	55	--	--	--	566	95	.01
4-21-2000	1512	61	--	--	--	565	100	.01
4-21-2000	1522	64	--	--	--	573	100	.01
4-21-2000	1529	65	--	--	--	586	110	.02
4-21-2000	1840	152	--	--	--	872	220	.06
4-21-2000	1958	171	--	--	--	548	180	.37
4-21-2000	2015	138	--	--	--	304	130	.15
4-21-2000	2131	107	--	--	--	212	85	.34
4-21-2000	2158	94	--	--	--	226	75	.12
4-21-2000	2237	--	--	--	--	--	--	.62
4-21-2000	2248	108	--	--	--	150	75	.48
4-21-2000	2323	75	--	--	--	155	55	.13
4-22-2000	0008	52	--	--	--	128	45	.20

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
4-22-2000	0029	50	--	--	--	116	40	0.32
4-22-2000	0047	49	--	--	--	107	38	.34
4-22-2000	0111	81	--	--	--	65	55	.71
4-22-2000	0129	75	--	--	--	116	50	.55
4-22-2000	0149	75	--	--	--	95	50	.74
4-22-2000	0206	68	--	--	--	105	40	.58
4-22-2000	0231	44	--	--	--	84	30	.54
4-22-2000	0252	41	--	--	--	83	28	.62
4-22-2000	0312	37	--	--	--	88	27	.54
4-22-2000	0533	29	--	--	--	262	29	.16
4-26-2000	0350	--	--	--	--	--	--	.01
4-26-2000	0402	15	--	--	--	336	24	.01
4-26-2000	0411	13	--	--	--	338	24	.01
4-26-2000	0420	12	--	--	--	342	21	.02
4-26-2000	0428	15	--	--	--	350	23	.02
4-26-2000	0443	15	--	--	--	380	24	.02
4-26-2000	0601	128	--	--	--	818	140	.06
4-26-2000	0756	115	--	--	--	614	140	.02
4-26-2000	0808	111	--	--	--	587	130	.02
4-26-2000	0820	110	--	--	--	585	130	.02
4-26-2000	0832	109	--	--	--	577	140	.02
4-26-2000	0845	107	--	--	--	577	140	.02
4-26-2000	0922	97	--	--	--	572	130	.03
4-26-2000	1024	102	--	--	--	578	140	.02
4-26-2000	1040	107	--	--	--	572	150	.01
4-26-2000	1104	109	--	--	--	573	130	.01
4-26-2000	2103	118	--	--	--	440	150	.02
4-26-2000	2129	90	--	--	--	421	140	.02
4-26-2000	2211	93	--	--	--	406	130	.01
5-02-2000	0752	--	--	--	--	410	110	.01
5-02-2000	0844	99	--	--	--	695	120	.02
5-02-2000	0850	185	--	--	--	732	140	.02
5-02-2000	0857	185	--	--	--	762	150	.02
5-02-2000	0905	206	--	--	--	764	150	.02
5-02-2000	0932	192	--	--	--	797	140	.01
5-08-2000	1705	125	--	--	--	1,010	36	.03
5-08-2000	1724	463	--	--	--	1,330	230	.15
5-08-2000	1817	471	--	--	--	1,640	250	.03
5-08-2000	1848	425	--	--	--	1,680	230	.02
5-08-2000	1854	436	--	--	--	1,690	220	.02

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
5-08-2000	1923	706	--	--	--	1,680	220	0.01
5-08-2000	2001	295	--	--	--	961	200	.01
5-08-2000	2048	--	--	--	--	--	--	.01
5-10-2000	1506	--	--	--	--	--	--	.02
5-10-2000	1535	273	--	--	--	909	190	.01
5-10-2000	1607	233	--	--	--	901	160	.01
5-10-2000	2027	989	--	--	--	--	--	2.4
5-10-2000	2030	--	--	--	--	335	450	1.92
5-10-2000	2048	264	--	--	--	--	--	.09
5-10-2000	2212	--	--	--	--	432	160	.08
5-10-2000	2227	305	--	--	--	--	--	1.13
5-10-2000	2229	--	--	--	--	216	160	1.34
5-10-2000	2234	129	--	--	--	--	--	.55
5-10-2000	2311	--	--	--	--	181	95	.07
5-11-2000	0019	61	--	--	--	--	--	.09
5-11-2000	0130	--	--	--	--	186	65	.02
5-11-2000	0201	55	--	--	--	--	--	.01
5-11-2000	0221	--	--	--	--	191	55	.01
5-14-2000	0024	77	--	--	--	506	55	.18
5-14-2000	0235	35	--	--	--	372	28	.02
5-18-2000	1856	--	--	--	--	419	--	.01
5-18-2000	1928	152	--	--	--	614	80	.05
5-18-2000	2007	190	--	--	--	747	100	.02
5-18-2000	2014	176	--	--	--	764	100	.02
5-18-2000	2021	183	--	--	--	772	100	.02
5-18-2000	2044	181	--	--	--	798	100	.01
5-18-2000	2119	157	--	--	--	820	80	.01
5-20-2000	0835	177	--	--	--	652	110	.02
5-20-2000	0912	170	--	--	--	618	110	.02
5-20-2000	0935	156	--	--	--	603	110	.01
5-20-2000	1010	144	--	--	--	592	100	.01
5-20-2000	1215	134	--	--	--	569	95	.02
5-20-2000	1239	137	--	--	--	565	100	.02
5-20-2000	1259	126	--	--	--	563	100	.02
5-20-2000	1323	130	--	--	--	560	95	.02
5-20-2000	1344	130	--	--	--	558	100	.02
5-20-2000	1513	128	--	--	--	523	110	.02
5-20-2000	1551	136	--	--	--	499	120	.02
5-20-2000	1638	119	--	--	--	483	120	.01
5-24-2000	0240	74	--	--	--	232	50	.05

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Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-02 (oil-grit separator outflow)—*Continued*								
5-24-2000	0414	62	--	--	--	236	50	0.01
5-25-2000	0137	52	--	--	--	284	35	.02
5-25-2000	0158	55	--	--	--	302	34	.02
5-25-2000	0226	64	--	--	--	328	35	.01
5-25-2000	0813	100	--	--	--	198	75	.11
5-25-2000	1018	84	--	--	--	170	80	.09
5-25-2000	1144	96	--	--	--	190	95	.02
5-25-2000	1207	90	--	--	--	196	100	.01
5-25-2000	2201	102	--	--	--	311	80	.02
5-25-2000	2223	108	--	--	--	331	80	.02
5-25-2000	2254	104	--	--	--	351	85	.01
5-25-2000	1039	168	--	--	--	424	110	.02
5-25-2000	1101	174	--	--	--	433	130	.02
5-25-2000	1131	167	--	--	--	444	120	.01
6-06-2000	[1]1148	83	--	--	--	385	--	--
6-06-2000	[1]1345	120	--	--	--	99	--	--
6-06-2000	[1]1525	86	--	--	--	72	--	--
6-06-2000	[1]2113	31	--	--	--	92	--	--
6-07-2000	[1]1016	34	--	--	--	236	--	--
Monitoring location 739-03 (oil-grit separator inflow)								
8-21-1999	2203	1,340	--	--	--	448	63	0.03
8-21-1999	2210	178	--	--	--	448	37	.03
8-21-1999	2216	82	--	--	--	415	52	.03
8-21-1999	2223	71	--	--	--	417	51	.03
8-21-1999	2229	78	--	--	--	403	46	.03
8-21-1999	2236	201	--	--	--	401	50	.03
8-21-1999	2249	280	--	--	--	403	47	.03
8-21-1999	2302	94	--	--	--	382	42	.03
8-21-1999	2315	42	--	--	--	377	39	.03
8-21-1999	2328	43	--	--	--	387	37	.03
8-21-1999	2341	46	--	--	--	403	42	.02
8-21-1999	2354	46	--	--	--	414	43	.02
8-22-1999	0212	29	--	--	--	377	24	.02
8-22-1999	0235	41	--	--	--	395	31	.01
8-22-1999	0257	--	--	--	--	422	33	.01
8-22-1999	0824	28	--	--	--	377	21	.02
8-27-1999	1600	925	--	--	--	486	210	.02
8-27-1999	1647	245	--	--	--	622	80	.02
9-06-1999	1149	6,140	--	--	--	534	150	.48
9-06-1999	1206	619	--	--	--	342	95	.13

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Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
9-07-1999	0228	475	--	--	--	245	75	0.96
9-07-1999	0237	761	--	--	--	189	65	.32
9-07-1999	0401	1,620	--	--	--	170	50	.37
9-07-1999	0415	4,240	--	--	--	876	70	.32
9-08-1999	1014	--	--	--	--	--	--	.05
9-08-1999	1021	623	--	--	--	856	110	.04
9-08-1999	1056	--	--	--	--	--	--	2.23
9-10-1999	0815	--	--	--	--	--	--	.25
9-10-1999	0816	2,080	--	--	--	223	85	.30
9-10-1999	0822	--	--	--	--	--	--	.89
9-10-1999	0823	3,070	--	--	--	152	120	.99
9-10-1999	0838	--	--	--	--	--	--	.25
9-10-1999	0851	728	--	--	--	113	80	.16
9-10-1999	0941	96	--	--	--	162	90	.02
9-10-1999	0956	--	--	--	--	--	--	.46
9-10-1999	1504	1,670	--	--	--	142	110	.50
9-10-1999	1535	--	--	--	--	--	--	.22
9-10-1999	1536	896	--	--	--	93	70	.22
9-10-1999	1629	--	--	--	--	--	--	.27
9-10-1999	1631	920	--	--	--	89	50	.28
9-10-1999	1726	--	--	--	--	--	--	.30
9-10-1999	1736	130	--	--	--	70	36	.40
9-10-1999	1744	276	--	--	--	62	55	1.01
9-10-1999	1805	317	--	--	--	43	27	.57
9-10-1999	1833	270	--	--	--	45	60	.91
9-10-1999	1837	--	--	--	--	--	--	2.21
9-10-1999	1844	479	--	--	--	36	45	.91
9-10-1999	1855	--	--	--	--	--	--	.45
9-10-1999	1905	200	--	--	--	41	37	.49
9-10-1999	1939	164	--	--	--	40	30	.47
9-10-1999	1950	--	--	--	--	--	--	.20
9-10-1999	2010	170	--	--	--	38	45	2.16
9-10-1999	2012	--	--	--	--	--	--	1.9
9-10-1999	2021	--	--	--	--	--	--	.84
9-10-1999	2034	40	--	--	--	32	22	.90
9-10-1999	2052	--	--	--	--	--	--	1.04
9-10-1999	2100	34	--	--	--	31	21	.78
9-10-1999	2119	781	--	--	--	34	55	2.13
9-10-1999	2137	315	--	--	--	27	31	2.55
9-10-1999	2138	--	--	--	--	--	--	2.51

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
9-10-1999	2144	64	--	--	--	21	23	1.77
9-10-1999	2145	--	--	--	--	--	--	1.85
9-10-1999	2153	163	--	--	--	23	19	2.39
9-10-1999	2159	266	--	--	--	29	31	2.65
9-15-1999	1910	--	--	--	--	--	--	.02
9-15-1999	1946	207	--	--	--	293	210	.14
9-15-1999	1947	--	--	--	--	--	--	.14
9-15-1999	2009	597	--	--	--	262	100	.18
9-15-1999	2011	--	--	--	--	--	--	.18
9-15-1999	2040	210	--	--	--	189	95	.14
9-15-1999	2041	--	--	--	--	--	--	.15
9-15-1999	2102	153	--	--	--	151	90	.20
9-15-1999	2111	--	--	--	--	--	--	.21
9-15-1999	2136	151	--	--	--	113	75	.17
9-15-1999	2139	--	--	--	--	--	--	.15
9-15-1999	2211	81	--	--	--	95	60	.05
9-15-1999	2316	--	--	--	--	--	--	.12
9-15-1999	2331	83	--	--	--	121	55	.21
9-15-1999	2355	--	--	--	--	--	--	.17
9-16-1999	0008	134	--	--	--	89	55	.23
9-16-1999	0026	--	--	--	--	--	--	.26
9-16-1999	0032	66	--	--	--	61	50	.19
9-16-1999	0045	--	--	--	--	--	--	.31
9-16-1999	0049	269	--	--	--	52	40	.28
9-16-1999	0103	--	--	--	--	--	--	.15
9-16-1999	0111	34	--	--	--	49	32	.10
9-16-1999	0635	--	--	--	--	--	--	.05
9-16-1999	0658	52	--	--	--	157	55	.11
9-16-1999	0826	--	--	--	--	--	--	.04
9-16-1999	0837	64	--	--	--	161	85	.08
9-16-1999	0859	--	--	--	--	--	--	.36
9-16-1999	0906	221	--	--	--	108	90	.27
9-16-1999	0928	--	--	--	--	--	--	.50
9-16-1999	0929	117	--	--	--	71	75	.49
9-16-1999	0939	107	--	--	--	58	80	.79
9-16-1999	1013	88	--	--	--	39	65	1.16
9-16-1999	1158	40	--	--	--	90	50	.04
9-16-1999	1204	--	--	--	--	--	--	.04
9-16-1999	1414	80	--	--	--	79	60	.38
9-16-1999	1417	--	--	--	--	--	--	.34

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
9-16-1999	1519	276	--	--	--	56	45	1.63
9-16-1999	1532	111	--	--	--	44	32	1.04
9-16-1999	1538	--	--	--	--	--	--	.48
9-16-1999	1550	--	--	--	--	--	--	1.04
9-16-1999	1556	--	--	--	--	--	--	1.04
9-16-1999	1605	--	--	--	--	--	--	2.02
9-16-1999	1612	--	--	--	--	--	--	1.21
9-16-1999	1639	--	--	--	--	--	--	.22
9-16-1999	1651	--	--	--	--	--	--	2.36
9-22-1999	2332	--	--	--	--	--	--	.01
9-22-1999	2333	181	--	--	--	297	140	.01
9-22-1999	2335	172	--	--	--	309	160	.03
9-22-1999	2336	173	--	--	--	312	170	.04
9-22-1999	2338	185	--	--	--	310	170	.04
9-22-1999	2339	183	--	--	--	305	170	.05
9-22-1999	2340	188	--	--	--	301	190	.04
9-22-1999	2341	188	--	--	--	298	190	.04
9-22-1999	2342	194	--	--	--	294	190	.04
9-22-1999	2344	204	--	--	--	295	190	.04
9-22-1999	2345	193	--	--	--	296	190	.04
9-22-1999	2346	194	--	--	--	296	200	.04
9-22-1999	2347	211	--	--	--	301	210	.04
9-22-1999	2348	199	--	--	--	308	200	.04
9-22-1999	2349	180	--	--	--	316	180	.04
9-22-1999	2350	179	--	--	--	324	160	.04
9-22-1999	2352	179	--	--	--	327	160	.03
9-22-1999	2353	156	--	--	--	332	130	.03
9-22-1999	2354	150	--	--	--	331	140	.03
9-22-1999	2355	139	--	--	--	329	130	.03
9-22-1999	2356	149	--	--	--	327	140	.03
9-22-1999	2357	130	--	--	--	327	120	.03
9-22-1999	2358	131	--	--	--	324	120	.03
9-22-1999	2359	127	--	--	--	326	120	.03
9-23-1999	0001	128	--	--	--	325	110	.03
10-09-1999	0800	130	--	--	--	412	50	<.01
10-10-1999	1415	90	--	--	--	260	36	.06
10-10-1999	1423	--	--	--	--	--	--	.07
10-10-1999	1449	82	--	--	--	207	36	.06
10-10-1999	1458	--	--	--	--	--	--	.08
10-10-1999	1524	45	--	--	--	203	35	.03

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
10-10-1999	1544	--	--	--	--	--	--	0.02
10-10-1999	1603	--	--	--	--	--	--	.01
10-10-1999	1612	--	--	--	--	--	--	.01
10-10-1999	1621	--	--	--	--	--	--	.01
10-10-1999	1630	--	--	--	--	--	--	.01
10-10-1999	1639	--	--	--	--	--	--	.01
10-10-1999	1648	--	--	--	--	--	--	.01
10-10-1999	1657	--	--	--	--	--	--	.01
10-10-1999	1706	--	--	--	--	--	--	.01
10-10-1999	1715	--	--	--	--	--	--	.01
10-10-1999	1724	--	--	--	--	--	--	.02
10-10-1999	1733	--	--	--	--	--	--	.02
10-10-1999	1742	--	--	--	--	--	--	.02
10-10-1999	1800	40	--	--	--	203	31	.01
10-10-1999	1801	--	--	--	--	--	--	.01
10-13-1999	2255	36	--	--	--	199	31	.99
10-13-1999	2258	38	--	--	--	189	31	1.5
10-13-1999	2300	38	--	--	--	193	27	1.99
10-13-1999	2302	35	--	--	--	198	28	2.39
10-13-1999	2303	32	--	--	--	204	27	2.6
10-13-1999	2304	33	--	--	--	199	28	2.74
10-13-1999	2306	29	--	--	--	190	24	2.79
10-13-1999	2308	34	--	--	--	207	23	1.74
10-13-1999	2310	--	--	--	--	220	22	1.73
10-13-1999	2312	29	--	--	--	84	109	.99
10-13-1999	2324	--	--	--	--	--	--	.19
10-14-1999	0702	--	--	--	--	--	--	.01
10-14-1999	1102	--	--	--	--	--	--	.01
10-18-1999	0042	537	--	--	--	46	75	.77
10-18-1999	0054	495	--	--	--	41	65	.45
10-18-1999	0117	156	--	--	--	38	50	.20
10-18-1999	0150	65	--	--	--	35	35	.25
10-18-1999	0219	115	--	--	--	179	90	.26
10-18-1999	0248	156	--	--	--	170	120	.24
10-20-1999	0809	192	--	--	--	201	220	.02
10-20-1999	0843	120	--	--	--	197	130	.07
10-20-1999	0856	131	--	--	--	158	140	.15
10-20-1999	0909	121	--	--	--	142	140	.10
10-20-1999	0928	124	--	--	--	148	150	.06
10-20-1999	0929	--	--	--	--	--	--	.05

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
10-20-1999	1107	100	--	--	--	161	130	0.04
10-20-1999	1201	339	--	--	--	147	160	.18
10-20-1999	1205	--	--	--	--	--	--	.45
10-20-1999	1208	244	--	--	--	102	160	.49
10-20-1999	1211	--	--	--	--	--	--	.48
10-20-1999	1216	324	--	--	--	86	150	.39
10-20-1999	1220	--	--	--	--	--	--	.38
10-20-1999	1226	176	--	--	--	75	130	.34
10-20-1999	1231	--	--	--	--	--	--	.33
10-20-1999	1236	218	--	--	--	64	120	.36
10-20-1999	1240	--	--	--	--	--	--	.36
10-20-1999	1245	135	--	--	--	59	110	.34
10-20-1999	1250	--	--	--	--	--	--	.28
10-20-1999	1256	111	--	--	--	56	95	.27
10-20-1999	1303	--	--	--	--	--	--	.23
10-20-1999	1311	134	--	--	--	57	85	.19
10-20-1999	1319	--	--	--	--	--	--	.26
10-20-1999	1325	123	--	--	--	57	95	.31
10-20-1999	1331	--	--	--	--	--	--	.30
10-20-1999	1336	108	--	--	--	54	85	.26
10-20-1999	1344	--	--	--	--	--	--	.23
10-20-1999	1407	83	--	--	--	54	60	.15
10-20-1999	1420	--	--	--	--	--	--	.11
10-20-1999	1504	61	--	--	--	78	75	.10
10-20-1999	1523	--	--	--	--	--	--	.07
10-20-1999	1649	45	--	--	--	103	55	.02
10-20-1999	1801	--	--	--	--	--	--	.02
10-20-1999	1805	44	--	--	--	131	55	.02
10-20-1999	1817	41	--	--	--	134	45	.01
10-20-1999	1829	40	--	--	--	135	45	.01
10-20-1999	1841	42	--	--	--	136	50	.01
10-23-1999	0152	79	--	--	--	154	55	.01
10-23-1999	0207	157	--	--	--	173	80	.15
10-23-1999	0220	201	--	--	--	166	60	.10
10-23-1999	0239	157	--	--	--	162	55	.07
10-23-1999	0257	132	--	--	--	155	60	.11
10-23-1999	0325	238	--	--	--	123	55	.18
10-23-1999	0342	403	--	--	--	97	55	.23
10-23-1999	0354	1,190	--	--	--	78	55	.25
10-23-1999	0411	815	--	--	--	65	45	.27

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
10-23-1999	0427	983	--	--	--	57	39	0.15
10-23-1999	0502	--	--	--	--	61	31	.04
10-23-1999	0528	61	--	--	--	70	35	.02
10-23-1999	0535	28	--	--	--	71	33	.02
10-23-1999	0544	33	--	--	--	72	34	.01
10-23-1999	0556	28	--	--	--	73	33	.01
10-23-1999	0628	--	--	--	--	78	45	.01
10-23-1999	0644	49	--	--	--	83	45	.02
10-23-1999	0657	47	--	--	--	94	45	.02
10-23-1999	0711	63	--	--	--	107	37	.02
10-23-1999	0730	22	--	--	--	119	29	.01
11-02-1999	2343	64	7.28	92.72	--	307	70	.10
11-03-1999	0001	161	24.65	75.35	--	329	130	.08
11-03-1999	0020	221	20.95	79.05	--	342	160	.12
11-03-1999	0036	172	23.34	76.66	--	286	160	.14
11-03-1999	0112	169	24.46	75.54	--	247	160	.15
11-03-1999	0131	123	21.08	78.92	--	200	120	.34
11-03-1999	0142	234	56.29	43.71	--	151	100	.32
11-03-1999	0152	285	68.3	31.7	--	116	90	.40
11-03-1999	0203	436	80.96	19.04	--	94	80	.35
11-03-1999	0213	334	78.9	21.1	--	79	70	.36
11-03-1999	0224	134	52.71	47.29	--	73	65	.24
11-03-1999	0239	88	40.26	59.74	--	64	50	.29
11-03-1999	0255	77	30.83	69.17	--	67	50	.24
11-03-1999	0309	75	51.58	48.42	--	67	45	.25
11-03-1999	0325	163	73.99	26.01	--	68	40	.21
11-03-1999	0359	106	66.85	33.15	--	69	38	.49
11-03-1999	0418	80	36.53	63.47	--	76	45	.24
11-03-1999	0455	179	79.61	20.39	--	58	36	.13
11-03-1999	0613	41	21.23	78.77	--	58	33	.06
11-03-1999	0737	77	46.25	53.75	--	84	50	.04
11-03-1999	0810	154	73.46	26.54	--	102	65	.02
11-03-1999	0829	87	52.08	47.92	--	112	65	.01
11-10-1999	2314	59	--	--	--	116	60	.10
11-12-1999	2318	140	--	--	--	224	130	.02
11-12-1999	2343	180	--	--	--	227	110	.08
11-14-1999	1743	98	--	--	--	286	70	.03
12-15-1999	0310	165	--	--	--	340	150	.09
12-15-1999	0504	116	--	--	--	213	100	.10
12-15-1999	0550	128	--	--	--	154	140	.08

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
12-21-1999	[1]0057	172	--	--	--	309	150	0.20
1-10-2000	1900	91	--	--	--	431	24	.10
1-10-2000	1919	47	--	--	--	554	25	.06
1-10-2000	1959	59	--	--	--	673	26	.04
1-10-2000	2028	63	--	--	--	684	32	.02
1-10-2000	2031	71	--	--	--	691	32	.02
1-10-2000	2034	69	--	--	--	693	37	.02
1-10-2000	2038	60	--	--	--	704	25	.02
1-10-2000	2041	62	--	--	--	722	22	.02
1-10-2000	2045	62	--	--	--	738	24	.02
1-10-2000	2049	62	--	--	--	755	25	.02
1-10-2000	2054	59	--	--	--	771	28	.01
1-10-2000	2058	62	--	--	--	775	20	.01
1-10-2000	2103	57	--	--	--	801	22	.01
1-10-2000	2109	46	--	--	--	832	23	.01
1-10-2000	2115	58	--	--	--	852	26	.01
1-10-2000	2122	60	--	--	--	890	27	.01
1-10-2000	2130	370	--	--	--	3,390	360	.01
1-13-2000	1023	386	--	--	--	3,830	360	.01
1-31-2000	0416	213	--	--	--	48,800	190	.01
1-31-2000	0432	1,220	--	--	--	57,200	550	.07
1-31-2000	0444	1,220	--	--	--	50,900	500	.17
1-31-2000	0457	480	--	--	--	38,000	500	.08
1-31-2000	0515	420	--	--	--	27,100	400	.07
1-31-2000	0532	403	--	--	--	20,300	400	.09
1-31-2000	0547	396	--	--	--	15,300	390	.10
1-31-2000	0601	349	--	--	--	12,400	500	.08
1-31-2000	0618	449	--	--	--	10,700	450	.08
1-31-2000	0656	537	--	--	--	9,850	360	.02
1-31-2000	0701	530	--	--	--	9,950	400	.02
1-31-2000	0705	496	--	--	--	10,100	600	.02
1-31-2000	0708	500	--	--	--	10,300	550	.02
1-31-2000	0712	462	--	--	--	10,500	550	.02
1-31-2000	0716	--	--	--	--	--	--	.01
1-31-2000	0717	450	--	--	--	10,600	550	.01
1-31-2000	0722	431	--	--	--	10,900	550	.01
1-31-2000	0726	--	--	--	--	--	--	.01
1-31-2000	0727	469	--	--	--	11,000	500	.01
1-31-2000	0734	384	--	--	--	11,100	500	.01
1-31-2000	0740	--	--	--	--	--	--	.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
2-14-2000	0204	2,380	--	--	--	29,700	290	0.01
2-14-2000	0210	1,470	4.7	95.3	--	35,100	370	.01
2-14-2000	0222	2,930	--	--	--	24,700	700	.08
2-14-2000	0234	2,500	--	--	--	17,500	700	.14
2-14-2000	0243	1,560	--	--	--	13,100	600	.16
2-14-2000	0259	1,270	--	--	--	9,410	550	.07
2-14-2000	0335	405	.71	99.29	--	6,710	350	.02
2-14-2000	0338	1,020	--	--	--	6,610	350	.02
2-14-2000	0349	1,050	--	--	--	6,920	310	.03
2-14-2000	0400	984	--	--	--	6,750	320	.02
2-14-2000	0404	913	--	--	--	6,660	320	.02
2-14-2000	0407	888	--	--	--	6,660	330	.02
2-14-2000	0411	933	--	--	--	6,660	320	.02
2-14-2000	0415	795	--	--	--	6,640	320	.02
2-14-2000	0420	955	--	--	--	6,630	320	.01
2-14-2000	0425	350	.4	99.6	--	6,650	320	.01
2-14-2000	0430	1,020	--	--	--	6,890	340	.01
2-14-2000	0434	1,160	--	--	--	7,020	360	.02
2-14-2000	0438	947	--	--	--	7,060	380	.02
2-14-2000	0449	1,030	--	--	--	6,870	400	.05
2-14-2000	0526	1,080	--	--	--	5,560	550	.04
2-14-2000	0552	1,180	--	--	--	5,030	650	.08
2-14-2000	0602	866	--	--	--	4,770	750	.17
2-14-2000	0608	1,020	6.27	93.73	--	4,330	900	.22
2-14-2000	1152	534	3.82	96.18	--	2,220	400	.25
2-14-2000	1157	675	--	--	--	2,040	400	.31
2-14-2000	1206	656	--	--	--	1,760	400	.16
2-14-2000	1222	640	--	--	--	1,670	400	.06
2-14-2000	1250	521	--	--	--	1,820	330	.02
2-14-2000	1309	476	--	--	--	--	--	.01
2-25-2000	1506	419	--	--	--	21,400	450	.01
2-25-2000	1525	1,200	10.96	89.04	--	14,200	1,900	.09
2-25-2000	1557	872	--	--	--	7,480	1,300	.09
2-25-2000	1631	433	--	--	--	5,270	800	.10
2-25-2000	1702	510	--	--	--	3,720	600	.08
2-25-2000	1734	361	--	--	--	3,020	400	.08
2-25-2000	1821	255	7.03	92.97	--	2,840	290	.02
2-25-2000	1827	228	4.73	95.27	--	2,900	270	.02
2-25-2000	1835	231	--	--	--	3,030	270	.01
2-25-2000	1846	214	--	--	--	3,220	260	.01

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
2-25-2000	1854	220	--	--	--	3,570	260	0.02
2-25-2000	1941	248	--	--	--	3,340	250	.08
2-25-2000	2040	244	--	--	--	2,500	280	.02
2-25-2000	2125	154	--	--	--	2,590	210	.02
2-25-2000	2205	146	--	--	--	2,620	190	.04
2-25-2000	2305	120	--	--	--	2,180	170	.02
2-25-2000	2319	132	21.17	78.83	--	2,110	160	.02
2-26-2000	0214	93	--	--	--	2,890	120	.02
2-26-2000	0232	81	4.64	95.36	--	2,860	120	.01
2-26-2000	0723	174	--	--	--	2,840	140	.05
2-26-2000	0800	127	--	--	--	2,350	160	.01
2-26-2000	0822	129	--	--	--	2,260	170	.01
2-28-2000	0906	574	--	--	--	4,000	550	.02
2-28-2000	1010	359	--	--	--	2,920	450	.03
2-28-2000	1132	289	--	--	--	2,390	380	.02
2-28-2000	1149	312	--	--	--	2,370	400	.01
2-28-2000	1209	323	--	--	--	2,380	400	.01
2-28-2000	1223	309	--	--	--	2,390	400	.02
2-28-2000	1240	270	--	--	--	2,360	360	.01
3-11-2000	1516	--	--	--	--	--	--	.01
3-11-2000	1536	321	--	--	--	7,300	390	.05
3-11-2000	1603	418	--	--	--	6,580	550	.02
3-11-2000	1610	392	--	--	--	6,220	500	.02
3-11-2000	1618	349	--	--	--	5,130	450	.02
3-11-2000	1625	326	--	--	--	3,810	450	.02
3-11-2000	1631	314	--	--	--	3,600	400	.02
3-11-2000	1637	343	--	--	--	3,450	400	.02
3-11-2000	1715	268	--	--	--	3,310	380	.04
3-11-2000	1830	248	--	--	--	3,150	320	.14
3-11-2000	1846	231	--	--	--	3,030	300	.21
3-11-2000	1859	243	--	--	--	2,690	270	.27
3-11-2000	1914	360	--	--	--	2,560	200	.21
3-11-2000	1934	674	--	--	--	1,950	200	.14
3-11-2000	2020	549	--	--	--	1,690	190	.09
3-11-2000	2202	355	--	--	--	1,180	150	.07
3-11-2000	2306	241	--	--	--	801	140	.02
3-12-2000	0027	117	--	--	--	608	95	.19
3-12-2000	0046	65	--	--	--	756	75	.26
3-12-2000	0138	42	--	--	--	685	65	.27
3-12-2000	0236	1,560	--	--	--	693	65	.02

Table 1*A*. Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
3-12-2000	0822	419	--	--	--	1,080	75	0.64
3-28-2000	0446	--	--	--	--	--	--	.01
3-28-2000	0512	386	--	--	--	16,400	320	.27
3-28-2000	0520	520	--	--	--	20,200	450	.26
3-28-2000	0537	581	16.55	83.45	--	13900	450	.22
3-28-2000	0554	492	--	--	--	9,720	450	.18
3-28-2000	0609	500	--	--	--	7,120	450	.26
3-28-2000	0622	393	9.21	90.79	--	4,610	340	.29
3-28-2000	0636	352	--	--	--	3,590	330	.24
3-28-2000	0651	351	--	--	--	3,190	350	.28
3-28-2000	0655	362	1.11	98.89	--	2,880	340	.96
3-28-2000	0659	393	--	--	--	2,420	230	.73
3-28-2000	0706	683	27.22	72.78	--	3,470	290	.38
3-28-2000	0719	--	--	--	--	--	--	.32
3-28-2000	0732	487	--	--	--	2,590	280	.33
3-28-2000	0747	456	--	--	--	2,260	280	.33
3-28-2000	0831	276	1.89	98.11	--	1,600	210	.23
3-28-2000	1059	220	--	--	--	1,250	170	.02
3-28-2000	1122	197	--	--	--	1,020	150	.01
3-28-2000	1155	126	--	--	--	837	110	.01
3-29-2000	0332	104	--	--	--	462	130	.01
3-29-2000	0355	87	--	--	--	508	120	.01
3-29-2000	0434	88	--	--	--	534	130	.01
3-29-2000	0332	--	--	--	--	--	--	.01
3-29-2000	0355	--	--	--	--	--	--	.01
4-04-2000	0345	132	--	--	--	2,180	85	.01
4-04-2000	0359	333	--	--	--	2,570	340	.02
4-04-2000	0406	258	--	--	--	3,080	290	.02
4-04-2000	0417	226	--	--	--	3,330	240	.01
4-04-2000	1523	2,350	--	--	--	2,600	340	.02
4-04-2000	1608	379	--	--	--	3,050	500	.08
4-04-2000	1729	340	--	--	--	2,440	500	.02
4-04-2000	1749	296	--	--	--	2,430	450	.01
4-04-2000	1816	256	--	--	--	2,440	400	.01
4-08-2000	2358	302	--	--	--	4,490	310	.02
4-09-2000	0005	289	--	--	--	4,580	310	.02
4-09-2000	0013	250	--	--	--	4,360	270	.01
4-09-2000	0022	277	--	--	--	3,650	300	.02
4-09-2000	0056	169	--	--	--	3,710	210	.01
4-09-2000	0119	211	--	--	--	3,910	200	.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
4-09-2000	0146	173	--	--	--	2,990	200	0.01
4-09-2000	0256	122	--	--	--	2,400	140	.02
4-09-2000	0406	74	--	--	--	1,250	75	.07
4-09-2000	0458	181	--	--	--	835	130	.22
4-09-2000	0533	113	--	--	--	558	95	.16
4-09-2000	0610	109	--	--	--	443	90	.20
4-09-2000	0653	85	--	--	--	347	75	.08
4-09-2000	0731	170	--	--	--	404	95	.51
4-09-2000	0751	107	--	--	--	408	70	.23
4-09-2000	0918	42	--	--	--	400	40	.02
4-09-2000	0944	36	--	--	--	427	37	.01
4-09-2000	1019	39	--	--	--	478	50	.01
4-11-2000	2043	166	--	--	--	1,320	180	.02
4-11-2000	2113	105	--	--	--	1,590	140	.01
4-11-2000	2149	84	--	--	--	1,800	110	.01
4-16-2000	0817	79	--	--	--	1,230	95	.02
4-16-2000	0849	88	--	--	--	1,230	90	.01
4-18-2000	1834	69	--	--	--	1,380	80	.01
4-18-2000	1909	169	--	--	--	1,370	190	.09
4-18-2000	1957	155	--	--	--	1,030	170	.12
4-18-2000	2031	142	--	--	--	692	150	.12
4-18-2000	2103	129	--	--	--	508	130	.13
4-18-2000	2222	72	--	--	--	401	90	.09
4-19-2000	0000	50	--	--	--	380	65	.08
4-19-2000	0233	24	--	--	--	419	45	.03
4-19-2000	0418	26	--	--	--	473	40	.02
4-19-2000	0452	39	--	--	--	482	55	.03
4-19-2000	0825	97	--	--	--	515	130	.04
4-19-2000	0947	106	--	--	--	536	150	.02
4-19-2000	1000	105	--	--	--	545	160	.02
4-19-2000	1022	97	--	--	--	561	150	.01
4-21-2000	1447	73	--	--	--	795	75	.01
4-21-2000	1501	178	--	--	--	886	240	.01
4-21-2000	1512	199	--	--	--	1,020	240	.01
4-21-2000	1522	196	--	--	--	1,090	250	.01
4-21-2000	1529	187	--	--	--	1,110	230	.02
4-21-2000	1840	124	--	--	--	783	180	.06
4-21-2000	1958	179	--	--	--	388	160	.37
4-21-2000	2015	115	--	--	--	243	110	.15
4-21-2000	2131	99	--	--	--	199	85	.34

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concen-tration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instanta-neous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
4-21-2000	2158	82	--	--	--	208	70	0.12
4-21-2000	2237	142	--	--	--	149	75	.62
4-21-2000	2248	98	--	--	--	185	65	.48
4-21-2000	2323	66	--	--	--	139	60	.13
4-22-2000	0008	52	--	--	--	119	45	.20
4-22-2000	0029	54	--	--	--	115	37	.32
4-22-2000	0047	53	--	--	--	103	39	.34
4-22-2000	0111	105	--	--	--	96	55	.71
4-22-2000	0129	99	--	--	--	121	50	.55
4-22-2000	0149	96	--	--	--	95	45	.74
4-22-2000	0206	71	--	--	--	102	37	.58
4-22-2000	0231	54	--	--	--	81	30	.54
4-22-2000	0252	46	--	--	--	82	28	.62
4-22-2000	0312	36	--	--	--	88	28	.54
4-22-2000	0533	41	--	--	--	218	36	.16
4-26-2000	0350	25	--	--	--	480	20	.01
4-26-2000	0402	44	--	--	--	554	40	.01
4-26-2000	0411	52	--	--	--	804	65	.01
4-26-2000	0420	58	--	--	--	877	70	.02
4-26-2000	0428	75	--	--	--	1,020	100	.02
4-26-2000	0443	75	--	--	--	1,130	85	.02
4-26-2000	0601	153	--	--	--	740	160	.06
4-26-2000	0756	100	--	--	--	547	130	.02
4-26-2000	0808	87	--	--	--	544	110	.02
4-26-2000	0820	57	--	--	--	554	130	.02
4-26-2000	0832	94	--	--	--	555	10	.02
4-26-2000	0845	96	--	--	--	557	10	.02
4-26-2000	0922	142	--	--	--	561	150	.03
4-26-2000	1024	127	--	--	--	555	180	.02
4-26-2000	1040	118	--	--	--	559	180	.01
4-26-2000	1104	117	--	--	--	567	130	.01
4-26-2000	2103	88	--	--	--	373	130	.02
4-26-2000	2129	75	--	--	--	362	120	.02
4-26-2000	2211	76	--	--	--	365	120	.01
5-02-2000	0752	63	--	--	--	605	50	.01
5-02-2000	0844	153	--	--	--	959	210	.02
5-02-2000	0850	160	--	--	--	941	200	.02
5-02-2000	0857	166	--	--	--	922	200	.02
5-02-2000	0905	167	--	--	--	909	230	.02
5-02-2000	0932	164	--	--	--	932	230	.01

Table 1*A.* Instantaneous discharge, specific conductance, turbidity, and concentrations and particle-size characteristics of suspended sediment in highway runoff sampled at the inlets and outlets of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (µS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
5-08-2000	1705	1,160	--	--	--	1,320	320	0.03
5-08-2000	1724	607	--	--	--	1,580	320	.15
5-08-2000	1817	401	--	--	--	1,770	220	.03
5-08-2000	1848	415	--	--	--	1,810	200	.02
5-08-2000	1854	432	--	--	--	1,790	230	.02
5-08-2000	1923	1,140	--	--	--	1,770	180	.01
5-08-2000	2001	209	--	--	--	804	170	.01
5-08-2000	2048	--	--	--	--	--	--	.01
5-10-2000	1506	--	--	--	--	--	--	.02
5-10-2000	1535	222	--	--	--	834	170	.01
5-10-2000	1607	212	--	--	--	869	170	.01
5-10-2000	2027	--	--	--	--	--	--	2.4
5-10-2000	2030	2,040	--	--	--	323	800	1.92
5-10-2000	2048	--	--	--	--	--	--	.09
5-10-2000	2212	1,380	--	--	--	331	220	.08
5-10-2000	2227	--	--	--	--	--	--	1.13
5-10-2000	2229	527	--	--	--	180	180	1.34
5-10-2000	2234	--	--	--	--	--	--	.55
5-10-2000	2311	218	--	--	--	177	130	.07
5-11-2000	0019	--	--	--	--	--	--	.09
5-11-2000	0130	150	--	--	--	189	75	.02
5-11-2000	0201	--	--	--	--	--	--	.01
5-11-2000	0221	75	--	--	--	237	50	.01
5-14-2000	0024	107	--	--	--	434	50	.18
5-14-2000	0235	75	--	--	--	343	30	.02
5-18-2000	1856	114	--	--	--	475	37	.01
5-18-2000	1928	261	--	--	--	952	130	.05
5-18-2000	2007	216	--	--	--	932	120	.02
5-18-2000	2014	202	--	--	--	916	110	.02
5-18-2000	2021	220	--	--	--	915	100	.02
5-18-2000	2044	176	--	--	--	919	100	.01
5-18-2000	2119	209	--	--	--	826	75	.01
5-20-2000	0835	167	--	--	--	549	110	.02
5-20-2000	0912	136	--	--	--	529	110	.02
5-20-2000	0935	141	--	--	--	522	100	.01
5-20-2000	1010	139	--	--	--	534	90	.01
5-20-2000	1215	130	--	--	--	543	95	.02
5-20-2000	1239	109	--	--	--	558	90	.02
5-20-2000	1259	113	--	--	--	539	90	.02
5-20-2000	1323	115	--	--	--	514	95	.02

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Date	Time	Suspended sediment concentration (mg/L)	Percentage of coarse-grained particles (% > 0.062 mm)	Percentage of coarse-grained particles (% 0.062 mm to 0.250 mm)	Percentage of coarse-grained particles (% > 0.250 mm)	Specific conductance (μS/cm at 250˚C)	Turbidity (ntu)	Instantaneous discharge (ft^3/s)
Monitoring location 739-03 (oil-grit separator inflow)—*Continued*								
5-20-2000	1344	131	--	--	--	540	110	0.02
5-20-2000	1513	148	--	--	--	438	140	.02
5-20-2000	1551	132	--	--	--	448	130	.02
5-20-2000	1638	124	--	--	--	458	120	.01
5-24-2000	0240	66	--	--	--	235	44	.05
5-24-2000	0414	58	--	--	--	295	35	.01
5-25-2000	0137	78	--	--	--	401	50	.02
5-25-2000	0158	86	--	--	--	480	50	.02
5-25-2000	0226	77	--	--	--	493	37	.01
5-25-2000	0813	95	--	--	--	171	70	.11
5-25-2000	1018	111	--	--	--	191	95	.09
5-25-2000	1144	104	--	--	--	227	95	.02
5-25-2000	1207	100	--	--	--	249	100	.01
5-25-2000	2201	116	--	--	--	485	75	.02
5-25-2000	2223	99	--	--	--	515	60	.02
5-25-2000	2254	107	--	--	--	548	55	.01
5-25-2000	1039	199	--	--	--	484	160	.02
5-25-2000	1101	166	--	--	--	517	120	.02
5-25-2000	1131	142	--	--	--	547	95	.01
6-06-2000	[1]1148	111	--	--	--	341	--	--
6-06-2000	[1]1345	106	--	--	--	104	--	--
6-06-2000	[1]1525	82	--	--	--	77	--	--
6-06-2000	[1]2113	29	--	--	--	86	--	--
6-07-2000	[1]1016	29	--	--	--	254	--	--

[1]Composite of two or more samples.

Table 1*B*. Suspended sediment concentrations of equipment blank samples and other quality-control samples collected from the inlet and the outlet of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts

[EQ, equipment; R, replicate; mg/L, milligrams per liter; mm, millimeters; %, percent; ( ), primary sample; --, no data]

Station identifier	Date	Time	Quality-assurance sample type	Suspended sediment concentration (mg/L)	Suspended sediment concentration (% > 0.062 mm)
136-02	2-09-2000	1440	EQ-Blank	14	--
136-02	5-03-2000	1450	EQ-Blank	2	--
136-02	5-24-2000	0938	R-Grab	51 (58)	--
136-02	5-25-2000	0943	R-Grab	286 (300)	--
136-02	6-12-2000	1420	EQ-Blank	0	--
136-03	6-12-2000	1450	EQ-Blank	0	--
136-04	2-09-2000	1420	EQ-Blank	[1]76	--
136-04	5-03-2000	1500	EQ-Blank	21	--
136-04	5-24-2000	0911	R-Grab	128 (197)	--
136-04	5-25-2000	0937	R-Grab	380 (396)	--
136-04	5-25-2000	0948	R-Grab	377 (390)	--
136-04	5-25-2000	0956	R-Grab	344 (341)	--
136-04	6-12-2000	1500	EQ-Blank	0	--
136-05	6-12-2000	1500	EQ-Blank	33*	--
739-02	12-21-1999	1430	EQ-Blank	0	--
739-02	2-09-2000	1250	EQ-Blank	35	--
739-02	5-03-2000	1405	EQ-Blank	12	--
739-02	6-08-2000	1200	EQ-Blank	0	--
739-03	12-21-1999	1330	EQ-Blank	12	--
739-03	2-09-2000	1300	EQ-Blank	23	--
739-03	2-25-2000	1506	R-EQ	470 (419)	--
739-03	2-25-2000	1525	R-EQ	1,160 (1,200)	4 (11)
739-03	2-25-2000	1557	R-EQ	872 (872)	--
739-03	2-25-2000	1631	R-EQ	640 (433)	--
739-03	2-25-2000	1702	R-EQ	518 (510)	--
739-03	2-25-2000	1734	R-EQ	348 (361)	--
739-03	2-25-2000	1821	R-EQ	244 (255)	3 (7)
739-03	2-25-2000	1827	R-EQ	233 (228)	2 (5)
739-03	2-25-2000	1835	R-EQ	225 (231)	--
739-03	2-25-2000	1846	R-EQ	211 (214)	--
739-03	2-25-2000	1854	R-EQ	215 (220)	--
739-03	2-25-2000	1941	R-EQ	231 (248)	--
739-03	2-25-2000	2040	R-EQ	230 (244)	--
739-03	2-25-2000	2125	R-EQ	152 (154)	--
739-03	2-25-2000	2205	R-EQ	137 (146)	--
739-03	2-25-2000	2305	R-EQ	123 (120)	--
739-03	2-25-2000	2319	R-EQ	113 (132)	3 (21)
739-03	2-26-2000	0214	R-EQ	84 (93)	--
739-03	2-26-2000	0232	R-EQ	78 (81)	4 (5)
739-03	2-26-2000	0723	R-EQ	125 (174)	--

Table 1*B*. Suspended sediment concentrations of equipment blank samples and other quality-control samples collected from the inlet and the outlet of structural best management practices at monitoring stations 136 and 739, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Time	Quality-assurance sample type	Suspended sediment concentration (mg/L)	Suspended sediment concentration (% > 0.062 mm)
739-03	2-26-2000	0800	R-EQ	122 (127)	--
739-03	2-26-2000	0822	R-EQ	120 (129)	0.5
739-03	2-28-2000	0906	R-EQ	454 (574)	--
739-03	2-28-2000	1010	R-EQ	396 (359)	8
739-03	5-03-2000	1400	EQ-Blank	5	--
739-03	6-08-2000	1200	EQ-Blank	0	--

[1]Suspected contamination.

Table 1*C*. Analytical results of double-blind samples analyzed at the U.S. Geological Survey Kentucky Sediment Laboratory, Louisville, Kentucky

[mg, milligrams; mg/L, miligrams per liter; mm, millimetes; %, percent; <,actual value is less than value shown; >,actual value is greater than value shown; --, no data]

Station identi-fier	Date	Actual sediment concentration (mg/L)	Reported sediment concentration (mg/L)	Relative percent difference	Actual mass of fines (mg)	Reported mass of fines (mg)	Percent difference fines	Actual mass of sand (mg)
136-03	1-10-2000	1,854.9	1830	1	1,149	1,118.9	-3	149.4
739-03	6-06-2000	45.9	43.5	5	35.5	--	--	8.1
739-02	6-06-2000	44	41.3	6	34.3	--	--	7.5
136-05	5-25-2000	908.6	884.4	3	501.9	--	--	134.1
136-05	5-25-2000	842.8	819.8	3	498.6	--	--	133.5
136-05	5-25-2000	68.3	61.3	10	35.6	--	--	8.8

Station identi-fier	Date	Reported mass of sand (mg)	Percent difference sand	Actual percentage of fine-grained particles (% < 0.062 mm)	Reported percentage of fine-grained particles (% < 0.062 mm)	Actual percentage of coarse-grained particles (% > 0.062 mm)	Reported percentage of coarse-grained particles (% > 0.062 mm)
136-03	1-10-2000	153.7	3	88	88	12	12
739-03	6-06-2000	--	--	--	--	--	--
739-02	6-06-2000	--	--	--	--	--	--
136-05	5-25-2000	--	--	--	--	--	--
136-05	5-25-2000	--	--	--	--	--	--
136-05	5-25-2000	--	--	--	--	--	--

Table 1*D*. Experimental water-column suspended sediment concentration data collected from the inlet of the 1,500-gallon off-line oil-grit separator at station 136, along the Southeast Expressway, Boston, Massachusetts

[mg/L, milligrams per liter; mm, millimeters; ft^3/s, cubic feet per second; %, percent; >, actual value is greater than value shown]

Sampler intake location relative to pipe floor (in feet)	Suspended sediment concentration (mg/L)	Suspended sediment concentration (% > 0.062 mm)	Instantaneous discharge (ft^3/s)
0.06	1,170	96	0.13
.06	551	88	.13
.06	810	92	.13
.14	829	95	.13
.14	707	94	.13
.14	876	93	.13
.19	405	87	.13
.19	279	82	.13
.19	331	79	.13
.06	352	87	.22
.06	434	88	.22
.06	421	87	.22
.14	253	70	.22
.14	279	80	.22
.14	251	81	.22
.19	203	74	.22
.19	233	81	.22
.19	243	79	.22
.06	2,150	92	.45
.06	1,280	86	.45
.06	1,740	93	.45
.19	732	73	.45
.19	724	63	.45
.19	798	85	.45
.29	755	83	.45
.29	718	78	.45
.29	857	87	.45

Table 1*E*. Particle-size distribution of pavement-sweeping samples collected along the Southeast Expressway, Boston, Massachusetts

[<, actual value is less than values shown; >,actual value is greater than values shown]

Particle size diameter (millimeters)	Percentage of particles sample collection date		
	6-15-1999	3-17-2000	6-15-2000
>16	0	0	0
8>16	3	6	0
4>8	2	4	2
2>4	1	9	3
1>2	3	15	9
0.5>1	8	28	25
0.250>0.5	26	21	29
0.125>0.25	34	8	16
0.062>0.125	15	2	6
<.062	8	7	10

Table 1*F*. Particle-size distribution of bottom-sediment samples collected from the structural best management practices, along the Southeast Expressway, Boston, Massachusetts

[<, actual value is less than values shown; >,actual value is greater than values shown]

Station Identi-fier	Date	Sample location	Percentage of particles-size fraction, in millimeters									
			>16	8>16	4>8	2>4	1>2	0.5>1	0.250>0.5	0.125>0.25	0.062>0.125	<0.062
136-01	12-23-1999	composite of both chambers	0	1	1	5	10	25	35	17	3	3
739-01	12-23-1999		0	1	4	4	10	26	35	13	2	5
749-01	1-19-2000		0	0	1	1	5	25	33	13	3	18
136-01	6-12-2000	primary chamber	0	1	2	5	10	18	33	18	4	8
136-01	6-12-2000	secondary chamber	0	0	2	3	3	3	14	20	12	44
739-01	6-08-2000	primary chamber	0	0	1	7	13	31	26	8	2	12
739-01	6-08-2000	secondary chamber	0	0	1	2	4	8	18	20	7	39
749-01	6-08-2000	primary chamber	0	0	2	3	5	12	34	28	5	12
749-01	6-08-2000	secondary chamber	0	0	1	2	2	5	18	24	9	39
136-06	6-14-2000	sump	0	0	11	10	17	25	21	7	2	7

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts

[E, estimated; -LR, laboratory replicate sample; -R, replicate sample; USEPA, United States Environmental Protection Agency; XRAL, XRAL Laboratory; ppm, parts per million; ppb, parts per billion; <, concentration is less than value shown; >, concentration is greater than value shown; --, no data; mm, millimeters]

Station identifier	Date	Inorganic analysis method	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Potassium (ppm)	Phosphorus total (ppm as P)	Carbon, inorganic total (ppm)	Aluminum (ppm)	Antimony (ppm)	Arsenic (ppm)	Barium (ppm)
3-Station composite	11-25-1998	USEPA 3050B	3,100	2,000	200	600	400	12,000	4,400	<5	<3	48
136-01	12-23-1999	USEPA 3050B	6,200	7,000	600	3,200	1,300	112,000	16,200	<5	4	228
136-01-LR	12-23-1999	USEPA 3050B	5,900	6,600	600	2,900	1,200	110,000	15,500	<5	4	206
136-01	12-23-1999	USEPA 3050B	2,500	1,300	400	800	>100	15,200	3,200	<5	<3	54
136-01-R	12-23-1999	USEPA 3050B	2,400	1,300	400	900	>100	9,900	3,400	<5	<3	44
136-01	12-23-1999	XRAL ICP70	2,400	1,400	500	1,000	300	5,800	3,500	<5	<3	40
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	USEPA 3050B	7,900	2,100	5,900	1,100	500	191,000	4,300	<5	3	238
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	USEPA 3050B	6,200	8,400	300	4,400	600	111,000	20,500	<5	3	344
739-01	12-23-1999	XRAL ICP70	6,300	9,900	600	4,300	1,200	113,000	21,200	18	8	373
739-01	12-23-1999	USEPA 3050B	2,800	1,100	>100	800	>100	8,100	2,900	<5	<3	36
739-01-LR	12-23-1999	USEPA 3050B	3,200	1,300	900	1,000	200	30,200	3,300	<5	<3	64
739-01-R	12-23-1999	USEPA 3050B	3,500	1,100	>100	1,000	>100	17,400	3,100	<5	<3	59
739-01	12-23-1999	XRAL ICP70	3,500	1,300	500	1,100	200	11,800	3,300	<5	<3	40
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	USEPA 3050B	7,700	1,900	2,200	1,600	>100	127,000	4,800	<5	<3	81
749-01	12-23-1999	USEPA 3050B	8,500	10,200	5,100	4,100	200	133,000	19,700	<5	6	345
749-01	1-19-2000	XRAL ICP70	8,600	11,400	5,600	3,800	1,100	132,000	18,900	16	7	357
749-01	1-19-2000	USEPA 3050B	3,200	1,200	200	900	>100	30,900	3,200	<5	<3	62
749-01	1-19-2000	XRAL ICP70	3,600	1,500	700	1,000	300	39,500	3,600	<5	<3	68
749-01-R	1-19-2000	XRAL ICP70	3,700	1,500	700	1,000	300	43,600	3,500	<5	<3	71
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	USEPA 3050B	7,000	1,300	20,100	700	1,000	377,000	6,500	<5	11	134

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Beryllium (ppm)	Bismuth (ppm)	Cadmium (ppm)	Chromium (ppm)	Cobalt (ppm)	Copper (ppm)	Iron (ppm)	Lantha-num (ppm)	Lead (ppm)	Manga-nese (ppm)	Mercury (ppm)	Molyb-denum (ppm)
3-Station composite	11-25-1998	<.5	<5	<1	62	<1	100	19,500	8.9	84	2,000	<1	1
136-01	12-23-1999	1	<5	7	196	13	710	54,200	23.2	438	531	<1	15
136-01-LR	12-23-1999	.9	<5	7	186	13	667	51,700	23.6	419	505	<1	14
136-01	12-23-1999	<.5	<5	<1	281	3	61.4	20,800	8	47	204	<1	6
136-01-R	12-23-1999	<.5	<5	<1	389	4	73.1	23,700	8.5	41	207	<1	7
136-01	12-23-1999	<.5	<5	<1	481	7	66.6	21,200	8.9	53	257	--	8
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	<.5	<5	<1	297	5	52.3	16,700	10.6	67	370	<1	7
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	1.1	<5	5	196	14	470	46,500	26.2	308	569	<1	11
739-01	12-23-1999	.6	<5	4	228	18	515	43,600	28.8	339	699	--	14
739-01	12-23-1999	<.5	<5	<1	348	4	81.6	22,200	10.1	36	203	<1	6
739-01-LR	12-23-1999	<.5	<5	<1	468	3	79	19,200	7.7	65	188	<1	9
739-01-R	12-23-1999	<.5	<5	<1	379	4	52.8	22,300	9.3	37	216	<1	8
739-01	12-23-1999	<.5	<5	<1	518	8	77.1	20,400	9.6	35	251	--	9
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	<.5	<5	<1	407	5	27.1	14,700	10.7	60	257	<1	13
749-01	12-23-1999	1.1	<5	7	163	13	493	40,000	24.6	350	508	<1	12
749-01	1-19-2000	.6	<5	7	200	15	502	34,900	24.3	359	584	--	14
749-01	1-19-2000	<.5	<5	<1	459	3	70.5	18,800	7.7	63	185	<1	9
749-01	1-19-2000	<.5	<5	1	491	6	90.4	17,400	7.8	108	233	--	10
749-01-R	1-19-2000	<.5	<5	<1	483	5	87	16,700	8.6	86	220	--	11
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	<.5	<5	2	373	4	89.1	16,200	5	86	117	<1	11

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Nickel (ppm)	Scandium (ppm)	Silver (ppm)	Strontium (ppm)	Tin (ppm)	Titanium (ppm)	Tungsten (ppm)	Vanadium (ppm)	Yttrium (ppm)	Zinc (ppm)	Zirconium (ppm)
3-Station composite	11-25-1998	15	0.8	<.2	12.6	<10	300	<10	19	4.1	328	3.2
136-01	12-23-1999	85	3.2	0.8	30.6	<10	1,000	<10	70	12.1	2,200	13.8
136-01-LR	12-23-1999	79	2.9	.9	28.9	<10	900	<10	66	11.2	2,060	12.8
136-01	12-23-1999	26	.6	<.2	13.7	<10	300	<10	15	3.7	218	5.4
136-01-R	12-23-1999	32	.7	<.2	13.6	<10	300	<10	18	4.2	203	5.8
136-01	12-23-1999	37	.6	<.2	13.1	<10	300	<10	18	4.3	170	7.1
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	72	.8	<.2	31.8	<10	400	<10	18	6.7	464	8.6
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	66	4.1	.3	49.5	<10	1,100	<10	76	13.4	1,800	17.8
739-01	12-23-1999	71	3.9	.8	51.4	21	800	<10	84	13.9	1,930	16.7
739-01	12-23-1999	27	.5	<.2	13.7	<10	200	<10	15	4.4	200	5.5
739-01-LR	12-23-1999	39	.6	<.2	20.5	<10	200	<10	18	4.2	300	6.4
739-01-R	12-23-1999	32	.5	<.2	15.9	<10	200	<10	16	4.7	242	6
739-01	12-23-1999	36	.5	<.2	16.7	<10	200	<10	18	4.9	178	7.2
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	35	1	<.2	31.8	<10	400	<10	15	8.2	244	8.8
749-01	12-23-1999	57	3.9	<.2	71.4	<10	1,000	<10	77	12.8	2,010	16.6
749-01	1-19-2000	57	3.5	.8	73.6	20	700	<10	80	12.9	2,060	14.4
749-01	1-19-2000	42	.6	<.2	19.7	<10	200	<10	17	4.1	306	6
749-01	1-19-2000	42	<.5	<.2	20.2	<10	200	<10	21	4.1	399	5.5
749-01-R	1-19-2000	37	<.5	<.2	22.4	<10	200	<10	20	4.2	369	5.1
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	46	<.5	1	56.3	255	200	<10	22	2.7	637	7.1

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Sediment size fraction (in mm)	Percentage of fine-grained particles (percent >0.062 mm)	Polychlori-nated byphenols, total (ppb)	4Hcypen-phenan-threne (ppb)	9H-Fluorene, 1Methyl (ppb)	9H-Fluorene (ppb)	Acenaph-thene (ppb)	Acenaph-thylene (ppb)	Anthra-cene, 2-Methyl (ppb)	Anthra-cene (ppb)	Benz (A) anthra-cene (ppb)
3-Station composite	11-25-1998	<2.00	--	67	150	<50	142	93.8	<50	--	232	610
136-01	12-23-1999	<0.062	--	--	--	--	--	--	--	--	--	--
136-01-LR	12-23-1999	<0.062	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	0.062 >2.00	100	--	--	--	--	--	--	--	--	--
136-01-R	12-23-1999	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	<2.00	--	75	129	E22.1	142	127	E28.9	E33.3	259	571
136-01	12-23-1999	>2.00	--	280	1,060	E73.6	1,390	E678	E710	E412	2,890	3,560
136-01-R	12-23-1999	>2.00	--	320	--	--	--	--	--	--	--	--
739-01	12-23-1999	<0.062	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	<0.062	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	0.062 >2.00	100	--	--	--	--	--	--	--	--	--
739-01-LR	12-23-1999	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
739-01-R	12-23-1999	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	<2.00	--	32	E42.1	<50	E35.2	E26.9	E24.9	E10.6	70.2	221
739-01	12-23-1999	>2.00	--	190	489	<85	713	168	413	E70.8	893	1,540
749-01	12-23-1999	<0.062	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	<0.062	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	0.062 >2.00	100	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
749-01-R	1-19-2000	0.062 >2.00	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	<2.00	--	112	E236	<250	331	272	E78.7	E45.5	415	915
749-01	1-19-2000	>2.00	--	2,000	E1,430	E44.6	11,800	E674	E464	E1,210	29,900	5,080

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Benzo (A) pyrene (ppb)	Benzo (B) fluoran-thene (ppb)	Benzo(GHI) perylene (ppb)	Benzo (K) fluoran-thene (ppb)	Chrysene (ppb)	Dibenz (AH), Anthracen (ppb)	Fluoran-thene (ppb)	Indeno 123-CD pyrene (ppb)	Isophorone (ppb)	Naptha-lene, 12 dimethl (ppb)	Naptha-lene, 16 dimethl (ppb)
3-Station composite	11-25-1998	611	1,080	455	335	773	70.9	1,550	--	<50	<50	<50
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01-LR	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	599	735	E190	847	698	E69.1	1,060	E250	<50	E11.7	E28.6
136-01	12-23-1999	2,700	3,140	E587	3,610	4,060	E266	8,050	E844	<750	E143	E430
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01-LR	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	265	238	E113	378	308	E38.2	461	E139	E14.2	E3.1	E7.2
739-01	12-23-1999	1,320	1,460	E343	1,260	1,170	E136	3,580	E430	<85	E9.6	E41.5
749-01	12-23-1999	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01-R	1-19-2000	--	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	841	1,200	E332	871	1,230	E130	1,940	E417	<250	E17.1	E53.9
749-01	1-19-2000	2,790	4,370	E701	3,160	9,220	E307	13,600	E937	<1,500	E119	E213

Table 1*G*. Concentrations of inorganic and organic constituents in bottom-sediment samples collected from three oil-grit separators located at monitoring stations 136, 739, and 749, along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Napthalene, 236 trimeth (ppb)	Napthalene, 26 dimethl (ppb)	Napthalene, 2-ethyl (ppb)	Napthalene, (ppb)	P-Cresol (ppb)	Phenan-threne 1methyl (ppb)	Phenan-threne (ppb)	Phenan-thri-dine (ppb)	Pyrene, 1-methyl, (ppb)	Pyrene, (ppb)
3-Station composite	11-25-1998	<50	<50	<50	65.6	348	--	1,230	--	57.8	1,290
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
136-01-LR	12-23-1999	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
136-01	12-23-1999	E26.4	E34.1	E15.5	67.7	705	63.2	1,020	E38.9	E36.4	783
136-01	12-23-1999	E355	E490	E199	E464	1,040	E482	8,380	E240	E436	6,360
136-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01-LR	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01-R	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
739-01	12-23-1999	E12.6	E10.7	E6.8	E25.7	161	E20.3	320	E11.5	E28.8	358
739-01	12-23-1999	E52.3	E32.2	E28.2	394	250	106	3,830	98	105	2,630
749-01	12-23-1999	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	--	--	--	--	--	--	--	--	--	--
749-01-R	1-19-2000	--	--	--	--	--	--	--	--	--	--
749-01	1-19-2000	E83.3	E67	E53.6	E160	325	E93.7	2,280	E47.5	E114	1,500
749-01	1-19-2000	E447	E509	E232	E1,430	E890	E1,010	29,600	E147	E533	8510

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts

[˚C, Degrees Celsius; E, estimated; ntu, nephelometric turbidity units; -R, replicate sample; USGS-MA U.S. Geological Survey-Massachusetts; mg/L, milligrams per liter; µg/L, micrograms per liter; µS/cm, microsiemen per centimeter; µm, micrometers; <, concentration is less than value shown; >, concentration is greater than value shown; (), laboratory rerun; fecal-indicator bacteria were mathematically estimated from subcomposites; --, no data]

Station identifier	Date	Specific conductance, laboratory (µS/cm at 25˚C)	Specific conductance, field (µS/cm at 25˚C)	ph water whole field (standard units)	Turbidity, field (ntu)	Oxygen demand, chemical (mg/L)	Coliform, fecal (col/100 mL)
Environmental samples							
739-02	9-30-1999	161	160	7.3	160	84	--
739-02-R	9-30-1999	161	160	7.3	160	79	--
739-02	1-10-2000	643	632	6.6	190	93	--
739-02	3-17-2000	1,050	990	7.6	75	88	--
739-02	6-02-2000	402	414	6.6	130	120	--
739-03	9-30-1999	149	147	7.3	170	77	5,900
739-03-R	9-30-1999	149	147	7.3	170	77	--
739-03	1-10-2000	737	735	7.9	210	93	390
739-03-R	1-10-2000	740	735	7.9	210	130	--
739-03	3-17-2000	4,390	4,150	7.4	110	85	11
739-03	6-02-2000	368	366	6.7	160	140	420
136-02	9-30-1999	242	242	7.2	140	94	--
136-02	1-10-2000	829	818	7.8	230	120	--
136-02-R	1-10-2000	823	821	7.8	220	120	--
136-02	3-17-2000	884	834	7.2	110	67	--
136-02	6-02-2000	315	312	6.8	130	42	--
136-03	9-30-1999	203	193	7.1	170	37	5,000
136-03	1-10-2000	930	922	7.7	230	130	370
136-03	3-17-2000	1,030	958	7.2	120	79	110
136-03	6-02-2000	325	320	6.7	130	130	<10
136-04	9-30-1999	195	189	7.1	250	130	--
136-04	1-10-2000	1,140	1,139	7.8	300	160	--
136-04	3-17-2000	457	428	7.2	110	55	--
136-04	6-02-2000	269	265	6.3	190	58	--
136-05	9-30-1999	122	120	7.3	280	71	--
136-05	1-10-2000	879	864	7.9	320	160	--
136-05	3-17-2000	302	278	7.1	110	54	--
136-05-R	3-17-2000	*24	278	7.1	110	50	--
136-05	6-02-2000	200	195	6.5	240	160	--
Quality-control samples							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	1.33	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	1.74	--	--	--	--	--
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	<2.6	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	E1.52	--	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	E1.37	1	--	--	<10	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	2	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	--	1	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Entero-cocci (col/100 mL)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Sulfate, dissolved (mg/L as SO4)	Chloride, dissolved (mg/L as Cl)
Environmental samples—*Continued*								
739-02	9-30-1999	--	9.6	0.6	18.0	1.6	13	19
739-02-R	9-30-1999	--	9.7	.6	18	1.6	13	19
739-02	1-10-2000	--	11	.7	100	1.5	11	170
739-02	3-17-2000	--	8.0	.8	190	1.1	9.7	300
739-02	6-02-2000	--	12	.8	61	2.1	18	90
739-03	9-30-1999	8,200	--	--	--	--	--	--
739-03-R	9-30-1999	--	8.6	.6	16	1.6	12	17
739-03	1-10-2000	3,800	15	.8	120	1.8	13	200
739-03-R	1-10-2000	--	15	.8	120	1.9	13	200
739-03	3-17-2000	410	20	2.3	840	2.6	21	1,300
739-03	6-02-2000	2,700	11	.7	54	1.8	18	76
136-02	9-30-1999	--	13	.9	27	2.2	19	35
136-02	1-10-2000	--	14	.9	130	1.8	14	220
136-02-R	1-10-2000	--	14	.9	130	1.9	14	220
136-02	3-17-2000	--	8.5	.7	150	1.2	11	250
136-02	6-02-2000	--	10	.7	45	1.7	14	67
136-03	9-30-1999	12,000	11	.8	22	1.8	17	26
136-03	1-10-2000	5,900	15	1.0	160	2	15	250
136-03	3-17-2000	580	10	.8	180	1.3	13	280
136-03	6-02-2000	2,600	11	.7	47	1.8	14	69
136-04	9-30-1999	--	11	.9	21	1.9	16	26
136-04	1-10-2000	--	11	.8	200	1.5	11	330
136-04	3-17-2000	--	5	.5	76	.8	7.3	120
136-04	6-02-2000	--	8.5	.7	37	1.3	13	55
136-05	9-30-1999	--	6.6	.6	11	1.4	9.5	15
136-05	1-10-2000	--	8.5	.6	150	1.3	9.5	240
136-05	3-17-2000	--	3.4	.3	49	.5	5.2	75
136-05-R	3-17-2000	--	3.4	.3	49	.5	5.3	76
136-05	6-02-2000	--	6.8	.5	25	.9	9.8	38
Quality-control samples—*Continued*								
Deionized water blanks								
USGS-MA Laboratory	7-12-1999	--	<0.02	<0.004	<0.06	<0.1	<0.1	<0.1
USGS-MA Laboratory	2-08-2000	--	<.02	<.014	<.09	<.24	<.31	<.29
Ambient-atmospheric blanks								
USGS-MA Laboratory	7-12-1999	--	--	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	--	--	--	--	--	--
Equipment blanks								
USGS-MA Laboratory	9-28-1999	--	--	--	<.09	<.24	<.31	<.29
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--	--
Material blanks								
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SIO2)	Solids, residue at 180˚C, dissolved (mg/L)	Residue, total at 105˚C, suspended (mg/L)	Nitrogen, nitrite dissolved (mg/L as N)	Nitrogen, NO2+NO3, dissolved (mg/L as N)
Environmental samples—*Continued*							
739-02	9-30-1999	0.4	2.7	94	--	0.07	0.42
739-02-R	9-30-1999	.4	2.7	98	--	.07	.42
739-02	1-10-2000	.3	1.5	325	188	.09	.48
739-02	3-17-2000	.1	.9	520	38	.03	.26
739-02	6-02-2000	.5	1.9	226	--	.11	1.3
739-03	9-30-1999	--	--	--	--	.08	.46
739-03-R	9-30-1999	.5	2.5	88	--	.08	.46
739-03	1-10-2000	.3	1.7	382	192	.10	.55
739-03-R	1-10-2000	.3	1.7	380	186	.09	.54
739-03	3-17-2000	.2	1.1	2,300	126	.06	.46
739-03	6-02-2000	.5	1.6	201	--	.08	1.4
136-02	9-30-1999	.6	3.0	131	--	.12	.50
136-02	1-10-2000	.3	1.8	428	216	.10	.63
136-02-R	1-10-2000	.3	1.8	428	224	.10	.62
136-02	3-17-2000	.1	.9	441	112	.03	.44
136-02	6-02-2000	.4	1.8	170	--	.08	1.0
136-03	9-30-1999	.5	2.5	117	--	.11	.58
136-03	1-10-2000	.3	1.9	475	230	.10	.60
136-03	3-17-2000	.1	.9	498	150	.04	.47
136-03	6-02-2000	.4	1.7	179	--	.08	1.1
136-04	9-30-1999	.5	2.1	115	--	.08	.46
136-04	1-10-2000	.2	1.5	590	272	.08	.51
136-04	3-17-2000	.1	.6	222	100	.03	.38
136-04	6-02-2000	.4	1.0	157	--	.06	1.2
136-05	9-30-1999	.4	1.2	73	--	.09	.40
136-05	1-10-2000	.2	1.2	447	286	.07	.46
136-05	3-17-2000	<.1	.5	141	119	.02	.22
136-05-R	3-17-2000	<.1	.5	<.3	--	.02	.22
136-05	6-02-2000	.3	.9	117	--	.03	.90
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<0.1	E0.038	<10	--	<0.01	<0.05
USGS-MA Laboratory	2-08-2000	<.1	E.0577	<10	--	<.01	<.05
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	--	--	--	<.01	<.05
USGS-MA Laboratory	2-08-2000	--	--	--	--	<.01	<.05
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<.1	<.09	<10	--	<.01	<.05
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Nitrogen, ammonia, dissolved (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)	Phosphorus, total (mg/L as P)	Phosphorus, dissolved (mg/L as P)	Phosphorus ortho, dissolved (mg/L as P)
Environmental samples—*Continued*							
739-02	9-30-1999	0.37	0.16	0.76	0.18	0.04	0.01
739-02-R	9-30-1999	.37	.75	.61	.04	.08	.05
739-02	1-10-2000	.69	1.8	.95	.32	.03	.02
739-02	3-17-2000	.42	.87	.56	.17	.04	.03
739-02	6-02-2000	.75	2.8	1.4	.50	.03	.02
739-03	9-30-1999	.42	1.4	.81	.25	.05	.03
739-03-R	9-30-1999	.42	1.4	.81	.24	.05	.03
739-03	1-10-2000	.74	1.8	1.0	2.5	.03	.02
739-03-R	1-10-2000	.74	2.0	1.0	.36	.03	.02
739-03	3-17-2000	.81	1.3	1.0	.19	.03	.03
739-03	6-02-2000	.72	2.9	1.4	.62	.02	<.01
136-02	9-30-1999	.66	2.1	1.3	.29	.06	.02
136-02	1-10-2000	.75	2.0	1.1	.38	.03	.01
136-02-R	1-10-2000	.71	2.1	1.1	.39	.03	.01
136-02	3-17-2000	.52	1.1	.68	.19	.01	<.01
136-02	6-02-2000	.55	2.3	1.1	.42	.04	.02
136-03	9-30-1999	.54	1.3	1.2	.24	.07	.01
136-03	1-10-2000	.75	2.1	1.1	.50	.03	.01
136-03	3-17-2000	.55	1.4	.80	.30	.02	<.01
136-03	6-02-2000	.67	2.8	1.3	.64	.04	.02
136-04	9-30-1999	1.1	2.4	1.6	.39	.10	E.05
136-04	1-10-2000	.69	2.0	1.0	.46	.04	.02
136-04	3-17-2000	.51	1.3	.64	.17	.01	<.01
136-04	6-02-2000	1.1	3.5	1.8	.70	.08	.03
136-05	9-30-1999	.87	2.2	1.3	.43	.10	.06
136-05	1-10-2000	.72	2.1	1.0	.53	.05	.03
136-05	3-17-2000	.37	.88	.45	.43	.02	<.01
136-05-R	3-17-2000	.36	.86	.43	.32	.02	<.01
136-05	6-02-2000	.79	3.8	1.3	.90	.08	.03
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<0.02	--	E0.051	--	<0.004	<0.01
USGS-MA Laboratory	2-08-2000	<.02	--	<.1	--	<.006	<.01
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	<.02	--	<.1	--	<.004	<.01
USGS-MA Laboratory	2-08-2000	<.02	--	<.1	--	<.006	<.01
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<.02	0.257	<.1	<0.008	<.006	<.01
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Aluminum, dissolved (µg/L as Al)	Antimony, dissolved (µg/L as Sb)	Arsenic, total (µg/L as As)	Arsenic, dissolved (µg/L as As)	Barium, dissolved (µg/L as Ba)	Beryllium, total recoverable (µg/L as Be)
Environmental samples—*Continued*							
739-02	9-30-1999	--	--	E2	--	--	<5
739-02-R	9-30-1999	--	--	E2	--	--	<5
739-02	1-10-2000	26	1	E2	<2	34	<5
739-02	3-17-2000			E2	--	--	<5
739-02	6-02-2000	--	--	4	--	--	<5
739-03	9-30-1999	--	--	E1	--	--	<5
739-03-R	9-30-1999	--	--	E2	--	--	<5
739-03	1-10-2000	24	1	E2	<2	37	<5
739-03-R	1-10-2000	28	2	3	<2	41	<5
739-03	3-17-2000	--	--	E2	--	--	<5
739-03	6-02-2000	--	--	4	--	--	<5
136-02	9-30-1999	--	--	E2	--		<5
136-02	1-10-2000	18	2	E3	<2	37	<5
136-02-R	1-10-2000	18	2	E2	<2	42	<5
136-02	3-17-2000	--	--	E2	--	--	<5
136-02	6-02-2000	--	--	3	--	--	<5
136-03	9-30-1999	--	--	3	--	--	<5
136-03	1-10-2000	11	2	3	<2	41	<5
136-03	3-17-2000	--	--	4	--	--	<5
136-03	6-02-2000	--	--	4	--	--	<5
136-04	9-30-1999	--	--	E3	--	--	<5
136-04	1-10-2000	25	2	3	<2	46	<5
136-04	3-17-2000	--	--	E2	--	--	<5
136-04	6-02-2000	--	--	4	--	--	<5
136-05	9-30-1999	--	--	3	--	--	<5
136-05	1-10-2000	24	2	4	<2	38	<5
136-05	3-17-2000	--	--	5	--	--	<5
136-05-R	3-17-2000	--	--	3	--	--	<5
136-05	6-02-2000	--	--	6	--	--	<5
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<1	<1	--	<1	<1	--
USGS-MA Laboratory	2-08-2000	<1	<1	--	<2	<1	--
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	<1	<1	--	<1	<1	--
USGS-MA Laboratory	2-08-2000	<1	<1	--	<2	<1	<1
Equipment blanks							
USGS-MA Laboratory	9-28-1999	--	--	<2.6	--	--	<5
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	2.08	<1	--	<1	<1	--
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Beryllium, dissolved (µg/L as Be)	Cadmium, water unfiltered, total (µg/L as Cd)	Cadmium, dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)
Environmental samples—*Continued*							
739-02	9-30-1999	--	1		20	--	--
739-02-R	9-30-1999	--	1		20	--	--
739-02	1-10-2000	<1	2	<1	25	10	<1
739-02	3-17-2000	--	1	--	12	--	--
739-02	6-02-2000	--	2	--	37	--	--
739-03	9-30-1999	--	1	--	20	--	--
739-03-R	9-30-1999	--	1	--	20	--	--
739-03	1-10-2000	<1	2	<1	25	11	<1
739-03-R	1-10-2000	<1	2	<1	26	9.5	<1
739-03	3-17-2000	--	3	--	15	--	--
739-03	6-02-2000	--	2	--	40	--	--
136-02	9-30-1999	--	1	--	19	--	--
136-02	1-10-2000	<1	2	<1	22	6.0	<1
136-02-R	1-10-2000	<1	2	<1	21	6.1	<1
136-02	3-17-2000	--	1	--	19	--	--
136-02	6-02-2000	--	2	--	40	--	--
136-03	9-30-1999	--	2	--	24	--	--
136-03	1-10-2000	<1	.3	<1	25	6.2	<1
136-03	3-17-2000	--	3	--	46	--	--
136-03	6-02-2000	--	2	--	45	--	--
136-04	9-30-1999	--	2	--	33	--	--
136-04	1-10-2000	<1	3	<1	34	13	<1
136-04	3-17-2000	--	1	--	18	--	--
136-04	6-02-2000	--	3	--	68	--	--
136-05	9-30-1999	--	2	--	40	--	--
136-05	1-10-2000	<1	3	<1	38	14	<1
136-05	3-17-2000	--	2	--	41	--	--
136-05-R	3-17-2000	--	1	--	30	--	--
136-05	6-02-2000	--	3	--	90	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<1	--	<1	--	<1	<1
USGS-MA Laboratory	2-08-2000	<1	--	<1	--	<.8	<1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	<1	--	<1	--	<1	<1
USGS-MA Laboratory	2-08-2000	<1	--	<1	--	<.8	<1
Equipment blanks							
USGS-MA Laboratory	9-28-1999	--	<0.11	--	<1	--	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	<1	--	<1	--	<1	<1
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/l as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)
Environmental samples—*Continued*							
739-02	9-30-1999	86	--	6,900	150	47	--
739-02-R	9-30-1999	85	--	7,000	140	47	--
739-02	1-10-2000	110	11	7,900	<10	71	<1
739-02	3-17-2000	60	--	3,800	<10	38	--
739-02	6-02-2000	140	--	11,000	330	78	--
739-03	9-30-1999	90	--	6,930	--	46	--
739-03-R	9-30-1999	86	--	7,100	150	46	--
739-03	1-10-2000	120	13	8,700	10	74	<1
739-03-R	1-10-2000	110	13	9,000	E8	73	<1
739-03	3-17-2000	70	--	5,100	<30	43	--
739-03	6-02-2000	180	--	11,000	150	129	--
136-02	9-30-1999	89	--	6,400	75	76	
136-02	1-10-2000	130	13	9,100	E9	86	<1
136-02-R	1-10-2000	130	14	8,900	14	85	<1
136-02	3-17-2000	78	--	5,600	<10	53	--
136-02	6-02-2000	130	--	8,300	355	73	--
136-03	9-30-1999	100	--	9,800	102	81	--
136-03	1-10-2000	150	15	11,000	16	90	<1
136-03	3-17-2000	170	--	22,000	E6	120	--
136-03	6-02-2000	9,600 (9,600)	--	11,000	290	210	--
136-04	9-30-1999	110	--	9,500	21	74	--
136-04	1-10-2000	150	13	11,000	E6	110	<1
136-04	3-17-2000	54	--	5,300	<10	43	--
136-04	6-02-2000	180	--	10,000	30	110	--
136-05	9-30-1999	130	--	11,000	26	88	--
136-05	1-10-2000	150	12	18,000	E7	100	<1
136-05	3-17-2000	130	--	29,000	<10	110	--
136-05-R	3-17-2000	91	--	14,000	<10	74	--
136-05	6-02-2000	280	--	15,000	21	170	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	--	<1	--	<10	--	<1
USGS-MA Laboratory	2-08-2000	--	<1	--	<10	--	<1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	<1	--	--	--	<1
USGS-MA Laboratory	2-08-2000	--	<1	--	--	--	<1
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<1.2	--	<21	<10	<1	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	<1	--	<1	--	<1
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Manganese, total recoverable (µg/L as Mn)	Manganese, dissolved (µg/L as Mn)	Mercury, total recoverable (µg/L as Hg)	Molyb-denum, dissolved (µg/L as Mo)	Nickel, total recoverable (µg/L as Ni)	Nickel, dissolved (µg/L as Ni)
Environmental samples—*Continued*							
739-02	9-30-1999	150	37	<0.1	--	12	--
739-02-R	9-30-1999	150	37	<.1	--	11	--
739-02	1-10-2000	170	24	<.3	2	14	2
739-02	3-17-2000	85	25	<.3	--	6	--
739-02	6-02-2000	230	79	<.3	--	17	--
739-03	9-30-1999	150	--	<.1	--	11	--
739-03-R	9-30-1999	150	35	<.1	--	13	--
739-03	1-10-2000	180	28	<.3	2	15	3
739-03-R	1-10-2000	190	29	<.3	2	16	2
739-03	3-17-2000	140	56	<.3	--	9	--
739-03	6-02-2000	260	74	<.3	--	19	--
136-02	9-30-1999	150	45	<.1	--	12	--
136-02	1-10-2000	190	35	<.3	2	17	3
136-02-R	1-10-2000	190	37	<.3	2	16	3
136-02	3-17-2000	110	27	<.3	--	9	--
136-02	6-02-2000	170	58	--	--	14	--
136-03	9-30-1999	220	35	<.1	--	15	--
136-03	1-10-2000	270	41	<.3	3	19	4
136-03	3-17-2000	510	30	<.3	--	22	--
136-03	6-02-2000	230	62	<.3	--	17	--
136-04	9-30-1999	220	56	<.1	--	17	--
136-04	1-10-2000	230	36	<.3	3	16	3
136-04	3-17-2000	110	29	<.3	--	9	--
136-04	6-02-2000	240	72	<.3	--	20	--
136-05	9-30-1999	230	39	<.1	--	18	--
136-05	1-10-2000	360	30	<.3	3	23	2
136-05	3-17-2000	930	20	<.3	--	22	--
136-05-R	3-17-2000	230	20	<.1	--	14	--
136-05	6-02-2000	310	59	--	--	24	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	--	<1	<1	<1	--	<1
USGS-MA Laboratory	2-08-2000	--	<1	<.2	<1	--	<1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	<1	--	<1	--	<1
USGS-MA Laboratory	2-08-2000	--	<1	--	<1	--	<1
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<2.8	<2.2	<1	--	--	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	<1	--	<1	--	2
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Silver, dissolved (µg/L as Ag)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)	Uranium, natural dissolved (µg/L as U)
Environmental samples—*Continued*							
739-02	9-30-1999	<3	--	--	310	--	--
739-02-R	9-30-1999	<3	--	--	310	--	--
739-02	1-10-2000	<3	<2	<1	490	25	<1
739-02	3-17-2000	<3		--	240	--	--
739-02	6-02-2000	<3	--	--	870	--	--
739-03	9-30-1999	<3	--	--	320	--	--
739-03-R	9-30-1999	<3	--	--	320	--	--
739-03	1-10-2000	<3	<2	<1	490	34	<1
739-03-R	1-10-2000	<3	<2	<1	480	33	<1
739-03	3-17-2000	<3	--	--	340	--	--
739-03	6-02-2000	<3	--	--	1,070	--	--
136-02	9-30-1999	<3	--	--	320	--	--
136-02	1-10-2000	<3	<2	<1	510	53	<1
136-02-R	1-10-2000	<3	<2	<1	510	51	<1
136-02	3-17-2000	<3	--	--	340	--	--
136-02	6-02-2000	<3	--	--	610	--	--
136-03	9-30-1999	<3	--	--	480	--	--
136-03	1-10-2000	<3	<2	<1	560	73	<1
136-03	3-17-2000	<3	--	--	890	--	--
136-03	6-02-2000	E1	--	--	1,100	--	--
136-04	9-30-1999	<3	--	--	470	--	--
136-04	1-10-2000	<3	<2	<1	590	31	<1
136-04	3-17-2000	<3	--	--	360	--	--
136-04	6-02-2000	E1	--	--	1,580	--	--
136-05	9-30-1999	<3	--	--	530	--	--
136-05	1-10-2000	<3	<2	<1	660	30	<1
136-05	3-17-2000	<3	--	--	850	--	--
136-05-R	3-17-2000	<3	--	--	620	--	--
136-05	6-02-2000	E2	--	--	2,200	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	--	<1	<1	--	<1	<1
USGS-MA Laboratory	2-08-2000	--	<2	<1	--	<1	<1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	<1	<1	--	<1	<1
USGS-MA Laboratory	2-08-2000	--	<2	<1	--	<1	<1
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<3	--	--	<31	--	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	<1	<1	--	<1	<1
USGS-MA Laboratory	3-18-1999	--	--	--	--	--	--

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Carbon, organic suspended (mg/L as C)	Carbon, organic dissolved (mg/L as C)	Cyanide, total (mg/L as Cn)	Oil and grease, total recoverable gravimetric (mg/L)	1,2,5,6 -Dibenz-anthracene, total (ug/L)	Acenaph-thylene, total (µg/L)
Environmental samples—*Continued*							
739-02	9-30-1999	3.1	9.7	--	7	<3.4	E0.1
739-02-R	9-30-1999	3.2	8.7	--	7	<3.4	E.1
739-02	1-10-2000	4.8	4.6	--	--	E.2	E.1
739-02	3-17-2000	>4.3	15	--	5	<3.4	<1.9
739-02	6-02-2000	>6.3	13	--	10	E.3	E.1
739-03	9-30-1999	1.3	8.7	--	6	<3.4	E.2
739-03-R	9-30-1999	3.4	10	--	--	--	--
739-03	1-10-2000	>4.9	5.2	<0.01	11	E.2	E.1
739-03-R	1-10-2000		5.3	--	9	E.2	E.1
739-03	3-17-2000	4.1	11	--	6	<3.4	<1.9
739-03	6-02-2000	>9.8	14	--	11	E.6	E.1
136-02	9-30-1999	3.8	--	--	8	<3.4	E.1
136-02	1-10-2000	>5	6.0	--	11	E.3	E.1
136-02-R	1-10-2000	--	--	--		E.2	E.1
136-02	3-17-2000	>6	4.4	--	5	<3.4	<1.9
136-02	6-02-2000	>8.5	11	--	--	--	--
136-03	9-30-1999	4.3	11	--	8.	<3.4	E.2
136-03	1-10-2000	4.2	6.0	<.01	12	E.3	E.1
136-03	3-17-2000	>5.1	5.0	--	7	<3.4	<1.9
136-03	6-02-2000	>6	14	--	--	E.5	E.1
136-04	9-30-1999	3.4	16	--	12	<3.4	E.2
136-04	1-10-2000	3.3	6.9	--	17	E.2	E.1
136-04	3-17-2000	3.4	4.1	--	4	<3.4	<1.9
136-04	6-02-2000	>5.2	18	--	--	--	--
136-05	9-30-1999	1.4	13	--	--	<3.4	E.2
136-05	1-10-2000	>5.1	6.6	--	18	E.2	E.1
136-05	3-17-2000	>4.3	3.0	--	8	--	--
136-05-R	3-17-2000	>6.3	3.0	--	7	<3.4	<1.9
136-05	6-02-2000	>5.5	14	--	--	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	--	<1	--	--	<10	<5
USGS-MA Laboratory	2-08-2000	--	<.3	--	--	<3.4	<1.9
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	.3	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	<.3	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	--	E.2	--	<1	<3.4	<1.9
USGS-MA Laboratory	6-01-2000	--	<.3	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	--	--	--	--	<10	<.5

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Acenph-thene, total (ug/L)	Anthra-cene, total (ug/L)	Aroclor 1221, pcb total (ug/L)	Aroclor 1232, pcb total (ug/L)	Aroclor 1248, pcb total (ug/L)	Aroclor 1254, pcb total (ug/L)
Environmental samples—*Continued*							
739-02	9-30-1999	E0.05	E0.1	<0.1	<0.1	<0.1	<0.1
739-02-R	9-30-1999	E.1	E.1	<.1	<.1	<.1	<.1
739-02	1-10-2000	E.1	E0.2	<.2	<.2	<.2	E.04
739-02	3-17-2000	<1.9	E.1	<.1	<.1	<.1	<.1
739-02	6-02-2000	E.1	E.2	<.1	<.1	<.1	<.1
739-03	9-30-1999	E.1	E.2	<.1	< .1	<.1	<.1
739-03-R	9-30-1999	--	--	--	--	--	--
739-03	1-10-2000	E.1	E.2	<.2	<.2	<.2	E.03
739-03-R	1-10-2000	E.1	E.2	<.2	<.2	<.2	E.03
739-03	3-17-2000	E.04	E.1	<.1	<.1	<.1	<.1
739-03	6-02-2000	E.2	E.3	<.1	<.1	<.1	<.1
136-02	9-30-1999	E.1	E.2	--	--	--	--
136-02	1-10-2000	E.1	E.3	<.2	<.2	<.2	E.05
136-02-R	1-10-2000	E.1	E.2	<.2	<.2	<.2	E.05
136-02	3-17-2000	E.04	E.1	<.1	<.1	<.1	<.1
136-02	6-02-2000	--	--	--	--	--	--
136-03	9-30-1999	<1.9	E.1	<.1	<.1	<.1	<.1
136-03	1-10-2000	E.1	E.3	<.2	<.2	<.2	E.05
136-03	3-17-2000	E.1	E.1	<.1	<.1	<.1	<.1
136-03	6-02-2000	E.1	E.2	--	--	--	--
136-04	9-30-1999	E.1	E.2	<.1	<.1	<.1	<.1
136-04	1-10-2000	E.2	E.3	<.2	<.2	<.2	E.05
136-04	3-17-2000	<1.9	E.1	<.1	<.1	<.1	<.1
136-04	6-02-2000	--	--	--	--	--	--
136-05	9-30-1999	E.1	E.3	<.1	< .1	<.1	<.1
136-05	1-10-2000	E.1	E.3	<.2	<.2	<.2	E.06
136-05	3-17-2000	--	--	<.1	<.1	<.1	<.1
136-05-R	3-17-2000	E.1	E.3	<.1	<.1	<.1	<.1
136-05	6-02-2000	--	--	--	--	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<5	<5	<.1	<.1	<.1	<.1
USGS-MA Laboratory	2-08-2000	<1.9	<2	<.1	<.1	--	<.1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	--	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<1.9	<2	<.1	<.1	<.1	<.1
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	<.5	<.5	<.1	<.1	<.1	<.1

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Aroclor 1260, pcb total (ug/L)	Aroclor 1016/1242, pcb total (ug/L)	Benzo-apyrene, total (ug/L)	Benzo B fluoranthene, total (ug/L)	Benzo K fluoranthene, total (ug/L)	Benzo-[Ghi]-perylene, total (ug/L)
Environmental samples—*Continued*							
739-02	9-30-1999	<0.1	--	E0.4	E0.7	E0.2	E0.4
739-02-R	9-30-1999	<.1	--	E.4	E.6	E.2	E.3
739-02	1-10-2000	E.03	E.03	E.8	E1.1	E.8	E.9
739-02	3-17-2000	<.1	<.1	E.3	E.5	E.3	E.2
739-02	6-02-2000	<.1	<.1	E1.1	E1.4	E1.2	E.9
739-03	9-30-1999	<.1	--	E.5	E.7	E.3	E.3
739-03-R	9-30-1999	--	--	--	--	--	--
739-03	1-10-2000	E.03	E.03	E.6	E.8	E.5	E.9
739-03-R	1-10-2000	E.03	E.03	E.7	E.9	E.6	E1.0
739-03	3-17-2000	<.1	<.1	E.3	E.5	E.4	E.3
739-03	6-02-2000	<.1	<.1	E1.6	E1.9	E1.8	E1.5
136-02	9-30-1999	--	--	E.5	E.8	E.2	E.4
136-02	1-10-2000	E.03	E.04	E1.0	E1.1	E.8	E1.5
136-02-R	1-10-2000	E.04	E.04	E.7	E.9	E.7	E1.4
136-02	3-17-2000	<.1	<.1	E.4	E.7	E.5	E.3
136-02	6-02-2000	--	--	--	--	--	--
136-03	9-30-1999	< .1	--	E.3	E.6	E.3	E.3
136-03	1-10-2000	E.04	E.05	E.9	E1.1	E.8	E1.0
136-03	3-17-2000	<.1	<.1	E.5	E.8	E.5	E.4
136-03	6-02-2000	--	--	E1.3	E2.0	E1.4	E1.1
136-04	9-30-1999	<.1	--	E.6	E1.0	E.4	E.7
136-04	1-10-2000	E.06	E.03	E.8	E1.3	E.9	E.9
136-04	3-17-2000	<.1	<.1	E.3	E.5	E.3	E.2
136-04	6-02-2000	--	--	--	--	--	--
136-05	9-30-1999	<.1	--	E.8	E1.2	E.5	E.8
136-05	1-10-2000	E.07	E.03	E1.0	E1.5	E1.0	E1.0
136-05	3-17-2000	<.1	<.1	--	--	--	--
136-05-R	3-17-2000	<.1	<.1	E.9	E1.2	E1.0	E.5
136-05	6-02-2000	--	--	--	--	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<.1	<.1	<10	<10	<10	<10
USGS-MA Laboratory	2-08-2000	<.1	<.1	<2.8	<3.0	<3.2	99
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	--	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<.1	<.1	<2.8	<3.0	<3.0	<3.1
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	<.1	<.1	<10	<10	<10	<10

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Chrysene, total (ug/L)	Fluoranthene, total (ug/L)	Fluorene, total (ug/L)	Petroleum hydrocarbons, total (mg/L)	Indeno (1,2,3 CD) pyrene, total (ug/L)	Phenanthrene, total (ug/L)
Environmental samples—*Continued*							
739-02	9-30-1999	E0.6	E0.9	E0.1	<0.1	E0.3	E0.4
739-02-R	9-30-1999	E.7	E.9	E.1	<.1	E.2	E.4
739-02	1-10-2000	E1.2	E1.8	E.2	7	E.8	E.8
739-02	3-17-2000	E.5	E.8	E.1	2.1	E.3	E.3
739-02	6-02-2000	E1.7	2.5	E.1	5.9	E1.1	E1.2
739-03	9-30-1999	E.6	E1.1	E.2	<.1	E.3	E.5
739-03-R	9-30-1999	--	--	--	--	--	--
739-03	1-10-2000	E1.0	E1.5	E.1	5	E.7	E.7
739-03-R	1-10-2000	E1.1	E1.6	E.1	6	E.7	E.7
739-03	3-17-2000	E.6	E1.0	E.1	2.7	E.3	E.3
739-03	6-02-2000	E2.4	3.6	E.2	4.7	E1.8	E1.8
136-02	9-30-1999	E.8	E1.2	E.1	--	E.4	E.5
136-02	1-10-2000	E1.6	E2.2	E.1	7	E1.1	E.9
136-02-R	1-10-2000	E1.2	E1.6	E.1	--	E.9	E.6
136-02	3-17-2000	E.7	E1.4	E.1	3.6	E.4	E.5
136-02	6-02-2000	--	--	--	4.8	--	--
136-03	9-30-1999	E.5	E.9	E.1	<.1	E.3	E.4
136-03	1-10-2000	E1.5	E2.0	E.2	6	E.9	E1.3
136-03	3-17-2000	E.9	E1.6	E.1	4.1	E.4	E.5
136-03	6-02-2000	E2.0	2.4	E.1	5.9	E1.4	E1.0
136-04	9-30-1999	E1.2	E1.5	E.1	<.1	E.4	E.8
136-04	1-10-2000	E1.6	E2.3	E.5	10	E.8	E1.3
136-04	3-17-2000	E.5	E.9	E.1	3.3	E.3	E.3
136-04	6-02-2000	--	--	--	8.9	--	--
136-05	9-30-1999	E1.3	E1.9	E.18	<.1	E.6	E1.1
136-05	1-10-2000	E1.8	2.7	E.3	10	E.9	E1.3
136-05	3-17-2000	--	--	--	3.0	--	--
136-05-R	3-17-2000	E1.4	2.9	.2	2.9	E.7	E1.7
136-05	6-02-2000	--	--	--	9.8	--	--
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<10	<5	<5	--	<10	<5
USGS-MA Laboratory	2-08-2000	<2.7	<2.33	<2.04	<.1	<3	<2.1
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	--	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<2.7	<2.33	<2.04	<.1	<3	<2.1
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	<10	<.5	<.5	--	<10	<.5

Table 1H. Physical properties and event mean concentrations of major inorganic constituents, nutrients, trace metals, suspended sediments, fecal-indicator bacteria, and semi-volatile organic compounds for highway runoff event mean concentrations from sequential points within the drainage system of the Southeast Expressway near Boston, Massachusetts—*Continued*

Station identifier	Date	Pyrene, total (ug/L)	Naphthalene, total (ug/L)	Suspended sediment (mg/L)	Suspended sediment, <.062 mm (mg/L)	Suspended sediment, 0.062 to 0.250 mm (mg/L)	Suspended sediment, > 0.250 mm (mg/L)
Environmental samples—*Continued*							
739-02	9-30-1999	E0.9	E0.1	174	171	2	1
739-02-R	9-30-1999	E.8	E.1	183	180	2	1
739-02	1-10-2000	E1.6	E.2	219	213	4	2
739-02	3-17-2000	E.7	<2.1	92	87	3	1
739-02	6-02-2000	2.3	E.1	340	305	25	10
739-03	9-30-1999	E1.0	E .2	193	169	4	19
739-03-R	9-30-1999	--	--	--	--	--	--
739-03	1-10-2000	E1.3	E.2	261	205	10	46
739-03-R	1-10-2000	E1.4	E.2	714	212	12	490
739-03	3-17-2000	E.8	<2.1	192	116	7	68
739-03	6-02-2000	3.1	E.2	912	369	110	433
136-02	9-30-1999	E1.1	E.1	175	166	9	4
136-02	1-10-2000	E2.0	E.2	251	244	5	2
136-02-R	1-10-2000	E1.5	E.1	247	241	4	2
136-02	3-17-2000	E1.1	<2.1	137	122	12	4
136-02	6-02-2000	--	--	257	227	22	8
136-03	9-30-1999	E.8	E.1	417	185	19	212
136-03	1-10-2000	E1.9	E.2	536	243	13	280
136-03	3-17-2000	E1.2	<2.1	714	141	14	558
136-03	6-02-2000	E2.2	E.04	799	280	104	415
136-04	9-30-1999	E1.4	E.2	281	266	8	7
136-04	1-10-2000	E2.2	E.2	327	294	14	19
136-04	3-17-2000	E.7	<2.1	121	104	6	11
136-04	6-02-2000	--	--	434	383	38	13
136-05	9-30-1999	E1.8	E.2	361	306	18	37
136-05	1-10-2000	2.5	E.2	482	312	54	116
136-05	3-17-2000	--	--	3,920	158	335	3,430
136-05-R	3-17-2000	E2.2	<2.1	3,100	140	261	2,700
136-05	6-02-2000	--	--	649	525	73	51
Quality-control samples—*Continued*							
Deionized water blanks							
USGS-MA Laboratory	7-12-1999	<5	<5	--	--	--	--
USGS-MA Laboratory	2-08-2000	<2.2	<.3	--	--	--	--
Ambient-atmospheric blanks							
USGS-MA Laboratory	7-12-1999	--	--	--	--	--	--
USGS-MA Laboratory	2-08-2000	--	--	--	--	--	--
Equipment blanks							
USGS-MA Laboratory	9-28-1999	<2.2	<2.1	--	--	--	--
USGS-MA Laboratory	6-01-2000	--	--	--	--	--	--
Material blanks							
USGS-MA Laboratory	7-29-1998	--	--	--	--	--	--
USGS-MA Laboratory	3-18-1999	<.5	<.5	--	--	--	--

Table 1*I*. Physical properties and concentrations of fecal-indicator bacteria collected from the inlet and the sump of the 1,500-gallon off-line oil-grit separators located along the Southeast Expressway, Boston, Massachusetts

[˚C, Degrees Celsius; ntu, nephelometric turbidity units; -R, replicate sample; µS/cm, microsiemen per centimeter; col/100 mL, colony per 100 milliliters; nd, not detected; --, no data]

Station identifier	Date	Time	Coliform, fecal (cols/100 mL)	Coliform, enterococci (cols./100 mL)	Turbidity, field (ntu)	Specific conductance, field (uS/cm at 25˚C)
136-03	9-30-1999	1110	5,800	14,000	125	141
136-03	9-30-1999	1200	4,200	8,000	110	101
136-03	9-30-1999	1230	2,100	10,000	95	89
136-03	9-30-1999	1300	3,200	8,000	60	114
136-03	1-10-2000	1549	860	25,000	240	603
136-03	1-10-2000	1619	1,170	23,000	310	283
136-03	1-10-2000	1659	420	6,200	165	619
136-03	1-10-2000	1732	60	6,100	140	401
136-03	1-10-2000	1755	297	3,600	90	306
136-03	3-16-2000	2333	50	1,300	290	3,410
136-03	3-17-2000	0055	50	370	150	969
136-03	3-17-2000	0250	10	80	65	383
136-03	3-17-2000	0450	70	350	85	414
136-03	6-02-2000	1845	nd	2,600	130	320
739-03	9-30-1999	1040	2,900	6,500	160	277
739-03	9-30-1999	1107	3,900	8,600	170	179
739-03	9-30-1999	1155	3,100	12,000	140	130
739-03-R	9-30-1999	1156	3,700	9,100	140	130
739-03	9-30-1999	1225	6,900	4,100	120	97
739-03	12-15-1999	0300	2,600	6,800	170	309
739-03	12-15-1999	0445	6,800	5,400	150	191
739-03	12-15-1999	0535	4,400	7,400	160	139
739-03	1-10-2000	1559	1,060	8,000	350	1,910
739-03	1-10-2000	1633	825	6,300	280	1,210
739-03	1-10-2000	1715	240	2,800	150	597
739-03	1-10-2000	1749	310	1,800	100	369
739-03	1-10-2000	1825	120	3,500	65	316
739-03	3-16-2000	2323	20	410	320	2,950
739-03	3-17-2000	0132	10	280	150	932
739-03	3-17-2000	0146	nd	280	65	408
739-03	3-17-2000	0207	70	350	75	650
739-03	3-17-2000	0231	20	1,100	100	12,300
739-03	6-02-2000	1744	nd	1,100	290	507
739-03	6-02-2000	1751	nd	1,100	220	356
739-03-R	6-02-2000	1752	nd	1,200	220	356
739-03	6-02-2000	1910	628	3,500	80	327
136-01	3-17-2000	1500	nd	170	--	694
739-01	3-17-2000	1535	nd	60	--	860

Table 1*I*. Physical properties and concentrations of fecal-indicator bacteria collected from the inlet and the sump of the 1¨500-gallon off-line oil-grit separators located along the Southeast Expressway, Boston, Massachusetts—*Continued*

Station identifier	Date	Time	Coliform, fecal (cols/100 mL)	Coliform, enterococci (cols./100 mL)	Turbidity, field (ntu)	Specific conductance, field (uS/cm at 25˚C)
Quality assurance						
Processing blank	9-30-1999	1100	nd	1	--	--
Processing blank	12-15-1999	1100	nd	nd	--	--
Processing blank	1-10-2000	1830	nd	nd	--	--
Deionized water	3-17-2000	1420	nd	nd	--	--
136-03 equip.	3-17-2000	1100	nd	nd	--	--
739-03 equip.	3-17-2000	1100	nd	nd	--	--
Processing blank	6-02-2000	0045	nd	nd	--	--