WATER-QUALITY CHARACTERISTICS OF URBAN STORM RUNOFF AT SELECTED SITES IN EAST BATON ROUGE PARISH, LOUISIANA, APRIL 1993 THROUGH JUNE 1995

By Dennis K. Demcheck, C. Paul Frederick, and Kurt L. Johnson

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CONVERSION FACTORS AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To obtain
inch (in.)	25.4	millimeter
inch per year (in./yr)	25.4	millimeter per year
foot (ft)	0.3048	meter
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
acre	4,047	square meter
square foot (ft^2)	0.09290	square meter
mile (mi)	1.609	kilometer
gallon (gal)	0.003785	cubic meter

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

Abbreviated water-quality units:

colonies per 100 milliliters (cols/100 mL)

microsiemens per centimeter at 25 degrees Celsius (µS/cm)

milligrams per liter (mg/L)

micrograms per liter (µg/L)

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ABSTRACT

Storm runoff was characterized for five watersheds in East Baton Rouge Parish, Louisiana. Each watershed has a predominant land use: established commercial, industrial, new commercial, residential, and undeveloped. The sites representing the watersheds were sampled six times during April 1993 through June 1995. The following water-quality data are reported: physical and chemical-related properties, fecal-indicator bacteria, major inorganic ions, nutrients, trace elements, volatile organic compounds, base/neutral-extractable organic compounds, acid-extractable organic compounds, pesticides, and polychlorinated biphenyls.

The results appear reasonable in relation to land use. At the residential site, the average event-mean concentration for total suspended solids (930 mg/L, milligrams per liter) was almost 2 times the concentration at the undeveloped site, and 4 to 12 times higher than concentrations at the other sites. No watershed consistently had concentrations of synthetic organic compounds that exceeded U.S. Environmental Protection Agency (USEPA) criteria. Lead concentrations exceeded the USEPA maximum contaminant level (MCL) of 50 micrograms per liter for drinking water at four sites. Concentrations of lead in runoff samples from the residential site exceeded the USEPA MCL in five of the six samples collected. Runoff samples from the undeveloped site contained higher concentrations of phosphorus and nitrogen and lower concentrations of trace-element concentrations, compared to samples from the commercial and industrial sites. However, average event-mean concentrations of phosphorus and nitrogen at the residential site (0.80 and 4.35 mg/L, respectively) were higher than at the undeveloped site (0.56 and 2.86 mg/L, respectively).

INTRODUCTION

Since the 1960's, urban storm runoff has been known to have potentially adverse effects on the water quality of receiving waters. The work of Weibel and others (1964) and Makepeace and others (1995) indicated that elevated concentrations of various chemical constituents were present in urban storm runoff. During dry periods, contaminants accumulate on land surfaces until they are mobilized by precipitation, washed into the urban drainage system, and eventually discharged into receiving waters as storm runoff. Generally, the contaminants carried by storm runoff do not come from a single identifiable source. This contamination comes from multiple or diffuse sources and is referred to as nonpoint-source contamination. The volume of urban storm runoff increases as metropolitan areas expand, as rural land is developed for residences, commercial businesses, industrial facilities, shopping centers, and recreational areas.

The Federal Clean Water Act, which was amended in 1987, mandated that the U.S. Environmental Protection Agency (USEPA) develop a permitting program to mitigate nonpoint-source contamination in urban storm runoff. Consequently, Federal stormwater regulations (U.S. Environmental Protection Agency, 1991), in accordance with the permit application process of the National Pollutant Discharge Elimination System (NPDES), require cities that have a population of 100,000 or more to characterize the quantity and quality of their storm runoff. In 1991, the estimated population of the City of Baton Rouge was 220,000. The population of the Baton Rouge metropolitan area was estimated to be 357,000 (U.S. Bureau of the Census, 1991).

As in any metropolitan area, municipal storm-sewer systems have been installed to provide drainage for developed areas. To meet technical data requirements of the USEPA stormwater permit application for the Baton Rouge metropolitan area, the U.S. Geological Survey (USGS) entered into a cooperative agreement with the City of Baton Rouge and East Baton Rouge Parish government in 1992. The City of Baton Rouge and East Baton Rouge Parish have a combined governmental system. Through the 1992 agreement, a data-collection network was established to characterize the quantity and quality of storm runoff from five watersheds in different land-use areas.

Purpose and Scope

This report describes water-quality characteristics of urban storm runoff from five watersheds that represent the different types of land use in East Baton Rouge Parish. Sites were selected in established commercial, industrial, new commercial, residential, and undeveloped areas. Rainfall, streamflow, and water-quality data collected at each of the five sites during six storms are presented. The data were collected during April 1993 through June 1995. Average event-mean concentrations (EMC) of selected water-quality properties and constituents were used in conjunction with streamflow data to estimate both individual storm and annual storm runoff loads. The water-quality properties and constituents that are reported include physical and chemical-related properties, fecal-indicator bacteria, major inorganic ions, nutrients, trace elements, volatile organic compounds, base/neutral-extractable organic compounds, acid-extractable organic compounds, pesticides, and polychlorinated biphenyls (PCB's).

General Description of Study Area

East Baton Rouge Parish (fig. 1) covers an area of approximately 293,000 acres between the Mississippi River and the Amite River. The parish has an extensive levee system along the Mississippi River; therefore, no substantial drainage from East Baton Rouge Parish into the Mississippi River occurs. Most of the parish is within the watershed of the Amite River. The Amite River flows generally southeastward to Lake Maurepas, Lake Pontchartrain, and the Gulf of Mexico.

The climate of East Baton Rouge Parish is humid-subtropical, but subject to continental polar fronts during the winter. Warm, moist air from the Gulf of Mexico provides abundant moisture during late spring and summer. The summer is characterized by hot temperatures and intense but brief thunderstorms. The fall, late September through November, usually is warm and relatively dry. The winter usually is cool; as cool fronts pass through, rainfall usually is prolonged and the ground remains saturated for days (J. M. Grymes III, Louisiana Office of State Climatology, written commun., 1993).

Acknowledgments

The authors thank Jorge M. Ferrer and Tran Nguyen of the Department of Public Works, City of Baton Rouge, for their advice and support throughout this project. Appreciation also is extended to J. M. Grymes III and staff at the Louisiana Office of State Climatology and the National Weather Service at Baton Rouge Metropolitan Airport, Baton Rouge, for providing rainfall records for East Baton Rouge Parish.

METHODS OF STUDY

Characterization of the water quality entailed identifying the types and concentrations of contaminants present in storm runoff from the watersheds. Essential to this characterization is the monitoring of the quantity of precipitation, and the quantity and quality of storm runoff from watersheds that have different land-use characteristics. Results of these measurements and water-quality analyses were used to determine EMC's of selected water-quality properties and constituents in storm runoff.

Definition of a Storm

For the purposes of this report, a storm is defined as that rainfall separated by at least 12 hours from another such storm. Permit regulations stipulate that runoff must be sampled only from storms preceded by at least 72 hours of dry weather. Also, USEPA criteria for sampling (1992) require samples to be collected at least one month apart. This criterion was met for all samples except for a 28-day interval between samples 1 and 2 at the established commercial site and the new commercial site.

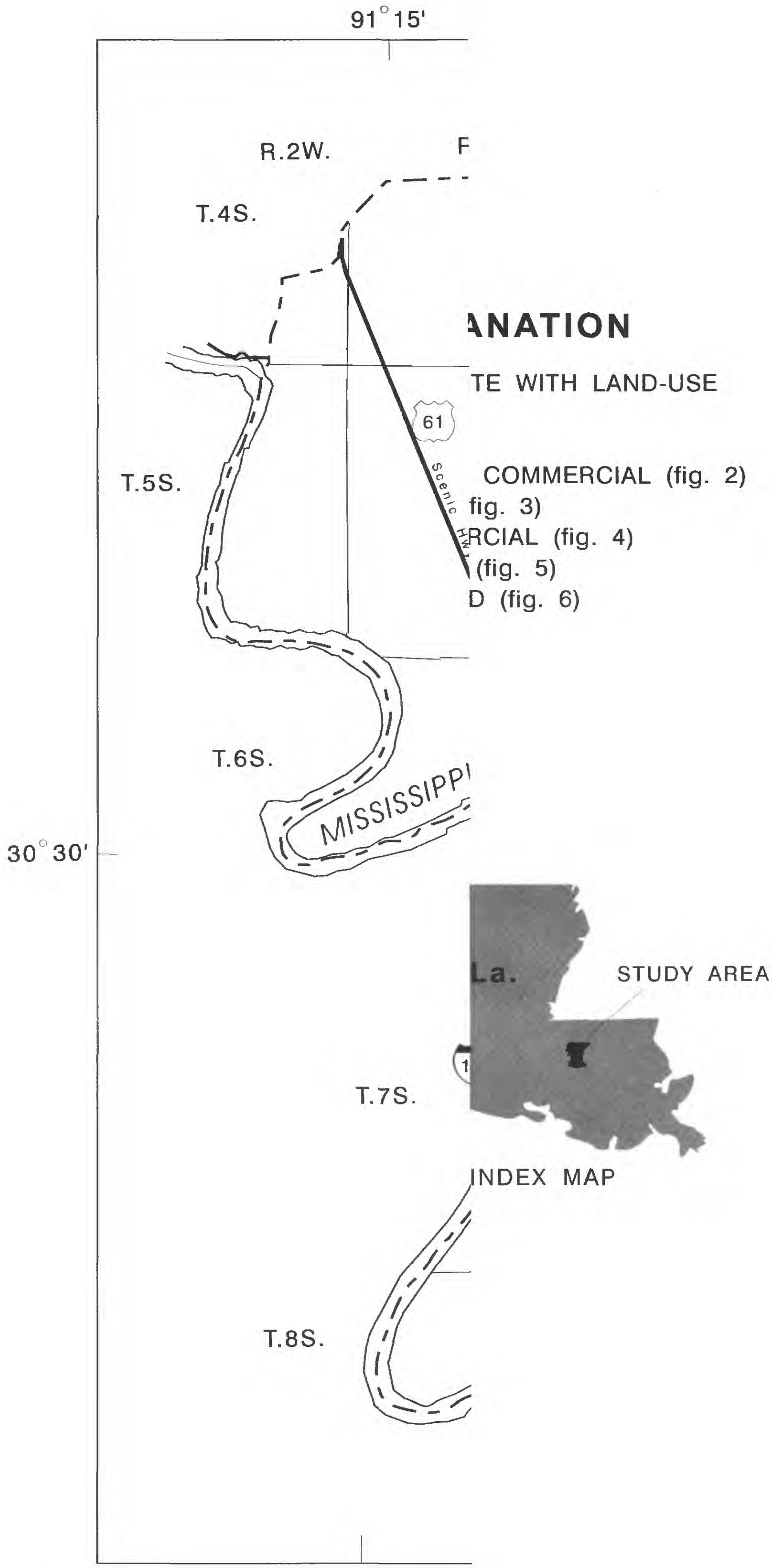

Figure 1. Sites in the stormw

Site Selection

Five sampling sites were selected to be representative of the different types of land use in East Baton Rouge Parish. The land uses that these sites represented are established commercial, industrial, new commercial, residential, and undeveloped areas. Watershed size was an important factor in site selection, because the watershed had to be large enough to provide the required minimum 4-hour sampling period for storm runoff (U.S. Environmental Protection Agency, 1992, 1991). Also, the watershed had to be small enough to represent a single dominant land use. To meet these requirements, the selected watersheds were at least 50 acres but no more than 4,500 acres.

Data Collection and Analysis

The water-quality-data-collection network consisted of five monitoring sites that received storm runoff from five watersheds (fig. 1). A monitoring station was constructed at each of the five sites and equipped with a rain gage, datalogger, and sampler. At each site, samples were collected during six storms. A relation between the amount of precipitation that falls on a watershed and the volume of runoff discharged from that watershed was determined. This relation enabled the automatic sampler to be programmed so that subsamples could be collected and composited to be representative of flow while ensuring that the capacity of the sampler would not be exceeded within a minimum of the initial 4 hours of sustained discharge.

The subsamples were stored on-site in as many as four 1-gal containers. Samples were chilled during collection by ice packed around the collection containers in the base of the sampler. The water samples were taken from the site, after the end of the runoff period, to the USGS laboratory in Baton Rouge for processing and preservation.

Precipitation

The intensity and duration of precipitation were measured for each site by a tipping-bucket rain gage at the monitoring station. The rain gage was installed at a site, unobstructed by any overhead objects within 45 degrees of the collection funnel. Precipitation amounts were recorded at 1-minute intervals and summed to obtain the cumulative precipitation measurement. Precipitation data were assumed to be representative of the entire watershed.

Streamflow

Gage height was measured and recorded at each monitoring station using a pressure-sensitive, bubbler-regulated stage gage. The bubbler regulator maintained a constant rate of air flowing through a tube that extended from the monitoring station to an orifice at the bottom of the channel or culvert. As stage rose, greater pressure was required to maintain a constant flow rate through the tube. Pressure changes were measured, converted to gage height, and recorded by the datalogger. Gage-height measurements with this system were affected minimally by rapid changes in temperature.

Streamflow and storm runoff volumes were quantified at each monitoring station using a stage-discharge rating. Manual discharge measurements were made at various gage heights using either a Price AA or pygmy meter and the 0.6-depth or 0.2- and 0.8-depth method (Buchanan and Somers, 1969). The various gage heights and their respective discharge volumes were entered into the datalogger, and a three-point interpolation method was used to create the stage-discharge rating. Using this stage-discharge rating, the datalogger then computed both instantaneous discharge and total discharge volume during an entire storm.

Water Quality

Samples of storm runoff were collected for each land use by automated samplers, which collected flow-weighted or proportional composite samples for at least the initial 4 hours of each storm. Each sampler was programmed according to individual land-use characteristics. The rain gage, datalogger, and sampler were integrated to compose a reliable, automatic data-collection system that was programmed according to the watershed's characteristics, such as size, amount of impervious area, and land use. The rain gage transmitted a pulse to the datalogger each time 0.01 in. of rainfall was collected. When 0.1 in. of rainfall in 1 hour was recorded, the datalogger was activated to measure gage height until a threshold level was reached. The datalogger then activated the sampler to collect a 0.2-gal subsample each time the predetermined discharge volume was reached. This process continued until the capacity of the sampler was met or the volume of runoff diminished. Aeration and exposure of samples to contamination during sample collection were minimized by use of a peristaltic pump. The result was a representative composite sample proportionally equivalent to the volume of storm runoff from that watershed. To be considered a representative composite sample, at least a 1.5-gal sample was collected.

Project personnel manually collected water samples for selected properties and constituents. The depth-integrated samples were collected in the appropriate containers by wading the stream during the initial 30 minutes of runoff discharged from the land-use area. Samples collected manually were analyzed to determine specific conductance, field pH, and water temperature, and concentrations of fecal coliform and fecal streptococcus bacteria, cyanide, oil and grease, volatile organic compounds, and phenols. After collection, the samples were transported to the USGS laboratory in Baton Rouge for further preparation and processing or analysis.

Water samples were composited in a Teflon-coated churn splitter. Use of the coated churn splitter enabled representative subsamples to be decanted for the appropriate chemical analyses. The samples for dissolved inorganic, nutrient, and trace-element analyses were filtered through 0.45-micrometer nitrocellulose filters and treated with the appropriate preservatives for later analysis at the USGS National Water-Quality Laboratory in Arvada, Colorado, using methods described by Fishman and Friedman (1989). Water samples for analysis of acid organic compounds, base/neutral organic compounds, and pesticides were stored at $4^{o}C$ until analysis. Samples were analyzed for synthetic organic compounds according to methods described by Wershaw and others (1987) and the U.S. Environmental Protection Agency (1979a, 1979b). Samples collected for analysis of biochemical oxygen demand and fecal coliform and fecal streptococcus bacteria were collected in sterilized glass bottles and processed within 4 hours of collection. Bacteria samples were analyzed at the USGS laboratory in Baton Rouge using the membrane-filter method described by Britton and Greeson (1988).

Quality Assurance and Quality Control

The purpose of the quality assurance and control procedures was to ensure the accuracy of the data. These procedures included the collection of duplicate samples, equipment-blank samples, and the compilation of percent-recovery data. The duplicate storm-runoff sample was used to check the precision of laboratory analysis and the sample-splitting process. The equipment-blank sample consisted of inorganic-free and organic-free water pumped and processed in the same manner as storm-runoff samples. Standard forms were developed and used to document field data collection, to request analytical services, and to provide a chain of custody when shipping water samples.

Calculation Of Annual Contaminant Load

An equation referred to as the "simple method" (U.S. Environmental Protection Agency, 1992), adapted from Schueler (1987), was used to estimate annual contaminant loads for urban watersheds in East Baton Rouge Parish. The "simple method" is described in detail in U.S. Environmental Protection Agency (1992, Section 5.4.3, p. 5-14). The "simple method" provides a quick and reasonable estimate of loads for the preparation of part 2 of the NPDES permit application. Values of annual rainfall, watershed characteristics, and a selected water-quality concentration are used in the equation to estimate annual contaminant loads. The "simple method" equation for estimation of annual contaminant loads in storm runoff is as follows:

$$L_i = \left[\frac{(P)\ (CF)\ (Rv_i)}{12}\right] (C_i)\ (A_i)\ (2.72) \tag{1}$$

where:

L_i is annual contaminant load for site i, in lb/yr;

P is average annual precipitation, in in/yr;

CF is correction factor that adjusts for storms where no runoff occurs (a value of 0.9 was used);

Rv_i is runoff coefficient for the watershed of site i;

C_i is average event-mean concentration of contaminant at site i, in mg/L; and

A_i is watershed area for site i, in acres.

WATERSHED CHARACTERISTICS AND SITE DESCRIPTION

Hourly rainfall data were obtained from the National Weather Service at Baton Rouge Metropolitan Airport, for a 10-year period, 1979-88 (J. M. Grymes III, Louisiana Office of State Climatology, written commun., 1993). These data were analyzed to determine storm characteristics, including average number and duration of storms, length of intervals between storms, and average storm total rainfall, for East Baton Rouge Parish. The average annual rainfall during the 10-year period 1979-88 was 62.4 in. (table 1). Analysis of the rainfall data indicated that, in the Baton Rouge metropolitan area, an average of 37.7 storms per year occurred after a 72-hour dry period.

East Baton Rouge Parish consists of about 22.5 percent developed and 77.5 percent undeveloped land (table 2). The developed land is 3.5 percent commercial, 2.3 percent industrial, and 16.7 percent residential (Wilbur Smith Associates, 1992). Runoff coefficients also were calculated for the five watersheds and are presented in table 2.

The five sites chosen to represent the watersheds were located in areas that were safely accessible during storms and darkness. The channel type was documented, as well as any culverts, ditches, and drains that control the flow. Project personnel extensively surveyed the watersheds using city and parish maps and on-site observations to determine acreage, land-use, and directions of drainage.

Site 1, which monitored the established commercial land-use area, was located at an open-channel, unlined drainage canal at Lobdell Boulevard (fig. 2). The sampling site was approximately 400 ft downstream from a double 5-ft by 4-ft box culvert under Lobdell Boulevard. The drainage canal received storm runoff through storm drains located along Harry Drive, Lobdell Boulevard, and within the shopping center parking lot. Land use in this 63-acre watershed was entirely established commercial.

Site 2, which monitored the industrial land-use area, was located at an open-channel, unlined drainage canal at Tom Drive, 0.1 mi east of Wooddale Boulevard (fig. 3). The sampling site was downstream from a double 7-ft by 5-ft box culvert at Tom Drive. The drainage canal received storm runoff from this 109-acre watershed through storm drains located along Wooddale Boulevard, Choctaw Drive, Tom Drive, and at various industrial businesses, warehouses, and distribution centers.

Site 3, which monitored the new commercial land-use area, was located at an open-channel, concrete-lined drainage canal (fig. 4). The canal is located in a new and rapidly developing commercial area of East Baton Rouge Parish. The site received storm runoff from this 157-acre watershed through drains located along Industriplex Boulevard, Sunbelt Court, and Exchequer Street, as well as small ditches.

Site 4, which monitored the residential land-use area, was located at an open-channel, concrete-lined drainage canal at Goodwood Boulevard, about 0.5 mi east of South Sherwood Forest Boulevard (fig. 5). The drainage canal received storm runoff from this 550.4-acre watershed through storm drains underlying streets. The sampling site was just upstream from a double 9-ft by 7-ft box culvert under Goodwood Boulevard. Most of the storm drains in this watershed were built from the late 1960's to early 1970's. This area includes mostly single-family residences.

Site 5, which monitored the undeveloped land-use area, was located on Beaver Bayou at Hooper Road (fig. 6). Beaver Bayou is an open-channel tributary to the Comite River, and is in the northeastern quadrant of East Baton Rouge Parish. Site 5, like much of the northern part of the parish, represents predominantly forested and undeveloped land, with scattered residential areas. The site received storm runoff from about 3,800 acres. The sampling site was just downstream of a triple 10-ft by 12-ft box culvert under Hooper Road.

Table 1. Summary of storms in East Baton Rouge Parish, Louisiana, having an antecedent 12-hour dry period, 1979-88

Number of storms during 1979-88	Average storm duration (hours)	Rainfall			
		Average rate (inches per hour)	Maximum rate (inches per hour)	Average per storm (inches)	Average annual total (inches)
906	7.89	0.09	3.52	0.69	62.4

Month	Average number of storms	Average storm duration (hours)	Rainfall			
			Average rate (inches per hour)	Maximum rate (inches per hour)	Average total per storm (inches)	Average monthly total (inches)
January	6.8	12.28	0.05	1.25	0.60	4.06
February	6.7	13.58	.08	1.30	1.04	6.99
March	5.8	9.53	.08	1.22	.77	4.45
April	6.1	8.07	.12	1.40	.97	5.91
May	6.5	7.66	.09	2.20	.73	4.73
June	10.0	5.51	.09	2.19	.48	4.80
July	11.2	4.96	.12	1.82	.58	6.47
August	12.1	4.26	.12	3.52	.49	5.95
September	6.7	7.54	.09	1.90	.64	4.30
October	5.8	8.47	.10	2.05	.81	4.68
November	6.4	7.08	.08	1.35	.59	3.79
December	6.5	12.06	.08	3.07	.96	6.24

Table 2. Coefficient used in the computation of annual contaminant load, and summary of land use in East Baton Rouge Parish, Louisiana

Primary land use[1]	[2]Land use for East Baton Rouge Parish (1988)		Runoff coefficient (Rv_i) for network watershed
	Acres	Percent of total	
Established commercial	4,909	1.75	0.99 (site 1)
Industrial	6,488	2.30	.81 (site 2)
New commercial	4,909	1.75	.51 (site 3)
Residential	47,430	16.7	.39 (site 4)
Undeveloped	220,700	77.5	.64 (site 5)
TOTAL[3]	284,400	100	N/A[4]

[1] Land used for agriculture is not included in this summary.
[2] Land use summary from Wilbur Smith Associates (1992).
[3] Rounded number.
[4] N/A, not applicable.

WATER-QUALITY CHARACTERISTICS OF URBAN STORM RUNOFF

Thirty water-quality samples were collected from five watersheds in East Baton Rouge Parish during April 1993 through June 1995. The average event-mean concentrations (EMC) of 12 properties and constituents for which annual contaminant loads were calculated are listed in table 3. In general, the residential site had the greatest average EMC's, probably indicating a variety of contaminant sources. At the residential site, the average EMC for total suspended solids (930 mg/L) was almost 2 times the undeveloped site, and more than 4 to 12 times higher than the other sites. This indicates that runoff from residences with their associated contaminants had substantial effects in this watershed.

Annual contaminant loads (table 4) for the five watersheds and estimated annual contaminant loads for five land-use areas in East Baton Rouge Parish (table 5) were calculated using the USEPA "simple method" (U.S. Environmental Protection Agency, 1992), adapted from Schueler (1987). The loads were computed in pounds per year. The relatively large size of the undeveloped watershed (3,800 acres) and the large amount of undeveloped land in the parish (220,700 acres, table 2) resulted in high values of total loading of contaminants. However, the residential land use areas in the parish (47,430 acres) still had a greater loading of zinc (84,800 pounds per year) as compared to the undeveloped watershed (71,900 pounds per year). Results of the water-quality analyses (tables A1-A10) and the minimum detection levels (MDL) of selected water-quality properties and constituents (table A11) are in the appendix. The results appear reasonable in relation to land use.

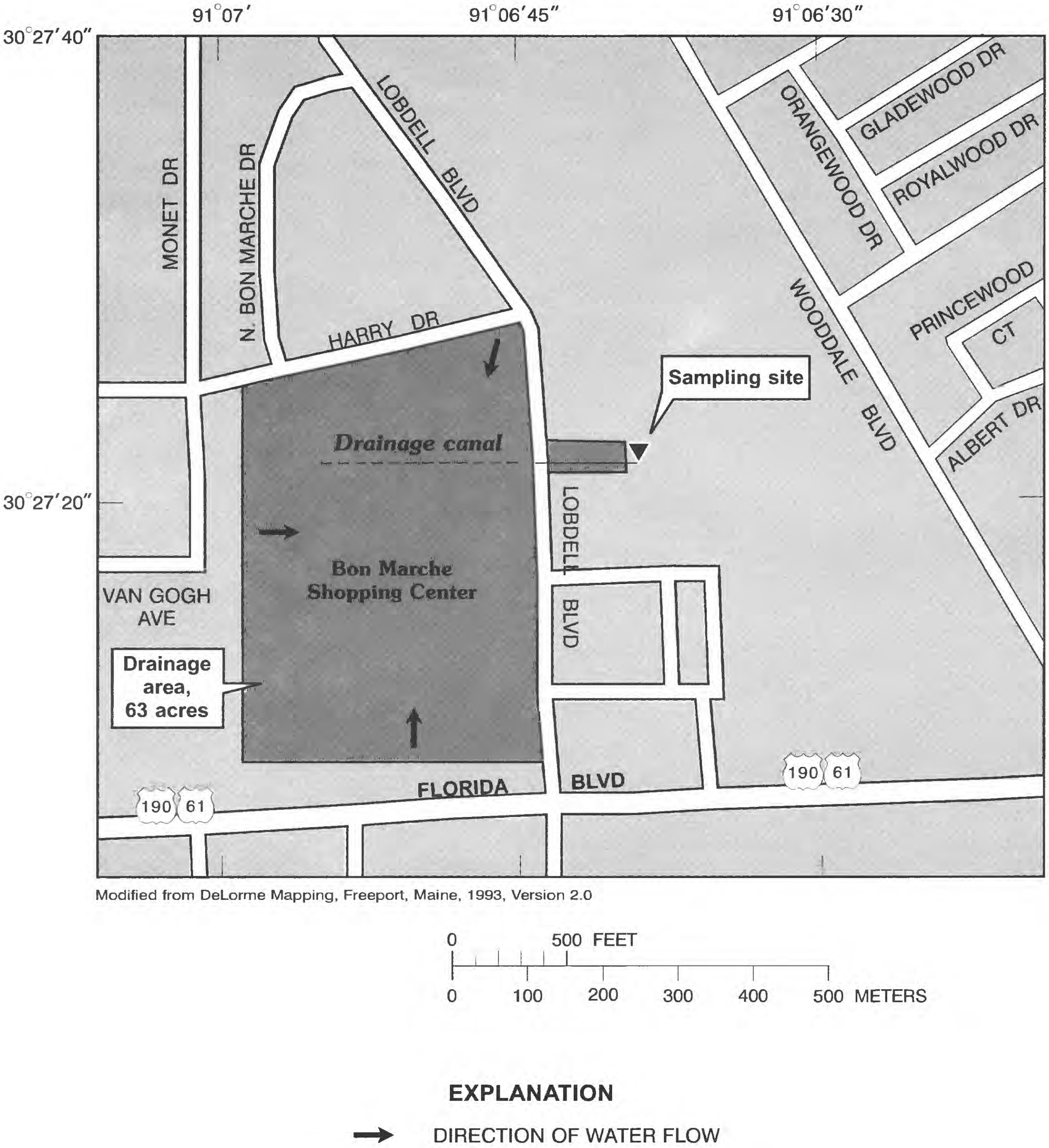

Figure 2. Established commercial land-use area, Lobdell Boulevard, Baton Rouge, Louisiana, 1993.

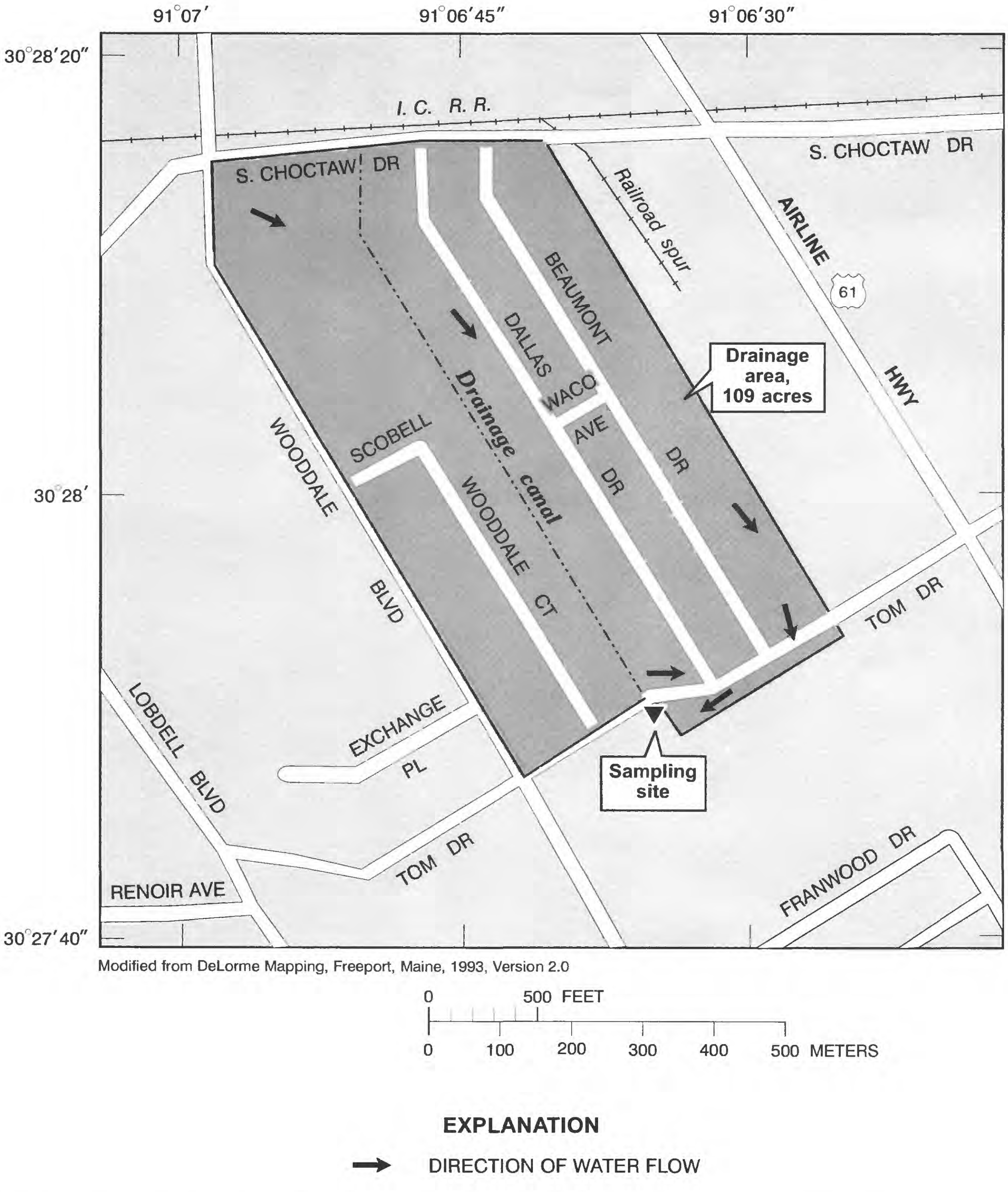

Figure 3. Industrial land-use area, Tom Drive, Baton Rouge, Louisiana, 1993.

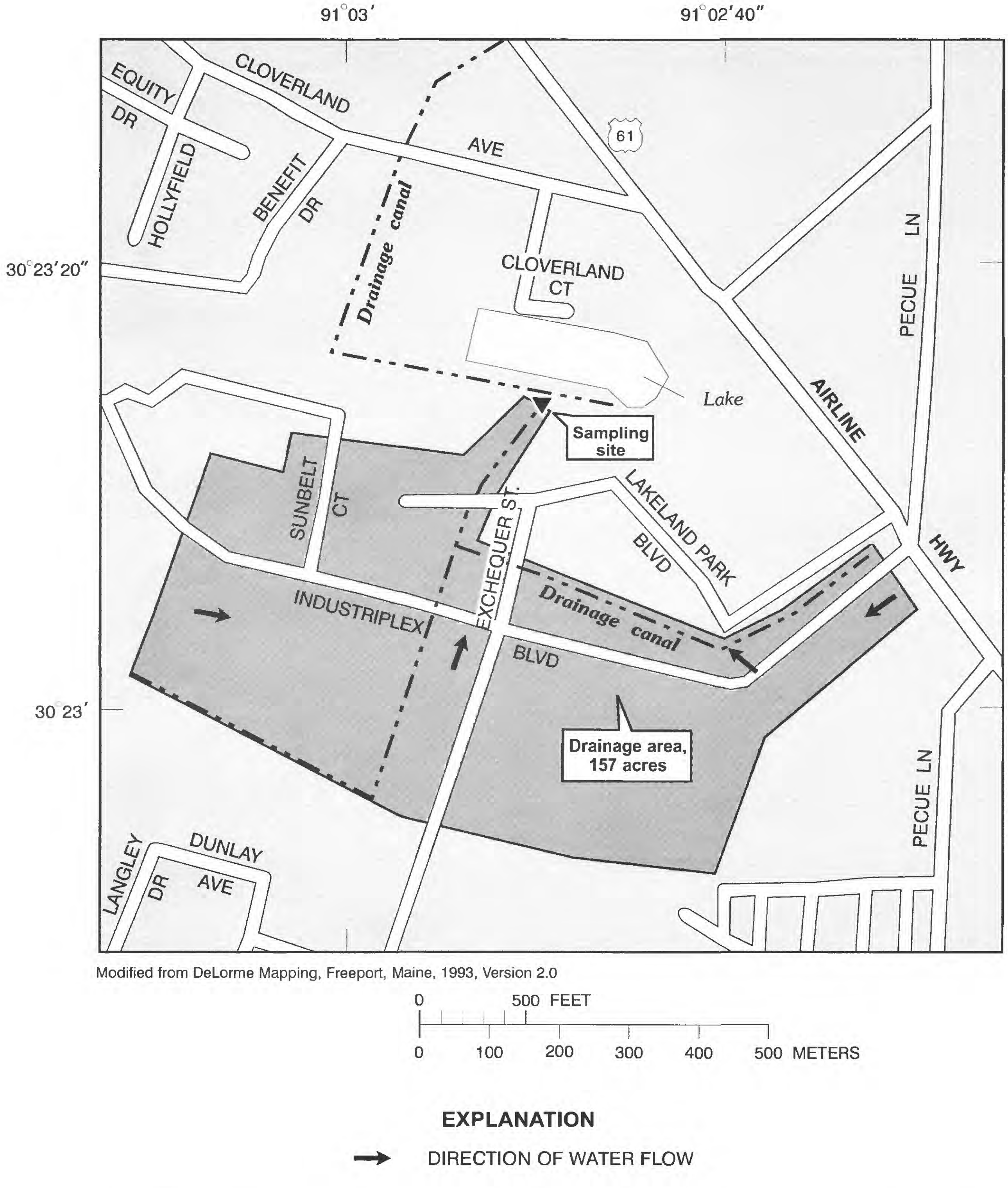

Figure 4. New commercial land-use area, Sunbelt Court, Baton Rouge metropolitan area, Louisiana, 1993.

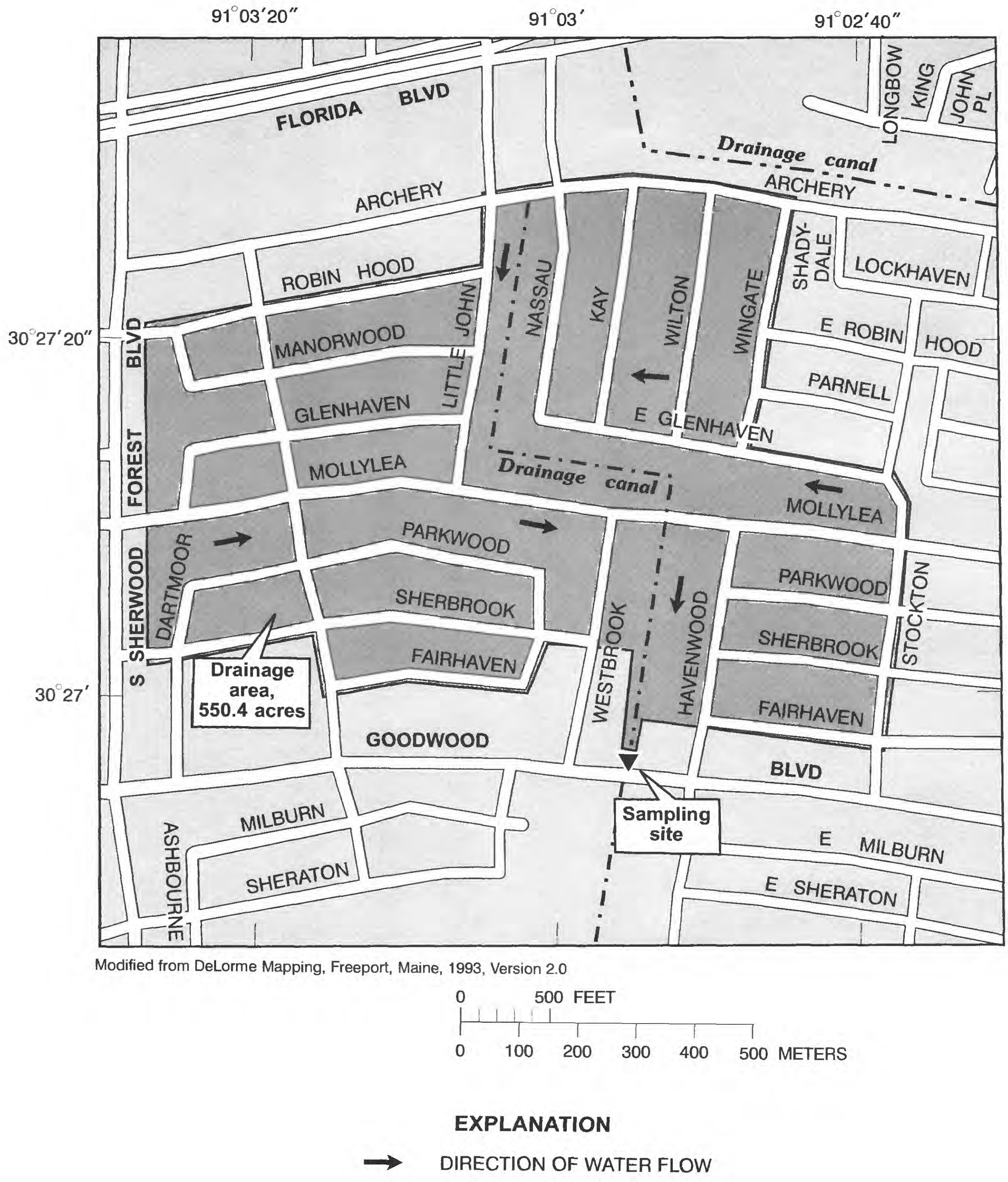

Figure 5. Residential land-use area, Goodwood Boulevard, Baton Rouge, Louisiana, 1993.

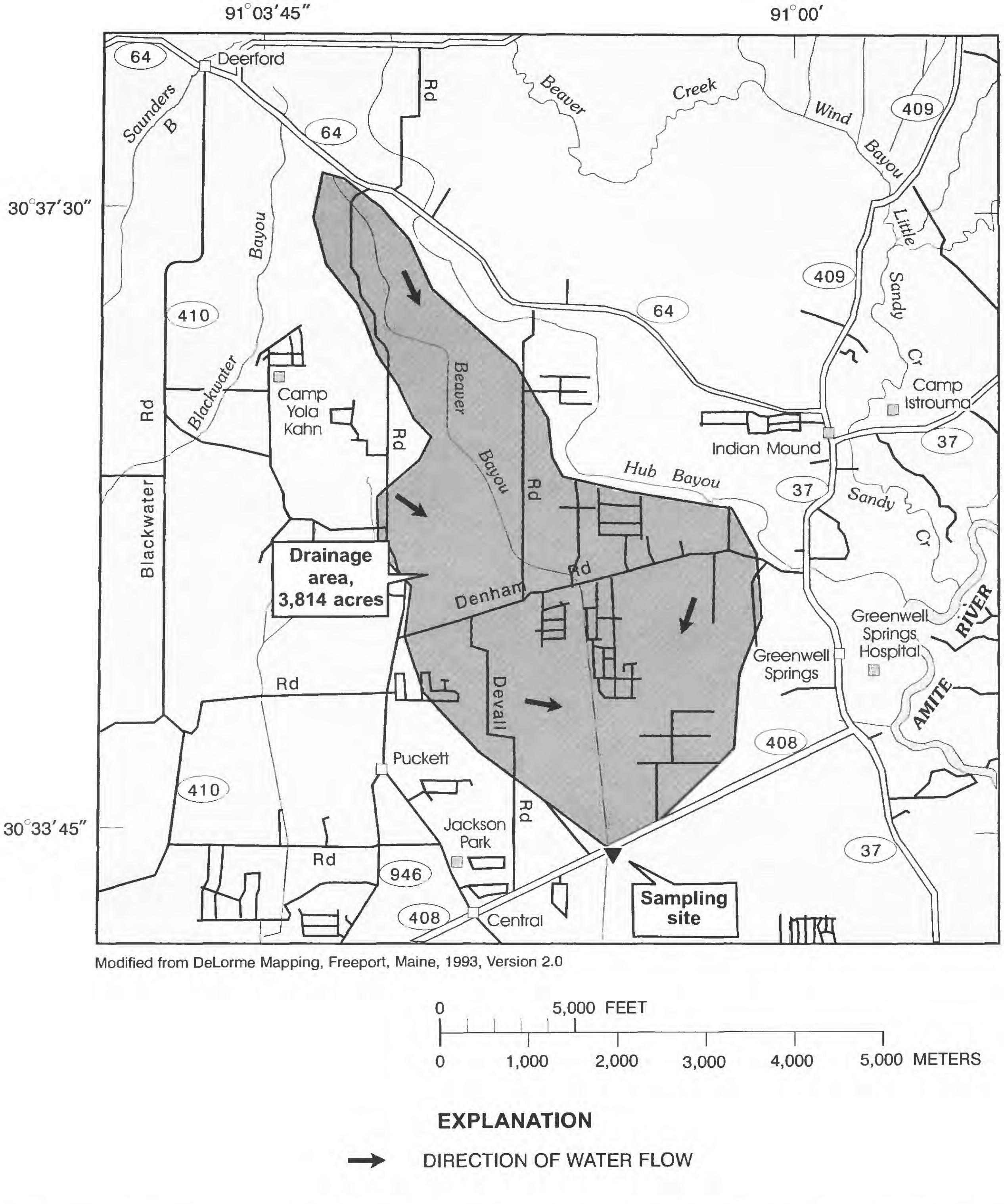

Figure 6. Undeveloped land-use area, Hooper Road, Baton Rouge metropolitan area, Louisiana, 1993.

Table 3. Average event-mean concentration of selected water-quality properties and constituents for five land-use areas within a storm runoff monitoring network in East Baton Rouge Parish, Louisiana, 1993-95

[Concentrations are in milligrams per liter.]

Water-quality property or constituent	Average event-mean concentration				
	Established commercial	Industrial	New commercial	Residential	Undeveloped
Biochemical oxygen demand	5.4	6.6	6.6	6.4	6.8
Chemical oxygen demand	42	73	71	61	58
Total suspended solids	74	108	211	930	474
Total dissolved solids	33	78	57	65	92
Nitrogen, total	1.21	1.60	1.44	4.35	2.86
Kjeldahl nitrogen, total	.90	1.30	1.22	4.16	2.40
Phosphorus, total	.11	.20	.19	.80	.56
Phosphorus, filtered	.06	.10	.08	.16	.18
Cadmium, total recoverable	<.001	<.001	<.001	<.001	<.001
Copper, total recoverable	.01	.01	.01	.05	.01
Lead, total recoverable	.03	.10	.04	.15	.03
Zinc, total recoverable	.09	.16	.28	.36	.04

Table 4. Annual contaminant loads of selected water-quality properties and constituents for five watersheds within a storm runoff monitoring network in East Baton Rouge Parish, Louisiana, 1993-95

[Loads are in pounds per year]

Water-quality property or constituent	Annual loads for watersheds				
	Established commercial	Industrial	New commercial	Residential	Undeveloped
Biochemical oxygen demand	4,290	7,420	6,730	17,500	211,000
Chemical oxygen demand	33,400	82,000	72,400	167,000	1,800,000
Total suspended solids	58,800	121,000	215,000	2,540,000	14,700,000
Total dissolved solids	26,200	87,700	58,100	178,000	2,850,000
Nitrogen, total	961	1,800	1,470	11,900	88,500
Kjeldahl nitrogen, total	715	1,460	1,240	11,400	74,300
Phosphorus, total	87	225	194	2,180	17,300
Phosphorus, dissolved	48	112	82	437	5,570
Cadmium, total recoverable	1	1	1	3	31
Copper, total recoverable	8	11	10	137	310
Lead, total recoverable	24	112	41	410	929
Zinc, total recoverable	71	180	285	983	1,240

Table 5. Estimated annual contaminant loads of selected water-quality properties and constituents for five land-use areas in East Baton Rouge Parish, Louisiana, 1993-95

[Loads are in pounds per year.]

Water-quality property or constituent	Estimated loads for parish				
	Established commercial	Industrial	New commercial	Residential	Undeveloped
Biochemical oxygen demand	334,000	442,000	210,000	1,510,000	12,200,000
Chemical oxygen demand	2,600,000	4,880,000	2,260,000	14,400,000	104,000,000
Total suspended solids	4,580,000	7,220,000	6,720,000	219,000,000	852,000,000
Total dissolved solids	2,040,000	5,220,000	1,820,000	15,300,000	165,000,000
Nitrogen, total	74,900	107,000	46,900	1,020,000	5,140,000
Kjeldahl nitrogen, total	55,700	87,000	38,900	980,000	4,320,000
Phosphorus, total	6,800	13,400	6,060	188,000	1,010,000
Phosphorus, dissolved	3,710	6,690	2,550	37,700	324,000
Cadmium, total recoverable	62	67	32	235	1,800
Copper, total recoverable	619	669	319	11,800	18,000
Lead, total recoverable	1,860	6,690	1,280	35,300	53,900
Zinc, total recoverable	5,570	10,700	8,920	84,800	71,900

At the established commercial site, average nutrient concentrations (table A2) were 1.21 mg/L total nitrogen, 0.90 mg/L ammonia plus organic nitrogen, 0.11 mg/L total phosphorus, and 0.06 mg/L filtered phosphorus. The average filtered phosphorus concentration was only slightly above the USEPA 0.05 mg/L criterion (U.S. Environmental Protection Agency, 1986) that is a major factor in accelerated plant growth. The polychlorinated biphenyl (PCB) Aroclors 1242 and 1254 both were detected five out of the six times sampled at concentrations that ranged from 0.1 to 0.2 µg/L, just at or above the MDL of 0.1 µg/L. Chlordane also was detected at a concentration of 0.1 µg/L in two samples. This persistent organochlorine insecticide was used extensively for termite control in East Baton Rouge Parish, before being banned in 1988. Toluene, an industrial solvent and trace component of diesel fuels, was detected three times at the MDL of 0.2 µg/L.

At the industrial site, average nutrient concentrations (table A4) were 1.60 mg/L total nitrogen, 1.30 mg/L ammonia plus organic nitrogen, 0.20 mg/L total phosphorus, and 0.10 mg/L filtered phosphorus. Several VOC's were detected at the industrial site. Methylene chloride, a strong solvent and a carcinogen, was detected three out of six times sampled at concentrations of 0.2 µg/L. Chloroform and tetrachloroethylene were detected once at concentrations of 0.6 µg/L. Ethylbenzene was detected three times, and toluene was detected four times. The largest chromium concentration, 44 µg/L, approached the USEPA MCL of 50 µg/L for drinking water. Mercury was detected in four samples, at concentrations that ranged from 0.1 to 0.2 µg/L, well below the MCL of 2.0 µg/L for drinking water. Base/neutral-extractable and acid-extractable organic compounds were detected frequently. These compounds mainly are high-temperature combustion products. Phenanthrene, pyrene, and fluoranthene were detected close to the MDL. Phthalates, a common plasticizing agent, were detected twice. Naphthalene was detected twice, and total phenols were detected five times, in concentrations that ranged from 1 to 9 µg/L.

At the new commercial site, average nutrient concentrations (table A6) were 1.44 mg/L total nitrogen, 1.22 mg/L ammonia plus organic nitrogen, 0.19 mg/L total phosphorus, and 0.08 mg/L filtered phosphorus. The largest chromium concentration (83 µg/L on May 1, 1993), exceeded the USEPA MCL of 50 µg/L for drinking water. Cadmium was detected twice at low concentrations of 2 µg/L. A review of the base/neutral-extractable and acid-extractable organic compounds indicates an episodic pattern. In four samples, these synthetic organic compounds were not detected, but on July 20, 1993, five were detected: di-n-octyl phthalate, fluoranthene, bis(2-ethylhexyl)phthalate, phenanthrene, and pyrene; and on June 22, 1994, 10 were detected: anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, phenanthrene, and pyrene. Pesticides and PCB's also were detected only during the July 1993 and June 1994 storms. The June 1994 storm runoff contained the persistent organochlorine insecticides aldrin, chlordane, DDD (a breakdown product of DDT), dieldrin, and heptachlor.

At the residential site, average nutrient concentrations (table A8) were 4.35 mg/L total nitrogen, 4.16 mg/L ammonia plus organic nitrogen, 0.80 mg/L total phosphorus, and 0.16 mg/L filtered phosphorus. Cadmium was detected in four out of six times sampled, more than in the industrial or commercial areas. A chromium concentration of 96 µg/L exceeded the USEPA MCL of 50 µg/L for drinking water. Chloroform (one detection at 0.5 µg/L), ethylbenzene (one detection at 0.3 µg/L), and toluene (four detections from 0.3 to 0.5 µg/L) were the only VOC's detected at this site. Pesticides and other synthetic organic compounds were detected in low concentrations. Aroclor 1242 was detected at 2.0 and 0.1 µg/L. Aroclor 1254 also was detected twice, at 0.3 and 0.1 µg/L. The organochlorine insecticide chlordane was detected in five of six samples, at concentrations that ranged from 0.1 to 1.2 µg/L. Although banned in 1988, chlordane continues to be detected in small amounts.

At the undeveloped site, average nutrient concentrations (table A10) were 2.86 mg/L total nitrogen, 2.40 mg/L ammonia plus organic nitrogen, 0.56 mg/L total phosphorus, and 0.18 mg/L filtered phosphorus. Samples from storm runoff at the undeveloped site had higher average EMC's of total phosphorus (0.56 mg/L) and total nitrogen (2.86 mg/L) than at the industrial and commercial sites, but lower than at the residential site (0.80 and 4.35 mg/L). This probably reflects the extensive use of fertilizers by homeowners. No VOC's were detected and only one base/neutral-extractable organic compound, 1,4-dichlorobenzene, was detected at 0.7 µg/L. No PCB's or pesticides were detected, supporting the designation of this area as undeveloped.

None of the sites had consistently elevated trace-element concentrations. At all sites except the undeveloped site, lead was the only constituent with a concentration that exceeded its USEPA MCL for drinking water (50 µg/L). Lead was also the only constituent that exceeded this level in five of the six samples from the residential site.

ANALYSIS OF QUALITY-CONTROL DATA

The blank analyses indicated that no substantial contamination occurred as a result of contact with collection and processing equipment. Results of the duplicate samples collected at the industrial sites July 21, 1993, indicated that inorganic constituents, nutrients, and trace metals concentrations were in close agreement. Two exceptions were dissolved phosphorus (0.05 and 0.19 mg/L), and total organic carbon (20 and 9.9 mg/L). Results from the pesticide and other synthetic organic compound duplicate analyses are difficult to interpret, as the two sets of samples had differing MDL's. Care must be taken in future studies to ensure replicate samples are analyzed using the same methodologies and detection levels.

SUMMARY

Water quality of urban storm runoff was characterized for five watersheds in East Baton Rouge Parish, Louisiana, during April 1993 through June 1995. Results of water-quality analyses enabled calculation of event-mean concentrations and annual load estimates of storm runoff from nonpoint sources. Samples were collected from watersheds representing land-uses characterized predominantly as established commercial, industrial, new commercial, residential, and undeveloped. Six samples were collected from each site; nearly all the samples were collected at least 30 days apart, and following at least 72 hours of dry weather. Flow-weighted samples were collected by automated samplers during the first 4 hours of each storm. Manual samples were collected during the first 30 minutes and analyzed for specific conductance, field pH, water temperature, fecal coliform and fecal streptococcus bacteria, cyanide, oil and grease, volatile organic compounds, biochemical oxygen demand, and phenols. The following water-quality data are reported: physical and chemical-related properties, fecal-indicator bacteria, major inorganic ions, nutrients, trace elements, volatile organic compounds, base/neutral-extractable organic compounds, acid-extractable organic compounds, pesticides, and polychlorinated biphenyls.

The results appear reasonable in relation to land use. At the residential site, the average event-mean concentration for total suspended solids (930 mg/L, milligrams per liter) was almost 2 times the concentration at the undeveloped site, and 4 to 12 times higher than concentrations at the other sites. This indicates that runoff from residences with their associated contaminants had substantial effects in this watershed. No watershed had consistently high concentrations of synthetic organic compounds that exceeded U.S. Environmental Protection Agency (USEPA) criteria. Lead concentrations exceeded the USEPA maximum contaminant level (MCL) of 50 micrograms per liter for drinking water at four sites. Concentrations of lead in runoff from the residential site exceeded the USEPA MCL in five of the six samples collected. Runoff samples from the undeveloped site contained higher concentrations of phosphorus and nitrogen and lower concentrations of trace-element concentrations, compared to samples from the two commercial and industrial sites. However, average event-mean concentrations of phosphorus and nitrogen at the residential site (0.80 and 4.35 mg/L, respectively) were higher than at the undeveloped site (0.56 and 2.86 mg/L, respectively).

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APPENDIX: WATER-QUALITY DATA

Table A1. Summary of water-quality data from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994

[NPDES, National Pollution Discharge Elimination System; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; °C, degrees Celsius; EMC, event-mean concentration; mg/L, milligrams per liter; EL, event load; lb/acre, pounds per acre]

Sampling site: Lobdell Boulevard
Drainage area: 2,731,212 square feet (62.7 acres)
Land use: Established commercial

City of Baton Rouge NPDES stormwater permitting water-quality data

					Grab sample		Composite sample							
					Biochemical oxygen demand, 5-day		Chemical oxygen demand		Total dissolved solids, filtered residue at 180°C		Total suspended solids, residue at 105°C		Nitrogen, total as N	
Event no.	Beginning date of storm	Antecedent dry period (hours)	Total rainfall volume (inches)	Total runoff volume (inches)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	4- 3-93	72	3.93	3.64	7.7	6.3	23	19	16	13	49	40	0.46	0.38
2	5- 1-93	72	1.29	1.22	5.5	1.6	42	12	38	11	68	19	1.7	.47
3	6-18-93	120	[a]1.84	1.83	3.3	1.4	68	28	55	23	69	29	1.6	.66
4	7-21-93	72	1.73	1.12	5.6	1.4	51	13	43	11	47	12	1.3	.33
5	12- 4-93	144	1.36	.88	3.4	.7	41	8	19	4	164	33	1.3	.26
6	3- 1-94	96	1.99	1.98	7.1	3.2	28	13	28	13	50	22	.87	.39

Composite sample

	Ammonia plus organic nitrogen (Kjeidahl), total as N		Phosphorus, total as P		Phosphorus, filtered as P		Cadmium, total recoverable as Cd		Copper, total recoverable as Cu		Lead, total recoverable as Pb		Zinc, total recoverable as Zn	
Event no.	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	0.32	0.26	0.06	0.05	0.04	0.03	<0.001	<0.0008	0.005	0.004	0.017	0.014	0.05	0.014
2	1.3	.36	.04	.01	.02	.01	<.001	<.0003	.004	.001	.030	.008	.09	<.025
3	1.2	.50	.10	.04	.05	.02	<.001	<.0004	.013	.005	.039	.016	.13	.054
4	.76	.19	.13	.03	.07	.02	<.001	<.0003	.008	.002	.021	.005	.10	.025
5	1.1	.22	.18	.04	.11	.02	<.001	<.0002	.014	.003	.086	.017	.14	.028
6	.70	.32	.12	.05	.05	.02	<.001	<.0004	.006	.003	.016	.007	.05	.023

[a] Rainfall volume was estimated based on runoff coefficient.

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994

[USEPA, U.S. Environmental Protection Agency; --, no data; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; <, less than]

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Runoff volume						
Discharge (cubic feet)	827,955	278,357	417,378	254,579	200,506	451,950
Specific conductance						
Specific conductance (microsiemens per centimeter at 25 degrees Celsius)	35	53	65	46	37	40
pH and alkalinity						
pH (standard units)	6.0	6.9	6.6	5.8	7.2	8.0
Alkalinity, laboratory, as $CaCO_3$ (milligrams per liter)	9.6	14	15	11	12	13
Temperature						
Temperature, water (degrees Celsius)	17.0	23.5	29.0	29.0	19.5	18.0
Dissolved oxygen and oxygen demand (milligrams per liter)						
Dissolved oxygen	7.8	7.7	7.3	7.3	8.2	7.8
Chemical oxygen demand	23	42	68	51	41	28
Biochemical oxygen demand, 5-day	7.7	5.5	3.3	5.6	3.4	7.1
Fecal indicator bacteria (colonies per 100 milliliters)						
Fecal coliform, 0.65 micrometer filter	[a]670	--	[a]98,000	380	33,000	[a]3,800
Fecal streptococcus, 0.45 micrometer filter	[a]3,100	9,800	12,000	--	26,000	64,000
Major inorganic ions (milligrams per liter)						
Calcium, filtered, as Ca	2.9	5.6	6.5	5.1	3.4	4.9
Magnesium, filtered, as Mg	.28	.48	.48	.37	.36	.53
Sodium, filtered, as Na	.90	2.5	4.4	2.3	2.3	1.5
Potassium, filtered, as K	.50	.60	.80	.90	.80	.70
Sulfate, filtered, as SO_4	1.8	4.2	5.4	4.8	2.8	2.6
Chlorine, total residual	<.1	<.1	<.1	<.1	<.1	<.1
Chloride, filtered, as Cl	.90	2.2	3.4	1.2	1.5	.80
Dissolved and suspended solids (milligrams per liter)						
Total dissolved solids, filtered, residue at 180 degrees Celsius	16	38	55	43	19	28
Suspended solids, residue at 105 degrees Celsius	49	68	69	47	164	50

[a] Results based on colony count outside the acceptable range (non-ideal colony count).

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Nutrients (milligrams per liter)						
Nitrogen, total as N	0.46	1.7	1.6	1.3	1.3	0.87
Nitrogen, ammonia plus organic (Kjeldahl), total as N	.32	1.3	1.2	.76	1.1	.7
Phosphorus, total as P	.06	.04	.10	.13	.18	.12
Phosphorus, filtered as P	.04	.02	.05	.07	.11	.05
Trace elements (micrograms per liter)						
Antimony (USEPA method), total recoverable as Sb	<10	<10	<10	<10	<10	<10
Arsenic, total as As	<1	<1	2	<1	1	2
Beryllium, total recoverable as Be	<10	<10	<10	<10	<10	<10
Cadmium, total recoverable as Cd	<1	<1	<1	<1	<1	<1
Chromium, total recoverable as Cr	2	5	6	4	13	4
Copper, total recoverable as Cu	5	4	13	8	14	6
Lead, total recoverable as Pb	17	30	39	21	86	16
Mercury, total recoverable as Hg	<.1	<.1	<.1	<.1	<.1	.1
Nickel, total recoverable as Ni	2	2	4	3	4	2
Selenium, total recoverable as Se	<2	<2	<2	<2	<1	<1
Silver (USEPA method), total recoverable as Ag	<.5	<.5	<.5	<.5	<.5	<.5
Silver, total recoverable as Ag	<1	<1	<1	<1	<1	<1
Thallium (USEPA method), total recoverable as Tl	<5	<10	<10	<5	<5	<5
Zinc, total recoverable as Zn	50	90	130	100	140	50
Cyanide, total recoverable as CN (milligrams per liter)	<.01	<.01	<.01	<.01	<.01	<.01
Cyanide (USEPA method), total recoverable as CN (milligrams per liter)	<.01	<.01	<.01	<.01	<.01	<.01
Organic compounds						
Carbon, organic, total as C (milligrams per liter)	30	19	17	14	11	9.5
Oil and grease, total recoverable, gravimetric (milligrams per liter)	<1	<1	<1	<1	<1	10
Volatile organic compounds (micrograms per liter)						
Acrolein, total	<20	<20	<20	<20	<20	<20
Acrylonitrile, total	<20	<20	<20	<20	<20	<20
Benzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Bromoform, total	<.2	<.2	<.2	<.2	<.2	<.2

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Volatile organic compounds (micrograms per liter)--Continued						
Carbon tetrachloride, total	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Chlorodibromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroform, total	<.2	<.2	<.2	<.2	<.2	<.2
1,3-Cisdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Dichlorobromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Ethylbenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Methyl bromide, total	<.2	<.2	<.2	<.2	<.2	<.2
Methyl chloride, total	.7	<.2	<.2	<.2	<.2	<.2
Methylene chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
Tetrachloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
Toluene, total	.2	<.2	.2	.2	<.2	<.2
1,3-Transdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Trichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
Vinyl chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloropropane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Transdichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,1-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,2-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,2,2-Tetrachloroethane, total recoverable	<.2	<.2	<.2	<.2	<.2	<.2
2-Chloroethylvinylether, total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Base/neutral-extractable organic compounds (micrograms per liter)						
Acenaphthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzidine, total	<40	<40	<40	<40	<40	<40

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Benzo(a)anthracene, 1,2-benzanthracene, total	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, total	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene, total	<10	<10	<10	<10	<10	<10
2,4-Benzo(g,h,i)perylene, total	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, total	<10	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroethoxy)methane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroisopropyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-ethylhexyl)phthalate, total	25.0	<5.0	6.0	<5.0	<5.0	<5.0
N-butylbenzyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene, total	<10	<10	<10	<10	<10	<10
Diethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-butyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-octyl phthalate, total	<10	<10	<10	<10	<10	<10
Fluoranthene, total	<5.0	<5.0	<5.0	<5.0	6.0	<5.0
Fluorene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene, total	<.2	<5.0	<5.0	<5.0	<.2	<5.0
Hexachlorocyclopentadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachloroethane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene, total	<10	<10	<10	<10	<10	<10
Isophorone, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodi-n-propylamine, total	<.2	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodimethylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodiphenylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, total	<.2	<5.0	<5.0	<5.0	<.2	<5.0
Nitrobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Phenanthrene, total	<5.0	<5.0	<5.0	<5.0	5.0	<5.0
Pyrene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,5,6-Dibenzoanthracene, total	<10	<10	<10	<10	<10	<10
O-chlorobenzene, total recoverable	<.2	<.2	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,3-Dichlorobenzene, total	<.2	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene, total	<.2	<5.0	<5.0	<5.0	<.2	<5.0
1,2-Diphenylhydrazine, total recoverable	<5.0	<5.0	<5.0	<5.0	<5	<5.0
1,2,4-Trichlorobenzene, total recoverable	<.2	<5.0	<5.0	<5.0	<.2	<5.0
2-Chloronaphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine, total	<20	<20	<20	<20	<20	<20
4-Bromophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acid-extractable organic compounds (micrograms per liter)						
Parachlorometa cresol, total	<30	<30	<30	<30	<30	<30
Pentachlorophenol, total	<30	<30	<30	<30	<30	<30
Phenols, total	4	2	2	6	2	2
2-Chlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol, total	<20	<20	<20	<20	<20	<20
4,6-Dinitroorthocresol, total	<30	<30	<30	<30	<30	<30
4-Nitrophenol, total	<30	<30	<30	<30	<30	<30
Pesticides (micrograms per liter)						
Aldrin, total	<.04	<.04	<.04	<.04	<.04	<.04
Chlordane, total	.1	<.1	<.1	<.1	.1	<.1

Table A2. Quality of runoff from a drainage canal at Lobdell Boulevard in an established commercial land-use area, Baton Rouge, Louisiana, during selected storms, April 3, 1993-March 1, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-21-93	12-4-93	3-1-94
Pesticides (micrograms per liter)--Continued						
4,4'-DDD, total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE, total	<.04	<.04	<.04	<.04	<.04	<.04
4,4'-DDT, total	<.1	<.1	<.1	<.1	<.1	<.1
Dieldrin, total	<.02	<.02	<.02	<.02	<.02	<.02
Endosulfan I, total recoverable	<.1	<.1	<.1	<.1	<.1	<.1
Beta-endosulfan, total	<.04	<.04	<.04	<.04	<.04	<.04
Endosulfan sulfate, total	<.6	<.6	<.6	<.6	<.6	<.6
Endrin, total recoverable	<.06	<.06	<.06	<.06	<.06	<.06
Endrin aldehyde, total	<.2	<.2	<.2	<.2	<.2	<.2
Heptachlor epoxide, total	<.8	<.8	<.8	<.8	<.8	<.8
Heptachlor, total	<.03	<.03	<.03	<.03	<.03	<.03
Toxaphene, total	<2	<2	<2	<2	<2	<2
Alpha benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Beta benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Delta benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Gamma benzene hexachloride (lindane), total	<.09	<.09	<.09	<.09	<.09	<.09
Polychlorinated biphenyls (micrograms per liter)						
Aroclor 1016, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1221, total	<1.0	<1.0	<1.0	<1.0	<1.0	<.1
Aroclor 1232, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1242, total	.1	<.1	.1	.2	.1	.1
Aroclor 1248, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1254, total	.1	<.1	.2	.1	.2	.1
Aroclor 1260, total	<.1	<.1	<.1	<.1	.1	.1

Table A3. Summary of water-quality data from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994

[NPDES, National Pollution Discharge Elimination System; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; °C, degrees Celsius; EMC, event-mean concentration; mg/L, milligrams per liter; EL, event load; lb/acre, pounds per acre]

Sampling site: Tom Drive
Drainage area: 4,752,396 square feet (109.1 acres)
Land use: Industrial

City of Baton Rouge NPDES stormwater permitting water-quality data

					Grab sample		Composite sample							
					Biochemical oxygen demand, 5-day		Chemical oxygen demand		Total dissolved solids, filtered residue at 180°C		Total suspended solids, residue at 105°C		Nitrogen, total as N	
Event no.	Beginning date of storm	Antecedent dry period (hours)	Total rainfall volume (inches)	Total runoff volume (inches)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	4-14-93	120	[a]6.00	5.18	8.2	9.6	120	141	79	93	79	93	0.92	1.08
2	6-18-93	144	1.44	1.01	7.6	1.7	190	44	2	0.5	10	2	2.61	.60
3	7-21-93	120	[a]2.77	2.39	5.8	3.1	37	20	122	66	148	80	1.56	.85
4	12- 4-93	144	1.36	1.12	4.3	1.1	43	1	70	18	188	48	1.62	.41
5	2-23-94	144	.55	.33	6.0	.4	27	2	98	7	82	6	1.11	.08
6	4-12-94	96	.74	.59	8.0	1.1	19	3	100	13	138	18	1.75	.23

Composite sample

	Ammonia plus organic nitrogen (Kjeldahl), total as N		Phosphorus, total as P		Phosphorus, filtered as P		Cadmium, total recoverable as Cd		Copper, total recoverable as Cu		Lead, total recoverable as Pb		Zinc, total recoverable as Zn	
Event no.	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	0.61	0.72	0.14	0.16	0.090	0.11	<0.001	<0.0012	0.010	0.012	0.024	0.028	0.15	0.176
2	2.2	.50	.13	.03	.100	.02	<.001	<.0002	<.001	<.001	<.001	<.001	<.01	<.002
3	1.4	.76	.25	.14	.190	.10	<.001	<.0005	.023	.012	.120	.065	.27	.146
4	1.4	.36	.24	.06	.090	.02	.001	.0003	.018	.005	.370	.094	.23	.059
5	.81	.06	.20	.01	.040	<.02	<.001	<.0001	.014	.001	.036	.003	.16	.12
6	1.4	.19	.27	.04	.060	.01	<.001	<.0001	.014	.002	.039	.005	.15	.020

[a] Rainfall volume was estimated based on runoff coefficient.

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994

[USEPA, U.S. Environmental Protection Agency; --, no data; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; <, less than]

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Runoff volume						
Discharge (cubic feet)	2,053,645	400,604	947,360	444,572	129,770	233,330
Specific conductance						
Specific conductance (microsiemens per centimeter at 25 degrees Celsius)	143	2	221	145	190	193
pH and alkalinity						
pH (standard units)	5.9	7.1	6.4	6.9	7.3	7.5
Alkalinity, laboratory, as $CaCO_3$ (milligrams per liter)	4.5	1.5	72	48	56	75
Temperature						
Temperature, water (degrees Celsius)	23.0	29.0	27.5	19.5	17.0	22.5
Dissolved oxygen and oxygen demand (milligrams per liter)						
Dissolved oxygen	2.7	.6	6.1	8.0	6.0	4.6
Chemical oxygen demand	120	190	37	43	27	19
Biochemical oxygen demand, 5-day	8.2	7.6	5.8	4.3	6.0	8.0
Fecal indicator bacteria (colonies per 100 milliliters)						
Fecal coliform, 0.65 micrometer filter	[a]14,000	58,000	5,200	[a]16,000	[a]600	2,500
Fecal streptococcus, 0.45 micrometer filter	2,300	61,000	--	29,000	32,000	58,000
Major inorganic ions (milligrams per liter)						
Calcium, filtered, as Ca	16	.04	23	16	24	24
Magnesium, filtered, as Mg	1.8	<.01	3.0	1.0	2.2	2.1
Sodium, filtered, as Na	5.7	<.20	9.2	2.7	6.4	5.9
Potassium, filtered, as K	1.1	<.10	1.3	.90	1.0	1.4
Sulfate, filtered, as SO_4,	14	<.10	23	22	26	26
Chlorine, total residual	<.1	<.1	<.1	<.1	<.1	<.1
Chloride, filtered, as Cl,	4.2	<.10	7.6	1.9	4.0	4.5
Dissolved and suspended solids (milligrams per liter)						
Total dissolved solids, filtered, residue at 180 degrees Celsius	79	2	122	70	98	100
Suspended solids, residue at 105 degrees Celsius	79	10	148	188	82	138

[a] Results based on colony count outside the acceptable range (non-ideal colony count).

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Nutrients (milligrams per liter)						
Nitrogen, total as N	0.92	2.61	1.56	1.62	1.11	1.75
Nitrogen, ammonia plus organic (Kjeldahl), total as N	.61	2.2	1.4	1.4	.81	1.4
Phosphorus, total as P	.14	.13	.25	.24	.20	.27
Phosphorus, filtered as P	.09	.10	.19	.09	.04	.06
Trace elements (micrograms per liter)						
Antimony (USEPA method), total recoverable as Sb	--	<10	<10	<10	<10	<10
Arsenic, total as As	2	<1	6	2	3	2
Beryllium, total recoverable as Be	<10	<10	<10	<10	<10	<10
Cadmium, total recoverable as Cd	<1	<1	<1	1	<1	<1
Chromium, total recoverable as Cr	3	<1	13	44	5	7
Copper, total recoverable as Cu	10	<1	23	18	14	14
Lead, total recoverable as Pb	24	<1	120	370	36	39
Mercury, total recoverable as Hg	<.1	<.1	.2	.1	.1	.1
Nickel, total recoverable as Ni	3	<1	7	6	4	8
Selenium, total recoverable as Se	<2	<2	<2	<1	<1	<1
Silver (USEPA method), total recoverable as Ag	--	<.5	<.5	<.5	<.5	<.5
Silver, total recoverable as Ag	<1	<1	<1	<1	<1	<1
Thallium (USEPA method), total recoverable as Tl	--	<5	<10	<10	<5	<20
Zinc, total recoverable as Zn	150	<10	270	230	160	150
Cyanide, total recoverable as CN (milligrams per liter)	<.01	<.01	<.01	<.01	<.01	<.01
Cyanide (USEPA method), total recoverable as CN (milligrams per liter)	<.01	<.01	<.01	<.01	<.01	<.01
Organic compounds						
Carbon, organic, total as C (milligrams per liter	37	24	9.9	11	24	12
Oil and grease, total recoverable, gravimetric (milligrams per liter	2	<1	<1	<1	8	<1
Volatile organic compounds (micrograms per liter)						
Acrolein, total	<20	<20	<20	<20	<20	<20
Acrylonitrile, total	<20	<20	<20	<20	<20	<20
Benzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Bromoform, total	<.2	<.2	<.2	<.2	<.2	<.2

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Volatile organic compounds (micrograms per liter)--Continued						
Carbon tetrachloride, total	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Chlorodibromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroform, total	<.2	.6	<.2	<.2	<.2	<.2
1,3-Cisdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Dichlorobromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Ethylbenzene, total	<.2	.2	<.2	<.2	2.0	1.4
Methyl bromide, total	<.2	<.2	<.2	<.2	<.2	<.2
Methyl chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
Methylene chloride, total	.2	.2	<.2	.2	<.2	<.2
Tetrachloroethylene, total	<.2	.6	<.2	<.2	<.2	<.2
Toluene, total	.3	.8	<.2	.4	.2	<.2
1,3-Transdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Trichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
Vinyl chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloropropane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Transdichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,1-Trichloroethane, total	<.2	<.2	<.2	<.2	.2	<.2
1,1,2-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,2,2-Tetrachloroethane, total recoverable	<.2	<.2	<.2	<.2	<.2	<.2
2-Chloroethylvinylether, total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Base/neutral-extractable organic compounds (micrograms per liter)						
Acenaphthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzidine, total	<40	<40	<40	<40	<40	<40

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Benzo(a)anthracene, 1,2-benzanthracene, total	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, total	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene, total	<10	<10	<10	<10	<10	<10
2,4-Benzo(g,h,i)perylene, total	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, total	<10	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroethoxy)methane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroisopropyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-ethylhexyl)phthalate, total	7.0	7.0	<5.0	<5.0	<5.0	<5.0
N-butylbenzyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene, total	<10	<10	<10	<10	<10	<10
Diethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-butyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-octyl phthalate, total	<10	<10	<10	<10	<10	<10
Fluoranthene, total	<5.0	16.0	<5.0	<5.0	<5.0	<5.0
Fluorene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene, total	<5.0	<5.0	<5.0	<.2	<5.0	<5.0
Hexachlorocyclopentadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachloroethane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene, total	<10	<10	<10	<10	<10	<10
Isophorone, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodi-n-propylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodimethylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodiphenylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, total	<5.0	<5.0	<5.0	.3	1.8	<5.0
Nitrobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Phenanthrene, total	<5.0	11	<5.0	<5.0	<5.0	<5.0
Pyrene, total	<5.0	12	<5.0	<5.0	<5.0	<5.0
1,2,5,6-Dibenzoanthracene, total	<10	<10	<10	<10	<10	<10
O-chlorobenzene, total recoverable	<5.0	<5.0	<5.0	<.20	<5.0	<5.0
1,2-Dichlorobenzene, total						
1,3-Dichlorobenzene, total	<5.0	<5.0	<5.0	<.20	<5.0	<5.0
1,4-Dichlorobenzene, total	<5.0	<5.0	<5.0	<.20	<5.0	<5.0
1,2-Diphenylhydrazine, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene, total recoverable	<5.0	<5.0	<5.0	<0.20	<5.0	<5.0
2-Chloronaphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine, total	<20	<20	<20	<20	<20	<20
4-Bromophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acid-extractable organic compounds (micrograms per liter)						
Parachlorometa cresol, total	<30	<30	<30	<30	<30	<30
Pentachlorophenol, total	<30	<30	<30	<30	<30	<30
Phenols, total	9	<1	4	1	9	4
2-Chlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol, total	<20	<20	<20	<20	<20	<20
4,6-Dinitroorthocresol, total	<30	<30	<30	<30	<30	<30
4-Nitrophenol, total	<30	<30	<30	<30	<30	<30
Pesticides (micrograms per liter)						
Aldrin, total	<.04	<.4	<.04	<.04	<.04	<.04
Chlordane, total	.1	1.	<.1	.2	.1	.1

Table A4. Quality of runoff from a drainage canal at Tom Drive in an industrial land-use area, Baton Rouge, Louisiana, during selected storms, April 14, 1993-April 12, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-14-93	6-18-93	7-21-93	12-4-93	2-23-94	4-12-94
Pesticides (micrograms per liter)--Continued						
4,4'-DDD, total	<0.1	<.1	<.1	<.1	<.1	<.1
4,4'-DDE, total	<.04	<.4	<.04	<.04	<.04	<.04
4,4'-DDT, total	<.1	<1	<.1	<.1	<.1	<.1
Dieldrin, total	<.02	<.2	<.02	<.02	<.02	<.02
Endosulfan I, total recoverable	<.1	<1	<.1	<.1	<.1	<.1
Beta-endosulfan, total	<.04	<.4	<.04	<.04	<.04	<.04
Endosulfan sulfate, total	<.6	<6	<.6	<.6	<.6	<.6
Endrin, total recoverable	<.06	<.6	<.06	<.06	<.06	<.06
Endrin aldehyde, total	<.2	<2	<.2	<.2	<.2	<.2
Heptachlor epoxide, total	<.8	<8	<.8	<.8	<.8	<.8
Heptachlor, total	<.03	<.3	<.03	<.03	<.03	<.03
Toxaphene, total	<20	<20	<2	<2	<2	<2
Alpha benzene hexachloride, total	<.03	<.3	<.03	<.03	<.03	<.03
Beta benzene hexachloride, total	<.03	<.3	<.03	<.03	<.03	<.03
Delta benzene hexachloride, total	<.09	<.9	<.09	<.09	<.09	<.09
Gamma benzene hexachloride (lindane), total	<.03	<.3	<.03	<.03	<.03	<.03
Polychlorinated biphenyls (micrograms per liter)						
Aroclor 1016, total	<.1	<1.0	<.1	<.1	<.1	<.1
Aroclor 1221, total	<1.0	<10	<1.0	<1.0	<1.0	<.1
Aroclor 1232, total	<.1	<1.0	<.1	<.1	<.1	<.1
Aroclor 1242, total	.2	<1.0	<.1	<.1	<.1	<.1
Aroclor 1248, total	<.1	<1.0	<.1	<.1	<.1	<.1
Aroclor 1254, total	<.1	<1.0	<.1	.1	.1	<.1
Aroclor 1260, total	<.1	<1.	<.1	.1	<.1	<.1

Table A5. Summary of water-quality data from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994

[NPDES, National Pollution Discharge Elimination System; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; °C, degrees Celsius; EMC, event-mean concentration; mg/L, milligrams per liter; EL, event load; lb/acre, pounds per acre]

Sampling site: Sunbelt Court
Drainage area: 6,838,920 square feet (157 acres)
Land use: New commercial

City of Baton Rouge NPDES stormwater permitting water-quality data

					Grab sample		Composite sample							
					Biochemical oxygen demand, 5-day		Chemical oxygen demand		Total dissolved solids, filtered residue at 180°C		Total suspended solids residue at 105°C		Nitrogen, total as N	
Event no.	Beginning date of storm	Antecedent dry period (hours)	Total rainfall volume (inches)	Total runoff volume (inches)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	4- 3-93	72	[a]3.13	2.32	5.9	3.1	80	42	70	37	223	117	0.86	0.45
2	5- 1-93	240	[b]1.38	.71	5.8	.9	31	5	40	6	192	31	1.47	.24
3	6-18-93	144	1.61	.45	7.7	.8	74	8	78	8	350	36	1.52	.16
4	7-20-93	120	1.53	.56	6.5	.8	78	10	60	8	87	11	1.32	.17
5	12- 4-93	120	[b]1.01	.52	6.7	.8	44	5	54	2	358	42	2.41	.28
6	6-22-94	72	1.96	.38	6.7	.6	120	10	74	6	54	5	1.05	.09

	Composite sample													
	Ammonia plus organic nitrogen (Kjeldahl), total as N		Phosphorus, total as P		Phosphorus, filtered as P		Cadmium, total recoverable as Cd		Copper, total recoverable as Cu		Lead, total recoverable as Pb		Zinc, total recoverable as Zn	
Event no.	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	0.64	0.34	0.14	0.07	0.06	0.03	<0.001	<0.0005	0.007	0.004	0.025	0.013	0.25	0.131
2	1.3	.21	.11	.02	.03	<.01	.002	.0003	.019	.003	.100	.016	.46	.074
3	1.4	.14	.19	.02	.09	.01	.002	.0002	.012	.001	.052	.005	.43	.044
4	.88	.11	.22	.03	.11	.01	<.001	<.0001	.006	.001	.019	.002	.20	.025
5	2.2	.26	.34	.04	.13	.02	<.001	<.0001	.011	.001	.025	.003	.24	.028
6	.91	.08	.12	.01	.04	<.01	<.001	<.0001	.005	<.001	.007	.001	.08	.007

[a] Rainfall volume data were obtained from the Louisiana Office of State Climatology in Baton Rouge
[b] Rainfall volume was estimated based on runoff coefficient

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994

[USEPA, U.S. Environmental Protection Agency; --, no data; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; <, less than]

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Runoff volume						
Discharge (cubic feet)	1,322,116	405,600	259,300	319,400	297,000	215,500
Specific conductance						
Specific conductance (microsiemens per centimeter at 25 degrees Celsius)	143	114	206	116	101	76
pH and alkalinity						
pH (standard units)	6.1	6.8	7.1	6.3	7.3	7.7
Alkalinity, laboratory, as $CaCO_3$ (milligrams per liter)	57	56	138	51	39	34
Temperature						
Temperature, water (degrees Celsius)	17.0	24.0	31.0	29.5	19.5	28.0
Dissolved oxygen and oxygen demand (milligrams per liter)						
Dissolved oxygen	7.2	8.5	4.4	6.9	7.7	7.3
Chemical oxygen demand	80	31	74	78	44	120
Biochemical oxygen demand, 5-day	5.9	5.8	7.7	6.5	6.7	6.7
Fecal indicator bacteria (colonies per 100 milliliters)						
Fecal coliform, 0.65 micrometer filter	[a]750	6,200	5,800	4,200	[a]17,000	[a]36,000
Fecal streptococcus, 0.45 micrometer filter	[a]1,900	5,600	270	--	15,000	22,000
Major inorganic ions (milligrams per liter)						
Calcium, filtered, as Ca	10	8.6	15	12	9.7	8.8
Magnesium, filtered, as Mg	1.6	1.1	2.3	1.3	1.1	1.2
Sodium, filtered, as Na	6.3	2.6	5.8	2.6	3.0	2.3
Potassium, filtered, as K	2.9	1.4	2.4	2.4	2.5	1.5
Sulfate, filtered, as SO_4	4.7	3.4	5.9	6.4	7.3	3.2
Chlorine, total residual	<.1	<.1	<.1	<.1	<.1	<.1
Chloride, filtered, as Cl	6.5	2.6	5.0	1.7	2.2	1.9
Dissolved and suspended solids (milligrams per liter)						
Total dissolved solids, filtered, residue at 180 degrees Celsius	70	40	78	60	54	74
Suspended solids, residue at 105 degrees Celsius	223	192	350	87	358	54

[a] Results based on colony count outside the acceptable range (non-ideal colony count).

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Nutrients (milligrams per liter)						
Nitrogen, total as N	0.86	1.47	1.52	1.32	2.41	1.05
Nitrogen, ammonia plus organic (Kjeldahl), total as N	.64	1.3	1.4	.88	2.2	.91
Phosphorus, total as P	.140	.110	.190	.220	.340	.120
Phosphorus, filtered as P	.060	.030	.090	.110	.130	.040
Trace elements (micrograms per liter)						
Antimony (USEPA method), total recoverable as Sb	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Arsenic, total as As	2	2	3	3	3	<1
Beryllium, total recoverable as Be	<10	<10	<10	<10	<10	<10
Cadmium, total recoverable as Cd	<1	2	2	<1	<1	<1
Chromium, total recoverable as Cr	9	83	15	7	11	4
Copper, total recoverable as Cu	7	19	12	6	11	5
Lead, total recoverable as Pb	25	100	52	19	25	7
Mercury, total recoverable as Hg	<.10	<.10	<.10	.10	.10	<.10
Nickel, total recoverable as Ni	14	40	21	9	10	4
Selenium, total recoverable as Se	<2	<2	<2	<2	<1	<1
Silver (USEPA method), total recoverable as Ag	<1.00	<.500	<.500	<.500	<1.00	<.500
Silver, total recoverable as Ag	<1	<1	<1	<1	<1	<1
Thallium (USEPA method), total recoverable as Tl	<5	<10	<10	<5	<5	<10
Zinc, total recoverable as Zn	250	460	430	200	240	80
Cyanide, total recoverable as CN (milligrams per liter)	<.010	<.010	<.010	<.010	<.010	--
Cyanide (USEPA method), total recoverable as CN (milligrams per liter)	<.010	<.010	<.010	<.010	<.010	<.010
Organic compounds						
Carbon, organic, total as C (milligrams per liter)	13	13	18	20	16	84
Oil and grease, total recoverable, gravimetric (milligrams per liter)	<1	<1	1	2	<1	1
Volatile organic compounds (micrograms per liter)						
Acrolein, total	<20	<20	<20	<20	<20	<20
Acrylonitrile, total	<20	<20	<20	<20	<20	<20
Benzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Bromoform, total	<.2	<.2	<.2	<.2	<.2	<.2

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Volatile organic compounds (micrograms per liter)--Continued						
Carbon tetrachloride, total	<.2	<.2	<.2	<.2	<.2	<.2
Chlorobenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Chlorodibromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Chloroform, total	<.2	<.2	<.2	<.2	<.2	<.2
1,3-Cisdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Dichlorobromomethane, total	<.2	<.2	<.2	<.2	<.2	<.2
Ethylbenzene, total	<.2	<.2	<.2	<.2	<.2	<.2
Methyl bromide, total	<.2	<.2	<.2	<.2	<.2	<.2
Methyl chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
Methylene chloride, total	<.2	<.2	<.2	.8	<.2	<.2
Tetrachloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
Toluene, total	<.2	<.2	.2	.3	<.2	<.2
1,3-Transdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<.2
Trichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
Vinyl chloride, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1-Dichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Dichloropropane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,2-Transdichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,1-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,2-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<.2
1,1,2,2-Tetrachloroethane, total recoverable	<.2	<.2	<.2	<.2	<.2	<.2
2-Chloroethylvinylether, total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Base/neutral-extractable organic compounds (micrograms per liter)						
Acenaphthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, total	<5.0	<5.0	<5.0	<5.0	<5.0	8.0
Benzidine, total	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Benzo(a)anthracene, 1,2-benzanthracene, total	<10.0	<10.0	<10.0	<10.0	<10.0	18.0
Benzo(a)pyrene, total	<10.0	<10.0	<10.0	<10.0	<10.0	21.0
Benzo(b)fluoranthene, total	<10.0	<10.0	<10.0	<10.0	<10.0	23.0
2,4-Benzo(g,h,i)perylene, total	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(k)fluoranthene, total	<10.0	<10.0	<10.0	<10.0	<10.0	18.0
Bis(2-chloroethyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroethoxy)methane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroisopropyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-ethylhexyl)phthalate, total	<5.0	<5.0	<5.0	210	<5.0	18.0
N-butylbenzyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene, total	<10.0	<10.0	<10.0	<10.0	<10.0	18.0
Diethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-butyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-octyl phthalate, total	<10.0	<10.0	<10.0	16.0	<10.0	<10.0
Fluoranthene, total	<5.0	<5.0	<5.0	22.0	<5.0	32.0
Fluorene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorocyclopentadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachloroethane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene, total	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Isophorone, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodi-n-propylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodimethylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodiphenylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Nitrobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Phenanthrene, total	<5.0	<5.0	<5.0	12.0	<5.0	26.0
Pyrene, total	<5.0	<5.0	<5.0	17.0	<5.0	25.0
1,2,5,6-Dibenzoanthracene, total	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
O-chlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene, total						
1,3-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Diphenylhydrazine, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chloronaphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
4-Bromophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acid-extractable organic compounds (micrograms per liter)						
Parachlorometa cresol, total	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0
Pentachlorophenol, total	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0
Phenols, total	2	<1	<1	4	4	5
2-Chlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
4,6-Dinitroorthocresol, total	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0
4-Nitrophenol, total	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0
Pesticides (micrograms per liter)						
Aldrin, total	<.040	<.040	<.040	<.40	<.040	1.3
Chlordane, total	<.1	<.1	<.1	1.0	<.1	60

Table A6. Quality of runoff from a drainage canal at Sunbelt Court in a new commercial land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, April 3, 1993-June 22, 1994—Continued

Water-quality property or constituent	Beginning date of storm					
	4-3-93	5-1-93	6-18-93	7-20-93	12-4-93	6-22-94
Pesticides (micrograms per liter)--Continued						
4,4'-DDD, total	<.10	<.10	<.10	<1.0	<.10	.20
4,4'-DDE, total	<.04	<.04	<.04	<.40	<.04	<.04
4,4'-DDT, total	<.10	<.10	<.10	<1.0	<.10	<.10
Dieldrin, total	<.020	<.020	<.020	.060	<.020	.060
Endosulfan I, total recoverable	<.1	<.1	<.1	<.1	<.1	<.1
Beta-endosulfan, total	<.04	<.04	<.04	<.04	<.04	<.04
Endosulfan sulfate, total	<.60	<.60	<.60	<.60	<.60	<.60
Endrin, total recoverable	<.060	<.060	<.060	<.060	<.060	<.060
Endrin aldehyde, total	<.20	<.20	<.20	<.20	<.20	<.20
Heptachlor epoxide, total	<.80	<.80	<.80	<.80	<.80	<.80
Heptachlor, total	<.030	<.030	<.030	<.30	<.030	.90
Toxaphene, total	<2	<2	<2	<2	<2	<2
Alpha benzene hexachloride, total	<.03	<.03	<.03	<.30	<.03	<.03
Beta benzene hexachloride, total	<.03	<.03	<.03	<.30	<.03	<.03
Delta benzene hexachloride, total	<.09	<.09	<.09	<.09	<.09	<.09
Gamma benzene hexachloride (lindane), total	<.030	<.030	<.030	<.30	<.030	<.030
Polychlorinated biphenyls (micrograms per liter)						
Aroclor 1016, total	<.1	<.1	<.1	<1.0	<.1	<.1
Aroclor 1221, total	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0
Aroclor 1232, total	<.1	<.1	<.1	<1.0	<.1	<.1
Aroclor 1242, total	<.1	<.1	<.1	1.0	<.1	.1
Aroclor 1248, total	<.1	<.1	<.1	<1.0	<.1	<.1
Aroclor 1254, total	<.1	<.1	<.1	<1.0	<.1	.1
Aroclor 1260, total	<.1	<.1	<.1	1.0	<.1	<.1

Table A7. Summary of water-quality data from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995

[NPDES, National Pollution Discharge Elimination System; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; °C, degrees Celsius; EMC, event mean concentration; mg/L, milligrams per liter; EL, event load; lb/acre, pounds per acre]

Sampling site: Goodwood Boulevard
Drainage area: 23,975,424 square feet (550.4 acres)
Land use: Residential

City of Baton Rouge NPDES stormwater permitting water-quality data

					Grab sample		Composite sample							
					Biochemical oxygen demand, 5-day		Chemical oxygen demand		Total dissolved solids, filtered residue at 180°C		Total suspended solids, residue at 105°C		Nitrogen, total as N	
Event no.	Beginning date of storm	Antecedent dry period (hours)	Total rainfall volume (inches)	Total runoff volume (inches)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	6-18-93	72	[a]1.81	0.12	5.9	0.2	67	2	74	2	707	20	2.7	0.8
2	7-21-93	72	2.52	.41	5.6	.5	45	4	53	5	416	39	2.6	.24
3	2-23-94	72	[a]1.06	.08	7.1	.1	90	2	84	1	464	8	3.0	.05
4	6-22-94	72	1.43	.21	5.2	.3	33	2	72	4	3,230	160	13.1	.65
5	11- 5-94	72	1.01	.10	7.7	.2	57	13	68	2	288	7	1.2	.03
6	3-13-95	72	4.26	1.36	7.1	2.2	73	23	40	12	474	146	3.5	1.08

	Composite sample													
	Ammonia plus organic nitrogen (Kjeidahl), total as N		Phosphorus, total as P		Phosphorus, filtered as P		Cadmium, total recoverable as Cd		Copper, total recoverable as Cu		Lead, total recoverable as Pb		Zinc, total recoverable as Zn	
Event no.	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	2.6	0.07	0.31	0.01	0.06	<0.01	0.002	<0.0001	0.01	<0.001	0.08	0.002	0.16	<0.001
2	2.1	.20	.58	.05	.29	.03	<.001	<.0001	.011	.001	.075	.007	.13	.012
3	2.8	.05	1.4	.02	.13	<.01	.002	<.0001	.038	.001	.28	.005	.27	.005
4	13	.64	1.6	.08	.09	<.01	.002	<.0001	.22	.011	.28	.014	1.3	.064
5	1.2	.03	.35	.01	.12	<.01	<.001	<.0001	.01	<.001	.036	.001	.08	.002
6	3.3	1.01	.58	.18	.28	.09	.001	.0003	.012	.004	.12	.037	.22	.068

[a] Rainfall volume was estimated based on runoff coefficient.

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995

[USEPA, U.S. Environmental Protection Agency; --, no data; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; <, less than]

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Runoff volume						
Discharge (cubic feet)	251,580	821,970	155,780	436,950	207,580	2,721,210
Specific conductance						
Specific conductance (microsiemens per centimeter at 25 degree Celsius)	136	68	170	125	101	82
pH and alkalinity						
pH (standard units)	7.2	6.1	6.5	7.1	5.9	6.7
Alkalinity, laboratory, as $CaCO_3$ (milligrams per liter)	51	24	104	107	39	18.6
Temperature						
Temperature, water (degrees Celsius)	32	26.6	17.0	27.0	26.0	18.5
Dissolved oxygen and oxygen demand (milligrams per liter)						
Dissolved oxygen	6.1	7.2	7.1	5.5	5.5	7.3
Chemical oxygen demand	67	45	90	33	57	73
Biochemical oxygen demand, 5-day	5.9	5.6	7.1	5.2	7.7	7.1
Fecal indicator bacteria (colonies per 100 milliliters)						
Fecal coliform, 0.65 micrometer filter	30,000	27,000	[a]92,000	[a]84,000	[a]194,000	190,000
Fecal streptococcus, 0.45 micrometer filter	15,000	--	80,000	[a]60,000	73,000	170,000
Major inorganic ions (milligrams per liter)						
Calcium, filtered, as Ca	15	4.6	14	10	9.2	5.1
Magnesium, filtered, as Mg	1.9	.75	2.4	2.5	1.5	.89
Sodium, filtered, as Na	6.1	3.1	5.0	3.1	7.3	3.0
Potassium, filtered, as K	1.6	2.2	1.3	1.1	2.0	2.1
Sulfate, filtered, as SO_4	4.7	4.1	5.5	2.3	4.3	2.2
Chlorine, total residual	<.1	<.1	<.1	<.1	<.1	--
Chloride, filtered, as Cl	5.0	2.0	4.1	2.3	5.8	4.0
Dissolved and suspended solids (milligrams per liter)						
Total dissolved solids, filtered, residue at 180 degrees Celsius	74	53	84	72	68	40
Suspended solids, residue at 105 degrees Celsius	707	416	464	3,230	288	474

[a] Results based on colony count outside the acceptable range (non-ideal colony count).

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Nutrients (milligrams per liter)						
Nitrogen, total as N	2.7	2.6	3.0	13	1.2	3.5
Nitrogen, ammonia plus organic (Kjeldahl), total as N	2.6	2.1	2.8	13	1.2	3.3
Phosphorus, total as P	.310	.580	1.40	1.60	.350	.580
Phosphorus, filtered as P	.060	.290	.130	.090	.120	.280
Trace elements (micrograms per liter)						
Antimony (USEPA method), total recoverable as Sb	<10.0	<10.0	<10.0	<10.0	<20.0	<10
Arsenic, total as As	4	4	5	10	2	8
Beryllium, total recoverable as Be	<10	<10	<10	20	<10	<10
Cadmium, total recoverable as Cd	2	<1	2	2	<1	1
Chromium, total recoverable as Cr	8	6	22	96	6	10
Copper, total recoverable as Cu	10	11	38	220	10	12
Lead, total recoverable as Pb	80	75	280	280	36	120
Mercury, total recoverable as Hg	<.10	.10	.20	<.10	.10	<.10
Nickel, total recoverable as Ni	13	11	65	270	7	27
Selenium, total recoverable as Se	<2	<2	<1	<1	<1	<1
Silver (USEPA method), total recoverable as Ag	<.500	<.500	<.500	<.500	<.500	<1
Silver, total recoverable as Ag	<1	<1	<1	<1	<1	<1
Thallium (USEPA method), total recoverable as Tl	<5	<5	<5	<10	<5	<5
Zinc, total recoverable as Zn	160	130	270	1,300	80	220
Cyanide, total recoverable as CN (milligrams per liter)	<.010	<.010	<.010	--	<.010	<.010
Cyanide (USEPA method), total recoverable as CN (milligrams per liter)	<.010	<.010	<.010	<.010	<.010	<.01
Organic compounds						
Carbon, organic, total as C (milligrams per liter)	38	22	26	8.4	20	35
Oil and grease, total recoverable, gravimetric (milligrams per liter)	<1	<1	11	<1	2	<1
Volatile organic compounds (micrograms per liter)						
Acrolein, total	<20	<20	<20	<20	<400	<100
Acrylonitrile, total	<20	<20	<20	<20	<400	<100
Benzene, total	<.2	<.2	<.2	<.2	<.2	<1.0
Bromoform, total	<.2	<.2	<.2	<.2	<.2	<1.0

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Volatile organic compounds (micrograms per liter)--Continued						
Carbon tetrachloride, total	<.2	<.2	<.2	<.2	<.2	<1.0
Chlorobenzene, total	<.20	<.20	<.20	<.20	<.20	<1.0
Chlorodibromomethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
Chloroethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
Chloroform, total	.5	<.2	<.2	<.2	<.2	<1.0
1,3-Cisdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<1.0
Dichlorobromomethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
Ethylbenzene, total	<.2	<.2	.3	<.2	<.2	<1.0
Methyl bromide, total	<.2	<.2	<.2	<.2	<.2	<1.0
Methyl chloride, total	<.2	<.2	<.2	<.2	<.2	<1.0
Methylene chloride, total	<.2	<.2	<.2	<.2	<.2	<1.0
Tetrachloroethylene, total	<.2	<.2	<.2	<.2	<.2	<1.0
Toluene, total	.3	.3	.5	.3	<.2	<1.0
1,3-Transdichloropropene, total	<.2	<.2	<.2	<.2	<.2	<1.0
Trichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<1.0
Vinyl chloride, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,1-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,1-Dichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,2-Dichloroethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,2-Dichloropropane, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,2-Transdichloroethylene, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,1,1-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,1,2-Trichloroethane, total	<.2	<.2	<.2	<.2	<.2	<1.0
1,1,2,2-Tetrachloroethane, total recoverable	<.2	<.2	<.2	<.2	<.2	<1.0
2-Chloroethylvinylether, total	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0
Base/neutral-extractable organic compounds (micrograms per liter)						
Acenaphthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzidine, total	<40	<40	<40	<40	<40	<40

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Benzo(a)anthracene, 1,2-benzanthracene, total	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, total	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene, total	<10	<10	<10	<10	<10	<10
2,4-Benzo(g,h,i)perylene, total	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, total	<10	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroethoxy)methane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroisopropyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-ethylhexyl)phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-butylbenzyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene, total	<10	<10	<10	<10	<10	<10
Diethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-butyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-octyl phthalate, total	<10	<10	<10	<10	<10	<10
Fluoranthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Fluorene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene, total	<5.0	<5.0	<5.0	<5.0	<0.2	<5.0
Hexachlorocyclopentadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachloroethane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene, total	<10	<10	<10	<10	<10	<10
Isophorone, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodi-n-propylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodimethylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodiphenylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, total	<5.0	<5.0	<5.0	<5.0	<.2	<5.0
Nitrobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Phenanthrene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyrene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,5,6-Dibenzoanthracene, total	<10	<10	<10	<10	<10	<10
O-chlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<.2	<5.0
1,2-Dichlorobenzene, total						
1,3-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<.2	<5.0
1,4-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<.2	<5.0
1,2-Diphenylhydrazine, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<0.2	<5.0
2-Chloronaphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine, total	<20	<20	<20	<20	<20	<20
4-Bromophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acid-extractable organic compounds (micrograms per liter)						
Parachlorometa cresol, total	<30	<30	<30	<30	<30	<30
Pentachlorophenol, total	<30	<30	<30	<30	<30	<30
Phenols, total	<1	4	5	5	2	11
2-Chlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol, total	<20	<20	<20	<20	<20	<20
4,6-Dinitroorthocresol, total	<30	<30	<30	<30	<30	<30
4-Nitrophenol, total	<30	<30	<30	<30	<30	<30
Pesticides (micrograms per liter)						
Aldrin, total	<.04	<.04	<.04	<.04	<.04	<.04
Chlordane, total	.8	.2	1.2	<.1	.1	.6

Table A8. Quality of runoff from a drainage canal at Goodwood Boulevard in a residential land-use area, Baton Rouge, Louisiana, during selected storms, June 18, 1993-March 13, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	6-18-93	7-21-93	2-23-94	6-22-94	11-5-94	3-13-95
Pesticides (micrograms per liter)--Continued						
4,4'-DDD, total	.2	<.1	.1	<.1	<.1	<.1
4,4'-DDE, total	<.1	<.04	<.04	<.04	<.04	<.04
4,4'-DDT, total	<.1	<.1	<.1	<.1	<.1	<.1
Dieldrin, total	.03	<.02	<.02	<.02	<.02	.02
Endosulfan I, total recoverable	<.1	<.1	<.1	<.1	<.1	<.1
Beta-endosulfan, total	<.04	<.04	<.04	<.04	<.04	<.04
Endosulfan sulfate, total	<.6	<.6	<.6	<.6	<.6	<.6
Endrin, total recoverable	<.06	<.06	<.06	<.06	<.06	<.06
Endrin aldehyde, total	<.2	<.2	<.2	<.2	<.2	<.2
Heptachlor epoxide, total	<.8	<.8	<.8	<.8	<.8	<.8
Heptachlor, total	<.03	<.03	.04	<.03	<.03	<.03
Toxaphene, total	<2	<2	<2	<2	<2	<2
Alpha benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Beta benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Delta benzene hexachloride, total	<.09	<.09	<.09	<.09	<.09	<.09
Gamma benzene hexachloride (lindane), total	<.03	<.03	<.03	<.03	<.03	<.03
Polychlorinated biphenyls (micrograms per liter)						
Aroclor 1016, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1221, total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1232, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1242, total	2	.1	<.1	<.1	<.1	<.1
Aroclor 1248, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1254, total	<.1	<.1	.3	<.1	<.1	.1
Aroclor 1260, total	<.1	<.1	<.1	<.1	<.1	<.1

Table A9. Summary of water-quality data from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994-June 29, 1995

[NPDES, National Pollution Discharge Elimination System; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; °C, degrees Celsius; EMC, event-mean concentration; mg/L, milligrams per liter; EL, event load; lb/acre, pounds per acre; --, no data]

Sampling site: Hooper Road
Drainage area: 166,137,840 square feet (3,814 acres)
Land use: Undeveloped

City of Baton Rouge NPDES stormwater permitting water-quality data

					Grab sample		Composite sample							
					Biochemical oxygen demand, 5-day		Chemical oxygen demand		Total dissolved solids, filtered residue at 180°C		Total suspended solids, residue at 105°C		Nitrogen, total as N	
Event no.	Beginning date of storm	Antecedent dry period (hours)	Total rainfall volume (inches)	Total runoff volume (inches)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	2-23-94	72	0.71	0.33	6.9	0.5	39	3	168	13	298	23	5.27	0.40
2	4-12-94	72	1.46	.55	7.4	.9	70	88	148	19	260	33	4.27	.54
3	10-19-94	72	2.17	2.16	7.7	3.8	65	32	46	22	350	171	2.14	1.05
4	3-13-95	72	5.67	3.82	8.2	7.1	56	49	62	54	526	456	2.05	1.78
5	5- 8-95	72	3.12	1.81	6.0	2.5	65	26	71	29	672	276	1.59	.65
6	6-29-95	72	3.17	.35	4.4	.4	54	4	60	5	740	60	1.87	.15

Composite sample

	Ammonia plus organic nitrogen (Kjeldahl), total as N		Phosphorus, total as P		Phosphorus, filtered as P		Cadmium, total recoverable as Cd		Copper, total recoverable as Cu		Lead, total recoverable as Pb		Zinc, total recoverable as Zn	
Event no.	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)	EMC (mg/L)	EL (lb/acre)
1	4.5	0.34	1.0	0.08	0.34	0.03	<0.001	<0.0001	0.006	<0.001	0.006	<0.001	0.030	0.002
2	3.6	.45	.86	.11	.34	.04	<.001	<.0001	.006	.001	.006	.001	.030	.004
3	1.7	.83	.32	.16	.21	.16	.002	.0001	.007	.003	.008	.004	.040	.020
4	1.9	1.65	.31	.27	.05	.04	<.001	<.0001	.005	.004	.010	.009	.030	.026
5	1.4	.58	.46	.19	.06	.07	<.001	<.0004	.003	.001	.010	.004	.040	.016
6	1.4	.11	.39	.03	.11	.01	<.001	<.0001	.005	<.001	.013	.011	.040	.003

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995

[USEPA, U.S. Environmental Protection Agency; --, no data; filtered, sample which passed through a 142-millimeter, 0.45-micrometer membrane filter; <, less than]

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Runoff volume						
Discharge (cubic feet)	--	--	--	--	--	--
Specific conductance						
Specific conductance (microsiemens per centimeter at 25 degrees Celsius)	266	226	88	89	86	96
pH and alkalinity						
pH (standard units)	7.4	6.8	6.3	6.8	6.9	7.3
Alkalinity, laboratory, as $CaCO_3$ (milligrams per liter)	56	45	13	8.7	11	11
Temperature						
Temperature, water (degrees Celsius)	17.0	20.5	22.5	18.0	21.5	23.0
Dissolved oxygen and oxygen demand (milligrams per liter)						
Dissolved oxygen	6.9	5.0	8.3	8.6	8.2	7.7
Chemical oxygen demand	39	70	65	56	65	54
Biochemical oxygen demand, 5-day	6.9	7.4	7.7	8.2	6	4.4
Fecal indicator bacteria, (colonies per 100 milliliters)						
Fecal coliform, 0.65 micrometer filter	[a]13,000	[a]800	[a]147,000	9,200	--	5,700
Fecal streptococcus, 0.45 micrometer filter	4,800	6,200	[a]77,000	27,000	--	6,700
Major inorganic ions (milligrams per liter)						
Calcium, filtered, as Ca	7.4	6.8	3.0	3.2	3.1	3.0
Magnesium, filtered, as Mg	2.8	2.5	1.1	1.3	1.2	1.2
Sodium, filtered, as Na	42	35	9.5	9.3	9.3	12
Potassium, filtered, as K	2.8	2.9	3.2	1.4	1.6	2.0
Sulfate, filtered, as SO_4	13	12	5.8	5.0	4.7	5.5
Chlorine, total residual	<.1	<.1	<.1	--	--	--
Chloride, filtered, as Cl	29	24	10	13	12	14
Dissolved and suspended solids (milligrams per liter)						
Total dissolved solids, filtered, residue at 180 degrees Celsius	168	148	46	62	71	60
Suspended solids, residue at 105 degrees Celsius	298	260	350	526	672	740

[a] Results based on colony count outside the acceptable range (non-ideal colony count).

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Nutrients (milligrams per liter)						
Nitrogen, total as N	5.3	4.3	2.1	2.0	1.6	1.9
Nitrogen, ammonia plus organic (Kjeldahl), total as N	4.5	3.6	1.7	1.9	1.4	1.4
Phosphorus, total as P	1.0	.86	.32	.31	.46	.39
Phosphorus, filtered as P	.34	.34	.21	.05	.06	.11
Trace elements (micrograms per liter)						
Antimony (USEPA method), total recoverable as Sb	<10	<10	<10	<10	<10	<10
Arsenic, total as As	4	4	4	2	3	3
Beryllium, total recoverable as Be	<10	<10	<10	<10	<10	<10
Cadmium, total recoverable as Cd	<1	<1	2	<1	<1	<1
Chromium, total recoverable as Cr	4	3	3.4	4.1	--	--
Copper, total recoverable as Cu	6	6	7	5	3	5
Lead, total recoverable as Pb	6	6	8	10	10	13
Mercury, total recoverable as Hg	.1	.1	.1	<.1	--	<.1
Nickel, total recoverable as Ni	6	5	5	5	6	6
Selenium, total recoverable as Se	<1	<1	<1	<1	<1	<1
Silver (USEPA method), total recoverable as Ag	<.5	<.5	<.5	--	--	--
Silver, total recoverable as Ag	<1	<1	<1	<1	<1	<1
Thallium (USEPA method), total recoverable as Tl	<10	<10	<5	<5	<10	<5
Zinc, total recoverable as Zn	30	30	40	30	40	40
Cyanide, total recoverable as CN (milligrams per liter)	<.01	<.01	<.01	<.01	<.01	<.01
Cyanide (USEPA method), total recoverable as CN (milligrams per liter)	<.01	<.01	--	<.01	<.01	<.01
Organic compounds						
Carbon, organic, total as C (milligrams per liter)	10	22	22	25	23	16
Oil and grease, total recoverable, gravimetric (milligrams per liter)	<1	<1	<1	<1	<1	<1
Volatile organic compounds (micrograms per liter)						
Acrolein, total	<20	<20	<400	<100	<20	<80
Acrylonitrile, total	<20	<20	<400	<100	<20	<80
Benzene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Bromoform, total	<.2	<.2	<.2	<1.0	<.2	<.8

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Volatile organic compounds (micrograms per liter)--Continued						
Carbon tetrachloride, total	<0.2	<0.2	<0.2	<1.0	<0.2	<0.8
Chlorobenzene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Chlorodibromomethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
Chloroethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
Chloroform, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,3-Cisdichloropropene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Dichlorobromomethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
Ethylbenzene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Methyl bromide, total	<.2	<.2	<.2	<1.0	<.2	<.8
Methyl chloride, total	<.2	<.2	<.2	<1.0	<.2	<.8
Methylene chloride, total	<.2	<.2	<.2	<1.0	<.2	<.8
Tetrachloroethylene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Toluene, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,3-Transdichloropropene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Trichloroethylene, total	<.2	<.2	<.2	<1.0	<.2	<.8
Vinyl chloride, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,1-Dichloroethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,1-Dichloroethylene, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,2-Dichloroethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,2-Dichloropropane, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,2-Transdichloroethylene, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,1,1-Trichloroethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,1,2-Trichloroethane, total	<.2	<.2	<.2	<1.0	<.2	<.8
1,1,2,2-Tetrachloroethane, total recoverable	<.2	<.2	<.2	<1.0	<.2	<.8
2-Chloroethylvinylether, total	<1.0	<1.0	<1.0	<5.0	<1.0	<4.0
Base/neutral-extractable organic compounds (micrograms per liter)						
Acenaphthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzidine, total	<40	<40	<40	<40	<40	<40

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Benzo(a)anthracene, 1,2-benzanthracene, total	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, total	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene, total	<10	<10	<10	<10	<10	<10
2,4-Benzo(g,h,i)perylene, total	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, total	<10	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroethoxy)methane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-chloroisopropyl)ether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bis(2-ethylhexyl)phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-butylbenzyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene, total	<10	<10	<10	<10	<10	<10
Diethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-butyl phthalate, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-octyl phthalate, total	<10	<10	<10	<10	<10	<10
Fluoranthene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Fluorene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<.8
Hexachlorocyclopentadiene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachloroethane, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene, total	<10	<10	<10	<10	<10	<10
Isophorone, total,	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodi-n-propylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodimethylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-nitrosodiphenylamine, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<.8
Nitrobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Base/neutral-extractable organic compounds (micrograms per liter)--Continued						
Phenanthrene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyrene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,5,6-Dibenzoanthracene, total	<10	<10	<10	<10	<10	<10
O-chlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<.8
1,2-Dichlorobenzene, total						
1,3-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<.8
1,4-Dichlorobenzene, total	<5.0	<5.0	<5.0	<5.0	<5.0	.7
1,2-Diphenylhydrazine, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene, total recoverable	<5.0	<5.0	<5.0	<5.0	<5.0	<.8
2-Chloronaphthalene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine, total	<20	<20	<20	<20	<20	<20
4-Bromophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenylphenylether, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acid-extractable organic compounds (micrograms per liter)						
Parachlorometa cresol, total	<30	<30	<30	<30	<30	<30
Pentachlorophenol, total	<30	<30	<30	<30	<30	<30
Phenols, total	3	<1	<1	9	<2	<1
2-Chlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, total	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol, total	<20	<20	<20	<20	<20	<20
4,6-Dinitroorthocresol, total	<30	<30	<30	<30	<30	<30
4-Nitrophenol, total	<30	<30	<30	<30	<30	<30
Pesticides (micrograms per liter)						
Aldrin, total	<.04	<.04	<.04	<.04	<.04	<.04
Chlordane, total	<.1	<.1	<.1	<.1	<.1	--

Table A10. Quality of runoff from Beaver Bayou at Hooper Road in an undeveloped land-use area, Baton Rouge metropolitan area, Louisiana, during selected storms, February 23, 1994 - June 29, 1995—Continued

Water-quality property or constituent	Beginning date of storm					
	2-23-94	4-12-94	10-19-94	3-13-95	5-8-95	6-29-95
Pesticides (micrograms per liter)--Continued						
4,4'-DDD, total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE, total	<.04	<.04	<.04	<.04	<.04	<.04
4,4'-DDT, total	<.1	<.1	<.1	<.1	<.1	<.1
Dieldrin, total	<.02	<.02	<.02	<.02	<.02	<.02
Endosulfan I, total recoverable	<.1	<.1	<.1	<.1	<.1	<.1
Beta-endosulfan, total	<.04	<.04	<.04	<.04	<.04	<.04
Endosulfan sulfate, total	<.6	<.6	<.6	<.6	<.6	<.6
Endrin, total recoverable	<.06	<.06	<.06	<.06	<.06	<.06
Endrin aldehyde, total	<.2	<.2	<.2	<.2	<.2	<.2
Heptachlor epoxide, total	<.8	<.8	<.8	<.8	<.8	<.8
Heptachlor, total	<.03	<.03	<.03	<.03	<.03	<.03
Toxaphene, total	<2	<2	<2	<2	<2	<2
Alpha benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Beta benzene hexachloride, total	<.03	<.03	<.03	<.03	<.03	<.03
Delta benzene hexachloride, total	<.09	<.09	<.09	<.09	<.09	<.09
Gamma benzene hexachloride (lindane), total	<.03	<.03	<.03	<.03	<.03	<.03
Polychlorinated biphenyls (micrograms per liter)						
Aroclor 1016, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1221, total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor 1232, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1242, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1248, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1254, total	<.1	<.1	<.1	<.1	<.1	<.1
Aroclor 1260, total	<.1	<.1	<.1	<.1	<.1	<.1

Table A11. Minimum detection levels of water-quality properties and constituents

[USEPA, U.S. Environmental Protection Agency; µS/cm, microsiemens per centimeter at 25 degrees Celsius]

Water-quality property or constituent	Minimum detection level	Water-quality property or constituent	Minimum detection level
Specific conductance, laboratory, in µS/cm	1	Alkalinity, laboratory, as $CaCO_3$	1
pH, laboratory, standard units	0.1	Chemical oxygen demand, in mg/L	10
Major inorganic ions (milligrams per liter)			
Calcium, filtered as Ca	.1	Potassium, filtered as K	0.1
Magnesium, filtered as Mg	.1	Sulfate, filtered as SO_4	.1
Sodium, filtered as Na	.1	Chloride, filtered as Cl	.1
Dissolved and suspended solids (milligrams per liter)			
Residue at 180 degrees Celsius, dissolved	1	Residue at 105 degrees Celsius, suspended	1
Nutrients (milligrams per liter)			
Nitrogen, nitrite plus nitrate, total as N	.05	Phosphorus, total as P	.01
Nitrogen, ammonia plus organic (Kjeldahl), total as N	.2	Phosphorus, filtered as P	.01
Trace elements (micrograms per liter) and cyanide (milligrams per liter)			
Antimony (USEPA method), total as Sb	10	Mercury, total as Hg	.1
Arsenic, total as As	1	Nickel, total as Ni	1
Beryllium, total as Be	10	Selenium, total as Se	1
Cadmium, total as Cd	1	Silver (USEPA method), total as Ag	1
Chromium, total as Cr	10	Thallium (USEPA method), total as Tl	5
Copper, total as Cu	1	Zinc, total as Zn	10
Lead, total as Pb	1	Cyanide (USEPA method), total as CN	.01
Organic compounds (milligrams per liter)			
Carbon, organic, total as C	.1	Oil and grease, total	1
Volatile organic compounds (micrograms per liter)			
Acrolein, total	20	1,2-Dichloropropane, total	0.2
Acrylonitrile, total	20	1,3-Dichloropropene, total	.2
Benzene, total	.2	Ethylbenzene, total	.2
Bromoform, total	.2	Methyl bromide, total	.2

Table A11. Minimum detection levels of water-quality properties and constituents—Continued

Water-quality property or constituent	Minimum detection level	Water-quality property or constituent	Minimum detection level
Volatile organic compounds (micrograms per liter) —Continued			
Carbon tetrachloride, total	.2	Methyl chloride, total	.2
Chlorobenzene, total	.2	Methylene chloride, total	.2
Chlorodibromomethane	.2	1,1,2,2-Tetrachloroethane, total	.2
Chloroethane, total	.2	Tetrachloroethylene, total	.2
2-Chloroethylvinylether, total	1.0	Toluene, total	.2
Chloroform, total	.2	1,2-Transdichloroethane, total	.2
Dichlorobromomethane, total	.2	1,1,1-Trichloroethane, total	.2
1,1-Dichloroethane, total	.2	1,1,2-Trichloroethane, total	.2
1,2-Dichloromethane, total	.2	Trichloroethylene, total	.2
1,1-Dichloroethylene, total	.2	Vinyl chloride, total	.2
Base/neutral-extractable organic compounds (micrograms per liter)			
Acenaphthylene, total	5	Benzo (b) fluoranthene, total	10
Acenaphthene, total	5	Benzo (ghi) perylene, total	10
Anthracene, total	5	Benzo (k) fluoranthene, total	10
Benzidine, total	40	Bis (2-Chloroethoxy) methane, total	5
Benzo (a) anthracene, total	10	Bis (2-Chloroethyl) ether, total	5
Benzo (a) pyrene, total	10	Bis (2-Chloroisopropyl) ether, total	5
Bis (2-ethylhexyl) phthalate, total	5	Fluoranthene, total	5
4-Bromophenyl phenyl ether, total	5	Fluorene, total	5
N-Butyl benzyl phthalate, total	5	Hexachlorobenzene, total	5
2-Chloronaphthalene, total	5	Hexachlorobutadiene, total	5
4-Chlorophenyl phenyl ether, total	5	Hexachlorocyclopentadiene, total	5
Chrysene, total	10	Hexachloroethane, total	5
1,2,5,6-Dibenzanthracene, total	10	Indeno (1,2,3) pyrene, total	10
1,2-Dichlorobenzene, total	5	Isophorone, total	5
1,3-Dichlorobenzene, total	5	Naphthalene, total	5
1,4-Dichlorobenzene, total	5	Nitrobenzene, total	5
3,3-Dichlorobenzidine, total	20	N-Nitrosodimethylamine, total	5

Table A11. Minimum detection levels of water-quality properties and constituents—Continued

Water-quality property or constituent	Minimum detection level	Water-quality property or constituent	Minimum detection level
Base/neutral-extractable organic compounds (micrograms per liter) —Continued			
Diethyl phthalate, total	5	N-Nitrosodi-N-propylamine, total	5
Dimethyl phthalate, total	5	N-Nitrosodiphenylamine, total	5
Di-N-butyl phthalate, total	5	Phenanthrene, total	5
2,4-Dinitro toluene, total	5	Pyrene, total	5
2,6-Dinitro toluene, total	5	1,2,4-Trichlorobenzene, total	5
Di-N-octyl phthalate, total	10		
Acid-extractable organic compounds (micrograms per liter)			
2-Chlorophenol, total	5	4-Nitrophenol, total	30
2,4-Dichlorophenol, total	5	Parachlorometacresol, total	30
2,4-Dimethylphenol, total	5	Pentachlorophenol, total	30
4,6-Dinitroorthocresol, total	30	Phenols, total	1
2-Nitrophenol, total	5	2,4,6-Trichlorophenol, total	20
Pesticides (micrograms per liter)			
Aldrin, total	.04	Dieldrin, total	.02
Alpha benzene hexachloride, total	.03	Endrin, total	.06
Beta benzene hexachloride, total	.03	Endrin aldehyde, total	.2
Lindane, total	.03	Heptachlor, total	.03
Delta benzene hexachloride, total	.09	Heptachlor epoxide, total	.8
Chlordane, total	.1	Endosulfan I alpha, total	.1
P,P' DDT, total	.1	Endosulfan II beta, total	.04
P,P' DDE, total	.04	Endosulfan sulfate, total	.6
P,P' DDD, total	.1	Toxaphene, total	2.0
Polychlorinated biphenyls (micrograms per liter)			
Arochlor 1016, total	.1	Arochlor 1248, total	.1
Arochlor 1221, total	1.0	Arochlor 1254, total	.1
Arochlor 1232, total	.1	Arochlor 1260, total	.1
Arochlor 1242, total	.1		