WATER QUALITY - BLACKSTONE RIVER

Final Report 1: Existing Data
Volume I: Data Summary






Submitted to: **Rhode Island Department of Environmental Management**

January 2004

Submitted by: **The Louis Berger Group, Inc.**

in association with

Applied Science Associates, Inc.

University of Rhode Island

University of Massachusetts - School of Marine Science and Technology

Rhode Island Department of Environmental Management

WATER QUALITY - BLACKSTONE RIVER

FINAL REPORT 1: EXISTING DATA
Volume I: Data Summary

Submitted to:
Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908

Submitted by:
The Louis Berger Group, Inc.
295 Promenade Street
Providence, RI 02908

in association with:
Applied Science Associates, Inc.
University of Rhode Island
University of Massachusetts - School of Marine Science and Technology

January 2004

Table of Content
Volume I: Data Summary

List of Figures and Tables

SECTION 3: EXISTING WATER QUALITY DATA FOR BLACKSTONE RIVER WATERSHED

SECTION 4: WATER QUALITY DATA SYNTHESIS

Table of Content
Volume II: Appendices

EXECUTIVE SUMMARY

OVERVIEW

The objective of this project is to provide the Rhode Island Department of Environmental Management (RIDEM) with the information to develop accurate and effective Total Maximum Daily Loads (TMDL) for the Blackstone River, Mill River, Peters River, and Valley Falls Pond. TMDLs are required under Section 303(d) of the Clean Water Act and USEPA's Water Quality Planning and Management Regulations (40 CFR Part 130). The 303(d) List identifies the following parameters of concern:

- Blackstone River: Biodiversity impacts, pathogens, copper, lead
- Mill River: Lead
- Peters River: Pathogens, copper, lead
- Valley Falls Pond: Biodiversity impacts, pathogens, phosphorus, nutrients, hypoxia, excess algal growth, lead

This report includes a description of the watershed, compilation of existing water quality data, data analysis and synthesis, and initial identification of data gaps. A total of 15 sediment, fish tissue, and water quality studies were reviewed along with additional data and information relevant for this project. The report consists of two volumes:

- Volume I: Data Summary
- Volume II: Appendices (with original data and graphs from the studies used for the data summary)

It should be noted that the data synthesis in this report is only based on data that were collected and published by different sources. Detection limits and analytical methods varied to some extent in the different studies. The reliability of the statistical averages generated in this report should be compared to the number of points in the data set. The number of data points is reported in appropriate tables.

- ***Blackstone River Watershed:*** The Blackstone River is an important natural, recreational, and cultural resource to both Rhode Island and Massachusetts. It has a total drainage area of 454 mi^2 with a total length of 48 miles. The Blackstone River is the second largest source of freshwater to Narragansett Bay. Approximately 75% of the watershed is located within Massachusetts with the remainder located in Rhode Island. The Massachusetts portion of the watershed encompasses Worcester County and small sections of Middlesex, Norfolk, and Bristol Counties. It encompasses a total of thirty cities and towns including Worcester and Attleboro. In Rhode Island, the watershed encompasses a portion of the following cities and towns: Burrillville, Glocester, North Smithfield, Smithfield, Woonsocket, Cumberland, Lincoln, Central Falls, and Pawtucket. There are a total of 102 dams located within the Blackstone River basin.

- ***Mill River:*** Mill River has a drainage area of approximately 35 mi^2. Most of the area is located in Massachusetts. The drainage area is characterized by open land and low-density residential development with limited areas of high density, urban development. The river flows into Harris Pond at the State line. From Harris Pond, the river flows for approximately 3,200 ft prior to being conveyed underground to the Blackstone River.

- ***Peters River:*** Peters River has a smaller drainage area than Mill River. Its headwaters are located in Bellingham, Massachusetts. The river flows for approximately 3.5 miles to the State line and continues for an additional one mile where it combines with the Blackstone River. The drainage area is characterized by medium to medium high residential development, and high density urban development in Woonsocket.

- ***Valley Falls Pond:*** Valley Falls Pond and its associated freshwater wetland system, known as Valley Falls Marshes, have been designated by RIDEM as Special Resource Protection Water. RIDEM made this designation due to the wetland system being the largest freshwater marsh and an important stop for migratory birds along the eastern flyway. The wetland system consists of marshland and open water, which form the boundary between Lincoln, Cumberland, and Central Falls. The Blackstone River flows though the open water system, which is created by the Valley Falls Dam. The Rhode Island Heritage Program has indicated the importance of the wetland because it supports several rare nesting birds: Least Bittern, Sora, American Bittern, Green-Winged Teal, and Marsh Wren.

FECAL COLIFORM SOURCES IN THE BLACKSTONE RIVER

Fecal coliform enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001) determined that on average 69% of the total load enters the Blackstone River in Massachusetts during wet weather. Equivalent dry weather load calculations are not available.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill appear to have high loadings of fecal coliform as expected.

- *Branch River:* The Branch River discharges roughly 25% of the flow in the Blackstone River at the confluence. Data by the USGS suggest that the coliform contributions are generally low. Data by the Blackstone River Initiative (BRI) indicate that coliform concentrations during wet weather from the Branch River are high, however.

- *City of Woonsocket:* Wright et al. (2001) calculated high fecal coliform loadings from the City of Woonsocket. The total load entering the Blackstone River between BRI Stations 13 and 17 was approximately 9%. The main sources are likely stormwater discharges.

- *RIPDES –permitted discharges:* Fecal coliform loads appear to be small, although fecal coliform concentrations were high in the effluent from the Blackstone Smithfield Company.

- *Mill River:* Dry weather concentrations were within the regulatory standards.

- *Peters River:* Given that the BRI fecal coliform data from the river were affected by a broken pipe, recent data are not available.

COPPER SOURCES IN THE BLACKSTONE RIVER

Copper enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001) determined that on average 79% of the total load during dry weather and 75% of the total load during wet weather enters the Blackstone River within Massachusetts. Primary sources are the Upper Blackstone Water Pollution Abatement District (UBWPAD) facility in Worchester, MA, and possibly resuspension of sediments from impoundments.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill may contain high loads of copper, although data do not exist. Wright et al. (2001) computed the load between Lonsdale and Slaters Mill as 4.1% of the total load.

- *Branch River, Mill River, Peters River:* The contributions of copper by the tributaries appeared to be comparatively small.

- *Woonsocket WWTF:* The copper concentrations in the final effluent were comparatively high. The load was calculated by Wright et al. (2001) with 5.9% of the total load entering the river.

- *RIPDES –permitted discharges:* Aside from the Woonsocket WWTF, and possibly the Osram Sylvania outfall, other discharges appeared to be minor sources of copper.

- *Other sources in the RI section of the River:* Aside from the copper loading from Massachusetts and the Woonsocket WWTF, the available data do not identify specific point sources for copper in the Rhode Island section of the river. Uncertain is also the role of resuspension of sediments from impoundments in the Rhode Island section.

LEAD SOURCES IN THE BLACKSTONE RIVER

Lead enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001) determined that on average 92% of the total load during dry weather and 72% of the total load during wet weather enters the Blackstone River within Massachusetts. Primary sources are the headwaters of the Blackstone River and possibly resuspension of sediments from Rice City Pond.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill in Central Falls and Pawtucket may contain high loads of lead, although data do not exist. Wright et al. (2001) computed the loading as 14% of the total load during wet weather, based on data from BRI Stations 20 and 21.

- *Branch River, Mill River, Peters River:* The contributions of lead by the tributaries appeared to be comparatively small. Within the Branch River watershed, the total lead concentrations within the Clear River were on average 3 times higher than the concentrations in the Branch River near its confluence, although the data come from different studies.

- *Woonsocket WWTF:* The lead concentrations in the final effluent of the BRI study were comparatively high. The load was calculated by Wright et al. (2001) with 4.5% of the total load entering the river. Concentrations in more recent samples collected by the treatment plant as part of the RIPDES monitoring are lower than the concentration during the BRI study, however. Therefore, the lead loading by the WWTF to the river should be reevaluated.

- *Other RIPDES –permitted Discharges:* Aside from the Woonsocket WWTF, the total lead concentrations from the Osram Sylvania Products Outfall 200 were elevated, and should be evaluated.

- *Other sources in the RI section of the River:* Aside from the lead loading from Massachusetts and the Woonsocket WWTF, the available data do not identify specific point sources for lead in the Rhode Island section of the river. Wright et al. (2001) calculated loadings of 4.5% to the Blackstone River during wet weather in the vicinity of the City of Woonsocket.

Nutrients and Related Parameters (for Valley Falls Pond)

Very little is known about Valley Falls Pond. The pond is eutrophic to hypertrophic, particularly in the summer. It should be noted that the wetland nature of the Valley Falls System (marshes and pond) needs to be considered in any TMDL calculations, since wetlands tend to have higher tolerances to nutrient loads than river or pond areas. However, this important avian resource clearly appears to be beyond its capacity to assimilate additional nutrient loads. While quantitative data are not presently available, it is clear that the nutrient status of Valley Falls Pond is likely controlled primarily by the nutrient levels in the incoming river water and recycling of nutrients from the sediments. In such enclosed systems, the release of nutrients from the sediments during the warmer months can provide a large fraction of the nutrients for algal production (blooms). Sediment core data are consistent with a highly organic enriched system; they contained 10% carbon by weight. In addition, the configuration of the Valley Falls Pond system likely enhances organic matter deposition, due to the apparently low flow-through and the configuration of the basin. Enhanced deposition results in an increased level of sediment nutrient release.

The Blackstone River was nutrient-enriched and likely a significant source for nutrients to Valley Falls Pond. The degree to which the Blackstone River contributes to the eutrophic status in the pond cannot be ascertained, however. Specifically, data collected by the River Rescue and BRI studies stem from the earlier 1990s, when the Woonsocket WWTF was still a significant source of nutrients to the river.

Biodiversity Impacts

Macroinvertebrate biodiversity data integrate the cumulative impact of stressors that result in habitat degradation and chemical contamination. The species density is affected by factors such as sediment type, temperature, dissolved oxygen concentration, rainfall / stream flow, organic content, and water chemistry. Stressors include organic loading from point and non-point sources, elevated sediment load.

Blackstone River bioassessments were conducted along the Blackstone River downstream of the Manville Dam. The results for the period from 1995 to 2001 indicated a moderately to slightly impaired benthic community. It appears that organic loading (nutrients, fine particulate organic matter, etc.) is the primary cause for the impaired macroinvertebrate assemblages. Metals do not appear to be a key stressor, as no lethal toxic effects were observed; there may be sublethal effects, however, which impact the growth and reproduction of the macroinvertebrates.

Data Gaps – Initial Recommendations

The final determination of data gaps depends on the selection of a water quality model. Different models require different data as input parameters. In addition, the degree of resolution (i.e., the lengths of individual river sections that will be modeled) needs to be determined. Therefore, the recommendations for data collection are preliminary and designed only to be a starting point for discussion.

- ***Fecal Coliform, Copper and Lead:*** The relative contributions of fecal coliform, copper, and lead from major sources should be updated by resampling the BRI stations 12 to 21, as well as the Woonsocket WWTP. BRI stations were well-spaced to reflect the population density bordering the Blackstone River and to address other logical sources such as tributaries and impoundments. Sampling should be conducted during wet and dry weather.

  Stations in addition to the BRI stations should be considered:
  - Branch River, just downstream of Slaterville Dam
  - Mill River, station at the MA/RI border
  - Peters River, station at the MA/RI border

- Blackstone River, station between BRI 19 and BRI 20
- Abbot Run Brook, stations at the confluence with the Blackstone River and at the MA/RI border
- Outfalls of the Osram Sylvania, Atlantic Thermoplastics (they could be sampled as part of RIDEM's RIPDES program)
- Major stormwater drainage pipes (a survey prior to monitoring activities may be needed to develop a list of key pipes)
- Sources in the vicinity of CERCLA and waste disposal sites
- Stations that address the role of impoundments in Rhode Island (particularly sediment)

The State of Massachusetts may participate during sampling activities by monitoring at least some of the key sources for fecal coliform and metals. Based on the existing data, it appears that the river will also require decreases in the loading to the Blackstone River within the watershed in Massachusetts in order to improve substantially in Rhode Island.

- ***Fish Tissues:*** Tissues from fish should be analyzed to evaluate bioaccumulation of hazardous contaminants. Fish should be collected at several representative stations along the river. At each location, at least five each of a representative predator and benthic species, of a size to be determined, should be collected. Analyses should, at a minimum, include PCBs, metals (cadmium, copper, lead, mercury), arsenic, and pesticides.

- ***Biodiversity Impacts:*** It appears that organic loading was a primary cause for the patterns observed in the macroinvertebrate data. These data were the basis for placing the Blackstone River on the 303(d) List for biodiversity impairments. A large point source at the time for organic loading was the Woonsocket WWTF. Since the fall of 2001, the WWTF was upgraded and the effluent was improved, resulting in lower organic loading to the river. It therefore appears wise to conduct the monitoring for biodiversity impacts in the Blackstone River in a two-phased approach:

  - *Phase 1: Macroinvertebrate Monitoring at existing Station:* Macroinvertebrate monitoring should be conducted at the station below the Manville Dam during the summer, using the identical approach that was used for the monitoring conducted between 1991 and 2001. Data should be compared to the historic data. If indeed the WWTF was the primary cause of the impairment at the station, the benthic community conditions in the Blackstone River should be improved.

  - *Phase 2: Expanded Macroinvertebrate Monitoring along the Blackstone River:* If the Phase 1 macroinvertebrate survey results in the same findings as the surveys conducted between 1991 and 2001 monitoring period, a more extensive survey is recommended to identify the stressor(s) for the biodiversity impairments along the Blackstone River.

- ***Valley Falls Pond:*** To develop and evaluate management alternatives for Valley Falls Pond requires additional data. At present, there is only a nutrient data set from this system from a single season. However, several of the listed concerns for this system relate directly to nutrient loads and levels, i.e., phosphorus, nutrients, and diversity. In addition, there are no data available on the configuration and flows within this wetland and pond system (depths, channels, flows, exchange with the river, watershed inputs). In addition, nutrient issues require additional information on nutrient cycling processes and related effects, such as recycling rate, benthic versus watercolumn algal blooms, watercolumn dissolved oxygen. These data would need to be integrated into a simple model to determine the relative effects of the local watershed, the river, and recycling on controlling the habitat quality of this system. Source reduction and management alternatives could be developed thereafter.

1.0 INTRODUCTION

1.1 Project Overview

The primary objective of this project is to provide the Rhode Island Department of Environmental Management (RIDEM) with the information to develop accurate and effective TMDLs for the Blackstone River, Mill River, Peters River, and Valley Falls Pond. The 303(d) List identifies the following parameters of concern (Table 1-1).

Table 1-1
Project Waterbodies and Impairments Identified in Group 1 of the 2000 303(d) List

Name	Area / Length	Class	Cause of Impairment
Blackstone River	15.7 miles	B1 / B1{a}	Biodiversity impacts, pathogens, copper, lead
Mill River	0.082	B	Lead
Peters River	0.469	B	Pathogens, copper, lead
Valley Falls Pond	42.7 ac	B1 (E)	Biodiversity impacts, pathogens, phosphorus, nutrients, hypoxia, excess algal growth, lead

TMDLs are required under Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130). The purpose of TMDLs is to reduce the pollutant loading to waterbodies from point and nonpoint sources in order to achieve water quality goals set for the waterbody.

1.2 Project Tasks

The project consists of the following components:

- Task 1: Review of existing water quality data and delineation of waterbody segments
- Task 2: Identification of data gaps (preliminary)
- Task 3: Preparation of a Monitoring Plan along with a Quality Assurance Project Plan (QAPP) to address data gaps
- Task 4: Implementation of the Monitoring Plan
- Task 5: Comprehensive water quality characterization
- Task 6: Project Meetings

This report presents the findings of Tasks 1 and 2. The findings are based on relevant existing data and information. Preliminary data gaps under Task 2 were identified to provide the additional data and information needed for the development of TMDLs. It is envisioned that these missing data will be obtained during the monitoring period of this project (Tasks 3 and 4).

The report consists of two volumes:

- Volume I: Data Summary
- Volume II: Appendices with original data and graphs from the studies used for the data summary

2.0 BLACKSTONE RIVER WATERSHED

2.1 Introduction

The Blackstone River is an important natural, recreational, and cultural resource to both Rhode Island and Massachusetts. In 1986, the Blackstone River Valley National Heritage Corridor was established by Congress to preserve and interpret the significant historic and cultural lands, waterways, and structures within the watershed. The National Park Service is working with the two States to pursue park development along the River and to coordinate a watershed land-use strategy. In Rhode Island, RIDEM is developing a greenway along the Blackstone River between the villages of Albion and Berkley. A bike path is also under development, which will ultimately extend from India Point Park in Providence to North Smithfield with connection to the East Bay bike path.

The Blackstone River has a total drainage area of 454 mi^2 with a total length of 48 miles. The drainage area is located in south-central Massachusetts and flows from Worcester, MA, to Main Street Dam in Pawtucket, RI, which is defined as the headwaters of the Seekonk River. The Seekonk River is a tidal estuary that flows for approximately seven (7) miles before combining with the Providence River at India Point. The Blackstone River is the second largest source of freshwater to Narragansett Bay.

Approximately 75% of the watershed is located within Massachusetts with the remainder located in Rhode Island. The Massachusetts portion of the watershed encompasses Worcester County and small sections of Middlesex, Norfolk, and Bristol Counties. It encompasses a total of thirty cities and towns including Worcester and Attleboro. In Rhode Island, the watershed encompasses a portion of the following cities and towns: Burrillville, Glocester, North Smithfield, Smithfield, Woonsocket, Cumberland, Lincoln, Central Falls, and Pawtucket.

The Blackstone River begins in the southern part of the City of Worcester at the confluence of Middle River and Weasel Brook. It flows southward for 16.5 miles through a narrow valley before crossing into Rhode Island. The terrain of the watershed is characterized by gently rolling hills with altitudes increasing to the west. Elevations range from 1,400 ft MSL at headwaters in Worcester to 150 ft MSL at the Rhode Island border. In general, the gradient of the Blackstone River is moderate with slopes averaging about 11 ft/mile from the headwaters to the Woonsocket gauging station. The tributary streams draining the western uplands tend to have steeper gradients than those draining eastern uplands.

There is a total of 452 miles of river and perennial streams in the Blackstone River watershed. Primary tributaries in Massachusetts are Kettle Brook, Quinsigamond River, Mumford River, and West River. Primary tributaries in Rhode Island are Abbot Run Brook, Mill River, Peters River, and Branch River. In addition, there are 183 lakes and ponds, 107 of them larger than 10 acres. The largest lake in the watershed is Lake Quinsigamond in Shrewsbury and Worcester (area: 781 acres). The majority of the lakes are formed or enlarged by impoundments. There are a total of 102 dams located within the Blackstone River basin.

The Mill River has a drainage area of approximately 35 mi^2, which is primarily located in Massachusetts. The drainage area is characterized by open land and low-density residential development with limited areas of high density, urban development. The headwater of Mill River is North Pond, located in Hopkinton, MA. The river flows into Harris Pond at the State line. Harris Pond is formed by an impoundment that serves as a water supply for the City of Woonsocket. From Harris Pond, the river flows for approximately 3,200 ft prior before being conveyed underground to the Blackstone River. From a headwall located 400 ft upstream of Social Street, the river flows for 1,150 ft through two 10-ft wide and 12-ft high underground concrete conduits to its confluence at the Blackstone River. The Army Corps of Engineers constructed the culverts in 1963 as part of a city-wide flood control project. As part of the project, the banks of the Mill River were armored with rip-rap. Tributaries to Mill River consist of Hop Brook, Quick River, Spring Brook, and Muddy Brook.

The Peters River has a smaller drainage area than the Mill River. Its headwaters are located in Bellingham, Massachusetts. The river flows for approximately 3.5 miles to the State line and continues for an additional one mile where it combines with the Blackstone River. The drainage area is characterized by medium to medium high residential development with high density, urban development in Woonsocket. Tributaries to Peters River consist of the following: Bungay Brook, Arnold Brook, and unnamed tributaries which originate in Franklin State Forest. The Peters River flows for approximately 5,000 ft before being conveyed underground. From Elm Street, the river flows 1,180 ft through a 10-ft by 10-ft underground concrete conduit to its confluence with the Blackstone River. The underground conduits were constructed as part of the same 1963 city-wide flood control project.

Valley Falls Pond and its associated freshwater wetland system, known as Valley Falls Marshes, have been designated by RIDEM as Special Resource Protection Water. RIDEM made this designation due to the wetland system being the largest freshwater marsh and an important stop for migratory birds along the eastern flyway. The wetland system forms the boundary between Lincoln, Cumberland, and Central Falls. The Blackstone River flows though the open water part of the system, which is created by the Valley Falls Dam. The Rhode Island Heritage Program has indicated the importance of the wetland because it supports several rare nesting birds: Least Bittern, Sora, American Bittern, Green-Winged Teal, and Marsh Wren.

Provided in Figure 2-1 is a general map of the entire Blackstone River Watershed. Figure 2-2 depicts the area surrounding Valley Falls Pond.

2.2 Geology

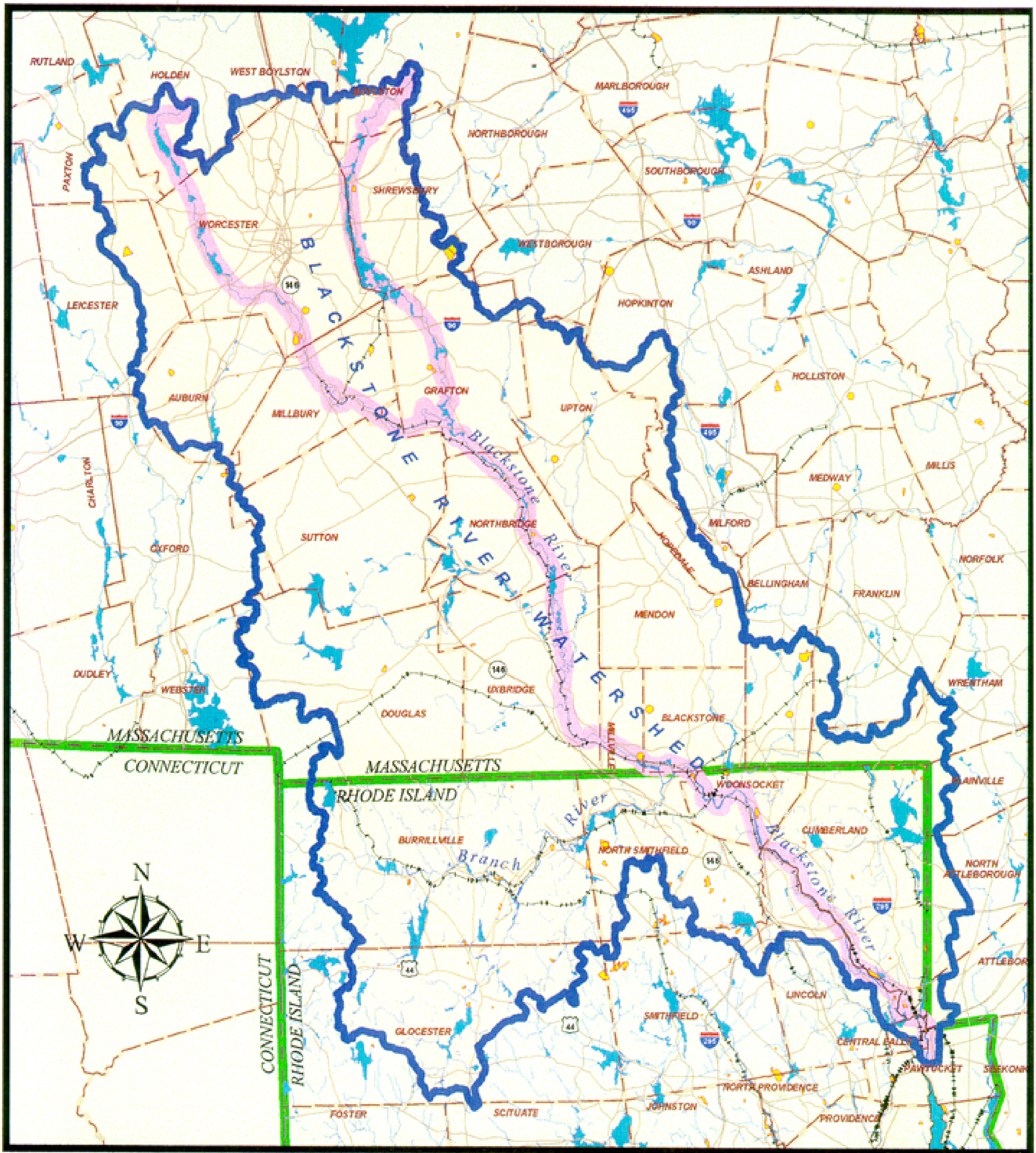
2.2.1 Surficial Geology

Within the Blackstone River watershed, overburden soils consist primarily of glacial till and outwash including glaciofluvial ice-contact deposits. Till is an ice-deposited sediment, and it is highly variable in texture (gravel, cobbles, stones, and boulders), composition, thickness, and structural features. This variability is often reflected in its hydraulic properties. Outwash or stratified drift deposits consist of well-sorted fine to coarse-grained sand and silt deposited from glacial meltwaters. Glaciofluvial deposits are ice-contact deposits located where meltwaters formed against bedrock. These deposits consist of well-sorted fine-grained sand and silt, and create a landscape of kames, terraces, eskers, and outwash plains.

The glacial deposits in Rhode Island can be divided into four principal types: upland till plains, Narragansett till plains, Charlestown and Block Island moraines, and outwash deposits. The Blackstone River watershed is dominated primarily by upland till plains with some regions of outwash deposits along the eastern and southeastern margins of the watershed. The upland till plains consists of till derived mostly from bedrock such as granite, schist, and gneiss. Bedrock outcrops are visible in some regions, along with scattered glacial stones and boulders. The till is relatively loose and unconsolidated; however, some areas are more heavily compacted. On average, the till is about twenty feet thick. Deposited in irregular layers by glacial meltwater, outwash deposits cover lowland areas and fill preglacial stream channels. The deposits consist of small particles of gravel, sand, silt, and clay. Windblown deposits of fine silt cap some of the outwash areas.

2.2.2 Soils

Soil deposits within the Blackstone River watershed also reflect the glacial origins of the landscape and consist of till, organic material, and outwash deposits including glaciofluvial parent materials.



LEGEND

- Blackstone River Watershed
- Town Boundary
- Major River, Stream
- Major Road
- Major Lake, Ponds
- Railroad
- State Boundary

Graphic Scale

2 0 2 4 Miles

Blackstone River TMDL

Figure: 2-1
BLACKSTONE RIVER WATERSHED

Rhode Island DEM

The Louis Berger Group, Inc.

Source: RIGIS, MASSGIS	File: BASE.apr	November 2001

Figure: 2-2
VALLEY FALLS POND AND SURROUNDING

File: BASE.apr

The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

January 2004

The dominant soil series within regions that are characterized by upland till plains are Canton and Paxton soils. Canton soils formed in the unconsolidated till deposits; Paxton soils formed within the consolidated deposits.

Canton soils are primarily located on the crests and side slopes of glacial upland hills and ridges. Slopes range from 0 to 35 percent. Typically, Canton soils have a three-inch thick surface layer of very dark, grayish-brown, fine sandy loam. The subsoil is dark yellowish-brown, yellowish-brown, and light olive-brown fine sandy loam. The substratum is olive-gray and light olive-gray gravelly loamy sand. Canton soils contain various degrees of slopes intermingled with areas of bare, hard, exposed bedrock. The permeability of the Canton soils is moderately rapid in the surface layer and subsoil and rapid in the substratum. Available water capacity is moderate and the soil is moderately to well-drained.

Paxton soils form on side slopes and crests of glacial till uplands and drumlins. Slopes range from 0 to 15 percent. Typically, Paxton soils have a five-inch thick surface layer of very dark, grayish-brown, fine sandy loam. The subsoil is brown and yellowish-brown fine sandy loam, and the substratum is light brownish-gray, yellowish-brown, and grayish-brown fine sandy loam. The permeability of the Paxton soils is moderate to moderately rapid in the surface layer and subsoil, and slow to very slow in the substratum. Available water capacity is moderate, and the soil is well-drained.

Within the outwash deposits, some areas are capped with windblown deposits of silt. Bridgehampton soils formed in these windblown deposits. These soils are commonly observed on glacial till uplands and outwash terraces. Slopes range from 0 to 15 percent. Typically, Bridgehampton soils have an eight-inch thick surface layer of very dark grayish-brown silt loam. The subsoil and substratum vary in coloration and texture from a dark yellowish-brown silt loam to a grayish-brown, very gravelly sand. The permeability of this soil is moderate in the surface layer and subsoil and rapid to very rapid in the substratum. The available water capacity is high and runoff is slow. Bridgehampton soils are medium to very strongly acidic.

Soils mapped within urbanized areas near the central portions of villages are variant and include Urban-land complex, Udorthents, and Merrimac urban land-complex. These soils are typically moderately well-drained to excessively-drained soils that have been disturbed by cutting or filling. The areas consist mainly of sites for buildings, paved roads, and parking lots. Additionally, hydric soils are associated with wetlands and other riparian areas adjacent to the many watercourses within the Blackstone River watershed.

Provided in Figure 2-3 is a general overview of soil types within the watershed and the appropriateness for subsurface disposal of wastewater. Several studies have concluded that failed septic systems can be a significant source of pathogens and nutrient loadings to a waterbody. The areas that rely on on-site disposal of wastewater are also shown in Figure 2-3.

2.2.3 Bedrock Geology

The bedrock formations in Rhode Island are almost completely mantled by deposits of outwash and glacial till. Bedrock and consolidated rocks within the Blackstone River watershed can be categorized into crystalline (igneous and metamorphic) and sedimentary rocks. Three distinct formations can be observed within the watershed; the Blackstone Group of metamorphic rock along the Blackstone Valley, older igneous granite rock of several ages, and Carboniferous sedimentary rock of the Narragansett Bay Group in eastern Rhode Island and pockets in north-central Rhode Island. Located in one of these pockets, much of the Woonsocket, Rhode Island area is underlain by this sedimentary rock, also known as the Bellingham Conglomerate. This sedimentary formation includes beds of gray to green sandstone, conglomerate, and phyllite. Metamorphism caused a foliation discordant to the bedding in many places, and numerous quartz veins intersect these beds.

Various types of igneous and metamorphic bedrock (granite, diorite, gabbro, schist, and gneiss) underlie areas of the watershed not underlain by sedimentary rocks of the Narragansett Bay group. The bedrock formations

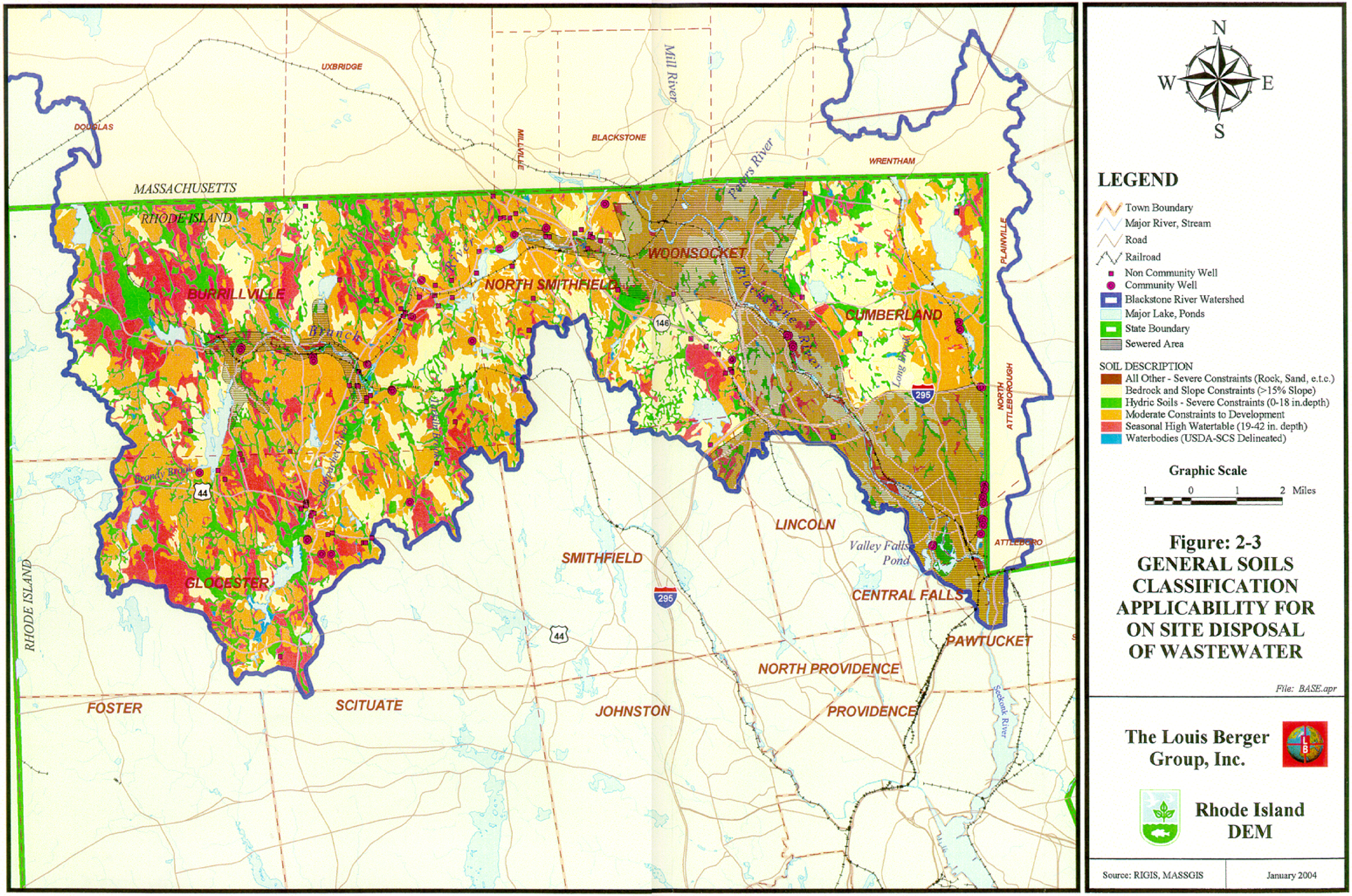


Figure: 2-3 GENERAL SOILS CLASSIFICATION APPLICABILITY FOR ON SITE DISPOSAL OF WASTEWATER

are of Paleozoic and Precambrian age and include the Nipsachuck Gneiss, the Absalona porphyroblastic biotite gneiss, Scituate Granite Gneiss, Ponaganset Gneiss, Esmond Granite, and the Blackstone series. The Blackstone Series of Precambrian metamorphic rocks includes quartzite, quartz-mica schist, amphibolite, and epidosite.

2.3 Climate

There are a total of eight weather stations that contain climatological data from the Northeast Regional Climatological Center, as listed below in Table 2-1. The individual gauging stations are geographically distributed equally in the watershed. A preliminary investigation showed no significant variability in the daily total rainfall amounts at different gauging stations. There is also a complete weather record maintained at T.F. Green Airport, located in Warwick, RI. A climatological summary of the airport station for the period 1961 to 1990 is presented in Table 2-2, and Figures 2-4 and 2-5.

Annual temperature in the area can range from a mean of 28°F in January to 73°F in July. Figure 2-5 is a box-whisker plot with the mid-point being the arithmetic mean and the range being the 95% confidence interval. The mean annual precipitation is 45.6 inches. Monthly precipitation levels are fairly uniform ranging only between 3.2 and 4.4 inches. The highest monthly precipitation over the thirty year period was 12.7 inches.

Table 2-1
Summary of Available Precipitation Records

Station Name	Record of Daily Rainfall
Barre Falls Dam, MA	1959 – present
Boylston, MA	1949 – present
Franklin, MA	1949 – present
Milford, MA	1949 – present
Northbridge, MA	1964 – present
West Medway, MA	1957 – present
Woonsocket, RI	1949 – present
Worcester, MA	1949 – present

2.4 Surface Water Hydrology

The USGS maintains a stream gauge on the Blackstone, which is located just upstream of the Villanova Street bridge in Woonsocket, Rhode Island. The period of record for the data summary is water years 1929 to 1999. The average annual mean flow is 779 cfs. The monthly mean flow ranges from a high of 1,511 cfs in March to a low of 309 cfs in August (Figure 2-6). Presented in Table 2-3 are the summary statistics for the Blackstone River at the Woonsocket gauge.

The USGS also maintains a stream gauge on the Branch River in Forestdale, Rhode Island, which is located approximately 400 feet downstream of Mill Dam. The Branch River is the largest tributary to the Blackstone River in Rhode Island and is impaired for pathogens and lead (see Section 2.4.3). The period of record for the data summary is water years 1940 to 1999. The average annual mean flow is 175 cfs. The monthly mean flow ranges from a high of 379 cfs in March to a low of 59.3 cfs and 59.4 cfs in July and August, respectively (see Figure 2-7). Presented in Table 2-4 are the summary statistics for the Branch River at the Forestdale gauge.

Table 2-2
Climatological Summary
Period of Record: June 1948 to July 1999
T. F. Green Airport

Month	Temperature (degrees F) Normals: Normal Max	Normal Min	Normal Avg	Extremes: Record Max	Year	Record Min	Year	Normal Number of Days: Max 90 and Above	Max 32 and Below	Min 32 and Below	Min 0 and Below
JANUARY	36.1	19.3	27.7	69	1995	-13	1976	0	12	28	1
FEBRUARY	37.9	21.1	29.5	72	1985	-7	1979	0	8	24	1
MARCH	46.6	29.5	38	85	1998	1	1967	0	1	20	0
APRIL	57.5	38.3	47.9	98	1976	14	1954	0	0	6	0
MAY	67.8	48	57.9	95	1996	29	1956	1	0	0	0
JUNE	76.9	57.3	67.1	97	1988	41	1980	2	0	0	0
JULY	82	63.7	72.8	102	1991	48	1988	4	0	0	0
AUGUST	80.6	63.2	71.5	104	1975	40	1965	2	0	0	0
SEPTEMBER	73.4	53.9	63.7	100	1983	32	1951	1	0	0	0
OCTOBER	63.2	43	53.1	88	1949	20	1976	0	0	4	0
NOVEMBER	52.2	35	43.6	81	1950	6	1989	0	0	13	0
DECEMBER	40.7	24.4	32.5	77	1998	-10	1980	0	7	25	0
Spring	57.3	38.6	47.9	98		1		1	1	26	0
Summer	79.8	61.1	70.5	104		40		8	0	0	0
Fall	62.9	44	53.5	100		6		1	0	17	0
Winter	38.2	21.6	29.9	77		-13		0	27	77	2
Annual	**59.6**	**41.3**	**50.4**	**104**		**-13**		**10**	**28**	**120**	**2**

Note: Normals are a 30 year average from 1961 to 1990.

Month	Precipitation (inches) Normal Precip.	Extremes: Greatest Monthly	Year	Least Monthly	Year	Greatest Daily	Year	Number of Days: 0.01" and above	0.1" and above	1.0" and above
JANUARY	3.88	11.66	1979	0.5	1970	2.9	1982	11	7	1
FEBRUARY	3.61	7.2	1984	0.39	1987	2.59	1966	10	6	1
MARCH	4.05	8.84	1983	0.56	1981	3.15	1987	11	7	1
APRIL	4.11	12.74	1983	1.48	1966	4.3	1983	11	6	1
MAY	3.76	8.38	1984	0.71	1964	5.15	1984	11	7	1
JUNE	3.33	11.08	1982	0.05	1949	3.29	1998	11	6	1
JULY	3.18	8.08	1976	0.32	1952	4.78	1976	9	5	1
AUGUST	3.63	11.12	1955	0.71	1984	6.31	1979	9	6	1
SEPTEMBER	3.48	7.92	1961	0.77	1959	4.71	1961	8	5	1
OCTOBER	3.74	11.89	1962	0.4	1994	5.39	1962	9	6	1
NOVEMBER	4.43	11.01	1983	0.81	1976	3.52	1983	11	7	1
DECEMBER	4.38	10.75	1969	0.58	1955	3.47	1969			
Spring	11.92	12.74		0.56		5.15		33	20	3
Summer	10.14	11.12		0.05		6.31		29	17	3
Fall	11.65	11.89		0.4		5.39		28	18	3
Winter	11.87	11.66		0.39		3.47		21	13	2
Annual	**45.58**	**12.74**		**0.05**		**6.31**		**111**	**68**	**11**

Month	Snowfall (inches) Normal Snowfall	Extremes: Greatest Snowfall	Year	Greatest Daily	Year	Num of Days: 0.1" and Above	3.0" and Above
JANUARY	10.00	37.20	1996	20.8	1996	5	1
FEBRUARY	10.80	30.90	1962	18.3	1961	6	1
MARCH	6.00	31.60	1956	14.7	1956	3	1
APRIL	0.70	7.60	1982	7.3	1982	1	0
MAY	0.20	7.00	1977	6.7	1977	0	0
JUNE	0.00	0.00	1999	0	1999	0	0
JULY	0.00	0.00	1998	0	1999	0	0
AUGUST	0.00	0.00	1998	0	1998	0	0
SEPTEMBER	0.00	0.00	1998	0	1998	0	0
OCTOBER	0.20	2.50	1979	2.5	1979	0	0
NOVEMBER	1.20	8.00	1989	8	1989	1	0
DECEMBER							
Spring	6.90	31.60		14.7		4	1
Summer	0.00	0.00		0		0	0
Fall	1.40	8.037.2		8		1	0
Winter	20.80	37.20		20.8		11	2
Annual	**29.10**			**20.8**		**16**	**3**

Figure 2-4
Air Temperature
Period of Record: June 1948 to July 1999
T.F. Green Airport, Providence

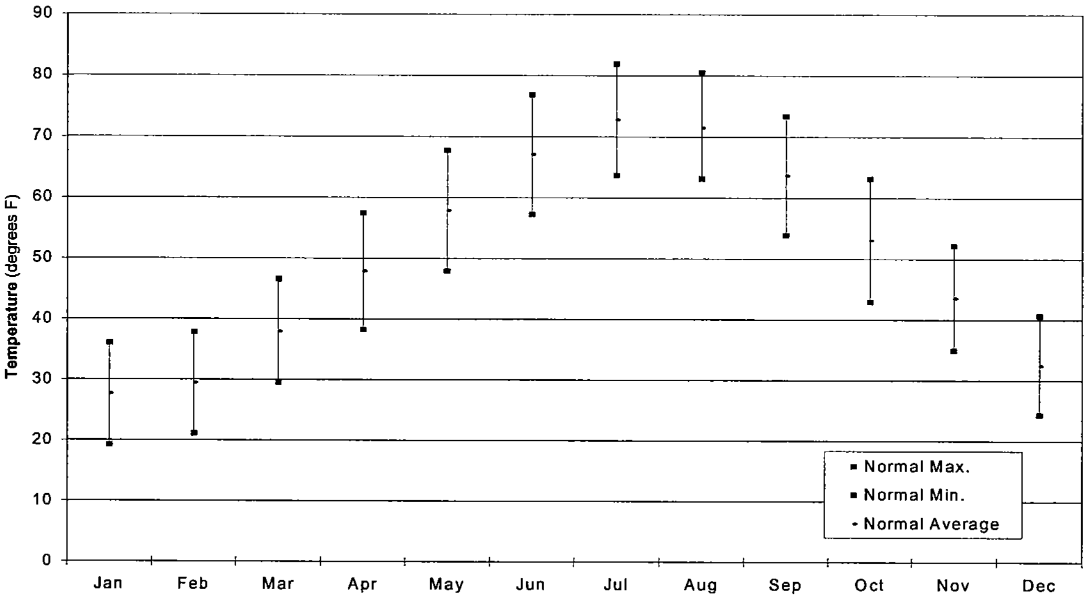


Figure 2-5
Annual Precipitation Trend

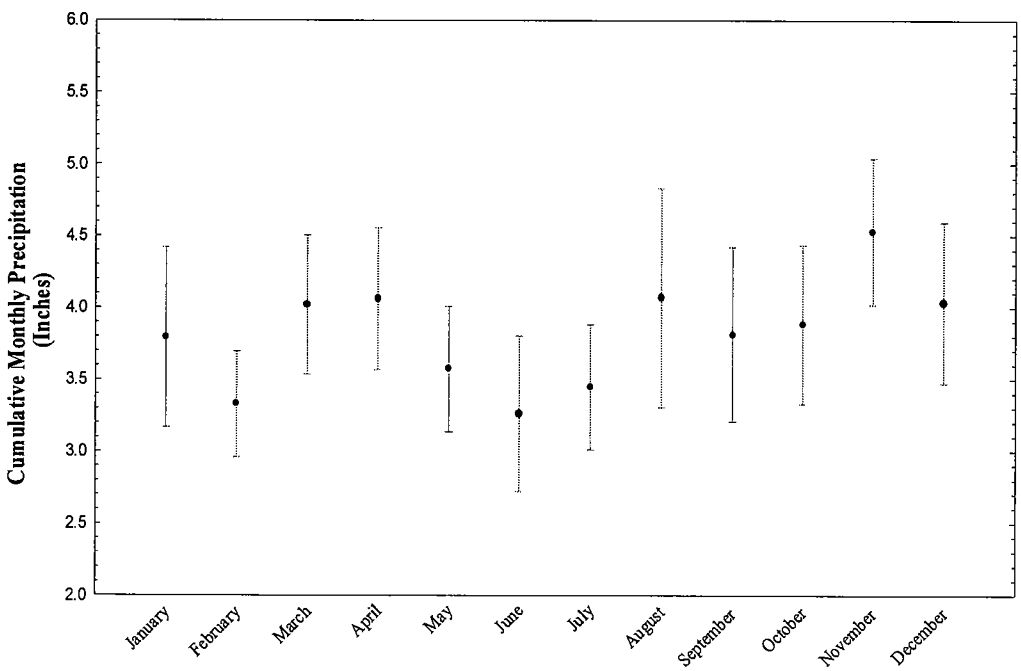


Figure 2-6
Blackstone River at Woonsocket
Monthly Mean Flow Data (USGS)
(for Water Years 1929 to 1999)

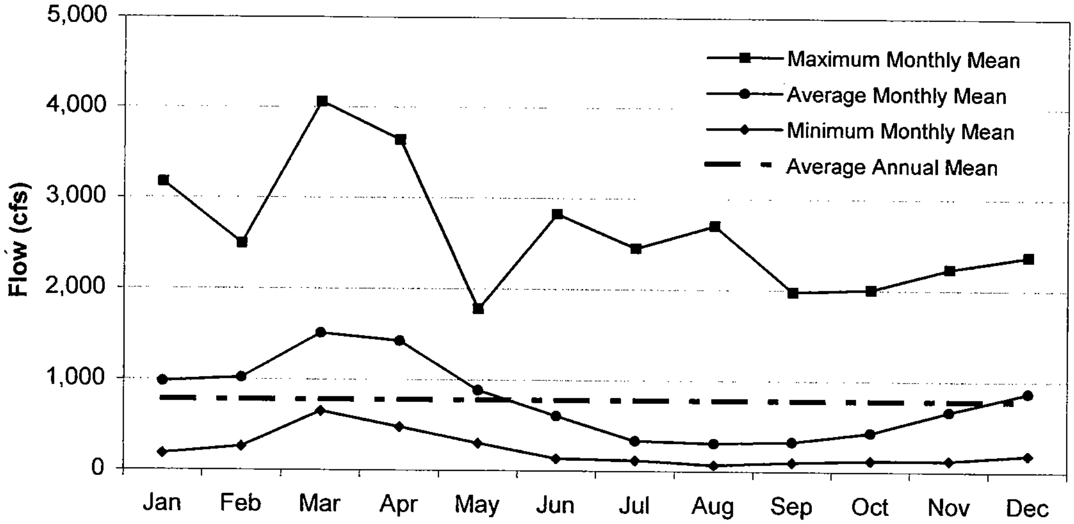


Figure 2-7
Branch River at Forestdale
Monthly Mean Flow Data (USGS)
(for Water Years 1940 to 1999)

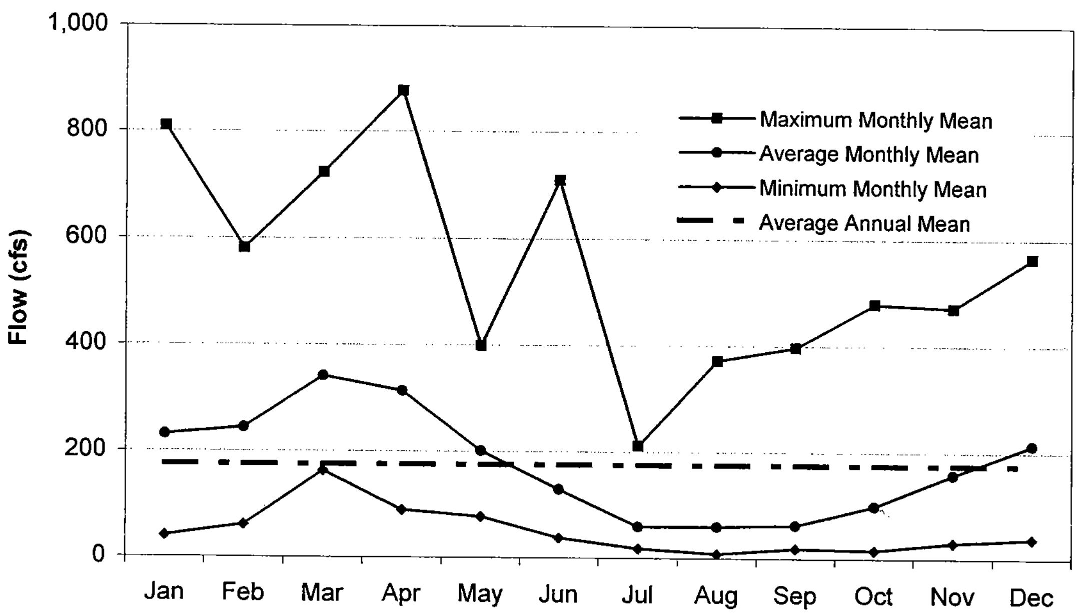


Table 2-3
Flow Data for the Blackstone River at Woonsocket, RI
(water years 1929 -1999)

Summary Statistics	Drainage Area & Flow Rates
Drainage area	416 sq.mi
Average Annual Mean	779 cfs = 503 MGD
Maximum Annual Mean	1,162 cfs = 751 MGD
Minimum Annual Mean	345 cfs = 223 MGD
10% exceeds	1,680 cfs = 1,086 MGD
50% exceeds	538 cfs = 348 MGD
90% exceeds	162 cfs = 105 MGD
7Q10	101.9 cfs = 65.9 MGD

Sources: Flow Data – USGS
7Q10 Flow - RIDEM, Office of Water Resources

Table 2-4
Flow Data for the Branch River at Forestdale, RI
(for water years 1940 -1999)

Summary Statistics	Drainage Area & Flow Rates
Drainage area	91.2 sq.mi
Average Annual Mean	175 cfs = 113 MGD
Maximum Annual Mean	261 cfs = 169 MGD
Minimum Annual Mean	76.5 cfs = 49.4 MGD
10% exceeds	379 cfs = 245 MGD
50% exceeds	122 cfs = 79 MGD
90% exceeds	26 cfs = 16.8 MGD
7Q10	13.4 cfs = 8.7 MGD

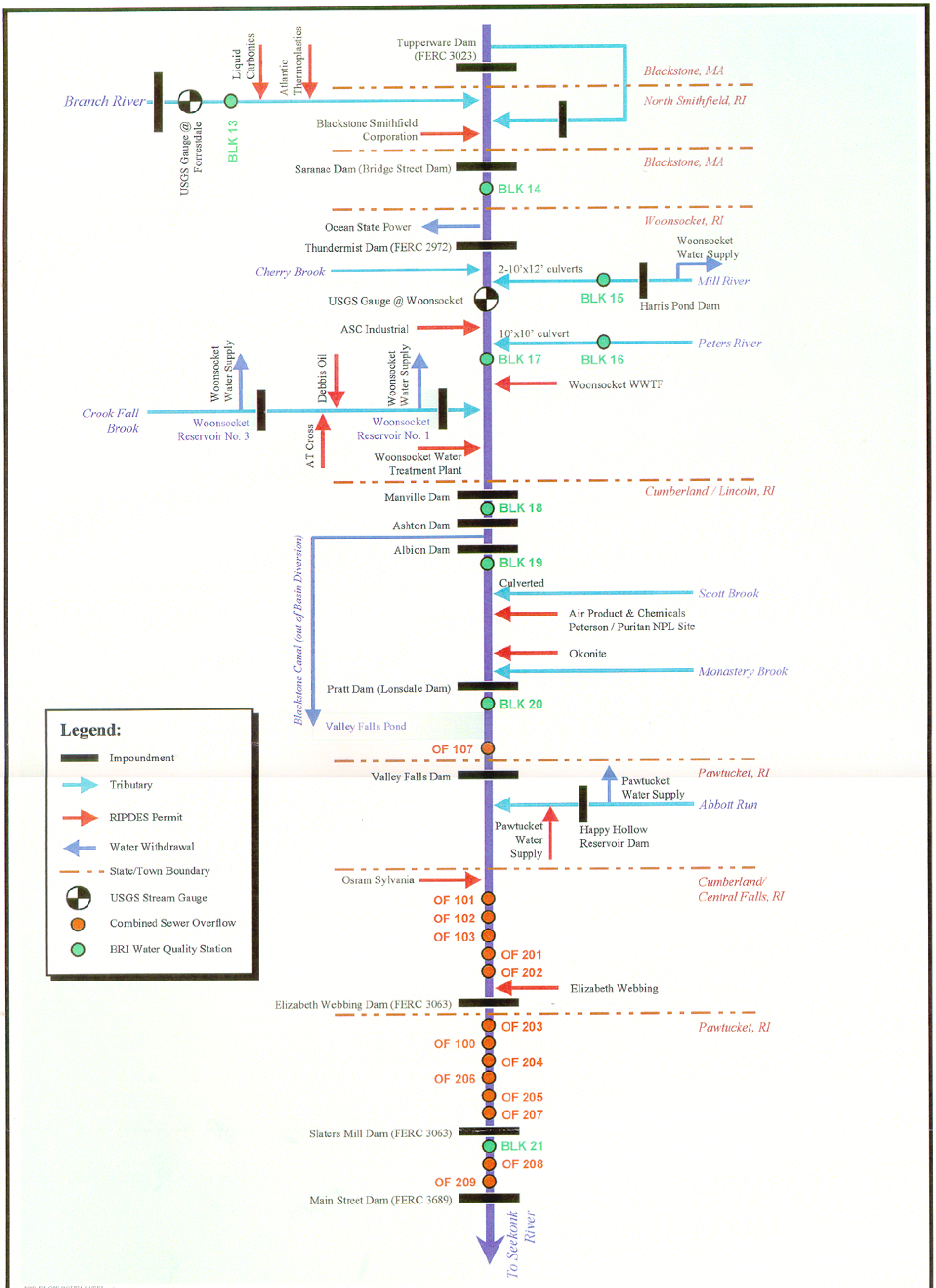
Sources: Flow Data - USGS
7Q10 Flow - RIDEM, Office of Water Resources

2.4.1. Tributaries

The portion of the Blackstone River watershed within Rhode Island has numerous tributaries and perennial streams, which flow into the main stem of the Blackstone River. Provided below is a brief description of the larger tributaries from north to south (see Figure 2-8 for flow schematic of main stem of the Blackstone River):

- ***Branch River***: The largest tributary within Rhode Island is the Branch River. The Branch River has a drainage area of approximately 91.2 mi^2, which represents approximately 20% of the drainage area of the Blackstone River. The Branch River flows west to east and meets the Blackstone River in North Smithfield near the State line. The following are primary tributaries to the Branch River: Clear River, Chepachet River, Pascoag River, and Tarklin Brook.

- ***Cherry Brook:*** The headwaters of Cherry Brook is Cedar Swamp Brook, which is a large wetland system located in North Smithfield at a low point between Woonsocket Hill and Whortleberry Hill. The brook flows north into the City of Woonsocket and enters the Blackstone River adjacent to the Providence and Worcester (P&W) railroad easement.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: ACOE, URI, RIDEM

Figure: 2-8

BLACKSTONE RIVER FLOW SCHEMATIC

- ***Mill River***: Mill River is one of the waterbodies specifically identified for TMDL development. It has a drainage area of approximately 35 mi^2, which represents approximately 8% of the drainage area of the Blackstone River. A description of the tributary is provided in Section 2.1.

- ***Peters River:*** Peters River is one of the waterbodies specifically identified for TMDL development. It has a smaller drainage area than the Mill River. A description of the tributary is provided in Section 2.1.

- ***Crook Fall Brook:*** Crook Fall Brook flows between three surface reservoirs used for drinking water (i.e., Woonsocket Reservoirs No. 3, 2, and 1). These reservoirs serve as the water supply for the City of Woonsocket. The Woonsocket Water Treatment Plant and subsequent effluent discharge is located at the confluence with the main stem.

- ***Mussey Brook:*** Mussey Brook flows west to east and drains Meaders Pond and Rochambeau Pond.

- ***West Sneech Brook:*** West Sneech Brook is a small tributary that flows north to south parallel to Mendon Road (Route 122). The brook enters the main stem approximately 0.5 miles north of the I-295 bridge crossing.

- ***Scott Brook:*** The headwaters of Scott Brook is a wetlands system north of I-295. The brook flows along Scott Road to a low point prior to Mendon Road, where the stream is culverted to the Blackstone River.

- ***Monastery Brook:*** Monastery Brook flows from Angel Road and crosses Mendon Road. The brook discharges to the Blackstone River at the backwaters of Pratt Dam.

- ***Abbot Run Brook:*** The headwaters of Abbot Run Brook is in Wrentham, MA. The brook flows southward meandering along the state line between North Attleboro and Cumberland. The brook enters the Blackstone River downstream of the impoundment at Happy Hollow Pond adjacent to the P&W rail crossing. Sneech Pond, Diamond Hill Reservoir, Arnold Mills Reservoir, Abbot Run, and Happy Hollow Reservoir are components of the City of Pawtucket and Town of Cumberland water supply system.

2.4.2. Impoundments

There are a total of 102 impoundments located within the Blackstone River Watershed. The impoundments were constructed over the years to provide water supply for drinking and industrial uses. There are also several impoundments that were constructed to generate hydroelectric power.

There are a total of nine impoundments on the main stem of the Blackstone River within the Rhode Island segment. Provided in Table 2-5 is a summary of data on all the impoundments within the RI portion of the watershed (i.e., drainage area, crest height, etc.). The impoundments on the main stem and its potential impact on river flow are discussed below (see Figure 2-8 for schematic of main stem). This discussion includes the Tupperware and Saranac Dams in Massachusetts; the two dams are close to the RI border.

- ***Tupperware Dam Blackstone, MA** (Flow Control):* Although located in Massachusetts, Tupperware dam is included in the study area due to its impact on flow in the River. The FERC license indicates the dam is operated as a run-of-the river. However, RIDEM has questioned its impact on potential fluctuations in flow levels. Flow studies have concluded that the dam has created significant fluctuations in river flow in the past. The hydropower facility is licensed to divert flow to operate a 2,000 KW power plant. Flow is diverted to a head pond with penstock intake via a 1,100-ft canal. Previous operational procedures of the dam diverted flow to the point of no-flow conditions from the Blackstone Gorge to the confluence with Branch River. RIDEM and current operators of the dam have negotiated terms to maintain a more consistent flow in the gorge.

Table 2-5

Dams and Impoundments in the Blackstone River Watershed in Rhode Island

Source: RI Department of Environmental Management

DAM NAME	RIVER	NEAR-TOWN	DAM-TYPE	PURPOSE	YEAR CONSTRUCTED	DAM LENGTH (feet)	DAM HEIGHT (feet)	MAX. FLOW (cfs)	MAX. STORAGE	NORMAL STORAGE	DRAINAGE AREA (sq. mile)	OWNER TYPE	HAZARD	SIZE
ARNOLD MILL POND	ABBOTT RUN	CUMBERLAND	EARTH,MASONRY	OTHER		150	8	1,040	13	10	18	LOCAL GOV.	LOW	SMALL
HAPPY HOLLOW POND	ABBOTT RUN	CENTRAL FALLS	MASONRY,EARTH	MUN WTR	1885	130	15	2,000	360	220	28	LOCAL GOV.	SIGNIF.	SMALL
HOWARD POND	ABBOTT RUN	CUMBERLAND			1883	90	4	260	60	40	20	PRIVATE	LOW	SMALL
PAWTUCKET RESERVOIR	ABBOTT RUN	CUMBERLAND	EARTH,GRAVITY,CONCRETE	MUN WTR	1928	2,900	33	6,700	5,300	5,125	18	LOCAL GOV.	HIGH	MEDIUM
RAWSON POND	ABBOTT RUN	CUMBERLAND	MASONRY,GRAVITY,EARTH	OTHER,RECREATION	1885	200	9	1,720	154	128	19	PRIVATE	LOW	SMALL
ROBIN HOLLOW POND	ABBOTT RUN	CENTRAL FALLS	EARTH,MASONRY	WTR SUPPLY	1937	200	13	1,680	240	208	27	PRIVATE	LOW	SMALL
CRANBERRY BOG- VERIFY	ABBOTT RUN - TR	CUMBERLAND					6		25	18		LOCAL GOV.	LOW	SMALL
THORNLEY FARM POND	ABBOTT RUN - TR	CUMBERLAND			1948	250	7	30	2	1	0	PRIVATE	LOW	SMALL
LAPIERRE FARM POND	ALDRICH BROOK	BURRILLVILLE	EARTH	FIRE/STOCK	1962		12	122	9	6	0	PRIVATE	LOW	SMALL
ALBION	*BLACKSTONE RIVER*	LINCOLN	MASONRY	OTHER	1850	400	18	138,000	347	235	411	PRIVATE	SIGNIF.	SMALL
ASHTON	*BLACKSTONE RIVER*	CUMBERLAND	MASONRY,EARTH,ARCH	OTHER	1885	318	18	19,800	200	112	421	PRIVATE	LOW	SMALL
CENTRAL FALLS	*BLACKSTONE RIVER*	CENTRAL FALLS	ROCKFILL,GRAVITY,EARTH	HYDROELEC	1850	220	14	17,300	160	98	473	PRIVATE	SIGNIF.	SMALL
ELIZ. WEBBING MILL (Pawtucket)	*BLACKSTONE RIVER*	CENTRAL FALLS/PAWT.												
MANVILLE	*BLACKSTONE RIVER*	CUMBERLAND	MASONRY	OTHER	1860	250	22	14,000	349	254	408	LOCAL GOV.	SIGNIF.	SMALL
PAWTUCKET LOWER (Main Street)	*BLACKSTONE RIVER*	PAWTUCKET	MASONRY	HYDROELEC	1896	200	17	18,000	20	12	474	PRIVATE	LOW	SMALL
PAWTUCKET UPPER (Slater Mill)	*BLACKSTONE RIVER*	PAWTUCKET	CONCRETE,MASONRY	OTHER	1800	200	15	20,700	60	45	474	PRIVATE	SIGNIF.	SMALL
PRATT DAM	*BLACKSTONE RIVER*	CUMBERLAND/LINC.										LOCAL GOV.	SIGNIF.	
VALLEY FALLS POND	*BLACKSTONE RIVER*	CENTRAL FALLS	GRAVITY,EARTH	HYDROELEC	1853	220	22	19,100	828	480	445	PRIVATE	SIGNIF.	SMALL
WOONSOCKET FALLS	*BLACKSTONE RIVER*	WOONSOCKET	CONCRETE,EARTH	FLOOD CTRL,HYDROELEC.	1960	268	17	18,900	500	400	369	LOCAL GOV.	SIGNIF.	SMALL
FORESTDALE POND	BRANCH RIVER	NORTH SMITHFIELD	MASONRY,ROCKFILL,GRAVITY	OTHER	1883	137	17	5,000	280	160	96	PRIVATE	SIGNIF.	SMALL
NASONVILLE POND	BRANCH RIVER	NORTH SMITHFIELD			1883	140	14	3,168	35	20	75	PRIVATE	LOW	SMALL
OAKLAND POND	BRANCH RIVER	BURRILLVILLE	GRAVITY,EARTH	OTHER	1850	330	11	4,280	196	114	68	PRIVATE	LOW	SMALL
SLATERSVILLE RESERVOIR LOWER	BRANCH RIVER	NORTH SMITHFIELD	ROCKFILL,MASONRY,EARTH	OTHER	1886	320	15	8,550	328	208	94	PRIVATE	LOW	SMALL
SLATERSVILLE RESERVOIR MIDDLE	BRANCH RIVER	NORTH SMITHFIELD	MASONRY,OTHER,EARTH	OTHER,RECREATION	1886	400	20	7,500	1,330	740	94	PRIVATE	SIGNIF.	MEDIUM
SLATERSVILLE RESERVOIR UPPER	BRANCH RIVER	NORTH SMITHFIELD	MASONRY,GRAVITY,EARTH	OTHER	1886	256	34	12,118	3,640	1,970	89	PRIVATE	SIGNIF.	MEDIUM
BURLINGAME RESERVOIR LOWER	BRANDY BROOK	GLOCESTER	EARTH	OTHER		250	3	306	3	2	2	STATE	LOW	LARGE
BURLINGAME RESERVOIR UPPER	BRANDY BROOK	GLOCESTER	EARTH,ROCKFILL,CONCRETE	WILDLIFE	1885	355	9	159	340	238	2	STATE	SIGNIF.	SMALL
PASCOAG RESERVOIR UPPER	BRANDY BROOK	BURRILLVILLE	GRAVITY,EARTH	RECREATION	1860	475	27	1,020	9,000	5,000	8	PRIVATE	HIGH	MEDIUM
SWEET'S MILL POND	BRANDY BROOK	GLOCESTER	EARTH,ROCKFILL	OTHER		50						STATE	LOW	SMALL
DIAMOND HILL RESERVOIR	BURNT SWAMP BROOK	CUMBERLAND	EARTH,GRAVITY,CONCRETE	MUN WTR	1971	2,000	76	3,100	#####	11,000	8	LOCAL GOV.	HIGH	MEDIUM
DUHALLOW POND	BURNT SWAMP BROOK	CUMBERLAND				75	8		8	7		LOCAL GOV.	LOW	SMALL
KER-ANNA POND	BURNT SWAMP BROOK	CUMBERLAND	EARTH,CONCRETE	RECREATION	1893	140	10	30	24	18	4	LOCAL GOV.	LOW	SMALL

Page 1

Table 2-5

Dams and Impoundments in the Blackstone River Watershed in Rhode Island

Source: RI Department of Environmental Management

DAM NAME	RIVER	NEAR-TOWN	DAM-TYPE	PURPOSE	YEAR CONSTRUCTED	DAM LENGTH (feet)	DAM HEIGHT (feet)	MAX. FLOW (cfs)	MAX. STORAGE	NORMAL STORAGE	DRAINAGE AREA (sq. mile)	OWNER TYPE	HAZARD	SIZE
DURFEE HILL WILDLIFE MARSH #2	CADY BROOK	GLOCESTER	EARTH	WILDLIFE	1965	180	8	55	55	45	0	STATE	LOW	SMALL
CHERRY VALLEY POND	CHEPACHET RIVER	GLOCESTER	EARTH,ROCKFILL,CONCRETE	RECREATION	1958	300	8	32	86	77	0	PRIVATE	LOW	SMALL
GILLERAN POND	CHEPACHET RIVER	BURRILLVILLE	EARTH,MASONRY	OTHER	1883	255	12	2,298	20	16	20	PRIVATE	LOW	SMALL
KEECH POND	CHEPACHET RIVER	GLOCESTER	GRAVITY,EARTH	RECREATION	1952	800	15	435	870	768	6	PRIVATE	LOW	SMALL
MAPLEVILLE POND	CHEPACHET RIVER	BURRILLVILLE	EARTH,MASONRY	IND WTR	1883	360	9	1,157	15	12	21	PRIVATE	LOW	SMALL
MOWRY POND	CHEPACHET RIVER	GLOCESTER	EARTH,MASONRY	OTHER	1883	180	9	1,082	42	24	12	PRIVATE	LOW	SMALL
SMITH + SAYLES RESERVOIR	CHEPACHET RIVER	GLOCESTER	MASONRY,GRAVITY,EARTH	RECREATION	1865	980	15	785	1,450	875	8	PRIVATE	LOW	MEDIUM
STEERE'S POND LOWER	CHEPACHET RIVER	GLOCESTER	EARTH,MASONRY	OTHER		180	9	1,074	24	12	16	PRIVATE	LOW	SMALL
VALENTINE MILL POND	CHEPACHET RIVER	GLOCESTER	MASONRY	OTHER									LOW	
WRIGHT, T. FARM POND	CHEPACHET RIVER - TR	GLOCESTER	EARTH	FIRE/STOCK	1973	300	11	65	8	6	0	PRIVATE	LOW	SMALL
TODD'S POND	CHERRY BROOK	NORTH SMITHFIELD	EARTH,MASONRY	OTHER		285	10	143	75	41	1	PRIVATE	LOW	SMALL
GREEN SHODDY MILL POND	CLEAR RIVER	BURRILLVILLE			1883	160	15	1,363	8	5	13	LOCAL GOV.	LOW	SMALL
PREMIER MILL POND	CLEAR RIVER	BURRILLVILLE	MASONRY,EARTH	OTHER	1883	450	10	1,265	10	9	14	PRIVATE	LOW	SMALL
PRENDERGAST MILL POND	CLEAR RIVER	BURRILLVILLE	CONCRETE,EARTH	OTHER	1928	110	14	1,174	28	19	13	PRIVATE	LOW	SMALL
WALLUM LAKE	CLEAR RIVER	BURRILLVILLE	MASONRY,GRAVITY,EARTH	RECREATION	1866	80	7	80	#####	9,000	2	PRIVATE	LOW	MEDIUM
WILSON RESERVOIR	CLEAR RIVER	BURRILLVILLE	GRAVITY,EARTH	RECREATION,OTHER	1866	480	21	395	840	590	13	PRIVATE	LOW	MEDIUM
BARKER FARM POND	CLEAR RIVER - TR	BURRILLVILLE			1957	680	10	168	5	3	0	PRIVATE	LOW	SMALL
LAFERRIER FARM POND	CLEAR RIVER - TR	BURRILLVILLE			1971	210	13	56	3	2	0	PRIVATE	LOW	SMALL
ROSS POND	CLEAR RIVER - TR	BURRILLVILLE	EARTH,CONCRETE	RECREATION		150	6	40	12	10		PRIVATE	LOW	SMALL
WOONSOCKET RESERVOIR #1	CROOKFALL BROOK	NORTH SMITHFIELD	EARTH,CONCRETE,MASONRY	MUN WTR	1883	240	41	2,200	145	105	8	LOCAL GOV.	SIGNIF.	MEDIUM
WOONSOCKET RESERVOIR #3	CROOKFALL BROOK	NORTH SMITHFIELD	MASONRY,GRAVITY,EARTH	MUN WTR	1895	1,500	27	433	4,740	3,950	3	LOCAL GOV.	HIGH	MEDIUM
PRATT POND	DAWLEY BROOK	NORTH SMITHFIELD	EARTH,MASONRY	RECREATION		156	8	15	18	15	0	STATE	LOW	SMALL
HANDY POND LOWER	HANDY BROOK	LINCOLN	EARTH	OTHER		100	12	90	10	8	1	PRIVATE	LOW	SMALL
HANDY POND UPPER	HANDY BROOK	LINCOLN	EARTH,CONCRETE	IND WTR		300	12	75	50	45	1	PRIVATE	LOW	SMALL
SPRING LAKE	HERRING BROOK	BURRILLVILLE	GRAVITY,EARTH	RECREATION	1885	55	8	56	840	690	1	PRIVATE	LOW	SMALL
CASS PARK POND	IRONMINE BROOK	WOONSOCKET	EARTH,CONCRETE	RECREATION	1946	400	8	250	8	6	3	LOCAL GOV.	LOW	SMALL
SYLVESTER POND	IRONMINE BROOK	WOONSOCKET	EARTH,CONCRETE	OTHER	1922	256	24	113	81	70	3	LOCAL GOV.	LOW	SMALL
KEACH POND	KEACH BROOK	EAST PUTNAM, CN	EARTH,ROCKFILL,MASONRY	RECREATION		100	10	950	76	61	3	STATE	LOW	SMALL
BUCK HILL POND	LEESON BROOK	BURRILLVILLE	GRAVITY,EARTH	RECREATION	1962	500	13	178	110	90	1	STATE	LOW	SMALL
SHIELDS FARM POND	LELAND BROOK - TR	BURRILLVILLE			1966		12	64	9	7	0	PRIVATE	LOW	SMALL
WILBUR POND	MARY BROWN BROOK	GLOCESTER	GRAVITY,EARTH	RECREATION	1854	150	7	50	100	56	1	PRIVATE	LOW	SMALL
HARRIS POND DAM	***MILL RIVER***	WOONSOCKET	EARTH,GRAVITY,CONCRETE	MUN WTR	1969	1,018	38	8,500	2,850	1,050	32	LOCAL GOV.	HIGH	MEDIUM

Page 2

Table 2-5

Dams and Impoundments in the Blackstone River Watershed in Rhode Island

Source: RI Department of Environmental Management

DAM NAME	RIVER	NEAR-TOWN	DAM-TYPE	PURPOSE	YEAR CONSTRUCTED	DAM LENGTH (feet)	DAM HEIGHT (feet)	MAX. FLOW (cfs)	MAX. STORAGE	NORMAL STORAGE	DRAINAGE AREA (sq. mile)	OWNER TYPE	HAZARD	SIZE
SOCIAL PARK POND LOWER	*MILL RIVER*	WOONSOCKET	EARTH,CONCRETE	RECREATION	1961	200	11	60	48	40	0	LOCAL GOV.	LOW	SMALL
MISCOE LAKE	MISCOE BROOK	CUMBERLAND	ROCKFILL,EARTH	OTHER	1937	75	12	70	244	226	3	PRIVATE	LOW	SMALL
CAMP ALDERSGATE POND	MOSQUITOHAWK BROOK	GLOCESTER	GRAVITY,EARTH	RECREATION	1973	500	10	6	5	4	1	PRIVATE	LOW	SMALL
LAKE ALDERSGATE	MOSQUITOHAWK BROOK - TR	GLOCESTER	EARTH	RECREATION		200	6	35	80	66	0	PRIVATE	LOW	SMALL
MEADER POND	MUSSEY BROOK	LINCOLN	ROCKFILL,EARTH,CONCRETE	OTHER		100	5	40	12	10	0	PRIVATE	LOW	SMALL
MEMORIAL PARK	MUSSEY BROOK	LINCOLN	EARTH	RECREATION		700	9	126	10	9	0	LOCAL GOV.	LOW	SMALL
MOWRY-PAINE POND	PAINE BROOK	GLOCESTER	EARTH,MASONRY	RECREATION		250	12	2,612	42	20	2	PRIVATE	LOW	SMALL
AKELA POND	PASCOAG RIVER	BURRILLVILLE	STONE,EARTH	OTHER	1883	50	10	329	6	5	9		LOW	SMALL
AMERICAN MILL POND	PASCOAG RIVER	BURRILLVILLE	STONE,EARTH	OTHER	1883	190	14	292	8	6	9	PRIVATE	LOW	SMALL
GRANITEVILLE POND LOWER	PASCOAG RIVER	BURRILLVILLE				700	4				29	PRIVATE	LOW	SMALL
HARRISVILLE POND	PASCOAG RIVER	BURRILLVILLE	ROCKFILL,GRAVITY,EARTH	OTHER,RECREATION	1854	550	19	3,200	100	56	43	PRIVATE	LOW	SMALL
UNION MILL POND	PASCOAG RIVER	BURRILLVILLE	EARTH,MASONRY	OTHER	1883	290	7	425	70	45	9	PRIVATE	SIGNIF.	SMALL
KNIBB FARM POND	PASCOAG RIVER - TR	BURRILLVILLE			1950	200	8	14	1	1		PRIVATE	LOW	SMALL
PECKHAM POND #1	PECKHAM BROOK	GLOCESTER	EARTH,MASONRY	OTHER		280	6	15	10	6		PRIVATE	LOW	SMALL
PECKHAM POND #2	PECKHAM BROOK	GLOCESTER	EARTH,MASONRY	OTHER		250	4		28	16		PRIVATE	LOW	SMALL
PECKHAM POND #3	PECKHAM BROOK	GLOCESTER	EARTH,MASONRY	OTHER			14	90	20	12		PRIVATE	LOW	SMALL
PECKHAM POND #4	PECKHAM BROOK	GLOCESTER	EARTH,MASONRY	OTHER	1800	100	5		4	2		PRIVATE	LOW	SMALL
PECKHAM POND #5	PECKHAM BROOK - TR	GLOCESTER					5					PRIVATE	LOW	
COOMER LAKE	PEEPTOAD BROOK	GLOCESTER	ROCKFILL,EARTH	RECREATION,WTR SUPPLY	1885	330	9	800	510	383	3	LOCAL GOV.	LOW	SMALL
SANDY BROOK POND #1	PEEPTOAD BROOK	GLOCESTER	EARTH,MASONRY	OTHER		230	7		30	25	3	PRIVATE	LOW	SMALL
SANDY BROOK POND #2	PEEPTOAD BROOK	GLOCESTER					6		3	2		PRIVATE	LOW	
JENCKESVILLE POND LOWER	*PETERS RIVER*	WOONSOCKET	CONCRETE,EARTH	OTHER	1905	105	9	930	4	3	11	PRIVATE	LOW	SMALL
JENKESVILLE POND UPPER	*PETERS RIVER*	WOONSOCKET	EARTH,CONCRETE	OTHER		80	7		9	7	11	PRIVATE	LOW	SMALL
LAKE BEL AIR	RANKIN BROOK	NORTH SMITHFIELD	EARTH,MASONRY	RECREATION		180	7	15	23	20	1	PRIVATE	LOW	SMALL
WINSOR FARM POND	RANKIN BROOK	NORTH SMITHFIELD	EARTH	WILDLIFE	1957	160	6	173	5	4	0	PRIVATE	LOW	SMALL
LITTLE ROUNDTOP POND	ROUNDTOP BROOK	BURRILLVILLE	EARTH	WILDLIFE	1965	100	6	27	20	18	0	STATE	LOW	SMALL
ROUND TOP PONDM	ROUNDTOP BROOK	BURRILLVILLE	GRAVITY,EARTH	RECREATION	1905	140	10	2,076	60	50	9	STATE	LOW	SMALL
O'REILLY POND	SAUNDERS BROOK - TR	GLOCESTER	EARTH	OTHER		300	4		7	5		PRIVATE	LOW	SMALL
FACTORY MUTUAL RESEARCH CTR LOWE	SHADY OAK BROOK	GLOCESTER	EARTH	OTHER	1948	300	24	800	125	75	2	PRIVATE	LOW	SMALL
FACTORY MUTUAL RESEARCH CTR UPPE	SHADY OAK BROOK	GLOCESTER	EARTH,MASONRY	OTHER	1972	350	19	1,115	10	6	2	PRIVATE	LOW	SMALL
DAVID KING FARM POND	SPRING GROVE BROOK	GLOCESTER	EARTH	FIRE/STOCK,WILDLIFE	1974	200	13	77	22	15	0	PRIVATE	LOW	SMALL
MOWER POND	SPRING GROVE BROOK	GLOCESTER	GRAVITY,EARTH	RECREATION	1885	300	14	63	265	234	1	PRIVATE	LOW	SMALL

Page 3

Table 2-5

Dams and Impoundments in the Blackstone River Watershed in Rhode Island

Source: RI Department of Environmental Management

DAM NAME	RIVER	NEAR-TOWN	DAM-TYPE	PURPOSE	YEAR CONSTRUCTED	DAM LENGTH (feet)	DAM HEIGHT (feet)	MAX. FLOW (cfs)	MAX. STORAGE	NORMAL STORAGE	DRAINAGE AREA (sq. mile)	OWNER TYPE	HAZARD	SIZE
OLD MILL POND	SPRING GROVE BROOK	GLOCESTER	EARTH,CONCRETE	OTHER		35	5	50	4	3	1	PRIVATE	LOW	SMALL
SNAKESKIN POND	SPRING GROVE BROOK	GLOCESTER	EARTH,MASONRY	OTHER		100	8	184	35	22	2	PRIVATE	LOW	SMALL
DAVIS FARM POND	SPRING GROVE BROOK - TR	GLOCESTER	EARTH	FIRE/STOCK	1951	390	10	52	2	1	0	PRIVATE	LOW	SMALL
NEW POND	SPRING GROVE BROOK - TR	GLOCESTER	EARTH	OTHER		450	8	35	16	6		PRIVATE	LOW	SMALL
SHINGLE MILL POND UPPER	STINGO BROOK - TR	GLOCESTER	EARTH,MASONRY	OTHER		150	8	85	32	15	2	PRIVATE	LOW	SMALL
SPRING GROVE POND	SUCKER BROOK	GLOCESTER	EARTH	OTHER								PRIVATE	LOW	SMALL
STEERE'S SAWMILL POND	SUCKER BROOK	GLOCESTER	EARTH,ROCKFILL	OTHER	1822	50	12	150	40	30	3	PRIVATE	LOW	SMALL
SUCKER BROOK BRIDGE POND	SUCKER BROOK	GLOCESTER	EARTH,CONCRETE	OTHER		160	13	242	15	9	3	PRIVATE	LOW	SMALL
SUCKER POND	SUCKER BROOK	BURRILLVILLE	GRAVITY,EARTH	OTHER	1883	220	13	117	330	278	1	PRIVATE	LOW	SMALL
NICHOLS POND	TARKILN BROOK	NORTH SMITHFIELD	GRAVITY,EARTH	RECREATION	1885	110	9	560	130	77	7	PRIVATE	LOW	SMALL
TARKILN MILL POND	TARKILN BROOK	NORTH SMITHFIELD			1882	150	11	2,923	35	15	9	PRIVATE	LOW	SMALL
TARKILN POND	TARKILN BROOK	NORTH SMITHFIELD	GRAVITY,EARTH	RECREATION	1886	140	10	915	85	65	9	LOCAL GOV.	LOW	SMALL
CLEMENCE FARM POND	TARKILN BROOK - TR	GLOCESTER	EARTH	FIRE/STOCK		200	8	77	11	9	0	PRIVATE	LOW	SMALL
THOMPSON POND	TARKILN BROOK - TR	GLOCESTER	EARTH	FIRE/STOCK		70	3		25	20	0	PRIVATE	LOW	SMALL
WOONSOCKET SPORTSMEN'S CLUB PON	TARKILN BROOK - TR	BURRILLVILLE	EARTH	RECREATION	1954	250	8	145	12	8	0	PRIVATE	LOW	SMALL
OLNEY POND	THREADMILL BROOK	LINCOLN	MASONRY,GRAVITY,EARTH	RECREATION	1883	220	28	88	1,860	1,490	1	STATE	HIGH	MEDIUM
STUMP HILL RESERVOIR- VERIFY	THREADMILL BROOK - TR	LINCOLN	EARTH	OTHER			10		5	4		LOCAL GOV.	LOW	SMALL
FORT FARM POND #1	TROUT BROOK	NORTH SMITHFIELD	EARTH	FIRE/STOCK,WILDLIFE	1963	170	11	70	27	23	0	PRIVATE	LOW	SMALL
O'HARA POND	TROUT BROOK	NORTH SMITHFIELD	EARTH,MASONRY	OTHER	1830	170	8	48	10	8	1	PRIVATE	LOW	SMALL
TROUT POND	TROUT POND BROOK	BURRILLVILLE	EARTH,MASONRY	FIRE/STOCK	1883	300	8	50	15	10	0	PRIVATE	LOW	SMALL
BLACK HUT POND	UNNAMED STREAM	BURRILLVILLE	EARTH	WILDLIFE	1968	270	11	65	16	11	0	STATE	LOW	SMALL
CHESTER ST. POND	UNNAMED STREAM	NORTH SMITHFIELD	EARTH	RECREATION		200	4	35	5	4		LOCAL GOV.	LOW	SMALL
MANN POND	WINDSOR BROOK	GLOCESTER	EARTH	FIRE/STOCK	1949	250	9	17	2	1	0	PRIVATE	LOW	SMALL

- ***Saranac Dam (aka Bridge Street Dam), Blackstone, MA*** *(Run-of-the-River):* Saranac Dam is located just downstream of the confluence of the Branch River at the State line, where the river reenters RI. The dam and associated canal and tailrace are no longer in use.

- ***Thundermist Dam (aka Woonsocket Falls), Woonsocket, RI*** *(Flow Control):* This dam is primarily used for flood control purposes. It is operated by the City of Woonsocket. Power generation capabilities were added later for a 1,200 KW powerhouse. The turbines operate at a flow range of 120 cfs to 1,000 cfs. Intake for the turbines is through two 8-ft diameter penstocks located approximately 60 ft upstream. Maximum flow diversion from the river, permitted by FERC, is 820 cfs. The dam is 266 ft long with a crest height of 40 ft. The maximum storage capacity of the reservoir behind the dam is 300 acre-ft. The Ocean State Power intake is located just upstream of Thundermist Dam with a permitted water withdrawal of 4 MGD. Water withdrawal is required to cease when river flow is below 7Q10 (102 cfs).

- ***Manville Dam, Cumberland/Lincoln, RI*** *(Run-of-the-River):* Manville Dam is 160 ft long with a crest height of 19 ft. The surface area of the reservoir is 58 acres with a storage capacity of 58 acre-ft at an elevation of 89.4 ft (NGVD). The dam is no longer used.

- ***Albion Dam, Cumberland/Lincoln, RI*** *(Run-of-the-River):* Albion Dam is 300 ft long with a crest height of 25 ft. The surface area of the reservoir is 55 acres with a storage capacity of 495 acre-ft. The dam was proposed for construction of a 940 KW generating facility in 1991; however, the facility was never constructed. The dam is no longer used.

- ***Ashton Dam, Cumberland/Lincoln, RI*** *(Run-of-the-River):* Ashton Dam is 318 ft long with a crest height of 18 ft. The maximum storage capacity of the reservoir behind the impoundment is 200 acre-ft. Ashton Dam was also proposed for use to generate hydroelectric power, but was never constructed. The dam is no longer used and is operated as run-of-the-river.

- ***Pratt Dam (aka Lonsdale Dam), Cumberland/Lincoln, RI*** *(Run-of-the-River):* Pratt Dam is no longer used. The RIDEM dam database had no information on the structure.

- ***Valley Falls Dam (aka Central Falls Dam), Cumberland/Central Falls, RI*** *(Run-of-the-River):* Valley Falls Dam has a FERC license to operate a 818 KW generating facility. The dam diverts flow to a 500-ft long and 35-ft wide headrace to two fix blade turbines. The turbines operate (on or off) at a minimum flow of 400 cfs. The dam is permitted to operate as run-of-the-river. The FERC permit requires inflow equal outflow below aquatic base flow of 238 cfs. The dam also has a low-flow bypass to operate when flows are below 7Q10 (108 cfs).

- ***Elizabeth Webbing Mill Dam (aka Pawtucket Dam, also Pantex Dam), Central Falls/Pawtucket, RI*** *(Flow Control):* Elizabeth Webbing Dam has a FERC license to operate a 670 KW electric generating facility. Flow is diverted to the plant to generate power. The FERC permit requires inflow to outflow below aquatic base flow of 238 cfs. The permittee is not required to provide flow over the spillway due to the tailwater depth of Slaters Mill dam located downstream.

- ***Slaters Mill Dam, Pawtucket, RI*** *(Run-of-the-River):* The historic dam diverts sufficient flow to turn a water wheel. The dam has a spillway height of 7 ft at a crest elevation of approximately 23 ft (NGVD).

- ***Main Street Dam (aka, Pawtucket Falls Dam), Pawtucket, RI*** *(Flow Control):* The Main Street Dam is the limits of tidally influenced Seekonk River and freshwater Blackstone. The dam diverts flow to the Bridge Mill Power Generating Facility, which has a capacity of 1700 KW. The dam is approximately 170 ft long with a dam height of 17 ft. The FERC license requires a minimum flow of 50 cfs over the spillway be maintained.

2.4.3. Water Quality Classification

The Blackstone River, Mill River, and Peters River have been classified as follows (Figure 2-9).

- ***Blackstone River:***
  - Class B1 from MA/RI border to CSO outfall located at the Blackstone River and Samoset Street in Central Falls. This includes Valley Falls Pond.
  - Class B1{a} from CSO outfall at the Blackstone River and Samoset Street in Central Falls to Main Street Dam in Pawtucket, RI.

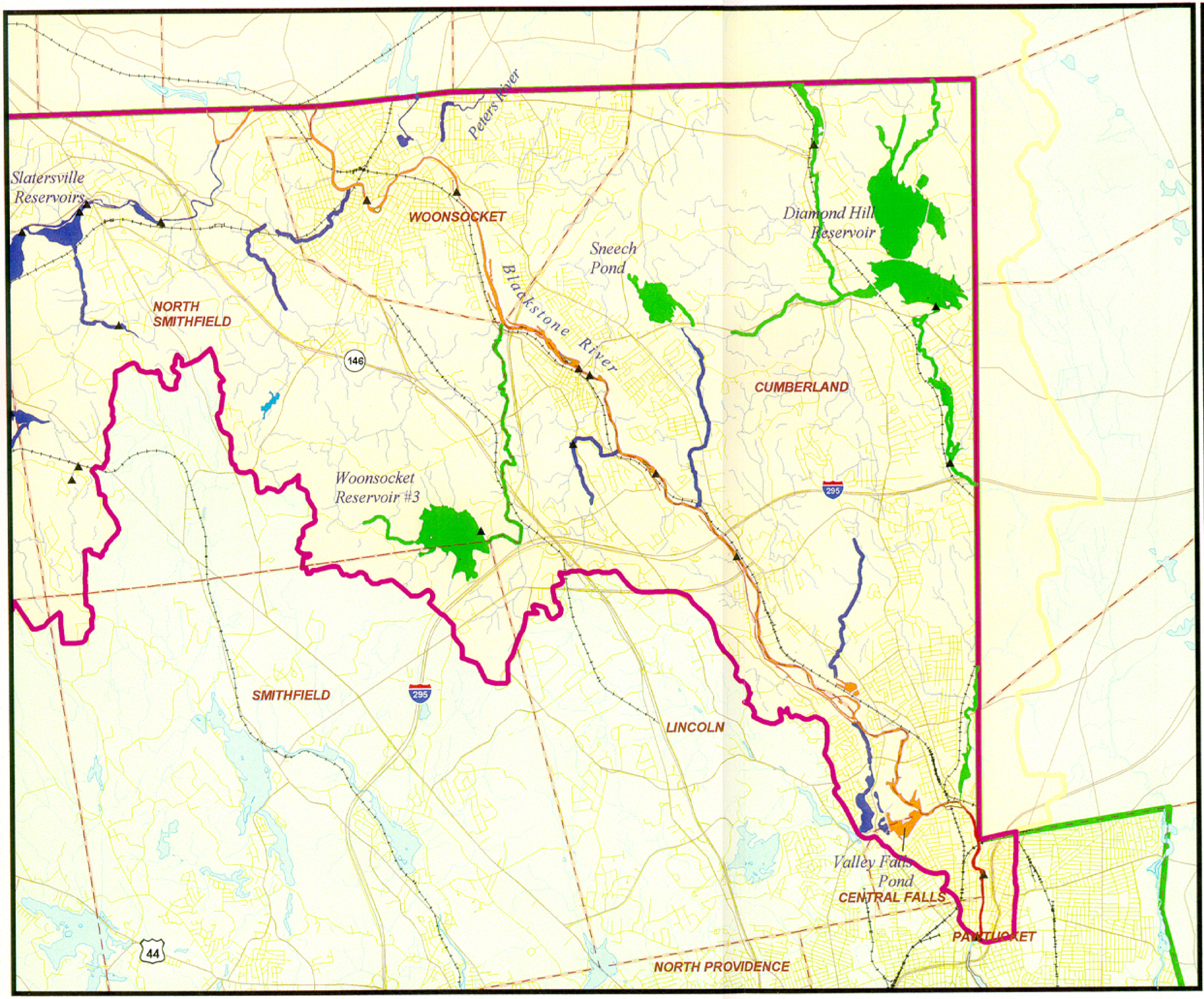
- ***Mill River:***
  - Class B from MA/RI border to confluence with the Blackstone River (RI segment).
  - Class B from North Pond to MA/RI border (MA segment).

- ***Peters River:***
  - Class B from MA/RI border to confluence with the Blackstone River (RI segment).
  - Class B from Curtis Pond to MA/RI border (MA segment).

The Rhode Island 2000 Draft 303(d) List of Impaired Waters cites numerous concerns in the Blackstone River and its tributaries. Presented below is a list of waterbodies identified in the RI portion of the Blackstone River watershed (Table 2-6). These impairments are relevant for this study as the individual tributaries represent point sources to the Blackstone River. Listed in Table 2-7 are Massachusetts 1998 303(d) List of Impaired Waterbodies within Blackstone River Watershed relevant for this study.

Table 2-6
State of Rhode Island 2000 303(d) List of Impaired Waterbodies
Impaired Waters within Blackstone River Watershed

Waterbody Name	Cause	Group
Branch River	Biodiversity Impacts, Pathogens, Lead	Group 2
Clear River	Biodiversity Impacts, Lead	Group 2
Slatersville Reservoir	Lead, Copper (Group 2) Pathogens, Phosphorus (Group 4)	Group 2, 4
Tarklin Brook	Biodiversity Impacts	Group 5
Scott Pond	Hypoxia, Phosphorus, Excess Algal Growth	Group 2
Blackstone River	Biodiversity Impacts, Pathogens, Copper, Lead (Group 1) Hypoxia, Nutrients, Ammonia (Group 5)	Group 1, 5
Valley Falls Pond	Biodiversity Impacts, Lead, Pathogens, Nutrients, Hypoxia, Excess Algal Growth	Group 1
Mill River	Lead	Group 1
Peters River	Pathogens, Copper, Lead	Group 1
Abbott Run Brook	Biodiversity Impacts (Group 2), Lead (Group 3)	Group 2, 3
Long Brook	Pathogens	Group 2
Ash Swamp Brook	Pathogens	Group 2
Burnt Swamp Brook	Pathogens	Group 2
Catamint Brook	Pathogens	Group 2
Robin Hollow Pond	Total Coliform	Group 2



N
W E
S

LEGEND

- Town Boundary
- Major River, Stream
- Road
- Railroad
- Dams, Impoundments
- Study Area
- Major Lakes, Ponds
- State Boundary
- Watershed Boundary

Water Quality Classification

- A
- B
- B1
- B1{a}
- ISL

Graphic Scale

1 0 1 Miles

Figure: 2-9
BLACKSTONE RIVER WATER QUALITY CLASSIFICATION

File: BASE.apr

The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS | January 2004

Table 2-7
State of Massachusetts 1998 303(d) List of Impaired Waterbodies
Impaired Waters within Blackstone River Watershed
(Limited to Study Area)

Waterbody	**Description**	**Cause of Impairment**
Blackstone River	Sampling station at Millville to Rhode Island border	PCBs, nutrients, pH, flow alteration, fecal coliform bacteria, suspended solids, turbidity
Peters River	Outlet of Curtis Pond in Bellingham to Rhode Island border	Metals, fecal coliform bacteria
Mill River	Outlet of North Pond in Milford/Upton to confluence with Blackstone River in Woonsocket	PCBs, metals
Harris Pond	Formed by impoundment in Mill River at Blackstone/Woonsocket line	Noxious plants

The Preliminary Data Report prepared by RIDEM indicates that the Blackstone River violates water quality standards for pathogens, copper, lead, and biodiversity. Valley Falls Pond violates water quality criteria for biodiversity impacts, pathogens, nutrients, hypoxia, and lead. Mill River violates criteria for lead and Peters River violates for pathogens, copper, and lead. As a result, RIDEM has given these waterbodies high priority for the development of TMDLs by placing them into Group 1.

2.4.4. Segment Classification

In accordance with the River Policy and Classification Plan, Rhode Island Rivers Council has designated segment classifications for the Blackstone River and its tributaries. Segment classifications are useful in providing input into the actual intended use of a waterbody in order to establish appropriate water quality goals. Provided below are the segment classifications established by the RI Rivers Council (Rhode Island Statewide Planning, 1998):

- ***Wallum Lake*** *(Water Supply):* Wallum Lake is a drinking water supply for Zambarano Hospital, but is approved for contact recreational use in Massachusetts. Hunting and hiking are supported within Buck Hill Wildlife Management Area and Douglas State Forest. Since Wallum Lake is a drinking water supply, there is a buffer zone around the Rhode Island portion of the lake; swimming and fishing are not allowed. Endangered species are documented in the eastern and southern high quality streams to the lake.

- ***Clear River – above Wilson Reservoir*** *(Recreational Open Space):* Three quarters of a mile from Wallum Lake to a point one-half mile above Wilson Reservoir, the Clear River is the receiving water for a permitted wastewater discharge from Zambarano. This segment has limited recreational potential but is valued open space for habitat resources.

- ***Clear River – below Wilson Reservoir*** *(Recreational Open Space):* The Clear River from Wilson Reservoir to its confluence with the Chepachet River is suitable for recreation, however is limited by low flows. In the last mile of the river, contact recreational activities are limited due to the permitted discharge from Burrillville Wastewater Treatment Facility.

- ***Wilson Reservoir*** *(Recreational Open Space):* Located in central Burrillville, the Wilson Reservoir is used for recreation and open space. Although suitable for swimming and boating, these recreational uses are threatened by the presence of failed or poorly functioning septic systems.

- ***Pascoag Reservoir*** *(Recreational Open Space):* The Pascoag Reservoir, also known as Echo Lake, is situated in south-central Burrillville. It is suitable for contact recreation and has two state boat ramps. The Pascoag River and its tributaries to its confluence with the Clear River are also valued as recreational open space.

- ***Nipmuc River and Pond*** *(Pristine):* The Nipmuc River and Pond are located in north central Burrillville and generally inaccessible. These pristine waterbodies are valuable open space.

- ***Spring Lake*** *(Recreational Open Space):* The lake is suitable for recreational swimming and boating.

- ***Smith Reservoir, Sayles Reservoir, and Keech Pond*** *(Recreational Open Space):* These three waterbodies are located in Glocester and are suitable for fishing, swimming, and boating. Critical habitat areas are located northeast of the Reservoir.

- ***Chepachet River*** *(Recreational Open Space):* The Chepachet River and its tributaries from Smith and Sayles Reservoir in Glocester to its confluence with the Clear and Branch Rivers are stocked for fishing and have open space value.

- ***Branch River – upstream of Slaterville Reservoir*** *(Recreational Open Space):* The Branch River from its confluence with the Clear and Chepachet Rivers to the Slatersville Reservoir is suitable for fishing and swimming. It has recreational open space value, and mill villages are located along its corridor.

- ***Slatersville Reservoir*** *(Recreational Open Space):* Slatersville Reservoir (upper and lower) has recreational value and is designated as swimmable and fishable. However, it has a boat ramp and fishing club access. Its current condition with respect to contact recreation is marginal due to fecal coliform and metals levels that exceed State standards. The Landfill Resource and Recovery Superfund site is located near the Slatersville Reservoir.

- ***Branch River – downstream of Slaterville Reservoir*** *(Recreational Multiple Use):* The Branch River from Slatersville Reservoir to its confluence with the Blackstone River at the Blackstone Gorge in the Town of North Smithfield has scenic and open space value with mill villages located along the river. It is suitable for non-contact recreation.

- ***Blackstone River – Blackstone Gorge to State line*** *(Recreational Open Space):* The Blackstone River is suitable for non-contact recreation. White water rafting is occasionally possible in this segment. Massachusetts and Rhode Island have purchased the riverbanks on both sides of the Gorge, where a bi-state park will developed.

- ***Blackstone River – State line to Thundermist Falls, Woonsocket*** *(Recreational Multiple Use):* The Blackstone River is suitable for non-contact recreational activities. Mills with historical value are located along the river corridor. Ocean State Power, which is in Burrillville, has a water intake located just upstream of Thundermist Dam.

- ***Blackstone River – Thundermist Falls to Manville Dam*** *(Recreational Multiple Use):* The Blackstone River is a multiple use urbanized open space with significant recreational value. Primary contact recreational activities are limited immediately downstream of the Woonsocket WWTF.

- ***Woonsocket Reservoirs and Crook Fall Brook*** *(Water Supply):* Woonsocket Reservoirs and Crook Fall Brook and its tributaries are components of a public water supply. The main reservoir, which is identified as Reservoir No. 3, is located in Smithfield and North Smithfield. Mill sites, historical resources, and archeological remains can be found along Crook Fall Brook.

- ***Sneech Pond** (Water Supply):* Sneech Pond is a public water supply for the Town of Cumberland. It is noted for its unique aquatic habitat.

- ***Diamond Hill Reservoir, Arnold Mills Reservoir, Abbot Run Brook, and Happy Hollow Reservoir** (Water Supply):* These waterbodies are components of the City of Pawtucket water supply. The water quality in Abbot Run, which flows into Massachusetts and returns to Rhode Island, is threatened due to urban development.

- ***Blackstone River – Manville Dam to Valley Falls Marsh** (Recreational Open Space):* The Blackstone River is classified as non-contact recreation. There are historic mills between Manville and Valley Falls. This river segment includes the Blackstone River State Park, as well as other local parks that provide open space.

- ***Valley Falls Marsh** (Recreational Open Space):* Valley Falls Marsh, identified as an important wetland system in Rhode Island, provides open space and habitat in a relatively urbanized setting. Located north of the City of Central Falls in the Towns of Lincoln and Cumberland, it is the largest freshwater wetland system in northern Rhode Island. From the Blackstone River, there is boat access to the marsh for fishing.

- ***Blackstone River – Valley Falls Marsh to Main Street Bridge, Pawtucket** (Recreational Open Space):* The Blackstone River is classified for multiple use in an urbanized open space. In addition to its historic value, this segment provides the setting for local parks, as well as the Slater Mill.

2.5 Groundwater Hydrology

2.5.1 Aquifers

Within the Blackstone River watershed, groundwater can be found within three distinct hydraulically-connected aquifers: bedrock, till, and stratified glacial outwash and drift deposits. Groundwater supplies are contained below the land surface in interstitial spaces within the bedrock. Interstices can range in size from minute pores in clay to expansive solution cavities in limestone. However, the largest groundwater supplies within the Blackstone River watershed are in the stratified glacial drift and outwash deposits of sand and gravel. Large quantities of water may be obtained from these deposits wherever they lie below the water table. Due to the large thickness of the outwash deposits, one of the best sources for groundwater are the pre-glacial river channels. Outwash deposits commonly exceed 200 feet thick in these channels. Municipal and industrial wells in these deposits commonly yield between 10 and 1,000 gpm (gallons per minute).

Because the groundwater supply is largely dependent upon recharge from the river, the quality of the water recharge is of great importance. Additionally, water supply is provided to some extent through wells driven into bedrock. The yield of bedrock-driven wells within the watershed can range from about 10 to 80 gpm.

2.5.2 Groundwater Resources

Groundwater is used extensively as a drinking water supply in the watershed. There are a total of 24 community wells and 51 non-community wells in the region. USGS has modeled the aquifer in the basin and determined the safe yield to be 12 MGD (Johnston and Dickerman, 1974). The USGS study indicated that pumping at higher rates would have a significant negative impact on stream flow hydrology. During periods of low flow, stream flow would leak into the aquifer depleting stream flow.

Provided in Figure 2-10 is a map showing groundwater classifications, well head protection areas, and areas of know groundwater contamination. Groundwater classes consist of the following (RIDEM, 1996):

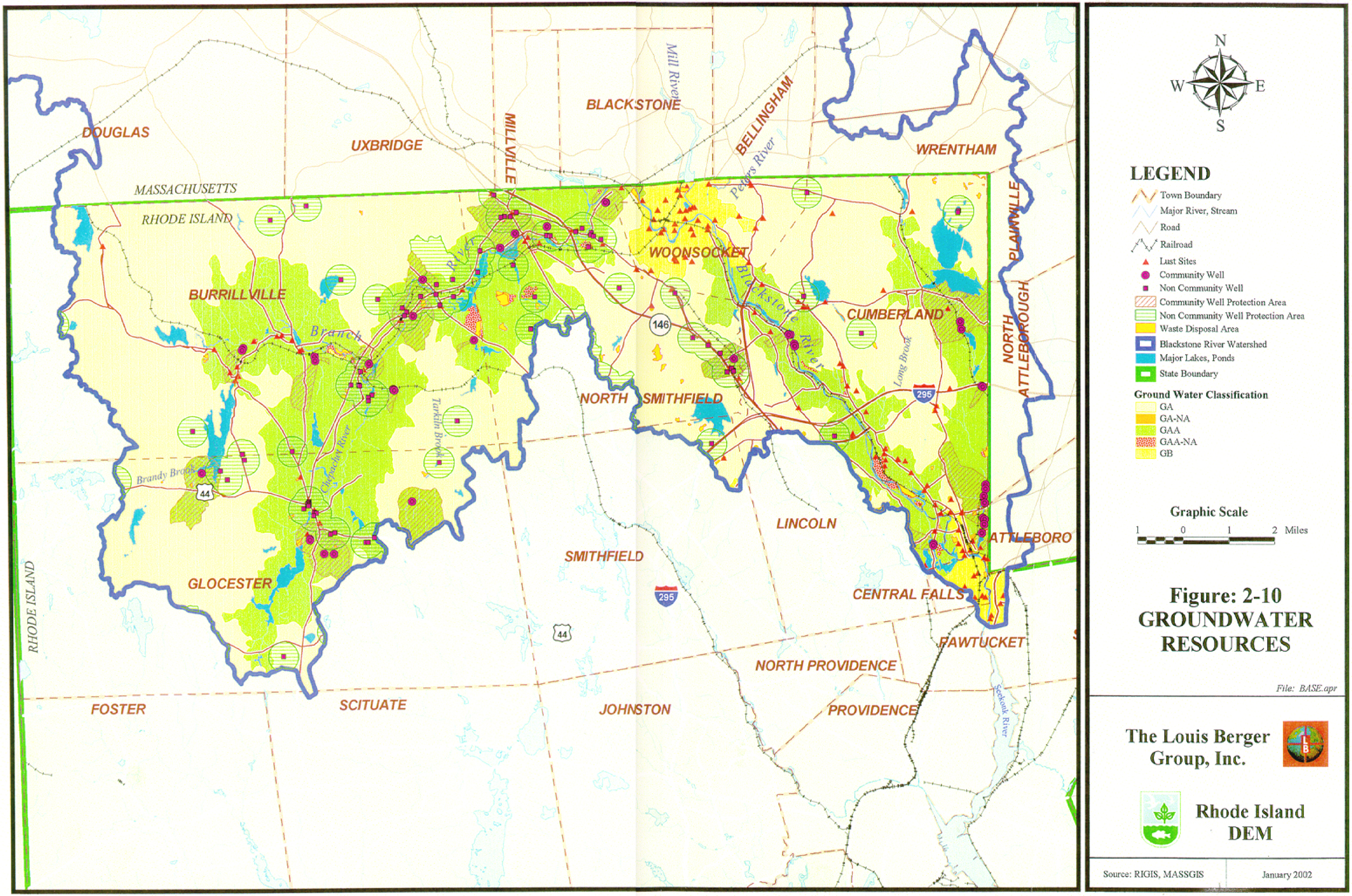


Figure: 2-10
GROUNDWATER RESOURCES

- *GAA:* Groundwater designated to be suitable for public or private drinking water use without treatment. These areas are applicable to wellhead protection areas and recharge areas for groundwater aquifers used for public water supply.
- *GA:* Groundwater designated to be suitable for public or private drinking water use without treatment.
- *GB:* Groundwater resources designated not suitable for public or private drinking water use.
- *NA:* The NA designation refers to areas of non-attainment due to pollutant concentrations greater than the groundwater quality standards for the applicable classification.

2.6 Land Use

In Massachusetts, the Blackstone River watershed has an area of approximately 335 mi^2 with the following land uses:

- 67% forested;
- 8% urban;
- 3% lakes; and
- 22% mainly low density to average density residential/commercial developments.

The City of Worcester, located at the headwaters of the Blackstone River, represents approximately 36% of the population and 11% of the land area.

In Rhode Island, the Blackstone River watershed has an area of approximately 110 mi^2 with the following land uses:

- 75% rural and/or very low density residential land, and
- 25% evenly divided by urban and higher density residential developments.

The Cities of Central Falls, Woonsocket, and Pawtucket are the major developed areas in Rhode Island, containing approximately 36% of the population and 8% of land area within the watershed.

Historically, developments in the watershed had the highest density along the banks of the Blackstone River and its tributaries. In general, the Rhode Island communities are more densely developed then the Massachusetts communities. In the last few decades, formerly rural towns along the Blackstone River have started to become more suburban communities.

The Blackstone River watershed has experienced significant growth in population and housing from 1960 to the present (Tables 2-8 and 2-9). One point of interest is that the population for the MA communities increased in the 1960s, remained stagnant in the 1970s, and increased on average by 8-9% during the 1980s and 1990s. The housing data, however, show exponential growth of residential development in the region with consistent 15% growth for the period of record. The population for the communities in RI experienced considerable growth from 1960 to 2000 with the exception of Pawtucket, Central Falls, and Woonsocket. The City of Woonsocket has experienced a consistent decline in population from 1960 to 2000. Pawtucket and Central Falls has also experienced a population decline from 1960 to 1970 with a resurgence in the 1980s and 1990s. It is interesting to note that Burrillville has experienced a significant increase in population from 1960 to 1990; however, there is a population decline in the 2000 census. In general, housing growth outpaced the population growth for the watershed. This is indicative of low-density residential development which is characteristic of the majority of the communities in the watershed.

Several of the smaller communities in the watershed show consistent growth while larger cities are stagnant or decrease in size. This growth pattern is typical for the trend of suburban sprawl that has been growing since the 1960s nationally. In the 1980s, the MA communities had growth rates of 10% to 20% with several towns

Table 2-8

Population and Housing Data

Town	Land Area (sq. miles)	1960	1970	1980	1990	2000
Population Data *(No. of persons)*						
Burrillville	55.6	9,119	10,087	13,164	16,230	15,796
Central Falls	1.2	19,858	18,716	16,995	17,637	18,928
Cumberland	28.8	18,792	26,605	27,069	29,038	31,840
Glocester	54.8	3,397	5,160	7,550	9,227	9,948
Lincoln	18.2	13,551	16,182	16,949	18,045	20,898
North Smithfield	24.0	7,632	9,349	9,972	10,497	10,618
Pawtucket	8.7	81,001	76,984	71,204	72,644	72,958
Smithfield	26.6	9,442	13,468	16,886	19,163	20,613
Woonsocket	7.7	47,080	46,820	45,914	43,877	43,224
Population Density Data *(No. of persons per square mile)*						
Burrillville	55.6	164	181	237	292	284
Central Falls	1.2	16,548	15,597	14,163	14,698	15,773
Cumberland	28.8	653	924	940	1,008	1,106
Glocester	54.8	62	94	138	168	182
Lincoln	18.2	745	889	931	991	1,148
North Smithfield	24.0	318	390	416	437	442
Pawtucket	8.7	9,310	8,849	8,184	8,350	8,386
Smithfield	26.6	355	506	635	720	775
Woonsocket	7.7	6,114	6,081	5,963	5,698	5,614
Housing Data *(No. of dwellings)*						
Burrillville	55.6	3,216	3,168	4,602	5,751	5,821
Central Falls	1.2	7,249	6,847	7,446	7,337	7,270
Cumberland	28.8	5,697	7,851	9,152	11,217	12,572
Glocester	54.8	1,743	1,685	2,829	3,460	3,786
Lincoln	18.2	4,283	5,215	6,348	7,281	8,508
North Smithfield	24.0	2,285	2,806	3,526	3,835	4,070
Pawtucket	8.7	28,130	27,864	29,768	31,615	31,819
Smithfield	26.6	2,763	3,835	5,117	6,308	7,396
Woonsocket	7.7	16,269	16,489	18,354	18,739	18,757
Housing Density Data *(No. of dwellings per square mile)*						
Burrillville	55.6	58	57	83	103	105
Central Falls	1.2	6,041	5,706	6,205	6,114	6,058
Cumberland	28.8	198	273	318	389	437
Glocester	54.8	32	31	52	63	69
Lincoln	18.2	235	287	349	400	467
North Smithfield	24.0	95	117	147	160	170
Pawtucket	8.7	3,233	3,203	3,422	3,634	3,657
Smithfield	26.6	104	144	192	237	278
Woonsocket	7.7	2,113	2,141	2,384	2,434	2,436

Source: RI Statewide Planning

Table 2-9
Population and Housing Growth

Town	1960 to 1970	1970 to 1980	1980 to 1990	1990 to 2000
Population Growth				
Burrillville	10.6%	30.5%	23.3%	-2.7%
Central Falls	-5.8%	-9.2%	3.8%	7.3%
Cumberland	41.6%	1.7%	7.3%	9.6%
Glocester	51.9%	46.3%	22.2%	7.8%
Lincoln	19.4%	4.7%	6.5%	15.8%
North Smithfield	22.5%	6.7%	5.3%	1.2%
Pawtucket	-5.0%	-7.5%	2.0%	0.4%
Smithfield	42.6%	25.4%	13.5%	7.6%
Woonsocket	-0.6%	-1.9%	-4.4%	-1.5%
Housing Growth				
Burrillville	-1.5%	45.3%	25.0%	1.2%
Central Falls	-5.5%	8.7%	-1.5%	-0.9%
Cumberland	37.8%	16.6%	22.6%	12.1%
Glocester	-3.3%	67.9%	22.3%	9.4%
Lincoln	21.8%	21.7%	14.7%	16.9%
North Smithfield	22.8%	25.7%	8.8%	6.1%
Pawtucket	-0.9%	6.8%	6.2%	0.6%
Smithfield	38.8%	33.4%	23.3%	17.2%
Woonsocket	1.4%	11.3%	2.1%	0.1%

Source: RI Statewide Planning

experiencing 20-30% growth, including West Boylston, Grafton, Upton, Hopkinton, Douglas, Uxbridge, Mendon, Hopedale, Franklin, Wrentham, Plainville, North Attleboro, Blackstone, and Millville.

Water use within the watershed can also be used as an indicator of growth and potential impact to streamflow hydrology. The USGS collects various water-use data on a watershed basis for the United States. The data were only available for 1985 and 1995. According to the USGS, there was a 23% increase in population using groundwater as a drinking water supply in the Blackstone River watershed.

Provided below in Table 2-10 is a detailed summary of land use within the RI portion of the watershed. This information is also presented graphically in Figures 2-11A and 2-11B.

Table 2-10
Summary of Land Use

Description	**Area (acres)**	**% of Area**
High Density Residential (<1/8 acre lots)	2,001	2.2%
Medium High Density Residential (¼ to 1/8 acre lots)	5,522	6.2%
Medium Density Residential (1 to ¼ acre lots)	7,533	8.4%
Medium Low Density Residential (1 to 2 acre lots)	1,040	1.2%
Low Density Residential (>2 acre lots)	936	1.0%
Forest	46,474	52.0%
Airports (and associated facilities)	83	0.1%
Commercial/Industrial Mixed	2,887	3.2%
Agriculture	4,026	4.5%
Developed Recreation (all recreation)	811	0.9%
Transitional Areas / Vacant Land / Brushland	1,476	1.7%
Institutional (schools, hospitals, churches, etc.) / Cemeteries	1,117	1.2%
Mines, Quarries and Gravel Pits	800	0.9%
Waste Disposal (landfills, junkyards, etc.)	363	0.4%
Water and Sewage Treatment	56	0.1%
Other Transportation (terminals, docks, etc.)	212	0.2%
Power Lines (100 ft or more width)	780	0.9%
Roads (divided highways >200 ft plus related facilities)	749	0.8%
Water	3,703	4.1%
Wetland (not to be classified)	8,832	9.9%
Total	**89,401**	**100%**

Source: Rhode Island Statewide Planning Program, 1999

2.7 Natural Resources and Protected Areas

2.7.1 Wetlands

The Blackstone River system includes various inland freshwater systems and discharges to a tidally influenced riverine system. The United States Fish and Wildlife Service (USFWS) National Classification System (Cowardin et al., 1979) and RIGIS were used to identify wetlands in the basin (Figure 2-12).

Wetlands located in the basin consist of non-tidal riverine systems, lacustrine wetland systems, and palustrine systems (ponds, emergent marshes, forested and scrub-shrub swamps, and areas of open water). Wetlands account for approximately 12,535 acres (or 14%) of the watershed. Significant wetland formations in the

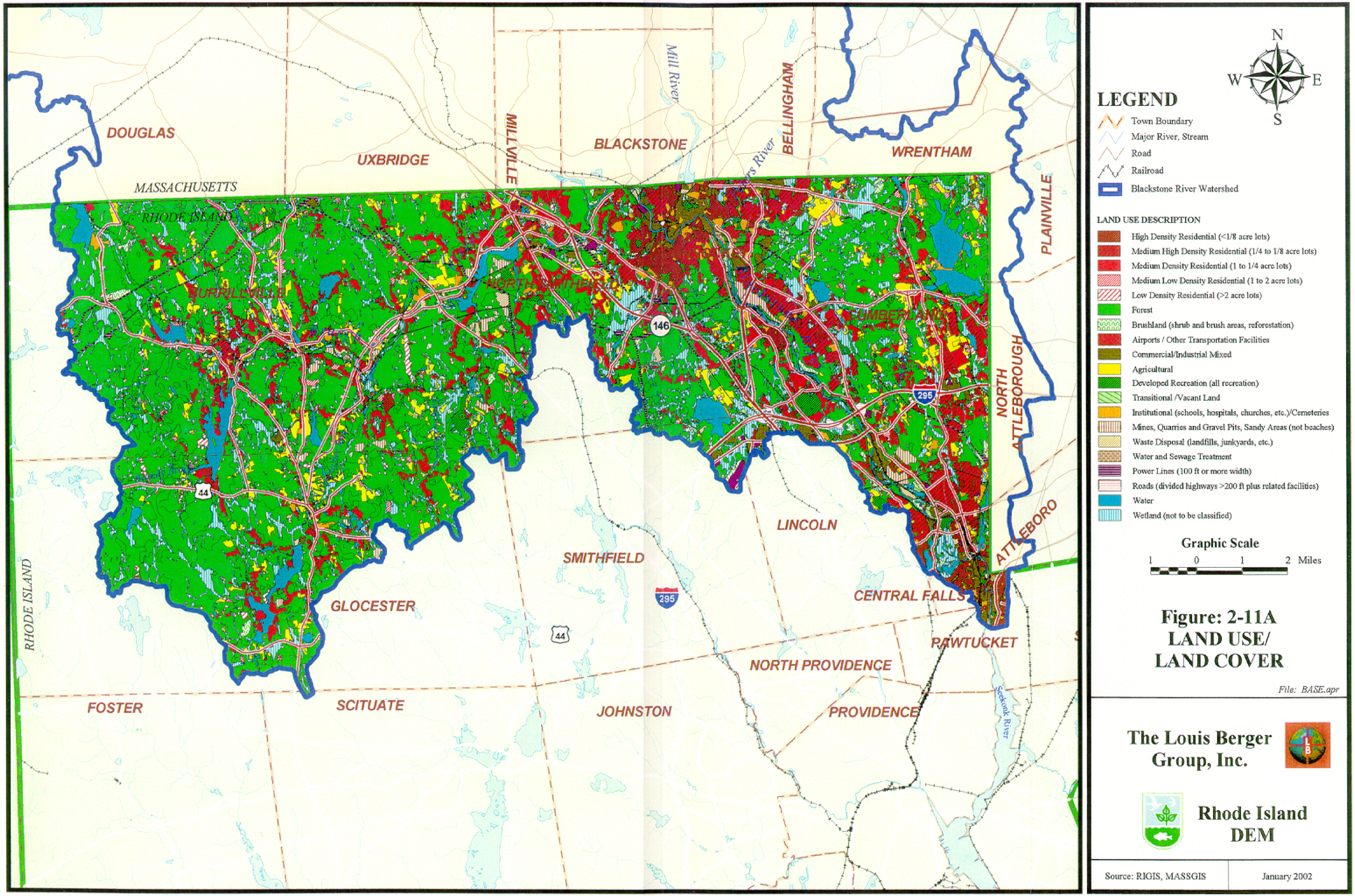


Figure: 2-11A
LAND USE/
LAND COVER

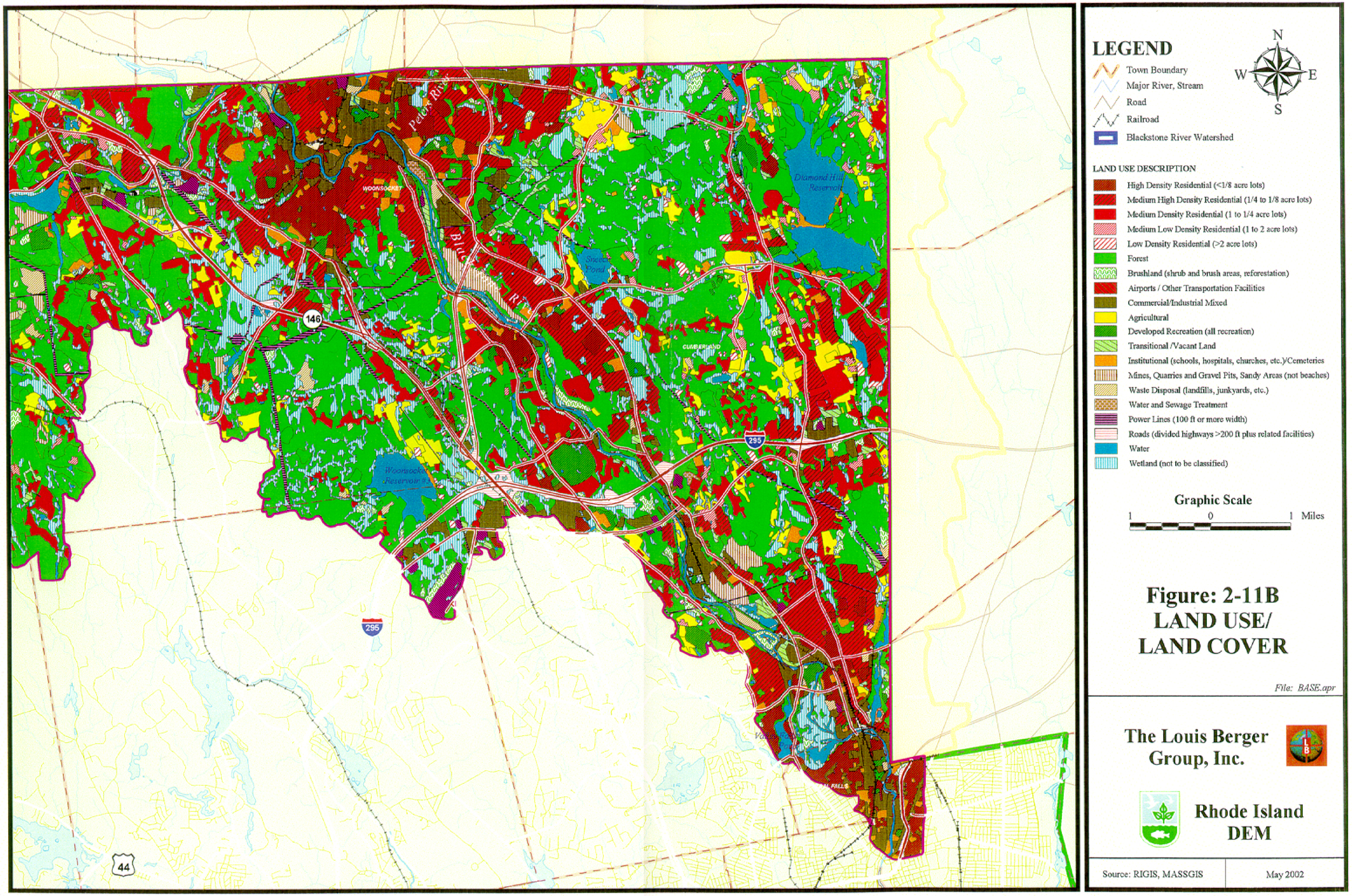


Figure: 2-11B LAND USE/ LAND COVER

watershed are Valley Falls Pond, Lonsdale Marsh, and Cedar Swamp. As previously discussed, Valley Falls Pond and its associated wetland system has been designated as a Special Resource Protection Water. The wetland system consists of marshland and an open water system creating a critical habitat for migratory birds.

In addition to wetlands, Figure 2-12 depicts land that has been preserved and protected by the State as greenspace and greenways. The figure depicts the following types of protected land: open space, scenic areas, Audubon land, and greenway corridor. Open land depicts areas of public and private land protected from future development. The land is under control of Federal, State, local municipality, or private foundation or society. The sites are numerous and scattered throughout the region. Greenways, which typically follow rivers or former railroad easements, connect the protected land (or greenspace) to form a linear system or corridor of protected lands. The goal of establishing greenways along river alignments is to create buffers of natural vegetation and wetlands to provide essential habitat and improve water quality.

Figure 2-12 also depicts the following special designated and/or protected areas:

- *Scenic Areas:* Designated by RIDEM as noteworthy or distinctive landscapes or views.
- *Audubon Lands:* Open space protected by Audubon Society of Rhode Island.

2.7.2 Special Natural Resource Protection Areas

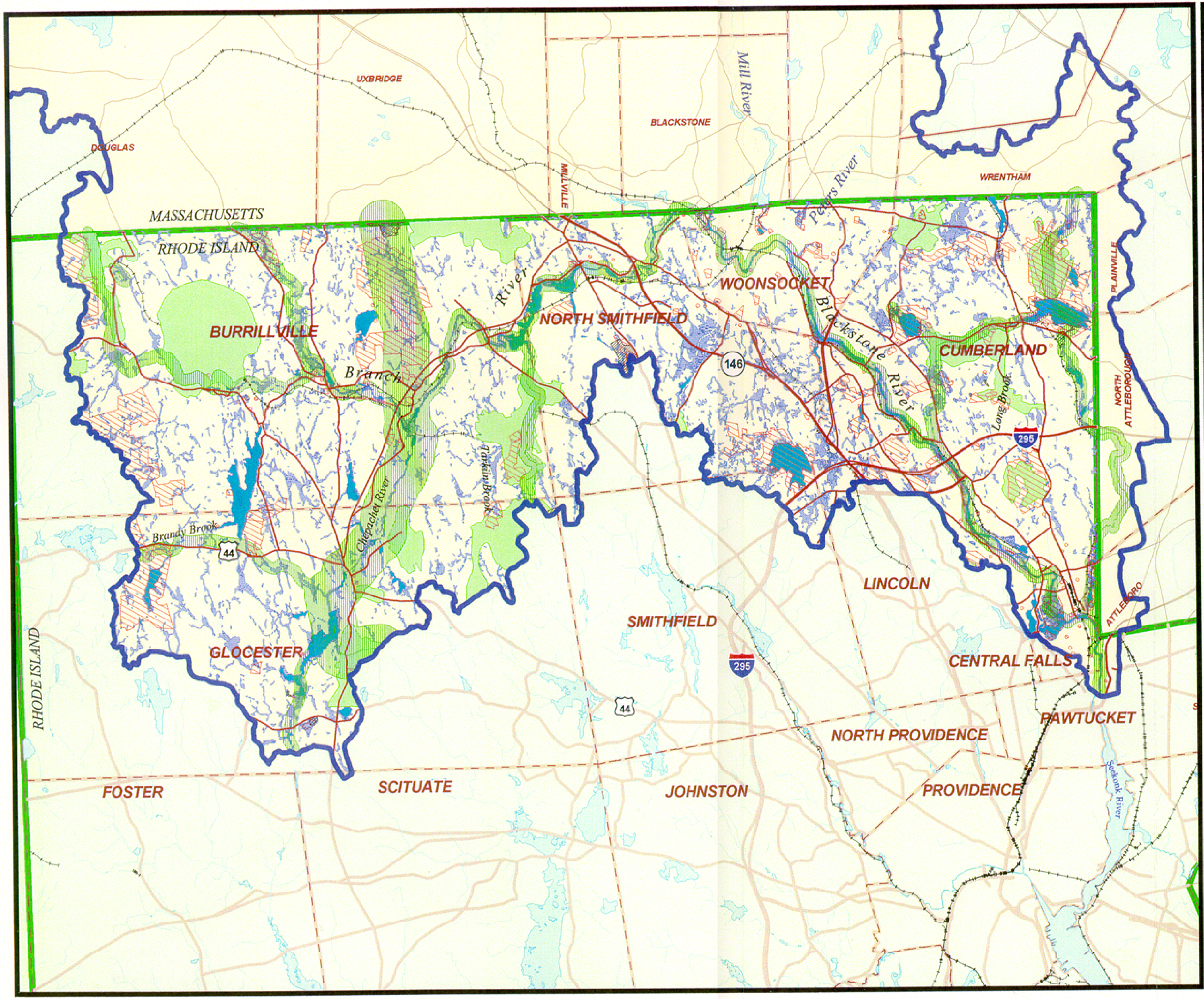
RIDEM has designated several Special Resource Protection Waters (SRPWs) as high quality waters. These waters have significant ecological or recreational uses, which may include, but is not limited to: wildlife refuge or management areas, public drinking water supplies, State and Federal Parks, designated estuarine sanctuary areas, waterbodies containing critical habitat, protected or threatened wetlands, and scenic river systems. Provided below is a list of Special Natural Resource Protection Areas in the Blackstone River watershed:

- Abbott Run Brook
- Ash Swamp Brook
- Crook Fall Brook
- Diamond Hill Reservoir
- East Sneech Brook
- Happy Hollow Pond
- Long Brook
- Lonsdale Marsh
- Arnold Mills Reservoir
- Robin Hollow Reservoir
- Smith and Sayles Reservoir
- Sneech Pond
- Valley Falls Pond
- Woonsocket Reservoirs No.1 and No. 3.

With the exception of Lonsdale Marsh, Smith and Sayles Reservoir, and Valley Falls Pond, each of the above waterbodies are water supply reservoirs or tributaries to water supply reservoirs. Lonsdale Marsh and Valley Falls Pond are listed as SRPWs due to these wetland systems providing critical habitat.

2.7.3 Forests

The Blackstone River Watershed is considered part of the Central Hardwood Forest Region, which has a variable climate and rich soils. The forest region is consistent with climates subject to adequate precipitation. The region can be broadly characterized as mixed Oak-Hickory. The majority of the tree species consist of



N
W E
S

LEGEND

- Town Boundary
- Major River, Stream
- Road
- Railroad
- Blackstone River Watershed
- Open Space
- Greenway Corridor
- Audubon Land
- Scenic Area
- Major Lakes, Ponds
- Wetland (Area 12,925 Acres)
- State Boundary

Graphic Scale

1 0 1 2 Miles

Figure: 2-12
NATURAL RESOURCES

File: BASE.apr

The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS | May 2002

white oak (*Quercus alba),* red oak (*Quercuc rubra*), and black oak (*Quercuc velutina).* The watershed contains deciduous forests, evergreen forests, and forested swamps. Provided in Table 2-11 is a summary of the type of forest within the Rhode Island portion of the watershed.

Table 2-11
Summary of Forest Coverage Data

Forest Description	Area (acres)	% of Total Area
Deciduous Forest (>80% hardwood)	32,999	37%
Developed Recreation (all recreation)	811	1%
Evergreen Forest (>80% softwood)	2,066	2%
Mixed Deciduous Forest (50 to 80% hardwood)	5,679	6%
Mixed Evergreen Forest (50 to 80% softwood)	5,729	6%
Total Area of Forests	**46,474**	**52%**
Total Area of Watershed (RI only)	**89,401**	

2.8 Aquatic Ecosystems

2.8.1 Fisheries

Historically, the Blackstone River has played an important role in supporting spawning runs of anadromous species of fish. Each spring, adult Atlantic salmon, river herring (alewife and blueback herring), and American shad would ascend the river to spawn. However, due to the construction of numerous impoundments along the river in the 1800's, the spawning process was interrupted and eliminated. The existence of the impoundments has virtually eliminated all anadromous fishery migration.

In November of 1994, the U.S. Army Corps of Engineers (USACE) studied ways to restore targeted species of anadromous fish to the Blackstone River (i.e., American Shad and River Herring). RIDEM's Division of Fish, Wildlife, and Estuarine Resources also conducted anadromous fishery restoration projects in the Blackstone River. One of the alternatives proposed by USACE was to remove part or all of the impoundments. A cleared breach would provide both upstream and downstream fish passage needs. However, other issues, such as contaminated sediments could be critical in determining whether the impoundment removal was feasible. Alternative solutions include fish ladders, locks, fish lifts, and retrofits.

Recent improvement in water quality in the Blackstone River and the advances of fishway technology have indicated that restoring populations of American shad and river herring to the lower reaches of the Blackstone River may be possible. Restoring the Atlantic salmon would be more difficult due to the number of dams on the main stem and tributaries. The Blackstone River was not included among 28 major rivers in New England that contained significant Atlantic salmon populations in pre-colonial times; consequently, it is not one of the rivers targeted for Atlantic salmon restorations (USFWS, 1989). Provided below in Table 2-12 is a summary of water quality chemistry necessary to sustain the fisheries.

Reintroduction of anadromous fishes to their previous spawning grounds in the Blackstone River would also have a positive effect on the ecology of the river. In freshwater areas where herring have been restored, studies show that resident fish populations were enhanced. The juvenile herring produced in the spawning run serve as a food supply for bass and other resident species. All life stages of anadromous herrings are important for age for many freshwater and marine fish. In addition, birds, amphibians, reptiles, and mammals have also been documented as predators.

Table 2-12
Life Supporting Conditions for American Shad, Alewife, and Blue Herrings

	Water Temperature (°C)	PH	Dissolved Oxygen (mg/l)	Total Suspended Solids (mg/l)
American Shad				
Eggs	>13	>6.0	>5.0	NL
Larvae	15.5 - 26.1	>6.7	>5.0	100
Alewife				
Eggs	>11	>5.0	>5.0	NL
Larvae	>8	>5.5	>5.0	500
Blue Herring				
Eggs	>14	>5.7	>5.0	NL
Larvae	>14	>6.2	>5.0	500

NL = Not listed
Source: USACE, 1994

A comprehensive fisheries surveys of the Blackstone River watershed was conducted by RIDEM in 1975 and MADEP, Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE) in 1973. The survey indicated that the fishery resources present were typical of warm water habitats (specific species were not listed). The species found were those capable of surviving in poor quality waters resulting in resident fish populations that were undesirable for sport fishing. Later fish data showed that the warm water habitat species were predominant (EEI, 1987). However, a greater number of game species were present, which included yellow perch, largemouth bass, smallmouth bass, black crappie, chain pickerel, and northern pike.

The main restoration objective of the RIDEM Study was to build fishways at the four lower dams (Phase I of the anadromous fishery restoration project) to open sufficient spawning and nursery habitat for self-sustaining populations of shad and river herring. Other objectives included providing sufficient flows during critical life-cycle periods during august and spring migration.

In the spring of 1993, RIDEM released approximately 3,000 adult blueback herring just below Albion Dam, between Cumberland and Lincoln. These fish were obtained from the Charles River through a cooperative effort with the Massachusetts Division of Marine Fisheries. The juvenile blueback herring were recovered in August of 1993 above Valley Falls Dam. The captured fish appeared to be in excellent health. These efforts indicated that the river has a high anadromous fish restoration potential.

The Massachusetts Department of Public Health (DPH) issued a fish consumption advisory due to polychlorinated biphenols (PCB) contamination for three impoundments, which were Riverdale, Rice City Ponds, and Blackstone River impoundment above the Blackstone Gorge.

2.8.1.1 Mill River

In August 1973, MADEP conducted a fish population survey in the Mill River. Twelve species of fish listed in order of dominance were detected: tesselated darter, largemouth bass, bluegill, yellow bullhead, pumpkinseed, fallfish, and blacknose dace, unidentified cyprinids, brown trout, chain pickerel, redfin pickerel, and yellow perch.

In May 1992, MADPH issued a fish consumption advisory for the Mill River based on fish toxics monitoring data generated by MADEP in 1990. The 1992 advisory stated that children younger than 12 years, pregnant women, and nursing mothers should not eat any fish from the Mill River in Hopedale in order to prevent exposure of developing fetuses and infants to PCB. MADEP further advised the general public to limit consumption of all fish from the Mill River in Hopedale to two meals per month. Although PCB levels were not above the EPA action limit, the fish consumption advisory was issued because of health concerns associated with exposure to the developing fetus and child as well as the concerns associated with long term exposure and potential cancer risks. In addition, mercury concentrations exceeding MADPH action level of 0.5 ppm were detected in fish from Hopedale Pond as well as at a station in the Mill River for the Town of Blackstone, Massachusetts.

2.8.1.2 Peters River

No specific fisheries data was available for the Peters River.

2.8.2 Migratory Waterfowl

The impoundments along the Blackstone River create favorable waterfowl marsh and open water habitats. Mallards, wood ducks, and Canada geese have been nesting in the region as well as rails and marsh birds. The river valley has been served as a migration corridor for green winged teal, pintail, widgeon, mergansers, and buffleheads. In addition, the important black duck has utilized the river and its watershed as a production area. The black duck was recognized as a species of international concern because of the long-term population decline indicated in the Atlantic Coast Joint Venture Plan (September 1994). The dams that created significant favorable waterfowl habitat along the Blackstone River are shown in Table 2-13.

Table 2-13
Areas of Significant Waterfowl Habitat

Dam and Location	Habitat Area (acres)
Lackey Pond, Uxbridge, MA	95
Manville Dam, Lincoln/Cumberland, RI	77
Ashton Dam, Lincoln/Cumberland, RI	20
Pratt (Lonsdale) Dam, Lincoln, RI	63
Valley Falls, Central Falls/Cumberland, RI	183

The primary impoundments of interest to the Rhode Island Division of Fish and Wildlife (RIDFW) were those behind Pratt (Lonsdale) Dam and Valley Falls Dam, which were identified as resource areas by the Rhode Island Natural Heritage Program (RINHP). These areas contained substantial space for nesting and migratory waterfowl within a high-density human populace. Maintenance and enhancement of these dams should be continued in order to provide quality waterfowl habitat in Rhode Island.

The Valley Falls marshes, within the municipalities of Lincoln, Cumberland, and Central Falls were considered to be the most valuable wetland wildlife habitat in northern Rhode Island. The marshes were designated as habitat for rare species, which included the rare marsh-nesting birds Least Bittern and Sora Rail. In addition, it has been providing feeding and resting habitat for migratory waterfowl in the spring and fall migration.

The goals of preserving significant waterfowl habitat associated with the Blackstone River could be achieved by (1) protecting, enhancing, and restoring existing important dams (dams that created habitat wetlands) and (2) Restoring, enhancing, or creating additional wetlands. The Pratt Dam and Valley Falls wetland areas were under consideration for wetland restoration projects along the Blackstone River. The targeted area for Pratt Dam was designated as "the island." Its location has been above the Pratt Dam and east and adjacent to an inactive solid waste landfill in Cumberland. It also occupied the portion of Peterson/Puritan Inc. site, which has been designated as a National Priority List (NPL) site. The Valley Falls targeted area for wetland restoration was at the location of the former Lonsdale Drive-In Theater, which is upstream from the Valley Falls Pond/Marshes. A restoration project at the theatre has been completed by the USACE.

2.9 Pollutant Sources

The Blackstone River has been part of American industrial revolution since 1793, when Samuel Slater constructed Slater Mill in Pawtucket. Slater Mill was the first cotton mill in the United States to use mechanical spinning machines. After the mill opened, mills and mill villages developed rapidly along the Blackstone River. Mill villages included Woonsocket, Blackstone, Millville, Uxbridge, and Millbury. By 1830, there was one dam for every river mile along the main stem and its tributaries.

The number of point source discharges has decreased dramatically in recent years with the construction of treatment plants, advent of National Pollutant Discharge Elimination System (NPDES) in accordance with the Clean Water Act, and reduction in the number of manufacturing facilities in the region. The current number of permitted discharges in Rhode Island within the watershed consists of the following:

- Seventeen minor permitted discharges (Section 2.9.1)
- One major permitted discharge (Woonsocket WWTF) (Section 2.9.2)
- Fifteen permitted CSOs. (Section 2.9.4)
- Stormwater discharges (Section 2.9.5)

These discharges are discussed below along with permitted point source discharges in Massachusetts (Section 2.9.3) and hazardous waste sites (Section 2.9.6).

2.9.1 Minor Permitted Discharges

There are a total of 17 active permitted facilities located in the Rhode Island portion of the watershed. Provided below in Table 2-14 is a listing of the facilities with a brief description of the type of discharge and receiving water. The facilities are located in Figures 2-13A and 2-13B. The locations of the point sources are also shown schematically in Figure 2-8.

- ***Contact and Cooling Water** (9):* Nine of the 17 facilities are permitted to discharge contact and non-contact cooling water. The sampling requirements for these facilities are limited to flow, temperature, and pH.

- ***Discharges including Metals** (2):* Okonite and Osram Sylvania have permit limits that include metals.

  - *Okonite:* Manufacturer of insulated wire and cable, located on Martin Street in Cumberland. The RIPDES permit has established limits for flow, temperature, oil & grease, copper, and pH.

  - *Osram Sylvania:* Osram Sylvania is engaged in the manufacturing of pressed and blown glassware (i.e., receiver tubes, incandescent lights, fluorescent lights, and high intensity glass lamps). Historically, the facility discharged treated industrial waste from the process. However, in 1996 the industrial wastestream was rerouted to NBC sanitary system in Bucklin Point service area, thereby no longer entering the Blackstone River. The permit still requires monitoring of metals (i.e., hexavalent chromium, silver, lead, chromium, cadmium, copper, zinc), arsenic, bioassays, flow, temperature, pH, oil & grease, and TSS.

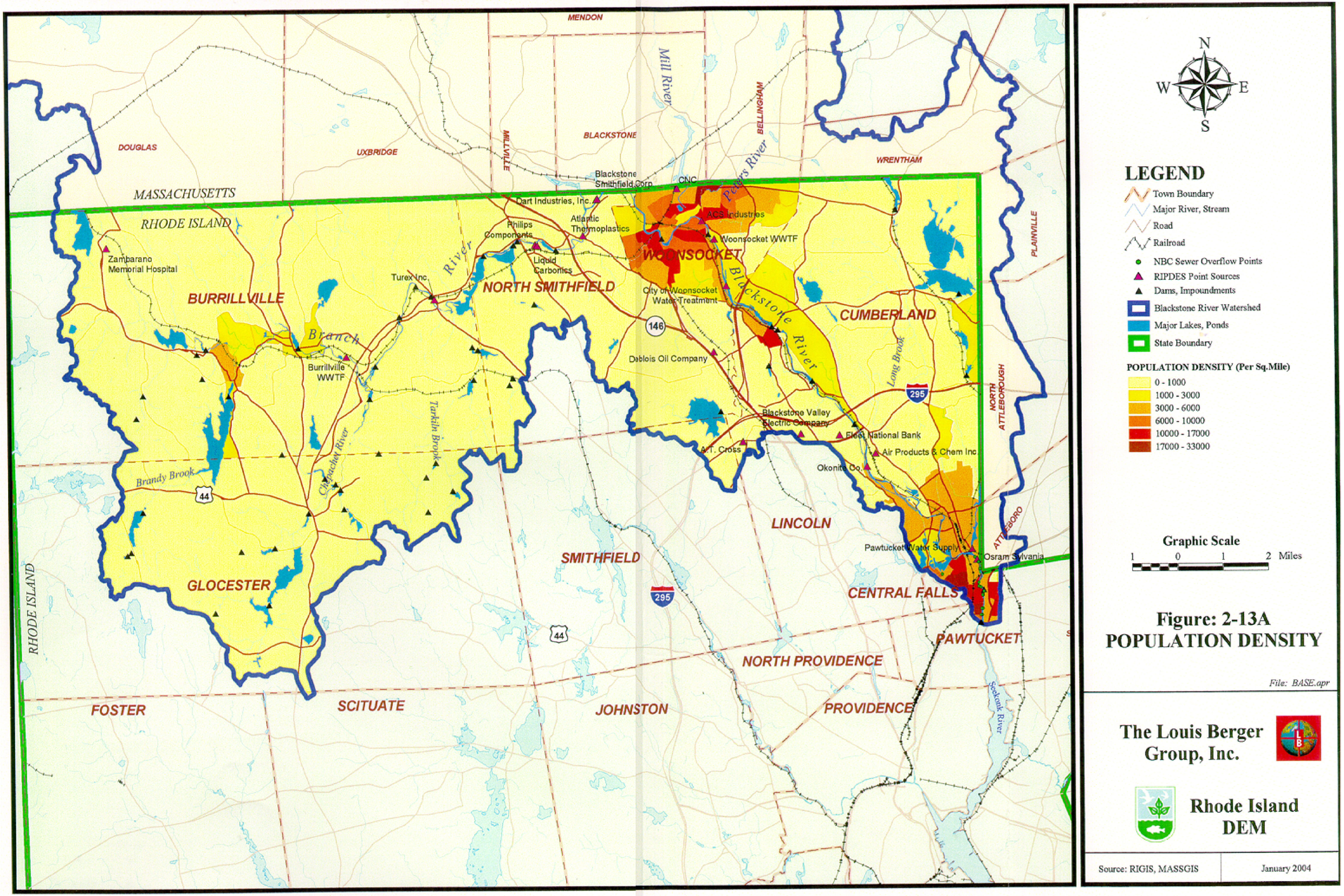


Figure: 2-13A
POPULATION DENSITY

File: BASE.apr

The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

January 2004

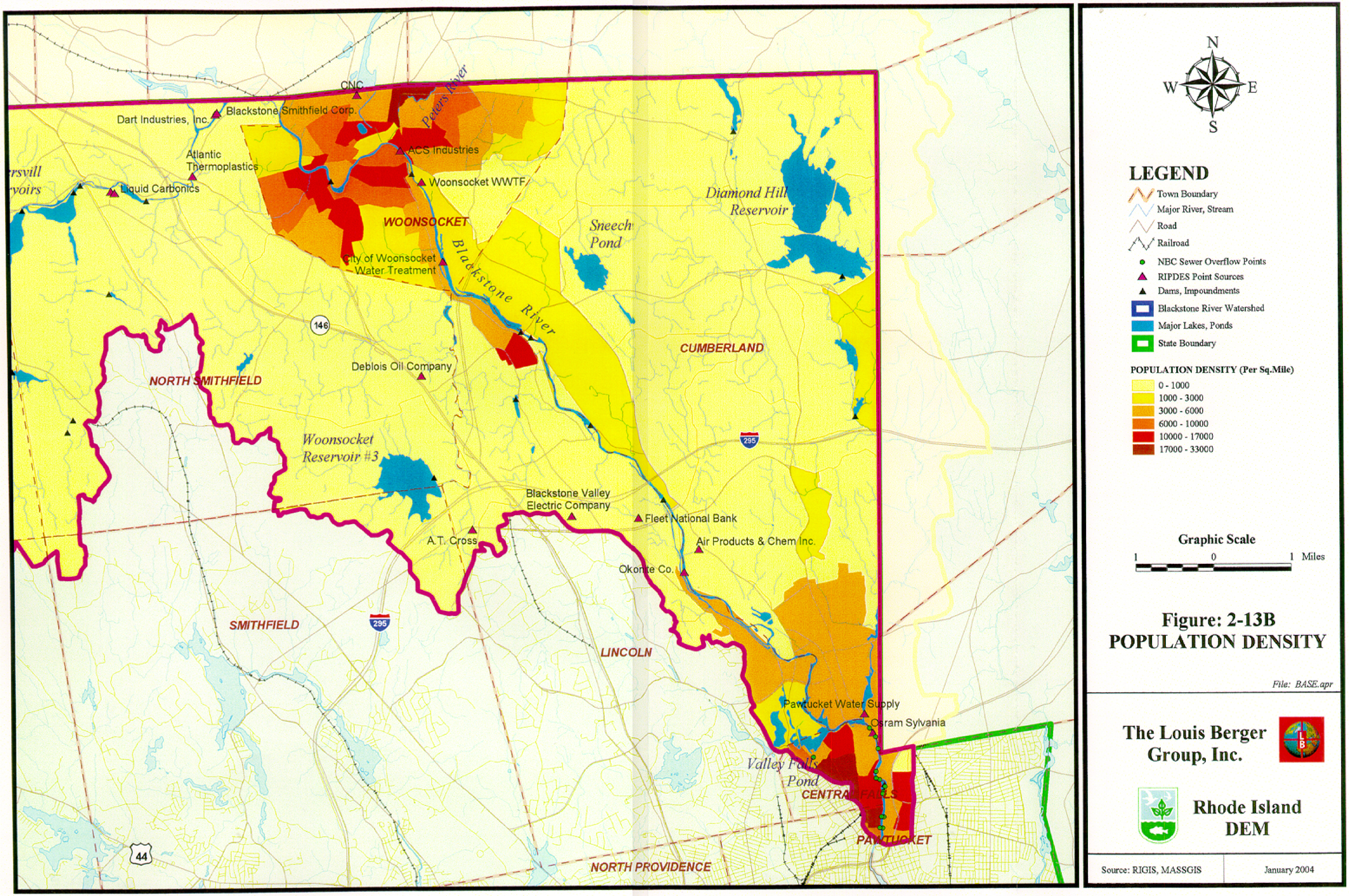


Figure: 2-13B
POPULATION DENSITY

- ***Sanitary Wastewater** (4):* In addition to the Woonsocket WWTF (discussed in Section 2.9.2), there are a total of four permitted discharges of sanitary wastewater in the watershed with Burrillville WWTF having the highest flow of the four.

- ***Water Treatment Plants** (2):* Two other discharges that may be significant are the two water treatment plants that are permitted to discharge filter backwash. Filter backwash discharge is inconsistent and highly dependent upon operation of the water plant. It would also suggest a periodic, slug-type discharge of effluent.

  - *Pawtucket Water Treatment Plant:* The discharge from the Pawtucket plant is resulting from backwash of sand filters used in the purification process. Each of the six filter beds must be backwashed after 48-hours of service. This translates to approximately once per week in the summer and twice per month in the winter. In addition to physical treatment, Pawtucket adds aluminum sulfate and orthophosphate prior to filtration.

  - *Woonsocket Water Treatment Plant:* The discharge from the Woonsocket plant is from backwash of granular activated carbon (GAC) vessels. Each of the three GAC is backwashed approximately four to five times per week. As part of the treatment process, Woonsocket adds the following: aluminum sulfate, non-ionic polymer, blended phosphate, hydrated lime, and chlorine.

Table 2-14
Summary of RIPDES Permits
Minor Industrial Discharges

RIPDES #	Name	Discharge Type	River
RI0021393	ACS Industries Inc 71 Villanova Street Woonsocket, RI 02895	Non contact cooling water (flow, temperature, pH)	Blackstone River
RI0020451	Air Products & Chemicals, Inc. 1226 Mendon Road Cumberland, RI 02864	Non-contact cooling water and cooling tower blow down (flow, temperature, pH, Cl)	Blackstone River
RI0023426	Ann & Hope Corporate Offices One Ann & Hope Way Cumberland, RI 02864	Non contact cooling water (flow, temperature, pH)	Blackstone River
RI0000124	AT Cross Company One Albion Road Lincoln, RI 02865	Non contact cooling water and stormwater (flow, temperature, pH)	Unnamed Tributary to Crook Fall Brook
RI000056	Atlantic Thermoplastics (former Tupperware) Route 146A North Smithfield, RI	Sanitary wastewater (flow, BOD, TSS, settleable solids, pH, **fecal coliform**, Cl, bioassay)	Branch River
RI0000485	Blackstone-Smithfield Corp. (former Tupperware) Butler Street North Smithfield, RI 02895	Cooling water (flow, temperature, **total phosphorus**, pH) Sanitary wastewater (flow, BOD, TSS, settleable solids, pH, **fecal coliform**, Cl)	Blackstone River
RI0100455	Burrillville Wastewater Treatment Facility 141 Clear River Drive Oakland, RI 02858	Sanitary wastewater (flow, BOD, TSS, settleable solids, **fecal coliform**, TRC, pH)	Clear River

RIPDES #	Name	Discharge Type	River
RI0023221	Cumberland Engineering Div. John Brown Plastics Trafalgar House 100 Roddy Avenue South Attleboro, MA	Non-contact cooling water (flow, temperature, pH, oil & grease)	Blackstone River
RI0023400	Deblois Oil Company 632 River Street Woonsocket, RI 02895	Stormwater (flow, oil & grease, PAHs, TSS)	Blackstone River
RI0023523	Elizabeth Webbing Mills Co. 521 Roosevelt Avenue Central Falls, RI 02863	Groundwater remediation system (flow, BTEX, MTBE, PAHs)	Blackstone River
RI0021865	Fleet National Bank 670 George Washington Hwy Lincoln, RI 02865	Air-handling condensate (flow, temperature, pH)	Unnamed Tributary to Blackstone River
RI0000019	Narragansett Imaging (Phillips Components) 100 Providence Pike Slatersville, RI 02876	Non-contact cooling water (flow, temperature, pH)	Branch River
RI0020141	Okonite Company 111 Martin Street Ashton, RI 02864	Contact and non-contact cooling water (flow, temperature, oil & grease, **copper**, pH)	Blackstone River
RI0001180	OSRAM Sylvania Products, Inc. 1193 Broad Street Central Falls, RI	Contact and non-contact cooling water (flow, temperature, pH, TSS, oil & grease, **metals**, bioassay) *Note: The discharge is now entering Bucklin Point through NBC's sanitary system.*	Blackstone River
RI0001589	Pawtucket Water Supply Board 120 Mill Street Cumberland, RI 02864	Filter backwash (flow, TSS, pH)	Abbott Run
RI0001627	City of Woonsocket Water Treatment Plant Manville Road Woonsocket, RI 02895	Filter backwash (flow, TSS, pH)	Blackstone River
RI0100129	Zambrano Hospital, Wastewater Treatment Facility Wallum Lake, RI	Sanitary wastewater (flow, BOD, TSS, settleable solids, **fecal coliform**, Cl)	Clear River

(Source: RIDEM, 2001a)

2.9.2 Major Permitted Discharges

The Woonsocket Regional Wastewater Treatment Facility (WWTF) is located on 11 Cumberland Hill Road in Woonsocket. The plant receives flows from Woonsocket and adjacent communities in Massachusetts (i.e., Bellingham, Blackstone, Millville). In 1999, the City leased the operation of the facility to US Filter. US Filter is also responsible for upgrade of the plant to ensure compliance with effluent limits and to provide nutrients removal. The design capacity of the plant is 16 MGD with an average flow of 9 to 10 MGD. RIDEM has given the facility a rank of "Poor" and found the facility to be deficient in areas of operations and maintenance. It has also been subject of several permit violations in 1998 and 1999. In 1999, RIDEM sought court injunctions against the City due to its failure to comply with a previous consent agreement.

In July 2001, the Wastewater Facility was upgraded to provide denitrification, cyanide destruction, and phosphorous removal. As of September 2001, the facility has been complying with the new permit limit developed as a result of modeling effort from BRI. Treatment consists of primary sedimentation, activated sludge, biological nitrogen removal, and chemical phosphorous removal. The effluent is further treated with dual media filtration and disinfection.

It should be noted that the significant upgrades to the Woonsocket Wastewater Facility have dramatically changed effluent characteristics. A review of effluent data prior to September 2001 will be of limited use in predicting future impacts to the Blackstone River. The location of the facility is shown in Figures 2-13A and 2-13B.

2.9.3 Massachusetts Facilities

Provided below in Table 2-15 is a listing of permitted point source discharges in the Blackstone River watershed located in Massachusetts.

Table 2-15
Summary of Massachusetts Facilities
Blackstone River Basin - Municipal and Industrial Treatment Plants

	Permittee:	NPDES #	Issuance	Flow	Treatment	Special Notes
Municipal	Upper Blackstone WPAD	MA0102369	9/30/1999	56.0 MGD	AWT; NH3N & TP	Under appeal
	Millbury	MA0100650	9/30/1999	1.2 MGD	AWT; NH3N & TP	Plans to connect to UB WPAD
	Grafton	MA0101311	9/30/1999	2.4 MGD	AWT; NH3N & TP	Permit appealed
	Northbridge	MA0100722	9/30/1999	2.0 MGD	AWT; NH3N & TP	----
	Uxbridge	MA0102440	9/30/1999	2.5 MGD	AWT; NH3N & TP	----
	Hopedale	MA0102202	9/20/1999	0.588 MGD	AWT; NH3N & TP	----
	Douglas	MA0101095	9/29/1995	0.18 MGD	Secondary (planning expansion; will be upgraded to AWT)	Will be reissued in 2001
	Upton	MA0100196	9/29/1995	0.3 MGD	AWT; NH3N & TP	Will be reissued in 2001
	Worcester	MAS010002	9/30/1998	----	----	Municipal storm water permit
	Worcester	MA0102997	11/8/1990	350 MGD	Disinfection	CSO treatment
Industrial	Guilford of Maine, E. Douglas	MA0101538	12/15/1999	1.25 MGD	Biological & sedimentation	Ground water & storm water
	New England Plating, Worcester	MA0005088	2/24/2000	0.20 MGD	Chemical addition; sedimentation for metals removal	Permit under appeal
	Wyman Gordon, Grafton	MA0004341	6/30/1997	----	Sedimentation	Process wastewater, NCCW, stormwater
	Lewcott Corp., Millbury	MA0028592	9/2/1992	-----	----	NCCW
	Norton, Co., Worcester	MA0000817	7/29/1975	----	Temp = 60-90; 7 outfalls	Uncontaminated cooling water
	Coz Chemical, Northbridge	MA0032549	9/29/1995		Contact & non-contact cooling water	Will be reissued in spring 2001
	Riverdale Mills Corporation	MAG250279		0.181 MGD	NCCW	Incomplete application

NCCW = non-contact cooling water
Source: MADEP, 1998

- ***Discharges to Peters River:*** There are no permitted NPDES discharges on the Peters River. There is one permitted facility that discharges to Mill River (Hopedale WWTF).

- ***Discharges to Mill River:*** The Hopedale Wastewater Treatment Facility has an average discharge of 0.95 MGD (permitted flow: 2.5 MGD) of treated wastewater effluent to the Mill River. The treated effluent receives advanced treatment for nutrient removal (nitrification and phosphorus). MADEP has conducted sampling studies upstream and downstream of the Hopedale WWTF and concluded there were no significant water quality concerns detected from the chemical data. However, the segment downstream of the point source discharge (approximately 1-mile) is on alert due to effluent toxicity.

2.9.4 Combined Sewer Overflows

The Narragansett Bay Commission has a total of 15 combined sewer overflows (CSOs) along the Blackstone River. CSOs are a significant source of pathogens. ASA (1992a) concluded that CSOs accounted for 92% of the fecal coliform loadings to the Providence River and 1% of the flow. Provided in Table 2-16 and 2-17 are the predicted overflow volumes and frequencies based on extensive modeling of the combined system (as determined by SWMM).

Table 2-16 summarizes the overflow volume for each CSO to the Blackstone River for five synthetic design storms. Table 2-17 summarizes the annual overflow volumes and frequency of occurrences for each of the CSOs, ranked by order of magnitude. The years 1951 and 1978 were selected as years having the number and magnitude of storm events within the normal range based on statistical analysis of precipitation in the greater Providence Area. Provided in Figure 2-13B is the location of the CSOs. The location of the CSOs are also shown schematically in Figure 2-8.

Table 2-16
Design Storm Model Results for CSOs on Blackstone River
Existing Conditions

Overflow	**Overflow Volume (MG)**				
	1-Month Storm	**2-Month Storm**	**3-Month Storm**	**6-Month Storm**	**12-Month Storm**
OF 101 (B)	0.09	0.21	0.30	0.46	0.63
OF 102	0.02	0.04	0.05	0.07	0.10
OF 103	2.55	3.95	4.78	6.19	7.63
OF 104	0.16	0.29	0.37	0.50	0.61
OF 105	0.78	1.30	1.61	2.14	2.69
OF 106	0.32	0.85	1.26	2.05	2.87
OF 107 (B)	0.00	0.00	0.00	0.00	0.00
OF 201	0.62	0.99	1.20	1.57	1.94
OF 202 (B)	0.00	0.01	0.01	0.03	0.04
OF 203	0.20	0.37	0.48	0.68	0.90
OF 204 (B)	0.00	0.00	0.00	0.00	0.33
OF 205	6.51	10.45	12.82	16.86	20.79
OF 206	0.03	0.09	0.13	0.22	0.31
OF 207	0.10	0.22	0.30	0.44	0.59
OF 208 (B)	0.00	0.01	0.01	0.04	0.06
OF 209	0.01	0.05	0.07	0.15	0.25
Total	**11.39**	**18.83**	**23.39**	**31.40**	**39.74**

Note: (B) refers to the regulator having been blocked due to low volume or frequency of overflow.
Source: Berger, 1997

Table 2-17
Design Storm Model Results for CSOs on Blackstone River
Existing Conditions

Overflow	1951 Simulation			1978 Simulation		
	Overflow Volume (MG)	Number of Events	Total Flow Duration	Overflow Volume (MG)	Number of Events	Total Flow Duration
OF 205	222.2	52	314	182.7	40	311
OF 103	93.9	62	428	76.7	50	367
OF 105	25.9	53	248	20.6	39	242
OF 201	22.2	56	312	18.7	41	288
OF 106	14.6	24	59	11.1	19	63
OF 203	7.3	39	130	5.8	31	156
OF 104	5.6	40	131	4.5	31	156
OF 101 (B)	4.1	29	73	3.2	26	87
OF 207	4.0	35	82	3.1	27	92
OF 206	1.7	23	47	1.3	20	59
OF 204 (B)	1.5	1	1	0.6	1	1
OF 209	0.8	14	22	0.8	15	34
OF 102	0.3	14	16	0.3	13	31
OF 208 (B)	0.2	2	2	0.1	2	10
OF 202 (B)	<0.1	2	2	<0.1	2	2
OF 107 (B)	<0.1	2	2	<0.1	2	2
Total	**404.3**	**NA**	**NA**	**329.5**	**NA**	**NA**

Note: (B) refers to the regulator having been blocked due to low volume or frequency of overflow.
Source: Berger, 1997

2.9.5 Stormwater

In December 2000, RIDEM developed a strategy to develop a watershed-specific permitting approach for the Blackstone River. The primary goal of the study was to identify potential sources of pollutants to the Blackstone River from stormwater runoff. The study identified facilities regulated in Phase I of the RIPDES Stormwater Program (See Table 2-18 for list of facilities permitted in Phase I). It also identified types of facilities that needed further treating due to potential impacts on water quality. The general conclusion was to target industrial uses that are predominant along the main stem: recyclers/auto salvage yards, chemical manufacturers, textile, petroleum storage facilities, and unpermitted storm sewers.

Phase II of the RIPDES Stormwater Program will target cities/towns below threshold population defined in Phase I. It will also target areas of higher population density, which are defined as urban areas. The following communities in the RI portion of the watershed will be required to obtain a RIPDES stormwater permit in Phase II: North Smithfield, Cumberland, Lincoln, Central Falls, Pawtucket, and Woonsocket. In addition, other government agencies such as RIDOT will also be required to obtain a permit.

Provided in Figures 2-13A and 2-13B are the population densities illustrating regions defined as urbanized areas under Phase II of the stormwater program.

As part of the TMDL Study, the following cities and towns were contacted to obtain stormwater mapping: Woonsocket, Cumberland, Lincoln, Pawtucket, and Central Falls. The purpose of the request was to identify stormwater outfalls that may be targeted for sampling.

Table 2-18
Summary of RIPDES Permits
Stormwater Discharges Associated with Industrial Activity

RIPDES #	Name	Address	River	SIC
RIR600142	Bill's Auto Parts, Inc	70 Macondry Street, Cumberland, RI 02864	Blackstone River	5015
RIR100342	Blackstone River Bikeway-RIDEM	Front Street Cumberland to Cumberland/Lincoln RI	Blackstone River	
RIR100316	Blackstone Valley Development	Maple Ridge Dr. Cumberland, RI 02864	Blackstone River	
RIR130278	Bruin Plastics Co., Inc.	P.O. Box 700 Glendale RI 02826	Blackstone River	2295
RIR230058	C.N.C. Int., L.P.	20 Privilege Street Woonsocket, RI 02895	Mill River	2843
RIR100343	Cumberland Crossing, LLC	2001 Mendon Road Cumberland, RI 02864	Blackstone River	
RIR200153	Cumberland Foundry Co., Inc.	310 West Wrentham Road Cumberland, RI 02864	Blackstone River	3321
RIR200034	Fairmount Foundry Inc.	25 Second Avenue Woonsocket, RI 02895	Blackstone River	3321
RIR110351	Laidlaw Transit, Inc-North	468 Comstock Road North Smithfield, RI 02864	Blackstone River	4173
RIR500027	Landfill & Resource Recovery	Oxford Road North Smithfield, RI 02895	Trout Brook	4953
RIR100240	Macklands Realty, Inc.	Curran Road Cumberland, RI 02864	Blackstone River	
RIR600008	Metech International, Inc	120 Mapleville Main Street Mapleville, RI 02893	Chepachet River	5093
RIR130188	Murdock Webbing Co.	27 Foundry Street Central Falls, RI 02863	Blackstone River	2241
RIR110003	Narragansett Imaging	51 Industrial Drive North Smithfield, RI 02896	Branch River	3674
RIR700038	Ocean State Power	1575 Sherman Farms Road Harrisville, RI 02830	Blackstone River	4911
RIR100365	Old Dominion Freight Line, Inc.	Industrial Drive Cumberland, RI 02864	Blackstone River	
RIR120028	Pharmacy Technologies Inc.	666 Park East Drive Woonsocket, RI 02895	Blackstone River	4225
RIR100263	PJC Realty	2130 Mendon Road Cumberland, RI 02864	West Sneech Brook	
RIR230023	Polytop Corporation	110 Graham Drive Slatersville, RI 02876	Branch River	3089
RIR800114	RI Army National Org. Maintenance	Shop #1A (OMS #1A) Woonsocket, RI 02895	Blackstone River	9711
RIR100269	RIDEM-Blackstone River Bikeway	Front Street Lincoln, RI 02865	Blackstone River	
RIR110234	Ryder Student Transportation	#1725 Slatersville, RI 02876	Blackstone River	
RIR230050	Technic Engineered Power Division	300 Park East Drive Woonsocket, RI 02895	Blackstone River	2819
RIR230133	Teknor Apex Company/ Teknor Color Co	20 Industrial Road Cumberland, RI 02864	Blackstone River	3087

RIPDES #	Name	Address	River	SIC
RIR100348	The Savage Living Trust & EAM	Hines Road Cumberland, RI 02864	Blackstone River	
RIR100331	Tiffany & Company	Maple Ridge Drive Cumberland, RI	Blackstone River	
RIR800183	TNT Red Star Express, Inc	Industrial Drive Cumberland, RI 02864	Blackstone Rive	4215
RIR130273	TYTEX, Inc	601 Park East Drive Woonsocket, RI 02895	Blackstone River	2389

(Source: RIDEM, 2001b)

Woonsocket, Central Falls, and Pawtucket have reasonably complete stormwater mapping. Cumberland and Lincoln have limited mapping to recent subdivisions. Both towns pointed out that the majority of stormwater outfalls were roads owned and maintained by RIDOT. In general, RIDOT has good mapping of storm drains on state roads. The date of the information is dependent on the extent of road maintenance on specific state road segments.

2.9.6 Hazardous Waste Sites

The Blackstone River has numerous State Hazardous Waste Sites (Massachusetts and Rhode Island) and USEPA Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites. The CERCLA list is a compilation of records from a nationwide database created to maintain and regulate those sites that USEPA has investigated for suspected or uncontrolled releases of hazardous substances or pollutants. Once a site is placed on the CERCLA list, it may be subjected to several levels of evaluation to determine the severity of the contamination from discovery and preliminary assessment to site inspection, and possibly application of the Hazardous Ranking System. Such a determination would place the site on the National Priority List (NPL) (Table 2-20).

Table 2-19
Summary of State CERCLA Sites in the Blackstone River Watershed (RI Segment)

Name	Street	Town	Description
Boylter Farm Area	Curran Road and Depot Street	Cumberland	CERCLA, Non-NPL
Burrillville Landfill #1	Whipple Avenue.	Burrillville	CERCLA, Non-NPL, Landfill
Burrillville Landfill #2	Route 102	Burrillville	CERCLA, Non-NPL, Landfill
Central Falls Landfill	Adjacent to Valley Falls Pond	Lincoln	CERCLA, Non-NPL
Cumberland Landfill	Albion Road	Cumberland	CERCLA, Non-NPL, Landfill
Dupraw Landfill	Dexter Rock Road	Lincoln	CERCLA, Non-NPL
Glass-Kraft	Railroad Street	North Smithfield	CERCLA, Non-NPL
Glocester Landfill	Chestnut Hill Road	Glocester	CERCLA, Non-NPL, Landfill
H&H Screw Location	George Washington Highway, Route 116	Lincoln	CERCLA, Non-NPL
J M Mills Landfill	Mendon Road	Cumberland	CERCLA, Non-NPL, Landfill, Associated with an NPL
Lenox Street Well	Mendon Road	Cumberland	CERCLA, Non-NPL, Associated with an NPL
Liquid Carbonic	Steel Street	North Smithfield	CERCLA, Non-NPL
Lonsdale Narrows	Off Lonsdale Avenue	Lincoln	CERCLA, Non-NPL
Lonza/Universal Chemical	Martin Street	Cumberland	CERCLA, Non-NPL, Associated with an NPL

Name	Street	Town	Description
Manville Well Field	Albion Road.	Lincoln	CERCLA, Non-NPL
McKee's Garage (Former)	1379 Diamond Hill Road	Cumberland	CERCLA, Non-NPL
New England Container Company	George Washington Highway	Smithfield	CERCLA, Non-NPL, Large Quantity Generator. Transporter
North Smithfield NIKE Launcher Area	Poundhill Road	North Smithfield	CERCLA, Non-NPL
Pawtucket Water Supply Board	Myrtle Street	Cumberland	CERCLA, Non-NPL
Phillips Components	Providence Pike	North Smithfield	CERCLA, Non-NPL, Large Quantity Generator
Woonsocket Transfer Station	Davidson Road	Woonsocket	CERCLA, Non-NPL

Table 2-20
Summary of National Priority List Sites

Name	Street	Town
Peterson and Puritan	Martin Street	Lincoln/Cumberland
Landfill and Resource Recovery	Oxford Road	North Smithfield
Stamina Mills	Mains Street	North Smithfield
Western Sand and Gravel	Douglas Pike	Burrillville

The CERCLA and NPL sites for Rhode Island are illustrated on Figure 2-14. Provided below is a detailed discussion of each of the four sites listed on the National Priority List. The Peterson Puritan site is of particular interest to this study due to close proximity to the main stem of the Blackstone River. The remaining three sites are each located in the Branch River Watershed. Stamina Mills is located just upstream of Forestdale approximately 4.5 miles from the confluence of the Blackstone River. Western Sand and Gravel and Landfill Resource and Recovery are located upland of Slatersville Reservoir in an unconfined aquifer formation having a saturated thickness of 60 ft and a transmissivity of 8,000 sq. ft/day.

2.9.6.1 Peterson and Puritan Inc.

- ***Media:*** Soil, debris, groundwater
- ***Contaminants:*** VOCs, organics, metals
- ***Description:*** Peterson and Puritan site is located in an industrial area adjacent to the Blackstone River in Cumberland and Lincoln at the Martin Street bridge. The site includes several areas: Peterson/Puritan, Pacific Chemical (Lonza and Universal Chemical), JM Landfill, State and Town recreation areas, woodlands, wetlands, Blackstone River (Ashton Dam to Pratt Dam), Blackstone River Canal, and affected municipal well fields in the Town of Cumberland and Lincoln.

  During operation, Peterson and Puritan packaged and distributed a variety of aerosol products including perfumes, oven cleaners, pesticides, hairspray, deodorants, and window cleaners. In 1974, there was a release of approximately 6,200 gallons of PCE due to an incident while offloading a rail car to the on-site tank farm. The recorded spill, along with other historical releases of VOCs into catchbasins and manholes is the primary source of soil and groundwater contamination. In 1979, State investigations revealed that VOCs (TCA, PCE) were detected in groundwater at concentrations raging from 27 to 166 mg/l.

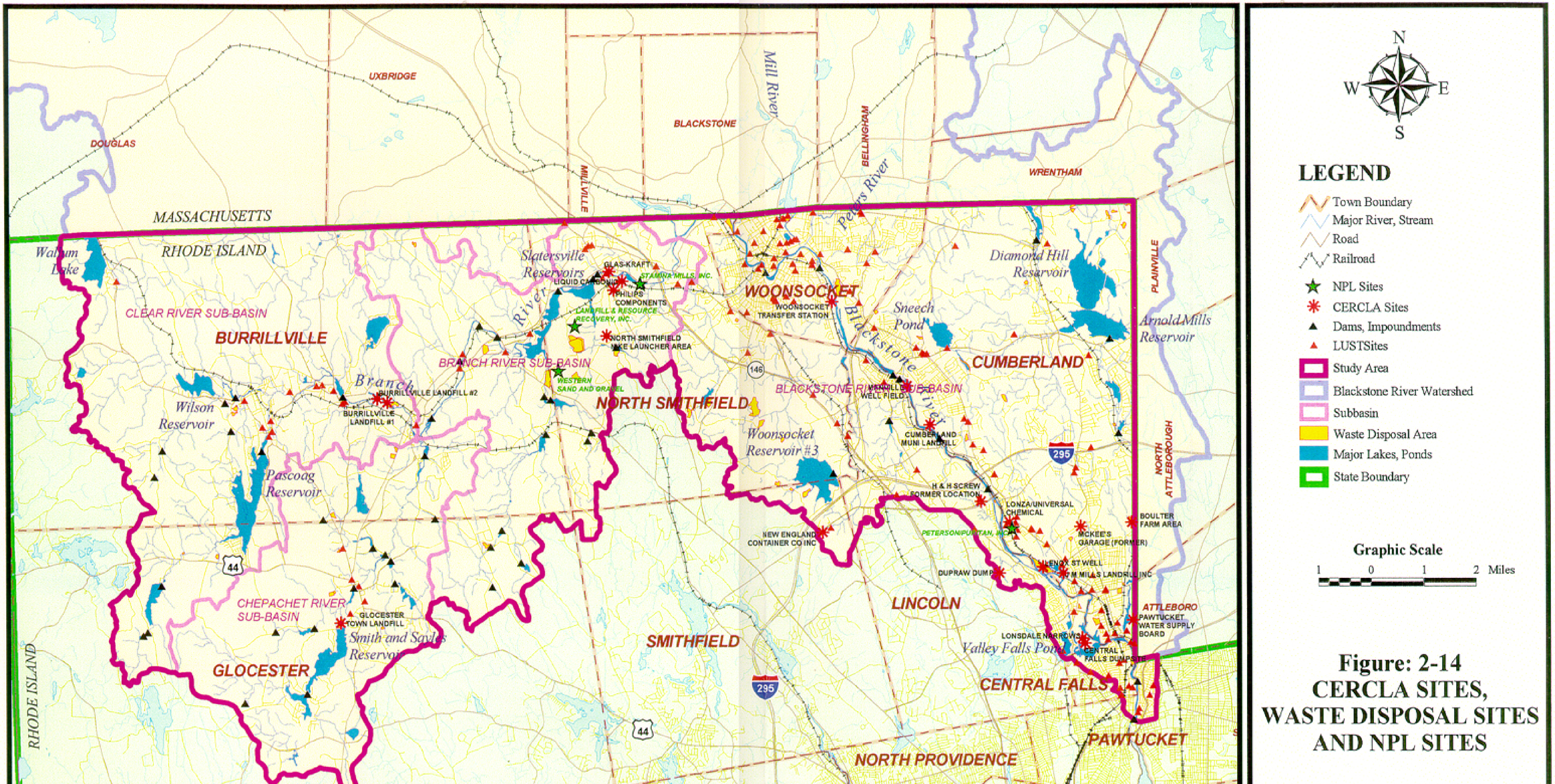


Figure: 2-14
CERCLA SITES, WASTE DISPOSAL SITES AND NPL SITES

File: BASE.apr

The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

May 2002

Pacific Chemical manufactured general industrial chemicals and specialty chemical materials for use in detergents, cosmetics, agriculture, and food. In 1981, RIDEM investigated on-site septic tanks and leachfields Samples detected the presence of acetone, 2-propanol, toluene, ethyl benzene, and methyl isobutyl ketone. Samples of the wastewater contained high concentrations of arsenic, chromium, nickel, PCE, and xylene. The primary contamination issue was associated with the discharge of acetone and isoproponal to on-site septic tanks and leachfields.

- ***Remedial Activities:*** The following remedial activities were proposed (USEPA, 2001):
  - Excavation and disposal of contaminated soils at manholes and catch basins
  - Excavation and removal of contaminated leachfields
  - Installation of soil vapor extraction system to remediate VOCs in the vadose zone
  - Installation of a 14,000 sq. ft. concrete pad in former tank farm to enhance vapor extraction
  - Groundwater extraction and treatment of contaminated groundwater
  - In-situ oxidation to reduce mobility of arsenic in groundwater migrating from leachfields
  - Natural attenuation of PAC contaminated groundwater
  - Environmental monitoring.

- ***Current Site Status:*** Construction of the soil vapor extraction system and the groundwater extraction system for the primary source control has been completed in March 1998. The system is currently in full operation and is removing contaminants from the soil and groundwater effectively (USEPA, 2001). Further investigations (i.e., JM Landfill site) are scheduled to begin in 2002. EPA plans to conduct water quality and sediment sampling within the Blackstone River from utility crossing to Pratt Dam. The river reach is approximately 1.5 miles.

- ***Impact to Blackstone River Water Quality for this TMDL study:*** Based on the level and type of contamination, the site potentially has a continued direct impact on the Blackstone River. Another primary factor is the site being located adjacent to the main stem of the river. Site reconnaissance has revealed seepage from landfill leachate. Further monitoring is needed to quantify impact of targeted contaminants.

2.9.6.2 Stamina Mills

- ***Media:*** Soil, sediment, debris, groundwater

- ***Contaminants***: VOCs, PCE, TCE, organics, pesticides, metals (chromium)

- ***Description:*** Stamina Mills is located on Main Street in North Smithfield, Rhode Island. The 5-acre site is a former textile weaving and finishing facility. The site is located within the 100-year flood plain of the Branch River. The facility was in operation from 1800 to 1975 when it was completely destroyed by fire. The facility had numerous functions over the years having significant uses of cleaning solvents, acids, bases and dyes for coloring, pesticides for moth proofing, and plasticizers. The waste produced by the Mill was disposed of at an on-site landfill. In 1969, an unknown quantity of TCE was released and contaminated the soil and underlying bedrock aquifer. There is also confirmed evidence that the spill was transported to the Branch River via runoff. The primary contaminants of concern identified in the Record of Decision affecting soil, groundwater, and sediment are VOCs (TCE, PCE), various organic compound, pesticides and metals (specifically chromium).

- ***Remedial Activities:*** The following remedial activities were proposed (USEPA, 2001):
  - In-situ vacuum extraction of soil contaminated with trichloroethylene
  - Excavation of approximately 550 cubic yards of landfill waste and sediments from within 100-year flood plain of Branch River
  - Construction of a RCRA C landfill cap

- Installation of leachate collection system
- Groundwater extraction and treatment of VOC contaminated groundwater
- Demolition and installation of impermeable barrier to two raceways
- Demolition and removal of remaining structures
- Grading and vegetating site at conclusion of remedial action.

- ***Current Site Status:*** The demolition of the raceway and other remaining facilities was completed in 1992. The two raceways were sealed and backfilled. Construction of a soil vapor extraction system was completed in December 1997 and became operational in May 1998. Excavation and final removal of landfill wastes for off-site disposal were complete in October 1999. The groundwater extraction and treatment system became operation in May 2000 and is anticipated to be operational for ten years.

- ***Impact to Blackstone River Water Quality for this TMDL study:*** The remedial action for the Stamina Mills is essentially complete with the exception of continued environmental monitoring. The primary impact to the Branch River was the sluice way, which has since been sealed. Further monitoring for this should be limited too future TMDL work on the Branch River.

2.9.6.3 Western Sand and Gravel

- ***Media:*** Soil, soil sludge, groundwater

- ***Contaminants:*** acids, solvents, TCE, PCE, VOCs, benzene, toluene, vinyl chloride, xylene, organics, arsenic, metals (chromium, lead)

- ***Description:*** Western Sand Gravel is a former 20-acre sand and gravel operation located along the Burrillville and North Smithfield line. The site was in operation from 1953 to 1979 as a sand and gravel operation and later a disposal site for liquid waste. In 1975, approximately 12-acres of the site was used to dispose 480,000 gallons of liquid waste, including chemical waste and septage. The liquid waste was disposed in unlined lagoons and seepage pits. Disposal of liquid waste continued until 1979 when a chemical pit fire forced officials to close operation. The site is located adjacent to Tarklin Brook, which is a tributary to Slatersville Reservoir. A contaminated plume from the unlined lagoons migrated off-site and contaminated the underlying high-yield aquifer. In 1982, EPA removed approximately 60,000 gallons of liquid waste from the twelve unlined disposal lagoons. In 1984, EPA provided alternate water supply to impacted residents and installed controls to minimize further off-site migration of contaminants.

- ***Remedial Activities:*** The following remedial activities were proposed (USEPA, 2001):
  - Construction of a RCRA C landfill cap
  - Installation of institutional controls (i.e., fence, signs)
  - Natural attenuation
  - Environmental monitoring (soils, groundwater, surface water).

- ***Current Site Status:*** The site is currently environmental monitored to evaluate the effectiveness of natural attenuation, which was originally proposed in 1991. EPA has reviewed the data and has concluded that natural attenuation is at or close to the predicted rate of natural attenuation. In October 2001, a Prospective Purchase Agreement was made between EPA and Supreme Mid-Atlantic Corporation to purchase the 25 acre site. Supreme Mid-Atlantic Corporation has proposed to construct a truck body assembly plant.

- ***Impact to Blackstone River Water Quality for this TMDL study:*** The site is far removed from the main stem of the Blackstone River and is thus unlikely to have a significant impact on loads to the Blackstone River. Further monitoring for this should be limited to future TMDL work on the Branch River.

2.9.6.4 Landfill and Resource Recovery, Inc.

- ***Media:*** Air, soil, debris, groundwater

- ***Contaminants:*** hydrogen sulfide, methane, VOCs

- ***Description:*** The Landfill and Resource Recovery, located in North Smithfield, consists of a 28-acre landfill and sand and gravel operation. The site has several wetland and perennial streams on the site, which are tributaries to the Slatersville Reservoir. The site began as a sand and gravel operation, and began accepting solid waste for disposal in 1927. There is documented evidence that hazardous waste was co-mingled with solid waste and disposed of on-site. The landfill ceased operation for hazardous waste disposal in 1979 at which time a PVC liner was installed. The landfill continued operation as a solid waste landfill until 1985. Solid waste was placed on top of the liner. In 1985, the owners of the site installed a second synthetic layer with gas vents to control air emissions. The landfill cover eroded into adjacent wetlands. Samples taken within the wetland indicated there was no contamination. Groundwater samples indicated the presence of VOCs, lead, chromium, and arsenic at low levels.

- ***Remedial Activities:*** The following remedial activities were proposed (USEPA, 2001):
  - Construction of a new cap layer more consistent with RCRA standards
  - Construction of stormwater controls to control runoff and minimize erosion
  - Installation of a landfill gas collection system with thermal destruction
  - Restoration and remediation of wetlands impacted due to erosion
  - Environmental site monitoring.

- ***Current Site Status:*** The construction of remedial facilities at the site is complete. Actual facilities constructed consist of a landfill cap, stabilized steep side slopes, and construction of thermal destruction system for landfill gases. In addition, institutional controls were installed. Environmental monitoring is still being conducted on-site.

- ***Impact to Blackstone River Water Quality for this TMDL study:*** The site is far removed from the main stem of the Blackstone River. As such, it is unlikely to have any significant impact on loadings to the Blackstone River. Further monitoring for this should be limited to future TMDL work on the Branch River.

3.0 EXISTING WATER QUALITY DATA FOR BLACKSTONE RIVER WATERSHED

Section 3.0 presents summaries of relevant water quality and related studies for the Blackstone River watershed. The types of data sought included: water quality, sediment quality, biological indicator parameters, and fish tissue. Primary parameters of concern consisted primarily of the following:

- Fecal coliform
- Copper
- Lead
- Nutrients (for the Valley Falls Pond assessment)
- Dissolved oxygen (for the Valley Falls Pond assessment)

However, related "secondary parameters" such as other heavy metals, total suspended solids, enterococcus, and others were summarized as well if the data were readily available. The secondary parameters may provide additional information regarding the processes that affect the primary parameters of concern.

The data were sought for the main stem of the Blackstone River, its tributaries, and for the reservoirs and impoundments in the watershed. Data were also sought for hazardous waste sites as they could impact the water quality in the river if pollutants find pathways to the streams via surface water runoff or groundwater transfer.

A total of 15 water quality, sediment, and biological studies were identified that are relevant for this project. These studies are summarized in Table 3-1. Each study is described in more detail in subsequent sections (Sections 3.1 to 3.15). These descriptions focus on the nature of the studies, locations, frequency, sampling constraints, and other information relevant to the interpretation of the data. Please note that the attached data discussion is limited to general conclusions/discussion presented in the original studies. A more comprehensive analysis of the water quality data, as relevant for the TMDL development, is presented in Section 4 in this volume.

The data of each study were synthesized in Microsoft Excel spreadsheets. Relevant data and graphs of each study are presented in Volume II (Appendices). Each study described within Section 3 has a corresponding Appendix number (e.g., Section 3.1 in Volume I corresponds to Appendix 1 in Volume II, etc.).

Table 3-1
Summary of Water Quality Data Sources in the Blackstone River Watershed

Section, Vol. I	Appendix, Vol. II	Study	Parameters	Matrix	Sampling Period
3.1	1	URI Wet Weather Study (Wright et al., 1991a)	Fecal coliform, TSS, metals, nutrients, PCBs, petroleum hydrocarbon, PAHs	Water	3 Storm Events: October 22, 1988 May 10, 1989 June 13, 1989
3.2	2	Systemwide Modeling for Providence CSO Program (URI, 1992)	Fecal coliform, TSS, metals, nutrients	Water	4 Storm Events: May 29, 1990 June 29, 1990 July 12, 1990 September 22, 1990
3.3	3	Blackstone River 1990, Pollutant Discharges and Water Quality Review (Wright et al., 1991b)	Fecal coliform, TSS, BOD, pH, Pb, ammonia, total phosphorus	Water	Monthly monitoring: 1988 and 1989
3.4	4	Blackstone River Water Quality Study (ASA, 1992b)	DO, temperature, nutrients, TSS	Water	July 9-11, 1991
3.5	5	Providence - Seekonk Rivers TMDL Study (RIDEM, unpubl. data)	TSS, nutrients, BOD	Water	May to Sep., 1995 May to Nov., 1996
3.6	6	River Rescue Project (Kerr and Lee, 1996)	pH, temperature, TSS, nutrients, dissolved metals	Water	1990 to 1995
3.7	7	URI Watershed Watch, Lakes Monitoring Data (URI, unpubl. data)	Secchi depth, algae density, nutrients, DO, alkalinity, anions, fecal coliform, E. coli	Water	1993 to 2000
3.8	8	RIDEM Chemical Monitoring for Section 305b Assessment (RIDEM, 2000)	Temp., DO, total lead and copper, nutrients, fecal coliform	Water	1991-2000
3.9	9	USGS Water Resources Data (USGS, 2000)	Temp., DO, total metals, nutrients, fecal coliform	Water	1990-1999

Table 3-1
Summary of Water Quality Data Sources in the Blackstone River Watershed

Section, Vol. I	Appendix, Vol. II	Study	Parameters	Matrix	Sampling Period
3.10	10	Water Quality Sampling of Tributaries (NBC, 1997 to 1999)	Fecal coliform	Water	1997 to present
3.11	11	MaDEP Fish Toxics Monitoring (Maietta, 1993)	Metals, PCBs, organics	Fish tissues	1993
3.12	12	Bioassessment Screening of Rhode Island Freshwater Benthic Macroinvertebrates (Gould, 1998, 1999, 2000)	Biodiversity, macrofauna	Aquatic organisms	summers of 1998, 1999, 2000
3.13	13	Sediment Core Study (King, unpubl. data)	Metals, nutrients	Sediment	1988
3.14	14	RIPDES-Permitted Discharges (RIDEM, unpubl. data)	Metals, nutrients, fecal coliform	Water	1997-2001
3.15	15	Blackstone River Initiative	Temp., DO, total metals, nutrients, fecal coliform	Water	1991-1993

3.1 University of Rhode Island – Wet Weather Study

(Wright et al., 1991a)

During 1988 and 1989, the University of Rhode Island conducted a study for the Narragansett Bay Commission in order to assess the impacts of CSO events on the Providence River and upper Narragansett Bay under wet weather conditions. The following tributaries were monitored during the study: Blackstone, Moshassuck, Woonasquatucket, Ten Mile, Pawtuxet, Seekonk, and Providence. URI conducted the study over the course of three storm events in 1988 and 1989.

3.1.1 Sampling

Water quality samples were collected before, after, and throughout the duration of each of the three storms at two or three stations on the Blackstone River. Samples were taken from the following stations (Figure 3-1):

- *BRSL:* Blackstone River at the state line.
- *WSTP:* Effluent from the Woonsocket Sewage Treatment Facility (WSTP).
- *BRCF:* Upper Blackstone River at Central Falls.
- *BRSM:* Blackstone River, located on the center and upstream side of the Main Street Bridge in Pawtucket just downstream of the Slaters Mill Complex.

Stations BRSL and BRCF were added at the request of the Narragansett Bay Program and RIDEM after the first storm event, in an attempt to better characterize the wet weather contribution from Massachusetts to the Blackstone River in Rhode Island. The characteristics of each of the three storm events are summarized in Table 3-2.

Table 3-2
Storm Characteristics

	Storm 1	Storm 2	Storm 3
Date of Event	22-Oct-88	10-May-89	13-Jun-89
Total Rainfall (inches)	0.9	1.94	0.37
Duration (hours)	11	32	9
Peak Intensity (inches/hour)	0.19	0.13	0.08
Start of Storm	00:00h	11:00h	06:00h
Antecendent Dry Period (days)	13.5	4.5	3.5

**Note: Rainfall characteristics are weighted by watershed (reported for the Blackstone watershed)*

The rainfall selection criteria were selected in order to isolate the effect of a discrete event to permit the characterization of runoff and the determination of the impact on receiving water quality. The selection criteria for the storm events were as follows:

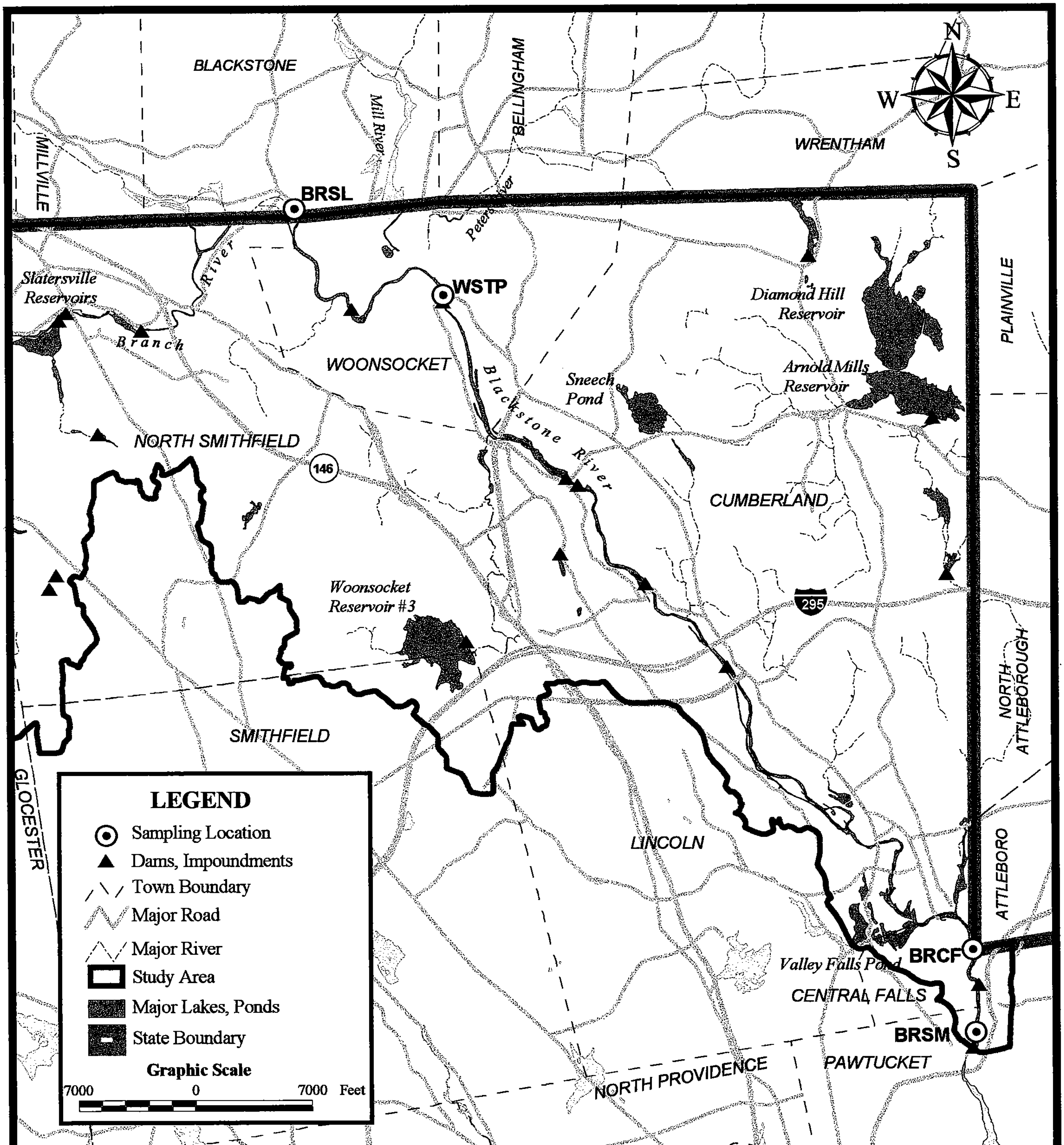
- Length of antecedent dry period – exceeded 5 days
- Minimum duration of rainfall – exceeded 6 hours
- Minimum amount of rainfall – exceeded 0.5 inches
- Length of dry post-storm period – exceeded 5 days

The May storm (Storm 2) was comparatively large with a total rainfall accumulation of almost 2 inches. It should also be noted that Storm 3 failed to meet the selection criteria because a storm event followed only 24 hours later with 0.8 inches of rain; the antecedent dry period was only 3.5 days.

Collection of samples commenced at each station a few hours prior to each storm. Throughout the duration of the storms, samples were collected every three hours for the first 12 hours. For the following 36 hours, samples were collected at four hour intervals. During days 3-5, samples were collected during low tide in conjunction with sampling in the Providence River. The samples were finally analyzed for E.coli, Enterococci, fecal coliform, BOD5, total solids, TSS, VSS, nutrients (nitrate, nitrite, ammonia, phosphates), oil and grease, and total, dissolved, and particulate metals (cadmium, chromium, copper, lead, nickel, zinc).

3.1.2 Data

The data of the dry and wet weather samples are presented in Appendix 1.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr	May 2002

Blackstone River Water Quality

Figure 3-1
URI WET WEATHER STUDY, 1991

3.2 Systemwide Modeling for Providence Area Combined Sewer System
(URI, 1992)

In 1990, URI conducted additional flow and water quality monitoring of CSOs and receiving waters. This project was undertaken in an attempt to provide data calibration and validation to NBC's Systemwide Stormwater Management Model (SWMM) and receiving water quality model. The data were summarized and submitted to NBC on July 24, 1992. The study provides continuous flow monitoring from May through October of 1990. Water quality monitoring was conducted during four storm events.

3.2.1 Sampling

Sampling was conducted at a single station (Figure 3-2):

- *BLSMDN:* Blackstone River, located at Slaters Mill. The station is not influenced by tidal flows. The station location is identical with Station BRSM in Figure 3-1.

The following water quality constituents were measured by the URI study: conductivity, fecal coliform, total suspended solids, nitrite and nitrate, orthophosphate, biochemical oxygen demand, total copper, total lead, and total nickel. The characteristics of each storm event are summarized in Table 3-3.

Table 3-3
Storm Characteristics

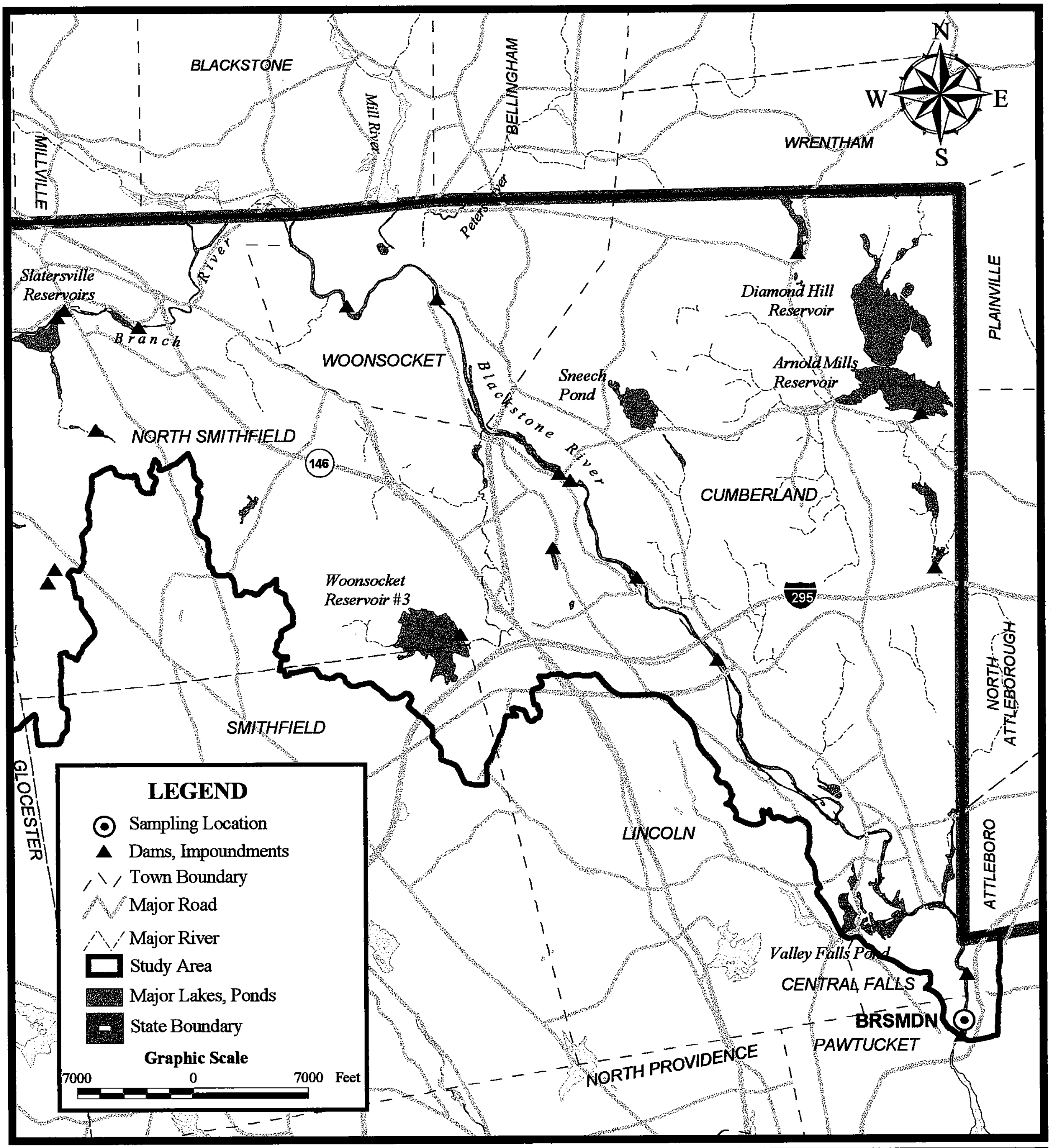
	Storm 1	**Storm 2**	**Storm 3**	**Storm 4**
Date of Event	May 29 to June 2, 1990	June 29 to 30, 1990	July 12 to 16, 1990	September 22 to 24, 1990
Total Rainfall (inches)	1.41	0.21	1.56	1.19
Duration (hours)	20	4	22	11
Peak Intensity (inches/hour)	0.21	0.09	0.29	0.53
Start of Storm	5/29, 14:00	6/29, 22:00	7/12, 09:00	9/22, 14:00
Antecedent Dry Period (days)	8	19	11	5

The selection criteria for the storm events were as follows:
- Length of antecedent dry period - exceeded 5 days
- Minimum duration of rainfall - exceeded 6 hours
- Minimum amount of rainfall - exceeded 0.5 inches
- Length of post-storm dry period - exceeded 5 days

Sampling was done before, during, and after each storm event in order to quantify impacts of the storm event. Samples were taken approximately every four hours during the storm after the start of runoff.

3.2.2 Data

The data of the dry and wet weather samples are presented in Appendix 2.



The Louis Berger Group, Inc.	Blackstone River Water Quality
Rhode Island DEM	**Figure 3-2** **URI WET WEATHER STUDY, 1992**
Source: RIGIS, MASSGIS	
File: BW SMPL.apr — May 2002	

3.3 Blackstone River 1990 – Pollutant Discharges and Water Quality Review
(Wright et al., 1991b)

This study, prepared for the Narragansett Bay Commission, is a technical review of available information on water quality issues in the watershed. The original purpose of the study was to identify water pollution control and abatement measures to be undertaken for the protection or restoration of in-stream and downstream uses of the Blackstone River.

3.3.1 Discharge Review

The study reviewed 19 permitted dischargers and 3 draft permits (Table 3-4). Of these, 3 permits had expired and 6 were due to expire before January 1, 1991. Monthly discharge monitoring reports (DMR) for 1988-1989 were reviewed and dischargers were ranked by loadings for BOD, TSS, fecal coliform (FC). The permit design flows totaled approximately 65.4 million gallons per day (MGD) for Massachusetts (MA) and 44.9 MGD for Rhode Island (RI). The data were compared in an attempt to develop an understanding for relative importance of the major point sources.

Table 3-4
Major Pollutant Discharge Elimination System Permits in the Blackstone River Watershed in Massachusetts and Rhode Island

Discharger	State ID	Federal	Expiration Date	Receiving Water	Class
Massachusetts Permits					
Uxbridge WWTF	M-197	MA0102440	12/4/89	Blackstone River	B
UBWPAD WWTF	M-181	MA0102369	10/30/90	Blackstone River	B
Douglas WWTF	M-099	MA0101095	12/10/90	Mumford River	B
Guilford Industries	M-124	MA0001538	8/28/91	Gilbon Brook	B
Northbridge WWTF	M-051	MA0100722	6/30/92	Blackstone River	B
Hopedale WWTF	M-149	MA0102202	7/29/92	Mill River	B
N.E. Plating	M-383	MA0005088	9/29/92	Mill River	B
Grafton WWTF	M-065	MA0101311	9/21/94	Blackstone River	B
Upton WWTF	M-011	MA0100196	9/21/94	West River	B
Millbury WWTF	M-061	MA0100650	9/22/94	Blackstone River	B
Rhode Island Permits					
Central Falls CSO	RI-0100145	None Listed	10/17/88	Blackstone/Moshassuck Rivers	C/B
BVDC WWTF	RI-0100072	None Listed	11/23/88	Seekonk River	SC
Smithfield Corporation	RI-0000485	None Listed	12/9/90	Blackstone River	C
Tupperware Company	RI-0000566	None Listed	12/9/90	Branch River	B
Burrillville WWTF	RI-0100455	None Listed	12/11/90	Clear River	C
Woonsocket WWTF	RI-0100111	None Listed	12/27/90	Blackstone River	C
GTE Products	RI-0001180	None Listed	2/18/91	Blackstone River	C
Okonite Company	RI-0020141	None Listed	7/31/91	Blackstone River	C
Zambarano Hospital	RI-0100129	None Listed	9/21/92	Clear River	C

UBWPAD - Upper Blackstone Water Pollution Abatement District
WWTF - Wastewater Treatment Facility
BVDC – Blackstone Valley District Commission
District Commission; Draft permits under review:
UBWPAD WWTF, Uxbridge WWTF, BVDC WWTF, and City of Worcester CSO Facility

A comparison was made of the Permit Limits and the "Quarterly Noncompliance Reports" (QNRs) of 1988 and 1989 (Table 3-5). The QNRs were provided for Massachusetts by the U.S. EPA, Region 1, and for Rhode Island by RIDEM. The summary is based on monthly samples over the 2-year period; therefore the maximum number of violations is 24 (i.e., 100%).

In general, violations occurred infrequently at most facilities. The most notable exception was the BVDC facility on the Seekonk River; chronic problems existed relative to total suspended solids (TSS), biochemical oxygen demand (BOD), and fecal coliform (FC). Almost all months were in violation. Other violations of significance concerned pH values in MA for four WWTF, and total residual chlorine (TRC) in the Zambarano and Burrillville discharges.

Table 3-5

Summary of Violation Months for Massachusetts and Rhode Island Dischargers during 1988-1989

Facility	TSS	BOD	SS	TRC	pH	FC	Flow	NH3	TP	Pb
Massachusetts Permits										
Grafton WWTF			2	4	5	1				
Guilford Industries	1	1			1					
Millbury WWTF	1	2		2			2			
N.E. Platting					10					
Northbridge WWTF					13					
UBWPAD WWTF	6		2		15	4		3		
Uxbridge WWTF		1		7	18					
Rhode Island Permits										
BVDC WWTF	24	24	23			22				
Burrillville WWTF	3			13	6	3	2		2	
GTE Products	1									4
Okonite Company					2					
Smithfield Corporation							7			
Tupperware Company	2	1			1	1				
Woonsocket WWTF	7	10	3		7	16	3			
Zambarano Hospital	1			23	1	3				

Maximum violations = 24, which is equivalent to the 24 month period in 1988-89.
TSS = Total suspended solids
BOD = 5-day biochemical oxygen demand
SS = Settleable solids
TRC = Total residual chlorine
FC = fecal coliform
NH3 = ammonia
TP = phosphorus
Pb = lead

3.3.2 Data Comparison

In addition to the point source evaluation, the most current water quality data at the time of the studies were utilized to provide snapshots of the Blackstone River's water quality from Worcester to Slaters Mill, in dry- and wet-weather conditions. Dry weather studies consisted of the following:

- 1985 study by MA Department of Environmental Quality Engineering for MA river portion (MADEQE, 1985)
- 1985 trace metal and organic surveys in 1985 by University of Rhode Island (Wright, 1988)
- 1987 study for RI river portion (EE-87) for Ocean State Power by Ecology and Environment, Inc. (EEI, 1988)
- 1989 trace metal survey by MADEP (MADEP, 1990)

In addition, the results were compared to the 1988-89 wet-weather study for trace metals and organic compounds in the RI river portion conducted by URI (Wright et al., 1991). This study is discussed in Section 3.1 of this report.

The MADEQE-85 and EE-87 studies measured dissolved oxygen The other studies included analyses of trace metals (cadmium, chromium, copper, lead, nickel, zinc) and polychlorinated biphenyls (PCB). See Appendix 3 for sampling locations of the studies and spatial distribution of concentrations.

3.4 Blackstone River Water Quality Study, 1991

(ASA, 1992b)

During July 9-11, 1991, a study was conducted in the reach of the Blackstone River downstream of a cooling water intake structure for a facility operated by Ocean State Power (OSP). OSP constructed a 500 megawatt combined cycle generating plant in Burrillville, RI. This plant requires up to 4.4 million gallons per day or 6.8 cubic feet per second of water for cooling and process purposes. This water is drawn from the Blackstone River, a short distance upstream of the Sayles Street bridge in Woonsocket, RI. OSP has been required to demonstrate that withdrawal during periods of low flow will not adversely affect river water quality in order to obtain a permit. The study was developed in order to assess and characterize dissolved oxygen levels in the river, along with levels of nutrients and other parameters affecting the DO balance.

3.4.1 Sampling

The study consisted of a total of eight sampling runs carried out over a 48 hour period. Measurements were taken at six hour intervals at 14 stations along the study area shown in Figure 3-3 and in Table 3-6, and also at intermediate points between stations.

Table 3-6
Water Quality Sampling Locations

Station No.	River Mile above Slaters Mill dam (miles)	Location Description
1	14.1	Center of span, Sayles St. bridge
1a	13.9	East bank, 30 yds below Thundermist dam
2	13.35	North bank upstream side of Bernon St. bridge
3a	12.35	Center of river, downstream side of Hamlet Ave bridge adjacent to fire station
3	12.29	Center of river, 100 yrds upstream of WWTF outfall
4	--	WWTF, chlorine contact tank spillway
5	11.97	Center of river, 300 yds downstream of Woonsocket WWTF outfall
6	11.67	Center of river, in line with south face of large building on east bank of river
7	11.23	Center of river, adjacent to Woonsocket water treatment plant
8	10.73	Center of river, at bend adj. to Rte 99 overpass on Woonsocket-Cumberland town line
9	10.17	Adjacent to gravel pit, 800 yds downstream of town line
10	9.74	Center of river, 50 yds above Manville dam
10a	6.61	Upstream side of bridge downstream of Manville dam
11	8.19	West bank of river, 50 yds above Albion dam

See Figure 3-3 for locations.

Water samples were collected at river stations 1 to 11 (excluding stations 1a, 3a, and 10a). The sampling depth was 1 m, although at the shallower river stations, samples were collected at a depth of 0.5 m or less. The samples were analyzed for biochemical oxygen demand (BOD), suspended solids, specific conductivity, chlorophyll *a,* and organic and inorganic nitrogen.

The sampling event constitutes dry weather conditions. The rainfall measured at the T.F. Green Airport in Providence during this time period was as follows:

July 4	0.00"	
July 5	0.03"	
July 6	0.00"	
July 7	0.08"	
July 8	0.00"	
July 9	0.00"	(Sampling)
July 10	Trace	(Sampling)
July 11	0.10"	(Sampling)

3.4.2 Data

The data from this study are presented in Appendix 4.

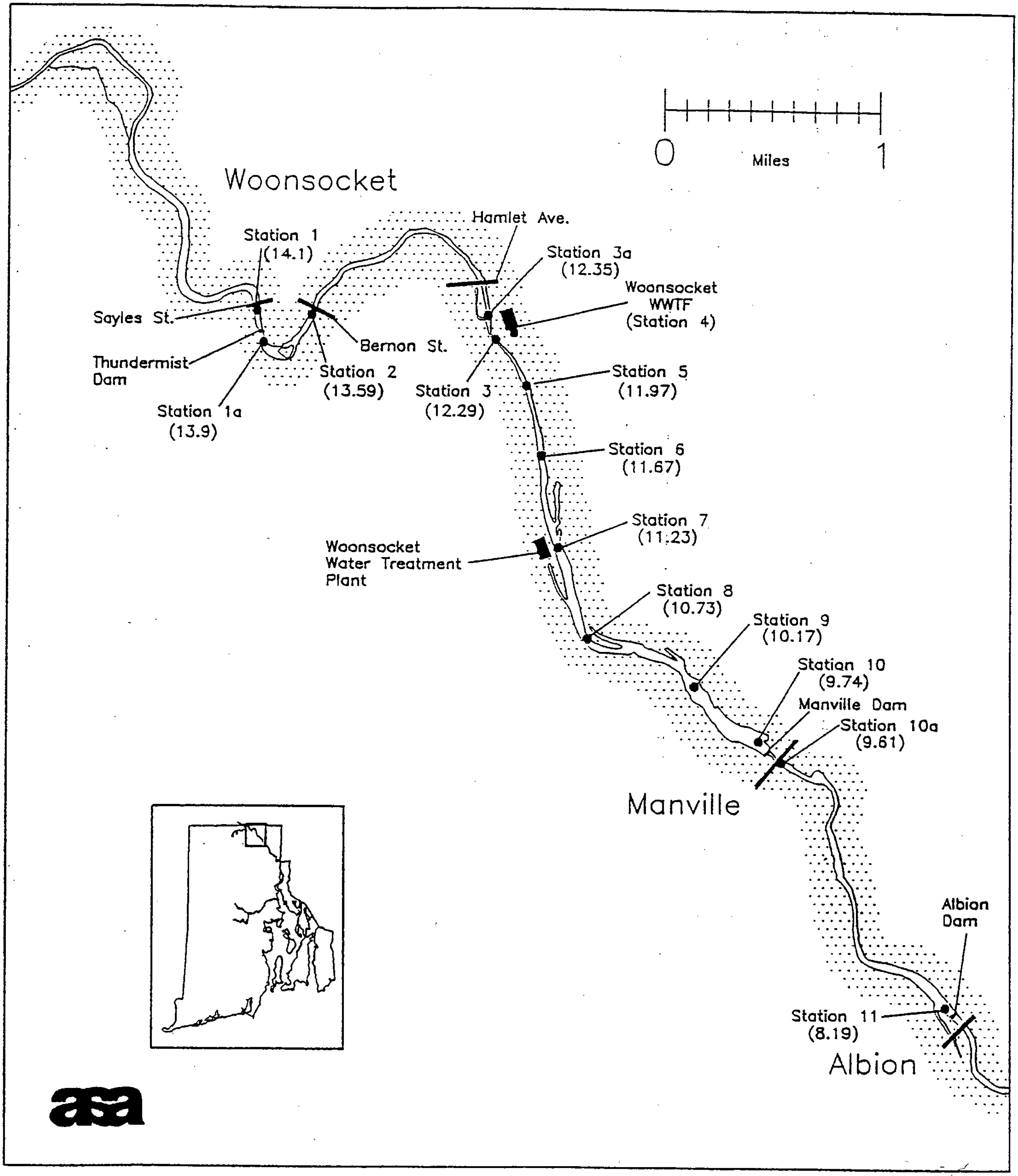


Figure 3-3: Location of field program sampling stations on the Blackstone River. Distances from Slaters Mill dam at the mouth of the river in Pawtucket is given (in miles) in parentheses. (ASA, 1992b)

3.5 Providence – Seekonk River Total Maximum Daily Load Project

(RIDEM, unpublished data)

RIDEM is currently in the process of developing a TMDL for the Providence and Seekonk Rivers to address hypoxia and nutrient loadings. Monitoring was conducted at numerous locations within the Providence and Seekonk Rivers including its tributaries: Blackstone, Moshassuck, Pawtuxet, Ten Mile, and Woonasquatucket Rivers.

3.5.1 Sampling

The sampling location on the Blackstone River was as follows:

- *Slaters Mill Dam:* Located in Pawtucket. The station location is identical with Station BRSM in Figure 3-1.

Samples were collected routinely at irregular intervals during the summers of 1995 and 1996. The sampling period for the 1995 survey was from the end of May to the end of September. The sampling period for the 1996 survey was from the beginning of May to mid November. The 1995 data consisted of a 24-hour composite sample taken at approximate one-hour intervals.

Sample analyses consisted of the following:

- *Nutrients:* nitrate/nitrite, phosphate, ammonia, total nitrogen, total phosphorous, total particulate carbon, total particulate nitrogen
- *Other parameters:* BOD_5, silicon dioxide, TSS

3.5.2 Data

Provided in Appendix 5 is a summary of data.

3.6 River Rescue Project, Water Quality in Rhode Island's Urban Waters, 1990-1995

(Kerr and Lee, 1996)

The River Rescue Project was a water quality monitoring program conducted between 1990 and 1995 (Kerr and Lee, 1996). Monitoring was conducted at ten stations along five tributaries: Blackstone, Moshassuck, Pawtuxet, Ten Mile, and Woonasquatucket Rivers. The program was developed as a partnership between Citizens Bank, URI Coastal Resource Center, and RI Sea Grant Program.

3.6.1 Sampling

Samples were collected approximately monthly at each sampling location. River Rescue monitored the Blackstone at three locations (Figure 3-4):

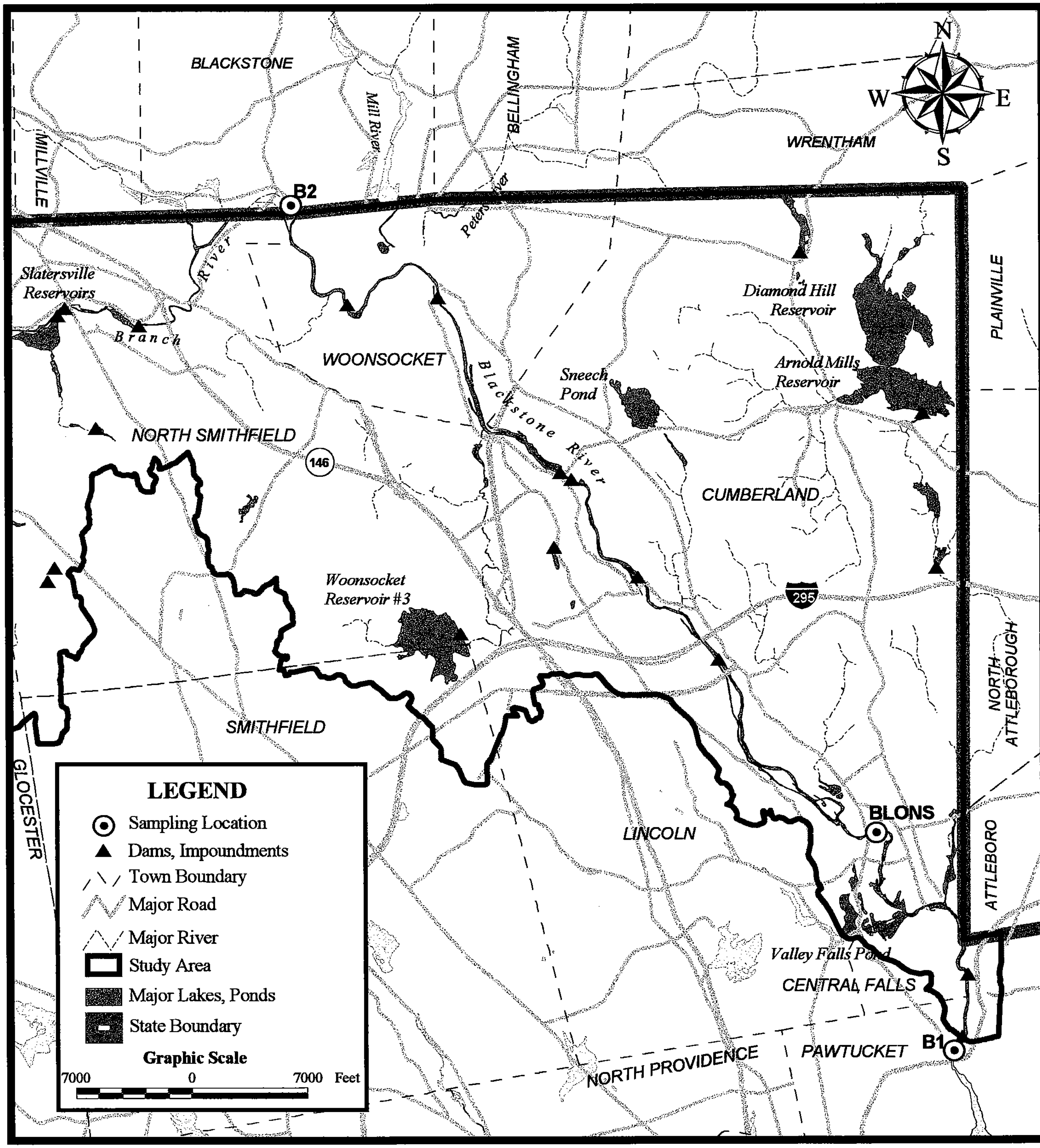
- *B2:* Station located in Blackstone, MA. Sampling was conducted from the upstream side or from the shore just upstream of the Main Street road bridge.
- *B_{lons}:* Station located at Route 122 in Lonsdale upstream of densely developed portions of the river. Sampling was conducted from midstream from the upstream side of the road bridge.
- *B1:* Station located at the mouth of the river near Main St. in Pawtucket, RI. Sampling was conducted at mid-flow from the upstream side of the road crossing.

Sample analyses consisted of the following:

- *In-situ measurements:* pH, water temperature, air temperature, dissolved oxygen, TSS, and hardness
- *Nutrients:* nitrate/nitrite, ammonia, dissolved inorganic and organic nitrogen, total dissolved nitrogen, total dissolved phosphorus, dissolved organic phosphorus, particulate phosphorus, and total phosphorus
- *Total metals:* cadmium, chromium, copper, lead, and nickel

3.6.2 Data

Provided in Appendix 6 is a summary of the data. The Kerr and Lee report (1996) indicated that the quality of the Blackstone River has improved during the 1990s, especially for concentrations of cadmium and nickel. Comparisons with historical data show decreases in chromium, cadmium, nickel, nitrogen, and phosphorus in conjunction with increases in copper and lead.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure 3-4
RIVER RESCUE STUDY 1990-1995

3.7 URI Watershed Watch, Lakes Monitoring Data, 1993-2000
(URI, unpublished data)

The URI Watershed Watch Program utilizes volunteers to sample various lakes and rivers in several watersheds throughout Rhode Island. The water quality analyses performed by the Watershed Watch provide information on the following parameters: nutrient enrichments (eutrophication), lake acidification, and bacterial contamination. Data are generally available from 1993 to 2000 with a few site exceptions.

3.7.1 Sampling

The following waterbodies in the Blackstone River watershed were monitored (Figure 3-5):

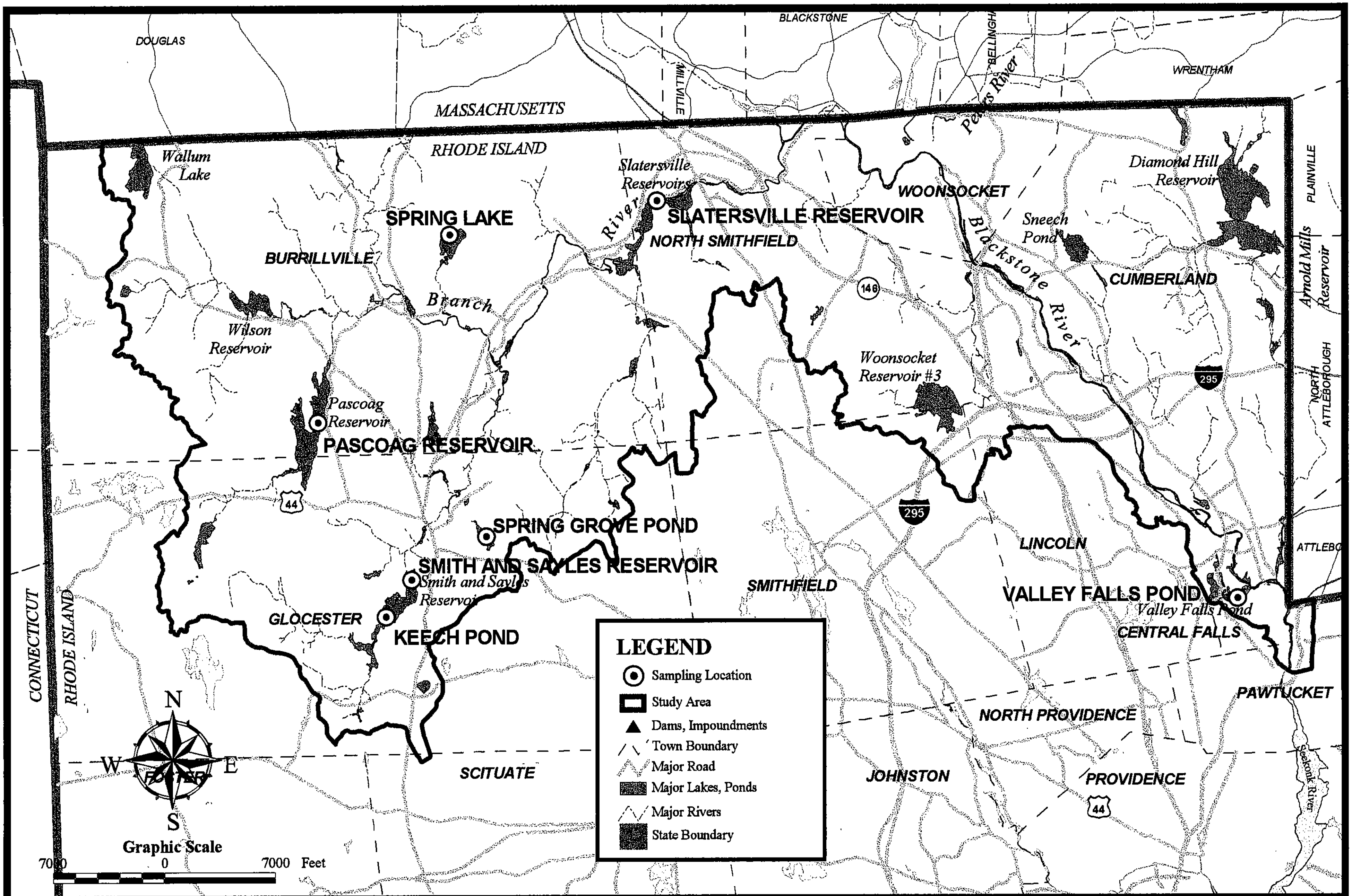
- *Pascoag Reservoir*
- *Spring Lake*
- *Keech Pond*
- *Smith and Sayles Reservoir*
- *Spring Grove Pond*
- *Slatersville Reservoir*
- *Valley Falls Pond*

The waterbodies were monitored for the following parameters:

- *Water Clarity:* Monitored weekly utilizing Secchi disk and view tube.
- *Algal Density:* Monitored bi-weekly.
- Dissolved Oxygen: Monitored bi-weekly at a depth of 1 m above bottom.
- *Water Temperature:* Monitored weekly at the surface and bi-weekly at depth.
- *Alkalinity and pH:* Analyzed three times per year.
- *Nutrients:* Total and dissolved phosphorus, ammonia, total and nitrate nitrogen analyzed three times per year.
- *Anions:* Analyzed three times per year to assess water hardness and potential impacts of road salts.
- *Bacteria:* Fecal coliform and E. coli generally analyzed three times per year to determine suitability of recreational use and potential contamination of sewage.

3.7.2 Data

Summaries of the data for each of the seven waterbodies are presented in Appendix 7.



The Louis Berger Group, Inc.

Rhode Island DEM

Figure 3-5
URI WATERSHED WATCH

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

3.8 State of the State's Waters- Rhode Island, 2000 Section 305(b) Report (Section III): Stream Sampling Sites for 1991-2000, Chemical Monitoring (RIDEM, 2000)

The Office of Water Resources' (OWR) surface water monitoring program was designed in an attempt to gather state-wide baseline data in conjunction with targeted monitoring information. Data collected is utilized in establishing and reviewing Rhode Island's water quality standards, to measure progress toward achieving water quality goals, and to supply information for use in permit limit development.

3.8.1 Sampling

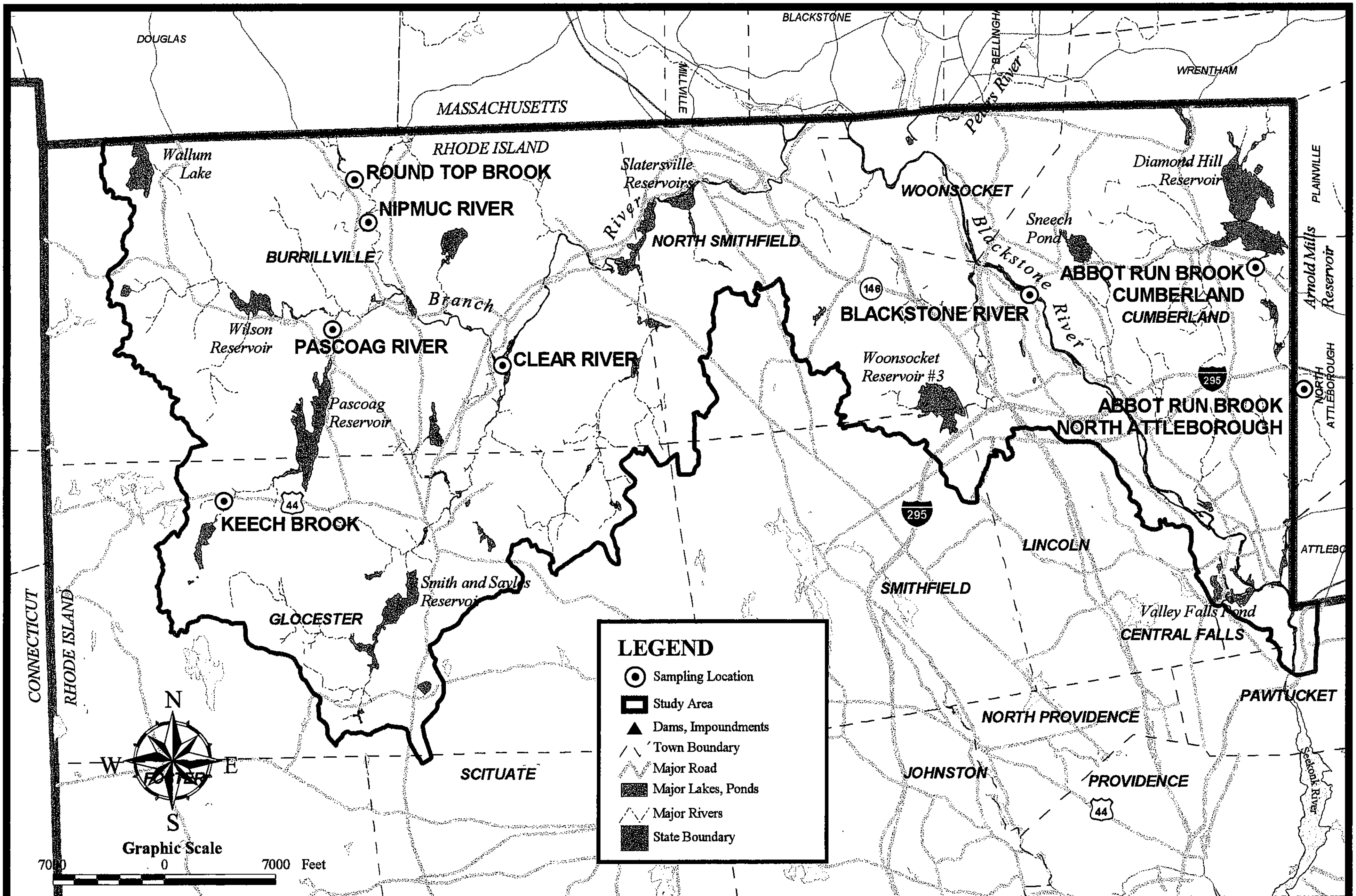
In 1991, RIDEM developed a cooperative agreement with URI's Civil and Environmental Engineering Department to conduct a study establishing a baseline monitoring program for the rivers of Rhode Island. Approximately twenty-five stations were monitored under this program during 1991, 1993, 1996, 1998, and 1999. Sampling was done on a quarterly (seasonal) basis during these years. Funding problems prevented the development and implementation of a cooperative agreement with URI for this program during 1995 and 1997.

Relevant stations within the project area consist of the following (Figure 3-6):

- *Round Top Brook*
- *Pascoag River*
- *Clear River*
- *Abbott Run Brook (Cumberland)*
- *Run Brook (North Attleboro)*

3.8.2. Data

The samples were analyzed for trace metals, nutrients, BOD5, and other parameters. Data are provided in Appendix 8.



The Louis Berger Group, Inc.

Rhode Island DEM

Figure 3-6
RIDEM CHEMICAL MONITORING

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

3.9 Multiple Station Analyses: Water Resources of the Blackstone River Basin, Massachusetts (USGS, 2000)

The U.S. Geological Survey (USGS) periodically collects water quality samples and data from selected water bodies. These data are published in the USGS's annual Water Resources Data reports (USGS, 2000).

3.9.1 Sampling

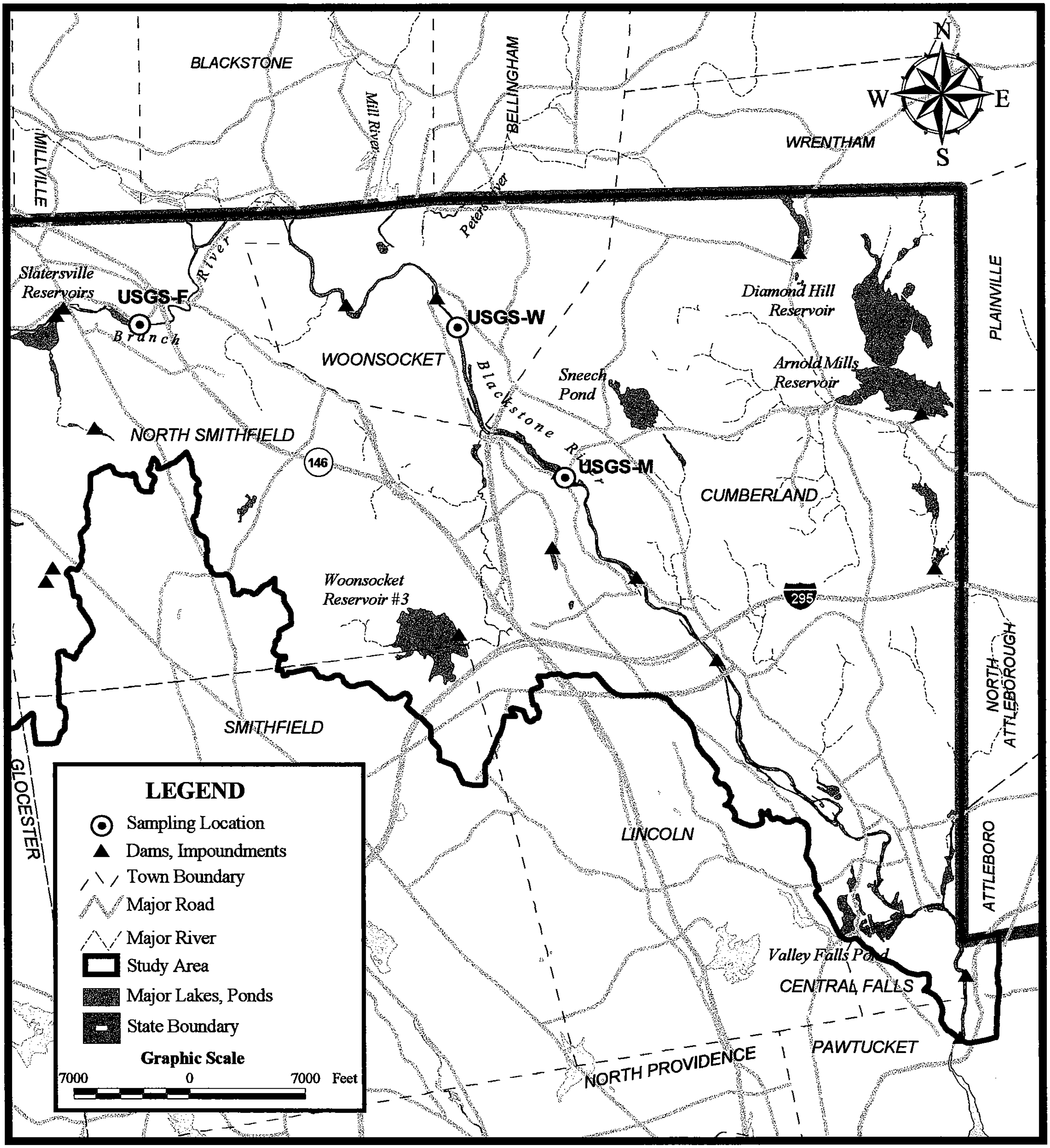
The USGS collected and continues to collect water samples from multiple stations within the Blackstone River Basin. Data for two stations are detailed in this report:

- *Branch River at Forestdale* (Station number 1111500): The station is located 1 mile east of Slatersville, and 1.6 miles upstream from the mouth of the river. The station is located on the left bank of the river, 20 ft upstream from an abandoned bridge site, and 400 ft downstream from Mill Dam at Forestdale.
- *Blackstone River at Manville* (Station number 1112900): The station is located at Manville Road Bridge, 400 ft downstream from the mill dam at Manville, and 2.5 miles downstream from Woonsocket Sewage Treatment Plant.

The exact station locations are not known; a map with the estimated station locations is presented in Figure 3-7.

3.9.2 Data

Parameters analyzed included temperature, specific conductance, pH, color, DO, coliform, calcium, magnesium, sodium, potassium, nitrate and nitrite, ammonia, phosphorus, aluminum, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, zinc, phenols, and oil and grease. The data for the Forestdale and Manville stations are presented in Appendix 9.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure 3-7
USGS STATIONS 1990-1999

3.10 Water Quality Sampling of Tributaries, 1998 to present
(NBC, 1998 to 2001)

NBC has initiated a program to monitor fecal coliform in the tributaries within the NBC service area. The NBC data set provides recent and continued sampling of fecal coliform data. The data set is used primarily by NBC in combination with inspection and maintenance of regulators and tide gates to assure there are no dry weather overflows.

3.10.1 Sampling

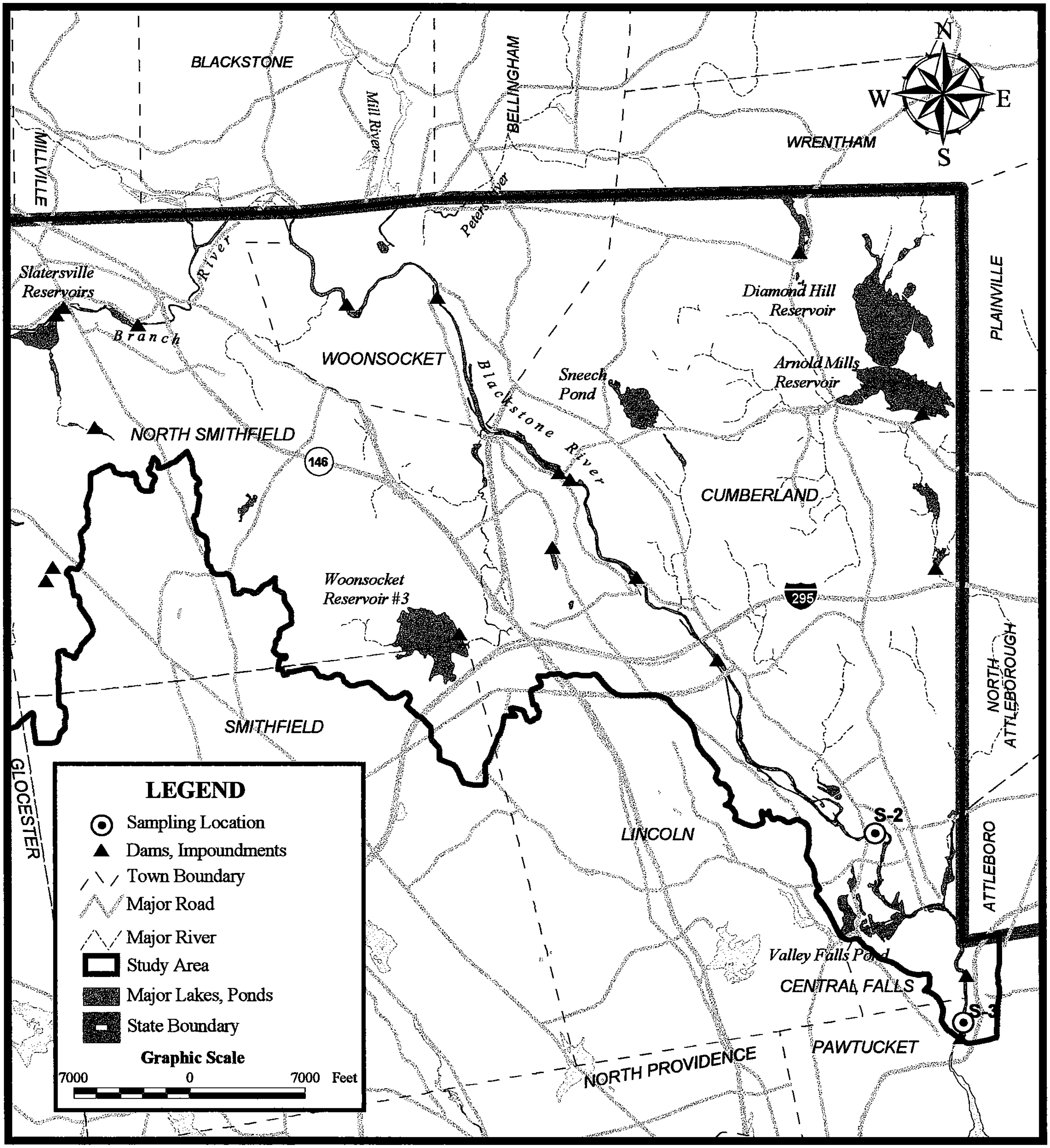
The program entails sampling on a weekly basis from 1998 to present. There are two sampling stations on the Blackstone River (Figure 3-8):

- *S-2: Lonsdale Avenue* (Whipple Bridge), Lincoln/Cumberland, RI
- *S-3: Slaters Mill Dam,* Pawtucket, RI.

Samples were collected routinely and not driven by specific weather conditions. The samples were separated into dry weather, wet weather, and mixed weather conditions, using T.F. Green Airport rain gage data.

3.10.2 Data

Provided in Appendix 10 is a summary of data.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure 3-8
NBC WATER QUALITY SAMPLING

3.11 The Blackstone River, Fish Toxics Monitoring – MADEP
(Maietta, 1993)

The Massachusetts Department of Environmental Protection (MADEP) collected, prepared, and analyzed edible fillets of fishes for selected metals, polychlorinated biphenyls (PCB), and organochlorine pesticides as part of an extensive, interstate evaluation of water quality, and biological integrity of the Blackstone River.

This work was performed in order to monitor for gross changes with the potential to occur as a result of the re-flooding of parts of the Riverdale Impoundment around 1984. The specific objectives of this project were as follows:

- Collect and analyze fish tissue samples from the Blackstone River Basin to provide data for human health risk assessment, and to further define the fate and transport of contaminants in the aquatic ecosystem.
- Provide fish toxics data for comparison with existing statewide database.

3.11.1 Sampling

Four of the major impoundments on the mainstem of the Blackstone River were chosen for this monitoring effort (Table 3-7). Waite Pond in Leicester, Massachusetts (MA) was chosen as a control site.

Table 3-7
1993 Blackstone River Fish Toxics Monitoring Survey - Sampling Location

Station Name	River Mile (from Slaters Mill)	Sampling Date	Description
Waite Pond	Control Station	6/15/93	Waite Pond in Leicester, MA (not in Blackstone watershed)
Fisherville Pond	37.0	7/7/93	Fisherville Pond downstream of confluence of the Blackstone and Quinsigamond River in Grafton, MA
Riverdale Impoundment	32.0	7/26/93	Riverdale Impoundment on Riverdale Street in Northbridge, MA
Rice City Pond	28.0	7/1/93	Rice City Pond on Hartford Avenue in Uxbridge, MA
Tupperware Impoundment	18.2	6/17/93	Tupperware Impoundment upstream of the Blackstone Gorge in Blackstone River, at RI/MA state line, Woonsocket, RI

Samples were collected during the summer of 1993 by electroshocking. Edible fish fillets were submitted to the laboratory for analyses of selected metals, PCBs, and organochlorine pesticides.

Fish captured for analysis included *Micropterus salmoides* or largemouth bass (5 fish), *Esox niger* or chain pickerel (1 fish), *Ameiurus nebulosus* or brown bullhead (4 fish), *Lepomis macrochirus* or bluegill (5 fish), *Perca Flavescens* or yellow perch (4 fish), and *Catostomus commersoni* or white sucker (3 fish).

3.11.2 Data Collection

Data are summarized for metals, mercury, and PCBs (Tables 3-8 to 3-12).

Table 3-8

Metal Concentrations in Fish Tissue – Summary

Metal	Mean Concentration (mg/kg)	Range (min.-max.)	Number of samples below Method Detection Limit
Arsenic	0.034	<0.040 - 0.10	28
Cadmium	0.30	<0.60 – Not listed	40
Chromium	0.56	<0.60 - 2.8	30
Copper	0.42	<0.60 - 1.4	31
Mercury	0.268	0.038 – 1.04	0
Lead	0.62	<1.0 - 2.2	37
Selenium	0.27	0.07 –0.65	0

Note: Forty (40) samples were analyzed.

Table 3-9

Copper Concentrations in Fish Tissue - by Station

Station Name	Range of Concentrations (mg/kg wet weight) (min.-max.)
Waite Pond	<0.03 - 1.4
Fisherville Pond	<0.03 – 0.8
Riverdale Impoundment	<0.03
Rice City Pond	<0.03 - 1.0
Tupperware Impoundment	<0.03 - 1.0

Table 3-10

Lead Concentrations in Fish Tissue - by Station

Station Name	Range of Concentrations (mg/kg wet weight) (min.-max.)
Waite Pond	<0.05
Fisherville Pond	<0.05 – 2.2
Riverdale Impoundment	<0.05
Rice City Pond	<0.05
Tupperware Impoundment	<0.05 – 2.2

Table 3-11

Mercury Concentrations in Fish Tissue - by Station

Station Name	Mean Concentration of Total Hg (mg/kg)	Range (min.-max.)
Waite Pond	0.817	0.457 - 1.04
Fisherville Pond	0.195	0.074 - 0.302
Riverdale Impoundment	0.101	0.058 - 0.156
Rice City Pond	0.096	<0.0002 - 0.118
Tupperware Impoundment	0.207	0.038 - 0.487

Table 3-12
PCB Concentrations in Fish Tissue - by Station

Station Name	Mean Concentration of Total PCB (mg/kg)	Range (min.-max.)
Waite Pond	0.09	<0.089 - <0.089
Fisherville Pond	0.24	<0.089 - 0.71
Riverdale Impoundment	1.08	<0.089 - 2.8
Rice City Pond	2.09	0.24 - 4.4
Tupperware Impoundment	0.87	<0.089 - 4.7

Mercury in edible fish fillets appeared to be a problem in Waite Pond. The Massachusetts Department of Public Health (MDPH) reviewed the data and in June issued a Public Health Fish Consumption Advisory. Mercury in edible fish fillets did not appear to be a significant problem in the Blackstone River or its impoundments. This may be attributable to the high concentrations of dissolved organics present in the river which can bind mercury or block methylization processes.

MDPH did not advise regarding any of the other metals detected. Arsenic was below method detection in most fish sampled. Arsenic concentrations were well below United States Environmental Protection Agency (EPA) criteria.

PCB, while absent from Waite Pond and at fairly low concentrations in Fisherville Pond, appeared to be a problem further downstream on the Blackstone River. Concentrations increase dramatically between the Fisherville Pond and Riverdale Impoundment. In June 1994, the MDPH issued advisories regarding the PCB contamination. The advisories were issued for Riverdale Impoundment, Rice City Pond, and the Tupperware Impoundment.

The full set of data for the Tupperware Impoundment, which is the impoundment closest to Rhode Island, is presented in Appendix 11.

3.12 Rapid Bioassessment Screening of Rhode Island Freshwater Benthic Macro-invertebrates

(Gould, 1998; Pomeroy, 2000; da Silva, 2000)

Through a contract with RIDEM, Roger Williams University has conducted an annual survey of macrofauna in Rhode Island Waters since 1991. The purpose of the survey is to document baseline freshwater macrofauna yearly in order to adequately monitor aquatic ecosystems and their distribution within Rhode Island.

3.12.1 Sampling

The 1998 sampling program had a total of 45 sampling stations for biological monitoring, encompassing a wide variety of different watershed environments and water quality types. Seven sampling stations were located within the Blackstone River watershed; station locations are identical to stations in Figure 3-6:

- *Nipmuc River*
- *Pascoag River*
- *Keech Brook*
- *Clear River*
- *Abbott Run Brook (Cumberland, RI)*
- *Abbott Run Brook (North Attleboro, MA)*
- *Blackstone River*

The 1999 and 2000 sampling programs had a total of 43 sampling stations. Sampling stations located within the Blackstone River watershed were the same as those surveyed during the 1998 sampling.

Sampling was done during the following periods:

- Summer of 1998, from mid-July to early August
- Summer of 1999, from June through July
- Summer of 2000, in August.

A hand-held drift net with an opening of 45 cm by 23 cm was utilized for the sampling. It was determined, through experimentation and consultation with other researchers, that three samples of approximately 1.0 m^2 were sufficient to generate suitable specimens indicative of the riffle community in the stream.

3.12.2 Data

Conclusions derived from the surveys are summarized below (following closely the text in the respective reports). For the year 2000 survey, we present the Biological Protocol Ranking only; physical scores were not available for that year. The detailed results of the Biological Protocol Ranking for 1998-2001 are provided in Appendix 12.

3.12.2.1 <u>Nipmuc River-Top Brook</u>

1998: The report concluded that this feeder stream to the Nipmuc River provided an excellent riffle habitat composed of small stone and pebble with a corresponding good macroinvertebrate population just below a large pool within the brook. Non-point sources to the brook include road, septic, and agricultural runoff, although the surrounding conservation land limits contaminated runoff to the brook. Signs of large mussels were present. The Nipmuc River is classified as a 2nd order stream. The physical score for the Nipmuc River was 92. The Biological Protocol Ranking score was 81% ***(non-impaired)***. The survey found three distinct organisms: *Gomphus sp., Nigronia sp.,* and *Oecetis sp.*

1999: Findings were similar to the survey conducted in 1998. Although the riffle area was relatively shallow (8 cm), diversity was great due to a good flow rate of water through the riffles. The physical score for the Nipmuc River was 88. The Biological Protocol Ranking score was 75% ***(slightly impaired)***. The survey found 12 distinct organisms: *Nigronia sp., Corydalus sp., Marcostemum sp., Parapsyche sp., Psychomyia sp., Chimarra sp., Chironomus sp.,* Horse Hair Worm, *Stenonema sp. Acroneuria sp., Lanthus sp.,* and *Boyeria sp.*

2000: The Biological Protocol Ranking score was 50% ***(moderately impaired)***. The survey identified 13 distinct organisms: *Nigronia sp., Neohermes sp., Macrostemum sp., Chimarra sp., Sialis sp., Pentaneura sp., Isotomurus sp., Aquatic Worm, Beloneuria sp., Perlesta sp.,* Stonefly Larvae, *Boveria sp.*, and Water Strider.

2001: This feeder stream to the Nipmuc River provides excellent small stone/pebble riffle with a corresponding good macroinvertebrate population just below a large pool within the brook. A Conservation Area protects surrounding land. Non-point inputs include road, septic and agriculture. In 1998, the dam supporting the pool was upgraded and signs of large mussels were present. Although relatively shallow, there is good flow and diversity continues to be high. The Biological Protocol Ranking score was 63% ***(slightly impaired)***.

3.12.2.2 Pascoag River

1998: The report concluded that downstream from the pond and dam, the Pascoag River exhibited well-oxygenated flow. Such conditions would generally lead to a good habitat for macroinvertebrates. However, human activities, such as litter, road runoff, and oil slicks, impacted the river. The river bottom consisted of embedded rocks of many sizes. During 1998 the water levels were moderate and debris in the river was noted. The Pascoag River is classified as a 2nd order stream. The physical score for the Pascoag River was 86. The Biological Protocol Ranking score was 75% ***(slightly impaired)***. The survey identified five distinct organisms: *Argia sp., Psephenus sp., Hydropsyche sp., Brachycentrus,* and *Stenonema sp.*

1999: Report conclusions were primarily the same as those drawn through the 1998 study. The physical score for the Pascoag River was 87. The Biological Protocol Ranking score was 75% ***(slightly impaired)***. The survey identified 10 distinct organisms: *Simulium sp., Stenelmis sp., Psephenus sp., Stenonema sp., Argia sp., Lanthus sp.,* Horse Hair Worm, Aquatic Worm, *Macrostemum sp.,* and *Chimarra sp.*

2000: The Biological Protocol Ranking score was 75% ***(slightly impaired)***. The survey identified 14 distinct organisms: *Simulium sp., Tipula sp., Stenelmis sp., Psephenus sp., Stenonema sp., Lestes sp., Corydalus sp., Macrostemum sp., Arctopsyche sp., Chimarra sp., Nvctiophvlax.sp., Mesovelia sp.,* Aquatic Worm, and Leech.

2001: Downstream from the pond and dam, this urbanized stream exhibits a well-oxygenated flow, which one would expect to be a good habitat for macroinvertebrates. However, human activities impact the river; these include litter, road runoff, and oil slicks. Septic, and other urban runoff is assumed to occur within the stream. Water flow, levels, and diversity are all moderate at this site. The Biological Protocol Ranking score was 69% ***(slightly impaired)***.

3.12.2.3 Keech Brook

1998: The report concluded that Keech Brook, located within the George Washington Management Area, is within a well-protected watershed. The flow during 1998 sampling was higher than in previous years. Riffles were composed of cobble and small stone. Keech Brook is classified as a 2nd order stream. The physical score for Keech Brook was 105. The Biological Protocol Ranking score was 50% ***(moderately impaired)***. The survey identified eight distinct organisms: *Nirgronia sp., Psepheus sp., Tipula sp., Hemerdromia sp., Isonychia sp., Hastapaerla sp., Stylogomphus sp.,* and *Rhyacophila sp.*

1999: The flow recorded during sampling in 1999 was lower than in previous years with a recorded depth of only 7 cm. Sand runoff from the nearby access road had washed into the stream. Only moderate diversity was found within the cobble and small stone riffles. The physical score for Keech Brook was 94. The Biological Protocol Ranking score was 44% ***(moderately impaired)***. The survey identified six distinct organisms: *Nigronia sp., Marcrostemum sp., Polycentropus sp., Gerris sp., Sialis sp.,* and *Chironomus sp.*

2000: The Biological Protocol Ranking score was 63% ***(slightly impaired)***. The survey identified twelve distinct organisms: *Boveria sp., Cordulegaster sp., Calopteryx sp., Macrostemum sp., Nigronia sp., Tipula sp., Neoperla sp., Beloneuria sp., Stenelmis sp., Pentaneura sp., Chironomus sp.*, and Water Striders.

2001: Riffles are composed of cobble and small stone. However, its shallow depth and low dissolved oxygen concentration during the sampling season contribute to its relatively low diversity. The Biological Protocol Ranking score was 50% ***(moderately impaired)***.

3.12.2.4 Clear River

1998: The report concluded that throughout the summer months, the riffle community within Clear River (Chepachet) is well-defined, associated with moderate size rocks. The largest point sources entering the river are the Burrillville Sewage Treatment plant (located upstream of the sampling station) and non-point sources from roads and suburban developments. The land surrounding the stream has continued to become more urbanized. During sample collection, a strong chlorine aroma was encountered. Road runoff was also observed near the bridge abutment. Diversity was fair. The Clear River is classified as a 4th order stream. The physical score for the Clear River was 86. The Biological Protocol Ranking score was 63% ***(slightly impaired)***. The survey identified seven distinct organisms: an unidentified genus from the family *Simulidae, Dineutus sp., Arctopsyche sp., Lirceus sp., Potamyia sp., Stenonema sp.,* and *Corydalus cornu.*

1999: During the 1999 sampling, both depth (24 cm) and flow were considered good. Stream cover was minimal, and trash was noted in surrounding areas. Diversity at this site was considered very good. The physical score for the Clear River was 90. The Biological Protocol Ranking score was 81% ***(non-impaired)***. The survey identified 15 distinct organisms: Right-handed snail, *Nigronia sp., Psephenus sp., Stenonema sp., Psephenus sp., Gammarus sp., Simulium sp., Macrostemum sp., Chimarra sp., Psychomyia sp., Tipular sp.,* Leech, and *Dasyheles sp.*

2000: The Biological Protocol Ranking score was 69% ***(slightly impaired)***. The survey identified 13 distinct organisms: *Stenonema sp., Stenelmis sp., Gammarus sp.,* Aquatic Worm, *Simulium sp., Macrostemum sp.,* Leeches, *Lestes sp., Boveria sp., Isotoma sp.,* Crayfish, Water Strider, and Dobson or Fishfly Larvae.

2001: Stream cover was minimal and some trash was noted. However, diversity at this site was very good and continued to increase for the 2001sampling season. There was a large amount of sand (approximately 50% of the substrate) noted in the reach this year. The Biological Protocol Ranking score was 63% ***(slightly impaired)***.

3.12.2.5 Abbot Run Brook (Cumberland)

1998: Abbot Run Brook exhibited good habitat. The land use surrounding the stream has become more suburbanized with many houses being constructed within the last few years. Sandbars were observed in several areas of the stream, likely due to runoff from the surrounding roads. Abbot Run Brook is classified as a 3rd order stream. The physical score for Abbot Run Brook (Cumberland) was 93. The Biological Protocol

Ranking score was 56% ***(moderately impaired)***. The survey identified five distinct organisms: *Hetaerina, Beloneuria sp., Agnetina sp., Stenonema sp.*, and *Dineutus sp.*

1999: Conditions were similar as during the 1998 survey. The land surrounding the stream had continued to become more urbanized with the appearance of many new houses. Runoff from the surrounding roads continued to be a factor. The physical score for Abbot Run Brook (Cumberland) was 82. The Biological Protocol Ranking score was 50% ***(moderately impaired)***. The survey identified six distinct organisms: *Marcrostemum sp., Chimarra sp., Beraea sp., Perlesta sp., Nigronia sp.,* and *Chironomus sp.*

2000: The Biological Protocol Ranking score was 63% ***(slightly impaired)***. The survey identified eight distinct organisms: *Macrostemum sp., Chimarra sp., Oligostomis sp., Neohermes sp., Nigronia sp., Corvdalus sp., Heptagenia sp.,* and *Stenonema sp.*

2001: This stream is relatively fast flowing providing excellent habitat. The relatively shallow depth and good riffle environment consisting of gravel-pebble substrate provide for a relatively diverse community. Growth of vegetation along the bank continued to expand. The Biological Protocol Ranking score was 50% ***(moderately impaired)***.

3.12.2.6 Abbot Run Brook (North Attleboro)

1998: The report concluded that the stream is fast-moving and is providing excellent habitat. The stream is located downstream from the Arnold Mills dam which provides some additional oxygenation. The stream supports a relatively diverse community, due to its shallow depth (10 cm) and a good riffle environment consisting of a gravel-pebble substrate. Non-point sources consist primarily of road runoff. The surrounding land use is primarily low density housing and small farmland. A sandbar developed in the stream during 1998 and vegetation along the bank continues to flourish providing more shade to parts of the stream. Abbot Run Brook is classified as a 3rd order stream. The physical score for Abbot Run Brook (North Attleboro) was 84. The Biological Protocol Ranking score was 81% ***(non-impaired)***. The survey identified eight distinct organisms: *Nigronia, Dineutus sp., Hydropsyche sp., Chimarra, unident., Simulium, Pisidium sp.,* and *Agnetina sp.*

1999: Report conclusions were primarily the same as those drawn in the 1998 study. The depth was found to be 14 cm, and some evidence of silt and a sandbar was found. Growth of vegetation along the bank continued to flourish. The physical score for Abbot Run Brook (North Attleboro) was 80. The Biological Protocol Ranking score was 63% ***(slightly impaired)***. The survey identified eight distinct organisms: *Perlesta sp., Chimarra sp., Marcrostemum sp.*, Caddisfly Case, Horse Hair Worm, *Nigronia sp., Lirceus sp., and Chironomus sp.*

2000: The Biological Protocol Ranking score was 50% ***(moderately impaired)***. The survey identified nine distinct organisms: *Stenonema sp., Piscicolaria reducta, Macrostemum sp., Pisidium sp.*, Horse Hair Worm, *Nigronia sp., Tipula sp., Chironomus sp.*, and Crayfish.

2001: The land surrounding the stream continues to be suburbanized with the appearance of new houses. Runoff from surrounding roads may have contributed to the noted levels of silt in spite of the good flow of this stream. The Biological Protocol Ranking score was 50% ***(moderately impaired)***.

3.12.2.7 Blackstone River

1998: The report concluded that the Blackstone River at the station below the Manville Dam is a fifth order stream. The riffle community is mainly composed of boulders to pebbles. Blue-green algae on the rocks were noted at the sample collection site. The river has point and non-point source additives; non-point sources include agricultural, road, and urban environments. During the summer of 1998 the organisms were more diverse than in previous years. The survey found five distinct organisms: *Corydalus cornutu*, *Hydropsyche sp.*, *Potamyia sp.*, *unident*, and *Stenonema*.

The physical score for the Blackstone River was 92 in a data set which included a low score of 30 for the Woonasquatucket River and a high score of 116 for the Ashaway River. The physical score was based on the following observations and measurements: predominant land use, local erosion, physical characteristics of stream bed (width, depth, velocity), channelization, canopy cover, sediment deposits, and substrate components (inorganic and organic).

The Biological Protocol Ranking was based on Plafkin *et al.* (1989) using the Wood River as a reference station. The score for the Blackstone River was 69% ***(slightly impaired)***. A score above 81% would be defined as non-impaired, and a score below 60% would be defined as moderately impaired.

1999: The report concluded that the Blackstone River at the station below the Manville Dam had low diversity. Blue-green algae were noted coating the surface of many of the rocks. Duckweed was present. The presence of trash surrounding the sampling area was also noted. The survey identified six distinct organisms: *Marcrostemum sp.*, *Rhyacophila sp.*, Caddisfly Case, Leech, *Gammarus sp.*, and *Nataraia sp.* The physical score for the Blackstone River was 83. The Biological Protocol Ranking score was 50% ***(moderately impaired)***.

2000: The Biological Protocol Ranking score was 63% ***(slightly impaired)***. The survey identified seven distinct organisms: *Macrostemum sp.*, *Nehalennia sp.*, *Stenonema sp.*, *Nixe sp.*, *Leucrocuta sp.*, Bloodworm Midge, and Fingernail Clam.

2001: Blue-green algae was noted on many rocks, as well as *Lemna* (duckweed). Trash also continued to be noted. The Biological Protocol Ranking score was 50% ***(moderately impaired)***.

3.13 Dr. John King, URI: Sediment Core Data, 1988
(unpublished data)

In 1988, Dr. John King of the University of Rhode Island collected cores at several locations on the Blackstone River. The research team usually determined the magnetic susceptibility on all cores from one site, and then chose the best core for trace metals analyses. Magnetic susceptibility is a measure of how magnetizable a substance can become in the presence of a magnetic field. Specifically, it is the ratio of magnetization to magnetic field. Susceptibility values are "dimensionless SI units." The data are still unpublished; permission was obtained from the Dr. King to include the data in this report (John King, pers. comm., 4/9/02).

3.13.1 Sampling

The sediment coring locations included the following two stations (Figure 3-9):

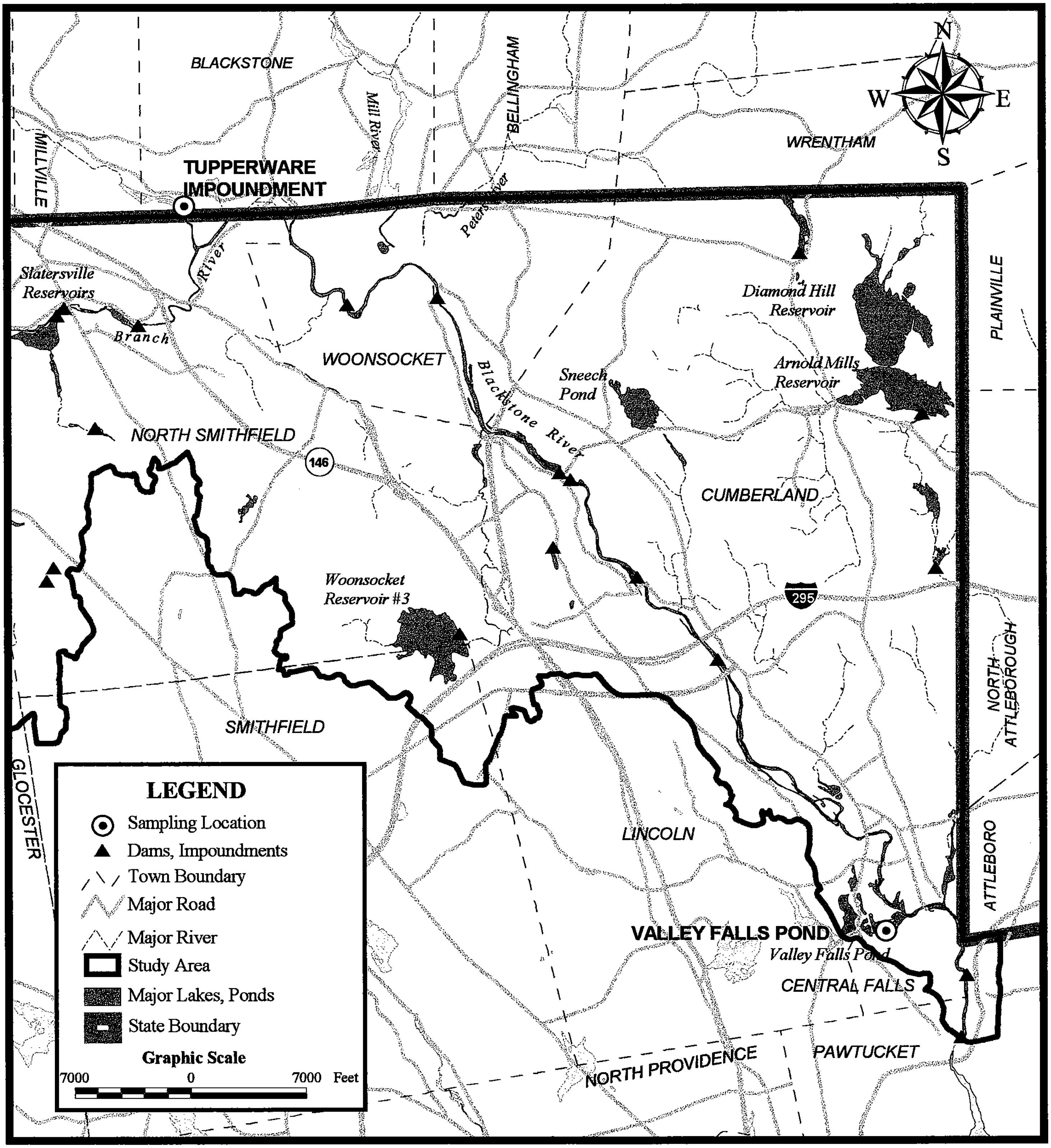
- *Tupperware Impoundment:* At the Tupperware Impoundment location, the research team determined the magnetic susceptibility of the sediment of two cores in order to identify polluted intervals (Cores TUPP1 and TUPP2). The station was located 10 m upstream of the center of the dam.

- *Valley Falls Pond:* Only one core was collected for Valley Falls Pond. The station was located in the in the center of the pond, which is located to the west of the mainstem of the Blackstone River.

Samples for both sites were analyzed for metals (cadmium, chromium, copper, iron, lead, manganese, nickel, silver, zinc). In addition, Valley Falls Pond sediment samples were analyzed for carbon, nitrogen and phosphorus.

3.13.2 Data

The data of the study are presented in Appendix 13.



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure 3-9
URI SEDIMENT SAMPLING (Dr.King)

3.14 RIPDES-Permitted Discharges: Effluent Data, 1997 - 2001

(RIDEM, unpublished data)

There are a total of 17 active permitted facilities located in the Rhode Island portion of the watershed, as described in Section 2.9.1. The following seven facilities discharge constituents of concern for this project (i.e., copper, lead, fecal coliform, nutrients):

- Atlantic Thermoplastics
- Blackstone Smithfield Corporation
- Burrillville Wastewater Treatment Facility
- Okonite Company
- Osram Sylvania Products, Inc (2 outfalls)
- Woonsocket Wastewater Treatment Facility
- Zambarano Memorial Hospital

The location of these facilities is presented in Figures 2-13A and 2-13B. Monitoring data collected as a requirement of the RIPDES permit were available from RIDEM for the period January 31, 1997 to October 31, 2001. These data are unpublished. The summary of the data are presented in Appendix 14.

3.15 Blackstone River Initiative: Water Quality Analysis of the Blackstone River Under Wet and Dry Weather Conditions

(Wright, et al., 2001)

The Blackstone River Initiative (BRI) was organized by United States Environmental Protection Agency (EPA) at the request of the commissioners of the Massachusetts Department of Environmental Protection (MADEP) and the Rhode Island Department of Environmental Management (RIDEM) in 1990. The BRI was an inter-agency, interstate project to monitor and model water and sediment quality of the Blackstone River. The project area extended from the headwaters at the City of Worcester, Massachusetts, to the confluence at Slaters Mill in Pawtucket, Rhode Island. A draft report was published in April 1996 and underwent a regional review by EPA. In November 1997, the Region I EPA Administrator requested a review with the EPA Science Advisory Board (SAB). A second draft in February 1998 was reviewed at a meeting in March 1998 by the SAB. A final report was issued in May 2001.

Objectives of the BRI consisted of the following (Wright et al., 2001):

- Describe the steady state, dry weather water quality conditions in the watershed, including the Blackstone, major tributaries, and major wastewater discharges;
- Measure sediment oxygen demand (SOD);
- Determine the toxicity of ambient water, sediments, and wastewater discharges;
- Calibrate and validate a dissolved oxygen and trace metal models for the river;
- Utilize the models and field data to estimate the relative contribution of dry and wet weather point and non-point pollutant sources;
- Describe the wet weather water quality conditions in the watershed to include the river, major tributaries, and major wastewater discharges;
- Identify and rank the major wet weather pollutant "hot spots" in the watershed;
- Determine the toxicity of ambient water under wet weather conditions and compare the results with criteria based toxicity;
- Determine the relative importance between wet weather non-point and point source pollutant loadings;
- Determine the wet weather loading rate of pollutants, especially nitrogen, to Narragansett Bay; and
- Forecast annual wet weather loading rates.

3.15.1 Sampling

3.15.1.1 Sampling Stations

Data were collected during three dry weather and three wet weather events. Samples were collected at a total of 17 locations along the river, 5 tributaries, and 2 treatment plant outfalls and 1 CSO (Figure 3-10; Table 3-13):

Figure 3-10
Map of Sampling Location (Source: BRI)

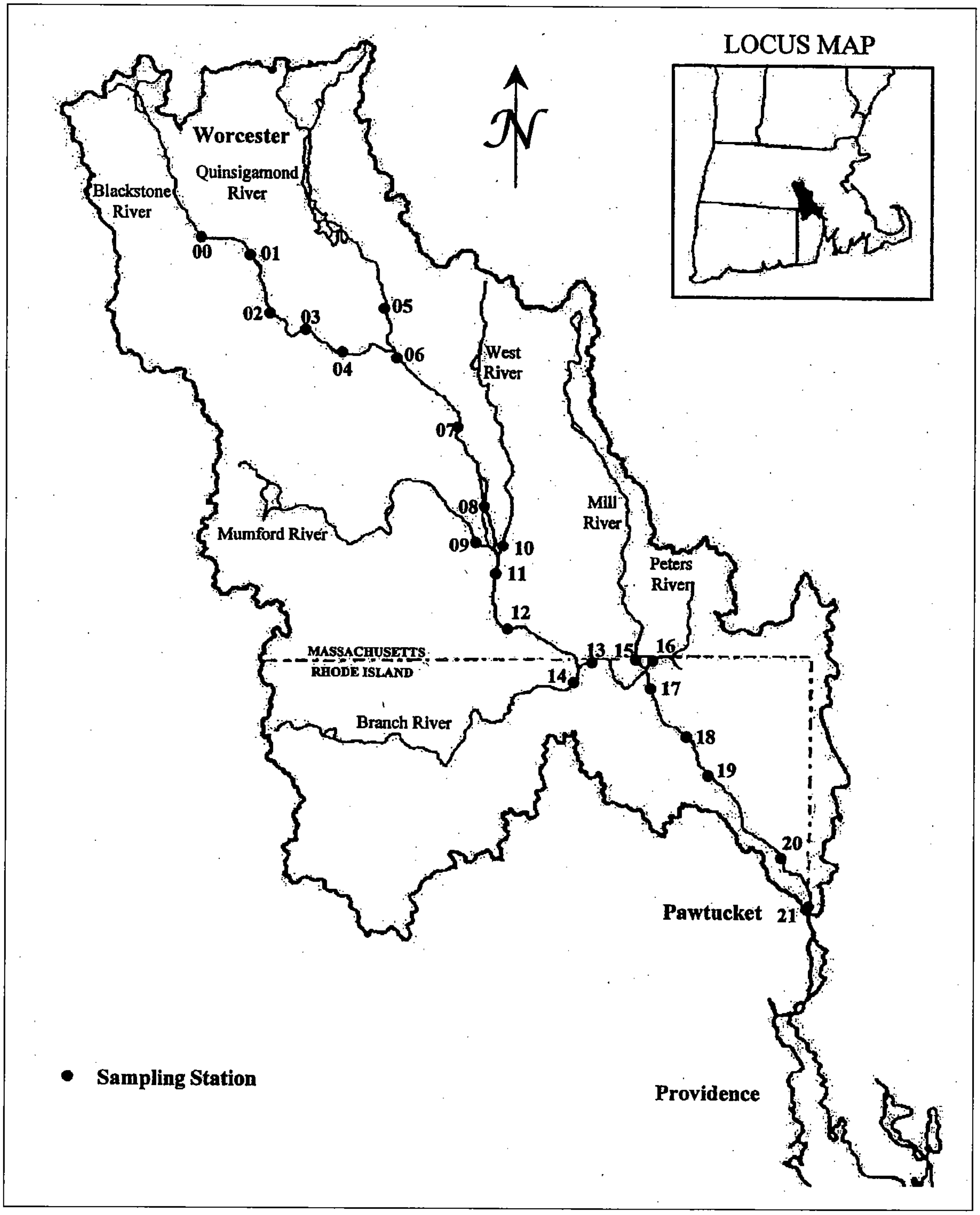


Table 3-13
Water Quality Sampling Locations

Dry Weather	Wet Weather	River	Location
Massachusetts Portion			
	BWW-00	Blackstone	Greenwood St., Worcester, MA
BLK-01	BWW-01	Blackstone	Millbury St., Worcester, MA
BLK-02	BWW-02	Blackstone	McCraken Rd., Millbury, MA
BLK-03		Blackstone	Riverlin St., Millbury, MA
BLK-04	BWW-04	Blackstone	Blackstone St. (Singing Dam), Sutton, MA
BLK-05	BWW-05	Quinsigamond	Millbury St., Grafton, MA
BLK-06	BWW-06	Blackstone	Route 122A, Grafton, MA
BLK-07	BWW-07	Blackstone	Riverdale St., Northbridge, MA
BLK-08	BWW-08	Blackstone	Hartford St., (Rice City Pond), Uxbridge, MA
BLK-09	BWW-09	Mumford	Mendon St., (Rte. 16), Uxbridge, MA
BLK-10	BWW-10	West	Centerville (Off Rte. 16), Uxbridge, MA
BLK-11	BWW-11	Blackstone	Route 122 Bridge, Uxbridge, MA
BLK-12		Blackstone	Route 122 (near USGS Gage), Millville, MA
Rhode Island Portion			
BLK-13	BWW-13	Blackstone	Bridge St. (State Boundary), Blackstone, MA
BLK-14	BWW-14	Branch	Route 146A, Slatersville, MA
BLK-15	BWW-15	Blackstone	Winter St., Woonsocket, RI
BLK-16	BWW-16	Mill	Route 114, Woonsocket, RI
BLK-17	BWW-17	Peters	Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI
BLK-18	BWW-18	Blackstone	Manville Hill Rd., Cumberland, RI
BLK-19		Blackstone	School St./Albion Rd., Cumberland, RI
BLK-20	BWW-20	Blackstone	Lonsdale Ave., Lonsdale, RI
BLK-21	BWW-21	Blackstone	Main St., (Slaters Mill), Pawtucket, RI

See Figure 3-10 for locations.

The program further included three point sources:

- Station 22: CSO facility in Worchester, MA (wet weather only)
- Station 23: Upper Blackstone Water Pollution Abatement District (UBWPAD)
- Station 24: Woonsocket Wastewater Treatment Facility (Woon-WWTF).

3.15.1.2 Hydrology

The system flow characterization of the Blackstone River was based on data from USGS established sites and additional flow gaging stations for subsequence development of the flow profile. Instream flow measurements were available at nine sites. There were three permanent USGS gaging stations in the watershed:

- Quinsigamond River at North Grafton, MA (upstream of river station 05)
- Branch River at Forestdale, RI (upstream of river station 14)
- Blackstone River at Woonsocket, RI (river station 17).

The USGS also established six temporary gaging stations for this study. These included four on the Blackstone River (river stations 01, 04, 11, and 20) and two on the tributaries (Mumford [station 09] and

Peters River [station 16]). Additional discharge data from other point sources such as industrial discharges were incorporated from the 1990 URI and EPA study. Flows for the dry weather survey are summarized in Table 3-14; flows for the wet weather survey are presented in Appendix 15.

Table 3-14
Summary of Flows (in cubic feet per second) for the 1991 Dry Weather Surveys

USGS Gage Location	7/10/91	7/11/91	July Average	8/14/91	8/15/91	August Average	10/2/91	10/3/91	October Average
Woonsocket	142	132	137	157	146	152	676	595	635.5
Quinsiga-mond River	7.7	6.9	7.3	8.6	8.5	8.6	56	48	52
Branch River	28	24	26	32	29	30.5	110	98	104

3.15.1.3 Dry Weather Sampling

The dry-weather program consisted of three 48-hour surveys in 1991 on the following dates:

- Survey 1: July 10-11, 1991
- Survey 2: August 14-15, 1991
- Survey 3: October 2-3, 1991

Samples were collected at 4 different times during each survey with the exception of dissolved oxygen which was measured 8 times.

3.15.1.4 Wet Weather Sampling

Three storms were sampled on the following dates:

- Storm 1: September 22, 1992
- Storm 2: November 2, 1992
- Storm 3: October 14, 1993.

Precipitation data are summarized in Table 3-15. The total number of samples per station was up to 9 in Storm 1, 14 in Storm 2, and 11 in Storm 3. Toxicity testing was performed on samples representing first flush and peak flow for each station and discharge. Due to the BRI's budget constraints three river stations were deleted from sampling (Stations 03, 12, and 19).

Table 3-15
Precipitation Log of Three Storms for the Blackstone River Wet Weather Studies

Gage Name	Location	Maintained by	Type	Rainfall in inches		
				Storm 1	Storm 2	Storm 3
R1N	Worcester Airport, MA	NWS	1	0.44	0.98	1.3
R2U	Westborough WWTF, MA	URI	1	NA	0.83	0.85
R3U	Millbury WWTF, MA	URI	1	NA	0.77	NA
R4M	Millbury WWTF, MA	WWTF	2	0.66	0.62	NA
R5N	Buffumville, MA	NWS	2	0.63	0.99	1.15
R6N	Northbridge, MA	NWS	2	0.54	0.94	0.69
R7N	West Hill Dam, MA	NWS	2	0.53	0.89	0.9
R8N	Putnam, CT	NWS	2	0.63	0.84	1.15
R9U	Burriville WWTF, RI	URI	1	NA	0.85	NA
R10M	Burriville WWTF, RI	WWTF	2	0.74	NA	0.48
R11N	Woonsocket, RI	NWS	2	0.56	0.86	0.61
R12U	Woonsocket WWTF, RI	URI	1	0.46	0.78	NA
R13M	Bucklin Pt. WWTF, RI	WWTF	2	0.49	NA	NA
R14S	Providence, RI	RIDEM	2	0.51	NA	NA
R15U	Fields Point WWTF, RI	URI	1	0.62	0.76	NA
R16N	TF Green Airport, RI	NWS	1	0.62	0.8	0.27

R1N: R=Rainfall; 1=Station ID; N=National Weather Service (NWS); U=URI; S=State; and M=Municipal; RIDEM=Rhode Island Department of Environmental Management; Type 1=Continuous Recorder; Type 2=Daily Load; NA=Not available.

3.15.2 Data Collection

Samples from the Blackstone River and its tributaries were analyzed for:

- biochemical oxygen demand (BOD5)
- total suspended solids (TSS)
- volatile suspended solids (VSS)
- chloride
- dissolved ammonia (NH3-N)
- dissolved nitrate (NO3-N)
- dissolved ortho-phosphorous (PO4-P)
- total and dissolved metals (cadmium, chromium, copper, lead, and nickel)
- hardness (calcium and magnesium)
- fecal coliform
- *E.coli* (wet weather only)
- chlorophyll *a* (dry weather only)
- toxicity.

Field measurements consisted of:
- dissolved oxygen (DO)
- temperature
- pH
- conductivity.

The three point sources (UBWPAD, Woon WWTF, CSO- Worchester) were analyzed for aluminum, cadmium, calcium, chromium, copper, lead, magnesium, nickel, zinc, ammonia, total solids, TSS, total organic carbon, and alkalinity.

Data are presented in Appendix 15.

3.15.3 Water Quality Computer Modeling

The BRI employed two fate and transport models: a DO model and a trace metals model. The DO model was an EPA supported model, QUAL2E. This steady state model simulates DO and all the constituents that impact DO, including CBOD, nutrients, and productivity. The trace metals model was PAWTOXIC, based on QUAL2E, which has been used by the authors in several stream systems in RI. It adopts a very simple but effective approach to trace metal dispersal pattern by considering two simplified equations involving net sediment transport and metal partitioning.

3.15.4 Toxicity Tests

As part of the BRI, three types of toxicity tests were implemented:

- *Water Column Toxicity:* The Water Column Toxicity test focused on acute and chronic toxicity. The testing was performed on water samples collected during, both, dry and wet weather surveys. The toxicity tests conducted were the fathead minnow, *Pimephales promelas,* larval growth and survival test and the *Ceriodaphnia dubia* survival and reproduction test. The responses of the two organisms were statistically compared to the responses of the organisms in laboratory control water.

- *Whole Sediment Toxicity:* The Whole Sediment Toxicity test was also conducted. The Blackstone River sediments were analyzed twice in 1991 and once in 1993 by the EPA Region I, Office of Ecosystem Protection (ESP). The test species utilized were *Chironomus tentans* and *Hyallela azteca.*

- *Sediment Pore Water Toxicity Analysis:* Pore Water Toxicity analysis was conducted from seven Blackstone River sediment stations. The organisms utilized for toxicity analysis were *Ceriodaphnia dubia and Pimephales promela.* Forty-eight hour acute toxicity tests compared organism response in the Blackstone River sediment pore water with lab culture water and reference pore water obtained from sediments in Gilboa Pond, Grey's Pond, and Lexington Pond.

4.0 WATER QUALITY DATA SYNTHESIS

4.1 Introduction

This section presents a summary of relevant available data for the Blackstone River watershed project area, including the Peters River and Mill River. The focus of the summary is to provide an overall understanding of the water quality in the Rhode Island section of the watershed. The data were specifically examined to provide information toward the goal of developing TMDLs for the following primary parameters:

- Fecal coliform
- Copper
- Lead

Nutrients and related parameters were assessed as they pertain to the water quality of Valley Falls Pond. Aside from these parameters, other key parameters were assessed to a limited extent as they may provide insight into processes that affect the concentrations and distribution of the primary parameters. Generally, other parameters, monitored in the original studies along with the primary parameters of interest, were statistically analyzed and presented in the Appendices.

The data synthesis provides information on the following issues:

- Concentration of parameters in space and time
- Sources for parameters
- Information that could be relevant for potential load reductions
- Data needs for field monitoring (see Section 5)

All tables and graphs for specific parameters are attached at the end of Section 4. Please note that, in order to avoid confusion as a result of the large number of graphs and tables in Section 4, all tables were numbered as *Figures*, rather than as a separate set of tables. However, reference made to tables in appendices in Volume II are labeled as "Table A [followed by the appendix number, followed by the number of the table in the respective appendix]".

It should be noted that the data synthesis in this report is only based on existing data that were collected and published by different sources. In addition, detection limits and analytical methods varied to some extent in the different studies. Our quality control measures were limited to the identification of unexplained outliers in the data sets and obvious reporting inconsistencies. Similarly, some of the statistical averages that were generated in this report are based on a very small amount of available data. The reliability of the statistical averages generated in this report should be compared to the number of points in the data set. The number of data points is reported in appropriate tables in the appendices. In addition, the appendices also include the original data of reviewed studies and should be used for reference in case of questions.

4.2 Methodology

The existing data described in Section 3 were reviewed. The sampling locations of the studies discussed in more detail in the text are listed in Figure 4-1 to 4-3. Individual parameters for which data exist were summarized in Figure 4-4.

The available data consist of the following:

- Surface water quality data from the Blackstone River watershed from regular monitoring studies (independent of weather conditions: Appendices 3 to 6, 8 to 10, and 15) and from targeted stormwater discharge investigations (Appendices 1, 2, and 15).

- Water quality data from the largest reservoirs in the Branch River watershed (Appendix 7).

- Information on RIPDES-permitted point sources such as Woonsocket Wastewater Treatment Facility (Appendix 14).

- Sediment quality data from Valley Falls Pond and Tupperware Impoundment (Appendix 13).

- Fish tissue data (Appendix 11).

- Benthic macroinvertebrate information from field screening during the summer (Appendix 12).

The quality control of the original data consisted mainly of the examination of outliers and inconsistencies. In case of uncertainties based on the data reports, we contacted the researchers involved in the data collection, if possible. These uncertainties included detection limits, analytical methods, analyzed fraction of the samples (e.g., dissolved versus total sample for metals), units (e.g., mg/g versus ug/g), reporting of nutrient component data (mg/l NO3 or NH3 versus mg/l N; mg/l PO4 versus mg/l P), sampling locations, sampling depth, etc.

Statistical analyses were limited to the determination of the mean concentrations and the range (i.e., minimum and maximum concentrations). For bacteriological data, the mean concentrations represent the geometric mean. The goal of the calculation of mean concentrations was to arrive at representative values. Representative values need to incorporate analytical results below the detection limit. Therefore, analyses that resulted in "not detected" were replaced by "<[detection limit]" when the detection limit was known. Values reported as "<[detection limit]" were used as follows:

- In most cases, the actual detection limit was used in the summation for the mean concentrations. The resulting mean concentration was then reported as "<[mean concentration]". For example, for the data string 80, 40, <40, <80, the reported mean concentration was <60.

- In selected cases where using the full value of the detection limit had only a minimal impact on the mean concentration, only 50% of the detection limit value was used in the summation for the mean concentration. For example, for the data string 80, 40, <4, 80, a value of 2 was used for the analytical result <4; the resulting mean was 51.

The waters of the Blackstone River watershed are designated as Class B, B1, or B1{a}waters (see Section 2.4.3 and Figure 2-9). Water quality data were compared to Rhode Island's water quality criteria for the respective classes, as appropriate; the criteria are listed in Figures 4-5 to 4-7.

The discussed data were separated into the following sections:

- Fecal coliform (Section 4.3)
- Copper (Section 4.4)
- Lead (Section 4.5)
- Nutrients and related Parameters (for Valley Falls Pond) (Section 4.6)
- Total suspended solids (Section 4.7)
- Flow (Section 4.8)
- Biodiversity Impacts (section 4.9)

Data were related to weather conditions to the extent possible to evaluate the effect of dry weather conditions and stormwater discharges. For studies where specific rainfall measurements were not available, rainfall data from T.F. Green Airport were used as reference. Rainfall data relevant for the various studies are included in the respective appendices.

4.3 Fecal Coliform

Fecal coliform data were available from the following sources:

- Regular Monitoring:
  - *Narragansett Bay Commission, 1997-2000:* Two stations in the lower part of Blackstone River (Appendix 10)
  - *USGS, 1990 - 2000:* Regular monitoring at the Branch River between the Slatersville dam and the Blackstone River, and on the Blackstone River at Manville (Appendix 9)
  - *RIDEM, 1991 – 2000:* Selected tributaries in the watershed (Round Top Brook, Pascaog River, Clear River, Abbot Run Brook) (Appendix 8)
  - *RIPDES-permitted discharge data* (Appendix 14)

- Stormwater Monitoring:
  - *URI, Wet Weather Study 1, 1988-1989:* Four stations along Blackstone River (Appendix 1)
  - *URI, Wet Weather Study 2, 1990:* Slaters Mill station only (Appendix 2)
  - *Blackstone River Initiative, 1991-1993:* Stations along entire Blackstone River (Appendix 15)

A summary of the mean fecal coliform concentrations from all available studies in the Rhode Island section of the river is presented in Figure 4-8 (means for fecal coliform represent *geometric* means). Data are organized by position in the watershed. These mean concentrations will be discussed in the text below.

4.3.1 Blackstone River

The most continuous data sets for the Blackstone River were collected by the USGS and the NBC for the following stations:

- *Manville (USGS Station at Manville, 1990-2000):* The mean dry weather fecal coliform concentration was 63 col/100 ml; the mean wet weather concentrations was 514 col/100 ml (Figure 4-8). The dry weather concentrations typically ranged between 20 and 200 col/100 ml; the wet weather concentrations typically ranged between 100 and 2,000 col/100 ml (Figure 4-10).

- *Lonsdale Avenue, Lonsdale (NBC Station S-2, 1997 to 2000):* This station is located upstream of the CSOs entering the lower Blackstone River in Central Falls. The mean dry weather fecal coliform concentration was 94 col/100 ml; the mean wet weather concentrations was 697 col/100 ml (Figure 4-8). The dry weather concentrations typically ranged between 10 and 1,000 col/100 ml; the wet weather concentrations typically ranged between 100 and 2,000 col/100 ml (Figure 4-11).

- *Slaters Mill (Station S-3, 1997 to 2000):* Fecal coliform concentrations increased between Lonsdale Avenue and Slaters Mill, possibly as a result of the CSO inflows. The mean dry weather fecal coliform concentration was 215 col/100 ml; the mean wet weather concentration was 2,200 col/100 ml (Figure 4-8). The dry weather concentrations typically ranged between 20 and 2,000 col/100 ml; the wet weather concentrations typically ranged between 100 and 10,000 col/100 ml (Figure 4-12).

Stormwater studies conducted by URI also show an increase in fecal coliform concentrations during wet weather. The mean dry and wet weather concentrations measured in the Rhode Island section of the

Blackstone River were similar to the measurements collected by the USGS and NBC (Figure 4-8). The fecal coliform concentrations typically remained elevated for several days after the storm.

During the Blackstone River Initiative (BRI; Wright et al., 2001), fecal coliform concentrations were collected along the entire Blackstone River (MA and RI sections). One sample run was conducted for fecal coliform during dry weather for each storm event. High dry weather concentrations were measured in the Branch River and Peters River (Figure 4-13), as discussed further below. In the Blackstone River, the highest concentrations were measured at BRI Station 17, possibly as a result of the inflow from Peters River, and at BRI Station 21, conceivably from dry weather CSO discharges from Central Falls and Pawtucket.

BRI wet weather concentrations are averaged for each of the three storms in Figures 4-14 to 4-16. These data reflect the considerable variability in fecal coliform supply to the river, as a function of the rainfall patterns and the nature of the sources. Fecal coliform loading during Storm 1 was concentrated in the upper Blackstone River watershed in Massachusetts and in the Branch River area of the Blackstone River (Figure 4-17). Source rankings computed by Wright et al. (2001) indicate that the Massachusetts segment contributed 69% of the fecal coliform in the Blackstone River (Figure 4-18). The highest load in the Rhode Island section was contributed between Lonsdale Avenue and Slaters Mill with 14%, possibly reflecting the contribution of CSOs.

Regulatory standards for fecal coliform were exceeded some of the time during dry weather sampling and most of the time during wet weather sampling (Figure 4-19).

4.3.2 Mill River

Fecal coliform concentrations were only measured by the BRI during dry weather sampling. The mean fecal coliform concentration was 73 col/100 ml, ranging between 10 and 120 col/100 ml (Figure 4-13).

The land use for the Massachusetts segment of the Mill River is primarily open space with low-density development. The Rhode Island segment of the river is characterized by high-density residential development and industrial/commercial zones. The river flows for 3,200 feet before being conveyed underground to the Blackstone River. In Massachusetts, the Hopedale WWTF is permitted discharge (0.6 MGD) to the Mill River. The Rhode Island segment is subject to several stormwater discharges and is incorporated into an Army Corps flood control project. CNC International is permitted to discharge stormwater associated with industrial activity. Sources of fecal coliform in Massachusetts would be primarily non-point from stormwater and migratory waterfowl in the upstream impoundments. Sources of fecal coliform in Rhode Island would also be due to non-point from stormwater.

4.3.3 Peters River

Fecal coliform data from Peters River are only available from the BRI study. Dry weather and wet weather concentrations were very high during all three storms (Figures 4-14 to 4-16). During the dry weather sampling events, the mean fecal coliform concentration was 567 col/100 ml, ranging between 260 and 1,060 col/100 ml (Figure 4-13). During Storm 2, dry weather concentrations were 46,000 col/100 ml; wet weather concentrations were 56,000 col/100 ml. The high concentrations most likely reflect a leak in a sewer pipe crossing the river (J. T. Gaucher, City Engineer, pers. comm., January 2002); the leak has since been repaired. Therefore, representative fecal coliform data reflecting current conditions are not available for Peters River.

The land use for the Massachusetts segment of the Peters River is medium to medium high density residential development with open space from Franklin State Forrest. The Rhode Island segment of the river consists of urban, high-density development. The river flows for approximately 5,000 feet before being conveyed underground to the Blackstone River. There are no permitted discharges on the Peters River. The Rhode Island segment is subject to several stormwater discharges and is incorporated into an USACE's flood control project. Sources of fecal coliform in Massachusetts would be primarily non-point from stormwater discharges associated with medium to medium high density development. Sources of fecal coliform in Rhode Island would also be due to non-point from stormwater. The Massachusetts segment of the Mill River is in non-attainment of fecal coliform bacteria

4.3.4 Branch River

Fecal coliform concentrations of the ponds and reservoirs in the Branch River watershed were very low (Figure 4-20). The geometric mean was below 10 MPN/100 ml. The maximum concentration was measured as 60 MPN/100 ml in the Slatersville Reservoir, located closest to the Blackstone River.

The longest fecal coliform record downstream of the reservoirs was obtained at the USGS station in Forestdale (1990-2000). Fecal coliform concentrations were low. The mean dry weather concentration was 19 col/100 ml; the mean wet weather concentration was 69 col/100 ml (Figure 4-8). The wet and dry weather concentrations typically ranged between 5 and 500 col/100 ml (Figure 4-9). The highest wet weather concentration was measured in 1998 with 2,000 col/100 ml.

The BRI measured fecal coliform concentrations in the Branch River at Station 14. The mean dry weather concentration was 280 col/100 ml, ranging between 160 and 220 col/100 ml (Figure 4-13). The mean dry weather concentrations prior to the three storms ranged from 320 to 1,800 col/100 ml (Figures 4-14 to 4-16). The mean wet weather concentrations for each of the three storms ranged from 280 to 2,900 col/100 ml. The highest concentrations during the storm were measured with 6,200 col/100 ml. These concentrations, particularly the dry weather concentrations were higher than the concentrations measured by the USGS (Figure 4-9). The reason for the discrepancy is not known and should be investigated in the sampling program to better define the fecal coliform loading of the Branch River to the Blackstone River.

Fecal coliform concentrations of the tributaries to the Branch River watershed (Round Top Brook, Pascaog River, Clear River) are low. The mean concentrations in all three streams were below 50 col/100 ml, both during dry and wet weather (Figure 4-21). The maximum concentration was measured in Round Top Brook at 3,900 col/100 ml. Given the low concentrations and the fact that the streams are upstream of the Slatersville Reservoir, their effect on the fecal coliform concentration in the Blackstone River is expected to be very small.

4.3.5 Other Tributaries

RIDEM also monitored Abbot Run Brook at two locations. The mean dry and wet weather concentrations in Cumberland were 7 col/100 ml (Figure 4-21). In North Attleboro, the mean dry and wet weather concentrations were 41 col/100 ml. However, the stations were located several miles upstream of the confluence with the Blackstone River. They are therefore not considered representative of the fecal coliform concentration and load entering the Blackstone River.

4.3.6 Woonsocket Wastewater Treatment Plant

Fecal coliform data are available from January 1997 to October 2001. The mean monthly average fecal coliform concentration was 13 col/100 ml, ranging between 1 and 100 col/100 ml (Figures 4-22 and 4-23). The highest monthly average was 108 col/100 ml. The maximum daily concentration was 240,000 col/100 ml. The mean monthly flow was 9.18 million gallons per day (MGD), or 14 cfs.

The mean fecal coliform concentrations of the final effluent from the Woonsocket WWTF of the URI 1988/89 study; Figure 4-8). The mean dry weather concentrations were below 50 col/100 ml; the maximum concentration was 17,000 col/100 ml. The mean wet weather concentrations were generally below 100 col/100 ml; the maximum concentration was 49,000 col/100 ml, however.

It should be noted that the significant upgrades to the Woonsocket Wastewater Facility may have changed effluent characteristics. The upgrades were completed by September 2001. Therefore, the effluent data prior to this date may not reflect present conditions.

4.3.7 CSOs

There are a total of 15 CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill. Fecal coliform concentrations on individual CSOs were not available. However, the fecal coliform concentrations in the CSOs are expected to be on the order of 10,000 to 1,000,000 col/100 ml (Berger, 1997). The fecal coliform loading from CSOs will be addressed during Phase III of the Narragansett Bay CSO Abatement Program. The CSOs capture much of the urban stormwater runoff in this area.

4.3.8 Other Point Sources

Other RIPDES-permitted point sources that are monitored for fecal coliform consist of the following (Figure 4-22):

- *Zambarano Memorial Hospital:* The hospital is located in the upper Branch River watershed. Concentrations and flow rates are comparatively low. The hospital is too far upstream in the watershed to have an effect on the Blackstone River.

- *Burrillville WWTF:* The treatment plant is located in the central region of the Branch River watershed, upstream of the Slatersville Reservoir. The effluent discharge rate is approximately 1/10 of the rate discharged by the Woonsocket WWTF. The fecal coliform concentrations are low. The monthly mean concentration was 28 col/100 ml. The highest daily maximum concentration was 300 col/100 ml.

- *Atlantic Thermoplastics:* The outfall is located on the lower Branch River. The mean monthly fecal coliform concentration was reported as 578 col/100 ml; the maximum reported concentration was 24,000 col/100 ml, which could be the upper detection limit. Flow rates are comparatively low with on average 1,200 gallons per day (or 0.002 cfs).

- *Blackstone Smithfield Co:* The outfall is located on the Blackstone River, just downstream of the confluence with the Branch River. The mean monthly fecal coliform concentration was reported as 4,980 col/100 ml; the maximum reported concentration was 24,000 col/100 ml, which could be the upper detection limit. Flow rates were comparatively low with on average 3,000 gallons per day (0.005 cfs).

4.3.9 Valley Falls Pond

Fecal coliform concentrations in the Valley Falls Pond were measured three times in Year 2000. The mean concentration was 57 MPN/100 ml; the maximum concentration was 200 MPN/100 ml (Figure 4-20). It is not known if these data represent dry weather or wet weather conditions, as the exact sampling date is still being sought.

4.3.10 Fecal Coliform Sources in the Blackstone River - Summary

Fecal coliform enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001 determined that on average 69% of the total load enters the Blackstone River in Massachusetts during wet weather. Equivalent dry weather load calculations are not available.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill appear to have high loadings of fecal coliform as expected.

- *Branch River:* The Branch River discharges on average 175 cfs/year. This represents roughly 25% of the flow in the Blackstone River at the confluence, based on the mean flow rate of 779 cfs in the Blackstone River at the USGS gage in Woonsocket. Data by the USGS suggest that the coliform contributions are generally low with the exception of two recent wet weather samples (Figure 4-9). Data by the Blackstone River Initiative indicate that coliform concentrations during wet weather from the Branch River are high, however.

- *City of Woonsocket:* Wright et al. (2001) calculated high fecal coliform loadings from the City of Woonsocket. The total load entering the Blackstone River between BRI Stations 13 and 17 was approximately 9%. The main sources are likely stormwater discharges.

- *RIPDES –permitted Discharges:* Fecal coliform loads appear to be small, although fecal coliform concentrations were high in the effluent from the Blackstone Smithfield Company.

- *Mill River:* Dry weather concentrations were within the regulatory standards.

- *Peters River:* Given that the BRI fecal coliform data from the river were affected by a broken pipe, recent data are not available.

4.4 Copper

Copper data were available from the following sources:

- Regular Monitoring:
  - *USGS, 1990 - 2000:* Approximately monthly monitoring at the Branch River between the Slatersville dam and the Blackstone River, and on the Blackstone River at Manville (Appendix 9)
  - *River Rescue, 1990-1993*: Approximately monthly monitoring at the MA/RI state border, Lonsdale Avenue bridge in Lonsdale, and Slaters Mill (Appendix 6).
  - *RIDEM, 1991 – 2000:* Selected tributaries in the watershed (Round Top Brook, Pascaog River, Clear River, Abbot Run Brook) (Appendix 8)
  - *RIPDES-permitted discharges* (Appendix 14)

- Stormwater Monitoring:
  - *URI, Wet Weather Study 1, 1988-1989:* Four stations along Blackstone River (Appendix 1)
  - *URI, Wet Weather Study 2, 1990:* Slaters Mill station only (Appendix 2)
  - *Blackstone River Initiative, 1991-1993:* Stations along entire Blackstone River (Appendix 15)

- Sediment cores were collected by Dr. King from URI in 1988 from the Tupperware Impoundment and Valley Falls Pond.

- Fish toxics monitoring in fish tissues in the Tupperware Impoundment (Appendix 11)

Most of the copper data are *total* copper concentrations. Dissolved copper data are limited to data collected by the USGS and the BRI study (Wright et al., 2001). On average, the dissolved fraction of the BRI samples represented 58% of the total copper concentration.

A summary of the mean total copper concentrations from all available water quality studies in the Rhode Island section of the river is presented in Figure 4-24. Data are organized by position in the watershed. These mean concentrations will be discussed in the text below.

4.4.1 Blackstone River

The most continuous data sets for the Blackstone River were collected by River Rescue (RR) and the USGS station in Manville. The total copper concentrations of the two studies generally ranged between 5 and 15 ug/l (Figures 4-26 and 4-27). The dissolved copper concentration at the USGS Manville station averaged 4.9 ug/l (Figure 4-26). The total copper concentrations at the MA/RI border (RR Station B2) and Slaters Mill (RR Station B1) decreased slightly over the 4-year monitoring period (Figure 4-27).

The USGS data were separated by weather conditions during sampling; however, both the total and dissolved copper fractions did not reveal a specific trend (Figure 4-26). Similarly, the River Rescue data did not reflect a clear trend based on weather conditions (Figure 4-28).

Targeted dry weather and stormwater studies were conducted by URI (Appendices 1, 2 and 15):

- *Dry Weather:* The mean total copper concentrations during dry weather ranged between 7.1 an 14.5 ug/l at stations in the Rhode Island section of the Blackstone River, consisting on average of 58% dissolved copper (Figures 4-29 and 4-30).

- *Wet Weather:* During wet weather, the total copper concentrations did not show consistent increases from dry weather conditions (Figures 4-32 to 4-34), although copper loads increased due to higher flows. In the Rhode Island section of the river, the highest copper concentrations were measured in the effluent from the Woonsocket Treatment Plant (Figure 4-24).

The BRI study indicated that the primary sources of copper loading are the Upper Blackstone Water Pollution Abatement District (UBWPAD) facility in Worchester, Massachusetts, and resuspended sediments from impoundments (Figures 4-32 to 4-34). Source rankings computed by Wright et al. (2001) indicate that the Massachusetts segment contributed on average 79% of the total copper load to the Blackstone River during dry weather and 75% during wet weather, ranging between 69% and 80% for the 3 storms (Figure 4-35). The UBWPAD contributed 26% on average. The Woonsocket WWTF contributed 5.9%, which is the highest contribution in the Rhode Island section of the Blackstone River.

The hardness in the Blackstone River was low (Figure 4-36). The copper concentrations measured during the BRI study exceeded the hardness-dependent regulatory standards for copper almost all the time, both during dry and wet weather (Figures 4-37 to 4-40).

The mean hardness at the three River Rescue stations ranged from 25 to 30 mg/l. For a hardness of 25 mg/l, the acute criteria for dissolved copper is 4.6 ug/l; the chronic criteria is 3.5 ug/l. Thus, the mean dissolved copper concentration of 4.9 ug/l at the USGS station in Manville slightly exceeded this standard. During the BRI study, the dissolved copper fraction represented 58% of the total copper fraction. Using this fraction, the *total* copper concentrations would exceed the acute criteria at 7.9 ug/l and the chronic criteria at 6.0 ug/l. Accordingly, the copper concentrations measured by River Rescue exceeded the regulatory standards frequently as well.

Copper concentrations in sediments are only available for the Tupperware Impoundment. Copper concentrations were elevated at 530 ug/g in the upper 22 cm of the sediment column, and then decreased sharply to less than 5 ug/kg (Appendix 13). The average copper concentration in Rhode Island soils is 13.6 ug/g with a standard deviation of 28.2 ug/g (RIDEM, 1995).

Copper concentrations in fish tissues were measured in the Tupperware Impoundment, along with other impoundments along the Blackstone River in Massachusetts (Appendix 11). Copper concentrations in the fish tissues from the Tupperware impoundment ranged from <0.03 to 1.0 mg/kg (wet weight).

4.4.2 Mill River

Copper data for Mill River are limited to the BRI study. During dry weather conditions, the mean total copper concentration was 3.7 ug/l, consisting of 30% dissolved copper during the July and August surveys and 72% dissolved copper during the October survey (Figures 4-29 to 4-31). The maximum total copper concentration was 6.6 ug/l. None of the samples exceeded the chronic or acute criteria for dissolved copper (Figures 4-30 and 4-37).

During the three storms of the BRI study, the mean total copper concentrations ranged between 0.8 to 2.9 ug/l (Figures 4-32 to 4-34). The highest total copper concentration measured in the Mill River was 5.6 ug/l. Estimated wet weather concentrations of dissolved copper did not exceed the chronic or acute criteria on average (Figures 4-38 and 4-39).

The total copper load contributed by Mill River to the Blackstone River appears to be small. Wright et al. (2001) calculated the dry weather loading as 0.63% (Figure 4-35). During wet weather, the combined loading of Mill River and Peters River was 0.36%.

4.4.3 Peters River

Copper data for Peters River are also limited to the BRI study. During dry weather conditions, the mean total copper concentrations were very variable between the three surveys. Most of the samples had concentrations between 1.6 and 3.3 ug/l, with the exception of two samples in July 1999, which contained 25 and 37 ug/l of total copper (Figure 4-29). On average, 8% of the samples exceeded the acute and as well as the chronic criteria for dissolved copper, and 33% exceeded the acute criteria (Figures 4-30 and 4-37).

During the three storms, the mean total copper concentrations ranged between 1.8 to 4.9 ug/l (Figures 4-32 to 4-34). The highest total copper concentration measured in the Peters River was 7.3 ug/l. Estimated mean wet weather concentrations of dissolved copper did not exceed the chronic or acute criteria (Figures 4-38 and 4-39).

The total copper load contributed by Peters River to the Blackstone River appears to be small. The dry weather load was calculated by Wright et al. (2001) as 0.53% (Figure 4-35). As mentioned above, the combined loading of Mill River and Peters River was 0.36%.

The Massachusetts segment of the Peters River is in non-attainment for metals, specifically copper. There are no data available to determine if the copper concentrations increase in the Rhode Island segment due to sources in Rhode Island. As discussed in Section 4.3.3, there are no permitted point source discharges to the Peters River. Sources of copper would consist of non-point sources, such as stormwater. Additional sources in Rhode Island may consist of abandoned refuse dump areas adjacent to the river.

4.4.4 Branch River

Copper was measured during the BRI study and by the USGS. Mean total copper concentrations at the USGS station in Forestdale were 2.8 ug/l, although only 5 samples were analyzed; the dissolved copper concentrations averaged 1.5 ug/l and were within regulatory standards (Figure 4-25). During the BRI study, the mean total copper concentrations during dry weather conditions ranged between 3.3 and 5.8 ug/l (Figure 4-29). The mean dissolved copper concentrations ranged between 1.4 and 3.1 ug/l (Figure 4-30); on average 33% of the BRI samples exceeded the chronic criteria, and 11% exceeded the acute criteria for dissolved copper (Figure 4-37).

During the three storms, the mean total copper concentrations ranged between 1.0 to 3.1 ug/l (Figures 4-32 to 4-34). The highest total copper concentration measured in the Branch River was 3.8 ug/l. Estimated wet weather concentrations of dissolved copper did not exceed the acute or chronic criteria on average (Figures 4-38 and 4-39).

The copper load contributed to the Blackstone River appears to be small. Wright et al. (2001) calculated the source loading of Branch River as 0.33% (Figure 4-35).

Copper data from the ponds and reservoirs in the Branch River watershed were not located. Mean total copper concentrations from the upper tributaries of the Branch River (Round Top Brook, Pascoag River, Clear River) ranged between 1.4 and 2.5 ug/l; the maximum concentration was 5.7 ug/l (Figure 4-41).

4.4.5 Other Tributaries

Total copper concentrations have been monitored by RIDEM in Abbot Run Brook at two stations since 1991. The mean concentrations at the two stations were below 2 ug/l, with a maximum concentration of 8.4 ug/l (Figure 4-41).

4.4.6 Woonsocket Wastewater Treatment Plant

Total copper monitoring data are available from January 1997 to October 2001 (Appendix 14). The mean monthly total copper concentration was 22.3 ug/l, ranging generally between 10 and 40 ug/l (Figure 4-42 and 4-43). The highest concentration exceeded 200 ug/l. The mean concentration decreased between 1997 and 2001 from generally less than 40 ug/l to less than 20 ug/l.

The copper concentrations in the effluent after completion of the WWTF upgrade in September 2001 are not yet known.

4.4.7 CSOs

Copper concentrations were not available from the outfalls entering the Blackstone River between Lonsdale and Slaters Mill.

4.4.8 Other Point Sources

Other RIPDES-permitted point sources that are monitored for copper consist of the following (Figure 4-42):

- *Burrillville WWTF:* The treatment plant is located in the central region of the Branch River watershed, upstream of the Slatersville Reservoir. The effluent discharge rate is approximately 10% of the rate discharged by the Woonsocket WWTF. Between 1997 and 2001, the mean monthly total copper concentration was 22 ug/l; the maximum daily concentration was 92 ug/l.

- *Okonite Company:* Total copper concentrations monitored in the Okonite outfall were very low with a daily maximum of only 0.04 ug/l.

- *Osram Sylvania Products:* Copper data for the effluent from Osram are limited to daily maximum concentrations. The highest concentration measured was 43 ug/l.

4.4.9 Valley Falls Pond

Copper concentrations in the water column were not available for Valley Falls Pond. Copper concentrations were only available for the sediments. Copper concentrations were elevated at 460 ug/g in the upper 3 feet in the sediment column, and then decreased sharply to less than 12 ug/g (Appendix 13). The average copper concentration in Rhode Island soils is 13.6 ug/g with a standard deviation of 28.2 ug/g (RIDEM, 1995).

4.4.10 Copper Sources in the Blackstone River - Summary

Copper enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001) determined that on average 79% of the total load during dry weather and 75% of the total load during wet weather enters the Blackstone River within Massachusetts. Primary sources are the UBWPAD and possibly resuspension of sediments from impoundments.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill may contain high loads of copper, although data do not exist. Wright et al. (2001) computed the load between Lonsdale and Slaters Mill as 4.1% of the total load.

- *Branch River, Mill River, Peters River:* The contributions of copper by the tributaries appeared to be comparatively small.

- *Woonsocket WWTF:* The copper concentrations in the final effluent were comparatively high. The load was calculated by Wright et al. (2001) with 5.9% of the total load entering the river.

- *RIPDES -permitted discharges:* Aside from the Woonsocket WWTF, and possibly the Osram Sylvania outfall, other discharges appeared to be minor sources of copper.

- *Other sources in the RI section of the River:* Aside from the copper loading from Massachusetts and the Woonsocket WWTF, the available data do not identify specific point sources for copper in the Rhode Island section of the river. Uncertain is also the role of resuspension of sediments from impoundments in the Rhode Island section.

4.5 Lead

Lead data were available from the same sources as copper data (see Section 4.4). Most of the lead data are *total* lead concentrations. Dissolved lead data are limited to the BRI study (Wright et al., 2001); on average, the dissolved fraction represented 40% of the total lead concentration. Dissolved lead data were also collected by the USGS between 1996 and 1999.

A summary of the mean total lead concentrations from all available water quality studies in the Rhode Island section of the river is presented in Figure 4-44. Data are organized by position in the watershed. These mean concentrations will be discussed in the text below.

4.5.1 Blackstone River

The most continuous data sets for the Blackstone River were collected by River Rescue (RR) and the USGS station in Manville.

The dissolved lead concentrations at the USGS Manville station ranged between 0.6 and 1.3 ug/l with a mean of 1.0 ug/l (Figure 4-46). There was no relationship between rainfall volume and lead concentration.

The total lead concentrations generally ranged between 2 and 6 ug/l (Figures 4-46 and 4-47). The mean total lead concentrations at the four RR and USGS stations were as follows (Figure 4-44):

- *MA/RI border (RR Station B2):* The mean dry weather concentration was 3.9 ug/l; the mean wet weather concentration was 6.5 ug/l.

- *Manville (USGS station):* The mean dry weather concentration was 8.1 ug/l; the mean wet weather concentration was 3.0 ug/l. The dry weather concentration was affected by two high values of 17 and 49 ug/l. Without these two values, the mean dry weather concentration was 4.0 ug/l.

- *Lonsdale Avenue (RR Station B_{lons}):* The mean dry weather concentration was 2.1 ug/l; the mean wet weather concentration was 8.3 ug/l.

- *Slaters Mill (RR Station B1):* The mean dry weather concentration was 4.1 ug/l; the mean wet weather concentration was 10.1 ug/l.

In summary, the mean total lead concentrations of the two studies ranged between 2 and 10 ug/l. The mean concentrations measured by River Rescue were significantly higher during wet weather than during dry weather (Figure 4-48). In the USGS data set, dry weather and wet weather concentrations were similar.

Targeted dry weather and stormwater studies were conducted by URI (Appendices 1, 2 and 15):

- *Dry weather:* The mean total lead concentrations during dry weather ranged between 1.6 and 18.5 ug/l at stations in the Rhode Island section of the Blackstone River (Figure 4-49), consisting of 40% dissolved lead (Figures 4-50 and 4-51). In the Massachusetts section of the river, the highest mean total lead concentration was 100 ug/l at BRI Station 07. Wright et al. (2001) calculated that the Massachusetts section of the Blackstone River watershed contributed on average 92% of the total load to the Blackstone River during dry weather (Figure 4-56). The highest loadings were from the river segments between BRI Stations 04 and 06 with 24% and BRI Stations 06 and 07 with 22%. In the Rhode Island section of the river, the highest total lead loads were from the section between BRI Stations 20 and 21 (Central Falls and Pawtucket) and the section between the BRI Stations 13 to 17 (Woonsocket).

- *Wet weather:* During wet weather, the total lead concentrations increased considerably from dry weather conditions (Figures 4-52 to 4-54). In the Rhode Island section of the river, the highest total lead concentrations were measured in the effluent from the Woonsocket Treatment Plant, ranging from 2.5 to 31.4 ug/l (Figure 4-44). The major source of lead in the Blackstone River, however, appeared to be the headwaters of the river in Massachusetts. This observation is reflected in the sharp concentration increases during the three storms between BRI Stations 00 and 06 (Figures 4-51 to 5-53). Concentrations were particularly high at the beginning of the storm (Figure 5-55). Wright et al. (2001) calculated that the Massachusetts segment contributed on average 72% of the total lead load during wet weather, ranging between 52% and 90% for the 3 storms (Figure 5-56). The headwaters (upstream of BRI Station 00) alone contributed on average 31%.

  Another source identified in the BRI study may be resuspended sediments from Rice City Pond. The total lead concentration increased between BRI Stations 07 and 08 during each of the three storms (Figures 4-52 to 4-55). The average lead loading from the pond was calculated as 14% (Figure 5-56).

In the Rhode Island section of the Blackstone River, the largest sources for lead were calculated by Wright et al. (2001) between BRI Stations 20 and 21 (Central Falls and Pawtucket) with 14%, and between BRI Stations 13 and 17 (Woonsocket) with 4.5%; the likely source is stormwater runoff from densely populated areas.

The mean hardness at the three River Rescue stations ranged from 25 to 30 mg/l. For a hardness of 25 mg/l, the acute criteria for dissolved lead is 13.9 ug/l; the chronic criteria is 0.5 ug/l. The dissolved lead concentrations measured during the BRI and USGS studies exceeded the chronic criteria for dissolved lead almost all the time, both during dry and wet weather (Figures 4-46, 4-50, and 4-57 to 4-60).

During the BRI study, the dissolved lead fraction represented 40% of the total lead concentration. Using this fraction, the *total* lead concentrations would exceed the acute criteria at 34.8 ug/l and the chronic criteria at 1.3 ug/l. Accordingly, the lead concentrations measured by River Rescue exceeded the chronic criteria for lead most of the time as well.

Lead concentrations in sediments are only available for the Tupperware Impoundment. Lead concentrations were elevated at 444 ug/g in the upper 22 cm of the sediment column, and then decreased sharply to less than 5 ug/kg (Appendix 13). The average lead concentration in Rhode Island soils is 33.5 ug/g with a standard deviation of 55.5 ug/g (RIDEM, 1995).

Lead concentrations in fish tissues were measured in the Tupperware Impoundment, along with other impoundments along the Blackstone River in Massachusetts (Appendix 11). Lead concentrations ranged from <0.05 to 2.2 mg/kg (wet weight).

4.5.2 Mill River

Lead data for Mill River are limited to the BRI study. During dry weather conditions, the mean total lead concentration was 5.8 ug/l, although this value was affected by one measurement of 48.8 ug/l during the August 1991 survey (Figure 4-49). Without this value, the mean total lead concentration was 2.0 ug/l. The dissolved lead fraction was 37% of total lead (Figures 4-49 to 4-51). None of the samples exceeded the acute criteria, but 44% of the samples exceeded the chronic criteria (Figures 4-50 and 4-57).

During the three storms, the mean total lead concentrations ranged between 1.6 and 3.0 ug/l (Figures 4-52 to 4-54). The highest total lead concentration measured in the Mill River was 6.1 ug/l. Estimated wet weather concentrations of dissolved lead did not exceed the acute criteria but exceeded the chronic criteria all the time (Figures 4-58 and 4-59).

The total lead load contributed by Mill River to the Blackstone River appears to be small. Wright et al. (2001) calculated the dry weather loading as 0.4% (Figure 4-56). The combined wet weather loading of Mill River and Peters River was determined as 1.1%.

The Massachusetts segment of the Mill River is in non-attainment for lead. There are no data available to determine if the lead concentrations increase in the Rhode Island segment due to sources in Rhode Island. As discussed in Section 4.3.2, there are two permitted discharges to the Mill River: the Hopedale WWTF and CNC International stormwater. Neither facility is required to sample for lead as part of their respective NPDES permit.

4.5.3 Peters River

Lead data for Peters River are also limited to the BRI study. During dry weather conditions, the mean total lead concentration was 5.3 ug/l, consisting of 49% dissolved lead (Figures 4-49 to 4-51). The maximum total lead concentration was 12.3 ug/l. None of the samples exceeded the acute criteria for dissolved lead, but 92% of the samples exceeded the chronic criteria (Figures 4-50 and 4-57).

During the three storms, the mean total lead concentrations at least doubled from dry weather conditions just prior to the storm. The mean wet weather conditions ranged between 2.8 to 10.6 ug/l (Figures 4-52 to 4-54). The highest total lead concentration measured in the Mill River was 19.0 ug/l. Estimated mean wet weather concentrations of dissolved lead did not exceed the acute criteria but exceeded the chronic criteria all the time (Figures 4-58 and 4-59).

The total lead load contributed by Peters River to the Blackstone River appears to be small. Wright et al. (2001) calculated the dry weather loading as 0.4% (Figure 4-56). As mentioned above, the combined wet weather loading of Mill River and Peters River was determined as 1.1%.

The Massachusetts segment of the Peters River is in non-attainment for lead. There are no data available to determine if the lead concentrations increase in the Rhode Island segment due to sources in Rhode Island. As discussed in Section 4.3.3, there are no permitted point source discharges to the Peters River. Sources of lead would consist of non-point sources, such as stormwater. Additional sources in Rhode Island may be due to abandoned refuse dump areas adjacent to river.

4.5.4 Branch River

Lead was measured during the BRI study and by the USGS. The mean total lead concentration at the USGS station in Forestdale was 1.8 ug/l, although only 5 samples were analyzed; the mean dissolved lead concentration was 0.8 ug/l and the maximum concentration was 1.3 ug/l (Figure 4-45). During the BRI study, the mean total lead concentration during dry weather conditions was 4.2 ug/l; the maximum concentration was 23.5 ug/l (Figure 4-49). The mean dissolved lead concentration during dry weather conditions was 0.9 ug/l; the maximum concentration was 1.5 ug/l (Figure 4-50). None of the dissolved lead concentrations exceeded the acute criteria, but 81% of the concentrations exceeded the chronic criteria (Figure 4-50 and 4-57).

During the three BRI storms, the mean total lead concentrations ranged between 1.0 to 3.0 ug/l (Figures 4-52 to 4-54). The highest total lead concentration measured in the Branch River was 7.8 ug/l. Estimated mean wet weather concentrations of dissolved lead did not exceed the acute criteria, but exceeded the chronic criteria most of the time (Figures 4-58 and 4-59).

The lead load contributed to the Blackstone River appears to be small. Wright et al. (2001) ranked the source loading of the Branch River with 1.4% during dry weather and 1.1% during wet weather (Figure 4-56).

Lead data from the ponds and reservoirs in the Branch River watershed were not located. Mean total lead concentrations from the upper tributaries of the Branch River were 1.4 ug/l in Round Top Brook, 2.2 ug/l in Pascoag River, and 4.7 ug/l Clear River (Figure 4-61). The mean concentrations in Clear River were twice as high as the mean concentration in the Branch River of the BRI study. The concentrations did not differ between dry and wet weather concentrations.

4.5.5 Other Tributaries

Total lead concentrations have been monitored by RIDEM in Abbot Run Brook since 1991. The mean concentrations at the two stations were 3.5 ug/l (Cumberland) and 4.2 ug/l (North Attleboro) (Figure 4-61).

4.5.6 Woonsocket Wastewater Treatment Plant

Total lead monitoring data are available from January 1997 to October 2001 (Appendix 14). The mean monthly total lead concentration was 4.7 ug/l, ranging generally between 1 and 10 ug/l (Figures 4-62 and 4-63). The highest concentration was 44 ug/l. The mean concentrations decreased between 1997 and 2001 from generally less than 10 ug/l to less than 5 ug/l.

During the BRI study, the lead concentration from the Woonsocket WWTF was considerably higher. The mean wet weather concentrations ranged between 15 and 20 ug/l (Figures 4-44, and 4-52 to 4-54). These data, however, are older than the monitoring data from the plant and were also collected over a shorter time period.

The lead concentrations in the effluent after completion of the WWTF upgrade in September 2001 are not yet known.

4.5.7 CSOs

Lead concentrations are not available from the outfalls entering the Blackstone River between Lonsdale and Slaters Mill. The increase in the lead concentration between BRI Stations 20 and 21 during wet weather may be a result of CSO discharges.

4.5.8 Other Point Sources

Other RIPDES-permitted point sources that are monitored for lead consist of the following (Figure 4-62):

- *Burrillville WWTF:* The treatment plant is located in the central region of the Branch River watershed, upstream of the Slatersville Reservoir. Between 1997 and 2001, the mean monthly total lead concentration was 1.3 ug/l; the maximum daily concentration was 8.0 ug/l.

- *Osram Sylvania Products:* Lead data for the effluent from Osram are limited to daily maximum concentrations. The concentrations in Osram's outfall 200 were comparatively high reaching up to 123 ug/l.

4.5.9 Valley Falls Pond

Lead concentrations in the water column were not available for Valley Falls Pond. Lead concentrations were only available for the sediments. Lead concentrations were elevated at 465 ug/g in the upper 3 feet in the sediment column, and then decreased sharply to less than 8 ug/g (Appendix 13). The average lead concentration in Rhode Island soils is 33.5 ug/g with a standard deviation of 55.5 ug/l (RIDEM, 1995).

4.4.10 Lead Sources in the Blackstone River - Summary

Lead enters the Rhode Island section of the Blackstone River primarily from the following sources:

- *Input from Massachusetts:* Wright et al. (2001) determined that on average 92% of the total load during dry weather and 72% of the total load during wet weather enters the Blackstone River within Massachusetts. Primary sources are the headwaters of the Blackstone River and possibly resuspension of sediments from Rice City Pond.

- *CSO:* The CSOs between Lonsdale Avenue in Lonsdale and Slaters Mill in Central Falls and Pawtucket may contain high loads of lead, although data do not exist. Wright et al. (2001) computed the loading as 14% of the total load during wet weather, based on data from BRI Stations 20 and 21.

- *Branch River, Mill River, Peters River:* The contributions of lead by the tributaries appeared to be comparatively small. Within the Branch River watershed, the total lead concentrations within the Clear River were on average 3 times higher than the concentrations in the Branch River near its confluence, although the data come from different studies.

- *Woonsocket WWTF:* The lead concentrations in the final effluent of the BRI study were comparatively high. The load was calculated by Wright et al. (2001) with 4.5% of the total load entering the river. Concentrations in more recent samples collected by the treatment plant as part of the RIPDES monitoring are lower than the concentration during the BRI study, however. Therefore, the lead loading by the WWTF to the river should be reevaluated.

- *Other RIPDES -permitted Discharges:* Aside from the Woonsocket WWTF, the total lead concentrations from the Osram Sylvania Products Outfall 200 were elevated, and should be evaluated.

- *Other sources in the RI section of the River:* Aside from the lead loading from Massachusetts and the Woonsocket WWTF, the available data do not identify specific point sources for lead in the Rhode Island section of the river. Wright et al. (2001) calculated loadings of 4.5% to the Blackstone River during wet weather between BRI Stations 13 and 17. This section received discharges from the City of Woonsocket.

4.6 Nutrients and Related Parameters (for Valley Falls Pond)

Valley Falls Pond and the Blackstone River are listed for biodiversity on the 303d list (Table 1-1). Biodiversity impacts are caused by a wide range of factors, such as high metal and organic compound concentrations and low dissolved oxygen concentrations due to low flow conditions and excess nutrient loads. In addition, Valley Falls Pond is listed for phosphorus, nutrients, hypoxia, and excess algal growth.

At this point, very little is known about Valley Falls Pond. The pond appears to be only a few feet deep, although water levels can rise substantially during high flow conditions in the Blackstone River. Its main source of water is the Blackstone River, but it also receives runoff from neighboring urban and high density residential developments (Figure 2-2). It is not known if stormwater drainage pipes enter the pond. The pond includes a number of side arms that appear to become disconnected from the system during low flow conditions.

The pond is eutrophic to hypertrophic (Figure 4-64), particularly in the summer. Causes for its trophic state are likely a combination of high nutrient loading from the river and stormwater runoff, combined with restricted flushing of the pond and high nutrient recycling from the sediment. Available data are limited to three surveys conducted by URI's Watershed team in the year 2000 (Table A7-8 in Appendix 7), and data on nutrients and related parameters from the Blackstone River.

Nutrients and other relevant data from the Blackstone River watershed data were available from the following sources:

- Regular Monitoring:
  - *USGS, 1990 - 2000:* Weekly to monthly monitoring at the Branch River between the Slatersville dam and the Blackstone River, and on the Blackstone River at Manville (Appendix 9).
  - *River Rescue, 1990-1993*: Approximately monthly monitoring at the MA/RI state border, Lonsdale Avenue bridge in Lonsdale, and Slaters Mill (Appendix 6).
  - *RIDEM, 1991 – 2000:* Selected tributaries in the watershed (Round Top Brook, Pascaog River, Clear River, Abbot Run Brook) (Appendix 8).
  - *Discharges from the Woonsocket Wastewater Treatment Facility* (Appendix 14).

  - *Providence–Seekonk River Total Maximum Daily Load Project:* Approximately weekly monitoring in 1995 and 1996 at Slaters Mill (Appendix 5).
  - *URI Watershed Watch, 1993-2000:* Two to four surveys a year of lakes and reservoirs in the Branch River watershed, as well as 4 surveys in Valley Falls Pond in 2000 (Appendix 7).

- Stormwater Monitoring:
  - *URI, Wet Weather Study 1, 1988-1989:* Four stations along Blackstone River (Appendix 1).
  - *URI, Wet Weather Study 2, 1990:* Slaters Mill station only (Appendix 2).
  - *Blackstone River Initiative, 1991-1993:* Stations along the Blackstone River (Appendix 15).

- Sediment cores were collected in Valley Falls Pond by Dr. King from URI in 1988.

4.6.1 Valley Falls Pond

Nutrient data for Valley Falls Pond are very limited. The only available survey data were obtained by Watershed Watch in May, July and October 2000 (URI, unpubl. data). Chlorophyll concentrations were high, reaching over 60 mg/l (Figure 4-64). Total phosphorus concentrations ranged from 0.22 to 0.39 mg/l, dissolved phosphorus concentrations ranged from 0.09 to 0.18 mg/l, nitrate concentrations ranged from 0.24 to 1.23 mg/l, and total nitrogen (one analysis only) was measured at 1.99 mg/l (Figure 4-65 to 4-68). Dissolved oxygen data are not available. The nutrient data and chlorophyll data indicate that the pond is eutrophic, reaching hypertrophic status some of the time (Figure 4-69).

Other nutrient related indicators also clearly show that Valley Falls Pond is eutrophic as has been concluded previously by RIDEM. In comparison to the other ponds and reservoirs measured by Watershed Watch (Branch River watershed; Figures 4-65- 4-69), Valley Falls Pond had several-fold higher nutrient levels. In addition, the bi-weekly chlorophyll data from the year 2001 indicate a highly nutrient-enriched system based on average and maximum levels of chlorophyll and constancy of the bloom conditions (Figure 4-64).

The sediment core data collected by Dr. King (URI, Figure 4-70) are consistent with a highly organic enriched system. The sediments contained 10% (100 ug/mg) carbon by weight suggesting that they contain potentially about 25% organic matter by weight.

It should be noted that the wetland nature of the Valley Falls System (marshes and pond) needs to be considered in any TMDL calculations, since wetlands tend to have higher tolerances to nutrient loads than river or pond areas. However, this important avian resource clearly appears to be beyond its capacity to assimilate additional nutrient loads. In fact, the inorganic nitrogen and phosphorus levels are so high (Figures 4-65 to 4-68) that it is not clear to what extent they are limiting plant growth at certain periods of the year (i.e., other factors may also be playing a role).

While quantitative data are not presently available, it is clear that the nutrient status of Valley Falls Pond is likely controlled primarily by the nutrient levels in the incoming river water and recycling of nutrients from the sediments. In such enclosed systems, the release of nutrients from the sediments during the warmer months can provide a large fraction of the nutrients for algal production (blooms). In addition, the configuration of the Valley Falls Pond system likely enhances organic matter deposition, due to the apparently low flow-through and the configuration of the basin. Enhanced deposition results in higher sediment nutrient releases.

In addition to nutrient recycling from the degradation of organic matter deposited in the sediments, the extent to which Valley Falls Pond becomes hypoxic or anoxic likely controls the rate and magnitude of inorganic phosphorus release. This mechanism results from the typically high retentive capacity of the sediments for ortho-phosphate when the overlying water is oxygenated, and the loss of this capacity when it becomes anaerobic.

Given the configuration and wetland nature of the Valley Falls Pond system, it is possible that it may serve to "improve" the nutrient-related health of the Blackstone River (by removing nutrients).

4.6.2 Blackstone River

Given the interrelationship between nutrient concentrations and related parameters, the data from the Blackstone River are grouped by individual study rather than by parameters to allow for better comparison. Specifically, the data groups consist of the following:

- Data summaries of all studies in the Rhode Island section of the Blackstone River (Figures 4-71 to 4-73)
- USGS study at Forestdale and Manville (Figures 4-74 to 4-85)
- River Rescue at MA/RI border, Lonsdale, and Slaters Mill (Figure 4-86 to 4-92)
- BRI dry weather data (Figures 4-93 to 4-95)
- BRI wet weather data for Storms 1 to 3 (Figures 4-96 to 4-110)
- BRI source loading calculations for nitrate, ammonia, and phosphate (Figures 4-111 to 4-113)
- Woonsocket Wastewater effluent (Figures 4-114 to 4-121)

The closest station to Valley Falls Pond is BRI Station 20 and River Rescue Station B_{lons}. The nutrient data at these stations indicate that the Blackstone River was nutrient-enriched. The data reflected considerable variability, both seasonally and annually. The fact that low nutrient concentrations exist in the river during certain times suggests that the river is restorable.

Nutrient concentrations during wet and dry weather conditions were generally similar. Nutrient loads, however, would have doubled since the flow rates doubled on average (Figure 4-100, 4-105, and 4-110).

The Blackstone River is a significant source for nutrients in Valley Falls Pond. The degree to which it contributes to its eutrophic status cannot be ascertained, however. Data collected by River Rescue and the BRI stem from the earlier 1990s, when the Woonsocket WWTF was still a significant source of nutrients to the river (see Section 4.6.6). Upgrades to the treatment plant may have influenced the concentrations measured by URI Watershed Watch in years 2000 and 2001. In addition, chlorophyll data for the river are not available which would allow direct comparison with Valley Falls Pond.

4.6.3 Mill River

Data are limited to dry weather data from the BRI study. Nutrient concentrations were low for Mill River (Figures 4-71 to 4-73, 4-93 to 4-95). Harris Pond, however, is listed as non-attainment for noxious plants with indications of hypoxia.

4.6.4 Peters River

As for Mill River, nutrient data for Peters River are limited to dry weather data from the BRI study. Nutrient concentrations were also low (Figures 4-71 to 4-73, 4-93 to 4-95).

4.6.5 Branch River

In the ponds and reservoirs of the Branch River watershed, nutrient concentrations were generally low. The mean nitrate concentrations were below 0.04 mg/l for most waterbodies (Figure 4-65). The exception was Slatersville Reservoir with mean nitrate concentrations of 0.16 mg/l; the maximum concentration was 0.21 mg/l, although data are limited. The mean total nitrogen concentrations in the ponds and reservoirs were below approximately 0.50 mg/l (Figure 4-66). The mean dissolved phosphorus concentrations were below 0.006 mg/l

(Figure 4-67). The mean total phosphorus concentrations were below 0.012 mg/l with the exception of the Slatersville Reservoir, which had a mean concentration of 0.020 mg/l (Figure 4-68). Chlorophyll concentrations and Secchi disk depth are only reported for the Slatersville Reservoir. These parameters indicated primarily mesotrophic conditions in the reservoir in the years 1995 and 2000. The conditions became eutrophic a few times during the summer. All other reservoirs upstream of the Slatersville Reservoir were oligotrophic and mesotrophic (Figure 4-69).

Nutrient concentrations in the Branch River downstream of the ponds and reservoirs prior to entering the Blackstone River were generally well below the mean concentrations of Blackstone River, although data are limited (Figures 4-71 to 4-83, 4-93 to 4-95).

4.6.6 Woonsocket Wastewater Treatment Plant

The average annual discharge from the WWTF of 9.17 MGD (Figure 4-114) represents approximately 2% of the average annual flow in the Blackstone River adjacent to the plant (503 MGD; Table 2-3). The nutrient concentration in the WWTF effluent was one to two orders of magnitude higher than the concentrations in the receiving waters, resulting in a discernible increase in nutrient concentrations in the Blackstone River. This increase is reflected, for example, by the sharp increase in the dry weather nutrient concentrations measured during the BRI study downstream of Station 17 (Figures 4-93 to 4-95).

From the data available, the treatment facility prior to 2000 did not appear to nitrify effectively (Fig 4-115 to 4-118). The result was an effluent dominated by ammonium. However, in year 2000, ammonium concentrations indicate efficient nitrification within the facility and a shift to an effluent dominated by nitrate. The immediate effect of this shift would have been a decrease in oxygen demand on the receiving waters.

It also appears that the total nitrogen and phosphorus discharges have declined significantly (Figures 4-119 and 4-120). However, this conclusion is based only on the last two measurements. The record for TSS clearly shows an improved discharge throughout 2001 (Figure 4-122). Taken in total, the improvements in TSS, BOD, nitrogen, and phosphorus discharges during year 2001 are unlikely to be fully reflected in year 2001 environmental monitoring data. This is due to the fact that (a) the nutrient improvements were not fully seen until late in the year and (b) it takes time for the full river system to reach a new balance with the reduced loading rate.

4.6.7 CSOs

CSOs are located downstream of Valley Falls Pond. Furthermore, data on nutrient concentrations in the CSOs were not located but are expected to be high during discharge periods.

4.6.8 Other Discharges

Known other discharges of nutrient sources are limited to RIPDES-permit holders (Appendix 14). Loads are considered small.

4.7 Total Suspended Solids

Total suspended solids (TSS) data are needed for water quality modeling. TSS concentrations in the Blackstone River were generally below approximately 5 mg/l (Figures 4-123 to 4-125). TSS concentrations generally increased during wet weather conditions (Figures 4-123, and 4-126 to 5-128). TSS concentrations of streams in the Branch River watershed were low with on average less than 3 mg/l.

Highest TSS concentrations were measured in the Woonsocket WWTF outfall. The mean dry weather TSS concentrations ranged between 15 and 80 mg/l (Figures 4-122 and 4-123). The highest concentrations were measured by the BRI study with 350 mg/l (Figure 5-127). More recent TSS concentrations in the effluent since the upgrade of the facility are not yet known.

TSS concentrations were also elevated in Peters River during the BRI stormwater studies. These concentrations may be a result of the broken sewer pipe crossing the river.

4.8 Flow

Continuous flow data for the Blackstone River are limited to the U.S Geological Survey station in Woonsocket (see Section 2.4). Other flow measurements were only collected for the URI stormwater studies (Appendices 1, 2, and 15). Flow data for the BRI study are summarized in Figures 4-100, 4-105, and 4-110. During Storm 1, flow rates increased by up to roughly 50%. During Storms 2 and 3, flow rates approximately doubled.

4.9 Biodiversity Impacts

Macroinvertebrate biodiversity data integrate the cumulative impact of stressors that result in habitat degradation and chemical contamination. These data also integrate the effect of short-term variability. However, conditions may not necessarily be symptomatic for the entire river, but could be caused by local conditions due to the limited migration pattern of the studied benthic organisms. The species density is affected by factors such as sediment type, temperature, dissolved oxygen concentration, rainfall / stream flow, organic content, and water chemistry. Stressors include organic loading from point and non-point sources, elevated sediment load.

Blackstone River bioassessments were conducted by Roger Williams University between 1991 and 2001 (Gould, 1998; Pomeroy, 2000; da Silva, 2002). The biomonitoring results for the period 1994 to 2001 generally indicated a moderately to slightly impaired benthic community with the exception of 1995, which was severely impaired (Figure 4-130). The station is located downstream of the Manville Dam, which can impact the instream water quality conditions and consequently the biomonitoring results.

4.9.1 Bioassessment Data

The detailed biomonitoring data of macroinvertebrates for the period from 1998 to 2001 for the reference station (Wood River) and the Blackstone River are summarized in Figure 4-131. The biometric indices were calculated and presented in Figure 4-132. The data allow for the following observations regarding the conditions in the Blackstone River:

- The invertebrate assemblage at the Blackstone River monitoring station was dominated by caddisflies (*Hydropsyche* spp.), which are in the Order Trichoptera. Hydropsyche is one of the most common and abundant caddisflies in North America (McCafferty, 1998). Hydropsyche are classified in the Filtering Collector functional feeding group (Cummins, 1973), and feed by building silken nets that they use to trap suspended food particles. At the family level, Hydropsychidae are classified as moderately tolerant of organic pollution, although there is considerable variation among individual species, with some species very tolerant of organic pollution, and others very intolerant.

- The Scraper and Filtering Collector functional feeding group ratio (USEPA, 1989) was lower in the Blackstone River than at the Wood River reference station. This reflects the dominance of Filterers/Collectors, and specifically Hydropsyche, in the Blackstone River assemblage. Filtering Collectors increase with the increasing presence of filamentous algae and aquatic mosses, and the increasing availability of fine particulate organic matter (FPOM) (USEPA, 1989). Strong empirical relationships exist between organic enrichment and periphyton biomass (Dodds et al., 2002), thus the dominance by the Filterer/Collector functional feeding group may also be reflective of eutrophic conditions in the Blackstone River during the sampling period.

- The virtual absence of shredders at the Blackstone River monitoring station suggests that particulate matter (leaf litter) inputs are not a dominant food source for invertebrates at this site. Leaf litter inputs influence densities of shredder insects, which are often highest in headwaters, and decrease in larger rivers (Wetzel, 2001). The presence of large numbers of Filterers/Collectors indicated that FPOM may be the dominant invertebrate food source, and may be responsible for the low numbers of shredders present in the Blackstone River compared to the reference site.

- The EPT and Chironomidae abundances ratio (USEPA, 1989) is used as a measure of community balance and as an indicator of environmental stress. Certain species of Chironomidae are tolerant of metal pollution, and may be dominant in habitats exposed to metal discharges where EPT taxa cannot persist; therefore, Chironomidae provide a good indicator of the presence of metal toxicity (Winner et al., 1980). While Chironomidae numbers were higher in the Blackstone River than at the reference site, these differences were small, and may not provide evidence supporting metal toxicity. The EPT/Chironomidae ratio was high; however, this simply reflects the dominance of Hydropsyche.

- The presence of pollution-sensitive Ephemeroptera taxa and the absence of large numbers of other pollution-tolerant species (e.g., Tubificidae, Oligochaeta) may indicate that toxins were not present in lethal concentrations at this site. No Plecoptera taxa, many of which are very intolerant of low oxygen, were present at Blackstone River site, but these taxa were collected in all four years at the reference site.

4.9.2 Potential Stressors

A list of candidate stressors was developed for the Blackstone River and evaluated to determine the primary stressor based on available data. Candidate stressors included organic matter, nutrients, pH, temperature, sediment, and toxics. The evaluation of each candidate stressor is based on the dry and wet weather water quality data, and the Woonsocket WWTF daily monitoring record (DMR); these data are presented elsewhere in this report.

- **Organic Matter:** Excessive organic matter can lead to low dissolved oxygen concentrations, which may adversely affect the survival and growth of benthic macroinvertebrates. Potential sources of organic matter include wastewater discharges and agricultural runoff. The dissolved oxygen monitoring data indicated that near-saturation dissolved oxygen levels are prevalent most of the time. However, these data do not assess whether these high levels are due to photosynthesis or a result of the dam. In addition, there is no quantification of the total organic carbon (TOC) and dissolved organic carbon (DOC). Available BOD data are not sensitive enough as an accurate measure of organic matter in natural systems such as the Blackstone River.

- **Nutrients:** Excessive nutrient inputs can lead to eutrophication (algal blooms) and low dissolved oxygen concentrations, which may adversely affect the survival of benthic macroinvertebrates. In particular, dissolved oxygen levels may become low during overnight hours due to plant respiration. Results from various monitoring programs indicated that the dissolved oxygen concentration was relatively high even during summer months. This may be due to the presence of the Manville Dam and the Woonsocket WWTF. A diurnal dissolved oxygen study conducted from July 9-11, 1991 (Appendix 4) indicated that DO remained above 6 mg/l at all of the monitoring sites for all sampling periods. This suggests that there were adequate DO concentrations in the Blackstone River at that time. However, the presence of blue-green algae, as noted in the biomonitoring reports, suggests potential enrichment and degradation of the water quality conditions. Because blue-green algae forms occur only under eutrophic conditions, their presence is a strong indication of organic loading in the river. The loading of nutrients by the Woonsocket WWTF was high during the macroinvertebrate sampling period.

- **Temperature and pH:** Benthic macroinvertebrates require a specific range of temperature and pH to live and grow. Changes in temperature and/or pH may adversely affect their survival. Treated wastewater, contact and cooling water permitted facilities, and urban runoff can potentially alter instream levels of temperature and pH. The Woonsocket WWTF DMR, instream water quality data, and diurnal monitoring at both reference and impaired stations would be adequate to characterize the temperature and pH conditions. Temperature and pH data from the BRI indicate that temperature and pH from the Woonsocket WWTF effluent are not a concern.

- **Sediment:** Excessive sedimentation can impair benthic communities through loss of habitat. Essentially, excess sediment can fill the pores in gravel and cobble substrate where macroinvertebrates live and grow. Based on the land use and physical characteristics of the Blackstone River watershed, potential sources of sediment at the biomonitoring station include agricultural runoff, urban runoff, forestry operations, construction sites, sand and gravel mining operations, and the Woonsocket WWTF. In addition, instream erosion from an unstable channel and banks may be playing a role if high flows are prevalent. However, information on the relative contribution of the various potential sources for sediment is not available.

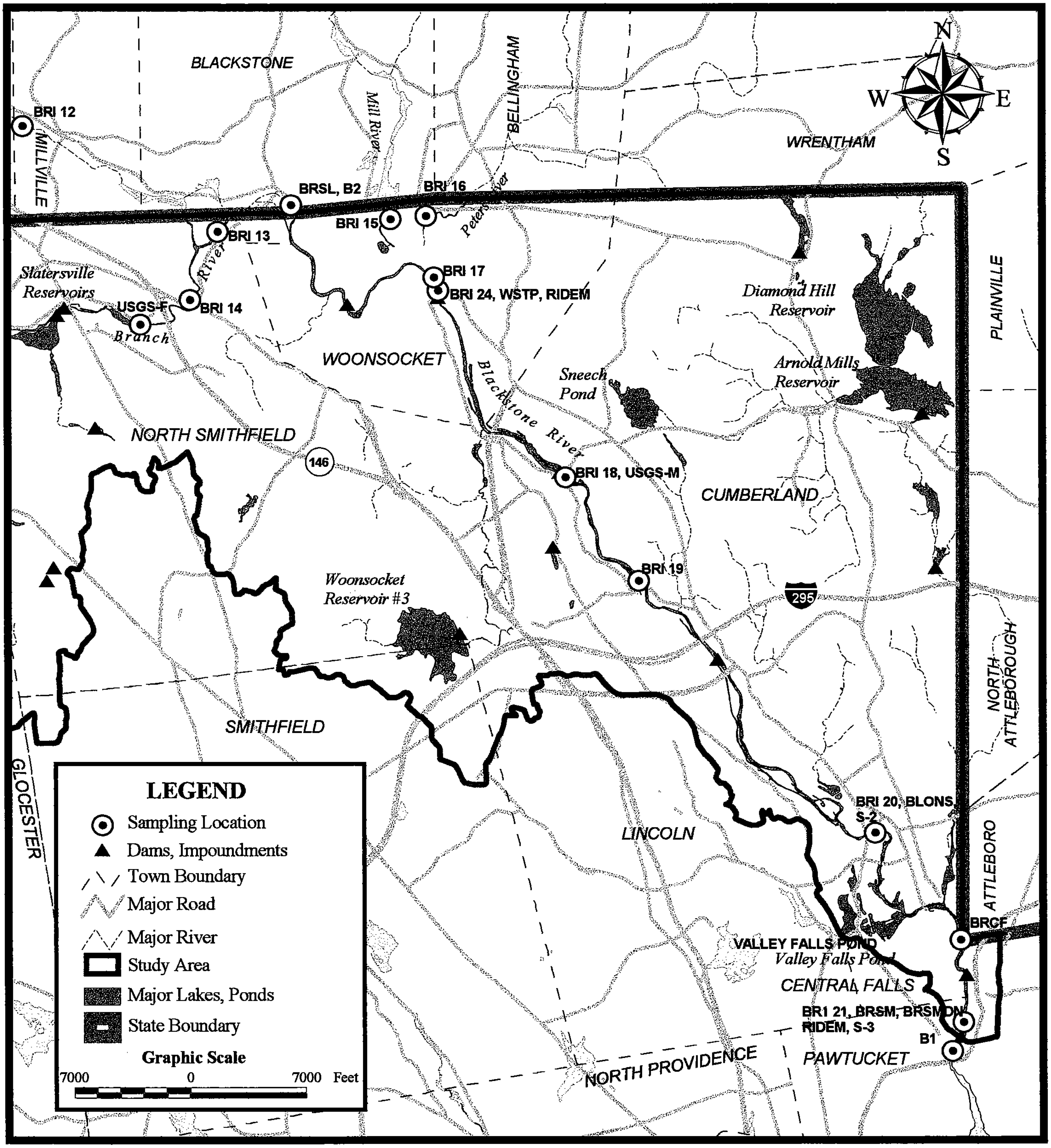
- **Toxics:** Two potential stressors that can cause toxic effects include heavy metals and ammonia. The Blackstone River is on the 303(d) list for copper and lead impairments. Studies have indicated that mayflies are more sensitive than Chironomids to copper exposure levels of 15 to 32 ug/L (Clements et al., 1988). The presence of pollution-sensitive Ephemeroptera taxa and the absence of large numbers of other pollution-tolerant species (e.g., Tubificidae, Oligochaeta) may indicate that toxins were not present in lethal concentrations at this site. However, these stressors may be present at a level to only cause sublethal biological effects (impacts on growth or reproduction) and shift in the macroinvertebrate population. Acute and chronic toxicity testing at the reference station and the Blackstone River would elucidate the impacts of the heavy metals and the ammonia on the macroinvertebrate community.

In summary, it appears that organic loading (nutrients, fine particulate organic matter, etc.) is the primary cause for the impaired macroinvertebrate assemblages. Metals do not appear to be a key stressor, as no lethal toxic effects were observed; there may be sublethal effects, however, which impact the growth and reproduction of the macroinvertebrates.

Figures for Section 4

The figures for Section 4 are grouped as follows:

Figures No.	Subject
4-1 to 4-2	Maps
4-3 to 4-4	Available Data and Stations
4-5 to 4-7	Water Quality Criteria
4-8 to 4-23	Fecal Coliform Data
4-24 to 4-43	Copper Data
4-44 to 4-63	Lead Data
4-64 to 4-121	Data for Nutrients and Related Parameters
4-122 to 4-129	Total Suspended Solids Data
4-130 to 4-132	Macroinvertebrate Data



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure 4-1
SAMPLE LOCATIONS
RHODE ISLAND SECTION

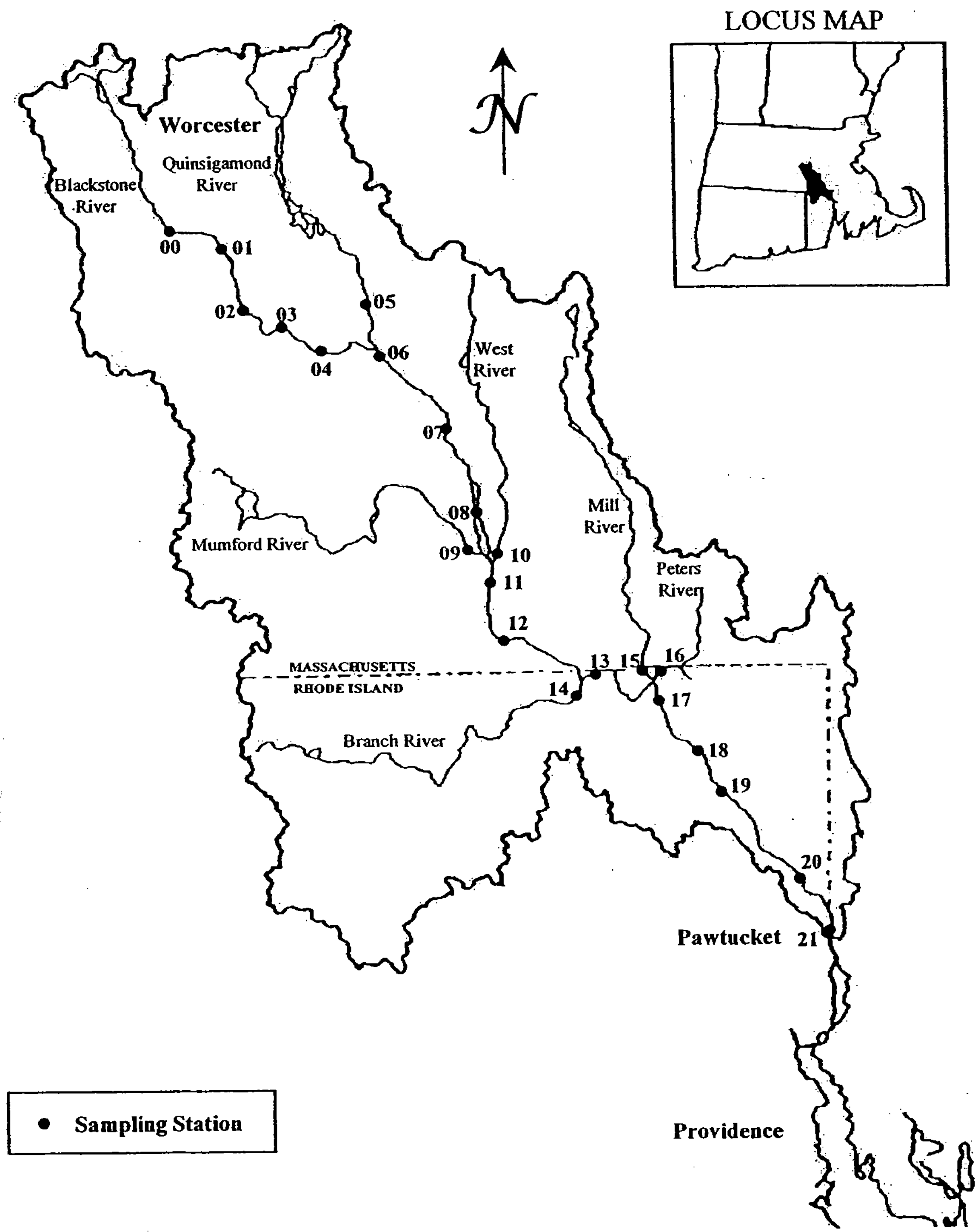


Figure 4-2: **Blackstone River Initiative, Sampling Locations**

Figure 4-3

Sampling Locations of Reviewed Studies in Blackstone River Watershed

Data Appen-dix	Study	Author	Station No. *(1)*	Station Location	Sampling Event Date(s)	Com-ments
1	Dry/Wet Weather Sampling	University of Rhode Island (Wright et al., 1991)	BRSL	Blackstone River at MA/RI state line	Oct. 22-26, 1988	
			WSTP	Woonsocket Sewage Treatment Plant	May 10-15, 1989	
			BRCF	Blackstone River above Central Falls, Pawtucket	June 10-16, 1989	
			BRSM	Blackstone River at Slaters Mill		
2	Dry/Wet Weather Sampling	University of Rhode Island (URI, 1992)	BRSMDN	Slaters Mill	5/29 - 6/2, 1990 6/29 - 6/30, 1990 7/11 - 7/16, 1990 9/22 - 9/24, 1990	
3	Blackstone River 1990 - Pollutant Discharge and Water Quality Review	University of Rhode Island (Wright et al., 1991b)		22 dischargers in BR watershed in MA and RI; comparisons with other studies	1998 to 1989	
4	Blackstone River 1991 - Water Quality Study	Applied Science Associates, Inc. (ASA, 1992b)	ASA 1	Sayles Street bridge , Woonsocket	July 9-11, 1991	
			ASA 1a	30 m below Thundermist Dam		
			ASA 2	Bernon Street bridge		
			ASA 3a	Hamlet Avenue bridge		
			ASA 3	90m upstream of Woonsocket WWTF outfall		
			ASA 4	Woonsocket WWWTP outfall		
			ASA 5	270m downstream of Woonsocket WWTF outfall		
			ASA 6	0.3 miles downstream of Station ASA 5		
			ASA 7	adjacent to Woonsocket Water Treatment Plant		
			ASA 8	Route 99 overpass, Woonsocket-Cumberland town line		
			ASA 9	800m downstream of ASA 8, adjacent to gravel pit		
			ASA 10	50 m upstream of Manville Dam		
			ASA 10a	Manville Dam bridge		
			ASA 11	50 m upstream of Albion Dam		
5	Providence River - Seekonk River TMDL Study, 1995, 1996	RIDEM (unpublished data)	RIDEM	Slaters Mill	May - Sep, 1995 May - Nov, 1996	
6	Rhode Island Urban Rivers	River Rescue	B2	Main Street, Blackstone, MA	up to 67 times year-round between 1990 and 1995	
			Blons	Route 122, Lonsdale, RI		
			B1	Main Street, Pawtucket, RI		
7	Lakes Monitoring Program	URI Watershed Watch (URI, unpubl. data)		Pascoag Reservoir	1993 to 2000	(2)
				Spring Lake		
				Keech Pond		
				Smith and Sayles Reservoir		
				Spring Grove Pond		
				Slatersville Reservoir		
				Valley Falls Pond		
8	Chemical Monitoring for Section 305b Assessment	RIDEM (RIDEM, 2000)		Round Top Brook	1991, 1993	
				Pascoag River	1996, 1998	
				Clear River	1999, 2000	
				Abbot Run Brook (Cumberland)	(3 to 6 times	
				Abbot Run Brook (North Attleboro)	each year)	
9	U.S. Geological Survey	Water Resources Data (USGS, 2000)	USGS-F	400ft downstream from Mill dam in Forestdale	1/1990 - 12/1999	
			USGS-M	Manville Rd. bridge, 2.5 miles downstream from Woon. WWTF		
10	Narragansett Bay Commission	Fecal Coliform Monitoring	S-2	Lonsdale Ave (Whipple Bridge), Lincoln/Cumberland	1/1997 to 10/2001	
			S-3	Slaters Mill Dam, Pawtucket		

Figure 4-3

Sampling Locations of Reviewed Studies in Blackstone River Watershed

Data Appendix	Study	Author	Station No. (1)	Station Location	Sampling Event Date(s)	Comments
11	Massachusetts Department of Environmental Protection	Fish Toxics Monitoring		Fisherville Pond, Grafton,MA	summer of 1993	
				Riverdale Impoundment, Northbridge, MA		
				Rice City Pond, Uxbridge, MA		
				Tupperware Impoundment, MA		
12	Gould, 1998; 1999; 2000	Bioassessment Screening of RI Freshwater Benthic Macroinvertebrates		Nipmuc River - Top Brook	summers of 1998 1999 2000	
				Pascoag River		
				Keech Brook		
				Clear River		
				Abbot Run Brook (Cumberland)		
				Abbot Run Brook (North Attleboro)		
				Blackstone River		
13	Sediment Core Data	Dr. John King, University of Rhode Island		Tupperware Impoundment	1988	
				Valley Falls Pond		
14	RIPDES-Permitted Discharges	RIDEM, unpublished data		Zambarano Memorial Hospital	1/1997 to 10/2001	
				Burrillville WWTF		
				Atlantic Thrmoplastics		
				Blackstone Smithfield Co.		
			RIDEM	Woonsocket WWTF		
				Okonite Company		
				Osram Sylvania (2 outfalls)		
15	Blackstone River Initiative	URI (Wright et al., 2001)	12	Route 122, Millville, MA	*3 Dry Weather Surveys:* July10-11, 1991 Aug. 14-15, 1991 Oct. 2-3, 1991	
			13	Bridge St. (State Boundary), Blackstone, MA		
			14	Route 146A, Slatersville, MA		
			15	Winter St., Woonsocket, RI		
			16	Route 114, Woonsocket, RI		
			17	Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI		
			24	Effluent, Woonsocket WWTF	*3 Wet Weather Surveys:* Sep.22, 1992 Nov. 2, 1992 Oct. 14, 1993	
			18	Manville Hill Rd., Cumberland, RI		
			19	School St./Albion Rd., Cumberland, RI		
			20	Lonsdale Ave., Lonsdale, RI		
			21	Main St., (Slaters Mill), Pawtucket, RI		

(1) Station names in brackets are names that were assigned during this data synthesis; original studies did not have numbers for these stations.
(2) Details of the locations in each reservoir are provided in Table A7-1 in Appendix 7.

Figure 4-4

Summary of Available Data for the Blackstone River Watershed

	URI: Wet Weather Study 1	URI: Wet Weather Study 2	URI: Water Quality Data Review	ASA: Blackstone River Water Quality Study	RIDEM: Prov.-Seekonk River TMDL Project	River Rescue: Water Quality	URI: Lakes Monitoring	RIDEM: Chemical Monit. (Sect. 305b)	USGS: Water Resources Data	NBC: Fecal Coliform Monit.	MADEP: Fish Toxics Monitoring	Gould: Bioassess- ment Screening for Benthic Macroinvertebrates	Dr. King: Sediment Core Data	RIPDES-Permitted Discharges	Blackstone River Initiative
Appendix No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	1988 -1989	1990	1988 -1989	1991	1995 -1996	1990 -1994	1993 - 2000	1991 -2000	1990 -1999	1997 -2001	1993	1998 -2000	1988	1997 -2001	1991 -1993
No. of Stations	4	1	22	14	1	2	7	5	2	5	4	7	2	7	25
Surface Water Samples/Stations	●	●	●	●	●	●		●	●	●				●	●
Lake Water Samples							●								
Sediment Samples													●		●
Fish Tissues / Benthic Macroinvertebrates											●	●			
Dry Weather	●	●		●	●	●		●	●	●					●
Wet Weather	●	●			●			●	●	●					●
Flow Data	●	●		●										●	●
Concentrations	●	●	●	●	●	●	●		●	●	●			●	●
Loads	●	●												●	●
Mean Trophic Status							●								
In-situ Parameters, Solids, BOD, Chlorophyll															
pH			●	●		●	●	●	●					●	●
Alkalinity							●		●						
Temperature		●		●		●	●	●	●					●	●
Dissolved Oxygen		●		●		●	●	●	●						●
Oxygen Saturation						●			●						
Conductivity		●		●				●	●						●
Secchi Depth							●								
BOD	●	●	●	●	●			●						●	●
COD									●					●	
Chlorophyll				●			●								●
Turbidity								●							
Total Solids									●						
Total Volatile Solids															●
Total Suspended Solids	●	●	●	●	●	●		●						●	●
Nutrients															
Nitrite, dissolved		●		●	●	●			●					●	
Nitrate, dissolved	●			●		●	●	●						●	●
Ammonia, dissolved	●		●	●	●	●		●	●					●	●
Dissolved Organic Nitrogen						●									
Dissolved Inorganic Nitrogen						●									
Total Dissolved Nitrogen						●									
Total Nitrogen					●		●						●	●	
Total Kjehldahl Nitrogen				●										●	●
Dissolved Inorganic Phosphorus (Phosphate)	●	●			●	●		●	●						●
Dissolved Organic Phosphorus						●									
Total Dissolved Phosphorus						●	●								
Particulate Phosphorus						●									
Total Phosphorus			●		●	●		●	●				●	●	
Total Organic Carbon					●								●		
Bacteriological Parameters															
Total Coliform									●						
Fecal Coliform	●	●	●				●	●	●	●				●	●
Fecal Streptococci									●						
Enterococci	●							●							
E. coli	●						●								●
PCBs and Other Organic Compounds															
PCBs	●										●				
Semi-Volatile Compounds (incl. PAHs)	●														
Pesticides	●										●				
Oil and Grease									●					●	
Total Petroleum Hydrocarbons	●														
Phenol									●						
Inorganic Compounds, Totals															
Arsenic											●				
Calcium						●			●						
Cadmium	●					●		●	●		●		●	●	●
Chloride							●	●	●						●
Chromium	●					●			●		●		●	●	●
Cobalt															
Copper	●	●				●		●	●		●		●	●	●
Cyanide														●	
Iron								●	●				●		
Lead	●	●	●			●		●	●		●		●	●	●
Magnesium						●			●						
Manganese									●				●		
Mercury									●		●				
Nickel	●	●				●			●				●	●	●
Potassium									●						
Selenium									●		●				
Silver									●				●	●	
Sodium							●	●	●						
Zinc									●				●	●	
Inorganic Compounds, Dissolved															
Arsenic									●						
Cadmium	●							●	●						●
Calcium									●						
Chloride									●						
Chromium	●								●						●
Copper	●								●						●
Iron															
Lead	●								●						●
Magnesium									●						
Manganese									●						
Mercury															
Nickel	●								●						●
Potassium									●						
Selenium															
Silver									●						
Sodium									●						
Zinc									●						
Other Parameters															
Hardness						●		●							●
Chlorine Residual			●											●	

The Louis Berger Group, Inc

Figure 4-5
RIDEM - Class Specific Criteria

Criterion	CLASS B and B1
Dissolved Oxygen	Cold Water Fish Habitat - Dissolved oxygen content of not less than 75% saturation, based on a daily average, and an instantaneous minimum dissolved oxygen concentration of at least 5 mg/l. For the period from October 1st to May 14th, where in areas identified by the RI Division of Fish and Wildlife as cold water fish spawning in areas the following criteria apply: For species whose early life stages are not directly exposed to the water column (i.e., early life stages are intergravel), the 7 day mean water column dissolved oxygen concentration shall not be less than 8 mg/l. for species that have early life stages exposed directly to the water column, the 7 day mean water column dissolved oxygen concentration shall not be less than 6.5 mg/l and the instantaneous minimum dissolved oxygen concentration shall not be less than 5.0 mg/l.
Fecal Coliform Bacteria (MPN/100ml)	Not to exceed a geometric mean value of 200 and not more than 20% of the samples shall exceed a value of 500.
pH (Standard Units)	6.5 - 9.0 or as naturally occurs.
Temperature Increase	The temperature increase shall not raise the temperature of the receiving waters above the recommended limit on the most sensitive receiving water use nor cause the growth of undesirable or nuisance species of biota and in no cases exceed 83 degrees F. Heated discharges into designated coldwater habitats shall not raise the temperature above 68 degrees F outside an established thermal mixing zone. In no case shall the temperature of the receiving water be raised more than 4 degrees F.
Chemical Constituents	a. None in concentrations or combinations that could be harmful to humans or fish and wildlife for the most sensitive and governing water class use, or unfavorably alter the biota, or which would make the waters unsafe or unsuitable for fish and wildlife or their propagation, impair the palatability of same, or impair waters for any other existing or designated use. None in such concentrations that would exceed the Water Quality Criteria and other guidelines. b. The ambient concentration of a pollutant in a water body shall not exceed the Ambient Water Quality Criteria and Guidelines for the protection of aquatic organisms from acute or chronic effects, unless the criteria or guidelines are modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in the RIDEM Site Specific Aquatic Life Water Quality Criteria Development Policy.
Nutrients	a. Average Total Phosphorus shall not exceed 0.025 mg/l in any lake, pond, kettlehole or reservoir, and average Total P in tributaries at the point where they enter such bodies of water shall not cause exceedance of this phosphorus criteria, except as naturally occurs, unless the Director determines, on a site-specific basis, that a different value for phosphorus is necessary to prevent cultural eutrophication. b. None in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication, nor cause exceedance of the criterion of (a) above in a downstream lake, pond, or reservoir. New discharges of wastes containing phosphates will not be permitted into or immediately upstream of lakes or ponds. Phosphates shall be removed from existing discharges to the extent that such removal is or may become technically and reasonable feasible.

Figure 4-6

Dissolved Metals Criteria

Metal	Acute Criteria (ug/l) Hardness (mg/l as $CaCO_3$) 25.0	35.0	45.0	Chronic Criteria (ug/l) Hardness (mg/l as $CaCO_3$) 25.0	35.0	45.0
Aluminum	750.0	750.0	750.0	87.0	87.0	87.0
Antimony	450.0	450.0	450.0	10.0	10.0	10.0
Arsenic	360.0	360.0	360.0	190.0	190.0	190.0
Cadmium	0.8	1.2	1.6	0.4	0.5	0.6
Chromium III	176.3	232.3	285.3	57.2	75.3	92.6
Chromium VI	15.0	15.0	15.0	10.0	10.0	10.0
Copper	4.6	6.3	8.0	3.5	4.6	5.7
Lead	13.9	20.3	26.8	0.5	0.8	1.0
Mercury	2.1	2.1	2.1	0.012	0.012	0.012
Nickel	438.1	582.3	720.3	48.7	64.7	80.0
Silver	0.3	0.6	0.9	-	-	-
Zinc	35.4	47.0	58.2	32.3	42.9	53.1

- = no criteria recommendation

Figure 4-7

Criteria for Ammonia

pH	Acute Criteria (mg/l as N)[1]	Chronic Criteria (mg/l as N)[2] Temperature (C) 10.0	15.0	20.0
6.5	48.8	8.9	6.5	4.7
7	36.1	7.9	5.7	4.2
7.5	19.9	5.8	4.2	3.1

[1]Ammonia criteria for acute and chronic is based upon criteria with early life stage absent.

[2]Chronic ammonia criteria is temperature and pH dependant.

Figure 4-8

Fecal Coliform *(col/100 ml) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone River	Tributary	WWTF/CSO	Station Location	Mean Concentration				Minimum Concentration				Maximum Concentration			
								Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	73											
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	19	69			2	1			200	2,000		
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	280											
		URI BRI wet	1991-1993		●			859	897	572	231	320	130	80	60	1,800	6,000	6,200	2,400
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA												
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line	104	264	510	178	47	38	130	70	230	3,700	2,100	250
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	73											
		URI BRI wet	1991-1993	●				113	303	363	370	67	50	90	90	270	1,900	1,500	1,900
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	73											
		URI BRI wet	1991-1993		●														
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	567											
		URI BRI wet	1991-1993		●			2,532	3,312	20,271	5,015	63	84	460	300	46,000	79,000	94,000	14,000
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	303											
		URI BRI wet	1991-1993	●				444	1,242	608	708	110	120	340	150	1,900	12,000	880	5,400
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		19	8	87	1	5	1	1	1	70	69,000	79,000	1
1	WSTP	URI	1988-1989			●		41	51	10	297	0	0	0	0	16,750	49,000	23,000	36,000
14	RIPDES	RIDEM	1997-2001			●		13											
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	107											
		URI BRI wet	1991-1993	●				147	425	1,153	194	120	59	310	14	220	4,800	10,000	990
9	Manville	USGS	1990-1999	●				63	514			0	43			380	3,400		
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI												
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI												
15	20	URI BRI dry	1991	●				93											
		URI BRI wet	1991-1993	●				101	206	316	258	61	48	77	51	140	770	890	1,900
10	S-2	NBC	1997-2000	●				94	697			3	23			24,000	15,000		
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket	102	632	48	394	55	63	0	310	190	290,000	830	500
1	BRSM	URI	1988-1989	●			Slaters Mill	511	1,248	544	184	230	250	9	21	740	19,000	7,200	490
2	BRSMDN	URI	1990	●				192	1,279	1,370	823	68	90	410	100	820	23,000	31,000	2,100
10	S-3	NBC	1997-2000	●				215	2,192			15	15			9,300	93,000		
15	21	URI BRI dry	1991	●				280											
		URI BRI wet	1991-1993	●				79	1,186	676	376	19	13	340	80	270	15,000	1,700	650
5	TMDL	RIDEM	1995-1996	●															
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI												

Regulatory Standard:
Not to exceed a geometric mean of 200 MPN/100 ml.
Not more than 20% of the samples shall exceed a value of 500 MPN/100 ml.

Figure 4-9
Fecal Coliform Concentration
USGS Station at Forestdale, Branch River

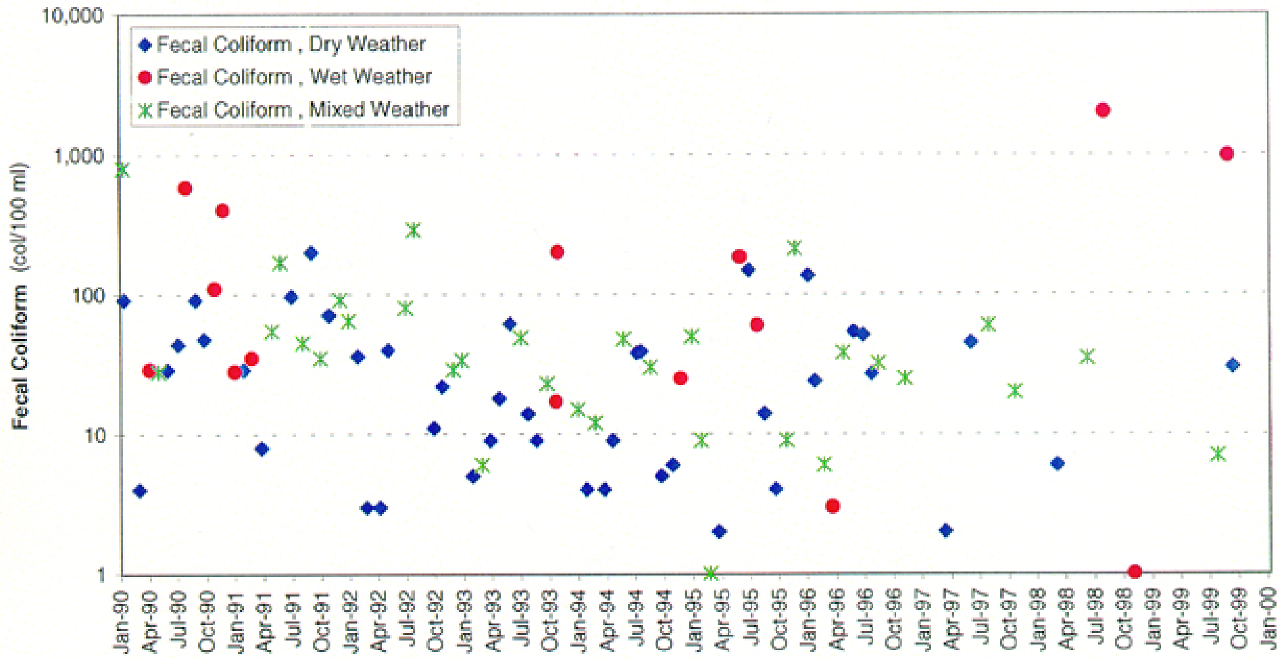


Figure 4-10
Fecal Coliform Concentration
USGS Station at Manville, Blackstone River

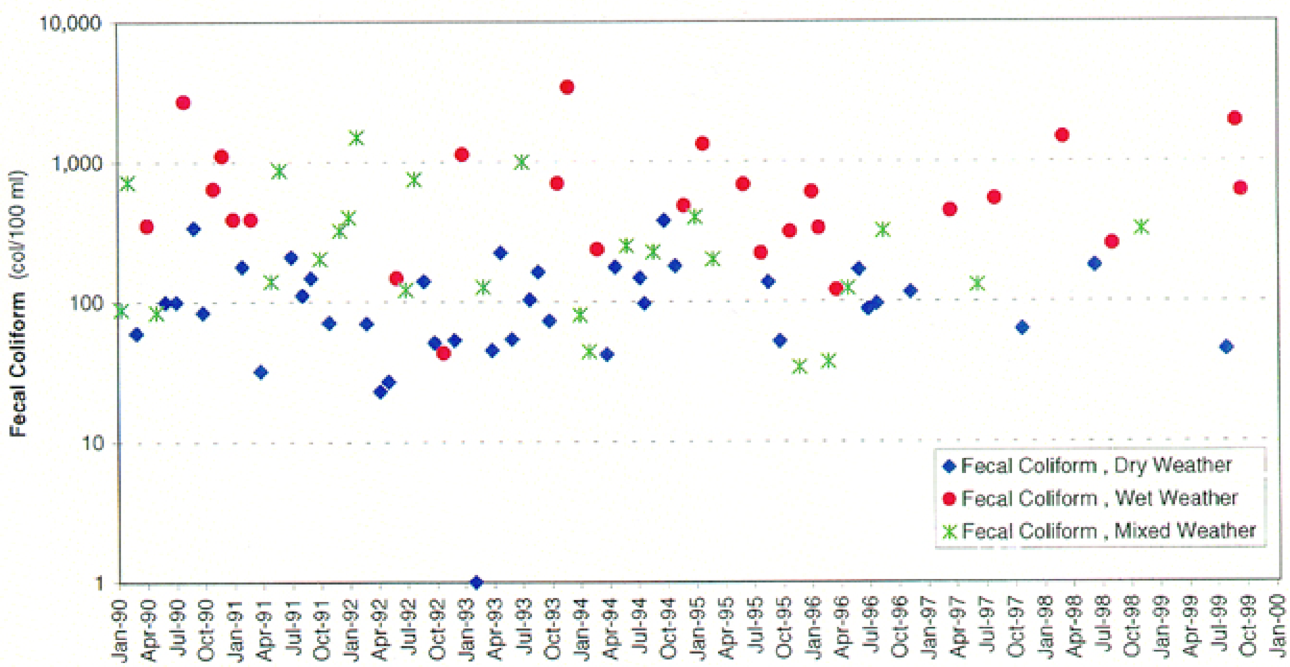


Figure 4-11

Fecal Coliform Concentration

Blackstone River, Lincoln/Cumberland (Lonsdale Avenue)

Narragansett Bay Commission

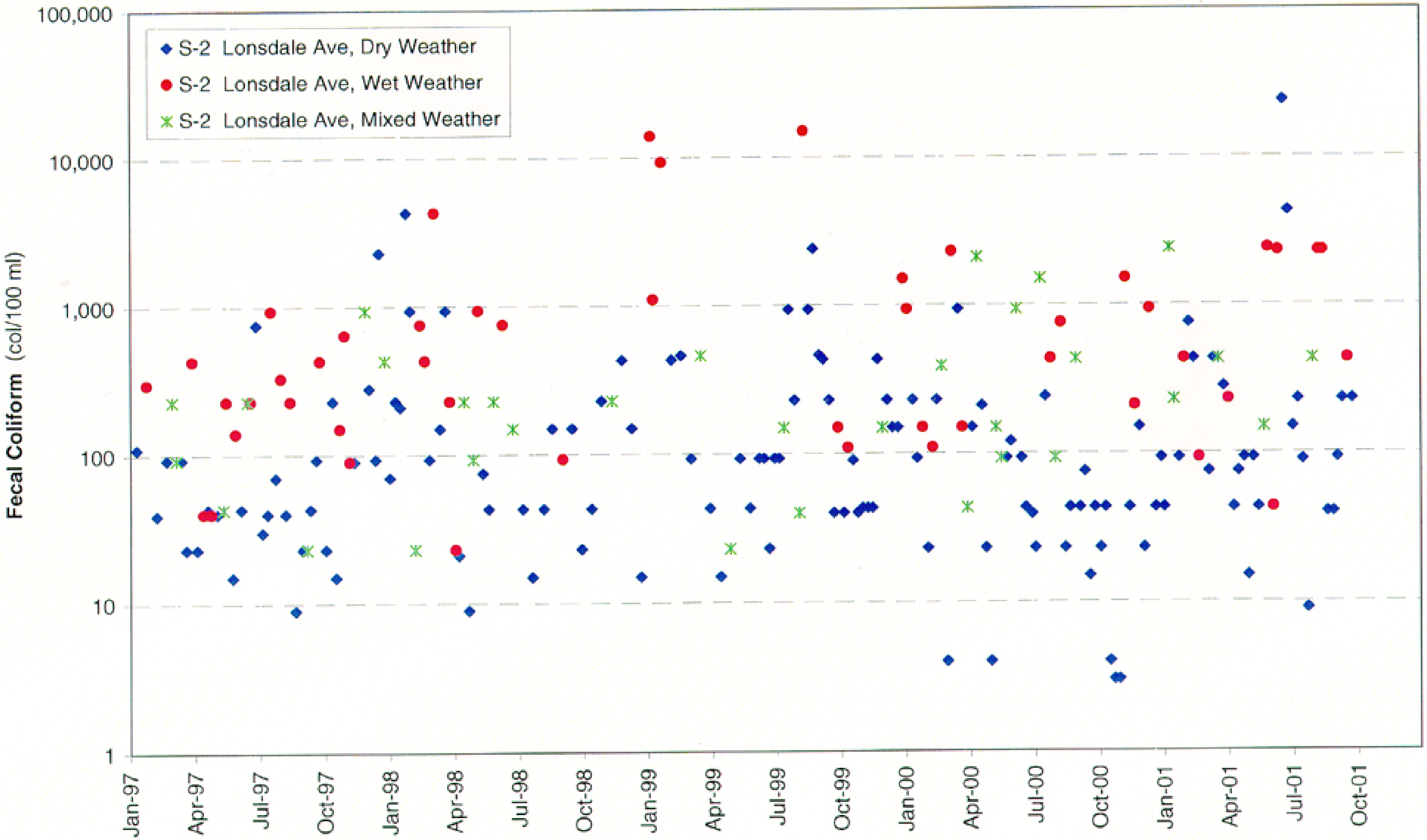


Figure 4-12

Fecal Coliform Concentration

Blackstone River, Pawtucket (Slater's Mill Dam)

Narragansett Bay Commission

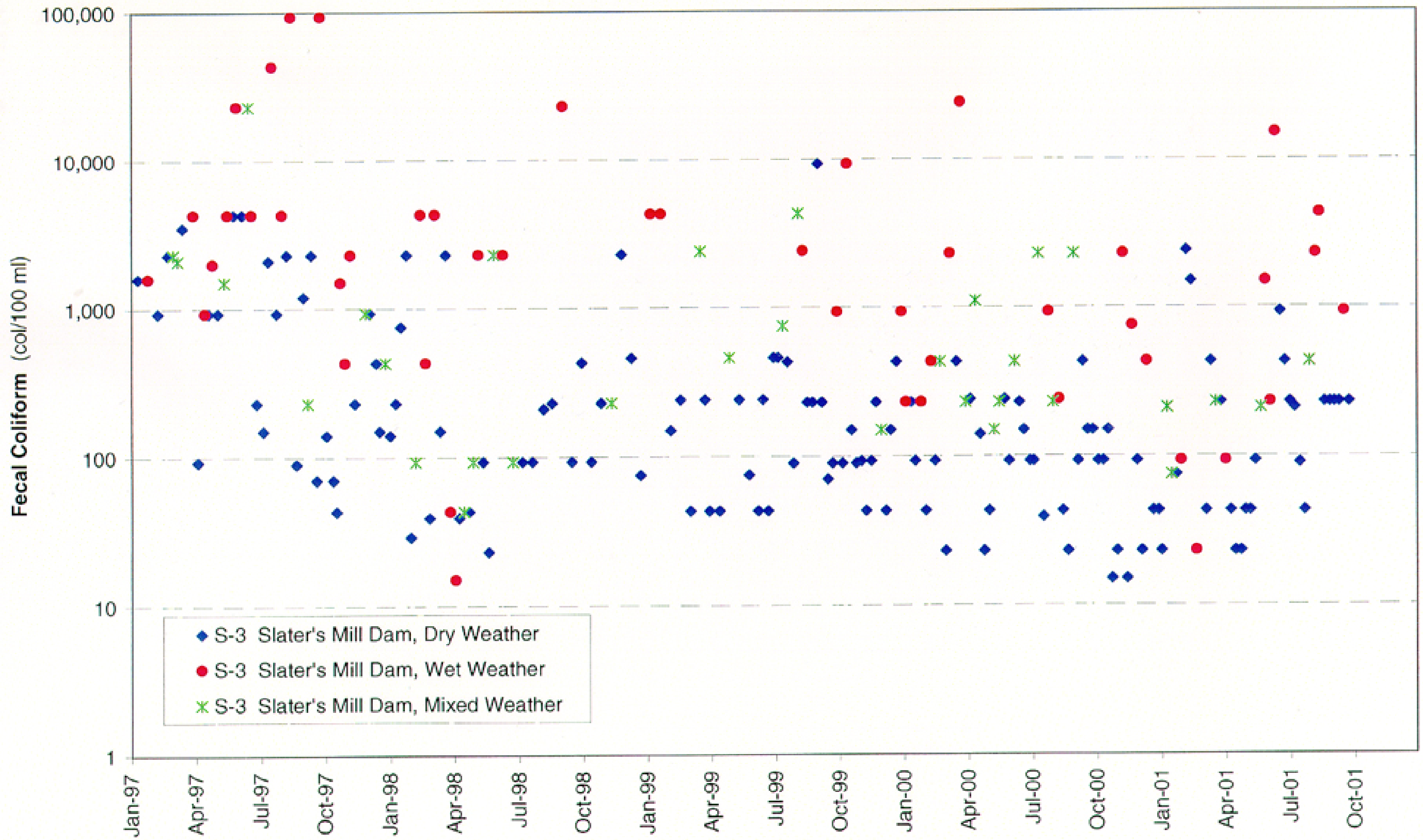


Figure 4-13

Blackstone River Initiative

Dry Weather Data: Fecal Coliform (col/100 ml)

Station	Blackstone River	Tributary	Location	River Mile	July 10, 1991	Aug. 14, 1991	Oct. 2, 1991	Mean
BLK01	●			45.7	1,800	4,180	3,500	**3,160**
BLK02	●			43.9	20	0	20	**13**
BLK03	●			41.3	580	1,060	20	**553**
BLK04	●			39.8	2,300	760	300	**1,120**
BLK05		●	Quinsigamond River	36.7 *(2.1)*	40	40	40	**40**
BLK06	●			36.3	900	320	120	**447**
BLK07	●			31.9	100	80	320	**167**
BLK08	●			27.8	120	320	160	**200**
BLK09		●	Mumford River	25.5 *(0.6)*	300	120	20	**147**
BLK10		●	West River	24.2 *(0.6)*	80	80	80	**80**
BLK11	●			23.2	80	80	140	**100**
BLK12	●			19.1	80	20	120	**73**
BLK13	●			16.6	100	80	40	**73**
BLK14		●	Branch River	17.4 *(0.8)*	160	220	460	**280**
BLK15		●	Mill River	13.3 *(0.7)*	20	80	120	**73**
BLK16		●	Peters River	13.1 *(1.1)*	380	1,060	260	**567**
BLK17	●			12.8	400	150	360	**303**
BLK18	●			9.9	20	60	240	**107**
BLK19	●			8.1	120	60	140	**107**
BLK20	●			3.7	200	20	60	**93**
BLK21	●			0.2	560	140	140	**280**

(*) Value in brackets and italics represents the distance from the confluence of the tributary with the Blackstone River to the sampling station.

Source: Massachusetts Department of Environmental Protection

Figure 4-14

Wet Weather Data - Storm I: Fecal Coliform (col/100 ml)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				13,000	5,739	4,360	1,103			*3,000*	*2,500*	*760*			*18,000*	*12,000*	*1,600*	
22			●	CSO facility in Worchester															
01	●				8,300	13,446	6,905	1,187			*11,000*	*5,300*	*880*			*17,000*	*9,700*	*1,600*	
23			●	UBWPAD, Worchester	120	92	75	39			*7*	*14*	*36*			*2,000*	*210*	*43*	
02	●				18	26	17	4			*3*	*7*	*4*			*1,400*	*28*	*5*	
03	●																		
04	●				610	931	258	179			*360*	*150*	*160*			*1,600*	*580*	*200*	
05		●		Quinsigamond River		580													
06	●				80	566	667	65			*330*	*310*	*35*			*980*	*1,400*	*120*	
07	●				230	689	343	307			*220*	*300*	*160*			*5,300*	*380*	*590*	
08	●				110	233	151	173			*230*	*60*	*150*			*240*	*300*	*200*	
09		●		Mumford River	60	189	161	33			*96*	*54*	*14*			*350*	*360*	*79*	
10		●		West River															
11	●				90	410	144	114			*270*	*80*	*100*			*510*	*280*	*130*	
12	●																		
13	●				270	945	507	116			*600*	*390*	*90*			*1,900*	*710*	*150*	
14		●		Branch River	1,100	2,932	1,358	890			*2,000*	*280*	*330*			*6,000*	*6,200*	*2,400*	
15		●		Mill River															
16		●		Peters River	5,600	1,384	13,180	693			*410*	*3,100*	*300*			*3,800*	*39,000*	*1,600*	
17	●				420	1,946	607	1,972			*510*	*410*	*720*			*8,500*	*810*	*5,400*	
24			●	Woonsocket WWTF	5	<1	13	<1			*<1*	*<1*	*<1*			*<1*	*14,000*	*<1*	
18	●				120	100	732	28			*59*	*310*	*14*			*140*	*1,700*	*58*	
19	●																		
20	●				61	144	101	61			*48*	*77*	*51*			*270*	*180*	*72*	
21	●			Slater's Mill	270	2,511	697	130			*180*	*400*	*80*			*11,000*	*1,700*	*210*	
25			●	Bucklin Point (Seekonk R.)	47	94	81	19			*5*	*39*	*<1*			*800*	*180*	*350*	

Regulatory Standard:
Not to exceed a geometric mean of 200 MPN/100 ml.
Not more than 20% of the samples shall exceed a value of 500 MPN/100 ml.

Figure 4-15

Wet Weather Data - Storm II: Fecal Coliform (col/100 ml)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean: During Storm	Mean: 24h After Storm	Mean: 48h After Storm	Mean: 72h After Strom	Minimum Concentration: Dry Weather	Min: During Storm	Min: 24h After Storm	Min: 48h After Storm	Min: 72h After Strom	Maximum Concentration: Dry Weather	Max: During Storm	Max: 24h After Storm	Max: 48h After Storm	Max: 72h After Strom
00	●				**1,700**	**5,561**	**856**	**2,500**	**1,400**		*1,800*	*190*				*9,300*	*3,000*		
22			●	CSO facility in Worchester	**400,000**	**190,000**													
01	●				**1,700**	**7,278**	**2,511**	**2,500**	**400**		*3,500*	*2,100*				*13,000*	*2,900*		
23			●	UBWPAD, Worchester	**29,000**	**73,004**	**70,540**	**110,000**	**21,000**		*12,000*	*39,000*				*120,000*	*100,000*		
02	●				**15,000**	**11,472**	**19,675**	**31,000**	**11,000**		*600*	*16,000*				*43,000*	*28,000*		
03	●																		
04	●				**9,800**	**19,972**	**27,794**	**17,000**	**6,300**		*8,300*	*16,000*				*38,000*	*61,000*		
05		●		Quinsigamond River															
06	●				**1,700**	**10,965**	**21,182**	**8,400**	**1,400**		*3,700*	*11,000*				*38,000*	*36,000*		
07	●				**1,200**	**2,538**	**15,522**	**16,000**	**4,900**		*1,200*	*11,000*				*5,000*	*20,000*		
08	●				**1,400**	**1,796**	**9,908**	**15,000**	**4,700**		*760*	*3,200*				*5,000*	*19,000*		
09		●		Mumford River	**3**	**138**	**145**	**140**	**190**		*60*	*90*	*140*			*350*	*260*	*140*	
10		●		West River	**NA**														
11	●				**120**	**348**	**3,451**	**8,800**	**4,700**		*250*	*1,300*				*680*	*6,200*		
12	●																		
13	●				**79**	**113**	**651**	**1,900**	**2,100**		*50*	*230*				*240*	*1,500*		
14		●		Branch River	**320**	**283**	**132**	**60**	**380**		*130*	*80*				*440*	*170*		
15		●		Mill River															
16		●		Peters River	**46,000**	**56,430**	**30,507**	**14,000**	**29,000**		*44,000*	*26,000*				*79,000*	*42,000*		
17	●				**110**	**449**	**605**	**1,200**	**2,000**		*120*	*340*				*1,200*	*870*		
24			●	Woonsocket WWTF	**70**	**115**	**2,230**	**1**	**10**		*2*	*230*				*69,000*	*79,000*		
18	●				**120**	**547**	**900**	**990**	**2,100**		*280*	*560*				*960*	*1,300*		
19	●																		
20	●				**140**	**171**	**670**	**150**	**840**		*90*	*590*				*390*	*760*		
21	●			Slater's Mill	**96**	**1,093**	**522**	**630**	**980**		*60*	*340*				*15,000*	*800*		
25			●	Bucklin Point (Seekonk R.)	**110**	**733**	**59**	**240**	**1,600**		*140*	*11*				*3,000*	*320*		

Regulatory Standard:
Not to exceed a geometric mean of 200 MPN/100 ml.
Not more than 20% of the samples shall exceed a value of 500 MPN/100 ml.

Figure 4-16

Wet Weather Data - Storm III: Fecal Coliform (col/100 ml)

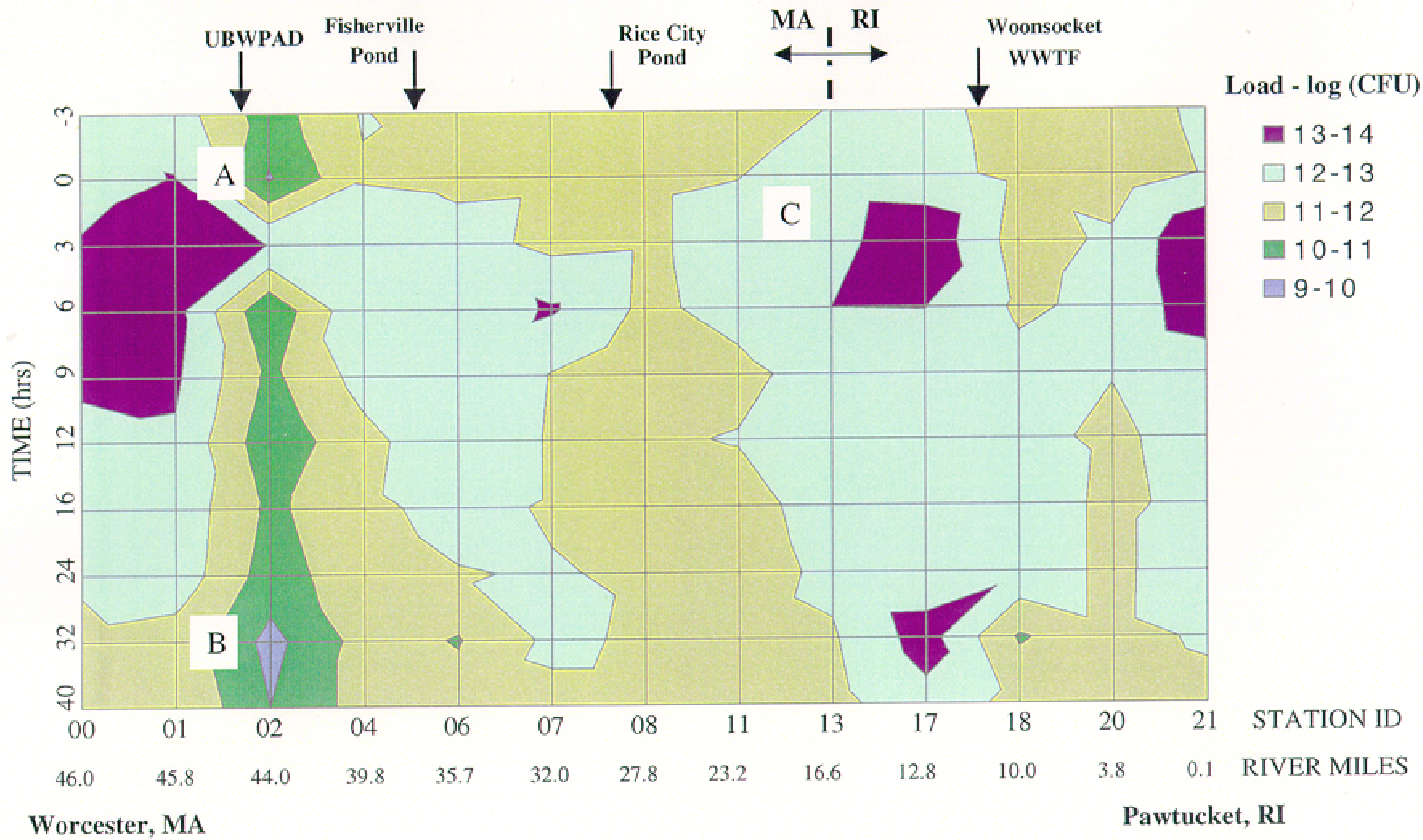
Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean Concentration: During Storm	Mean Concentration: 24h After Storm	Mean Concentration: 48h After Storm	Mean Concentration: 72h After Strom	Minimum Concentration: Dry Weather	Minimum Concentration: During Storm	Minimum Concentration: 24h After Storm	Minimum Concentration: 48h After Storm	Minimum Concentration: 72h After Strom	Maximum Concentration: Dry Weather	Maximum Concentration: During Storm	Maximum Concentration: 24h After Storm	Maximum Concentration: 48h After Storm	Maximum Concentration: 72h After Strom
00	●				**1,100**	**8,781**	**3,933**	**2,100**			*930*	*2,300*				*52,000*	*8,200*		
22			●	CSO facility in Worchester		**1,249**					*40*					*52,000*			
01	●				**1,500**	**7,388**	**4,113**	**1,600**			*2,100*	*2,600*				*16,000*	*6,700*		
23			●	UBWPAD, Worchester	**30**	**56**	**39**	**190**			*35*	*21*				*90*	*120*		
02	●				**1,200**	**1,221**	**3,388**	**900**			*350*	*2,100*				*13,000*	*8,000*		
03	●																		
04	●				**210**	**684**	**2,070**	**1,100**			*20*	*700*				*16,000*	*4,100*		
05		●		Quinsigamond River															
06	●				**420**	**741**	**3,298**	**1,900**			*140*	*2,100*				*4,100*	*6,100*		
07	●				**260**	**546**	**2,743**	**2,300**			*290*	*1,600*				*1,100*	*5,200*		
08	●				**130**	**251**	**3,047**	**2,000**			*190*	*1,900*				*310*	*4,600*		
09		●		Mumford River	**34**	**88**	**262**	**82**			*41*	*140*				*200*	*430*		
10		●		West River															
11	●				**110**	**196**	**654**	**1,100**			*99*	*200*				*330*	*1,900*		
12	●																		
13	●				**67**	**261**	**145**	**230**			*130*	*90*				*380*	*290*		
14		●		Branch River	**1,800**	**870**	**1,043**	**230**			*460*	*370*				*1,300*	*5,800*		
15		●		Mill River															
16		●		Peters River	**63**	**465**	**20,717**	**13,000**			*84*	*460*				*1,200*	*94,000*		
17	●				**1,900**	**2,194**	**613**	**150**			*550*	*430*				*12,000*	*880*		
24			●	Woonsocket WWTF		**5**	**23**				*4*	*8*				*6*	*36*		
18	●				**220**	**1,404**	**2,329**	**260**			*360*	*1,400*				*4,800*	*10,000*		
19	●																		
20	●				**120**	**354**	**465**	**1,900**			*120*	*190*				*770*	*890*		
21	●			Slater's Mill	**19**	**608**	**851**	**650**			*13*	*610*				*6,900*	*1,200*		
25			●	Bucklin Point (Seekonk R.)	**1**	**244**	**75**	**40**			*90*	*32*				*900*	*110*		

Regulatory Standard:
Not to exceed a geometric mean of 200 MPN/100 ml.
Not more than 20% of the samples shall exceed a value of 500 MPN/100 ml.

Figure 4-17

BLACKSTONE RIVER INITIATIVE
FECAL COLIFORM LOADING - STORM 1



Fecal Coliform Loading for Storm 1, September 22-24, 1992

Table 4-18

Source Rankings by Dry and Wet Load

Fecal Coliform

Blackstone River Initiative (Wright et al., 2001)

Station No.						Fecal Coliform *(1E12 pounds)*					Fecal Coliform *(%)*				
							Wet Loads					Wet Loads			
From	To	Blackstone River	Tributary	WWTF/CSO	Location	Dry Weather Load	Storm 1	Storm 2	Storm 3	Average - All Storms	Dry Weather Load	Storm 1	Storm 2	Storm 3	Avergaege - All Storms
headw	00	●					6.73	20.80	11.20			12.40	2.80	29.20	**32.69**
21				●	CSO facility in Worchester			6.34	4.03				0.80	10.50	
00	01(*)	●					7.00	5.41				12.80	0.70		**4.68**
22				●	UBWPAD, Worchester		0.83	336.00	8.51			1.53	45.10	22.20	**16.24**
01	02	●						226.00	5.08				30.30	13.30	**10.55**
02	03	●					0.89	47.90	2.34			1.64	6.40	6.11	**3.73**
03	04	●													
05			●		Quinsigamond River										
04	06	●					0.35					0.64			**0.22**
06	07	●					0.20		1.68			0.37		4.39	**0.82**
07	08	●						11.90					1.60		
09			●		Mumford River		0.04	0.79	0.23			0.08	0.10	0.60	**0.09**
10			●		West River										
08	11	●					0.28					0.51			**0.18**
11	12	●													
12	13	●													
14			●		Branch River		3.29	1.02	0.48			6.05	0.10	1.26	**2.46**
15			●		Mill River										**4.12**
16			●		Peters River		3.03	34.30	0.17			5.57	4.60	0.44	
13	17	●					11.40					20.90			**8.73**
24				●	Woonsocket WWTF		0.65	13.70	2.63			1.19	1.80	6.87	**1.05**
17	18	●							1.73					4.52	
18	19	●							0.26					0.68	
19	20	●													
20	21	●					19.80	41.10				36.40	5.50		**14.44**
Sum of Rankings - MA							**16.3**	**655.1**	**33.1**			**30.0**	**87.8**	**86.3**	**69.2**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**38.2**	**90.1**	**5.3**			**70.1**	**12.0**	**13.8**	**30.8**
Totals							54.5	745.3	38.3			100.1	99.8	100.1	**100.0**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Table 4-19

Exceedences of Regulatory Standards - Dry and Wet Weather Surveys

Fecal Coliform

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone River	Tributary	WWTF/CSO	Location	Log Mean > 200 col/100 ml								10% of Samples exceeding 400 col/100 ml							
					Dry Weather				Wet Weather				Dry Weather				Wet Weather			
					July 11-13, 1991	Aug. 14-15, 1991	Oct. 2-3, 1991	*Total Exceedences (%)*	*Storm 1:* Sep. 22-24, 1992	*Storm 2:* Nov. 2-5, 1992	*Storm 3:* Oct. 12-16, 1993	*Total Exceedences (%)*	July 11-13, 1991	Aug. 14-15, 1991	Oct. 2-3, 1991	*Total Exceedences (%)*	*Storm 1:* Sep. 22-24, 1992	*Storm 2:* Nov. 2-5, 1992	*Storm 3:* Oct. 12-16, 1993	*Total Exceedences (%)*
00	●								●	●	●	*100%*					●	●	●	*100%*
22			●	CSO facility in Worchester																
01	●							*0%*	●	●	●	*100%*					●	●	●	*100%*
23			●	UBWPAD, Worchester																
02	●							*0%*		●	●	*67%*						●	●	*67%*
03	●				●	●		*67%*												
04	●				●	●	●	*100%*	●	●	●	*100%*					●	●	●	*100%*
05		●		Quinsigamond River				*0%*												
06	●				●	●		*67%*	●	●	●	*100%*					●	●	●	*100%*
07	●						●	*33%*	●	●	●	*100%*					●	●	●	*100%*
08	●					●		*33%*		●	●	*67%*						●	●	*67%*
09		●		Mumford River	●			*33%*				*0%*								*0%*
10		●		West River				*0%*												
11	●							*0%*		●	●	*67%*					●	●	●	*100%*
12	●							*0%*												
13	●							*0%*	●	●		*67%*					●	●		*67%*
14		●		Branch River		●	●	*67%*	●	●	●	*100%*					●	●	●	*100%*
15		●		Mill River				*0%*												
16		●		Peters River	●	●	●	*100%*	●	●	●	*100%*					●	●	●	*100%*
17	●				●		●	*67%*	●	●	●	*100%*					●	●	●	*100%*
24			●	Woonsocket WWTF				*0%*												
18	●						●	*33%*		●	●	*67%*						●	●	*67%*
19	●							*0%*												
20	●				●			*33%*		●	●	*67%*						●	●	*67%*
21	●				●			*33%*	●	●	●	*100%*					●	●	●	*100%*

Figure 4-20

Fecal Coliform Concentration (MPN/100 ml) - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**4**		**12**	**4**	**2**	**1**	**3**	**2**	**6**
	Minimum	*0*		*9*	*0*	*0*	*0*	*0*	*1*	*<1*
	Maximum	*15*		*15*	*13*	*7*	*1*	*8*	*4*	*13*
SPRING LAKE	**Mean**	**2**	**1**	**5**	**3**	**1**	**4**	**1**	**2**	**2**
	Minimum	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*<1*	*1*
	Maximum	*36*	*2*	*27*	*29*	*3*	*36*	*2*	*5*	*4*
KEECH POND	**Mean**	**6**	**11**	**12**	**3**	**8**	**2**	**7**	**2**	**5**
	Minimum	*0*	*4*	*2*	*1*	*0*	*0*	*2*	*1*	*<2*
	Maximum	*64*	*64*	*52*	*15*	*25*	*3*	*22*	*4*	*12*
SMITH AND SAYLES RESERVOIR	**Mean**	**2**	**0**	**2**	**2**	**2**	**0**	**1**	**3**	**4**
	Minimum	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*	*<1*
	Maximum	*17*	*0*	*5*	*4*	*5*	*0*	*1*	*8*	*17*
SPRING GROVE POND	**Mean**	**3**	**3**	**5**	**4**	**0**	**2**	**6**	**3**	**3**
	Minimum	*0*	*0*	*3*	*3*	*0*	*0*	*0*	*2*	*<1*
	Maximum	*17*	*14*	*9*	*4*	*0*	*5*	*17*	*4*	*7*
SLATERSVILLE RESERVOIR	**Mean**	**5**			**8**					**3**
	Minimum	*0*			*0*					*2*
	Maximum	*60*			*60*					*4*
VALLEY FALLS POND	**Mean**	**57**								**57**
	Minimum	*25*								*25*
	Maximum	*200*								*200*

Note: Mean Concentration is expressed as geometric mean.

Criteria (Class B & B1)
Geometric Mean - 200 MPN/100ml
80th Percentile - 500 MPN/100 ml

Figure 4-21

RIDEM Chemical Monitoring of Tributaries, Section 305b

Fecal Coliform Concentrations *(col/100 ml)*

Date	Round Top Brook	Pascoag River	Clear River	Abbot Run Brook *(Cumberland)*	Abbot Run Brook *(North Attleboro)*	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
12-Mar-91		1	2	1	4	●		
13-May-91	6	24	120	1	31			●
29-Jul-91	80	70	1,700	10	80			●
06-Sep-91	10	100	570	1	130			●
26-Apr-93	49	21	260	20	390		●	
10-Aug-93	14		170	32	120	●		
27-Dec-93	4	2	4	65	32	●		
11-Mar-96	1	12	1	3	1			●
14-May-96	2	13	16	7	20			●
20-Aug-96	3,900	840	81	4	84	●		
02-Oct-96	8	15	32	3	48			●
14-Apr-98		12	4	1	11	●		
05-Aug-98	30	800	68	10	100	●		
26-Oct-98	13	66	15	6	19	●		
20-Jan-99	2	2	5	2	88			●
19-Mar-99	1	4	4	1	27	●		
10-Jun-99	19	51	110	27	110	●		
19-Aug-99	150	510	40	14	140	●		
12-Oct-99	11	64	110	130	200			●
15-Mar-00	3		10	3	20			●
30-May-00	5	32	90	10	56	●		
18-Sep-00	7	73	29	60	110			●
11-Dec-00		2	6	7	4			●
Statistical Summary - All Samples								
Count	20	21	23	23	23	●	●	●
Geometric Mean	**12**	**26**	**30**	**7**	**41**	●	●	●
Minimum	1	1	1	1	1	●	●	●
Maximum	3,900	840	1,700	130	390	●	●	●
Statistical Summary - Dry Weather								
Count	9	10	11	11	11	●		
Geometric Mean	**22**	**36**	**22**	**7**	**41**	●		
Minimum	1	1	2	1	4	●		
Maximum	3,900	840	170	65	140	●		
Statistical Summary - Mixed and Wet Weather								
Count	11	11	12	12	12		●	●
Geometric Mean	**7**	**19**	**40**	**6**	**40**		●	●
Minimum	1	2	1	1	1		●	●
Maximum	80	100	1,700	130	390		●	●

ND = Not detected

(1) Dry Weather: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) Wet Weather: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) Mixed Weather: Conditions that did not meet Wet or Dry Weather criteria.

Figure 4-22

RIPDES-permitted Point Sources

Fecal Coliform *(col/100 ml)*

Data Period: January 31, 1997, to October 31, 2001

	Flow *(gallons per day)*								Fecal Coliform Concentration *(MPN/100 ml)*							
	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*
Monthly Mean																
Average	50,000	830,000	1,200	2,992	9,180,000	80,000	580,000	330,000	4	28	578	4,981	13			
Minimum	30,000	640,000	268	2,400	5,230,000	30,000	460,000		0	2	2	2	2			
Maximum	70,000	1,220,000	2,988	4,608	13,520,000	140,000	710,000	670,000	66	149	24,000	24,000	108			
Weekly Average																
Average									22	75	930					
Minimum									0	3	2		2			
Maximum									1,100	300	24,000		80,038			
Daily Maximum																
Average	80,000	1,100,000				150,000		530,000	22	149	930		4,818			
Minimum	40,000	700,000				60,000		310,000	0	8	2		2			
Maximum	90,000	2,580,000				250,000		1,820,000	1,100	300	24,000		240,000			

	Flow *(cfs)*							
Monthly Mean								
Average	0.077	1.282	0.002	0.005	14.175	0.124	0.896	0.510
Minimum	0.046	0.988	0.000	0.004	8.076	0.046	0.710	
Maximum	0.108	1.884	0.005	0.007	20.877	0.216	1.096	1.035

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Figure 4-23

Woonsocket Wastewater Treatment Facility - Effluent

Fecal Coliform Concentration

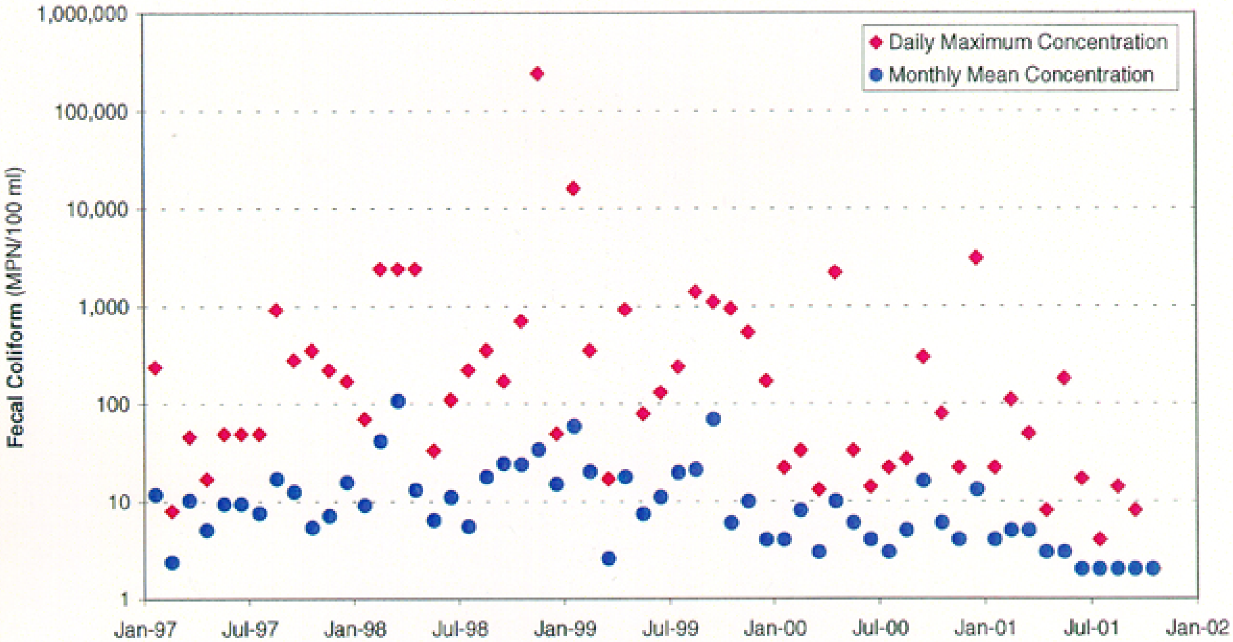


Figure 4-24

Total Copper *(ug/l) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Concentration				Minimum Concentration				Maximum Concentration			
								Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	**12.4**				*8.8*				*15.5*			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	**2.8**		**2.0**		*2.0*				*3.0*			
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	**4.4**				*1.8*				*7.4*			
		URI BRI wet	1991-1993		●			**2.6**	**2.0**	**1.8**	**1.6**	*2.2*	*0.0*	*1.0*	*0.7*	*2.9*	*3.8*	*2.9*	*2.3*
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA	**8.9**		**13.5**		*2.5*		*10.5*		*24.5*		*20.6*	
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line												
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	**11.7**				*8.1*				*20.3*			
		URI BRI wet	1991-1993	●				**9.0**	**8.3**	**11.0**	**11.1**	*6.1*	*3.3*	*8.3*	*6.5*	*13.0*	*11.7*	*14.7*	*14.1*
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	**3.7**				*0.2*				*6.8*			
		URI BRI wet	1991-1993		●			**1.6**	**1.7**	**1.4**	**1.8**	*1.6*	*0.0*	*0.5*	*0.5*	*1.7*	*5.6*	*2.8*	*4.5*
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	**7.4**				*1.6*				*37.4*			
		URI BRI wet	1991-1993		●			**3.6**	**3.7**	**2.7**	**2.0**	*2.2*	*0.5*	*1.5*	*1.7*	*4.6*	*7.3*	*3.8*	*3.0*
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	**9.7**				*6.0*				*19.8*			
		URI BRI wet	1991-1993	●				**9.3**	**9.8**	**9.3**	**10.0**	*8.0*	*4.7*	*7.0*	*6.8*	*10.0*	*14.0*	*11.8*	*13.4*
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		**57.0**	**54.6**	**47.9**	**49.4**	*33.2*	*7.4*	*4.6*	*26.1*	*97.1*	*84.0*	*84.7*	*74.3*
1	WSTP	URI	1988-1989			●													
14	RIPDES	RIDEM	1997-2001			●			**22.3**										
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	**10.0**				*6.5*				*13.3*			
		URI BRI wet	1991-1993	●				**11.1**	**9.4**	**11.8**	**10.0**	*8.5*	*4.4*	*9.0*	*6.5*	*12.5*	*13.6*	*15.3*	*11.8*
9	Manville	USGS	1990-1999	●				**9.3**		**7.6**		*1.0*		*3.0*		*18.0*		*11.0*	
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	**8.6**				*6.8*				*12.4*			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI	**10.7**		**14.9**		*6.0*		*6.7*		*16.4*		*31.3*	
15	20	URI BRI dry	1991	●				**7.9**				*4.8*				*10.6*			
		URI BRI wet	1991-1993	●				**8.7**	**8.6**	**11.0**	**10.6**	*6.9*	*4.5*	*6.9*	*5.6*	*9.8*	*10.7*	*15.4*	*14.9*
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket												
1	BRSM	URI	1988-1989	●			Slaters Mill	**11.2**	**11.6**	**12.1**	**13.3**	*8.1*	*7.3*	*8.6*	*8.8*	*14.5*	*14.8*	*15.0*	*22.7*
2	BRSMDN	URI	1990	●				**9.4**	**11.7**	**9.2**	**7.5**	*6.0*	*5.1*	*4.0*	*5.3*	*14.2*	*79.4*	*14.2*	*9.8*
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				**8.5**				*6.4*				*12.4*			
		URI BRI wet	1991-1993	●				**7.4**	**8.6**	**8.8**	**11.5**	*5.1*	*5.0*	*6.7*	*8.8*	*8.8*	*10.6*	*10.9*	*16.6*
5	TMDL	RIDEM	1995-1996	●															
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI	**7.7**		**13.0**		*1.0*		*7.4*		*13.4*		*22.3*	

***Dissolved* Copper Criteria**	**Criteria (ug/l)** *for Hardness (mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-25

Copper Concentration

USGS Station at Forestdale, Branch River

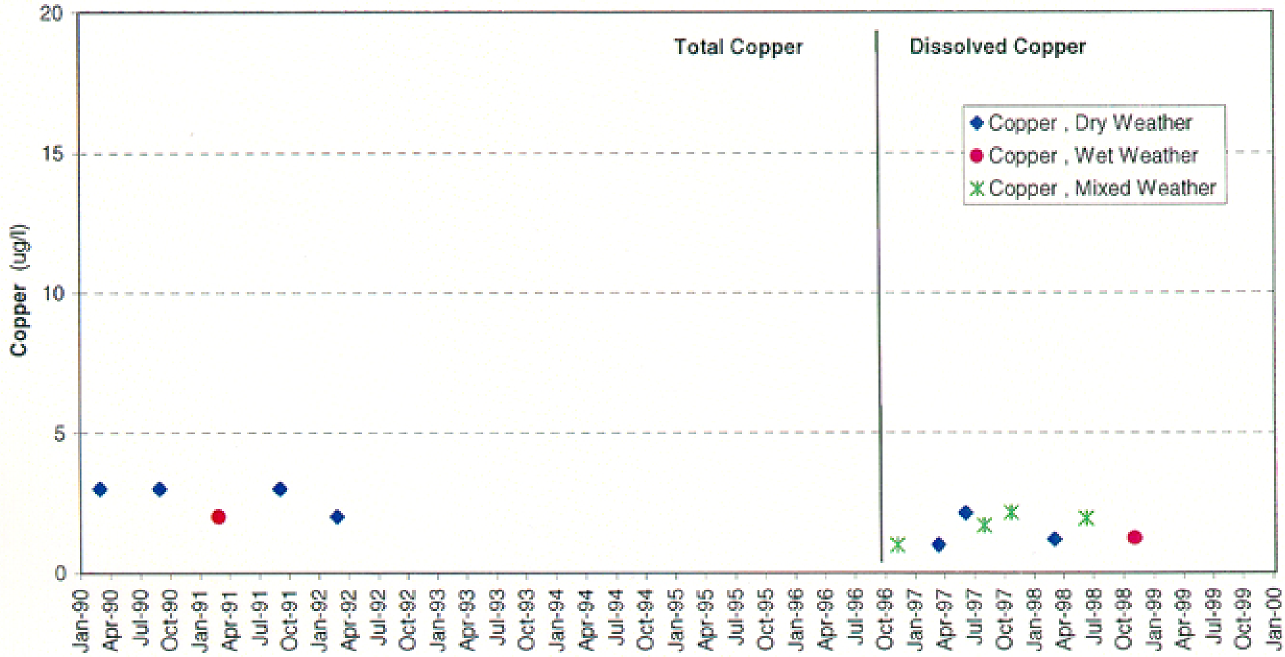


Figure 4-26

Copper Concentration

USGS Station at Manville, Blackstone River

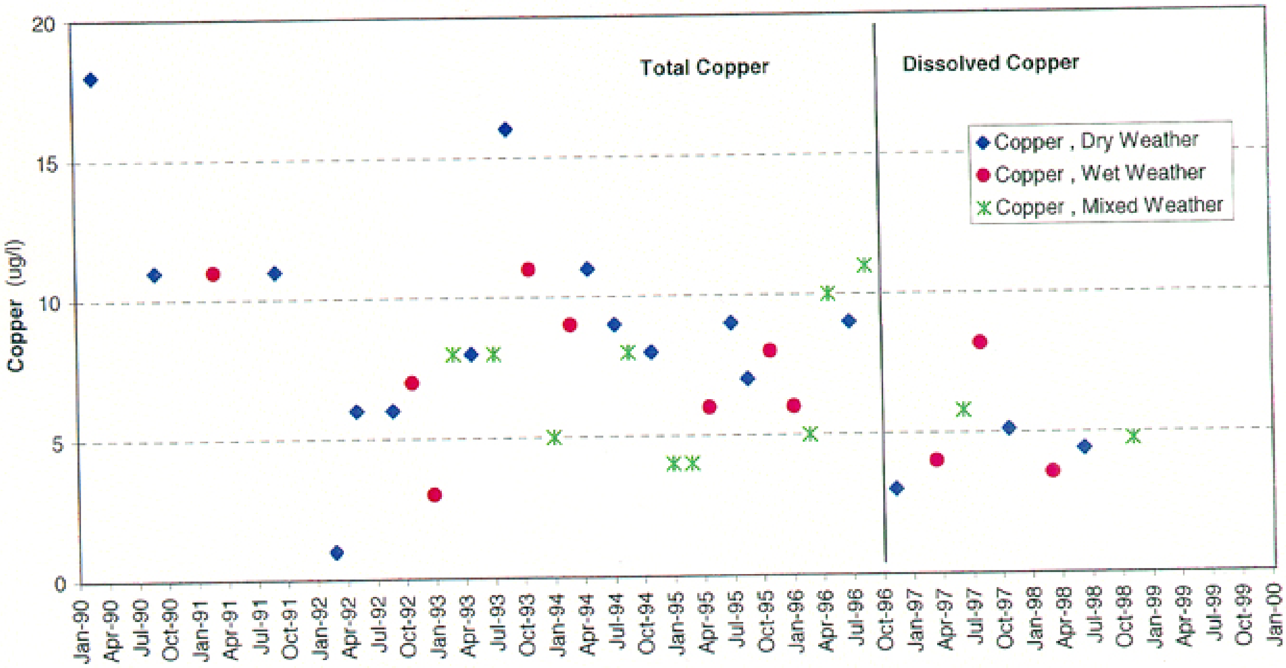


Figure 4-27
Total Copper Concentration
(Kerr and Lee, 1996)

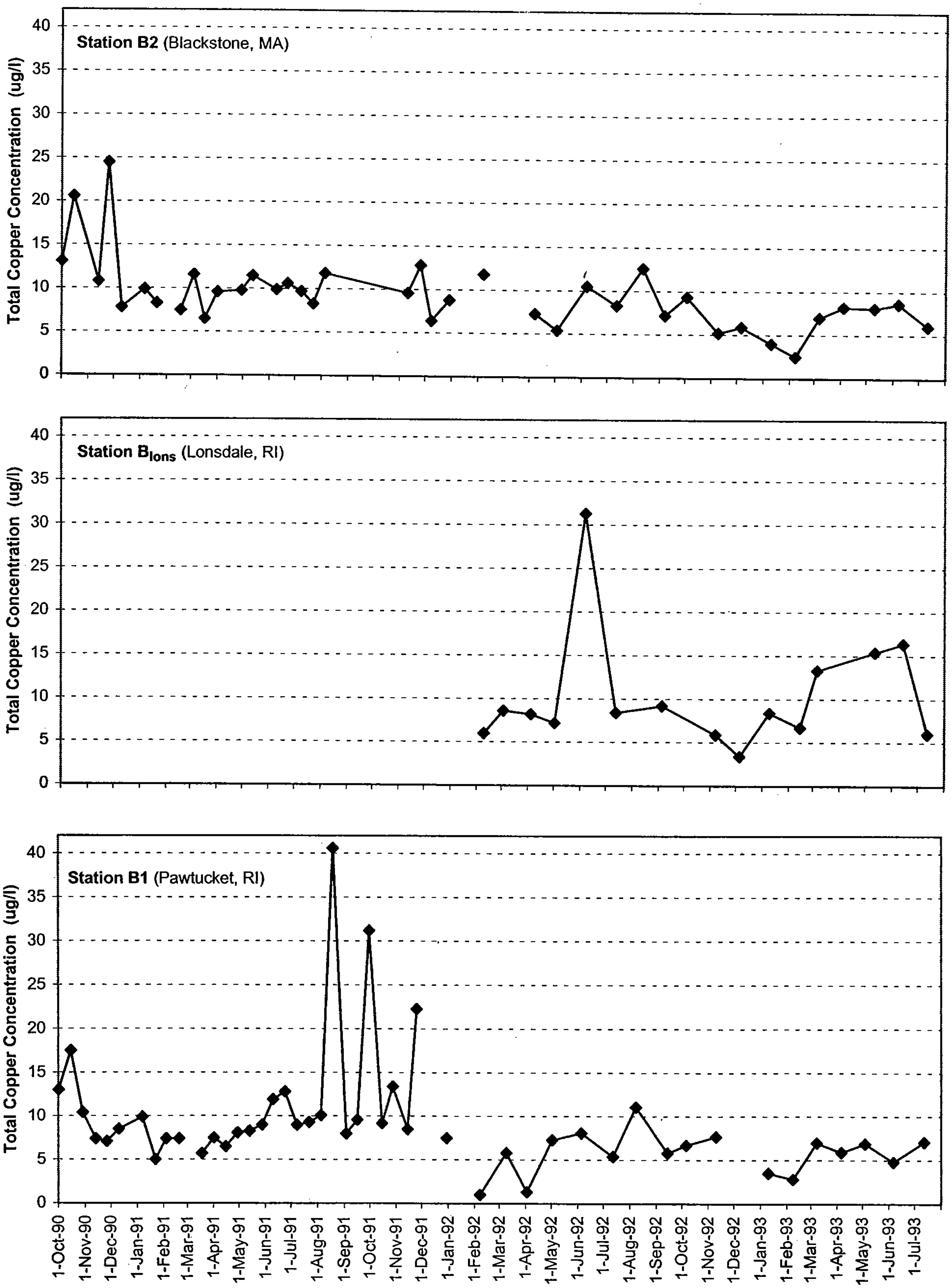


Figure 4-28

River Rescue Project, 1990-1995
(Kerr and Lee, 1996)

Total Copper for all Sampling Events

		All Samples		Wet Weather(*)						Dry Weather			
				Same day of rainfall		0 (same day) and 1 day after rainfall		2nd day only after rainfall		3 to 4 days after rain		More than 4 days after rain	
Station No.	**Station Location**	Count	**Total Copper** (ug/l)	Count	**Total Copper** (ug/l)	Count	**Total Copper** (ug/l)	Count	**Total Copper** (ug/l)	Count	**Total Copper** (ug/l)	Count	**Total Copper** (ug/l)
B2	Blackstone River, Main Street, Blackstone, MA	*39*	**9.4**	*2*	**12.2**	*5*	**13.5**	*3*	**8.8**	*9*	**8.5**	*22*	**8.9**
B_{lons}	Blackstone River, Lonsdale Avenue	*15*	**10.3**	*0*	**...**	*4*	**14.9**	*3*	**6.2**	*2*	**8.3**	*5*	**10.7**
B1	Blackstone River, Main Street, Pawtucket	*47*	**9.4**	*1*	**7.4**	*5*	**13.0**	*3*	**6.5**	*7*	**10.6**	*29*	**7.7**

NOTE:
(*) Rainfall is defined as 0.25" or more on a given day. Rainfall data are from the RI Airport.

Figure 4-29

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Total Copper Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Copper Concentrations Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	Dissolved Copper Fraction *Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			15.00	6.70	6.90	8.70	**9.33**	73.94	41%	28%	43%	16%	**32%**
BLK02	●			49.80	38.70	29.80	28.80	**36.78**	66.35	74%	70%	89%	93%	**82%**
BLK03	●			45.80	29.00	25.60	26.80	**31.80**	59.91		76%	98%	80%	**85%**
BLK04	●			28.30	25.90	26.90	27.60	**27.18**	66.81	70%	79%	74%	71%	**73%**
BLK05		●	Quinsigamond R.	1.30	1.60	1.20	5.40	**2.38**	52.23	8%	6%	8%		**7%**
BLK06	●			29.60	21.70	17.20	20.20	**22.18**	60.27	51%	67%	98%	71%	**72%**
BLK07	●			22.80	22.80		21.00	**22.20**	55.95	35%	38%			**36%**
BLK08	●			45.50	24.10	14.30	53.80	**34.43**	54.00		34%	71%	13%	**40%**
BLK09		●	Mumford River	11.00	9.20	6.60	2.50	**7.33**	19.16	1%	1%	2%	4%	**2%**
BLK10		●	West River	41.00	1.40	10.70	23.40	**19.13**	21.89	3%	7%	1%	0%	**3%**
BLK11	●			15.70	23.00	25.50	25.70	**22.48**	45.74	32%	28%	33%	30%	**31%**
BLK12	●			11.90	11.60	8.80	11.40	**10.93**	45.04	61%	45%	92%	40%	**60%**
BLK13	●			8.80	9.90	14.10	8.50	**10.33**	40.42	59%	41%	50%	33%	**46%**
BLK14		●	Branch River	7.40	7.10	1.80	6.80	**5.78**	14.88	16%	41%		1%	**20%**
BLK15		●	Mill River	4.80	3.70	4.30	2.40	**3.80**	24.54	65%	3%	51%	4%	**31%**
BLK16		●	Peters River	24.90	2.90	37.40	2.00	**16.80**	35.74	59%	90%	12%	5%	**41%**
BLK17	●			9.00	10.40	13.00	7.30	**9.93**	40.34	50%	28%	55%	25%	**39%**
BLK18	●			6.50	10.90	10.70		**9.37**	41.27			96%		**96%**
BLK19	●			7.50	6.80	9.10	7.10	**7.63**	41.32	51%	47%	73%	76%	**62%**
BLK20	●			6.90	8.70	7.70	5.90	**7.30**	42.14	54%	43%	68%	49%	**53%**
BLK21	●		Slaters Mill	6.70	8.60	8.50	6.70	**7.63**	43.55	51%	43%	60%	57%	**53%**

Statistics - all 3 Surveys

Station No.	Mean	*Mini-mum*	*Maxi-mum*	Dissolved Copper Fraction
BLK01	**9.4**	*4.3*	*15.0*	54%
BLK02	**25.7**	*12.5*	*49.8*	84%
BLK03	**24.6**	*9.1*	*45.8*	80%
BLK04	**22.2**	*11.0*	*29.0*	79%
BLK05	**2.2**	*1.0*	*5.4*	39%
BLK06	**20.2**	*8.4*	*29.6*	74%
BLK07	**18.3**	*12.4*	*22.8*	57%
BLK08	**26.2**	*14.3*	*53.8*	53%
BLK09	**4.4**	*1.3*	*11.0*	21%
BLK10	**8.5**	*1.0*	*41.0*	38%
BLK11	**18.8**	*14.2*	*25.7*	41%
BLK12	**12.4**	*8.8*	*15.5*	60%
BLK13	**11.7**	*8.1*	*20.3*	51%
BLK14	**4.4**	*1.8*	*7.4*	53%
BLK15	**3.7**	*0.2*	*6.8*	44%
BLK16	**7.4**	*1.6*	*37.4*	56%
BLK17	**9.7**	*6.0*	*19.8*	52%
BLK18	**10.0**	*6.5*	*13.3*	77%
BLK19	**8.6**	*6.8*	*12.4*	67%
BLK20	**7.9**	*4.8*	*10.6*	68%
BLK21	**8.5**	*6.4*	*12.4*	63%
			Mean	*58%*

August 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	*Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			9.90	7.60	11.50	10.10	**9.78**	65.41	64%	70%	52%	89%	**69%**
BLK02	●			26.80	23.90	27.70	22.00	**25.10**	55.15	87%	86%	85%	92%	**87%**
BLK03	●			28.30	22.40	30.80	22.70	**26.05**	55.20	79%	80%	86%	84%	**83%**
BLK04	●			29.00	21.20	26.30	22.80	**24.83**	54.34	86%	86%	84%	84%	**85%**
BLK05		●	Quinsigamond R.	2.10	3.40	3.20	1.00	**2.43**	44.17	5%	9%	78%	10%	**25%**
BLK06	●			25.50	22.30	26.00	24.50	**24.58**	51.31	73%	92%	77%	73%	**79%**
BLK07	●			20.10	13.30	21.90	16.40	**17.93**	47.96	54%	77%	57%	76%	**66%**
BLK08	●			36.80	16.00	29.90	25.20	**26.98**	43.83	41%	64%	59%	65%	**57%**
BLK09		●	Mumford River	1.30	2.90	2.10	1.30	**1.90**	16.84	8%	17%	43%	8%	**19%**
BLK10		●	West River	1.00	1.50	4.80	3.40	**2.68**	18.44	10%	20%	73%	79%	**46%**
BLK11	●			16.30	14.30	20.40	14.20	**16.30**	35.61	37%	50%	57%	45%	**47%**
BLK12	●			11.80	12.20	14.80	10.80	**12.40**	34.53	61%	93%	59%	54%	**67%**
BLK13	●			10.80	8.60	13.50	8.10	**10.25**	30.22	56%	59%	60%	51%	**56%**
BLK14		●	Branch River	3.40	2.50	2.10	5.20	**3.30**	16.85	44%	92%	86%	29%	**63%**
BLK15		●	Mill River	4.60	3.30	0.20	6.60	**3.68**	21.18	35%		50%	2%	**29%**
BLK16		●	Peters River	3.10			2.60	**2.85**	28.41	16%			88%	**52%**
BLK17	●			7.30	6.00	7.40	8.30	**7.25**	29.56	74%	53%	58%	47%	**58%**
BLK18	●			10.40	10.70	7.80	13.10	**10.50**	32.66	91%	63%	71%	46%	**68%**
BLK19	●			9.10	8.70	9.40	12.40	**9.90**	35.39	71%	79%	73%		**75%**
BLK20	●			8.80	9.30	10.60	9.00	**9.43**	38.72	89%	59%	52%	62%	**65%**
BLK21	●		Slaters Mill	7.70	11.70	12.40	8.10	**9.98**	37.59	69%	57%	52%	65%	**61%**

October 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	*Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			11.20	4.30	8.90	11.60	**9.00**	47.98	48%	63%	97%	41%	**62%**
BLK02	●			14.10	12.50	17.20	17.60	**15.35**	53.94	87%	70%	90%	82%	**82%**
BLK03	●			16.80	9.10	18.80	19.50	**16.05**	52.91	74%	75%	72%	75%	**74%**
BLK04	●			14.50	11.00	16.30	16.90	**14.68**	49.31	85%	51%	83%	93%	**78%**
BLK05		●	Quinsigamond R.	1.40	1.20	1.30	2.90	**1.70**	39.59	57%	100%	92%	86%	**84%**
BLK06	●			16.90	8.40	15.20	14.60	**13.78**	46.90	49%	95%	71%	68%	**71%**
BLK07	●			17.30	13.50	12.40	15.70	**14.73**	44.77	76%	56%	69%	77%	**70%**
BLK08	●			19.90	16.40	14.40	17.80	**17.13**	44.96	55%	69%	71%	57%	**63%**
BLK09		●	Mumford River	5.20	2.10	2.80	5.30	**3.85**	13.63	38%	38%	36%	58%	**43%**
BLK10		●	West River	1.60	1.70	2.30	9.30	**3.73**	17.57	94%	59%	43%		**65%**
BLK11	●			16.30	21.00	14.30	18.90	**17.63**	33.24	65%	29%	56%	35%	**46%**
BLK12	●			13.00	15.50	14.00	13.10	**13.90**	33.16	54%	32%	78%	52%	**54%**
BLK13	●			12.90	12.30	20.30	12.50	**14.50**	31.65	56%	48%		47%	**50%**
BLK14		●	Branch River	4.20	3.90		4.10	**4.07**	11.54	86%	97%		44%	**76%**
BLK15		●	Mill River	2.70	2.80	6.80	1.80	**3.53**	18.83	74%	64%		78%	**72%**
BLK16		●	Peters River	2.90	3.30		1.60	**2.60**	29.14	86%	64%			**75%**
BLK17	●			9.80	19.80	9.20	9.20	**12.00**	27.98	52%		61%	66%	**60%**
BLK18	●			13.30	8.80	7.40	10.90	**10.10**	28.22	45%	93%	76%	54%	**67%**
BLK19	●			7.20	7.40	10.00	8.90	**8.38**	29.32	61%	72%	58%	67%	**65%**
BLK20	●			4.80	7.50		8.90	**7.07**	29.49				85%	**85%**
BLK21	●		Slaters Mill	6.40	6.80	9.90	8.50	**7.90**	30.35	95%	78%	57%	68%	**75%**

Figure 4-30

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Dissolved Copper Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Exceedances: Acute Criteria Run #1	Acute Run #2	Acute Run #3	Acute Run #4	Acute Mean	Exceedances: Chronic Criteria Run #1	Chronic Run #2	Chronic Run #3	Chronic Run #4	Chronic Mean	Average Hardness	Acute Criteria	Chronic Criteria	Statistics of all 3 Surveys: Mean	Mini-mum	Maxi-mum
BLK01	●			6.10	1.90	3.00	1.40	**3.10**											73.9	12.80	8.77	**5.0**	*1.4*	*9.0*
BLK02	●			37.10	27.20	26.40	26.90	**29.40**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	66.4	11.56	7.99	**21.4**	*8.8*	*37.1*
BLK03	●				22.10	25.20	21.40	**22.90**		◆	◆	◆	●		◆	◆	◆	●	59.9	10.50	7.33	**18.8**	*6.8*	*26.6*
BLK04	●			19.90	20.40	19.90	19.50	**19.93**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	66.8	11.64	8.04	**17.6**	*5.6*	*24.9*
BLK05		●	Quinsigamond R.	0.10	0.10	0.10		**0.10**											52.2	9.23	6.52	**0.8**	*0.1*	*2.5*
BLK06	●			15.10	14.50	16.90	14.40	**15.23**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	60.3	10.56	7.36	**14.6**	*8.0*	*20.6*
BLK07	●			7.90	8.60			**8.25**						◆	◆			●	56.0	9.85	6.91	**10.0**	*7.6*	*13.1*
BLK08	●			7.50	8.30	10.20	7.00	**8.25**			◆			◆	◆	◆	◆	●	54.0	9.52	6.70	**11.3**	*7.0*	*17.7*
BLK09		●	Mumford River	0.10	0.10	0.10	0.10	**0.10**											19.2	4.61	3.47	**0.7**	*0.1*	*3.1*
BLK10		●	West River	1.30	0.10	0.10	0.10	**0.40**											21.9	4.61	3.47	**1.1**	*0.1*	*3.5*
BLK11	●			5.10	6.40	8.50	7.60	**6.90**			◆				◆	◆	◆	●	45.7	8.14	5.82	**7.5**	*5.1*	*11.6*
BLK12	●			7.30	5.20	8.10	4.60	**6.30**			◆			◆		◆		●	45.0	8.03	5.74	**7.3**	*4.6*	*11.3*
BLK13	●			5.20	4.10	7.10	2.80	**4.80**								◆			40.4	7.25	5.23	**5.7**	*2.8*	*8.1*
BLK14		●	Branch River	1.20	2.90		0.10	**1.40**		◆					◆				14.9	4.61	3.47	**2.1**	*0.1*	*3.8*
BLK15		●	Mill River	3.10	0.10	2.20	0.10	**1.38**											24.5	4.61	3.47	**1.2**	*0.1*	*3.1*
BLK16		●	Peters River	14.70	2.60	4.60	0.10	**5.50**	◆					◆				●	35.7	6.45	4.71	**3.1**	*0.1*	*14.7*
BLK17	●			4.50	2.90	7.20	1.80	**4.10**								◆			40.3	7.23	5.23	**4.6**	*1.8*	*7.2*
BLK18	●				3.70	10.30		**7.00**			◆					◆		●	41.3	7.39	5.33	**6.8**	*3.7*	*10.3*
BLK19	●			3.80	3.20	6.60	5.40	**4.75**								◆	◆		41.3	7.40	5.33	**5.6**	*3.2*	*6.9*
BLK20	●			3.70	3.70	5.20	2.90	**3.88**											42.1	7.54	5.42	**5.0**	*2.9*	*7.8*
BLK21	●		Slaters Mill	3.40	3.70	5.10	3.80	**4.00**											43.6	7.78	5.58	**5.2**	*3.4*	*6.7*

August 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Acute Run #1	Acute Run #2	Acute Run #3	Acute Run #4	Acute Mean	Chronic Run #1	Chronic Run #2	Chronic Run #3	Chronic Run #4	Chronic Mean	Average Hardness	Acute Criteria	Chronic Criteria
BLK01	●			6.30	5.30	6.00	9.00	**6.65**									◆		65.4	11.41	7.90
BLK02	●			23.20	20.50	23.60	20.30	**21.90**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	55.2	9.71	6.83
BLK03	●			22.40	18.00	26.60	19.10	**21.53**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	55.2	9.72	6.83
BLK04	●			24.90	18.20	22.10	19.20	**21.10**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	54.3	9.58	6.74
BLK05		●	Quinsigamond R.	0.10	0.30	2.50	0.10	**0.75**											44.2	7.88	5.65
BLK06	●			18.50	20.60	20.00	18.00	**19.28**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	51.3	9.07	6.42
BLK07	●			10.80	10.20	12.50	12.40	**11.48**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	48.0	8.52	6.06
BLK08	●			15.00	10.30	17.70	16.40	**14.85**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	43.8	7.82	5.61
BLK09		●	Mumford River	0.10	0.50	0.90	0.10	**0.40**											16.8	4.61	3.47
BLK10		●	West River	0.10	0.30	3.50	2.70	**1.65**								◆			18.4	4.61	3.47
BLK11	●			6.00	7.20	11.60	6.40	**7.80**		◆	◆		●	◆	◆	◆	◆	●	35.6	6.43	4.70
BLK12	●			7.20	11.30	8.80	5.80	**8.28**	◆	◆	◆		●	◆	◆	◆	◆	●	34.5	6.25	4.58
BLK13	●			6.00	5.10	8.10	4.10	**5.83**	◆		◆		●	◆	◆	◆	◆	●	30.2	5.51	4.08
BLK14		●	Branch River	1.50	2.30	1.80	1.50	**1.78**											16.9	4.61	3.47
BLK15		●	Mill River	1.60	0.20	0.10	0.10	**0.50**											21.2	4.61	3.47
BLK16		●	Peters River	0.50			2.30	**1.40**											28.4	5.20	3.87
BLK17	●			5.40	3.20	4.30	3.90	**4.20**	◆					◆		◆		●	29.6	5.40	4.01
BLK18	●			9.50	6.70	5.50	6.00	**6.93**	◆	◆		◆	●	◆	◆	◆	◆	●	32.7	5.93	4.36
BLK19	●			6.50	6.90	6.90		**6.77**	◆	◆	◆		●	◆	◆	◆		●	35.4	6.39	4.67
BLK20	●			7.80	5.50	5.50	5.60	**6.10**	◆					◆	◆	◆	◆	●	38.7	6.96	5.05
BLK21	●		Slaters Mill	5.30	6.70	6.40	5.30	**5.93**						◆	◆	◆	◆	●	37.6	6.77	4.92

October 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Acute Run #1	Acute Run #2	Acute Run #3	Acute Run #4	Acute Mean	Chronic Run #1	Chronic Run #2	Chronic Run #3	Chronic Run #4	Chronic Mean	Average Hardness	Acute Criteria	Chronic Criteria
BLK01	●			5.40	2.70	8.60	4.80	**5.38**			◆					◆			48.0	8.52	6.06
BLK02	●			12.30	8.80	15.40	14.50	**12.75**	◆		◆	◆	●	◆	◆	◆	◆	●	53.9	9.51	6.70
BLK03	●			12.50	6.80	13.60	14.60	**11.88**	◆		◆	◆	●	◆	◆	◆	◆	●	52.9	9.34	6.59
BLK04	●			12.30	5.60	13.50	15.80	**11.80**	◆		◆	◆	●	◆		◆	◆	●	49.3	8.74	6.20
BLK05		●	Quinsigamond R.	0.80	1.20	1.20	2.50	**1.43**											39.6	7.11	5.14
BLK06	●			8.20	8.00	10.80	10.00	**9.25**			◆	◆	●	◆	◆	◆	◆	●	46.9	8.34	5.94
BLK07	●			13.10	7.60	8.60	12.10	**10.35**	◆		◆	◆	●	◆	◆	◆	◆	●	44.8	7.98	5.71
BLK08	●			11.00	11.30	10.20	10.20	**10.68**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	45.0	8.01	5.73
BLK09		●	Mumford River	2.00	0.80	1.00	3.10	**1.73**											13.6	4.61	3.47
BLK10		●	West River	1.50	1.00	1.00		**1.17**											17.6	4.61	3.47
BLK11	●			10.60	6.10	8.00	6.60	**7.83**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	33.2	6.03	4.43
BLK12	●			7.00	5.00	10.90	6.80	**7.43**	◆		◆	◆	●	◆	◆	◆	◆	●	33.2	6.01	4.42
BLK13	●			7.20	5.90		5.90	**6.33**	◆	◆		◆	●	◆	◆		◆	●	31.7	5.76	4.25
BLK14		●	Branch River	3.60	3.80		1.80	**3.07**						◆	◆				11.5	4.61	3.47
BLK15		●	Mill River	2.00	1.80		1.40	**1.73**											18.8	4.61	3.47
BLK16		●	Peters River	2.50	2.10			**2.30**											29.1	5.32	3.96
BLK17	●			5.10		5.60	6.10	**5.60**			◆	◆	●	◆		◆	◆	●	28.0	5.12	3.82
BLK18	●			6.00	8.20	5.60	5.90	**6.43**	◆	◆	◆	◆	●	◆	◆	◆	◆	●	28.2	5.17	3.85
BLK19	●			4.40	5.30	5.80	6.00	**5.38**			◆	◆	●	◆	◆	◆	◆	●	29.3	5.36	3.98
BLK20	●			3.40	4.20		7.60	**5.07**				◆			◆		◆	●	29.5	5.39	4.00
BLK21	●		Slaters Mill	6.10	5.30	5.60	5.80	**5.70**	◆		◆	◆	●	◆	◆	◆	◆	●	30.4	5.53	4.10

Figure 4-31

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Particulate Copper Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			8.9	4.8	3.9	7.3	**6.23**
BLK02	●			11.7	11.5	3.4	1.9	**7.13**
BLK03	●				6.9	0.4	5.4	**4.23**
BLK04	●			8.4	5.5	7.0	8.1	**7.25**
BLK05		●	Quinsigamond River	1.2	1.5	1.1		**1.27**
BLK06	●			14.5	7.2	0.3	5.8	**6.95**
BLK07	●			14.9	14.2			**14.55**
BLK08	●			37.5	15.8	4.1	46.8	**26.05**
BLK09		●	Mumford River	10.9	9.1	6.5	2.4	**7.22**
BLK10		●	West River	39.7	1.3	10.6	23.3	**18.73**
BLK11	●			10.6	16.6	17.0	18.1	**15.58**
BLK12	●			4.6	6.4	0.7	6.8	**4.63**
BLK13	●			3.6	5.8	7.0	5.7	**5.53**
BLK14		●	Branch River	6.2	4.2		6.7	**5.70**
BLK15		●	Mill River	1.7	3.6	2.1	2.3	**2.42**
BLK16		●	Peters River	10.2	0.3	32.8	1.9	**11.30**
BLK17	●			4.5	7.5	5.8	5.5	**5.83**
BLK18	●				7.5	0.4		**3.95**
BLK19	●			3.7	3.6	2.5	1.7	**2.88**
BLK20	●			3.2	5.0	2.5	3.0	**3.42**
BLK21	●		Slaters Mill	3.3	4.9	3.4	2.9	**3.63**

Statistics - all 3 surveys

Mean	*Minimum*	*Maximum*
4.3	*0.3*	*8.9*
4.3	*1.7*	*11.7*
4.3	*0.4*	*6.9*
4.6	*1.1*	*8.4*
1.1	*0.0*	*3.1*
5.6	*0.3*	*14.5*
8.5	*3.1*	*14.9*
14.9	*4.1*	*46.8*
3.6	*1.2*	*10.9*
6.8	*0.1*	*39.7*
11.3	*5.7*	*18.1*
5.1	*0.7*	*10.5*
5.4	*3.5*	*7.0*
2.7	*0.1*	*6.7*
2.1	*0.0*	*6.5*
4.4	*0.2*	*32.8*
4.2	*1.9*	*7.5*
3.7	*0.4*	*7.5*
2.7	*1.7*	*4.2*
2.9	*1.0*	*5.1*
3.3	*0.3*	*6.0*

August 1991 Survey

BLK01	●			3.6	2.3	5.5	1.1	**3.13**
BLK02	●			3.6	3.4	4.1	1.7	**3.20**
BLK03	●			5.9	4.4	4.2	3.6	**4.53**
BLK04	●			4.1	3.0	4.2	3.6	**3.73**
BLK05		●	Quinsigamond River	2.0	3.1	0.7	0.9	**1.67**
BLK06	●			7.0	1.7	6.0	6.5	**5.30**
BLK07	●			9.3	3.1	9.4	4.0	**6.45**
BLK08	●			21.8	5.7	12.2	8.8	**12.13**
BLK09		●	Mumford River	1.2	2.4	1.2	1.2	**1.50**
BLK10		●	West River	0.9	1.2	1.3	0.7	**1.02**
BLK11	●			10.3	7.1	8.8	7.8	**8.50**
BLK12	●			4.6	0.9	6.0	5.0	**4.13**
BLK13	●			4.8	3.5	5.4	4.0	**4.43**
BLK14		●	Branch River	1.9	0.2	0.3	3.7	**1.52**
BLK15		●	Mill River	3.0	3.2	0.0	6.5	**3.18**
BLK16		●	Peters River	2.6			0.3	**1.45**
BLK17	●			1.9	2.8	3.1	4.4	**3.05**
BLK18	●			0.9	4.0	2.3	7.1	**3.58**
BLK19	●			2.6	1.8	2.5		**2.30**
BLK20	●			1.0	3.8	5.1	3.4	**3.33**
BLK21	●		Slaters Mill	2.4	5.0	6.0	2.8	**4.05**

October 1991 Survey

BLK01	●			5.8	1.6	0.3	6.8	**3.63**
BLK02	●			1.8	3.7	1.8	3.0	**2.58**
BLK03	●			4.3	2.3	5.2	4.9	**4.18**
BLK04	●			2.2	5.4	2.8	1.1	**2.88**
BLK05		●	Quinsigamond River	0.6	0.0	0.1		**0.23**
BLK06	●			8.7	0.4	4.4	4.6	**4.53**
BLK07	●			4.2	5.9	3.8	3.6	**4.38**
BLK08	●			8.9	5.1	4.2	7.6	**6.45**
BLK09		●	Mumford River	3.2	1.3	1.8	2.2	**2.13**
BLK10		●	West River	0.1	0.7	1.3		**0.70**
BLK11	●			5.7	14.9	6.3	12.3	**9.80**
BLK12	●			6.0	10.5	3.1	6.3	**6.48**
BLK13	●			5.7	6.4		6.6	**6.23**
BLK14		●	Branch River	0.6	0.1		2.3	**1.00**
BLK15		●	Mill River	0.7	1.0		0.4	**0.70**
BLK16		●	Peters River	0.4	0.2			**0.30**
BLK17	●			4.7		3.6	3.1	**3.80**
BLK18	●			7.3	0.6	1.8	5.0	**3.67**
BLK19	●			2.8	2.1	4.2	2.9	**3.00**
BLK20	●				1.4		1.3	**1.97**
BLK21	●		Slaters Mill	0.3	1.5	4.3	2.7	**2.20**

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

Figure 4-32

Wet Weather Data - Storm I: Total Copper (ug/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**6.0**	**6.2**	**5.7**	**3.0**			*4.8*	*1.3*	*2.4*			*7.4*	*11.3*	*3.6*	
22			●	CSO facility in Worchester															
01	●				**7.1**	**8.8**	**6.4**	**3.1**			*1.3*	*4.7*	*2.8*			*14.8*	*8.4*	*3.4*	
23			●	UBWPAD, Worchester	**68.2**	**68.7**	**52.5**	**52.3**			*60.1*	*47.5*	*48.9*			*74.1*	*58.6*	*55.7*	
02	●				**41.8**	**15.9**	**6.9**	**33.0**			*1.8*	*2.2*	*24.2*			*42.7*	*11.7*	*41.7*	
03	●																		
04	●				**43.6**	**50.7**	**27.4**	**26.4**			*38.6*	*24.7*	*24.4*			*69.1*	*30.0*	*28.3*	
05		●		Quinsigamond River	**1.1**	**2.8**	**1.2**	**0.9**			*2.2*	*1.0*	*0.8*			*3.2*	*1.5*	*1.0*	
06	●				**30.2**	**41.1**	**30.5**	**23.6**			*38.1*	*25.2*	*23.0*			*43.9*	*40.2*	*24.1*	
07	●				**23.1**	**22.7**	**25.8**	**24.8**			*21.0*	*23.9*	*22.9*			*23.8*	*28.3*	*26.6*	
08	●				**23.9**	**35.8**	**24.7**	**27.0**			*29.4*	*19.2*	*23.8*			*45.8*	*29.3*	*30.1*	
09		●		Mumford River	**2.9**	**1.9**	**1.3**	**1.5**			*1.1*	*1.1*	*1.1*			*2.6*	*1.6*	*1.8*	
10		●		West River	**2.0**	**2.5**	**1.9**	**1.3**			*1.4*	*1.3*	*1.1*			*4.3*	*3.0*	*1.5*	
11	●				**15.5**	**19.2**	**15.4**	**17.9**			*17.2*	*13.7*	*17.4*			*21.8*	*19.0*	*18.4*	
12	●																		
13	●				**13.0**	**10.9**	**10.6**	**11.0**			*10.4*	*10.3*	*10.0*			*11.7*	*11.0*	*12.0*	
14		●		Branch River	**2.9**	**3.1**	**2.5**	**2.1**			*2.7*	*2.1*	*1.9*			*3.8*	*2.9*	*2.3*	
15		●		Mill River	**1.6**	**1.7**	**1.7**	**1.8**			*1.3*	*1.3*	*1.8*			*2.2*	*2.8*	*1.8*	
16		●		Peters River	**4.6**	**4.9**	**3.1**	**1.8**			*2.1*	*2.7*	*1.7*			*6.6*	*3.7*	*1.9*	
17	●				**10.0**	**11.6**	**9.3**	**10.2**			*10.4*	*7.8*	*9.5*			*12.6*	*11.8*	*10.8*	
24			●	Woonsocket WWTF	**33.2**	**54.5**	**26.4**	**49.3**			*23.5*	*22.2*	*48.9*			*71.2*	*32.4*	*49.7*	
18	●				**12.5**	**11.2**	**12.9**	**10.5**			*10.1*	*11.1*	*10.0*			*12.3*	*15.3*	*11.0*	
19	●																		
20	●				**9.4**	**9.7**	**10.9**	**11.5**			*9.4*	*10.0*	*11.4*			*10.3*	*11.7*	*11.6*	
21	●				**8.8**	**9.8**	**9.3**	**13.9**			*9.1*	*8.6*	*11.1*			*10.6*	*10.5*	*16.6*	
25			●	Bucklin Point (Seekonk R.)	**15.7**	**21.8**	**19.5**	**17.5**			*19.2*	*17.4*	*16.0*			*26.5*	*22.5*	*18.9*	

***Dissolved* Copper Criteria**	**Criteria (ug/l)** *(mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-33

Wet Weather Data - Storm II: Total Copper (ug/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**3.0**	**9.9**	**3.9**	**4.6**	**3.7**		*3.6*	*2.8*	*4.0*			*22.7*	*4.6*	*5.2*	
22			●	CSO facility in Worchester	**15.0**	**17.5**					*13.0*					*22.0*			
01	●				**8.1**	**15.2**	**6.2**	**3.0**	**4.4**		*7.9*	*4.4*	*2.8*			*22.9*	*10.0*	*3.1*	
23			●	UBWPAD, Worchester	**17.9**	**15.6**	**18.8**	**17.1**	**14.0**		*13.0*	*15.6*	*16.3*			*19.1*	*22.0*	*17.9*	
02	●				**15.2**	**18.9**	**10.7**	**8.2**	**8.4**		*10.9*	*7.1*	*7.5*			*27.0*	*16.1*	*8.9*	
03	●																		
04	●				**10.9**	**29.9**	**12.0**	**7.1**	**7.2**		*11.6*	*8.4*	*5.7*			*60.6*	*18.0*	*8.5*	
05		●		Quinsigamond River	**1.5**	**2.1**	**1.4**	**1.4**	**1.0**		*1.0*	*0.8*	*1.0*			*4.1*	*2.0*	*1.8*	
06	●				**13.0**	**21.6**	**13.6**	**10.1**	**8.9**		*12.9*	*10.3*	*9.7*			*50.8*	*18.0*	*10.5*	
07	●				**13.2**	**13.8**	**14.9**	**11.3**	**12.6**		*12.7*	*12.0*	*9.3*			*15.8*	*16.5*	*13.3*	
08	●				**14.0**	**18.6**	**20.1**	**14.5**	**10.1**		*14.7*	*15.5*	*12.2*			*33.0*	*25.6*	*16.7*	
09		●		Mumford River	**2.3**	**1.1**	**1.2**	**1.4**	**0.9**		*0.7*	*1.0*	*1.3*			*1.4*	*1.3*	*1.5*	
10		●		West River	**1.0**	**1.1**	**1.1**	**1.5**	**1.4**		*0.9*	*0.6*	*1.1*			*1.4*	*1.7*	*1.9*	
11	●				**12.5**	**12.5**	**21.1**	**11.8**	**9.8**		*9.0*	*13.4*	*7.5*			*22.0*	*41.3*	*16.1*	
12	●																		
13	●				**7.8**	**7.3**	**10.6**	**9.5**	**12.1**		*6.3*	*8.3*	*6.5*			*8.5*	*13.3*	*12.4*	
14		●		Branch River	**2.2**	**1.9**	**1.8**	**1.6**	**2.3**		*1.7*	*1.5*	*1.5*			*2.3*	*2.1*	*1.6*	
15		●		Mill River	**1.7**	**1.9**	**1.2**	**2.9**	**1.7**		*1.0*	*0.8*	*1.2*			*5.6*	*1.5*	*4.5*	
16		●		Peters River	**3.9**	**4.0**	**2.6**	**1.9**	**1.7**		*2.0*	*1.6*	*1.7*			*7.3*	*3.8*	*2.1*	
17	●				**8.0**	**8.0**	**8.7**	**8.8**	**9.5**		*6.8*	*7.0*	*6.8*			*9.2*	*10.5*	*10.8*	
24			●	Woonsocket WWTF	**40.6**	**33.0**	**35.4**	**26.3**	**NA**		*7.4*	*4.6*	*26.1*			*55.7*	*61.9*	*26.5*	
18	●				**8.5**	**8.8**	**10.3**	**9.8**	**11.1**		*7.4*	*9.0*	*7.7*			*10.2*	*12.0*	*11.8*	
19	●																		
20	●				**6.9**	**7.5**	**9.9**	**7.3**	**8.9**		*6.7*	*6.9*	*5.6*			*9.8*	*11.4*	*8.9*	
21	●				**5.1**	**6.6**	**8.4**	**9.8**	**9.2**		*5.0*	*6.7*	*8.8*			*8.2*	*10.9*	*10.7*	
25			●	Bucklin Point (Seekonk R.)	**20.5**	**45.5**	**31.7**	**42.9**			*16.9*	*24.2*	*32.3*			*87.2*	*37.0*	*53.4*	

***Dissolved* Copper Criteria**	**Criteria (ug/l)**		
	(mg/l as $CaCO_3$)		
	25	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-34

Wet Weather Data - Storm III: Total Copper (ug/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**0.9**	**22.9**	**3.6**	**3.4**			*3.7*	*2.8*	*2.7*			*44.0*	*4.9*	*5.2*	
22			●	CSO facility in Worchester		**27.9**			**9.7**		*9.7*					*67.1*			
01	●				**3.5**	**19.2**	**11.1**	**6.8**			*1.2*	*3.1*	*2.8*			*30.4*	*21.4*	*17.9*	
23			●	UBWPAD, Worchester	**30.0**	**26.9**	**25.7**	**40.2**			*22.4*	*24.0*	*25.7*			*32.2*	*29.1*	*71.1*	
02	●				**11.8**	**32.0**	**14.2**	**13.2**			*13.3*	*13.2*	*12.2*			*42.0*	*15.7*	*13.9*	
03	●																		
04	●				**11.6**	**21.3**	**13.3**	**11.4**			*6.5*	*5.8*	*9.8*			*36.0*	*22.0*	*12.5*	
05		●		Quinsigamond River		**1.2**	**0.6**	**0.7**			*1.0*	*0.5*	*0.6*			*1.4*	*0.7*	*0.8*	
06	●				**7.2**	**17.7**	**20.7**	**11.6**			*8.0*	*12.3*	*8.7*			*28.0*	*35.8*	*15.2*	
07	●				**14.2**	**17.2**	**21.3**	**14.3**	**14.7**		*10.5*	*17.9*	*10.2*			*24.0*	*30.2*	*17.9*	
08	●				**7.0**	**10.6**	**42.8**	**15.3**	**14.2**		*6.4*	*20.4*	*11.3*			*17.9*	*97.0*	*19.7*	
09		●		Mumford River			**1.0**	**1.5**	**1.9**			*0.5*	*1.2*				*1.6*	*1.7*	
10		●		West River	**0.7**	**1.4**	**1.0**	**0.7**	**1.7**			*0.6*	*0.5*				*1.5*	*0.9*	
11	●				**6.9**	**10.0**	**26.5**	**17.8**	**13.7**		*6.4*	*13.5*	*12.1*			*14.0*	*41.2*	*25.1*	
12	●																		
13	●				**6.1**	**6.7**	**11.7**	**13.0**	**4.1**		*3.3*	*9.2*	*12.2*			*9.5*	*14.7*	*14.1*	
14		●		Branch River		**1.0**	**1.2**	**1.2**				*1.0*	*0.7*				*1.3*	*1.5*	
15		●		Mill River	**1.6**	**1.5**	**1.3**	**0.8**	**1.3**			*0.5*	*0.5*				*2.6*	*1.0*	
16		●		Peters River	**2.2**	**2.0**	**2.5**	**2.2**	**1.3**		*0.5*	*1.5*	*1.7*			*3.2*	*3.8*	*3.0*	
17	●				**9.9**	**9.7**	**9.9**	**10.9**	**11.6**		*4.7*	*9.2*	*9.5*			*14.0*	*10.6*	*13.4*	
24			●	Woonsocket WWTF	**97.1**	**76.2**	**81.8**	**72.6**			*72.2*	*75.8*	*71.1*			*84.0*	*84.7*	*74.3*	
18	●				**12.2**	**8.1**	**12.2**	**9.6**			*4.4*	*11.0*	*6.5*			*13.6*	*13.7*	*11.2*	
19	●																		
20	●				**9.8**	**8.4**	**12.1**	**13.0**			*4.5*	*10.5*	*10.9*			*10.7*	*15.4*	*14.9*	
21	●				**8.4**	**9.3**	**8.7**	**10.9**			*9.0*	*7.3*	*9.8*			*9.6*	*9.9*	*12.5*	
25			●	Bucklin Point (Seekonk R.)	**9.9**	**11.1**	**11.7**	**12.9**			*4.5*	*8.2*	*12.4*			*16.0*	*15.3*	*14.0*	

***Dissolved* Copper Criteria**	**Criteria (ug/l)** *(mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-35

Source Rankings by Dry and Wet Load

Total Copper

Blackstone River Initiative (Wright et al., 2001)

Station No. From	Station No. To	Blackstone River	Tributary	WWTF/CSO	Location	Total Copper *(pounds)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Average - All Storms	Total Copper *(%)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Avergaege - All Storms
headw.	00	●					1.79	9.60	40.10			2.75	7.42	22.30	**10.90**
21				●	CSO facility in Worchester		1.27	0.79	3.77			1.95	0.61	2.10	**0.70**
00	01(*)	●						0.50			**4.82**		0.39		**0.79**
22				●	UBWPAD, Worchester		30.70	15.60	33.90		**27.91**	47.10	12.10	18.90	**26.20**
01	02	●						6.01	22.40				4.65	12.50	**5.71**
02	03	●					13.50	21.70			**2.72**	20.60	16.80		**12.60**
03	04	●									**0.26**				
05			●		Quinsigamond River		0.04	0.18	0.13		**0.83**	0.06	0.14	0.07	**0.09**
04	06	●									**6.54**				
06	07	●							7.50		**2.77**			4.18	**1.39**
07	08	●					4.20	13.30	29.60		**13.60**	6.44	10.30	16.50	**11.10**
09			●		Mumford River		0.50	1.00	0.25		**2.78**	0.77	0.77	0.14	**0.68**
10			●		West River		0.60	0.29	0.08		**1.42**	0.92	0.22	0.04	
08	11	●						20.70			**13.40**		16.00		**5.37**
11	12	●													
12	13	●									**2.36**				
14			●		Branch River		0.38	0.14	0.51		**3.84**	0.58	0.11	0.29	**0.33**
15			●		Mill River		0.12	0.30	0.03		**0.63**	0.18	0.23	0.02	**0.36**
16			●		Peters River		0.14	0.48	0.09		**0.53**	0.21	0.37	0.05	
13	17	●					4.30		17.80		**0.00**	6.59		9.92	**5.52**
24				●	Woonsocket WWTF		4.10	5.44	12.70		**5.04**	6.29	4.21	7.07	**5.88**
17	18	●						17.40			**4.37**		13.40		**4.50**
18	19	●					3.61		10.70			5.53		5.99	**3.85**
19	20	●									**0.41**				
20	21	●						15.90			**5.80**		12.30		**4.12**
Sum of Rankings - MA							**52.6**	**89.7**	**137.7**		**79.4**	**80.6**	**69.4**	**76.7**	**75.5**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**12.7**	**39.7**	**41.8**		**20.6**	**19.4**	**30.6**	**23.3**	**24.6**
					Totals		65	129	180		**100**	100	100	100	**100**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Figure 4-36

Wet Weather Data - Storms I to III: Hardness (mg/l CaCO3)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	STORM I: Mean Concentration					STORM II: Mean Concentration					STORM III: Mean Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				55.2	35.0	36.3	48.9		43.7	33.6	33.8	37.0		45.0	25.0	30.0	32.5	
22			●	CSO facility in Worchester						10.2	33.2				5.0	5.0			
01	●				66.7	49.8	47.2	60.9		82.9	40.1	39.3	42.0		57.4	32.5	31.8	35.0	
23			●	UBWPAD, Worchester	48.7	48.7	41.0	52.7		53.0	43.6	36.7	46.0		35.0	27.5	27.5	22.5	
02	●				62.4	58.9	46.4	57.2		62.9	41.9	38.2	44.9		49.9	29.1	26.2	30.0	
03	●																		
04	●				59.2	51.4	48.1	51.4		51.7	44.5	32.7	41.8		40.0	19.1	22.5	30.0	
05		●		Quinsigamond River	48.2	47.1	47.4	47.8		48.4	46.8	44.7	46.1		45.0	35.0	32.5	31.8	
06	●				54.9	53.1	49.3	46.3		49.9	47.7	32.5	41.4		40.0	28.3	22.5	30.6	
07	●				58.4	52.4	52.6	49.3		48.9	48.6	36.5	35.0		37.5	30.8	26.8	28.1	
08	●				48.9	46.5	50.5	47.9		48.7	45.3	39.7	32.5		40.0	31.6	25.0	24.3	
09		●		Mumford River	16.7	16.6	16.4	16.5		18.3	14.9	11.3	10.6		17.5	15.0	16.9	13.7	
10		●		West River	20.5	19.8	19.7	20.5		15.6	17.7	15.9	15.8		25.0	22.5	22.5	20.6	
11	●				43.5	39.7	41.1	43.3		36.2	31.7	29.5	23.0		37.5	30.0	29.3	26.2	
12	●																		
13	●				38.0	34.9	34.1	35.6		27.3	26.3	23.9	25.1		37.5	27.5	29.3	27.5	
14		●		Branch River	11.0	10.3	10.3	10.7		10.9	10.1	8.7	9.1		12.5	12.5	13.7	11.2	
15		●		Mill River	19.2	18.2	18.5	18.4		21.3	20.6	19.3	20.3		32.5	22.5	20.0	19.4	
16		●		Peters River	26.0	20.1	19.0	23.0		25.6	22.2	20.0	20.3		25.0	22.5	22.5	20.6	
17	●				38.5	32.4	33.2	33.2		29.9	27.5	25.7	29.3		32.5	29.1	28.7	26.8	
24			●	Woonsocket WWTF	21.0	20.6	32.8	49.9		24.4	25.3	23.8	20.8		17.5	11.7	10.0	5.0	
18	●				41.0	39.0	35.1	34.5		30.9	29.6	25.6	28.2		32.5	26.6	27.5	27.5	
19	●																		
20	●				40.2	39.6	39.5	39.0		32.1	31.9	26.8	26.4		32.5	26.6	27.5	27.5	
21	●				39.0	39.5	38.6	40.6		31.7	32.1	28.4	25.9		30.0	25.0	27.5	89.9	
25			●	Bucklin Point (Seekonk R.)	36.7	38.6	26.1	33.5		36.2	44.7	50.4	46.9		52.4	24.1	31.2	39.3	

Table 4-37

Exceedences of Regulatory Standards - Dry Weather Surveys

Dissolved Copper

Data: **Blackstone River Initiative (BRI)** (Wright et al., 2001)
BRI concentrations were compared to RI Regulatory Standards

Station No.	Blackstone River	Tributary	WWTF/CSO	Location	Acute Criteria, Dry Weather: July 11-13, 1991	Acute: Aug. 14-15, 1991	Acute: Oct. 2-3, 1991	Acute: *Total Exceedences (%)*	Chronic Criteria, Dry Weather: July 11-13, 1991	Chronic: Aug. 14-15, 1991	Chronic: Oct. 2-3, 1991	Chronic: *Total Exceedences (%)*
00	●											
22			●	CSO facility in Worchester								
01	●				0%	0%	25%	***8%***	0%	25%	25%	***17%***
23			●	UBWPAD, Worchester	0%	0%	0%	***0%***				
02	●				100%	100%	75%	***92%***	100%	100%	100%	***100%***
03	●				100%	100%	75%	***92%***	100%	100%	100%	***100%***
04	●				100%	100%	75%	***92%***	100%	100%	75%	***92%***
05		●		Quinsigamond River *(*)*	0%	0%	0%	***0%***	0%	0%	0%	***0%***
06	●				100%	100%	50%	***83%***	100%	100%	100%	***100%***
07	●				0%	100%	75%	***58%***	100%	100%	100%	***100%***
08	●				25%	100%	75%	***67%***	100%	100%	100%	***100%***
09		●		Mumford River	0%	0%	0%	***0%***	0%	0%	0%	***0%***
10		●		West River	0%	0%	0%	***0%***	0%	25%	0%	***8%***
11	●				25%	50%	100%	***58%***	75%	100%	100%	***92%***
12	●				25%	75%	75%	***58%***	50%	100%	100%	***83%***
13	●				0%	50%	100%	***50%***	25%	100%	100%	***75%***
14		●		Branch River	33%	0%	0%	***11%***	33%	0%	67%	***33%***
15		●		Mill River	0%	0%	0%	***0%***	0%	0%	0%	***0%***
16		●		Peters River	25%	0%	0%	***8%***	25%	0%	0%	***8%***
17	●				0%	25%	67%	***31%***	25%	50%	100%	***58%***
24			●	Woonsocket WWTF								
18	●				50%	75%	100%	***75%***	50%	100%	100%	***83%***
19	●				0%	100%	50%	***50%***	50%	100%	100%	***83%***
20	●				0%	25%	33%	***19%***	0%	100%	67%	***56%***
21	●				0%	0%	75%	***25%***	0%	100%	100%	***67%***

Dissolved **Copper Criteria**	Criteria (ug/l) for Hardness (mg/l as $CaCO_3$): *25*	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-38

Wet Weather Data: **Exceedence of Dissolved Copper** (*) - ***Acute Criteria***

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	STORM I: Mean Concentration					STORM II: Mean Concentration					STORM III: Mean Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●															●			
22			●	CSO facility in Worchester						●	●					●			
01	●										●					●	●		
23			●	UBWPAD, Worchester	●	●	●	●		●	●	●	●		●	●	●	●	
02	●				●			●			●					●	●	●	
03	●																		
04	●				●	●	●	●			●	●				●	●	●	
05		●		Quinsigamond River															
06	●				●	●	●	●			●	●				●	●	●	
07	●				●	●	●	●				●			●	●	●	●	
08	●				●	●	●	●			●	●	●		●	●	●	●	
09		●		Mumford River															
10		●		West River															
11	●				●	●	●	●		●	●	●	●			●	●	●	
12	●																		
13	●				●							●	●				●	●	
14		●		Branch River															
15		●		Mill River															
16		●		Peters River															
17	●					●						●				●	●	●	
24			●	Woonsocket WWTF	●	●	●	●		●	●	●	●		●	●	●	●	
18	●						●					●	●		●		●	●	
19	●																		
20	●											●					●	●	
21	●							●					●			●			
25			●	Bucklin Point (Seekonk R.)	●	●	●	●		●	●	●	●			●	●	●	

(*) Note: The total lead concentrations were compared to the dissolved lead regulatory standards of Rhode Island by assuming a constant concentration of 40% dissolved lead in the total lead samples.

- ● The mean concentration exceeded the regulatory criteria.
- (blank) The mean concentration did not exceed the regulatory criteria.
- (shaded) No samples were analyzed.

Dissolved **Copper Criteria**	**Criteria (ug/l)** *for Hardness (mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-39

Wet Weather Data: **Exceedence of Dissolved Copper** (*) - ***Chronic Criteria***

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	STORM I: Mean Concentration – Dry Weather	STORM I – During Storm	STORM I – 24h After Storm	STORM I – 48h After Storm	STORM I – 72h After Strom	STORM II: Mean Concentration – Dry Weather	STORM II – During Storm	STORM II – 24h After Storm	STORM II – 48h After Storm	STORM II – 72h After Strom	STORM III: Mean Concentration – Dry Weather	STORM III – During Storm	STORM III – 24h After Storm	STORM III – 48h After Storm	STORM III – 72h After Strom
00	●										●					●			
22			●	CSO facility in Worchester						●	●					●			
01	●										●					●	●		
23			●	UBWPAD, Worchester	●	●	●	●		●	●	●	●		●	●	●	●	
02	●				●	●		●		●	●	●			●	●	●	●	
03	●																		
04	●				●	●	●	●			●	●			●	●	●	●	
05		●		Quinsigamond River															
06	●				●	●	●	●		●	●	●	●			●	●	●	
07	●				●	●	●	●		●	●	●	●		●	●	●	●	
08	●				●	●	●	●		●	●	●	●			●	●	●	
09		●		Mumford River															
10		●		West River															
11	●				●	●	●	●		●	●	●	●			●	●	●	
12	●																		
13	●				●	●	●	●		●	●	●	●			●	●	●	
14		●		Branch River															
15		●		Mill River															
16		●		Peters River															
17	●				●	●	●	●		●	●	●	●		●	●	●	●	
24			●	Woonsocket WWTF	●	●	●	●		●	●	●	●		●	●	●	●	
18	●				●	●	●	●		●	●	●	●		●	●	●	●	
19	●																		
20	●					●	●	●				●	●		●	●	●	●	
21	●					●	●	●				●	●		●	●	●		
25			●	Bucklin Point (Seekonk R.)	●	●	●	●		●	●	●	●			●	●	●	

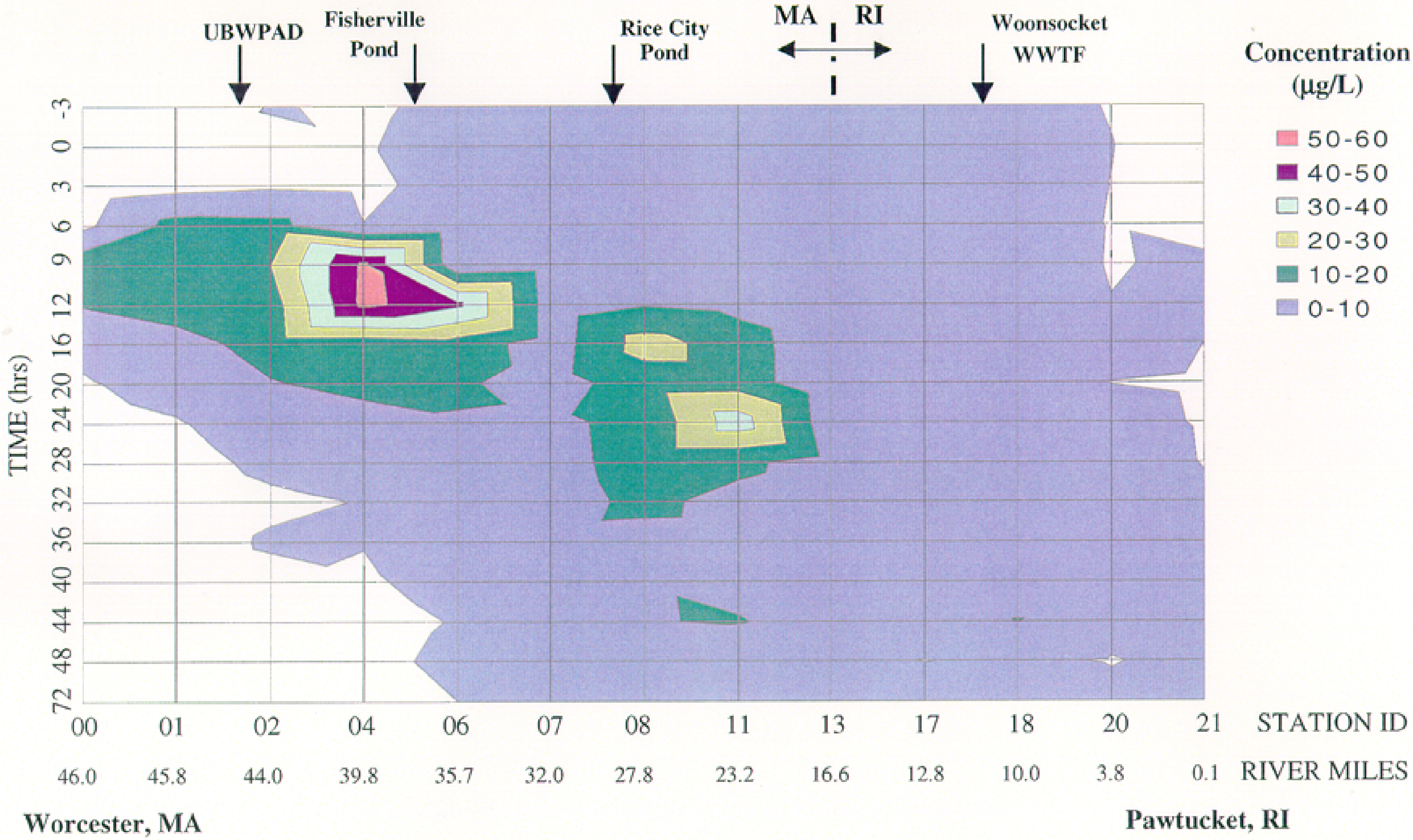
(*) Note: The total lead concentrations were compared to the dissolved lead regulatory standards of Rhode Island by assuming a constant concentration of 40% dissolved lead in the total lead samples.

- ● The mean concentration exceeded the regulatory criteria.
- (blank) The mean concentration did not exceed the regulatory criteria.
- (shaded) No samples were analyzed.

***Dissolved* Copper Criteria**	**Criteria (ug/l)** *for Hardness (mg/l as $CaCO_3$)* 25	35	45
Acute Criteria	4.6	6.3	8.0
Chronic Criteria	3.5	4.6	5.7

Figure 4-40

BLACKSTONE RIVER INITIATIVE
ACUTE COPPER VIOLATIONS - STORM 2



Acute Copper Violations for Storm 2, November 2-5, 1992.
White Denotes No Violations

Figure 4-41

RIDEM Chemical Monitoring of Tributaries, Section 305b

Total Copper Concentration *(ug/l)*

Date	Round Top Brook	Pascoag River	Clear River	Abbot Run Brook *(Cumberland)*	Abbot Run Brook *(North Attleboro)*	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
12-Mar-91	0.30	2.80	1.80	1.00	0.70	●		
13-May-91	1.10	3.10	3.90	3.50	5.30			●
29-Jul-91	1.70	4.60	4.90	2.20	0.60			●
06-Sep-91	2.70	1.90	5.50	0.70	0.40			●
26-Apr-93	0.80	1.10	1.40	1.80	1.10		●	
10-Aug-93	0.20		4.50	1.10	1.40	●		
27-Dec-93	1.40	5.70	0.50	2.80	2.00	●		
11-Mar-96	1.60	2.10	1.10	4.00	1.10			●
14-May-96	1.50	3.10	1.80	1.30	1.40			●
20-Aug-96	3.70	4.20	4.00	1.30	3.30	●		
02-Oct-96	1.40	2.50	0.50	1.30	0.50			●
14-Apr-98	0.90	3.30	0.90	1.30	1.20	●		
05-Aug-98	2.10	2.90	3.00	1.60	2.80	●		
26-Oct-98	1.00	1.80	2.10	1.30	1.30	●		
20-Jan-99	0.90	0.90	1.90	0.90	1.00			●
19-Mar-99	ND	1.17	ND	0.95	ND	●		
10-Jun-99	1.15	2.09	2.93	2.05	1.24	●		
19-Aug-99	ND	1.64	2.10	0.91	1.17	●		
12-Oct-99	ND	1.49	1.35	ND	ND			●
15-Mar-00		1.25	3.88	3.44	2.80			●
30-May-00		1.20		8.36	6.73	●		
18-Sep-00		1.00	3.21	1.16				●
11-Dec-00		1.55	1.85	0.82	0.87			●
Statistical Summary - All Samples								
Count	19	22	21	22	20	●	●	●
Geometric Mean	**1.40**	**2.34**	**2.53**	**1.99**	**1.85**	●	●	●
Minimum	0.20	0.90	0.50	0.70	0.40	●	●	●
Maximum	3.70	5.70	5.50	8.36	6.73	●	●	●
Statistical Summary - Dry Weather								
Count	8	10	9	11	10	●		
Geometric Mean	**1.34**	**2.68**	**2.43**	**2.06**	**2.18**	●		
Minimum	0.20	1.17	0.50	0.91	0.70	●		
Maximum	3.70	5.70	4.50	8.36	6.73	●		
Statistical Summary - Mixed and Wet Weather								
Count	8	12	12	11	10		●	●
Geometric Mean	**1.46**	**2.05**	**2.61**	**1.92**	**1.51**		●	●
Minimum	0.80	0.90	0.50	0.70	0.40		●	●
Maximum	2.70	4.60	5.50	4.00	5.30		●	●

ND = Not detected

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Figure 4-42

RIPDES-permitted Point Sources

Total Copper (ug/l)

Data Period: January 31, 1997, to October 31, 2001

	Flow *(gallons per day)*								Total Copper *(ug/l)*							
	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*
Monthly Mean																
Average	50,000	830,000	1,200	2,992	9,180,000	80,000	580,000	330,000		22.38			22.33			
Minimum	30,000	640,000	268	2,400	5,230,000	30,000	460,000			6.30			6.90			
Maximum	70,000	1,220,000	2,988	4,608	13,520,000	140,000	710,000	670,000		74.30			64.30			
Weekly Average																
Average																
Minimum																
Maximum																
Daily Maximum																
Average	80,000	1,100,000				150,000		530,000		32.07			45.26	0.02		13.87
Minimum	40,000	700,000				60,000		310,000		9.00			13.00	0.02		0.01
Maximum	90,000	2,580,000				250,000		1,820,000		91.60			206.30	0.04		43.00

	Flow *(cfs)*							
Monthly Mean								
Average	0.077	1.282	0.002	0.005	14.175	0.124	0.896	0.510
Minimum	0.046	0.988	0.000	0.004	8.076	0.046	0.710	
Maximum	0.108	1.884	0.005	0.007	20.877	0.216	1.096	1.035

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Figure 443

Woonsocket Wastewater Treatment Facility - Effluent

Total Copper

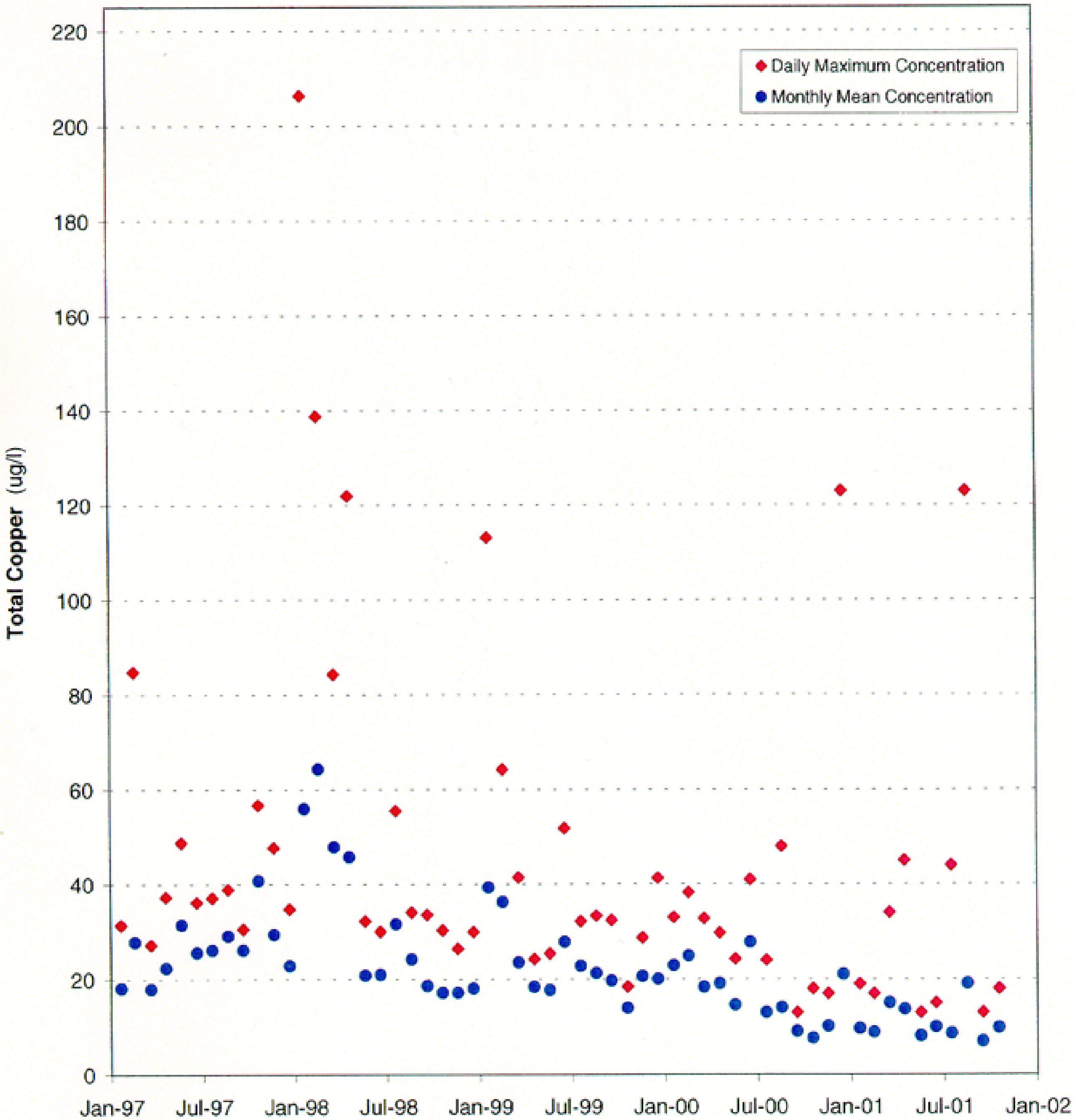


Figure 4-44

Total Lead *(ug/l) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Concentration: Dry Weather	Mean: During Storm	Mean: 24h After Storm	Mean: 48h After Storm	Minimum Concentration: Dry Weather	Min: During Storm	Min: 24h After Storm	Min: 48h After Storm	Maximum Concentration: Dry Weather	Max: During Storm	Max: 24h After Storm	Max: 48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	9.6				2.9				19.8			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	1.8		1.0		1.0				3.0			
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	4.2				1.0				23.5			
		URI BRI wet	1991-1993		●			1.2	2.2	1.6	1.1	1.1	0.2	0.9	0.8	1.3	7.8	2.8	1.7
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA	3.9		6.5		1.6		4.7		7.0		9.6	
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line												
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	14.2				6.2				41.2			
		URI BRI wet	1991-1993	●				3.9	3.7	6.2	7.4	2.7	1.3	3.4	3.2	5.1	6.4	14.4	13.3
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	5.8				1.0				48.8			
		URI BRI wet	1991-1993		●			3.1	2.6	2.1	1.9	0.9	1.0	0.8	0.8	7.4	6.1	5.1	3.8
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	5.3				1.2				12.3			
		URI BRI wet	1991-1993		●			2.9	7.2	4.7	3.3	1.3	2.9	1.5	2.0	5.4	19.0	8.3	6.8
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	6.6				3.7				14.8			
		URI BRI wet	1991-1993	●				3.8	11.5	5.3	5.2	2.4	2.6	3.3	1.5	5.3	44.8	12.4	9.6
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		20.0	18.3	14.4	14.7	9.4	3.2	2.5	10.5	31.4	30.0	26.7	22.8
1	WSTP	URI	1988-1989			●													
14	RIPDES	RIDEM	1997-2001			●		4.7											
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	7.4				3.2				29.8			
		URI BRI wet	1991-1993	●				3.5	4.1	5.5	5.1	2.6	2.5	3.6	1.3	4.2	8.3	7.6	9.6
9	Manville	USGS	1990-1999	●				8.1		3.0		2.0		1.0		49.0		5.0	
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	4.2				2.0				7.2			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI	2.1		8.3		1.4		1.6		2.7		21.7	
15	20	URI BRI dry	1991	●				3.0				0.1				5.5			
		URI BRI wet	1991-1993	●				3.2	4.0	5.2	5.0	2.2	2.7	2.8	1.8	4.1	6.0	9.4	9.6
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket												
1	BRSM	URI	1988-1989	●			Slaters Mill	5.7	7.9	7.8	8.4	2.5	2.5	3.9	5.4	11.1	15.2	9.7	13.2
2	BRSMDN	URI	1990	●				2.8	4.4	4.0	2.7	1.5	1.7	1.2	1.0	4.5	22.0	6.8	4.8
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				3.7				0.1				5.1			
		URI BRI wet	1991-1993	●				3.5	8.6	5.0	5.5	3.1	2.7	3.0	3.0	3.7	20.2	10.9	7.2
5	TMDL	RIDEM	1995-1996	●															
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI	4.1		10.1		0.8		3.6		11.3		20.5	

Dissolved **Lead Criteria**	**Criteria (ug/l)** *for Hardness (mg/l as $CaCO_3$)* 25	35	45
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1

Figure 4-45
Lead Concentration
USGS Station at Forestdale, Branch River

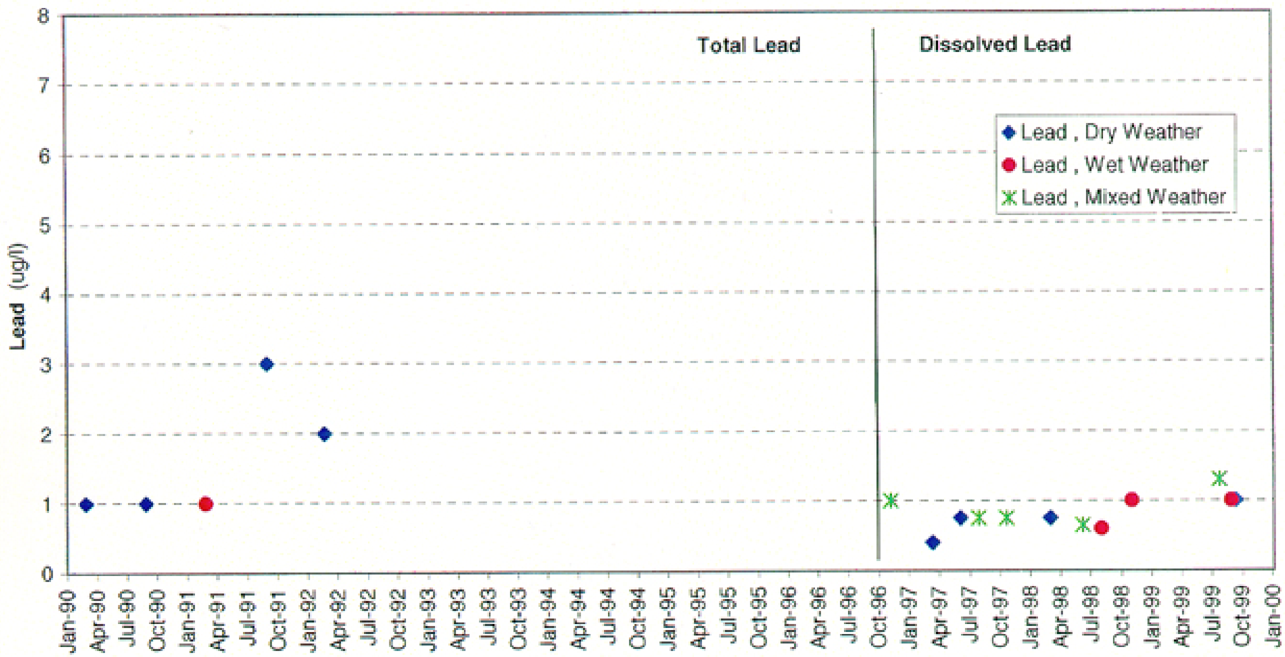


Figure 4-46
Lead Concentration
USGS Station at Manville, Blackstone River

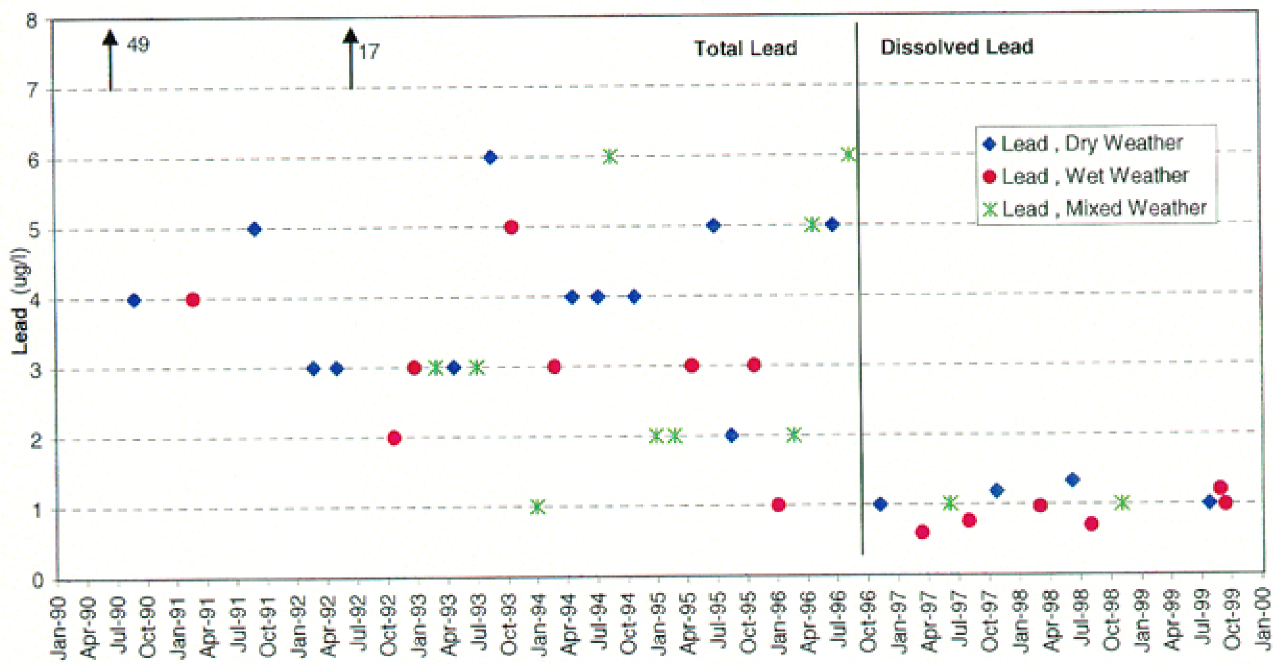


Figure 4-47
Total Lead Concentration
(Kerr and Lee, 1996)

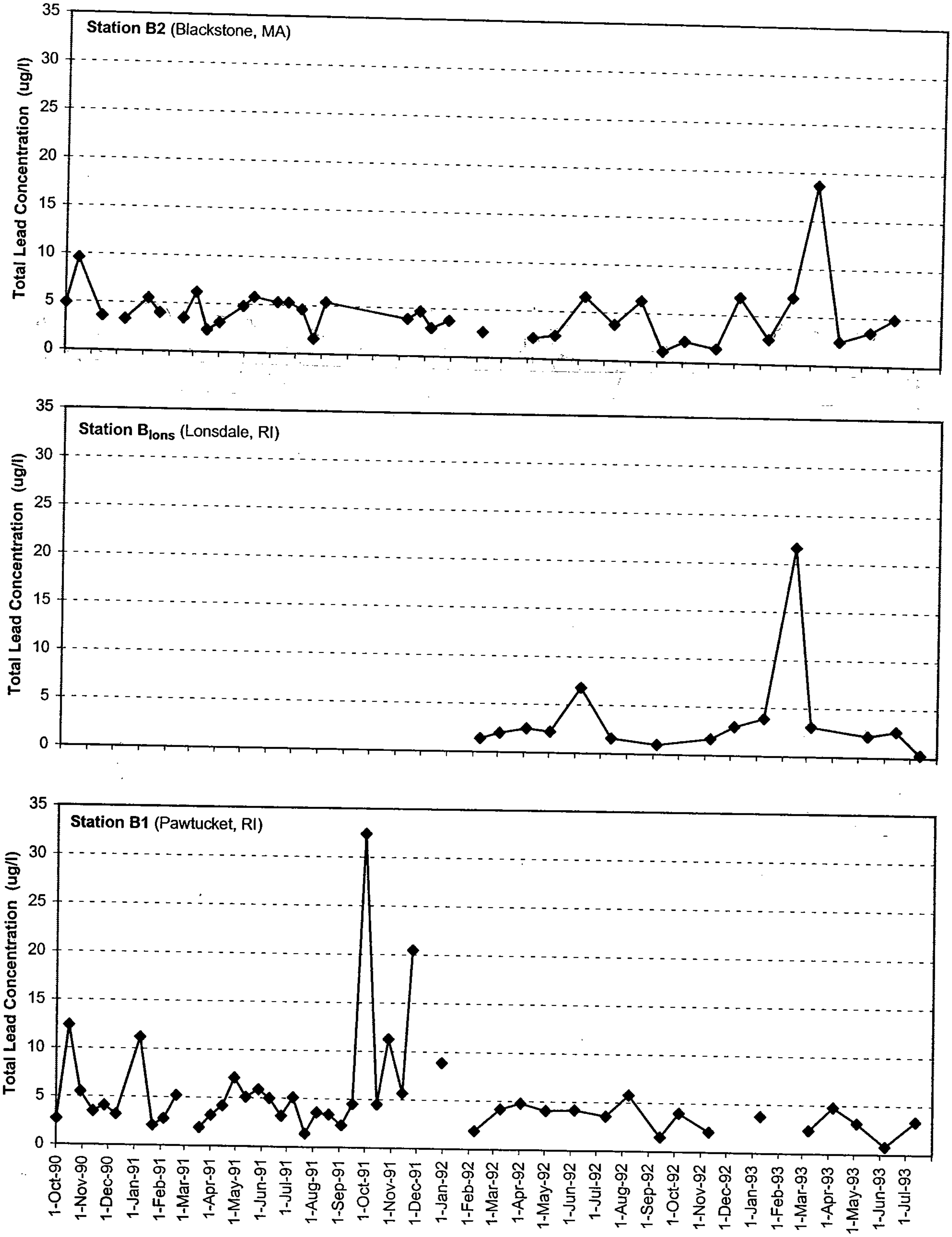


Figure 4-48

River Rescue Project, 1990-1995
(Kerr and Lee, 1996)

Total Lead for all Sampling Events

Concentrations

		All Samples		Wet Weather(*)						Dry Weather			
				Same day of rainfall		0 (same day) and 1 day after rainfall		2nd day only after rainfall		3 to 4 days after rain		More than 4 days after rain	
Station No.	**Station Location**	Count	**Total Lead** (ug/l)	Count	**Total Lead** (ug/l)	Count	**Total Lead** (ug/l)	Count	**Total Lead** (ug/l)	Count	**Total Lead** (ug/l)	Count	**Total Lead** (ug/l)
B2	Blackstone River, Main Street, Blackstone, MA	*38*	**4.5**	*2*	**5.5**	*5*	**6.5**	*3*	**9.3**	*9*	**3.3**	*20*	**3.9**
B_{lons}	Blackstone River, Lonsdale Avenue	*15*	**3.7**	*0*	**...**	*4*	**8.3**	*3*	**1.9**	*2*	**3.2**	*5*	**2.1**
B1	Blackstone River, Main Street, Pawtucket	*46*	**5.4**	*1*	**5.2**	*5*	**10.1**	*3*	**4.2**	*7*	**7.9**	*28*	**4.1**

NOTE:
(*) Rainfall is defined as 0.25" or more on a given day. Rainfall data are from the RI Airport.

Figure 4-49

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Total Lead Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Lead Concentrations: Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	Dissolved Lead Fraction: *Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			5.00	3.90	1.40	7.20	**4.38**	73.94	38%	13%	50%	15%	**29%**
BLK02	●			3.50	3.20	1.30	4.00	**3.00**	66.35	17%	3%	85%	75%	**45%**
BLK03	●			3.50	2.90	1.00	3.30	**2.68**	59.91	11%	17%		73%	**34%**
BLK04	●			3.00	4.10	8.80	5.00	**5.23**	66.81	3%	10%	24%	4%	**10%**
BLK05		●	Quinsigamond R.	0.90	1.90	1.90	2.80	**1.88**	52.23	11%	5%	5%	82%	**26%**
BLK06	●			58.70	118.00	2.80	13.00	**48.13**	60.27	10%	80%	93%	15%	**50%**
BLK07	●			16.70	274.00	98.40	12.90	**100.50**	55.95	10%	2%	5%	40%	**14%**
BLK08	●			23.60	16.90	4.80	32.50	**19.45**	54.00	8%	18%	88%	3%	**29%**
BLK09		●	Mumford River	1.10	3.30	7.90	2.80	**3.78**	19.16	82%	6%	11%	25%	**31%**
BLK10		●	West River	3.40	2.20	3.60	29.60	**9.70**	21.89	24%	55%	44%		**41%**
BLK11	●			9.20	15.80	53.30	32.00	**27.58**	45.74	13%	23%	6%	11%	**14%**
BLK12	●			5.10	19.80	2.90	6.10	**8.48**	45.04	55%		90%	93%	**79%**
BLK13	●			12.40	10.30	18.20	15.70	**14.15**	40.42	12%	13%	12%	5%	**10%**
BLK14		●	Branch River	23.50	1.60	1.00	2.00	**7.03**	14.88		94%	80%	10%	**61%**
BLK15		●	Mill River	1.70	1.00		1.70	**1.47**	24.54	47%			24%	**35%**
BLK16		●	Peters River	9.40	3.50	12.30	8.90	**8.53**	35.74	61%	37%	28%	16%	**35%**
BLK17	●			3.70	4.00	4.50	4.70	**4.23**	40.34	14%	3%	51%	9%	**19%**
BLK18	●			4.30	3.20	3.40	4.20	**3.78**	41.27	5%	3%	59%	2%	**17%**
BLK19	●			2.20	2.00	2.50	2.50	**2.30**	41.32	5%	5%	32%	12%	**13%**
BLK20	●				1.70	1.60	1.60	**1.63**	42.14			94%	6%	**50%**
BLK21	●		Slaters Mill	2.70	3.30	4.90	3.40	**3.58**	43.55	11%	3%	33%	15%	**15%**

Statistics - all 3 Surveys

Station No.	Mean	*Mini-mum*	*Maxi-mum*	Dissolved Lead Fraction
BLK01	**10.2**	*1.4*	*54.3*	27%
BLK02	**5.0**	*1.3*	*18.7*	49%
BLK03	**6.0**	*1.0*	*25.7*	30%
BLK04	**5.4**	*2.5*	*13.4*	43%
BLK05	**2.7**	*0.5*	*8.3*	38%
BLK06	**24.4**	*2.8*	*118.0*	49%
BLK07	**41.5**	*6.4*	*274.0*	43%
BLK08	**18.3**	*4.8*	*37.2*	40%
BLK09	**3.8**	*1.0*	*7.9*	39%
BLK10	**6.2**	*2.2*	*29.6*	52%
BLK11	**17.2**	*7.8*	*53.3*	35%
BLK12	**9.6**	*2.9*	*19.8*	60%
BLK13	**14.2**	*6.2*	*41.2*	25%
BLK14	**4.2**	*1.0*	*23.5*	53%
BLK15	**5.8**	*1.0*	*48.8*	37%
BLK16	**5.3**	*1.2*	*12.3*	49%
BLK17	**6.6**	*3.7*	*14.8*	28%
BLK18	**7.4**	*3.2*	*29.8*	35%
BLK19	**4.2**	*2.0*	*7.2*	35%
BLK20	**3.0**	*0.1*	*5.5*	46%
BLK21	**3.7**	*0.1*	*5.1*	38%
			Mean	***40%***

August 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Lead Concentrations: Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	Dissolved Lead Fraction: *Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			4.60	54.30	19.70	5.70	**21.08**	65.41	54%	8%	23%	74%	
BLK02	●			4.80	6.70	18.70	3.70	**8.48**	55.15	65%	36%		68%	**56%**
BLK03	●			3.50	8.30	25.70	3.20	**10.18**	55.20	34%	39%		38%	**37%**
BLK04	●			13.40	4.70	6.90	2.50	**6.88**	54.34	30%	85%	96%	60%	**68%**
BLK05		●	Quinsigamond R.		8.30	6.20	0.50	**5.00**	44.17		40%	34%	20%	**31%**
BLK06	●			9.20	17.00		6.70	**10.97**	51.31	78%	70%		58%	**69%**
BLK07	●			11.70	13.00	32.00	6.40	**15.78**	47.96	49%	88%	66%	72%	**69%**
BLK08	●			25.60	20.40	37.20	18.80	**25.50**	43.83	51%	46%	66%	59%	**55%**
BLK09		●	Mumford River	1.10	6.10	5.10	1.00	**3.33**	16.84	36%	80%	63%	10%	**47%**
BLK10		●	West River		4.80	6.30		**5.55**	18.44			73%		**73%**
BLK11	●			11.40	11.00	26.90	7.80	**14.28**	35.61	37%	84%		55%	**59%**
BLK12	●			6.50	19.20	13.40	5.70	**11.20**	34.53	34%	82%	45%	53%	**53%**
BLK13	●			8.20		41.20	6.20	**18.53**	30.22	67%			13%	**40%**
BLK14		●	Branch River	2.80	2.50	1.90	3.10	**2.58**	16.85	43%	52%	47%	35%	**44%**
BLK15		●	Mill River	2.10	48.80	1.10	4.10	**14.03**	21.18	52%		18%	5%	**25%**
BLK16		●	Peters River	2.90	2.00	3.90	8.00	**4.20**	28.41	59%	40%	44%	54%	**49%**
BLK17	●			5.00	4.50	5.80	10.20	**6.38**	29.56	30%	29%	26%		**28%**
BLK18	●			6.60	4.50	4.60	6.90	**5.65**	32.66	83%	58%	76%	19%	**59%**
BLK19	●			3.90	7.20	5.80	6.60	**5.88**	35.39	64%	69%	88%	2%	**56%**
BLK20	●			3.50	3.40	5.00	0.10	**3.00**	38.72	66%	12%	42%	100%	**55%**
BLK21	●		Slaters Mill	3.80	4.90	5.00	0.10	**3.45**	37.59	76%	45%	14%	100%	**59%**

October 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Lead Concentrations: Run #1	Run #2	Run #3	Run #4	MEAN	Average Hardness	Dissolved Lead Fraction: *Run #1*	*Run #2*	*Run #3*	*Run #4*	MEAN
BLK01	●			2.60	4.30	6.00	7.60	**5.13**	47.98	15%	21%	48%	18%	**26%**
BLK02	●			2.60	3.30	4.80	3.90	**3.65**	53.94	35%	39%	42%	69%	**46%**
BLK03	●			2.70	2.90	9.70	4.70	**5.00**	52.91	11%	21%	14%	30%	**19%**
BLK04	●			3.90	3.50	4.90	4.30	**4.15**	49.31	62%	46%	39%	53%	**50%**
BLK05		●	Quinsigamond R.	2.10	1.40	0.80	1.10	**1.35**	39.59	33%	50%	50%	91%	**56%**
BLK06	●			8.30	7.70	33.60	6.30	**13.98**	46.90	28%	30%		27%	**28%**
BLK07	●			9.80	6.70	8.80	7.00	**8.08**	44.77	62%	43%	31%	47%	**46%**
BLK08	●			10.20	7.70	8.60	13.10	**9.90**	44.96	36%		29%	44%	**37%**
BLK09		●	Mumford River	2.40	5.10	4.90	4.30	**4.18**	13.63	100%	22%	20%	14%	**39%**
BLK10		●	West River	4.60	2.90	3.20	2.40	**3.28**	17.57	52%	31%	53%	38%	**43%**
BLK11	●			8.50	13.10	9.40	8.00	**9.75**	33.24	61%	14%	36%	23%	**33%**
BLK12	●			7.40	10.90	10.80	7.60	**9.18**	33.16	91%	14%	57%	22%	**46%**
BLK13	●			8.20	9.70	14.40	6.90	**9.80**	31.65	37%	19%	26%	20%	**25%**
BLK14		●	Branch River	6.80	1.30	1.50	1.80	**2.85**	11.54		92%	47%	17%	**52%**
BLK15		●	Mill River	3.30	1.20	2.30	1.20	**2.00**	18.83	76%	67%	17%	42%	**50%**
BLK16		●	Peters River	2.50	3.40	1.20	5.00	**3.03**	29.14	84%	56%	100%	8%	**62%**
BLK17	●			11.30	6.60	4.40	14.80	**9.28**	27.98	83%	15%	32%	16%	**36%**
BLK18	●			9.60	6.50	4.70	29.80	**12.65**	28.22	32%	26%	23%		**27%**
BLK19	●			3.70	4.40	3.60	5.70	**4.35**	29.32	59%	34%	31%	25%	**37%**
BLK20	●			3.80	3.90	5.50	4.40	**4.40**	29.49	24%	26%	42%	39%	**32%**
BLK21	●		Slaters Mill	5.10	3.00	3.00	4.60	**3.93**	30.35				41%	**41%**

Figure 4-50

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Dissolved Lead Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Exceedances – Acute Criteria: *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Exceedances – Chronic Criteria: *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Average Hardness	Acute Criteria	Chronic Criteria
BLK01	●			1.90	0.50	0.70	1.10	**1.05**						◆					73.9	46.42	1.81
BLK02	●			0.60	0.10	1.10	3.00	**1.20**									◆		66.4	41.20	1.61
BLK03	●			0.40	0.50	0.60	2.40	**0.98**									◆		59.9	36.82	1.43
BLK04	●			0.10	0.40	2.10	0.20	**0.70**								◆			66.8	41.52	1.62
BLK05		●	Quinsigamond R.	0.10	0.10	0.10	2.30	**0.65**									◆		52.2	31.63	1.23
BLK06	●			5.60	94.80	2.60	2.00	**26.25**		◆				◆	◆	◆	◆	●	60.3	37.06	1.44
BLK07	●			1.60	5.80	4.70	5.20	**4.33**						◆	◆	◆	◆	●	56.0	34.13	1.33
BLK08	●			1.80	3.00	4.20	0.90	**2.48**						◆	◆	◆		●	54.0	32.82	1.28
BLK09		●	Mumford River	0.90	0.20	0.90	0.70	**0.68**						◆		◆	◆	●	19.2	13.88	0.54
BLK10		●	West River	0.80	1.20	1.60		**1.20**						◆	◆	◆		●	21.9	13.88	0.54
BLK11	●			1.20	3.70	3.40	3.60	**2.98**						◆	◆	◆	◆	●	45.7	27.30	1.06
BLK12	●			2.80		2.60	5.70	**3.70**						◆		◆	◆	●	45.0	26.83	1.05
BLK13	●			1.50	1.30	2.10	0.80	**1.43**						◆	◆	◆		●	40.4	23.79	0.93
BLK14		●	Branch River		1.50	0.80	0.20	**0.83**							◆	◆		●	14.9	13.88	0.54
BLK15		●	Mill River	0.80			0.40	**0.60**						◆				●	24.5	13.88	0.54
BLK16		●	Peters River	5.70	1.30	3.40	1.40	**2.95**						◆	◆	◆	◆	●	35.7	20.73	0.81
BLK17	●			0.50	0.10	2.30	0.40	**0.83**								◆			40.3	23.73	0.92
BLK18	●			0.20	0.10	2.00	0.10	**0.60**								◆			41.3	24.34	0.95
BLK19	●			0.10	0.10	0.80	0.30	**0.33**											41.3	24.38	0.95
BLK20	●					1.50	0.10	**0.80**								◆			42.1	24.92	0.97
BLK21	●		Slaters Mill	0.30	0.10	1.60	0.50	**0.63**								◆			43.6	25.85	1.01

Statistics of all 3 Surveys

Station No.	Mean	*Mini-mum*	*Maxi-mum*
BLK01	**2.1**	*0.4*	*4.5*
BLK02	**1.9**	*0.1*	*3.1*
BLK03	**1.3**	*0.3*	*3.2*
BLK04	**2.3**	*0.1*	*6.6*
BLK05	**1.1**	*0.1*	*3.3*
BLK06	**12.4**	*1.7*	*94.8*
BLK07	**6.3**	*1.6*	*21.0*
BLK08	**6.9**	*0.9*	*24.5*
BLK09	**1.4**	*0.1*	*4.9*
BLK10	**1.9**	*0.8*	*4.6*
BLK11	**4.0**	*1.2*	*9.2*
BLK12	**4.8**	*1.5*	*15.7*
BLK13	**2.4**	*0.8*	*5.5*
BLK14	**0.9**	*0.2*	*1.5*
BLK15	**0.7**	*0.2*	*2.5*
BLK16	**2.2**	*0.4*	*5.7*
BLK17	**1.9**	*0.1*	*9.4*
BLK18	**1.9**	*0.1*	*5.5*
BLK19	**1.7**	*0.1*	*5.1*
BLK20	**1.2**	*0.1*	*2.3*
BLK21	**1.2**	*0.1*	*2.9*

August 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Acute *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Chronic *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Average Hardness	Acute Criteria	Chronic Criteria
BLK01	●			2.50	4.50	4.50	4.20	**3.93**						◆	◆	◆	◆	●	65.4	40.56	1.58
BLK02	●			3.10	2.40		2.50	**2.67**						◆	◆		◆	●	55.2	33.59	1.31
BLK03	●			1.20	3.20		1.20	**1.87**							◆			●	55.2	33.63	1.31
BLK04	●			4.00	4.00	6.60	1.50	**4.03**						◆	◆	◆	◆	●	54.3	33.05	1.29
BLK05		●	Quinsigamond R.		3.30	2.10	0.10	**1.83**							◆	◆		●	44.2	26.26	1.02
BLK06	●			7.20	11.90	12.80	3.90	**8.95**						◆	◆	◆	◆	●	51.3	31.01	1.21
BLK07	●			5.70	11.50	21.00	4.60	**10.70**						◆	◆	◆	◆	●	48.0	28.77	1.12
BLK08	●			13.00	9.40	24.50	11.00	**14.48**						◆	◆	◆	◆	●	43.8	26.03	1.01
BLK09		●	Mumford River	0.40	4.90	3.20	0.10	**2.15**							◆	◆		●	16.8	13.88	0.54
BLK10		●	West River		2.80	4.60	1.30	**2.90**							◆	◆	◆	●	18.4	13.88	0.54
BLK11	●			4.20	9.20		4.30	**5.90**						◆	◆		◆	●	35.6	20.65	0.80
BLK12	●			2.20	15.70	6.00	3.00	**6.73**						◆	◆	◆	◆	●	34.5	19.95	0.78
BLK13	●			5.50			0.80	**3.15**						◆			◆	●	30.2	17.18	0.67
BLK14		●	Branch River	1.20	1.30	0.90	1.10	**1.13**						◆	◆	◆	◆	●	16.9	13.88	0.54
BLK15		●	Mill River	1.10		0.20	0.20	**0.50**						◆					21.2	13.88	0.54
BLK16		●	Peters River	1.70	0.80	1.70	4.30	**2.13**						◆	◆	◆	◆	●	28.4	16.03	0.62
BLK17	●			1.50	1.30	1.50		**1.43**						◆	◆	◆		●	29.6	16.76	0.65
BLK18	●			5.50	2.60	3.50	1.30	**3.23**						◆	◆	◆	◆	●	32.7	18.74	0.73
BLK19	●			2.50	5.00	5.10	0.10	**3.18**						◆	◆	◆		●	35.4	20.51	0.80
BLK20	●			2.30	0.40	2.10	0.10	**1.23**						◆		◆		●	38.7	22.67	0.88
BLK21	●		Slaters Mill	2.90	2.20	0.70	0.10	**1.48**						◆	◆			●	37.6	21.94	0.85

October 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	Mean	Acute *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Chronic *Run #1*	*Run #2*	*Run #3*	*Run #4*	Mean	Average Hardness	Acute Criteria	Chronic Criteria
BLK01	●			0.40	0.90	2.90	1.40	**1.40**								◆	◆	●	48.0	28.79	1.12
BLK02	●			0.90	1.30	2.00	2.70	**1.73**							◆	◆	◆	●	53.9	32.78	1.28
BLK03	●			0.30	0.60	1.40	1.40	**0.93**								◆	◆		52.9	32.09	1.25
BLK04	●			2.40	1.60	1.90	2.30	**2.05**						◆	◆	◆	◆	●	49.3	29.67	1.16
BLK05		●	Quinsigamond R.	0.70	0.70	0.40	1.00	**0.70**									◆		39.6	23.24	0.91
BLK06	●			2.30	2.30		1.70	**2.10**						◆	◆		◆	●	46.9	28.07	1.09
BLK07	●			6.10	2.90	2.70	3.30	**3.75**						◆	◆	◆	◆	●	44.8	26.65	1.04
BLK08	●			3.70	2.80	2.50	5.80	**3.70**						◆	◆	◆	◆	●	45.0	26.78	1.04
BLK09		●	Mumford River	2.40	1.10	1.00	0.60	**1.28**						◆	◆	◆	◆	●	13.6	13.88	0.54
BLK10		●	West River	2.40	0.90	1.70	0.90	**1.48**						◆	◆	◆	◆	●	17.6	13.88	0.54
BLK11	●			5.20	1.80	3.40	1.80	**3.05**						◆	◆	◆	◆	●	33.2	19.12	0.74
BLK12	●			6.70	1.50	6.20	1.70	**4.03**						◆	◆	◆	◆	●	33.2	19.07	0.74
BLK13	●			3.00	1.80	3.80	1.40	**2.50**						◆	◆	◆	◆	●	31.7	18.09	0.71
BLK14		●	Branch River		1.20	0.70	0.30	**0.73**							◆	◆		●	11.5	13.88	0.54
BLK15		●	Mill River	2.50	0.80	0.40	0.50	**1.05**						◆	◆			●	18.8	13.88	0.54
BLK16		●	Peters River	2.10	1.90	1.20	0.40	**1.40**						◆	◆	◆		●	29.1	16.49	0.64
BLK17	●			9.40	1.00	1.40	2.30	**3.53**						◆	◆	◆	◆	●	28.0	15.76	0.61
BLK18	●			3.10	1.70	1.10		**1.97**						◆	◆	◆		●	28.2	15.91	0.62
BLK19	●			2.20	1.50	1.10	1.40	**1.55**						◆	◆	◆	◆	●	29.3	16.61	0.65
BLK20	●			0.90	1.00	2.30	1.70	**1.48**						◆	◆	◆	◆	●	29.5	16.72	0.65
BLK21	●		Slaters Mill	2.10	1.20	1.10	1.90	**1.58**						◆	◆	◆	◆	●	30.4	17.26	0.67

Figure 4-51

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Particulate Lead Concentration** *(ug/l)*

July 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			3.1	3.4	0.7	6.1	**3.33**
BLK02	●			2.9	3.1	0.2	1.0	**1.80**
BLK03	●			3.1	2.4		0.9	**2.13**
BLK04	●			2.9	3.7	6.7	4.8	**4.53**
BLK05		●	Quinsigamond River	0.8	1.8	1.8	0.5	**1.23**
BLK06	●			53.1	23.2	0.2	11.0	**21.88**
BLK07	●			15.1	268.2	93.7	7.7	**96.18**
BLK08	●			21.8	13.9	0.6	31.6	**16.98**
BLK09		●	Mumford River	0.2	3.1	7.0	2.1	**3.10**
BLK10		●	West River	2.6	1.0	2.0		**1.87**
BLK11	●			8.0	12.1	49.9	28.4	**24.60**
BLK12	●			2.3		0.3	0.4	**1.00**
BLK13	●			10.9	9.0	16.1	14.9	**12.73**
BLK14		●	Branch River	2.3	0.1	0.2	1.8	**1.10**
BLK15		●	Mill River	0.9			1.3	**1.10**
BLK16		●	Peters River	3.7	2.2	8.9	7.5	**5.58**
BLK17	●			3.2	3.9	2.2	4.3	**3.40**
BLK18	●			4.1	3.1	1.4	4.1	**3.17**
BLK19	●			2.1	1.9	1.7	2.2	**1.98**
BLK20	●					0.1	1.5	**0.80**
BLK21	●		Slaters Mill	2.4	3.2	3.3	2.9	**2.95**

Statistics - all 3 surveys

Mean	*Minimum*	*Maximum*
8.1	*0.7*	*49.8*
2.0	*0.2*	*4.3*
3.1	*0.9*	*8.3*
3.2	*0.3*	*9.4*
1.7	*0.1*	*5.0*
10.6	*0.2*	*53.1*
35.0	*1.5*	*268.2*
11.4	*0.6*	*31.6*
2.4	*0.0*	*7.0*
1.7	*1.0*	*2.6*
11.8	*1.8*	*49.9*
3.5	*0.3*	*9.4*
8.0	*2.7*	*16.1*
1.1	*0.1*	*2.3*
1.3	*0.4*	*3.9*
3.1	*0.0*	*8.9*
4.3	*1.9*	*12.5*
3.5	*1.1*	*6.5*
2.5	*0.7*	*6.5*
1.8	*0.0*	*3.2*
2.6	*0.0*	*4.3*

August 1991 Survey

BLK01	●			2.1	49.8	15.2	1.5	**17.15**
BLK02	●			1.7	4.3		1.2	**2.40**
BLK03	●			2.3	5.1		2.0	**3.13**
BLK04	●			9.4	0.7	0.3	1.0	**2.85**
BLK05		●	Quinsigamond River		5.0	4.1	0.4	**3.17**
BLK06	●			2.0	5.1	8.5	2.8	**4.60**
BLK07	●			6.0	1.5	11.0	1.8	**5.07**
BLK08	●			12.6	11.0	12.7	7.8	**11.02**
BLK09		●	Mumford River	0.7	1.2	1.9	0.9	**1.18**
BLK10		●	West River		1.0	1.7		**1.35**
BLK11	●			7.2	1.8		3.5	**4.17**
BLK12	●			4.3	3.5	7.4	2.7	**4.48**
BLK13	●			2.7			5.4	**4.05**
BLK14		●	Branch River	1.6	1.2	1.0	2.0	**1.45**
BLK15		●	Mill River	1.0		0.9	3.9	**1.93**
BLK16		●	Peters River	1.2	1.2	2.2	3.7	**2.08**
BLK17	●			3.5	3.2	4.3		**3.67**
BLK18	●			1.1	1.9	1.1	5.6	**2.43**
BLK19	●			1.4	2.2	0.7	6.5	**2.70**
BLK20	●			1.2	3.0	2.9	0.0	**1.78**
BLK21	●		Slaters Mill	0.9	2.7	4.3	0.0	**1.98**

October 1991 Survey

BLK01	●			2.2	3.4	3.1	6.2	**3.73**
BLK02	●			1.7	2.0	2.8	1.2	**1.93**
BLK03	●			2.4	2.3	8.3	3.3	**4.07**
BLK04	●			1.5	2.0	3.0	2.0	**2.13**
BLK05		●	Quinsigamond River	1.4	0.7	0.4	0.1	**0.65**
BLK06	●			6.0	5.4		4.6	**5.33**
BLK07	●			3.7	3.8	6.1	3.7	**3.73**
BLK08	●			6.5	4.8	6.1	7.3	**6.18**
BLK09		●	Mumford River	0.0	4.0	3.9	3.7	**2.90**
BLK10		●	West River	2.2	2.0	1.5	1.5	**1.80**
BLK11	●			3.3	11.3	6.0	6.2	**6.70**
BLK12	●			0.7	9.4	4.6	5.9	**5.15**
BLK13	●			5.2	7.9	10.6	5.5	**7.30**
BLK14		●	Branch River		0.1	0.8	1.5	**0.80**
BLK15		●	Mill River	0.8	0.4	1.9	0.7	**0.95**
BLK16		●	Peters River	0.4	1.5	0.0	4.6	**1.63**
BLK17	●			1.9	5.6	3.0	12.5	**5.75**
BLK18	●			6.5	4.8	3.6		**4.96**
BLK19	●			1.5	2.9	2.5	4.3	**2.80**
BLK20	●			2.9	2.9	3.2	2.7	**2.92**
BLK21	●		Slaters Mill	2.9	2.9	3.2	2.7	**2.92**

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

Figure 4-52

Wet Weather Data - Storm I: Total Lead (ug/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**6.5**	**20.6**	**11.3**	**5.4**			*7.3*	*8.7*	*3.9*			*32.6*	*17.3*	*6.9*	
22			●	CSO facility in Worchester															
01	●				**3.3**	**14.8**	**9.7**	**4.7**			*11.1*	*3.8*	*3.0*			*21.6*	*14.0*	*6.4*	
23			●	UBWPAD, Worchester	**3.9**	**3.3**	**3.3**	**2.2**			*2.4*	*2.3*	*2.0*			*4.3*	*5.7*	*2.4*	
02	●				**3.4**	**16.9**	**7.4**	**3.2**			*5.5*	*4.5*	*2.6*			*31.9*	*11.0*	*3.8*	
03	●																		
04	●				**3.0**	**12.5**	**9.0**	**3.2**			*7.3*	*5.6*	*2.9*			*18.2*	*14.2*	*3.4*	
05		●		Quinsigamond River		**11.5**	**1.5**	**1.2**			*1.2*	*1.0*	*1.1*			*30.6*	*2.0*	*1.2*	
06	●				**7.5**	**17.1**	**8.9**	**6.7**			*8.6*	*7.5*	*6.5*			*33.5*	*10.0*	*6.8*	
07	●				**5.9**	**7.9**	**8.6**	**9.1**			*6.6*	*6.1*	*7.1*			*9.3*	*11.4*	*11.0*	
08	●				**9.0**	**18.2**	**10.2**	**10.3**			*14.8*	*5.5*	*8.8*			*23.7*	*12.2*	*11.7*	
09		●		Mumford River	**0.9**	**1.7**	**1.4**	**1.4**			*0.8*	*0.9*	*0.9*			*2.3*	*2.3*	*1.9*	
10		●		West River		**1.3**	**0.8**	**0.6**			*1.2*	*0.5*				*1.4*	*1.1*		
11	●				**4.8**	**9.3**	**6.3**	**6.5**			*6.6*	*4.8*	*6.1*			*12.7*	*9.6*	*6.9*	
12	●																		
13	●				**4.0**	**4.4**	**4.6**	**3.6**			*3.2*	*3.4*	*3.2*			*6.4*	*6.6*	*3.9*	
14		●		Branch River		**3.0**	**1.4**	**1.1**			*1.1*	*0.9*	*1.0*			*6.3*	*2.1*	*1.2*	
15		●		Mill River	**7.4**	**2.9**	**1.6**	**2.3**			*1.3*	*1.4*	*1.7*			*5.6*	*1.9*	*2.9*	
16		●		Peters River	**5.4**	**10.6**	**4.3**	**3.0**			*3.7*	*3.7*	*2.1*			*19.0*	*4.9*	*3.8*	
17	●				**5.3**	**8.4**	**5.0**	**5.4**			*5.6*	*4.0*	*4.3*			*10.2*	*5.4*	*6.4*	
24			●	Woonsocket WWTF	**9.4**	**16.5**	**6.7**	**11.8**			*6.7*	*5.3*	*11.2*			*21.6*	*9.0*	*12.3*	
18	●				**4.2**	**4.0**	**5.0**	**6.5**			*2.9*	*3.6*	*3.4*			*4.7*	*6.0*	*9.6*	
19	●																		
20	●				**3.4**	**4.3**	**3.5**	**4.0**			*3.2*	*2.8*	*2.8*			*5.7*	*4.3*	*5.1*	
21	●				**3.1**	**14.0**	**3.8**	**3.7**			*5.0*	*3.1*	*3.0*			*20.2*	*4.3*	*4.4*	
25			●	Bucklin Point (Seekonk R.)	**5.2**	**7.7**	**8.6**	**6.2**			*6.1*	*6.7*	*5.4*			*9.7*	*10.6*	*7.0*	

***Dissolved* Lead Criteria**	**Criteria (ug/l)**		
	(mg/l as $CaCO_3$)		
	25	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1.0

Figure 4-53

Wet Weather Data - Storm II: Total Lead (ug/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**2.3**	**15.1**	**4.8**	**6.1**	**4.1**		*3.8*	*4.3*	*5.7*			*41.1*	*5.3*	*6.4*	
22			●	CSO facility in Worchester	**26.0**	**28.5**					*22.0*					*35.0*			
01	●				**4.5**	**17.6**	**6.2**	**2.2**	**3.5**		*4.6*	*3.2*	*2.0*			*26.7*	*9.1*	*2.4*	
23			●	UBWPAD, Worchester	**1.6**	**3.1**	**3.7**	**2.2**	**3.2**		*1.9*	*2.7*	*1.8*			*4.7*	*4.5*	*2.5*	
02	●				**4.7**	**14.5**	**5.5**	**3.4**	**3.5**		*2.9*	*2.7*	*2.7*			*28.8*	*10.3*	*4.0*	
03	●																		
04	●				**1.9**	**20.8**	**7.2**	**2.7**	**3.5**		*3.2*	*3.9*	*1.5*			*51.3*	*13.4*	*3.8*	
05		●		Quinsigamond River		**2.2**	**3.0**	**4.0**	**1.0**		*0.8*	*1.5*	*0.9*			*3.1*	*4.7*	*7.0*	
06	●				**2.8**	**14.0**	**13.5**	**6.4**	**6.2**		*5.4*	*7.4*	*6.1*			*37.7*	*19.4*	*6.6*	
07	●				**3.5**	**5.0**	**9.5**	**6.8**	**8.0**		*3.8*	*7.4*	*6.3*			*6.5*	*11.6*	*7.2*	
08	●				**4.1**	**8.2**	**12.7**	**15.7**	**5.6**		*5.0*	*9.4*	*14.0*			*18.5*	*15.1*	*17.4*	
09		●		Mumford River		**1.4**	**2.9**	**1.1**	**1.3**		*0.7*	*0.8*	*0.8*			*2.4*	*8.9*	*1.4*	
10		●		West River	**0.8**	**1.1**	**1.0**	**0.8**	**0.8**		*0.5*	*0.4*	*0.6*			*1.7*	*2.1*	*0.9*	
11	●				**3.5**	**4.6**	**13.6**	**9.6**	**10.3**		*2.1*	*8.4*	*7.6*			*10.9*	*28.5*	*11.6*	
12	●																		
13	●				**2.7**	**3.7**	**7.2**	**8.5**	**10.2**		*2.4*	*3.9*	*7.7*			*5.6*	*14.4*	*9.2*	
14		●		Branch River	**1.3**	**2.4**	**1.6**	**1.0**	**1.7**		*0.9*	*1.2*	*0.8*			*7.8*	*2.2*	*1.2*	
15		●		Mill River	**1.0**	**3.0**	**1.7**	**1.5**	**1.0**		*1.2*	*0.9*	*1.4*			*6.1*	*3.4*	*1.5*	
16		●		Peters River	**1.9**	**6.0**	**4.3**	**2.8**	**1.8**		*2.9*	*1.5*	*2.6*			*8.7*	*8.3*	*2.9*	
17	●				**2.4**	**3.8**	**6.1**	**3.5**	**9.3**		*2.6*	*3.3*	*1.5*			*5.3*	*12.4*	*5.5*	
24			●	Woonsocket WWTF	**19.1**	**11.1**	**13.7**	**11.0**	**NA**		*3.2*	*2.5*	*10.5*			*19.5*	*22.7*	*11.4*	
18	●				**2.6**	**3.9**	**4.7**	**3.1**	**5.2**		*2.5*	*3.9*	*1.3*			*8.3*	*6.0*	*4.8*	
19	●																		
20	●				**2.2**	**3.2**	**6.1**	**3.6**	**5.4**		*2.7*	*2.9*	*1.8*			*4.2*	*8.2*	*5.4*	
21	●				**3.7**	**5.8**	**6.2**	**6.6**	**6.8**		*2.7*	*3.0*	*5.9*			*10.1*	*10.9*	*7.2*	
25			●	Bucklin Point (Seekonk R.)	**10.6**	**13.4**	**9.4**	**38.3**			*5.0*	*7.7*	*4.3*			*24.9*	*12.9*	*72.3*	

Dissolved **Lead Criteria**	**Criteria (ug/l)** *(mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1

Figure 4-54

Wet Weather Data - Storm III: Total Lead (ug/l)

Blackstone River Initiative (Wright et al., 2001)

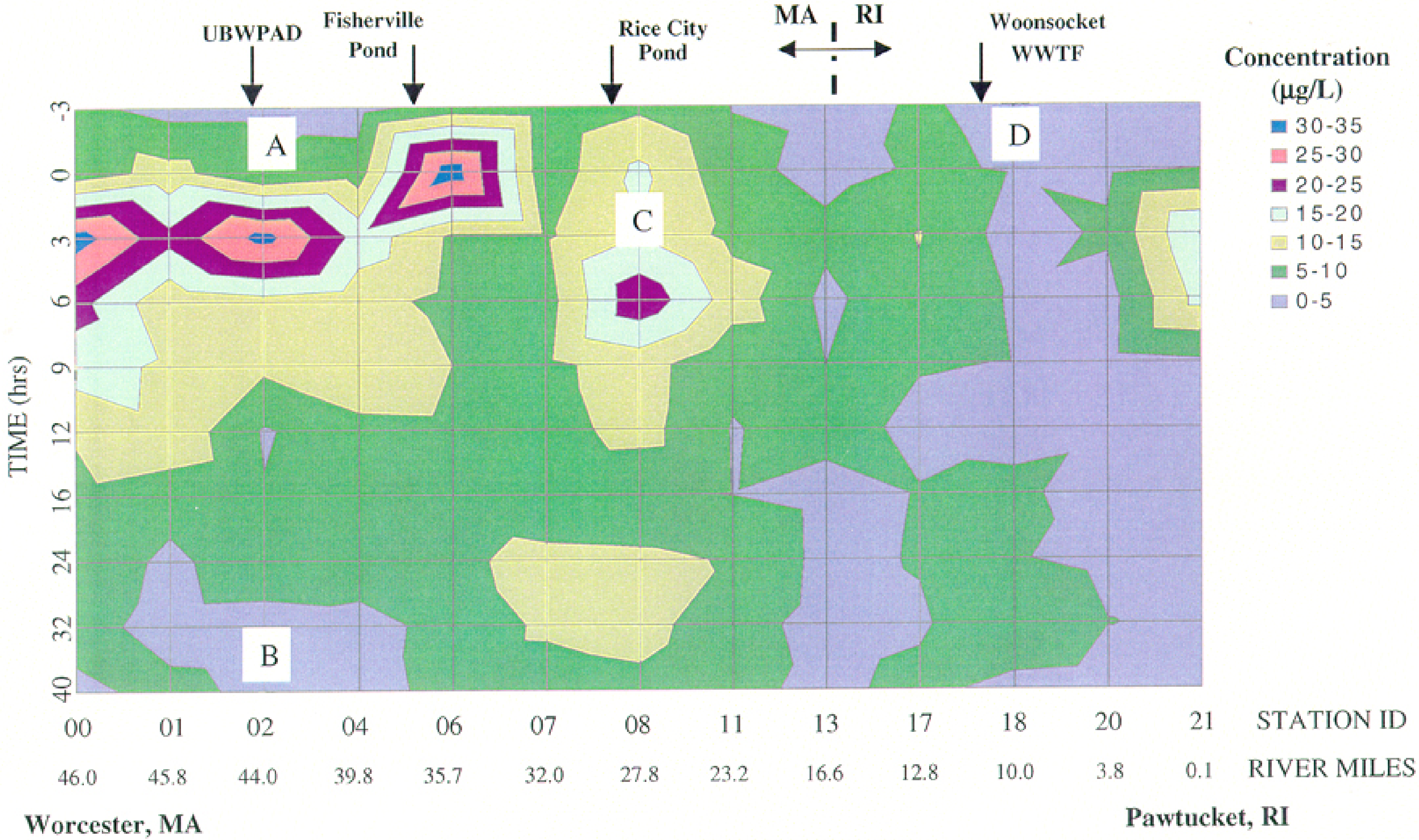
Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**7.7**	**49.5**	**5.7**	**3.5**			*3.0*	*3.9*	*2.5*			*89.2*	*8.1*	*5.3*	
22			●	CSO facility in Worchester		**16.4**			**2.0**		*2.0*					*57.6*			
01	●				**2.6**	**34.2**	**24.4**	**3.8**			*3.2*	*1.8*	*2.8*			*53.4*	*67.2*	*5.6*	
23			●	UBWPAD, Worchester	**0.8**	**1.9**	**1.8**	**2.3**			*1.5*	*1.1*	*1.1*			*2.2*	*3.4*	*3.4*	
02	●				**3.0**	**31.3**	**12.3**	**2.7**			*1.2*	*6.4*	*1.9*			*68.0*	*21.1*	*3.3*	
03	●																		
04	●				**3.0**	**12.7**	**12.8**	**12.0**			*1.3*	*4.9*	*3.0*			*24.0*	*20.9*	*31.2*	
05		●		Quinsigamond River	**1.6**	**1.8**	**1.6**	**1.4**			*1.6*	*0.7*	*0.6*			*2.0*	*3.0*	*2.1*	
06	●				**5.0**	**12.4**	**17.6**	**8.6**			*2.5*	*6.3*	*1.5*			*23.0*	*37.9*	*24.9*	
07	●				**4.9**	**5.7**	**16.6**	**9.2**	**7.6**		*4.7*	*12.0*	*7.4*			*7.1*	*23.1*	*11.5*	
08	●				**5.1**	**8.6**	**30.3**	**14.3**	**6.9**		*7.5*	*14.1*	*6.8*			*10.1*	*68.0*	*22.9*	
09		●		Mumford River	**0.8**	**1.5**	**1.3**	**1.5**	**1.4**		*1.1*	*0.7*	*0.9*			*2.1*	*1.6*	*2.2*	
10		●		West River	**2.6**	**2.0**	**1.7**	**1.9**	**3.2**		*0.9*	*0.5*	*0.9*			*2.9*	*2.9*	*3.0*	
11	●				**5.8**	**13.4**	**15.1**	**24.3**	**7.9**		*4.2*	*6.8*	*8.9*			*25.2*	*25.8*	*57.4*	
12	●																		
13	●				**5.1**	**3.1**	**6.7**	**10.2**	**4.0**		*1.3*	*4.0*	*6.6*			*4.0*	*11.8*	*13.3*	
14		●		Branch River	**1.1**	**1.3**	**1.9**	**1.3**			*0.2*	*1.1*	*1.1*			*2.8*	*2.8*	*1.7*	
15		●		Mill River	**0.9**	**1.9**	**2.8**	**2.1**	**1.8**		*1.0*	*0.8*	*0.8*			*2.7*	*5.1*	*3.8*	
16		●		Peters River	**1.3**	**4.9**	**5.5**	**4.1**	**2.6**		*3.3*	*4.4*	*2.0*			*7.5*	*7.3*	*6.8*	
17	●				**3.7**	**22.2**	**4.8**	**6.7**	**7.8**		*4.4*	*4.3*	*5.5*			*44.8*	*5.2*	*9.6*	
24			●	Woonsocket WWTF	**31.4**	**27.2**	**22.9**	**21.5**			*24.5*	*20.6*	*20.5*			*30.0*	*26.7*	*22.8*	
18	●				**3.7**	**4.5**	**6.8**	**5.7**			*4.4*	*6.0*	*4.9*			*4.5*	*7.6*	*6.5*	
19	●																		
20	●				**4.1**	**4.4**	**5.9**	**7.5**			*3.3*	*4.1*	*6.2*			*6.0*	*9.4*	*9.6*	
21	●				**3.6**	**6.0**	**5.0**	**6.3**			*5.4*	*3.8*	*5.6*			*6.8*	*6.9*	*6.9*	
25			●	Bucklin Point (Seekonk R.)	**2.7**	**5.5**	**3.2**	**4.0**			*3.2*	*2.7*	*2.5*			*9.2*	*3.5*	*7.3*	

***Dissolved* Lead Criteria**	**Criteria (ug/l)** *(mg/l as $CaCO_3$)*		
	25	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1

Figure 4-55

BLACKSTONE RIVER INITIATIVE

LEAD - STORM 1



Lead Concentration for Storm 1, September 22-24, 1992

Table 4-56

Source Rankings by Dry and Wet Load

Total Lead

Blackstone River Initiative (Wright et al., 2001)

Station No. From	Station No. To	Blackstone River	Tributary	WWTF/CSO	Location	Total Lead *(pounds)* Dry Weather Load	Total Lead *(pounds)* Wet Loads Storm 1	Storm 2	Storm 3	Average - All Storms	Total Lead *(%)* Dry Weather Load	Total Lead *(%)* Wet Loads Storm 1	Storm 2	Storm 3	Avergaege - All Storms
headw	00	●					5.12	15.10	86.20			25.70	15.60	51.20	**31.10**
21				●	CSO facility in Worchester			1.31	1.78				1.35	1.06	**0.35**
00	01(*)	●						0.16			**3.67**		0.16		**0.06**
22				●	UBWPAD, Worchester		1.51	2.15	1.69		**3.01**	7.60	2.22	1.00	**3.64**
01	02	●					2.92	8.84	26.30		**0.15**	14.70	9.11	15.60	**13.90**
02	03	●					0.02	12.10			**1.58**	0.09	12.50		**4.27**
03	04	●									**1.27**				
05			●		Quinsigamond River		0.09	0.34	0.28		**0.79**	0.46	0.35	0.17	**0.33**
04	06	●							0.16		**23.80**			0.09	**0.03**
06	07	●									**22.20**				
07	08	●					0.60	18.40	35.30		**7.28**	3.02	19.00	20.90	**14.50**
09			●		Mumford River		0.09	1.81	0.39		**2.68**	0.45	1.86	0.23	**1.00**
10			●		West River		0.03	0.11	0.24		**1.21**	0.15	0.11	0.14	
08	11	●						11.50			**10.40**		11.80		**2.80**
11	12	●									**0.91**				
12	13	●									**13.00**				
14			●		Branch River		0.33	1.04	0.60		**1.43**	1.67	1.07	0.36	**1.05**
15			●		Mill River		0.12	0.28	0.10		**0.44**	0.60	0.29	0.06	**1.06**
16			●		Peters River		0.27	0.69	0.23		**0.42**	1.36	0.71	0.14	
13	17	●					1.98		6.02		**1.74**	9.95		3.57	**4.54**
24				●	Woonsocket WWTF		1.12	2.05	3.92		**1.31**	5.62	2.11	2.33	**3.38**
17	18	●					0.23				**0.01**	1.15			**0.39**
18	19	●						8.00	5.28		**0.23**		8.24	3.13	**3.85**
19	20	●									**0.46**				
20	21	●					5.47	13.20			**2.07**	27.50	13.60		**13.80**
Sum of Rankings - MA							**10.4**	**71.8**	**152.3**	**0.0**	**92.0**	**52.3**	**74.1**	**90.4**	**72.0**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**9.5**	**25.3**	**16.2**	**0.0**	**8.1**	**47.9**	**26.0**	**9.6**	**28.1**
Totals							19.9	97.1	168.5	**0.0**	**100.1**	100.1	100.1	100.0	**100.1**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Table 4-57

Exceedences of Regulatory Standards - Dry Weather Surveys

Dissolved Lead

Data: **Blackstone River Initiative (BRI)** (Wright et al., 2001)
BRI concentrations were compared to RI Regulatory Standards

Station No.	Blackstone River	Tributary	WWTF/CSO	Location	Acute Criteria, Dry Weather: July 11-13, 1991	Acute: Aug. 14-15, 1991	Acute: Oct. 2-3, 1991	Acute: *Total Exceedences (%)*	Chronic Criteria, Dry Weather: July 11-13, 1991	Chronic: Aug. 14-15, 1991	Chronic: Oct. 2-3, 1991	Chronic: *Total Exceedences (%)*
00	●											
22			●	CSO facility in Worchester								
01	●				0%	0%	0%	***0%***	25%	100%	50%	***58%***
23			●	UBWPAD, Worchester								
02	●				0%	0%	0%	***0%***	25%	100%	75%	***67%***
03	●				0%	0%	0%	***0%***	25%	67%	50%	***47%***
04	●				0%	0%	0%	***0%***	25%	100%	100%	***75%***
05		●		Quinsigamond River (*)	0%	0%	0%	***0%***	25%	67%	25%	***39%***
06	●				25%	0%	0%	***8%***	100%	100%	100%	***100%***
07	●				0%	0%	0%	***0%***	100%	100%	100%	***100%***
08	●				0%	0%	0%	***0%***	75%	100%	100%	***92%***
09		●		Mumford River	0%	0%	0%	***0%***	75%	50%	100%	***75%***
10		●		West River	0%	0%	0%	***0%***	100%	100%	100%	***100%***
11	●				0%	0%	0%	***0%***	100%	100%	100%	***100%***
12	●				0%	0%	0%	***0%***	100%	100%	100%	***100%***
13	●				0%	0%	0%	***0%***	100%	100%	100%	***100%***
14		●		Branch River	0%	0%	0%	***0%***	75%	100%	67%	***81%***
15		●		Mill River	0%	0%	0%	***0%***	50%	33%	50%	***44%***
16		●		Peters River	0%	0%	0%	***0%***	100%	100%	75%	***92%***
17	●				0%	0%	0%	***0%***	25%	100%	100%	***75%***
24			●	Woonsocket WWTF								
18	●				0%	0%	0%	***0%***	25%	100%	100%	***75%***
19	●				0%	0%	0%	***0%***	0%	75%	100%	***58%***
20	●				0%	0%	0%	***0%***	50%	50%	100%	***67%***
21	●				0%	0%	0%	***0%***	25%	50%	100%	***58%***

Dissolved Lead Criteria	**Criteria** (ug/l) *for Hardness (mg/l as $CaCO_3$)* *25*	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1

Figure 4-58

Wet Weather Data: **Exceedence of Dissolved Lead (*) - *Acute Criteria***

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	STORM I: Mean Concentration					STORM II: Mean Concentration					STORM III: Mean Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●															●			
22			●	CSO facility in Worchester						●						●			
01	●																		
23			●	UBWPAD, Worchester															
02	●																		
03	●																		
04	●																		
05		●		Quinsigamond River															
06	●																		
07	●																		
08	●																		
09		●		Mumford River															
10		●		West River															
11	●																		
12	●																		
13	●																		
14		●		Branch River															
15		●		Mill River															
16		●		Peters River															
17	●																		
24			●	Woonsocket WWTF											●	●	●	●	
18	●																		
19	●																		
20	●																		
21	●																		
25			●	Bucklin Point (Seekonk R.)															

(*) Note: The total lead concentrations were compared to the dissolved lead regulatory standards of Rhode Island by assuming a constant concentration of 40% dissolved lead in the total lead samples.

●	The mean concentration exceeded the regulatory criteria.
	The mean concentration did not exceed the regulatory criteria.
	No samples were analyzed.

Dissolved Lead Criteria	Criteria (ug/l) *for Hardness (mg/l as* $CaCO_3$*)*		
	25	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1.0

Figure 4-59

Wet Weather Data - Storm I: Exceedence of Lead - Chronic Criteria

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	STORM I: Mean Concentration: Dry Weather	STORM I: During Storm	STORM I: 24h After Storm	STORM I: 48h After Storm	STORM I: 72h After Strom	STORM II: Mean Concentration: Dry Weather	STORM II: During Storm	STORM II: 24h After Storm	STORM II: 48h After Storm	STORM II: 72h After Strom	STORM III: Mean Concentration: Dry Weather	STORM III: During Storm	STORM III: 24h After Storm	STORM III: 48h After Storm	STORM III: 72h After Strom
00	●				●	●	●	●			●	●	●		●	●	●	●	
22			●	CSO facility in Worchester						●	●					●			
01	●					●	●	●			●	●				●	●	●	
23			●	UBWPAD, Worchester	●	●	●				●	●				●	●	●	
02	●					●	●			●	●	●	●			●	●	●	
03	●																		
04	●					●	●				●	●	●		●	●	●	●	
05		●		Quinsigamond River		●						●	●						
06	●				●	●	●	●			●	●	●		●	●	●	●	
07	●				●	●	●	●		●	●	●	●		●	●	●	●	
08	●				●	●	●	●		●	●	●	●		●	●	●	●	
09		●		Mumford River		●	●	●			●	●	●			●	●	●	
10		●		West River				●			●	●			●	●	●	●	
11	●				●	●	●	●		●	●	●	●		●	●	●	●	
12	●																		
13	●				●	●	●	●		●	●	●	●		●	●	●	●	
14		●		Branch River		●	●			●	●	●	●		●	●	●	●	
15		●		Mill River	●	●	●	●			●	●	●			●	●	●	
16		●		Peters River	●	●	●	●		●	●	●	●			●	●	●	
17	●				●	●	●	●		●	●	●	●		●	●	●	●	
24			●	Woonsocket WWTF	●	●	●	●		●	●	●	●		●	●	●	●	
18	●				●	●	●	●		●	●	●	●		●	●	●	●	
19	●																		
20	●				●	●	●	●		●	●	●	●		●	●	●	●	
21	●				●	●	●	●		●	●	●	●		●	●	●	●	
25			●	Bucklin Point (Seekonk R.)	●	●	●	●		●	●	●	●			●	●	●	

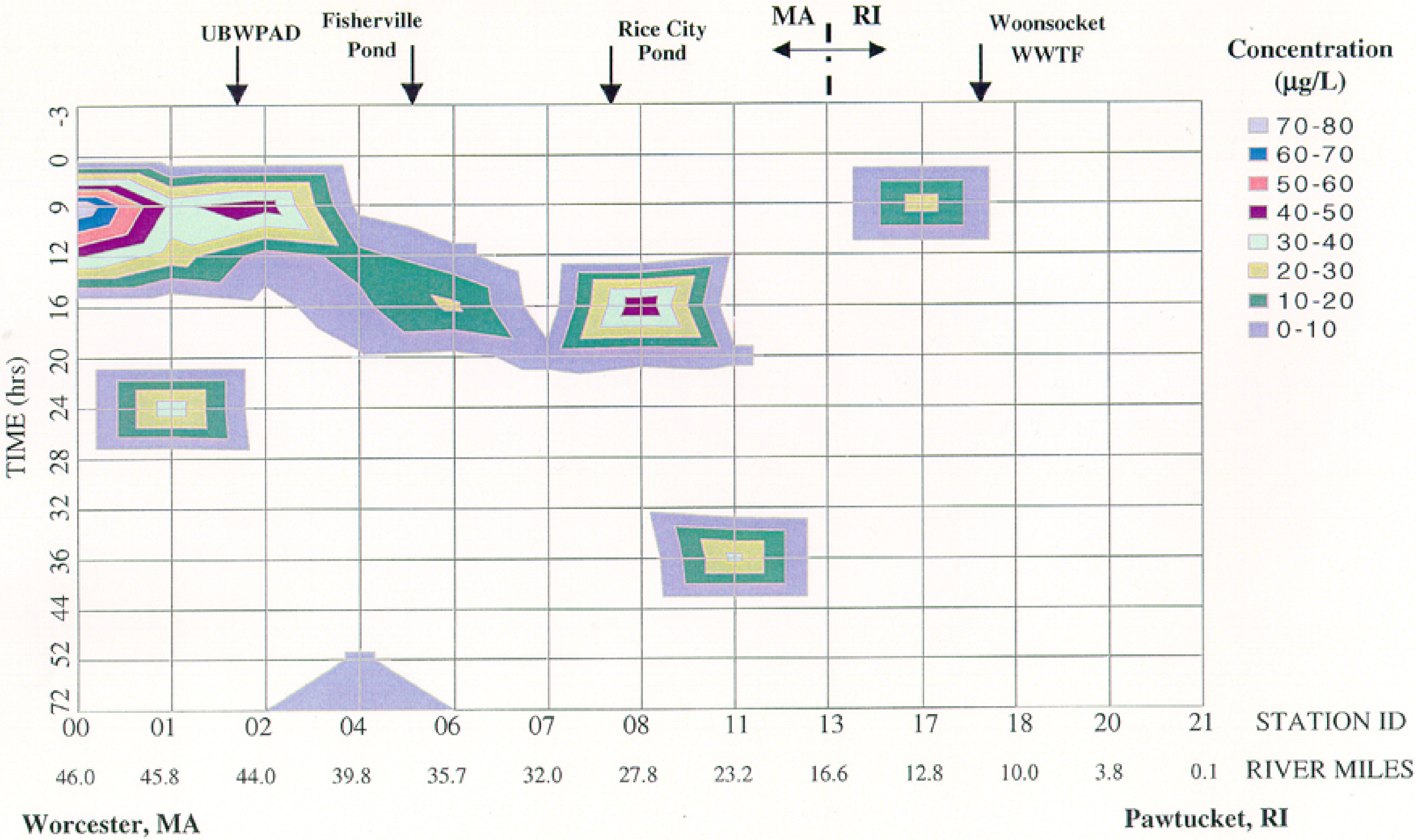
Note: The total lead concentrations were compared to the dissolved lead regulatory standards of Rhode Island by assuming a constant concentration of 40% dissolved lead in the total lead samples.

● The mean concentration exceeded the regulatory criteria.
The mean concentration did not exceed the regulatory criteria.
No samples were analyzed.

Dissolved Lead Criteria	Criteria (ug/l) *for Hardness (mg/l as* $CaCO_3$*)*		
	25	*35*	*45*
Acute Criteria	13.9	20.3	26.8
Chronic Criteria	0.5	0.8	1.0

Figure 4-60

BLACKSTONE RIVER INITIATIVE
ACUTE LEAD VIOLATIONS - STORM 3



Acute Lead Violations for Storm 3, October 12-16, 1993.

White Denotes No Violations

Figure 4-61

RIDEM Chemical Monitoring of Tributaries, Section 305b

Total Lead Concentration *(ug/l)*

Date	Round Top Brook	Pascoag River	Clear River	Abbot Run Brook *(Cumberland)*	Abbot Run Brook *(North Attleboro)*	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
12-Mar-91	0.50	1.70	1.00	1.30	1.20	●		
13-May-91	0.90	4.30	6.30	17.20	11.80			●
29-Jul-91	1.30	3.30	2.10	4.60	1.30			●
06-Sep-91	0.90	2.40	1.40	1.30	0.70			●
26-Apr-93	2.10	1.30	8.30	4.90	2.80		●	
10-Aug-93	0.30		3.60	2.70	1.30	●		
27-Dec-93	1.60	2.90	10.20	1.80	3.00	●		
11-Mar-96	0.20	3.60	1.80	4.30	0.60			●
14-May-96	0.90	1.80	1.50	1.00	24.10			●
20-Aug-96	5.60	3.40	5.90	0.70	1.20	●		
02-Oct-96	1.00	1.50	0.90	0.30	0.30			●
14-Apr-98	0.80	1.70	13.00	7.20	0.90	●		
05-Aug-98	0.80	1.70	4.20	2.40	4.10	●		
26-Oct-98	1.70	1.80	2.10	4.80	13.80	●		
20-Jan-99	0.80	0.80	1.80	0.80	0.80			●
19-Mar-99	0.85	1.60	12.94	10.91	5.44	●		
10-Jun-99	2.43	1.90	2.13	1.68	ND	●		
19-Aug-99	ND	ND	ND	ND	ND	●		
12-Oct-99				1.18	0.83			●
15-Mar-00	1.64			1.89				●
30-May-00				2.36	1.09	●		
18-Sep-00				1.90				●
11-Dec-00				1.42				●
Statistical Summary - All Samples								
Count	19	16	17	22	18	●	●	●
Geometric Mean	**1.35**	**2.23**	**4.66**	**3.48**	**4.18**	●	●	●
Minimum	0.20	0.80	0.90	0.30	0.30	●	●	●
Maximum	5.60	4.30	13.00	17.20	24.10	●	●	●
Statistical Summary - Dry Weather								
Count	9	8	9	10	9	●		
Geometric Mean	**1.62**	**2.09**	**6.12**	**3.59**	**3.56**	●		
Minimum	0.30	1.60	1.00	0.70	0.90	●		
Maximum	5.60	3.40	13.00	10.91	13.80	●		
Statistical Summary - Mixed and Wet Weather								
Count	9	8	8	12	9		●	●
Geometric Mean	**1.08**	**2.38**	**3.01**	**3.40**	**4.80**		●	●
Minimum	0.20	0.80	0.90	0.30	0.30		●	●
Maximum	2.10	4.30	8.30	17.20	24.10		●	●

ND = Not detected

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Figure 4-62

RIPDES-permitted Point Sources

Total Lead *(ug/l)*

Data Period: January 31, 1997, to October 31, 2001

	Flow *(gallons per day)*								Total Lead *(ug/l)*							
	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*	Zambarano Memorial Hospital	Burrillville WWTF	Atlantic Thermoplastics	Blackstone Smithfield Co.	Woonsocket WWTF	Okonite, Co.	Osram Sylvania Products *(Outfall 001)*	Osram Sylvania Products *(Outfall 200)*
Monthly Mean																
Average	50,000	830,000	1,200	2,992	9,180,000	80,000	580,000	330,000		1.31			4.74		0.03	
Minimum	30,000	640,000	268	2,400	5,230,000	30,000	460,000			1.00			1.00		0.02	
Maximum	70,000	1,220,000	2,988	4,608	13,520,000	140,000	710,000	670,000		2.40			13.20		0.05	
Weekly Average																
Average																
Minimum																
Maximum																
Daily Maximum																
Average	80,000	1,100,000				150,000		530,000		2.42			8.52		0.03	37.43
Minimum	40,000	700,000				60,000		310,000		1.00			1.00		0.02	0.04
Maximum	90,000	2,580,000				250,000		1,820,000		8.00			44.10		0.05	123.00

	Flow *(cfs)*							
Monthly Mean								
Average	0.077	1.282	0.002	0.005	14.175	0.124	0.896	0.510
Minimum	0.046	0.988	0.000	0.004	8.076	0.046	0.710	
Maximum	0.108	1.884	0.005	0.007	20.877	0.216	1.096	1.035

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Figure 4- 63

Woonsocket Wastewater Treatment Facility - Effluent

Total Lead

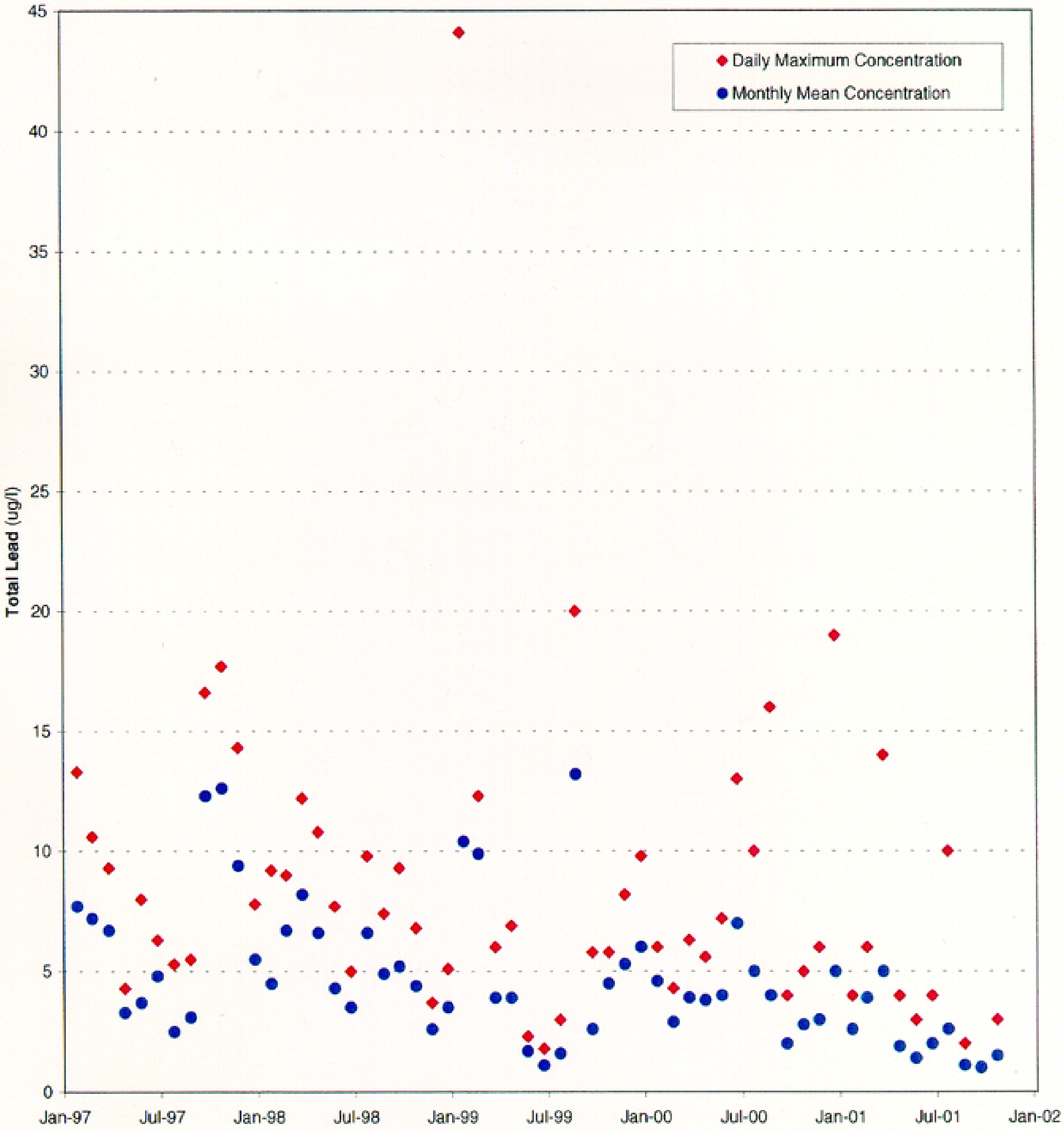


Figure 64a

Valley Falls Pond

Chlorophyll, Year 2000

Source: URI Watershed Watch, unpub. Data

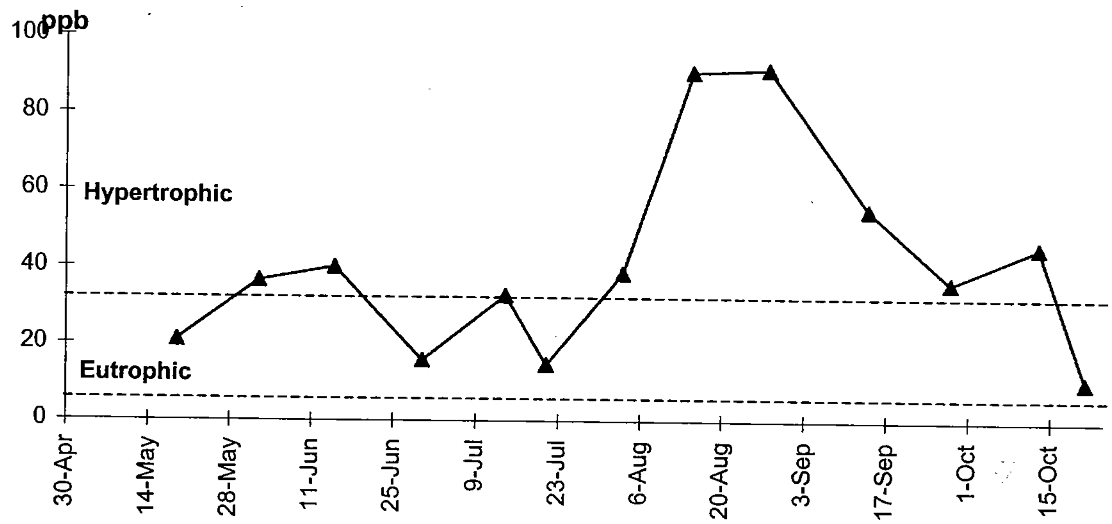


Figure 64b

Valley Falls Pond

Chlorophyll, Year 2001

Source: URI Watershed Watch, unpub. Data

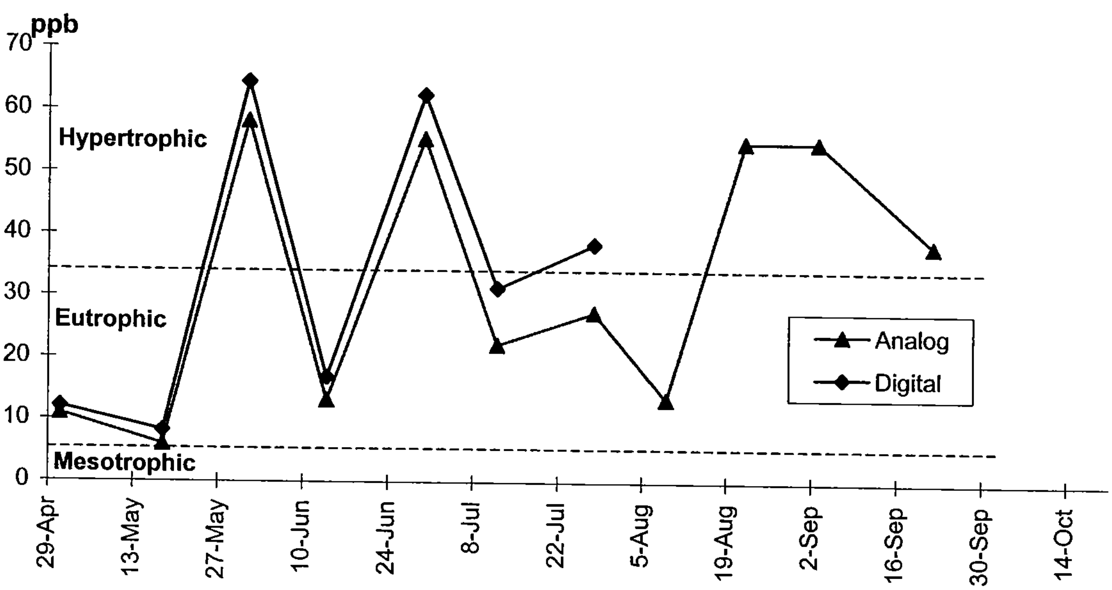


Figure 4-65

Nitrate Concentration (ug/l N) - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**<40**		**<40**	**65**	**<40**	**<40**	**33**	**<40**	**30**
	Minimum	*<40*		*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*
	Maximum	*105*		*<40*	*105*	*<40*	*<40*	*60*	*<40*	*50*
SPRING LAKE	**Mean**	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**	**37**	**23**	**<40**
	Minimum	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*30*	*<40*
	Maximum	*70*	*<40*	*<40*	*<40*	*<40*	*<40*	*70*	*<40*	*<40*
KEECH POND	**Mean**	**<49**	**83**	**<40**	**50**	**40**	**33**	**40**	**48**	**50**
	Minimum	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*
	Maximum	*210*	*210*	*<40*	*110*	*80*	*60*	*80*	*70*	*80*
SMITH AND SAYLES RESERVOIR	**Mean**	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**
	Minimum	*<40*	*<40*	*<40*		*<40*	*<40*		*<40*	*<40*
	Maximum	*80*	*<40*	*<40*		*<40*	*<40*		*<40*	*80*
SPRING GROVE POND	**Mean**	**<40**	**<40**	**80**	**85**	**<40**	**<40**	**<40**	**<40**	**<40**
	Minimum	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*	*<40*
	Maximum	*175*	*<40*	*140*	*175*	*<40*	*<40*	*<40*	*<40*	*<40*
SLATERSVILLE RESERVOIR	**Mean**	**157**			**133**					**180**
	Minimum	*100*			*100*					*150*
	Maximum	*210*			*160*					*210*
VALLEY FALLS POND	**Mean**	**767**								**767**
	Minimum	*240*								*240*
	Maximum	*1,230*								*1,230*

Regulatory Standard: --

Figure 4-66

Total Nitrogen Concentration at 1 m Depth (ug/l N) - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**298**		**345**	**335**	**360**	**223**	**267**	**273**	**280**
	Minimum	*150*		*250*	*310*	*285*	*190*	*150*	*210*	
	Maximum	*440*		*440*	*360*	*435*	*260*	*370*	*350*	
SPRING LAKE	**Mean**	**338**	**565**	**175**	**340**	**308**	**277**	**243**	**355**	**440**
	Minimum	*100*	*280*	*100*		*255*	*210*	*130*	*320*	
	Maximum	*850*	*850*	*250*		*360*	*360*	*430*	*390*	
KEECH POND	**Mean**	**443**	**385**	**387**	**470**	**633**	**427**	**430**	**343**	**470**
	Minimum	*40*	*250*	*260*	*340*	*560*	*270*	*330*	*40*	
	Maximum	*705*	*520*	*490*	*600*	*705*	*630*	*500*	*580*	
SMITH AND SAYLES RESERVOIR	**Mean**	**374**	**800**	**370**	**340**	**300**	**225**	**265**	**330**	**360**
	Minimum	*190*				*285*	*190*	*200*	*300*	
	Maximum	*360*				*315*	*260*	*330*	*360*	
SPRING GROVE POND	**Mean**	**445**	**335**	**485**	**510**	**820**	**433**	**330**	**370**	**280**
	Minimum	*240*	*300*	*470*		*700*	*250*	*240*	*320*	
	Maximum	*940*	*370*	*500*		*940*	*790*	*480*	*420*	
SLATERSVILLE RESERVOIR	**Mean**	**510**			**530**					**490**
	Minimum									
	Maximum									
VALLEY FALLS POND	**Mean**	**1,990**								**1,990**
	Minimum									
	Maximum									

Regulatory Standard: --

Figure 4-67

Dissolved Phosphorus Concentration (ug/l P) - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**<4**		**<4**	**2.7**	**<4**	**<4**	**<4**	**<4**	**<4**
	Minimum	*<4*		*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*
	Maximum	*4.0*		*<4*	*4.0*	*<4*	*<4*	*<4*	*<4*	*<4*
SPRING LAKE	**Mean**	**<4**	**6.3**	**<4**	**<4**	**<4**	**<4**	**<4**	**4.3**	**2.7**
	Minimum	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*
	Maximum	*15.0*	*15.0*	*<4*	*<4*	*<4*	*<4*	*<4*	*6.0*	*4.0*
KEECH POND	**Mean**	**<5**	**12.7**	**<4**	**<4**	**<4**	**<4**	**<4**	**<5**	**<4**
	Minimum	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*
	Maximum	*34.0*	*34.0*	*<4*	*<4*	*<4*	*<4*	*<4*	*5.0*	*6.0*
SMITH AND SAYLES RESERVOIR	**Mean**	**<4**	**<4**	**<4**	**<4**	**<4**	**<4**	**<4**	**<4**	**<4**
	Minimum	*<4*	*<4*	*<4*		*<4*	*<4*		*<4*	*<4*
	Maximum	*<4*	*<4*	*<4*		*<4*	*<4*		*<4*	*<4*
SPRING GROVE POND	**Mean**	**<4**	**<4**	**<4**	**<4**	**4.7**	**<4**	**<4**	**<4**	**6.0**
	Minimum	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*	*<4*
	Maximum	*14.0*	*<4*	*<4*	*<4*	*10.0*	*<4*	*<4*	*<4*	*14.0*
SLATERSVILLE RESERVOIR	**Mean**	**5.4**			**6.3**					**4.5**
	Minimum	*<4*			*<4*					*<4*
	Maximum	*15.0*			*15.0*					*7.0*
VALLEY FALLS POND	**Mean**	**129.7**								**129.7**
	Minimum	*93.0*								*93.0*
	Maximum	*175.0*								*175.0*

Regulatory Standard: Average *Total* Phosphorus concentation of 25 ug/l P for lakes, ponds, and reservoirs.

Figure 4-68

Total Phosphorus Concentration at 1 m Depth (ug/l P) - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**7.4**		**9.3**	**8.7**	**7.3**		**5.0**	**6.7**	**7.3**
	Minimum	<3		8.0	7.0	5.0		<3	6.0	5.0
	Maximum	11.0		11.0	10.0	9.0		8.0	7.0	11.0
SPRING LAKE	**Mean**	**10.1**	**22.3**	**8.0**	**7.3**	**6.7**		**10.0**	**8.3**	**8.0**
	Minimum	<3	5.0	6.0	5.0	5.0		<3	5.0	4.0
	Maximum	48.0	48.0	10.0	9.0	9.0		13.0	11.0	11.0
KEECH POND	**Mean**	**12.1**	**12.0**	**14.7**	**14.0**	**12.0**		**9.0**	**11.3**	**11.5**
	Minimum	<3	9.0	12.0	10.0	9.0		7.0	10.0	<3
	Maximum	21.0	15.0	20.0	21.0	15.0		12.0	13.0	17.0
SMITH AND SAYLES RESERVOIR	**Mean**	**11.8**	**25.0**	**6.7**	**14.0**	**7.7**		**7.5**	**11.5**	**10.3**
	Minimum	<3	23.0	<3	8.0	6.0		5.0	11.0	8.0
	Maximum	27.0	27.0	11.0	20.0	9.0		10.0	12.0	15.0
SPRING GROVE POND	**Mean**	**11.8**	**9.0**	**13.7**	**13.0**	**14.5**		**15.7**	**7.5**	**9.0**
	Minimum	5.0	7.0	12.0	11.0	12.0		7.0	5.0	7.0
	Maximum	24.0	11.0	15.0	16.0	17.0		24.0	10.0	10.0
SLATERSVILLE RESERVOIR	**Mean**	**20.2**			**18.3**					**22.0**
	Minimum	15.0			15.0					19.0
	Maximum	25.0			22.0					25.0
VALLEY FALLS POND	**Mean**	**325.0**								**325.0**
	Minimum	218.0								218.0
	Maximum	390.0								390.0

Regulatory Standard: Average *Total* Phosphorus concentation of 25 ug/l P for lakes, ponds, and reservoirs.

Figure 4-69

Trophic Status Concentration - Reservoirs

Waterbody		All Years (1993-2000)	1993	1994	1995	1996	1997	1998	1999	2000
PASCOAG RESERVOIR	**Mean**	**O**		**O**	**O**	**O**		**O**	**O**	**O**
	Minimum									
	Maximum									
SPRING LAKE	**Mean**	**O**	**M**	**O**	**O**	**O**		**O**	**O**	**O**
	Minimum									
	Maximum									
KEECH POND	**Mean**	**M**	**M**	**M**	**M**	**M**		**O**	**M**	**M**
	Minimum									
	Maximum									
SMITH AND SAYLES RESERVOIR	**Mean**	**M**	**E**	**O**	**M**	**O**		**O**	**M**	**M**
	Minimum									
	Maximum									
SPRING GROVE POND	**Mean**	**O/M**	**O**	**M**	**M**	**M**		**M**	**O**	**O**
	Minimum									
	Maximum									
SLATERSVILLE RESERVOIR	**Mean**	**M**			**M**					**M**
	Minimum									
	Maximum									
VALLEY FALLS POND	**Mean**	**E**								**E**
	Minimum									
	Maximum									

O = Oligotrophic
M = Mesotrophic
E = Eutrophic

Figure 4-70

Nutrient Concentrations in Sediments
Valley Falls Pond

Sample Depth (cm)	**Carbon** (ug/mg)	**Nitrogen** (ug/mg)	**Phosphorus** (ug/mg)
1	88.8	6.3	1.80
3	71.9	4.8	1.84
9	70.2	4.8	2.11
16	87.9	6.2	2.08
31	151	22.1	1.49
51	172.2	9.4	1.50
Mean	**107.0**	**8.9**	**1.80**

Source: Dr. John King, University of Rhode Island (unpublished data)

Figure 4-71

Nitrate and Nitrite *(mg/l N) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Flow				Minimum Flow				Maximum Flow			
								Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	1.80				0.63				4.53			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	0.31		0.21		0.20		0.10		0.63		0.30	
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	0.21				0.01				0.31			
		URI BRI wet	1991-1993		●														
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA		1.03				0.36				2.41		
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line	3.19	3.10	3.05	3.28	2.86	1.84	2.01	2.00	3.51	3.79	4.31	4.74
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	1.35				0.68				2.38			
		URI BRI wet	1991-1993	●				1.77	1.38	1.71	1.34		0.47	0.65	0.71		2.29	1.85	1.85
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	0.33				0.16				0.89			
		URI BRI wet	1991-1993		●														
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	0.67				0.42				0.95			
		URI BRI wet	1991-1993		●														
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	0.91				0.39				1.46			
		URI BRI wet	1991-1993	●				1.93	1.60	1.58	1.72		1.36	1.17	1.34		2.17	2.25	1.85
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		3.37	4.48	4.73	4.72		0.03	0.02	0.01		14.65	13.74	13.52
1	WSTP	URI	1988-1989			●		23.71	19.87	12.10	2.83	17.88	11.16	4.97	0.89	29.54	27.63	16.08	6.85
14	RIPDES	RIDEM	1997-2001			●			5.99				4.12				41.68		
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	1.43				0.62				4.65			
		URI BRI wet	1991-1993	●				2.23	1.87	1.79	1.54		1.36	1.12	1.15		2.79	2.91	2.25
9	Manville	USGS	1990-1999	●				1.02		0.84		0.26		0.40		1.90		1.60	
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	1.29				0.25				1.97			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI		1.25				0.56				3.34		
15	20	URI BRI dry	1991	●				1.37				0.15				2.29			
		URI BRI wet	1991-1993	●				1.87	1.82	1.85	2.02		1.40	0.82	1.33		2.09	2.47	2.85
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket	3.29	2.69	2.60	3.04	2.50	1.86	1.74	1.98	4.07	3.13	3.99	4.09
1	BRSM	URI	1988-1989	●			Slaters Mill	5.27	5.26	5.25	5.69	2.76	2.32	2.02	2.02	9.38	9.19	9.82	10.45
2	BRSMDN	URI	1990	●				1.36	1.40	1.29	1.09	1.17	0.97	0.82	0.60	1.59	1.92	1.77	1.52
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				1.53				0.54				2.41			
		URI BRI wet	1991-1993	●				1.83	1.75	1.84	2.10		1.42	1.45	1.62		2.07	2.25	2.81
5	TMDL	RIDEM	1995-1996	●				1.55		1.44		0.47		0.28		2.31		1.99	
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI		1.04				0.01				4.15		

Figure 4-72

Ammonia *(mg/l N) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Flow: Dry Weather	Mean Flow: During Storm	Mean Flow: 24h After Storm	Mean Flow: 48h After Storm	Minimum Flow: Dry Weather	Minimum Flow: During Storm	Minimum Flow: 24h After Storm	Minimum Flow: 48h After Storm	Maximum Flow: Dry Weather	Maximum Flow: During Storm	Maximum Flow: 24h After Storm	Maximum Flow: 48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	**0.14**				*0.04*				*0.37*			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	**0.13**	**0.07**			*0.06*	*0.01*			*0.69*	*0.13*		
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	**0.14**				*0.01*				*0.62*			
		URI BRI wet	1991-1993		●														
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA	**0.42**				*0.01*				*1.84*			
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line	**0.17**	**0.26**	**0.16**	**0.22**	*0.13*	*0.12*	*0.04*	*0.14*	*0.20*	*0.53*	*0.29*	*0.32*
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	**0.14**				*0.01*				*0.38*			
		URI BRI wet	1991-1993	●				**0.09**	**0.12**	**0.37**	**0.60**		*0.00*	*0.02*	*0.00*		*0.07*	*0.24*	*0.19*
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	**0.12**				*0.03*				*0.39*			
		URI BRI wet	1991-1993		●														
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	**0.18**				*0.04*				*0.33*			
		URI BRI wet	1991-1993		●														
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	**0.14**				*0.01*				*0.77*			
		URI BRI wet	1991-1993	●				**0.05**	**0.05**	**0.15**	**0.45**		*0.00*	*0.05*	*0.00*		*0.03*	*0.08*	*0.12*
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		**21.10**	**16.57**	**16.96**	**15.29**		*0.53*	*0.43*	*0.36*		*30.00*	*31.00*	*21.30*
1	WSTP	URI	1988-1989			●		**3.96**	**3.70**	**2.75**	**17.73**	*2.60*	*0.32*	*0.93*	*3.11*	*5.32*	*7.76*	*4.86*	*29.60*
14	RIPDES	RIDEM	1997-2001			●		**20.04**				*0.50*				*30.10*			
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	**0.71**				*0.04*				*1.54*			
		URI BRI wet	1991-1993	●				**1.67**	**1.21**	**1.26**	**1.14**		*0.04*	*0.50*	*0.28*		*3.20*	*3.50*	*2.13*
9	Manville	USGS	1990-1999	●				**0.47**	**0.39**			*0.05*	*0.01*			*1.20*	*0.84*		
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	**0.58**				*0.20*				*1.03*			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI	**0.43**				*0.00*				*1.46*			
15	20	URI BRI dry	1991	●				**0.31**				*0.01*				*0.55*			
		URI BRI wet	1991-1993	●				**0.34**	**0.48**	**0.58**	**0.50**		*0.31*	*0.32*	*0.21*		*0.58*	*0.92*	*0.74*
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket	**0.17**	**0.15**	**0.09**	**0.17**	*0.17*	*0.06*	*0.01*	*0.12*	*0.17*	*0.21*	*0.19*	*0.22*
1	BRSM	URI	1988-1989	●			Slaters Mill	**0.20**	**0.32**	**0.30**	**0.18**	*0.15*	*0.01*	*0.01*	*0.06*	*0.28*	*1.44*	*0.94*	*0.23*
2	BRSMDN	URI	1990	●															
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				**0.30**				*0.04*				*0.64*			
		URI BRI wet	1991-1993	●				**0.39**	**0.49**	**0.38**	**0.36**		*0.33*	*0.10*	*0.08*		*0.54*	*0.58*	*0.43*
5	TMDL	RIDEM	1995-1996	●				**0.16**	**0.15**			*0.01*	*0.06*			*0.75*	*0.29*		
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI	**0.33**				*0.00*				*1.30*			

pH	Acute Criteria (mg/l	Chronic Criteria Temperature (C) 10.0	15.0	20.0
6.5	48.8	8.9	6.5	4.7
7.0	36.1	7.9	5.7	4.2
7.5	19.9	5.8	4.2	3.1

[1]Ammonia criteria for acute and chronic is based on criteria with early life stages absent.
[2]Chronic ammonia criteria is temperature and pH dependent.

Figure 4-73

Phosphate *(mg/l P) - Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Flow: Dry Weather	Mean Flow: During Storm	Mean Flow: 24h After Storm	Mean Flow: 48h After Storm	Minimum Flow: Dry Weather	Minimum Flow: During Storm	Minimum Flow: 24h After Storm	Minimum Flow: 48h After Storm	Maximum Flow: Dry Weather	Maximum Flow: During Storm	Maximum Flow: 24h After Storm	Maximum Flow: 48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	**0.16**				*0.01*				*0.46*			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale	**0.02**		**0.01**		*0.01*		*0.01*		*0.12*		*0.01*	
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	**0.04**				*0.01*				*0.14*			
		URI BRI wet	1991-1993		●			**0.28**	**0.25**	**0.26**	**0.25**		*0.14*	*0.18*	*0.14*		*0.36*	*0.30*	*0.31*
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA		**0.07**				*0.00*				*0.31*		
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line	**0.33**	**0.31**	**0.25**	**0.30**	*0.09*	*0.10*	*0.07*	*0.10*	*0.56*	*0.52*	*0.49*	*0.50*
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	**0.14**				*0.01*				*0.38*			
		URI BRI wet	1991-1993	●															
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	**0.03**				*0.01*				*0.08*			
		URI BRI wet	1991-1993		●														
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	**0.02**				*0.01*				*0.06*			
		URI BRI wet	1991-1993		●														
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	**0.09**				*0.01*				*0.20*			
		URI BRI wet	1991-1993	●				**0.17**	**0.16**	**0.15**	**0.18**		*0.06*	*0.06*	*0.09*		*0.30*	*0.23*	*0.26*
15	24	URI BRI dry	1991			●													
		URI BRI wet	1991-1993			●	Effluent, Woonsocket Sewage Treatment Plant	**5.26**	**4.81**	**4.32**	**4.55**		*2.91*	*2.45*	*2.28*		*6.14*	*5.27*	*4.81*
1	WSTP	URI	1988-1989			●		**10.56**	**12.59**	**12.38**	**12.33**	*10.36*	*10.48*	*8.21*	*7.51*	*10.76*	*14.93*	*17.56*	*17.27*
14	RIPDES	RIDEM	1997-2001			●													
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	**1.54**				*0.01*				*0.36*			
		URI BRI wet	1991-1993	●				**0.37**	**0.37**	**0.40**	**0.32**		*0.26*	*0.23*	*0.30*		*0.46*	*0.56*	*0.36*
9	Manville	USGS	1990-1999	●				**0.22**		**0.01**		*0.15*		*0.02*		*0.53*		*0.32*	
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	**0.14**				*0.01*				*0.33*			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●			Lonsdale Ave., Lonsdale, RI		**0.08**				*0.00*				*0.40*		
15	20	URI BRI dry	1991	●				**0.14**				*0.01*				*0.34*			
		URI BRI wet	1991-1993	●				**0.29**	**0.28**	**0.31**	**0.48**		*0.19*	*0.21*	*0.23*		*0.40*	*0.44*	
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket	**0.26**	**0.26**	**0.21**	**0.27**	*0.17*	*0.10*	*0.04*	*0.13*	*0.35*	*0.37*	*0.47*	*0.41*
1	BRSM	URI	1988-1989	●			Slaters Mill	**0.63**	**0.61**	**0.76**	**0.67**	*0.25*	*0.11*	*0.17*	*0.15*	*1.35*	*1.46*	*1.86*	*1.61*
2	BRSMDN	URI	1990	●				**0.20**	**0.20**	**0.22**	**0.18**	*0.05*	*0.05*	*0.05*	*0.61*	*0.30*	*0.31*	*0.39*	*1.52*
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				**0.11**				*0.01*				*0.28*			
		URI BRI wet	1991-1993	●				**0.31**	**0.25**	**0.26**	**0.30**		*0.10*	*0.13*	*0.23*		*0.41*	*0.42*	*0.48*
5	TMDL	RIDEM	1995-1996	●				**0.14**		**1.58**		*0.05*		*0.05*		*0.31*		*0.39*	
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI		**0.09**				*0.01*				*0.53*		

Figure 4-74

Nitrate and Nitrite Concentration

USGS Station at Forestdale, Branch River

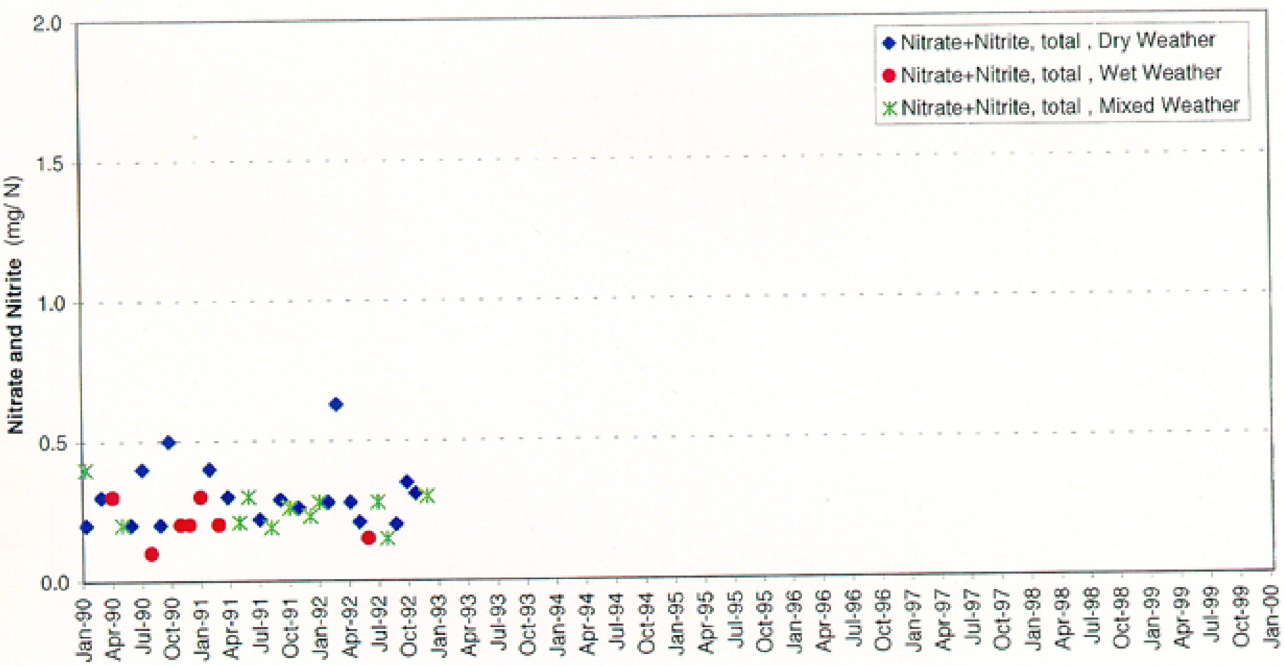


Figure 4-75

Nitrate and Nitrite Concentration

USGS Station at Manville, Blackstone River

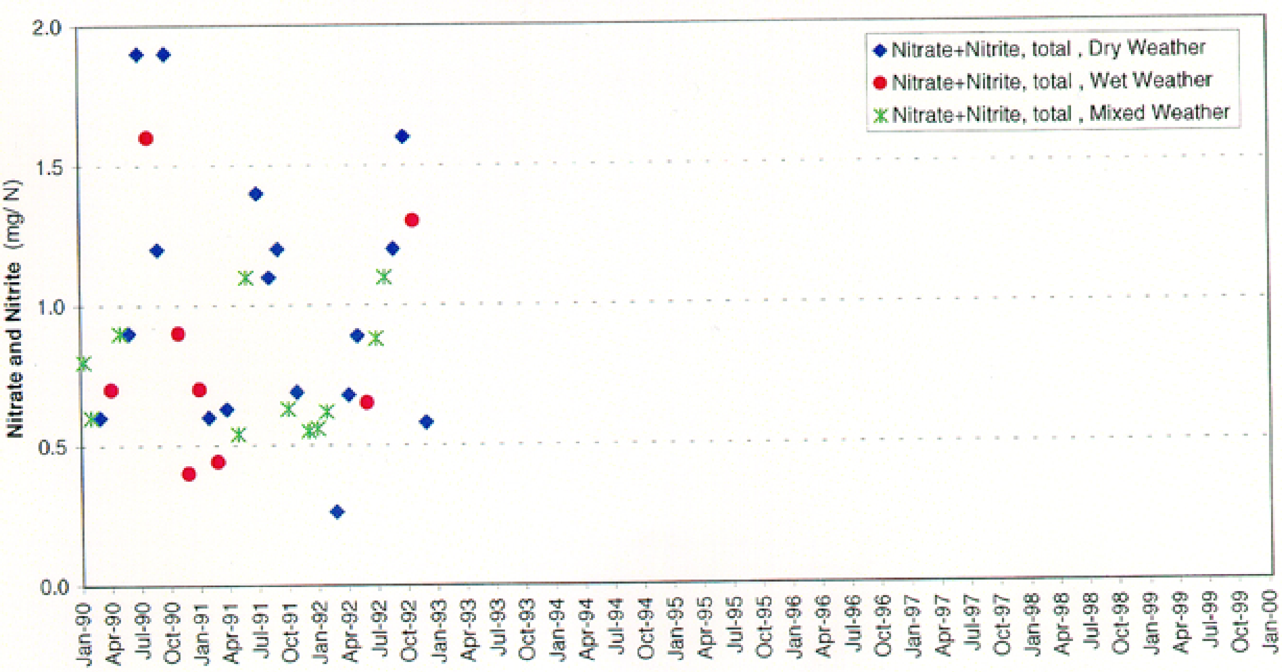


Figure 4-76
Total Ammonia Concentration
USGS Station at Forestdale, Branch River

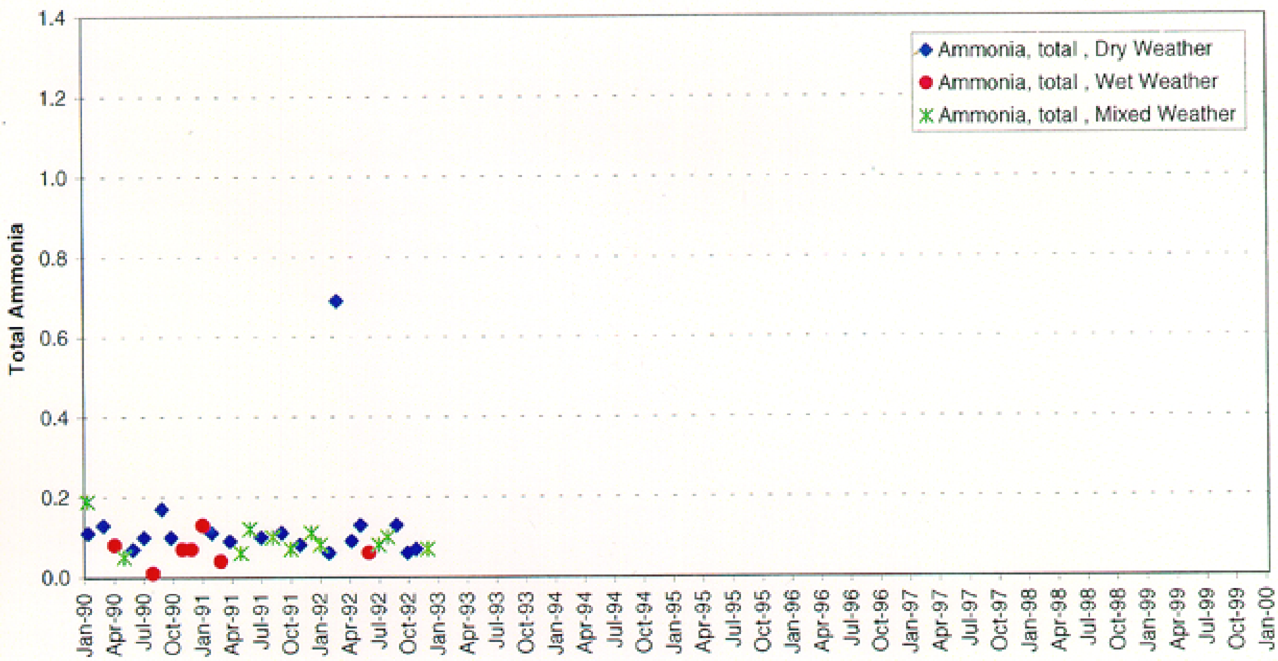


Figure 4-77
Total Ammonia Concentration
USGS Station at Manville, Blackstone River

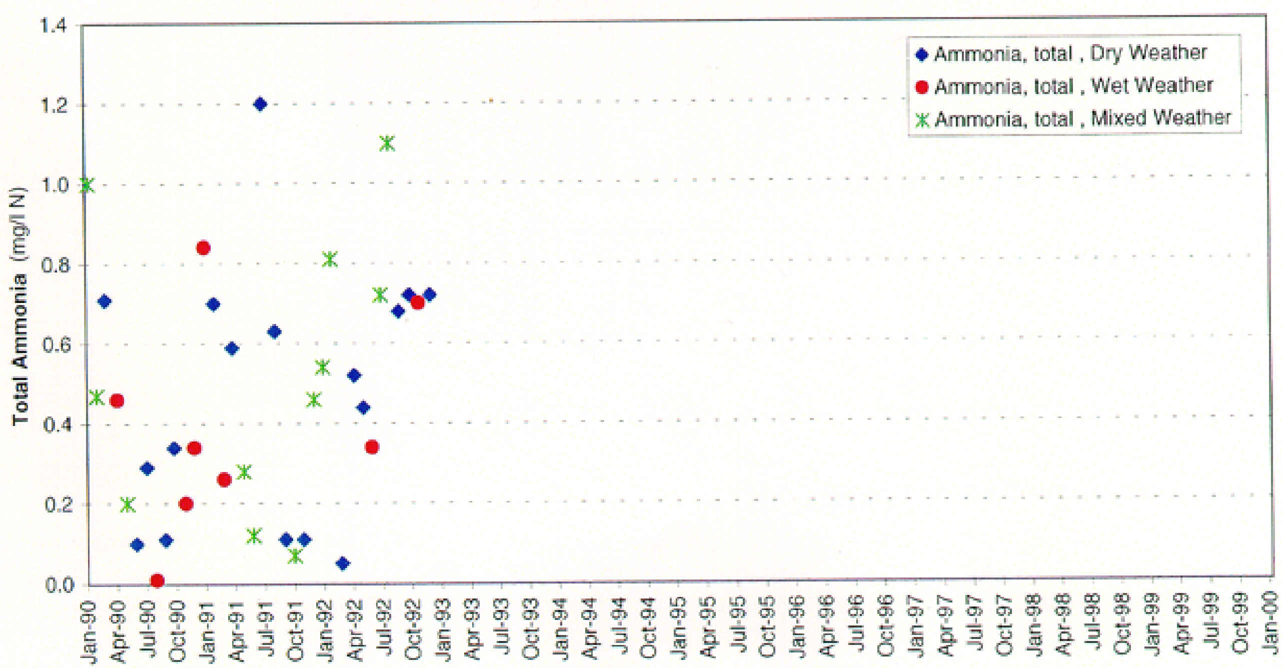


Figure 4-78
Ammonia and Total Organic Nitrogen Concentration
USGS Station at Forestdale, Branch River

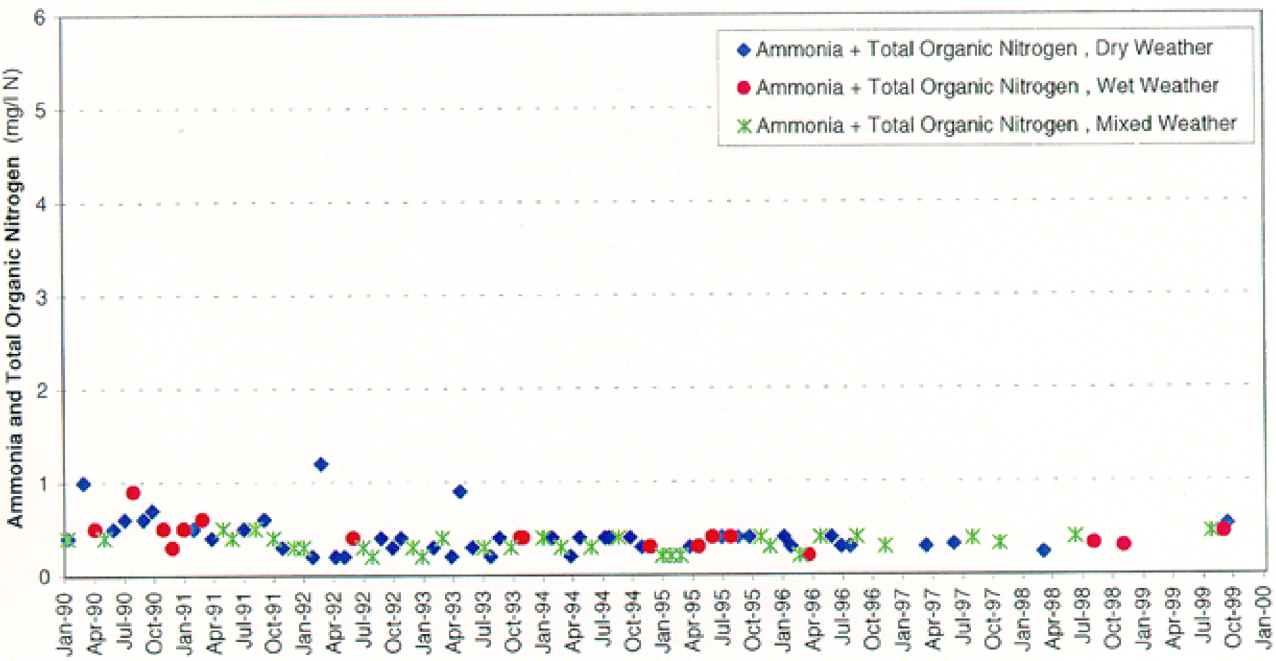


Figure 4-79
Ammonia and Total Organic Nitrogen Concentration
USGS Station at Manville, Blackstone River

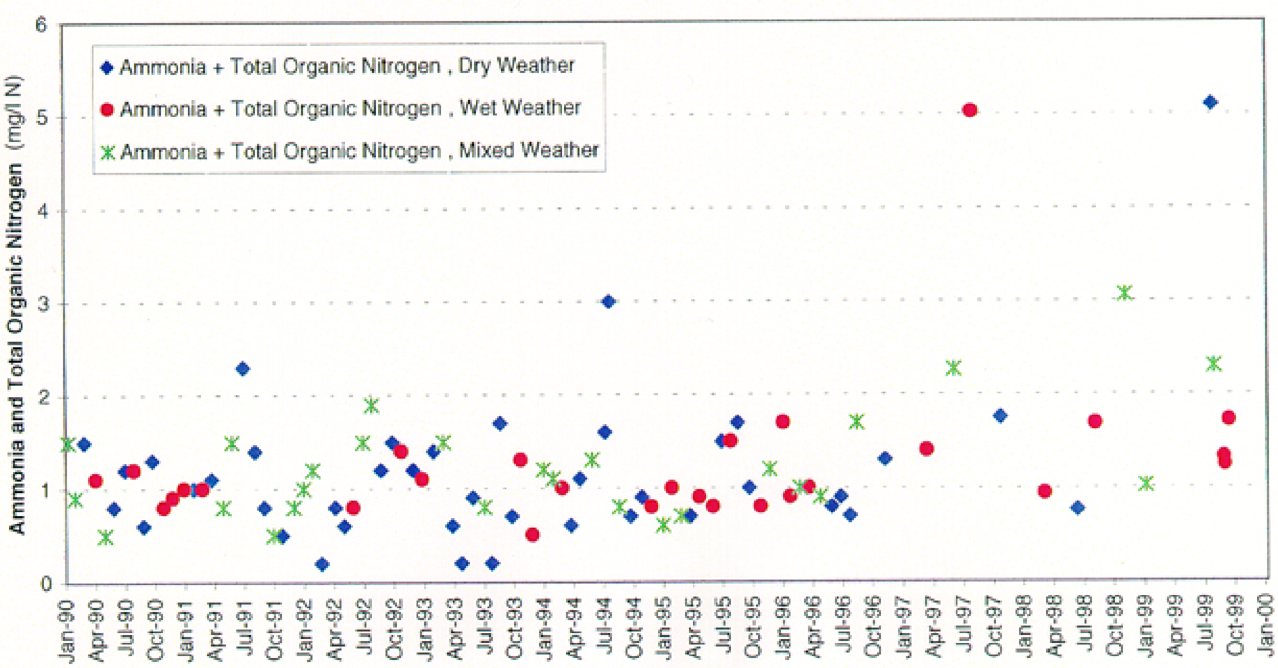


Figure 4-80

Orthophosphate Concentration

USGS Station at Forestdale, Branch River

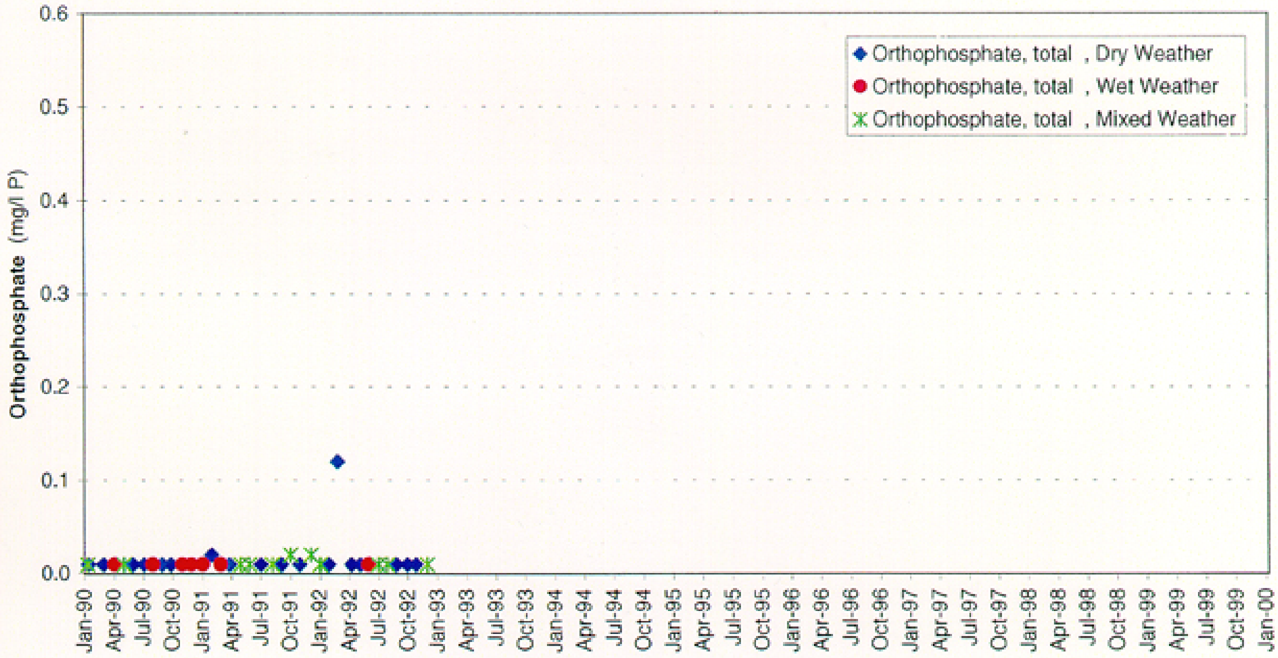


Figure 4-81

Orthophosphate Concentration

USGS Station at Manville, Blackstone River

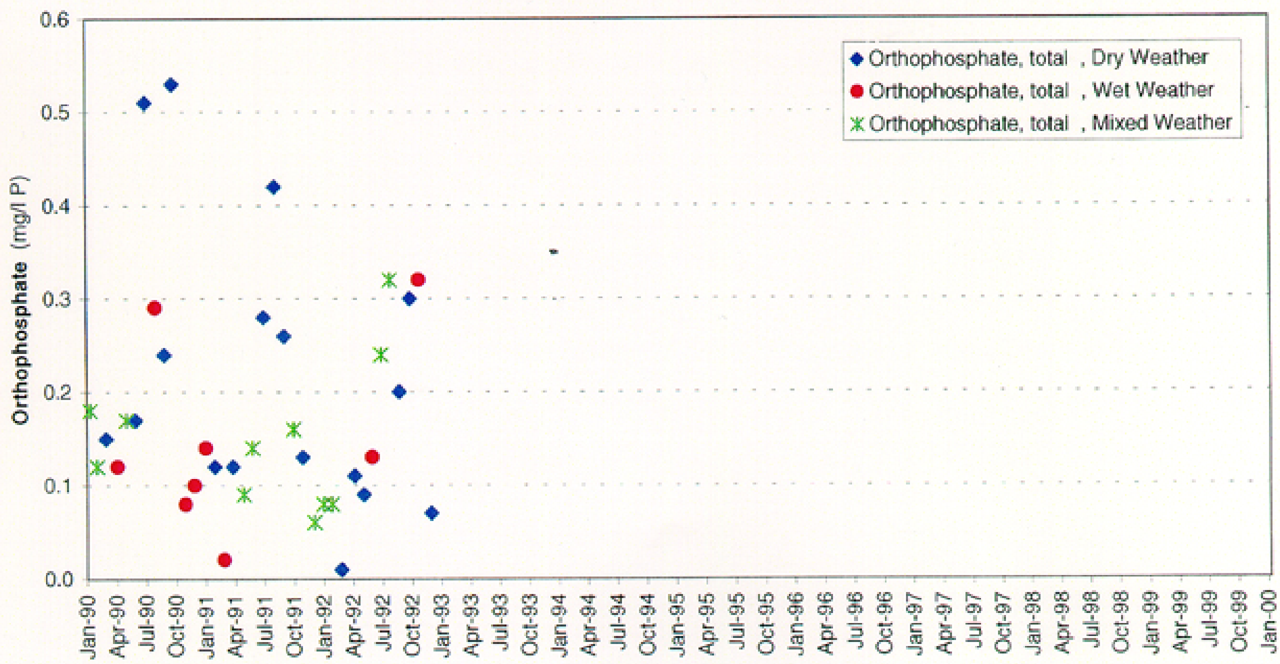


Figure 4-82

Total Phosphorus Concentration

USGS Station at Forestdale, Branch River

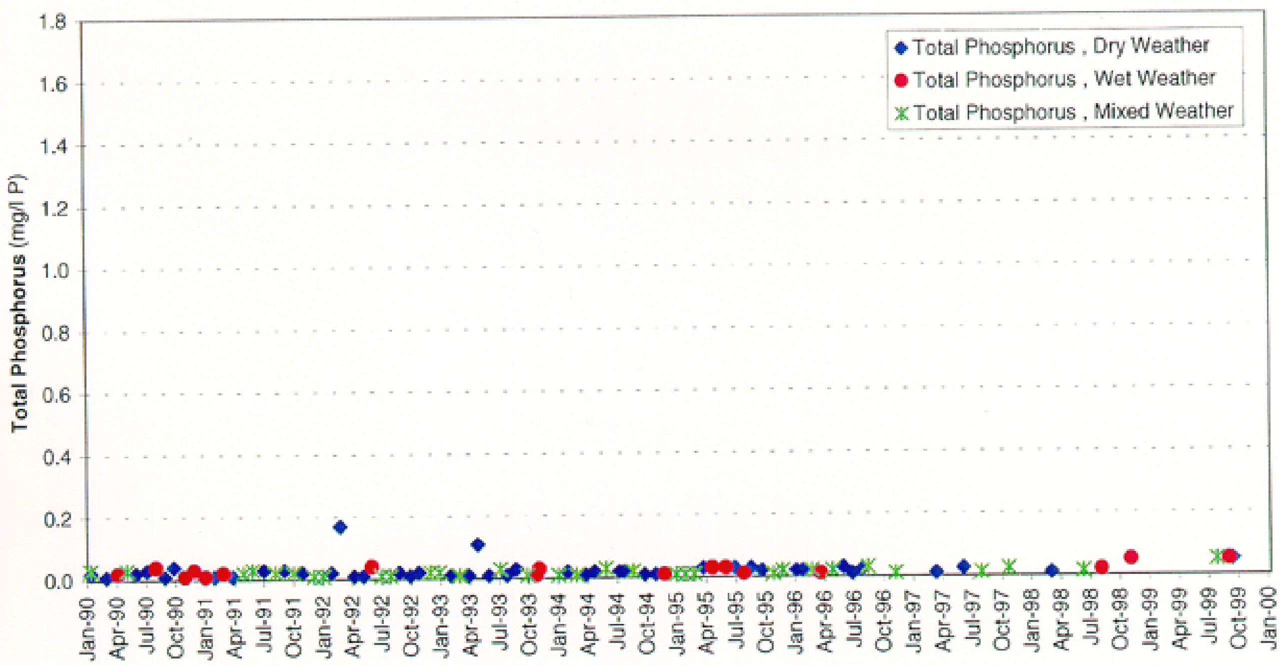


Figure 4-83

Total Phosphorus Concentration

USGS Station at Manville, Blackstone River

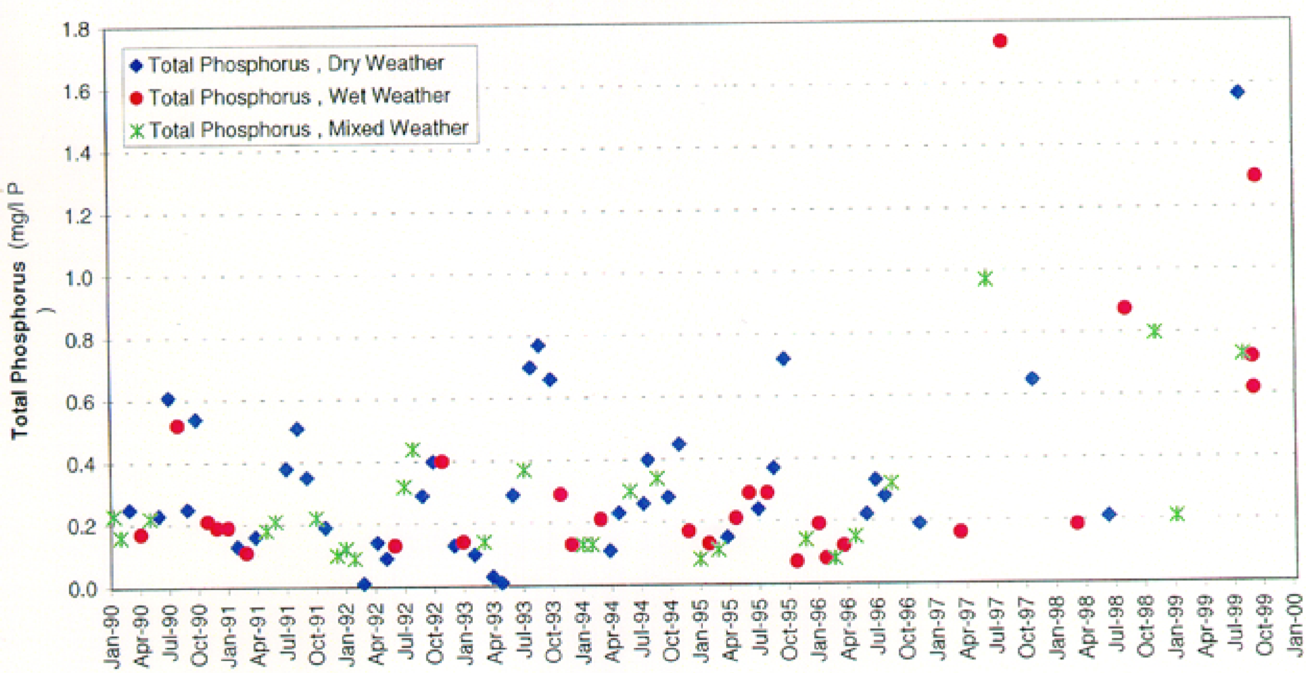


Figure 4-84

Dissolved Oxygen Concentration

USGS Station at Forestdale, Branch River

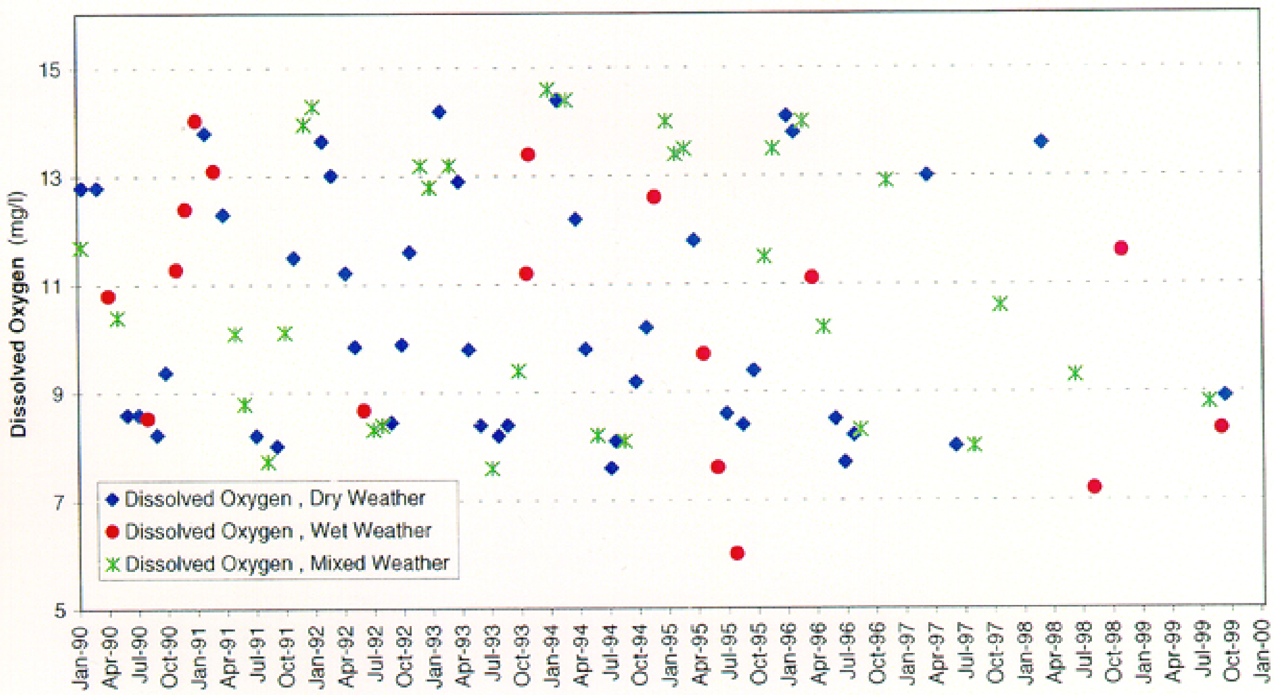


Figure 4-85

Dissolved Oxygen Concentration

USGS Station at Manville, Blackstone River

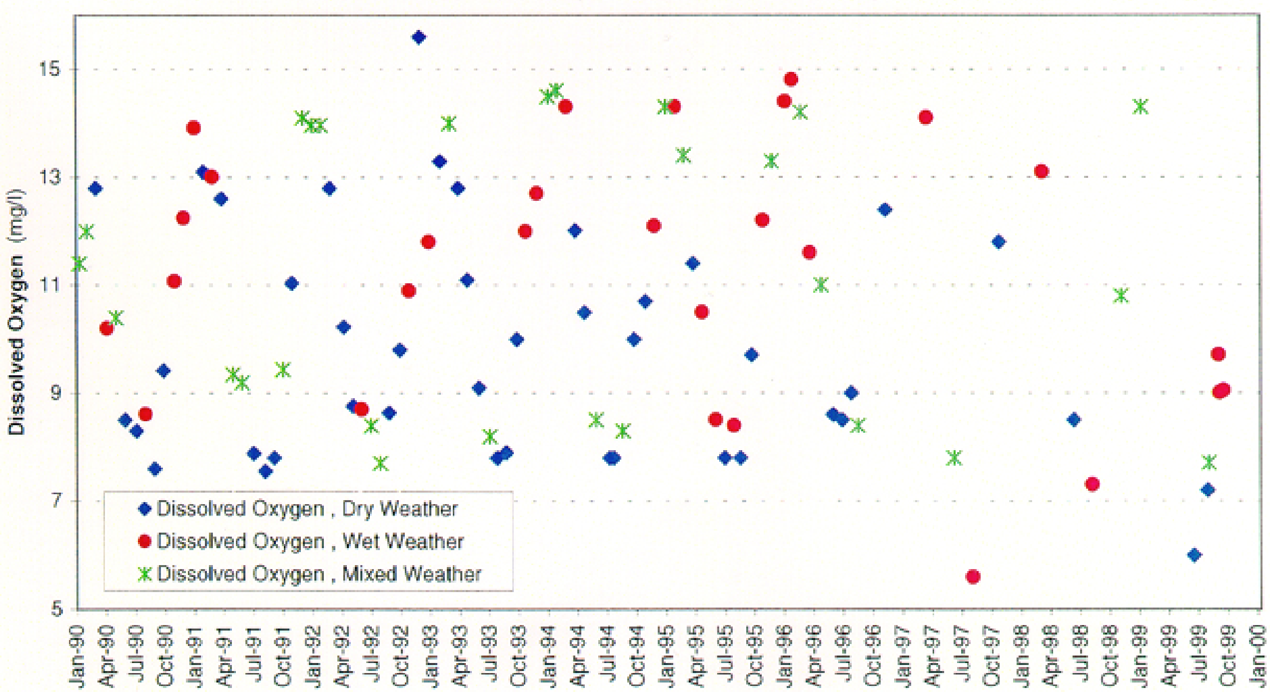


Figure 4-86
Nitrate+Nitrite Concentration
(Kerr and Lee, 1996)

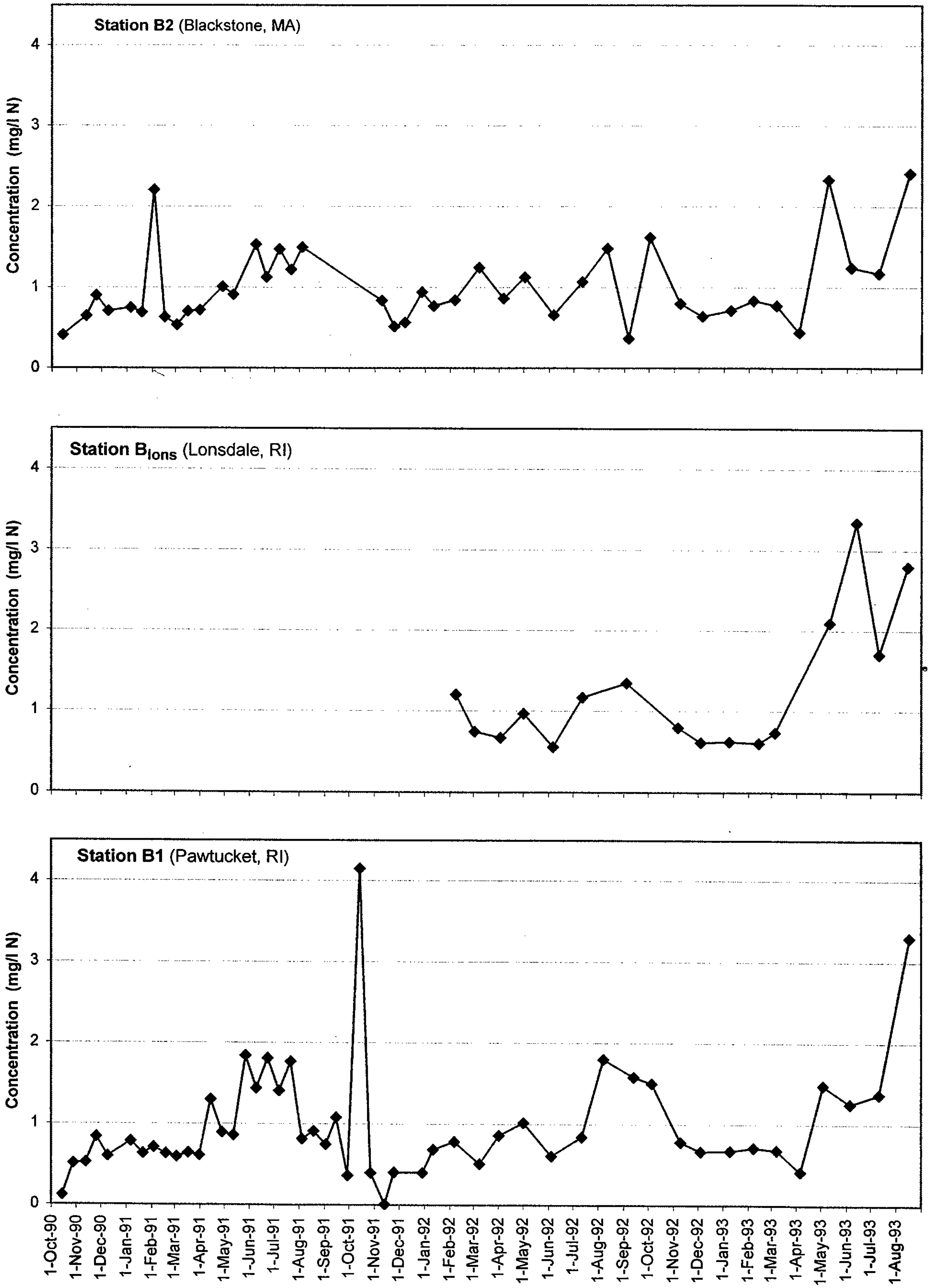


Figure 4-87

Dissolved Ammonia Concentration

(Kerr and Lee, 1996)

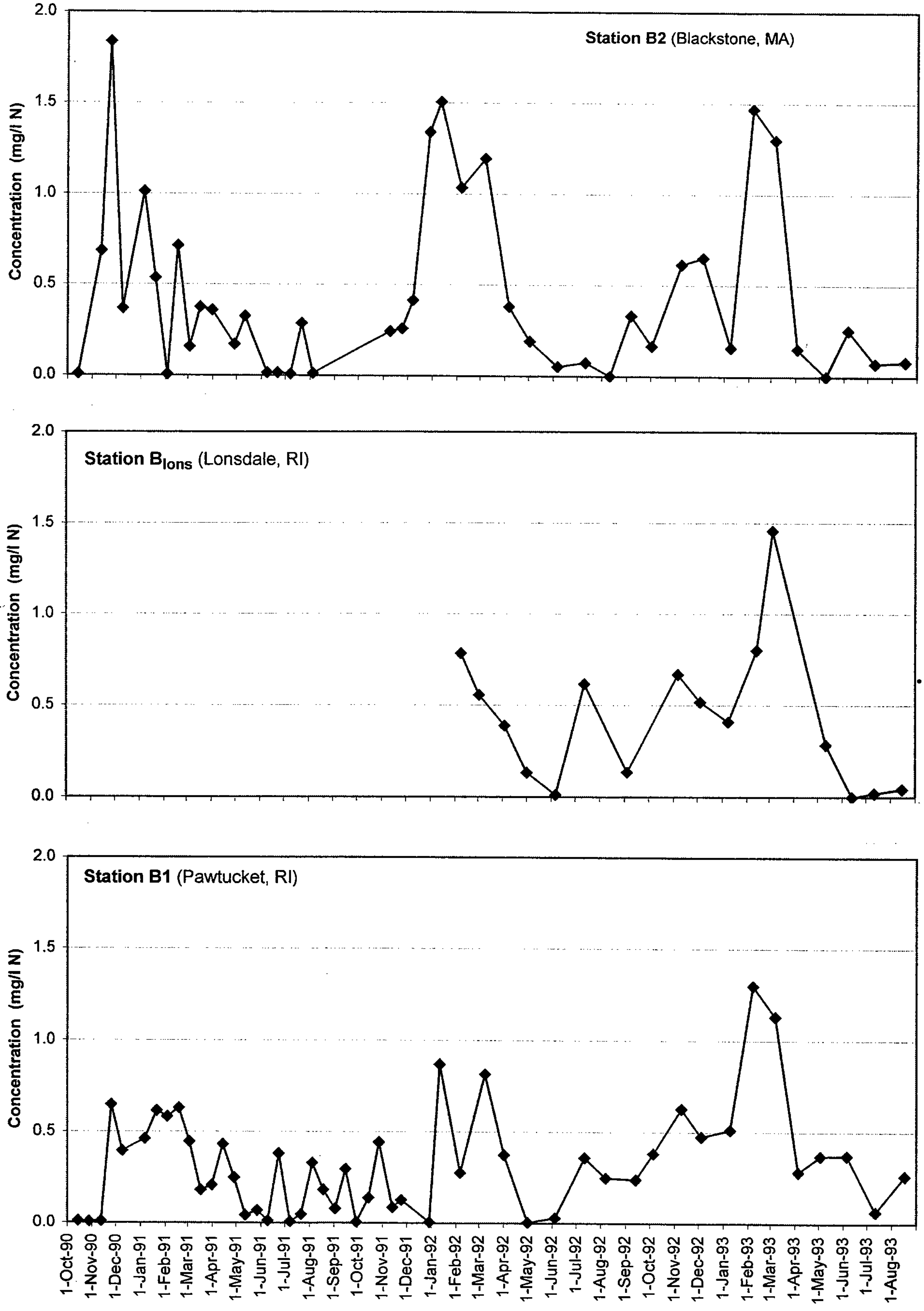


Figure 4-88

Total Dissolved Nitrogen Concentration

(Kerr and Lee, 1996)

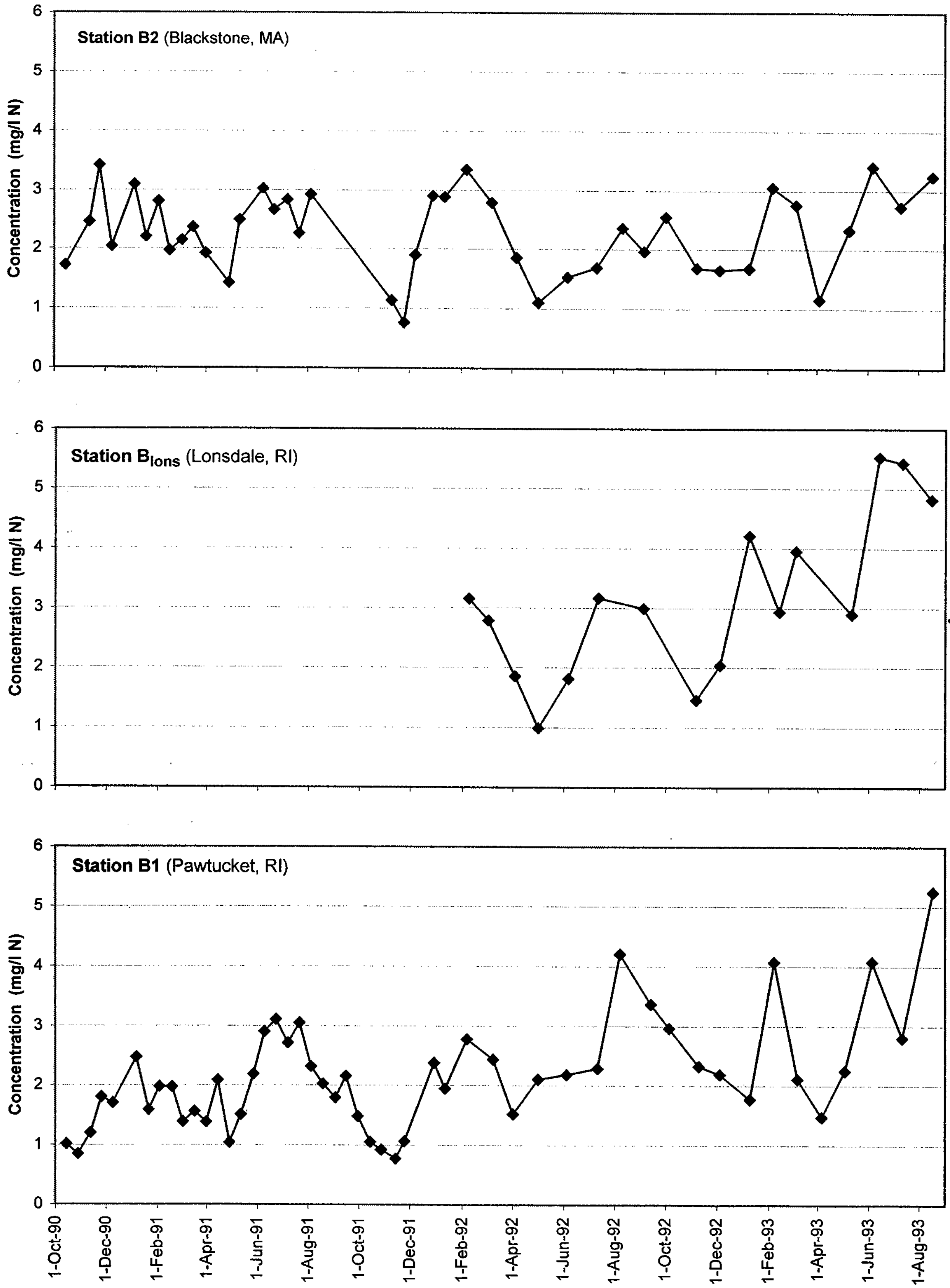


Figure 4-89
Phosphate (Dissolved Inorganic Phosphorus) Concentration
(Kerr and Lee, 1996)

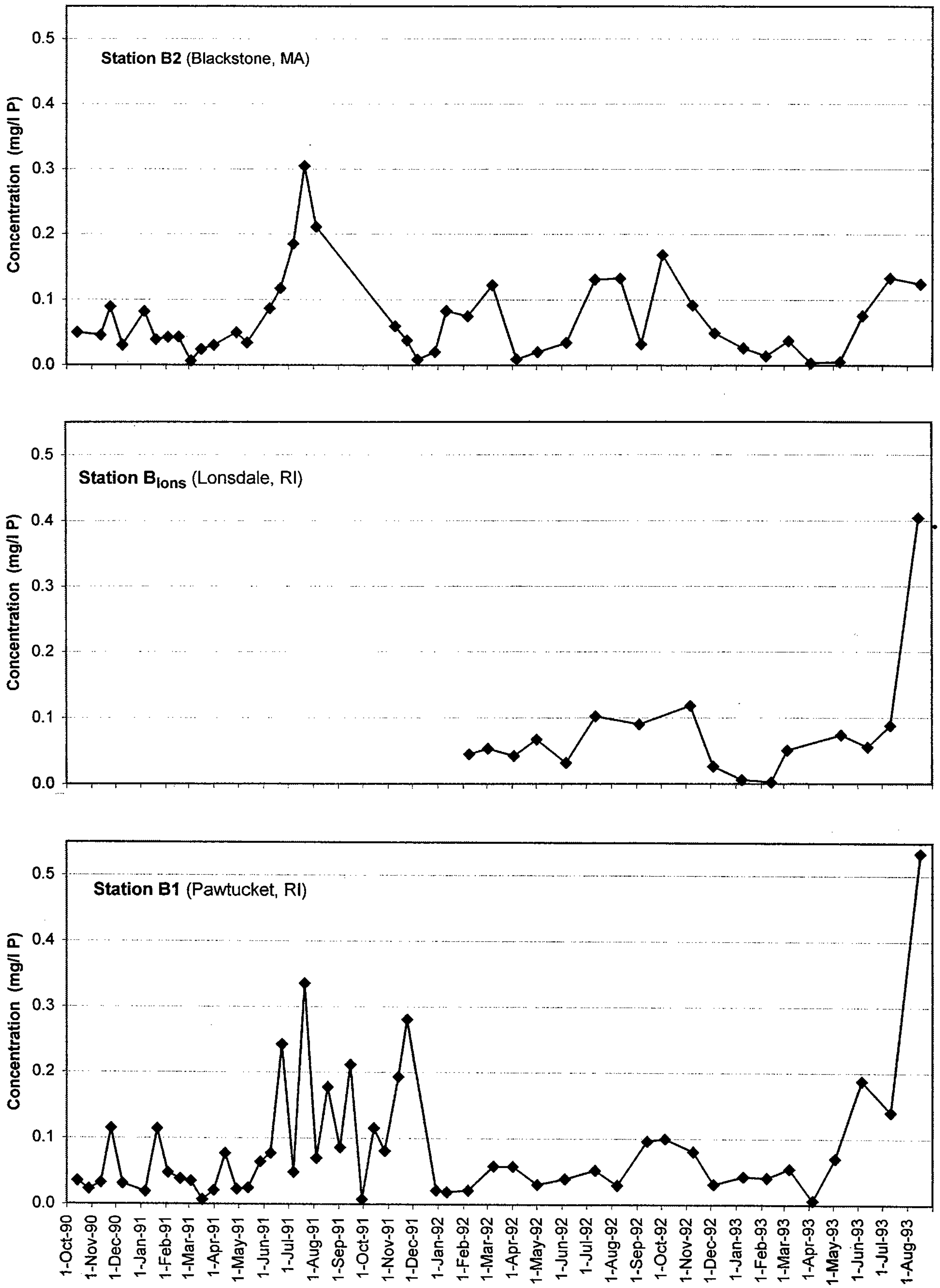


Figure 4-90

Total Phosphorus Concentration

(Kerr and Lee, 1996)

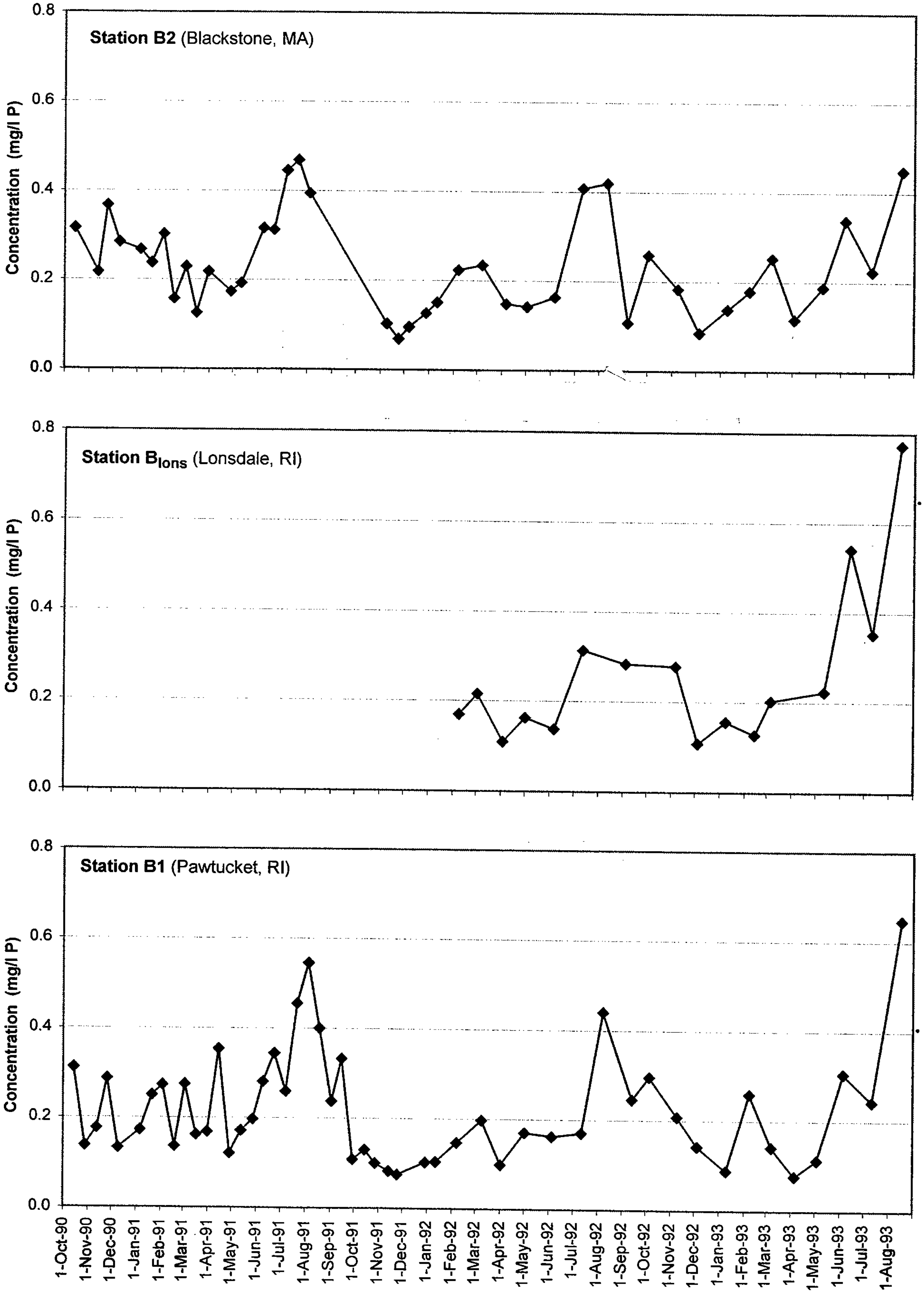


Figure 4-91
Dissolved Oxygen Concentration
(Kerr and Lee, 1996)

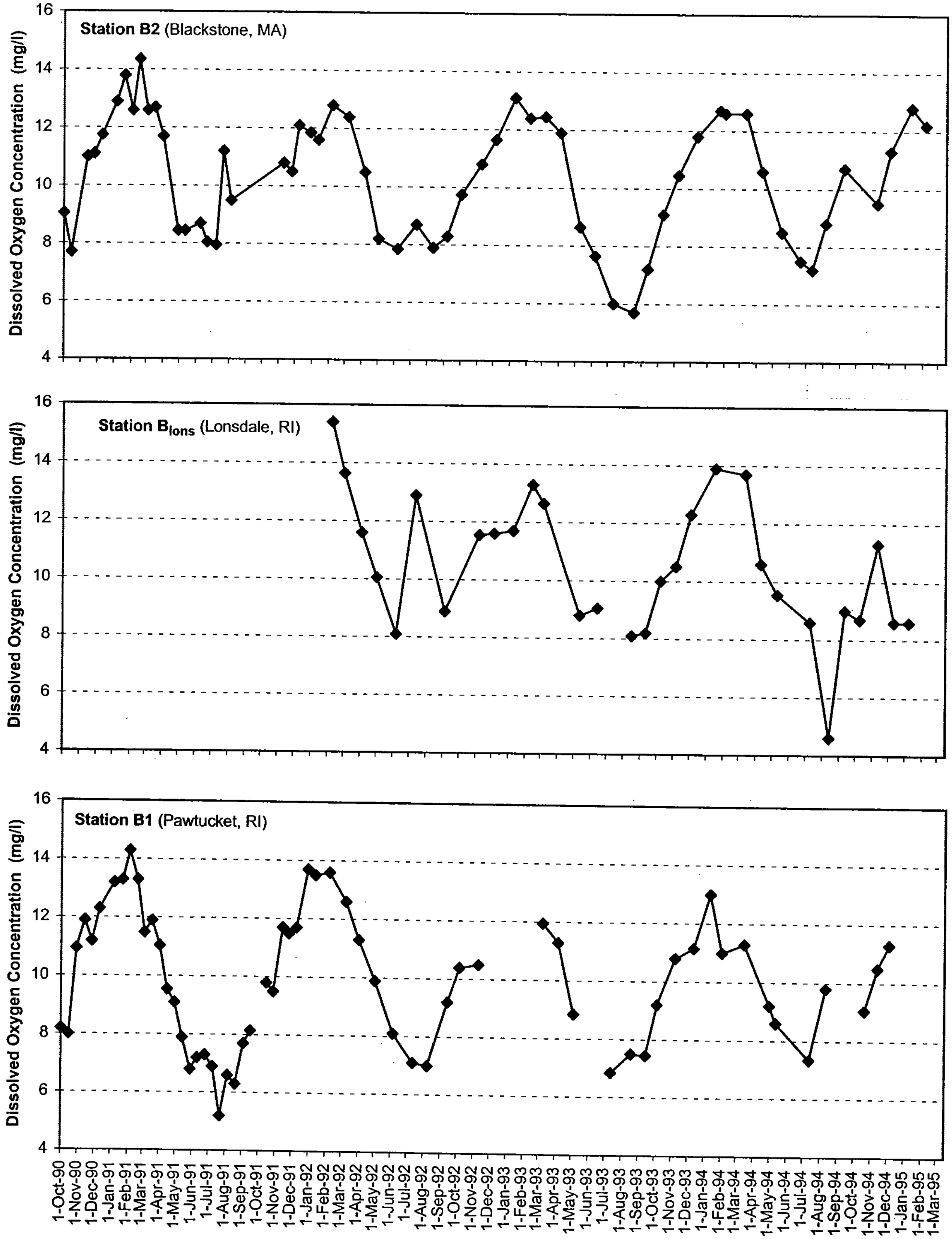


Figure 4-92
Water Temperature
(Kerr and Lee, 1996)

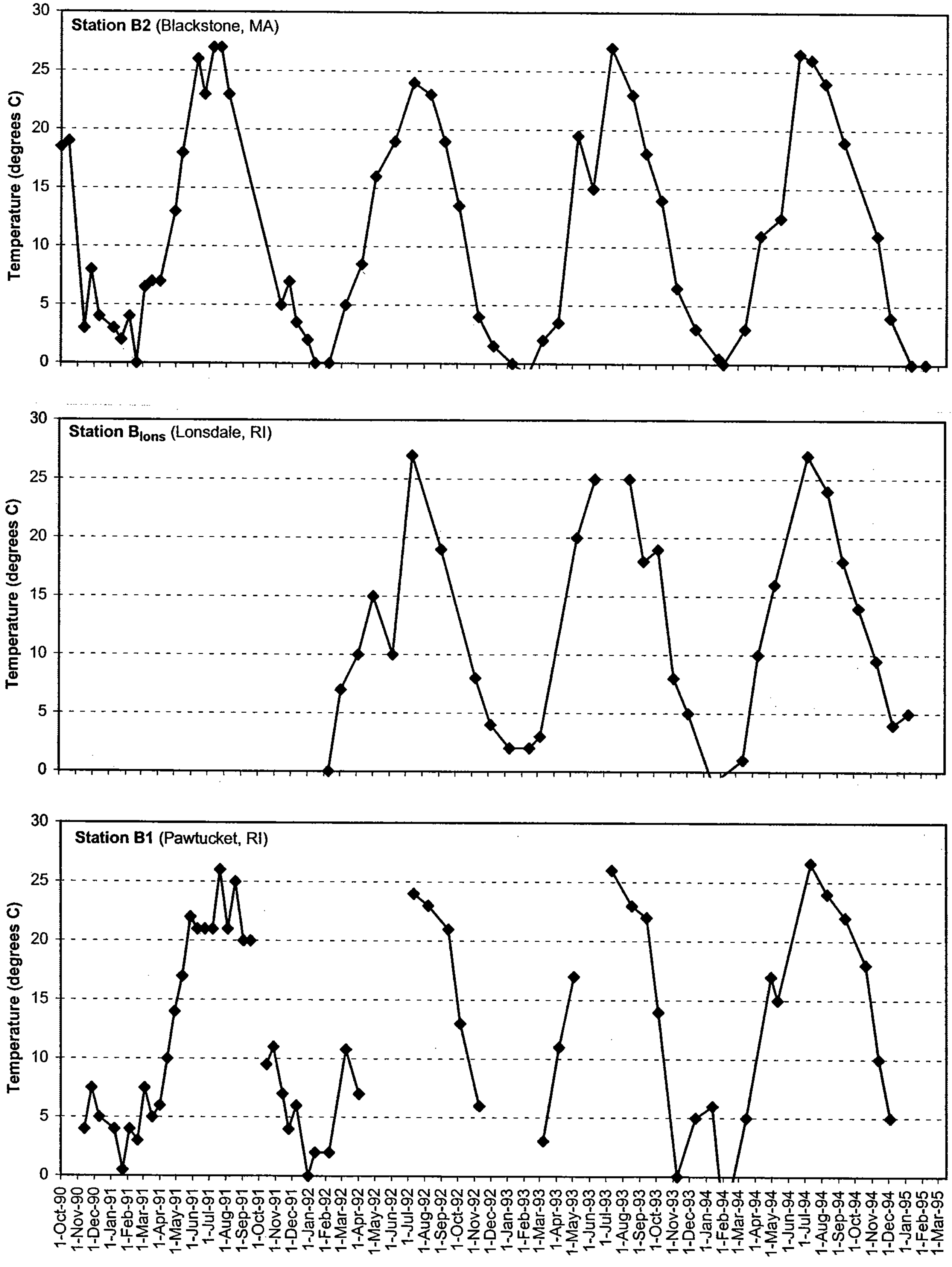


Figure 4-93

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Nitrate Concentration** *(mg/l N)*

July 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Lead Concentrations					Statistics - all 3 Surveys		
				Run #1	Run #2	Run #3	Run #4	MEAN	Mean	Mini-mum	Maxi-mum
BLK01	●			0.65	0.51	1.00	0.45	**0.65**	**0.86**	*0.16*	*2.19*
BLK02	●			2.89	2.57	4.55	2.02	**3.01**	**2.93**	*1.24*	*4.77*
BLK03	●			4.03	3.64	4.16	3.89	**3.93**	**3.25**	*1.01*	*5.21*
BLK04	●			4.43	4.20	4.42	4.47	**4.38**	**3.29**	*1.13*	*4.47*
BLK05		●	Quinsigamond R.	0.13	0.08	0.20	4.06	**1.12**	**0.42**	*0.03*	*4.06*
BLK06	●			2.78	2.64	4.42	0.07	**2.48**	**2.35**	*0.07*	*4.42*
BLK07	●			2.74	2.85	3.63	3.68	**3.23**	**2.62**	*0.80*	*4.24*
BLK08	●			2.37	2.29	2.79	3.10	**2.64**	**2.42**	*0.90*	*4.28*
BLK09		●	Mumford River	0.15	0.14	0.15	3.18	**0.91**	**0.61**	*0.09*	*3.18*
BLK10		●	West River	0.12	0.03	0.10	0.17	**0.10**	**0.15**	*0.01*	*0.98*
BLK11	●			1.70	1.52	2.67	1.74	**1.91**	**1.46**	*0.64*	*2.67*
BLK12	●			1.77	1.39	1.92	1.65	**1.68**	**1.80**	*0.63*	*4.53*
BLK13	●			1.57	1.50	1.73	1.46	**1.57**	**1.35**	*0.68*	*2.38*
BLK14		●	Branch River	0.24	0.23	0.01	0.27	**0.19**	**0.21**	*0.01*	*0.31*
BLK15		●	Mill River	0.38	0.29	0.20	0.39	**0.32**	**0.33**	*0.16*	*0.89*
BLK16		●	Peters River	0.76	0.77	NS	0.77	**0.77**	**0.67**	*0.42*	*0.95*
BLK17	●			1.28	1.20	0.39	1.46	**1.08**	**0.91**	*0.39*	*1.46*
BLK18	●			1.23	1.17	1.47	1.41	**1.32**	**1.43**	*0.62*	*4.65*
BLK19	●			1.40	1.37	1.57	1.62	**1.49**	**1.29**	*0.25*	*1.97*
BLK20	●			1.64	1.71	1.74	1.98	**1.77**	**1.37**	*0.15*	*2.29*
BLK21	●		Slaters Mill	1.59	1.98	2.02	1.90	**1.87**	**1.53**	*0.54*	*2.41*

August 1991 Survey

BLK01	●			0.16	1.45	0.71	0.66	**0.75**
BLK02	●			2.70	3.81	4.18	4.77	**3.86**
BLK03	●			4.28	3.63	3.57	5.21	**4.18**
BLK04	●			4.09	4.21	3.35	4.20	**3.96**
BLK05		●	Quinsigamond R.	0.03	0.14	0.13	0.12	**0.10**
BLK06	●			3.42	2.89	4.05	3.37	**3.43**
BLK07	●			4.20	2.54	4.24	2.86	**3.46**
BLK08	●			2.85	4.28	3.80	2.86	**3.45**
BLK09		●	Mumford River	2.46	0.14	0.64	0.09	**0.83**
BLK10		●	West River	0.98	0.19	0.01	0.09	**0.32**
BLK11	●			1.41	1.45	2.00	1.20	**1.51**
BLK12	●			4.53	1.60	2.38	1.33	**2.46**
BLK13	●			0.97	0.82	2.38	0.95	**1.28**
BLK14		●	Branch River	0.25	0.28	0.22	0.31	**0.27**
BLK15		●	Mill River	0.25	0.25	0.17	0.89	**0.39**
BLK16		●	Peters River	0.56	0.65	0.68	0.95	**0.71**
BLK17	●			0.79	0.82	0.82	1.14	**0.89**
BLK18	●			1.43	1.17	4.65	1.52	**2.19**
BLK19	●			1.76	1.51	1.57	1.97	**1.70**
BLK20	●			2.03	1.74	1.98	2.29	**2.01**
BLK21	●		Slaters Mill	1.67	1.626	1.717	2.413	**1.86**

October 1991 Survey

BLK01	●			1.55	0.24	2.19	0.736	**1.18**
BLK02	●			1.24	1.88	2.617	1.985	**1.93**
BLK03	●			1.27	1.012	2.049	2.212	**1.64**
BLK04	●			1.13	1.301	1.481	2.212	**1.53**
BLK05		●	Quinsigamond R.	0.06	0.067	0.055	0.034	**0.05**
BLK06	●			1.32	0.954	0.974	1.327	**1.14**
BLK07	●			0.80	1.418	1.229	1.191	**1.16**
BLK08	●			1.23	0.897	1.397	1.191	**1.18**
BLK09		●	Mumford River	0.09	0.096	0.098	0.102	**0.10**
BLK10		●	West River	0.01	0.029	0.041	0.034	**0.03**
BLK11	●			1.08	0.636	0.804	1.259	**0.94**
BLK12	●			2.12	0.665	0.634	1.599	**1.25**
BLK13	●			2.07	0.773	0.676	1.259	**1.20**
BLK14		●	Branch River	0.24	0.164	0.154	0.202	**0.19**
BLK15		●	Mill River	0.44	0.164	0.183	0.279	**0.27**
BLK16		●	Peters River	0.69	0.434	0.424	0.539	**0.52**
BLK17	●			1.31	0.559	0.564	0.61	**0.76**
BLK18	●			0.62	1.022	0.706	0.766	**0.78**
BLK19	●			1.08	0.25	0.536	0.817	**0.67**
BLK20	●			0.39	0.154	0.507	0.299	**0.34**
BLK21	●		Slaters Mill	1.38	0.791	0.536	0.714	**0.86**

Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

Figure 4-94

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Ammonia Concentration** *(mg/l N)*

July 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Total Lead Concentrations				
				Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			0.14	0.17	0.24	0.24	**0.20**
BLK02	●			0.48	0.26	0.24	0.45	**0.36**
BLK03	●			0.29	0.21	0.11	0.18	**0.20**
BLK04	●			0.38	0.29	0.28	0.33	**0.32**
BLK05		●	Quinsigamond R.	0.07	0.07	0.01	0.08	**0.06**
BLK06	●			0.12	0.13	0.12	0.16	**0.13**
BLK07	●			0.22	0.16	0.05	0.08	**0.12**
BLK08	●			0.12	0.05	0.14	0.11	**0.11**
BLK09		●	Mumford River	0.09	0.04	0.01	0.06	**0.05**
BLK10		●	West River	0.04	0.04	0.04	0.07	**0.05**
BLK11	●			0.06	0.06	0.10	0.02	**0.06**
BLK12	●			0.04	0.05	0.05	0.06	**0.05**
BLK13	●			0.05	0.06	0.05	0.09	**0.06**
BLK14		●	Branch River	0.09	0.12	0.08	0.09	**0.09**
BLK15		●	Mill River	0.06	0.04	0.05	0.05	**0.05**
BLK16		●	Peters River	0.22	0.26	0.25	0.33	**0.27**
BLK17	●			0.06	0.05	0.05	0.09	**0.06**
BLK18	●			1.03	1.54	1.01	1.07	**1.16**
BLK19	●			1.03	0.60	0.77	0.99	**0.85**
BLK20	●			0.55	0.50	0.43	0.45	**0.48**
BLK21	●		Slaters Mill	0.33	0.31	0.36	0.25	**0.31**

Statistics - all 3 Surveys		
Mean	*Mini-mum*	*Maxi-mum*
0.28	*0.01*	*1.37*
0.45	*0.01*	*1.61*
0.36	*0.01*	*1.66*
0.44	*0.01*	*1.72*
0.10	*0.01*	*0.49*
0.33	*0.01*	*1.21*
0.27	*0.01*	*0.93*
0.19	*0.01*	*0.78*
0.09	*0.01*	*0.46*
0.10	*0.01*	*0.55*
0.15	*0.02*	*0.41*
0.14	*0.04*	*0.37*
0.14	*0.01*	*0.38*
0.14	*0.01*	*0.62*
0.12	*0.03*	*0.39*
0.18	*0.04*	*0.33*
0.14	*0.01*	*0.77*
0.71	*0.04*	*1.54*
0.58	*0.20*	*1.03*
0.31	*0.01*	*0.55*
0.30	*0.04*	*0.64*

August 1991 Survey

BLK01	●			1.37	0.65	0.01	0.01	**0.51**
BLK02	●			1.61	0.73	0.01	0.01	**0.59**
BLK03	●			1.66	0.75	0.03	0.01	**0.61**
BLK04	●			1.72	1.13	0.02	0.01	**0.72**
BLK05		●	Quinsigamond R.	0.49	0.32	0.09	0.01	**0.23**
BLK06	●			1.21	0.58	0.69	0.01	**0.62**
BLK07	●			0.58	0.93	0.42	0.01	**0.48**
BLK08	●			0.13	0.78	0.32	0.01	**0.31**
BLK09		●	Mumford River	0.26	0.46	0.15	0.01	**0.22**
BLK10		●	West River	0.55	0.18	0.13	0.13	**0.25**
BLK11	●			0.09	0.41	0.40	0.26	**0.29**
BLK12	●			0.13	0.33	0.37	0.27	**0.27**
BLK13	●			0.08	0.38	0.34	0.26	**0.27**
BLK14		●	Branch River	0.22	0.62	0.25	0.01	**0.28**
BLK15		●	Mill River	0.09	0.26	0.26	0.39	**0.25**
BLK16		●	Peters River	0.20	0.28	0.17	0.18	**0.21**
BLK17	●			0.01	0.22	0.10	0.14	**0.12**
BLK18	●			0.88	1.25	0.22	0.74	**0.77**
BLK19	●			0.67	0.43	0.75	0.83	**0.67**
BLK20	●			0.49	0.34	0.04	0.43	**0.32**
BLK21	●		Slaters Mill	0.50	0.44	0.64	0.04	**0.40**

October 1991 Survey

BLK01	●			0.15	0.11	0.15	0.17	**0.14**
BLK02	●			0.19	0.07	0.75	0.54	**0.39**
BLK03	●			0.16	0.14	0.24	0.56	**0.28**
BLK04	●			0.18	0.20	0.32	0.46	**0.29**
BLK05		●	Quinsigamond R.	0.01	0.01	0.01	0.01	**0.01**
BLK06	●			0.21	0.13	0.40	0.16	**0.23**
BLK07	●			0.14	0.23	0.20	0.24	**0.20**
BLK08	●			0.07	0.15	0.21	0.18	**0.15**
BLK09		●	Mumford River	0.01	0.01	0.01	0.03	**0.01**
BLK10		●	West River	0.01	0.01	0.01	0.01	**0.01**
BLK11	●			0.07	0.09	0.10	0.09	**0.09**
BLK12	●			0.08	0.12	0.09	0.12	**0.10**
BLK13	●			0.08	0.10	0.19	0.01	**0.09**
BLK14		●	Branch River	0.02	0.04	0.07	0.01	**0.04**
BLK15		●	Mill River	0.06	0.03	0.11	0.08	**0.07**
BLK16		●	Peters River	0.06	0.06	0.05	0.04	**0.06**
BLK17	●			0.01	0.77	0.10	0.05	**0.23**
BLK18	●			0.04	0.16	0.33	0.22	**0.19**
BLK19	●			0.21	0.20	0.23	0.21	**0.21**
BLK20	●			0.17	0.01	0.21	0.17	**0.14**
BLK21	●		Slaters Mill	0.14	0.20	0.25	0.15	**0.19**

Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

Figure 4-95

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Phosphate Concentration** *(mg/l P)*

July 1991 Survey

Station No.	Blackstone R.	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
				Total Lead Concentrations				
BLK01	●			0.023	0.010	0.010	0.010	**0.013**
BLK02	●			0.893	0.996	1.149	0.110	**0.787**
BLK03	●			0.893	0.855	1.067	0.931	**0.937**
BLK04	●			0.711	0.760	0.849	0.931	**0.813**
BLK05		●	Quinsigamond R.	0.082	0.034	0.083	0.876	**0.269**
BLK06	●			0.637	0.432	0.466	0.055	**0.398**
BLK07	●			0.674	0.571	0.521	0.493	**0.565**
BLK08	●			0.527	0.477	0.411	0.439	**0.464**
BLK09		●	Mumford River	0.126	0.015	0.066	0.411	**0.155**
BLK10		●	West River	0.148	0.019	0.010	0.010	**0.047**
BLK11	●			0.381	0.241	0.193	0.104	**0.230**
BLK12	●			0.462	0.241	0.165	0.095	**0.241**
BLK13	●			0.308	0.383	0.220	0.120	**0.258**
BLK14		●	Branch River	0.010	0.050	0.138	0.010	**0.052**
BLK15		●	Mill River	0.020	0.050	0.083	0.010	**0.041**
BLK16		●	Peters River	0.025	0.050	NS	0.010	**0.021**
BLK17	●			0.132	0.201	0.050	0.059	**0.111**
BLK18	●			0.164	0.286	0.165	0.128	**0.186**
BLK19	●			0.188	0.258	0.193	0.065	**0.176**
BLK20	●			0.122	0.229	0.176	0.072	**0.150**
BLK21	●		Slaters Mill	0.102	0.201	0.165	0.010	**0.120**

Statistics - all 3 Surveys

Mean	*Minimum*	*Maximum*
0.050	*0.010*	*0.195*
0.801	*0.110*	*1.343*
0.826	*0.342*	*1.456*
0.735	*0.415*	*1.400*
0.103	*0.010*	*0.876*
0.428	*0.055*	*0.895*
0.346	*0.077*	*0.674*
0.260	*0.010*	*0.527*
0.070	*0.010*	*0.411*
0.030	*0.010*	*0.148*
0.147	*0.010*	*0.381*
0.159	*0.010*	*0.462*
0.139	*0.010*	*0.383*
0.036	*0.010*	*0.138*
0.029	*0.010*	*0.083*
0.023	*0.010*	*0.062*
0.088	*0.010*	*0.201*
0.154	*0.010*	*0.361*
0.142	*0.010*	*0.330*
0.140	*0.010*	*0.340*
0.114	*0.010*	*0.280*

August 1991 Survey

BLK01	●			0.051	0.010	0.010	0.010	**0.020**
BLK02	●			1.195	0.827	1.020	1.343	**1.096**
BLK03	●			1.038	0.673	1.020	1.456	**1.047**
BLK04	●			0.809	0.827	0.829	1.400	**0.966**
BLK05		●	Quinsigamond R.	0.010	0.010	0.010	0.063	**0.023**
BLK06	●			0.650	0.313	0.656	0.895	**0.629**
BLK07	●			0.315	0.077	0.144	0.586	**0.281**
BLK08	●			0.010	0.036	0.010	0.417	**0.118**
BLK09		●	Mumford River	0.010	0.010	0.010	0.041	**0.018**
BLK10		●	West River	0.079	0.010	0.010	0.024	**0.031**
BLK11	●			0.010	0.010	0.010	0.193	**0.056**
BLK12	●			0.087	0.010	0.010	0.165	**0.068**
BLK13	●			0.010	0.010	0.010	0.120	**0.038**
BLK14		●	Branch River	0.063	0.010	0.072	0.024	**0.042**
BLK15		●	Mill River	0.010	0.010	0.083	0.024	**0.032**
BLK16		●	Peters River	0.010	0.010	0.062	0.024	**0.027**
BLK17	●			0.010	0.010	0.109	0.176	**0.076**
BLK18	●			0.161	0.010	0.179	0.361	**0.178**
BLK19	●			0.130	0.010	0.169	0.330	**0.160**
BLK20	●			0.099	0.010	0.340	0.249	**0.175**
BLK21	●		Slaters Mill	0.087	0.010	0.280	0.193	**0.143**

October 1991 Survey

BLK01	●			0.048	0.157	0.195	0.068	**0.117**
BLK02	●			0.342	0.619	0.502	0.619	**0.521**
BLK03	●			0.342	0.526	0.489	0.619	**0.494**
BLK04	●			0.415	0.444	0.416	0.434	**0.427**
BLK05		●	Quinsigamond R.	0.010	0.022	0.024	0.010	**0.017**
BLK06	●			0.205	0.260	0.249	0.316	**0.258**
BLK07	●			0.161	0.200	0.205	0.205	**0.193**
BLK08	●			0.161	0.225	0.205	0.205	**0.199**
BLK09		●	Mumford River	0.010	0.022	0.010	0.103	**0.036**
BLK10		●	West River	0.010	0.022	0.010	0.010	**0.013**
BLK11	●			0.205	0.150	0.117	0.150	**0.156**
BLK12	●			0.249	0.150	0.117	0.150	**0.167**
BLK13	●			0.161	0.150	0.017	0.150	**0.120**
BLK14		●	Branch River	0.010	0.031	0.010	0.010	**0.015**
BLK15		●	Mill River	0.010	0.031	0.010	0.010	**0.015**
BLK16		●	Peters River	0.010	0.031	0.010	0.032	**0.021**
BLK17	●			0.048	0.137	0.049	0.068	**0.076**
BLK18	●			0.048	0.138	0.137	0.068	**0.098**
BLK19	●			0.078	0.138	0.107	0.032	**0.089**
BLK20	●			0.078	0.155	0.078	0.068	**0.095**
BLK21	●		Slaters Mill	0.078	0.090	0.078	0.068	**0.079**

Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

Figure 4-96

Wet Weather Data - Storm I: Nitrate+Nitrite (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**0.58**	**0.36**	**0.20**	**0.16**			*0.28*	*0.15*	*0.16*			*0.41*	*0.29*	*0.16*	
22			●	CSO facility in Worchester															
01	●				**0.50**	**0.48**	**0.45**	**0.37**			*0.36*	*0.40*	*0.35*			*0.61*	*0.53*	*0.39*	
23			●	UBWPAD, Worchester	**4.75**	**4.16**	**4.18**	**4.30**			*2.87*	*3.37*	*4.18*			*5.09*	*5.64*	*4.42*	
02	●				**1.54**	**0.98**	**1.36**	**1.16**			*0.68*	*0.97*	*0.97*			*1.47*	*1.94*	*1.34*	
03	●																		
04	●				**1.75**	**2.02**	**2.21**	**2.55**			*1.62*	*1.87*	*1.70*			*2.63*	*2.86*	*3.40*	
05		●		Quinsigamond River	**0.22**	**0.18**	**0.15**	**0.13**			*0.12*	*0.11*				*0.25*	*0.18*		
06	●				**3.36**	**3.44**	**3.45**	**2.23**			*3.34*	*3.05*	*1.64*			*3.58*	*3.75*	*2.81*	
07	●				**2.29**	**2.88**	**3.59**	**2.46**			*2.71*	*3.16*	*2.22*			*3.05*	*3.96*	*2.69*	
08	●				**2.62**	**2.27**	**2.79**	**2.43**			*2.08*	*2.62*	*2.17*			*2.42*	*3.02*	*2.69*	
09		●		Mumford River	**0.16**	**0.15**	**0.46**	**0.57**			*0.14*	*0.10*	*0.48*			*0.18*	*0.86*	*0.65*	
10		●		West River	**0.02**	**0.02**	**0.05**				*0.02*					*0.02*			
11	●				**2.32**	**1.94**	**1.62**	**1.60**			*1.85*	*1.22*				*2.04*	*1.77*		
12	●																		
13	●				**1.79**	**1.54**	**1.18**	**0.91**			*1.40*	*1.07*	*0.71*			*1.63*	*1.32*	*1.10*	
14		●		Branch River	**0.45**	**0.42**	**0.35**	**0.33**			*0.38*	*0.33*	*0.32*			*0.46*	*0.36*	*0.33*	
15		●		Mill River	**0.47**	**0.43**	**0.42**	**0.38**			*0.41*	*0.41*	*0.34*			*0.46*	*0.43*	*0.41*	
16		●		Peters River	**0.43**	**0.74**	**0.57**	**0.51**			*0.62*	*0.51*	*0.51*			*0.88*	*0.64*	*0.51*	
17	●				**1.57**	**1.43**	**1.29**	**1.39**			*1.36*	*1.18*	*1.34*			*1.54*	*1.44*	*1.44*	
24			●	Woonsocket WWTF	**0.64**	**0.51**	**0.44**	**0.65**			*0.10*	*0.32*	*0.42*			*1.01*	*0.63*	*0.88*	
18	●				**1.38**	**1.38**	**1.33**	**1.26**			*1.36*	*1.20*	*1.20*			*1.41*	*1.46*	*1.31*	
19	●																		
20	●				**1.80**	**1.87**	**1.99**	**2.23**			*1.83*	*1.85*	*2.10*			*1.90*	*2.10*	*2.36*	
21	●				**1.60**	**1.49**	**1.70**	**2.21**			*1.42*	*1.47*	*2.13*			*1.57*	*1.88*	*2.28*	
25			●	Bucklin Point (Seekonk R.)	**2.40**	**0.51**	**1.50**	**1.56**			*0.04*	*0.03*	*0.86*			*1.33*	*3.44*	*2.26*	

Figure 4-97

Wet Weather Data - Storm I: Ammonia (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				0.05	0.20	0.09	0.20			0.08	0.05	0.05			0.31	0.12	0.35	
22			●	CSO facility in Worchester															
01	●				0.11	0.29	0.15	0.27			0.20	0.04	0.08			0.42	0.27	0.45	
23			●	UBWPAD, Worchester	1.34	3.97	1.64	1.16			3.46	1.14	0.46			4.32	2.10	1.86	
02	●				1.82	2.32	0.77	1.22			1.73	0.52				2.95	1.20		
03	●																		
04	●				0.81	1.26	1.08	0.10			0.97	0.20	0.10			1.66	1.61	0.10	
05		●		Quinsigamond River															
06	●				0.36	0.44	0.77	0.24			0.37	0.46	0.22			0.50	1.01	0.26	
07	●				0.51	1.19	0.94	0.33			1.08	0.28	0.08			1.35	1.79	0.58	
08	●				0.46	1.59	1.06	0.08			1.52	0.72	0.08			1.64	1.27	0.08	
09		●		Mumford River	0.06	0.06	0.07				0.05	0.06				0.06	0.07		
10		●		West River															
11	●				0.09	0.29	0.46	0.14			0.15	0.31	0.08			0.52	0.70	0.20	
12	●																		
13	●					0.04	0.10	0.10				0.02					0.24		
14		●		Branch River		0.24	0.08	0.05			0.12	0.06	0.05			0.36	0.09	0.05	
15		●		Mill River															
16		●		Peters River		0.26	0.06	0.07											
17	●						0.07	0.11				0.05	0.09				0.08	0.12	
24			●	Woonsocket WWTF	34.30	26.33	22.65	19.50			23.70	16.30	17.70			30.00	31.00	21.30	
18	●				4.20	2.40	2.34	2.05			1.60	1.76	1.97			3.20	3.50	2.13	
19	●																		
20	●				0.32	0.51	0.67	0.48			0.42	0.41	0.21			0.58	0.92	0.74	
21	●				0.42	0.48	0.32	0.26			0.41	0.11	0.08			0.54	0.58	0.43	
25			●	Bucklin Point (Seekonk R.)	2.00	5.80	3.00	2.00			3.20	1.20	0.40			8.20	7.20	3.60	

Figure 4-98

Wet Weather Data - Storm I: Phosphate (mg/l P)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**0.03**	**0.02**	**0.03**	**0.03**			*0.02*	*0.02*	*0.03*			*0.03*	*0.03*	*0.03*	
22			●	CSO facility in Worchester															
01	●				**0.02**	**0.04**	**0.02**				*0.02*	*0.02*				*0.06*	*0.02*		
23			●	UBWPAD, Worchester	**1.97**	**2.03**	**1.47**	**0.61**			*1.97*	*1.40*	*0.54*			*2.09*	*1.54*	*0.68*	
02	●				**1.13**	**0.82**	**0.82**	**0.27**			*0.59*	*0.74*	*0.27*			*1.13*	*0.90*	*0.27*	
03	●																		
04	●				**1.11**	**1.01**	**0.67**	**0.56**			*0.76*	*0.58*	*0.36*			*1.15*	*0.76*	*0.76*	
05		●		Quinsigamond River	**0.02**		**0.02**												
06	●				**0.77**	**0.91**	**0.71**	**0.57**			*0.89*	*0.59*	*0.55*			*0.94*	*0.94*	*0.59*	
07	●				**0.64**	**0.65**	**0.68**	**0.63**			*0.62*	*0.65*	*0.61*			*0.68*	*0.72*	*0.65*	
08	●				**0.65**	**0.61**	**0.64**	**0.67**			*0.48*	*0.61*	*0.64*			*0.67*	*0.67*	*0.70*	
09		●		Mumford River	**0.02**	**0.02**	**0.02**	**0.02**			*0.02*	*0.02*	*0.02*			*0.02*	*0.02*	*0.02*	
10		●		West River			**0.02**												
11	●				**0.36**	**0.35**	**0.36**	**0.44**			*0.34*	*0.34*	*0.42*			*0.36*	*0.38*	*0.45*	
12	●																		
13	●				**0.33**	**0.27**	**0.29**	**0.28**			*0.25*	*0.28*	*0.25*			*0.28*	*0.30*	*0.31*	
14		●		Branch River	**0.03**	**0.02**	**0.02**	**0.02**			*0.02*	*0.02*	*0.02*			*0.03*	*0.02*	*0.02*	
15		●		Mill River	**0.02**														
16		●		Peters River	**0.03**	**0.03**	**0.02**	**0.02**			*0.02*	*0.02*	*0.02*			*0.04*	*0.02*	*0.02*	
17	●				**0.27**	**0.27**	**0.22**	**0.24**			*0.24*	*0.21*	*0.22*			*0.30*	*0.23*	*0.26*	
24			●	Woonsocket WWTF	**4.21**	**5.42**	**3.25**	**2.90**			*4.39*	*2.45*	*2.28*			*5.97*	*5.27*	*3.51*	
18	●				**0.48**	**0.38**	**0.46**	**0.33**			*0.36*	*0.36*	*0.30*			*0.41*	*0.56*	*0.36*	
19	●																		
20	●				**0.21**	**0.22**	**0.27**	**0.33**			*0.19*	*0.21*	*0.28*			*0.26*	*0.32*	*0.38*	
21	●				**0.21**	**0.13**	**0.16**	**0.25**			*0.10*	*0.13*	*0.23*			*0.17*	*0.18*	*0.26*	
25			●	Bucklin Point (Seekonk R.)	**6.25**	**5.39**	**3.86**	**3.59**			*5.03*	*3.51*	*3.51*			*5.64*	*4.27*	*3.67*	

Figure 4-99

Wet Weather Data - Storm I: Dissolved Oxygen (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				8.4	7.5	8.8	7.3			6.4	8.4	7.3			8.3	9.1	7.3	
22			●	CSO facility in Worchester															
01	●				8.4	7.1	8.3	7.2			6.3	7.8	7.2			7.5	8.8	7.2	
23			●	UBWPAD, Worchester		6.7	7.8				6.4					6.9			
02	●				7.7	7.1	7.8	8.0			6.8	7.5	8.0			7.3	8.3	8.0	
03	●																		
04	●				8.7	8.4	9.0	8.8			8.2	8.6	8.7			8.6	9.2	8.9	
05		●		Quinsigamond River	10.2	7.1	8.9	8.7			7.0	8.0	8.5			7.2	9.6	8.9	
06	●				8.3	7.8	8.5	8.6			7.7	8.4	8.5			7.8	8.7	8.7	
07	●				8.6	8.9	9.1	8.3			8.4	7.8	8.1			9.2	9.9	8.4	
08	●				9.9	7.5	8.7	8.2			7.1	7.7	7.8			7.7	9.3	8.5	
09		●		Mumford River	10.4	9.5	10.2	8.7			9.4	9.5	7.2			9.6	10.5	10.2	
10		●		West River	9.6	8.9	9.4	8.2			8.9	8.9	7.0			8.9	10.0	9.4	
11	●				10.4	8.6	9.3	7.9			8.5	8.7	6.5			8.7	9.7	9.2	
12	●																		
13	●				11.0	10.0	10.4	9.6			9.9	10.1	8.6			10.2	10.8	10.6	
14		●		Branch River	10.0	9.4	10.2	9.3			8.9	9.8	8.2			9.7	10.6	10.3	
15		●		Mill River	8.4	8.4	8.6	8.4			7.9	7.9	7.4			8.7	9.4	9.4	
16		●		Peters River	8.4	7.0	6.7	7.2			6.4	5.2	6.0			7.3	7.9	8.4	
17	●				9.8	9.4	9.7	9.4			8.5	8.3	9.2			10.1	10.6	9.5	
24			●	Woonsocket WWTF															
18	●				6.9	7.0	6.9	7.4			6.5	6.0	7.1			7.3	7.7	7.7	
19	●																		
20	●				9.1	6.5	8.0	7.6			6.1	5.9	6.8			6.7	9.9	8.4	
21	●				9.1	8.7	9.1	9.0			8.1	8.1	8.9			9.1	9.8	9.0	
25			●	Bucklin Point (Seekonk R.)	3.5	2.6	2.5	2.2			2.2	1.8	2.0			3.2	3.1	2.3	

Regulatory Standard:
Instantaneous minimum dissolved oxygen concentration of at least 5 mg/l.

Figure 4-100

Wet Weather Data - Storm I: Flow Rate (cfs)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Flow Rate: Dry Weather	Mean Flow Rate: During Storm	Mean Flow Rate: 24h After Storm	Mean Flow Rate: 48h After Storm	Mean Flow Rate: 72h After Strom	Minimum Flow Rate: Dry Weather	Minimum Flow Rate: During Storm	Minimum Flow Rate: 24h After Storm	Minimum Flow Rate: 48h After Storm	Minimum Flow Rate: 72h After Strom	Maximum Flow Rate: Dry Weather	Maximum Flow Rate: During Storm	Maximum Flow Rate: 24h After Storm	Maximum Flow Rate: 48h After Storm	Maximum Flow Rate: 72h After Strom
00	●				**15**	**90**	**38**	**19**			*38*	*22*	*15*			*172*	*54*	*22*	
22			●	CSO facility in Worchester															
01	●				**17**	**97**	**41**	**20**			*41*	*24*	*17*			*185*	*58*	*24*	
23			●	UBWPAD, Worchester															
02	●				**73**	**177**	**100**	**65**			*107*	*50*	*50*			*268*	*142*	*81*	
03	●																		
04	●				**79**	**173**	**126**	**60**			*93*	*80*	*53*			*245*	*163*	*66*	
05		●		Quinsigamond River	**5**	**5**	**8**	**5**			*4*	*7*	*5*			*6*	*9*	*6*	
06	●				**80**	**96**	**148**	**95**			*67*	*120*	*90*			*111*	*166*	*100*	
07	●				**107**	**98**	**110**	**122**			*95*	*103*	*120*			*101*	*123*	*123*	
08	●				**109**	**123**	**119**	**136**			*115*	*108*	*136*			*129*	*130*	*136*	
09		●		Mumford River	**12**	**14**	**12**	**10**			*12*	*12*	*9*			*15*	*14*	*11*	
10		●		West River	**8**	**9**	**9**	**9**			*8*	*9*	*9*			*9*	*9*	*9*	
11	●				**133**	**158**	**155**	**172**			*142*	*148*	*166*			*173*	*162*	*177*	
12	●																		
13	●				**169**	**211**	**202**	**214**			*188*	*192*	*210*			*232*	*209*	*218*	
14		●		Branch River	**33**	**49**	**43**	**38**			*42*	*41*	*36*			*55*	*46*	*40*	
15		●		Mill River	**6**	**10**	**12**	**16**			*6*	*9*	*15*			*12*	*17*	*17*	
16		●		Peters River	**2**	**9**	**7**	**4**			*4*	*4*	*4*			*13*	*11*	*4*	
17	●				**162**	**235**	**211**	**249**			*163*	*205*	*209*			*292*	*215*	*289*	
24			●	Woonsocket WWTF															
18	●				**181**	**222**	**216**	**271**			*205*	*186*	*226*			*250*	*226*	*315*	
19	●																		
20	●				**210**	**240**	**247**	**262**			*226*	*215*	*253*			*253*	*265*	*271*	
21	●				**239**	**248**	**247**	**262**			*241*	*215*	*253*			*253*	*265*	*271*	
25			●	Bucklin Point (Seekonk R.)															

Figure 4-101

Wet Weather Data - Storm II: Nitrate+Nitrite (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean: During Storm	Mean: 24h After Storm	Mean: 48h After Storm	Mean: 72h After Strom	Minimum Concentration: Dry Weather	Min: During Storm	Min: 24h After Storm	Min: 48h After Storm	Min: 72h After Strom	Maximum Concentration: Dry Weather	Max: During Storm	Max: 24h After Storm	Max: 48h After Storm	Max: 72h After Strom
00	●				**0.14**	**0.17**	**0.06**	**0.11**	**0.09**		*0.02*	*0.02*	*0.09*			*0.36*	*0.08*	*0.12*	
22			●	CSO facility in Worchester	**1.56**	**1.34**					*1.24*					*1.43*			
01	●				**0.41**	**0.28**	**0.17**	**0.30**	**0.31**		*0.16*	*0.11*				*0.41*	*0.22*		
23			●	UBWPAD, Worchester	**1.70**	**0.44**	**0.08**	**0.01**	**0.61**		*0.18*	*0.03*	*0.01*			*0.68*	*0.18*	*0.01*	
02	●				**0.80**	**0.29**	**0.26**	**0.28**	**0.22**		*0.19*	*0.17*	*0.17*			*0.42*	*0.38*	*0.39*	
03	●																		
04	●				**NA**	**0.47**	**0.40**	**0.37**	**0.49**		*0.07*	*0.31*	*0.31*			*1.21*	*0.62*	*0.42*	
05		●		Quinsigamond River	**0.11**	**0.10**	**0.03**	**0.02**			*0.05*	*0.02*	*0.02*			*0.12*	*0.05*	*0.02*	
06	●				**1.75**	**1.05**	**0.54**	**0.50**	**0.52**		*0.29*	*0.40*	*0.41*			*1.86*	*0.75*	*0.58*	
07	●				**1.72**	**1.63**	**0.62**	**0.54**			*1.43*	*0.54*				*1.77*	*0.66*		
08	●				**2.00**	**1.76**	**0.81**	**0.52**			*1.57*	*0.57*				*2.00*	*1.49*		
09		●		Mumford River	**0.12**	**0.15**	**0.09**	**0.23**			*0.13*	*0.04*	*0.07*			*0.17*	*0.12*	*0.38*	
10		●		West River	**0.10**	**0.11**	**0.02**	**0.06**					*0.03*			*0.39*	*0.04*	*0.08*	
11	●				**NA**	**1.57**	**0.96**	**1.17**			*0.95*	*0.70*	*0.67*			*2.22*	*1.40*	*1.67*	
12	●																		
13	●				**1.28**	**0.62**	**2.15**	**1.33**			*0.47*	*0.65*	*1.29*			*0.81*	*5.07*	*1.36*	
14		●		Branch River	**0.37**	**0.37**	**0.32**	**0.33**			*0.31*	*0.28*	*0.32*			*0.42*	*0.38*	*0.33*	
15		●		Mill River	**0.55**	**0.59**	**0.47**	**0.49**			*0.46*	*0.43*	*0.48*			*0.87*	*0.49*	*0.49*	
16		●		Peters River	**0.75**	**0.72**	**0.46**	**0.60**			*0.54*	*0.40*	*0.45*			*0.82*	*0.52*	*0.74*	
17	●				**2.13**	**1.47**	**1.41**	**1.97**			*1.37*	*1.17*	*1.34*			*1.58*	*1.86*	*2.60*	
24			●	Woonsocket WWTF	**0.21**	**0.19**	**0.11**	**0.01**	**NA**		*0.03*	*0.02*	*0.01*			*0.84*	*0.31*	*0.01*	
18	●				**2.74**	**1.60**	**1.29**	**1.31**			*1.48*	*1.12*	*1.15*			*1.72*	*1.51*	*1.47*	
19	●																		
20	●				**1.80**	**1.58**	**1.33**	**1.35**			*1.40*	*0.82*	*1.33*			*1.77*	*1.70*	*1.36*	
21	●				**1.91**	**1.69**	**1.63**	**1.69**			*1.52*	*1.45*	*1.62*			*1.83*	*1.83*	*1.75*	
25			●	Bucklin Point (Seekonk R.)	**3.69**	**1.45**	**0.58**				*1.20*	*0.22*				*1.88*	*1.48*		

Figure 4-102

Wet Weather Data - Storm II: Ammonia (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean Concentration: During Storm	Mean Concentration: 24h After Storm	Mean Concentration: 48h After Storm	Mean Concentration: 72h After Strom	Minimum Concentration: Dry Weather	Minimum Concentration: During Storm	Minimum Concentration: 24h After Storm	Minimum Concentration: 48h After Storm	Minimum Concentration: 72h After Strom	Maximum Concentration: Dry Weather	Maximum Concentration: During Storm	Maximum Concentration: 24h After Storm	Maximum Concentration: 48h After Storm	Maximum Concentration: 72h After Strom
00	●				**0.03**	**0.10**	**0.04**	**0.03**	**0.07**		*0.03*	*0.01*	*0.01*			*0.20*	*0.06*	*0.04*	
22			●	CSO facility in Worchester	**3.20**	**0.82**					*0.35*					*1.28*			
01	●				**0.18**	**0.20**	**0.14**	**0.20**	**0.23**		*0.07*	*0.09*	*0.18*			*0.35*	*0.22*	*0.22*	
23			●	UBWPAD, Worchester	**13.10**	**13.95**	**11.77**	**15.45**	**12.50**		*7.38*	*8.10*	*13.30*			*20.60*	*12.80*	*17.60*	
02	●				**5.32**	**4.48**	**3.17**	**4.80**	**5.51**		*2.55*	*1.73*	*4.08*			*7.09*	*4.42*	*5.52*	
03	●																		
04	●				**3.46**	**4.41**	**2.21**	**2.83**	**2.77**		*2.27*	*1.40*	*1.34*			*6.65*	*2.85*	*4.32*	
05		●		Quinsigamond River															
06	●				**4.25**	**4.41**	**2.21**	**2.66**	**1.40**		*3.02*	*1.63*	*2.52*			*6.17*	*3.00*	*2.80*	
07	●				**2.57**	**3.21**	**2.73**	**1.26**	**1.16**		*2.65*	*1.55*	*1.25*			*4.40*	*4.56*	*1.26*	
08	●				**1.65**	**2.53**	**2.73**	**2.16**	**1.05**		*2.12*	*1.97*	*2.11*			*3.48*	*3.31*	*2.20*	
09		●		Mumford River	**0.01**	**0.05**	**0.06**	**0.02**	**0.01**			*0.05*	*0.02*				*0.06*	*0.02*	
10		●		West River	**NA**	**0.10**													
11	●				**0.61**	**0.78**	**1.51**	**1.13**	**0.72**		*0.63*	*0.88*	*1.07*			*1.15*	*2.10*	*1.19*	
12	●																		
13	●				**0.12**	**0.25**	**0.98**	**1.60**	**0.56**		*0.13*	*0.38*	*1.53*			*0.49*	*1.97*	*1.66*	
14		●		Branch River	**0.08**	**0.09**	**0.09**	**0.09**	**0.15**		*0.06*	*0.03*	*0.05*			*0.14*	*0.17*	*0.13*	
15		●		Mill River	**0.31**	**0.36**	**0.35**	**0.34**	**0.26**		*0.32*	*0.26*	*0.33*			*0.45*	*0.39*	*0.35*	
16		●		Peters River	**0.28**	**0.21**	**0.21**	**0.12**	**0.34**		*0.01*	*0.05*	*0.03*			*0.54*	*0.51*	*0.21*	
17	●				**0.12**	**0.11**	**0.35**	**1.20**	**0.74**		*0.08*	*0.16*				*0.18*	*0.68*		
24			●	Woonsocket WWTF	**29.00**	**22.85**	**27.87**	**26.10**	**29.80**		*18.40*	*24.80*	*25.80*			*32.70*	*33.60*	*26.40*	
18	●				**0.80**	**1.20**	**1.15**	**1.13**	**2.06**		*0.42*	*0.75*	*0.74*			*1.87*	*1.62*	*1.52*	
19	●																		
20	●				**0.54**	**0.67**	**0.76**	**0.81**	**1.48**		*0.47*	*0.32*	*0.68*			*0.80*	*1.15*	*0.93*	
21	●				**0.73**	**0.79**	**0.76**	**0.72**	**1.33**		*0.33*	*0.50*	*0.67*			*1.07*	*1.18*	*0.76*	
25			●	Bucklin Point (Seekonk R.)	**14.10**	**14.90**	**11.66**	**16.15**	**19.30**		*9.78*	*6.45*	*15.60*			*25.90*	*19.60*	*16.70*	

Figure 4-103

Wet Weather Data - Storm II: Phosphate (mg/l P)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration Dry Weather	Mean Concentration During Storm	Mean Concentration 24h After Storm	Mean Concentration 48h After Storm	Mean Concentration 72h After Strom	Minimum Concentration Dry Weather	Minimum Concentration During Storm	Minimum Concentration 24h After Storm	Minimum Concentration 48h After Storm	Minimum Concentration 72h After Strom	Maximum Concentration Dry Weather	Maximum Concentration During Storm	Maximum Concentration 24h After Storm	Maximum Concentration 48h After Storm	Maximum Concentration 72h After Strom
00	●				**0.02**	**0.06**	**0.02**	**0.01**			*0.01*	*0.01*				*0.16*	*0.05*		
22			●	CSO facility in Worchester	**0.09**	**0.27**					*0.23*					*0.31*			
01	●				**0.01**	**0.04**	**0.02**	**0.01**	**0.01**		*0.01*	*0.01*				*0.10*	*0.03*		
23			●	UBWPAD, Worchester	**1.15**	**1.41**	**1.26**	**1.26**	**0.24**		*1.30*	*0.84*	*1.22*			*1.53*	*1.61*	*1.30*	
02	●				**0.83**	**0.54**	**0.31**	**0.16**	**0.05**		*0.35*	*0.21*	*0.02*			*0.71*	*0.43*	*0.30*	
03	●																		
04	●				**0.90**	**0.59**	**0.41**	**0.25**	**0.16**		*0.42*	*0.27*	*0.23*			*0.79*	*0.58*	*0.27*	
05		●		Quinsigamond River															
06	●				**0.71**	**0.58**	**0.30**	**0.24**	**0.18**		*0.40*	*0.21*	*0.24*			*0.77*	*0.36*	*0.24*	
07	●				**0.69**	**0.64**	**0.31**	**0.29**			*0.52*	*0.25*	*0.25*			*0.69*	*0.39*	*0.32*	
08	●				**0.63**	**0.60**	**0.40**	**0.33**			*0.55*	*0.34*	*0.30*			*0.65*	*0.58*	*0.35*	
09		●		Mumford River		**0.01**										*0.01*			
10		●		West River	**0.01**	**0.01**		**0.04**											
11	●				**0.31**	**0.27**	**0.29**	**0.20**	**NA**		*0.25*	*0.23*	*0.19*			*0.30*	*0.39*	*0.21*	
12	●																		
13	●				**0.16**	**0.17**	**0.21**	**0.17**			*0.14*	*0.18*	*0.14*			*0.18*	*0.25*	*0.20*	
14		●		Branch River															
15		●		Mill River		**0.03**	**0.01**	**0.01**								*0.08*	*0.01*		
16		●		Peters River	**0.03**	**0.05**	**0.01**	**0.01**			*0.03*	*0.01*	*0.01*			*0.09*	*0.03*	*0.01*	
17	●				**0.19**	**0.17**	**0.18**	**0.23**			*0.16*	*0.16*	*0.21*			*0.18*	*0.24*	*0.25*	
24			●	Woonsocket WWTF	**4.70**	**3.57**	**4.70**	**6.08**			*2.91*	*3.21*	*5.96*			*4.18*	*7.16*	*6.19*	
18	●				**0.18**	**0.31**	**0.27**	**0.32**			*0.26*	*0.23*	*0.31*			*0.36*	*0.31*	*0.33*	
19	●																		
20	●				**0.23**	**0.22**	**0.28**	**0.25**			*0.19*	*0.25*	*0.23*			*0.23*	*0.32*	*0.27*	
21	●				**0.32**	**0.21**	**0.22**	**0.25**			*0.18*	*0.17*	*0.24*			*0.25*	*0.26*	*0.25*	
25			●	Bucklin Point (Seekonk R.)	**3.76**	**4.07**	**2.75**	**3.90**			*2.03*	*2.36*	*3.63*			*5.23*	*3.10*	*4.16*	

Figure 4-104

Wet Weather Data - Storm II: Dissolved Oxygen (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				11.6	11.3	11.2	10.2	7.4		10.8	10.8	9.9			11.8	11.6	10.4	
22			●	CSO facility in Worchester															
01	●				11.0	11.2	10.7	9.9	7.0		10.8	10.4	9.6			11.6	11.1	10.2	
23			●	UBWPAD, Worchester					5.4										
02	●				9.4	9.6	9.9	8.6	6.5		8.9	9.3	8.0			10.0	10.9	9.1	
03	●																		
04	●				10.4	10.6	10.7	9.7	7.8		10.0	10.1	9.5			11.5	11.0	9.8	
05		●		Quinsigamond River	1.6	10.3	10.6	9.9	7.2		9.5	10.0	9.6			11.1	11.2	10.2	
06	●				10.3	10.4	10.6	9.4	7.0		9.8	10.2	9.2			11.5	11.0	9.5	
07	●				8.5	9.9	8.9	9.8	7.8		8.3	8.4				12.2	9.6		
08	●				8.3	9.4	8.8	8.5	7.8		7.7	7.7	8.3			12.0	9.6	8.7	
09		●		Mumford River	9.4	10.3	9.5	9.2	8.4		8.7	8.0	9.0			11.2	10.4	9.3	
10		●		West River	9.1	10.0	8.8	8.8	8.3		8.3	8.1	8.4			12.2	9.8	9.1	
11	●				8.9	10.3	8.8	8.6	8.3		7.6	8.0	8.4			13.6	10.2	8.7	
12	●																		
13	●				9.9	9.9	8.8	9.5	8.1		8.0	7.8	8.3			11.8	9.9	10.6	
14		●		Branch River	8.6	10.2	9.5	8.7	9.0		7.9	8.2				12.8	10.4		
15		●		Mill River	5.8	7.0	7.3	8.7	8.7		6.5	6.0	8.6			7.3	8.7	8.8	
16		●		Peters River	6.3	6.6	7.1	6.9	7.0		6.1	6.2	6.7			7.3	8.1	7.0	
17	●				11.4	10.9	9.3	9.8	8.0		8.8	8.2	9.2			12.0	10.8	10.4	
24			●	Woonsocket WWTF					6.0										
18	●				8.1	6.9	7.5	8.5	8.2		6.5	6.1	8.4			7.4	9.7	8.6	
19	●																		
20	●				8.5	7.0	7.3	7.5	8.0		6.7	6.6	7.4			7.7	7.9	7.6	
21	●				8.6	7.4	7.4	9.0	8.6		7.2	6.8	8.7			8.0	8.3	9.2	
25			●	Bucklin Point (Seekonk R.)	2.8	3.2	2.8	2.4	2.0		2.0	2.4	1.9			5.0	3.5	2.8	

Regulatory Standard:
Instantaneous minimum dissolved oxygen concentration of at least 5 mg/l.

Figure 4-105

Wet Weather Data - Storm II: Flow Rate (cfs)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Flow Rate					Minimum Flow Rate					Maximum Flow Rate				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**72**	**149**	**122**	**117**	**57**		*65*	*113*	*113*			*228*	*128*	*121*	
22			●	CSO facility in Worchester															
01	●				**77**	**160**	**131**	**126**	**62**		*71*	*122*	*122*			*245*	*138*	*130*	
23			●	UBWPAD, Worchester															
02	●				**107**	**245**	**165**	**167**	**103**		*107*	*142*	*156*			*453*	*222*	*177*	
03	●																		
04	●				**108**	**247**	**194**	**178**	**108**		*108*	*142*	*165*			*380*	*273*	*191*	
05		●		Quinsigamond River	**2**	**7**	**16**	**15**	**16**		*3*	*15*	*15*			*14*	*16*	*15*	
06	●				**111**	**230**	**202**	**212**	**126**		*153*	*141*	*179*			*334*	*286*	*245*	
07	●				**100**	**211**	**251**	**204**	**183**		*100*	*205*	*200*			*367*	*339*	*208*	
08	●				**206**	**176**	**328**	**278**	**279**		*105*	*282*	*269*			*269*	*436*	*287*	
09		●		Mumford River	**34**	**56**	**103**	**97**	**74**		*34*	*97*	*93*			*86*	*104*	*100*	
10		●		West River	**13**	**16**	**22**	**27**	**29**		*13*	*20*	*27*			*21*	*25*	*27*	
11	●				**252**	**248**	**453**	**402**	**382**		*152*	*409*	*389*			*376*	*553*	*414*	
12	●																		
13	●				**321**	**336**	**581**	**534**	**497**		*222*	*540*	*520*			*483*	*676*	*547*	
14		●		Branch River	**68**	**86**	**125**	**129**	**113**		*66*	*116*	*128*			*105*	*130*	*130*	
15		●		Mill River	**10**	**15**	**21**	**26**	**18**		*9*	*16*	*21*			*22*	*24*	*31*	
16		●		Peters River	**6**	**18**	**18**	**13**	**11**		*6*	*16*	*11*			*30*	*21*	*14*	
17	●				**259**	**310**	**608**	**633**	**569**		*282*	*445*	*606*			*365*	*693*	*660*	
24			●	Woonsocket WWTF															
18	●				**295**	**359**	**628**	**679**	**568**		*265*	*451*	*628*			*500*	*767*	*730*	
19	●																		
20	●				**328**	**399**	**697**	**754**	**630**		*294*	*500*	*697*			*554*	*852*	*810*	
21	●				**294**	**358**	**704**	**878**	**702**		*208*	*446*	*799*			*458*	*890*	*956*	
25			●	Bucklin Point (Seekonk R.)															

Figure 4-106

Wet Weather Data - Storm III: Nitrate+Nitrite (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**0.25**	**0.25**	**0.17**	**0.16**			*0.21*	*0.16*	*0.16*			*0.30*	*0.21*	*0.16*	
22			●	CSO facility in Worchester		**0.18**	**0.17**				*0.17*					*0.21*			
01	●				**0.50**	**0.39**	**0.36**	**0.25**			*0.29*	*0.33*	*0.09*			*0.50*	*0.41*	*0.37*	
23			●	UBWPAD, Worchester	**7.32**	**4.46**	**6.72**	**4.73**			*4.16*	*4.50*	*4.62*			*4.73*	*9.02*	*5.07*	
02	●				**3.56**	**1.89**	**1.58**	**1.83**			*0.89*	*1.28*	*1.44*			*3.89*	*1.83*	*2.14*	
03	●																		
04	●				**2.80**	**1.53**	**1.05**	**1.49**			*0.77*	*0.86*	*1.30*			*2.07*	*1.22*	*1.71*	
05		●		Quinsigamond River	**0.04**	**0.03**	**0.03**	**0.03**			*0.03*	*0.03*	*0.03*			*0.04*	*0.03*	*0.03*	
06	●				**2.30**	**2.38**	**1.23**	**1.36**			*2.02*	*1.06*	*1.23*			*2.59*	*1.67*	*1.45*	
07	●				**2.28**	**2.35**	**1.57**	**1.01**			*2.28*	*1.18*	*0.41*			*2.44*	*2.60*	*1.30*	
08	●				**2.45**	**2.45**	**1.90**	**1.13**			*2.35*	*1.49*	*0.83*			*2.54*	*2.54*	*1.40*	
09		●		Mumford River	**0.13**	**0.13**	**0.11**	**0.08**			*0.13*	*0.08*	*0.08*			*0.13*	*0.13*	*0.08*	
10		●		West River															
11	●				**2.11**	**1.69**	**0.34**	**0.30**			*0.34*	*0.34*	*0.08*			*2.49*	*0.34*	*0.43*	
12	●																		
13	●				**2.25**	**2.00**	**1.80**	**1.78**			*1.85*	*1.77*	*1.65*			*2.29*	*1.85*	*1.85*	
14		●		Branch River	**0.08**	**0.08**	**0.35**	**0.38**			*0.08*	*0.35*	*0.35*			*0.08*	*0.35*	*0.48*	
15		●		Mill River	**1.30**	**1.26**	**1.42**	**1.58**			*1.14*	*1.30*	*1.36*			*1.32*	*1.65*	*1.89*	
16		●		Peters River	**0.59**	**0.54**	**0.54**	**0.44**			*0.51*	*0.46*	*0.42*			*0.59*	*0.59*	*0.51*	
17	●				**2.09**	**1.89**	**2.04**	**1.81**			*1.41*	*1.85*	*1.77*			*2.17*	*2.25*	*1.85*	
24			●	Woonsocket WWTF	**9.27**	**12.73**	**13.63**	**13.51**			*8.88*	*13.52*	*13.50*			*14.65*	*13.74*	*13.52*	
18	●				**2.58**	**2.62**	**2.74**	**2.06**			*2.46*	*2.58*	*2.00*			*2.79*	*2.91*	*2.25*	
19	●																		
20	●				**2.01**	**2.02**	**2.25**	**2.49**			*1.96*	*1.96*	*1.87*			*2.09*	*2.47*	*2.85*	
21	●				**1.98**	**2.06**	**2.19**	**2.41**			*2.03*	*2.13*	*1.57*			*2.07*	*2.25*	*2.81*	
25			●	Bucklin Point (Seekonk R.)	**0.86**	**0.78**	**0.14**	**0.34**			*0.78*	*0.14*	*0.34*			*0.78*	*0.14*	*0.34*	

Figure 4-107

Wet Weather Data - Storm III: Ammonia (mg/l N)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**0.04**	**0.06**	**0.03**	**0.02**			*0.06*	*0.01*	*0.01*			*0.07*	*0.07*	*0.02*	
22			●	CSO facility in Worchester		**0.56**	**0.64**				*0.07*					*1.50*			
01	●				**0.30**	**0.10**	**0.06**	**0.07**			*0.05*	*0.04*	*0.05*			*0.20*	*0.09*	*0.15*	
23			●	UBWPAD, Worchester	**1.74**	**0.84**	**0.93**	**0.32**			*0.07*	*0.15*	*0.06*			*1.64*	*2.08*	*0.90*	
02	●				**0.40**	**0.41**	**0.14**	**0.15**			*0.17*	*0.09*	*0.06*			*0.71*	*0.24*	*0.35*	
03	●																		
04	●				**0.16**	**0.34**	**0.23**	**0.17**			*0.13*	*0.09*	*0.14*			*0.65*	*0.48*	*0.21*	
05		●		Quinsigamond River	**0.05**	**0.01**	**0.02**	**0.05**			*0.01*	*0.01*	*0.03*			*0.01*	*0.04*	*0.06*	
06	●				**0.16**	**0.11**	**0.27**	**0.09**			*0.09*	*0.08*	*0.07*			*0.16*	*0.35*	*0.10*	
07	●				**0.05**	**0.09**	**0.28**	**0.13**			*0.05*	*0.17*	*0.07*			*0.12*	*0.40*	*0.28*	
08	●				**0.11**	**0.11**	**0.25**	**0.12**			*0.05*	*0.10*	*0.02*			*0.18*	*0.31*	*0.19*	
09		●		Mumford River															
10		●		West River	**0.01**	**0.03**	**0.02**	**0.03**			*0.02*	*0.00*	*0.01*			*0.05*	*0.04*	*0.06*	
11	●				**0.01**	**0.02**	**0.10**	**0.17**			*0.01*	*0.03*	*0.11*			*0.04*	*0.18*	*0.23*	
12	●																		
13	●				**0.06**	**0.05**	**0.04**	**0.12**			*0.04*	*0.01*	*0.03*			*0.07*	*0.05*	*0.19*	
14		●		Branch River	**0.01**	**0.06**	**0.04**	**0.07**			*0.05*	*0.02*	*0.06*			*0.08*	*0.07*	*0.10*	
15		●		Mill River	**0.67**	**0.85**	**1.04**	**0.93**			*0.63*	*0.98*	*0.82*			*1.09*	*1.12*	*0.98*	
16		●		Peters River	**0.03**	**0.03**	**0.04**	**0.05**			*0.02*	*0.01*	*0.05*			*0.03*	*0.05*	*0.06*	
17	●				**0.02**	**0.03**	**0.05**	**0.04**			*0.03*	*0.01*	*0.01*			*0.03*	*0.08*	*0.09*	
24			●	Woonsocket WWTF		**0.52**	**0.37**	**0.26**			*0.50*	*0.26*	*0.20*			*0.53*	*0.43*	*0.36*	
18	●				**0.01**	**0.03**	**0.30**	**0.24**			*0.02*	*0.02*	*0.17*			*0.04*	*0.50*	*0.28*	
19	●																		
20	●				**0.17**	**0.25**	**0.32**	**0.23**			*0.19*	*0.21*	*0.08*			*0.31*	*0.57*	*0.35*	
21	●				**0.01**	**0.20**	**0.07**	**0.10**			*0.05*	*0.05*	*0.04*			*0.36*	*0.10*	*0.13*	
25			●	Bucklin Point (Seekonk R.)	**23.20**	**19.40**	**11.04**	**15.67**			*12.50*	*8.94*	*12.20*			*25.10*	*12.50*	*18.00*	

Figure 4-108

Wet Weather Data - Storm III: Phosphate (mg/l P)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean Concentration: During Storm	Mean Concentration: 24h After Storm	Mean Concentration: 48h After Storm	Mean Concentration: 72h After Strom	Minimum Concentration: Dry Weather	Minimum Concentration: During Storm	Minimum Concentration: 24h After Storm	Minimum Concentration: 48h After Storm	Minimum Concentration: 72h After Strom	Maximum Concentration: Dry Weather	Maximum Concentration: During Storm	Maximum Concentration: 24h After Storm	Maximum Concentration: 48h After Storm	Maximum Concentration: 72h After Strom
00	●				**0.01**	**0.01**	**0.01**	**0.01**			*0.01*	*0.01*	*0.01*			*0.01*	*0.01*	*0.01*	
22			●	CSO facility in Worchester		**0.30**	**0.23**				*0.23*					*0.34*			
01	●				**0.01**	**0.01**	**0.01**	**0.01**			*0.01*	*0.01*	*0.01*			*0.01*	*0.01*	*0.01*	
23			●	UBWPAD, Worchester	**1.65**	**1.84**	**1.11**	**1.10**			*1.60*	*0.99*	*1.04*			*1.98*	*1.34*	*1.16*	
02	●				**0.74**	**0.46**	**0.25**	**0.31**			*0.20*	*0.23*	*0.26*			*0.92*	*0.26*	*0.33*	
03	●																		
04	●				**0.48**	**0.27**	**0.25**	**0.30**			*0.19*	*0.22*	*0.25*			*0.41*	*0.28*	*0.39*	
05		●		Quinsigamond River															
06	●				**0.54**	**0.53**	**0.30**	**0.24**			*0.50*	*0.25*	*0.24*			*0.54*	*0.32*	*0.24*	
07	●				**0.39**	**0.43**	**0.30**	**0.22**			*0.43*	*0.25*	*0.11*			*0.43*	*0.39*	*0.29*	
08	●				**0.36**	**0.38**	**0.37**	**0.24**			*0.36*	*0.32*	*0.11*			*0.39*	*0.43*	*0.32*	
09		●		Mumford River	**0.26**	**0.27**	**0.25**	**0.24**			*0.23*	*0.24*	*0.24*			*0.33*	*0.26*	*0.24*	
10		●		West River															
11	●				**0.33**	**0.30**	**0.23**	**0.27**			*0.30*	*0.23*	*0.26*			*0.30*	*0.23*	*0.29*	
12	●																		
13	●				**0.36**	**0.32**	**0.28**	**0.30**			*0.30*	*0.24*	*0.30*			*0.36*	*0.30*	*0.30*	
14		●		Branch River															
15		●		Mill River															
16		●		Peters River															
17	●				**0.06**	**0.05**	**0.06**	**0.07**			*0.04*	*0.06*	*0.04*			*0.06*	*0.06*	*0.09*	
24			●	Woonsocket WWTF	**6.86**	**5.45**	**5.01**	**4.67**			*5.11*	*4.81*	*4.39*			*6.14*	*5.22*	*4.81*	
18	●				**0.46**	**0.41**	**0.46**	**0.30**			*0.36*	*0.41*	*0.25*			*0.46*	*0.52*	*0.35*	
19	●																		
20	●				**0.44**	**0.39**	**0.40**	**0.85**			*0.37*	*0.33*	*0.78*			*0.40*	*0.44*	*0.89*	
21	●				**0.39**	**0.40**	**0.39**	**0.42**			*0.37*	*0.36*	*0.36*			*0.41*	*0.42*	*0.48*	
25			●	Bucklin Point (Seekonk R.)	**1.83**	**4.41**	**1.50**	**0.94**			*1.95*	*0.67*	*0.91*			*5.64*	*3.25*	*0.97*	

Figure 4-109

Wet Weather Data - Storm III: Dissolved Oxygen (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean: During Storm	Mean: 24h After Storm	Mean: 48h After Storm	Mean: 72h After Strom	Minimum Concentration: Dry Weather	Min: During Storm	Min: 24h After Storm	Min: 48h After Storm	Min: 72h After Strom	Maximum Concentration: Dry Weather	Max: During Storm	Max: 24h After Storm	Max: 48h After Storm	Max: 72h After Strom
00	●				9.0	10.5	10.9	11.0			10.4	10.0	10.2			10.6	11.3	11.8	
22			●	CSO facility in Worchester															
01	●				9.0	10.5	11.0	10.4			10.0	10.8	9.0			11.0	11.0	11.4	
23			●	UBWPAD, Worchester															
02	●				7.9	10.4	10.0	9.4			8.6	9.4	9.0			12.5	10.5	9.8	
03	●																		
04	●				9.2	11.2	11.1	10.3			10.5	10.8	9.4			12.5	11.5	10.9	
05		●		Quinsigamond River	8.2	10.9	10.2	10.3			9.9	10.0	10.0			12.5	10.5	10.8	
06	●				8.2	11.2	10.9	10.2			9.1	10.3	9.4			14.0	11.5	10.8	
07	●				8.8	9.4	11.7	11.6			8.8	9.6	10.0			9.8	14.4	13.0	
08	●				9.0	9.0	11.0	11.8			8.4	9.6	10.6			9.4	12.4	13.0	
09		●		Mumford River	9.8	9.7	11.5	12.1			9.4	9.8	10.8			10.4	14.0	13.2	
10		●		West River	8.2	8.4	10.0	11.2			8.2	8.8	9.8			8.8	11.3	13.0	
11	●				6.5	9.6	11.1	11.2			9.0	9.4	10.1			10.8	13.5	12.4	
12	●																		
13	●				10.5	9.7	11.4	12.1			9.4	10.2	10.5			10.2	12.9	13.5	
14		●		Branch River	9.1	9.5	11.4	11.8			9.4	9.8	10.3			9.8	12.8	13.4	
15		●		Mill River	5.3	7.1	6.8	6.6			6.3	4.7	5.2			7.6	8.1	8.0	
16		●		Peters River	6.3	7.4	7.5	8.1			6.8	7.0	7.6			8.4	8.1	8.6	
17	●				10.6	9.7	11.9	12.4			9.2	10.0	10.6			10.4	13.4	13.8	
24			●	Woonsocket WWTF															
18	●				9.1	9.7	9.7	10.3			9.0	9.4	9.6			10.3	10.0	11.2	
19	●																		
20	●				9.2	10.5	10.4	10.9			9.4	8.2	10.3			11.1	13.2	12.0	
21	●				9.7	10.9	11.1	11.1			9.8	10.0	10.4			11.8	13.8	12.1	
25			●	Bucklin Point (Seekonk R.)	5.2	4.0	3.5	2.9			2.4	3.0	2.3			5.0	4.5	3.6	

Regulatory Standard:
Instantaneous minimum dissolved oxygen concentration of at least 5 mg/l.

Figure 4-110

Wet Weather Data - Storm III: Flow Rate (cfs)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Flow Rate: Dry Weather	Mean Flow Rate: During Storm	Mean Flow Rate: 24h After Storm	Mean Flow Rate: 48h After Storm	Mean Flow Rate: 72h After Strom	Minimum Flow Rate: Dry Weather	Minimum Flow Rate: During Storm	Minimum Flow Rate: 24h After Storm	Minimum Flow Rate: 48h After Storm	Minimum Flow Rate: 72h After Strom	Maximum Flow Rate: Dry Weather	Maximum Flow Rate: During Storm	Maximum Flow Rate: 24h After Storm	Maximum Flow Rate: 48h After Storm	Maximum Flow Rate: 72h After Strom
00	●				**38**	**325**	**125**	**75**			*38*	*109*	*48*			*530*	*140*	*100*	
22			●	CSO facility in Worchester															
01	●				**41**	**350**	**134**	**81**			*41*	*117*	*52*			*570*	*150*	*108*	
23			●	UBWPAD, Worchester		**51**	**46**	**32**			*33*	*30*	*31*			*69*	*75*	*33*	
02	●					**829**													
03	●																		
04	●				**109**	**465**	**293**	**201**			*109*	*246*	*173*			*746*	*378*	*230*	
05		●		Quinsigamond River	**8**	**17**	**28**	**24**			*9*	*26*	*22*			*21*	*30*	*27*	
06	●				**98**	**261**	**286**	**206**			*98*	*216*	*110*			*456*	*456*	*260*	
07	●				**144**	**255**	**359**	**224**			*144*	*278*	*144*			*421*	*570*	*265*	
08	●				**152**	**180**	**365**	**290**			*127*	*332*	*283*			*229*	*414*	*301*	
09		●		Mumford River	**17**	**34**	**28**	**26**			*23*	*18*	*25*			*41*	*37*	*27*	
10		●		West River	**9**	**11**	**12**	**12**			*9*	*12*	*12*			*13*	*13*	*13*	
11	●				**202**	**221**	**371**	**284**			*143*	*188*	*235*			*372*	*494*	*346*	
12	●																		
13	●				**228**	**262**	**428**	**373**			*177*	*223*	*299*			*423*	*580*	*495*	
14		●		Branch River	**41**	**55**	**48**	**45**			*43*	*45*	*45*			*62*	*54*	*45*	
15		●		Mill River	**No Flow**														
16		●		Peters River	**2**	**4**	**3**	**4**			*2*	*3*	*3*			*7*	*4*	*5*	
17	●				**165**	**207**	**412**	**447**			*172*	*207*	*406*			*246*	*797*	*551*	
24			●	Woonsocket WWTF															
18	●				**240**	**259**	**406**	**396**			*218*	*236*	*338*			*280*	*682*	*429*	
19	●																		
20	●				**255**	**277**	**439**	**427**			*231*	*250*	*363*			*300*	*746*	*464*	
21	●				**254**	**321**	**348**	**514**			*264*	*290*	*402*			*385*	*485*	*668*	
25			●	Bucklin Point (Seekonk R.)	**23**	**20**	**20**	**19**			*16*	*12*	*14*			*24*	*24*	*23*	

Table 4-111
Source Rankings by Dry and Wet Load
Nitrate (as N)

Blackstone River Initiative (Wright et al., 2001)

Station No. From	Station No. To	Blackstone River	Tributary	WWTF/CSO	Location	Nitrate (as N) *(1000 pounds)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Average - All Storms	Nitrate *(as N)* *(%)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Avergaege - All Storms
headw	00	●					0.07	0.15	0.32			1.17	0.90	2.75	**1.63**
21				●	CSO facility in Worchester			0.07					0.41		**0.08**
00	01(*)	●					0.04		0.12		**2.66**	0.66		1.03	**0.58**
22				●	UBWPAD, Worchester		2.29	0.29	4.29		**49.60**	37.90	1.75	36.60	**26.20**
01	02	●						0.20					1.21		**0.41**
02	03	●					0.52	0.21	0.39		**3.46**	8.54	1.29	3.34	**4.57**
03	04	●									**1.12**				
05			●		Quinsigamond River		0.00				**0.15**	0.03			**0.01**
04	06	●					1.09	0.39	0.03		**0.76**	18.10	2.41	0.27	**7.29**
06	07	●						0.14			**2.35**		0.85		**0.28**
07	08	●						0.27	0.27		**0.61**		1.65	2.26	**1.31**
09			●		Mumford River		0.40	0.15	0.01		**0.62**	6.62	0.91	0.10	**0.58**
10			●		West River		0.00	0.02	0.00		**0.08**	0.02	0.10	0.01	
08	11	●						1.46			**1.98**		8.97		**3.00**
11	12	●					0.70	5.01	2.36		**5.28**	11.60	30.80	20.20	**21.10**
12	13	●									**2.98**				
14			●		Branch River		0.03	0.18	0.15		**0.90**	0.50	1.09	1.26	**0.96**
15			●		Mill River		0.03	0.07	0.04		**0.30**	0.43	0.42	0.32	**0.70**
16			●		Peters River		0.02	0.07	0.02		**0.32**	0.30	0.42	0.15	
13	17	●							0.80					6.80	**2.27**
24				●	Woonsocket WWTF		0.05		2.08		**7.90**	0.89		17.70	**6.27**
17	18	●					0.15				**3.20**	2.55			**0.90**
18	19	●					0.64	1.66	0.84		**2.19**	10.60	10.20	7.14	**9.56**
19	20	●									**2.58**				
20	21	●						5.96			**10.90**		36.60		**12.20**
Sum of Rankings - MA							**5.1**	**8.4**	**7.8**		**71.7**	**84.6**	**51.3**	**66.6**	**67.0**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**0.9**	**7.9**	**3.9**		**28.3**	**15.3**	**48.7**	**33.4**	**32.9**
					Totals		6.0	16.3	11.7		**99.9**	99.9	100.0	99.9	**99.9**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Table 4-112

Source Rankings by Dry and Wet Load

Ammonia (as N)

Blackstone River Initiative (Wright et al., 2001)

Station No. From	Station No. To	Blackstone River	Tributary	WWTF/CSO	Location	Ammonia (as N) *(1000 pounds)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Average - All Storms	Ammonia (as N) *(%)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Avergaege - All Storms
headw	00	●					0.05	0.07	0.07			0.76	0.30	2.90	**0.06**
21				●	CSO facility in Worchester			0.08	0.09				0.33	3.69	**1.25**
00	01(*)	●					0.01	0.01			**2.62**	0.18	0.04		**1.34**
22				●	UBWPAD, Worchester		1.08	11.40	0.63		**4.87**	17.80	49.60	25.00	**31.20**
01	02	●					0.21	1.53	0.48		**8.28**	3.39	6.63	19.00	**9.83**
02	03	●						1.97			**0.35**		8.54		**2.89**
03	04	●									**4.52**				
05			●		Quinsigamond River				0.01		**0.46**			0.28	**0.09**
04	06	●						1.10			**1.01**		4.77		**1.61**
06	07	●					0.15	0.34	0.12			2.53	1.47	4.76	**2.96**
07	08	●					0.20					3.32			**1.12**
09			●		Mumford River		0.00	0.00	0.002		**0.65**	0.05	0.01	0.08	**0.07**
10			●		West River				0.002		**0.25**			0.08	
08	11	●						0.18	0.01		**0.10**		0.77	0.36	**0.38**
11	12	●						0.90			**1.04**		3.90		
12	13	●									**0.35**				
14			●		Branch River		0.03	0.12	0.04		**1.93**	0.56	0.52	1.47	**0.86**
15			●		Mill River				0.03		**0.48**			1.03	**0.41**
16			●		Peters River		0.00	0.02	0.002		**0.25**	0.02	0.08	0.08	
13	17	●					0.01					0.18			**0.07**
24				●	Woonsocket WWTF		2.48	4.21	0.06		**67.30**	40.80	18.20	2.42	**20.80**
17	18	●					1.85		0.98		**2.49**	30.40		38.80	**23.40**
18	19	●													
19	20	●									**3.01**				
20	21	●						1.11					4.81		**1.63**
Sum of Rankings - MA							**1.7**	**17.6**	**1.41**		**24.5**	**28.0**	**76.4**	**56.2**	**52.8**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**4.4**	**5.5**	**1.11**		**75.5**	**72.0**	**23.6**	**43.8**	**47.2**
Totals							6.1	23.0	2.53		**100.0**	100.0	100.0	100.0	**100.0**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Table 4-113

Source Rankings by Dry and Wet Load

Orthophosphate (as P)

Blackstone River Initiative (Wright et al., 2001)

Station No. From	Station No. To	Blackstone River	Tributary	WWTF/CSO	Location	Orthophosphate (as P) *(1000 pounds)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Average - All Storms	Orthophosphate (as P) *(%)* Dry Weather Load	Wet Loads Storm 1	Wet Loads Storm 2	Wet Loads Storm 3	Wet Loads Avergaege - All Storms
headw	00	●					0.01	0.05	0.01			0.39	2.27	0.26	**1.09**
21				●	CSO facility in Worchester			0.01	0.05				0.44	0.93	**0.35**
00	01(*)	●									**1.40**				
22				●	UBWPAD, Worchester		0.72	1.01	1.07		**63.20**	46.50	44.90	21.60	**42.00**
01	02	●					0.07					4.18			**1.55**
02	03	●					0.06	0.06			**2.45**	4.11	2.80		**2.57**
03	04	●													
05			●		Quinsigamond River			0.00	0.002		**0.29**		0.09	0.04	**0.05**
04	06	●													
06	07	●							0.60		**0.86**			12.20	**4.52**
07	08	●					0.11	0.15			**0.15**	6.75	6.85		**5.06**
09			●		Mumford River		0.00	0.00	0.04		**0.60**	0.06	0.13	0.83	**0.14**
10			●		West River			0.00	0.001		**0.13**		0.18	0.02	
08	11	●						0.06			**1.82**		2.67		**0.99**
11	12	●							0.33		**2.65**			6.61	**2.45**
12	13	●									**2.99**				
14			●		Branch River		0.00	0.01	0.001		**0.61**	0.06	0.31	0.02	**0.45**
15			●		Mill River		0.00	0.00			**0.10**	0.06	0.13		**0.18**
16			●		Peters River		0.00	0.01			**0.08**	0.06	0.22		
13	17	●					0.02	0.05			**1.67**	1.09	2.22		**1.23**
24				●	Woonsocket WWTF		0.40	0.72	0.83		**19.50**	25.80	31.90	16.80	**27.70**
17	18	●					0.12	0.07	0.51			7.46	3.16	10.20	**7.72**
18	19	●					0.05		1.52			3.47		30.60	**1.29**
19	20	●									**0.46**				
20	21	●						0.04			**1.12**		1.69		**0.63**
Sum of Rankings - MA							**0.97**	**1.34**	**2.10**		**76.5**	**62.0**	**60.3**	**42.5**	**60.8**
Sum of Rankings - RI *(incl. Mill and Peters Rivers)*							**0.59**	**0.90**	**2.86**		**23.5**	**38.0**	**39.6**	**57.6**	**39.2**
					Totals		1.56	2.24	4.96		**100.1**	100.0	100.0	100.1	**100.0**

(*) For Dry weather data, rankings between Segment "00 and 01" include the Segment "Headwater to 00".

Figure 4-114

Final Effluent Monitoring Data: *Woonsocket Wastewater Treatment Facility*

Nutrients, TSS, BOD5

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	gallons per day
Concentrations										
Monthly Average										
Average	6.75	15.69	20.70	20.65	20.04	0.33	5.66	17.67	5.60	9,180,000
Minimum	5.60	6.00	2.40	6.50	0.50	0.05	4.07	2.10	0.40	5,230,000
Maximum	7.47	40.20	60.10	35.10	30.10	0.73	7.68	34.00	10.20	13,520,000
Maximum Daily										
Average	7.38	32.57	43.22	36.59	28.51	0.54	1.32	33.22	9.38	
Minimum	6.94	10.00	5.00	9.00	2.00	0.00	0.01	4.30	0.70	
Maximum	10.00	130.00	132.00	75.00	43.00	4.50	11.40	74.00	19.20	
Loads (kg/day)										
Monthly Average										
Average		574	735							
Minimum		178	52							
Maximum		1,765	1,657							
Maximum Daily										
Average		1,526	1,975							
Minimum		310	113							
Maximum		6,449	6,344							
Count	55	58	58	11	58	58	58	16	58	58

Data Source: Rhode Island Department of Environmental Management

Figure 4-115
Woonsocket Wastewater Treatment Facility - Effluent
Nitrate (as N)

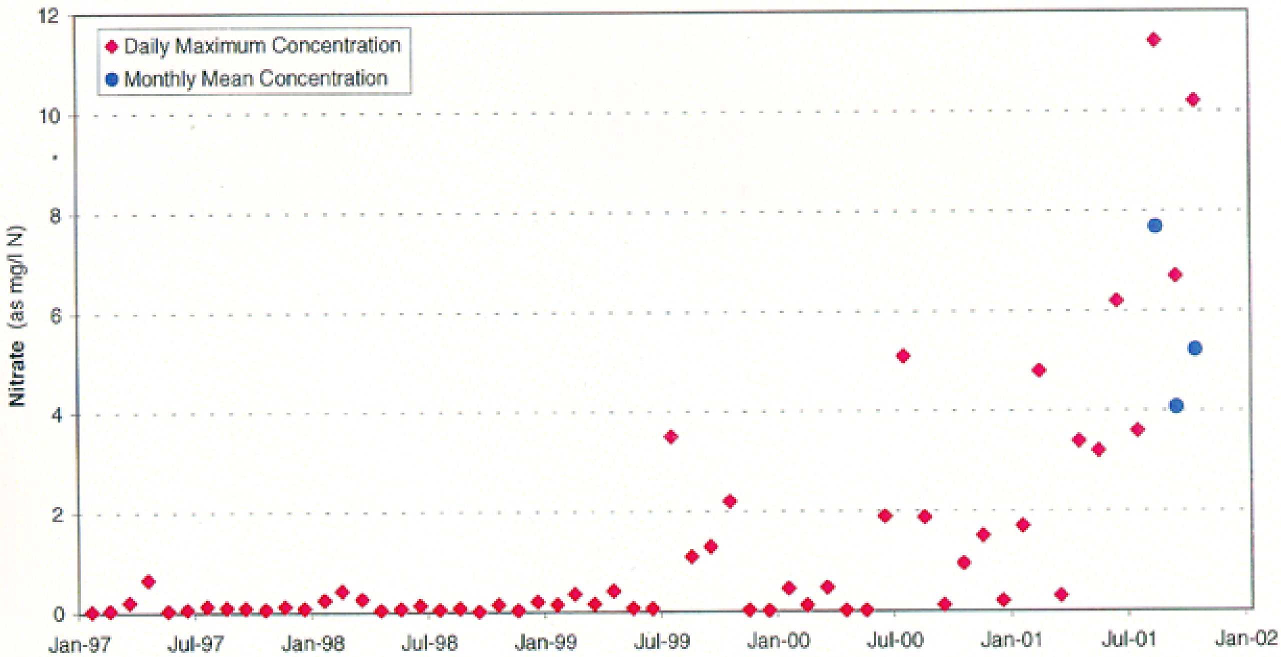


Figure 4-116
Woonsocket Wastewater Treatment Facility - Effluent
Nitrite (as N)

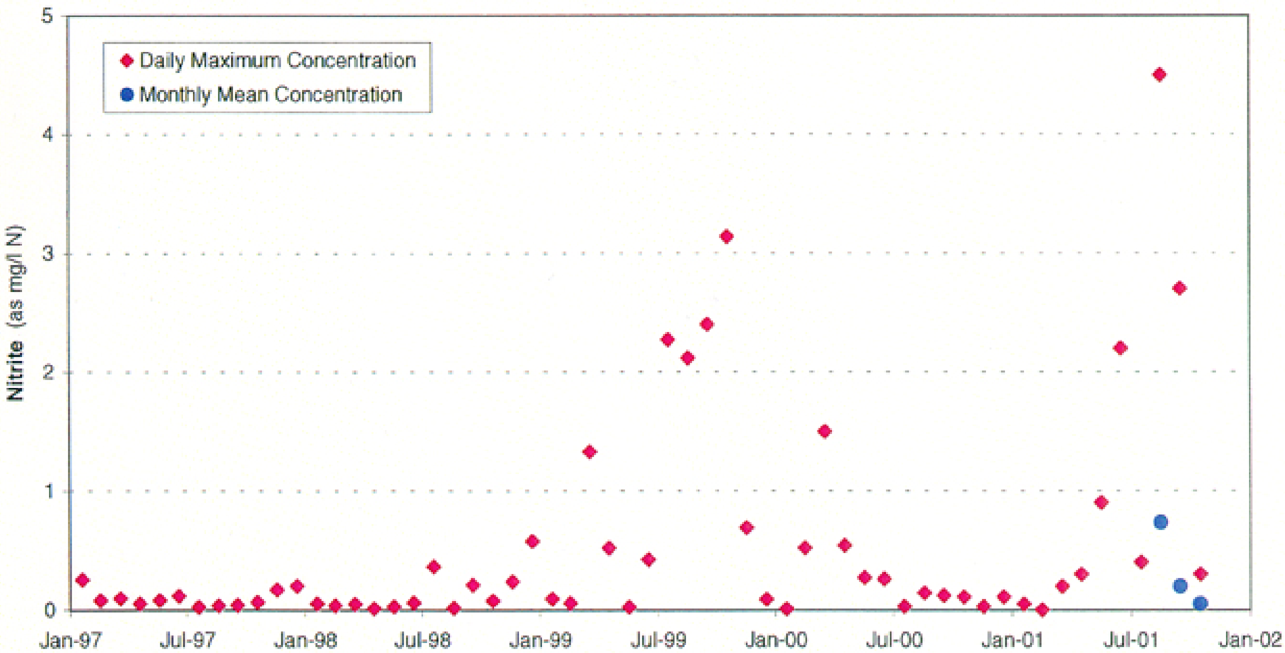


Figure 4-117

Woonsocket Wastewater Treatment Facility - Effluent

Ammonia (as N)

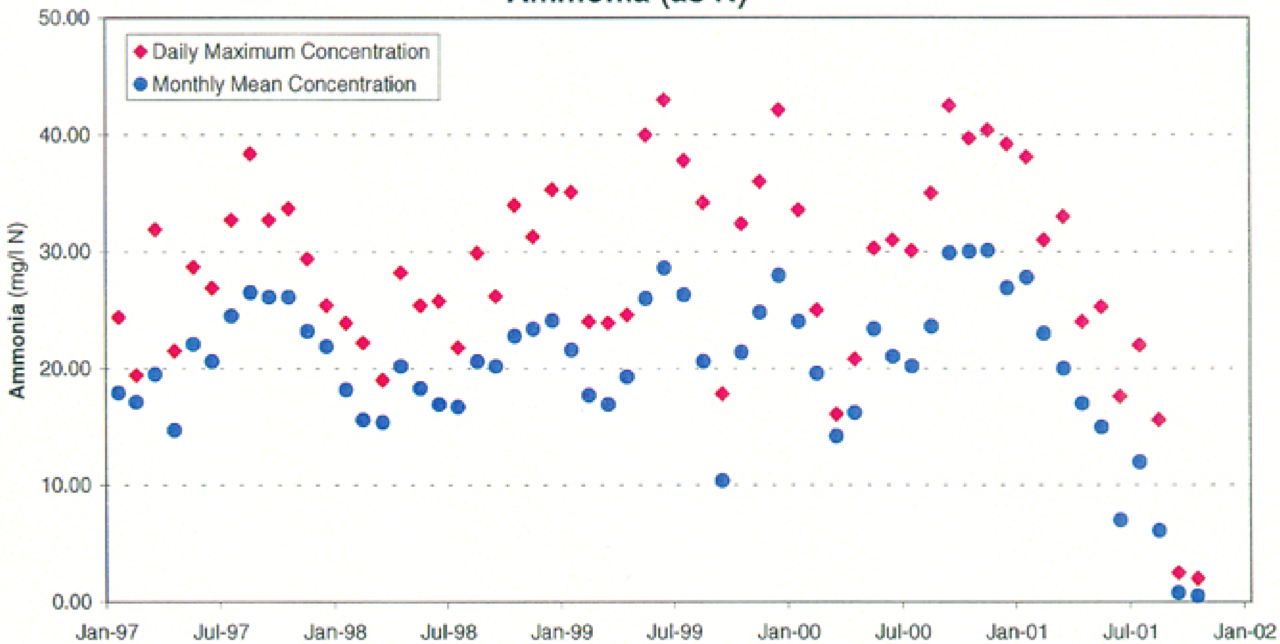


Figure 4-118

Woonsocket Wastewater Treatment Facility - Effluent

Total Kjeldhal Nitrogen (as N)

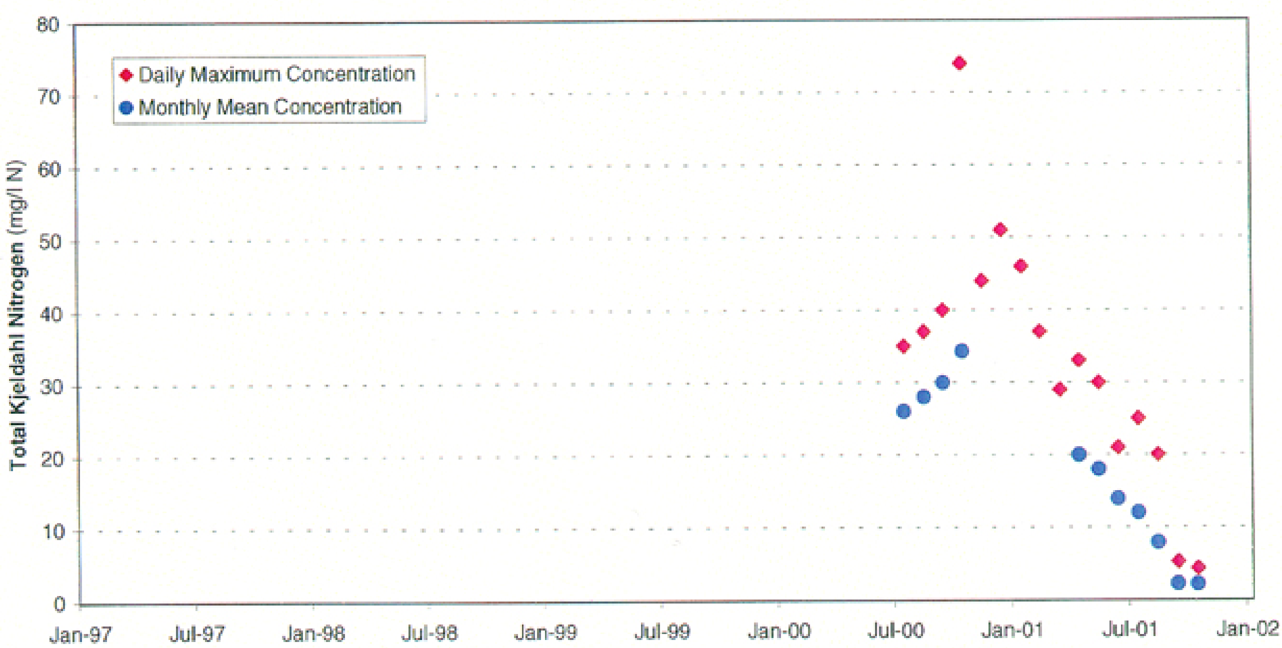


Figure 4-119
Woonsocket Wastewater Treatment Facility - Effluent
Total Nitrogen

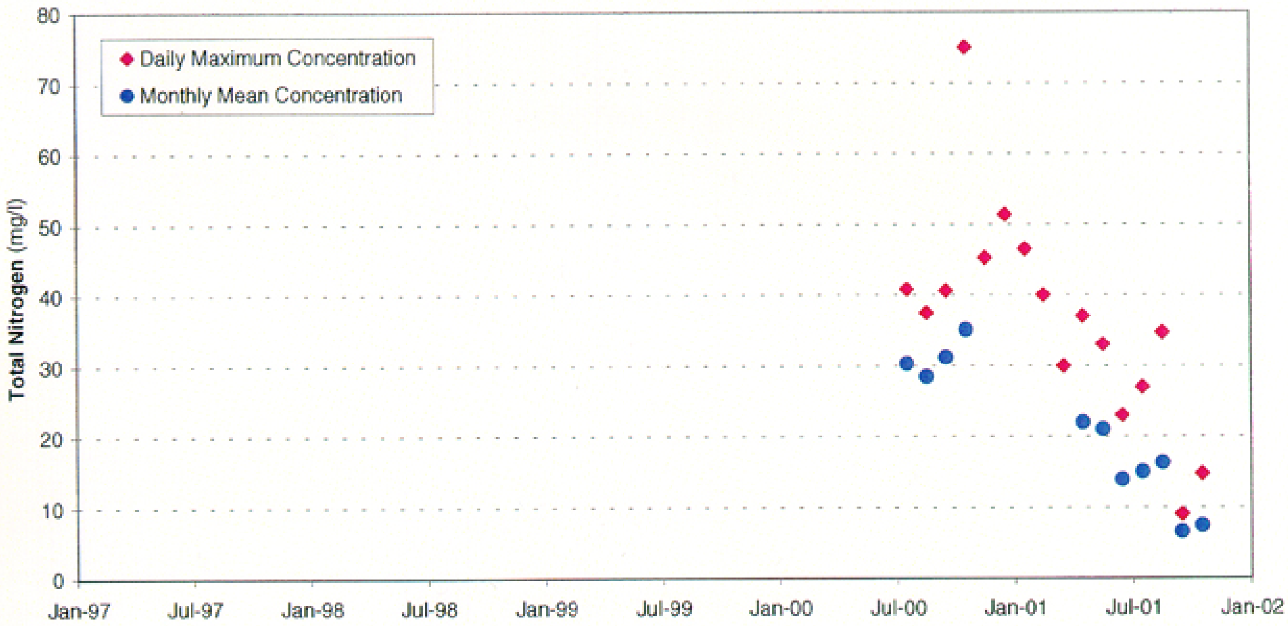


Figure 4-120
Woonsocket Wastewater Treatment Facility - Effluent
Total Phosphorus

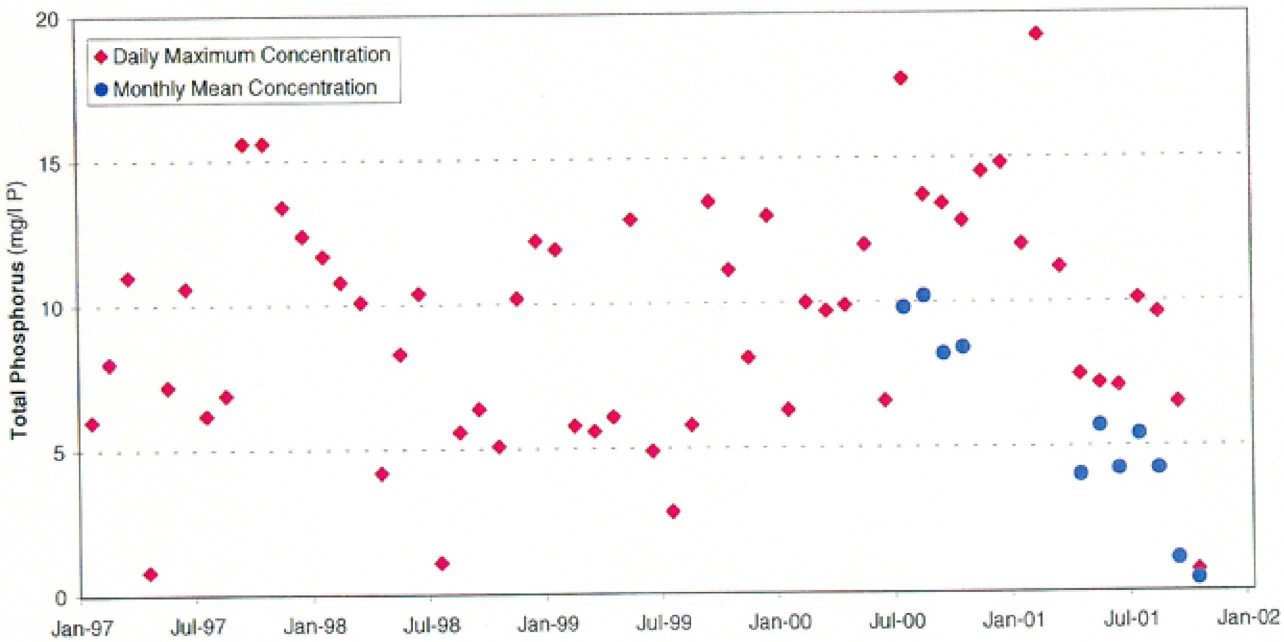


Figure 4-121

Woonsocket Wastewater Treatment Facility - Effluent

BOD

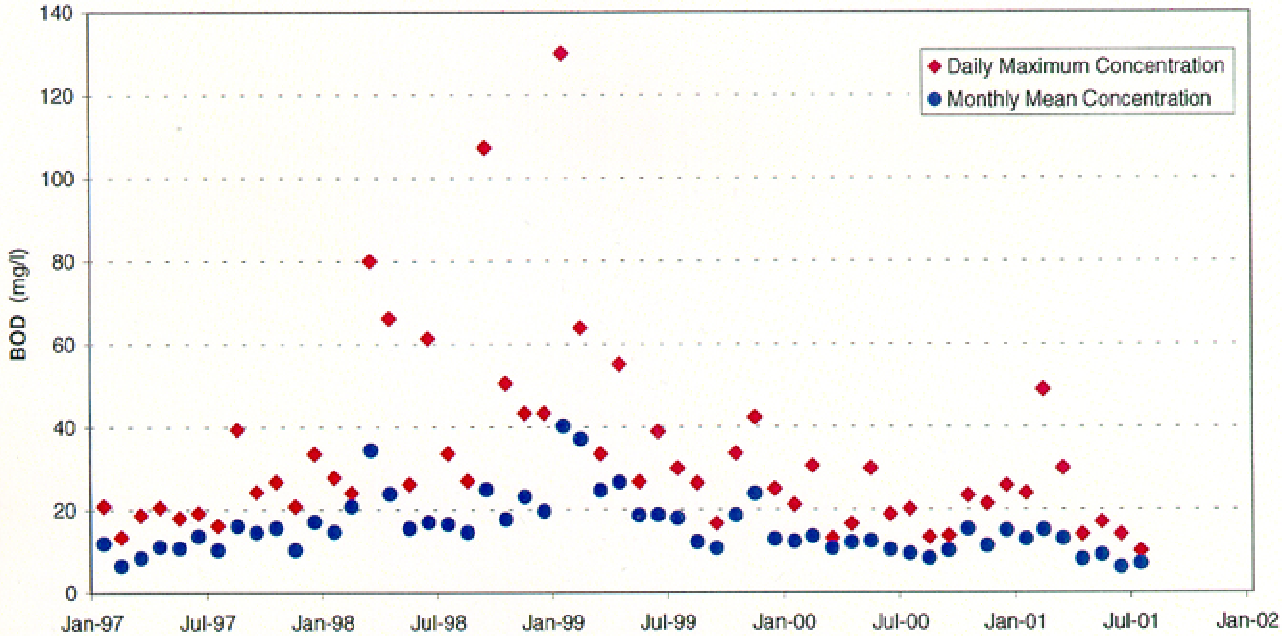


Figure 4-122

Woonsocket Wastewater Treatment Facility - Effluent

Total Suspended Solids (TSS)

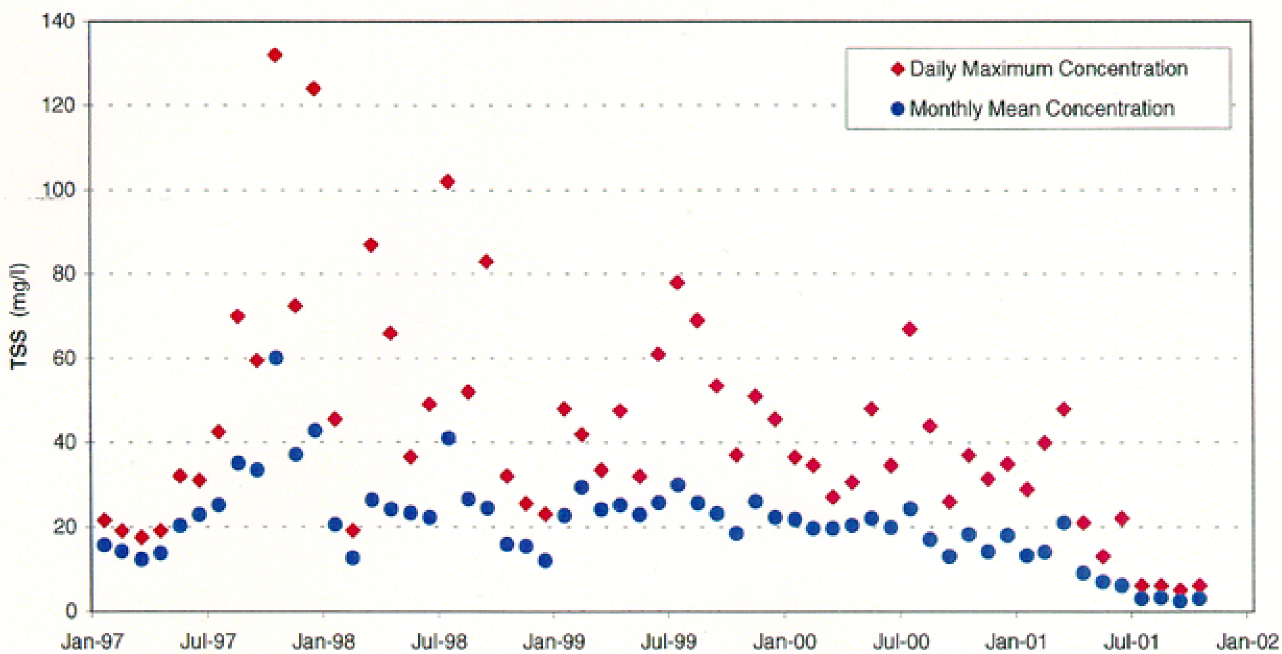


Figure 4-123

Total Suspended Solids *(mg/l)* **-** *Data Summary (all studies in Rhode Island Section of Blackstone River)*

Data Appendix	Station No.	Study Author	Year(s) of data collection	Blackstone R.	Tributary	WWTF/CSO	Station Location	Mean Concentration				Minimum Concentration				Maximum Concentration			
								Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm	Dry Weather	During Storm	24h After Storm	48h After Storm
15	12	URI BRI dry	1991	●			Route 122, Millville, MA	4.7				2.2				9.4			
		URI BRI wet	1991-1993	●															
9	Forestdale	USGS	1990-1999		●		Branch River, 400ft downst. of Mill dam in Forestdale												
15	14	URI BRI dry	1991		●		Branch River, Route 146A, Slatersville, MA	2.2				0.6				4.0			
		URI BRI wet	1991-1993		●			2.0	2.7	3.9	2.0	1.4	1.0	1.0	1.0	2.6	6.0	20.2	4.4
6	B2	River Rescue	1990-1995	●			Main Street, Blackstone, MA	2.8		2.6		0.6				5.2			
1	BRSL	URI	1988-1989	●			Blackstone River at MA/RI state line	13.0	11.6	10.3	8.9	8.2	7.2	5.2	6.8	17.8	13.6	14.0	11.5
15	13	URI BRI dry	1991	●			Bridge St. (State Boundary), Blackstone, MA	5.4				2.4				8.4			
		URI BRI wet	1991-1993	●				3.5	3.2	4.4	6.3	2.6	2.2	1.6	2.0	4.6	4.7	8.0	13.4
15	15	URI BRI dry	1991		●		Mill River, Winter St., Woonsocket, RI	3.4				1.8				6.2			
		URI BRI wet	1991-1993		●			4.1	7.9	5.0	6.2	2.0	2.2	2.4	2.2	8.0	43.2	10.4	28.0
15	16	URI BRI dry	1991		●		Peters River, Route 114, Woonsocket, RI	4.2				1.0				9.0			
		URI BRI wet	1991-1993		●			6.8	19.2	9.5	9.9	2.0	2.0	1.4	1.8	15.0	90.4	53.4	56.0
15	17	URI BRI dry	1991	●			Hamlet Ave., (Rte. 122 and 126), Woonsocket, RI	5.1				2.4				8.2			
		URI BRI wet	1991-1993	●				2.5	7.1	5.7	4.7	1.4	1.4	1.6	1.4	4.2	30.6	11.8	11.2
15	24	URI BRI dry	1991			●	Effluent, Woonsocket Sewage Treatment Plant												
		URI BRI wet	1991-1993			●		79.3	71.8	84.0	55.9	6.8	17.2	9.0	3.4	202.0	297.0	350.0	227.0
1	WSTP	URI	1988-1989			●		15.0	33.6	14.5	12.0		9.3	13.0			50.6	16.0	
14	RIPDES	RIDEM	1997-2001			●			20.7				<2.4				132.0		
15	18	URI BRI dry	1991	●			Manville Hill Rd., Cumberland, RI	4.5				2.4				8.6			
		URI BRI wet	1991-1993	●				3.9	4.1	6.8	9.2	3.0	1.2	3.4	2.8	4.6	11.8	11.2	22.5
9	Manville	USGS	1990-1999	●															
15	19	URI BRI dry	1991	●			School St./Albion Rd., Cumberland, RI	5.0				2.2				8.2			
		URI BRI wet	1991-1993	●															
6	Blons	River Rescue	1990-1995	●															
15	20	URI BRI dry	1991	●			Lonsdale Ave., Lonsdale, RI	3.8				1.8				7.0			
		URI BRI wet	1991-1993	●				2.6	3.8	8.2	6.3	1.3	1.2	2.0	2.8	3.8	11.8	26.4	12.0
10	S-2	NBC	1997-2000	●															
1	BRCF	URI	1988-1989	●			Blackstone River above Central Falls, Pawtucket	10.7	10.2	10.8	8.3	6.2	2.0	2.2	7.4	15.2	22.0	18.0	9.2
1	BRSM	URI	1988-1989	●			Slaters Mill	6.9	8.5	8.2	10.7	2.4	2.8	2.1	6.7	12.0	19.8	12.4	25.4
2	BRSMDN	URI	1990	●				3.4	4.6	5.2	6.0	0.8	1.8	1.0	0.8	5.5	12.8	12.4	11.6
10	S-3	NBC	1997-2000	●															
15	21	URI BRI dry	1991	●				4.8				1.4				7.0			
		URI BRI wet	1991-1993	●				3.8	6.7	4.6	5.4	1.4	1.3	1.8	1.8	5.0	31.4	12.2	11.0
5	TMDL	RIDEM	1995-1996	●				8.0		26.8		2.7		1.7		37.5		51.9	
6	B1	River Rescue	1990-1995	●			Main Street, Pawtucket, RI	2.8		6.3		0.5		1.6		8.7		16.2	

Figure 4-124

Total Suspended Solids Concentration

(Kerr and Lee, 1996)

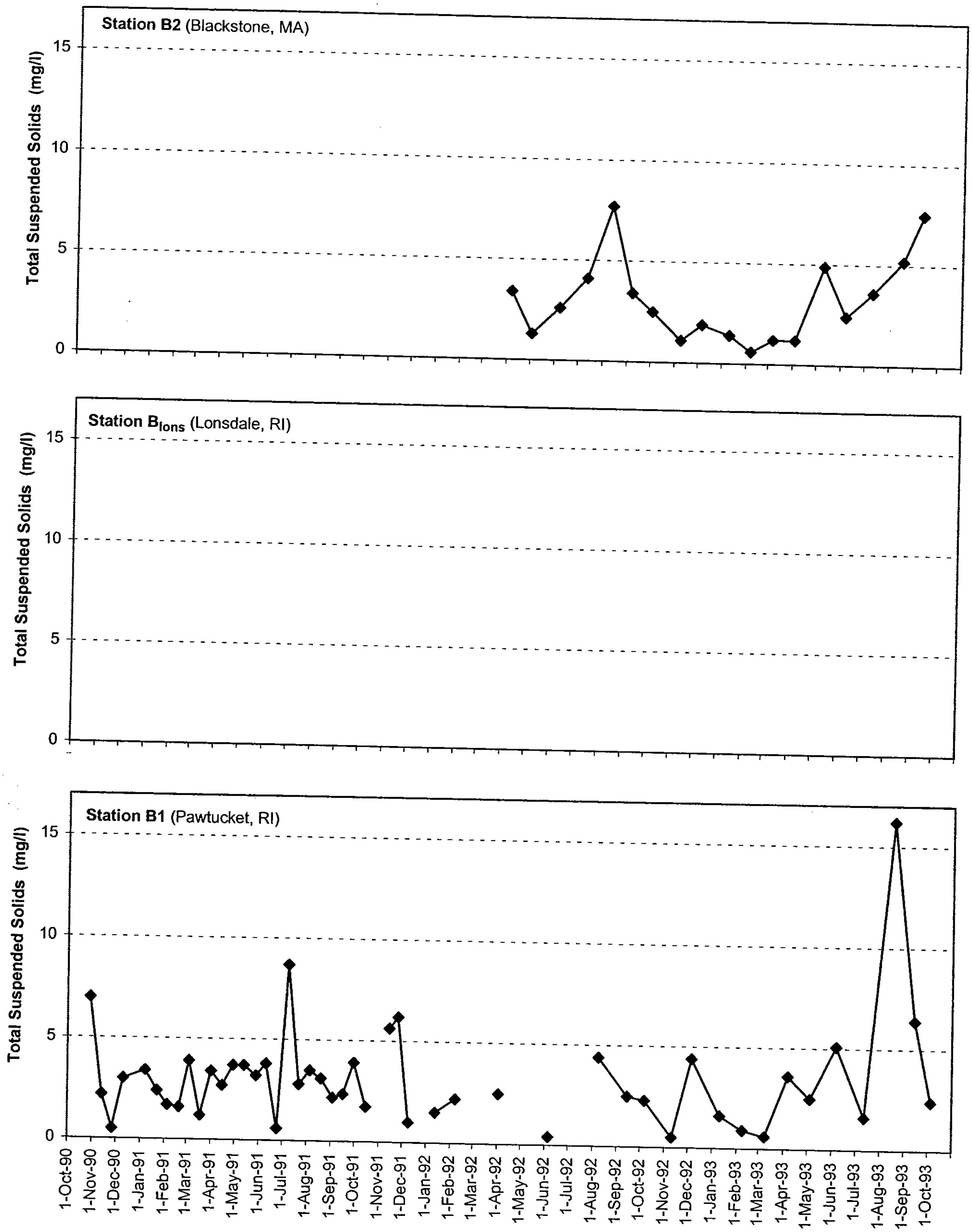


Figure 4-125

Blackstone River Initiative (Wright et al., 2001)

Dry Weather Sampling: **Total Suspended Solids Concentration** *(mg/l)*

July 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			2.4	2.8	0.6	3.0	**2.20**
BLK02	●			4.6	3.6	3.6	3.8	**3.90**
BLK03	●			0.5	1.4	1.8	0.5	**1.05**
BLK04	●			1.2	1.4	1.4	1.8	**1.45**
BLK05		●	Quinsigamond River	1.6	0.6	0.3	0.6	**0.78**
BLK06	●			6.6	1.8	3.2	4.0	**3.90**
BLK07	●			4.2	5.2	9.2	5.6	**6.05**
BLK08	●			5.0	6.8	18.4	16.2	**11.60**
BLK09		●	Mumford River	1.8	0.6	1.8	2.6	**1.70**
BLK10		●	West River	2.2	1.2	1.2	2.8	**1.85**
BLK11	●			9.4	6.6	12.4	13.4	**10.45**
BLK12	●			5.0	9.4	7.0	5.2	**6.65**
BLK13	●			6.4	7.2	8.4	6.8	**7.20**
BLK14		●	Branch River	1.6	2.0	0.6	1.4	**1.40**
BLK15		●	Mill River	2.4	2.6	1.8	4.0	**2.70**
BLK16		●	Peters River	5.4	5.4	3.4	7.0	**5.30**
BLK17	●			5.6	8.2	7.8	8.0	**7.40**
BLK18	●			8.6	2.6	6.4	5.4	**5.75**
BLK19	●			5.8	8.0	8.2	5.6	**6.90**
BLK20	●			3.8	3.2	4.8	3.6	**3.85**
BLK21	●		Slaters Mill	4.6	5.0	6.8	5.6	**5.50**

Statistics - all 3 surveys

Mean	*Mini-mum*	*Maxi-mum*
3.0	*0.6*	*4.6*
3.6	*1.4*	*5.4*
2.3	*0.5*	*5.6*
2.3	*1.2*	*4.0*
1.0	*0.3*	*1.8*
4.2	*1.0*	*11.8*
5.7	*3.2*	*9.2*
8.9	*3.0*	*18.4*
1.5	*0.3*	*2.6*
1.6	*1.0*	*2.8*
6.7	*2.4*	*13.4*
4.7	*2.2*	*9.4*
5.4	*2.4*	*8.4*
2.2	*0.6*	*4.0*
3.4	*1.8*	*6.2*
4.2	*1.0*	*9.0*
5.1	*2.4*	*8.2*
4.5	*2.4*	*8.6*
5.0	*2.2*	*8.2*
3.8	*1.8*	*7.0*
4.8	*1.4*	*7.0*

August 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			3.0	3.2	3.4	4.2	**3.45**
BLK02	●			4.8	3.0	3.0	1.4	**3.05**
BLK03	●			2.0	1.0	1.6	0.6	**1.30**
BLK04	●			1.8	2.6	1.8	1.8	**2.00**
BLK05		●	Quinsigamond River	1.4	1.8	1.6	0.3	**1.26**
BLK06	●			3.6	2.8	1.0	2.0	**2.35**
BLK07	●			8.6	6.8	5.6	4.4	**6.35**
BLK08	●			3.8	6.2	17.8	8.6	**9.10**
BLK09		●	Mumford River	1.6	1.6	1.4	1.2	**1.45**
BLK10		●	West River	1.6	1.4	1.8	1.0	**1.45**
BLK11	●			5.2	6.0	2.4	4.0	**4.40**
BLK12	●			3.6	5.4	3.0	3.2	**3.80**
BLK13	●			5.4	4.4	4.8	4.4	**4.75**
BLK14		●	Branch River	2.0	3.8	4.0	2.6	**3.10**
BLK15		●	Mill River	3.8	5.2	6.2	4.0	**4.80**
BLK16		●	Peters River	2.0	3.2	5.8	9.0	**5.00**
BLK17	●			3.4	4.2	4.4	4.6	**4.15**
BLK18	●			2.4	5.4	4.0	4.2	**4.00**
BLK19	●			4.0	5.8	6.8	3.0	**4.90**
BLK20	●			2.6	4.4	5.4	7.0	**4.85**
BLK21	●		Slaters Mill	4.8	7.0	6.2	6.8	**6.20**

October 1991 Survey

Station No.	Blackstone River	Tributary	Location	Run #1	Run #2	Run #3	Run #4	MEAN
BLK01	●			3.2	4.0	4.6	2.0	**3.45**
BLK02	●			3.4	3.6	5.4	3.4	**3.95**
BLK03	●			4.4	4.4	5.6	3.6	**4.50**
BLK04	●			3.8	3.2	4.0	2.4	**3.35**
BLK05		●	Quinsigamond River	1.2	1.0	0.6	0.6	**0.85**
BLK06	●			4.2	5.4	11.8	3.6	**6.25**
BLK07	●			5.0	6.2	3.2	3.8	**4.55**
BLK08	●			7.4	8.4	3.0	5.2	**6.00**
BLK09		●	Mumford River	1.6	1.6	1.4	0.3	**1.21**
BLK10		●	West River	1.8	1.8	1.2	1.0	**1.45**
BLK11	●			5.4	6.6	5.0	3.6	**5.15**
BLK12	●			3.4	6.6	2.2	2.8	**3.75**
BLK13	●			4.2	4.6	5.4	2.4	**4.15**
BLK14		●	Branch River	3.0	3.0	1.6	1.0	**2.15**
BLK15		●	Mill River	3.6	3.0	2.0	2.0	**2.65**
BLK16		●	Peters River	3.4	2.4	1.0	2.2	**2.25**
BLK17	●			4.0	5.0	2.4	3.8	**3.80**
BLK18	●			4.6	4.0	3.4	2.8	**3.70**
BLK19	●			3.6	5.0	2.2	2.4	**3.30**
BLK20	●			NS	3.6	2.8	1.8	**2.73**
BLK21	●		Slaters Mill	4.2	3.6	2.0	1.4	**2.80**

Figure 4-126

Wet Weather Data - Storm I: Total Suspended Solids (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**2.4**	**6.7**	**7.7**	**5.6**			*1.3*	*5.6*	*3.2*			*15.4*	*11.0*	*8.0*	
22			●	CSO facility in Worchester															
01	●				**2.6**	**13.7**	**4.5**	**3.0**			*3.4*	*2.8*	*2.2*			*26.4*	*6.0*	*3.8*	
23			●	UBWPAD, Worchester	**6.2**	**9.0**	**6.7**	**6.8**			*8.2*	*6.4*	*4.8*			*9.8*	*6.8*	*8.8*	
02	●				**9.0**	**8.7**	**5.8**	**5.8**			*4.2*	*4.8*				*14.2*	*7.2*		
03	●																		
04	●				**5.0**	**31.1**	**6.0**	**2.2**			*23.6*	*2.4*	*1.5*			*35.8*	*10.2*	*2.8*	
05		●		Quinsigamond River	**1.5**	**1.5**	**1.3**	**2.3**			*1.4*	*0.8*	*2.0*			*1.7*	*1.6*	*2.5*	
06	●				**3.8**	**9.6**	**6.9**	**6.1**			*7.5*	*2.6*	*5.2*			*11.4*	*9.4*	*7.0*	
07	●				**1.8**	**7.1**	**8.6**	**7.5**			*6.2*	*3.2*	*4.0*			*8.8*	*12.4*	*11.0*	
08	●				**6.2**	**15.7**	**8.0**	**6.3**			*11.8*	*3.4*	*2.6*			*18.2*	*12.6*	*10.0*	
09		●		Mumford River	**1.8**	**1.4**	**1.6**	**3.1**			*0.8*	*1.0*	*2.0*			*2.0*	*2.0*	*4.2*	
10		●		West River	**2.3**	**2.5**	**4.7**	**2.4**			*0.8*	*1.2*	*1.5*			*4.0*	*9.2*	*3.2*	
11	●				**2.8**	**8.3**	**4.7**	**4.0**			*6.0*	*3.6*	*3.8*			*11.2*	*6.4*	*4.2*	
12	●																		
13	●				**2.6**	**3.5**	**3.9**	**4.0**			*2.8*	*2.6*	*4.0*			*4.4*	*5.2*	*4.0*	
14		●		Branch River		**3.5**	**1.7**	**2.7**			*1.6*	*1.0*	*1.0*			*6.0*	*2.4*	*4.4*	
15		●		Mill River	**2.0**	**3.0**	**4.1**	**4.1**			*2.2*	*2.8*	*3.5*			*4.2*	*5.4*	*4.6*	
16		●		Peters River	**15.0**	**12.0**	**5.1**	**3.8**			*2.8*	*3.6*	*1.8*			*17.0*	*6.8*	*5.8*	
17	●				**1.4**	**6.7**	**5.3**	**3.0**			*3.8*	*3.0*	*1.4*			*9.8*	*7.5*	*4.6*	
24			●	Woonsocket WWTF	**6.8**	**35.9**	**21.8**	**23.0**			*17.2*	*9.0*	*3.4*			*66.0*	*30.5*	*42.5*	
18	●				**4.2**	**3.3**	**6.3**	**3.8**			*1.2*	*3.6*	*2.8*			*4.8*	*10.5*	*4.8*	
19	●																		
20	●				**1.3**	**1.9**	**3.1**	**3.7**			*1.2*	*2.0*	*2.8*			*2.8*	*4.8*	*4.6*	
21	●				**5.0**	**2.7**	**2.7**	**1.9**			*1.3*	*2.6*	*1.8*			*4.0*	*3.0*	*2.0*	
25			●	Bucklin Point (Seekonk R.)	**18.7**	**28.7**	**16.3**	**18.1**			*17.4*	*7.4*	*17.8*			*47.5*	*24.4*	*18.4*	

Figure 4-127

Wet Weather Data - Storm II: Total Suspended Solids (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration					Minimum Concentration					Maximum Concentration				
					Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom	Dry Weather	During Storm	24h After Storm	48h After Storm	72h After Strom
00	●				**1.6**	**17.3**	**2.5**	**1.5**	**3.5**		*2.2*	*1.6*	*1.4*			*65.0*	*3.4*	*1.6*	
22			●	CSO facility in Worchester	**18.0**	**26.8**					*20.0*					*33.6*			
01	●				**12.2**	**20.5**	**4.7**	**2.1**	**3.7**		*5.0*	*2.8*	*1.8*			*31.8*	*11.6*	*2.4*	
23			●	UBWPAD, Worchester	**12.5**	**10.2**	**6.5**	**9.7**	**3.0**		*3.8*	*3.6*	*8.0*			*16.8*	*10.0*	*11.4*	
02	●				**9.0**	**23.6**	**7.2**	**2.2**	**1.8**		*3.8*	*3.4*	*1.4*			*72.6*	*14.0*	*3.0*	
03	●																		
04	●				**3.6**	**25.2**	**7.5**	**3.5**	**1.4**		*3.4*	*5.0*	*3.2*			*73.9*	*12.6*	*3.8*	
05		●		Quinsigamond River	**1.0**	**4.6**	**1.4**		**1.0**		*1.2*	*1.0*				*8.0*	*1.8*		
06	●				**3.2**	**14.8**	**6.7**	**4.4**	**1.4**		*1.6*	*2.0*	*2.8*			*51.3*	*11.4*	*6.0*	
07	●				**3.4**	**4.8**	**6.5**	**7.7**	**5.7**		*2.8*	*3.4*	*4.0*			*9.0*	*11.0*	*11.4*	
08	●				**3.4**	**8.4**	**9.6**	**8.0**	**11.7**		*1.2*	*1.8*	*4.2*			*19.8*	*22.2*	*11.8*	
09		●		Mumford River		**2.2**	**1.9**	**1.2**			*1.4*	*1.0*				*2.8*	*2.8*		
10		●		West River		**1.5**	**1.8**	**1.8**			*1.2*	*1.2*				*1.6*	*3.0*		
11	●				**4.2**	**6.4**	**15.7**	**4.6**			*2.4*	*1.4*	*1.2*			*16.0*	*39.0*	*8.0*	
12	●																		
13	●				**3.4**	**2.9**	**4.7**	**5.4**	**3.7**		*2.2*	*1.6*	*2.0*			*4.7*	*8.0*	*8.8*	
14		●		Branch River	**1.4**	**2.3**	**2.4**	**1.1**	**1.6**		*1.6*	*1.2*	*1.0*			*2.8*	*4.7*	*1.2*	
15		●		Mill River	**2.2**	**3.7**	**3.2**	**2.8**	**2.0**		*2.4*	*2.4*	*2.8*			*5.4*	*4.4*	*2.8*	
16		●		Peters River	**2.0**	**28.9**	**2.9**	**7.2**	**2.2**		*2.0*	*1.4*				*90.4*	*6.8*		
17	●				**2.0**	**2.5**	**4.5**	**3.1**	**8.7**		*1.4*	*1.6*	*1.4*			*3.8*	*6.8*	*4.8*	
24			●	Woonsocket WWTF	**202.0**	**149.3**	**197.0**	**121.7**	**235.0**		*23.0*	*15.0*	*16.4*			*297.0*	*350.0*	*227.0*	
18	●				**3.0**	**2.6**	**7.0**	**17.1**	**1.6**		*1.8*	*3.4*	*11.6*			*3.8*	*10.6*	*22.5*	
19	●																		
20	●				**2.8**	**3.3**	**9.8**	**6.0**	**7.0**		*2.0*	*4.2*	*3.8*			*4.7*	*13.8*	*8.2*	
21	●				**1.4**	**3.3**	**5.7**	**6.0**	**4.0**		*2.0*	*1.8*	*2.4*			*5.3*	*12.2*	*9.6*	
25			●	Bucklin Point (Seekonk R.)	**14.4**	**57.1**	**17.6**	**17.8**	**3.3**		*15.6*	*3.4*	*15.5*			*146.0*	*28.3*	*20.0*	

Figure 4-128

Wet Weather Data - Storm III: Total Suspended Solids (mg/l)

Blackstone River Initiative (Wright et al., 2001)

Station No.	Blackstone R.	Tributary	WWTF/CSO	Location	Mean Concentration: Dry Weather	Mean: During Storm	Mean: 24h After Storm	Mean: 48h After Storm	Mean: 72h After Strom	Minimum Concentration: Dry Weather	Min: During Storm	Min: 24h After Storm	Min: 48h After Storm	Min: 72h After Strom	Maximum Concentration: Dry Weather	Max: During Storm	Max: 24h After Storm	Max: 48h After Storm	Max: 72h After Strom
00	●				2.6	32.8	5.7	2.4			1.2	1.8	1.8			73.0	12.0	3.4	
22			●	CSO facility in Worchester		73.5	52.0		47.4		47.4					96.0			
01	●				0.8	32.4	9.1	3.0			0.5	3.6	1.8			53.4	14.4	4.8	
23			●	UBWPAD, Worchester	2.6	5.4	4.0	4.0			1.6	1.4	1.8			8.2	5.6	7.8	
02	●				6.4	25.9	10.4	2.2			1.2	3.6	1.4			39.0	17.0	2.8	
03	●																		
04	●				3.0	67.9	11.4	3.7			0.5	4.4	2.0			129.2	26.6	6.0	
05		●		Quinsigamond River		0.9	2.5	2.3			0.6	1.2	2.2			1.4	4.0	2.4	
06	●				0.6	36.2	15.9	6.5			2.0	6.4	2.6			99.2	29.4	12.2	
07	●				4.8	7.2	13.2	7.9	7.2		6.6	8.4	4.2			8.2	18.6	11.0	
08	●				8.2	9.0	29.0	9.8	5.6		7.8	13.6	8.2			9.6	62.6	12.2	
09		●		Mumford River	1.6	2.4	2.9	3.7	3.8		2.0	1.6	1.0			3.0	4.0	11.2	
10		●		West River	1.0	3.0	2.3	2.1	0.6		1.0	1.2	1.0			5.2	4.0	2.8	
11	●				5.8	4.7	23.1	10.5			2.8	6.0	5.2			6.0	42.4	14.2	
12	●																		
13	●				4.6	3.2	4.5	9.5	3.4		2.4	3.8	4.4			3.6	5.2	13.4	
14		●		Branch River	2.6	2.2	7.5	2.3			1.0	2.0	1.0			2.8	20.2	4.4	
15		●		Mill River	8.0	17.1	7.6	11.7	6.6		3.8	6.2	2.2			43.2	10.4	28.0	
16		●		Peters River	3.4	16.8	20.6	18.7	2.4		3.0	3.2	2.0			44.0	53.4	56.0	
17	●				4.2	12.0	7.3	8.0	5.6		1.8	5.4	4.9			30.6	11.8	11.2	
24			●	Woonsocket WWTF	29.2	30.1	33.1	23.1			25.2	26.4	13.3			34.4	41.3	30.4	
18	●				4.6	6.5	7.1	6.6			3.6	5.4	4.9			11.8	11.2	10.2	
19	●																		
20	●				3.8	6.3	11.8	9.1			2.0	5.6	6.8			11.8	26.4	12.0	
21	●				5.0	14.1	5.3	8.4			3.0	1.8	6.2			31.4	9.8	11.0	
25			●	Bucklin Point (Seekonk R.)	10.0	21.7	18.6	15.5			9.0	8.4	6.8			35.6	43.2	31.2	

Figure 4-129

RIDEM Chemical Monitoring of Tributaries, Section 305b

Total Suspended Solids Concentration *(mg/l)*

Date	Round Top Brook	Pascoag River	Clear River	Abbot Run Brook *(Cumberland)*	Abbot Run Brook *(North Attleboro)*	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
12-Mar-91	1.20	1.20	2.60	3.40	2.60	●		
13-May-91	0.40	4.00	2.00	1.00	3.40			●
29-Jul-91	1.00	1.50	2.50	2.20	0.60			●
06-Sep-91	1.60	2.60	2.40	3.00	1.40			●
26-Apr-93	1.80	1.80	3.40	1.20	3.20		●	
10-Aug-93			2.40	3.40	0.80	●		
27-Dec-93		3.60	0.80	2.20	1.00	●		
11-Mar-96	1.50	2.80	1.10	1.10	1.50			●
14-May-96	1.80	1.80	3.20	3.00	6.20			●
20-Aug-96	10.80	4.30	2.20	2.50	4.60	●		
02-Oct-96	1.20	1.00	1.40	2.00	1.00			●
14-Apr-98	0.86	4.14	1.44	1.98	4.54	●		
05-Aug-98	1.43	1.57	3.87	1.47	0.80	●		
26-Oct-98	2.77	2.33	4.13	2.20	1.97	●		
20-Jan-99	1.20	2.33	2.00	2.97	2.50			●
19-Mar-99	1.90	2.13	3.80	1.97	0.53	●		
10-Jun-99	2.18	3.13	3.08	3.43	3.60	●		
19-Aug-99	2.83	1.49	2.17	3.30	3.73	●		
12-Oct-99	1.67	2.72	1.94	2.97	1.62			●
15-Mar-00	0.66	1.16	1.33	2.00	2.25			●
30-May-00	1.70	1.80	2.60	3.93	4.73	●		
18-Sep-00	2.83	1.57	2.47	2.07	1.50			●
11-Dec-00	0.80	7.23	0.53	3.20	1.77			●
Statistical Summary - All Samples								
Count	21	22	23	23	23	●	●	●
Mean	**2.01**	**2.55**	**2.32**	**2.46**	**2.43**	●	●	●
Minimum	0.40	1.00	0.53	1.00	0.53	●	●	●
Maximum	10.80	7.23	4.13	3.93	6.20	●	●	●
Statistical Summary - Dry Weather								
Count	9	10	11	11	11	●		
Mean	**2.85**	**2.57**	**2.64**	**2.71**	**2.63**	●		
Minimum	0.86	1.20	0.80	1.47	0.53	●		
Maximum	10.80	4.30	4.13	3.93	4.73	●		
Statistical Summary - Mixed and Wet Weather								
Count	12	12	12	12	12		●	●
Mean	**1.37**	**2.54**	**2.02**	**2.23**	**2.25**		●	●
Minimum	0.40	1.00	0.53	1.00	0.60		●	●
Maximum	2.83	7.23	3.40	3.20	6.20		●	●

ND = Not detected

(1) Dry Weather: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) Wet Weather: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) Mixed Weather: Conditions that did not meet Wet or Dry Weather criteria.

Figure 4-130

Summary of Blackstone River Biomonitoring Data

Year	Bioassessment Result (%)	Biomonitoring Rating
1994	55.8	Moderately Impaired
1995	21.0	Severely Impaired
1996	56.3	Moderately Impaired
1997	62.5	Slightly Impaired
1998	68.8	Slightly Impaired
1999	50.0	Moderately Impaired
2000	62.5	Slightly Impaired
2001	50.0	Moderately Impaired

Figure 4-131

Biomonitoring Field Data

Taxa	Wood River (Reference Station)				Blackstone River Station			
	1998	1999	2000	2001	1998	1999	2000	2001
Hirudinea					2	1		1
Tubificidae								
Oligochaeta			18	1				1
Isopoda								1
Amphipoda			14			1		1
Decapoda			2	1	1			
Gastropoda								
Pelecypoda			1	2			8	11
Coleoptera			16	16				3
Lepidoptera								
Tipulidae				1	1			3
Simulidae	2		1	3				
Tabanidae								
Culicidae								
Chironomidae			5	6	1	7	8	10
Plecoptera	6	25	3	10				
Siphlonuridae				2				
Stenonema							10	2
Limnephilidae				8				
Hydropsyche	82	36	12	15	79	91	46	60
Chimarra			3	12				4
Hemiptera								
Diptera								
Porifera								
Megaloptera	8	25	6	3				
Sialidae								
Bivalvia								
Odonata		1	19	6			8	
Ephemeroptera	2	13		14	16		20	3
Nematoda								

Figure 4-132

Biometric Indices

	Wood River (Reference Station)				Blackstone River Station			
	1998	**1999**	**2000**	**2001**	**1998**	**1999**	**2000**	**2001**
Total Number	100	100	100	100	100	100	100	100
Taxa Richness	6	5	12	15	6	4	6	12
Shredder/total	0.06	0.25	0.33	0.35	0.01	0.01	0.00	0.08
EPT Index	90	74	18	61	95	91	76	69
FBI	4.20	4.36	4.76	4.43	4.36	4.62	5.00	5.33
% Contribution	82%	36%	19%	16%	79%	91%	46%	60%
Scrapers/Filterers	0.05	0.36	0.55	0.78	0.20	0.00	0.54	0.12
EPT/Chiron.			3.6	10.17	95	13	9.5	6.9
Community Similarity								
Community Loss	Ref	0.95	0.88	Ref	0.98	0.99	0.96	0.92
Jaccard Coef	Ref	1.000	1.000	Ref	0.200	0.125	0.286	0.421
Taxa Richness			6		6	3	3	3
Shredders/total			6		0	0	0	0
EPT Index			6		6	6	6	6
FBI			6		6	6	6	6
% Contribution			0		0	0	0	0
Scrapers/filter			6		6	0	6	0
EPT/Chiron			6		6	6	6	6
Community loss			3		3	3	3	3
Total			**81.3%**		**68.8%**	**50.0%**	**62.5%**	**50.0%**

Sources: 1998: Gould, 1998
1999, 2000: Pomeroy, 2000
2001: da Silva, S., 2002

5.0 DATA GAPS – INITIAL RECOMMENDATIONS

The final determination of data gaps depends in part on the selection of a water quality model. Different models require different data as input parameters. In addition, the degree of resolution (i.e., the lengths of individual river sections that will be modeled) needs to be determined. Therefore, the recommendations for data collection are preliminary and designed only to be a starting point for discussion.

5.1 Fecal Coliform, Copper and Lead

The relative contributions of fecal coliform, copper, and lead from major sources should be updated by resampling the BRI stations 12 to 21, as well as the Woonsocket WWTP. BRI stations were well-spaced to reflect the population density bordering the Blackstone River and to address other logical sources such as tributaries and impoundments (Figure 4-2). In addition, major storm sewers should be sampled.

5.1.1 Parameters

Parameters to be determined should consist at least of the following parameters (unless stated otherwise in Section 5.1.2):

- Flow
- Fecal coliform
- Hardness
- Total and dissolved copper (both components should be monitored to allow for calibration of the partitioning coefficient within the water quality model)
- Total and dissolved lead
- Total suspended solids
- Depending on the selected water quality model, other parameters may be required such as pH, dissolved organic carbon, major cation concentrations, and major anion concentrations.

These stations should be sampled several times during wet and dry weather.

5.1.2 Sampling Stations

The data from the BRI study are now 10 years old. Changes in contaminant loadings may have occurred that could have influenced the total loads in the river (such as the upgrades of the Woonsocket WWTF that may have affected its effluent quality). Further, dissolved metal concentration data are limited to only the dry weather event of the BRI study; there are no wet weather dissolved metals data.

At the same time, the BRI is the most comprehensive dry and wet weather study of the entire watershed. Therefore, a sampling program should incorporate the stations from the BRI to allow for comparisons. Additional stations should be added to address the goals of this TMDL project, however.

Suggested stations for a sampling program are listed below. This list may be modified after the water quality model to be used for this study has been determined and the segmentation for the modeling has been decided.

1. *BRI Station 12 (Blackstone River):* Determine loads coming from Massachusetts. This station could be moved to a location just downstream of the Tupperware Dam.

2. *BRI Station 14 (Branch River):* Determine the contributions of the Branch River to the Blackstone River. Specifically, fecal coliform concentrations appear to be high during dry and wet weather conditions.

3. *Branch River (just downstream of Slaterville Dam):* To determine the loading from the Branch River watershed, prior to receiving discharges from the Town of Slatersville. This station is particularly relevant for fecal coliform, and may not be needed for copper and lead.

4. *BRI Station 13 (Blackstone River):* Determine the concentrations in the Blackstone River prior to entering the main urban area of the City of Woonsocket, yet after the confluence with the Branch River.

5. *BRI Station 15, or further downstream (Mill River):* As close to its confluence with the Blackstone River as possible (considering that it partly runs underground in the City of Woonsocket).

6. *Station at the MA/RI border (Mill River):* Station just downstream of Harris Pond, to determine the loads entering the Rhode Island section of the river from Massachusetts.

7. *BRI Station 16, or further downstream (Peters River):* As close to its confluence with the Blackstone River as possible (considering that it partly runs underground in the City of Woonsocket).

8. *Station at the MA/RI border (Peters River):* To determine the loads entering the Rhode Island section of the river from Massachusetts.

9. *BRI Station 17 (Blackstone River):* Downstream of the main urban area of the City of Woonsocket as well as downstream of the confluence with Mill River and Peters River (since these two tributaries run underground before they enter the Blackstone River, they may receive discharges that are downstream from the BRI stations 15 and 16, respectively.)

10. *BRI Station 24 (Woonsocket Wastewater Treatment Plant):* The treatment plant was a considerable source for metals in the past.

11. *BRI Station 18 (Blackstone River):* Downstream of the Woonsocket WWTF, but upstream of the main urban area of the Town of Manville.

12. *BRI Station 19 (Blackstone River):* Downstream of the main urban area of the Town of Manville.

13. *Station between BRI 19 and 20 (Blackstone River):* The distance between Stations 19 and 20 is large. A station could be added in the vicinity of the communities of Ashton or Berkeley.

14. *BRI Station 20 (Blackstone River):* Concentrations upstream of the Central Falls urban area and inflows of CSOs.

15. *Abbot Run Brook:* At the confluence with the Blackstone River. One or two additional stations could be considered within the Abbot Run Brook watershed since the brook flows from Rhode Island into Massachusetts and back into Rhode Island.

16. *BRI Station 21 (Blackstone River):* Slaters Mill.

In addition, the following stations could be considered:

17. *Osram Sylvania Outfall:* The lead and copper concentrations Outfall 200 of the Osram Sylvania Products Company were high. However, the plant has been downsized. Coordination with RIPDES is recommended to evaluate if Osram is a source at present.

18. *Atlantic Thermoplastics:* The fecal coliform concentrations in the outfall were high (although the flow from the outfall was low). Sampling could be conducted by RIDEM as part of compliance monitoring.

19. *Major stormwater drainage pipes:* Key stormwater drainage pipes from municipalities (other than CSOs in Central Falls) could be included in this survey. A survey prior to monitoring activities may be needed to develop a list of key pipes. Storm sewer should be targeted from various land uses.

    As discussed in Section 2.9.5, the Cities and Towns of Woonsocket, Central Falls, Cumberland, Lincoln, and Pawtucket, as well as RIDOT were contacted to obtain existing mapping of stormwater. Woonsocket, Central Falls, and Pawtucket had reasonably complete stormwater mapping. Lincoln and Cumberland had limited data with detailed information from recent subdivisions. RIDOT has good mapping on reaches of state roads associated with drainage improvement projects. The mapping is not available in digital format providing limited usefulness in developing a GIS layer. Stormwater outfalls on river targeted river segments can be digitized to provide a figure showing potential sampling locations. Complete mapping to determine drainage areas for individual outfalls would be cumbersome requiring several approximations based on topography.

20. *Sources in the vicinity of CERCLA and waste disposal sites:* EPA is planning to collect samples in the Blackstone River adjacent to the Peterson and Puritan site. Generally, however, information about contributions from CERCLA, NPL, and waste disposal sites (Figure 2-14 and Section 2.9.6) is not available. A survey may be needed to assess the likelihood of contributions to the Blackstone River.

21. *Stations that address the role of impoundments in Rhode Island:* The data from Massachusetts indicate that impoundments are a significant source of metals during high flow events. The role of the impoundments in Rhode Island should be investigated to assess if the impoundment could also be a source. Water quality sampling should be complemented with sediment samples from major impoundments.

22. *Key sources in Massachusetts:* The State of Massachusetts may want to participate during sampling activities by monitoring at least some of the key sources for fecal coliform and metals, such as UBWPAD and the outflow from Rice City Pond. Based on the existing data discussed in Section 4, it appears that it will also require decreases in the loading to the Blackstone River within the watershed in Massachusetts in order to improve substantially in Rhode Island.

After the first few sampling events, the data should be evaluated for the following:

- *Addition of stations:* Additional stations could be added to increase the density of stations along the river.

- *Elimination of stations:* Some of the stations could be eliminated if they do not contribute to locating sources.

- *Point source survey:* High concentrations and loads should be investigated in specific river segments by searching for specific point sources, which could be added to the monitoring program or which could be monitored individually.

- *Model requirements:* Additional data needs should be assessed to improve the accuracy of the water quality modeling.

5.2 Fish Tissues

Tissues from fish should be analyzed to evaluate bioaccumulation of hazardous contaminants. Fish should be collected at several representative stations along the river. At each location, at least five each of a representative predator and benthic species, of a size to be determined, should be collected. Skin-on fillets from these fish could be composited prior to analyses. Analyses should, at a minimum, include PCBs, metals (cadmium, copper, lead, mercury), arsenic, and pesticides. PCBs are on the Freshwater Fish Consumption Advisory List, issued by the Massachusetts Department of Public Health on June 2002 (www.state.ma.us/dph/beha/fishlist.htm) for the Blackstone River above the Blackstone Gorge.

5.3 Biodiversity Impacts

It appears that organic loading was a primary cause for the patterns observed in the macroinvertebrate data. These data were the basis for placing the Blackstone River on the 303(d) List for biodiversity impairments. A large point source at the time for organic loading was the Woonsocket WWTF. Since the fall of 2001, the WWTF was upgraded and the effluent was improved, resulting in lower organic loading to the river. It therefore appears wise to conduct the monitoring for biodiversity impacts in the Blackstone River in a two-phased approach:

5.3.1 Phase 1: Macroinvertebrate Monitoring at existing Station

Macroinvertebrate monitoring should be conducted at the station below the Manville Dam during the summer, using the identical approach that was used for the monitoring conducted between 1991 and 2001. In addition, relevant instream water quality data should be collected at the station including dissolved oxygen, temperature, pH, nutrient concentrations. In addition to the Blackstone River station, the Wood River station should be sampled.

Data should be compared to the historic data. Data should further be evaluated alongside existing water quality from the Blackstone River during dry and wet weather and with water quality data from the effluent of the Woonsocket WWTF.

If indeed the WWTF was the primary cause of the impairment at the station, the benthic community conditions in the Blackstone River should be improved.

5.3.2 Phase 2: Expanded Macroinvertebrate Monitoring along the Blackstone River

If the Phase 1 macroinvertebrate survey results in the same findings as the surveys conducted between 1991 and 2001 monitoring period, a more extensive survey is recommended to identify the stressor(s) for the biodiversity impairments along the Blackstone River. Specifically, this survey would consist of the following components:

- Macroinvertebrate sampling at the following stations:
  - Wood River (Biological Reference Station)
  - Blackstone River, just downstream of the Massachusetts-Rhode Island border
  - Blackstone River biomonitoring station (existing station downstream of the Manville Dam)
  - Blackstone River, just upstream of Slaters Mill

- Ambient water quality monitoring which includes the following parameters:
  - Dissolved metals (clean metals)
  - Metals in sediment
  - Chemical oxygen demand (COD) and biological oxygen demand (BOD)

- Total organic carbon (TOC)
- Dissolved organic carbon (DOC)
- Nitrogen
- Phosphorous

Monitoring should include dry and wet weather conditions and should be conducted at the same stations as for the macroinvertebrate sampling. In addition, the Woonsocket WWTF effluent should be tested. Finally, sampling should be coordinated with other water quality monitoring surveys on the river.

- Diurnal parameters should be monitored for dissolved oxygen, temperature, and pH at the following stations:
  - Reference station
  - Blackstone River Biomonitoring Station (below Manville Dam)

- Instream acute and chronic toxicity should be tested using indicator species at the macroinvertebrate sampling stations.

5.4 Valley Falls Pond

To develop and evaluate management alternatives for Valley Falls Pond requires additional data. At present, there is only a nutrient data set from this system from a single season. However, several of the listed concerns for this system relate directly to nutrient loads and levels, i.e., phosphorus, nutrients, and diversity. In addition, there are no data available on the configuration and flows within this wetland and pond system (depths, channels, flows, exchange with the river, watershed inputs). In addition, nutrient issues require additional information on nutrient cycling processes and related effects, such as recycling rate, benthic versus watercolumn algal blooms, watercolumn dissolved oxygen. To address the nutrient issues in Valley Falls Pond a targeted nutrient analysis needs to be conducted which would include:

- Direct land inputs of nutrients
- Bathymetric survey of the pond, including water level changes with different flows in the Blackstone River
- Determination of exchange with river (includes placement of a gauge in the pond)
- Additional sampling of key nutrient parameters in the pond and adjacent river (nitrate+nitrite, ortho-phosphate, ammonium, particulate nitrogen, particulate phosphorus, total nitrogen, total phosphorus, chlorophyll, dissolved oxygen, temperature, depth). The parameters should be investigated during dry and wet weather conditions.
- Survey of pond to determine macrophyte issues (versus watercolumn chlorophyll)
- Estimate of summer recycling of nitrogen and phosphorus
- Light penetration
- Sediment organic matter pools/deposition rates
- Exchange with the emergent wetland portions of the system.

These data would need to be integrated into a simple model to determine the relative effects of the local watershed, the river, and recycling on controlling the habitat quality of this system. Source reduction and management alternatives could be developed thereafter.

REFERENCES

Documents

ASA (Applied Science Associates, Inc.), 1992a, *Receiving Water Quality Modeling for the Combined Sewer Overflow Facilities.*

ASA (Applied Science Associates, Inc.), 1992b, *Blackstone River Water Quality Study - 1991 Field Program Results.*

Berger (Louis Berger Group, Inc.), 1997, *Conceptual Design Report Amendment for the Combined Sewer Overflow Control Facilities Program.* Prepared for the Narragansett Bay Commission.

Clements, W.H., D.S. Cherry, and J. Cairns, Jr. 1988, Structural alterations in aquatic insect communities exposed to copper in laboratory streams. *Environ. Tox. and Chem.,* 7(9):715-722.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979, Classification of Wetlands and Deep-Water Habitats of the United States.

Cummins, K. W., 1973, Trophic relations of aquatic insects. *Annual Reviews of Entomology,* 18:183-206.

da Silva, S., 2002, *Establishment and Filed Testing of a Rapid Bioassessment Screening of Rhode Island Freshwater Benthic Macroinvertebrates, 2001 Results.* Prepared for the Rhode Island Department of Environmental Management.

Dodds, W. K., Smith, V. H., and K. Lohman, 2002, Nitrogen and phosphorus relationships to benthic algal biomass in temperate streams. *Canadian Journal of Fisheries and Aquatic Sciences,* 59:865-874.

EEI (Ecology and Environment, Inc.), 1987, *Biological Survey of the Blackstone River, Woonsocket, Rhode Island.* Prepared for Ocean State Power.

EEI (Ecology and Environment, Inc.), 1988, *Effects of Ocean State Power Water Withdrawal on Dissolved Oxygen in the Blackstone River.* 195 Sugg Road, P.O. Box D, Buffalo, NY, 14225.

Gould, M., 1998, *Establishment and Filed Testing of a Rapid Bioassessment Screening of Rhode Island Freshwater Benthic Macroinvertebrates, 1998 Results*, 1998. Prepared for the Rhode Island Department of Environmental Management.

Johnston, H.E. and D.C. Dickerman, 1974, *Availability of Groundwater in the Branch River Basin, Providence County, Rhode Island.*

Kerr, M. and Lee V., 1996, *Water Quality in Rhode Island's Urban Rivers: Blackstone, Moshassuck, Pawtuxet, Ten Mile, Woonasquatucket River Rescue Results 1990-1995.*

Maietta, R.J., 1993, *The Blackstone River - Fish Toxics Monitoring 1993.* Massachusetts Department of Environmental Protection.

MADEP (Massachusetts Department of Environmental Protection), 1998, *Blackstone River Basin Water Quality Assessment Report*, Executive Office of Environmental Affairs, Bureau of Resource Protection, Division of Watershed Protection.

MADEP (Massachusetts Department of Environmental Protection), 1990, *Unpublished Data – Water Quality Survey 1989*. Westboro, MA.

MADEQE, (Massachusetts Department of Environmental Quality Engineering), 1985, *Blackstone River Basin 1985 Water Quality Survey Data and Wastewater Discharge Survey Data*. Division of Water Pollution Control, Westboro, MA.

McCafferty, W. P., 1998, *Aquatic entomology: the fisherman's and ecologists' illustrated guide to insects and their relatives*. Jones and Bartlett Publishers, Sudbury, Massachusetts.

NBC (Narragansett Bay Commission), 1997 to 2001, *Tributary Monitoring of Fecal Coliform*, 1997 to 2001.

Pomeroy, S., 2000, *Establishment and Filed Testing of a Rapid Bioassessment Screening of Rhode Island Freshwater Benthic Macroinvertebrates, 1999 Results and 2000 Results*. Prepared for the Rhode Island Department of Environmental Management.

RIDEM (Rhode Island Department of Environmental Management), 1995, Background levels of priority pollutant metals in Rhode Island soils.

RIDEM (Rhode Island Department of Environmental Management), 1996, *Rules and Regulations for Groundwater Quality*.

RIDEM (Rhode Island Department of Environmental Management), 2000, *State of the State's Waters-Rhode Island, 2000 Section 305(b) Report (Section III): Stream Sampling Sites for 1991-2000, Chemical Monitoring*.

RIDEM (Rhode Island Department of Environmental Management), unpubl. data, *Providence-Seekonk River Total Maximum Daily Load (TMDL) Project*.

RIDEM (Rhode Island Department of Environmental Management), 2001a, *RIPDES Stormwater Permits Database for Permitted Facilities in Blackstone River*.

RIDEM (Rhode Island Department of Environmental Management), 2001b, *Discharge Monitoring Report Data for Permitted Facilities in Blackstone River*.

Rhode Island Statewide Planning Program, 1998, Rivers Policy and Classification Plan (Report Number 92).

Rhode Island Statewide Planning Program, 1999, *An Analysis of Rhode Island Land Use*. Techn. Paper 147.

URI (University of Rhode Island), 1992, Department of Civil and Environmental Engineering, *System Wide Modeling for the Providence Area Combined Sewer System*.

URI (University of Rhode Island), unpubl. data, *Cooperative Extension, URI Watershed Watch Lakes Monitoring Data 1993-2000*.

USACE (U.S. Army Corps of Engineers), 1994, *Blackstone River Restoration Study*.

USEPA (U.S. Environmental Protection Agency), 2001, (Refers to summary data on each of the NPL site maintained on web page). The web site is "*EPA Region 1, Superfund Program, Summary of NPL sites*".

USEPA (U.S. Environmental Protection Agency), 1989, *Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates and fish.* United States Environmental Protection Agency Office of Water, EPA 444/4-89-001, Washington, D.C.

USFWS (U.S. Fish and Wildlife Services), 1989, *Final Environmental Impact Statement 1989-2021: Atlantic Salmon Restoration in New England.* Region 5, Newton Corner, Massachusetts.

USGS (U.S. Geological Survey), 2000, *Multiple Station Analyses: Water Resources of the Blackstone River Basin.*

Wetzel, R. G., 2001, *Limnology: Lake and River Ecosystems.* Third edition. Academic Press, Orlando, Florida.

Winner, R. W., Boesel, M. W., and M. P. Farrell, 1980, Insect community structure as an index of heavy-metal pollution in lotic systems. *Canadian Journal of Fisheries and Aquatic Sciences*, 37:647-655.

Wright, R.M., 1988, *Development of a One Dimensional Water Quality Model for the Blackstone River: Part 2; Trace Metal Modeling in the Blackstone River.* Narragansett Bay Project, Rhode Island Department of Environmental Management, Providence, RI.

Wright, R.M. et al., 1991a, *Problem Assessment and Source Identification and Ranking of Wet Weather Discharges Entering Providence and Seekonk Rivers*, 1991.

Wright, R.M., I. Runge, Y-S. Lee, and R.R. Chaudhury, 1991b, *The Blackstone River 1990.*

Wright, R.M., P. Nolan, D. Pincumbe, E. Hartman, and O.J. Viator, 2001, *The Blackstone River Initiative: Water Quality Analysis of the Blackstone River Under Wet and Dry Weather Conditions.* May 2001.

Personal Communication

Gaucher, J. T., City Engineer, City of Woonsocket, January 2002.

King, John, Dr., University of Rhode Island, April 8, 2002.

WATER QUALITY - BLACKSTONE RIVER

Final Report 1: Existing Data
Volume II: Appendices






Submitted to: **Rhode Island Department of Environmental Management**

January 2004

Submitted by: **The Louis Berger Group, Inc.**

in association with

Applied Science Associates, Inc.

University of Rhode Island
University of Massachusetts - School of Marine Science and Technology

Rhode Island Department of Environmental Management

WATER QUALITY - BLACKSTONE RIVER

FINAL REPORT 1: EXISTING DATA
Volume II: Appendices

Submitted to:
Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908

Submitted by:
The Louis Berger Group, Inc.
295 Promenade Street
Providence, RI 02908

in association with:
Applied Science Associates, Inc.
University of Rhode Island
University of Massachusetts - School of Marine Science and Technology

January 2004

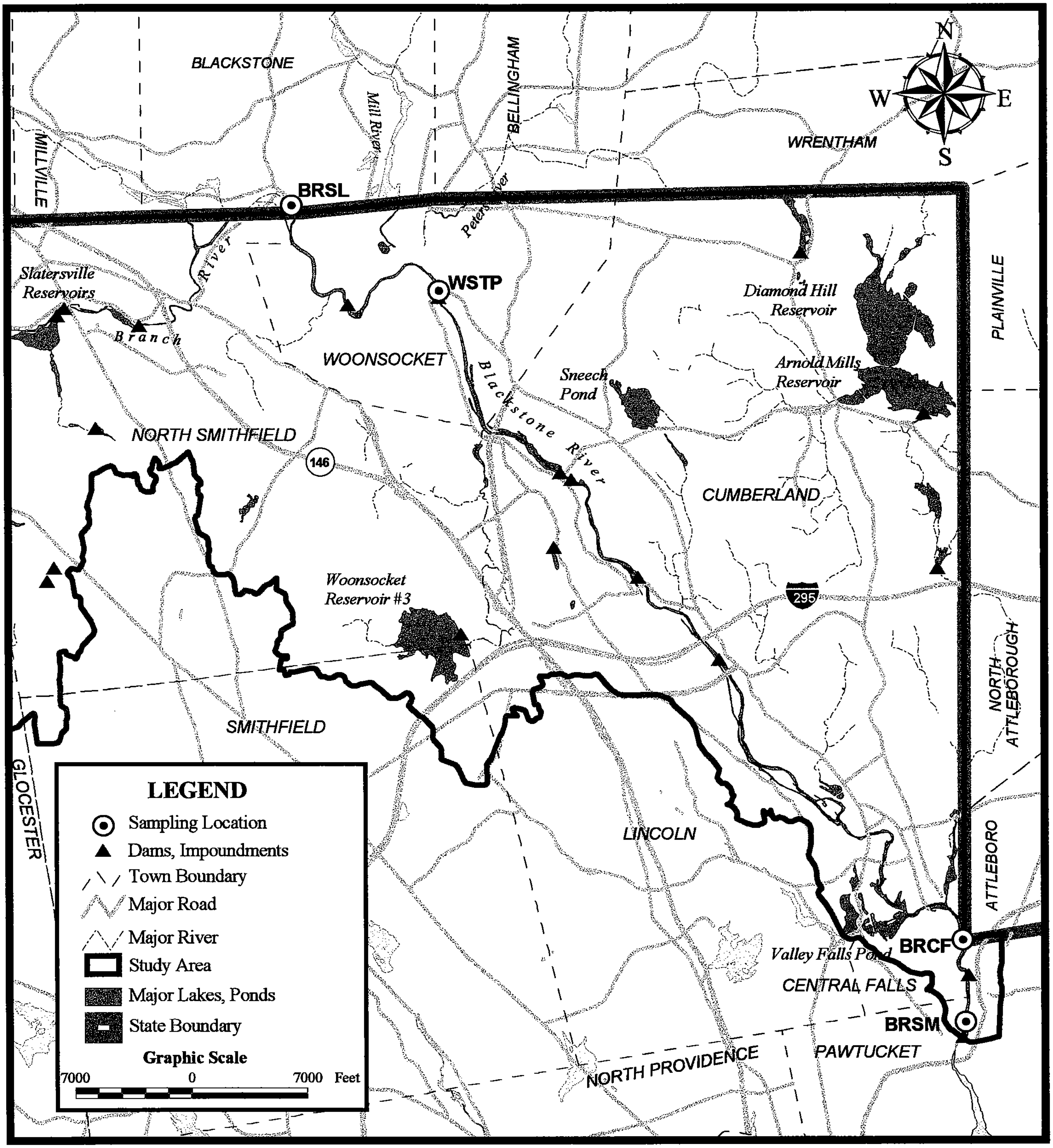
Table of Content
Volume II: Appendices

Appendix 1

University of Rhode Island: Wet Weather Study

Wet Weather Sampling

(Wright et al., 1991a)



The Louis Berger Group, Inc.	Blackstone River Water Quality
Rhode Island DEM	**Figure A1-1** **URI WET WEATHER STUDY, 1991**
Source: RIGIS, MASSGIS	
File: BW SMPL.apr — May 2002	

Table A1-1

URI Storm Sampling of the Blackstone River (Station BRSL), at the MA/RI State Line (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l)*	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l) *	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part. (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
	Dry	5/10/89	8:05		8.2																2.2	2.86	0.09	0.13	47	46	2
S	Rain	5/10/89	12:10		7.2																				40	34	670
T	Rain	5/10/89	15:15		10.2																2.4	2.99	0.23	0.33	38	32	360
O	Rain	5/10/89	18:20		7.6																				43	34	8
R	Rain	5/10/89	21:20		7.2																1.6	3.01	0.24	0.53	45	40	22
M	Rain	5/11/89	0:35		13.6					* No data collected for metal concentrations															64	56	20
	Rain	5/11/89	4:15		8.0																3.0	2.72	0.12	0.49	57	50	32
2	Rain	5/11/89	7:58		9.4																				100	90	140
	Rain	5/11/89	11:55		11.6																2.0	2.51	0.10	0.25	220	170	53
	Rain	5/11/89	16:05		12.2																				2,800	1,900	180
	Rain	5/11/89	20:00		12.0																4.0	2.27	0.17	0.33	3,700	1,700	280
	Rain	5/12/89	23:51		13.2																				980	740	540
	Rain	5/12/89	3:55		12.4																2.0	1.84	0.15	0.12			
	24h	5/12/89	7:58		9.3																				2,100	2,000	290
	24h	5/12/89	20:20		5.2																1.50	2.01	0.07	0.12	500	380	230
	24h																										
	48h	5/13/89	21:00		6.8																	2.00	0.10	0.14	240	110	12
	48h																										
	48h																										
	72h	5/15/89	22:15		8.4																	2.17	0.22	0.25	62	52	5
	72h																										
	Dry	6/12/89	15:15		17.8																	3.51	0.56	0.20	230	150	30
S	Rain	6/13/89	6:55		13.2																	3.79	0.52	0.23	310	180	61
T	Rain	6/13/89	9:40		12.0																	3.76	0.42	0.15	440	190	158
O	Rain	6/13/89	12:15		13.1																	3.38	0.42	0.17	560	440	210
R	24h	6/13/89	15:00		12.7																	3.77	0.44	0.19	130	60	81
M	24h	6/13/89	17:54		14.0																	4.02	0.46	0.19	170	140	54
	24h	6/13/89	23:40		14.0																	4.31	0.49	0.28	370	320	200
3	24h	6/14/89	4:15		14.0																	4.20	0.47	0.29	640	550	230
	24h	6/14/89	7:15		11.7																	4.11	0.32	0.04	200	200	83
	24h																										
	24h																										
	48h	6/14/89	14:50		10.3																	4.36	0.50	0.28	250	180	31
	48h	6/14/89	23:00		11.5																	4.74	0.48	0.32	70	70	27
	48h *(1)*	6/15/89	2:50		12.1																	4.77	0.47	0.33	800	720	390
	48h *(1)*	6/15/89	11:00		12.7																	4.67	0.42	0.26	370	150	43
	72h *(1)*																										
	72h *(1)*																										

Table A1-1

URI Storm Sampling of the Blackstone River (Station BRSL), at the MA/RI State Line (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l)*	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l) *	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part. (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
S	**Dry Weather**																										
T	Count, all storms				2																1	2	2	2	2	2	2
A	**Mean(**) all Storms**				**13**																**2.2**	**3.19**	**0.33**	**0.17**	**104**	**98**	**16**
T	Minimum, all storms				8.2																2.2	2.86	0.09	0.13	47	150	30
I	Maximum, all storms				17.8																2.2	3.51	0.56	0.20	230	530	89
S	**Wet Weather - *during storm***																										
T	Count, all storms				15																6	9	9	9	14	14	14
I	Mean(**) Storm 1																										
C	Mean(**) Storm 2				10.4																2.50	2.56	0.17	0.34	165	441	210
S	Mean(**) Storm 3				12.8																	3.64	0.45	0.18	424	270	143
	Mean(**) all Storms				**11.6**																**2.50**	**3.10**	**0.31**	**0.26**	**264**	**355**	**176**
	Minimum, all storms				7.2																1.60	1.84	0.10	0.12	38	32	8
	Maximum, all storms				13.6																4.00	3.79	0.52	0.53	3,700	11,000	670
	Wet Weather - *up to 24h after storm*																										
	Count, all storms				22																7	15	15	15	21	21	21
	Mean(**) Storm 1																										
	Mean(**) Storm 2				9.9																2.36	2.48	0.15	0.31	218	556	217
	Mean(**) Storm 3				13.1																	3.92	0.44	0.19	308	260	135
	Mean(**) all Storms				**11.5**																**2.36**	**3.20**	**0.30**	**0.25**	**259**	**408**	**176**
	Minimum, all storms				5.2																1.50	1.84	0.07	0.04	38	32	8
	Maximum, all storms				14.0																4.00	4.31	0.52	0.53	3,700	2,000	670
	Wet Weather - *up to 48h after storm*																										
	Count, all storms				25																7	18	18	18	24	24	24
	Mean(**) Storm 1																										
	Mean(**) Storm 2				9.7																2.36	2.42	0.15	0.29	220	524	203
	Mean(**) Storm 3				12.7																	4.04	0.45	0.21	260	233	114
	Mean(**) all Storms				**11.2**																**2.40**	**3.23**	**0.30**	**0.25**	**239**	**379**	**158**
	Minimum, all storms				5.2																1.50	1.84	0.07	0.04	38	32.0	8.0
	Maximum, all storms				14.0																4.00	4.74	0.52	0.53	3,700	2,000	670
	Wet Weather - *3/4 days after storm* *(2)*																										
	Count, all storms				1																0	1	1	1	1	1	1
	Mean(**) Storm 1																										
	Mean(**) Storm 2				8.4																	2.17	0.22	0.25	62	52	5
	Mean(**) Storm 3																										
	Mean(**) all Storms				**8.4**																	**2.17**	**0.22**	**0.25**	**62**	**52**	**5**
	Minimum, all storms																										
	Maximum, all storms																										

(**) Mean is geometric for fecal coliform.

(1) New rainstorm between appr. 6/15/89, 0:00, and 6/15/90, 23:00h, with 0.8" of rain. These data were excluded from the statistical summary.

(2) Storm 2 only.

Table A1-2

URI Storm Sampling of the Blackstone River (Station WSTP), Woonsocket Sewage Treatment Plant (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l)*	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l) *	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part. (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform *(post-chlorinated)* (MPN/100ml)	E.Coli *(post-chlorinated)* (col/100 ml)	Enterococci *(post-chlorination)* (col/100 ml)
	Dry	5/10/89	8:45		15.0																14.0	17.88	10.36	5.32	16,750	5300	290
S	Rain	5/10/89	13:00		50.6																				14,000	13000	1700
T	Rain	5/10/89	16:02		50.0																	11.16	11.14	6.13	0	0	0.1
O	Rain	5/10/89	18:45		48.6																				43,000	28,000	740
R	Rain	5/10/89	22:00																			15.76	10.76	2.85	0	0	0.1
M	Rain	5/11/89	1:35		22.0																						20
	Rain	5/11/89	4:50																		8.0	14.70	10.80	5.20			5
2	Rain	5/11/89	8:30		29.6																				210	60	3
	Rain	5/11/89	12:30																			16.71	10.96	7.76	0	0	2
	Rain	5/11/89	16:40		38.0																				10	0	0.1
	Rain	5/11/89	20:25		30.0																	16.45	11.33	7.24			
	Rain	5/12/89	0:40		24.0																				10	10	20
	Rain	5/12/89	4:25		9.3																	16.01	10.48	6.15	0	0	0.1
	24h	5/12/89	8:35		13.0																				23,000	19,000	540
	24h	5/12/89	21:15		16.0																	14.17	8.21	2.21	40	20	4
	24h																										
	48h	5/13/89	21:50		12.0																	29.60	7.51	0.89	36,000	31000	2700
	48h																										
	48h																										
	72h	5/15/89	23:00		8.0																	41.55	5.89	1.45	16,500	15100	1570
	72h																										
	Dry	6/12/89	16:10																			29.54	10.76	2.60	0	0	200
S	Rain	6/13/89	7:45																			20.21	13.25	0.32	11	6	1
T	Rain	6/13/89	10:10																		23.0	27.63	14.93	1.31	49,000	37,000	8,900
O	Rain	6/13/89	12:55																			26.00	14.61	2.90	30	20	3
R	24h	6/13/89	15:35																		20.0	16.08	15.66	4.68	0	0	0
M	24h	6/13/89	18:40																			7.83	16.45	4.86	0	0	1
	24h	6/14/89	0:10																		8.0	4.97	16.49	4.08			
3	24h	6/14/89	4:45																			9.57	16.54	1.88	0	0	0
	24h	6/14/89	8:15																		4.0	11.66	17.56	0.93	0	0	0
	24h																										
	24h																										
	48h	6/14/89	15:25																		10.0	3.11	17.27	6.85	60	20	1
	48h	6/14/89	23:30																		6.0	8.62	17.03	2.68	0		100
	48h *(1)*	6/15/89	3:20																			11.47	16.99	1.14	1,000	0	
	48h *(1)*	6/15/89	11:55																			18.65	16.94	0.77	0	0	1,030
	72h *(1)*																										
	72h *(1)*																										

* No data collected for metal concentrations

Table A1-2

URI Storm Sampling of the Blackstone River (Station WSTP), Woonsocket Sewage Treatment Plant (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l)*	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l) *	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part. (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform *(post-chlorinated)* (MPN/100ml)	E.Coli *(post-chlorinated)* (col/100 ml)	Enterococci *(post-chlorination)* (col/100 ml)
S	**Dry Weather**																										
T	Count, all storms				1																1.0	2	2	2	2	2	2
A	**Mean(**) all Storms**				**15**																**14.0**	**23.7**	**10.56**	**3.96**	**41**	**2,650**	**245**
T	Minimum, all storms																					17.9	10.36	2.60	0	150	30
I	Maximum, all storms																					29.5	10.8	5.3	16,750	530	89
S	**Wet Weather - *during storm***																										
T	Count, all storms				9																2.0	9	9	9	12	12	14
I	Mean(**) Storm 1																										
C	Mean(**) Storm 2				33.6																8.0	15.1	10.9	5.9	10	4,563	226
S	Mean(**) Storm 3																					24.6	14.3	1.5	253	12,342	2,968
	Mean(**) all Storms				**33.6**																**8.0**	**19.9**	**12.6**	**3.7**	**51**	**8,453**	**1,597**
	Minimum, all storms				9.3																8.0	11.2	10.5	0.3	0	0	0
	Maximum, all storms				50.6																23.0	27.6	14.9	7.8	49,000	11,000	8,900
	Wet Weather - *up to 24h after storm*																										
	Count, all storms				11																5.0	15	15	15	18	18	20
	Mean(**) Storm 1																										
	Mean(**) Storm 2				30.1																8.0	15.0	10.5	5.4	23	5,463	233
	Mean(**) Storm 3																					15.5	15.7	2.6	3	5,289	1,272
	Mean(**) all Storms				**30.1**																**8.0**	**15.2**	**13.1**	**4.0**	**8**	**5,376**	**753**
	Minimum, all storms				9.3																4.0	5.0	8.2	0.3	0	0	0
	Maximum, all storms				50.6																23.0	27.6	17.6	7.8	49,000	37,000	8,900
	Wet Weather - *up to 48h after storm*																										
	Count, all storms				12																7.0	18	18	18	21	20	23
	Mean(**) Storm 1																										
	Mean(**) Storm 2				28.6																8.0	16.8	10.1	4.8	43	7,591	410
	Mean(**) Storm 3																					13.6	16.0	3.0	3	4,631	1,001
	Mean(**) all Storms				**28.6**																**2.4**	**15.2**	**13.1**	**3.9**	**11**	**6,111**	**705**
	Minimum, all storms				9.3																4.0	3.1	7.5	0.3	0	0	0
	Maximum, all storms				50.6																23.0	29.6	17.6	7.8	49,000	37,000	8,900
	Wet Weather - *3/4 days after storm (2)*																										
	Count, all storms				1																0.0	1	1	1	1	1	1
	Mean(**) Storm 1																										
	Mean(**) Storm 2				8.0																	41.6	5.9	1.5	16,500	15,100	1,570
	Mean(**) Storm 3																										
	Mean(**) all Storms				**8.0**																	**41.6**	**5.9**	**1.5**	**16,500**	**15,100**	**1,570**
	Minimum, all storms																										
	Maximum, all storms																										

(**) Mean is geometric for fecal coliform.

(1) New rainstorm between appr. 6/15/89, 0:00, and 6/15/90, 23:00h, with 0.8" of rain. These data were excluded from the statistical summary.

(2) Storm 2 only.

Table A1-3

URI Storm Sampling of the Blackstone River (Station BRCF), Central Falls (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l) *	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l)*	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
	Dry	5/10/89	9:28		6.2																<2	2.50	0.17	0.17	55	49	5
S	Rain	5/10/89	13:35		7.4																				63	45	10
T	Rain	5/10/89	16:45																		2.0	2.54	0.15	0.17	110	90	5
O	Rain	5/10/89	19:20		6.6																				170	170	21
R	Rain	5/10/89	22:40		7.6																1.6	2.63	0.18	0.12	410	330	53
M	Rain	5/11/89	1:30		2.0																				390	240	61
	Rain	5/11/89	4:45		8.6																2.4	2.60	0.18	0.21	350	300	140
2	Rain	5/11/89	9:15		12.8																				890	640	130
	Rain	5/11/89	13:00		12.0																2.5	2.39	0.13	0.16	3,100	2,900	180
	Rain	5/11/89	17:20		14.0																				3,000	2,800	99
	Rain	5/11/89	21:15		13.4																	2.15	0.12	0.15	1,155	1,120	80
	Rain	5/12/89	0:30		17.6																				290,000	220,000	280
	Rain	5/12/89	4:35		22.0																2.7	1.86	0.10	0.06	250,000	180,000	300
	24h	5/12/89	9:10		18.0																				830	790	90
	24h	5/12/89	22:00		10.0																1.60	1.74	0.04	0.04	0.1		100
	24h																										
	48h																										
	48h	5/13/89	22:26		7.4																	1.98	0.13	0.12	310	280	35
	48h																										
	72h	5/14/89	23:25		6.8																	2.11	0.09	0.03	500	390	27
	72h																										
	Dry	6/12/89	16:45		15.2																	4.07	0.35	0.17	190	30	35
S	Rain	6/13/89	8:20		9.0																	3.13	0.37	0.16	220	150	70
T	Rain	6/13/89	10:45		9.4																	2.92	0.37	0.16	180	150	50
O	Rain	6/13/89	12:45																						620	540	490
R	24h	6/13/89	13:25		8.4																	3.06	0.34	0.17	180	130	94
M	24h	6/13/89	16:10		2.2																	3.23	0.35	0.12	85	61	46
	24h	6/13/89	19:00		9.2																	3.42	0.36	0.17	240	230	143
3	24h	6/14/89	5:10		9.0																	3.57	0.44	0.19	490	220	1,200
	24h	6/14/89	9:10		8.0																	3.54	0.47	0.01	350	330	1,500
	24h	6/14/89	12:00		9.0																	3.99	0.32	0.17	430	430	730
	24h																										
	48h	6/14/89	16:00		9.2																	4.09	0.41	0.22	500	420	62
	48h																										
	48h *(1)*	6/15/89	3:55		9.4																	4.02	0.53	0.25	270	250	860
	48h *(1)*	6/15/89	12:35		8.7																	4.30	0.50	0.19	4,600	3,600	83
	72h *(1)*																										
	72h *(1)*																										
	72h *(1)*																										

* No data collected for metal concentrations

Table A1-3

URI Storm Sampling of the Blackstone River (Station BRCF), Central Falls (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

STATISTICS

Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium-diss. (ug/l) *	Cadmium-part. (ug/l) *	Cadmium-Total (ug/l) *	Chromium-diss. (ug/l) *	Chromium-part. (ug/l)*	Chromium-total (ug/l) *	Copper-diss. (ug/l) *	Copper-part. (ug/l) *	Copper-total (ug/l) *	Lead-diss. (ug/l) *	Lead-part (ug/l) *	Lead-total (ug/l) *	Nickel-diss. (ug/l) *	Nickel-part. (ug/l) *	Nickel-total (ug/l) *	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
Dry Weather																										
Count, all storms				2																0	2	2	2	2	2	2
Mean(**) all Storms				**10.70**																	**3.29**	**0.26**	**0.17**	**102**	40	20
Minimum, all storms				6.2																	2.5	0.2	0.2	55.0	30.0	5.0
Maximum, all storms				15.2																	4.1	0.4	0.2	190.0	49.0	35.0
Wet Weather - *during storm*																										
Count, all storms				13																5	8	8	8	15	15	15
Mean(**) Storm 1																										
Mean(**) Storm 2				11.3																2.24	2.36	0.14	0.15	1,375	34,053	113
Mean(**) Storm 3				9.2																	3.03	0.37	0.16	291	280	203
Mean(**) all Storms				**10.2**																**2.24**	**2.69**	**0.26**	**0.15**	**632**	**17166**	**158**
Minimum, all storms				2.0																1.6	1.9	0.1	0.1	63.0	45.0	5.0
Maximum, all storms				22.0																2.7	3.1	0.4	0.2	290,000	220,000	490
Wet Weather - *up to 24h after storm*																										
Count, all storms				21																6	15	15	15	23	22	23
Mean(**) Storm 1																										
Mean(**) Storm 2				11.7																	2.27	0.13	0.13	672	31,494	111
Mean(**) Storm 3				8.0																2.13	3.36	0.38	0.14	266	249	480
Mean(**) all Storms				**9.9**																**2.13**	**2.82**	**0.25**	**0.14**	**423**	**15,872**	**295**
Minimum, all storms				2.0																1.6	1.7	0.0	0.0	0	45	5
Maximum, all storms				22.0																2.7	4.0	0.5	0.2	290,000	220,000	1,500
Wet Weather - *up to 48h after storm*																										
Count, all storms				23																6	17	17	17	25	24	25
Mean(**) Storm 1																										
Mean(**) Storm 2				11.4																	2.24	0.13	0.13	638	29,265	106
Mean(**) Storm 3				8.2																2.13	3.44	0.38	0.15	283	266	439
Mean(**) all Storms				**9.8**																**2.13**	**2.84**	**0.25**	**0.14**	**425**	**14,765**	**272**
Minimum, all storms				2.0																1.6	1.7	0.0	0.0	0	45	5
Maximum, all storms				22.0																2.7	4.1	0.5	0.2	290,000	220,000	1,500
Wet Weather - *3/4 days after storm (2)*																										
Count, all storms				1																0	1	1	1	1	1	1
Mean(**) Storm 1																										
Mean(**) Storm 2				6.8																	2.1	0.1	0.0	500	390	27
Mean(**) Storm 3																										
Mean(**) all Storms				**6.8**																	**2.1**	**0.1**	**0.0**	**500**	**390**	**27**
Minimum, all storms																										
Maximum, all storms																										

(**) Mean is geometric for fecal coliform.

(1) New rainstorm between appr. 6/15/89, 0:00, and 6/15/90, 23:00h, with 0.8" of rain.
These data were excluded from the statistical summary.

(2) Storm 2 only.

Table A1-4
URI Storm Sampling of the Blackstone River (Station BRSM), Slater's Mill (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium -diss. (ug/l)	Cadmium -part. (ug/l)	Cadmium -Total (ug/l)	Chromium -diss. (ug/l)	Chromium -part. (ug/l)	Chromium -total (ug/l)	Copper -diss. (ug/l)	Copper -part. (ug/l)	Copper -total (ug/l)	Lead -diss. (ug/l)	Lead -part (ug/l)	Lead -total (ug/l)	Nickel -diss (ug/l)	Nickel -part. (ug/l)	Nickel -total (ug/l)	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
	Dry	10/18/88																							730		
S	Dry	10/21/88	18:56	142	2.4	0.61	0.10	0.71	2.64	1.97	4.61	9.70	1.14	10.84	1.20	1.31	2.51	18.20	1.00	19.20	<2	9.38	1.35	0.15	740	530	53
T	Rain	10/22/88	1:22	748	3.2																	9.05	1.23	0.15	540	270	80
O	Rain	10/22/88	4:30	258	2.8	0.52	0.07	0.59	2.61	1.64	4.25	9.40	1.71	11.11	1.20	1.27	2.47	16.20	0.64	16.84	<2	9.19	1.33	0.47	2,100	1,700	430
R	Rain	10/22/88	7:30	231	3.2																	9.00	1.35	0.51			
M	Rain	10/22/88	11:00	203	4.7	0.43	0.15	0.58	2.43	2.57	5.00	9.70	3.25	12.95	1.90	4.19	6.09	15.90	2.32	18.22	<2	8.99	1.46	1.44	19,000	11,000	2,000
	24h	10/22/88	14:24	398	4.9																	9.25	1.59	0.26	7,200	6,300	3,000
1	24h																										
	24h	10/22/88	18:00	511	10.4	0.57	0.19	0.76	2.44	3.16	5.60	9.60	2.52	12.12	1.50	3.42	4.92	17.50		17.50	<2	9.39	1.48	0.06	1,060	1,060	460
	24h	10/22/88	21:50	406	10.0																	9.56	1.71	0.70	470	460	150
	24h	10/23/88	1:25	390	6.8	0.57	0.13	0.70	2.48	2.33	4.81	10.40	2.18	12.58	1.50	2.35	3.85	16.50	1.80	18.30	<2	9.44	1.69	0.50	640	630	120
	24h	10/23/88	5:25	457	7.2																	9.66	1.83	0.59	740	600	53
	24h	10/23/88	9:30	551	7.3	0.56	0.22	0.78	2.08	3.83	5.91	9.10	3.31	12.41	1.40	3.87	5.27	16.50		16.50	<2	9.82	1.86	0.94	9	7	97
	48h	10/23/88	13:50	748	17.2																	9.79	1.61	0.06	490	390	170
	48h	10/23/88	17:35	686	25.4	0.57	0.85	1.42	1.87	9.82	11.69	12.00	10.70	22.70	1.90	11.30	13.20	16.60	12.20	28.80	<2	10.44	1.51	0.14	300	250	80
	48h	10/23/88	21:40	493	9.6																	10.45	1.29	0.22	260	230	10
	48h	10/24/88	2:33	558	6.7	0.57	0.26	0.83	3.08	24.70	27.78	10.50	3.34	13.84	1.80	3.60	5.40					10.32	1.18	0.21	450	350	20
	48h																										
	72h																										
	72h																										
	72h	10/25/88	3:30	349	6.8	0.75	0.37	1.12	2.78	4.86	7.64	11.80	4.94	16.74	1.60	5.05	6.65					9.98	1.16	0.54	2,200	800	200
	96h																										
	96h	10/26/88	5:00	295	5.1	0.75	0.22	0.97	2.03	3.58	5.61	9.00	4.04	13.04	1.50	4.08	5.58	17.20	2.02	19.22	<2	6.15	0.93	0.52	830	700	70
	96h																										
	Dry	5/10/89	9:10	1,245	6.4	0.12	0.50	0.62	0.76	0.32	1.08	5.70	2.44	8.14	1.60	1.94	3.54	5.50	0.88	6.38		2.76	0.25	0.28	550	520	89
S	Rain	5/10/89	12:45	1,146	6.9																				250	230	12
T	Rain	5/10/89	16:10	1,365	8.9	0.26	0.50	0.76	0.68	4.48	5.16	6.10	4.46	10.56	3.30	4.23	7.53	4.60	3.15	7.75	1.4	2.92	0.26	0.35	2,300	1,800	290
O	Rain	5/10/89	19:40	1,384	6.6																				2,000	200	140
R	Rain	5/10/89	22:55	1,384	11.6	0.12	0.50	0.62	0.68	1.93	2.61	13.30	1.50	14.80	4.60	2.07	6.67	4.90	0.99	5.89	2.0	2.92	0.11	0.02	3,700	1,100	170
M	Rain	5/11/89	2:00	1,510	9.2	0.07	0.60	0.67				5.40													660	470	83
	Rain	5/11/89	6:00	1,621	10.3	0.16	0.36	0.52	0.62	2.81	3.43	6.90	2.88	9.78	2.80	2.87	5.67	4.60	0.85	5.45	2.5	2.86	0.19	0.16	2,600	1,600	570
2	Rain	5/11/89	9:20	1,957	13.6	0.41	0.44	0.85				5.30	7.75	13.05	4.50	8.88	13.38					2.94	0.25	0.30	760	590	100
	Rain	5/11/89	12:16	2,188	14.0	0.66	0.42	1.08	0.66	8.01	8.67	4.40	8.02	12.42	4.50	10.70	15.20	2.90	3.51	6.41	2.7	2.96	0.22	0.29	1,500	1,300	67
	Rain	5/11/89	15:50	2,219	13.0	0.57	0.36	0.93				4.50	8.52	13.02	2.50	7.78	10.28					2.72	0.17	0.22	2,800	2,800	160
	Rain	5/11/89	20:23	2,532	15.8	0.15	0.44	0.59	0.38	3.66	4.04	4.70	2.57	7.27	2.40	2.78	5.18	4.30	0.71	5.01	1.7	2.48	0.18	0.26	2,900	2,800	160
	Rain	5/12/89	0:33	2,930	16.0	0.24	0.52	0.76				5.30	3.36	8.66	3.40	3.47	6.87					2.46	0.13	0.17	2,800	2,200	330
	Rain	5/12/89	4:23	3,167	19.8	0.26	0.54	0.80	0.92	4.51	5.43	6.10	3.47	9.57	3.00	3.61	6.61	4.40	1.27	5.67	3.0	2.32	0.12	0.13	2,100	1,900	230
	24h	5/12/89	8:00	3,412	2.1	0.50	0.60	1.10	0.42	5.62	6.04	4.60	3.98	8.58	4.10	4.78	8.88	4.20	2.99	7.19		2.13	0.21	0.25	2,400	2,300	130
	24h	5/12/89	21:38	3,202	12.4	0.29	0.42	0.71				6.20	7.30	13.50	1.70	7.98	9.68					2.02	0.17	0.19	1,700	790	50
	24h	5/13/89	2:30	3,202	10.8																				510	410	49
	48h	5/13/89	8:45	3,158	10.8	0.34	0.54	0.88				5.20	3.64	8.84	2.10	4.08	6.18					2.02	0.17	0.18	250	240	420
	48h	5/13/89	21:10	2,532	7.6	0.16	0.44	0.60	0.46	4.11	4.57	4.40	4.47	8.87	2.40	4.04	6.44	5.60	2.02	7.62		2.22	0.15	0.14	21	170	40
	48h	5/14/89	2:40	2,447	8.0																				420	340	42
	72h	5/14/89	23:50	2,204	18.0	0.35	0.26	0.61	0.30	2.16	2.46	5.00	1.74	6.74	1.80	1.93	3.73	1.30	1.30	2.60		2.41	0.16	0.15	164	160	37
	72h	5/15/89	3:05	2,093	8.0	0.06	0.28	0.34				5.20	4.67	9.87	0.80	1.40	2.20					2.45	0.16	0.16	110	106	36
	Dry	6/12/89	17:45	1,403	12.0	0.64	0.52	1.16	1.78	3.55	5.3	9.80	4.73	14.53	6.40	4.70	11.10	5.70	0.61	6.31		3.67	0.29	0.17	230	150	30
S	Rain	6/13/89	7:10	1,185	10.1	0.78	0.49	1.27				8.60	4.59	13.19	4.00	4.99	8.99					3.81	0.19	0.01	310	180	61
T	Rain	6/13/89	10:20	1,185	9.6	0.62	0.26	0.88	2.78	2.25	5.0	7.80	2.63	10.43	9.40	3.75	13.15	5.10	0.28	5.38		4.04	0.36	0.18	440	190	158
O	Rain	6/13/89	13:00	1,157	10.1	0.64	0.37	1.01				8.00	3.52	11.52	5.40	4.45	9.85					4.08	0.36	0.16	560	440	210
R	24h	6/13/89	16:20	1,134	9.0	0.62	0.62	1.24	1.74	4.44	6.2	9.00	5.95	14.95	2.80	6.83	9.63	5.00	0.81	5.81		3.77	0.32	0.16	130	60	81
M	24h	6/13/89	19:25	1,087	8.9	0.48	0.55	1.03				7.20	5.39	12.59	3.00	5.58	8.58					4.14	0.34	0.19	170	140	54
	24h	6/13/89	23:00	1,087	10.3	0.54	0.61	1.15	2.44	4.89	7.3	7.20	5.94	13.14	2.60	6.78	9.38	5.00	0.79	5.79		4.33	0.45	0.23	370	320	200
3	24h	6/14/89	2:45	1,038	6.2	0.74	0.61	1.35				6.80	5.09	11.89	3.00	5.86	8.86					4.51	0.48	0.21	640	550	230
	24h	6/14/89	7:30	1,049	7.0	0.92	0.17	1.09	2.36	4.38	6.7	9.40	2.48	11.88	6.00	2.84	8.84	5.40	0.27	5.67		4.01	0.32	0.01	200	200	83
	24h																										
	24h																										
	48h	6/14/89	15:21	1,015	8.0	0.70	0.41	1.11				8.80	4.07	12.87	5.60	5.10	10.70					4.50	0.47	0.23	250	180	31
	48h	6/14/89	23:30	956	9.3	1.28	0.19	1.47	1.44	4.03	5.5	9.40	3.41	12.81	4.80	3.48	8.28	5.80	0.33	6.13		4.87	0.43	0.21	70	70	27
	48h *(1)*	6/15/89	3:55	1,015	11.3	1.04	0.32	1.36				8.80	4.55	13.35	10.60	7.19	17.79					4.80	0.55	0.25	800	720	390
	48h *(1)*	6/15/89	11:22	956	7.8	0.90	0.29	1.19	2.14	3.99	6.1	8.40	3.33	11.73	5.40	4.50	9.90	5.60	0.34	5.94		4.58	0.49	0.23	370	150	43
	72h *(1)*																										
	72h *(1)*																										
	72h *(1)*	6/16/89	14:25	1,311	13.3	0.88	0.24	1.12				10.00	3.68	13.68	10.40	5.90	16.30					4.54	0.33	0.19			

Table A1-4

URI Storm Sampling of the Blackstone River (Station BRSM), Slater's Mill (Wright et al., 1991) -TSS, Metals, Bacteria, Nutrients

	Dry Weather, Rainfall, or Period after rain	Date	Time	Flow (cfs)	TSS (mg/l)	Cadmium -diss. (ug/l)	Cadmium -part. (ug/l)	Cadmium -Total (ug/l)	Chromium -diss. (ug/l)	Chromium -part. (ug/l)	Chromium -total (ug/l)	Copper -diss. (ug/l)	Copper -part. (ug/l)	Copper -total (ug/l)	Lead -diss. (ug/l)	Lead -part (ug/l)	Lead -total (ug/l)	Nickel -diss (ug/l)	Nickel -part. (ug/l)	Nickel -total (ug/l)	BOD5 (mg/l)	NO3 (mg/L)	PO4 (mg/L)	NH3 (mg/L)	Fecal Coliform (MPN/100ml)	E.Coli (col/100 ml)	Enterococci (col/100 ml)
S	**Dry Weather**																										
T	Count, all storms			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	4	3	3
A	**Mean(*) all Storms**			**930**	**6.93**	**0.46**	**0.37**	**0.83**	**1.73**	**1.95**	**3.67**	**8.40**	**2.77**	**11.17**	**3.07**	**2.65**	**5.72**	**9.80**	**0.83**	**10.63**	**<2**	**5.27**	**0.63**	**0.20**	**511**	**400**	**57**
T	Minimum, all storms			142	2.4	0.12	0.10	0.62	0.76	0.32	1.08	5.70	1.14	8.14	1.20	1.31	2.51	5.50	0.61	6.31	<2	2.76	0.25	0.15	230	150	30
I	Maximum, all storms			1,403	12.0	0.64	0.52	1.16	2.64	3.55	5.30	9.80	4.73	14.53	6.40	4.70	11.10	18.20	1.00	19.20	<2	9.38	1.35	0.28	740	530	89
S	**Wet Weather - *during storm***																										
T	Count, all storms			19	19	15	15	15	9	9	9	15	14	14	14	14	14	9	9	9	8	16	16	16	18	18	18
I	Mean(*) Storm 1			360	3.5	0.48	0.11	0.59	2.52	2.11	4.63	9.55	2.48	12.03	1.55	2.73	4.28	16.05	1.48	17.53	<2	9.06	1.34	0.64	2,783	4,323	837
C	Mean(*) Storm 2			1950	12.1	0.29	0.47	0.76	0.66	4.23	4.89	6.20	4.73	11.01	3.44	5.15	8.60	4.28	1.75	6.03	2.22	2.73	0.18	0.21	1,647	1,416	193
S	Mean(*) Storm 3			1176	9.9	0.68	0.37	1.05	2.78	2.25	5.03	8.13	3.58	11.71	6.27	4.40	10.66	5.10	0.28	5.38		3.98	0.30	0.12	424	270	143
	Mean(*) all Storms			**1162**	**8.5**	**0.48**	**0.32**	**0.80**	**1.99**	**2.86**	**4.85**	**7.96**	**3.60**	**11.59**	**3.75**	**4.09**	**7.85**	**8.48**	**1.17**	**9.65**		**5.26**	**0.61**	**0.32**	**1,248**	**2003**	**391**
	Minimum, all storms			203	2.8	0.07	0.07	0.52	0.38	1.64	2.61	4.40	1.50	7.27	1.20	1.27	2.47	2.90	0.28	5.01	1.40	2.32	0.11	0.01	250	180	12
	Maximum, all storms			3167	19.8	0.78	0.60	1.27	2.78	8.01	8.67	13.30	8.52	14.80	9.40	10.70	15.20	16.20	3.51	18.22	3.00	9.19	1.46	1.44	19,000	11,000	2,000
	Wet Weather - *up to 24h after storm*																										
	Count, all storms			33	33	25	25	25	16	16	16	25	24	24	24	24	24	16	14	16	6	29	29	29	32	32	32
	Mean(*) Storm 1			415	6.1	0.53	0.15	0.68	2.41	2.71	5.11	9.64	2.59	12.23	1.50	3.02	4.52	16.52	1.59	17.47		9.34	1.55	0.56	884	2,447	710
	Mean(*) Storm 2			2,215	11.4	0.31	0.48	0.78	0.62	4.43	5.05	6.07	4.89	11.02	3.35	5.38	8.72	4.27	1.92	6.20		2.61	0.18	0.21	1,565	1,366	169
	Mean(*) Storm 3			1,115	8.9	0.67	0.46	1.13	2.33	3.99	6.32	8.00	4.45	12.45	4.53	5.14	9.66	5.13	0.54	5.66		4.09	0.35	0.14	308	260	135
	Mean(*) all Storms			**1,248**	**8.8**	**0.50**	**0.36**	**0.86**	**1.79**	**3.71**	**5.50**	**7.90**	**3.98**	**11.90**	**3.12**	**4.51**	**7.63**	**8.64**	**1.35**	**9.78**		**5.34**	**0.70**	**0.31**	**752**	**1,358**	**338**
	Minimum, all storms			203	2.1	0.07	0.07	0.52	0.38	1.64	2.61	4.40	1.50	7.27	1.20	1.27	2.47	2.90	0.27	5.01	1.40	2.02	0.11	0.01	9	7	12
	Maximum, all storms			3,412	19.8	0.9	0.6	1.3	2.8	8.0	8.7	13.30	8.52	14.95	9.40	10.70	15.20	17.50	3.51	18.30	3.00	9.82	1.86	1.44	19,000	11,000	3,000
	Wet Weather - *up to 48h after storm*																										
	Count, all storms			42	42	31	31	31	20	20	20	31	30	30	30	30	30	19	17	19	6	37	37	37	41	41	41
	Mean(*) Storm 1			474	8.5	0.54	0.27	0.81	2.43	6.86	9.29	10.10	3.86	13.96	1.60	4.29	5.89	16.53	4.24	19.36		9.60	1.51	0.45	672	1,788	513
	Mean(*) Storm 2			2298	11.0	0.30	0.48	0.77	0.60	4.39	4.99	5.89	4.76	10.69	3.18	5.17	8.35	4.44	1.94	6.37		2.54	0.18	0.20	1,034	1,180	169
	Mean(*) Storm 3			1089	8.9	0.73	0.43	1.16	2.15	4.00	6.15	8.22	4.31	12.53	4.66	4.97	9.63	5.26	0.50	5.76		4.21	0.37	0.16	260	233	114
	Mean(*) all Storms			**1287**	**9.4**	**0.52**	**0.39**	**0.91**	**1.73**	**5.08**	**6.81**	**8.07**	**4.31**	**12.39**	**3.15**	**4.81**	**7.95**	**8.74**	**2.22**	**10.50**		**5.45**	**0.69**	**0.27**	**565**	**1,067**	**265**
	Minimum, all storms			203	2.1	0.07	0.07	0.52	0.38	1.64	2.61	4.40	1.50	7.27	1.20	1.27	2.47	2.90	0.27	5.01	1.40	2.02	0.11	0.01	9	7.0	10.0
	Maximum, all storms			3412	25.4	1.28	0.85	1.47	3.08	24.70	27.78	13.30	10.70	22.70	9.40	11.30	15.20	17.50	12.20	28.80	3.00	10.45	1.86	1.44	19,000	11,000	3,000
	Wet Weather - *3/4 days after storm* (2)																										
	Count, all storms			4	4	4	4	4	3	3	3	4	4	4	4	4	4	2	2	2	0	4	4	4	4	4	4
	Mean(*) Storm 1			322	6.0	0.75	0.30	1.05	2.41	4.22	6.63	10.40	4.49	14.89	1.55	4.57	6.12	17.20	2.02	19.22		8.07	1.05	0.53	1,351	750	135
	Mean(*) Storm 2			2,149	13.0	0.20	0.27	0.47	0.30	2.16	2.46	5.10	3.21	8.31	1.30	1.67	2.97	1.30	1.30	2.60		2.43	0.16	0.16	134	133	37
	Mean(*) Storm 3																										
	Mean(*) all Storms			**1,235**	**9.5**	**0.48**	**0.28**	**0.76**	**1.35**	**3.19**	**4.54**	**7.75**	**3.85**	**11.60**	**1.43**	**3.12**	**4.54**	**9.25**	**1.66**	**10.91**		**5.25**	**0.60**	**0.34**	**426**	**442**	**86**
	Minimum, all storms			295	5.1	0.06	0.22	0.34	0.30	2.16	2.46	5.00	1.74	6.74	0.80	1.40	2.20	1.30	1.30	2.60		2.41	0.16	0.15	110	106	36
	Maximum, all storms			2,204	18.0	0.75	0.37	1.12	2.78	4.86	7.64	11.80	4.94	16.74	1.80	5.05	6.65	17.20	2.02	19.22		9.98	1.16	0.54	2,200	800	200

(*) Mean is geometric for fecal coliform.

(1) New rainstorm between appr. 6/15/89, 0:00, and 6/15/90, 23:00h, with 0.8" of rain.
These data were excluded from the statistical summary.

(2) Storms 1 and 2 only.

Figure Set 1

FLOW VOLUME

Event 1: October 22-26, 1988
Event 2: May 10-15, 1989
Event 3: June 12-15, 1989

Table A1-5

RAW WET WEATHER STUDY PRECIPITATION CHEMISTRY DATA

Event I	Prudence	Kent Hts
Start, 10/21/88	4:30 PM	1:25 PM
End, 10/23/88	4:15 PM	2:30 PM
mm rain	8.6	14.7
ppm nitrate	0.18	0.18
ppm sulfate	1.51	0.71
ppm chloride	5.84	0.94
ppm sodium	5.21	0.51
ppm ammonium	ND	ND
ppm potassium	0.18	0.06
pH	5.09	4.89
conductivity, umho/cm	36.4	10.8
Fluxes, mg/m2		
nitrate	1.5	2.6
sulfate	13.0	10.4
chloride	50.2	13.8
sodium	44.8	7.5
ammonium	0.0	0.0
potassium	1.5	0.9

Event II	Prudence	Kent Hts	N.Smithfld	Scituate
Start, 5/10/89	9:00 AM	7:55 AM	8:55 AM	9:35 AM
End, 5/13/89	10:00 AM	9:00 AM	9:30 AM	10:30 AM
mm rain	62.0	67.8	60.9	61.9
ppm nitrate	1.10	0.79	1.11	1.08
ppm sulfate	2.68	1.51	1.99	1.96
ppm chloride	1.06	0.15	0.11	0.13
ppm sodium	0.52	0.09	0.04	0.04
ppm ammonium	0.11	0.09	0.11	0.12
ppm potassium	0.06	0.03	0.02	0.02
pH	4.19	4.34	4.29	4.30
conductivity, umho/cm	32.2	18.2	23.3	23.4
Fluxes, mg/m2				
nitrate	68.2	53.6	67.6	66.9
sulfate	166.2	102.4	121.2	121.3
chloride	65.7	10.2	6.7	8.0
sodium	32.2	6.1	2.4	2.5
ammonium	6.8	6.1	6.7	7.4
potassium	3.7	2.0	1.2	1.2

Event III	Prudence	Kent Hts	N.Smithfld	Scituate
Start, 6/13/89	6:45 AM	6:55 AM	7:52 AM	9:20 AM
End, 6/16/89	10:00 AM	1:50 PM	12:05 PM	10:50 AM
mm rain	36.2	46.2	30.2	32.2
ppm nitrate	1.79	2.00	1.35	1.45
ppm sulfate	3.11	4.52	2.80	1.91
ppm chloride	1.19	1.46	0.50	0.74
ppm sodium	0.60	0.57	0.20	0.38
ppm ammonium	0.39	0.38	0.25	0.27
ppm potassium	0.07	0.07	0.05	0.05
pH	4.11	3.95	4.17	4.06
conductivity, umho/cm	39.2	52.9	31.5	39.0
Fluxes, mg/m2				
nitrate	64.8	92.4	40.8	46.7
sulfate	112.6	208.8	84.6	61.5
chloride	43.1	67.5	15.1	23.8
sodium	21.7	26.3	6.0	12.2
ammonium	14.1	17.6	7.6	8.7
potassium	2.5	3.2	1.5	1.6

The mm rain in Table H are the actual totals at each site for each storm.

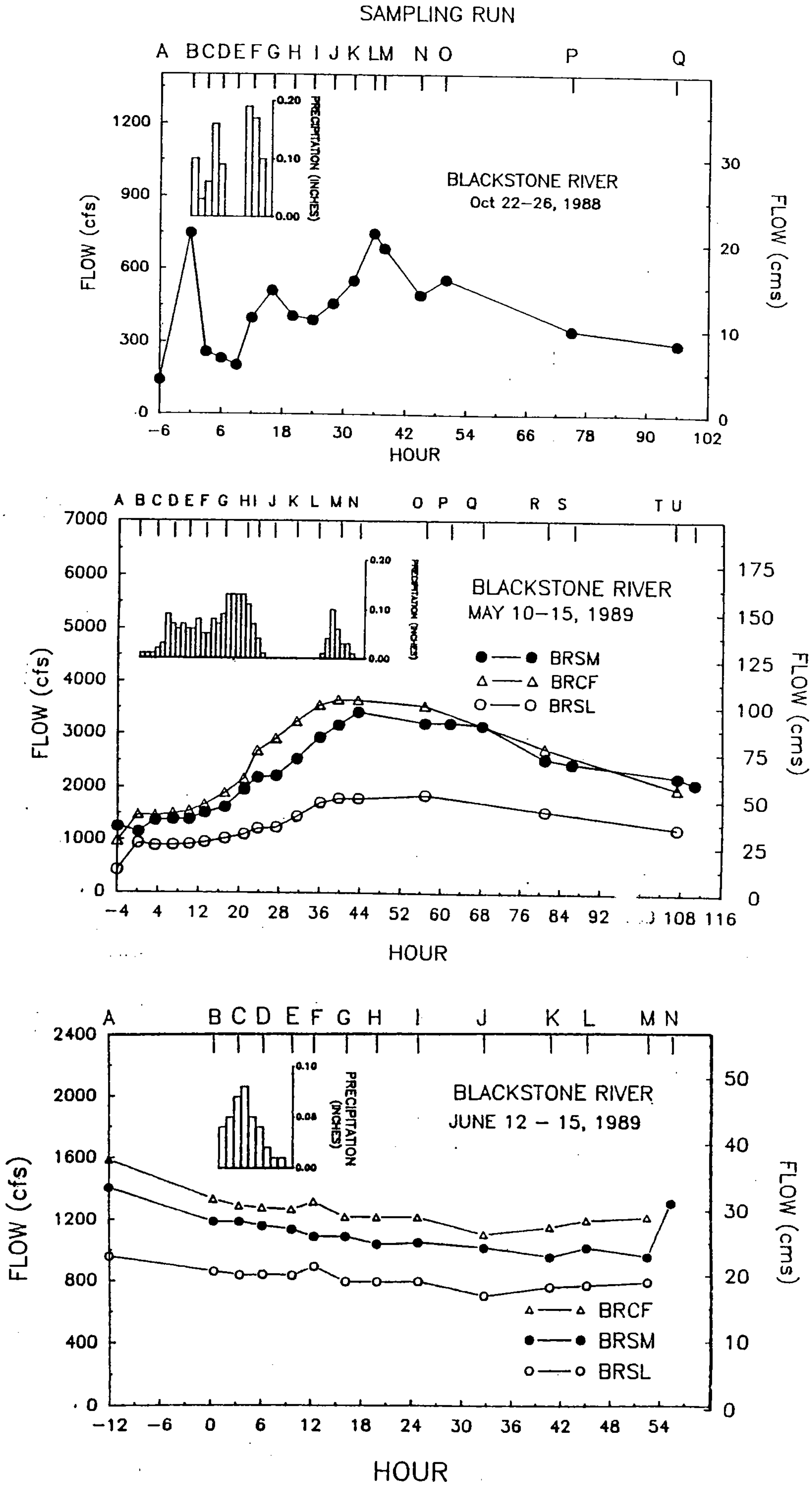

SAMPLING RUN
A BCDEFGHIJKLM N O P Q
BLACKSTONE RIVER
Oct 22–26, 1988
PRECIPITATION (INCHES)
0.20
0.10
0.00
FLOW (cfs)
FLOW (cms)
HOUR
0
300
600
900
1200
0
10
20
30
−6
6
18
30
42
54
66
78
90
102
A B C D E F G HI J K L M N O P Q R S T U
BLACKSTONE RIVER
MAY 10–15, 1989
BRSM
BRCF
BRSL
0
1000
2000
3000
4000
5000
6000
7000
0
25
50
75
100
125
150
175
−4
4
12
20
28
36
44
52
60
68
76
84
92
108
116
HOUR
A B C D E F G H I J K L M N
BLACKSTONE RIVER
JUNE 12 – 15, 1989
0.10
0.05
0.00
BRCF
BRSM
BRSL
0
400
800
1200
1600
2000
2400
0
10
20
30
40
50
−12
−6
0
6
12
18
24
30
36
42
48
54
HOUR

Figure A1-1b

Figure Set 2

TOTAL SUSPENDED SOLIDS
CADMIUM
CHROMIUM
COPPER
LEAD
NICKEL

Event 1: October 22-26, 1988
Event 2: May 10-15, 1989
Event 3: June 12-15, 1989

Note:
Unless otherwise noted, graph lines pertain to Blackstone River Station BRSM (Slater's Mills)

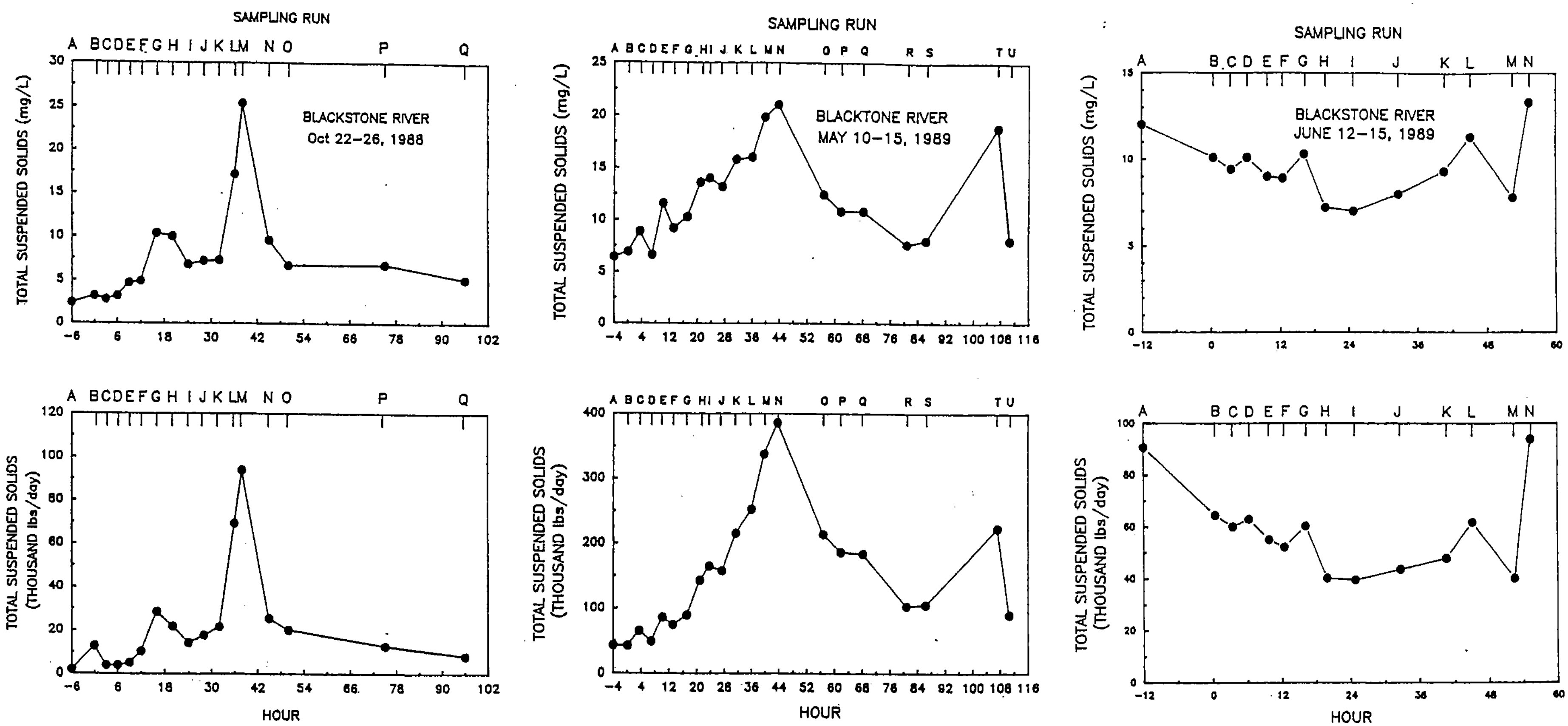

SAMPLING RUN
BLACKSTONE RIVER
Oct 22–26, 1988
BLACKTONE RIVER
MAY 10–15, 1989
BLACKSTONE RIVER
JUNE 12–15, 1989
TOTAL SUSPENDED SOLIDS (mg/L)
TOTAL SUSPENDED SOLIDS
(THOUSAND lbs/day)
HOUR

Figure A1-2

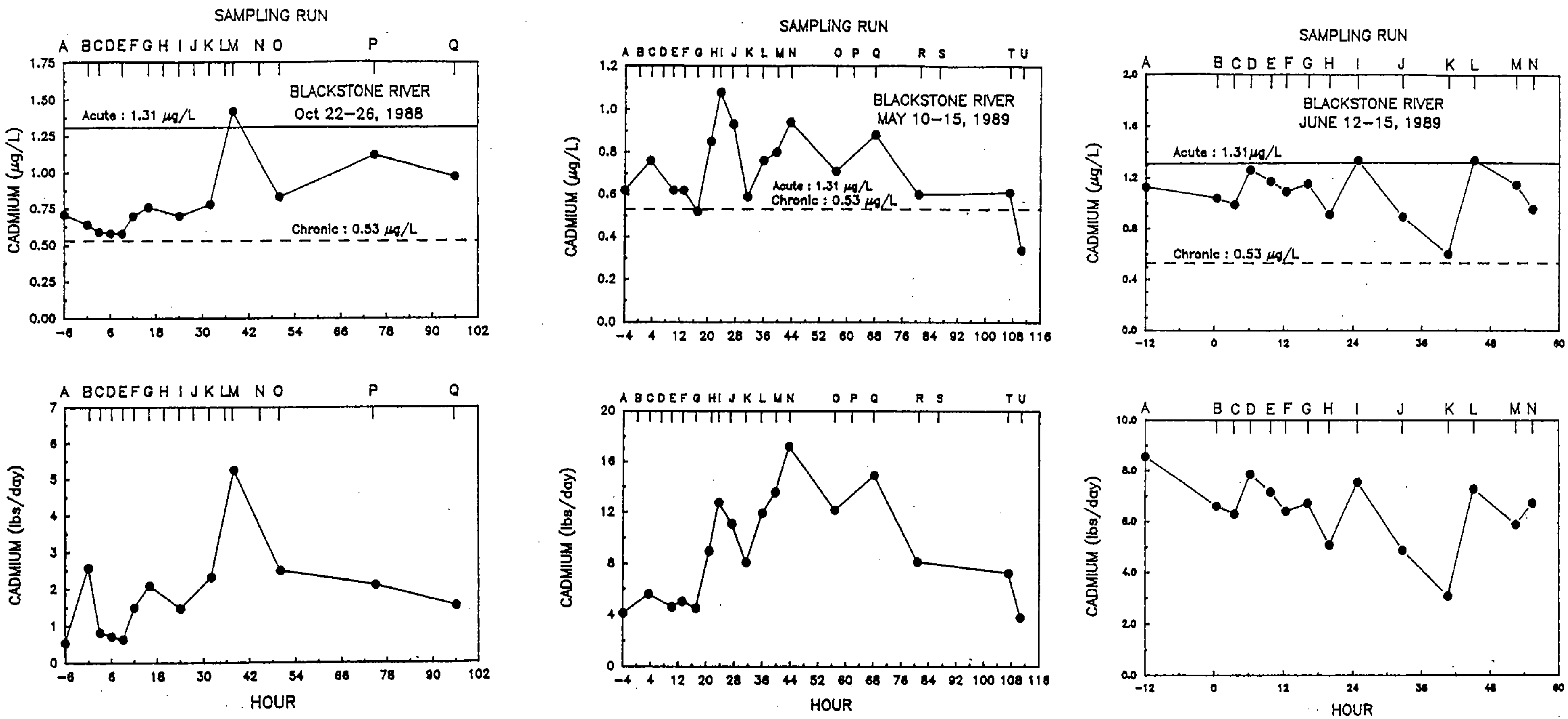
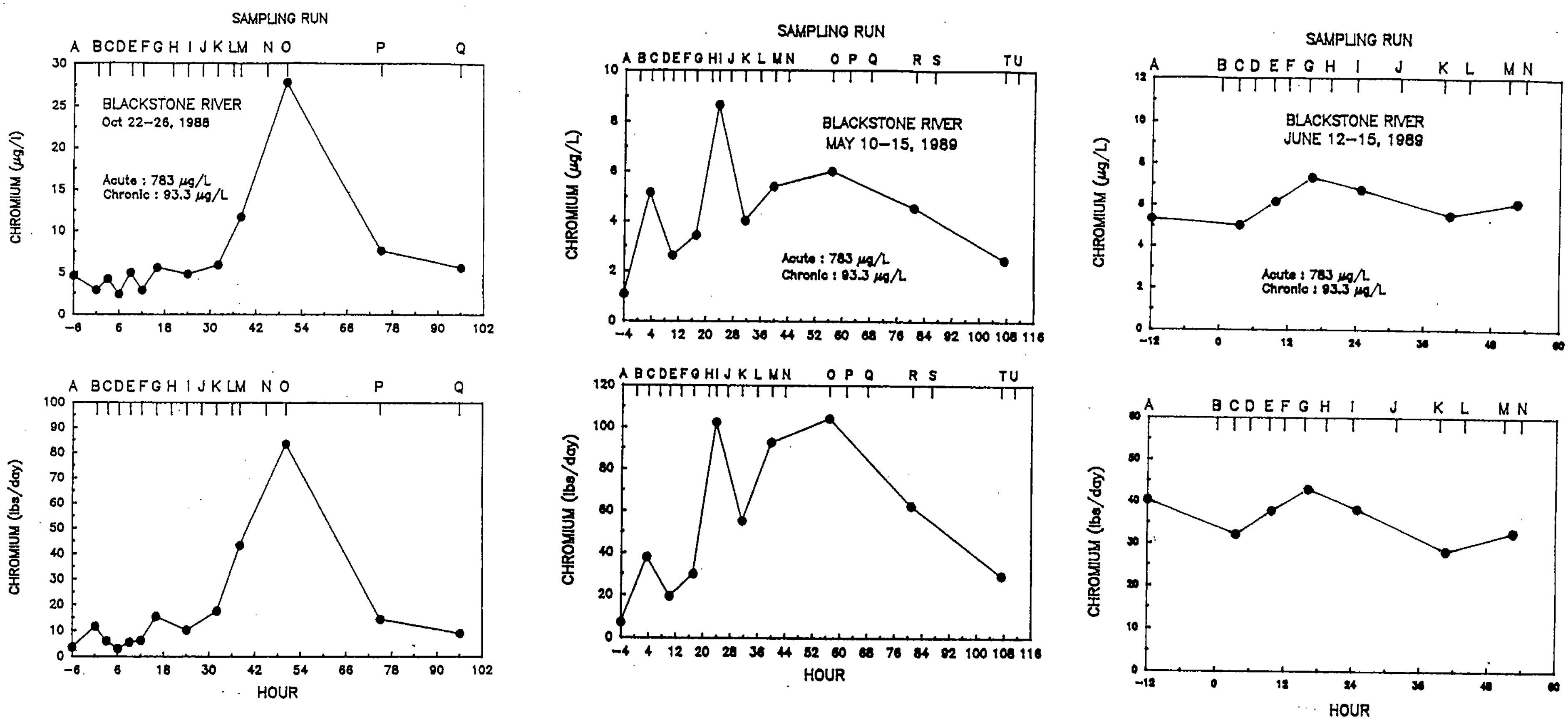

SAMPLING RUN
BLACKSTONE RIVER
Oct 22–26, 1988
Acute : 1.31 μg/L
Chronic : 0.53 μg/L
CADMIUM (μg/L)
CADMIUM (lbs/day)
HOUR
BLACKSTONE RIVER
MAY 10–15, 1989
BLACKSTONE RIVER
JUNE 12–15, 1989

Figure A1-3



SAMPLING RUN
BLACKSTONE RIVER
Oct 22–26, 1988
Acute : 783 µg/L
Chronic : 93.3 µg/L
CHROMIUM (µg/l)
CHROMIUM (lbs/day)
HOUR
BLACKSTONE RIVER
MAY 10–15, 1989
CHROMIUM (µg/L)
BLACKSTONE RIVER
JUNE 12–15, 1989

Figure A1-4

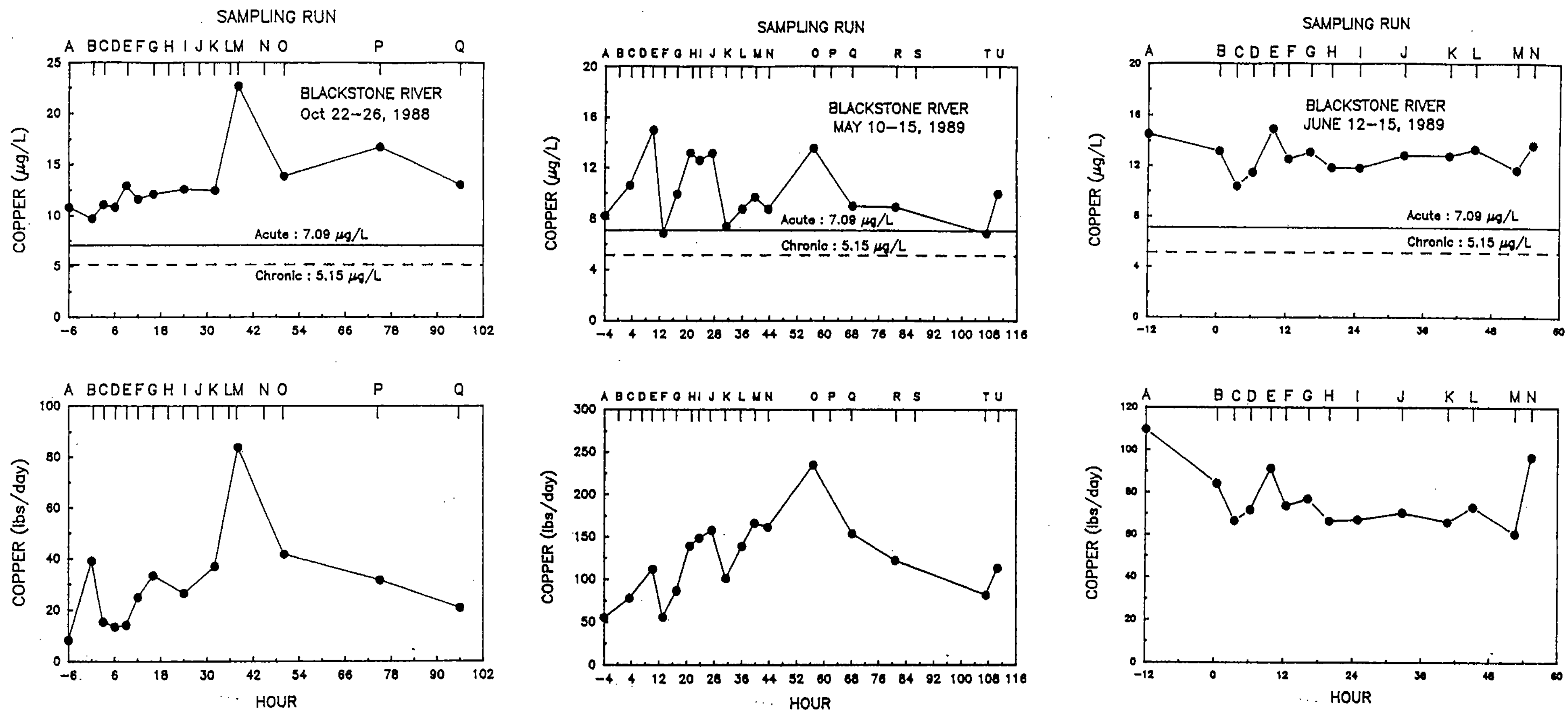

SAMPLING RUN
BLACKSTONE RIVER
Oct 22-26, 1988
Acute : 7.09 μg/L
Chronic : 5.15 μg/L
COPPER (μg/L)
COPPER (lbs/day)
HOUR
BLACKSTONE RIVER
MAY 10-15, 1989
BLACKSTONE RIVER
JUNE 12-15, 1989

Figure A1-5

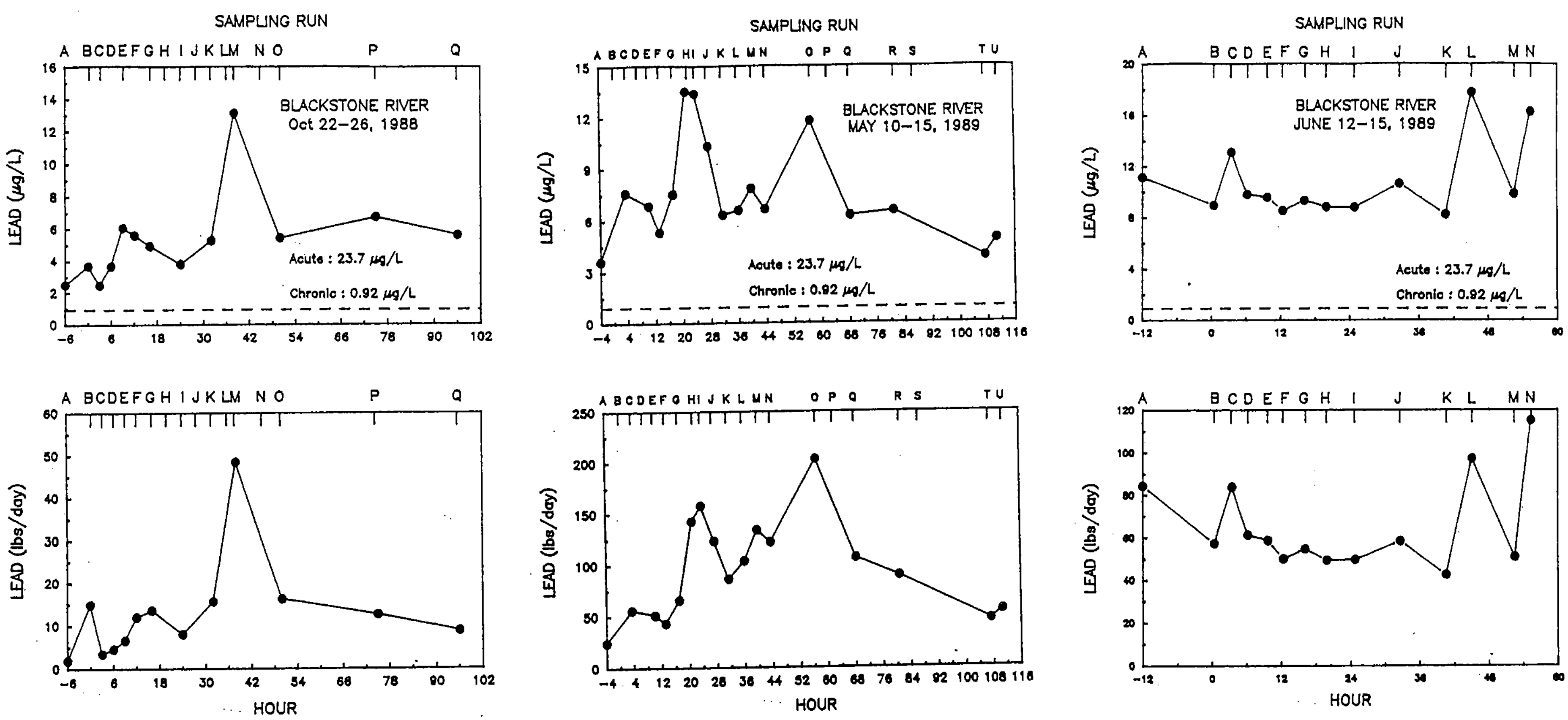

SAMPLING RUN
BLACKSTONE RIVER
Oct 22–26, 1988
Acute : 23.7 µg/L
Chronic : 0.92 µg/L
BLACKSTONE RIVER
MAY 10–15, 1989
BLACKSTONE RIVER
JUNE 12–15, 1989
LEAD (µg/L)
LEAD (lbs/day)
HOUR

Figure A1-6

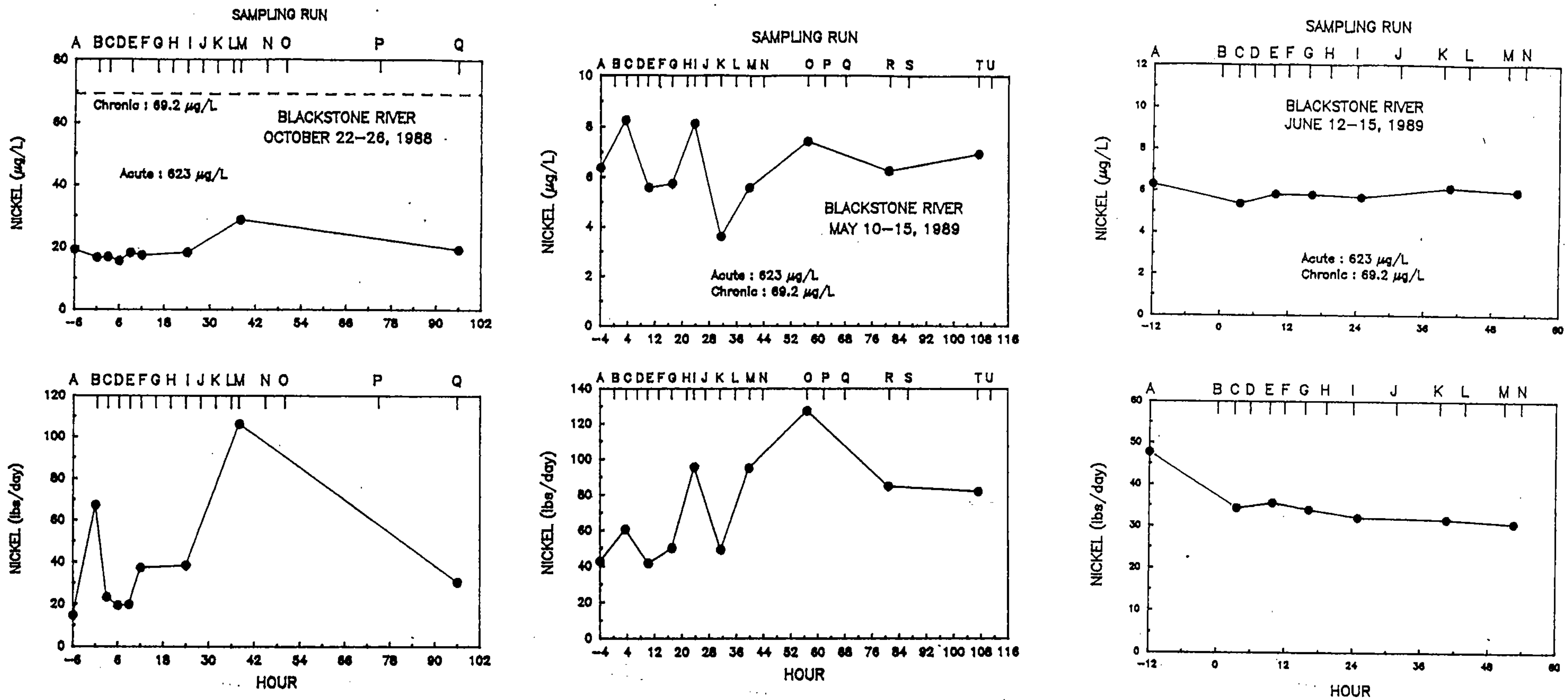

SAMPLING RUN
BLACKSTONE RIVER
OCTOBER 22–26, 1988
Chronic : 69.2 µg/L
Acute : 623 µg/L
NICKEL (µg/L)
NICKEL (lbs/day)
HOUR
BLACKSTONE RIVER
MAY 10–15, 1989
Acute : 623 µg/L
Chronic : 69.2 µg/L
BLACKSTONE RIVER
JUNE 12–15, 1989
Acute : 623 µg/L
Chronic : 69.2 µg/L

Figure A1-7

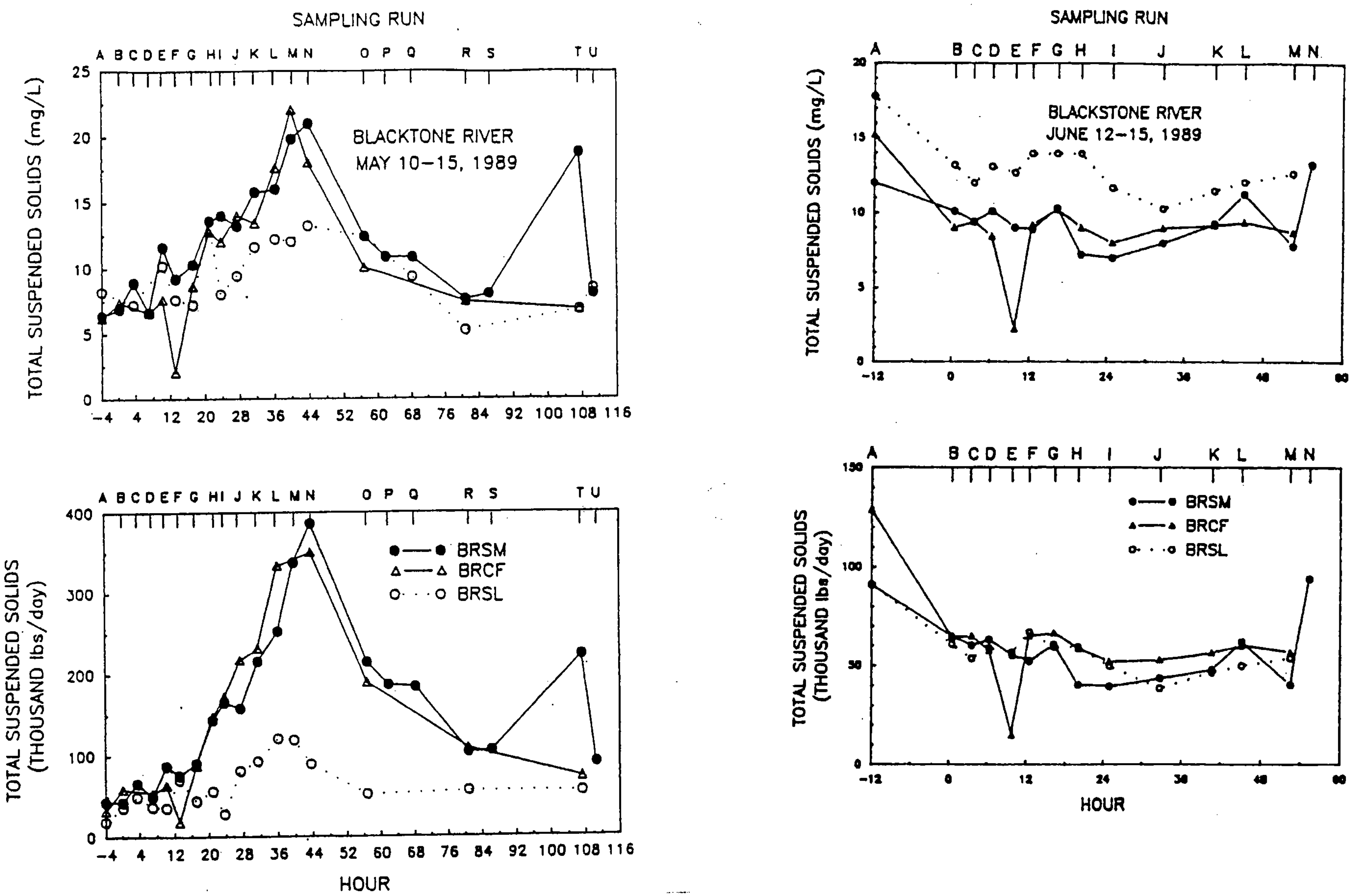


Figure A1-8 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Total Suspended Solids

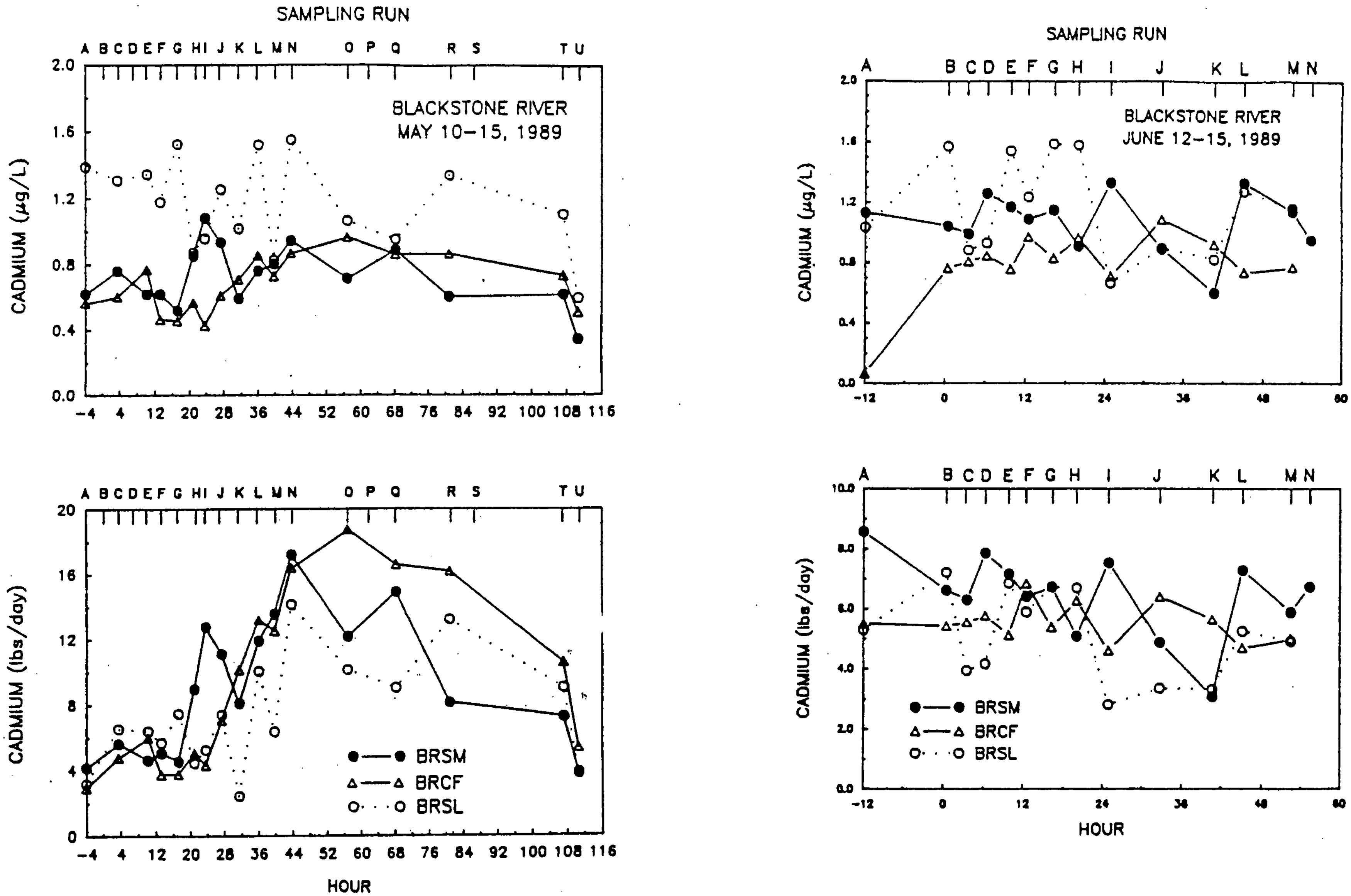


Figure A1-9 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Cadmium

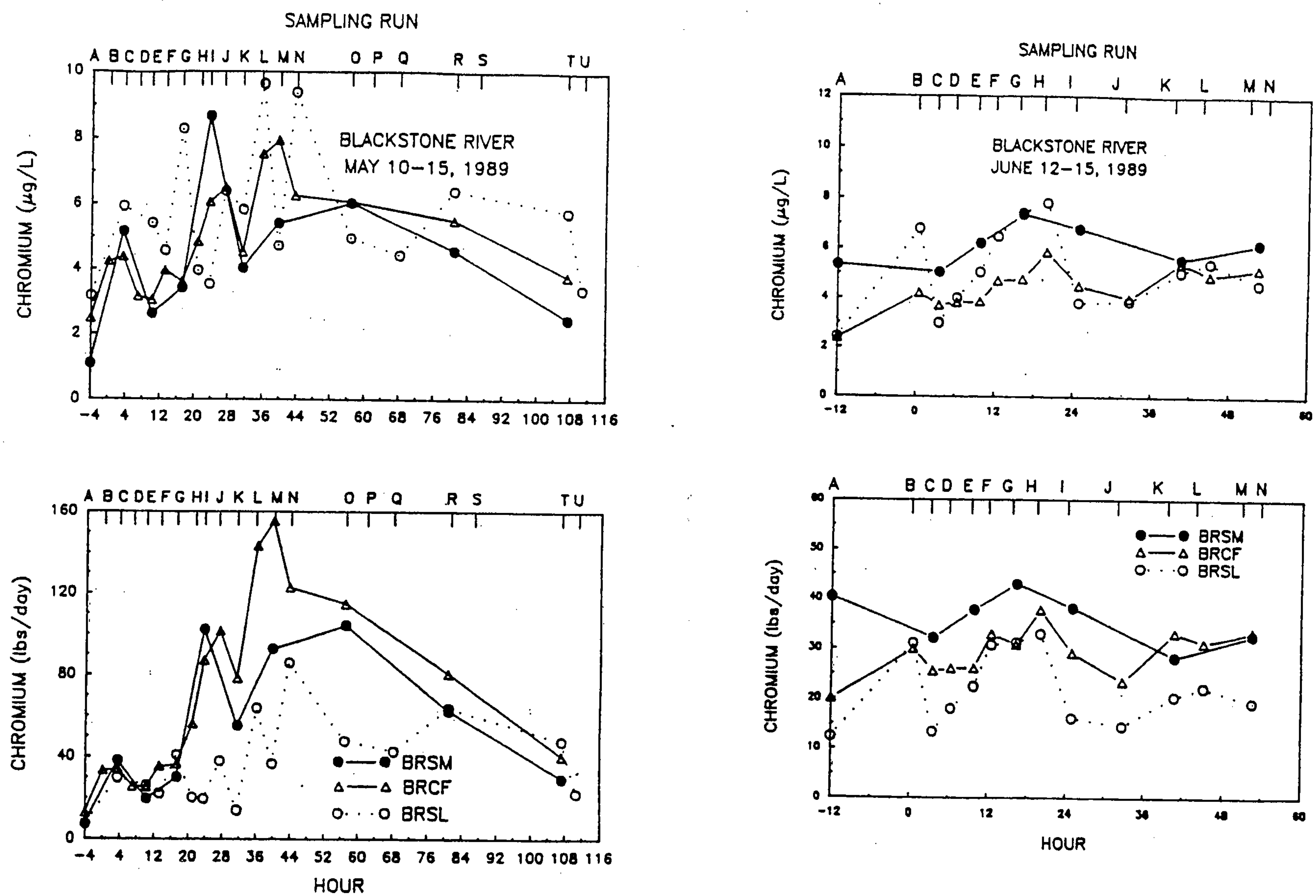


Figure A1-10 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Chromium

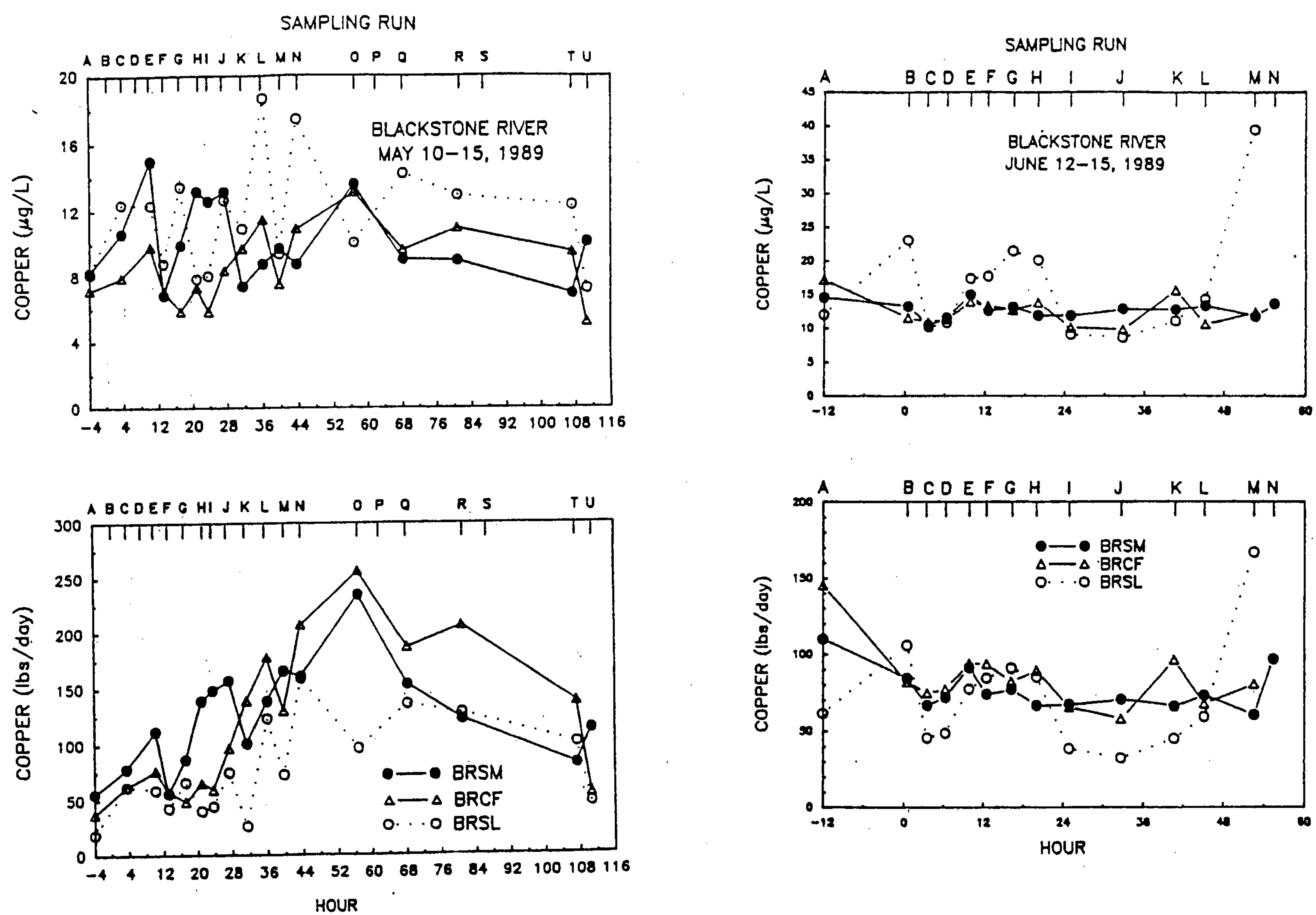


Figure A1-11 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Copper

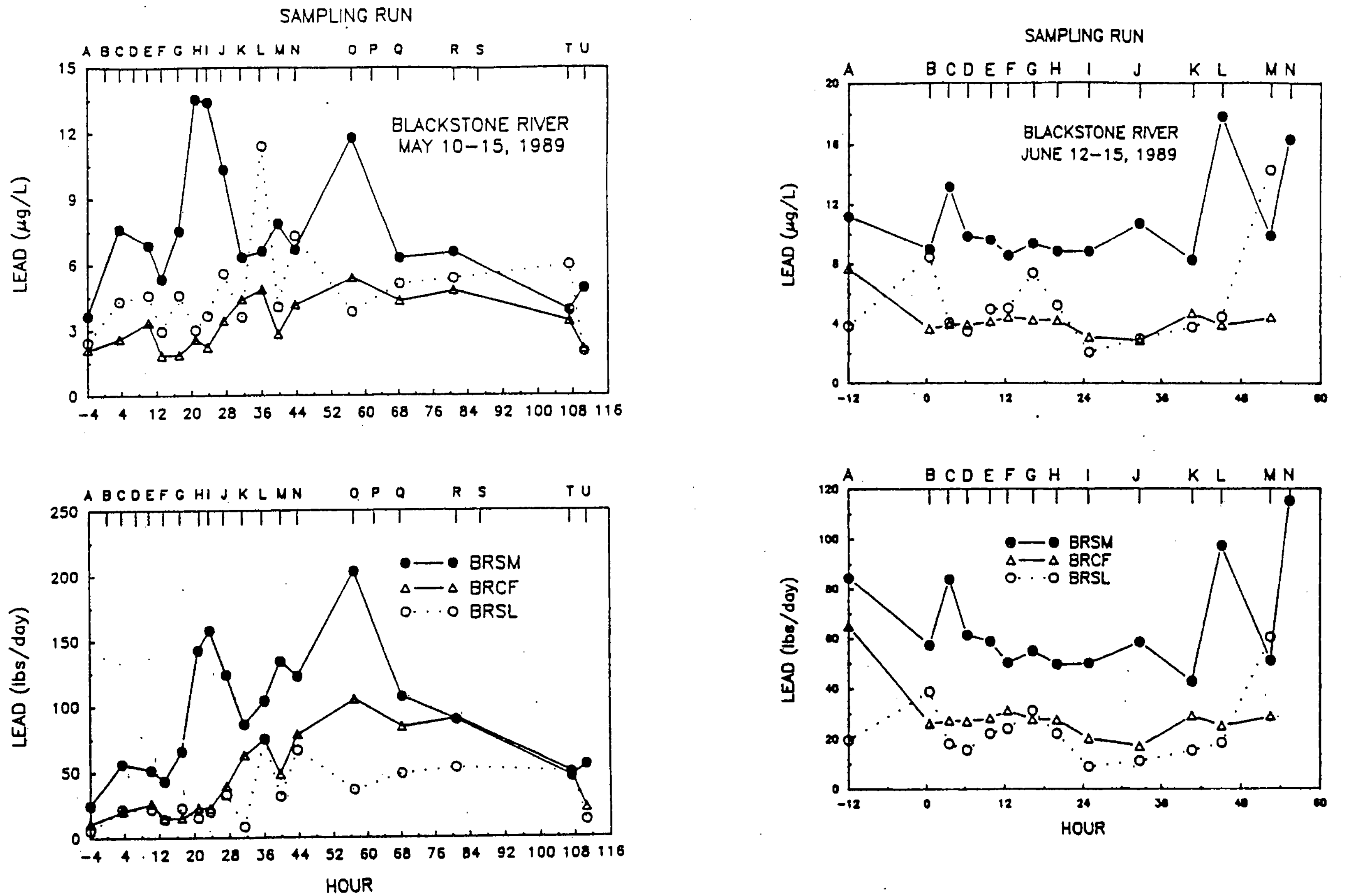


Figure A1-12 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Lead

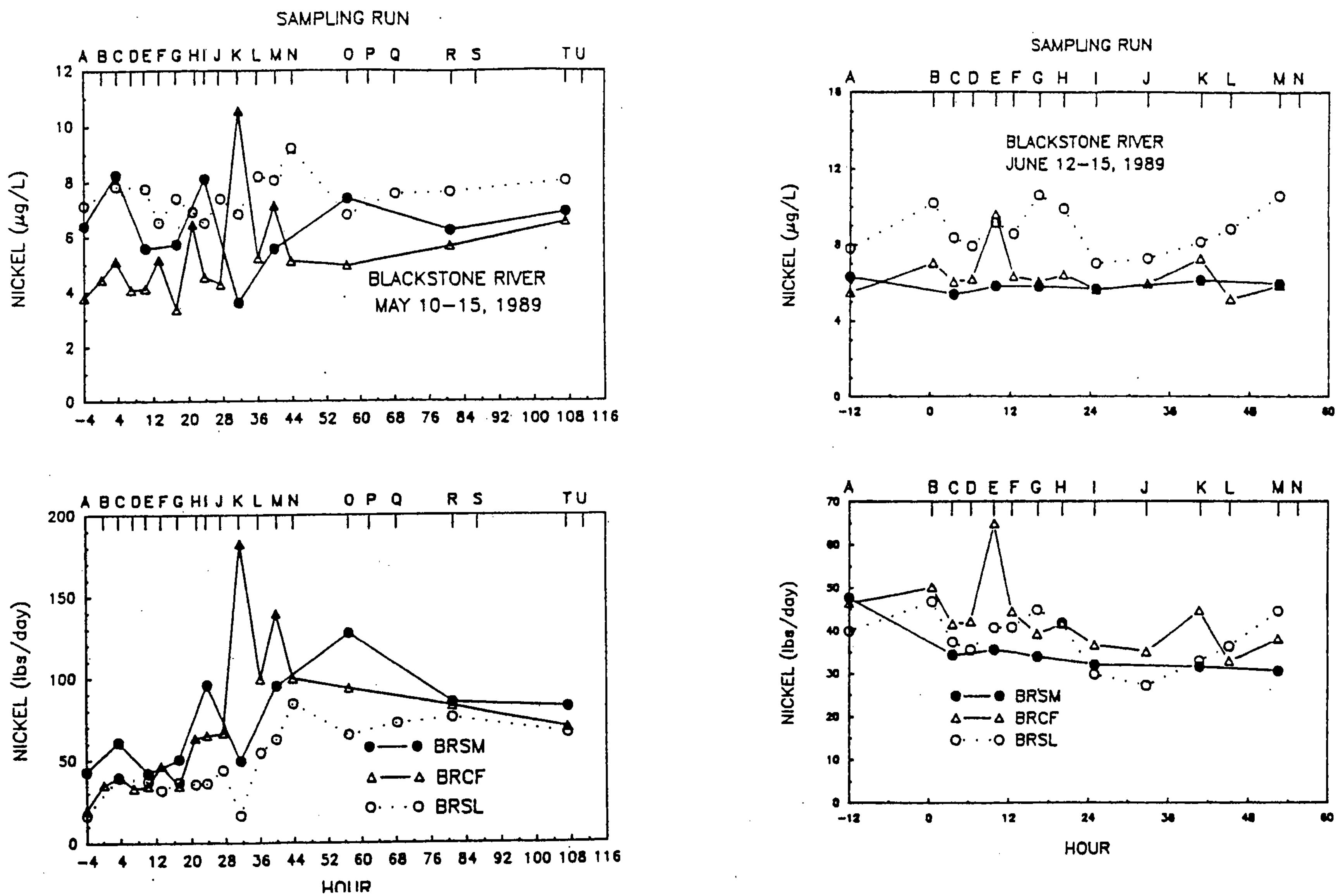


Figure A1-13 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Nickel

Figure Set 3

DISSOLVED AMMONIA
DISSOLVED NITRATE
DISSOLVED ORTHOPHOSPHATE

Event 1: October 22-26, 1988
Event 2: May 10-15, 1989
Event 3: June 12-15, 1989

Note:
Unless otherwise noted, graph lines pertain to Blackstone River Station BRSM (Slater's Mills)

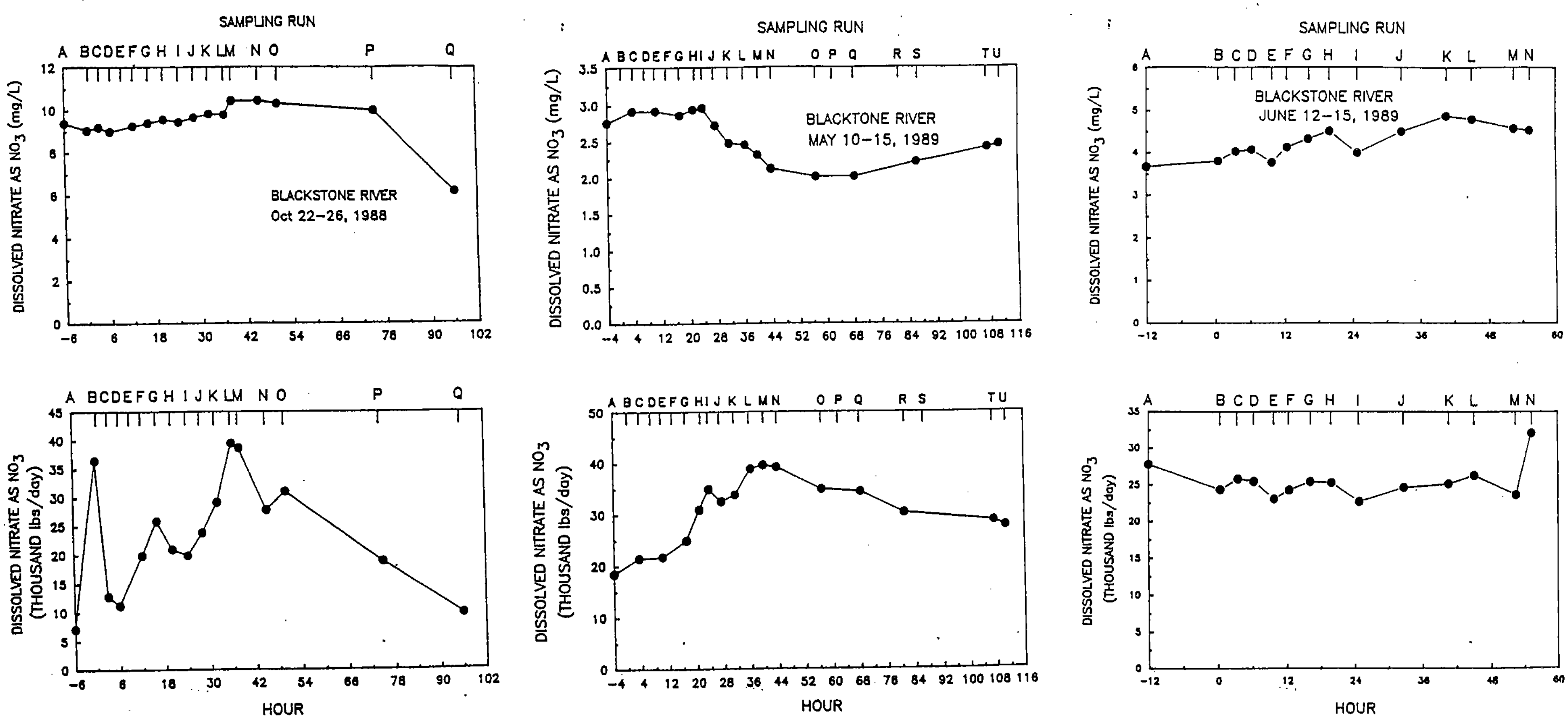

SAMPLING RUN
BLACKSTONE RIVER
Oct 22-26, 1988
BLACKTONE RIVER
MAY 10-15, 1989
BLACKSTONE RIVER
JUNE 12-15, 1989
DISSOLVED NITRATE AS NO_3 (mg/L)
DISSOLVED NITRATE AS NO_3 (THOUSAND lbs/day)
HOUR

Figure A1-14

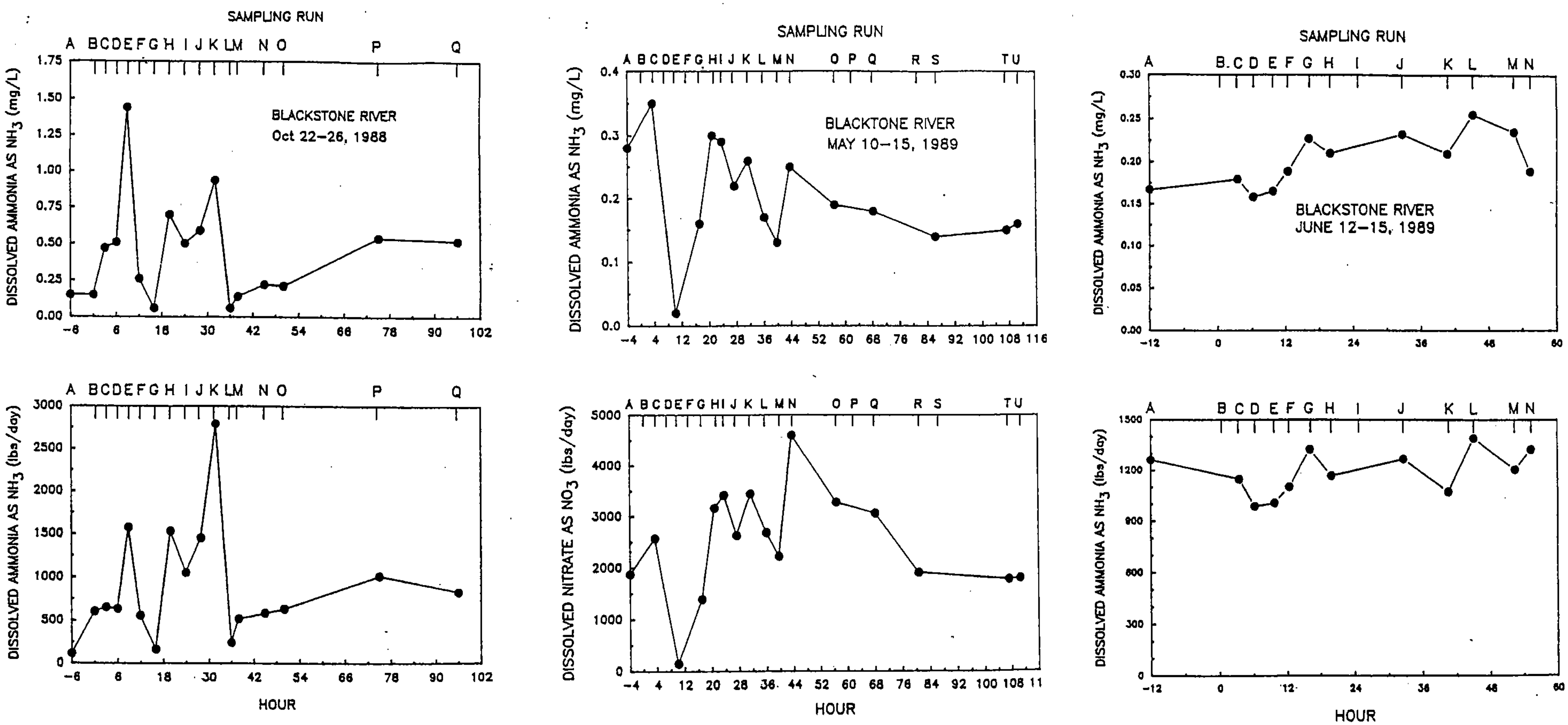

SAMPLING RUN
BLACKSTONE RIVER
Oct 22-26, 1988
DISSOLVED AMMONIA AS NH_3 (mg/L)
DISSOLVED AMMONIA AS NH_3 (lbs/day)
HOUR
BLACKTONE RIVER
MAY 10-15, 1989
DISSOLVED NITRATE AS NO_3 (lbs/day)
BLACKSTONE RIVER
JUNE 12-15, 1989

Figure A1-15

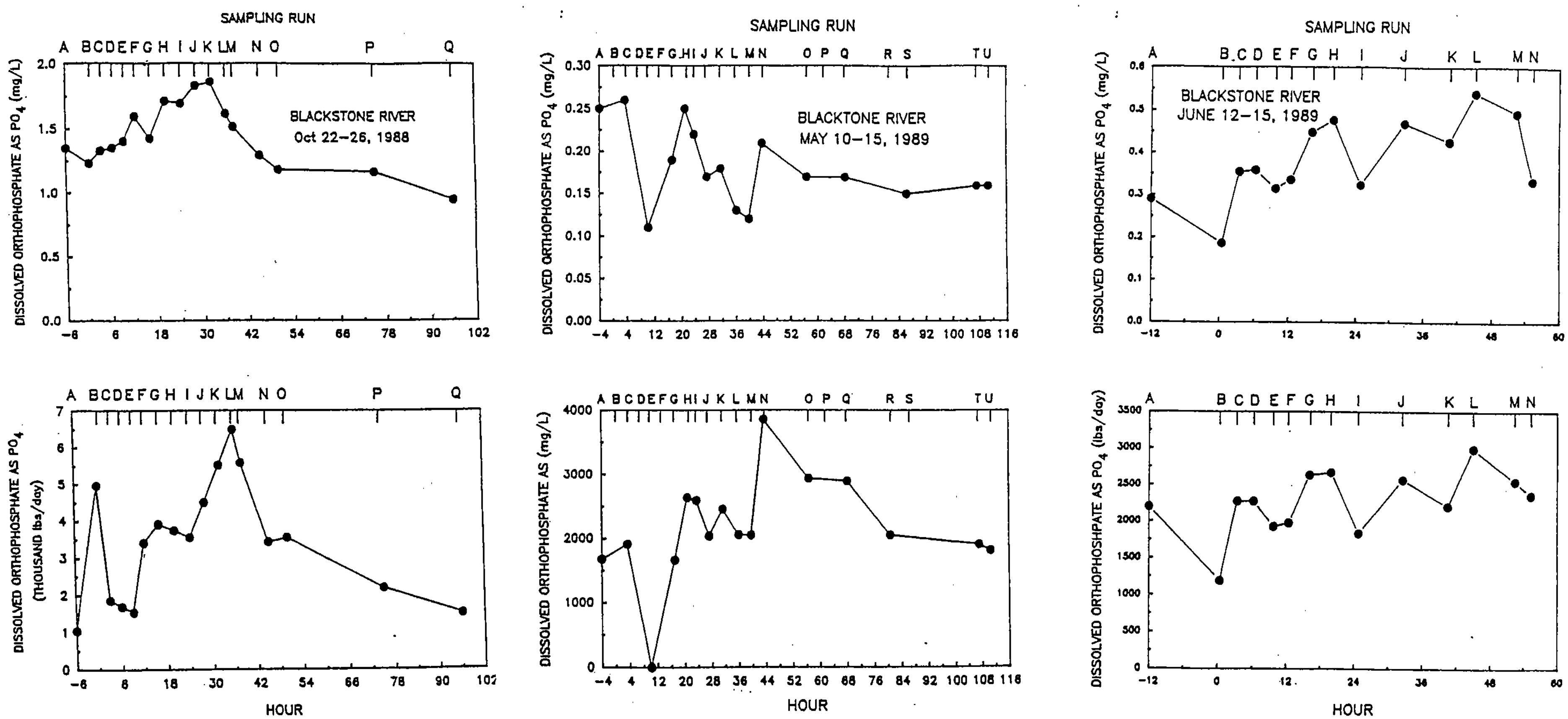

SAMPLING RUN
BLACKSTONE RIVER
Oct 22–26, 1988
DISSOLVED ORTHOPHOSPHATE AS PO_4 (mg/L)
DISSOLVED ORTHOPHOSPHATE AS PO_4 (THOUSAND lbs/day)
HOUR
SAMPLING RUN
BLACKTONE RIVER
MAY 10–15, 1989
DISSOLVED ORTHOPHOSPHATE AS PO_4 (mg/L)
DISSOLVED ORTHOPHOSPHATE AS (mg/L)
HOUR
SAMPLING RUN
BLACKSTONE RIVER
JUNE 12–15, 1989
DISSOLVED ORTHOPHOSPHATE AS PO_4 (mg/L)
DISSOLVED ORTHOPHOSHPATE AS PO_4 (lbs/day)
HOUR

Figure A1-16

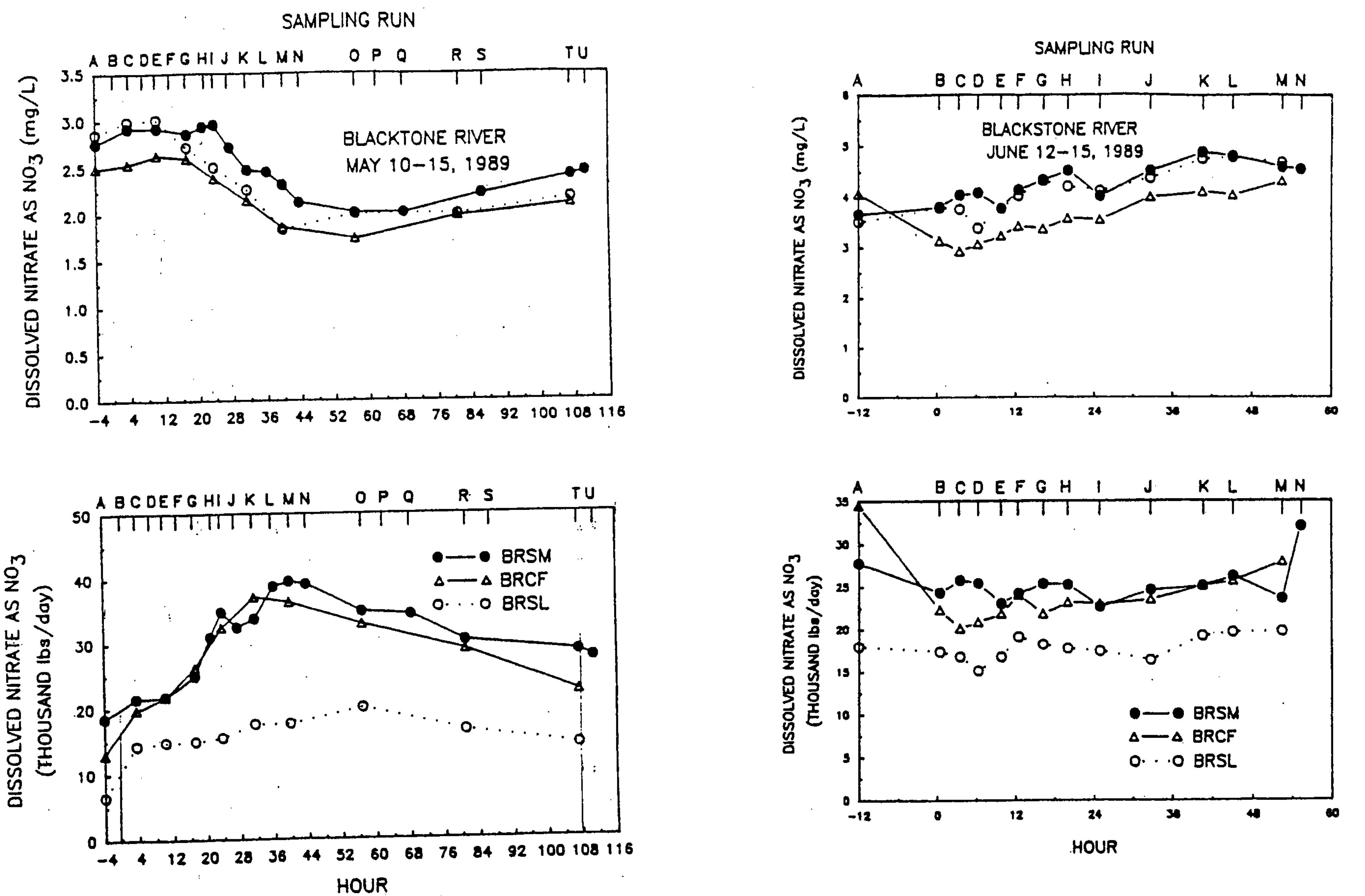


Figure A1-17 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Nitrate

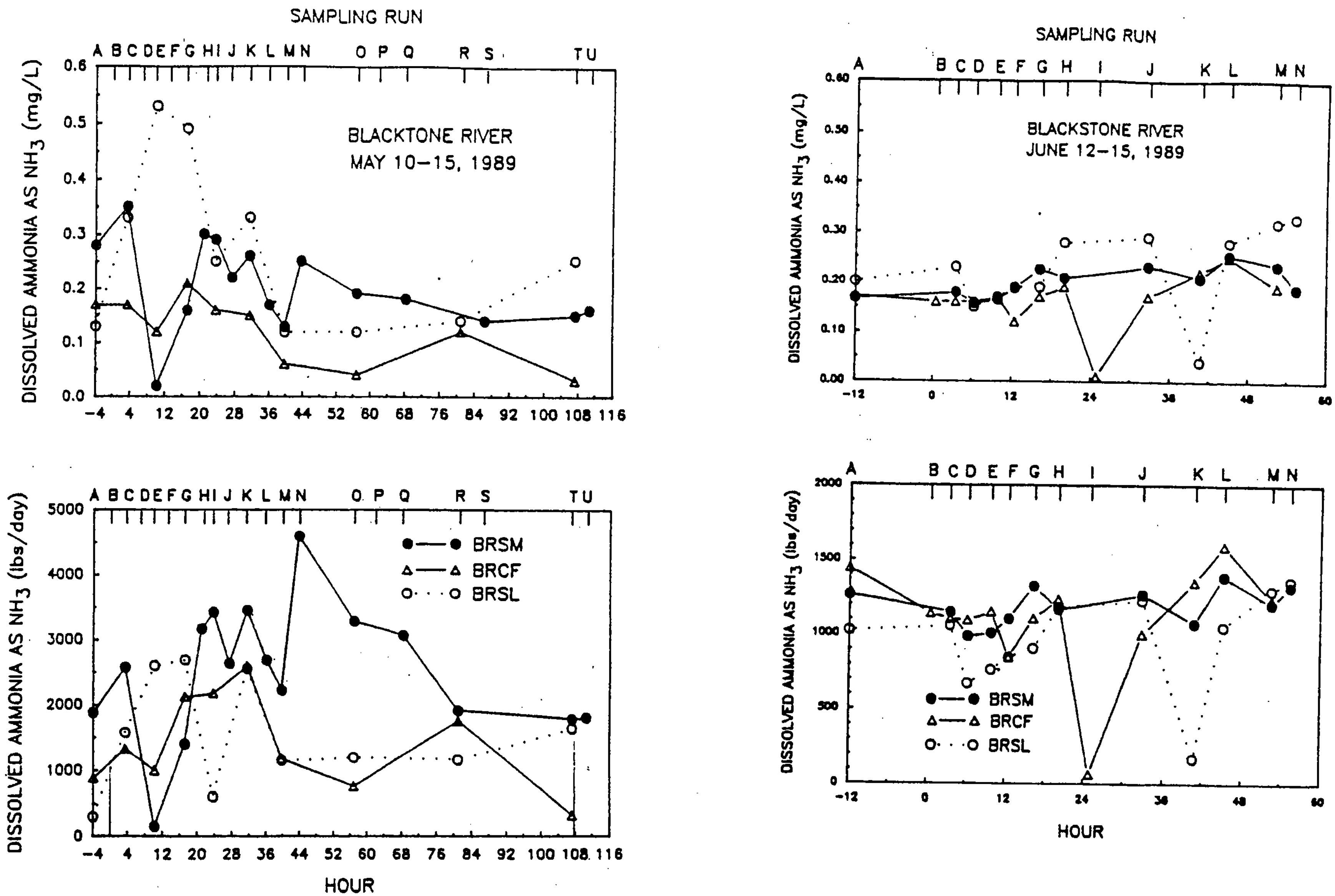


Figure A1-18 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Ammonia

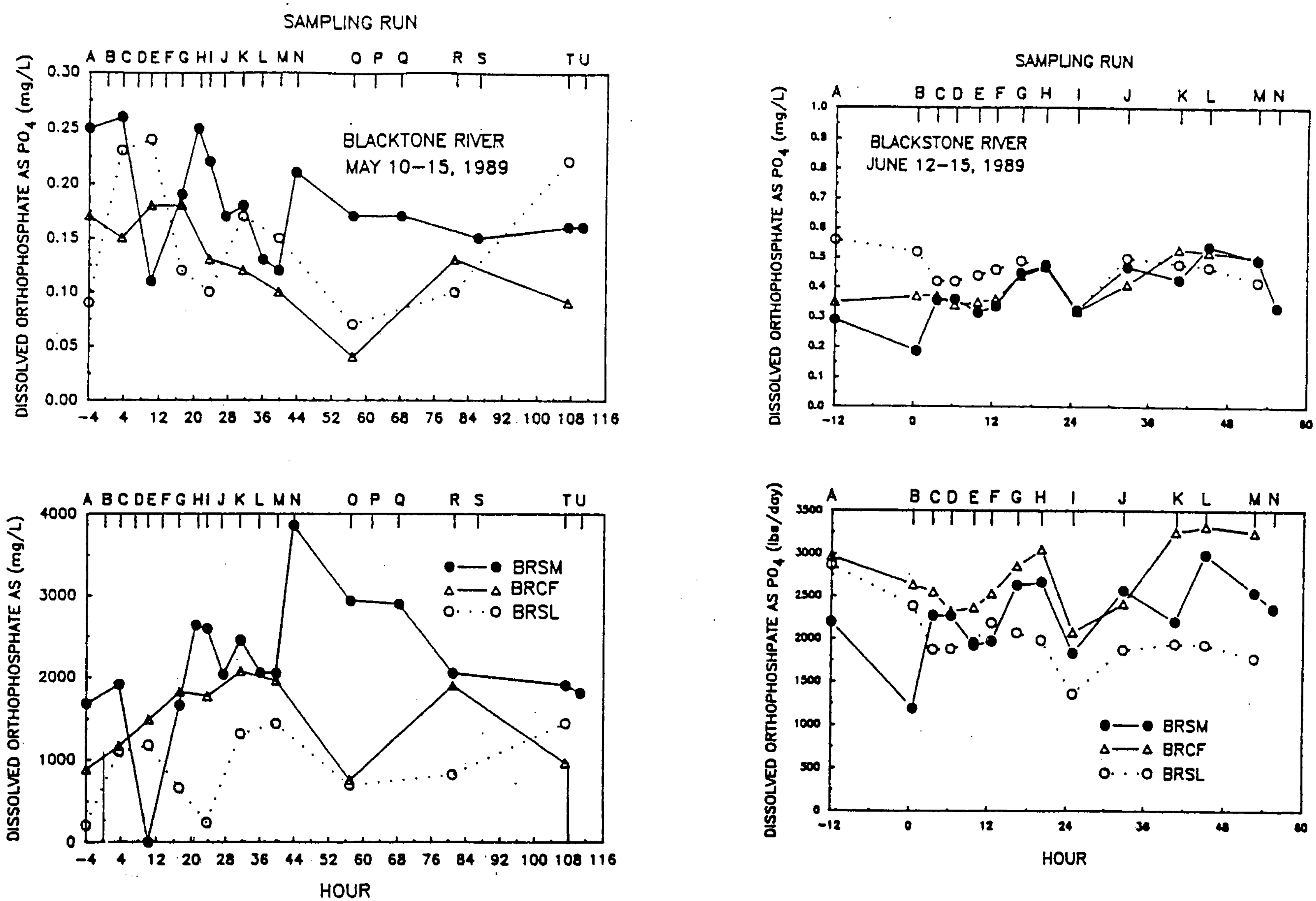


Figure A1-19 Comparison of the Blackstone River Station at Slater's Mill to the State Line Station and Central Falls Station for Orthophosphate

Figure Set 4

FECAL COLIFORM

Event 1: October 22-26, 1988
Event 2: May 10-15, 1989
Event 3: June 12-15, 1989

Note:
Unless otherwise noted, graph lines pertain to Blackstone River Station BRSM (Slater's Mills)

Figure A1-20 Indicator Inputs From Blackstone River (Event 1)

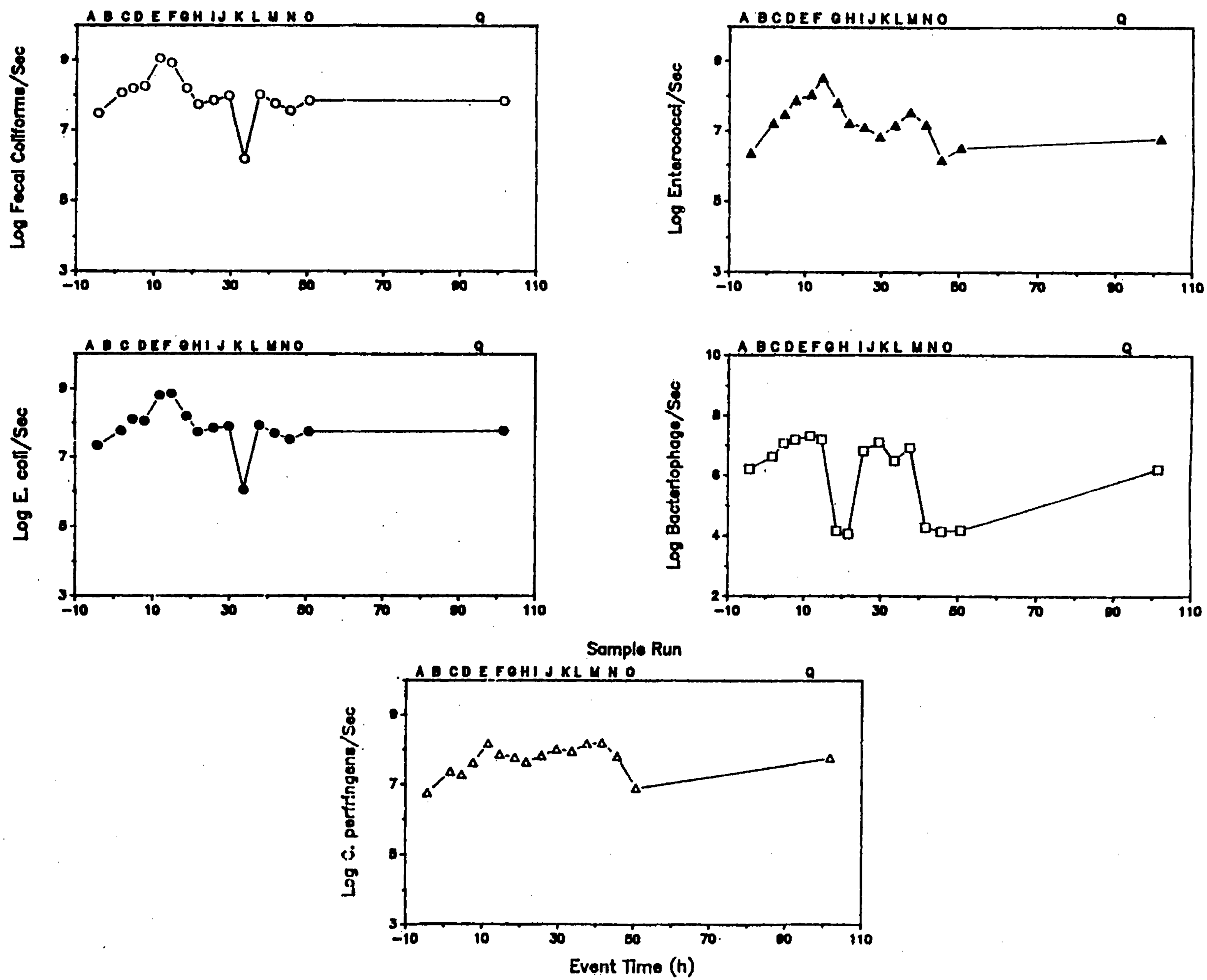


Figure A1-21 Indicator Inputs From Blackstone River (Event 2)

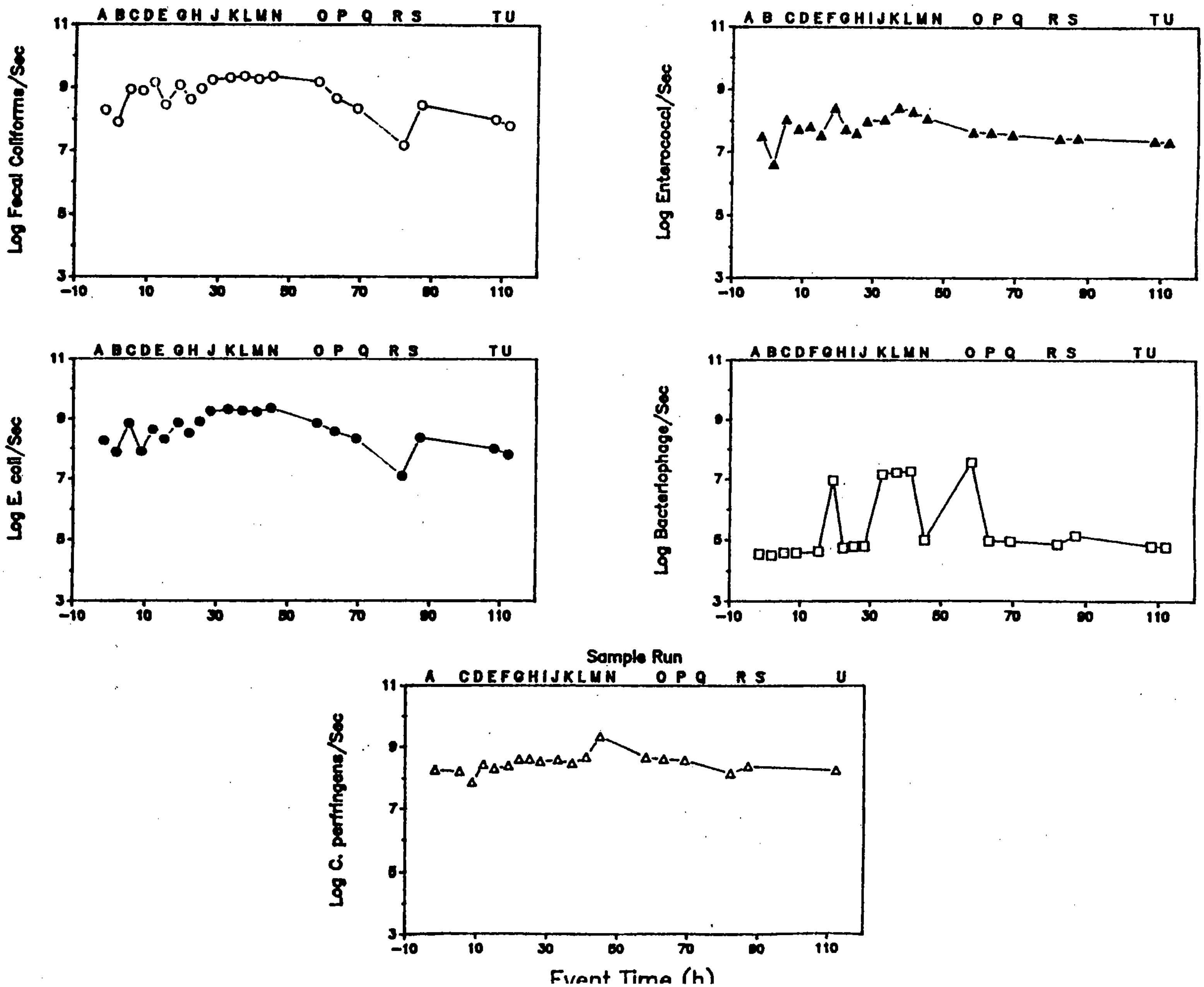
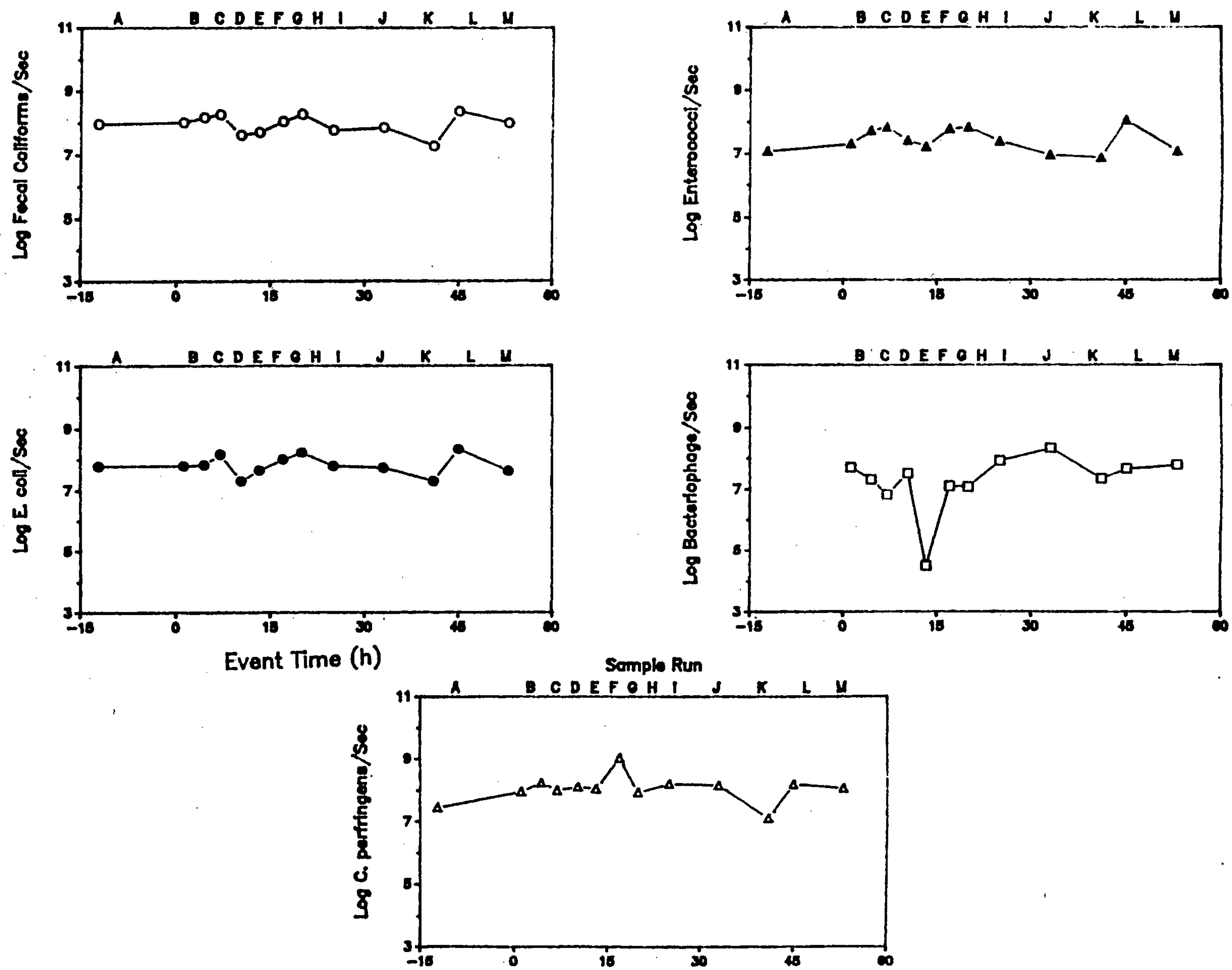


Figure A1-22 Indicator Inputs From Blackstone River (Event 3)

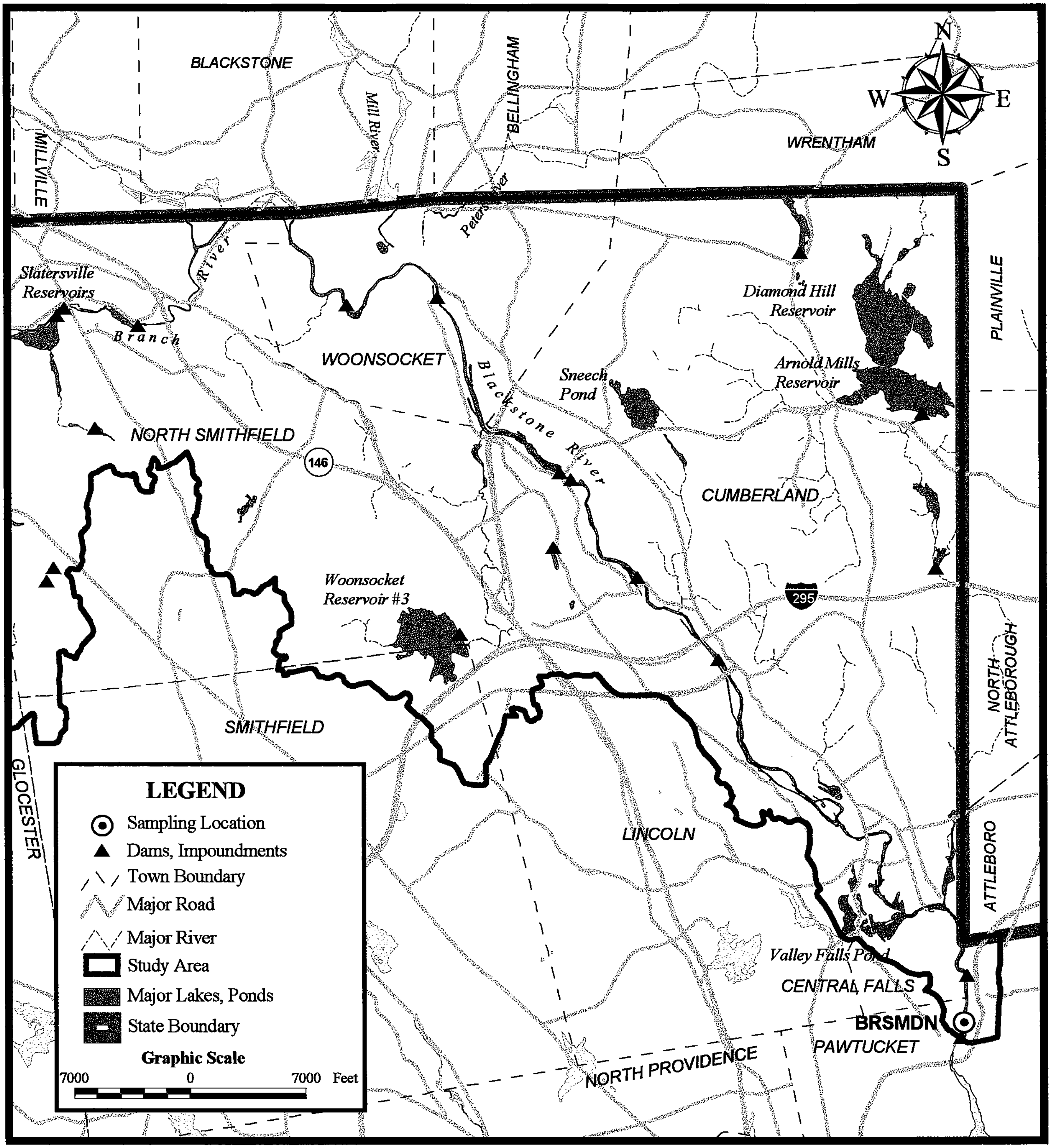


Appendix 2

Systemwide Modeling for the Providence Area Combined Sewer System

Wet Weather Sampling

(URI, 1992)



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr	May 2002

Blackstone River Water Quality

Figure A2-1
URI WET WEATHER STUDY, 1992

Figure A2-1

URI Sampling for CSO Modeling and IIC Facility (pre-construction), 1990 (URI, 1992; Wright et al., 1993)

	Station No. **Station Name** Appr. Location	**BRSMDN:** **Blackstone River,** Downstream (Slater's Mill)													
	Dry Weather, Rainfall, or Period after Rain	**Date**	**Time** *(h)*	**Temperature** *(deg. C)*	**Conductivity** *(umho/cm)*	**Fecal Coliform** *(MPN/100 ml)*	**Flow** *(cfs)*	**Diss. Oxygen** *(mg/l)*	**TSS** *(mg/l)*	**Nitrite + Nitrate** *(mg/l as N)*	**PO4** *(mg/l as P)*	**BOD5 **** *(mg/l)*	**Cu, total** *(ug/l)*	**Pb, total** *(ug/l)*	**Ni, total** *(ug/l)*
	Dry	5/29/90	1029	16.5	170	68	823	9.6	2.2	1.196	0.053	<1	6.0	1.8	5.5
S	Rain	5/29/90	1506	16.5	165	90	779	9.6	3.0	1.001	0.060	<1	5.1	2.7	4.6
T	Rain	5/29/90	1821	16.0	155	4,000	844	9.3	4.0	1.013	0.063	<1	5.2	1.7	4.4
O	Rain	5/29/90	2059	15.8	155	3,300	887	9.2	4.6	0.973	0.059	3	6.2	4.8	3.8
R	Rain	5/29/90	2329	15.5	150	2,600	945	9.0	5.6	0.992	0.052	<1	6.2	3.8	4.9
M	Rain	5/30/90	0245	15.2	159	570	991	8.6	5.2	1.066	0.088	<1	5.6	2.5	4.1
	Rain	5/30/90	0617	15.2	153	730	1,159	8.9	7.2	1.128	0.086	<1	6.1	3.1	4.3
1	24h	5/30/90	1015	15.1	154	2,000	1,285	9.1	3.2	0.910	0.086	4	6.6	3.3	4.6
	24h	5/30/90	1404	15.5	145	680	1,552	9.6	7.0	0.823	0.065	<1	7.3	4.3	3.9
	24h	5/30/90	1853	15.4	16.5	3,700	1,721	9.6	4.6	0.887	0.070	<1	7.5	4.0	4.7
	24h	5/30/90	2150	14.5	135	3,400	1,882	9.5	4.0	0.914	0.051	<1	8.1	4.1	4.6
	24h	5/31/90	0220	14.0	130	1,700	2,034	10.1	12.2	0.837	0.082	<1	8.5	4.4	4.0
	24h	5/31/90	0613	13.8	131	3,700	2,019	9.0	12.4	0.926	0.077	4	4.0	1.2	4.0
	48h	5/31/90	1022	14.8	137	2,100	2,003	9.6	10.6	0.731	0.053	2	9.8	4.8	5.1
	48h														
	48h	6/1/90	0930	16.0	132	...	1,580	9.9	11.6	0.605	0.104	3	7.1	3.0	4.0
	72h														
	72h	6/2/90	0855	16.8	148	...	1,171	11.2	5.2	0.623	0.068	...	5.9	2.4	4.2
	96h														
	96h														
S	Dry	6/29/90	1620	24.2	290	220	349	8.4	5.5	1.504	0.302	2	7.5	1.5	6.1
T	Rain	6/29/90	2228	23.7	285	290	333	8.2	4.2	1.553	0.242	3	7.7	3.7	6.4
O	24h	6/30/90	0141	23.0	280	460	357	7.6	4.0	1.600	0.231	4	8.1	3.9	6.1
R	24h	6/30/90	0432	22.8	280	200	178	7.7	6.5	1.723	0.287	2	9.2	5.5	6.9
M	24h	6/30/90	0731	28.9	280	...	432	7.5	2.5	1.520	0.214	...	9.4	7.2	6.5
2	24h	6/30/90	1140	22.0	270	160	310	7.8	4.0	1.834	0.239	<1	9.1	12.6	6.8
	Dry	7/11/90	2017	22.5	285	820	108	7.9	5.2	1.589	0.204	<1	9.9	3.2	6.3
S	Rain	7/12/90	1042	21.0	270	1,000	103	8.1	4.8	1.684	0.274	<1	79.4	22.0	11.7
T	Rain	7/12/90	1345	21.0	269	250	119	7.8	3.4	1.472	0.234	<1	8.6	2.7	5.1
O	Rain	7/12/90	1652	21.0	275	5,000	326	8.2	5.4	1.712	0.293	<1	10.7	7.2	6.2
R	Rain	7/12/90	1940	20.0	246	23,000	449	7.6	12.8	1.503	0.289	<1	9.3	3.0	5.5
M	Rain	7/12/90	2249	20.0	320	9,100	365	8.6	6.2	1.622	0.300	<1	9.9	7.3	5.3
	Rain	7/13/90	0215	20.2	280	1,500	365	8.2	6.6	1.586	0.246	<1	10.1	6.6	6.1
3	Rain	7/13/90	0554	20.0	267	730	341	8.1	7.2	1.532	0.244	<1	10.5	4.6	6.3
	24h	7/13/90	1112	20.6	290	680	407	8.0	6.6	1.771	0.382	<1	9.6	1.2	6.5
	24h	7/13/90	1429	21.2	290	550	398	8.1	7.0	1.716	0.385	<1	12.5	6.7	10.8
	24h	7/13/90	1821	21.7	280	870	407	8.8	7.6	1.585	0.251	<1	11.9	5.7	6.2
	24h	7/13/90	2213	21.1	249	820	365	8.2	2.6	1.642	0.302	1	12.9	6.0	5.9
	24h	7/14/90	0203	20.1	228	780	398	8.3	8.8	1.487	0.315	1	11.6	5.6	5.1
	24h	7/14/90	0538	19.3	206	570	318	8.3	6.6	1.459	0.238	1	14.2	6.8	5.7
	48h														
	72h	7/15/90	0747	21.5	250	...	318	8.7	8.6	1.778	0.229	...	10.6	6.2	6.1
	72h														
	96h														
	96h	7/16/90	1236	16.5	288	...	606	7.9	5.0	1.849	0.234	...	11.5	5.2	6.5
	120h														
	Dry	9/22/90	0825	15.5	215	110	108	10.0	0.8	1.166	0.250	<1	14.2	4.5	8.8
S	Rain	9/22/90	1405	15.2	220	210	147	10.0	2.4	1.919	0.276	<1	10.5	2.2	7.8
T	Rain	9/22/90	1856	15.0	230	340	65	9.9	1.8	1.330	0.223	<1	6.9	2.1	7.0
O	Rain	9/22/90	2220	15.1	230	10,000	637	9.8	2.6	1.496	0.306	5	11.4	2.7	8.6
R	24h	9/23/90	0130	15.1	190	31,000	114	9.6	3.0	1.085	0.298	<1	8.9	4.4	7.4
M	24h	9/23/90	0520	15.0	219	5,200	130	9.8	1.8	1.279	0.281	<1	7.6	2.9	7.5
	24h	9/23/90	0915	14.9	209	950	204	6.6	2.2	1.627	0.261	<1	9.4	3.3	7.5
4	24h	9/23/90	1430	15.8	230	570	217	9.9	1.2	1.364	0.293	<1	9.0	2.3	6.5
	24h	9/23/90	1815	16.2	238	630	230	9.6	1.0	1.399	0.305	<1	7.9	2.7	6.4
	24h	9/23/90	2120	15.8	238	410	230	9.6	1.8	1.516	0.296	<1	7.9	2.7	5.7
	48h	9/24/90	0200	15.4	232	510	...	9.5	1.0	1.516	0.308	<1	9.1	1.8	6.8
	48h	9/24/90	0510	15.0	235	660	...	9.4	0.8	1.519	0.242	<1	5.3	1.6	5.2
	48h	9/24/90	0955	15.1	229	100	172	9.7	0.8	1.470	0.283	<1	5.5	1.0	4.5

Figure A2-1

URI Sampling for CSO Modeling and IIC Facility (pre-construction), 1990 (URI, 1992; Wright et al., 1993)

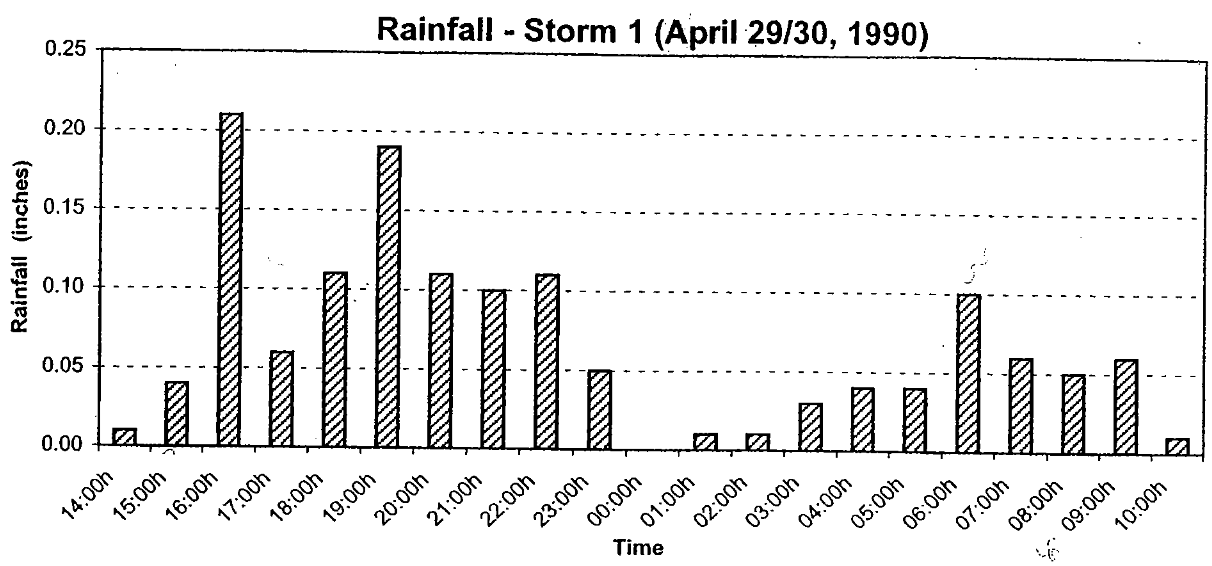
	Dry Weather, Rainfall, or Period after Rain	Date	Time (h)	Temperature (deg. C)	Conductivity (umho/cm)	Fecal Coliform (MPN/100 ml)	Flow (cfs)	Diss. Oxygen (mg/l)	TSS (mg/l)	Nitrite + Nitrate (mg/l as N)	PO4 (mg/l as P)	BOD5 ** (mg/l)	Cu, total (ug/l)	Pb, total (ug/l)	Ni, total (ug/l)
	Dry Weather														
S	Count, all storms		4	4	4	4	4	4	4	4	4	4	4	4	4
T	**Mean(*), all storms**		**185**	**19**	**234**	**192**	**347**	**9.0**	**3.4**	**1.364**	**0.202**	**0.9**	**9.4**	**2.8**	**6.7**
A	Minimum, all storms		1	16	170	68	108	7.9	0.8	1.166	0.053	0.5	6.0	1.5	5.5
T	Maximum, all storms		1,620	24	290	820	823	10.0	5.5	1.589	0.302	2.0	14.2	4.5	8.8
I	**Wet Weather**														
S	*- during storm*														
T	Count, Storms 1,3,4		16	16	16	16	16	16	16	16	16	16	16	16	16
I	Mean(*) Storm 1		1,121	16	156	1,043	934	9.1	4.9	1.029	0.068	0.9	5.7	3.1	4.4
C	Mean(*) Storm 2		2,228	24	285	290	333	8.2	4.2	1.553	0.242	3.0	7.7	3.7	6.4
S	Mean(*) Storm 3		0	20	275	2,244	295	8.1	6.6	1.587	0.269		19.8	7.6	6.6
	Mean(*) Storm 4		1,796	15	227	894	283	9.9	2.3	1.582	0.268	2.0	9.6	2.3	7.8
	Mean(*) Storms 1,3,4		**96**	**17**	**213**	**1,279**	**504**	**9.0**	**4.6**	**1.399**	**0.202**	**1.5**	**11.7**	**4.4**	**6.3**
	Minimum, Storms 1,3,4		0	15	150	90	65	7.6	1.8	0.973	0.052	0.5	5.1	1.7	3.8
	Maximum, Storms 1,3,4		2,329	21	320	23,000	1,159	10.0	12.8	1.919	0.306	5.0	79.4	22.0	11.7
	Wet Weather														
	- up to 24h after storm														
	Count, Storms 1,3,4		34	34	34	34	34	34	34	34	34	34	34	34	34
	Mean(*) Storm 1		1,036	15	123	1,508	1,342	9.3	6.1	0.956	0.070	1.3	6.4	3.3	4.3
	Mean(*) Storm 2		647	24	279	256	322	7.8	4.2	1.646	0.243	2.4	8.7	6.6	6.5
	Mean(*) Storm 3		0	21	265	1,312	335	8.2	6.6	1.598	0.289	0.6	16.2	6.6	6.6
	Mean(*) Storm 4		1,078	15	222	1,362	219	9.4	2.0	1.446	0.282	1.0	8.8	2.8	7.2
	Mean(*) Storms 1,3,4		**78**	**17**	**194**	**1,391**	**632**	**9.0**	**4.9**	**1.333**	**0.214**	**1.0**	**10.5**	**4.2**	**6.0**
	Minimum, Storms 1,3,4		0	14	17	90	65	6.6	1.0	0.823	0.051	0.5	4.0	1.2	3.8
	Maximum, Storms 1,3,4		2,329	22	320	31,000	2,034	10.1	12.8	1.919	0.385	5.0	79.4	22.0	11.7
	Wet Weather														
	- up to 48h after storm														
	Count, Storms 1,3,4		39	39	39	38	37	39	39	39	39	37	39	39	39
	Mean(*) Storm 1		1,027	15	125	1,547	1,328	9.4	6.8	0.915	0.071	1.5	6.7	3.4	4.4
	Mean(*) Storm 2														
	Mean(*) Storm 3		0	21	265	1,312	310	8.2	6.6	1.598	0.289	0.6	16.2	6.6	6.6
	Mean(*) Storm 4		871	15	225	950	180	9.4	1.7	1.460	0.281	0.9	8.3	2.5	6.7
	Mean(*) Storms 1,3,4		**72**	**17**	**195**	**1,245**	**420**	**9.0**	**5.0**	**1.324**	**0.214**	**1.0**	**10.4**	**4.2**	**5.9**
	Minimum, Storms 1,3,4		0	14	17	90	65	6.6	0.8	0.605	0.051	0.5	4.0	1.0	3.8
	Maximum, Storms 1,3,4		2,329	22	320	31,000	2,034	10.1	12.8	1.919	0.385	5.0	79.4	22.0	11.7
	Wet Weather														
	- Days 3 to 5 after storm														
	Count, Storms 1,3														
	Mean(*) Storm 1														
	Mean(*) Storm 2														
	Mean(*) Storm 3														
	Mean(*) Storm 4														
	Mean(*) Storms 1,3														
	Minimum, Storms 1,3														
	Maximum, Storms 1,3														

(*) Mean is geometric for fecal coliform.

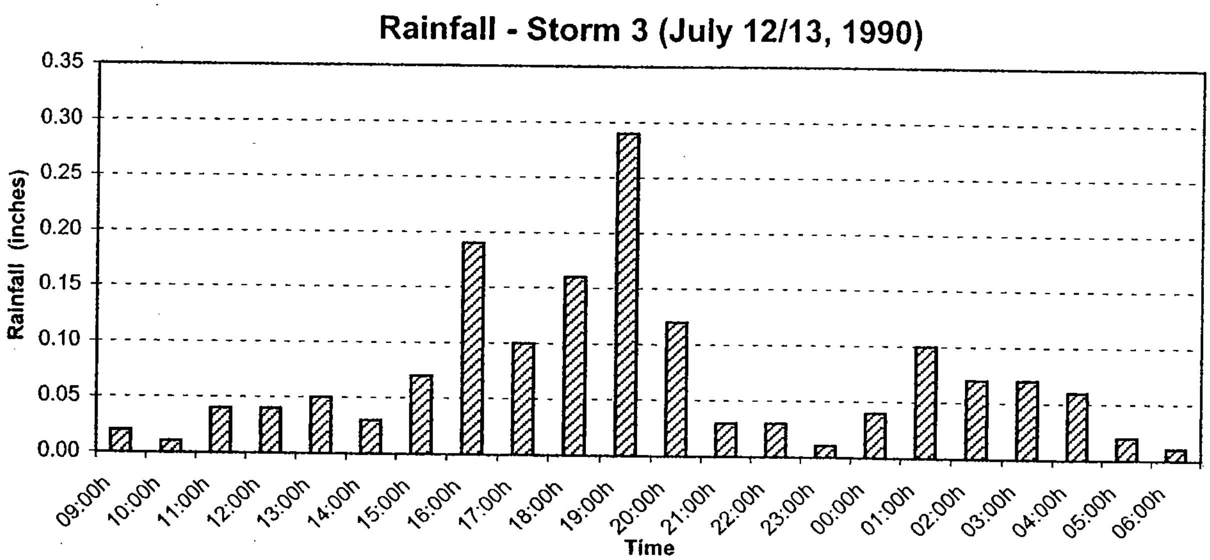
(**) Data reported by New England Testing Laboratory, Inc.

... Not determined.

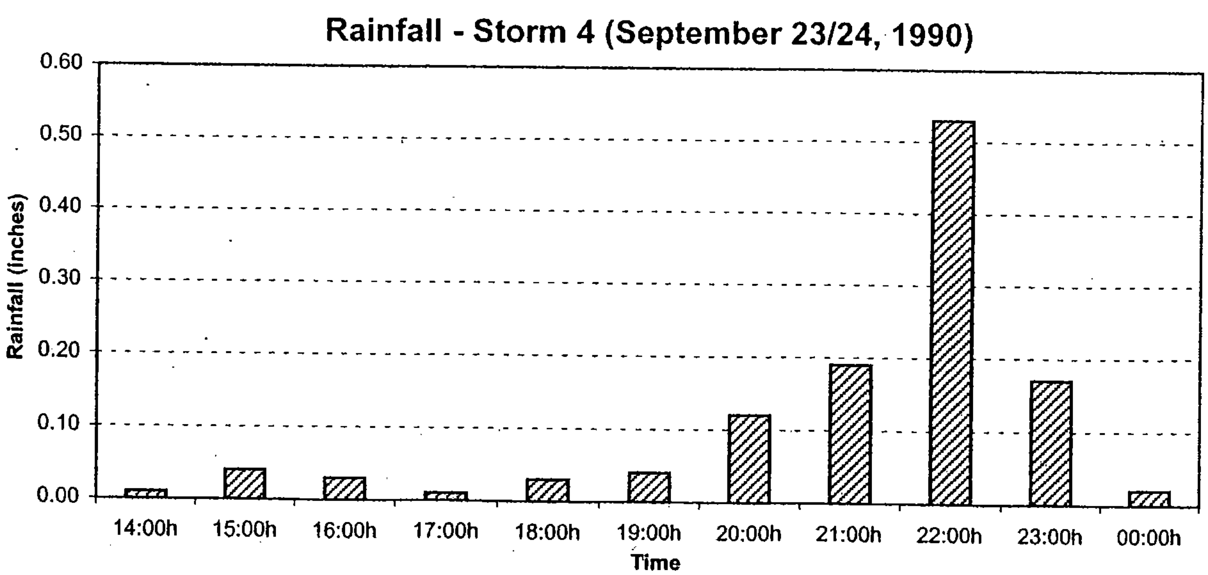
Figure A2-1b



Rainfall - Storm 1 (April 29/30, 1990)
Rainfall (inches)
0.25
0.20
0.15
0.10
0.05
0.00
14:00h
15:00h
16:00h
17:00h
18:00h
19:00h
20:00h
21:00h
22:00h
23:00h
00:00h
01:00h
02:00h
03:00h
04:00h
05:00h
06:00h
07:00h
08:00h
09:00h
10:00h
Time



Rainfall - Storm 3 (July 12/13, 1990)
Rainfall (inches)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
09:00h
10:00h
11:00h
12:00h
13:00h
14:00h
15:00h
16:00h
17:00h
18:00h
19:00h
20:00h
21:00h
22:00h
23:00h
00:00h
01:00h
02:00h
03:00h
04:00h
05:00h
06:00h
Time



Rainfall - Storm 4 (September 23/24, 1990)
Rainfall (inches)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
14:00h
15:00h
16:00h
17:00h
18:00h
19:00h
20:00h
21:00h
22:00h
23:00h
00:00h
Time

Table A2-2 Rainfall Hyetographs for May to October 1990

Date	Time	Rain		Date	Time	Rain		Date	Time	Rain		Date	Time	Rain	
05/21/90	0800	0.01		07/01/90	2000	1.19		07/27/90	0800	0.00		09/22/90	1700	0.01	
05/21/90	0900	0.08		07/01/90	2100	0.12		07/27/90	0900	0.02		09/22/90	1800	0.03	
05/21/90	1000	0.06		07/01/90	2200	0.01		08/06/90	2100	0.08		09/22/90	1900	0.04	
05/21/90	1100	0.07		07/12/90	0900	0.02		08/06/90	2200	0.01		09/22/90	2000	0.12	
05/21/90	1200	0.05		07/12/90	1000	0.01		08/06/90	2300	0.02		09/22/90	2100	0.19	Storm 4
05/21/90	1300	0.02		07/12/90	1100	0.04		07/08/90	0400	0.18		09/22/90	2200	0.53	
05/29/90	1400	0.01		07/12/90	1200	0.04		07/08/90	0500	0.46		09/22/90	2300	0.17	
05/29/90	1500	0.04		07/12/90	1300	0.05		07/08/90	0600	0.56		09/23/90	0000	0.02	
05/29/90	1600	0.21		07/12/90	1400	0.03		07/08/90	0700	0.42		10/04/90	2000	0.02	
05/29/90	1700	0.06		07/12/90	1500	0.07		07/08/90	0800	0.02		10/04/90	2100	0.06	
05/29/90	1800	0.11		07/12/90	1600	0.19		08/11/90	0600	0.01		10/04/90	2200	0.03	
05/29/90	1900	0.19		07/12/90	1700	0.10		08/11/90	0700	0.04		10/04/90	2300	0.09	
05/29/90	2000	0.11		07/12/90	1800	0.16		08/11/90	0800	0.03		10/09/90	0700	0.01	
05/29/90	2100	0.10		07/12/90	1900	0.29		08/11/90	0900	0.11		10/09/90	0800	0.04	
05/29/90	2200	0.11		07/12/90	2000	0.12		08/11/90	1000	0.08		10/09/90	0900	0.09	
05/29/90	2300	0.05		07/12/90	2100	0.03		08/11/90	1100	0.52		10/09/90	1000	0.12	
05/29/90	0000	0.00		07/12/90	2200	0.03	Storm 3	08/11/90	1200	0.91		10/09/90	1100	0.01	
05/29/90	0100	0.01		07/12/90	2300	0.01		08/11/90	1300	0.74		10/12/90	1600	0.02	
05/29/90	0200	0.01		07/13/90	0000	0.04		08/11/90	1400	0.32		10/12/90	1700	0.05	
05/29/90	0300	0.03		07/13/90	0100	0.10		08/11/90	1500	0.12		10/12/90	1800	0.10	
05/29/90	0400	0.04		07/13/90	0200	0.07		08/11/90	1600	0.12		10/12/90	1900	0.05	
05/29/90	0500	0.04	Storm 1	07/13/90	0300	0.07		08/11/90	1700	0.12		10/12/90	2000	0.01	
05/29/90	0600	0.10		07/13/90	0400	0.06		08/24/90	1700	0.01		10/12/90	2100	0.01	
05/29/90	0700	0.06		07/13/90	0500	0.02		08/24/90	1800	0.37		10/13/90	0600	0.08	
05/29/90	0800	0.05		07/13/90	0600	0.01		08/24/90	1900	0.16		10/13/90	0700	0.00	
05/29/90	0900	0.06		07/25/90	0100	0.22		08/24/90	2000	0.02		10/13/90	0800	0.00	
05/29/90	1000	0.01		07/25/90	0200	0.06		08/24/90	2100	0.00		10/13/90	0900	0.33	
06/07/90	0500	0.06		07/25/90	0300	0.00		08/24/90	2200	0.02		10/13/90	1000	0.10	
06/07/90	0600	0.04		07/25/90	0400	0.33		08/24/90	2300	0.12		10/13/90	1100	0.00	
06/07/90	0700	0.02		07/25/90	0500	0.38		08/25/90	0000	0.02		10/13/90	1200	0.06	
06/07/90	0800	0.03		07/25/90	0600	0.15		08/25/90	0100	0.01		10/13/90	1300	0.04	
06/09/90	0800	0.06		07/25/90	0700	0.04		09/15/90	0800	0.01		10/13/90	1400	0.22	
06/09/90	0900	0.19		07/25/90	0800	0.00		09/15/90	0900	0.00		10/13/90	1500	0.00	
06/09/90	1000	0.21		07/25/90	0900	0.00		09/15/90	1000	0.60		10/13/90	1600	0.00	
06/09/90	1800	0.17		07/25/90	1000	0.00		09/15/90	1100	0.05		10/13/90	1700	0.00	
06/09/90	1900	0.79		07/25/90	1100	0.05		09/17/90	0300	0.02		10/13/90	1800	0.02	
06/09/90	2000	0.17		07/25/90	1200	0.00		09/17/90	0400	0.10		10/13/90	1900	0.02	
06/10/90	1900	0.40		07/25/90	1300	0.00		09/17/90	0500	0.07		10/13/90	2000	0.02	
06/10/90	2000	0.12		07/25/90	1400	0.00		09/17/90	0600	0.04		10/14/90	0300	0.03	
06/10/90	2100	0.05		07/25/90	1500	0.20		09/17/90	0700	0.02		10/14/90	0400	0.37	
06/29/90	2200	0.03		07/25/90	1600	0.04		09/22/90	1400	0.01		10/14/90	0500	0.79	
06/29/90	2300	0.09		07/27/90	0500	0.01		09/22/90	1500	0.04	Storm 4	10/14/90	0600	0.17	
06/30/90	0000	0.08		07/27/90	0600	0.02		09/22/90	1600	0.03		10/14/90	0700	0.01	
06/30/90	0100	0.01		07/27/90	0700	0.06									

Figure A2-2
STORM 1: Flow

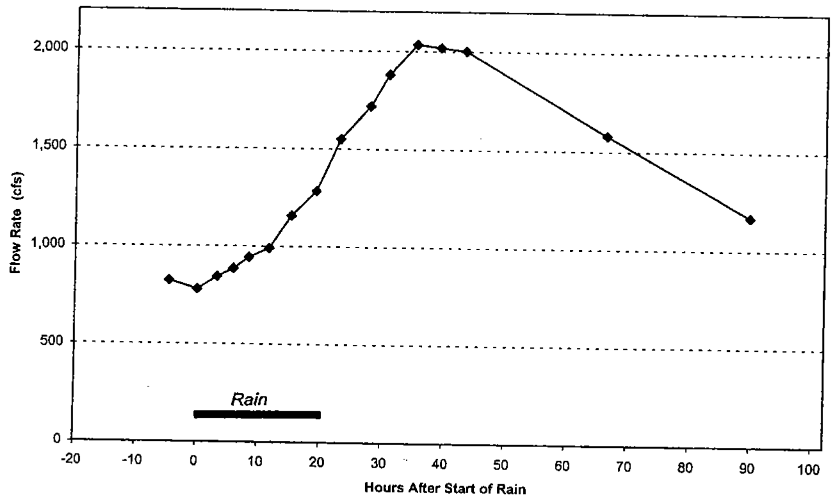


Figure A2-4
STORM 1: Fecal Coliform

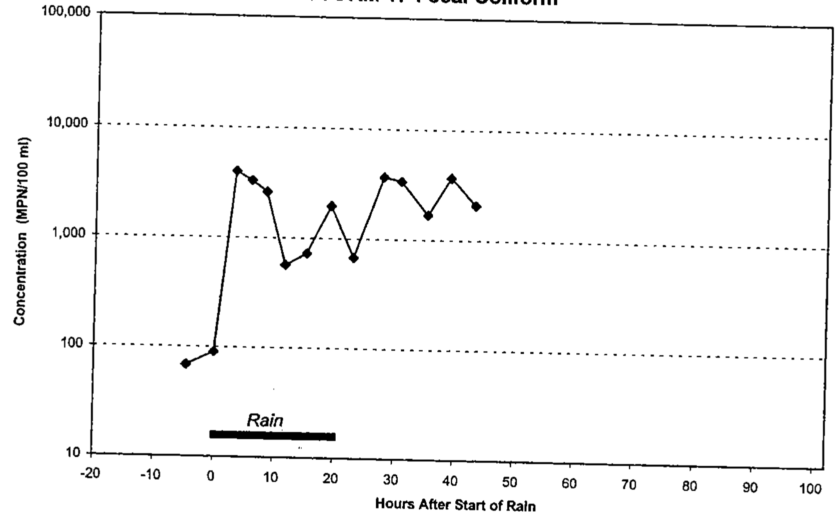


Figure A2-3
STORM 1: Temperature

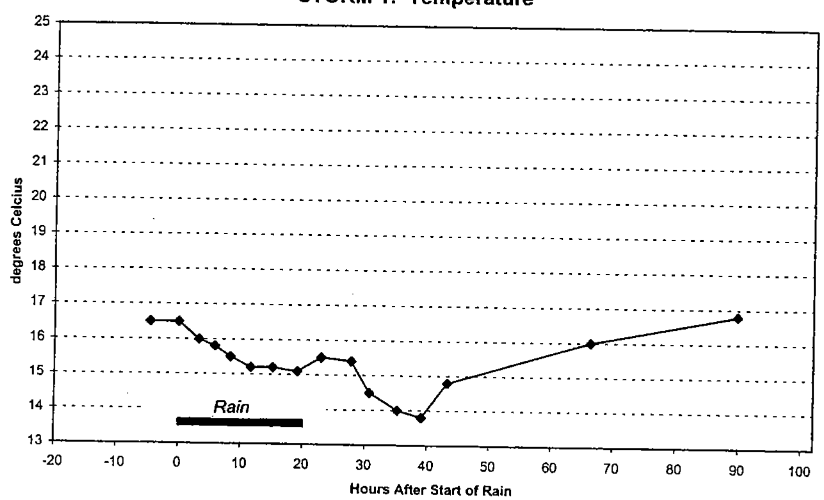


Figure A2-5
STORM 1: Dissolved Oxygen

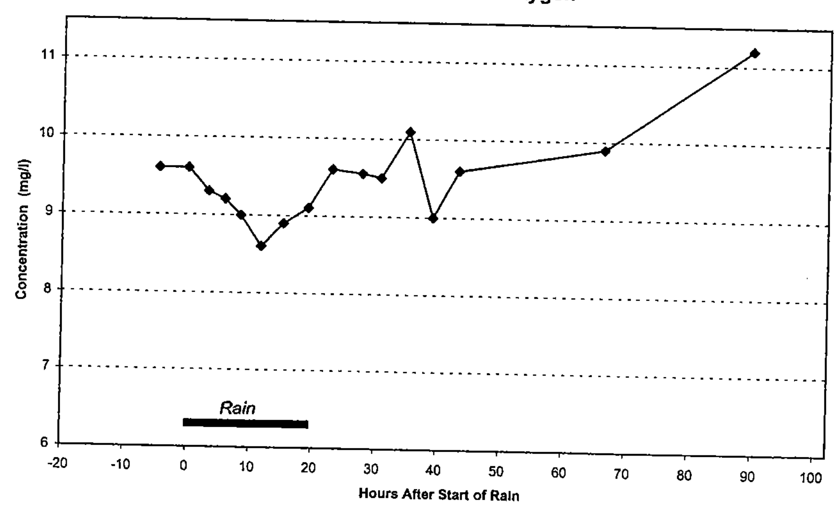


Figure A2-6
STORM 1: Total Suspended Sediment

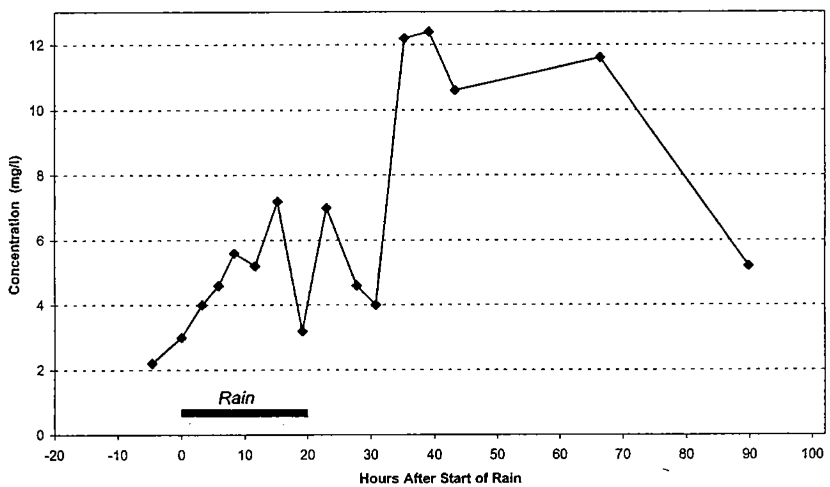


Figure A2-8
STORM 1: Phosphate

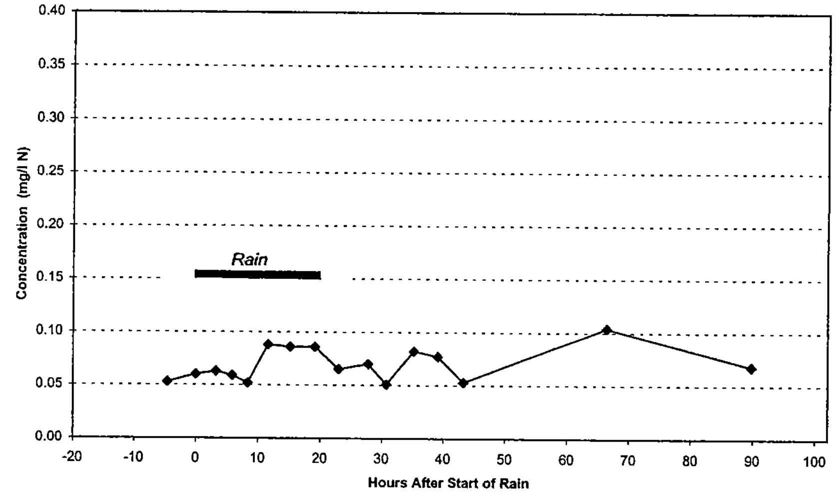


Figure A2-7
STORM 1: Nitrate + Nitrite

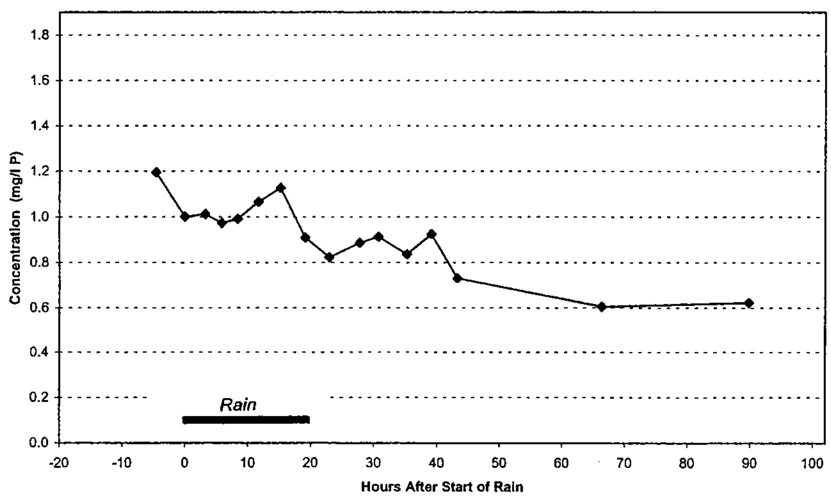


Figure A2-9
STORM 1: Total Copper

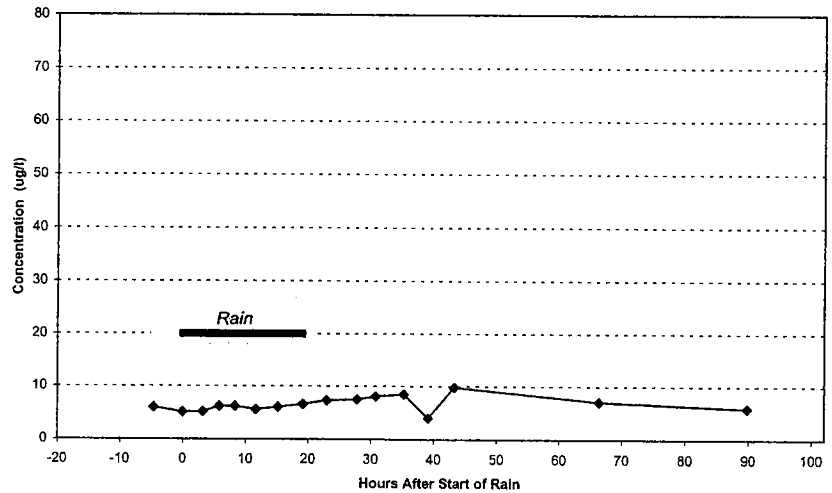


Figure A2-10
STORM 1: Total Lead

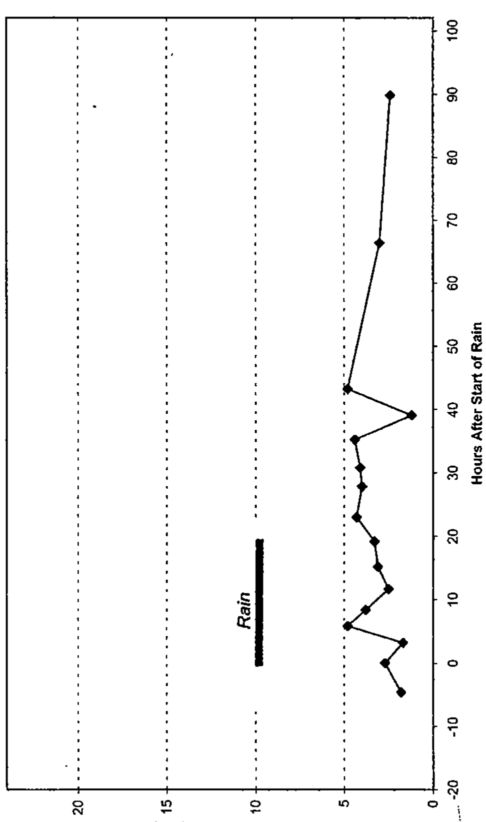


Figure A2-11
STORM 1: Total Nickel

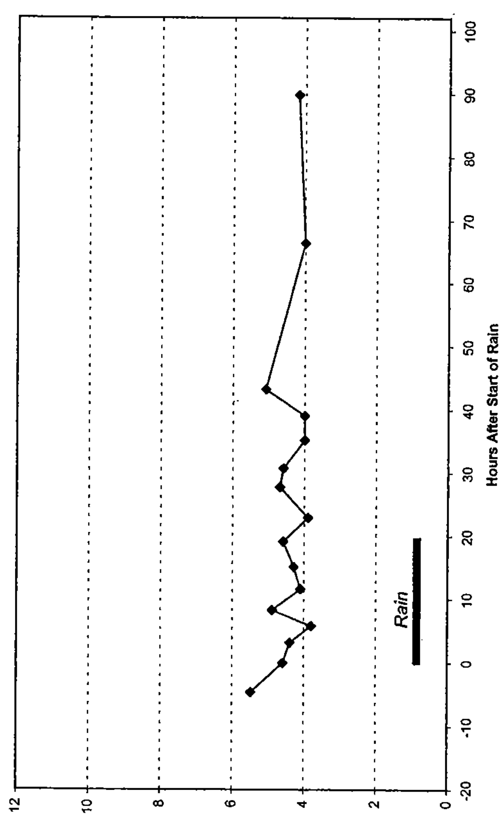


Figure A2-12
STORM 3: Flow

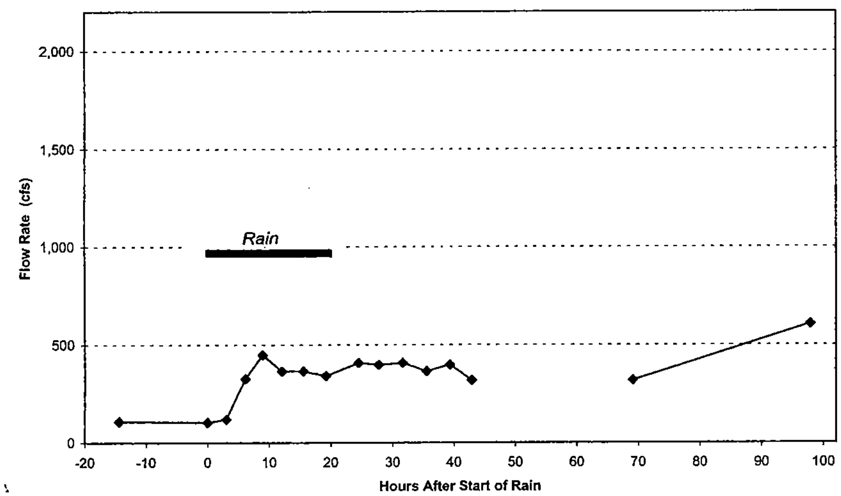


Figure A2-14
STORM 3: Fecal Coliform

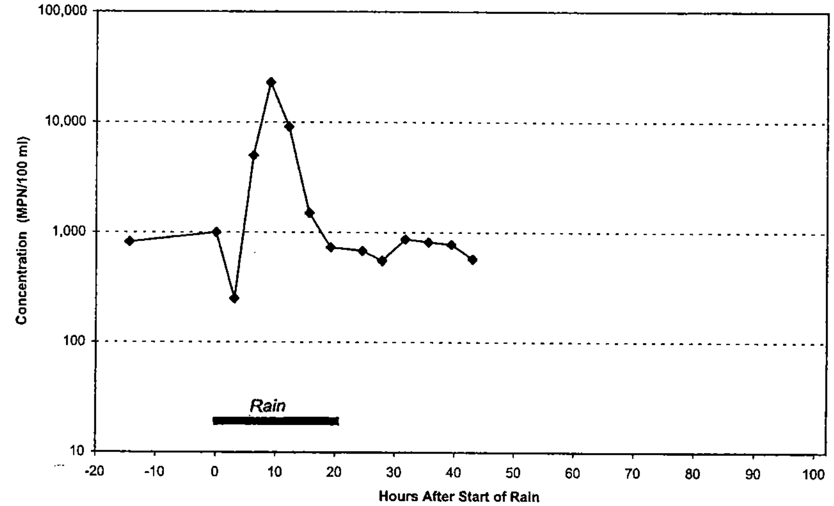


Figure A3-13
STORM 3: Temperature

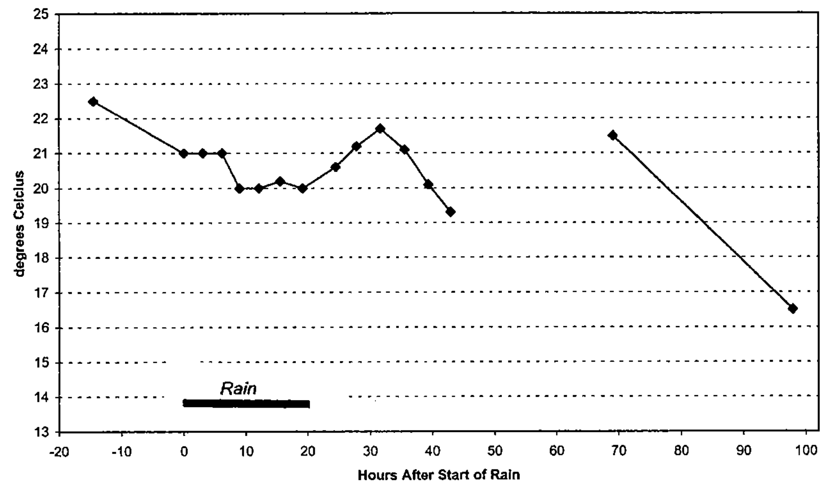


Figure A2-15
STORM 3: Dissolved Oxygen

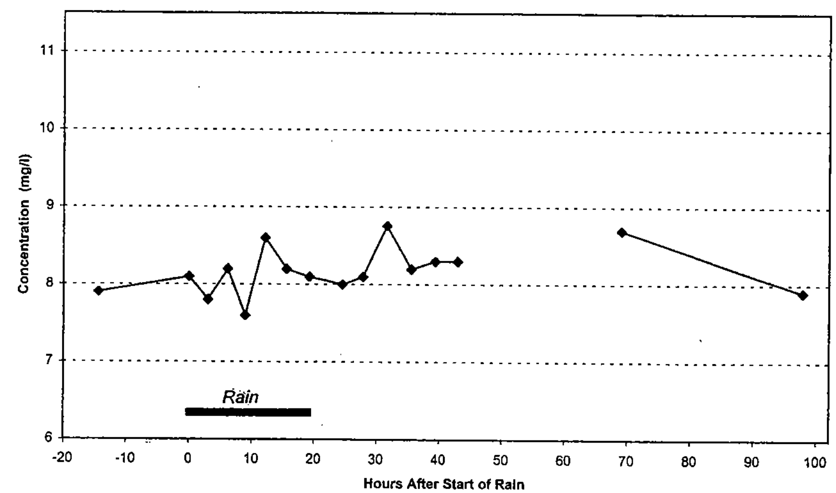


Figure A2-16
STORM 3: Total Suspended Sediment

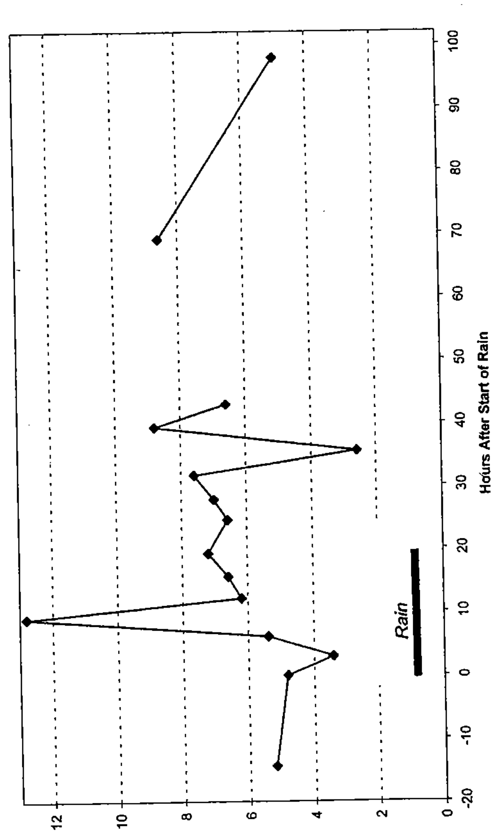


Figure A2-18
STORM 3: Phosphate

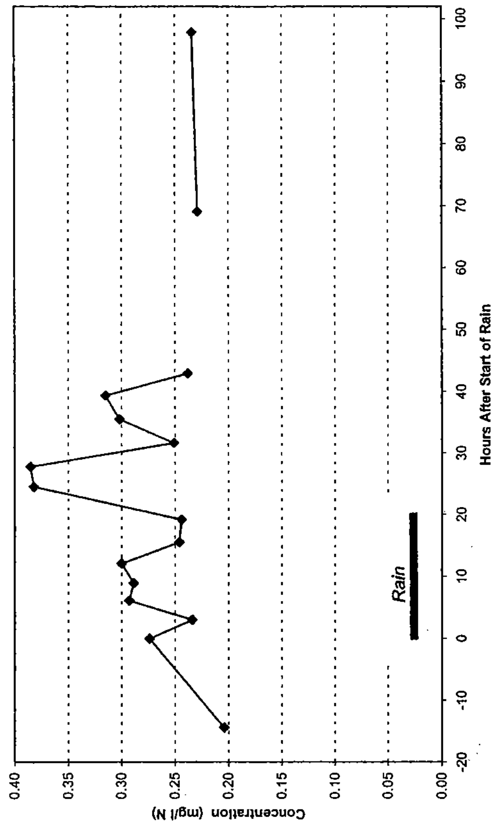


Figure A2-17
STORM 3: Nitrate + Nitrite

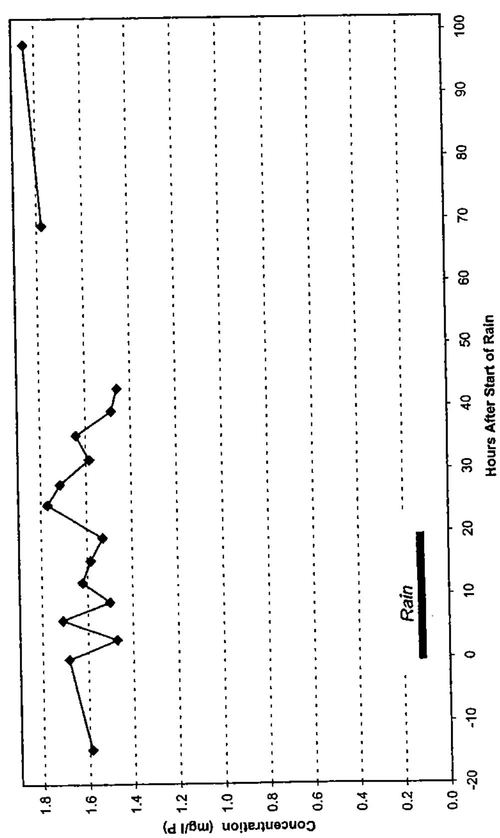


Figure A2-19
STORM 3: Total Copper

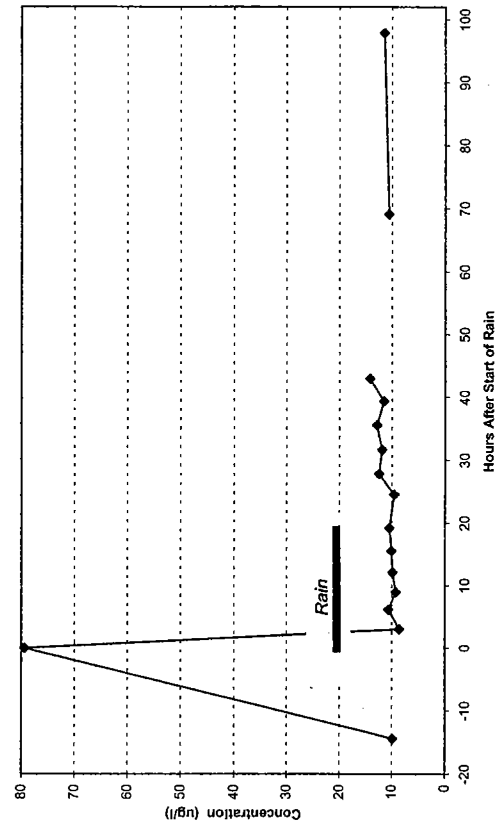


Figure A2-20
STORM 3: Total Lead

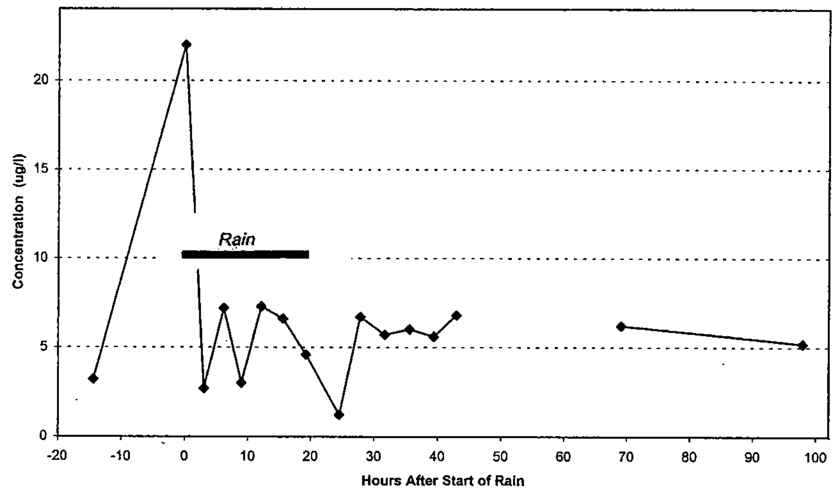


Figure A2-21
STORM 3: Total Nickel

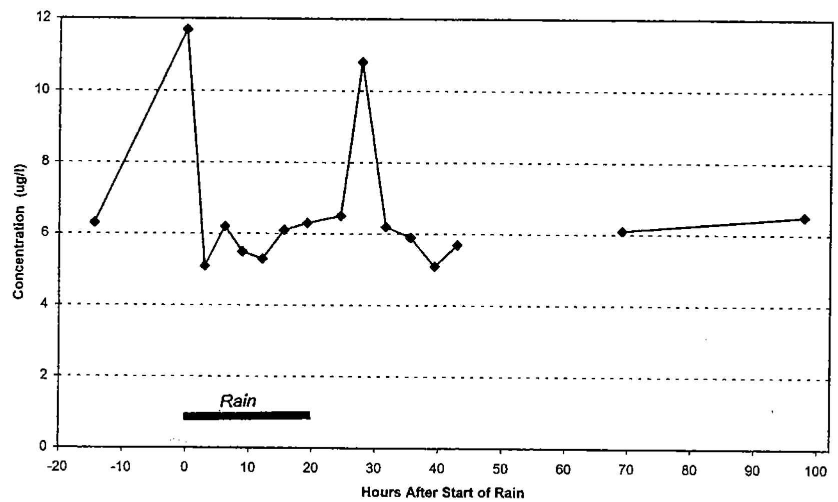


Figure A2-22

STORM 4: Flow

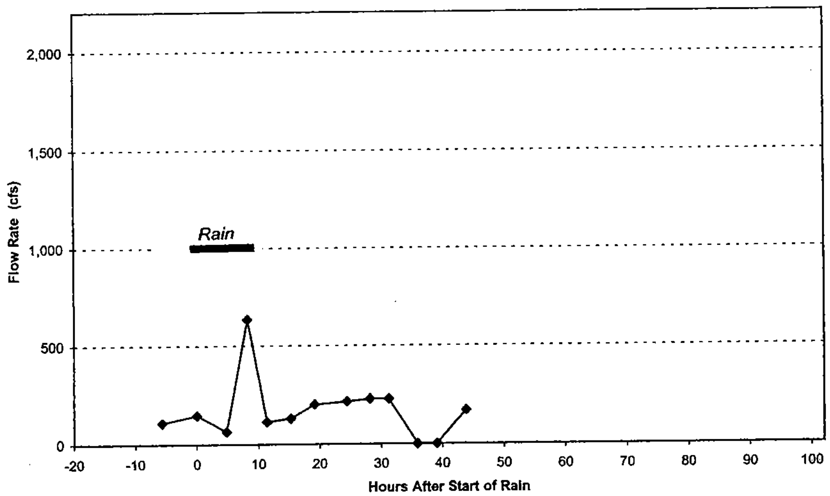


Figure A2-24

STORM 4: Fecal Coliform

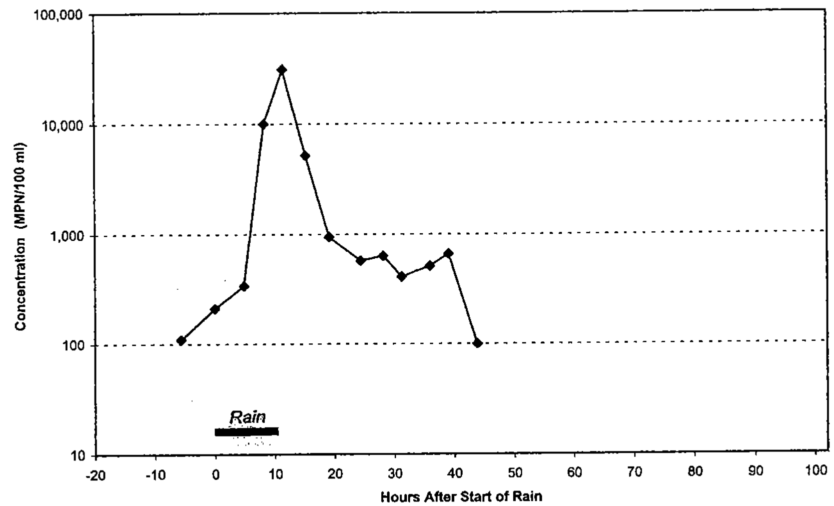


Figure A2-23

STORM 4: Temperature

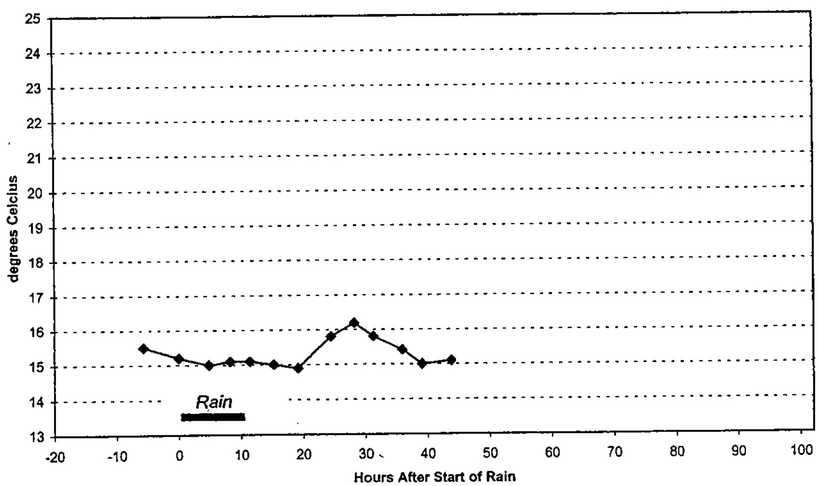


Figure A2-25

STORM 4: Dissolved Oxygen

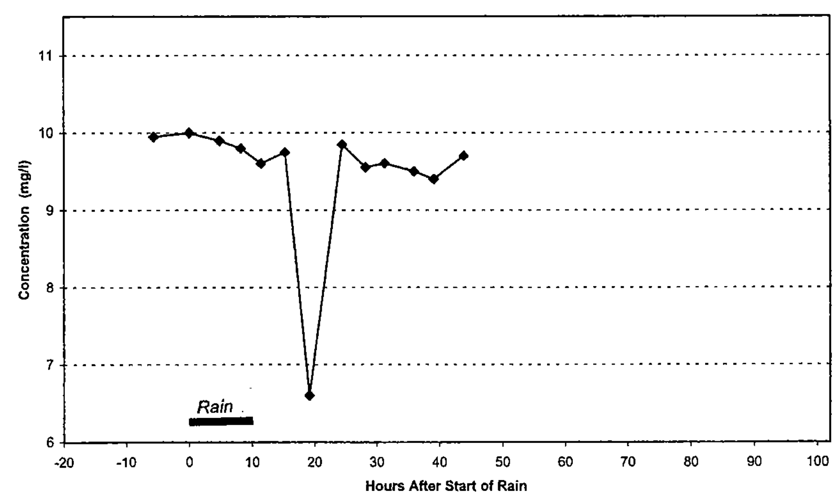


Figure A2-26

STORM 4: Total Suspended Sediment

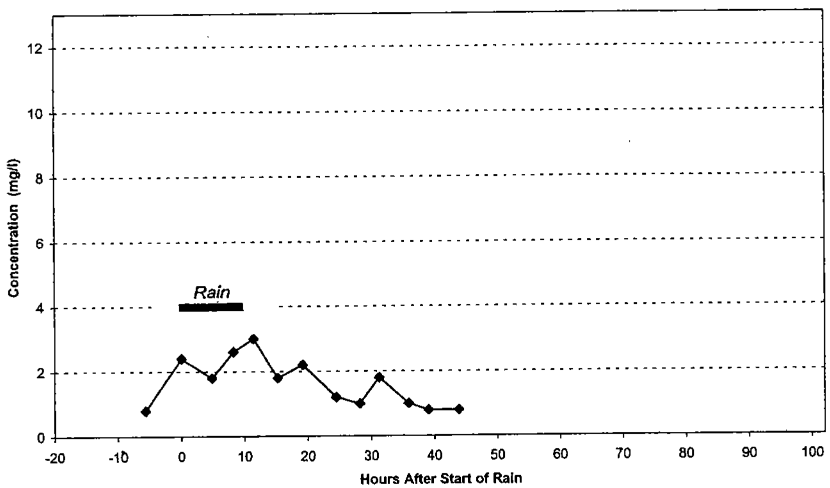


Figure A2-28

STORM 4: Phosphate

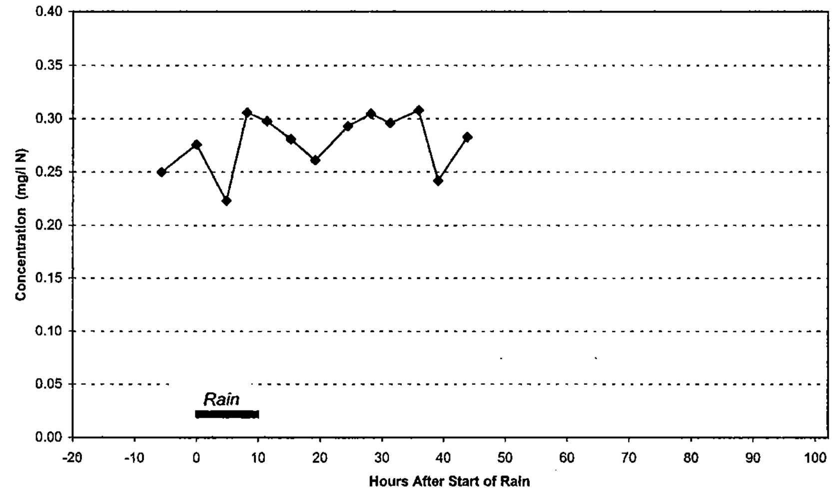


Figure A2-27

STORM 4: Nitrate + Nitrite

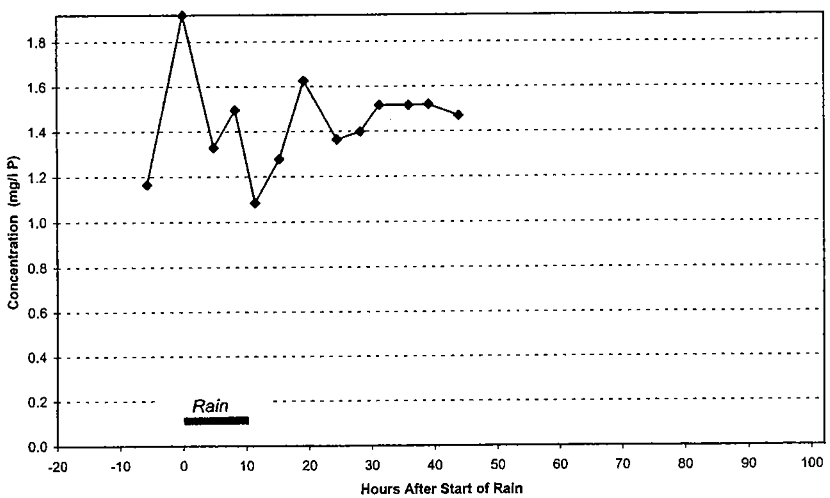


Figure A2-29

STORM 4: Total Copper

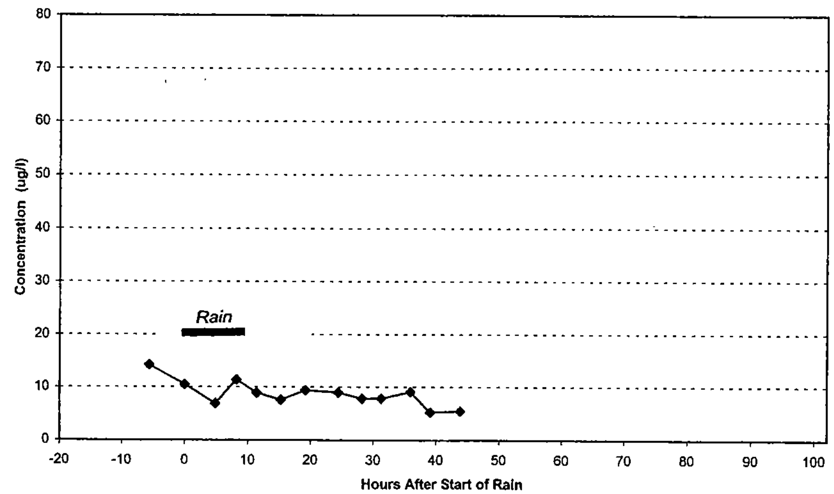


Figure A2-30

STORM 4: Total Lead

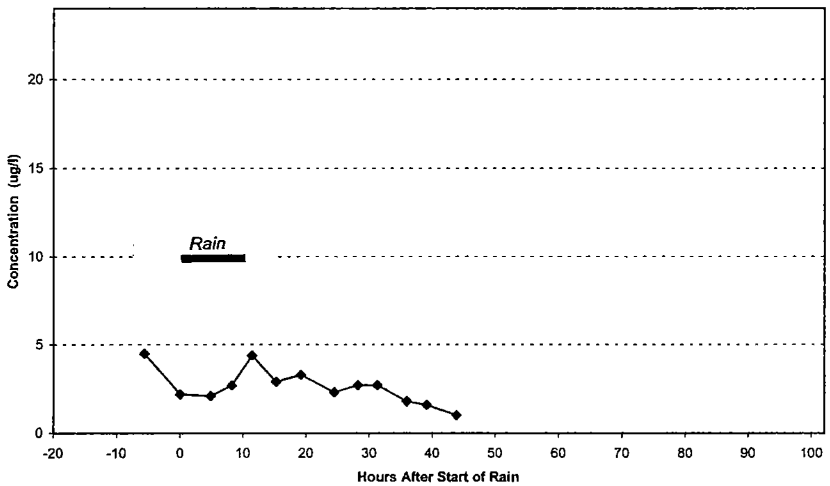


Figure A2-31

STORM 4: Total Nickel

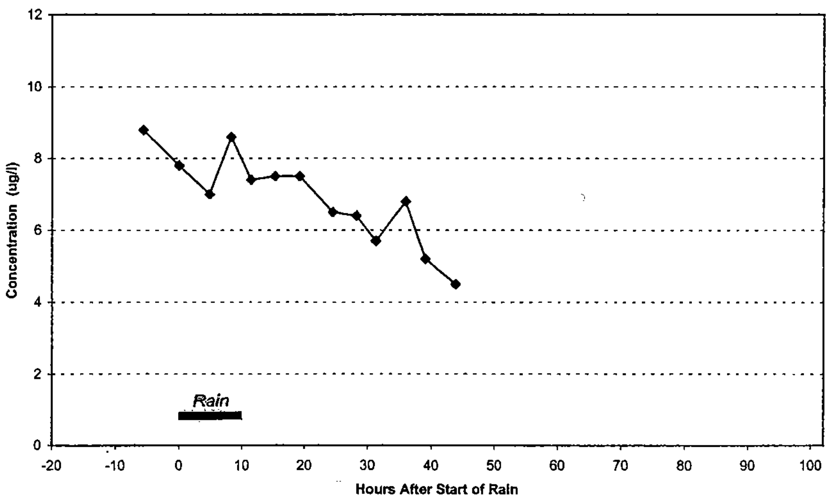


Table A2-3

Systemwide Modeling for the Providence Area Combined Sewer System (URI, 1992)

Total Wet Weather Loading from Blackstone River

Constituent	Units	Storm 1	Storm 2	Storm 3	Storm 4
Fecal Coliform	x10E14 microbial density/event	146.00	0.36	52.30	30.30
Total Suspended Solids	pounds/event	223,000.00	612.00	22,300.00	1,790.00
BOD		37,000.00	811.00	1,580.00	1,380.00
Copper		144.00	0.77	36.00	5.60
Lead		63.90	4.82	18.20	---
Nickel		61.30	0.97	12.20	3.00
Nitrate+Nitrite		7,870.00	167.00	4,400.00	1,520.00
Orthophosphate		1,400.00	25.50	912.00	275.00

--- = No available.

Appendix 3

University of Rhode Island:
The Blackstone River 1990

Pollutant Discharges and Water Quality Review

(Wright et al., 1991b)

Figure Set 1

MAPS OF SAMPLING LOCATIONS

Dry Weather Studies used for Data Comparison (*)

Map 1: 1985 study by MA Department of Environmental Quality Engineering for MA river portion (MADEQE, 1985)

Map 2: 1985 trace metal and organic surveys in 1985 by University of Rhode Island (Wright, 1988)

Map 3: 1989 trace metal survey by MADEP (MADEP, 1990).

Note: No map is available for the Ecology and Environment (1988) study

(*) The wet weather study by URI in 1988/89 (Wright et al, 1991) was also used in the data comparison as discussed in Section 3.1; data and maps are presented in Appendix 1.

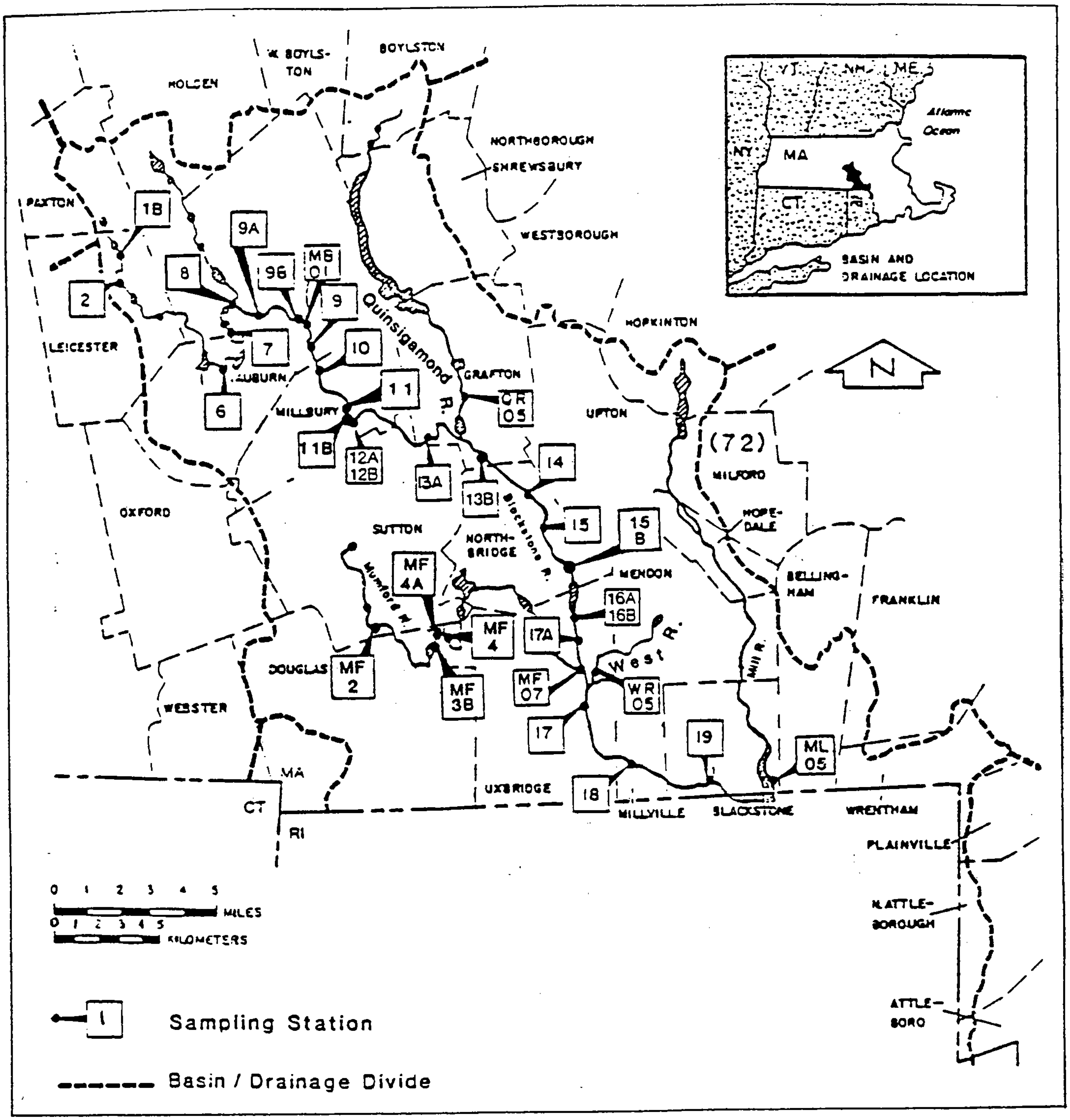


Figure A3-1 Sampling Locations for the 1985 MA DEQE Study (MA DEQE 1985)

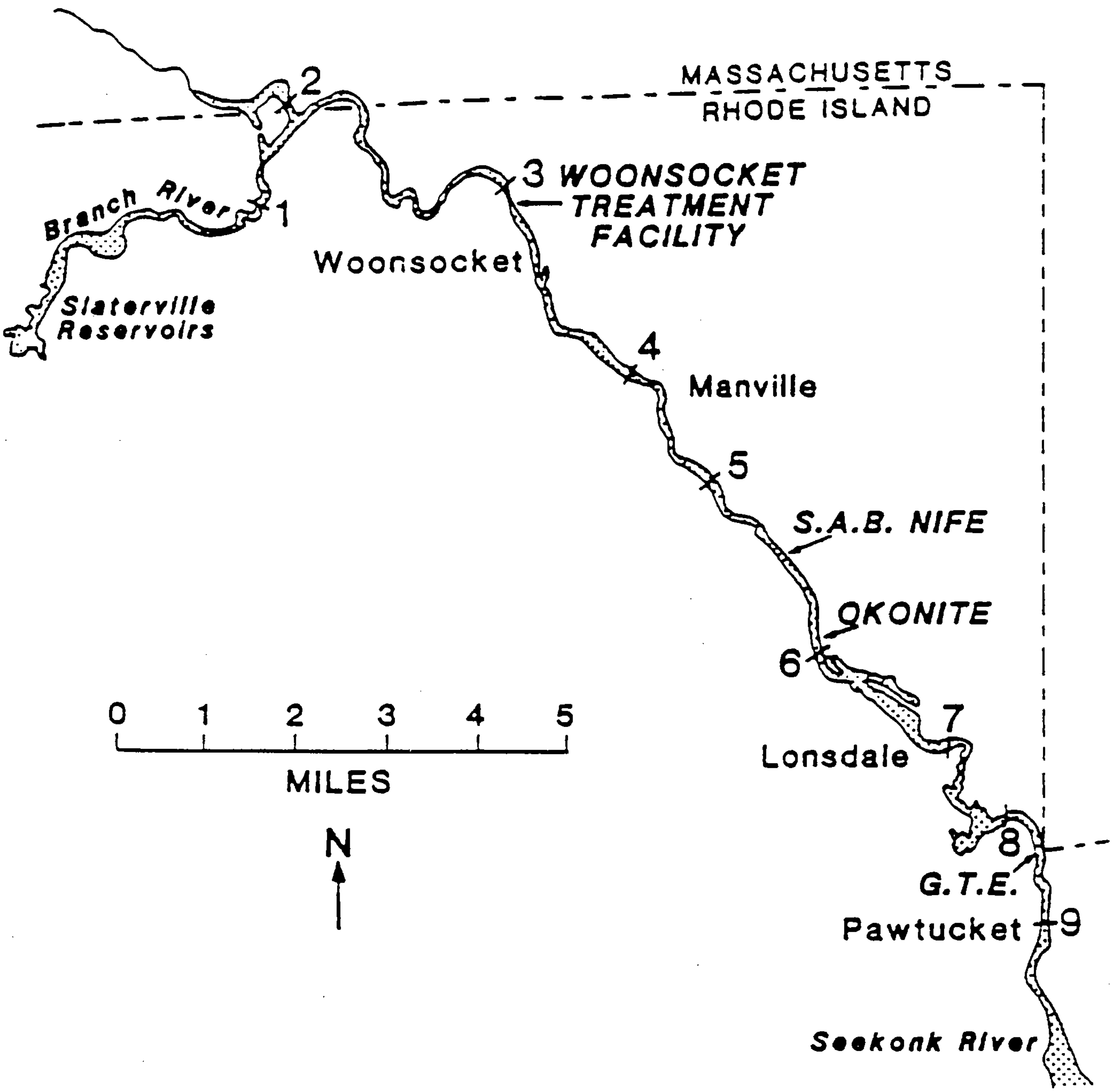


Figure A3-2 Sampling Locations for the 1985 URI Study (Wright 1988)

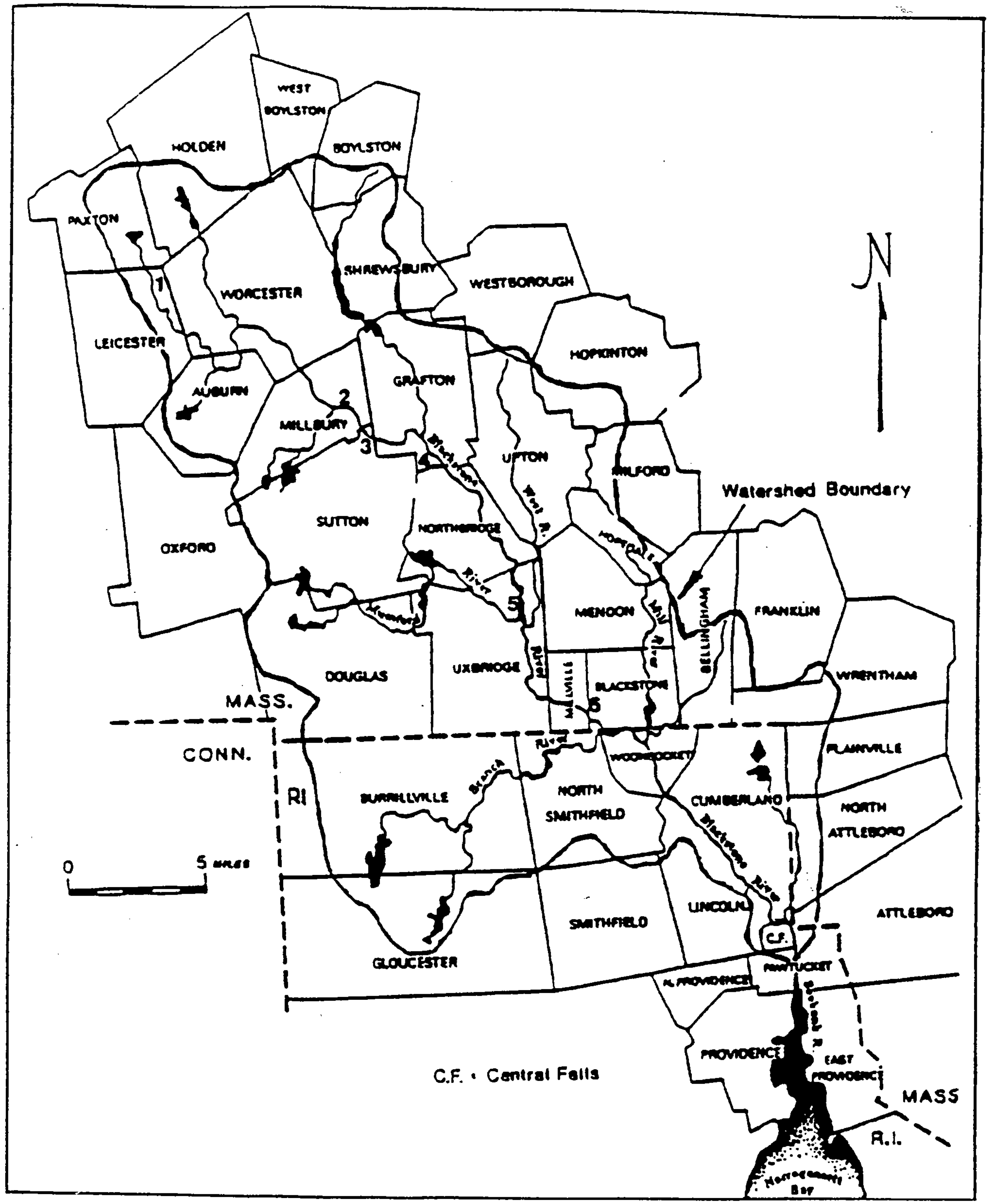


Figure A3-3 Sampling Locations for the 1989 MA DEP Study (Lewis and Brubaker 1990)

Figure Set 2

DATA

Dry Weather Studies used for Data Comparison (*)

- Cadmium
- Chromium
- Copper
- Lead
- Nickel
- Zinc
- Dissolved Oxygen

(*) The wet weather study by URI in 1988/89 (Wright et al, 1991), also used in the data comparison, is discussed in Section 3.1; data and maps are presented in Appendix 1.

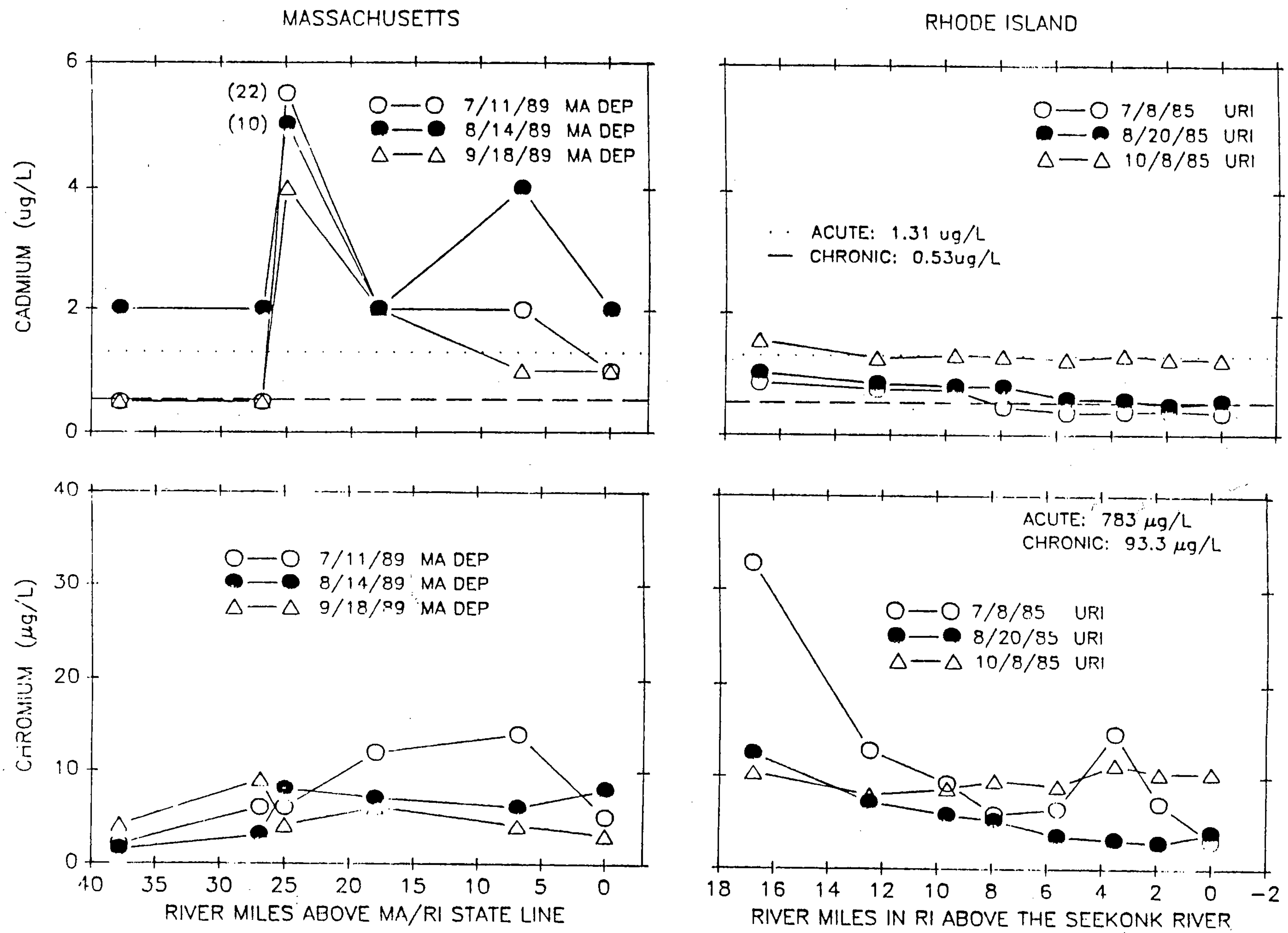


Figure A3-4: Actual Steady State Profiles in the Blackstone River from Worchester, MA, to Pawtucket, RI: **Cadmium and Chromium**

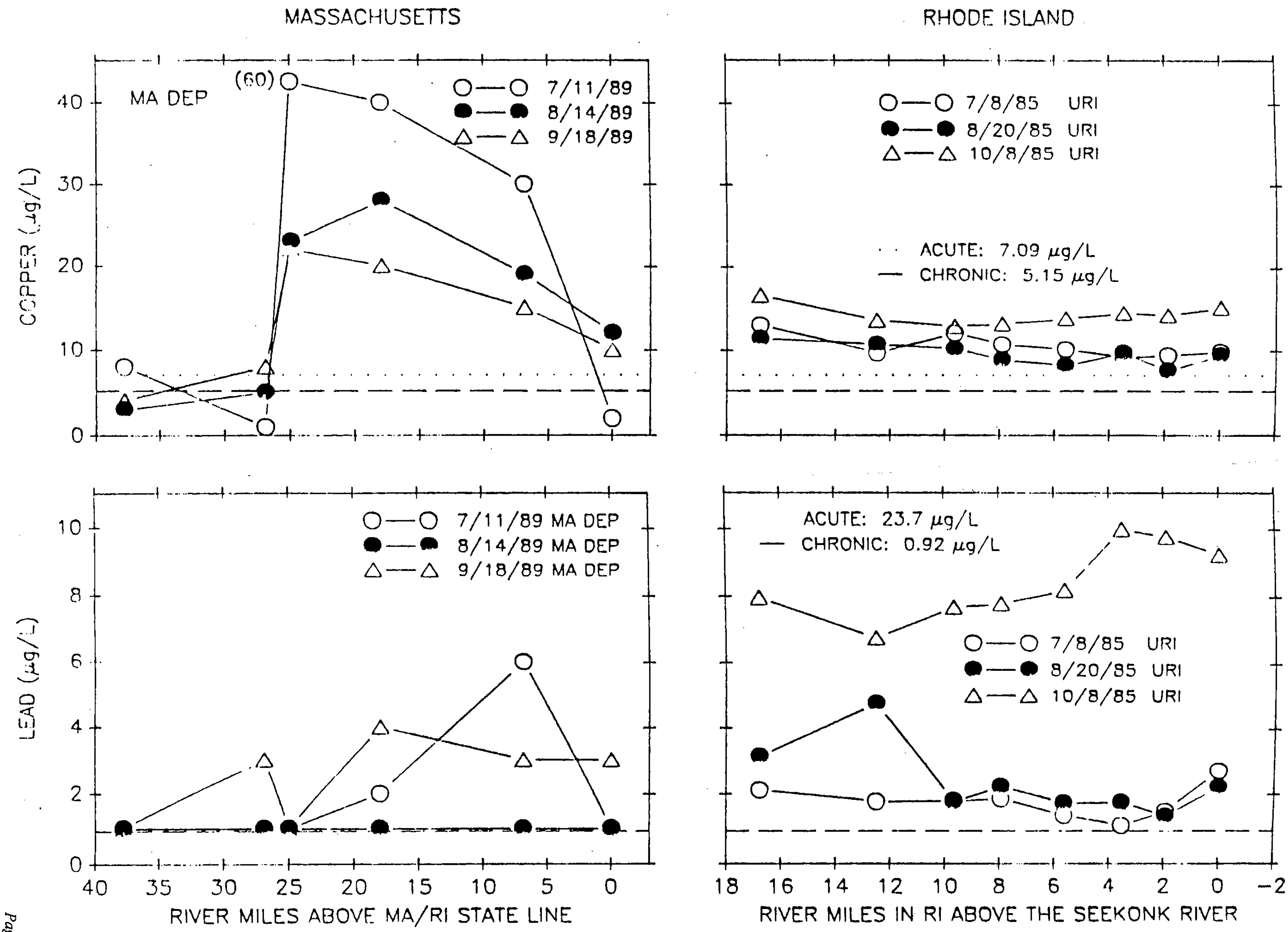


Figure A3-5: Actual Steady State Profiles in the Blackstone River from Worchester, MA, to Pawtucket, RI: **Copper and Lead**

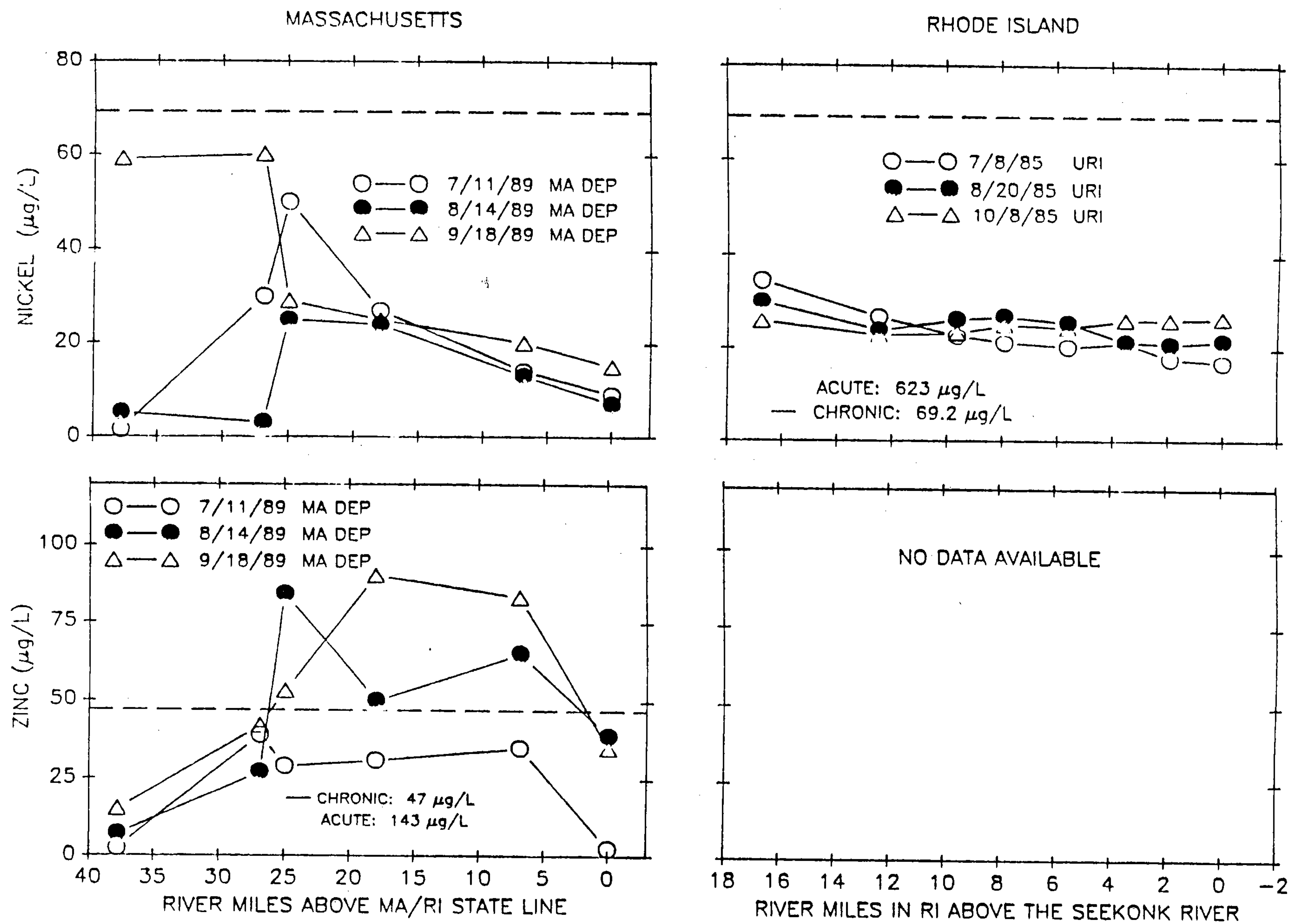


Figure A3-6: Actual Steady State Profiles in the Blackstone River from Worchester, MA, to Pawtucket, RI: **Nickel and Zinc**

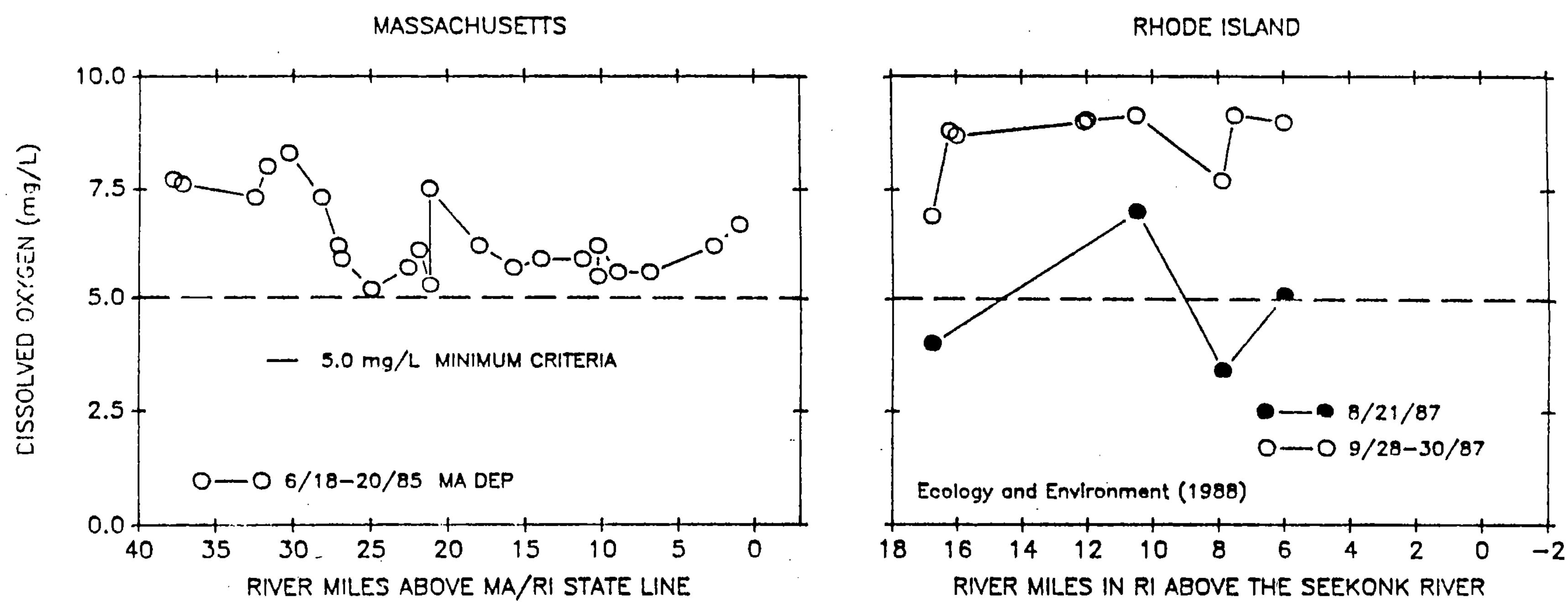


Figure A3-7: Actual Steady State Profiles in the Blackstone River from Worchester, MA, to Pawtucket, RI: **Dissolved Oxygen**

Appendix 4

Blackstone River Water Quality Study, 1991

Water Quality Data

(ASA, 1992b)

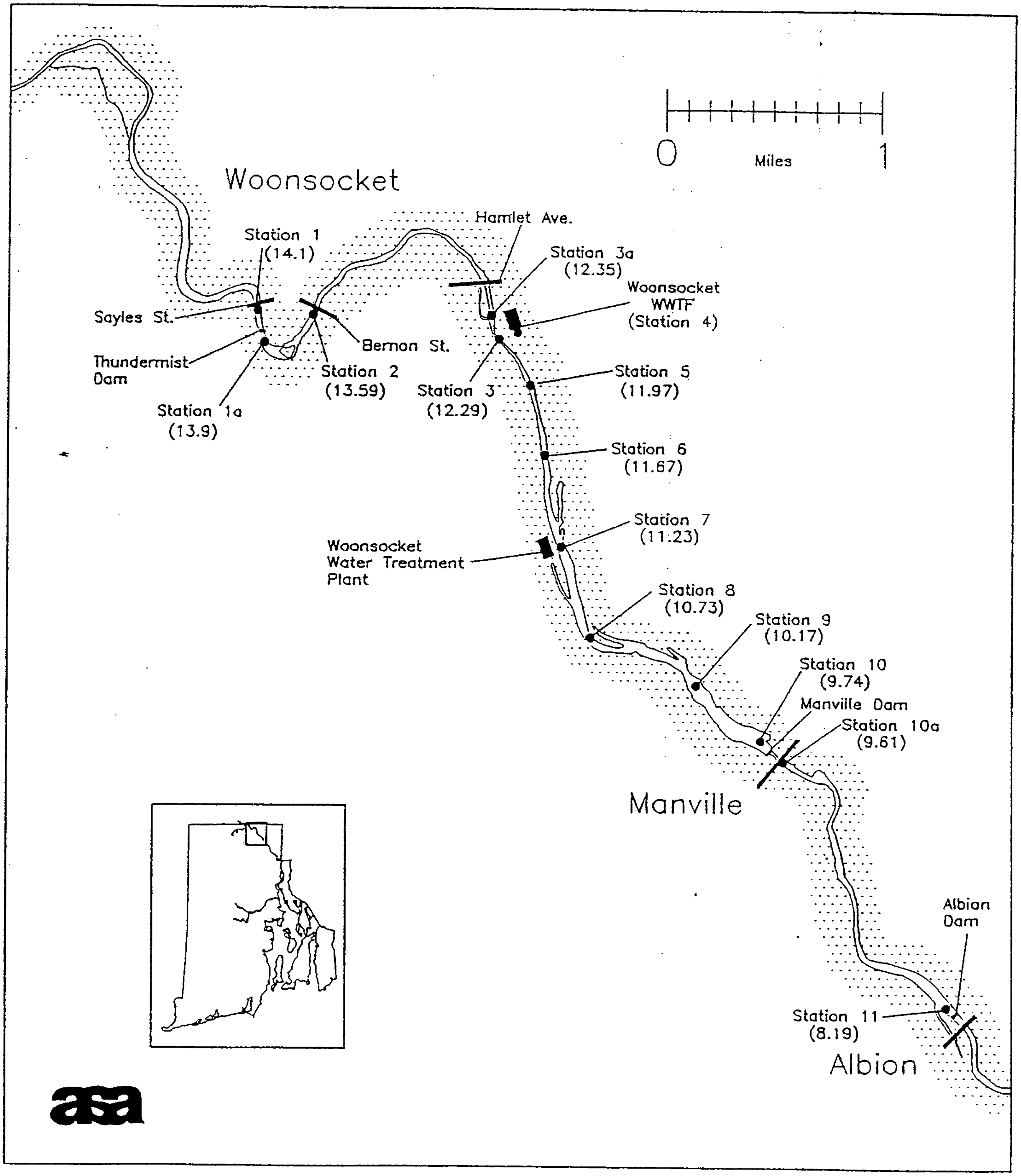


Figure A4-1 Location of field program sampling stations on the Blackstone River. Distance from Slaters Mill dam at the mouth of the river in Pawtucket is given (in miles) in parentheses.

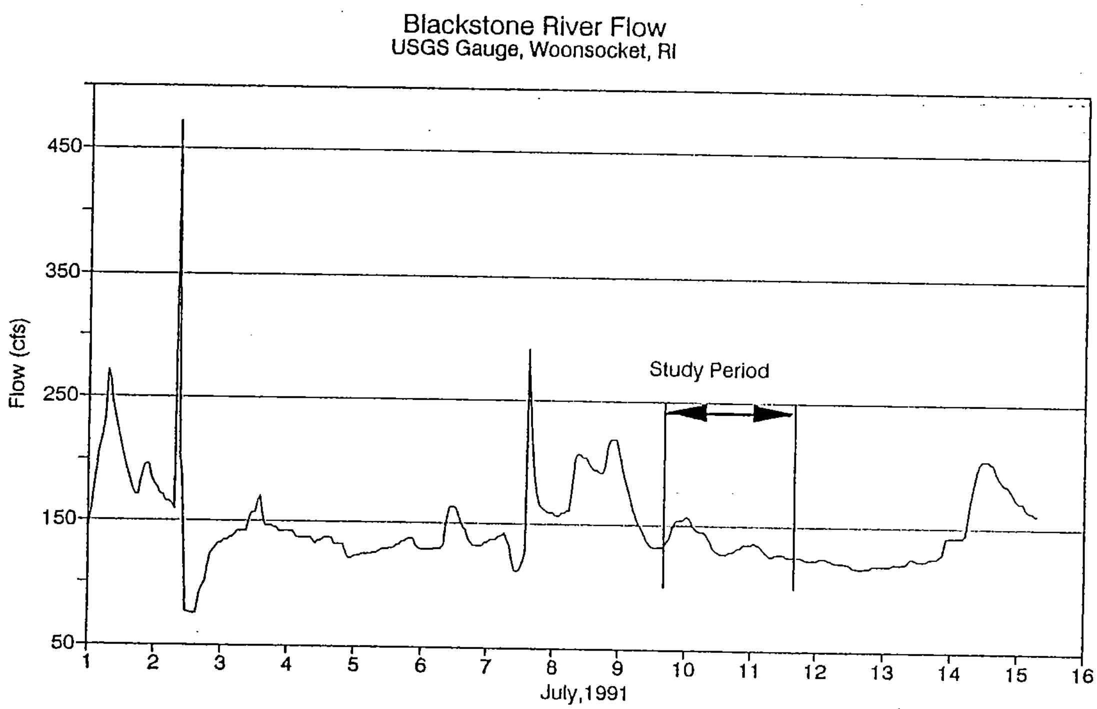


Figure A4-2 Blackstone River flow at the USGS gauge in Woonsocket, Rhode Island for the period of July 1 through July 15, 1991.

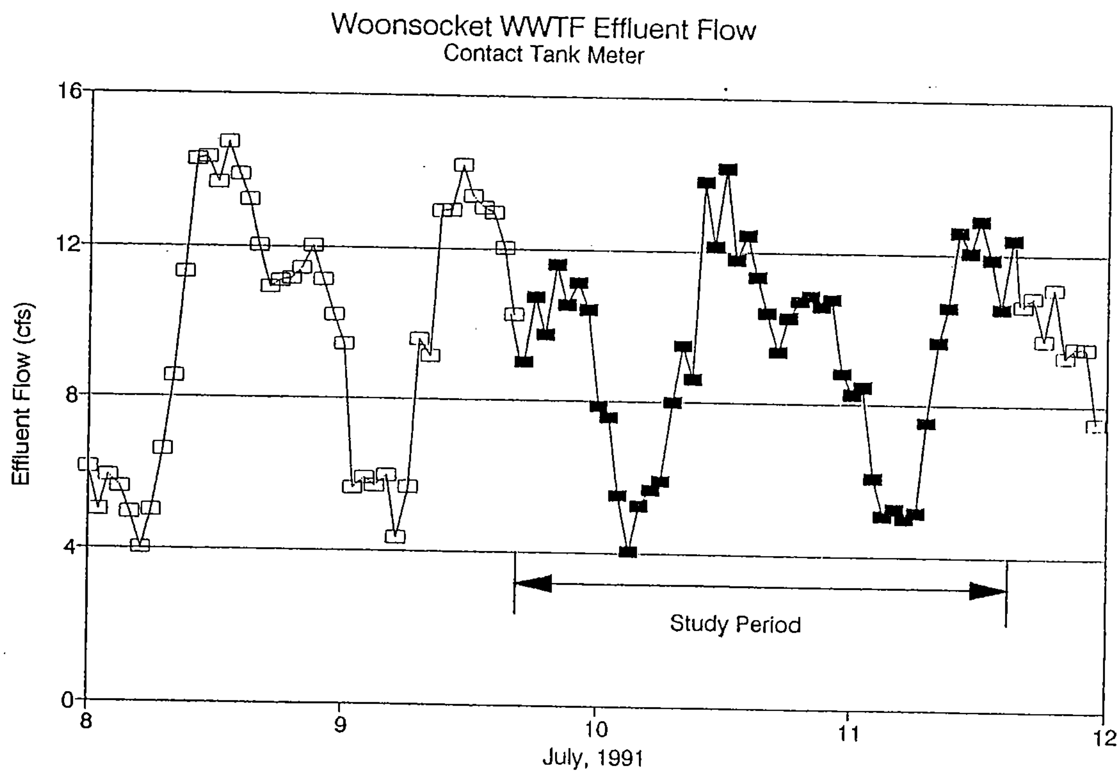


Figure A4-3 Woonsocket WWTF effluent flow as a function of time for the period July 8-July 12, 1991. Flows concurrent with the period of the field study are highlighted in black.

Table A4-1

Time (EDT)	Date (m-d-yr)	RIVER FLOW (cfs)	WWTF Flow (cfs)
17:00	07/09/91	132.4	9.0
18:00	07/09/91	134.8	10.7
19:00	07/09/91	139.6	9.7
20:00	07/09/91	146.8	11.6
21:00	07/09/91	151.6	10.5
22:00	07/09/91	154	11.1
23:00	07/09/91	154	10.4
00:00	07/10/91	154	7.9
01:00	07/10/91	156.4	7.6
02:00	07/10/91	156.4	5.5
03:00	07/10/91	154	4.0
04:00	07/10/91	149.2	5.3
05:00	07/10/91	146.8	5.7
06:00	07/10/91	144.4	5.9
07:00	07/10/91	144.4	8.0
08:00	07/10/91	144.4	9.5
09:00	07/10/91	142	8.6
10:00	07/10/91	137.2	13.8
11:00	07/10/91	132.4	12.2
12:00	07/10/91	130	14.2
13:00	07/10/91	128.6	11.8
14:00	07/10/91	127.2	12.4
15:00	07/10/91	127.2	11.4
16:00	07/10/91	127.2	10.4

Time (EDT)	Date (m-d-yr)	RIVER FLOW (cfs)	WWTF Flow (cfs)
17:00	07/10/91	128.6	9.4
18:00	07/10/91	128.6	10.2
19:00	07/10/91	130	10.7
20:00	07/10/91	132.4	10.9
21:00	07/10/91	132.4	10.6
22:00	07/10/91	134.8	10.8
23:00	07/10/91	134.8	8.8
00:00	07/11/91	134.8	8.3
01:00	07/11/91	134.8	8.4
02:00	07/11/91	137.2	6.1
03:00	07/11/91	134.8	5.1
04:00	07/11/91	134.8	5.3
05:00	07/11/91	132.4	5.0
06:00	07/11/91	128.6	5.2
07:00	07/11/91	127.2	7.5
08:00	07/11/91	125.8	9.7
09:00	07/11/91	125.8	10.6
10:00	07/11/91	127.2	12.6
11:00	07/11/91	127.2	12.1
12:00	07/11/91	127.2	12.9
13:00	07/11/91	127.2	11.9
14:00	07/11/91	125.8	10.6
15:00	07/11/91	125.8	12.4
16:00	07/11/91	125.8	10.6

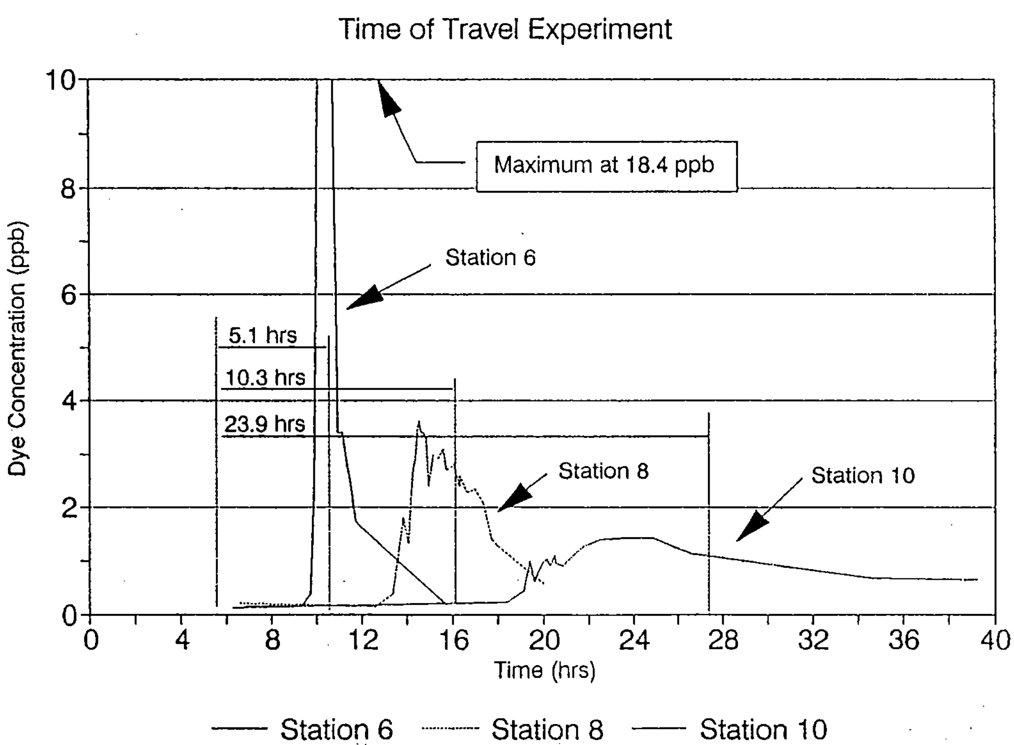


Figure A4-4

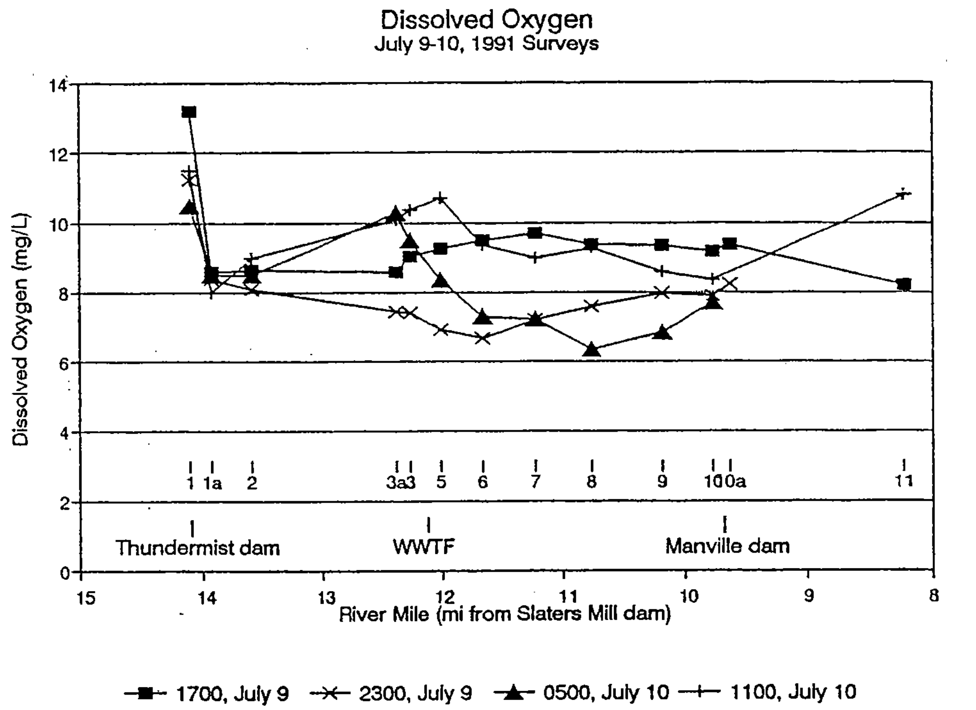
Time histories of dye concentration at stations 6, 8, and 10 following the dye release at 0540 EDT on July 10, 1991 at station 3a. The time of travel for the centroid of the dye cloud between station 3a and each downstream station is also shown.

Table A4-2 Means, standard deviations, maximum and minimum values of the in-situ measurement parameters: Dissolved oxygen, temperature, and pH. Means, standard deviations, maximum and minimum values of the analytical parameters.

Station Number	River Mile (mi)	Statistic	Dissolved Oxygen (mg/L)	Temperature (deg C)	pH (units)	Biochemical Oxygen Demand (5-day) (mg/l)	Total Kjeldahl Nitrogen (as N) (mg/L)	Ammonia (as N) (mg/l)	Nitrate (as N) (mg/l)	Nitrite (as N) (mg/l)	Chlorophyll a (ug/L)	Total Suspende Solids (mg/L)	Specific Conductance (umho/cm)
1	14.1	mean	11.87	23.96	7.83	3.25	1.25	0.45	1.36	0.004	42.50	7.14	310.38
		std dev	0.94	0.79	1.04	0.80	0.74	0.04	0.20	0.007	15.29	2.16	9.16
		min	10.50	22.80	9.34	2.00	0.17	0.40	1.10	0.000	6.00	3.70	297.00
		max	13.20	25.00	6.73	4.30	2.95	0.52	1.73	0.020	56.00	10.80	323.00
1a	13.9	mean	8.33	23.88									
		std dev	0.19	0.89									
		min	8.00	22.50									
		max	8.60	25.00									
2	13.59	mean	8.38	23.53	7.75		1.13	0.44	1.31	0.002	45.25	7.61	313.89
		std dev	0.50	1.24	0.87		0.12	0.06	0.12	0.004	7.81	1.99	8.85
		min	7.50	22.00	8.98		1.00	0.34	1.10	0.000	28.00	4.50	302.00
		max	9.10	25.50	6.86		1.40	0.52	1.52	0.010	56.00	11.30	331.00
3a	12.35	mean	8.60	23.50									
		std dev	1.14	1.36									
		min	7.00	22.00									
		max	10.30	26.00									
3	12.29	mean	8.59	23.50	7.87	3.19	1.31	0.46	1.28	0.003	34.29	7.18	309.25
		std dev	1.15	1.35	0.72	0.63	0.66	0.05	0.20	0.004	15.51	2.07	9.61
		min	6.80	22.00	9.03	2.40	0.88	0.40	0.92	0.000	8.00	4.90	297.00
		max	10.40	26.00	7.01	4.40	3.05	0.55	1.58	0.010	52.00	11.30	328.00
4	wwtf Cl Contact outlet	mean	1.20	29.75	7.23	7.83	22.41	20.50	0.12	0.028		14.35	1650.00
		std dev	0.12	0.62	0.30	1.80	2.21	1.12	0.12	0.010		6.80	83.22
		min	1.05	29.00	6.85	5.40	19.50	19.00	0.01	0.010		5.10	1510.00
		max	1.40	31.00	7.87	10.00	26.50	22.50	0.40	0.040		25.30	1730.00
	wwtf downstream of spillway	mean	5.15	29.81									
		std dev	0.97	0.62									
		min	2.60	29.00									
		max	5.70	31.00									

Table 4.2 Continued.

Station Number	River Mile (mi)	Statistic	Dissolved Oxygen (mg/L)	Temperature (deg C)	pH	Biochemical Oxygen Demand (5-day) (mg/l)	Total Kjeldahl Nitrogen (as N) (mg/L)	Ammonia (as N) (mg/l)	Nitrate (as N) (mg/l)	Nitrite (as N) (mg/l)	Chlorophyll a (ug/L)	Total Suspende Solids (mg/L)	Specific Conductance (umho/cm)
5	11.97	mean	8.24	23.92	7.61		2.79	2.02	1.13	0.012	38.00	6.61	412.44
		std dev	1.40	1.60	0.46		0.65	0.59	0.12	0.006	13.38	2.06	34.55
		min	6.52	22.00	8.21		2.00	1.48	0.91	0.000	12.00	3.80	373.00
		max	10.70	26.00	6.85		4.40	3.60	1.32	0.020	52.00	9.50	497.00
6	11.67	mean	7.90	23.83	7.60	3.09	2.56	1.88	1.20	0.018	34.50	415.25	
		std dev	1.37	1.38	0.39	1.20	1.17	0.92	0.23	0.004	12.56	38.14	
		min	6.30	22.00	8.28	0.00	0.00	0.00	0.91	0.010	14.00	360.00	
		max	9.50	26.00	7.12	4.10	4.40	3.60	1.52	0.020	52.00	497.00	
7	11.23	mean	8.24	24.13	7.68		2.55	1.94	1.16	0.019	33.00	7.42	411.56
		std dev	1.24	1.11	0.37		0.49	0.45	0.14	0.007	6.24	1.70	29.59
		min	6.45	22.00	8.37		1.68	1.30	0.90	0.010	24.00	4.20	362.00
		max	9.72	25.30	7.21		3.15	2.65	1.32	0.030	40.00	9.30	451.00
8	10.73	mean	7.91	24.04	7.63	2.54	2.43	1.84	1.14	0.019	28.50	6.63	415.11
		std dev	1.19	0.65	0.30	0.93	0.20	0.23	0.13	0.003	11.17	2.53	12.83
		min	6.35	22.80	8.22	0.00	2.05	1.26	0.91	0.010	8.00	2.40	397.00
		max	9.38	25.00	7.31	3.40	2.65	2.08	1.38	0.020	44.00	11.70	432.00
9	10.17	mean	8.16	24.42	7.72		1.90	1.74	1.22	0.023	30.67	5.74	403.00
		std dev	0.71	0.79	0.29		0.98	0.30	0.14	0.007	13.00	3.71	21.25
		min	6.85	23.50	8.15		0.20	1.30	1.03	0.020	0.00	0.00	364.00
		max	9.35	26.00	7.32		3.15	2.08	1.46	0.040	44.00	11.80	432.00
10	9.74	mean	8.36	24.41	7.76	3.04	2.38	1.75	1.18	0.026	31.25	8.19	394.88
		std dev	0.66	0.96	0.29	1.25	0.33	0.25	0.16	0.007	10.63	2.58	30.76
		min	7.45	23.00	8.14	0.00	1.94	1.30	1.02	0.020	14.00	5.10	335.00
		max	9.40	26.25	7.32	4.20	2.85	2.08	1.46	0.040	44.00	12.70	432.00
10a	9.61	mean	8.39	23.00									
		std dev	0.61	0.94									
		min	7.80	21.50									
		max	9.40	24.00									
11	8.19	mean	8.78	24.50	7.92	4.02	1.88	1.60	1.32	0.048	42.33	7.83	384.50
		std dev	1.34	0.45	0.36	1.11	0.95	0.28	0.22	0.011	5.71	4.93	36.29
		min	6.70	24.00	8.35	2.40	0.33	1.14	1.04	0.030	30.00	1.50	317.00
		max	10.80	25.00	7.38	5.20	2.85	2.08	1.68	0.060	48.00	15.20	432.00



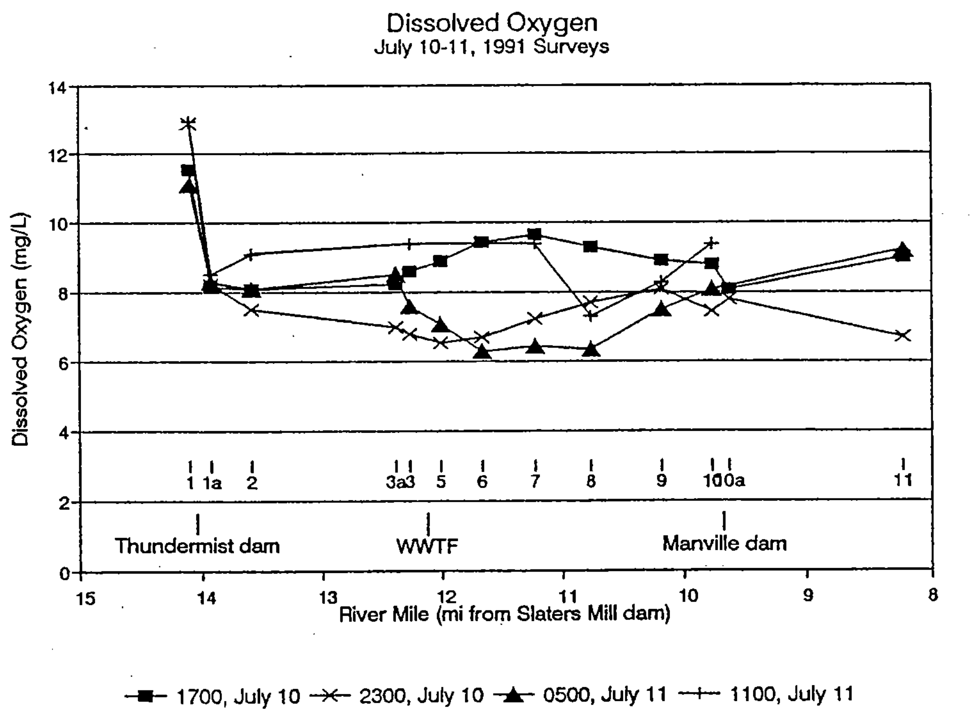
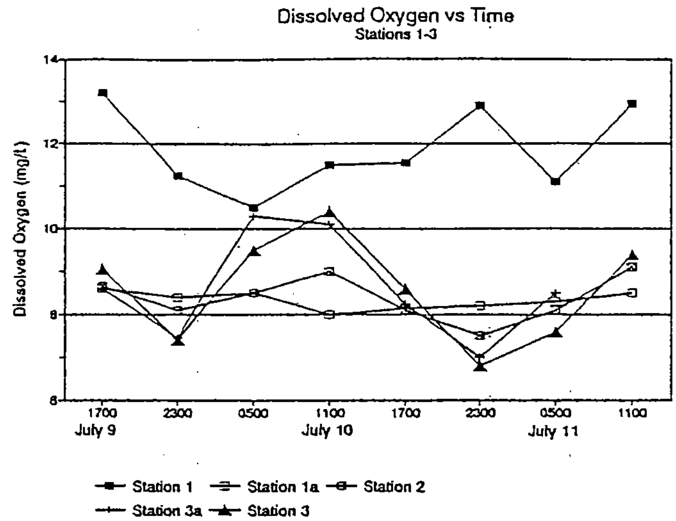
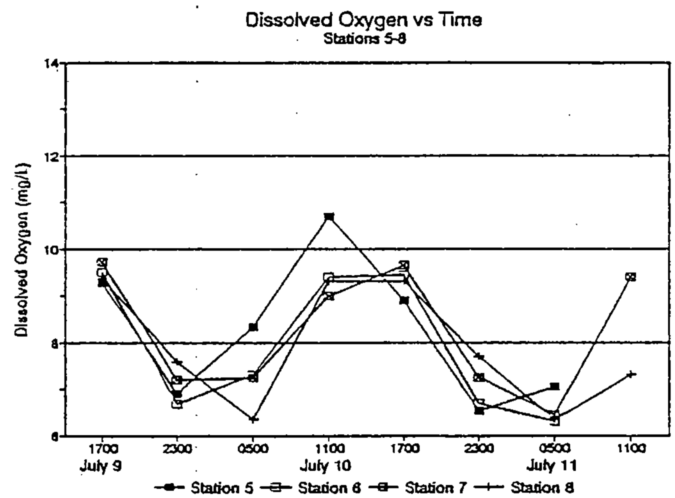


Figure A4-5 Mean surface dissolved oxygen concentrations along the study area during the field program.





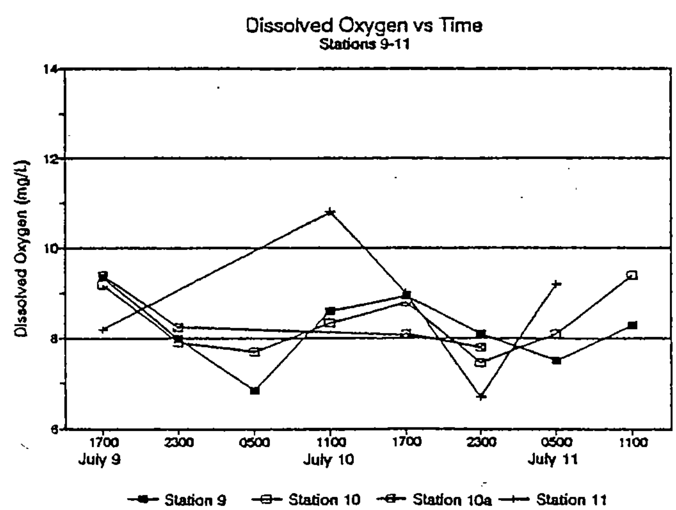
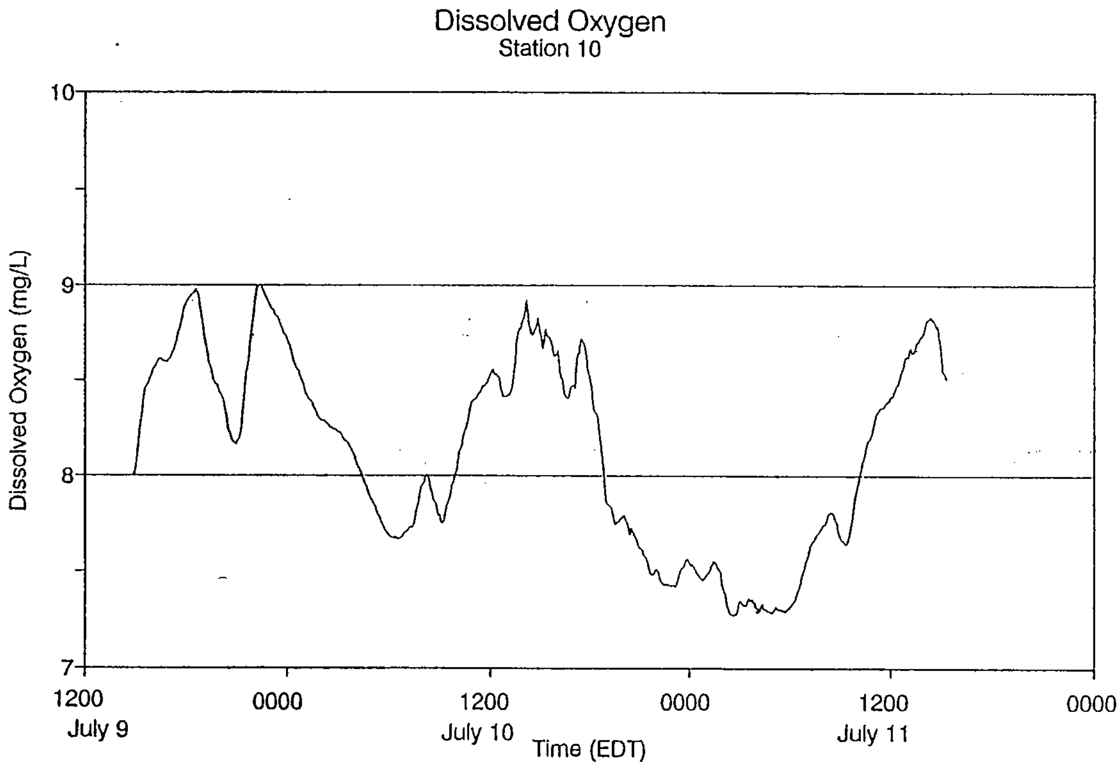


Figure A4-6 Dissolved oxygen concentrations vs time at each station.



Dissolved oxygen vs time at station 10.

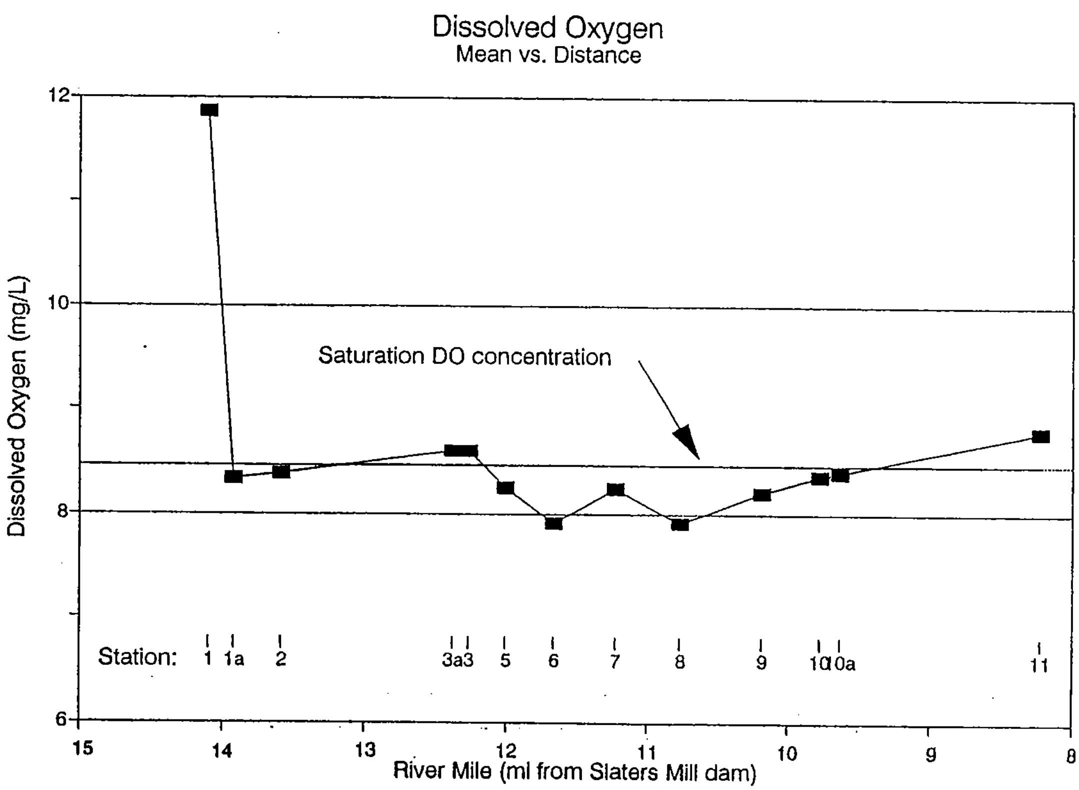


Figure A4-7 Mean dissolved oxygen concentration as a function of distance along the river. The saturation DO concentration is approximately 8.45 mg/L (at 24°C).

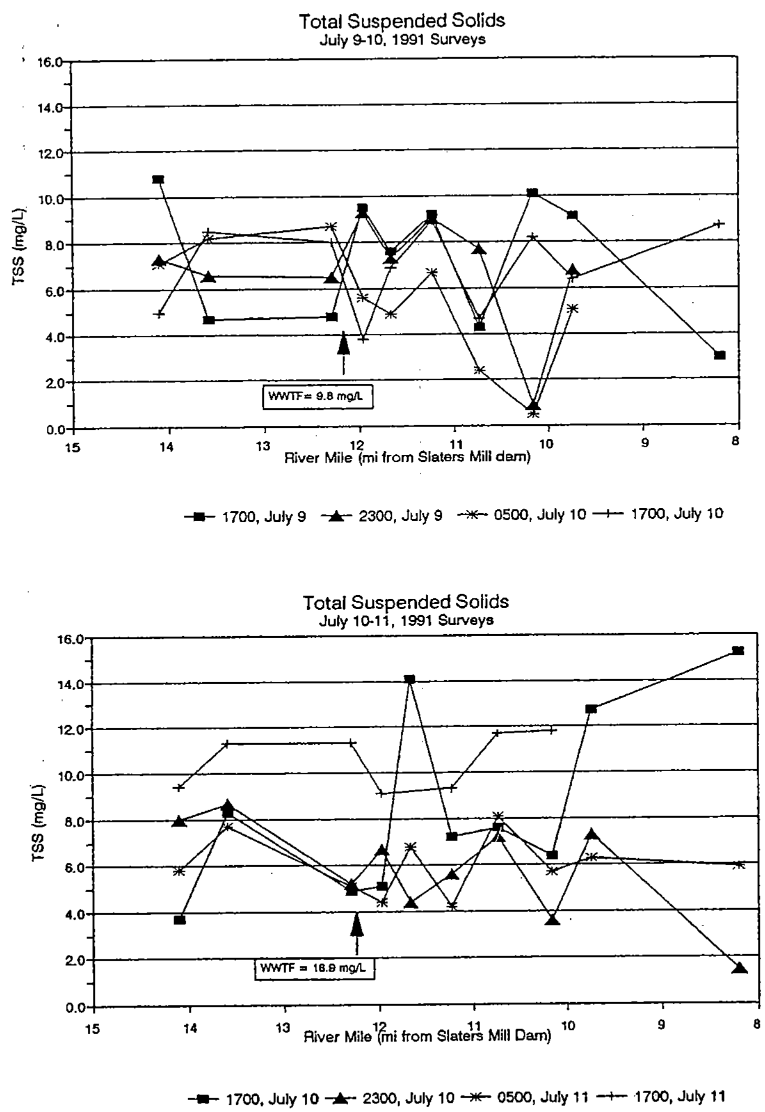


Figure A4-8

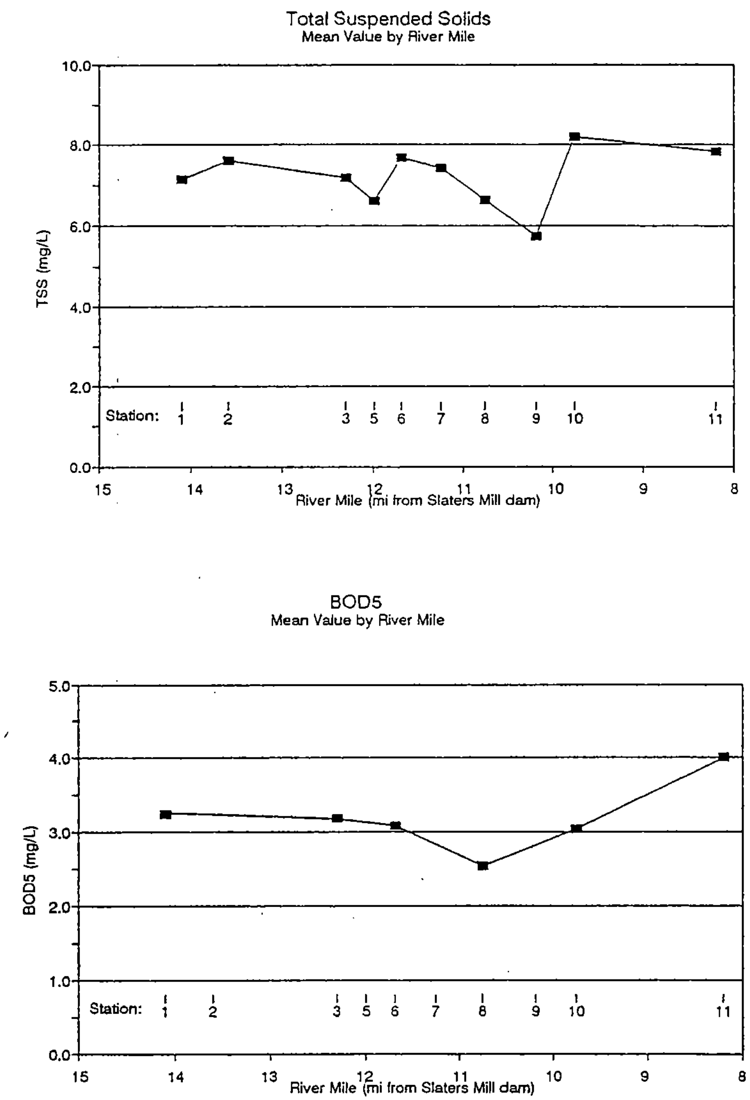


Figure A4-9 Mean total suspended solids (TSS) and biochemical oxygen demand (BOD5) concentrations as functions of distance along the river.

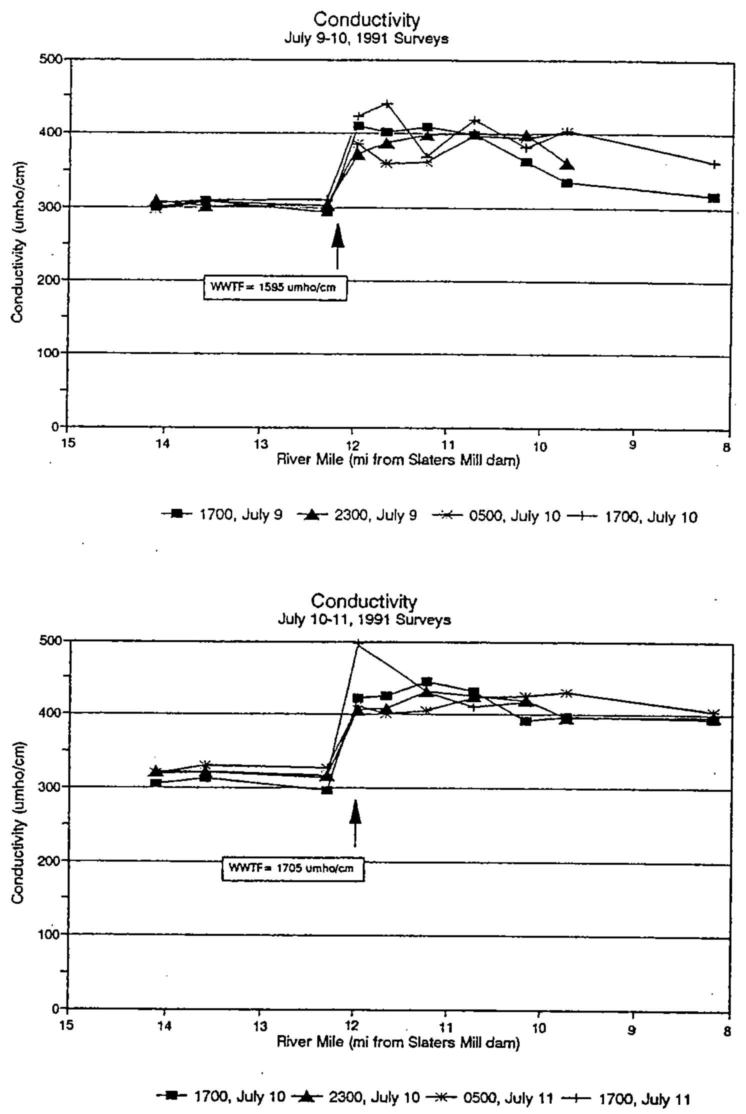


Figure A4-10

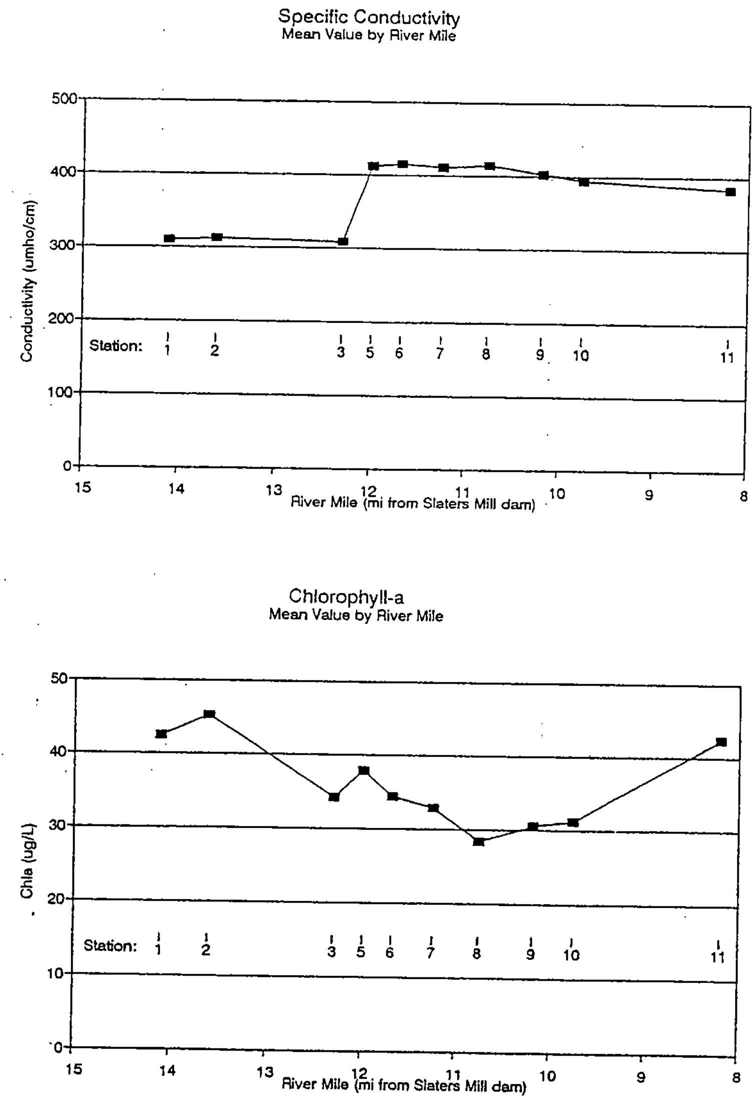


Figure A4-11 Mean specific conductivity and chlorophyll *a* concentrations as functions of distance along the river.

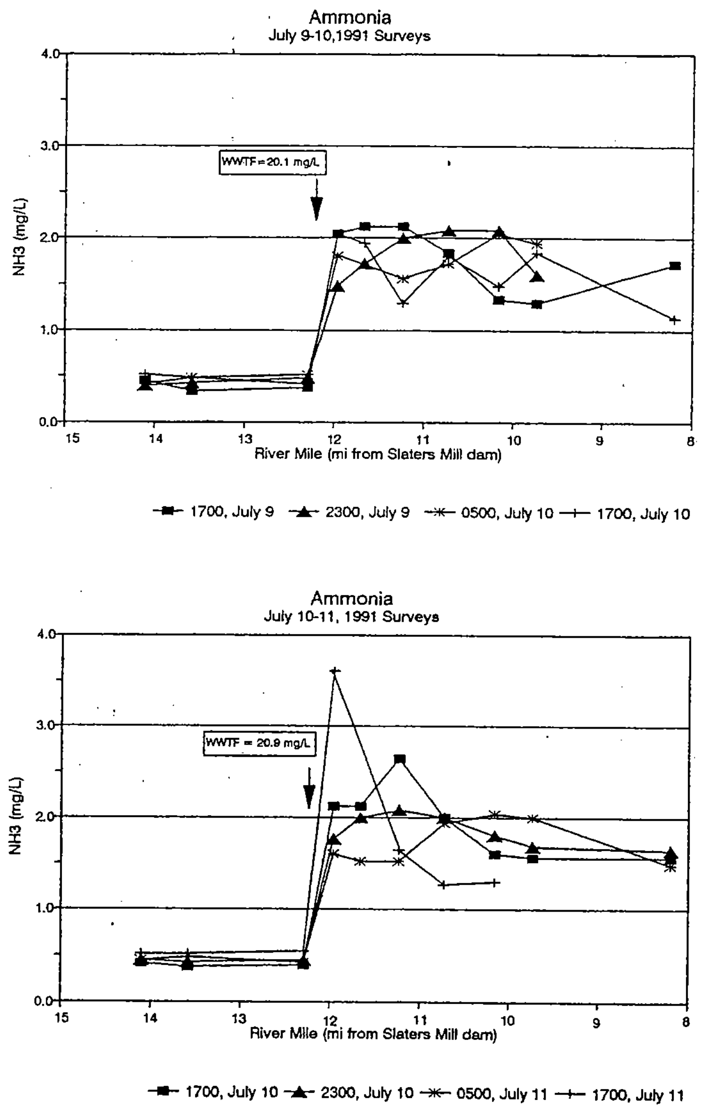


Figure A4-12

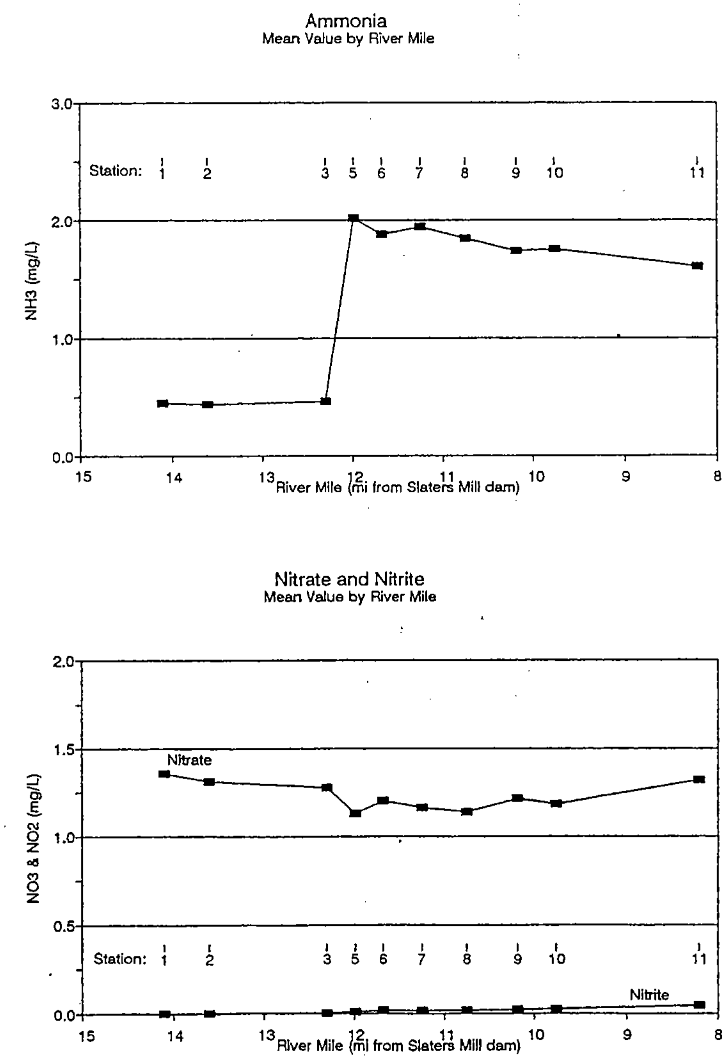
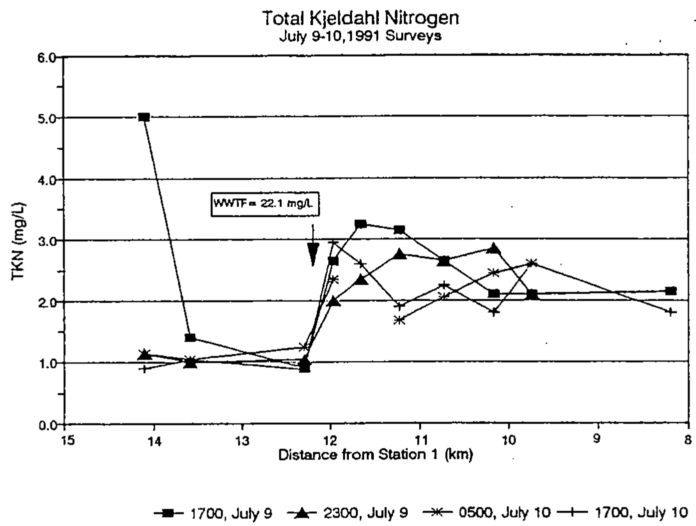
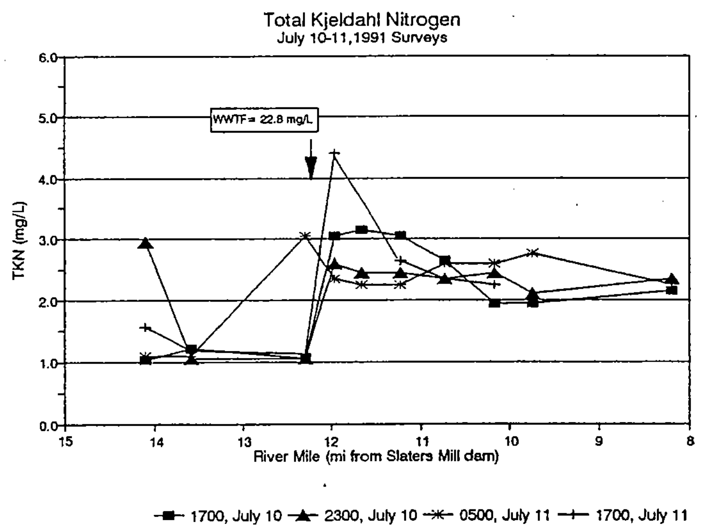
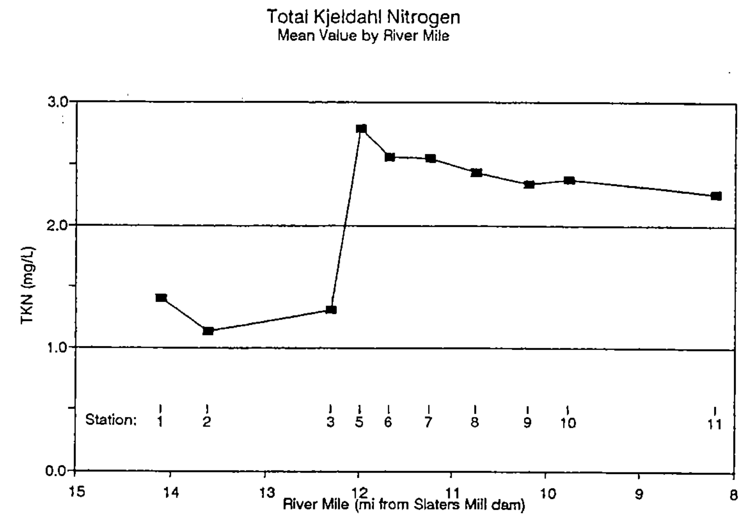


Figure A4-13 Mean ammonia, nitrate and nitrite concentrations as functions of distance along the river.







Mean total Kjeldahl nitrogen (TKN) concentration as a function of distance along the river.

Figure A4-14

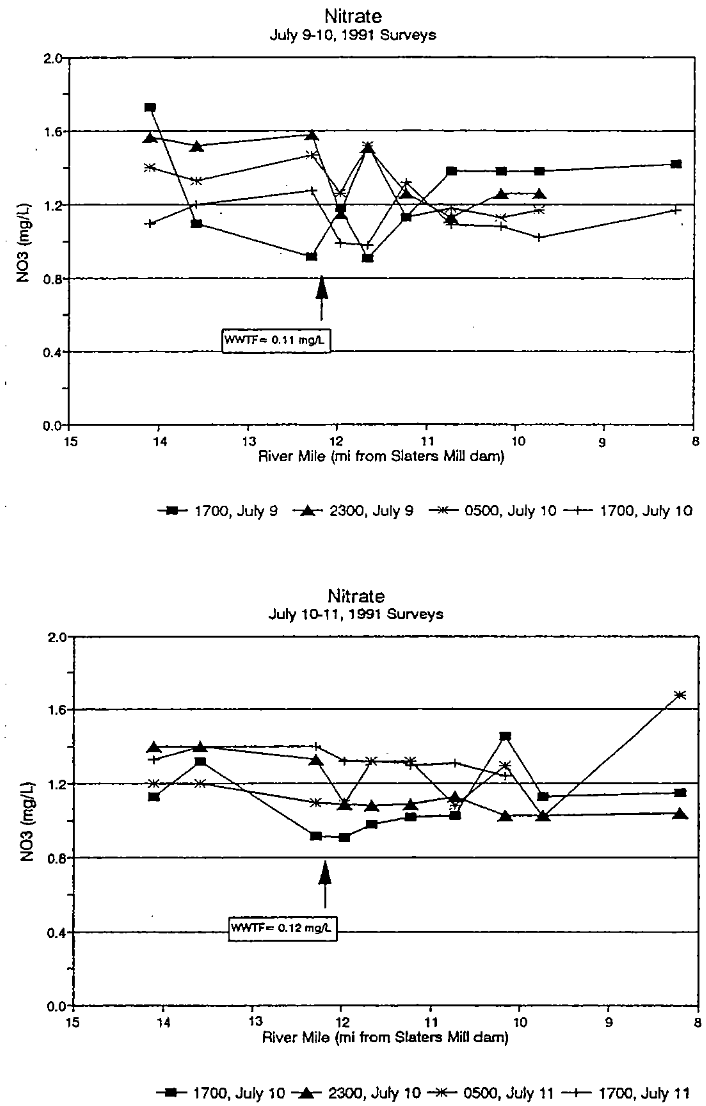


Figure A4-15

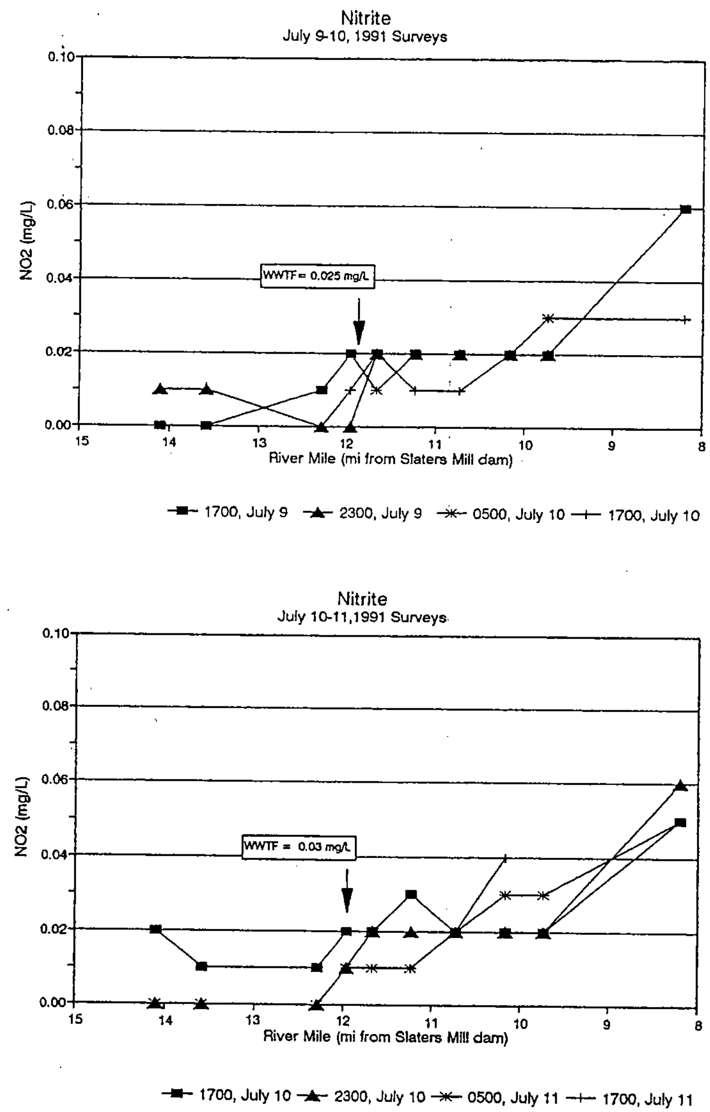


Figure A4-16

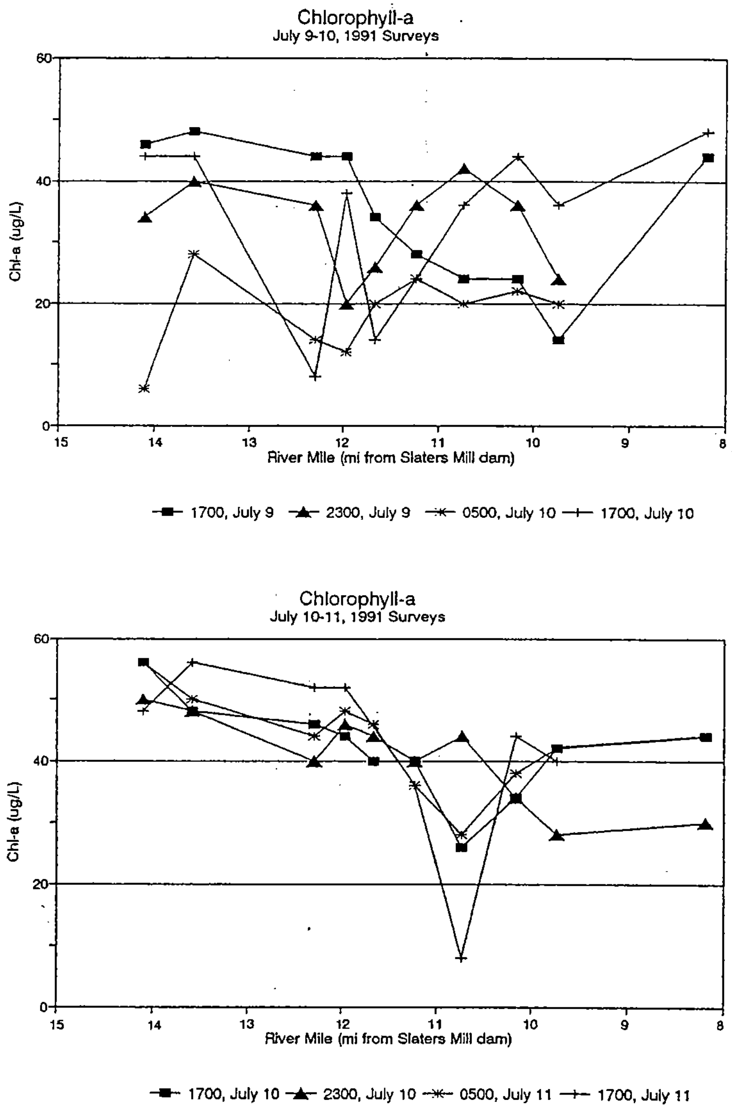


Figure A4-17

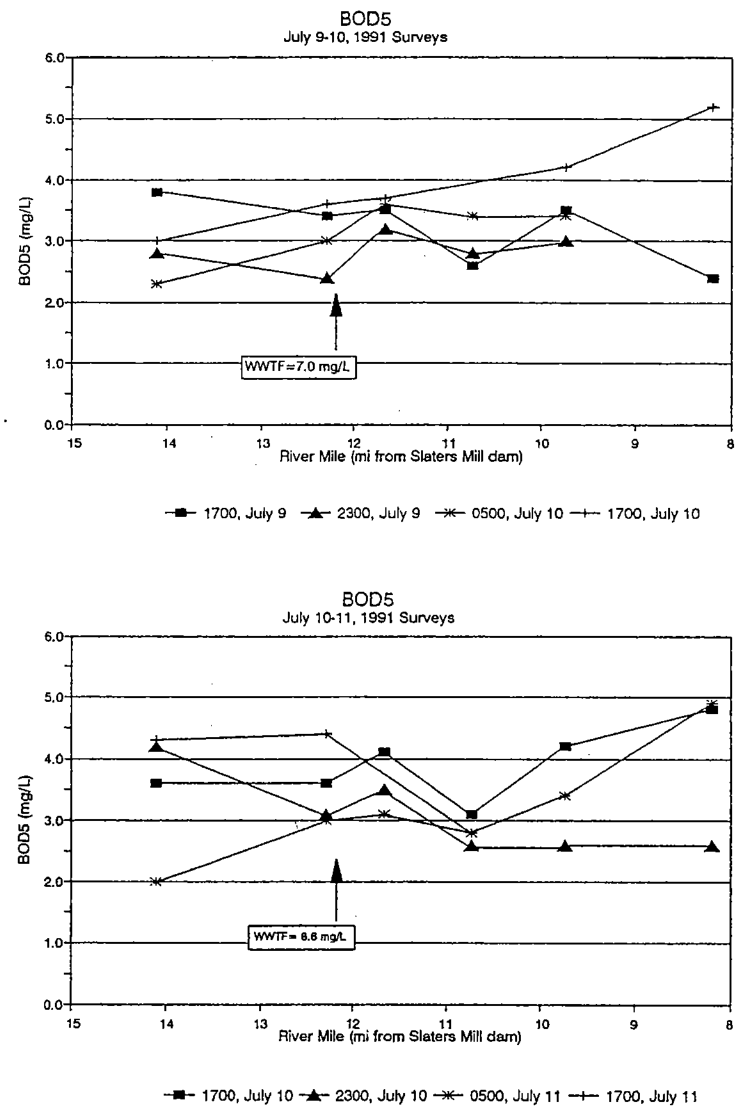
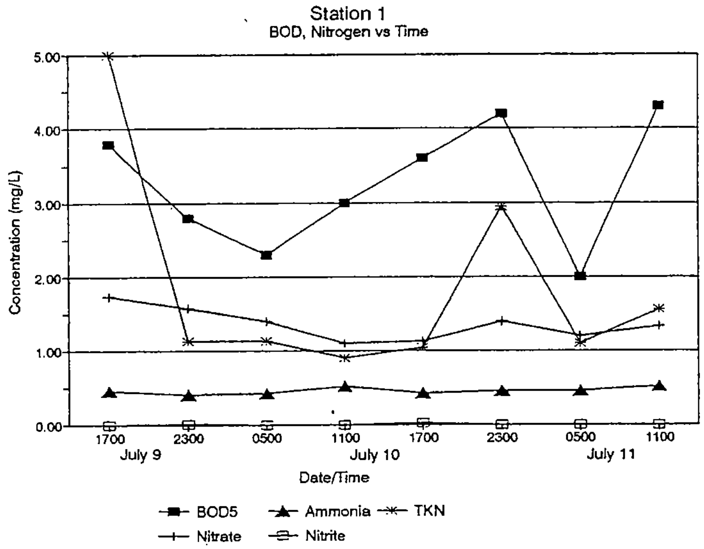


Figure A4-18



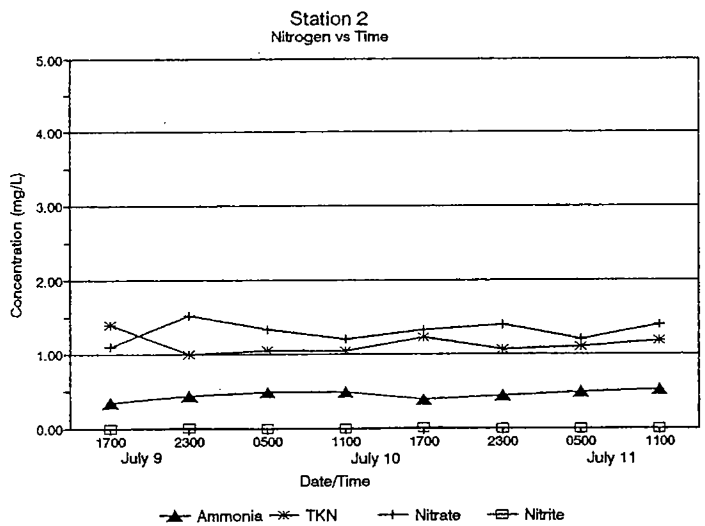
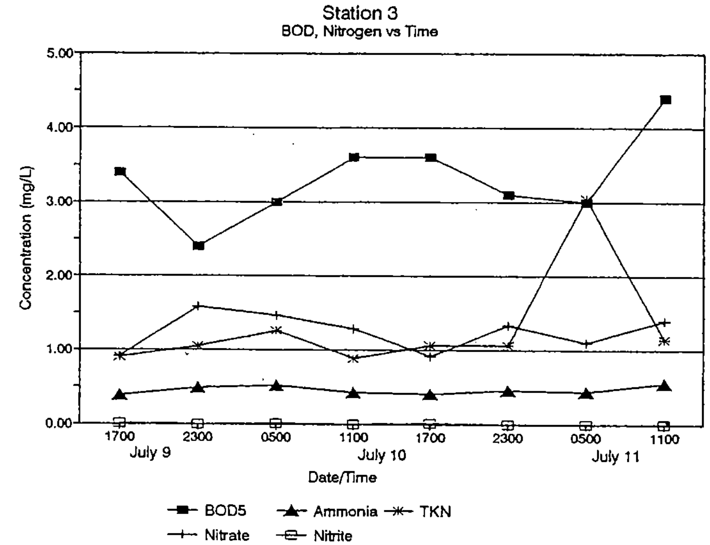


Figure A4-19



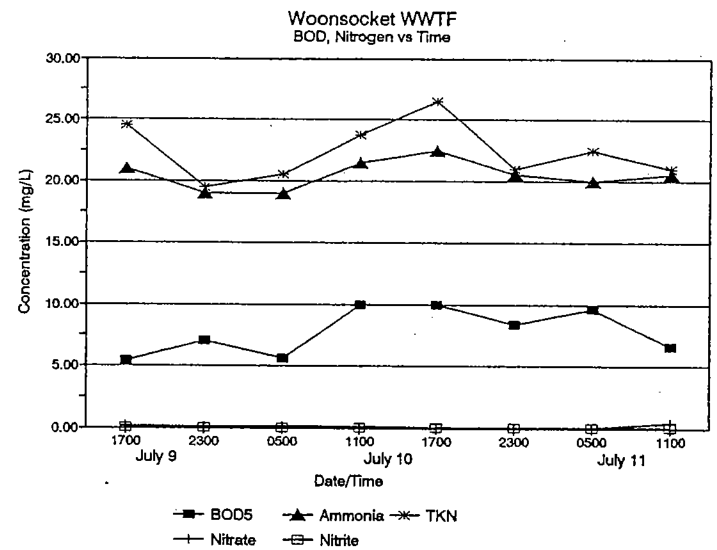


Figure A4 -20

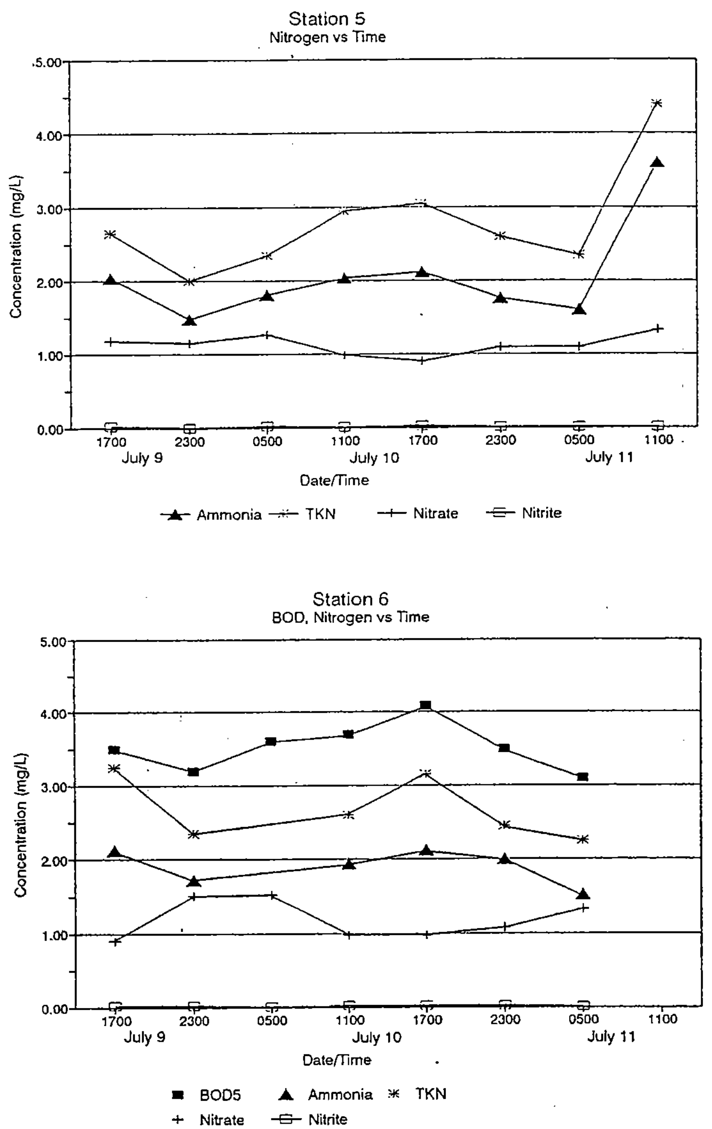


Figure A4-21

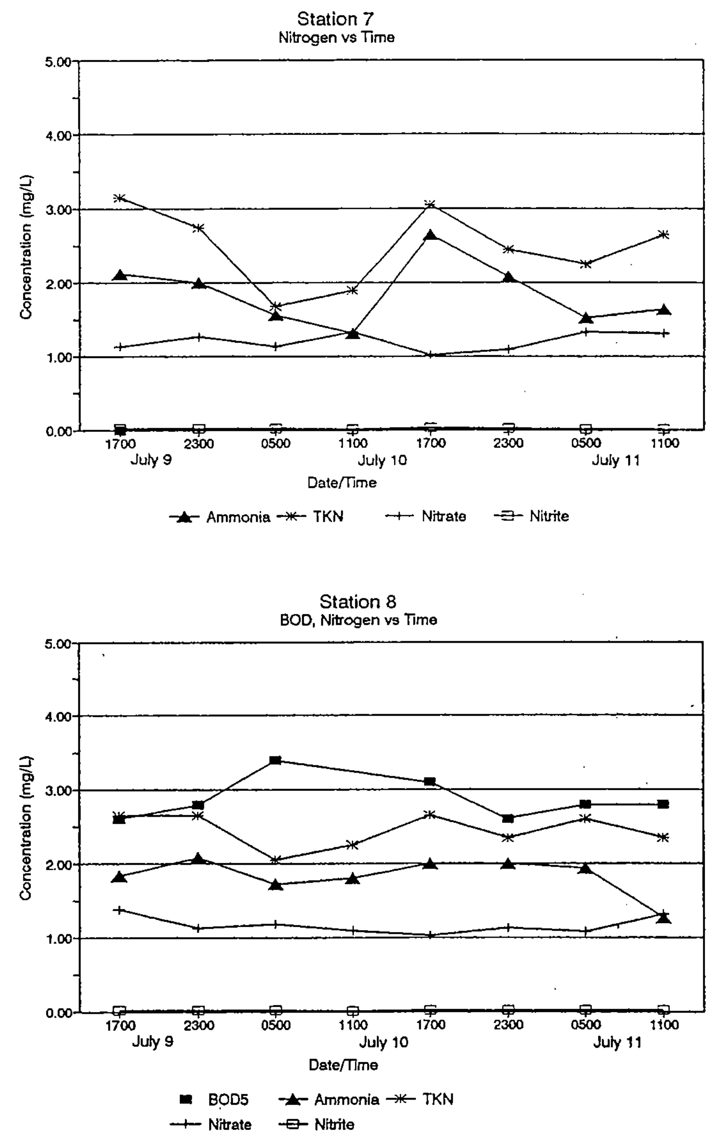


Figure A4-22

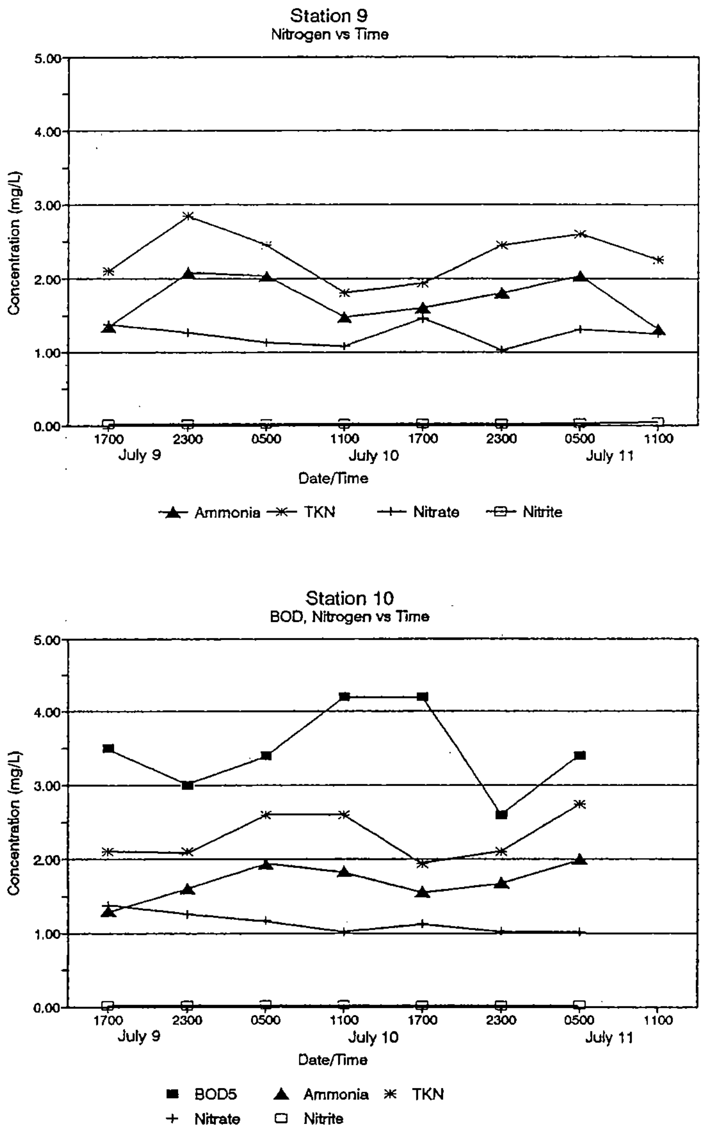


Figure A4-23

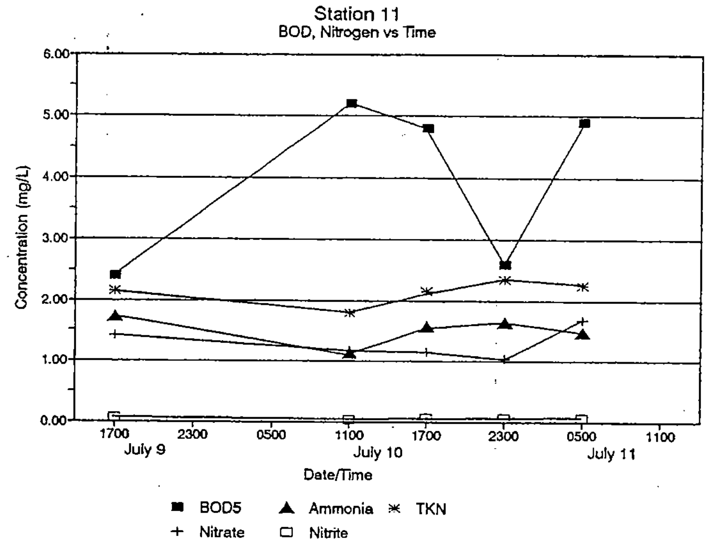


Figure A4-24

Table A4-3 Mean values of DO consumption, nitrate production, and NBOD and CBOD determined from the long term BOD analyses.

Elapsed Time (days)	Mean DO Consumption (mg/L)	Mean NO3 Concentration (mg/L)	Mean NBOD (mg/L)	Mean CBOD (mg/L)
0	0.00	1.20	0.00	0.00
5	3.61	1.11	-0.43	4.05
10	6.80	1.15	-0.24	7.04
14	10.90	1.79	2.68	8.22
20	13.81	1.78	2.64	11.18

Table A4-4 Flow-weighted mean concentrations and fluxes of analytical parameters at the upstream boundary to the study area (station 1) and the Woonsocket WWTF.

Parameter	Upstream Boundary (Mean Flow = 136 cfs)		WWTF Effluent Input (Mean Flow = 8.2 cfs)	
	Mean Concentration (mg/L)	Mean (g/sec)	Mean Concentration (mg/L)	Mean (g/sec)
Total Suspended Solids	7.2	27.7	16.4	3.8
BOD5	3.2	12.4	9.0	2.1
Ammonia	0.5	1.8	23.7	5.5
Total Kjeldahl Nitrogen	1.8	6.9	26.0	6.0
Nitrate	1.4	5.3	0.15	0.03
Nitrite	0.003	0.01	0.03	0.01
Conductivity	310.8	------	1903.8	------

Table A4-5

In-situ Measurement Program Data Listings

Survey	Station	Date	Time (EDT)	Temperature (deg C)	DO (mg/L)	pH (units)
A	4	7/9/91	1840	29.5	1.3	6.93
B	4	7/10/91	45	29	1.1	6.85
C	4	7/10/91	730	29	1.25	7
D	4	7/10/91	1325	30.2	1.4	7.87
E	4	7/10/91	1824	30	1.1	7.24
F	4	7/10/91	2343	29.5	1.05	7.4
G	4	7/11/91	655	29.8	1.1	7.26
H	4	7/11/91	1345	31	1.3	7.3
A	4-Outfall	7/9/91	1840	30	5.7	
B	4-Outfall	7/10/91	45	29	5.6	
C	4-Outfall	7/10/91	730	29	5.6	
D	4-Outfall	7/10/91	1325	30.2	5.4	
E	4-Outfall	7/10/91	1824	30	5.4	
F	4-Outfall	7/10/91	2343	29.5	5.4	
G	4-Outfall	7/11/91	655	29.8	2.6	
H	4-Outfall	7/11/91	1345	31	5.5	
A	5	7/9/91	2000	25	9.28	7.33
B	5	7/10/91	239	22	6.9	6.85
C	5	7/10/91	925	22.2	8.35	7.18
D	5	7/10/91	1500	26	10.7	7.97
E	5	7/10/91	1938	26	8.9	8.15
F	5	7/11/91	121	23.5	6.52	7.71
G	5	7/11/91	820	22.75	7.05	7.44
H	5	7/11/91	1715			8.21
A	6	7/9/91	2011	25.5	9.5	7.39
B	6	7/10/91	301	22.5	6.68	7.12
C	6	7/10/91	940	22	7.3	7.21
D	6	7/10/91	1505	23.8	9.4	7.94
E	6	7/10/91	1943	26	9.45	8.28
F	6	7/11/91	135	24	6.7	7.77
G	6	7/11/91	835	23	6.3	7.49
H	6					
A	7	7/9/91	2020	25	9.72	7.44
B	7	7/10/91	317	23.5	7.2	7.21
C	7	7/10/91	1005	22	7.25	7.21
D	7	7/10/91	1518	23.5	9	7.87
E	7	7/10/91	1954	25.3	9.65	8.37
F	7	7/11/91	159	25	7.25	7.77
G	7	7/11/91	910	23.5	6.45	7.62
H	7	7/11/91	1645	25.25	9.4	7.95

Survey	Station	Date	Time (EDT)	Temperature (deg C)	DO (mg/L)	pH (units)
A	8	7/9/91	2029	24	9.38	7.43
B	8	7/10/91	326	24	7.58	7.31
C	8	7/10/91	1017	22.8	6.35	7.38
D	8	7/10/91	1520	23.5	9.3	7.92
E	8	7/10/91	2000	24.8	9.3	8.22
F	8	7/11/91	209	25	7.7	7.78
G	8	7/11/91	1000	24	6.35	7.59
H	8	7/11/91	1630	24.25	7.3	7.37
A	9	7/9/91	2037	23.5	9.35	7.45
B	9	7/10/91	336	23.5	7.98	7.32
C	9	7/10/91	1025	24	6.85	7.39
D	9	7/10/91	1550	24.8	8.6	8
E	9	7/10/91	1550	24.8	8.6	8.15
F	9	7/11/91	220	24	8.1	7.76
G	9	7/11/91	1020	24.75	7.5	7.78
H	9	7/11/91	1600	26	8.3	7.93
A	10	7/9/91	2044	23.5	9.18	7.48
B	10	7/10/91	347	23	7.9	7.32
C	10	7/10/91	1040	24	7.7	7.42
D	10	7/10/91	1610	25.2	8.35	7.97
E	10	7/10/91	2014	24.5	8.8	8.14
F	10	7/11/91	231	24	7.45	7.75
G	10	7/11/91	1040	24.8	8.1	7.91
H	10	7/11/91	1515	26.25	9.4	8.05
A	10a	7/9/91	2216	21.5	9.4	
B	10a	7/10/91	400	23	8.25	
C	10a					
D	10a					
E	10a	7/10/91	2046	24	8.1	
F	10a	7/11/91	313	23.5	7.8	
G	10a					
H	10a					
A	11	7/9/91	2230	24	8.2	7.38
B	11					
C	11					
D	11	7/10/91	1640	25	10.8	8.35
E	11	7/10/91	2103	25	9	8.14
F	11	7/11/91	338	24	6.7	7.61
G	11	7/11/91	1103	24.5	9.2	8.13
H	11					

Table A4-6

Listing of Analytical Results from Rhode Island Analytical Laboratory, Inc.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID							
7/10/91:							
A1	10.8	3.8	0.45	5.00	1.73	<0.01	301
A1R	<0.5	0.6	<0.01	0.13	0.01	<0.01	<0.1
A2	4.7	---	0.34	1.40	1.10	<0.01	309
A2R	4.5	---	0.38	1.15	1.33	<0.01	307
A3	4.8	3.4	0.38	0.90	0.92	0.01	294
A4	7.2	5.4	21.0	24.5	0.16	0.02	1,600
A5	9.5	---	2.04	2.65	1.18	0.02	411
A6	7.6	3.5	2.12	3.25	0.91	0.02	402
A7	9.2	---	2.12	3.15	1.13	0.02	410
A8	4.3	2.6	1.84	2.65	1.38	0.02	399
A9	10.1	---	1.34	2.10	1.38	0.02	364
A10	9.1	3.5	1.30	2.10	1.38	0.02	335
A11	3.0	2.4	1.72	2.15	1.42	0.06	317

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

RI ANALYTICAL LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID							
7/10/91:							
B1	7.3	2.8	0.40	1.13	1.57	0.01	309
B2	6.6	---	0.43	1.00	1.52	0.01	302
B3	6.5	2.4	0.49	1.05	1.58	<0.01	304
B3R	7.7	2.4	0.45	1.00	1.15	<0.01	300
B4	15.2	7	19.0	19.5	0.10	0.01	1,540
B5	9.3	---	1.48	2.00	1.15	<0.01	373
B6	7.3	3.2	1.72	2.35	1.51	0.02	388
B7	9.0	---	2.00	2.75	1.26	0.02	398
B8	7.7	2.8	2.08	2.65	1.13	0.02	400
B9	0.9	---	2.08	2.85	1.26	0.02	399
B10	6.8	3	1.60	2.10	1.26	0.02	361
C1	7.1	2.3	0.42	1.13	1.40	<0.01	297
C2	8.2	---	0.49	1.05	1.33	<0.01	308
C3	8.7	3	0.52	1.25	1.47	0.01	303
C4	5.1	5.6	19.0	20.5	0.13	0.03	1,510

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

RI ANALYTICAL LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID							
7/10/91:							
C5	5.6	---	1.80	2.35	1.26	0.02	386
C5R	6.0	---	1.72	2.75	1.19	0.01	380
C6	4.9	3.6	**	**	1.52	0.01	360
C7	6.7	---	1.56	1.68	1.13	0.02	362
C8	2.4	3.4	1.72	2.05	1.18	0.02	397
C9	<0.5	---	2.04	2.45	1.13	0.02	394
C10	5.1	3.4	1.94	2.60	1.17	0.03	403
D1	5.0	3	0.52	0.90	1.10	<0.01	306
D2	8.5	---	0.49	1.04	1.20	<0.01	310
D3	8.0	3.6	0.42	0.88	1.28	<0.01	311
D4	11.8	10	21.5	23.8	0.07	0.04	1,730
D5	3.8	---	2.04	2.95	0.99	0.01	424
D6	6.9	3.7	1.94	2.60	0.98	0.02	440
D6R	5.3	3.7	2.00	3.15	1.08	0.02	431
D7	8.9	---	1.30	1.90	1.32	0.01	370

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

**No sulfuric acid preserved sample provided.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID							
7/10/91:							
D8	4.7	---	1.80	2.25	1.09	0.01	420
D9	8.2	---	1.48	1.80	1.08	0.02	382
D10	6.4	4.2	1.84	2.60	1.02	0.03	404
D11	8.7	5.2	1.14	1.80	1.17	0.03	363
D12	6.0	0.7	0.42	0.70	0.20	<0.01	94.2
7/11/91:							
E1	3.7	3.6	0.42	1.04	1.13	0.02	306
E2	8.3	---	0.38	1.22	1.32	0.01	313
E3	4.9	3.6	0.40	1.06	0.92	0.01	297
E4	25.3	10	22.5	26.5	0.02	0.04	1,730
E5	5.1	---	2.12	3.05	0.91	0.02	423
E6	14.1	4.1	2.12	3.15	0.98	0.02	426
E7	7.2	---	2.65	3.05	1.02	0.03	445
E7R	6.7	---	2.60	3.05	0.90	0.03	451
E8	7.6	3.1	2.00	2.65	1.03	0.02	432
E9	6.4	---	1.60	1.94	1.46	0.02	392
E10	12.7	4.2	1.56	1.94	1.13	0.02	397
E11	15.2	4.8	1.56	2.15	1.15	0.05	394

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91
DATA REPORTED: 09/03/91

INVOICE #: D3672
P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID 7/11/91:							
F1	8.0	4.2	0.45	2.95	1.40	<0.01	323
F1R	<0.5	0.2	0.01	0.17	0.02	<0.01	<0.1
F2	8.7	---	0.43	1.06	1.40	<0.01	323
F3	5.2	3.1	0.45	1.06	1.33	<0.01	317
F4	15.3	8.4	20.5	21.0	0.01	0.03	1,690
F5	6.7	---	1.76	2.60	1.09	0.01	406
F6	4.4	3.5	2.00	2.45	1.08	0.02	408
F7	5.6	---	2.08	2.45	1.09	0.02	432
F8	7.2	2.6	2.00	2.35	1.13	0.02	426
F8R	6.0	2.8	1.94	2.35	0.91	0.02	427
F9	3.6	---	1.80	2.45	1.03	0.02	420
F10	7.3	2.6	1.68	2.10	1.03	0.02	396
F11	1.5	2.6	1.64	2.35	1.04	0.06	397
G1	5.8	2.0	0.45	1.10	1.20	<0.01	321
G2	7.7	---	0.49	1.10	1.20	<0.01	331
G3	5.1	3	0.43	3.05	1.10	<0.01	328
G4	24.0	9.6	20.0	22.5	0.05	0.03	1,670

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

RI ANALYTICAL LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91
DATA REPORTED: 09/03/91

INVOICE #: D3672
P.O. #:

UNITS:	TOTAL SUSPENDED SOLIDS (mg/l)	BOD_5* (mg/l)	AMMONIA (AS N) (mg/l)	TOTAL KJELDAHL NITROGEN (mg/l)	NITRATE (AS N) (mg/l)	NITRITE (AS N) (mg/l)	SPECIFIC CONDUCTANCE (μmhos/cm)
SAMPLE ID 7/11/91:							
G5	4.4	---	1.60	2.35	1.09	0.01	412
G6	6.8	3.1	1.52	2.25	1.32	0.01	401
G7	4.2	---	1.52	2.25	1.32	0.01	405
G8	8.1	2.8	1.94	2.60	1.08	0.02	424
G9	5.7	---	2.04	2.60	1.30	0.03	426
G9R	5.0	---	2.00	2.65	1.08	0.02	432
G10	6.3	3.4	2.00	2.75	1.02	0.03	431
G11	5.9	4.9	1.48	2.25	1.68	0.05	404
H1	9.4	4.3	0.52	1.56	1.33	<0.01	320
H2	11.3	---	0.52	1.18	1.40	<0.01	322
H3	11.3	4.4	0.55	1.14	1.40	<0.01	314
H4	10.9	6.6	20.5	21.0	0.40	0.02	1,730
H5	9.1	---	3.60	4.40	1.32	0.01	497
H7	9.3	---	1.64	2.65	1.30	0.01	431
H8	11.7	2.8	1.26	2.35	1.31	0.02	411
H9	11.8	---	1.30	2.25	1.24	0.04	418
H10	14.9	4.3	1.74	2.15	1.44	0.04	422
H12	8.5	1.8	0.63	0.75	0.37	<0.01	93.2

*Due to the precision of the BOD_5 test, results are normally reported to the nearest whole number. The decimals used above are only for comparative purposes and are beyond the scope of the test.

RI ANALYTICAL LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

SAMPLE ID: A6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	11.5	---	---
5	7.6	3.9	1.11
10	4.6	6.9	1.22
14	0.4/8.8	11.1	2.67
20	4.0	15.9	2.00

SAMPLE ID: B6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	9.5	---	---
5	6.6	2.9	1.24
10	3.2/8.5	6.3	1.38
14	3.7	11.1	2.05
20	1.7	13.1	1.74

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

SAMPLE ID: C6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	11.4	---	---
5	7.7	3.7	1.09
10	4.7	6.7	1.29
14	2.8/8.6	8.6	2.15
20	5.7	11.5	1.75

SAMPLE ID: D6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	11.1	---	---
5	7.8	3.3	0.98
10	5.5	5.6	1.02
14	0.7/8.5	10.4	1.40
20	5.2	13.7	1.99

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

SAMPLE ID: D6R

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	11.3	---	---
5	7.8	3.5	1.13
10	5.5	5.8	0.88
14	0.8/8.5	10.5	1.04
20	5.2	13.8	1.72

SAMPLE ID: F6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	11.3	---	---
5	6.7	4.6	1.05
10	1.9/8.6	9.4	1.21
14	3.6	14.4	1.94
20	1.5	16.5	2.00

RI ANALYTICAL LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

ASA Associates
DATE RECEIVED: 07/10 & 7/11/91 INVOICE #: D3672
DATA REPORTED: 09/03/91 P.O. #:

SAMPLE ID: G6

DAY	DO (MG/L)	ACCUMULATED DO CONSUMED BY SAMPLE (MG/L)	NO_3-N (MG/L)
0	9.9	---	---
5	6.5	3.4	1.14
10	3.0/8.5	6.9	1.03
14	5.2	10.2	1.25
20	3.2	12.2	1.24

RI ANALYTICAL LABORATORIES, INC.

5. SUMMARY

The measurement program produced eight views of the river during the summer season when temperatures in the river were relatively high, approximately 24°C., and flows were low, between 130-150 cfs. The data should therefore be descriptive of the river during near-worst case conditions. DO concentrations were relatively close to saturation values over the study area. Lowest DO levels were above 70% of saturation. Mean DO at the sag point between stations 6-8 was 93% of the saturation level. Mean DO varied between a low value of 7.9 mg/L at stations 6 and 8 to a high value of nearly 11.9 mg/L at station 1. The largest change in mean DO occurred across the Thundermist dam, where DO dropped from a supersaturated concentration of 11.9 mg/L at station 1 to the the saturation value of 8.33 mg/L several yards below the dam at station 1a. Mean DO was relatively constant at between 7.9-8.8 mg/L at stations below the Thundermist dam. Significant diurnal variations of DO observed along most of the river were probably due to phytoplankton productivity. Chlorophyll *a* concentrations ranged between 20-55 ug/L during the study. Chlorophyll *a* was higher at stations 1 and 2, 38 and 45 ug/L respectively, declining to a low mean value of 28 ug/L at station 8. The concentration then rose to above 40 ug/L at the downstream station 11.

TSS levels were variable through the area, with no trends evident. TSS concentrations in the WWTF effluent were similar to those in the river, suggesting that the WWTF has a minor impact on TSS in the river. WWTF effluent also had no measurable impact on BOD in the river, which averaged between 2.5 to 4.5 mg/L. The WWTF did significantly change TKN and conductivity levels in the river. TKN increased from 1.31 mg/L above the outfall to 2.8 mg/L downstream of the outfall. Conductivity levels upstream of the facility were approximately 300 mg/L, increasing to greater than 400 mg/L below the facility. The mean ammonia concentration of the WWTF outfall samples was 20.5 mg/L. This produced an increase in the river from 0.46 mg/L at station 3 to 2.02 mg/L at station 5.

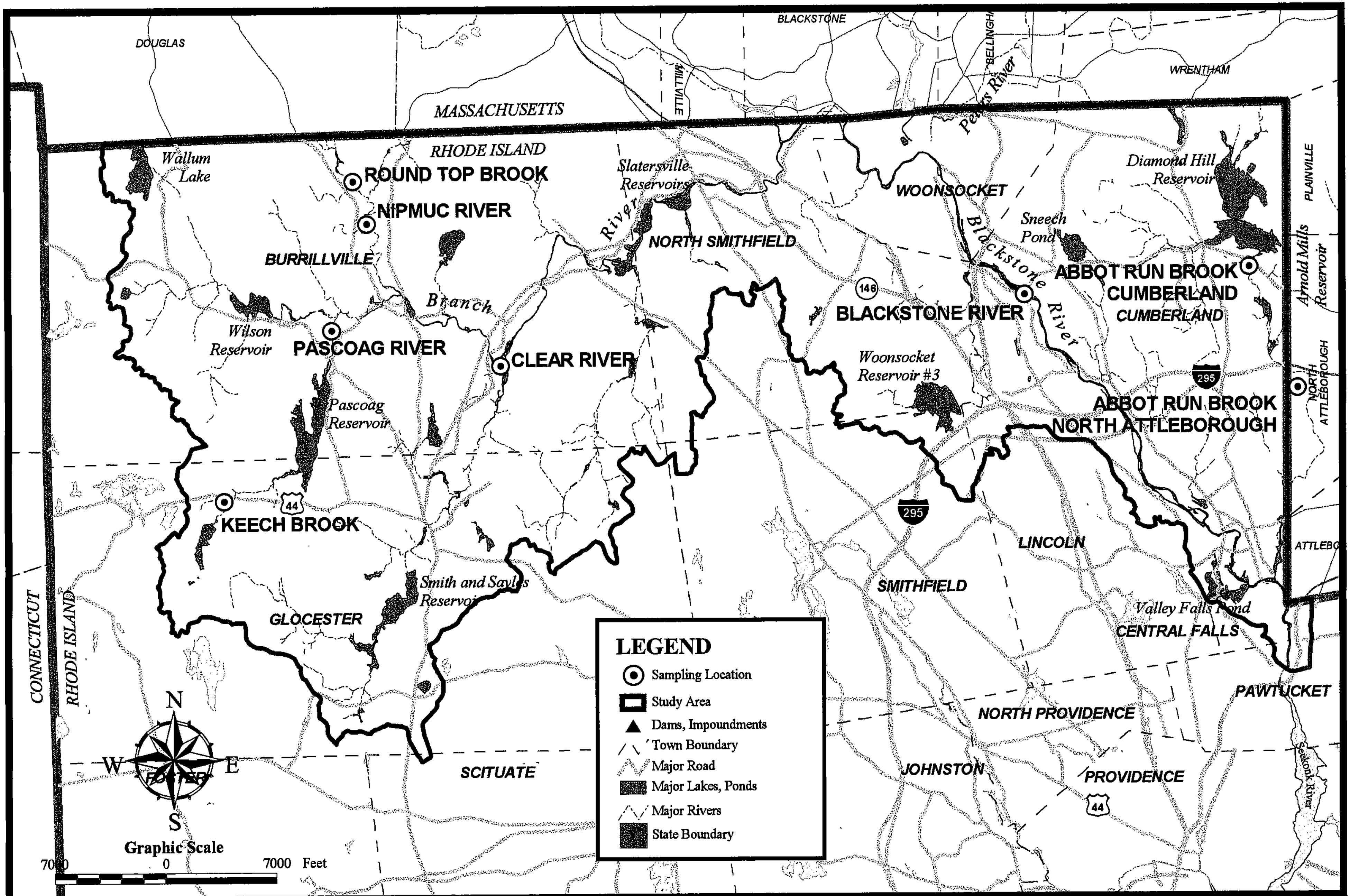
Nitrate was relatively constant between 1.13 and 1.32 mg/L over the river. Dilution from the WWTF outfall accounts for the slight drop from 1.28 to 1.13 mg/L seen between between stations 3 and 5. The mean nitrate concentration in WWTF samples was 0.12 mg/L. Nitrite concentrations are small, increasing from 0.01 mg/L at station 1 to 0.05 mg/L at station 11.

The dye time of travel experiment was conducted over a period of nearly 40 hours following the release of dye at station 3a. Analysis of the data yielded travel times of 5.3, 10.3 and 23.9 hours between station 3a and stations 6, 8, and 10, respectively. The corresponding mean current speeds were 5.95, 9.03, and 3.28 cm/sec between stations 3a-6, 6-8 and 8-10, respectively. Measurements of water depth at the center of the river were also made to assess the bottom. The measurements indicated that the bottom in nearly all areas of the river were composed of rocks and gravel. Mean depths at the center of the river typically ranged between 4-6 ft above station 8 to greater than 7 feet below station 8. The deepest areas of the river (11-12 ft) were shortly upstream of stations 9 and 10.

Appendix 5

Providence - Seekonk River Total Maximum Daily Load (TMDL) Project

(RIDEM, unpubl. data)



The Louis Berger Group, Inc.

Rhode Island DEM

Figure A8-1
RIDEM CHEMICAL MONITORING

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

Table A5-1

Providence River Seekonk River TMDL Sampling Data

(RIDEM, unpublished data)

Sampling Station: DEM-SM (Slaters Mill Pawtucket, RI)

Date	5-Day Biochemical Oxygen Demand (mg/l)	Total Suspended Solids (mg/l)	Total Particulate Carbon (mg/l)	Silicon dioxide (SiO2 mg/l)	Nitrate-Nitrite (mg/l as N)	Ammonia (mg/ as N)	Total Particulate Nitrogen (mg/l)	Total Nitrogen (mg/l)	Orthophosphate (mg/l as P)	Total Phosphorous (mg/l)	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
31-May-95	2	...	1.41	2.26	1.908	0.168	0.138	3.028	0.289	0.255			●
01-Jun-95	5	...	0.75	...	...	...	0.118	3.014	...	0.230			●
02-Jun-95	2	...	1.54	2.38	1.846	0.172	0.176	3.354	0.272	0.270			●
09-Jun-95	2	...	1.74	2.37	1.757	0.277	0.205	3.105	0.388	0.321		●	
14-Jun-95	2	...	1.35	2.56	1.358	0.168	0.156	2.455	0.379	0.362			●
22-Jun-95	1	...	1.59	2.49	1.339	0.019	0.217	2.111	0.254	0.237	●		
27-Jun-95	1	...	2.24	2.46	1.212	0.162	0.302	2.551	*(ed)*	*(ed)*	●		
28-Jun-95	1	...	2.20	2.40	1.318	0.093	0.309	2.569	*(ed)*	*(ed)*	●		
29-Jun-95	8	...	2.26	2.33	1.618	0.065	0.212	2.628	0.177	0.173	●		
14-Jul-95	1	...	2.01	0.59	1.813	0.053	0.226	2.751	0.074	0.175	●		
18-Jul-95	1	...	2.11	1.81	1.532	0.100	0.227	2.517	0.160	0.258		●	
19-Jul-95	1	...	2.50	2.04	1.388	0.130	0.232	2.301	0.163	0.289			●
20-Jul-95	3	...	1.90	1.68	1.455	0.040	0.207	2.378	0.150	0.258			●
27-Jul-95	1	...	1.97	1.85	1.878	0.058	0.183	2.760	0.170	0.271	●		
08-Aug-95	*(ed)*	...	1.16	2.17	1.876	0.287	0.124	2.854	0.157	0.242		●	
09-Aug-95	4	...	1.54	0.53	1.636	0.169	0.171	2.486	0.101	0.427			●
10-Aug-95	4	...	0.64	2.30	2.275	0.109	0.102	2.603	0.111	0.169			●
16-Aug-95	1	...	2.09	1.39	1.607	0.033	0.255	2.130	0.123	0.214	●		
22-Aug-95	1	...	2.09	1.46	2.156	0.035	0.263	2.823	0.137	0.237	●		
23-Aug-95	3	...	2.32	0.83	1.992	0.036	0.281	...	0.098	0.273	●		
24-Aug-95	1	...	1.90	1.50	2.198	0.045	0.428	*(ed)*	0.154	*(ed)*	●		
30-Aug-95	4	...	1.80	1.56	2.310	0.131	0.358	3.114	0.174	0.471	●		
08-Sep-95	3	...	2.45	2.16	1.835	0.022	0.459	3.671	0.249	0.474	●		
14-Sep-95	3	...	2.24	2.29	1.994	0.088	0.350	3.951	0.319	0.523		●	
19-Sep-95	4	...	1.66	1.76	1.984	0.057	0.252	2.509	0.204	0.302		●	
20-Sep-95	4	...	1.78	1.07	1.909	0.178	0.316	2.755	0.075	0.247		●	
21-Sep-95	1	...	2.33	2.21	2.256	0.010	0.369	2.716	0.113	0.243			●
02-May-96	1	...	0.52	1.62	0.473	0.253	0.060	1.165	0.050	0.137	●		
14-May-96	1	...	1.17	1.76	0.551	0.213	0.132	1.072	0.045	0.100			●
28-May-96	2	...	1.58	1.77	1.133	0.106	0.269	1.700	0.065	0.117	●		
29-May-96	1	...	1.00	1.65	1.254	0.107	0.109	1.902	0.053	0.137	●		
30-May-96	1	...	1.35	1.64	1.225	0.165	0.143	2.376	0.074	0.150		●	
05-Jun-96	1	...	0.91	2.23	1.101	0.148	0.090	1.730	0.111	0.192			●
18-Jun-96	1	...	1.83	3.00	1.802	0.087	0.207	2.446	0.133	0.240	●		
24-Jun-96	1	6.55	1.11	2.75	1.835	0.229	0.158	2.641	0.144	0.250		●	
25-Jun-96	1	6.09	1.16	2.70	1.534	0.185	0.140	2.351	0.158	0.273			●
26-Jun-96	1	5.70	1.25	2.86	1.397	0.182	0.155	2.308	0.165	0.253			●
11-Jul-96	2	7.62	2.18	2.22	1.076	0.005	0.347	2.162	0.144	0.245	●		
15-Jul-96	3	17.61	2.26	1.66	0.515	0.062	0.229	*(ed)*	0.059	*(ed)*			
16-Jul-96	1	16.03	2.29	1.89	0.538	0.086	0.227	1.199	0.077	0.228		●	
17-Jul-96	...	51.93	4.85	2.33	0.491	0.082	0.455	1.337	0.086	0.326		●	
31-Jul-96	1	5.62	1.14	2.61	1.289	0.057	0.214	1.875	0.165	0.254			●
15-Aug-96	...	4.48	1.15	2.29	1.168	0.314	0.179	1.944	0.132	0.248			●
19-Aug-96	3	6.56	0.78	2.49	1.591	0.403	0.122	2.462	0.187	0.271	●		
20-Aug-96	3	2.71	0.89	2.46	1.534	0.259	0.154	2.419	0.154	0.231	●		
21-Aug-96	...	37.53	6.32	2.38	1.568	0.236	0.675	4.961	0.112	0.324	●		
05-Sep-96	1	4.19	0.79	2.66	1.988	0.082	0.125	2.542	0.151	0.214	●		
19-Sep-96	1	32.55	1.48	1.87	0.710	0.135	0.188	1.361	0.052	0.281		●	
02-Oct-96	1	5.07	0.53	3.02	1.361	0.195	0.065	2.083	0.122	0.208	●		
15-Oct-96	3	3.90	0.39	3.13	0.775	0.134	0.055	1.443	0.067	0.139	●		
16-Oct-96	1	3.61	0.56	3.13	0.738	0.231	0.068	1.399	0.109	0.139	●		
17-Oct-96	1	3.68	0.57	3.01	1.858	0.748	0.089	1.650	0.314	0.177	●		
14-Nov-96	1	5.34	0.75	3.21	0.753	0.553	0.104	2.117	0.098	0.161	●		

Table A5-1

Providence River Seekonk River TMDL Sampling Data

(RIDEM, unpublished data)

Sampling Station: DEM-SM (Slaters Mill Pawtucket, RI)

Date	5-Day Biochemical Oxygen Demand (mg/l)	Total Suspended Solids (mg/l)	Total Particulate Carbon (mg/l)	Silicon dioxide (SiO_2 mg/l)	Nitrate-Nitrite (mg/l as N)	Ammonia (mg/ as N)	Total Particulate Nitrogen (mg/l)	Total Nitrogen (mg/l)	Orthophosphate (mg/l as P)	Total Phosphorous (mg/l)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)

Statistical Summary - all data													
Count	49	19	53	52	52	52	53	50	50	49	●	●	●
Mean	**2.0**	**11.93**	**1.67**	**2.13**	**1.475**	**0.153**	**0.215**	**2.396**	**0.150**	**0.249**	●	●	●
Minimum	1	2.71	0.39	0.53	0.473	0.005	0.055	1.072	0.045	0.100	●	●	●
Maximum	8	51.93	6.32	3.21	2.310	0.748	0.675	4.961	0.388	0.523	●	●	●

Statistical Summary - Dry Weather													
Count	25	10	26	26	26	26	26	24	24	23	●		
Mean	**1.9**	**8.02**	**1.72**	**2.21**	**1.548**	**0.156**	**0.235**	**2.452**	**0.144**	**0.233**	●		
Minimum	1	2.71	0.39	0.59	0.473	0.005	0.055	1.165	0.050	0.117	●		
Maximum	8	37.53	6.32	3.21	2.310	0.748	0.675	4.961	0.314	0.474	●		

Statistical Summary - Wet Weather													
Count	9	4	11	11	11	11	11	11	11	11		●	
Mean	**2.0**	**26.76**	**1.978**	**1.996**	**1.441**	**0.153**	**0.240**	**2.419**	**0.158**	**0.284**		●	
Minimum	1	1.74	1.111	1.075	0.277	0.057	0.124	0.388	0.052	0.150		●	
Maximum	4	51.93	4.848	2.747	1.994	0.287	0.455	3.951	0.388	0.523		●	

(ed) = edited

... = No data.

(1) Dry Weather: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) Wet Weather: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) Mixed Weather: Conditions that did not meet Wet or Dry Weather criteria.

Table A5-2

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by RIDEM in 1995 and 1996 are marked

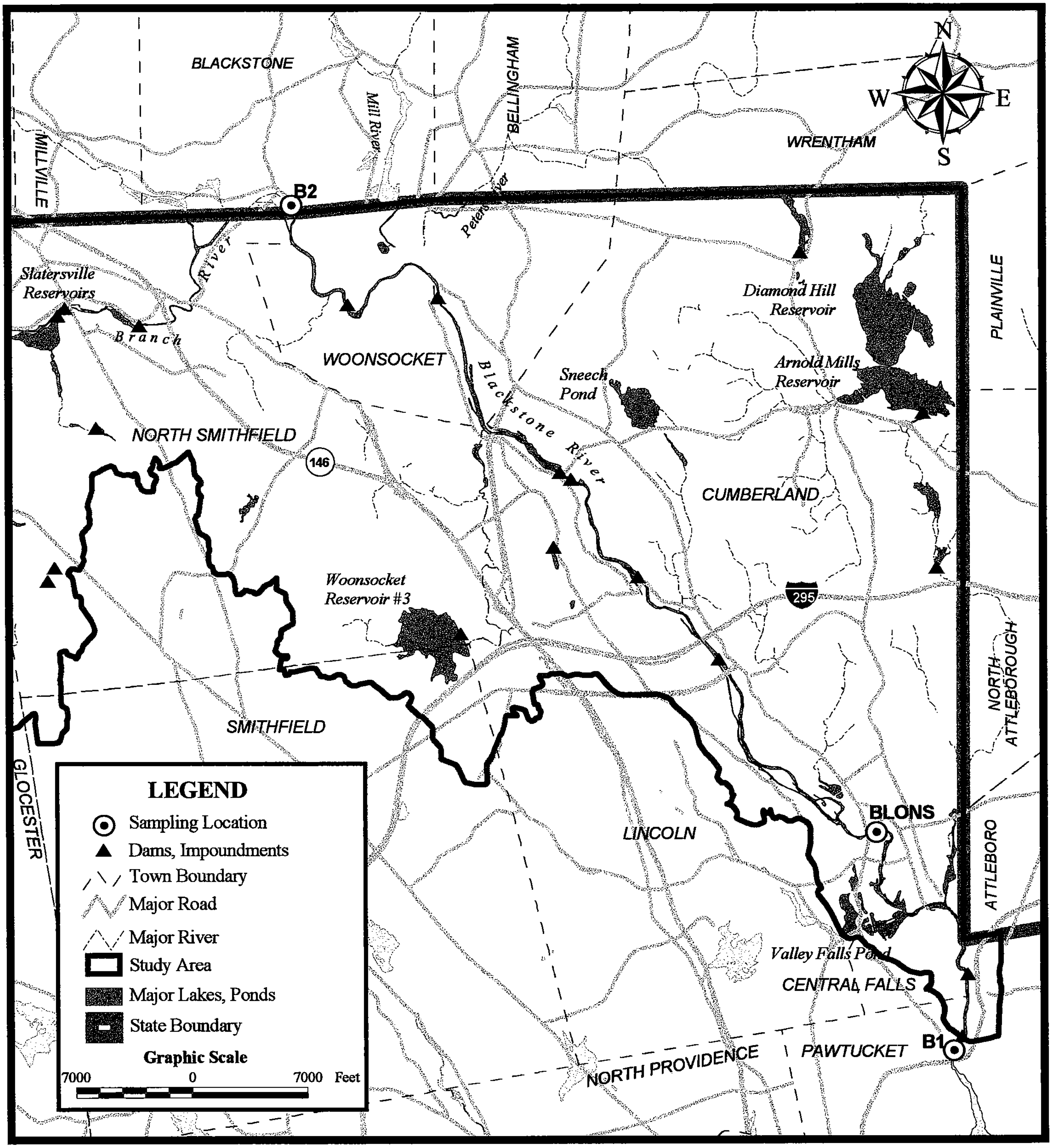
Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	1	0.54		Tr		0.77						0.02	0.13
1995	2	0.30				Tr		0.03	0.05	Tr		0.78	
1995	3			Tr			0.06		0.04			0.03	0.11
1995	4	Tr	0.81		0.06		0.32		0.73		0.01	0.11	0.06
1995	5		Tr	0.12		0.05			0.42		1.08		
1995	6	0.02		0.03			0.07		0.54		1.92		0.35
1995	7	0.90		Tr	0.10		0.98		0.01		0.17	1.09	
1995	8			0.04	0.24		0.30	0.01				Tr	
1995	9			0.87	0.56		Tr						1.03
1995	10		Tr		0.01	0.04	Tr						
1995	11	0.10		Tr		0.39	0.10	0.30				0.05	
1995	12	0.08		Tr	0.08	Tr	0.46		Tr			0.69	
1995	13				0.53	Tr	0.21			0.12		0.05	
1995	14	Tr		Tr	0.02	0.09	0.04			0.35	0.30	1.15	0.35
1995	15	0.05	0.57	0.02		0.35					0.61	0.52	Tr
1995	16	0.26	0.28	0.01		Tr							0.05
1995	17	0.01		0.44		0.30		0.05		2.72	Tr		0.01
1995	18	0.01		0.05	Tr	0.02		0.37				0.15	
1995	19	Tr			0.58	0.22						0.25	0.05
1995	20	1.22	Tr		Tr		0.28				0.04		0.03
1995	21	0.09	0.01	0.40	0.39			Tr			1.29	Tr	Tr
1995	22	0.02	0.04	Tr	0.01					0.49			
1995	23	0.07	0.19	Tr				Tr		0.02			
1995	24		0.20	Tr		0.03	Tr					Tr	0.01
1995	25	Tr	Tr			0.02	0.06	Tr		0.04			
1995	26		Tr			Tr	0.01	Tr		0.32			
1995	27	Tr	0.05					Tr	0.01			Tr	
1995	28		0.99		0.58	Tr		0.01			0.95		
1995	29				Tr	0.52		0.40				0.21	
1995	30			0.05	0.18	0.03							
1995	31			Tr					Tr				

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	1				0.07	0.02		Tr	0.28	0.14			0.20
1996	2	0.07	0.03	0.30	0.52	0.02				0.13	0.02		1.16
1996	3	0.22	0.09	0.02		0.25	0.45	0.52			Tr		
1996	4	Tr				Tr	0.18	0.35		0.01			
1996	5	Tr		0.19	Tr	0.03	0.07					0.01	
1996	6			0.83	Tr	0.26			Tr				0.87
1996	7	0.06		0.48	0.42					1.21		0.16	1.15
1996	8	0.12	Tr	0.03	0.03	0.18				0.02	2.06	0.08	0.36
1996	9	Tr	0.12		0.32		Tr	0.04	Tr		0.30	0.53	
1996	10	0.05			0.13	0.27	0.05	0.01	0.07	0.01	0.01		
1996	11		0.27		Tr	0.15	Tr						0.08
1996	12	1.08			0.04	0.10	Tr			0.04			0.04
1996	13				0.04			3.57	0.93	0.13	Tr		0.03
1996	14		0.16		0.01					0.03	Tr		0.16
1996	15			0.17				Tr					Tr
1996	16	Tr	0.05		2.00	0.47							Tr
1996	17	0.03	Tr		Tr	0.14	0.03			0.93			0.68
1996	18						0.06			1.91			
1996	19	0.98		0.04			0.10	0.11			0.25	0.16	1.17
1996	20			0.64			0.46				2.81		0.01
1996	21	Tr	0.73		Tr	0.19	0.14		Tr				
1996	22		Tr		Tr		0.02			0.41	0.10		
1996	23		0.02	Tr	0.04		Tr	0.45	0.05	0.26	0.34		
1996	24	0.85	0.57		0.04	Tr	0.35		0.39	0.05	0.01		0.46
1996	25	Tr		Tr	Tr		0.04		0.01	0.17		0.02	0.10
1996	26			0.01	0.03			0.07	0.01			1.42	
1996	27	1.42	0.02				Tr					Tr	0.03
1996	28	Tr	0.13				Tr		0.45	0.03	0.21		Tr
1996	29	0.11			0.69	Tr	Tr			0.24			0.07
1996	30	0.02			0.50	0.36	0.22				0.09	Tr	
1996	31	0.01						0.45			Tr		0.02

Appendix 6

River Rescue Project: Water Quality in Rhode Island's Urban Waters (1990 to 1995)

(Kerr and Lee, 1996)



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure A6-1
RIVER RESCUE STUDY 1990-1995

Data for

Metals,
Dissolved Oxygen,
Temperature,
Calcium,
Magnesium,
Hardness,
Total Suspended Solids

Table A6-1: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B2
Blackstone River, Main Street, Blackstone, MA

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
1990	Dry	1-Oct-90	15:45		18.5	19.5	9.1	9.4	97		11.5	2.3	38.2	0.46	1.70	13.1	4.9	12.2	1	1		1	0.01	0.04			0.01
	1 day	15-Oct-90	11:30		19.0	21.0	7.7	9.3	83		4.3	2.0	19.0	1.13	4.20	20.6	9.6	8.6	1	1		1		1.52	0.71	0.30	0.07
																	0.9					1					
	3-4 days	13-Nov-90	10:00		3.0	-1.0	11.0	13.5	82		4.0	1.7	17.0	0.67	1.90	10.8	3.6	4.4	1	1		1				1.12	
	Dry	25-Nov-90	15:30		8.0	14.0	11.1	11.8	94		8.0	2.2	29.0	3.88	2.80	24.5		9.8	1	1				0.08	0.11		
	2 days	10-Dec-90	11:15		4.0	9.0	11.8	13.1	90		5.6	2.0	22.2	0.47	1.70	7.8	3.3	4.2	1	1		1			0.26	0.05	
1991	Dry	6-Jan-91	15:00		3.0	4.0	12.9	13.5	96		6.0	2.0	23.2	0.53	3.10	9.9	5.5	5.5	1	1		1		0.10			
	3-4 days	20-Jan-91	12:00		2.0	6.0	13.8	13.8	100		6.0	2.0	23.2	0.49	2.20	8.3	4.0	6.7	1	1		1				0.04	1.33
	Dry	4-Feb-91	15:30		4.0	14.0	12.6	13.1	96																		0.20
	3-4 days	17-Feb-91	15:30		0.0	0.0	14.4	14.6	98		8.0	2.0	28.2	0.52	1.70	7.5	3.5	4.2	1	1		1			0.05	0.92	0.10
	Same day	4-Mar-91	15:00		6.5	8.5	12.6	12.3	102		5.5	1.8	21.2	0.55	4.00	11.6	6.2	3.9	1	1		1	0.85	0.61	0.54		
	3-4 days	17-Mar-91	15:00		7.0	10.5	12.7	12.1	105		9.6	2.3	33.4	0.41	1.20	6.5	2.3	4.9	1	1		1			0.07	0.51	
	Dry	1-Apr-91	15:00		7.0	8.5	11.7	12.1	96		8.1	2.2	29.3	0.76	6.00	9.6	3.1	3.8	1	1		1		0.21	0.15		0.07
	Dry	29-Apr-91	15:30		13.0	16.0	8.5	10.5	80		9.4	2.1	32.1	0.64	2.80	9.8	4.8	6.3	1	1		1					
	2 days	12-May-91	14:30		18.0	29.0	8.5	9.5	89		9.8	2.0	32.7	0.72	3.50	11.5	5.8	5.4	1	1		1			0.66		
	Dry	9-Jun-91			26.0	30.0	8.7	8.1	107		13.3	2.7	44.4	3.49	2.20	9.9	5.3	6.8	1	1		1					0.03
	3-4 days	22-Jun-91	16:00		23.0	19.0	8.1	8.6	94		13.4	2.5	43.8	0.54	1.90	10.6	5.3	7.4	1	1		1	0.01			0.47	
	Dry	8-Jul-91	10:00		27.0	26.0	8.0	8.0	100		14.3	2.8	47.4	0.50	2.50	9.7	4.6	7.3	1	1		1		0.08		0.03	
	Dry	22-Jul-91	16:00		27.0	29.0	11.2	8.0	141		14.8	3.0	49.1	0.36	1.50	8.3	1.6	7.6	1	1		1					
	1 day	5-Aug-91	14:00		23.0	27.0	9.5	8.6	111		13.5	2.6	44.4	0.46	2.60	11.8	5.4	11.8	1	1		1		0.79	0.07		
	Dry	10-Nov-91	14:20		5.0	1.5	10.8	12.8	85		10.8	1.4	32.7	0.88	2.10	9.6	3.9	6.8	1	1		1	0.01				
	Same day	25-Nov-91	15:00		7.0	2.0	10.5	12.1	86		10.7	2.0	34.8	0.67	2.00	12.8	4.7	7.1	1	1		1	0.39	0.51	0.69	0.45	
	Dry	8-Dec-91	11:00		3.5	8.0	12.1	13.3	91		11.5	2.4	38.5	0.67	2.30	6.4	3.0	4.7	1	1		1			0.23		0.15
	Dry	29-Dec-91	10:30		2.0	5.0	11.9	13.8	86		9.3	1.9	30.9	0.83	2.30	8.8	3.8	5.1	1	1		1					

Table A6-1: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B2
Blackstone River, Main Street, Blackstone, MA

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
1992	Dry	12-Jan-92	12:00		0.0	-3.0	11.6	14.6	79																	0.17	
	Dry	7-Feb-92	15:30		0.0	-1.0	12.8	14.6	88		8.1	2.0	28.5	1.00	1.70	11.8	2.7	4.1	1	1		1				0.09	
	Same day	8-Mar-92	16:45	7.1	5.0	6.5	12.4	12.8	97														0.05	0.95			
	Dry	7-Apr-92	11:00	6.9	8.5	12.5	10.5	11.7	90	3.4	8.6	2.6	32.2	0.60	1.00	7.3	2.2	4.8	1	1		1					
	Dry	3-May-92	13:20	6.8	16.0	20.0	8.2	9.9	83	1.3	8.2	2.5	30.8	0.20	1.40	5.4	2.5	3.8		1		1	0.05	0.13	0.08		
	1 day	7-Jun-92	15:30	6.8	19.0	26.0	7.9	9.3	85	2.6	4.5	2.1	19.9	0.60	2.70	10.5	6.6	5.4	1	1		1		0.73	0.67		
	Dry	12-Jul-92	16:15	7.3	24.0	24.0	8.7	8.4	103	4.1	10.1	2.6	35.9	0.40	3.10	8.3	3.8	6.2	1	1		1				0.17	
	3-4 days	12-Aug-92	18:20	7.0	23.0	20.0	7.9	8.6	92	7.7	8.9	2.8	33.8	0.70	3.80	12.6	6.3	7.3	1	1		1		0.23		2.73	
	3-4 days	7-Sep-92	18:00	7.0	19.0	20.0	8.3	9.3	89	3.4	9.8	1.2	29.4	0.37	1.10	7.2	1.1	5.3	1	1		1					2.04
	Dry	3-Oct-92	10:30	7.1	13.5	19.5	9.8	10.4	94	2.5	9.7	1.0	28.4	0.43	3.15	9.4	2.2	7.0	1	1		1					0.03
	3-4 days	9-Nov-92	8:20	6.9	4.0	-7.5	10.8	13.1	82	1.1	10.1	1.1	29.8	0.36	2.20	5.2	1.5	5.5		1		1					0.35
	Dry	6-Dec-92	13:15	6.9	1.5	1.0	11.7	14.0	83	1.9	9.0	1.4	28.4	0.17	2.31	5.9	6.9	4.0	1	1		1		0.24	0.01	0.41	0.05
1993	Dry	10-Jan-93	13:30	6.8	0.0	-6.0	13.1	14.6	90	1.4		0.4		0.24	1.92	4.0	2.6	2.8				1					
	Dry	7-Feb-93	15:30	7.0	-1.0	-7.0	12.4	15.0	82	0.6	4.0	0.8	13.4	0.20	1.09	2.5	7.0	4.6				1		0.12			
	2 days	7-Mar-93		7.0	2.0	6.0	12.5	13.8	90	1.2	4.0	0.7	13.0	0.30	3.87	7.0	18.7	5.1	1	1	1	1		0.01	0.65	0.29	
	3-4 days	4-Apr-93	17:15	6.8	3.5	9.5	11.9	13.3	90	1.2	2.0	0.6		0.33	0.88	8.2	2.5	3.6	1	1		1		0.01	0.18	1.44	
	Dry	10-May-93	14:15	6.9	19.5	21.0	8.7	9.2	94	4.9	7.0	1.1	21.9	0.24	1.57	8.1	3.5	4.3	1	1		1					
	Dry	7-Jun-93	10:05	6.9	15.0	15.5	7.7	10.1	76	2.4	7.0	1.1	22.2	0.17	1.98	8.6	4.9	6.3	1	1		1		0.12	0.09	0.04	
	Dry	11-Jul-93	10:00	7.0	27.0	27.0	6.0	8.0	75	3.6	10.0	1.5	31.0	0.15	0.41	6.0		7.1	1	1				0.01		0.01	0.10
	Dry	18-Aug-93	9:20	7.0	23.0	19.0	5.7	8.6	66	5.2													0.13	0.13			
	2 days	12-Sep-93	10:50	6.9	18.0	19.5	7.2	9.5	76	7.5															0.87		0.09
	Dry	11-Oct-93	17:00	7.0	14.0	8.5	9.1	10.3	88																		
	3-4 days	8-Nov-93	16:15	7.0	6.5	4.5	10.5	12.3	85																	0.60	
	2 days	13-Dec-93	12:00	6.9	3.0	7.0	11.8	13.5	88																0.63	0.25	
1994	Dry	24-Jan-94	16:25	6.8	0.5	6.5	12.7	14.4	88																		
	Dry	2-Feb-94	11:00	6.9	0.0	-10.0	12.6	14.6	86															0.03			
	3-4 days	13-Mar-94	16:45	6.7	3.0	7.5	12.6	13.5	94																0.10	2.32	0.26
	Dry	11-Apr-94	16:45	6.9	11.0	14.0	10.6	11.0	96															0.23			0.04
	1 day	17-May-94	15:11	6.8	12.5	11.5	8.5	10.7	80														0.06	0.54	0.09		
	Dry	20-Jun-94	15:30	7.1	26.5	27.0	7.5	8.0	93																		
	Dry	12-Jul-94	13:35	7.1	26.0	28.5	7.2	8.1	89																		0.13
	1 day	6-Aug-94	13:30	7.2	24.0	25.0	8.8	8.4	105														0.02	1.06			
	Dry	9-Sep-94	17:00	7.4	19.0	20.5	10.7	9.3	115																		0.20
	Dry	9-Nov-94	15:10	7.0	11.0	15.0	9.5	11.0	86																	0.09	
	Dry	3-Dec-94	13:00	6.8	4.0	15.0	11.3	13.1	86																		
1995	3-4 days	11-Jan-95	13:05	6.9	0.0		12.8	14.6	88																		0.90
	2 days	6-Feb-95	14:10	7.0	0.0	-10.0	12.2	14.6	83																0.81		

Table A6-1: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B2 Blackstone River, Main Street, Blackstone, MA																											
																			Norms for Copper		**Norms for Lead**		**Rain *before* Sampling** (inches)				
YEAR	**Dry Weather, Days after Rainfall** (used for statistics)	**Date**	**Time**	**pH**	**Temperature - Water**	**Temperature - Air**	**Diss. Oxygen** (measured in water)	**Diss. Oxygen** (Saturation Level)	**Diss. Oxygen** (%Saturation in water)	**TSS**	**Calcium** (total)	**Magnesium** (total)	**Hardness**	**Cadmium** (total)	**Chromium** (total)	**Copper** (total)	**Lead** (total)	**Nickel** (total)	**Exceedence of Acute Criteria**	**Exceedence of Chronic Criteria**	**Exceedence of Acute Criteria**	**Exceedence of Chronic Criteria**	**Same day** (up to sampling)	**1 day**	**2 days**	**3 days**	**4 days**
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
	All Samples																										
S	Count	60		35	60	59	60	60	60	18	38	39	37	39	39	39	38	39	35	37	1	38					
T	**Mean**			**6.9**	**11.0**	**12.2**	**10.4**	**11.5**	**91**	**3.1**	**8.6**	**1.9**	**30.1**	**0.67**	**2.32**	**9.4**	**4.5**	**5.9**									
A	Minimum			6.7	-1.0	-10.0	5.7	8.0	66	0.6	2.0	0.4	13.0	0.15	0.41	2.5	0.9	2.8									
T	Maximum			7.4	27.0	30.0	14.4	15.0	141	7.7	14.8	3.0	49.1	3.88	6.00	24.5	18.7	12.2									
I	Frequency of Exceedance of Cu Criteria (%)																		90%	95%	3%	100%					
S	**Dry Weather** - ***more than 4 days after rainstorm***																										
T	Count			20	34	34	34	34	34	11	21	22	21	22	22	22	20	22	19	20	0	20					
I	**Mean**			**7**	**11.9**	**13.0**	**10.2**	**11.3**	**91**	**2.8**	**9.5**	**1.9**	**31.8**	**0.76**	**2.22**	**8.9**	**3.9**	**5.9**									
C	Minimum			7	-1.0	-10.0	5.7	8.0	66	0.6	4.0	0.4	13.4	0.15	0.41	2.5	1.6	2.8									
S	Maximum			7	27.0	30.0	13.1	15.0	141	5.2	14.8	3.0	49.1	3.88	6.00	24.5	7.0	12.2									
	Frequency of Exceedance of Cu Criteria (%)																		86%	91%	0%	100%					
	Dry Weather - ***3 to 4 days after rainstorm***																										
	Count			7	12	11	12	12	12	4	9	9	8	9	9	9	9	9	8	9	0	9					
	Mean			**7**	**7.8**	**8.0**	**11.2**	**12.3**	**91**	**3.4**	**8.0**	**1.8**	**29.8**	**0.49**	**1.88**	**8.5**	**3.3**	**5.5**									
	Minimum			7	0.0	-7.5	7.9	8.6	82	1.1	2.0	0.6	17.0	0.33	0.88	5.2	1.1	3.6									
	Maximum			7	23.0	20.0	14.4	14.6	105	7.7	13.4	2.8	43.8	0.70	3.80	12.6	6.3	7.4									
	Frequency of Exceedance of Cu Criteria (%)																		89%	100%	0%	100%					
	Wet Weather - ***Same day of rainstorm***																										
	Count			1	3	3	3	3	3	0	2	2	2	2	2	2	2	2	2	2	0	2					
	Mean			**7**	**6.2**	**5.7**	**11.8**	**12.4**	**95**		**8.1**	**1.9**	**28.0**	**0.61**	**3.00**	**12.2**	**5.5**	**5.5**									
	Minimum			7	5.0	2.0	10.5	12.1	86		5.5	1.8	21.2	0.55	2.00	11.6	4.7	3.9									
	Maximum			7	7.0	8.5	12.6	12.8	102		10.7	2.0	34.8	0.67	4.00	12.8	6.2	7.1									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	0%	100%					
	Wet Weather - ***0 (same day) to 1 days after rainstorm***																										
	Count			4	8	8	8	8	8	1	5	5	5	5	5	5	5	5	5	5	0	5					
	Mean			**7**	**14.5**	**15.9**	**9.7**	**10.4**	**94**	**2.6**	**7.7**	**2.1**	**27.8**	**0.68**	**3.10**	**13.5**	**6.5**	**7.4**									
	Minimum			7	5.0	2.0	7.7	8.4	80	2.6	4.3	1.8	19.0	0.46	2.00	10.5	4.7	3.9									
	Maximum			7	24.0	27.0	12.6	12.8	111	2.6	13.5	2.6	44.4	1.13	4.20	20.6	9.6	11.8									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	0%	100%					
	Wet Weather - ***2nd day only after rainstorm***																										
	Count			4	6	6	6	6	6	2	3	3	3	3	3	3	3	3	3	3	1	3					
	Mean			**7**	**7.5**	**10.1**	**10.6**	**12.3**	**86**	**4.4**	**6.5**	**1.6**	**22.7**	**0.50**	**3.02**	**8.8**	**9.3**	**4.9**									
	Minimum			7	0.0	-10.0	7.2	9.5	76	1.2	4.0	0.7	13.0	0.30	1.70	7.0	3.3	4.2									
	Maximum			7	18.0	29.0	12.5	14.6	90	7.5	9.8	2.0	32.7	0.72	3.87	11.5	18.7	5.4									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	33%	100%					

Table A6-2: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B$_{lons}$
Blackstone River, Lonsdale Avenue

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
1992																											
	Dry	9-Feb-92	17:00	7.1	0.0	4.0	15.4	14.6	105		5.5	2.0	22.0	0.50	1.00	6.0	1.4	3.4	1	1		1		0.08			
	Dry	3-Mar-92	15:00	7.0	7.0	10.0	13.7	12.1	112		6.1	2.0	23.5	0.30	1.30	8.6	2.0	6.4	1	1		1	0.02		0.00	0.08	
	3-4 days	4-Apr-92	13:30	7.0	10.0	13.0	11[illegible]	11.3	103		6.2	2.3	25.0	0.40	1.30	8.2	2.5	2.2	1	1		1				0.01	0.39
	Dry	2-May-92	10:30	6.9	15.0	18.0	10.[illegible]	10.1	100		7.2	2.8	29.5	0.30	1.30	7.2	2.2	2.6	1	1		1	0.03	0.08			
	1 day	7-Jun-92		6.8	10.0	13.0	8.1	11.3	72		3.6	1.9	16.8	0.50	2.70	31.3	6.8	2.9	1	1		1		0.73	0.67		
	1 day	13-Jul-92	13:30	7.0	27.0	30.0	12.9	8.0	162		9.7	2.6	34.9	0.30	1.00	8.4	1.6	5.7	1	1		1	0.04	0.29			0.17
	2 days	5-Sep-92	9:45	6.9	19.0	20.0	8.9	9.3	96		9.2	1.1	27.6	0.25	0.60	9.2	1.0	3.4	1	1		1			2.04		0.00
	2 days	7-Nov-92	15:45	7.0	8.0	6.0	11.6	11.8	98		11.1	1.2	32.5	0.28	0.60	5.9	1.7	3.7	1	1		1			0.35		0.80
	2 days	5-Dec-92	11:25	6.8	4.0	3.0	11.6	13.1	88		7.0	1.2	22.3	0.09	1.86	3.4	3.0	2.4				1	0.24	0.01	0.41	0.05	0.00
1993	3-4 days	9-Jan-93	14:15	6.4	2.0	-3.0	11.7	13.8	85		3.0	0.8	10.9	0.25	1.66	8.4	3.9	3.1	1	1		1					0.73
	1 day	14-Feb-93	13:15	6.8	2.0	6.0	13.3	13.8	96			0.3		0.11	1.41	6.7	21.7	3.9	1	1	1	1		0.58	1.43		
	1 day	6-Mar-93	13:00	6.9	3.0	5.0	12.7	13.5	94		1.0	0.5			1.96	13.3	3.1	3.2	1	1		1	0.01	0.65	0.29		
	Dry	12-May-93	17:45	7.0	20.0	30.0	8.8	9.1	97		8.0	1.0	24.0		0.67	15.4	2.2	4.1	1	1		1		0.05			
	Dry	14-Jun-93	17:45	7.0	25.0	30.0	9.1	8.3	110		7.0	1.4	23.2		1.01	16.4	2.7	4.9	1	1		1					
	?	12-Jul-93									7.0	1.4	23.1		0.61	6.0	0.3	4.2	1	1			0.15?		0.01		0.01
	Dry	16-Aug-93	17:00	7.2	25.0	25.0	8.1	8.3	98																	0.23	
	1 day	11-Sep-93	10:00	7.0	18.0	14.0	8.2	9.5	87															0.87		0.09	0.02
	Dry	8-Oct-93	15:00	7.1	19.0	27.0	10.0	9.3	108																		
	1 day	6-Nov-93	8:00	7.0	8.0	10.0	10.5	11.8	89															0.60			
	Dry	3-Dec-93	15:15	6.9	5.0	11.0	12.3	12.8	96																		
1994	Dry	17-Jan-94	10:00	6.9	-1.0	-10.0	13.9																				0.01
	3-4 days	13-Mar-94	8:00	6.6	1.0	2.0	13.7	14.2	96																0.01	2.32	0.26
	Dry	10-Apr-94	11:00	6.8	10.0	15.0	10.6																0.08			0.04	0.08
	2 days	10-May-94	16:30	6.8	16.0	20.0	9.6	9.9	97																0.44	0.06	0.26
	Dry	9-Jul-94	16:00	7.2	27.0	33.0	8.6	8.0	108															0.13	0.02		
	3-4 days	14-Aug-94	9:30	6.9	24.0	27.0	4.6	8.4	55															0.05		0.55	
	Dry	11-Sep-94	16:30	7.1	18.0	22.0	9.0	9.5	95																0.22		
	Dry	9-Oct-94	9:30	6.9	14.0	15.0	8.7	10.3	84																		
	1 day	11-Nov-94	14:00	7.0	9.5	9.0	11.3	11.4	99															0.40			
	1 day	11-Dec-94	15:00	6.9	4.0	7.0	8.6	13.1	66														0.13	0.56	0.06		0.13
1995	1 day	8-Jan-95	14:30	6.9	5.0	9.0	8.6	12.8	67															0.90	0.02		

Table A6-2: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

Bions
Blackstone River, Lonsdale Avenue

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time (h)	pH	Temperature - Water (C)	Temperature - Air (C)	Diss. Oxygen (measured in water) mg/l	Diss. Oxygen (Saturation Level) mg/l	Diss. Oxygen (%Saturation in water) %	TSS mg/l	Calcium (total) mg/l	Magnesium (total) mg/l	Hardness mg/l	Cadmium (total) ug/l	Chromium (total) ug/l	Copper (total) ug/l	Lead (total) ug/l	Nickel (total) ug/l	Norms for Copper: Exceedence of Acute Criteria (Exceedance marked as"1")	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
	All Samples																										
S	Count	31	29	30	30	30	30	28	28	0	14	15	13	11	15	15	15	15	14	14	1	14					
T	**Mean**		**0.6**	**6.9**	**11.8**	**14.0**	**10.5**	**11.0**	**95**		**6.5**	**1.5**	**24.3**	**0.30**	**1.27**	**10.3**	**3.7**	**3.7**									
A	Minimum		0.3	6.4	-1.0	-10.0	4.6	8.0	55		1.0	0.3	10.9	0.09	0.60	3.4	0.3	2.2									
T	Maximum		0.7	7.2	27.0	33.0	15.4	14.6	162		11.1	2.8	34.9	0.50	2.70	31.3	21.7	6.4									
I	Frequency of Exceedance of Cu Criteria (%)																		93%	93%	7%	93%					
S	**Dry Weather** - ***more than 4 days after rainstorm***																										
T	Count		13	13	13	13	13	11	11	0	5	5	5	3	5	5	5	5	5	5	0	5					
I	**Mean**		**0.6**	**7.0**	**14.2**	**17.7**	**10.6**	**10.2**	**101**		**6.8**	**1.8**	**24.4**	**0.37**	**1.06**	**10.7**	**2.1**	**4.3**									
C	Minimum		0.4	6.8	-1.0	-10.0	8.1	8.0	84		5.5	1.0	22.0	0.30	0.67	6.0	1.4	2.6									
S	Maximum		0.7	7.2	27.0	33.0	15.4	14.6	112		8.0	2.8	29.5	0.50	1.30	16.4	2.7	6.4									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	0%	100%					
	Dry Weather - ***3 to 4 days after rainstorm***																										
	Count		4	4	4	4	4	4	4	0	2	2	2	2	2	2	2	2	2	2	0	2					
	Mean		**0.5**	**6.7**	**9.3**	**9.8**	**10.4**	**11.9**	**85**		**4.6**	**1.6**	**17.9**	**0.33**	**1.48**	**8.3**	**3.2**	**2.7**									
	Minimum		0.3	6.4	1.0	-3.0	4.6	8.4	55		3.0	0.8	10.9	0.25	1.30	8.2	2.5	2.2									
	Maximum		0.6	7.0	24.0	27.0	13.7	14.2	103		6.2	2.3	25.0	0.40	1.66	8.4	3.9	3.1									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	0%	100%					
	Wet Weather - ***Same day of rainstorm***																										
	Count		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	Mean																										
	Minimum																										
	Maximum																										
	Frequency of Exceedance of Cu Criteria (%)																										
	Wet Weather - ***0 (same day) to 1 days after rainstorm***																										
	Count		8	9	9	9	9	9	9	0	3	4	2	3	4	4	4	4	4	4	1	4					
	Mean		**0.5**	**6.9**	**9.6**	**11.4**	**10.5**	**11.7**	**92**		**4.8**	**1.3**	**25.9**	**0.30**	**1.77**	**14.9**	**8.3**	**3.9**									
	Minimum		0.3	6.8	2.0	5.0	8.1	8.0	66		1.0	0.3	16.8	0.11	1.00	6.7	1.6	2.9									
	Maximum		0.6	7.0	27.0	30.0	13.3	13.8	162		9.7	2.6	34.9	0.50	2.70	31.3	21.7	5.7									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	25%	100%					
	Wet Weather - ***2nd day only after rainstorm***																										
	Count		4	4	4	4	4	4	4	0	3	3	3	3	3	3	3	3	2	2	0	3					
	Mean		**0.6**	**6.9**	**11.8**	**12.3**	**10.4**	**11.0**	**95**		**9.1**	**1.2**	**27.5**	**0.21**	**1.02**	**6.2**	**1.9**	**3.2**									
	Minimum		0.4	6.8	4.0	3.0	8.9	9.3	88		7.0	1.1	22.3	0.09	0.60	3.4	1.0	2.4									
	Maximum		0.7	7.0	19.0	20.0	11.6	13.1	98		11.1	1.2	32.5	0.28	1.86	9.2	3.0	3.7									
	Frequency of Exceedance of Cu Criteria (%)																		67%	67%	0%	100%					

Table A6-3: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B1
Blackstone River, Main Street, Pawtucket

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
1990	Dry	1-Oct-90	16:00				8.2	9.2	89		9.5	2.0	32.0	0.35	1.60	13.0	2.7	6.1	1	1		1	0.01	0.04			0.01
	1 day	15-Oct-90	7:30				8.0	9.1	88		2.2	1.0	9.6	0.64	4.10	17.5	12.4	6.2	1	1		1		1.52	0.71	0.30	0.07
	Dry	29-Oct-90	7:40			7.5	11.0	11.3	97	7.0	3.9	2.0	18.0	0.40	1.50	10.4	5.5	3.4	1	1		1		0.23		0.12	
	3-4 days	13-Nov-90	7:20		4.0	-1.0	11.9	13.1	91	2.2	3.6	2.4	18.9	0.35	1.50	7.4	3.5	3.4	1	1		1				1.12	
	Dry	26-Nov-90	7:30		7.5	6.0	11.2	12.0	93	0.5	6.0	2.0	23.2	0.37	1.30	7.1	4.1	3.7	1	1		1			0.08	0.11	
	2 days	10-Dec-90	7:30		5.0	6.0	12.3	12.8	96	3.0	4.6	2.0	19.7	0.48	1.50	8.5	3.2	4.9	1	1		1			0.26	0.05	
1991	Dry	7-Jan-91	8:00		4.0	0.0	13.2	13.1	101	3.4	6.2	2.0	23.7	0.48	1.30	9.9	11.2	4.2	1	1		1			0.10		
	Dry	22-Jan-91	9:15		0.5	-9.0	13.3	14.4	92	2.4	4.0	1.9	17.8	0.35	1.00	5.0	2.1	3.5		1		1		0.11			
	Dry	4-Feb-91	7:30		4.0	2.0	14.3	13.1	109	1.7	6.0	1.8	22.4	0.38	1.20	7.4	2.8	3.4	1	1		1					0.20
	Same day	19-Feb-91	7:30		3.0	5.0	13.3	13.5	99	1.6	6.6	1.9	24.3	0.46	0.80	7.4	5.2	3.7	1	1		1	0.30	0.04			0.05
	Same day	4-Mar-91	7:30		7.5	6.5	11.5	12.0	96	3.9													0.85	0.61	0.54		
	3-4 days	18-Mar-91	7:30		5.0	5.0	11.9	12.8	93	1.2	7.6	1.9	26.8	0.30	0.60	5.7	1.9	3.3	1	1		1				0.07	0.51
	Dry	1-Apr-91	7:30	6.9	6.0	4.5	11.1	12.4	89	3.4	9.2	2.2	32.0	0.53	6.00	7.5	3.2	2.7	1	1		1		0.21	0.15		0.07
	Dry	15-Apr-91	7:30	6.9	10.0	7.0	9.6	11.3	85	2.7	11.5	2.4	38.8	0.43	1.10	6.5	4.2	5.2	1	1		1			0.10		
	Dry	29-Apr-91	7:30	6.9	14.0	8.0	9.1	10.3	88	3.7	8.9	1.8	29.6	0.66	2.40	8.1	7.1	4.6	1	1		1					
	3-4 days	13-May-91	7:30	6.9	17.0	19.0	7.9	9.7	82	3.7	8.4	1.9	28.6	0.49	2.40	8.3	5.1	4.0	1	1		1				0.66	
	Dry	28-May-91	7:45	6.9	22.0	23.0	6.8	8.7	78	3.2	11.8	2.4	39.4	0.44	1.50	9.0	5.9	5.0	1	1		1	0.02	0.03			
	Dry	10-Jun-91	7:30	7.1	21.0	18.0	7.2	8.9	81	3.8	12.4	2.9	42.9	0.43	1.20	11.9	5.0	5.3	1	1		1					
	Dry	24-Jun-91	7:15	7.1	21.0	15.0	7.3	8.9	82	0.6	14.3	3.1	48.4	0.45	1.50	12.8	3.2	6.6	1	1		1		0.01	0.01		
	Dry	8-Jul-91	7:30	7.3	21.0	27.0	6.9	8.9	77	8.7	14.5	2.6	47.0	0.26	1.00	9.0	5.1	4.7	1	1		1		0.08		0.03	
	Dry	22-Jul-91	7:30	7.1	26.0	24.0	5.2	8.1	64	2.8	16.1	2.9	52.0	0.33	1.20	9.3	1.4	6.7	1	1		1					
	1 day	5-Aug-91	7:30	7.1	21.0	21.0	6.6	8.9	74	3.5	12.4	2.5	41.3	0.43	1.50	10.1	3.6	5.7	1	1		1		0.79	0.07		
	?	19-Aug-91	7:30	7.1	25.0	22.0	6.3	8.3	76	3.1	13.6	1.7	40.8	0.62	0.90	40.6	3.4	6.1	1	1		1	0.00?	0.02			0.02
	Dry	3-Sep-91	7:30		20.0	16.0	7.7	9.1	85	2.2	11.4	1.6	35.1	0.35	0.90	8.0	2.3	7.0	1	1		1					
	2 days	16-Sep-91	7:30		20.0	22.0	8.2	9.1	90	2.3	11.6	1.3	34.5	0.47	1.00	9.6	4.5	5.2	1	1		1		0.09	0.25		
	3-4 days	30-Sep-91								3.9	6.3	1.4	21.6	1.43	3.70	31.2	32.4	30.1	1	1	1	1					0.53
	?	15-Oct-91	7:30		9.5	5.0	9.8	11.4	86	1.7	9.0	1.3	27.7	0.75	1.90	9.2	4.5	5.9	1	1		1	0.0?				0.15
	Dry	28-Oct-91	7:30		11.0	10.0	9.5	11.0	86		9.9	1.8	32.2	0.91	2.10	13.4	11.3	12.4	1	1		1					
	3-4 days	14-Nov-91	7:30	6.9	7.0	6.0	11.7	12.1	96	5.6	4.3	0.8	14.0	0.64	3.50	8.5	5.7	3.8	1	1		1		0.01	0.13	1.93	0.22
	1 day	25-Nov-91	7:15	6.9	4.0	1.0	11.5	13.1	88	6.2	3.8	1.2	14.3	1.04	5.70	22.3	20.5	20.9	1	1	1	1		0.39	0.51	0.69	0.45
	Dry	9-Dec-91	7:20	6.9	6.0	12.0	11.7	12.4	94	1.0																0.23	
	1 day	30-Dec-91	13:00		0.0	2.0	13.7	14.6	94		12.8	1.5	38.3	0.50	1.80	7.5	8.9	3.7	1	1		1		0.59			

Table A6-3: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B1
Blackstone River, Main Street, Pawtucket

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
1992	Dry	12-Jan-92	13:00	6.8	2.0	-1.0	13.5	13.8	98	1.5																0.17	
	Dry	7-Feb-92	14:30	7.0	2.0	3.0	13.6	13.8	98	2.2	5.5	2.0	22.0	0.40	0.90	1.0	1.9	2.9				1				0.09	
	3-4 days	9-Mar-92	14:30	7.1	10.8	10.2	12.6	11.1	114		6.1	2.0	23.5	0.50	0.90	5.8	4.2	7.5	1	1		1	0.01		0.06	0.95	
	2 days	2-Apr-92	15:00	7.0	7.0	10.0	11.3	12.1	93	2.5	5.3	2.0	21.5	0.15	0.90	1.3	4.8	4.8				1		0.01	0.39	0.05	
	Dry	2-May-92	15:00	6.9			9.9	14.6	68		6.4	2.1	24.6	0.70	0.50	7.3	4.1	3.9	1	1		1	0.03	0.08			
	?	5-Jun-92	17:00	6.9			8.1	14.6	55	0.4	6.6	2.8	28.0	0.20	1.00	8.1	4.2	2.6	1	1		1	0.3?				2.04
	Dry	12-Jul-92	10:00	7.1	24.0	30.0	7.1	8.4	84		9.0	2.5	32.8	0.20	0.90	5.4	3.6	3.9	1	1		1				0.17	
	Dry	8-Aug-92	10:00	6.9	23.0	28.0	7.0	8.6	82	4.4	9.6	2.7	35.1	0.40	1.40	11.1	5.8	6.0	1	1		1					0.10
	Dry	14-Sep-92	18:00	7.1	21.0	17.0	9.2	8.9	103	2.5	8.7	1.0	25.8	0.24	0.20	5.8	1.5	4.0	1	1		1				0.09	
	Dry	6-Oct-92	17:00	7.1	13.0	14.0	10.4	10.5	99	2.3	10.3	1.2	30.8	0.39	0.90	6.7	4.0	4.0	1	1		1					
	Dry	10-Nov-92	14:00	6.9	6.0	7.0	10.5	12.4	84	0.5	10.2	1.0	29.4	0.27	0.50	7.7	2.1	3.8	1	1		1					
	Dry	5-Dec-92								4.4													0.24	0.01	0.41	0.05	
1993	Dry	10-Jan-93								1.6	3.0	0.3	8.6	0.21	1.51	3.5	3.8	2.7				1					
	Dry	8-Feb-93								0.9	9.0	1.4	28.3	0.20	1.28	2.8		3.7							0.12		
	3-4 days	8-Mar-93	14:00	6.9	3.0	9.0	12.0	13.5	89	0.6	3.0	0.7	10.4	0.67	1.12	7.0	2.4	3.0	1	1		1			0.10	0.65	0.29
	Dry	6-Apr-93	14:30	6.7	11.0	11.0	11.3	11.0	102	3.6	1.0	0.4		0.17	0.94	5.9	4.8	2.6	1	1		1				0.01	0.18
	Dry	4-May-93	15:00	7.0	17.0	22.0	8.9	9.7	92	2.5	5.0	0.9	16.0	0.12	1.03	6.9	3.2	2.6	1	1		1					
	Dry	6-Jun-93								5.1	9.0	1.3	28.0	0.06	0.33	4.8	0.8	3.2		1		1	0.12	0.09	0.04		
	Dry	12-Jul-93	10:30	7.2	26.0	31.0	6.9	8.1	84	1.6	9.0	1.5	28.5		0.54	7.1	3.4	4.3	1	1		1			0.01		0.01
	Same day	18-Aug-93	19:00	7.1	23.0	20.0	7.5	8.6	87	16.2													0.61	0.13			
	3-4 days	14-Sep-93	13:00	7.1	22.0	29.0	7.5	8.7	85	6.4																	0.87
	Dry	5-Oct-93	17:00	7.1	14.0	11.0	9.2	10.3	89	2.4															0.19		
	3-4 days	8-Nov-93	11:30	6.8	0.0	8.0	10.8	14.6	74																	0.60	
	1 day	12-Dec-93	11:30	6.9	5.0	7.0	11.2	12.8	87															0.63	0.25		
1994	3-4 days	12-Jan-94	10:00	6.9	6.0	4.0	13.0	12.4	104														0.00				0.70
	Dry	2-Feb-94	10:30	6.8	-4.0	-10.0	11.0	16.4	67															0.03			
	Dry	15-Mar-94	12:00	6.8	5.0	8.0	11.3	12.8	88																		0.01
	1 day	30-Apr-94	14:30	7.1	17.0	26.0	9.2	9.7	95														0.02	0.61	0.44	0.38	
	3-4 days	12-May-94	12:00	6.9	15.0		8.6	10.1	85																		0.44
	Dry	12-Jul-94	18:30	7.5	26.6	26.6	7.4	8.0	92																		0.13
	Dry	11-Aug-94	15:00	7.4	24.0	32.0	9.8	8.4	116																		
	Dry	13-Sep-94	18:00	7.5	22.0	25.0		8.7																			0.22
	Dry	20-Oct-94	16:30	7.0	18.0	17.0	9.1	9.5	96																0.01		
	3-4 days	13-Nov-94	15:00	7.3	10.0	10.0	10.5	11.3	93																	0.40	
	Dry	4-Dec-94	8:30	6.8	5.0	5.0	11.3	12.8	88																		
1995																											

Table A6-3: **River Rescue Project - Water Quality in the Tributaries, 1990-1995** (Kerr and Lee, 1996)

B1
Blackstone River, Main Street, Pawtucket

YEAR	Dry Weather, Days after Rainfall (used for statistics)	Date	Time	pH	Temperature - Water	Temperature - Air	Diss. Oxygen (measured in water)	Diss. Oxygen (Saturation Level)	Diss. Oxygen (%Saturation in water)	TSS	Calcium (total)	Magnesium (total)	Hardness	Cadmium (total)	Chromium (total)	Copper (total)	Lead (total)	Nickel (total)	Norms for Copper: Exceedence of Acute Criteria	Norms for Copper: Exceedence of Chronic Criteria	Norms for Lead: Exceedence of Acute Criteria	Norms for Lead: Exceedence of Chronic Criteria	Rain *before* Sampling (inches): Same day (up to sampling)	1 day	2 days	3 days	4 days
			(h)		(C)	(C)	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	(Exceedance marked as"1")								
STATISTICS	**All Samples**																										
	Count	67	62	45	57	57	61	62	61	47	47	47	46	46	47	47	46	47	41	43	2	46					
	Mean		**0.5**	**7.0**	**12.2**	**12.3**	**10.0**	**11.1**	**89**	**3.2**	**8.1**	**1.8**	**28.0**	**0.45**	**1.54**	**9.4**	**5.4**	**5.5**									
	Minimum		0.3	6.7	-4.0	-10.0	5.2	8.0	55	0.4	1.0	0.3	8.6	0.06	0.20	1.0	0.8	2.6									
	Maximum		0.8	7.5	26.6	32.0	14.3	16.4	116	16.2	16.1	3.1	52.0	1.43	6.00	40.6	32.4	30.1									
	Frequency of Exceedance of Cu Criteria (%)																		87%	91%	4%	100%					
	Dry Weather - ***more than 4 days after rainstorm***																										
	Count		36	28	33	34	35	36	35	29	29	29	28	28	29	29	28	29	24	26	0	28					
	Mean		**0.5**	**7.0**	**13.6**	**13.2**	**9.7**	**10.8**	**89**	**2.8**	**8.7**	**1.8**	**30.1**	**0.37**	**1.30**	**7.7**	**4.1**	**4.6**									
	Minimum		0.3	6.7	-4.0	-10.0	5.2	8.0	64	0.5	1.0	0.3	8.6	0.06	0.20	1.0	0.8	2.6									
	Maximum		0.8	7.5	26.6	32.0	14.3	16.4	116	8.7	16.1	3.1	52.0	0.91	6.00	13.4	11.3	12.4									
	Frequency of Exceedance of Cu Criteria (%)																		83%	90%	0%	100%					
	Dry Weather - ***3 to 4 days after rainstorm***																										
	Count		11	9	11	10	11	11	11	7	7	7	7	7	7	7	7	7	7	7	1	7					
	Mean		**0.5**	**7.0**	**9.1**	**9.9**	**10.8**	**11.8**	**91**	**3.4**	**5.6**	**1.6**	**20.5**	**0.63**	**1.96**	**10.6**	**7.9**	**7.9**									
	Minimum		0.3	6.8	0.0	-1.0	7.5	8.7	74	0.6	3.0	0.7	10.4	0.30	0.60	5.7	1.9	3.0									
	Maximum		0.6	7.3	22.0	29.0	13.0	14.6	114	6.4	8.4	2.4	28.6	1.43	3.70	31.2	32.4	30.1									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	14%	100%					
	Wet Weather - ***Same day of rainstorm***																										
	Count		3	1	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	0	1					
	Mean		**0.5**	**7.1**	**11.2**	**10.5**	**10.8**	**11.3**	**94**	**7.2**	**6.6**	**1.9**	**24.3**	**0.46**	**0.80**	**7.4**	**5.2**	**3.7**									
	Minimum		0.3	7.1	3.0	5.0	7.5	8.6	87	1.6	6.6	1.9	24.3	0.46	0.80	7.4	5.2	3.7									
	Maximum		0.8	7.1	23.0	20.0	13.3	13.5	99	16.2	6.6	1.9	24.3	0.46	0.80	7.4	5.2	3.7									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	0%	100%					
	Wet Weather - ***0 (same day) to 1 days after rainstorm***																										
	Count		9	5	8	8	9	9	9	5	5	5	5	5	5	5	5	5	5	5	1	5					
	Mean		**0.4**	**7.0**	**10.1**	**11.1**	**10.3**	**11.4**	**90**	**6.3**	**7.6**	**1.6**	**25.5**	**0.61**	**2.78**	**13.0**	**10.1**	**8.0**									
	Minimum		0.3	6.9	0.0	1.0	6.6	8.6	74	1.6	2.2	1.0	9.6	0.43	0.80	7.4	3.6	3.7									
	Maximum		0.8	7.1	23.0	26.0	13.7	14.6	99	16.2	12.8	2.5	41.3	1.04	5.70	22.3	20.5	20.9									
	Frequency of Exceedance of Cu Criteria (%)																		100%	100%	20%	100%					
	Wet Weather - ***2nd day only after rainstorm***																										
	Count		3	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	0	3					
	Mean		**0.4**	**7.0**	**10.7**	**12.7**	**10.6**	**11.3**	**93**	**2.6**	**7.2**	**1.8**	**25.2**	**0.37**	**1.13**	**6.5**	**4.2**	**5.0**									
	Minimum		0.3	7.0	5.0	6.0	8.2	9.1	90	2.3	4.6	1.3	19.7	0.15	0.90	1.3	3.2	4.8									
	Maximum		0.6	7.0	20.0	22.0	12.3	12.8	96	3.0	11.6	2.0	34.5	0.48	1.50	9.6	4.8	5.2									
	Frequency of Exceedance of Cu Criteria (%)																		67%	67%	0%	100%					

Data for

Nutrients

Tabbe A6-4

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B2: Blackstone River at Main St. in Blackstone, MA
Nutrient Concentrations

DATE	Dissolved NO2+NO3 (mg/l as N)	Dissolved NO2 (mg/l as N)	Dissolved NO3 (mg/l as N)	Dissolved NH4 (mg/l as N)	Dissolved Inorg N (mg/l as N)	Total Diss. N (mg/l as N)	Dissolved Org. N (mg/l as N)	Dissolved Inorg P (mg/l as P)	Total Diss. P (mg/l as P)	Dissolved Org P (mg/l as P)	Particul. P (mg/l as P)	Total P (mg/l as P)
14-Oct-90	0.410	0.004	0.406	0.007	0.417	1.721	1.304	0.050	0.113	0.063	0.203	0.316
12-Nov-90	0.647	0.013	0.634	0.684	1.331	2.460	1.128	0.046	0.101	0.055	0.116	0.217
24-Nov-90	0.900	0.055	0.845	1.837	2.737	3.421	0.684	0.089	0.211	0.122	0.156	0.367
9-Dec-90	0.709	0.001	0.708	0.367	1.077	2.039	0.963	0.031	0.084	0.053	0.200	0.284
5-Jan-91	0.750	0.003	0.747	1.013	1.763	3.095	1.332	0.082	0.124	0.042	0.143	0.267
19-Jan-91	0.690	0.005	0.684	0.536	1.225	2.202	0.977	0.039	0.097	0.058	0.140	0.237
3-Feb-91	2.206	0.002	2.204	0.007	2.213	2.810	0.597	0.043	0.099	0.056	0.203	0.302
16-Feb-91	0.634	0.005	0.629	0.713	1.347	1.970	0.623	0.043	0.065	0.022	0.092	0.157
3-Mar-91	0.538	0.002	0.536	0.158	0.696	2.146	1.449	0.007	0.083	0.076	0.147	0.230
16-Mar-91	0.707	0.022	0.685	0.377	1.084	2.365	1.281	0.024	0.059	0.034	0.068	0.126
31-Mar-91	0.721	0.004	0.717	0.360	1.081	1.924	0.844	0.031	0.129	0.098	0.089	0.218
28-Apr-91	1.009	0.005	1.004	0.171	1.180	1.428	0.248	0.050	0.069	0.020	0.105	0.174
11-May-91	0.913	0.004	0.910	0.327	1.240	2.493	1.253	0.034	0.087	0.053	0.106	0.193
8-Jun-91	1.532	0.001	1.531	0.016	1.548	3.028	1.481	0.086	0.239	0.152	0.077	0.315
21-Jun-91	1.127	0.001	1.127	0.016	1.143	2.667	1.524	0.117	0.244	0.127	0.068	0.312
7-Jul-91	1.472	0.001	1.472	0.010	1.482	2.837	1.354	0.185	0.319	0.134	0.126	0.445
21-Jul-91	1.221	0.003	1.218	0.288	1.509	2.264	0.755	0.305	0.361	0.056	0.107	0.468
4-Aug-91	1.496	0.003	1.493	0.013	1.509	2.923	1.414	0.211	0.275	0.064	0.119	0.394
9-Nov-91	0.837	0.012	0.825	0.244	1.081	1.138	0.057	0.060	0.067	0.007	0.037	0.103
24-Nov-91	0.518	0.019	0.499	0.260	0.778	0.764	0.000	0.038	0.032	0.000	0.038	0.069
7-Dec-91	0.566	0.021	0.544	0.415	0.981	1.897	0.916	0.009	0.067	0.058	0.029	0.096
28-Dec-91	0.942	0.007	0.935	1.340	2.282	2.903	0.621	0.020	0.079	0.059	0.048	0.127
11-Jan-92	0.770	0.025	0.744	1.507	2.277	2.881	0.604	0.083	0.117	0.034	0.034	0.151
6-Feb-92	0.843	0.020	0.823	1.036	1.879	3.351	1.472	0.075	0.170	0.095	0.054	0.224
7-Mar-92	1.244	0.006	1.237	1.196	2.440	2.790	0.350	0.122	0.172	0.049	0.063	0.234
6-Apr-92	0.864	0.003	0.861	0.380	1.244	1.855	0.611	0.009	0.075	0.066	0.073	0.148
2-May-92	1.126	0.008	1.118	0.191	1.318	1.103	0.000	0.020	0.088	0.068	0.054	0.142
6-Jun-92	0.659	0.045	0.614	0.053	0.712	1.529	0.817	0.035	0.104	0.069	0.060	0.164
11-Jul-92	1.067	0.033	1.034	0.076	1.142	1.689	0.547	0.131	0.150	0.020	0.257	0.408
11-Aug-92	1.483	0.054	1.429	0.001	1.484	2.361	0.877	0.133	0.239	0.107	0.180	0.419
6-Sep-92	0.364	0.007	0.357	0.333	0.698	1.964	1.266	0.033	0.033	0.160	0.075	0.107
2-Oct-92	1.618	0.021	1.597	0.166	1.784	2.553	0.769	0.168	0.168	0.163	0.090	0.259
8-Nov-92	0.801	0.072	0.729	0.613	1.414	1.683	0.268	0.092	0.092	0.074	0.091	0.183
5-Dec-92	0.639	0.023	0.616	0.650	1.289	1.653	0.363	0.049	0.049	0.051	0.036	0.085
9-Jan-93	0.715	0.015	0.700	0.159	0.874	1.678	0.804	0.027	0.027	0.010	0.111	0.138
6-Feb-93	0.834	0.035	0.799	1.468	2.302	3.053	0.751	0.014	0.014	0.038	0.165	0.179
6-Mar-93	0.774	0.031	0.743	1.300	2.073	2.756	0.682	0.037	0.078	0.041	0.174	0.252
3-Apr-93	0.441	0.006	0.434	0.152	0.593	1.155	0.562	0.004	0.028	0.024	0.088	0.116
9-May-93	2.332	0.003	2.329	0.001	2.333	2.327	0.000	0.006	0.067	0.061	0.121	0.188
6-Jun-93	1.242	0.037	1.206	0.254	1.497	3.406	1.909	0.076	0.116	0.041	0.220	0.337
10-Jul-93	1.170	0.053	1.117	0.073	1.244	2.726	1.483	0.133	0.217	0.084	0.006	0.223
17-Aug-93	2.411	0.007	2.405	0.082	2.493	3.244	0.751	0.125	0.291	0.166	0.157	0.448

Tabbe A6-4

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B2: Blackstone River at Main St. in Blackstone, MA

Nutrient Concentrations

Statistics		Dissolved NO2+NO3 (mg/l as N)	Dissolved NO2 (mg/l as N)	Dissolved NO3 (mg/l as N)	Dissolved NH4 (mg/l as N)	Dissolved Inorg N (mg/l as N)	Total Diss. N (mg/l as N)	Dissolved Org. N (mg/l as N)	Dissolved Inorg P (mg/l as P)	Total Diss. P (mg/l as P)	Dissolved Org P (mg/l as P)	Particul. P (mg/l as P)	Total P (mg/l as P)
1990	Count	4	4	4	4	4	4	4	4	4	4	4	4
	Mean	0.667	0.018	0.648	0.724	1.390	2.410	1.020	0.054	0.127	0.073	0.169	0.296
	Maximum	0.900	0.055	0.845	1.837	2.737	3.421	1.304	0.089	0.211	0.122	0.203	0.367
	Minimum	0.410	0.001	0.406	0.007	0.417	1.721	0.684	0.031	0.084	0.053	0.116	0.217
1991	Count	18	18	18	18	18	18	18	18	18	18	18	18
	Mean	0.993	0.007	0.987	0.348	1.341	2.270	0.929	0.077	0.139	0.062	0.097	0.235
	Maximum	2.206	0.022	2.204	1.340	2.282	3.095	1.524	0.305	0.361	0.152	0.203	0.468
	Minimum	0.518	0.001	0.499	0.007	0.696	0.764	0.000	0.007	0.032	0.000	0.029	0.069
1992	Count	12	12	12	12	12	12	12	12	12	12	12	12
	Mean	0.957	0.027	0.930	0.517	1.473	2.118	0.662	0.079	0.121	0.080	0.089	0.210
	Maximum	1.618	0.072	1.597	1.507	2.440	3.351	1.472	0.168	0.239	0.163	0.257	0.419
	Minimum	0.364	0.003	0.357	0.001	0.698	1.103	0.000	0.009	0.033	0.020	0.034	0.085
1993	Count	8	8	8	8	8	8	8	8	8	8	8	8
	Mean	1.240	0.023	1.217	0.436	1.676	2.543	0.868	0.053	0.105	0.058	0.130	0.235
	Maximum	2.411	0.053	2.405	1.468	2.493	3.406	1.909	0.133	0.291	0.166	0.220	0.448
	Minimum	0.441	0.003	0.434	0.001	0.593	1.155	0.000	0.004	0.014	0.010	0.006	0.116
1990 to	Count	42	42	42	42	42	42	42	42	42	42	42	42
1993	Mean	1.034	0.016	1.017	0.420	1.453	2.279	0.832	0.072	0.126	0.067	0.101	0.227
	Maximum	2.411	0.072	2.405	1.837	2.737	3.421	1.909	0.305	0.361	0.166	0.257	0.468
	Minimum	0.364	0.001	0.357	0.001	0.417	0.764	0.000	0.004	0.014	0.000	0.006	0.069

Table A6-5

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B_{lons}: Blackstone River at Route 122 in Lonsdale, RI

Nutrient Concentrations

DATE	Dissolved NO2+NO3	Dissolved NO2	Dissolved NO3	Dissolved NH4	Dissolved Inorg N	Total Diss. N	Dissolved Org. N	Dissolved Inorg P	Total Diss. P	Dissolved Org P	Particul. P	Total P
	(mg/l as N)	(mg/l as N)	(mg/l as N)	(mg/l as N)	(mg/l as N)	(mg/l as N)	(mg/l as N)	(mg/l as P)	(mg/l as P)	(mg/l as P)	(mg/l as P)	(mg/l as P)
8-Feb-92	1.202	0.018	1.184	0.784	1.985	3.156	1.171	0.045	0.136	0.091	0.033	0.169
2-Mar-92	0.745	0.002	0.744	0.556	1.302	2.790	1.488	0.053	0.172	0.118	0.044	0.216
3-Apr-92	0.671	0.000	0.670	0.389	1.060	1.855	0.795	0.042	0.075	0.033	0.034	0.109
1-May-92	0.970	0.004	0.965	0.133	1.103	0.989	0.000	0.067	0.123	0.056	0.040	0.163
6-Jun-92	0.559	0.036	0.522	0.012	0.571	1.815	1.244	0.032	0.094	0.063	0.044	0.138
12-Jul-92	1.170	0.046	1.125	0.616	1.786	3.167	1.381	0.102	0.222	0.120	0.091	0.313
4-Sep-92	1.345	0.056	1.289	0.136	1.481	2.994	1.513	0.090	0.254	0.164	0.029	0.283
6-Nov-92	0.797	0.010	0.787	0.670	1.467	1.459	0.000	0.118	0.202	0.084	0.076	0.278
4-Dec-92	0.616	0.019	0.598	0.519	1.135	2.038	0.903	0.026	0.093	0.067	0.015	0.108
8-Jan-93	0.623	0.008	0.615	0.411	1.034	4.211	3.177	0.006	0.066	0.060	0.090	0.156
13-Feb-93	0.606	0.004	0.603	0.800	1.407	2.940	1.533	0.002	0.068	0.065	0.060	0.128
5-Mar-93	0.735	0.020	0.715	1.457	2.192	3.955	1.763	0.051	0.078	0.028	0.124	0.203
11-May-93	2.095	0.006	2.089	0.285	2.380	2.898	0.518	0.074	0.117	0.044	0.106	0.223
13-Jun-93	3.342	0.004	3.338	0.001	3.342	5.526	2.184	0.055	0.509	0.454	0.032	0.541
11-Jul-93	1.703	0.027	1.677	0.020	1.723	5.427	3.704	0.088	0.319	0.231	0.033	0.352
15-Aug-93	2.796	0.045	2.752	0.044	2.840	4.822	1.982	0.404	0.680	0.276	0.093	0.773

Table A6-5

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B_{lons}: Blackstone River at Route 122 in Lonsdale, RI

Nutrient Concentrations

Statistics		Dissolved NO2+NO3 (mg/l as N)	Dissolved NO2 (mg/l as N)	Dissolved NO3 (mg/l as N)	Dissolved NH4 (mg/l as N)	Dissolved Inorg N (mg/l as N)	Total Diss. N (mg/l as N)	Dissolved Org. N (mg/l as N)	Dissolved Inorg P (mg/l as P)	Total Diss. P (mg/l as P)	Dissolved Org P (mg/l as P)	Particul. P (mg/l as P)	Total P (mg/l as P)
1990	Count	0	0	0	0	0	0	0	0	0	0	0	0
	Mean												
	Maximum												
	Minimum												
1991	Count	0	0	0	0	0	0	0	0	0	0	0	0
	Mean												
	Maximum												
	Minimum												
1992	Count	9	9	9	9	9	9	9	9	9	9	9	9
	Mean	0.897	0.021	0.876	0.424	1.321	2.251	0.944	0.064	0.152	0.088	0.045	0.198
	Maximum	1.345	0.056	1.289	0.784	1.985	3.167	1.513	0.118	0.254	0.164	0.091	0.313
	Minimum	0.559	0.000	0.522	0.012	0.571	0.989	0.000	0.026	0.075	0.033	0.015	0.108
1993	Count	7	7	7	7	7	7	7	7	7	7	7	7
	Mean	1.700	0.016	1.684	0.431	2.131	4.254	2.123	0.097	0.263	0.165	0.077	0.339
	Maximum	3.342	0.045	3.338	1.457	3.342	5.526	3.704	0.404	0.680	0.454	0.124	0.773
	Minimum	0.606	0.004	0.603	0.001	1.034	2.898	0.518	0.002	0.066	0.028	0.032	0.128
1990 to	Count	16	16	16	16	16	16	16	16	16	16	16	16
1993	Mean	1.249	0.019	1.230	0.427	1.675	3.128	1.460	0.079	0.201	0.122	0.059	0.260
	Maximum	3.342	0.056	3.338	1.457	3.342	5.526	3.704	0.404	0.680	0.454	0.124	0.773
	Minimum	0.559	0.000	0.522	0.001	0.571	0.989	0.000	0.002	0.066	0.028	0.015	0.108

Table A6-6

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B1: Blackstone River at Main St. in Pawtucket, RI
Nutrient Concentrations

DATE	Dissolved NO2+NO3 (mg/l as N)	Dissolved NO2 (mg/l as N)	Dissolved NO3 (mg/l as N)	Dissolved NH4 (mg/l as N)	Dissolved Inorg N (mg/l as N)	Total Diss. N (mg/l as N)	Dissolved Org. N (mg/l as N)	Dissolved Inorg P (mg/l as P)	Total Diss. P (mg/l as P)	Dissolved Org P (mg/l as P)	Particul. P (mg/l as P)	Total P (mg/l as P)
14-Oct-90	0.122	0.005	0.117	0.012	0.134	1.016	0.882	0.035	0.077	0.042	0.234	0.312
28-Oct-90	0.514	0.004	0.511	0.008	0.522	0.849	0.327	0.023	0.034	0.011	0.104	0.138
12-Nov-90	0.526	0.010	0.516	0.010	0.536	1.208	0.671	0.033	0.088	0.056	0.089	0.177
25-Nov-90	0.842	0.053	0.789	0.648	1.490	1.806	0.316	0.115	0.147	0.032	0.140	0.287
9-Dec-90	0.602	0.004	0.598	0.395	0.997	1.704	0.708	0.031	0.068	0.037	0.065	0.133
6-Jan-91	0.789	0.028	0.762	0.462	1.251	2.471	1.220	0.019	0.088	0.068	0.085	0.173
21-Jan-91	0.638	0.010	0.628	0.615	1.253	1.592	0.338	0.114	0.117	0.003	0.133	0.251
3-Feb-91	0.711	0.015	0.696	0.584	1.295	1.975	0.680	0.048	0.119	0.071	0.155	0.273
18-Feb-91	0.634	0.003	0.631	0.630	1.264	1.973	0.710	0.039	0.053	0.014	0.084	0.137
3-Mar-91	0.597	0.003	0.594	0.446	1.043	1.389	0.346	0.035	0.084	0.049	0.190	0.275
17-Mar-91	0.646	0.010	0.636	0.181	0.827	1.561	0.734	0.007	0.052	0.046	0.110	0.163
31-Mar-91	0.613	0.003	0.610	0.207	0.820	1.388	0.568	0.021	0.084	0.063	0.085	0.169
14-Apr-91	1.302	0.004	1.299	0.431	1.733	2.089	0.355	0.077	0.261	0.185	0.092	0.353
28-Apr-91	0.898	0.045	0.853	0.249	1.148	1.047	0.000	0.023	0.056	0.033	0.065	0.121
12-May-91	0.862	0.004	0.858	0.043	0.905	1.512	0.606	0.025	0.084	0.059	0.087	0.172
27-May-91	1.843	0.112	1.730	0.070	1.913	2.189	0.277	0.064	0.090	0.026	0.107	0.197
9-Jun-91	1.440	0.008	1.432	0.014	1.454	2.903	1.449	0.077	0.214	0.137	0.067	0.281
23-Jun-91	1.808	0.008	1.800	0.381	2.189	3.110	0.920	0.243	0.291	0.048	0.053	0.344
7-Jul-91	1.407	0.006	1.401	0.008	1.415	2.713	1.297	0.048	0.161	0.112	0.099	0.259
21-Jul-91	1.768	0.031	1.738	0.047	1.816	3.053	1.237	0.335	0.394	0.058	0.062	0.455
4-Aug-91	0.818	0.084	0.735	0.329	1.147	2.318	1.171	0.070	0.469	0.399	0.077	0.545
18-Aug-91	0.912	0.015	0.897	0.182	1.094	2.027	0.933	0.177	0.274	0.097	0.126	0.400
2-Sep-91	0.748	0.006	0.742	0.080	0.828	1.795	0.967	0.086	0.188	0.102	0.050	0.238
15-Sep-91	1.080	0.014	1.066	0.296	1.377	2.156	0.779	0.212	0.298	0.086	0.035	0.333
29-Sep-91	0.366	0.006	0.359	0.005	0.371	1.487	1.116	0.008	0.068	0.061	0.040	0.108
14-Oct-91	4.149	0.023	4.126	0.139	4.288	1.054	0.000	0.115	0.095	0.000	0.035	0.130
27-Oct-91	0.397	0.090	0.307	0.442	0.839	0.921	0.082	0.081	0.067	0.000	0.033	0.100
13-Nov-91	0.008	0.005	0.003	0.087	0.096	0.774	0.679	0.193	0.051	0.000	0.032	0.083
24-Nov-91	0.403	0.028	0.375	0.127	0.530	1.064	0.534	0.281	0.038	0.000	0.038	0.076
29-Dec-91	0.400	0.014	0.386	0.005	0.405	2.378	1.972	0.021	0.078	0.057	0.025	0.103
11-Jan-92	0.688	0.022	0.666	0.869	1.557	1.948	0.392	0.019	0.083	0.065	0.021	0.104
6-Feb-92	0.784	0.023	0.761	0.277	1.061	2.775	1.714	0.021	0.111	0.090	0.036	0.147
8-Mar-92	0.510	0.006	0.504	0.814	1.324	2.435	1.111	0.058	0.188	0.130	0.009	0.197
1-Apr-92	0.863	0.002	0.861	0.375	1.237	1.520	0.283	0.058	0.079	0.021	0.020	0.099
1-May-92	1.019	0.003	1.016	0.003	1.022	2.104	1.082	0.030	0.153	0.123	0.017	0.171
4-Jun-92	0.607	0.011	0.596	0.029	0.636	2.182	1.545	0.039	0.142	0.103	0.020	0.163
11-Jul-92	0.845	0.014	0.831	0.359	1.205	2.287	1.082	0.052	0.127	0.075	0.043	0.170
7-Aug-92	1.799	0.043	1.756	0.249	2.048	4.203	2.155	0.029	0.297	0.268	0.144	0.441
13-Sep-92	1.582	0.071	1.511	0.239	1.821	3.368	1.547	0.096	0.241	0.144	0.006	0.246
5-Oct-92	1.501	0.058	1.443	0.382	1.883	2.963	1.080	0.100	0.233	0.133	0.063	0.296
9-Nov-92	0.783	0.010	0.773	0.627	1.410	2.325	0.915	0.081	0.150	0.069	0.059	0.208
4-Dec-92	0.667	0.019	0.648	0.475	1.142	2.190	1.048	0.031	0.101	0.070	0.041	0.142
9-Jan-93	0.672	0.004	0.668	0.513	1.185	1.777	0.593	0.042	0.070	0.028	0.019	0.089
7-Feb-93	0.710	0.024	0.687	1.300	2.010	4.073	2.063	0.041	0.087	0.046	0.173	0.260
7-Mar-93	0.683	0.009	0.674	1.130	1.813	2.111	0.298	0.055	0.073	0.019	0.068	0.142
5-Apr-93	0.417	0.010	0.407	0.282	0.699	1.475	0.776	0.007	0.054	0.047	0.024	0.077
3-May-93	1.478	0.023	1.455	0.369	1.847	2.249	0.402	0.070	0.082	0.012	0.031	0.113
5-Jun-93	1.252	0.009	1.243	0.371	1.624	4.075	2.452	0.188	0.201	0.013	0.105	0.305
11-Jul-93	1.369	0.021	1.347	0.065	1.434	2.801	1.367	0.140	0.169	0.028	0.074	0.243
17-Aug-93	3.299	0.048	3.251	0.260	3.560	5.243	1.684	0.534	0.568	0.034	0.078	0.647

Table A6-6

River Rescue Project - Water Quality in the Tributaries, 1990 - 1995 (Kerr and Lee, 1996)

Station B1: Blackstone River at Main St. in Pawtucket, RI
Nutrient Concentrations

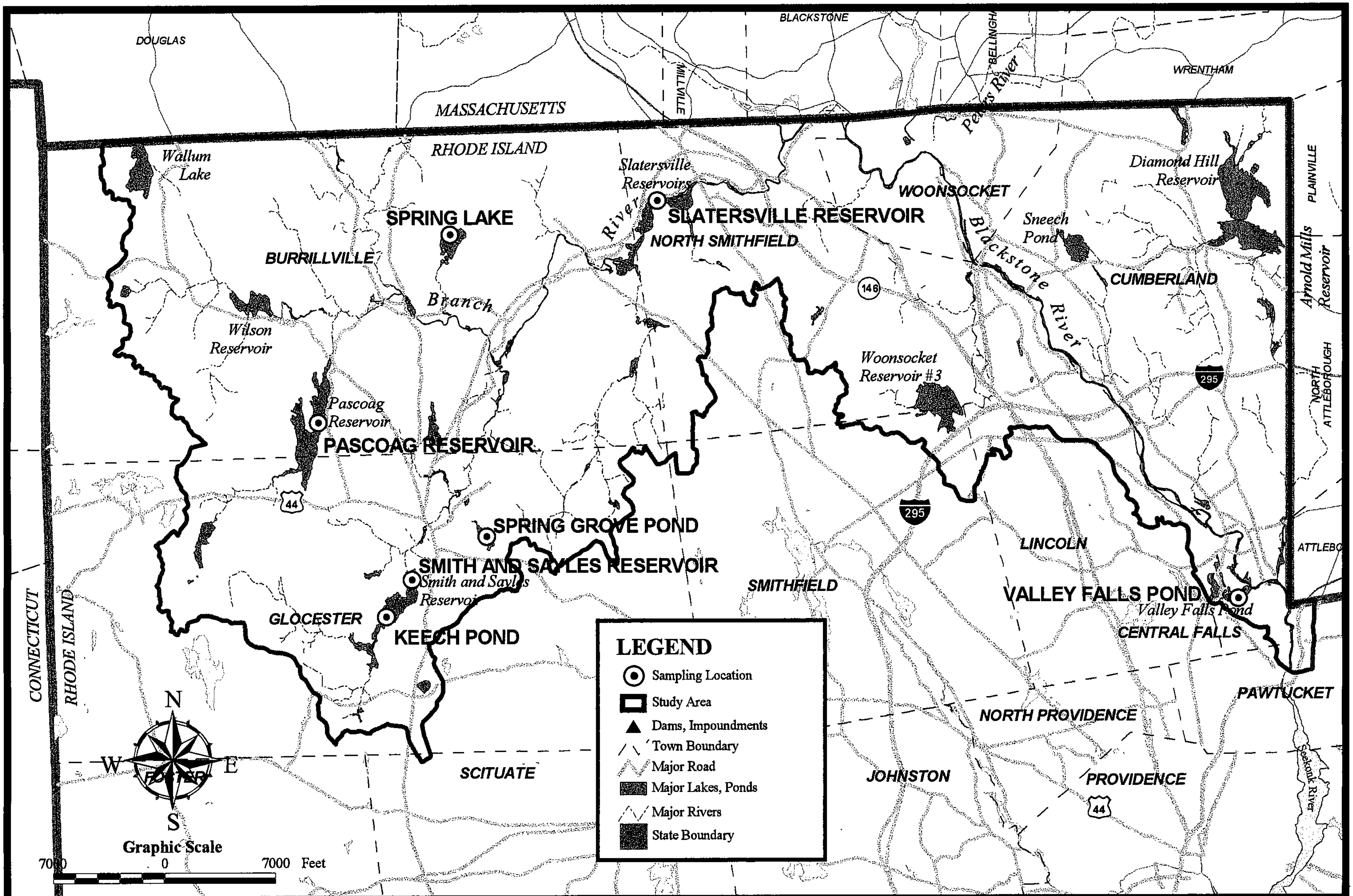
Statistics		Dissolved NO2+NO3 (mg/l as N)	Dissolved NO2 (mg/l as N)	Dissolved NO3 (mg/l as N)	Dissolved NH4 (mg/l as N)	Dissolved Inorg N (mg/l as N)	Total Diss. N (mg/l as N)	Dissolved Org. N (mg/l as N)	Dissolved Inorg P (mg/l as P)	Total Diss. P (mg/l as P)	Dissolved Org P (mg/l as P)	Particul. P (mg/l as P)	Total P (mg/l as P)
1990	Count	5	5	5	5	5	5	5	5	5	5	5	5
	Mean	0.521	0.015	0.506	0.215	0.736	1.317	0.581	0.047	0.083	0.036	0.126	0.209
	Maximum	0.842	0.053	0.789	0.648	1.490	1.806	0.882	0.115	0.147	0.056	0.234	0.312
	Minimum	0.122	0.004	0.117	0.008	0.134	0.849	0.316	0.023	0.034	0.011	0.065	0.133
1991	Count	25	25	25	25	25	25	25	25	25	25	25	25
	Mean	1.010	0.023	0.987	0.243	1.252	1.878	0.759	0.097	0.151	0.071	0.079	0.230
	Maximum	4.149	0.112	4.126	0.630	4.288	3.110	1.972	0.335	0.469	0.399	0.190	0.545
	Minimum	0.008	0.003	0.003	0.005	0.096	0.774	0.000	0.007	0.038	0.000	0.025	0.076
1992	Count	12	12	12	12	12	12	12	12	12	12	12	12
	Mean	0.971	0.024	0.947	0.392	1.362	2.525	1.163	0.051	0.159	0.108	0.040	0.199
	Maximum	1.799	0.071	1.756	0.869	2.048	4.203	2.155	0.100	0.297	0.268	0.144	0.441
	Minimum	0.510	0.002	0.504	0.003	0.636	1.520	0.283	0.019	0.079	0.021	0.006	0.099
1993	Count	8	8	8	8	8	8	8	8	8	8	8	8
	Mean	1.235	0.019	1.217	0.536	1.771	2.976	1.204	0.135	0.163	0.028	0.071	0.234
	Maximum	3.299	0.048	3.251	1.300	3.560	5.243	2.452	0.534	0.568	0.047	0.173	0.647
	Minimum	0.417	0.004	0.407	0.065	0.699	1.475	0.298	0.007	0.054	0.012	0.019	0.077
1990 to	Count	50	50	50	50	50	50	50	50	50	50	50	50
1993	Mean	1.039	0.022	1.017	0.334	1.374	2.245	0.946	0.091	0.155	0.073	0.067	0.222
	Maximum	4.149	0.112	4.126	1.300	4.288	5.243	2.452	0.534	0.568	0.399	0.234	0.647
	Minimum	0.008	0.002	0.003	0.003	0.096	0.774	0.000	0.007	0.034	0.000	0.006	0.076

Appendix 7

URI Watershed Watch
Lakes Monitoring Data 1993 to 2000

Pascoag Reservoir
Spring Lake
Keech Pond
Smith and Sayles Reservoir
Spring Grove Pond
Slatersville Reservoir
Valley Falls Pond

(URI, 1993 to 2000)



The Louis Berger Group, Inc.

Rhode Island DEM

Figure A7-1
URI WATERSHED WATCH

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

Table A7-1
URI Watershed Watch
Lake Monitoring Data
Sampling Locations
(URI, 1993 to 2000)

URIWW Watershed Code	Depth Code	Max. Depth (m)	Public Access?	Name	Town	Lake Size (sq. meters)	Lake Size (acres)	Near-by Landmarks
B	D	5.8	Y	Pascoag Reservoir	Burrillville - Glocester	1,369,233	342.3	State fishing access/parking off Jackson Schoolhouse Rd.
B	D	7.0	Y	Spring Lake	Burrillville	383,808	96.0	Spring Lake Rd., adjacent to the Black Hut Mgmt Area
B	S	4.2	Y	Keech Pond	Glocester	199,372	49.8	Access from Chestnut Hill Rd. off Rte. 102
B	S	3.4	Y	Smith and Sayles Reservoir	Glocester	699,364	174.8	State ramp/parking area off Sand Dam Rd., 10 h.p. limit
B	S	4.1	N	Spring Grove Pond	Glocester	90,591	22.6	Access from Spring Grove Rd., off Rte 44
B	D	5.5	Y	Slaterville Reservior	North Smithfield	260,602	65.2	Access off of Rte 5
B	S	0.7	Y	Valley Falls Pond	Central Falls	NA		East of Lonsdale Ave and north of Hunt Street

Depth Code
S = Shallow Reservoir
D = Deep Reservoir

Table A7-2
URI Watershed Watch
Pascoag Reservoir

Parameter	1993 May	1993 July	1993 November	1993 Mean	1994 May	1994 July	1994 November	1994 Mean	1995 May	1995 July	1995 November	1995 Mean
Alkalinity (mg/L)	...	...	...	...	1	1.8	3.7	2.1	0.7	1.9	...	1.3
Chloride (mg/L)	...	...	...	...	13	...	16	14.5	14	16	16	15.3
Dissolved Phosphorus (ug/L)	...	...	...	...	<4	<4	<4	<4	<4	<4	4	2.7
Fecal Coliform (Count per 100ml)	...	...	...	...	15	9	14	12.4	0	13	6	4.3
E.coli (Count per 100ml)	...	...	...	...	9	9	11	9.6	0	13	6	4.3
Nitrate- as Nitrogen (ug/L)	...	...	...	...	<40	...	<40	<40	70	<40	105	65
pH	...	...	...	...	5.8	6.2	6.1	6.0	6.0	6.0	7.0	6.2
Sodium (mg/L)	...	...	...	...	14	12	12	13.0	5	12	12	10.0
Total Phosphorus (ug/L)	...	...	...	...	9	11	8	9.3	7	10	9	8.7
Mean Trophic Status	...	...	...	...	...	...	...	O	...	...	...	O
Total-Nitrogen	...	...	...	...	...	250	440	345	310	360	...	335

Parameter	1996 May	1996 July	1996 November	1996 Mean	1997 May	1997 July	1997 November	1997 Mean	1998 May	1998 July	1998 November	1998 Mean
Alkalinity (mg/L)	0.6	1.1	...	0.8	0.3	0.9	1.5	0.9	0.4	2	1.4	1.3
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	15	...	10	12.5	10	...	15	12.5	20	10	15	15.0
Dissolved Phosphorus (ug/L)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	1	7	0	1.9	0	1	0	1.0	4	0	8	3.2
E.coli (Count per 100ml)	1	7	0	1.9	0	1	0	1.0	4	0	7	3.0
Nitrate- as Nitrogen (ug/L)	<40	<40	<40	<40	<40	<40	...	<40	<40	<40	60	33.0
pH	5.5	6.3	5.8	5.8	5.5	7.1	6.1	6.2	5.7	6.2	5.7	5.9
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	9	8	5	7.3	...	...	...	...	8	4	<3	5.0
Mean Trophic Status	...	...	...	O	...	...	...	...	...	...	...	O
Total-Nitrogen	285	435	...	360	190	260	220	223	150	280	370	267

Parameter	1999 May	1999 July	1999 September	1999 October	1999 Mean	2000 May	2000 July	2000 September	2000 October	2000 Mean
Alkalinity (mg/L)	1.1	2.4	...	3.2	2.2	1.4	1.3	...	2	1.6
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	15	15	...	20	16.7	15	15	...	15	15.0
Dissolved Phosphorus (ug/L)	<4	<4	...	<4	<4	<4	<4	...	<4	<4
Fecal Coliform (Count per 100ml)	1	4	...	1	1.6	<1	3	...	13	6.2
E.coli (Count per 100ml)	1	2	...	1	1.4	<1	3	...	13	6.2
Nitrate- as Nitrogen (ug/L)	<40	<40	...	...	<40	50	<40	...	<40	30.0
pH	6.3	6.4	...	6.3	6.3	5.9	6.0	...	6.3	6.0
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	7	7	...	6	6.7	11	5	...	6	7.3
Mean Trophic Status	...	...	...	...	O	...	...	...	...	O
Total-Nitrogen	210	260	...	350	273	280	...	...	...	280

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-3
URI Watershed Watch
Spring Lake

Parameter	1993 May	1993 July	1993 November	1993 Mean	1994 May	1994 July	1994 November	1994 Mean	1995 May	1995 July	1995 November	1995 Mean
Alkalinity (mg/L)	6.2	6.35	7.34	6.64	...	5.6		5.6	2.3	3.7	3	...
Chloride (mg/L)	3	4	5	4	3	4	5	4	4	3	3	3
Dissolved Phosphorus (ug/L)	15	<4	<4	6.3	<4	<4	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	0	...	2	1	...	27	1	5.2	1	29	1	3.1
E.coli (Count per 100ml)	0	...	2	1	...	20	1	4.5	1	27	1	3.0
Nitrate- as Nitrogen (ug/L)	<40	<40	<40	<40	<40	...	<40	<40	<40	<40	<40	<40
pH	6.2	7.1	6.8	6.7	...	6.9	...	6.9	7.0	7.0	7.0	7.0
Sodium (mg/L)	5	17	6	9.3	5	6	5	5.3	5	6	6	5.7
Total Phosphorus (ug/L)	14	48	5	22.3	6	10	8	8.0	9	8	5	7.3
Mean Trophic Status	...	...	...	M	...	...	...	O	...	...	...	O
Total-Nitrogen	...	850	280	565	100	250	...	175	...	340	...	340

Parameter	1996 May	1996 July	1996 November	1996 Mean	1997 May	1997 July	1997 November	1997 Mean	1998 May	1998 July	1998 November	1998 Mean
Alkalinity (mg/L)	1.4	2.4	...	1.9	1.3	2.1	3.5	2.3	...	1	2	1.5
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	5	<5	5	3.5	5	<5	5	3.5	<5	5	5	3.5
Dissolved Phosphorus (ug/L)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	0	0	3	1.4	0	36	2	4.2	1	1	2	1.3
E.coli (Count per 100ml)	0	0	3	1.4	0	35	2	4.1	1	1	2	1.3
Nitrate- as Nitrogen (ug/L)	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	70	36.7
pH	6.2	6.5	6.4	6.4	5.5	...	6.1	5.8	...	5.6	6.0	5.8
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	6	5	9	6.7	...	...	...	...	7	<3	13	10.0
Mean Trophic Status	...	...	...	O	...	...	...	...	...	...	...	O
Total-Nitrogen	...	255	360	308	210	360	260	277	130	170	430	243

Parameter	1999 May	1999 July	1999 September	1999 October	1999 Mean	2000 May	2000 July	2000 September	2000 October	2000 Mean
Alkalinity (mg/L)	2.4	3.8	...	3.5	3.2	3.4	3.2	...	4.1	3.6
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	5	<5	...	5	3.5	5	5	...	5	5.0
Dissolved Phosphorus (ug/L)	6	5	...	<4	4.3	<4	4	...	<4	2.7
Fecal Coliform (Count per 100ml)	<1	5	...	1	1.7	4	2	...	1	2.0
E.coli (Count per 100ml)	<1	3	...	1	1.4	4	2	...	1	1.4
Nitrate- as Nitrogen (ug/L)	<40	<40	...	30	23.3	<40	<40	...	<40	<40
pH	6.6	6.8	...	6.7	6.7	6.6	6.9	...	7.0	6.8
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	11	9	...	5	8.3	11	9	...	4	8.0
Mean Trophic Status	...	...	...	...	O	...	...	...	...	O
Total-Nitrogen	370	390	...	320	355	440	...	...	...	440

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-4
URI Watershed Watch
Keech Pond

	1993				1994				1995			
Parameter	May	July	November	Mean	May	July	November	Mean	May	July	November	Mean
Alkalinity (mg/L)	1.0	2.61	2.63	2.07	1	...	3	2.1	1.7	3.2	...	2.4
Chloride (mg/L)	9	12	16	12	11	...	14	12.5	14	17	20	17
Dissolved Phosphorus (ug/L)	<4	34	<4	12.7	<4	<4	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	4	5	64	10.9	2	52	18	12.3	2	15	1	3.1
E.coli (Count per 100ml)	4	5	63	10.8	2	15	13	7.3	2	15	1	3.1
Nitrate- as Nitrogen (ug/L)	<40	<40	210	83.3	<40	<40	<40	<40	<40	<40	110	50
pH	5.9	6.3	5.8	6.0	6.0	4.2	5.3	5.2	6.0	7.0	6.0	6.3
Sodium (mg/L)	9	10	10	10.0	9	11	12	11.0	11	13	12	12.0
Total Phosphorus (ug/L)	12	9	15	12.0	12	12	20	14.7	11	21	10	14.0
Mean Trophic Status	...	...	...	M	...	...	...	M	...	...	...	M
Total-Nitrogen	...	250	520	385	260	410	490	387	340	...	600	470

	1996				1997				1998			
Parameter	May	July	November	Mean	May	July	November	Mean	May	July	November	Mean
Alkalinity (mg/L)	1.3	2.4	...	1.9	1.3	2.5	2.9	2.2	1	2.8	2.3	2.0
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	15	...	10	13.0	10	...	20	15.0	25	10	...	18.0
Dissolved Phosphorus (ug/L)	<4	<4	<4	<4	<4	...	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	0	19	25	7.8	0	3	2	1.8	9	22	2	7.3
E.coli (Count per 100ml)	0	19	23	7.6	0	3	2	1.8	9	12	2	6.0
Nitrate- as Nitrogen (ug/L)	<40	<40	80	40.0	<40	<40	60	33.3	<40	<40	80	40.0
pH	5.8	6.3	5.3	5.8	5.6	6.1	6	5.9	5.8	6.1	6.3	6.1
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	9	15	12	12.0	...	...	...	...	9	7	12	9.0
Mean Trophic Status	...	...	...	M	...	...	...	...	...	...	...	O
Total-Nitrogen	705	...	560	632.5	270	630	380	427	330	500	460	430

	1999					2000				
Parameter	May	July	...	October	Mean	May	July	September	October	Mean
Alkalinity (mg/L)	0.9	3.7	...	1.1	1.9	1	2.1	2.8	...	1.9
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	20	20	...	20	20.0	15	15	...	15	15.0
Dissolved Phosphorus (ug/L)	<4	5	...	<4	<5	<4	6	...	<4	<4
Fecal Coliform (Count per 100ml)	<1	4	...	1	1.6	12	4	...	<2	4.6
E.coli (Count per 100ml)	<1	2	...	1	1.3	12	3	...	<2	4.2
Nitrate- as Nitrogen (ug/L)	55	<40	...	70	48.3	50	<40	...	80	50.0
pH	6.4	6.6	...	6.0	6.3	6.0	6.1	6.2	...	6.1
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	13	11	...	10	11.3	15	17	...	<3	11.5
Mean Trophic Status	...	...	...	...	M	...	...	...	...	M
Total-Nitrogen	40	580	...	410	343	470	...	...	...	470

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-5
URI Watershed Watch
Smith and Sayles Reservoir

Parameter	1993 May	1993 July	1993 November	1993 Mean	1994 May	1994 July	1994 November	1994 Mean	1995 May	1995 July	1995 November	1995 Mean
Alkalinity (mg/L)	...	...	...	...	1	1	3.3	1.7	...	3.3	...	3.3
Chloride (mg/L)	9	10	...	9.5	10	...	14	12	...	13	...	13
Dissolved Phosphorus (ug/L)	<4	<4	...	<4	<4	<4	<4	<4	...	<4	...	<4
Fecal Coliform (Count per 100ml)	0	0	...	0	0	5	1	1.7	0	4	2	2.0
E.coli (Count per 100ml)	0	0	...	0	0	5	0	1.7	...	3	2	2.4
Nitrate- as Nitrogen (ug/L)	<40	<40	...	<40	<40	...	<40	<40	...	<40	...	<40
pH	...	...	...	...	6.1	6.3	6.0	6.1	...	7.0	...	7.0
Sodium (mg/L)	7	9	...	8.0	8	12	9	10.0	...	10	0	5.0
Total Phosphorus (ug/L)	27	23	...	25.0	<3	7	11	6.7	...	8	20	14.0
Mean Trophic Status	...	...	...	E	...	...	...	O	...	...	...	M
Total-Nitrogen	...	800	...	800	...	370	...	370	...	340	...	340

Parameter	1996 May	1996 July	1996 November	1996 Mean	1997 May	1997 July	1997 November	1997 Mean	1998 May	1998 July	1998 November	1998 Mean
Alkalinity (mg/L)	0.7	2.7	...	1.7	0.8	2.8	...	1.8	1.6	...	...	1.6
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	10	...	15	12.5	10	...	...	10.0	10	...	...	10.0
Dissolved Phosphorus (ug/L)	<4	<4	<4	<4	<4	<4	...	<4	<4	...	...	<4
Fecal Coliform (Count per 100ml)	0	1	5	1.7	0	0	...	0.0	1	0	...	1.0
E.coli (Count per 100ml)	0	1	5	1.7	0	0	...	0.0	1	0	...	1.0
Nitrate- as Nitrogen (ug/L)	<40	<40	<40	<40	<40	<40	...	44.0	<40	...	...	<40
pH	5.8	6.4	6.1	6.1	5.3	6.2	...	5.8	6.2	...	...	6.2
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	9	8	6	7.7	...	...	...	...	10	5	...	7.5
Mean Trophic Status	...	...	...	O	...	...	...	...	...	...	...	O
Total-Nitrogen	315	...	285	300	190	260	...	225	200	330	...	265

Parameter	1999 May	1999 July	1999 September	1999 October	1999 Mean	2000 May	2000 July	2000 September	2000 October	2000 Mean
Alkalinity (mg/L)	1.9	3.6	...	...	2.8	1.6	2.8	...	3.4	2.6
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	15	20	...	...	17.5	15	15	...	15	15.0
Dissolved Phosphorus (ug/L)	<4	<4	...	...	<4	<4	<4	...	<4	<4
Fecal Coliform (Count per 100ml)	1	8	...	...	2.8	17	5	...	<1	4.4
E.coli (Count per 100ml)	1	8	...	...	8.0	14	3	...	<1	1.7
Nitrate- as Nitrogen (ug/L)	<40	<40	...	...	<40	<40	<40	...	80	40.0
pH	6.1	6.7	...	...	6.4	6.1	6.0	...	6.3	6.1
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	12	11	...	...	11.5	15	8	...	8	10.3
Mean Trophic Status	...	...	...	...	M	...	...	...	...	M
Total-Nitrogen	300	360	...	...	330	360	...	...	...	360

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-6
URI Watershed Watch
Spring Grove Pond

Parameter	1993 May	1993 July	1993 November	1993 Mean	1994 May	1994 July	1994 November	1994 Mean	1995 May	1995 July	1995 November	1995 Mean
Alkalinity (mg/L)	4.7	...	5.47	5.09	4	5.8	5.8	5.2	4.9	4.4	...	4.6
Chloride (mg/L)	11	...	14	12.5	9	...	13	11.0	10	9	18	12
Dissolved Phosphorus (ug/L)	<4	...	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Fecal Coliform (Count per 100ml)	0	14	2	3.0	3	9	4	4.8	3	4	4	3.6
E.coli (Count per 100ml)	0	13	2	3.0	3	2	1	1.8	3	4	4	3.6
Nitrate- as Nitrogen (ug/L)	<40	...	<40	<40	140	...	<40	80	175	<40	60	85
pH	6.5	...	6.3	6.4	6.6	6.5	6.2	6.5	7.0	7.0	7.0	7.0
Sodium (mg/L)	10	...	10	10.0	8	10	10	9.0	9	10	13	10.7
Total Phosphorus (ug/L)	11	...	7	9.0	12	15	14	13.7	16	12	11	13.0
Mean Trophic Status	...	...	...	O	...	...	...	M	...	...	...	M
Total-Nitrogen	300	...	370	335	...	470	500	485	...	510	...	510

Parameter	1996 May	1996 July	1996 November	1996 Mean	1997 May	1997 July	1997 November	1997 Mean	1998 May	1998 July	1998 November	1998 Mean
Alkalinity (mg/L)	3.3	3.9	...	3.6	3.1	5.1	7.9	5.4	3.3	3.6	3.4	3.4
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	15	...	5	10.0	10	...	45	28.0	10	15	25	17.0
Dissolved Phosphorus (ug/L)	10	<4	<4	4.7	<4	<4	<4	<4	<4	<4	...	<4
Fecal Coliform (Count per 100ml)	0	0	0	0.0	0	5	0	1.7	17	14	0	6.2
E.coli (Count per 100ml)	0	0	0	0.0	0	5	0	1.7	17	9	0	5.3
Nitrate- as Nitrogen (ug/L)	<40	<40	<40	<40	<40	<40	<40	<40	<40	...	<40	<40
pH	6.4	6.3	6.2	6.3	5.7	6.2	6.1	6.0	6.7	6.1	6.0	6.3
Sodium (mg/L)	9	10	13	11.0	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	12	17	14.5	...	...	...	...	16	24	7	15.7
Mean Trophic Status	...	...	...	M	...	...	...	...	...	...	...	M
Total-Nitrogen	700		940	820	250	790	260	433	480	270	240	330

Parameter	1999 May	1999 July	1999 September	1999 October	1999 Mean	2000 May	2000 July	2000 September	2000 October	2000 Mean
Alkalinity (mg/L)	...	4.2	...	3.9	4.1	3.8	4.6	...	6.1	4.8
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	...	25	...	20	23.0	15	15	...	20	17.0
Dissolved Phosphorus (ug/L)	...	<4	...	<4	<4	<4	<4	...	14	6.0
Fecal Coliform (Count per 100ml)	...	2	4	...	2.8	...	7	...	<1	2.6
E.coli (Count per 100ml)	...	2	3	...	2.4	...	6	...	<1	2.4
Nitrate- as Nitrogen (ug/L)	...	<40	...	<40	<40	<40	<40	...	<40	<40
pH	...	6.5	...	6.5	6.5	6.6	6.8	...	6.7	6.7
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	10	...	5	7.5	10	7	...	10	9.0
Mean Trophic Status	...	...	...	...	O	...	...	...	...	O
Total-Nitrogen	...	420	...	320	370	280	...	...	...	280

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-7
URI Watershed Watch
Slatersville Reservoir

	1993				1994				1995			
Parameter	May	July	November	Mean	May	July	November	Mean	May	July	November	Mean
Alkalinity (mg/L)	...	...	...	...	...	...	...	...	4.5	9.2	...	6.8
Chloride (mg/L)	...	...	...	...	...	...	...	...	16	22	17	18.0
Dissolved Phosphorus (ug/L)	...	...	...	...	...	...	...	...	<4	<4	15	6.3
Fecal Coliform (Count per 100ml)	...	...	...	...	...	...	...	...	0	7	60	7.5
E.coli (Count per 100ml)	...	...	...	...	...	...	...	...	0	6	40	6.2
Nitrate- as Nitrogen (ug/L)	...	...	...	...	...	...	...	...	100	160	140	133.3
pH	...	...	...	...	...	...	...	...	6.0	7.0	7.0	6.6
Sodium (mg/L)	...	...	...	...	...	...	...	...	18	11	14	14.0
Total Phosphorus (ug/L)	...	...	...	...	...	...	...	...	15	18	22	18.3
Mean Trophic Status	...	...	...	...	...	...	...	...	...	...	...	M
Total-Nitrogen	...	...	...	...	...	...	...	...	...	530	...	530

	1996				1997				1998			
Parameter	May	July	November	Mean	May	July	November	Mean	May	July	November	Mean
Alkalinity (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Dissolved Phosphorus (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
Fecal Coliform (Count per 100ml)	...	...	...	...	...	...	...	...	...	...	...	...
E.coli (Count per 100ml)	...	...	...	...	...	...	...	...	...	...	...	...
Nitrate- as Nitrogen (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
pH	...	...	...	...	...	...	...	...	...	...	...	...
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
Mean Trophic Status	...	...	...	...	...	...	...	...	...	...	...	...
Total-Nitrogen	...	...	...	...	...	...	...	...	...	...	...	...

	1999					2000				
Parameter	May	July	September	October	Mean	May	July	September	October	Mean
Alkalinity (mg/L)	...	...	...	...	...	4.7	8.2	...	...	6.4
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	...	...	...	...	...	20	25	...	...	23.0
Dissolved Phosphorus (ug/L)	...	...	...	...	...	<4	7	...	...	4.5
Fecal Coliform (Count per 100ml)	...	...	...	...	...	4	2	...	...	2.8
E.coli (Count per 100ml)	...	...	...	...	...	4	2	...	...	2.0
Nitrate- as Nitrogen (ug/L)	...	...	...	...	...	150	210	...	...	180.0
pH	...	...	...	...	...	6.4	6.6	...	6.4	6.5
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	...	...	...	...	19	25	...	...	22.0
Mean Trophic Status	...	...	...	...	...	...	...	...	...	M
Total-Nitrogen	...	...	...	...	...	490	...	...	...	490

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Table A7-8
URI Watershed Watch
Valley Falls Pond

Parameter	1993 May	1993 July	1993 November	1993 Mean	1994 May	1994 July	1994 November	1994 Mean	1995 May	1995 July	1995 November	1995 Mean
Alkalinity (mg/L)	...											
Chloride (mg/L)												
Dissolved Phosphorus (ug/L)												
Fecal Coliform (Count per 100ml)												
E.coli (Count per 100ml)												
Nitrate- as Nitrogen (ug/L)												
pH												
Sodium (mg/L)												
Total Phosphorus (ug/L)												
Mean Trophic Status												
Total-Nitrogen												

Parameter	1996 May	1996 July	1996 November	1996 Mean	1997 May	1997 July	1997 November	1997 Mean	1998 May	1998 July	1998 November	1998 Mean
Alkalinity (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Dissolved Phosphorus (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
Fecal Coliform (Count per 100ml)	...	...	...	...	...	...	...	...	...	...	...	...
E.coli (Count per 100ml)	...	...	...	...	...	...	...	...	...	...	...	...
Nitrate- as Nitrogen (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
pH	...	...	...	...	...	...	...	...	...	...	...	...
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	...	...	...	...	...	...	...	...	...	...	...
Mean Trophic Status	...	...	...	...	...	...	...	...	...	...	...	...
Total-Nitrogen	...	...	...	...	...	...	...	...	...	...	...	...

Parameter	1999 May	1999 July	1999 September	1999 October	1999 Mean	2000 May	2000 July	2000 September	2000 October	2000 Mean
Alkalinity (mg/L)	...	...	...	...	...	...	...	...	...	...
Calcium (mg/L)	...	...	...	...	...	...	...	...	...	...
Chloride (mg/L)	...	...	...	...	...	60	80	...	60	67.0
Dissolved Phosphorus (ug/L)	...	...	...	...	...	93	121	...	175	129.7
Fecal Coliform (Count per 100ml)	...	...	...	...	...	200	37	...	25	57.0
E.coli (Count per 100ml)	...	...	...	...	...	200	23	...	25	24.0
Nitrate- as Nitrogen (ug/L)	...	...	...	...	...	830	240	...	1230	767.0
pH	...	...	...	...	...	7.1	7.7	...	7.1	7.3
Sodium (mg/L)	...	...	...	...	...	...	...	...	...	...
Total Phosphorus (ug/L)	...	...	...	...	...	367	390	...	218	325.0
Mean Trophic Status	...	...	...	...	...	...	...	...	...	E
Total-Nitrogen	...	...	...	...	...	1990	...	...	...	1990

... Not Sampled or Not Available
<___: Below detection limit
TNTC: Too numerous to count
TDTC: Very High Levels of background bacteria, unable to distinguish fecal coliform or E. coli

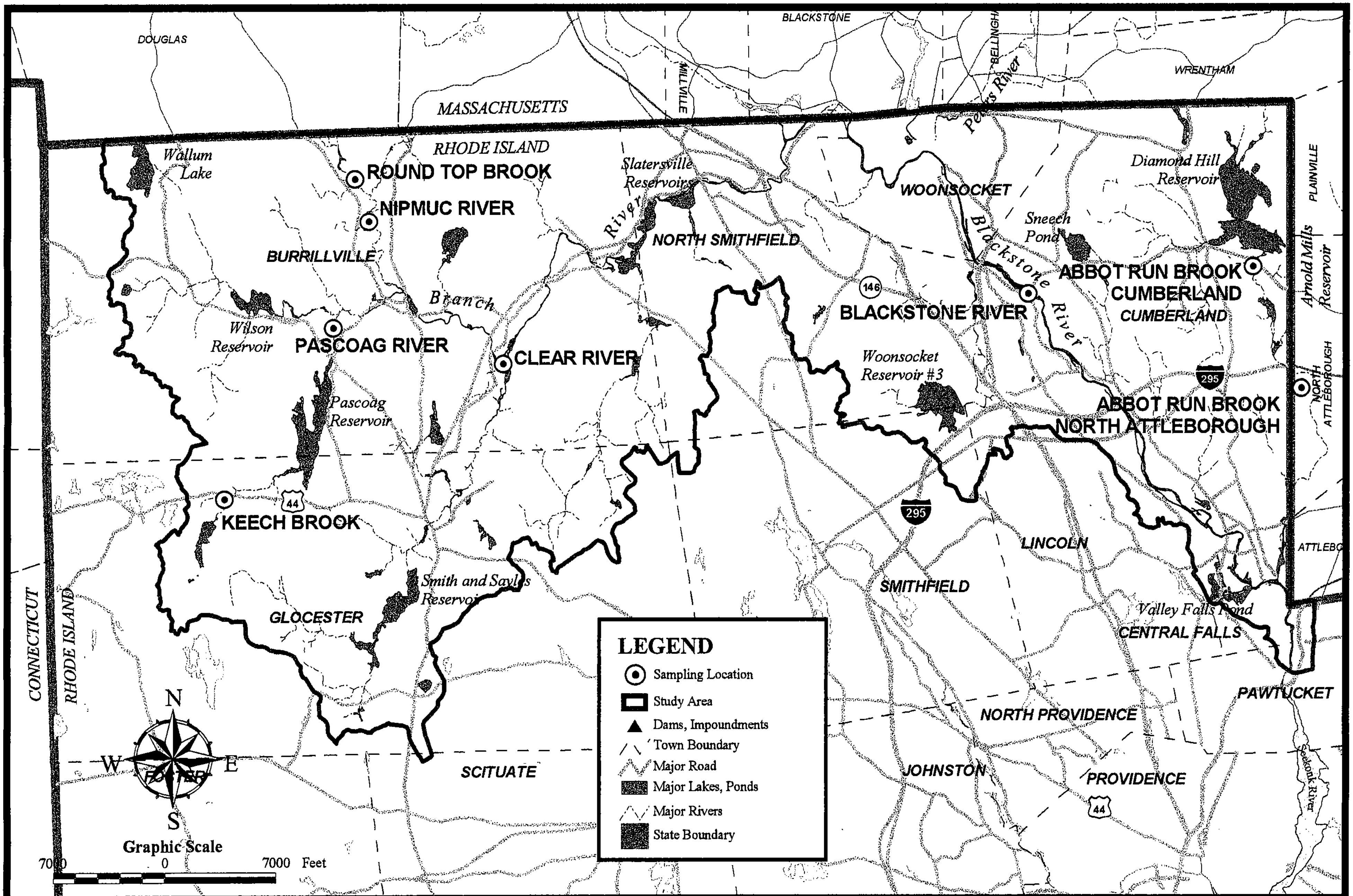
Detection Limits
Dissolved Phosphorus: MDL = 4 ug/L
Total Phosphorus: MDL = 3 ug/L
Nitrate-Nitrogen: MDL = 50 ug/L 1993 to 1996; 40 ug/L after 1996

Trophic Level
O: Oligotrophic (Total Phosphorus <10 ug/L)
M: Mesotrophic (Total Phosphorus = 10-24 ug/L)
E: Eutrophic (Total Phosphorus >24 ug/L)

Appendix 8

State of the State's Waters- Rhode Island, 2000 Section 305(b) Report (Section III):
Stream Sampling Sites for 1991-2000, Chemical Monitoring

(RIDEM, 2000)



The Louis Berger Group, Inc.

Rhode Island DEM

Figure A8-1
RIDEM CHEMICAL MONITORING

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

Table A8-1a

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by RIDEM are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	1				Tr		Tr		0.00	0.00	0.00	0.31	0.08
1991	2			0.54	0.01	0.02						Tr	0.07
1991	3			0.61			Tr	0.20	0.07		Tr	Tr	0.98
1991	4			0.85			0.25		0.79			Tr	0.15
1991	5	0.10	Tr	Tr	Tr		0.03	0.03		1.10			
1991	6	Tr	0.02	0.10		0.98					0.53		0.23
1991	7		0.53	0.50	Tr			0.08					Tr
1991	8	Tr					Tr					Tr	
1991	9	0.55							0.33				0.10
1991	10			Tr		0.66		Tr	1.67		Tr	0.22	0.25
1991	11	0.20	Tr	Tr				0.10		Tr	0.15	1.93	
1991	12	0.74					0.11				Tr	0.13	
1991	13		0.10		0.10			0.36				0.01	0.27
1991	14		0.92	0.51		0.05		0.03		0.25			0.12
1991	15		0.05	0.07	0.26		0.02		0.02	0.09	0.48	0.01	Tr
1991	16	1.33	Tr		Tr		0.01				0.15		
1991	17	0.04	Tr		0.08	0.57				Tr	0.20		0.21
1991	18	Tr	0.04	1.26	0.08	0.01	Tr		0.02	0.07	0.40		Tr
1991	19		0.42	0.08			0.47		2.51	0.46			
1991	20		0.10		Tr				0.14	0.62			
1991	21	0.11		Tr	3.06			Tr	0.43			0.45	0.12
1991	22			0.39	0.08		0.01					0.69	
1991	23			0.90			0.01	0.36		0.07		0.51	Tr
1991	24			0.35		Tr			Tr	0.15		0.39	
1991	25		Tr	0.02		Tr		Tr		1.75	Tr		
1991	26	Tr	0.05					1.55		0.53			
1991	27	Tr	0.08	0.07	Tr	0.03		0.05			Tr		
1991	28	0.07	Tr	Tr		0.02					Tr		
1991	29			0.15				Tr				Tr	0.59
1991	30	0.10		0.21	1.13	0.77	0.02				0.25	Tr	Tr
1991	31	0.20				0.19			Tr		0.49		

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1993	1		0.04		1.44		0.58					0.05	
1993	2		Tr		0.18			Tr					
1993	3	0.02			0.01			0.38		0.04	0.19		Tr
1993	4	0.01	Tr	0.29	Tr	Tr	0.04			0.03			0.19
1993	5	0.73		0.65		Tr	0.09					0.60	2.86
1993	6		0.12	0.01		Tr	0.12		Tr			Tr	0.01
1993	7		Tr					0.10	Tr	0.02			Tr
1993	8	Tr	Tr	Tr			0.01	0.01	Tr	0.09			Tr
1993	9	Tr		0.01			0.30			Tr			
1993	10	Tr		0.21	0.45			0.01		0.87	Tr		0.25
1993	11	0.04		0.11	0.03	0.05							0.63
1993	12	0.05	1.43		0.76			0.15			0.27	Tr	
1993	13	0.57	0.58	2.44	0.02	0.02			0.23				Tr
1993	14	0.01		0.14				Tr				Tr	Tr
1993	15	0.06			Tr				Tr	Tr	0.06	Tr	Tr
1993	16		2.32		Tr	0.06			Tr	0.32			0.01
1993	17	Tr	0.03	0.72	0.90	0.12			0.13	0.02	0.02	0.35	
1993	18	Tr	0.07	0.08	Tr	0.14			0.61	0.47	0.02	0.23	Tr
1993	19		0.02			0.16	Tr	0.23			0.03	0.57	0.33
1993	20					0.17	Tr	0.22	Tr		0.30	Tr	
1993	21		0.19	0.01			0.10			0.07	0.88		1.10
1993	22	0.56	0.26		0.14	0.04	Tr			0.10			
1993	23	0.02	Tr	0.01	Tr					0.02			
1993	24	0.22	Tr	1.44								0.05	Tr
1993	25	Tr		0.08	0.02	Tr			0.15			Tr	0.05
1993	26				0.85					1.28			Tr
1993	27	Tr	Tr		0.22	Tr	0.16	0.73		0.75	0.53		
1993	28	Tr	Tr	0.29		Tr			0.11		0.01	1.50	
1993	29	0.01		0.50		0.05		0.35					0.15
1993	30			Tr			Tr				0.82		0.18
1993	31	0.12				0.31					0.42		

Table A8-1b

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by RIDEM are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	1				0.07	0.02		Tr	0.28	0.14			0.20
1996	2	0.07	0.03	0.30	0.52	0.02				0.13	0.02		1.16
1996	3	0.22	0.09	0.02		0.25	0.45	0.52			Tr		
1996	4	Tr				Tr	0.18	0.35		0.01			
1996	5	Tr		0.19	Tr	0.03	0.07					0.01	
1996	6			0.83	Tr	0.26			Tr				0.87
1996	7	0.06		0.48	0.42					1.21		0.16	1.15
1996	8	0.12	Tr	0.03	0.03	0.18				0.02	2.06	0.08	0.36
1996	9	Tr	0.12		0.32		Tr	0.04	Tr		0.30	0.53	
1996	10	0.05			0.13	0.27	0.05	0.01	0.07	0.01	0.01		
1996	11		0.27		Tr	0.15	Tr						0.08
1996	12	1.08			0.04	0.10	Tr			0.04			0.04
1996	13				0.04			3.57	0.93	0.13	Tr		0.03
1996	14		0.16		0.01					0.03	Tr		0.16
1996	15			0.17				Tr					Tr
1996	16	Tr	0.05		2.00	0.47							Tr
1996	17	0.03	Tr		Tr	0.14	0.03			0.93			0.68
1996	18						0.06			1.91			
1996	19	0.98		0.04			0.10	0.11			0.25	0.16	1.17
1996	20			0.64			0.46				2.81		0.01
1996	21	Tr	0.73		Tr	0.19	0.14		Tr				
1996	22		Tr		Tr		0.02			0.41	0.10		
1996	23		0.02	Tr	0.04		Tr	0.45	0.05	0.26	0.34		
1996	24	0.85	0.57		0.04	Tr	0.35		0.39	0.05	0.01		0.46
1996	25	Tr		Tr	Tr		0.04		0.01	0.17		0.02	0.10
1996	26			0.01	0.03			0.07	0.01			1.42	
1996	27	1.42	0.02				Tr					Tr	0.03
1996	28	Tr	0.13				Tr		0.45	0.03	0.21		Tr
1996	29	0.11			0.69	Tr	Tr			0.24			0.07
1996	30	0.02			0.50	0.36	0.22				0.09	Tr	
1996	31	0.01						0.45			Tr		0.02

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	1			0.15	0.84	0.31	0.27				0.12		0.02
1998	2				0.27	0.49	Tr						
1998	3			0.01		Tr	0.36						
1998	4	Tr	0.17	Tr		0.19							
1998	5		0.40	0.03	Tr	0.25		0.51					
1998	6	0.07	Tr			0.62							
1998	7	0.73		Tr		0.42	0.29	Tr		0.54			
1998	8	0.79		0.39	0.02	0.02	0.06	Tr		0.47	0.46		0.20
1998	9	0.36		3.02	0.63	0.83				0.05	0.65		
1998	10			Tr	0.29	1.64					0.88	Tr	
1998	11		0.22			0.31			0.15		0.08	1.38	
1998	12		1.08	Tr			0.13				Tr		
1998	13	0.23					3.29						
1998	14			0.11			1.37				1.23E		
1998	15	0.26		Tr	Tr		0.88			Tr		Tr	
1998	16	0.63		Tr	0.01		0.14	Tr		0.13		0.00	
1998	17	Tr	0.29		1.53	0.08	Tr	Tr	0.71			0.49	0.07
1998	18	0.10	1.87	0.13			0.46		0.45				
1998	19		Tr	1.68	0.06		0.50		0.20		Tr		
1998	20	Tr	Tr	Tr	0.35		0.04	Tr				0.23	Tr
1998	21			0.19								0.03	
1998	22			0.15			Tr			0.99			0.06
1998	23	1.68	0.05		0.55		0.01	0.37	Tr				Tr
1998	24	1.63	1.22		0.01		Tr						0.18
1998	25	0.05	0.06			0.09			Tr				
1998	26				0.34			Tr	0.62			0.63	
1998	27				0.01		0.16		Tr	0.10			
1998	28	Tr	0.49						0.06		0.34		0.10
1998	29	Tr				0.14	0.18	0.09	0.16		0.02		0.45
1998	30	0.01			Tr		1.47		0.04	0.02E			0.19
1998	31	0.01				0.66		0.40	Tr				

Table A8-1c

Rainfall at T.F. Green Airport *(*)*

Sampling Periods of Monitoring by RIDEM are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	1			0.20	Tr			0.06					
1999	2		2.12				0.02	0.02				0.39	
1999	3	1.70	0.51	0.12		0.19	0.02	Tr				1.78	
1999	4		0.14	0.44	0.04	0.28		0.03			0.90		Tr
1999	5		Tr			0.14			Tr		0.12		
1999	6	Tr	0.02	0.69	Tr			Tr		0.14			0.48
1999	7	0.03	0.04	0.02	Tr					0.01			1.02
1999	8	0.36	Tr			0.20			0.72	0.56			
1999	9	0.45			0.13			Tr		0.01	0.01		
1999	10				Tr			Tr	Tr	2.27	0.39	0.02	0.03
1999	11	Tr		Tr	0.29				Tr			0.01	
1999	12	0.05	0.22	Tr	0.04			Tr	Tr			0.07	
1999	13	0.01	0.02	Tr				0.13	Tr		0.54	Tr	0.04
1999	14	0.26	Tr	0.12			0.08		0.07	0.01	0.28	0.05	0.27
1999	15	1.43		0.45		Tr	Tr		0.41	1.12			0.28
1999	16				0.55					1.98			0.01
1999	17		Tr		0.02		0.03			Tr	0.37		
1999	18	0.93	0.83			0.01	Tr		Tr		0.83		
1999	19					0.63		0.24					
1999	20				Tr	0.45			0.04		0.96	0.05	0.14
1999	21	0.04	Tr	0.08			Tr		0.12				0.12
1999	22	0.03		0.47	0.19				0.01	0.01			Tr
1999	23	0.04			0.28	1.85		0.33			0.11		
1999	24	1.29	Tr	0.34		0.50		0.01				0.02	
1999	25	Tr	0.06	Tr		Tr	Tr	Tr		0.09		0.20	
1999	26		0.01		Tr				1.67			0.03	
1999	27	Tr		0.02	Tr				0.21			0.23	
1999	28	0.07	1.48	0.37		Tr							
1999	29	0.01		0.01			Tr			0.01		Tr	
1999	30						0.02			0.79			
1999	31												

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	1	Tr		Tr		Tr			0.03		Tr		
2000	2	Tr		Tr		0.08	0.42		0.04	0.62			
2000	3	Tr	0.03		0.03			Tr	0.23	Tr			
2000	4	1.25	0.03		0.32			0.09	0.01	0.15	0.03	Tr	
2000	5	0.21	0.01	Tr			Tr				0.22	0.03	
2000	6		Tr				2.57		Tr		0.08		
2000	7					Tr	0.08		0.18				
2000	8				0.04	Tr							0.11
2000	9	0.02		0.03	0.47	0.03		Tr	Tr	0.08	Tr	Tr	
2000	10	1.33		Tr		0.87		Tr	0.42	0.01		1.83	0.03
2000	11	Tr	Tr	1.96	0.03	0.03	0.90		0.03			0.04	0.03
2000	12			0.56			0.08						0.01
2000	13	0.12	Tr			0.64	Tr		0.46	0.17		0.03	
2000	14		1.47			0.01	0.07	Tr	0.45			0.75	0.64
2000	15		Tr		0.04		0.04	Tr	0.04	0.96			
2000	16	Tr	Tr	0.25	0.06			0.13	0.22		0.09		0.49
2000	17			0.87	0.09		0.26			Tr	Tr	Tr	2.23
2000	18		0.35		0.38	0.24	0.01	0.41	0.11		0.69		t
2000	19		0.05		0.17	0.50	0.09	0.02	0.01	1.11	Tr		0.27
2000	20	Tr	Tr	Tr	0.01	0.07				0.18			0.15
2000	21	Tr		Tr	1.61	Tr		Tr		Tr			
2000	22			Tr	1.14	0.34		0.02					0.05
2000	23	Tr			0.05	0.08			0.17	0.21			
2000	24		Tr			0.87		Tr	Tr	0.02			
2000	25	0.61	0.35	0.01				0.01					
2000	26	0.01	0.11	0.04	0.09		Tr	0.45		0.28		1.91	
2000	27						0.20	0.81					
2000	28		0.20	1.53		Tr	Tr			0.01		Tr	t
2000	29			0.12			0.07	Tr			Tr		t
2000	30	Tr		Tr			Tr	0.32	Tr		0.10	0.14	0.34
2000	31	0.64						0.59			0.12		t

(*) Data from April to December 2000 are from the National Weather Service from their Providence Station.

Table A8-2: RIDEM Chemical Monitoring, Section 305b

Round Top Brook

Burrillville (Brook Road)

Date	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
12-Mar-91	2.70			5.6	25	0.30	12.6			4.4	62	0.50		0.18		6.3		6.0	5.0	1.20	0.50	●		
13-May-91	0.50			5.5	40	1.10	8.9	1	6	2.3	225	0.90		0.14	0.02	6.3	0.09	4.0	23.0	0.40	0.80			●
29-Jul-91	1.33			8.2	53	1.70	8.1	20	80	5.8	217	1.30		0.07		6.8		3.7	18.1	1.00	0.90			●
18-Sep-91	0.55		0.12	8.0	49	2.70	7.8	60	10	4.0	193	0.90	0.03	0.14		7.0		4.0	24.0	1.60	0.70			●
26-Apr-93				7.8	25	0.80	11.9	26	49	8.9	215	2.10		0.06		4.8		3.8	9.0	1.80	2.10		●	
10-Aug-93	0.80			11.1	70	0.20	7.5	14	14	3.6	998	0.30	0.02	0.08		6.7		5.4	23.0		1.00	●		
27-Dec-93	0.80			11.3	30	1.40	12.0	1	4	8.9	223	1.60	0.00	3.85		3.9	0.15	0.9	1.0		1.30	●		
11-Mar-96	1.90		0.08	13.3		1.60	13.2		1	1.7		0.20	ND	0.19	0.02	5.5	0.07	6.3	1.1	1.50	2.30			●
14-May-96	0.20		0.17	8.1		1.50	11.5		2	3.6		0.90	ND	1.47	ND	5.8	0.06	5.4	9.0	1.80				●
20-Aug-96	0.90		0.25	9.9		3.70	8.4		3,900	6.1		5.60		0.17	ND	6.6	0.10	6.6	20.5	10.80	5.20	●		
02-Oct-96	0.40		0.10	13.2		1.40	9.4		8	4.0		1.00	ND	0.09	ND	6.3	ND	5.7	14.0	1.20	1.20			●
14-Apr-98	0.81		0.20	0.0	40	0.90	7.5			8.0	123	0.80	0.04			6.0	0.00	4.4	16.3	0.86		●		
05-Aug-98	0.77		0.20	9.9	65	2.10	7.6		30	10.4	1,019	0.80	0.15			6.5	0.02	6.1	23.0	1.43		●		
26-Oct-98	1.00		0.20	5.6	40	1.00	10.5		13	8.5	550	1.70	0.11			6.1	0.01	4.7	9.5	2.77		●		
20-Jan-99	1.16		0.50	6.5	23	0.90	12.6		2	6.7	118	0.80	0.04		0.01	6.0	0.00	3.7	1.8	1.20	1.23			●
19-Mar-99	1.83		0.33	62.6		ND	9.0		1	7.3	109	0.85	0.21		0.00	5.8	0.01	4.3	5.0	1.90	8.42	●		
10-Jun-99	0.95		ND	10.1		1.15	8.4		19	10.2	1,017	2.43	0.08		0.01	6.4	0.02	6.5	19.5	2.18	2.22	●		
19-Aug-99	0.70		ND	15.5		ND	7.7		150	11.7	890	ND	0.05		ND	6.6	0.00	7.9	19.5	2.83	2.34	●		
12-Oct-99	0.20	0.28		11.3		ND	10.1		11	10.4	556		0.06		0.00	6.2	0.01	5.6	12.5	1.67	1.75			●
15-Mar-00		0.46		10.3			12.7		3	7.3	523	1.64	0.10		0.00	6.0	0.04	5.4	5.0	0.66	0.75			●
30-May-00		0.50		9.8			9.5		5	5.3	346		0.11		0.02	5.7	0.02	6.2	15.0	1.70	1.67	●		
18-Sep-00		0.43		12.8			8.6		7	9.9	1,120		0.08		0.01	6.5	0.03	5.9	18.5	2.83	2.18			●
11-Dec-00	0.44	8.55		12.8						7.5	103		0.08		0.00	6.3	0.02	4.2	3.5	0.80	2.86			●

Statistical Summary - All Samples

	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
Count	19	5	12	23	11	19	22	6	20	23	19	19	18	11	14	23	18	23	23	21	19	●	●	●
MEAN (*)	**0.94**	**2.04**	**0.22**	**11.7**	**42**	**1.40**	**9.8**	**20**	**12**	**6.8**	**453**	**1.35**	**0.08**	**0.59**	**0.01**	**6.1**	**0.04**	**5.1**	**12.9**	**2.01**	**2.07**	●	●	●
Minimum	0.20	0.28	0.08	0.0	23	0.20	7.5	1	1	1.7	62	0.20	0.00	0.06	0.00	3.9	0.00	0.9	1.0	0.40	0.50	●	●	●
Maximum	2.70	8.55	0.50	62.6	70	3.70	13.2	60	3,900	11.7	1,120	5.60	0.21	3.85	0.02	7.0	0.15	7.9	24.0	10.80	8.42	●	●	●

Statistical Summary - Dry Weather

	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
Count	10	1	5	11	6	8	11	2	9	11	10	9	9	4	3	11	9	11	11	9	8	●		
MEAN (*)	**1.13**	**0.50**	**0.24**	**13.8**	**45**	**1.34**	**9.1**	**4**	**22**	**7.7**	**534**	**1.62**	**0.09**	**1.07**	**0.01**	**6.0**	**0.04**	**5.4**	**14.3**	**2.85**	**2.83**	●		
Minimum	0.70	0.50	0.20	0.0	25	0.20	7.5	1	1	3.6	62	0.30	0.00	0.08	0.00	3.9	0.00	0.9	1.0	0.86	0.50	●		
Maximum	2.70	0.50	0.33	62.6	70	3.70	12.6	14	3900	11.7	1,019	5.60	0.21	3.85	0.02	6.7	0.15	7.9	23.0	10.80	8.42	●		

Statistical Summary - Mixed and Wet Weather

	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
Count	9	4	5	12	5	8	11	4	11	12	9	9	6	7	7	12	8	12	12	12	11		●	●
MEAN (*)	**0.74**	**2.43**	**0.19**	**9.8**	**38**	**1.46**	**10.4**	**13**	**7**	**6.0**	**363**	**1.08**	**0.07**	**0.31**	**0.01**	**6.1**	**0.04**	**4.8**	**11.6**	**1.37**	**1.52**		●	●
Minimum	0.20	0.28	0.08	5.5	23	0.80	7.8	1	1	1.7	103	0.20	0.03	0.06	0.00	4.8	0.00	3.7	1.1	0.40	0.70		●	●
Maximum	1.90	8.55	0.50	13.3	53	2.70	13.2	60	80	10.4	1,120	2.10	0.10	1.47	0.02	7.0	0.09	6.3	24.0	2.83	2.86		●	●

ND = Not detected

* Mean is geometric for Fecal Coliform and Enterococci

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Table A8-3: RIDEM Chemical Monitoring, Section 305b

Pascoag River

Burrillville (Grove Street Bridge)

Date	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
12-Mar-91	2.43		0.12	9.6	38	2.80	12.4	1	1	6.6	149	1.70		0.12		6.1		9.0	5.0	1.20	1.00	•		
13-May-91	0.80		0.10	9.0	50	3.10	8.7	44	24	4.1	249	4.30	0.02	0.06	0.02	5.8	0.11	6.0	23.0	4.00	1.05			•
29-Jul-91	1.07		0.16	10.6	55	4.60	7.8	330	70	7.4	216	3.30	0.02	0.08		6.1		6.0	19.9	1.50	0.64			•
18-Sep-91	0.40		0.10	12.0	58	1.90	7.3	520	100	6.1	154	2.40	0.02	0.11		6.9		6.0	26.0	2.60	1.10			•
26-Apr-93				12.8	32	1.10	10.9	21	21	3.4	164	1.30		0.04		5.3		7.0	10.5	1.80	1.70		•	
10-Aug-93																						•		
27-Dec-93	0.90		0.23	17.3	35	5.70	13.0	14	2	10.4	298	2.90	0.05	1.13		6.2	0.15	3.5	1.0	3.60	1.20	•		
11-Mar-96	2.10		0.08	31.3		2.10	12.4		12	5.9		3.60	ND	0.20	0.02	5.9	0.07	14.5	4.0	2.80	0.90			•
14-May-96	0.40		0.26	16.8		3.10	11.0		13	4.6		1.80	ND	0.10	ND	5.9	0.05	8.6	13.5	1.80	1.90			•
20-Aug-96	0.30		0.28	43.0		4.20	7.8		840	19.9		3.40	0.03	0.25	ND	7.0	0.10	22.4	18.0	4.30	1.80	•		
02-Oct-96	0.40		0.07	25.7		2.50	8.8		15	9.5		1.50	ND	0.05	ND	6.6	ND	12.1	17.5	1.00	1.30			•
14-Apr-98	0.83		0.20	22.6	100	3.30	10.4		12	33.3	727	1.70	0.08	0.08		6.7	0.02	0.0	15.8	4.14		•		
05-Aug-98	0.52		0.20	11.1	68	2.90	7.2		800	8.6	495	1.70	0.08	0.08		6.6	0.02	7.0	24.0	1.57		•		
26-Oct-98	2.40		0.20	12.4	70	1.80	10.2		66	11.6	216	1.80	0.07	0.28		6.6	0.01	9.7	10.0	2.33		•		
20-Jan-99	0.70		0.40	15.7	49	0.90	12.4		2	9.2	179	0.80	0.09	0.18	0.01	6.4	0.00	9.0	3.8	2.33	2.22			•
19-Mar-99	2.57		0.76	10.3		1.17	10.0		4	23.7	465	1.60	0.09	0.08	ND	6.7	0.00	25.2	6.2	2.13	6.45	•		
10-Jun-99	ND		ND	16.0		2.09	8.6		51	10.4	250	1.90	0.06	0.09	0.01	6.5	0.01	9.1	20.8	3.13	0.84	•		
19-Aug-99	0.53		ND	17.0		1.64	8.2		510	9.2	203	ND	0.01	0.06	ND	6.6	0.00	9.5	22.5	1.49	1.47	•		
12-Oct-99	0.55	0.21		15.9		1.49	10.2		64	7.7	111		0.07	0.09	0.00	6.1	0.01	8.2	14.0	2.72	1.60			•
15-Mar-00		0.52		33.9		1.25	12.4			23.7	218		0.07	0.18	0.00	6.4	0.04	11.2	6.5	1.16	0.90			•
30-May-00		0.60		13.6		1.20	8.9		32	16.0	263		0.07	0.13	0.01	6.0	0.02	9.0	17.1	1.80	1.65	•		
18-Sep-00				21.3		1.00	8.7		73	11.6	185		0.05	0.15	0.01	6.2	0.03	9.9	18.5	1.57	1.13			•
11-Dec-00		0.65		17.7		1.55	12.9		2	17.2	205		0.05	0.12	0.00	6.9	0.02	14.9	3.0	7.23	22.50			•

Statistical Summary - All Samples

	BOD	Cd Diss.	Cd Total	Chloride	Conductivity	Copper	DO	Enterococci	Fecal Coliform	Hardness	Iron	Lead	Ammonia	Nitrate	Orthophosphate	pH	Phosphorus	Sodium	Temperature	TSS	Turbidity	Dry	Wet	Mixed
Count	16	4	14	22	10	22	22	6	21	22	18	16	17	22	9	22	17	22	22	22	19	•	•	•
MEAN (*)	**1.06**	**0.50**	**0.23**	**18.0**	**56**	**2.34**	**10.0**	**36**	**26**	**11.8**	**264**	**2.23**	**0.05**	**0.17**	**0.01**	**6.3**	**0.04**	**9.9**	**13.7**	**2.55**	**2.70**	•	•	•
Minimum	0.30	0.21	0.07	9.0	32	0.90	7.2	1	1	3.4	111	0.80	0.01	0.04	0.00	5.3	0.00	0.0	1.0	1.00	0.64	•	•	•
Maximum	2.57	0.65	0.76	43.0	100	5.70	13.0	520	840	33.3	727	4.30	0.09	1.13	0.02	7.0	0.15	25.2	26.0	7.23	22.50	•	•	•

Statistical Summary - Dry Weather

	BOD	Cd Diss.	Cd Total	Chloride	Conductivity	Copper	DO	Enterococci	Fecal Coliform	Hardness	Iron	Lead	Ammonia	Nitrate	Orthophosphate	pH	Phosphorus	Sodium	Temperature	TSS	Turbidity	Dry	Wet	Mixed
Count	8	1	7	10	5	10	10	2	10	10	9	8	9	10	2	10	9	10	10	10	7	•		
MEAN (*)	**1.31**	**0.60**	**0.28**	**17.3**	**62**	**2.68**	**9.7**	**4**	**36**	**15.0**	**341**	**2.09**	**0.06**	**0.23**	**0.01**	**6.5**	**0.04**	**10.4**	**14.0**	**2.57**	**2.06**	•		
Minimum	0.30	0.60	0.12	9.6	35	1.17	7.2	1	1	6.6	149	1.60	0.01	0.06	0.01	6.0	0.00	0.0	1.0	1.20	0.84	•		
Maximum	2.57	0.60	0.76	43.0	100	5.70	13.0	14	840	33.3	727	3.40	0.09	1.13	0.01	7.0	0.15	25.2	24.0	4.30	6.45	•		

Statistical Summary - Mixed and Wet Weather

	BOD	Cd Diss.	Cd Total	Chloride	Conductivity	Copper	DO	Enterococci	Fecal Coliform	Hardness	Iron	Lead	Ammonia	Nitrate	Orthophosphate	pH	Phosphorus	Sodium	Temperature	TSS	Turbidity	Dry	Wet	Mixed
Count	8	3	7	12	5	12	12	4	11	12	9	8	8	12	7	12	8	12	12	12	12		•	•
MEAN (*)	**0.80**	**0.46**	**0.17**	**18.6**	**49**	**2.05**	**10.3**	**112**	**19**	**9.2**	**187**	**2.38**	**0.05**	**0.11**	**0.01**	**6.2**	**0.04**	**9.4**	**13.4**	**2.54**	**3.08**		•	•
Minimum	0.40	0.21	0.07	9.0	32	0.90	7.3	21	2	3.4	111	0.80	0.02	0.04	0.00	5.3	0.00	6.0	3.0	1.00	0.64		•	•
Maximum	2.10	0.65	0.40	33.9	58	4.60	12.9	520	100	23.7	249	4.30	0.09	0.20	0.02	6.9	0.11	14.9	26.0	7.23	22.50		•	•

ND = Not detected

* Mean is geometric for Fecal Coliform and Enterococci

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Table A8-4: RIDEM Chemical Monitoring, Section 305b

Clear River

Burrillville (Victory Highway)

Date	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
12-Mar-91	2.43		0.05	11.0	45	1.80	12.9		2	5.8	186	1.00	0.06	0.26		6.6		6.0	5.0	2.60	0.80	●		
13-May-91	0.80		0.09	14.0	60	3.90	8.9	17	120	5.0	416	6.30	0.07	0.42	0.02	6.1	0.15	8.0	20.0	2.00	1.20			●
29-Jul-91	1.42		0.07	17.7	111	4.90	7.5	180	1,700	16.3	418	2.10	0.16	1.18		6.7		8.5	19.1	2.50	0.97			●
06-Sep-91	0.07			33.0	125	5.50	7.5	170	570	14.4	256	1.40	0.20	0.57		7.1		14.0	24.5	2.40	1.20			●
26-Apr-93				14.6	40	1.40	11.0	85	260	5.5	447	8.30	0.10	0.08		5.4		6.6	11.5	3.40	4.40		●	
10-Aug-93	2.40			59.9	275	4.50	6.7	44	170	17.6	1,102	3.60	0.92	3.12	0.02	6.6		38.0	23.0	2.40	1.60	●		
27-Dec-93	1.70		0.14	19.8	50	0.50	13.2	25	4	7.9	314	10.20	0.33	3.85		6.0	0.15	4.1	1.0	0.80	0.80	●		
11-Mar-96	2.50		ND	28.7		1.10	13.0		1	4.6		1.80	0.11	0.20	0.02	5.9	0.08	13.1	3.0	1.10	0.50			●
14-May-96	0.30		0.18	17.8		1.80	9.4		16	5.2		1.50	0.12	0.08	ND	6.2	0.06	10.0	12.0	3.20	1.60			●
20-Aug-96	4.30		0.22	38.6		4.00	6.6		81	14.7		5.90	0.68	0.95	ND	6.7	0.13	21.9	20.0	2.20	1.80	●		
02-Oct-96	1.10		ND	35.6		0.50	9.0		32	9.6		0.90	0.57	0.16	ND	6.6	ND	15.6	16.5	1.40	1.30			●
14-Apr-98	1.35		0.20	6.7	78	0.90	10.5		4	10.3	283	13.00	0.26	0.07		6.5	0.02	9.1	16.5	1.44		●		
05-Aug-98	1.07		0.20	24.0	150	3.00	7.1		68	16.0	982	4.20	0.37	0.36		6.6	0.04	17.3	22.8	3.87		●		
26-Oct-98	1.03		0.20	18.4	115	2.10	9.8		15	15.3	593	2.10	0.34	0.36		6.5	0.01	15.3	9.5	4.13		●		
20-Jan-99	0.70		0.60	14.1	40	1.90	12.5		5	9.0	189	1.80	0.10	0.11	0.01	6.2	0.01	8.0	2.5	2.00	1.74			●
19-Mar-99	2.19		0.46	24.7		ND	11.0		4	10.3	189	12.94	0.35	0.12	0.01	6.4	0.01	10.1	6.0	3.80	2.08	●		
10-Jun-99	1.23		ND	47.1		2.93	8.3		110	21.7	1,055	2.13	0.53	1.15	0.02	6.7	0.03	28.3	20.8	3.08	2.82	●		
19-Aug-99	5.90		ND	63.3		2.10	3.7		40	24.7	728	ND	4.77	1.06	0.13	6.7	0.14	42.0	20.0	2.17	2.86	●		
12-Oct-99	0.20	0.26		18.7		1.35	10.2		110	9.8	211		0.30	0.10	0.00	6.6	0.01	10.0	13.2	1.94	1.95			●
16-Mar-00		0.50		20.5		3.88	12.5		10	10.3	565		0.38	0.29	0.01	6.1	0.05	13.4	5.5	1.33	1.36			●
30-May-00				20.4			9.3		90	11.1	612		0.32	0.56	0.03	6.2	0.03	10.7	16.2	2.60	2.10	●		
18-Sep-00		0.54		38.2		3.21	7.9		29	17.5	872		1.59	0.66	0.07	6.6	0.08	20.2	17.5	2.47	2.85			●
11-Dec-00		0.71		21.4		1.85	13.6		6	10.7	211		0.33	0.18	0.01	6.7	0.03	9.2	3.0	0.53	3.00			●
Statistical Summary - All Samples																								
Count	18	4	11	23	11	21	23	6	23	23	19	17	23	23	12	23	17	23	23	23	20	●	●	●
MEAN (*)	**1.71**	**0.50**	**0.22**	**26.4**	**99**	**2.53**	**9.7**	**60**	**30**	**11.9**	**507**	**4.66**	**0.56**	**0.69**	**0.03**	**6.4**	**0.06**	**14.7**	**13.4**	**2.32**	**1.85**	●	●	●
Minimum	0.07	0.26	0.05	6.7	40	0.50	3.7	17	1	4.6	186	0.90	0.06	0.07	0.00	5.4	0.01	4.1	1.0	0.53	0.50	●	●	●
Maximum	5.90	0.71	0.60	63.3	275	5.50	13.6	180	1700	24.7	1,102	13.00	4.77	3.85	0.13	7.1	0.15	42.0	24.5	4.13	4.40	●	●	●
Statistical Summary - Dry Weather																								
Count	10	0	7	11	6	9	11	2	11	11	10	9	11	11	5	11	9	11	11	11	8	●		
MEAN (*)	**2.36**		**0.21**	**30.4**	**119**	**2.43**	**9.0**	**33**	**22**	**14.1**	**604**	**6.12**	**0.81**	**1.08**	**0.04**	**6.5**	**0.06**	**18.4**	**14.6**	**2.64**	**1.86**	●		
Minimum	1.03		0.05	6.7	45	0.50	3.7	25	2	5.8	186	1.00	0.06	0.07	0.01	6.0	0.01	4.1	1.0	0.80	0.80	●		
Maximum	5.90		0.46	63.3	275	4.50	13.2	44	170	24.7	1,102	13.00	4.77	3.85	0.13	6.7	0.15	42.0	23.0	4.13	2.86	●		
Statistical Summary - Mixed and Wet Weather																								
Count	8	4	4	12	5	12	12	4	12	12	9	8	12	12	7	12	8	12	12	12	12		●	●
MEAN (*)	**0.89**	**0.50**	**0.24**	**22.9**	**75**	**2.61**	**10.3**	**82**	**40**	**9.8**	**398**	**3.01**	**0.34**	**0.34**	**0.02**	**6.3**	**0.06**	**11.4**	**12.4**	**2.02**	**1.84**		●	●
Minimum	0.07	0.26	0.07	14.0	40	0.50	7.5	17	1	4.6	189	0.90	0.07	0.08	0.00	5.4	0.01	6.6	2.5	0.53	0.50		●	●
Maximum	2.50	0.71	0.60	38.2	125	5.50	13.6	180	1700	17.5	872	8.30	1.59	1.18	0.07	7.1	0.15	20.2	24.5	3.40	4.40		●	●

ND = Not detected

* Mean is geometric for Fecal Coliform and Enterococci

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Table A8-5: RIDEM Chemical Monitoring, Section 305b

Abbott Run Brook (Cumberland)

(Cumberland, Route 120)

Date	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
12-Mar-91	0.35			14.5	68	1.00	12.3	1	1	18.2	156	1.30		0.22		6.5	0.07	9.0	6.0	3.40	1.50	●		
13-May-91	0.90		0.15	17.9	90	3.50	9.6	1	1	19.1	267	17.20	0.06	0.30	0.03	6.5	0.20	10.0	17.0	1.00	1.70			●
29-Jul-91	1.43		0.14	17.3	99	2.20	7.7		10	20.4	660	4.60	0.08	0.32		7.0		9.7	19.0	2.20	4.67			●
06-Sep-91	0.95		0.05	20.5	88	0.70	7.4		1	13.6	565	1.30	0.15	0.09		7.1		11.0	23.0	3.00	5.00			●
26-Apr-93	1.20		0.07	22.4	65	1.80	11.0	2	20	10.8	743	4.90		0.18		6.0		9.9	12.5	1.20	2.70		●	
10-Aug-93	0.90			19.8	100	1.10	7.9	16	32	12.9	964	2.70	0.06	0.53	0.01	6.6		11.7	21.0	3.40	6.20	●		
27-Dec-93	0.90		0.20	25.4	75	2.80	13.0	62	65	21.1	211	1.80	0.26	2.90		6.0	0.20	8.9	2.0	2.20	2.10	●		
11-Mar-96	1.80		0.37	28.0		4.00	10.4		3	12.2		4.30	ND	0.31	0.03	6.7	0.09	12.1	3.0	1.10	0.90			●
14-May-96	0.30		0.19	26.1		1.30	11.3		7	17.5		1.00	0.09	0.25	ND	6.9	0.07	12.8	15.0	3.00	1.80			●
20-Aug-96	1.00		0.14	26.8		1.30	9.3		4	21.8		0.70	0.03	0.04	ND	7.4	0.10	13.5	23.5	2.50	1.40	●		
02-Oct-96	0.60		ND	35.3		1.30	9.0		3	20.9		0.30	0.08	0.09	ND	7.0	ND	12.4	17.0	2.00	1.90			●
14-Apr-98	1.07		0.00	8.0	82	1.30	10.0		1	22.9	151	7.20	0.08	0.21		7.0	0.02	10.6	14.0	1.98		●		
05-Aug-98	1.13		0.20	14.0	108	1.60	9.6		10	22.6	1,111	2.40	0.14	0.20		6.7	0.01	10.2	19.0	1.47		●		
26-Oct-98	0.73		0.20	15.8	105	1.30	7.9		6	23.0	624	4.80	0.20	0.12		7.1	0.01	11.3	20.0	2.20		●		
20-Jan-99	1.25		0.24	19.5	72	0.90	11.7		2	22.1	328	0.80	0.06	0.20	0.00	7.1	0.01	10.4	4.8	2.97	3.42			●
19-Mar-99	2.50		0.35	28.3		0.95	12.4		1	20.0	163	10.91	0.06	0.23	0.00	6.9	0.01	10.7	6.0	1.97	2.74	●		
10-Jun-99	0.53		ND	19.3		2.05	8.5		27	26.2	935	1.68	0.19	0.00	0.00	6.7	0.01	11.8	17.8	3.43	2.20	●		
19-Aug-99	1.13		ND	20.3		0.91	8.3		14	19.8	786	ND	0.07	0.06	ND	6.6	0.00	11.1	18.0	3.30	9.93	●		
12-Oct-99	0.35	0.23		23.8		ND	10.3		130	24.0	470	1.18	0.05	0.09	0.00	7.1	0.00	11.0	14.0	2.97	6.30			●
15-Mar-00		0.38		23.4		3.44	12.8		3	20.0	425	1.89	0.05	0.17	0.00	6.8	0.04	10.3	5.0	2.00	1.76			●
30-May-00				25.3		8.36	9.1		10	21.9	230	2.36	0.11	0.13	0.00	6.1	0.03	10.4	15.6	3.93	2.30	●		
18-Sep-00		0.54		24.2		1.16	8.3		60	20.2	865	1.90	0.11	0.11	0.10	6.9	0.11	9.8	18.0	2.07	14.41			●
11-Dec-00		0.37		20.5		0.82	12.9		7	24.3	179	1.42	0.11	0.15	0.00	7.0	0.03	10.6	3.5	3.20	4.58			●

Statistical Summary - All Samples

	BOD	Cd Diss.	Cd Total	Chloride	Cond.	Copper	DO	Entero.	Fecal	Hardness	Iron	Lead	Ammonia	Nitrate	Ortho-P	pH	Phos.	Sodium	Temp.	TSS	Turb.	Dry	Wet	Mixed
Count	19	4	13	23	11	22	23	5	23	23	19	22	20	23	11	23	18	23	23	23	20	●	●	●
MEAN (*)	**1.00**	**0.38**	**0.18**	**21.6**	**87**	**1.99**	**10.0**	**5**	**7**	**19.8**	**518**	**3.48**	**0.10**	**0.30**	**0.02**	**6.8**	**0.06**	**10.8**	**13.7**	**2.46**	**3.88**	●	●	●
Minimum	0.30	0.23	0.00	8.0	65	0.70	7.4	1	1	10.8	151	0.30	0.03	0.00	0.00	6.0	0.00	8.9	2.0	1.00	0.90	●	●	●
Maximum	2.50	0.54	0.37	35.3	108	8.36	13.0	62	130	26.2	1,111	17.20	0.26	2.90	0.10	7.4	0.20	13.5	23.5	3.93	14.41	●	●	●

Statistical Summary - Dry Weather

	BOD	Cd Diss.	Cd Total	Chloride	Cond.	Copper	DO	Entero.	Fecal	Hardness	Iron	Lead	Ammonia	Nitrate	Ortho-P	pH	Phos.	Sodium	Temp.	TSS	Turb.	Dry	Wet	Mixed
Count	10	0	6	11	6	11	11	3	11	11	10	10	10	11	4	11	10	11	11	11	8	●		
MEAN (*)	**1.02**		**0.18**	**19.8**	**90**	**2.06**	**9.8**	**10**	**7**	**20.9**	**533**	**3.59**	**0.12**	**0.42**	**0.00**	**6.7**	**0.05**	**10.8**	**14.8**	**2.71**	**3.55**	●		
Minimum	0.35		0.00	8.0	68	0.91	7.9	1	1	12.9	151	0.70	0.03	0.00	0.00	6.0	0.00	8.9	2.0	1.47	1.40	●		
Maximum	2.50		0.35	28.3	108	8.36	13.0	62	65	26.2	1,111	10.91	0.26	2.90	0.01	7.4	0.20	13.5	23.5	3.93	9.93	●		

Statistical Summary - Mixed and Wet Weather

	BOD	Cd Diss.	Cd Total	Chloride	Cond.	Copper	DO	Entero.	Fecal	Hardness	Iron	Lead	Ammonia	Nitrate	Ortho-P	pH	Phos.	Sodium	Temp.	TSS	Turb.	Dry	Wet	Mixed
Count	9	4	7	12	5	11	12	2	12	12	9	12	10	12	7	12	8	12	12	12	12		●	●
MEAN (*)	**0.98**	**0.38**	**0.17**	**23.2**	**83**	**1.92**	**10.2**	**1**	**6**	**18.8**	**500**	**3.40**	**0.08**	**0.19**	**0.02**	**6.8**	**0.07**	**10.8**	**12.7**	**2.23**	**4.10**		●	●
Minimum	0.30	0.23	0.05	17.3	65	0.70	7.4	1	1	10.8	179	0.30	0.05	0.09	0.00	6.0	0.00	9.7	3.0	1.00	0.90		●	●
Maximum	1.80	0.54	0.37	35.3	99	4.00	12.9	2	130	24.3	865	17.20	0.15	0.32	0.10	7.1	0.20	12.8	23.0	3.20	14.41		●	●

ND = Not detected

* Mean is geometric for Fecal Coliform and Enterococci

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Table A8-6: RIDEM Chemical Monitoring, Section 305b

Abbot Run Brook (North Attleboro)

North Attleboro (Valley Road)

Date	BOD (mg/l)	Cadmium, Dissolved (ug/l)	Cadmium, Total (ug/l)	Chloride (mg/l)	Conductivity (umhos/cm)	Copper, Total (ug/l)	Dissolved Oxygen (mg/l)	Enterococci (col/100ml)	Fecal Coliform (col/100ml)	Hardness (mg/l)	Iron (ug/l)	Lead, Total (ug/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Orthophosphate, Dissolved (mg/l)	pH	Phosphorus, Total (mg/l)	Sodium, Total (mg/l)	Temperature (deg C)	TSS (mg/l)	Turbidity (NTU)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
12-Mar-91	1.64			16.0	72	0.70	12.5	1	4	18.2	143	1.20	0.02	0.30		6.4		8.0	6.5	2.60	0.93	●		
13-May-91	0.70	0.20		27.9	100	5.30	8.7	17	31	21.9	288	11.80	0.02	0.49	0.02	6.5	0.16	13.0	21.0	3.40	1.40			●
29-Jul-91	0.98		0.03	17.4	103	0.60	8.1	120	80	22.5	245	1.30		0.26		6.7		10.0	19.2	0.60	1.29			●
18-Sep-91	0.45			21.0	98	0.40	8.0	1,100	130	16.4	210	0.70		0.17		7.1		12.0	23.0	1.40	1.50			●
26-Apr-93			0.05	26.2	70	1.10	11.0	65	390	15.0	850	2.80	0.02	0.40	0.06	6.0		10.9	10.0	3.20	3.10		●	
10-Aug-93			0.10	21.3	100	1.40	7.8	140	120	16.7	521	1.30		0.23	0.01	6.8		10.7	23.0	0.80	2.60	●		
27-Dec-93	2.00		0.09	31.2	90	2.00	13.0	12	32	23.6	236	3.00	0.13	3.24		6.2	0.29	10.2	2.0	1.00	1.30	●		
11-Mar-96	1.60		ND	32.3		1.10	10.0		1	14.5		0.60	ND	0.56	0.03	6.6	0.07	14.6	3.0	1.50	0.90			●
14-May-96	0.20		0.27	28.8		1.40	11.0		20	20.2		24.10	0.02	0.44	ND	6.8	0.05	13.2	14.0	6.20	2.80			●
20-Aug-96	0.50		0.13	30.0		3.30	8.4		84	22.7		1.20	0.03	0.23	ND	7.2	0.09	13.7	21.0	4.60	2.40	●		
02-Oct-96	0.60		ND	35.2		0.50	9.3		48	22.1		0.30	ND	0.34	ND	7.0	ND	14.0	16.3	1.00	2.50			●
14-Apr-98	0.86		0.40	8.2	120	1.20	9.1		11	27.2	300	0.90	0.11	0.46		6.9	0.02	12.1	17.3	4.54		●		
05-Aug-98	0.53		0.20	16.4	123	2.80	8.4		100	26.2	621	4.10	0.08	0.54		7.0	0.01	11.2	22.6	0.80		●		
26-Oct-98	1.15		0.20	16.6	110	1.30	10.5		19	26.4	412	13.80	0.08	0.36		6.9	0.01	12.1	11.0	1.97		●		
20-Jan-99	0.85		0.27	25.7	88	1.00	11.7		88	24.6	217	0.80	0.03	0.71	0.01	7.1	0.02	13.6	3.8	2.50	3.03			●
19-Mar-99	2.34		0.39	34.6		ND	10.8		27	24.1	165	5.44		0.09	0.01	6.8	0.01	13.1	7.0	0.53	2.79	●		
10-Jun-99	0.45		ND	20.9		1.24	9.0		110	28.0	625	ND	0.09	0.42	0.00	7.0	0.01	12.3	20.2	3.60	6.23	●		
19-Aug-99	0.90		ND	20.7		1.17	8.8		140	21.6	554	ND	0.08	0.16	ND	6.8	0.01	11.6	18.8	3.73	7.32	●		
12-Oct-99	0.40	ND		12.4		ND	10.2		200	27.1	338	0.83	0.03	0.41	0.00	6.8	0.01	12.0	12.0	1.62	4.85			●
15-Mar-00		0.33		26.9		2.80	12.3		20	24.1	361		0.05	0.42	0.01	6.7	0.04	11.8	6.0	2.25	2.03			●
30-May-00				26.3		6.73	10.0		56	27.9	402	1.09	0.07	0.46	0.02	6.7	0.02	12.5	15.2	4.73	3.10	●		
18-Sep-00		0.39		25.2			9.6		110	24.4	481		0.07	0.32	0.01	7.1	0.03	11.1	18.0	1.50	7.45			●
11-Dec-00				18.5		0.87	13.1		4	25.8	201		0.04	0.51	0.00	6.8	0.02	11.6	3.0	1.77	4.27			●
Statistical Summary - All Samples																								
Count	17	3	11	23	11	20	23	7	23	23	19	18	17	23	12	23	17	23	23	23	20	●	●	●
MEAN (*)	**0.95**	**0.31**	**0.19**	**23.5**	**98**	**1.85**	**10.1**	**42**	**41**	**22.6**	**377**	**4.18**	**0.06**	**0.50**	**0.02**	**6.8**	**0.05**	**12.0**	**13.6**	**2.43**	**3.09**	●	●	●
Minimum	0.20	0.20	0.03	8.2	70	0.40	7.8	1	1	14.5	143	0.30	0.02	0.09	0.00	6.0	0.01	8.0	2.0	0.53	0.90	●	●	●
Maximum	2.34	0.39	0.40	35.2	123	6.73	13.1	1100	390	28.0	850	24.10	0.13	3.24	0.06	7.2	0.29	14.6	23.0	6.20	7.45	●	●	●
Statistical Summary - Dry Weather																								
Count	9	0	7	11	6	10	11	3	11	11	10	9	9	11	4	11	9	11	11	11	8	●		
MEAN (*)	**1.15**		**0.22**	**22.0**	**103**	**2.18**	**9.8**	**12**	**41**	**23.9**	**398**	**3.56**	**0.08**	**0.59**	**0.01**	**6.8**	**0.05**	**11.6**	**15.0**	**2.63**	**3.33**	●		
Minimum	0.45		0.09	8.2	72	0.70	7.8	1	4	16.7	143	0.90	0.02	0.09	0.00	6.2	0.01	8.0	2.0	0.53	0.93	●		
Maximum	2.34		0.40	34.6	123	6.73	13.0	140	140	28.0	625	13.80	0.13	3.24	0.02	7.2	0.29	13.7	23.0	4.73	7.32	●		
Statistical Summary - Mixed and Wet Weather																								
Count	8	3	4	12	5	10	12	4	12	12	9	9	8	12	8	12	8	12	12	12	12		●	●
MEAN (*)	**0.72**	**0.31**	**0.16**	**24.8**	**92**	**1.51**	**10.3**	**110**	**40**	**21.5**	**355**	**4.80**	**0.04**	**0.42**	**0.02**	**6.8**	**0.05**	**12.3**	**12.4**	**2.25**	**2.93**		●	●
Minimum	0.20	0.20	0.03	12.4	70	0.40	8.0	17	1	14.5	201	0.30	0.02	0.17	0.00	6.0	0.01	10.0	3.0	0.60	0.90		●	●
Maximum	1.60	0.39	0.27	35.2	103	5.30	13.1	1100	390	27.1	850	24.10	0.07	0.71	0.06	7.1	0.16	14.6	23.0	6.20	7.45		●	●

ND = Not detected

* Mean is geometric for Fecal Coliform and Enterococci

(1) *Dry Weather*: Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.

(2) *Wet Weather*: Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.

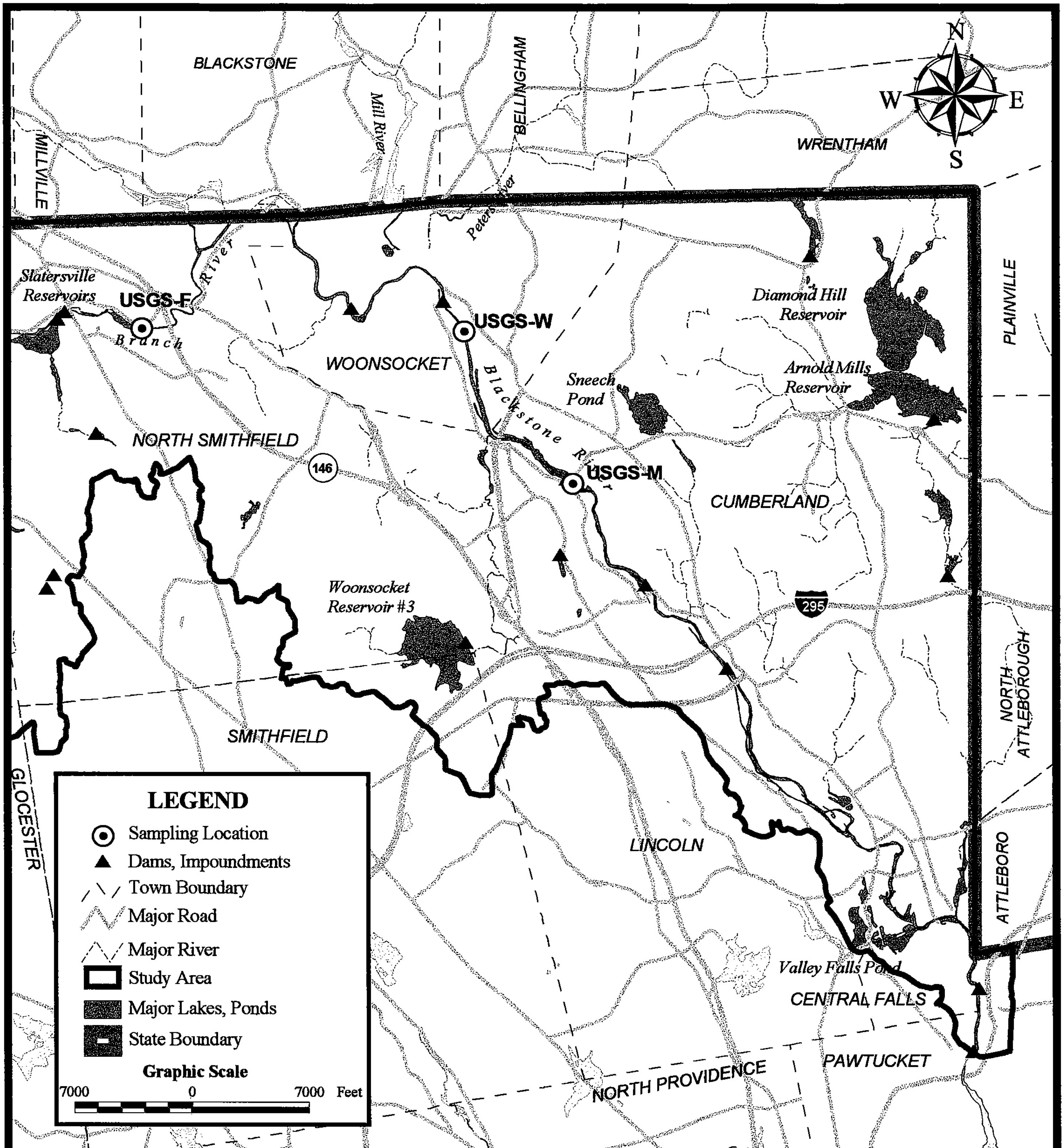
(3) *Mixed Weather*: Conditions that did not meet Wet or Dry Weather criteria.

Appendix 9

Multiple Station Analyses:
Water Resources of the Blackstone River Basin, MA

U.S. Geological Survey

(USGS, 2000)



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr	May 2002

Blackstone River Water Quality

Figure A9-1
USGS STATIONS 1990-1999

USGS

Forestdale Station

Branch River

Table A9-1a

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - FORESTDALE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	1	0.21			Tr	0.01		0.63			0.01		
1990	2		0.18		0.03			Tr		Tr			
1990	3		Tr		2.31		0.03						0.02
1990	4	0.06	0.47		0.19	0.25	0.02				0.15		2.09
1990	5		Tr	Tr		0.57			Tr			Tr	
1990	6			0.14	Tr	Tr		Tr	0.08			0.99	
1990	7				0.11	0.29	0.17		0.02	Tr			0.05
1990	8	0.39				0.03	0.02		1.15			0.13	0.26
1990	9	0.03	Tr				0.49	Tr			0.31		
1990	10	0.03	0.51		0.06	1.22	0.08		Tr	Tr	Tr	1.12	
1990	11	Tr			0.44	Tr	0.05	Tr	1.18		0.07	Tr	
1990	12	Tr		0.34				1.28			0.30	Tr	
1990	13					0.43		0.20			0.71		
1990	14	Tr		0.02		0.33					1.52		
1990	15	0.15	0.37	0.01	1.19		Tr	0.01		0.61	Tr		0.75
1990	16		0.39			0.72	Tr	Tr					0.17
1990	17		Tr	0.11	0.25	0.17				0.26		Tr	
1990	18	Tr		0.38		0.01	Tr				0.45	Tr	0.29
1990	19			0.19			0.03		0.08	0.09	0.31		Tr
1990	20	0.36		0.26	Tr	0.10	Tr		Tr	0.05			
1990	21	0.59		0.01	0.45	0.35	Tr		Tr				0.04
1990	22	0.07	0.32					Tr	0.04	1.20	Tr		0.07
1990	23		0.15			Tr	Tr	Tr	Tr		0.51	0.11	0.13
1990	24	0.03	0.35				Tr	0.53	1.15		0.27	0.08	1.18
1990	25	0.55	0.15		0.05	Tr		0.55	0.04				
1990	26	0.77			0.01				Tr	0.02	0.12		
1990	27		0.04				Tr	0.32		0.01		Tr	
1990	28							Tr			0.23	Tr	0.37
1990	29	1.34			0.07	0.90	0.24	Tr	Tr			0.02	Tr
1990	30	0.43		0.55	0.41	0.32	Tr	Tr		0.04			Tr
1990	31			Tr									0.06

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	1				Tr		Tr		0.00	0.00	0.00	0.31	0.08
1991	2			0.54	0.01	0.02						Tr	0.07
1991	3			0.61			Tr	0.20	0.07		Tr	Tr	0.98
1991	4			0.85			0.25		0.79			Tr	0.15
1991	5	0.10	Tr	Tr	Tr		0.03	0.03		1.10			
1991	6	Tr	0.02	0.10		0.98					0.53		0.23
1991	7		0.53	0.50	Tr			0.08					Tr
1991	8	Tr					Tr					Tr	
1991	9	0.55							0.33				0.10
1991	10			Tr		0.66		Tr	1.67		Tr	0.22	0.25
1991	11	0.20	Tr	Tr				0.10		Tr	0.15	1.93	
1991	12	0.74					0.11				Tr	0.13	
1991	13		0.10		0.10			0.36				0.01	0.27
1991	14		0.92	0.51		0.05		0.03		0.25			0.12
1991	15		0.05	0.07	0.26		0.02		0.02	0.09	0.48	0.01	Tr
1991	16	1.33	Tr		Tr		0.01				0.15		
1991	17	0.04	Tr		0.08	0.57				Tr	0.20		0.21
1991	18	Tr	0.04	1.26	0.08	0.01	Tr		0.02	0.07	0.40		Tr
1991	19		0.42	0.08			0.47		2.51	0.46			
1991	20		0.10		Tr				0.14	0.62			
1991	21	0.11		Tr	3.06			Tr	0.43			0.45	0.12
1991	22			0.39	0.08		0.01					0.69	
1991	23			0.90			0.01	0.36		0.07		0.51	Tr
1991	24			0.35		Tr			Tr	0.15		0.39	
1991	25		Tr	0.02		Tr		Tr		1.75	Tr		
1991	26	Tr	0.05					1.55		0.53			
1991	27	Tr	0.08	0.07	Tr	0.03		0.05			Tr		
1991	28	0.07	Tr	Tr		0.02					Tr		
1991	29			0.15				Tr				Tr	0.59
1991	30	0.10		0.21	1.13	0.77	0.02				0.25	Tr	Tr
1991	31	0.20				0.19			Tr		0.49		

Table A9-1b

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - FORESTDALE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1992	1		Tr		0.01	0.08	2.04		Tr				
1992	2		Tr	Tr		0.13						Tr	0.05
1992	3			0.02		0.05		0.25		2.04		0.80	0.41
1992	4	1.33	0.09			Tr		0.18	0.10			Tr	0.01
1992	5	0.01	Tr				0.67	Tr				0.35	0.24
1992	6						0.73	0.16				Tr	
1992	7		Tr	0.95			Tr			Tr			Tr
1992	8		0.08	0.06	0.01	0.58	Tr	Tr		0.31			
1992	9	0.17		Tr	0.01	0.12		0.17	2.73		0.03		
1992	10			0.01	Tr				Tr		0.60		Tr
1992	11		Tr	1.38	0.25	Tr			0.23	0.09	0.01	0.03	2.40
1992	12				0.06	Tr		0.29			0.11	0.09	1.43
1992	13		0.03			Tr		0.04	Tr			1.02	0.14
1992	14	0.85	0.14			Tr		0.75	0.30				Tr
1992	15		0.68					0.73	0.22		Tr	Tr	
1992	16	0.07	0.31		0.60	0.04		0.28	0.39		Tr		
1992	17	Tr		Tr	0.64			Tr	0.71		0.01	0.04	0.82
1992	18		0.05		0.18	Tr		0.01	1.11				Tr
1992	19		Tr	0.24	0.03		0.05		0.04	Tr	0.25		Tr
1992	20	0.02			Tr		0.10		Tr				0.15
1992	21		Tr		Tr		0.02				0.14	0.04	
1992	22		Tr	0.19	0.13		0.01			0.28		0.91	0.01
1992	23	2.37	Tr	0.04	Tr			0.51		0.48		1.24	Tr
1992	24	Tr	0.03		0.10	0.09	0.79				0.10	0.02	Tr
1992	25		0.09		0.31	0.02					0.27	0.07	0.02
1992	26		0.52	0.44	Tr	0.05		0.01	0.14	1.86		0.44	
1992	27			0.24	0.01	0.01	0.20	0.05	Tr	Tr		Tr	
1992	28	Tr	Tr	0.03									Tr
1992	29		0.08					0.05	0.09	0.03			0.52
1992	30			0.05	Tr		Tr				Tr		0.37
1992	31	Tr		0.39		0.25		0.11			0.01		0.26

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1993	1		0.04		1.44		0.58					0.05	
1993	2		Tr		0.18			Tr					
1993	3	0.02			0.01			0.38		0.04	0.19		Tr
1993	4	0.01	Tr	0.29	Tr	Tr	0.04			0.03			0.19
1993	5	0.73		0.65		Tr	0.09					0.60	2.86
1993	6		0.12	0.01		Tr	0.12		Tr			Tr	0.01
1993	7		Tr					0.10	Tr	0.02			Tr
1993	8	Tr	Tr	Tr			0.01	0.01	Tr	0.09			Tr
1993	9	Tr		0.01			0.30			Tr			
1993	10	Tr		0.21	0.45			0.01		0.87	Tr		0.25
1993	11	0.04		0.11	0.03	0.05							0.63
1993	12	0.05	1.43		0.76			0.15			0.27	Tr	
1993	13	0.57	0.58	2.44	0.02	0.02			0.23				Tr
1993	14	0.01		0.14				Tr				Tr	Tr
1993	15	0.06			Tr				Tr	Tr	0.06	Tr	Tr
1993	16		2.32		Tr	0.06			Tr	0.32			0.01
1993	17	Tr	0.03	0.72	0.90	0.12			0.13	0.02	0.02	0.35	
1993	18	Tr	0.07	0.08	Tr	0.14			0.61	0.47	0.02	0.23	Tr
1993	19		0.02			0.16	Tr	0.23			0.03	0.57	0.33
1993	20					0.17	Tr	0.22	Tr		0.30	Tr	
1993	21		0.19	0.01			0.10			0.07	0.88		1.10
1993	22	0.56	0.26		0.14	0.04	Tr			0.10			
1993	23	0.02	Tr	0.01	Tr					0.02			
1993	24	0.22	Tr	1.44								0.05	Tr
1993	25	Tr		0.08	0.02	Tr			0.15			Tr	0.05
1993	26				0.85					1.28			Tr
1993	27	Tr	Tr		0.22	Tr	0.16	0.73		0.75	0.53		
1993	28	Tr	Tr	0.29		Tr			0.11		0.01	1.50	
1993	29	0.01		0.50		0.05		0.35					0.15
1993	30			Tr			Tr				0.82		0.18
1993	31	0.12				0.31					0.42		

Table A9-1c

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - FORESTDALE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1994	1		0.03		Tr	0.06	0.01	Tr		0.15	0.04	0.20	
1994	2	0.10	Tr	0.04	Tr						0.03	Tr	
1994	3	0.05	0.02	1.06	Tr				Tr				
1994	4	0.78		0.03	Tr	0.10							
1994	5	Tr				0.64			1.06	0.20			1.10
1994	6	0.08		Tr	0.08	0.26	0.26		0.02			0.09	
1994	7	0.40		0.01	0.04	0.06	Tr	0.02				Tr	0.13
1994	8	0.70	0.20	0.58		0.44		0.13					Tr
1994	9		0.28	0.26				Tr		0.22	Tr	Tr	0.06
1994	10		Tr	2.32	0.23							0.40	0.56
1994	11		0.55	0.01			Tr		0.03				0.13
1994	12	0.11	Tr		0.13	0.02	Tr		0.33	Tr			
1994	13	0.01	0.05		0.85		0.43		0.95	Tr			Tr
1994	14	Tr	Tr				1.52		0.15	0.01			Tr
1994	15			0.11		0.09		0.72					Tr
1994	16			Tr	0.55	0.54				Tr			Tr
1994	17	0.51		0.04	Tr	0.06			0.08	0.04			0.10
1994	18	1.00		0.05		0.03		0.01	1.22	0.51	0.01	2.37	0.10
1994	19			0.02	Tr	Tr			0.04		Tr	0.41	
1994	20			Tr		Tr	Tr				0.02		
1994	21		0.16	0.06			0.01		1.36			0.27	
1994	22	Tr		1.15					0.88	0.25	Tr	0.09	
1994	23	Tr	0.30			0.60		0.08		2.45	0.30	Tr	0.73
1994	24		0.26			Tr	Tr	0.03		0.04			1.66
1994	25			Tr	0.04	0.07	Tr			Tr			Tr
1994	26	0.09	0.25		0.05	0.01		Tr		Tr			
1994	27	Tr		0.38	0.10		Tr	0.24		0.25		0.01	
1994	28	1.70		0.44				0.11		Tr		1.50	Tr
1994	29			0.61	Tr		0.47		0.22				
1994	30			0.02	Tr								
1994	31							Tr			Tr		0.01

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	1	0.54		Tr		0.77						0.02	0.13
1995	2	0.30				Tr		0.03	0.05	Tr		0.78	0.00
1995	3			Tr			0.06		0.04			0.03	0.11
1995	4	Tr	0.81		0.06		0.32		0.73		0.01	0.11	0.06
1995	5		Tr	0.12		0.05			0.42		1.08		
1995	6	0.02		0.03			0.07		0.54		1.92		0.35
1995	7	0.90		Tr	0.10		0.98		0.01		0.17	1.09	
1995	8			0.04	0.24		0.30	0.01				Tr	
1995	9			0.87	0.56		Tr						1.03
1995	10		Tr		0.01	0.04	Tr						
1995	11	0.10		Tr		0.39	0.10	0.30				0.05	
1995	12	0.08		Tr	0.08	Tr	0.46		Tr			0.69	
1995	13				0.53	Tr	0.21			0.12		0.05	
1995	14	Tr		Tr	0.02	0.09	0.04			0.35	0.30	1.15	0.35
1995	15	0.05	0.57	0.02		0.35					0.61	0.52	Tr
1995	16	0.26	0.28	0.01		Tr							0.05
1995	17	0.01		0.44		0.30		0.05		2.72	Tr		0.01
1995	18	0.01		0.05	Tr	0.02		0.37				0.15	
1995	19	Tr			0.58	0.22						0.25	0.05
1995	20	1.22	Tr		Tr		0.28				0.04		0.03
1995	21	0.09	0.01	0.40	0.39			Tr			1.29	Tr	Tr
1995	22	0.02	0.04	Tr	0.01					0.49			
1995	23	0.07	0.19	Tr				Tr		0.02			
1995	24		0.20	Tr		0.03	Tr					Tr	0.01
1995	25	Tr	Tr			0.02	0.06	Tr		0.04			
1995	26		Tr			Tr	0.01	Tr		0.32			
1995	27	Tr	0.05					Tr	0.01			Tr	
1995	28		0.99		0.58	Tr		0.01			0.95		
1995	29				Tr	0.52		0.40				0.21	
1995	30			0.05	0.18	0.03							
1995	31			Tr					Tr				

Table A9-1d

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - FORESTDALE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	1				0.07	0.02		Tr	0.28	0.14			0.20
1996	2	0.07	0.03	0.30	0.52	0.02				0.13	0.02		1.16
1996	3	0.22	0.09	0.02		0.25	0.45	0.52			Tr		
1996	4	Tr				Tr	0.18	0.35		0.01			
1996	5	Tr		0.19	Tr	0.03	0.07					0.01	
1996	6			0.83	Tr	0.26			Tr				0.87
1996	7	0.06		0.48	0.42					1.21		0.16	1.15
1996	8	0.12	Tr	0.03	0.03	0.18				0.02	2.06	0.08	0.36
1996	9	Tr	0.12		0.32		Tr	0.04	Tr		0.30	0.53	
1996	10	0.05			0.13	0.27	0.05	0.01	0.07	0.01	0.01		
1996	11		0.27		Tr	0.15	Tr						0.08
1996	12	1.08			0.04	0.10	Tr			0.04			0.04
1996	13				0.04			3.57	0.93	0.13	Tr		0.03
1996	14		0.16		0.01					0.03	Tr		0.16
1996	15			0.17				Tr					Tr
1996	16	Tr	0.05		2.00	0.47							Tr
1996	17	0.03	Tr		Tr	0.14	0.03			0.93			0.68
1996	18						0.06			1.91			
1996	19	0.98		0.04			0.10	0.11			0.25	0.16	1.17
1996	20			0.64			0.46				2.81		0.01
1996	21	Tr	0.73		Tr	0.19	0.14		Tr				
1996	22		Tr		Tr		0.02			0.41	0.10		
1996	23		0.02	Tr	0.04		Tr	0.45	0.05	0.26	0.34		
1996	24	0.85	0.57		0.04	Tr	0.35		0.39	0.05	0.01		0.46
1996	25	Tr		Tr	Tr		0.04		0.01	0.17		0.02	0.10
1996	26			0.01	0.03			0.07	0.01			1.42	
1996	27	1.42	0.02				Tr					Tr	0.03
1996	28	Tr	0.13				Tr		0.45	0.03	0.21		Tr
1996	29	0.11			0.69	Tr	Tr			0.24			0.07
1996	30	0.02			0.50	0.36	0.22				0.09	Tr	
1996	31	0.01						0.45			Tr		0.02

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	1	Tr	0.03	0.01	0.11	0.28	0.53			Tr		1.39	0.30
1997	2	0.11		0.16			0.11	0.07				0.54	
1997	3	0.02	0.02	0.04		0.18		0.08E	0.09	0.02	0.15		
1997	4		0.03	0.02		Tr		0.16E	0.01				0.06
1997	5	0.03	0.91	0.10					0.45		0.16		0.06
1997	6			0.15	Tr	0.09			0.18				
1997	7	Tr		0.00								0.04	
1997	8		Tr	0.03			Tr	0.01	0.25	0.12		0.81	
1997	9	0.13				0.12			0.45			1.24	
1997	10	0.09		0.17		0.15		0.06				0.01	0.31
1997	11	0.27	Tr	Tr						0.36			0.02
1997	12		Tr		0.68				0.01	Tr			0.01
1997	13		Tr		0.49	0.11	0.06		0.65	0.02			
1997	14		0.66	0.68								1.10	Tr
1997	15		0.03	0.36		0.07					Tr	Tr	
1997	16	0.81	0.02			0.30		Tr	0.18		Tr	Tr	
1997	17	Tr	0.06		0.39	Tr			0.29				
1997	18				0.45	Tr	0.05		1.09				
1997	19		0.07		0.53	0.60	0.19						
1997	20			Tr		0.08			0.05E	0.04			
1997	21		Tr	Tr		Tr		0.02	1.16			0.08	
1997	22	0.31	Tr	0.23	Tr	Tr	1.26	0.14E	0.12			0.58	
1997	23	0.04								Tr		0.04	0.73
1997	24	0.11			0.01		Tr	0.09E			Tr	Tr	Tr
1997	25	1.40		0.05	0.08	0.70	Tr	0.33			0.82		0.47
1997	26		0.02	0.50			0.03			Tr	0.09	0.14	
1997	27	Tr	0.04								0.58	Tr	0.21
1997	28	0.95			0.51				Tr	0.02		Tr	0.06
1997	29			0.67					1.34	0.41			0.42
1997	30	Tr		Tr						Tr		0.09	0.19
1997	31			1.51							Tr		Tr

Table A9-1e

Rainfall at T.F. Green Airport *(*)*

Sampling Periods of Monitoring by USGS are marked - FORESTDALE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	1			0.15	0.84	0.31	0.27				0.12		0.02
1998	2				0.27	0.49	Tr						
1998	3			0.01		Tr	0.36						
1998	4	Tr	0.17	Tr		0.19							
1998	5		0.40	0.03	Tr	0.25		0.51					
1998	6	0.07	Tr			0.62							
1998	7	0.73		Tr		0.42	0.29	Tr		0.54			
1998	8	0.79		0.39	0.02	0.02	0.06	Tr		0.47	0.46		0.20
1998	9	0.36		3.02	0.63	0.83				0.05	0.65		
1998	10			Tr	0.29	1.64					0.88	Tr	
1998	11		0.22			0.31			0.15		0.08	1.38	
1998	12		1.08	Tr			0.13				Tr		
1998	13	0.23					3.29						
1998	14			0.11			1.37				1.23E		
1998	15	0.26		Tr	Tr		0.88			Tr		Tr	
1998	16	0.63		Tr	0.01		0.14	Tr		0.13		0.00	
1998	17	Tr	0.29		1.53	0.08	Tr	Tr	0.71			0.49	0.07
1998	18	0.10	1.87	0.13			0.46		0.45				
1998	19		Tr	1.68	0.06		0.50		0.20		Tr		
1998	20	Tr	Tr	Tr	0.35		0.04	Tr				0.23	Tr
1998	21			0.19								0.03	
1998	22			0.15			Tr			0.99			0.06
1998	23	1.68	0.05		0.55		0.01	0.37	Tr				Tr
1998	24	1.63	1.22		0.01		Tr						0.18
1998	25	0.05	0.06			0.09			Tr				
1998	26				0.34			Tr	0.62			0.63	
1998	27				0.01		0.16		Tr	0.10			
1998	28	Tr	0.49						0.06		0.34		0.10
1998	29	Tr				0.14	0.18	0.09	0.16		0.02		0.45
1998	30	0.01			Tr		1.47		0.04	0.02E			0.19
1998	31	0.01				0.66		0.40	Tr				

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	1			0.20	Tr			0.06					
1999	2		2.12				0.02	0.02				0.39	
1999	3	1.70	0.51	0.12		0.19	0.02	Tr				1.78	
1999	4		0.14	0.44	0.04	0.28		0.03			0.90		Tr
1999	5		Tr			0.14			Tr		0.12		
1999	6	Tr	0.02	0.69	Tr			Tr		0.14			0.48
1999	7	0.03	0.04	0.02	Tr					0.01			1.02
1999	8	0.36	Tr			0.20			0.72	0.56			
1999	9	0.45			0.13			Tr		0.01	0.01		
1999	10				Tr			Tr	Tr	2.27	0.39	0.02	0.03
1999	11	Tr		Tr	0.29				Tr			0.01	
1999	12	0.05	0.22	Tr	0.04			Tr	Tr			0.07	
1999	13	0.01	0.02	Tr				0.13	Tr		0.54	Tr	0.04
1999	14	0.26	Tr	0.12			0.08		0.07	0.01	0.28	0.05	0.27
1999	15	1.43		0.45		Tr	Tr		0.41	1.12			0.28
1999	16				0.55					1.98			0.01
1999	17		Tr		0.02		0.03			Tr	0.37		
1999	18	0.93	0.83			0.01	Tr		Tr		0.83		
1999	19					0.63		0.24					
1999	20				Tr	0.45			0.04		0.96	0.05	0.14
1999	21	0.04	Tr	0.08			Tr		0.12				0.12
1999	22	0.03		0.47	0.19				0.01	0.01			Tr
1999	23	0.04			0.28	1.85		0.33			0.11		
1999	24	1.29	Tr	0.34		0.50		0.01				0.02	
1999	25	Tr	0.06	Tr		Tr	Tr	Tr		0.09		0.20	
1999	26		0.01		Tr				1.67			0.03	
1999	27	Tr		0.02	Tr				0.21			0.23	
1999	28	0.07	1.48	0.37		Tr							
1999	29	0.01		0.01			Tr			0.01		Tr	
1999	30						0.02			0.79			
1999	31												

Table A9-2

Branch River, *USGS Forestdale Station*

Date	Time (h)	Temperature (deg C)	Conductance, spec. (uS/cm)	pH	Dissolved Oxygen (Concentration) (mg/l)	Dissolved Oxygen (%Saturation) (%)	Chemical Oxygen Demand (mg/l)	Alkalinity, Carbonate (mg/l - CaCO3)	Calcium, dissolved (mg/l Ca)	Magnesium, dissolved (mg/l Mg)	Sodium, dissolved (mg/l)	Potassium, dissolved (mg/l)	Chloride, dissolved (mg/l)	Sulfate, dissolved (mg/l SO4)	Iron, total (ug/l)	Manganese, total (ug/l)	Aluminum (ug/l)	Cadmium, total (ug/l)	Chromium, total (ug/l)	Copper, total (ug/l)	Lead, total (ug/l)	Nickel, total (ug/l)	Silver, total (ug/l)	Zinc, total (ug/l)
17-Jan-90	11:45	2.2	106	6.9	11.7			9																
19-Jan-90	13:30	2.6	103	6.4	12.8			6																
7-Mar-90	13:00	3.0	97	5.8	12.8		17	4	3.8	0.8	11	1.2	16	9.7	300	70	140	1	1	3	1	2	1	20
11-Apr-90	11:15	8.2	79	6.6	10.8			4																
9-May-90	11:10	13.9	82	6.8	10.4			5																
6-Jun-90	12:00	18.3	73	6.3	8.6		32	4																
11-Jul-90	11:20	22.6	108	6.5	8.6			6																
8-Aug-90	10:55	23.7	98	6.3	8.5			6																
5-Sep-90	11:30	20.4	74	6.9	8.2		21	10	3.7	0.7	8.7	1.0	14	5.4	770	30	120	1	2	3	1	1	1	10
3-Oct-90	10:50	15.1	112	7.3	9.4																			
7-Nov-90	11:00	8.9	71	6.8	11.3																			
5-Dec-90	10:45	5.0	70	7.0	12.4		16																	
9-Jan-91	10:30	0.9	83	7.3	14.0																			
6-Feb-91	11:15	2.8	85	7.0	13.8																			
6-Mar-91	11:15	5.0	68	6.9	13.1		12		2.8	0.6	7.3	0.8	11	7.2	220	50	170	1	3	2	1	1	1	10
3-Apr-91	11:15	7.3	77	6.9	12.3																			
8-May-91	10:50	14.1	70	7.6	10.1																			
5-Jun-91	11:45	16.1	82	7.0	8.8		12																	
10-Jul-91	8:00	21.5	116	7.4	8.2																			
14-Aug-91	7:30	22.6	130	7.5	7.7																			
11-Sep-91	10:15	20.6	50	7.5	8.0		25		4.6	0.9	11	1.3	18	10.0	680	90	90	1	1	3	3	1	1	10
9-Oct-91	8:45	13.1	81	6.7	10.1																			
6-Nov-91	7:30	7.5	85	7.2	11.5																			
11-Dec-91	8:25	3.0	75	7.6	14.0		10																	
8-Jan-92	9:00	0.8	75	7.9	14.3																			
5-Feb-92	8:40	1.4	83	7.8	13.7																			
4-Mar-92	12:00	2.7	75	7.3	13.0		13		3.3	0.7	8.2	0.8	12	7.7	230	60	120	1	1	2	2	2	1	20
15-Apr-92	10:15	8.6	88	6.9	11.2																			
13-May-92	10:20	14.2	82	7.4	9.9			6																
9-Jun-92	13:30	20.6	63	7.1	8.7		19																	
8-Jul-92	7:45	21.6	94	6.5	8.3			10																
5-Aug-92	8:30	22.0	105	5.8	8.4			13																
2-Sep-92	8:30	19.6	88	6.1	8.5		16	15	4.1	0.9	9.7	1.3	15	7.0										
6-Oct-92	12:50	13.3	107	6.0	9.9			8																
2-Nov-92	13:30	8.0	92	6.7	11.6			8																
7-Dec-92	11:30	3.0	74	6.4	13.2		10	4																
4-Jan-93	12:15	2.5	67	6.2	12.8			3																
8-Feb-93	12:45	2.0	84	5.8	14.2			5																
8-Mar-93	12:45	3.0	96	6.3	13.2		45	5	2.8	0.6	8.7	0.9	9	4.4										
5-Apr-93	12:00	4.0	63	6.0	12.9			2																
3-May-93	12:00	16.0	72	6.3	9.8			4																
7-Jun-93	13:15	19.0	102	7.2	8.4	90	25	9																
12-Jul-93	12:00	27.5	121	6.4	7.6	97		11																
2-Aug-93	12:15	27.5	115	6.8	8.2	105		12																
30-Aug-93	14:30	26.0	131	6.9	8.4	103	22	13	5.6	1.3	15	2.1	25	6.0										
4-Oct-93	12:00	16.0	128	7.2	9.4	97		10																
1-Nov-93	12:00	9.5	99	6.9	11.2	100		8																
10-Nov-93	15:00	6.7	97	7.2	13.4	107	21	4																
10-Jan-94	12:30	0.5	88	7.2	14.6	99		6																
7-Feb-94	11:45	1.0	89	6.1	14.4			4																

Date	Cadmium, dissolved (ug/l)	Chromium, dissolved (ug/l)	Copper, dissolved (ug/l)	Lead, dissolved (ug/l)	Nickel, dissolved (ug/l)	Silver, dissolved (ug/l)	Zinc, dissolved (ug/l)	Ammonia, total (mg/l N)	Ammonia + Total Organic Nitrogen (mg/l N)	Nitrate+Nitrite, total (mg/l N)	Total Phosphorus (mg/l P)	Orthophosphate, total (mg/l P)	Total Coliform (col/100 ml)	Fecal Coliform (col/100 ml)	Streptococci, Fecal, KF Agar (col/100 ml)	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
17-Jan-90								0.19	0.40	0.40	0.03	0.01	440	800	22			●
19-Jan-90								0.11	0.40	0.20	0.02	0.01	440	92	13	●		
7-Mar-90								0.13	1.00	0.30	0.01	0.01	62	4	4	●		
11-Apr-90								0.08	0.50	0.30	0.02	0.01	950	29	32		●	
9-May-90								0.05	0.40	0.20	0.03	0.01	1,100	28	18			●
6-Jun-90								0.07	0.50	0.20	0.02	0.01	800	29	6	●		
11-Jul-90								0.10	0.60	0.40	0.03	0.01	600	44	38	●		
8-Aug-90								0.01	0.90	0.10	0.04	0.01	3,400	580	1,400		●	
5-Sep-90								0.17	0.60	0.20	0.01	0.01	820	92	170	●		
3-Oct-90								0.10	0.70	0.50	0.04	0.01	520	48	98	●		
7-Nov-90								0.07	0.50	0.20	0.01	0.01	900	110	22		●	
5-Dec-90								0.07	0.30	0.20	0.03	0.01	8,200	400	620		●	
9-Jan-91								0.13	0.50	0.30	0.01	0.01	700	28	14		●	
6-Feb-91								0.11	0.50	0.40	0.01	0.02	420	29	14	●		
6-Mar-91								0.04	0.60	0.20	0.02	0.01	1,000	35	24		●	
3-Apr-91								0.09	0.40	0.30	0.01	0.01	230	8	9	●		
8-May-91								0.06	0.50	0.21	0.02	0.01	980	55	33			●
5-Jun-91								0.12	0.40	0.30	0.03	0.01	2,200	170	290			●
10-Jul-91								0.10	0.50	0.22	0.03	0.01	370	97	31,625	●		
14-Aug-91								0.10	0.50	0.19	0.02	0.01	256	45	360			●
11-Sep-91								0.11	0.60	0.29	0.03	0.01	1,250	200	700	●		
9-Oct-91								0.07	0.40	0.26	0.02	0.02	244	35	1,300			●
6-Nov-91								0.08	0.30	0.26	0.02	0.01	625	71	57	●		
11-Dec-91								0.11	0.30	0.23	0.01	0.02	1,000	92	36			●
8-Jan-92								0.08	0.30	0.28	0.01	0.01	1,475	65	212			●
5-Feb-92								0.06	0.20	0.28	0.02	0.01	238	36	13	●		
4-Mar-92								0.69	1.20	0.63	0.17	0.12	63	3	2	●		
15-Apr-92								0.09	0.20	0.28	0.01	0.01	775	3	70	●		
13-May-92								0.13	0.20	0.21	0.01	0.01	1,000	40	54	●		
9-Jun-92								0.06	0.40	0.15	0.04	0.01					●	
8-Jul-92								0.08	0.30	0.28	0.01	0.01	430	80	2,964			●
5-Aug-92								0.10	0.20	0.15	0.01	0.01	1,250	290	800			●
2-Sep-92								0.13	0.40	0.20	0.02	0.01	345			●		
6-Oct-92								0.06	0.30	0.35	0.01	0.01	175	11	172	●		
2-Nov-92								0.07	0.40	0.31	0.02	0.01	114	22	34	●		
7-Dec-92								0.07	0.30	0.30	0.02	0.01	900	29	58			●
4-Jan-93									0.20		0.02		925	34	20			●
8-Feb-93									0.30		0.01		194	5	2	●		
8-Mar-93									0.40		0.01		281	6	5			●
5-Apr-93									0.20		0.01		625	9	12	●		
3-May-93									0.90		0.11		293	18	7	●		
7-Jun-93									0.30		0.01		800	62	17	●		
12-Jul-93			–						0.30		0.03		306	49	1,280			●
2-Aug-93									0.20		0.01		150	14	680	●		
30-Aug-93									0.40		0.03		190	9	211	●		
4-Oct-93									0.30		0.01		139	23	101			●
1-Nov-93									0.40		0.01		178	17	78		●	
10-Nov-93									0.40		0.03		4,700	200	973		(●)	
10-Jan-94									0.40		0.01			15	22			●
7-Feb-94									0.40		0.02		322	4	19	●		

Table A9-2

Branch River, *USGS Forestdale Station*

Date	Time	Temperature	Conductance, spec.	pH	Dissolved Oxygen (*Concentration*)	Dissolved Oxygen (*%Saturation*)	Chemical Oxygen Demand	Alkalinity, Carbonate	Calcium, dissolved	Magnesium, dissolved	Sodium, dissolved	Potassium, dissolved	Chloride, dissolved	Sulfate, dissolved
	(h)	deg C	uS/cm		mg/l	%	mg/l	mg/l - CaCO3	mg/l Ca	mg/l Mg	mg/l	mg/l	mg/l	mg/l SO4
7-Mar-94	12:30	1.0	111	6.5	14.4		11	3	3.9	0.9	13	1.0	21	8.6
4-Apr-94	10:00	7.4	79	6.3	12.2	103		2						
2-May-94	12:30	15.0	97	6.9	9.8	97		5						
6-Jun-94	12:30	20.5	106	7.1	8.2	91	14	6						
18-Jul-94	12:30	24.5	124	7.2	7.6	91		12						
1-Aug-94	13:00	28.0	122	7.1	8.1	101		13						
29-Aug-94	14:00	23.0	96	6.7	8.1	95	18	5	4.3	0.9	11	1.5	18	7.8
3-Oct-94	12:45	16.0	100	6.9	9.2	93		7						
7-Nov-94	12:30	13.0	103	6.8	10.2	96		6						
5-Dec-94	12:15	5.0	77	6.6	12.6	98	32	3						
9-Jan-95	11:15	2.0	75	6.1	14.0	101		3						
6-Feb-95	12:00	1.5	95	6.1	13.4	97		4						
6-Mar-95	11:30	3.0	104	6.7	13.5	100	20	4	3.4	0.8	13	1.0	21	7.2
3-Apr-95	12:00	9.0	94	6.7	11.8	100		4						
1-May-95	12:00	13.0	90	6.7	9.7	92		5						
12-Jun-95	12:15	22.0	104	5.9	7.6	89	14	7						
10-Jul-95	12:15	25.5	110	6.0	8.6	105		9						
7-Aug-95	14:00	24.0	127	6.4	6.0	72		14						
28-Aug-95	12:45	23.5	126	6.4	8.4	99	16	11	5.0	1.3	16	2.1	24	6.5
2-Oct-95	12:30	18.0	134	6.8	9.4	100		13						
6-Nov-95	12:00	9.0	96	6.0	11.5	100		5						
4-Dec-95	13:30	4.0	99	6.2	13.5	103		5						
16-Jan-96	10:45	1.0	142	6.4	14.1		10	8						
5-Feb-96	11:15	1.5	97	6.2	13.8	97		3						
4-Mar-96	12:45	2.0	92	6.2	14.0	100	12	3	3.4	0.8	12	0.9	18	6.0
1-Apr-96	12:45	9.5	104	6.6	11.1	97		4						
6-May-96	12:00	14.0	86	6.4	10.2	98		4						
10-Jun-96	12:00	21.0	118	7.0	8.5	94	10	8						
8-Jul-96	12:15	26.0	130	6.8	7.7	97		10						
5-Aug-96	12:30	26.0	115	6.8	8.2	99		4						
26-Aug-96	12:30	25.0	128	6.7	8.3	99	17	6	4.9	1.1	16	1.6	25	6.0
19-Nov-96	13:00	5.0	96	6.6	12.9	102		5						
25-Mar-97	13:00	6.0	90	6.2	13.0	103	10	4	3.4	0.7	12	0.8	17.22	7.4
17-Jun-97	13:30	23.0	114	6.2	8.0	94	10	7						
12-Aug-97	12:45	26.0	146	6.3	8.0	99	14	11	5.6	1.3	18.6	1.8	28.59	6.2
4-Nov-97	13:00	12.0	125	7.4	10.6	99	10	9						
17-Mar-98	13:30	4.5	78	6.8	13.6	105	10	2	2.8	0.7	9.6	0.8	13.75	6.5
23-Jun-98	11:15	21.5	62	6.6	9.3	104	13	4						
18-Aug-98	13:00	26.0	116	7.4	7.2	90	13	9	4.7	1.0	13.9	1.7	21.16	5.7
17-Nov-98	12:00	8.0	90	6.6	11.6	99	10	5						
10-Aug-99	12:15	24.0	151	6.7	8.8		19	15	5.7	1.4	19.1	2.5	29.44	5.3
16-Sep-99	8:30	22.0	153	6.9	8.3		10	15	5.8	1.4	19.2	2.6	28.78	5.9
28-Sep-99	12:45	19.0	113	6.6	8.9		16	8	5.2	1.1	12.8	1.5	18.93	11.4

Date	Iron, total	Manganese, total	Aluminum	Cadmium, total	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Cadmium, dissolved	Chromium, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Silver, dissolved	Zinc, dissolved
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
7-Mar-94																	
4-Apr-94																	
2-May-94																	
6-Jun-94																	
18-Jul-94																	
1-Aug-94																	
29-Aug-94																	
3-Oct-94																	
7-Nov-94																	
5-Dec-94																	
9-Jan-95																	
6-Feb-95																	
6-Mar-95																	
3-Apr-95																	
1-May-95																	
12-Jun-95																	
10-Jul-95																	
7-Aug-95																	
28-Aug-95																	
2-Oct-95																	
6-Nov-95																	
4-Dec-95																	
16-Jan-96																	
5-Feb-96																	
4-Mar-96																	
1-Apr-96																	
6-May-96																	
10-Jun-96																	
8-Jul-96																	
5-Aug-96																	
26-Aug-96																	
19-Nov-96	450	40	150								1	1	1	1	1	1	6
25-Mar-97	160	40	120								0.1	1	1	0.4	1	1	5
17-Jun-97	394	65	44								0.55	1	2.13	0.75	1	1	2.7
12-Aug-97	557	97	25								0.55	1	1.68	0.75	1	1	1.3
4-Nov-97	263	25	25								0.55	1	2.15	0.75	1	1	4.62
17-Mar-98	147	42	201								0.55	1	1.18	0.75	1	0.6	10.3
23-Jun-98	506	79	193								0.55	1	1.94	0.65	1	0.6	7.28
18-Aug-98	895	88	50								0.05			0.6		0.2	
17-Nov-98	295	17	52								1	1	1.23	1	1	0.6	3.52
10-Aug-99	738	101	69.5								1			1.3		0.2	
16-Sep-99	475	120	71.2								1			1		0.2	
28-Sep-99	393	123	86.6								0.14			1		0.2	

Date	Ammonia, total	Ammonia + Total Organic Nitrogen	Nitrate+Nitrite, total	Total Phosphorus	Orthophosphate, total	Total Coliform	Fecal Coliform	Streptococci, Fecal, KF Agar	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
	mg/l N	mg/l N	mg/l N	mg/l P	mg/l P	col/100 ml	col/100 ml	col/100 ml			
7-Mar-94		0.30		0.01		261	12	47			●
4-Apr-94		0.20		0.01		395	4	0	●		
2-May-94		0.40		0.02		1,125	9	4	●		
6-Jun-94		0.30		0.03		325	48	81			●
18-Jul-94		0.40		0.02		200	38	567	●		
1-Aug-94		0.40		0.02		350	39	134	●		
29-Aug-94		0.40		0.02		117	30	128			●
3-Oct-94		0.40		0.01		63	5	40	●		
7-Nov-94		0.30		0.01		122	6	13	●		
5-Dec-94		0.30		0.01		395	25	38		●	
9-Jan-95		0.20		0.01		406	50	41			●
6-Feb-95		0.20		0.01		166	9	4			●
6-Mar-95		0.20		0.01		263	1	80			●
3-Apr-95		0.30		0.03		146	2	54	●		
1-May-95		0.30		0.03		530		900		●	
12-Jun-95		0.40		0.03		475	183	2,300		●	
10-Jul-95		0.40		0.03		975	148	1,583	●		
7-Aug-95		0.40		0.01		138	60	1,580		●	
28-Aug-95		0.40		0.03		400	14	3,900	●		
2-Oct-95		0.40		0.02		70	4	660	●		
6-Nov-95		0.40		0.01		180	9	97			●
4-Dec-95		0.30		0.02		273	212	3			●
16-Jan-96		0.40		0.02		1,075	136	79	●		
5-Feb-96		0.30		0.02		275	24	31	●		
4-Mar-96		0.20		0.02		103	6	8			●
1-Apr-96		0.20		0.01		73	3	12		●	
6-May-96		0.40		0.02		556	38	50			●
10-Jun-96		0.40		0.03		140	54	326	●		
8-Jul-96		0.30		0.01		292	51	930	●		
5-Aug-96		0.30		0.02		120	27	940	●		
26-Aug-96		0.40		0.03		77	32	1,230			●
19-Nov-96		0.30		0.01			25				●
25-Mar-97		0.30		0.01			2		●		
17-Jun-97		0.32		0.02			45		●		
12-Aug-97		0.38		0.01			60				●
4-Nov-97		0.33		0.02			20				●
17-Mar-98		0.24		0.01			6		●		
23-Jun-98		0.40		0.01			35				●
18-Aug-98		0.33		0.02			2,000			●	
17-Nov-98		0.30		0.05			1			●	
10-Aug-99		0.46		0.05			7				●
16-Sep-99		0.45		0.05			967			●	
28-Sep-99		0.53		0.05			30		●		

Table A9-2

Branch River, *USGS Forestdale Station*

Date	Time (h)	Temperature deg C	Conductance, spec. uS/cm	pH	Dissolved Oxygen *(Concentration)* mg/l	Dissolved Oxygen *(%Saturation)* %	Chemical Oxygen Demand mg/l	Alkalinity, Carbonate mg/l - CaCO3	Calcium, dissolved mg/l Ca	Magnesium, dissolved mg/l Mg	Sodium, dissolved mg/l	Potassium, dissolved mg/l	Chloride, dissolved mg/l	Sulfate, dissolved mg/l SO4
Statistics - All Samples														
Count		93	93	93	93	46	38	73	21	21	21	21	21	21
Mean (*)		13.0	97	6.7	10.6	98	16.4	6.9	4.2	0.9	12.7	1.4	19.3	7.0
Minimum		0.5	50	5.8	6.0	72	10	2.0	2.8	0.6	7.3	0.8	9.0	4.4
Maximum		28.0	153	7.9	14.6	107	45	15.0	5.8	1.4	19.2	2.6	29.4	11.4
Statistics - Dry Weather														
Count		44	44	44	44	20	15	35	10	10	10	10	10	10
Mean (*)		13.9	99	6.7	10.4	99	16.9	7.2	4.2	0.9	11.4	1.3	17.4	7.8
Minimum		1.0	50	5.8	7.6	90	10	2.0	2.8	0.7	8.2	0.8	12.0	5.4
Maximum		28.0	142	7.8	14.4	105	32	15.0	5.6	1.3	16.0	2.1	25.0	11.4
Statistics - Wet Weather														
Count		17	17	17	17	9	9	12	3	3	3	3	3	3
Mean (*)		12.8	93	6.8	10.4	94	16.3	7.0	4.4	1.0	13.5	1.7	20.3	6.3
Minimum		0.9	63	5.9	6.0	72	10	3.0	2.8	0.6	7.3	0.8	11.0	5.7
Maximum		26.0	153	7.4	14.0	107	32	15.0	5.8	1.4	19.2	2.6	28.8	7.2
Statistics - Wet and Mixed Weather														
Count		49	49	49	49	26	23	38	11	11	11	11	11	11
Mean (*)		24.6	192	13.5	21.5	193	32.4	13.5	8.7	2.0	27.4	3.1	41.6	12.7
Minimum		1.4	125	11.7	13.6	163	20	6.0	5.6	1.2	16.0	1.7	20.0	10.1
Maximum		53.5	304	15.3	28.6	211	77	30.0	11.5	2.8	38.3	5.0	58.2	15.8

Date	Iron, total ug/l	Manganese, total ug/l	Aluminum ug/l	Cadmium, total ug/l	Chromium, total ug/l	Copper, total ug/l	Lead, total ug/l	Nickel, total ug/l	Silver, total ug/l	Zinc, total ug/l	Cadmium, dissolved ug/l	Chromium, dissolved ug/l	Copper, dissolved ug/l	Lead, dissolved ug/l
Statistics - All Samples														
Count	17	17	17	5	5	5	5	5	5	5	12	8	8	12
Mean (*)	440	67	102	1.0	1.6	2.6	1.6	1.4	1.0	14	0.6	1.0	1.5	0.8
Minimum	147	17	25	1.0	1.0	2.0	1.0	1.0	1.0	10	0.1	1.0	1.0	0.4
Maximum	895	123	201	1.0	3.0	3.0	3.0	2.0	1.0	20	1.0	1.0	2.2	1.3
Statistics - Dry Weather														
Count	8	8	8	4	4	4	4	4	4	4	4	3	3	4
Mean (*)	384	65	115	1.0	1.3	2.8	1.8	1.5	1.0	15	0.3	1.0	1.4	0.7
Minimum	147	30	44	1.0	1.0	2.0	1.0	1.0	1.0	10	0.1	1.0	1.0	0.4
Maximum	770	123	201	1.0	2.0	3.0	3.0	2.0	1.0	20	0.6	1.0	2.1	1.0
Statistics - Wet Weather														
Count	4	4	4	1	1	1	1	1	1	1	3	1	1	3
Mean (*)	471	69	86	1.0	3.0	2.0	1.0	1.0	1.0	10	0.7	1.0	1.2	0.9
Minimum	220	17	50								0.1			0.6
Maximum	895	120	170								1.0			1.0
Statistics - Wet and Mixed Weather														
Count	9	9	9	1	1	1	1	1	1	1	8	5	5	8
Mean (*)	974	137	178	1.0	3.0	2.0	1.0	1.0	1.0	10	1.4	2.0	2.9	1.8
Minimum	483	42	75								0.6	2.0	2.2	1.3
Maximum	1633	222	363								2.0	2.0	3.4	2.3

Date	Nickel, dissolved ug/l	Silver, dissolved ug/l	Zinc, dissolved ug/l	Ammonia, total mg/l N	Ammonia + Total Organic Nitrogen mg/l N	Nitrate+Nitrite, total mg/l N	Total Phosphorus mg/l P	Orthophosphate, total mg/l P	Total Coliform col/100 ml	Fecal Coliform col/100 ml	Streptococci, Fecal, KF Agar col/100 ml	Dry Weather *(1)*	Wet Weather *(2)*	Mixed Weather *(3)*
Statistics - All Samples														
Count	8	12	8	36	93	36	93	36	79	90	79	●	●	●
Mean (*)	1.0	0.6	5	0.11	0.39	0.27	0.02	0.01	383	28	70	●	●	●
Minimum	1.0	0.2	1	0.01	0.20	0.10	0.01	0.01		1	0	●	●	●
Maximum	1.0	1.0	10	0.69	1.20	0.63	0.17	0.12	8200	2000	31625	●	●	●
Statistics - Dry Weather														
Count	3	4	3	18	44	18	44	18	40	43	39	●		
Mean (*)	1.0	0.7	6	0.13	0.42	0.31	0.02	0.02	310	19	51	●		
Minimum	1.0	0.2	3	0.06	0.20	0.20	0.01	0.01	62	2	0	●		
Maximum	1.0	1.0	10	0.69	1.20	0.63	0.17	0.12	1250	200	31625	●		
Statistics - Wet Weather														
Count	1	3	1	7	17	7	17	7	13	15	13		●	
Mean (*)	1.0	0.3	3.5	0.07	0.42	0.21	0.02	0.01	720	69	152		●	
Minimum		0.2		0.01	0.20	0.10	0.01	0.01	73	1	12		●	
Maximum		0.6		0.13	0.90	0.30	0.05	0.01	8200	2000	2300		●	
Statistics - Wet and Mixed Weather														
Count	5	8	5	18	49	18	49	18	39	47	40		●	●
Mean (*)	2.0	1.1	8.3	0.16	0.76	0.46	0.04	0.02	2228	385	959		●	●
Minimum	2.0	0.4	4.8	0.06	0.40	0.25	0.02	0.02	150	2	15		●	●
Maximum	2.0	1.6	10.8	0.32	1.40	0.70	0.10	0.03	10400	2800	5264		●	●

(1) *Dry Weather:* Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.
(2) *Wet Weather:* Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.
(3) *Mixed Weather:* Conditions that did not meet Wet or Dry Weather criteria.

USGS

Manville Station

Blackstone River

Table A9-3a

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - MANVILLE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	1	0.21			Tr	0.01		0.63			0.01		
1990	2		0.18		0.03			Tr		Tr			
1990	3		Tr		2.31		0.03						0.02
1990	4	0.06	0.47		0.19	0.25	0.02				0.15		2.09
1990	5		Tr	Tr		0.57			Tr			Tr	
1990	6			0.14	Tr	Tr		Tr	0.08			0.99	
1990	7				0.11	0.29	0.17		0.02	Tr			0.05
1990	8	0.39				0.03	0.02		1.15			0.13	0.26
1990	9	0.03	Tr				0.49	Tr			0.31		
1990	10	0.03	0.51		0.06	1.22	0.08		Tr	Tr	Tr	1.12	
1990	11	Tr			0.44	Tr	0.05	Tr	1.18		0.07	Tr	
1990	12	Tr		0.34				1.28			0.30	Tr	
1990	13					0.43		0.20			0.71		
1990	14	Tr		0.02		0.33					1.52		
1990	15	0.15	0.37	0.01	1.19		Tr	0.01		0.61	Tr		0.75
1990	16		0.39			0.72	Tr	Tr					0.17
1990	17		Tr	0.11	0.25	0.17				0.26		Tr	
1990	18	Tr		0.38		0.01	Tr				0.45	Tr	0.29
1990	19			0.19			0.03		0.08	0.09	0.31		Tr
1990	20	0.36		0.26	Tr	0.10	Tr		Tr	0.05			
1990	21	0.59		0.01	0.45	0.35	Tr		Tr				0.04
1990	22	0.07	0.32					Tr	0.04	1.20	Tr		0.07
1990	23		0.15			Tr	Tr	Tr	Tr		0.51	0.11	0.13
1990	24	0.03	0.35				Tr	0.53	1.15		0.27	0.08	1.18
1990	25	0.55	0.15		0.05	Tr		0.55	0.04				
1990	26	0.77			0.01				Tr	0.02	0.12		
1990	27		0.04				Tr	0.32		0.01		Tr	
1990	28							Tr			0.23	Tr	0.37
1990	29	1.34			0.07	0.90	0.24	Tr	Tr			0.02	Tr
1990	30	0.43		0.55	0.41	0.32	Tr	Tr		0.04			Tr
1990	31			Tr									0.06

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	1				Tr		Tr		0.00	0.00	0.00	0.31	0.08
1991	2			0.54	0.01	0.02						Tr	0.07
1991	3			0.61			Tr	0.20	0.07		Tr	Tr	0.98
1991	4			0.85			0.25		0.79			Tr	0.15
1991	5	0.10	Tr	Tr	Tr		0.03	0.03		1.10			
1991	6	Tr	0.02	0.10		0.98					0.53		0.23
1991	7		0.53	0.50	Tr			0.08					Tr
1991	8	Tr					Tr					Tr	
1991	9	0.55							0.33				0.10
1991	10			Tr		0.66		Tr	1.67		Tr	0.22	0.25
1991	11	0.20	Tr	Tr				0.10		Tr	0.15	1.93	
1991	12	0.74					0.11				Tr	0.13	
1991	13		0.10		0.10			0.36				0.01	0.27
1991	14		0.92	0.51		0.05		0.03		0.25			0.12
1991	15		0.05	0.07	0.26		0.02		0.02	0.09	0.48	0.01	Tr
1991	16	1.33	Tr		Tr		0.01				0.15		
1991	17	0.04	Tr		0.08	0.57				Tr	0.20		0.21
1991	18	Tr	0.04	1.26	0.08	0.01	Tr		0.02	0.07	0.40		Tr
1991	19		0.42	0.08			0.47		2.51	0.46			
1991	20		0.10		Tr				0.14	0.62			
1991	21	0.11		Tr	3.06			Tr	0.43			0.45	0.12
1991	22			0.39	0.08		0.01					0.69	
1991	23			0.90			0.01	0.36		0.07		0.51	Tr
1991	24			0.35		Tr			Tr	0.15		0.39	
1991	25		Tr	0.02		Tr		Tr		1.75	Tr		
1991	26	Tr	0.05					1.55		0.53			
1991	27	Tr	0.08	0.07	Tr	0.03		0.05			Tr		
1991	28	0.07	Tr	Tr		0.02					Tr		
1991	29			0.15				Tr				Tr	0.59
1991	30	0.10		0.21	1.13	0.77	0.02				0.25	Tr	Tr
1991	31	0.20				0.19			Tr		0.49		

Table A9-3b

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - MANVILLE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1992	1		Tr		0.01	0.08	2.04		Tr				
1992	2		Tr	Tr		0.13						Tr	0.05
1992	3			0.02		0.05		0.25		2.04		0.80	0.41
1992	4	1.33	0.09			Tr		0.18	0.10			Tr	0.01
1992	5	0.01	Tr				0.67	Tr				0.35	0.24
1992	6						0.73	0.16				Tr	
1992	7		Tr	0.95			Tr			Tr			Tr
1992	8		0.08	0.06	0.01	0.58	Tr	Tr		0.31			
1992	9	0.17		Tr	0.01	0.12		0.17	2.73		0.03		
1992	10			0.01	Tr				Tr		0.60		Tr
1992	11		Tr	1.38	0.25	Tr			0.23	0.09	0.01	0.03	2.40
1992	12				0.06	Tr		0.29			0.11	0.09	1.43
1992	13		0.03			Tr		0.04	Tr			1.02	0.14
1992	14	0.85	0.14			Tr		0.75	0.30				Tr
1992	15		0.68					0.73	0.22		Tr	Tr	
1992	16	0.07	0.31		0.60	0.04		0.28	0.39		Tr		
1992	17	Tr		Tr	0.64			Tr	0.71		0.01	0.04	0.82
1992	18		0.05		0.18	Tr		0.01	1.11				Tr
1992	19		Tr	0.24	0.03		0.05		0.04	Tr	0.25		Tr
1992	20	0.02			Tr		0.10		Tr				0.15
1992	21		Tr		Tr		0.02				0.14	0.04	
1992	22		Tr	0.19	0.13		0.01			0.28		0.91	0.01
1992	23	2.37	Tr	0.04	Tr			0.51		0.48		1.24	Tr
1992	24	Tr	0.03		0.10	0.09	0.79				0.10	0.02	Tr
1992	25		0.09		0.31	0.02					0.27	0.07	0.02
1992	26		0.52	0.44	Tr	0.05		0.01	0.14	1.86		0.44	
1992	27			0.24	0.01	0.01	0.20	0.05	Tr	Tr		Tr	
1992	28	Tr	Tr	0.03									Tr
1992	29		0.08					0.05	0.09	0.03			0.52
1992	30			0.05	Tr		Tr				Tr		0.37
1992	31	Tr		0.39		0.25		0.11			0.01		0.26

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1993	1		0.04		1.44		0.58					0.05	
1993	2		Tr		0.18			Tr					
1993	3	0.02			0.01			0.38		0.04	0.19		Tr
1993	4	0.01	Tr	0.29	Tr	Tr	0.04			0.03			0.19
1993	5	0.73		0.65		Tr	0.09					0.60	2.86
1993	6		0.12	0.01		Tr	0.12		Tr			Tr	0.01
1993	7		Tr					0.10	Tr	0.02			Tr
1993	8	Tr	Tr	Tr			0.01	0.01	Tr	0.09			Tr
1993	9	Tr		0.01			0.30			Tr			
1993	10	Tr		0.21	0.45			0.01		0.87	Tr		0.25
1993	11	0.04		0.11	0.03	0.05							0.63
1993	12	0.05	1.43		0.76			0.15			0.27	Tr	
1993	13	0.57	0.58	2.44	0.02	0.02			0.23				Tr
1993	14	0.01		0.14				Tr				Tr	Tr
1993	15	0.06			Tr				Tr	Tr	0.06	Tr	Tr
1993	16		2.32		Tr	0.06			Tr	0.32			0.01
1993	17	Tr	0.03	0.72	0.90	0.12			0.13	0.02	0.02	0.35	
1993	18	Tr	0.07	0.08	Tr	0.14			0.61	0.47	0.02	0.23	Tr
1993	19		0.02			0.16	Tr	0.23			0.03	0.57	0.33
1993	20					0.17	Tr	0.22	Tr		0.30	Tr	
1993	21		0.19	0.01			0.10			0.07	0.88		1.10
1993	22	0.56	0.26		0.14	0.04	Tr			0.10			
1993	23	0.02	Tr	0.01	Tr					0.02			
1993	24	0.22	Tr	1.44								0.05	Tr
1993	25	Tr		0.08	0.02	Tr			0.15			Tr	0.05
1993	26				0.85					1.28			Tr
1993	27	Tr	Tr		0.22	Tr	0.16	0.73		0.75	0.53		
1993	28	Tr	Tr	0.29		Tr			0.11		0.01	1.50	
1993	29	0.01		0.50		0.05		0.35					0.15
1993	30			Tr			Tr				0.82		0.18
1993	31	0.12				0.31					0.42		

Table A9-3c

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - MANVILLE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1994	1		0.03		Tr	0.06	0.01	Tr		0.15	0.04	0.20	
1994	2	0.10	Tr	0.04	Tr						0.03	Tr	
1994	3	0.05	0.02	1.06	Tr				Tr				
1994	4	0.78		0.03	Tr	0.10							
1994	5	Tr				0.64			1.06	0.20			1.10
1994	6	0.08		Tr	0.08	0.26	0.26		0.02			0.09	
1994	7	0.40		0.01	0.04	0.06	Tr	0.02				Tr	0.13
1994	8	0.70	0.20	0.58		0.44		0.13					Tr
1994	9		0.28	0.26				Tr		0.22	Tr	Tr	0.06
1994	10		Tr	2.32	0.23							0.40	0.56
1994	11		0.55	0.01			Tr		0.03				0.13
1994	12	0.11	Tr		0.13	0.02	Tr		0.33	Tr			
1994	13	0.01	0.05		0.85		0.43		0.95	Tr			Tr
1994	14	Tr	Tr				1.52		0.15	0.01			Tr
1994	15			0.11		0.09		0.72					Tr
1994	16			Tr	0.55	0.54				Tr			Tr
1994	17	0.51		0.04	Tr	0.06			0.08	0.04			0.10
1994	18	1.00		0.05		0.03		0.01	1.22	0.51	0.01	2.37	0.10
1994	19			0.02	Tr	Tr			0.04		Tr	0.41	
1994	20			Tr		Tr	Tr				0.02		
1994	21		0.16	0.06			0.01		1.36			0.27	
1994	22	Tr		1.15					0.88	0.25	Tr	0.09	
1994	23	Tr	0.30			0.60		0.08		2.45	0.30	Tr	0.73
1994	24		0.26			Tr	Tr	0.03		0.04			1.66
1994	25			Tr	0.04	0.07	Tr			Tr			Tr
1994	26	0.09	0.25		0.05	0.01		Tr		Tr			
1994	27	Tr		0.38	0.10		Tr	0.24		0.25		0.01	
1994	28	1.70		0.44				0.11		Tr		1.50	Tr
1994	29			0.61	Tr		0.47		0.22				
1994	30			0.02	Tr								
1994	31							Tr			Tr		0.01

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	1	0.54		Tr		0.77						0.02	0.13
1995	2	0.30				Tr		0.03	0.05	Tr		0.78	0.00
1995	3			Tr			0.06		0.04			0.03	0.11
1995	4	Tr	0.81		0.06		0.32		0.73		0.01	0.11	0.06
1995	5		Tr	0.12		0.05			0.42		1.08		
1995	6	0.02		0.03			0.07		0.54		1.92		0.35
1995	7	0.90		Tr	0.10		0.98		0.01		0.17	1.09	
1995	8			0.04	0.24		0.30	0.01				Tr	
1995	9			0.87	0.56		Tr						1.03
1995	10		Tr		0.01	0.04	Tr						
1995	11	0.10		Tr		0.39	0.10	0.30				0.05	
1995	12	0.08		Tr	0.08	Tr	0.46		Tr			0.69	
1995	13				0.53	Tr	0.21			0.12		0.05	
1995	14	Tr		Tr	0.02	0.09	0.04			0.35	0.30	1.15	0.35
1995	15	0.05	0.57	0.02		0.35					0.61	0.52	Tr
1995	16	0.26	0.28	0.01		Tr							0.05
1995	17	0.01		0.44		0.30		0.05		2.72	Tr		0.01
1995	18	0.01		0.05	Tr	0.02		0.37				0.15	
1995	19	Tr			0.58	0.22						0.25	0.05
1995	20	1.22	Tr		Tr		0.28				0.04		0.03
1995	21	0.09	0.01	0.40	0.39			Tr			1.29	Tr	Tr
1995	22	0.02	0.04	Tr	0.01					0.49			
1995	23	0.07	0.19	Tr				Tr		0.02			
1995	24		0.20	Tr		0.03	Tr					Tr	0.01
1995	25	Tr	Tr			0.02	0.06	Tr		0.04			
1995	26		Tr			Tr	0.01	Tr		0.32			
1995	27	Tr	0.05					Tr	0.01			Tr	
1995	28		0.99		0.58	Tr		0.01			0.95		
1995	29				Tr	0.52		0.40				0.21	
1995	30			0.05	0.18	0.03							
1995	31			Tr					Tr				

Table A9-3d

Rainfall at T.F. Green Airport

Sampling Periods of Monitoring by USGS are marked - MANVILLE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	1				0.07	0.02		Tr	0.28	0.14			0.20
1996	2	0.07	0.03	0.30	0.52	0.02				0.13	0.02		1.16
1996	3	0.22	0.09	0.02		0.25	0.45	0.52			Tr		
1996	4	Tr				Tr	0.18	0.35		0.01			
1996	5	Tr		0.19	Tr	0.03	0.07					0.01	
1996	6			0.83	Tr	0.26			Tr				0.87
1996	7	0.06		0.48	0.42					1.21		0.16	1.15
1996	8	0.12	Tr	0.03	0.03	0.18				0.02	2.06	0.08	0.36
1996	9	Tr	0.12		0.32		Tr	0.04	Tr		0.30	0.53	
1996	10	0.05			0.13	0.27	0.05	0.01	0.07	0.01	0.01		
1996	11		0.27		Tr	0.15	Tr						0.08
1996	12	1.08			0.04	0.10	Tr			0.04			0.04
1996	13				0.04			3.57	0.93	0.13	Tr		0.03
1996	14		0.16		0.01					0.03	Tr		0.16
1996	15			0.17				Tr					Tr
1996	16	Tr	0.05		2.00	0.47							Tr
1996	17	0.03	Tr		Tr	0.14	0.03			0.93			0.68
1996	18						0.06			1.91			
1996	19	0.98		0.04			0.10	0.11			0.25	0.16	1.17
1996	20			0.64			0.46				2.81		0.01
1996	21	Tr	0.73		Tr	0.19	0.14		Tr				
1996	22		Tr		Tr		0.02			0.41	0.10		
1996	23		0.02	Tr	0.04		Tr	0.45	0.05	0.26	0.34		
1996	24	0.85	0.57		0.04	Tr	0.35		0.39	0.05	0.01		0.46
1996	25	Tr		Tr	Tr		0.04		0.01	0.17		0.02	0.10
1996	26			0.01	0.03			0.07	0.01			1.42	
1996	27	1.42	0.02				Tr					Tr	0.03
1996	28	Tr	0.13				Tr		0.45	0.03	0.21		Tr
1996	29	0.11			0.69	Tr	Tr			0.24			0.07
1996	30	0.02			0.50	0.36	0.22				0.09	Tr	
1996	31	0.01						0.45			Tr		0.02

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	1	Tr	0.03	0.01	0.11	0.28	0.53			Tr		1.39	0.30
1997	2	0.11		0.16			0.11	0.07				0.54	
1997	3	0.02	0.02	0.04		0.18		0.08E	0.09	0.02	0.15		
1997	4		0.03	0.02		Tr		0.16E	0.01				0.06
1997	5	0.03	0.91	0.10					0.45		0.16		0.06
1997	6			0.15	Tr	0.09			0.18				
1997	7	Tr		0.00								0.04	
1997	8		Tr	0.03			Tr	0.01	0.25	0.12		0.81	
1997	9	0.13				0.12			0.45			1.24	
1997	10	0.09		0.17		0.15		0.06				0.01	0.31
1997	11	0.27	Tr	Tr						0.36			0.02
1997	12		Tr		0.68				0.01	Tr			0.01
1997	13		Tr		0.49	0.11	0.06		0.65	0.02			
1997	14		0.66	0.68								1.10	Tr
1997	15		0.03	0.36		0.07					Tr	Tr	
1997	16	0.81	0.02			0.30		Tr	0.18		Tr	Tr	
1997	17	Tr	0.06		0.39	Tr			0.29				
1997	18				0.45	Tr	0.05		1.09				
1997	19		0.07		0.53	0.60	0.19		0.00E				
1997	20			Tr		0.08			0.05E	0.04			
1997	21		Tr	Tr		Tr		0.02	1.16			0.08	
1997	22	0.31	Tr	0.23	Tr	Tr	1.26	0.14E	0.12			0.58	
1997	23	0.04								Tr		0.04	0.73
1997	24	0.11			0.01		Tr	0.09E			Tr	Tr	Tr
1997	25	1.40		0.05	0.08	0.70	Tr	0.33			0.82		0.47
1997	26		0.02	0.50			0.03			Tr	0.09	0.14	
1997	27	Tr	0.04								0.58	Tr	0.21
1997	28	0.95			0.51				Tr	0.02		Tr	0.06
1997	29			0.67					1.34	0.41			0.42
1997	30	Tr		Tr						Tr		0.09	0.19
1997	31			1.51							Tr		Tr

Table A9-3e

Rainfall at T.F. Green Airport *(*)*

Sampling Periods of Monitoring by USGS are marked - MANVILLE Station

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	1			0.15	0.84	0.31	0.27				0.12		0.02
1998	2				0.27	0.49	Tr						
1998	3			0.01		Tr	0.36						
1998	4	Tr	0.17	Tr		0.19							
1998	5		0.40	0.03	Tr	0.25		0.51					
1998	6	0.07	Tr			0.62							
1998	7	0.73		Tr		0.42	0.29	Tr		0.54			
1998	8	0.79		0.39	0.02	0.02	0.06	Tr		0.47	0.46		0.20
1998	9	0.36		3.02	0.63	0.83				0.05	0.65		
1998	10			Tr	0.29	1.64					0.88	Tr	
1998	11		0.22			0.31			0.15		0.08	1.38	
1998	12		1.08	Tr			0.13				Tr		
1998	13	0.23					3.29						
1998	14			0.11			1.37				1.23E		
1998	15	0.26		Tr	Tr		0.88			Tr		Tr	
1998	16	0.63		Tr	0.01		0.14	Tr		0.13		0.00	
1998	17	Tr	0.29		1.53	0.08	Tr	Tr	0.71			0.49	0.07
1998	18	0.10	1.87	0.13			0.46		0.45				
1998	19		Tr	1.68	0.06		0.50		0.20		Tr		
1998	20	Tr	Tr	Tr	0.35		0.04	Tr				0.23	Tr
1998	21			0.19								0.03	
1998	22			0.15			Tr			0.99			0.06
1998	23	1.68	0.05		0.55		0.01	0.37	Tr				Tr
1998	24	1.63	1.22		0.01		Tr						0.18
1998	25	0.05	0.06			0.09			Tr				
1998	26				0.34			Tr	0.62			0.63	
1998	27				0.01		0.16		Tr	0.10			
1998	28	Tr	0.49						0.06		0.34		0.10
1998	29	Tr				0.14	0.18	0.09	0.16		0.02		0.45
1998	30	0.01			Tr		1.47		0.04	0.02E			0.19
1998	31	0.01				0.66		0.40	Tr				

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	1			0.20	Tr			0.06					
1999	2		2.12				0.02	0.02				0.39	
1999	3	1.70	0.51	0.12		0.19	0.02	Tr				1.78	
1999	4		0.14	0.44	0.04	0.28		0.03			0.90		Tr
1999	5		Tr			0.14			Tr		0.12		
1999	6	Tr	0.02	0.69	Tr			Tr		0.14			0.48
1999	7	0.03	0.04	0.02	Tr					0.01			1.02
1999	8	0.36	Tr			0.20			0.72	0.56			
1999	9	0.45			0.13			Tr		0.01	0.01		
1999	10				Tr			Tr	Tr	2.27	0.39	0.02	0.03
1999	11	Tr		Tr	0.29				Tr			0.01	
1999	12	0.05	0.22	Tr	0.04			Tr	Tr			0.07	
1999	13	0.01	0.02	Tr				0.13	Tr		0.54	Tr	0.04
1999	14	0.26	Tr	0.12			0.08		0.07	0.01	0.28	0.05	0.27
1999	15	1.43		0.45		Tr	Tr		0.41	1.12			0.28
1999	16				0.55					1.98			0.01
1999	17		Tr		0.02		0.03			Tr	0.37		
1999	18	0.93	0.83			0.01	Tr		Tr		0.83		
1999	19					0.63		0.24					
1999	20				Tr	0.45			0.04		0.96	0.05	0.14
1999	21	0.04	Tr	0.08			Tr		0.12				0.12
1999	22	0.03		0.47	0.19				0.01	0.01			Tr
1999	23	0.04			0.28	1.85		0.33			0.11		
1999	24	1.29	Tr	0.34		0.50		0.01				0.02	
1999	25	Tr	0.06	Tr		Tr	Tr	Tr		0.09		0.20	
1999	26		0.01		Tr				1.67			0.03	
1999	27	Tr		0.02	Tr				0.21			0.23	
1999	28	0.07	1.48	0.37		Tr							
1999	29	0.01		0.01			Tr			0.01		Tr	
1999	30						0.02			0.79			
1999	31												

Table A9-4

Blackstone River, *USGS Manville Station*

Date	Time	Temperature	Conductance, spec.	pH	Dissolved Oxygen (Concentration)	Dissolved Oxygen (%Saturation)	Chemical Oxygen Demand	Alkalinity, Carbonate	Calcium, dissolved	Magnesium, dissolved	Sodium, dissolved	Potassium, dissolved	Chloride, dissolved	Sulfate, dissolved	Iron, total	Manganese, total	Aluminum	Cadmium, total	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total
	(h)	deg C	uS/cm		mg/l	%	mg/l	mg/l - CaCO3	mg/l Ca	mg/l Mg	mg/l	mg/l	mg/l	mg/l SO4	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
17-Jan-90	13:30	2.3	253	6.9	11.4			24																
7-Feb-90	14:14	1.5	226	6.5	12.0			12																
7-Mar-90	16:00	2.0	248	7.0	12.8		24	15	9.9	1.7	31	2.3		15.0	1,900	130	710	1	3	18	49	6	1	50
11-Apr-90	13:45	9.4	203	6.7	10.2			15																
9-May-90	13:05	14.1	202	6.9	10.4			15																
6-Jun-90	14:20	18.1	208	6.2	8.5		29	15																
11-Jul-90	13:30	23.0	342	7.1	8.3			17																
8-Aug-90	13:46	22.7	248	6.7	8.6			14																
5-Sep-90	13:45	20.4	224	7.1	7.6		29	14	11.0	1.9	28	3.0		15.0	610	90	80	1	2	11	4	9	1	10
3-Oct-90	12:40	15.8	305	7.2	9.4																			
7-Nov-90	13:00	9.3	178	7.1	11.1																			
5-Dec-90	12:50	5.3	122	7.1	12.3		23																	
9-Jan-91	12:00	0.0	201	6.9	13.9																			
6-Feb-91	13:15	2.8	204	7.2	13.1																			
6-Mar-91	13:30	5.0	160	6.9	13.0		15		7.0	1.2	18	1.7		11.0	450	80	210	1	4	11	4	2	1	20
3-Apr-91	13:00	7.5	197	7.0	12.6																			
8-May-91	12:25	14.4	158	7.3	9.4																			
5-Jun-91	13:15	15.8	185	7.2	9.2		18																	
10-Jul-91	11:30	23.1	368	7.8	7.9																			
14-Aug-91	10:15	23.4	305	7.3	7.6																			
11-Sep-91	12:40	20.6	294	7.7	7.8		34		12.0	2.1	37	3.7		24.0	570	130	100	1	2	11	5	8	1	20
9-Oct-91	10:50	12.7	196	7.4	9.4																			
6-Nov-91	9:45	7.4	184	7.3	11.0																			
11-Dec-91	12:15	3.8	217	7.7	14.1		11																	
8-Jan-92	11:30	1.5	187	7.4	14.0																			
5-Feb-92	11:40	0.7	204	7.2	14.0																			
4-Mar-92	8:15	2.3	228	7.1	12.8		17		9.1	1.7	26	2.3		14.0	370	100	130	1	1	1	3	4	1	30
15-Apr-92	12:00	9.4	199	7.1	10.2																			
13-May-92	12:30	14.8	220	6.8	8.8			17							570	130	70	1	1	6	3	4	1	20
9-Jun-92	17:40	20.0	166	7.0	8.7		23	24																
8-Jul-92	12:00	22.5	300	7.0	8.4			23																
5-Aug-92	13:05	23.5	297	6.3	7.7			26																
2-Sep-92	15:35	21.4	303	6.9	8.6		21	46	12.0	2.1	38	4.2		26.0	590	150	60	1	2	6	17	1	1	30
6-Oct-92	14:45	14.2	313	6.5	9.8			25																
3-Nov-92	13:45	7.9	264	6.6	10.9			22							620	110	50	1	1	7	2	9	1	30
8-Dec-92	13:00	2.0	213	7.7	15.6		10	16																
5-Jan-93	14:30	5.0	170	7.2	11.8			14							410	70	170	1	2	3	3	3	1	10
9-Feb-93	12:00	1.0	244	7.0	13.3	92		21																
10-Mar-93	9:35	4.0	389	6.5	14.0		15	20	10.0	1.8	53	2.6		15.0	440	110	100	1	1	8	3	4	1	30
6-Apr-93	12:20	6.0	187	6.8	12.8			10																
4-May-93	15:00	16.0	235	6.7	11.1	96		15							660	100	130	1	8	8	3	6	1	10
8-Jun-93	13:45	18.0	318	7.2	9.1		35	23																
13-Jul-93	13:15	26.5	338	6.6	8.2	102		22							380	200	60	1	2	8	3	7	1	20
4-Aug-93	11:30	26.5	415	7.0	7.8	96		26																
31-Aug-93	14:20	26.0	410	7.5	7.9	97	37	25	14.0	2.8	57	6.1		32.0	320	230	80	1	1	16	6	9	1	20
5-Oct-93	12:30	16.0	378	6.7	10.0	99		23																
2-Nov-93	13:30	9.0	274	6.6	12.0	102		23							660	70	110	1	4	11	5	8	1	30
7-Dec-93	13:30	6.0	170	6.8	12.7	101	28	12																
11-Jan-94	12:45	1.0	260	7.2	14.5	100		18							300	120	60	1	1	5	1	4	1	30
8-Feb-94	10:30	0.5	285	7.2	14.6	100		15																

Date	Cadmium, dissolved	Chromium, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Silver, dissolved	Zinc, dissolved	Ammonia, total	Ammonia + Total Organic Nitrogen	Nitrate+Nitrite, total	Total Phosphorus	Orthophosphate, total	Total Coliform	Fecal Coliform	Streptococci, Fecal, KF Agar	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l N	mg/l N	mg/l N	mg/l P	mg/l P	col/100 ml	col/100 ml	col/100 ml			
17-Jan-90								1.00	1.50	0.80	0.23	0.180	36,000	88	170			●
7-Feb-90								0.47	0.90	0.60	0.16	0.120	32,500	720	340			●
7-Mar-90								0.71	1.50	0.60	0.25	0.150	6,900	60	50	●		
11-Apr-90								0.46	1.10	0.70	0.17	0.120	11,000	350	150		●	
9-May-90								0.20	0.50	0.90	0.22	0.170	1,900	84	14			●
6-Jun-90								0.10	0.80	0.90	0.23	0.170	2,000	100	22	●		
11-Jul-90								0.29	1.20	1.90	0.61	0.510	750	100	23	●		
8-Aug-90								0.01	1.20	1.60	0.52	0.290	34,000	2,700	2,400		●	
5-Sep-90								0.11	0.60	1.20	0.25	0.240	3,400	340	56	●		
3-Oct-90								0.34	1.30	1.90	0.54	0.530	820	84	42	●		
7-Nov-90								0.20	0.80	0.90	0.21	0.080	10,000	640	60		●	
5-Dec-90								0.34	0.90	0.40	0.19	0.100	38,000	1,100	2,100		●	
9-Jan-91								0.84	1.00	0.70	0.19	0.140	14,000	390	94		●	
6-Feb-91								0.70	1.00	0.60	0.13	0.120	23,000	180	17	●		
6-Mar-91								0.26	1.00	0.44	0.11	0.020	44,000	390	130		●	
3-Apr-91								0.59	1.10	0.63	0.16	0.120	950	32	3	●		
8-May-91								0.28	0.80	0.54	0.18	0.090	22,000	140	12			●
5-Jun-91								0.12	1.50	1.10	0.21	0.140	10,000	870	1,300			●
10-Jul-91								1.20	2.30	1.40	0.38	0.280	1,420	210	0	●		
14-Aug-91								0.63	1.40	1.10	0.51	0.420	435	112	478	●		
11-Sep-91								0.11	0.80	1.20	0.35	0.260	1,700	148	65	●		
9-Oct-91								0.07	0.50	0.63	0.22	0.160	1,500	204	57			●
6-Nov-91								0.11	0.50	0.69	0.19	0.130	625	71	57	●		
11-Dec-91								0.46	0.80	0.55	0.10	0.060	8,250	325	168			●
8-Jan-92								0.54	1.00	0.56	0.12	0.080	7,600	400	90			●
5-Feb-92								0.81	1.20	0.62	0.09	0.080	6,500	1,500	143			●
4-Mar-92								0.05	0.20	0.26	0.01	0.010	1,760	70	25	●		
15-Apr-92								0.52	0.80	0.68	0.14	0.110	975	23	11	●		
13-May-92								0.44	0.60	0.89	0.09	0.090	1,300	27	5	●		
9-Jun-92								0.34	0.80	0.65	0.13	0.130	1,780	147	87		●	
8-Jul-92								0.72	1.50	0.88	0.32	0.240	495	122	90			●
5-Aug-92								1.10	1.90	1.10	0.44	0.320	9,650	750	54			●
2-Sep-92								0.68	1.20	1.20	0.29	0.200	55	140	60	●		
6-Oct-92								0.72	1.50	1.60	0.40	0.300	310	51	92	●		
3-Nov-92								0.70	1.40	1.30	0.40	0.320	2,120	43	40		●	
8-Dec-92								0.72	1.20	0.58	0.13	0.070	975	53	10	●		
5-Jan-93									1.10		0.14		8,000	1,125	1,300		●	
9-Feb-93									1.40		0.10		6	1	6	●		
10-Mar-93									1.50		0.14		560	127	20			●
6-Apr-93									0.60		0.03		1,075	45	26	●		
4-May-93									0.20		0.01		11,000	223	12	●		
8-Jun-93									0.90		0.29		875	54	13	●		
13-Jul-93									0.80		0.37		10,750	1,000	21			●
4-Aug-93									0.20		0.70		850	103	96	●		
31-Aug-93									1.70		0.77		1,050	163	20	●		
5-Oct-93									0.70		0.66		1,050	73	180	●		
2-Nov-93									1.30		0.29		11,300	700	149		●	
7-Dec-93									0.50		0.13		92,000	3,400	4,300		●	
11-Jan-94									1.20		0.13		3,800	80	24			●
8-Feb-94									1.10		0.13		2,900	44	69			●

Table A9-4

Blackstone River, *USGS Manville Station*

Date	Time (h)	Temperature deg C	Conductance, spec. uS/cm	pH	Dissolved Oxygen *(Concentration)* mg/l	Dissolved Oxygen *(%Saturation)* %	Chemical Oxygen Demand mg/l	Alkalinity, Carbonate mg/l - CaCO3	Calcium, dissolved mg/l Ca	Magnesium, dissolved mg/l Mg	Sodium, dissolved mg/l	Potassium, dissolved mg/l	Chloride, dissolved mg/l	Sulfate, dissolved mg/l SO4	Iron, total ug/l	Manganese, total ug/l	Aluminum ug/l	Cadmium, total ug/l	Chromium, total ug/l	Copper, total ug/l	Lead, total ug/l	Nickel, total ug/l	Silver, total ug/l	Zinc, total ug/l	Cadmium, dissolved ug/l	Chromium, dissolved ug/l	Copper, dissolved ug/l	Lead, dissolved ug/l	Nickel, dissolved ug/l	Silver, dissolved ug/l	Zinc, dissolved ug/l	Ammonia, total mg/l N	Ammonia + Total Organic Nitrogen mg/l N	Nitrate+Nitrite, total mg/l N	Total Phosphorus mg/l P	Orthophosphate, total mg/l P	Total Coliform col/100 ml	Fecal Coliform col/100 ml	Streptococci, Fecal, KF Agar col/100 ml	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
8-Mar-94	14:15	3.0	338	6.8	14.3	106	24	15	11.0	1.9	52	2.8		22.0	480	110	220	1	1.3	9	3	4	1	30									1.00		0.21		5,333	235	400		•	
5-Apr-94	11:00	9.0	202	6.5	12.0	103		11																									0.60		0.11		1,173	42	14	•		
3-May-94	12:30	15.0	264	7.0	10.5	103		17							600	150	130	1	1.6	11	4	4	1	20									1.10		0.23		17,600	177	9	•		
7-Jun-94	14:00	21.0	326	7.1	8.5	96	27	21																									1.30		0.30		4,500	250	98			•
19-Jul-94	12:30	25.0	371	7.4	7.8	94		27							510	140	90	1	2.9	9	4	6	1	20									1.60		0.26		850	147	50	•		
2-Aug-94	12:15	26.5	370	7.4	7.8	96		31																									3.00		0.40		600	97	40	•		
30-Aug-94	12:00	23.0	310	6.8	8.3	97	23	23	13.0	2.3	41	3.9		25.0	750	150	110	1	2.2	8	6	6	1	20									0.80		0.34		1,680	225	98			•
4-Oct-94	12:00	14.0	274	6.9	10.0	97		18																									0.70		0.28		5,400	380	57	•		
8-Nov-94	12:30	12.5	316	7.2	10.7	100		22							530	70	90	1	2.4	8	4	7	1	30									0.90		0.45		1,960	180	50	•		
6-Dec-94	11:45	7.0	177	6.8	12.1	99	35	12																									0.80		0.17		16,000	480	650		•	
10-Jan-95	12:00	1.5	203	6.3	14.3	100		12							300	70	120	1	1.6	4	2	4	1	20									0.60		0.08		12,400	400	286			•
7-Feb-95	12:00	0.5	257	6.6	14.3	99		16																									1.00		0.13		14,600	1,320	133		(•)	
7-Mar-95	12:45	4.0	250	6.9	13.4	100	24	13	9.6	1.7	30	3.6		16.0	450	150	110	1	1	4	2	5	1	10									0.70		0.11		5,800	200	72			•
4-Apr-95	12:00	9.0	252	6.6	11.4	100		15																									0.70		0.15		850	0	7	•		
2-May-95	11:45	12.5	209	6.9	10.5	99		16							640	140	140	1	1.7	6	3	7	1	20									0.90		0.21		2,200		440		•	
13-Jun-95	11:30	20.0	297	6.6	8.5	94	22	18																									0.80		0.29		4,533	680	960		•	
11-Jul-95	12:45	24.0	366	6.5	7.8	93		24							640	230	150	1	1.9	9	5	7	1	10									1.50		0.24		5,000		595	•		
8-Aug-95	12:00	22.0	383	6.3	8.4	95		27																									1.50		0.29		850	220	1,633		•	
29-Aug-95	12:15	22.5	464	6.4	7.8	91	26	30	16.0	3.1	66	6.9		44.0	510	200	50	1	1.3	7	2	6	1	10									1.70		0.37		417	137	510	•		
3-Oct-95	11:15	17.5	394	6.2	9.7	101		23																									1.00		0.72		1,100	52	94	•		
7-Nov-95	11:30	8.0	242	6.1	12.2	97		18							570	80	120	1	1	8	3	5	1	20									0.80		0.07		7,300	315	76		•	
5-Dec-95	11:10	4.0	290	6.3	13.3	100		19																									1.20		0.14		5,067	34	5,700			•
16-Jan-96	14:00	1.0	340	5.8	14.4	99	22	21							470	110	80	1	1.1	6	1	5	1	50									1.70		0.19		13,400	600	240		(•)	
6-Feb-96	9:15	0.5	233	6.7	14.8	101		13																									0.90		0.08		22,333	333	403		(•)	
5-Mar-96	12:30	2.0	294	6.9	14.2	102	12	16	9.6	1.8	40	2.2		14.0	610	100	90	1	1	5	2	3	1	30									1.00		0.08		293	37	6			•
2-Apr-96	13:00	9.5	271	6.6	11.6	102		18																									1.00		0.12		3,900	120	130		•	
7-May-96	13:15	13.0	226	7.1	11.0	103		14							670	100	180	1	3.1	10	5	4	1	30									0.90		0.15		4,400	124	31			•
11-Jun-96	12:00	21.5	304	7.2	8.6	99	15	18																									0.80		0.22		4,800	168	115	•		
9-Jul-96	12:30	25.0	346	7.2	8.5	103		13							720	180	110	1	2.3	9	5	5	1	20									0.90		0.33		1,020	88	148	•		
6-Aug-96	12:30	25.0	291	7.0	9.0	105		11																									0.70		0.28		1,140	96	240	•		
27-Aug-96	13:00	24.0	328	7.2	8.4	97	22	15	13.0	2.1	41	4.2		24.0	660	120	110	1	2.6	11	6	6	1	10									1.70		0.32		933	320	337			•
21-Nov-96	10:00	5.0	244	6.8	12.4	98		22							490	60	110								1.0	1.0	3.0	1.0	3.0	1.0	16		1.30		0.19			116		•		
27-Mar-97	9:45	7.0	288	6.3	14.1	117	18	21	10.8	1.7	39	2.5		16.0	470	80	110								3.0	1.0	4.0	0.6	3.0	1.0	14		1.40		0.16			440			•	
19-Jun-97	9:00	22.5	493	6.4	7.8	91	21	31							645	192	87								0.7	1.0	5.8	1.0	5.7	1.0	11		2.27		0.97			131				•
14-Aug-97	9:30	24.0	623	6.6	5.6	67	31	44	16.4	2.9	91	6.7		59.2	390	177	64								0.7	1.3	8.2	0.8	6.5	1.0	12		5.03		1.73			540			•	
6-Nov-97	10:30	11.0	317	6.6	11.8	105	16	19							534	86	70								0.7	1.2	5.1	1.2	5.6	1.0	21		1.76		0.65			63		•		
19-Mar-98	10:00	5.5	235	7.0	13.1	103	10	14	8.5	1.6	30	1.9		14.2	567	74	340								0.6	1.0	3.6	1.0	3.0	0.6	21		0.94		0.18			1,483			•	
25-Jun-98	8:45	22.0	188	7.1	8.5		14	14							943	117	156								0.6	1.0	4.4	1.3	2.9	0.6	12		0.76		0.21			180		•		
20-Aug-98	9:00	23.0	374	7.4	7.3	85	13	26	12.5	2.1	51	4.6		31.3	539	82	91								0.2			0.7		0.2			1.69		0.87			255			•	
19-Nov-98	10:00	8.0	352	6.8	10.8	91	15	27							425	54	78								1.0	1.0	4.8	1.0	6.7	0.2	18		3.06		0.80			328				•
20-Jan-99	10:45	1.3	341	6.2	14.3			8	7.1	1.5	50	2.2		11.1																			1.02		0.21							•
30-Jun-99	9:00	27.0	590	5.9	6.0			44																																•		
12-Aug-99	9:45	23.0	573	7.3	7.2		38	43	17.1	3.1	80	8.0		46.9	493	215	55.5								1.0			1.0		0.2			5.10		1.56			45		•		
16-Aug-99	11:00	23.3	470	6.8	7.7			37	15.5	2.8	60	7.7		0.5																			2.30		0.73							•
14-Sep-99	14:00	20.0	323	7.1	9.7		21	23	12.2	2.3	41	4.1		29.5	641	193	114								2.0			1.2		0.2			1.32		0.72			1,925			(•)	
17-Sep-99	9:45	19.8	139	6.5	9.0			19	8.3	1.6	26	3.4		15.1																			1.24		0.62						•	
30-Sep-99	8:30	19.0	444	7.1	9.1		25	25	15.4	2.8	64	5.7		44.3	508	115	86.3											1.0		0.2			1.71		1.29			610			•	

Table A9-4

Blackstone River, *USGS Manville Station*

Date	Time	Temperature	Conductance, spec.	pH	Dissolved Oxygen *(Concentration)*	Dissolved Oxygen *(%Saturation)*	Chemical Oxygen Demand	Alkalinity, Carbonate	Calcium, dissolved	Magnesium, dissolved	Sodium, dissolved	Potassium, dissolved	Chloride, dissolved	Sulfate, dissolved
	(h)	deg C	uS/cm		mg/l	%	mg/l	mg/l - CaCO3	mg/l Ca	mg/l Mg	mg/l	mg/l	mg/l	mg/l SO4
Statistics - All Samples														
Count		97	97	97	97	49	38	78	24	24	24	24	0	24
Mean (*)		**13.1**	**284**	**6.9**	**10.6**	**98**	**22.2**	**20.4**	**11.7**	**2.1**	**45.4**	**4.0**		**23.5**
Minimum		0.0	122	5.8	5.6	67	10.0	8.0	7.0	1.2	18.0	1.7		0.5
Maximum		27.0	623	7.8	15.6	117	38.0	46.0	17.1	3.1	91.5	8.0		59.2
Statistics - Dry Weather														
Count		42	42	42	42	20	14	33	8	8	8	8	0	8
Mean (*)		**16.0**	**302**	**7.0**	**9.8**	**98**	**24.6**	**21.5**	**12.6**	**2.3**	**45.3**	**4.6**		**27.1**
Minimum		1.0	184	5.9	6.0	91	10.0	10.0	9.1	1.7	26.0	2.3		14.0
Maximum		27.0	590	7.8	15.6	105	38.0	46.0	17.1	3.1	79.6	8.0		46.9
Statistics - Wet Weather														
Count		28	28	28	28	16	14	24	9	9	9	9	0	9
Mean (*)		**10.8**	**262**	**6.7**	**11.2**	**98**	**22.2**	**19.6**	**11.3**	**2.0**	**45.9**	**3.7**		**26.9**
Minimum		0.0	122	5.8	5.6	67	10.0	12.0	7.0	1.2	18.0	1.7		11.0
Maximum		24.0	623	7.4	14.8	117	35.0	44.0	16.4	2.9	91.5	6.7		59.2
Statistics - Wet and Mixed Weather														
Count		55	55	55	55	29	24	45	16	16	16	16	0	16
Mean (*)		**21.6**	**542**	**13.6**	**22.4**	**196**	**40.9**	**39.2**	**22.4**	**4.0**	**90.9**	**7.5**		**42.0**
Minimum		0.5	280	12.0	13.3	158	21.0	20.0	14.1	2.7	48.0	3.9		11.5
Maximum		50.5	1116	15.1	29.4	220	62.0	81.0	31.8	5.7	###	14.4		84.2

Date	Iron, total	Manganese, total	Aluminum	Cadmium, total	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Cadmium, dissolved	Chromium, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Silver, dissolved	Zinc, dissolved
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Statistics - All Samples																	
Count	43	43	43	31	31	31	31	31	31	31	11	8	8	12	8	12	8
Mean (*)	**572**	**125**	**125**	**1.0**	**2.1**	**8.2**	**5.4**	**5.4**	**1.0**	**23**	**1.0**	**1.1**	**4.9**	**1.0**	**4.5**	**0.6**	**16**
Minimum	300	54	50	1	1	1	1	1	1	10	0	1.0	3.0	0.6	2.9	0.2	11
Maximum	1900	230	710	1	8	18	49	9	1	50	3	1.3	8.2	1.3	6.7	1.0	21
Statistics - Dry Weather																	
Count	18	18	18	14	14	14	14	14	14	14	4	3	3	4	3	4	3
Mean (*)	**642**	**139**	**132**	**1.0**	**2.3**	**9.3**	**8.1**	**5.9**	**1.0**	**21**	**0.8**	**1.1**	**4.2**	**1.1**	**3.8**	**0.7**	**16**
Minimum	320	60	50	1	1	1	2	1	1	10	0.6	1.0	3.0	1.0	2.9	0.2	12
Maximum	1900	230	710	1	8	18	49	9	1	50	1.0	1.2	5.1	1.3	5.6	1.0	21
Statistics - Wet Weather																	
Count	14	14	14	8	8	8	8	8	8	8	5	3	3	6	3	6	3
Mean (*)	**530**	**106**	**136**	**1.0**	**2.0**	**7.6**	**3.0**	**5.4**	**1.0**	**26**	**1.3**	**1.1**	**5.3**	**0.9**	**4.2**	**0.5**	**16**
Minimum	390	70	50	1	1	3	1	2	1	10	0.2	1.0	3.6	0.6	3.0	0.2	12
Maximum	660	193	340	1	4	11	5	9	1	50	3.0	1.3	8.2	1.2	6.5	1.0	21
Statistics - Wet and Mixed Weather																	
Count	25	25	25	17	17	17	17	17	17	17	7	5	5	8	5	8	5
Mean (*)	**1041**	**231**	**237**	**2.0**	**3.7**	**14.6**	**6.3**	**10.2**	**2.0**	**48**	**2.1**	**2.1**	**10.5**	**1.9**	**10.4**	**1.1**	**30**
Minimum	690	124	110	2	2	7	2	5	2	20	0.8	2.0	8.3	1.6	8.7	0.4	23
Maximum	1410	393	520	2	7	22	11	16	2	80	4.0	2.3	14.0	2.2	13.2	2.0	39

Date	Ammonia, total	Ammonia + Total Organic Nitrogen	Nitrate+Nitrite, total	Total Phosphorus	Orthophosphate, total	Total Coliform	Fecal Coliform	Streptococci, Fecal, KF Agar	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)
	mg/l N	mg/l N	mg/l N	mg/l P	mg/l P	col/100 ml	col/100 ml	col/100 ml			
Statistics - All Samples											
Count	36	96	36	96	36	81	91	81	●	●	●
Mean (*)	**0.47**	**1.21**	**0.90**	**0.32**	**0.18**	**2,939**	**160**	**74**	●	●	●
Minimum	0.01	0.20	0.26	0.01	0.01	6	0	0	●	●	●
Maximum	1.20	5.10	1.90	1.73	0.53	92,000	3,400	5,700	●	●	●
Statistics - Dry Weather											
Count	17	41	17	41	17	37	40	37	●		
Mean (*)	**0.47**	**1.17**	**1.02**	**0.34**	**0.22**	**1,208**	**63**	**29**	●		
Minimum	0.05	0.20	0.26	0.01	0.01	6	0	0	●		
Maximum	1.20	5.10	1.90	1.56	0.53	23,000	380	595	●		
Statistics - Wet Weather											
Count	8	28	8	28	8	21	26	21		●	
Mean (*)	**0.39**	**1.24**	**0.84**	**0.35**	**0.15**	**9,356**	**514**	**318**		●	
Minimum	0.01	0.50	0.40	0.07	0.02	850	43	40		●	
Maximum	0.84	5.03	1.60	1.73	0.32	92,000	3,400	4,300		●	
Statistics - Wet and Mixed Weather											
Count	19	55	19	55	19	44	51	44		●	●
Mean (*)	**0.92**	**2.49**	**1.59**	**0.62**	**0.30**	**25,221**	**1,130**	**1,156**		●	●
Minimum	0.08	1.00	0.94	0.15	0.08	1,143	77	46		●	●
Maximum	1.94	8.09	2.70	2.71	0.64	128,000	4,900	10,000		●	●

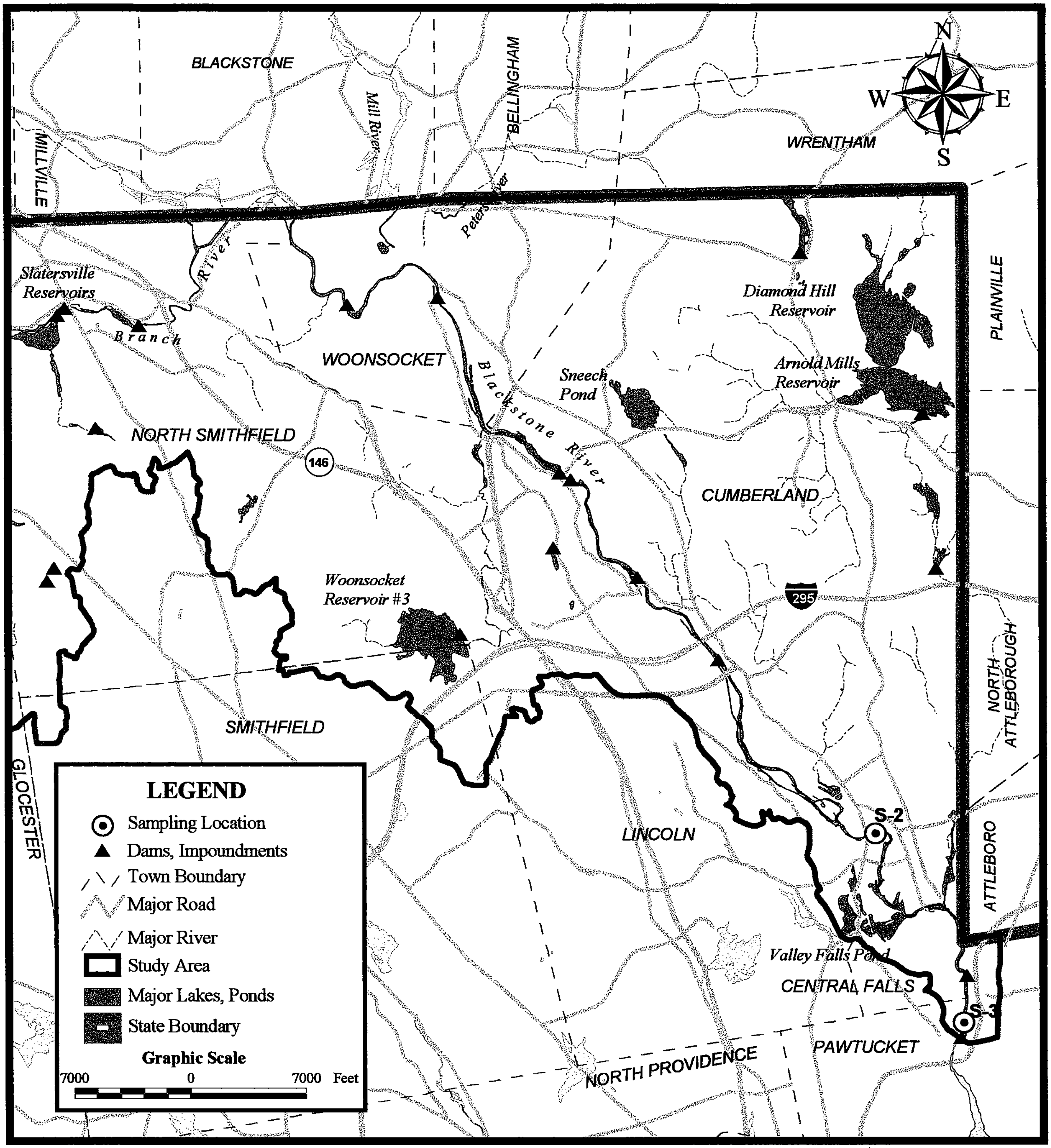
(1) *Dry Weather:* Rainfall of less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.
(2) *Wet Weather:* Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.
(3) *Mixed Weather:* Conditions that did not meet Wet or Dry Weather criteria.

Appendix 10

Water Quality Sampling of Tributaries 1997 - Present

Fecal Coliform Data

(NBC, 1998 - 2001)



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr	May 2002

Blackstone River Water Quality

Figure A10-1
NBC WATER QUALITY SAMPLING

Table A10-1a

Rainfall at T.F. Green Airport

Sampling Periods of Continuous Monitoring by NBC are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	1				0.07	0.02		Tr	0.28	0.14			0.20
1996	2	0.07	0.03	0.30	0.52	0.02				0.13	0.02		1.16
1996	3	0.22	0.09	0.02		0.25	0.45	0.52			Tr		
1996	4	Tr				Tr	0.18	0.35		0.01			
1996	5	Tr		0.19	Tr	0.03	0.07					0.01	
1996	6			0.83	Tr	0.26			Tr				0.87
1996	7	0.06		0.48	0.42					1.21		0.16	1.15
1996	8	0.12	Tr	0.03	0.03	0.18				0.02	2.06	0.08	0.36
1996	9	Tr	0.12		0.32		Tr	0.04	Tr		0.30	0.53	
1996	10	0.05			0.13	0.27	0.05	0.01	0.07	0.01	0.01		
1996	11		0.27		Tr	0.15	Tr						0.08
1996	12	1.08			0.04	0.10	Tr			0.04			0.04
1996	13				0.04			3.57	0.93	0.13	Tr		0.03
1996	14		0.16		0.01					0.03	Tr		0.16
1996	15			0.17				Tr					Tr
1996	16	Tr	0.05		2.00	0.47							Tr
1996	17	0.03	Tr		Tr	0.14	0.03			0.93			0.68
1996	18						0.06			1.91			
1996	19	0.98		0.04			0.10	0.11			0.25	0.16	1.17
1996	20			0.64			0.46				2.81		0.01
1996	21	Tr	0.73		Tr	0.19	0.14		Tr				
1996	22		Tr		Tr		0.02			0.41	0.10		
1996	23		0.02	Tr	0.04		Tr	0.45	0.05	0.26	0.34		
1996	24	0.85	0.57		0.04	Tr	0.35		0.39	0.05	0.01		0.46
1996	25	Tr		Tr	Tr		0.04		0.01	0.17		0.02	0.10
1996	26			0.01	0.03			0.07	0.01			1.42	
1996	27	1.42	0.02				Tr					Tr	0.03
1996	28	Tr	0.13				Tr		0.45	0.03	0.21		Tr
1996	29	0.11			0.69	Tr	Tr			0.24			0.07
1996	30	0.02			0.50	0.36	0.22				0.09	Tr	
1996	31	0.01						0.45			Tr		0.02

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	1	Tr	0.03	0.01	0.11	0.28	0.53			Tr		1.39	0.30
1997	2	0.11		0.16			0.11	0.07				0.54	
1997	3	0.02	0.02	0.04		0.18		0.08E	0.09	0.02	0.15		
1997	4		0.03	0.02		Tr		0.16E	0.01				0.06
1997	5	0.03	0.91	0.10					0.45		0.16		0.06
1997	6			0.15	Tr	0.09			0.18				
1997	7	Tr										0.04	
1997	8		Tr	0.03			Tr	0.01	0.25	0.12		0.81	
1997	9	0.13				0.12			0.45			1.24	
1997	10	0.09		0.17		0.15		0.06				0.01	0.31
1997	11	0.27	Tr	Tr						0.36			0.02
1997	12		Tr		0.68				0.01	Tr			0.01
1997	13		Tr		0.49	0.11	0.06		0.65	0.02			
1997	14		0.66	0.68								1.10	Tr
1997	15		0.03	0.36		0.07					Tr	Tr	
1997	16	0.81	0.02			0.30		Tr	0.18		Tr	Tr	
1997	17	Tr	0.06		0.39	Tr			0.29				
1997	18				0.45	Tr	0.05		1.09				
1997	19		0.07		0.53	0.60	0.19						
1997	20			Tr		0.08			0.05E	0.04			
1997	21		Tr	Tr		Tr		0.02	1.16			0.08	
1997	22	0.31	Tr	0.23	Tr	Tr	1.26	0.14E	0.12			0.58	
1997	23	0.04								Tr		0.04	0.73
1997	24	0.11			0.01		Tr	0.09E			Tr	Tr	Tr
1997	25	1.40		0.05	0.08	0.70	Tr	0.33			0.82		0.47
1997	26		0.02	0.50			0.03			Tr	0.09	0.14	
1997	27	Tr	0.04								0.58	Tr	0.21
1997	28	0.95			0.51				Tr	0.02		Tr	0.06
1997	29			0.67					1.34	0.41			0.42
1997	30	Tr		Tr						Tr		0.09	0.19
1997	31			1.51							Tr		Tr

Table A10-1b

Rainfall at T.F. Green Airport

Sampling Periods of Continuous Monitoring by NBC are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	1			0.15	0.84	0.31	0.27				0.12		0.02
1998	2				0.27	0.49	Tr						
1998	3			0.01		Tr	0.36						
1998	4	Tr	0.17	Tr		0.19							
1998	5		0.40	0.03	Tr	0.25		0.51					
1998	6	0.07	Tr			0.62							
1998	7	0.73		Tr		0.42	0.29	Tr		0.54			
1998	8	0.79		0.39	0.02	0.02	0.06	Tr		0.47	0.46		0.20
1998	9	0.36		3.02	0.63	0.83				0.05	0.65		
1998	10			Tr	0.29	1.64					0.88	Tr	
1998	11		0.22			0.31			0.15		0.08	1.38	
1998	12		1.08	Tr			0.13				Tr		
1998	13	0.23					3.29						
1998	14			0.11			1.37				1.23E		
1998	15	0.26		Tr	Tr		0.88			Tr		Tr	
1998	16	0.63		Tr	0.01		0.14	Tr		0.13			
1998	17	Tr	0.29		1.53	0.08	Tr	Tr	0.71			0.49	0.07
1998	18	0.10	1.87	0.13			0.46		0.45				
1998	19		Tr	1.68	0.06		0.50		0.20		Tr		
1998	20	Tr	Tr	Tr	0.35		0.04	Tr				0.23	Tr
1998	21			0.19								0.03	
1998	22			0.15			Tr			0.99			0.06
1998	23	1.68	0.05		0.55		0.01	0.37	Tr				Tr
1998	24	1.63	1.22		0.01		Tr						0.18
1998	25	0.05	0.06			0.09			Tr				
1998	26				0.34			Tr	0.62			0.63	
1998	27				0.01		0.16		Tr	0.10			
1998	28	Tr	0.49						0.06		0.34		0.10
1998	29	Tr				0.14	0.18	0.09	0.16		0.02		0.45
1998	30	0.01			Tr		1.47		0.04	0.02E			0.19
1998	31	0.01				0.66		0.40	Tr				

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	1			0.20	Tr			0.06					
1999	2		2.12				0.02	0.02				0.39	
1999	3	1.70	0.51	0.12		0.19	0.02	Tr				1.78	
1999	4		0.14	0.44	0.04	0.28		0.03			0.90		Tr
1999	5		Tr			0.14			Tr		0.12		
1999	6	Tr	0.02	0.69	Tr			Tr		0.14			0.48
1999	7	0.03	0.04	0.02	Tr					0.01			1.02
1999	8	0.36	Tr			0.20			0.72	0.56			
1999	9	0.45			0.13			Tr		0.01	0.01		
1999	10				Tr			Tr	Tr	2.27	0.39	0.02	0.03
1999	11	Tr		Tr	0.29				Tr			0.01	
1999	12	0.05	0.22	Tr	0.04			Tr	Tr			0.07	
1999	13	0.01	0.02	Tr				0.13	Tr		0.54	Tr	0.04
1999	14	0.26	Tr	0.12			0.08		0.07	0.01	0.28	0.05	0.27
1999	15	1.43		0.45		Tr	Tr		0.41	1.12			0.28
1999	16				0.55					1.98			0.01
1999	17		Tr		0.02		0.03			Tr	0.37		
1999	18	0.93	0.83			0.01	Tr		Tr		0.83		
1999	19					0.63		0.24					
1999	20				Tr	0.45			0.04		0.96	0.05	0.14
1999	21	0.04	Tr	0.08			Tr		0.12				0.12
1999	22	0.03		0.47	0.19				0.01	0.01			Tr
1999	23	0.04			0.28	1.85		0.33			0.11		
1999	24	1.29	Tr	0.34		0.50		0.01				0.02	
1999	25	Tr	0.06	Tr		Tr	Tr	Tr		0.09		0.20	
1999	26		0.01		Tr				1.67			0.03	
1999	27	Tr		0.02	Tr				0.21			0.23	
1999	28	0.07	1.48	0.37		Tr							
1999	29	0.01		0.01			Tr			0.01		Tr	
1999	30						0.02			0.79			
1999	31												

Table A10-1c

Rainfall at T.F. Green Airport *(*)*

Sampling Periods of Continuous Monitoring by NBC are marked

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	1	Tr		Tr		Tr			0.03				
2000	2	Tr		Tr		0.08	0.42		0.04	0.62			
2000	3	Tr	0.03		0.03			Tr	0.23	Tr			
2000	4	1.25	0.03		0.32			0.09	0.01	0.15	0.03	Tr	
2000	5	0.21	0.01	Tr			Tr				0.22	0.03	
2000	6		Tr				2.57		Tr		0.06		
2000	7					Tr	0.08		0.18				
2000	8				0.04	Tr							0.02
2000	9	0.02		0.03	0.47	0.03		Tr	Tr	0.08	Tr	Tr	
2000	10	1.33		Tr		0.87		Tr	0.43			1.83	0.03
2000	11	Tr	Tr	1.96	0.03	0.03	0.90		0.03			0.04	0.03
2000	12			0.56			0.08						0.01
2000	13	0.12	Tr			0.64			0.46	0.17		0.03	
2000	14		1.47			0.01	0.07		0.45			0.75	0.64
2000	15		Tr		0.04		0.03	0.85	0.04	0.96			
2000	16	Tr	Tr	0.25	0.06		Tr	0.05	0.22		0.09		0.49
2000	17			0.87	0.09		0.26			Tr	Tr	Tr	2.23
2000	18		0.35		0.38	0.24	0.01	0.41	0.11		0.69		Tr
2000	19		0.05		0.17	0.50	0.09	0.02	0.01	1.11	Tr		0.27
2000	20	Tr	Tr	Tr	0.01	0.07				0.18			0.15
2000	21	Tr		Tr	1.61	Tr							
2000	22			Tr	1.14	0.30		0.02					0.05
2000	23	Tr			0.05	0.08			0.17	0.21			
2000	24		Tr			0.87			Tr	0.02			
2000	25	0.61	0.35	0.01				0.01					
2000	26	0.01	0.11	0.04	0.09		Tr	0.45		0.28		1.91	
2000	27						0.20	0.81					
2000	28		0.20	1.53		Tr	Tr						Tr
2000	29			0.12			0.07						Tr
2000	30	Tr		Tr			Tr	0.32	Tr		0.10	0.14	0.34
2000	31	0.64						0.61			0.12		Tr

Year	day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	1							0.07			0.09		
2001	2		0.01	0.01			1.54						
2001	3						0.02		0.25				
2001	4							0.15	0.37	0.05			
2001	5	0.10	0.93	1.53				0.35					
2001	6	0.20		0.30	0.23						0.05		
2001	7												
2001	8	0.10	0.04		0.84			0.04					
2001	9	0.02	0.03	0.25	0.11								
2001	10		0.03	0.01				0.09	0.09				
2001	11						2.01	0.41	0.01				
2001	12				0.72		0.01	0.01	0.61				
2001	13			1.01	0.01				0.92				
2001	14		0.01								0.04		
2001	15	0.44	0.02			0.02					0.03		
2001	16		0.23								0.33		
2001	17			0.04	0.04		2.66	0.08	0.11		0.01		
2001	18			0.04	0.06								
2001	19	0.56											
2001	20	0.13							1.69	0.01			
2001	21	0.11		0.78	0.02					1.05			
2001	22		0.04	2.04		0.66	0.23			2.08			
2001	23		0.06	0.04		0.75	0.23		0.05		0.07		
2001	24			0.01	0.01	1.70	0.02			0.01			
2001	25		0.55			0.05		0.11		0.32	0.01		
2001	26		0.01	0.12		0.47		0.60					
2001	27					0.16			0.17				
2001	28					0.15			0.01	0.11			
2001	29			0.03									
2001	30	0.74		2.57									
2001	31												

(*) Data from May 2000 to December 2001 are from the National Weather Service from their Providence Station.

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

	Fecal Coliform Concentration (col/100 ml)		**Weather**			**Rainfall Amount during and before Sampling** (inches)			
Date	**S-2 Whipple Bridge, Lonsdale Ave**	**S-3 Slater's Mill Dam**	**Dry Weather** *(1)*	**Wet Weather** *(2)*	**Mixed Weather** *(3)*	**Same Day**	**1 day**	**2 days**	**3 days**
1/14/97	110	1,600	●			...	...	...	0.27
1/28/97	300	1,600		●		0.95	...	...	1.40
2/11/97	39	930	●			...	...	...	...
2/25/97	93	2,300	●			...	...	...	...
3/5/97	230	2,300			●	0.10	0.02	0.04	0.16
3/11/97	93	2,100			●	...	0.17	...	0.03
3/18/97	93	3,500	●			...	...	...	0.36
3/25/97	23		●			0.05	...	...	0.23
4/2/97	430	4,300		●		...	0.11	1.51	
4/9/97	23	93	●			...	...	...	...
4/18/97	40	930		●		0.45	0.39		...
4/24/97	43	930	●			0.01	...	...	...
4/29/97	40	2,000		●			0.51	...	...
5/7/97	40	930	●			...	0.09	...	...
5/16/97	43	1,500			●	0.30	0.07	...	0.11
5/20/97	230	4,300		●		0.08	0.60	...	...
5/29/97	15	4,300	●			...	...	...	...
6/2/97	140	23,000		●		0.11	0.53	...	...
6/10/97	43	4,300	●			...	...	...	...
6/19/97	230	23,000			●	0.19	0.05	...	...
6/23/97	230	4,300		●		...	1.26	...	...
7/1/97	750	230	●				...	...	...
7/10/97	30	150	●			0.06	...	0.01	...
7/17/97	40	2,100	●			...	...	...	...
7/22/97	930	43,000		(●)		0.14	0.02	...	...
7/29/97	70	930	●			...	...	...	...
8/5/97	330	4,300		●		0.45	0.01	0.09	...
8/12/97	40	2,300	●			0.01	...	...	0.45
8/18/97	230	93,000		●		1.09	0.29	0.18	
8/26/97	9	90	●			...	...	...	...
9/5/97	23	1,200	●			...	...	0.02	...
9/11/97	23	230			●	0.36	...	...	0.12
9/16/97	43	2,300	●			...	...	...	0.02
9/24/97	93	70	●			...	...	...	...
9/29/97	430	93,000		●		0.41	0.02	...	...
10/8/97	23	140	●			...	...	...	0.16
10/17/97	230	70	●				...	...	...
10/22/97	15	43	●			...	...	...	...
10/27/97	150	1,500		●		0.58	0.09	0.82	...
11/3/97	640	430		●		...	0.54	1.39	
11/10/97	90	2,300		●		0.01	1.24	0.81	0.04
11/17/97	90	230	●			...	...		1.10
12/2/97	930	930			●	...	0.30	0.09	...
12/8/97	280	930	●			...	...	...	0.06
12/17/97	93	430	●			...	...	...	...
12/22/97	2,300	150	●			...	...	...	...
12/30/97	430	430			●	0.19	0.42	0.06	0.21

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

	Fecal Coliform Concentration (col/100 ml)		**Weather**			**Rainfall Amount during and before Sampling** (inches)			
Date	**S-2 Whipple Bridge, Lonsdale Ave**	**S-3 Slater's Mill Dam**	**Dry Weather** *(1)*	**Wet Weather** *(2)*	**Mixed Weather** *(3)*	**Same Day**	**1 day**	**2 days**	**3 days**
06-Jan-98	70	140	●			0.07			
14-Jan-98	230	230	●				0.23		
21-Jan-98	210	750	●						0.10
29-Jan-98	4,300	2,300	●						
04-Feb-98	930	29	●			0.17			
11-Feb-98	23	93			●	0.22			
18-Feb-98	750	4,300		●		1.87	0.29		
25-Feb-98	430	430		●		0.06	1.22	0.05	
03-Mar-98	93	39	●			0.01		0.15	0.49
10-Mar-98	4,300	4,300		●			3.02	0.39	
18-Mar-98	150	150	●			0.13			
26-Mar-98	930	2,300	●						
01-Apr-98	230	43		●		0.84			
09-Apr-98	23	15		●		0.63	0.02		
14-Apr-98	21	39	●						
21-Apr-98	230	43			●		0.35	0.06	
28-Apr-98	9	43	●				0.01	0.34	
04-May-98	93	93			●	0.19		0.49	0.31
11-May-98	930	2,300		●		0.31	1.64	0.83	0.02
18-May-98	75	93	●				0.08		
26-May-98	43	23	●				0.09		
02-Jun-98	230	2,300			●		0.27	0.66	
15-Jun-98	750	2,300		●		0.88	1.37	3.29	0.13
29-Jun-98	150	93			●	0.18		0.16	
13-Jul-98	43	93	●						
27-Jul-98	15	93	●						
12-Aug-98	43	210	●				0.15		
24-Aug-98	150	230	●						
08-Sep-98	93	23,000		●		0.47	0.54		
21-Sep-98	150	93	●						
05-Oct-98	23	430	●						
19-Oct-98	43	93	●						
02-Nov-98	230	230	●						
17-Nov-98	230	230			●	0.49			
01-Dec-98	430	2,300	●			0.02			
15-Dec-98	150	460	●						
28-Dec-98	15	75	●			0.10			

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

Date	Fecal Coliform Concentration (col/100 ml)		Weather			Rainfall Amount during and before Sampling (inches)			
	S-2 Whipple Bridge, Lonsdale Ave	S-3 Slater's Mill Dam	Dry Weather (1)	Wet Weather (2)	Mixed Weather (3)	Same Day	1 day	2 days	3 days
11-Jan-99	14,000	4,300		(●)				0.45	0.36
14-Jan-99	1,100			(●)		0.26	0.01	0.05	
26-Jan-99	9,300	4,300		●				1.29	0.04
09-Feb-99	430	150	●					0.04	0.02
23-Feb-99	460	240	●						
09-Mar-99	93	43	●				0.02	0.69	
23-Mar-99	460	2,400			●		0.47	0.08	
30-Mar-99		240	●				0.01	0.37	0.02
05-Apr-99	43	43	●				0.04		
20-Apr-99	15	43	●						0.02
04-May-99	23	460			●	0.28	0.19		
18-May-99	93	240	●			0.01			
01-Jun-99	43	75	●						
14-Jun-99	93	43	●			0.08			
21-Jun-99	93	240	●						
28-Jun-99	23	43	●						
06-Jul-99	93	460	●					0.03	
12-Jul-99	93	460	●						
19-Jul-99	150	750			●	0.24			
26-Jul-99	930	430	●					0.01	0.33
03-Aug-99	230	90	●						
10-Aug-99	40	4,300			●			0.72	
16-Aug-99	15,000	2,400		(●)			0.41	0.07	
23-Aug-99	930	230	●				0.01	0.12	0.04
30-Aug-99	2,400	230	●						0.21
07-Sep-99	460	9,300	●			0.01	0.14		
13-Sep-99	430	230	●						2.27
21-Sep-99	230	70	●						
28-Sep-99	40	90							0.09
04-Oct-99	150	930		●		0.90			
12-Oct-99	40	90	●					0.39	0.01
18-Oct-99	110	9,300		●		0.83	0.37		
25-Oct-99	90	150	●					0.11	
01-Nov-99	40	90	●						
08-Nov-99	43	93	●						
15-Nov-99	43	43	●				0.05		0.07
22-Nov-99	43	93	●					0.05	
29-Nov-99	430	230	●					0.23	0.03
06-Dec-99	150	150			●	0.48			
13-Dec-99	230	43	●			0.04			0.03
20-Dec-99	150	150	●			0.14			
28-Dec-99	150	430	●						

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

Date	**Fecal Coliform Concentration** (col/100 ml)		**Weather**			**Rainfall Amount during and before Sampling** (inches)			
Date	**S-2 Whipple Bridge, Lonsdale Ave**	**S-3 Slater's Mill Dam**	**Dry Weather** *(1)*	**Wet Weather** (2)	**Mixed Weather** (3)	**Same Day**	**1 day**	**2 days**	**3 days**
04-Jan-00	1,500	930		●		1.25			
10-Jan-00	930	230		●		1.33	0.02		
18-Jan-00	230	230	●						
24-Jan-00	93	93	●						
01-Feb-00	150	230		●			0.64		
08-Feb-00	23	43	●						0.01
15-Feb-00	110	430		●			1.47		
21-Feb-00	230	93	●					0.05	0.35
28-Feb-00	390	430			●	0.20		0.11	0.35
07-Mar-00	4	23	●						
13-Mar-00	2,300	2,300		●			0.56	1.96	
22-Mar-00	930	430	●						
28-Mar-00	150	24,000		●		1.53		0.04	0.01
04-Apr-00	43	230			●	0.32	0.03		
11-Apr-00	150	240	●			0.03		0.47	0.04
18-Apr-00	2,100	1,100			●	0.38	0.09	0.06	0.04
25-Apr-00	210	140	●					0.05	1.14
01-May-00	23	23	●						
08-May-00	4	43	●						
15-May-00	150	150			●		0.01	0.64	
22-May-00	93	230			●	0.30		0.07	0.50
30-May-00	93	240	●						
05-Jun-00	120	93	●						0.42
13-Jun-00	930	430			●		0.08	0.90	
20-Jun-00	93	230	●				0.09	0.01	0.26
26-Jun-00	43	150	●						
05-Jul-00	39	93	●				0.09		
10-Jul-00	23	93	●						
17-Jul-00	1,500	2,300			●		0.05	0.85	
24-Jul-00	240	39	●					0.02	
31-Jul-00	430	930		●		0.61	0.32		
07-Aug-00	93	230			●	0.18			0.01
15-Aug-00	750	240		●		0.04	0.45	0.46	
21-Aug-00	23	43	●					0.01	0.11
28-Aug-00	43	23	●						
05-Sep-00	430	2,300			●		0.15		0.62
11-Sep-00	43	93	●					0.08	
18-Sep-00	75	430	●						0.96
25-Sep-00	15	150	●				0.02	0.21	
02-Oct-00	43	150	●						
10-Oct-00	23	93	●						
17-Oct-00	43	93	●				0.09		
24-Oct-00	4	150	●						
30-Oct-00	3	15	●			0.10			
06-Nov-00	3	23	●				0.03		
14-Nov-00	1,500	2,300		●		0.75	0.03		0.04
20-Nov-00	43	15	●						
27-Nov-00	210	750		●			1.91		
04-Dec-00	150	93	●						
11-Dec-00	23	23	●			0.03	0.03		0.02
18-Dec-00	930	430		●			2.23	0.49	
27-Dec-00	43	43	●						

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

	Fecal Coliform Concentration (col/100 ml)		**Weather**			**Rainfall Amount during and before Sampling** (inches)			
Date	**S-2 Whipple Bridge, Lonsdale Ave**	**S-3 Slater's Mill Dam**	**Dry Weather** (1)	**Wet Weather** (2)	**Mixed Weather** (3)	**Same Day**	**1 day**	**2 days**	**3 days**
04-Jan-01	93	43	●						
08-Jan-01	43	23	●			0.10		0.20	0.10
16-Jan-01	2,400	210			●		0.44		
22-Jan-01	230	75			●		0.11	0.13	0.56
29-Jan-01	93	75	●						
05-Feb-01	430	93		●		0.93			0.01
12-Feb-01	750	2,400	●					0.03	0.03
19-Feb-01	430	1,500	●						0.23
26-Feb-01	93	23		●		0.01	0.55		0.06
12-Mar-01	75	43	●					0.01	0.25
19-Mar-01	430	430	●				0.04	0.04	
26-Mar-01	430	230			●	0.12		0.01	0.04
02-Apr-01	280	230	●						2.57
09-Apr-01	230	93		●		0.11	0.84		0.23
16-Apr-01	43	43	●						0.01
23-Apr-01	75	23	●					0.02	
01-May-01	93	23	●						
07-May-01	15	43	●						
14-May-01	93	43	●						
21-May-01	43	93	●						
29-May-01	150	210			●		0.15	0.16	0.47
04-Jun-01	2,400	1,500		●			0.02	1.54	
11-Jun-01	43	230		●		2.01			
18-Jun-01	2,300	15,000		●			2.66		
25-Jun-01	24,000	930	●				0.02	0.23	0.23
02-Jul-01	4,300	430	●				0.07		
09-Jul-01	150	230	●				0.04		
16-Jul-01	230	210	●						
23-Jul-01	90	90	●						
30-Jul-01	9	43	●						
06-Aug-01	430	430			●			0.37	0.25
14-Aug-01	2,300	2,300		●			0.92	0.61	0.01
20-Aug-01	2,300	4,300		●		1.69			0.11
27-Aug-01	40	230	●			0.17			
04-Sep-01	40	230	●			0.05			
10-Sep-01	93	230	●						
17-Sep-01	230	230	●						
24-Sep-01	430	930		●		0.01		2.08	1.05
01-Oct-01	230	230	●			0.09			0.11

(1) *Dry Weather:* Rainfall less than 0.05" on the day of sampling and rainfall of less than 0.3" on days 1 to 4 prior to sampling day.
(2) *Wet Weather:* Rainfall of more than 0.3" on day of sampling, rainfall of more than 0.5" one day before sampling, and/or rainfall of more than 1.0" on days 2 and 3 prior to sampling.
(3) *Mixed Weather:* Conditions that did not meet Wet or Dry Weather criteria.

Table A10-2

Fecal Coliform Monitoring Data
Narragansett Bay Commission

	All Samples		Dry Weather		Wet Weather		Mixed Weather	
	S-2 Lonsdale Ave	S-3 Slater's Mill	S-2 Lonsdale Ave	S-3 Slater's Mill	S-2 Lonsdale Ave	S-3 Slater's Mill	S-2 Lonsdale Ave	S-3 Slater's Mill
Statistics - 1997								
Count	47	46	26	25	14	14	7	7
Geom. Mean	**101**	**1,268**	**60**	**547**	**213**	**5275**	**153**	**1477**
Minimum	9	43	9	43	40	430	23	230
Maximum	2,300	93,000	2,300	4,300	930	93000	930	23000
Statistics - 1998								
Count	37	37	23	23	8	8	6	6
Geom. Mean	**140**	**245**	**102**	**171**	**384**	**943**	**125**	**162**
Minimum	9	15	9	23	23	15	23	43
Maximum	4,300	23,000	4,300	2,300	4,300	23,000	230	2,300
Statistics - 1999								
Count	41	41	30	31	6	5	5	5
Geom. Mean	**183**	**264**	**128**	**145**	**1,812**	**3,287**	**99**	**882**
Minimum	15	43	15	43	110	930	23	150
Maximum	15,000	9,300	2,400	9,300	15,000	9,300	460	4,300
Statistics - 2000								
Count	52	52	32	32	11	11	9	9
Geom. Mean	**100**	**179**	**41**	**78**	**520**	**861**	**311**	**500**
Minimum	3	15	3	15	110	230	43	150
Maximum	2,300	24,000	930	430	2,300	24,000	2,100	2,300
Statistics - 2001								
Count	39	39	25	25	9	9	5	5
Geom. Mean	**222**	**201**	**140**	**136**	**555**	**596**	**434**	**201**
Minimum	9	23	9	23	43	23	150	75
Maximum	24,000	15,000	24,000	2,400	2,400	15,000	2,400	430
Statistics - All Samples from 1997-2001								
Count	216	215	136	136	48	47	32	32
Weighted Mean	**149**	**431**	**94**	**215**	**697**	**2,192**	**224**	**645**
Minimum	3	15	3	15	23	15	23	43
Maximum	24,000	93,000	24,000	9,300	15,000	93,000	2,400	23,000

Appendix 11

The Blackstone River
- Fish Toxics Monitoring
Massachusetts Department of Environmental Protection

(Maietta, 1993)

Table A11-1
1993 Blackstone River
Fish Toxics Monitoring Survey for
Tupperware Impoundment

Species Code	Sample Code	Sample Type	Length (cm)	Weight (grams)
BRF93-1	C	I	54.5	2,300
BRF93-2	LMB	I	44.1	1,380
BRF93-3	LMB	I	40.4	1,080
BRF93-4	LMB	C	33	510
BRF93-5	LMB	C	32.9	500
BRF93-6	LMB	C	34.5	620
BRF93-7	CP	I	36.9	320
BRF93-8	BB	C	29.7	350
BRF93-9*	BB	C	32.2	370
BRF93-10	BB	C	30.5	370
BRF93-11*	BB	C	29.9	300
BRF93-12	B	C	18.6	120
BRF93-13	B	C	18.9	120
BRF93-14	B	C	21	160
BRF93-15	B	C	21.6	170
BRF93-16	B	C	17.7	130
BRF93-17*	YP	C	25.4	260
BRF93-18	YP	C	26.9	260
BRF93-19	YP	C	22.9	180
BRF93-20	YP	C	20.3	110
BRF93-21	WS	C	44.6	990
BRF93-22	WS	C	46.5	990
BRF93-23	WS	C	41.7	850

*Abnormality noted on field sheets (lesions, tumors, or melanoma)

Species Code	**Common Name**	**Scientific Name**
LMB	Largemouth bass	*Micropterus salmoides*
BB	Brown bullhead	*Ameiurus nebulosus*
YB	Yellow bullhead	*Ameiurus natalis*
WP	White perch	*Morone americana*
YP	Yellow perch	*Perca flavescens*
B	Bluegill	*Lepomis macrochirus*
C	Common carp	*Cyprinus carpio*
WS	White sucker	*Catostomus commersoni*

Sample Type
I – Individual
C- Composite

Table A11-2
1993 Blackstone River
Results of Metals Analysis for
Tupperware Impoundment

Sample Code	Species Code	Sample Type	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)
BRF93-1	C	I	Bdl	Bdl	Bdl	1	0.068	Bdl	0.35
BRF93-2	LMB	I	Bdl	Bdl	0.6	Bdl	0.479	Bdl	0.16
BRF93-3	LMB	I	Bdl	Bdl	Bdl	Bdl	0.487	1.8	0.15
BRF93-4-6	LMB	C	0.06	Bdl	1.2	Bdl	0.316	Bdl	0.12
BRF93-7	CP	I	Bdl	Bdl	1.4	Bdl	0.038	Bdl	0.07
BRF93-8-11	BB	C	0.03	Bdl	1.4	Bdl	0.055	Bdl	0.09
BRF93-12-16	B	C	Bdl	Bdl	Bdl	Bdl	0.226	2.2	0.28
BRF93-17-20	YP	C	Bdl	Bdl	Bdl	Bdl	0.097	Bdl	0.25
BRF93-21-23	WS	C	Bdl	Bdl	Bdl	0.6	0.100	Bdl	0.31

Abbreviations: Bdl = below method detection limits

Species Code	**Common Name**	**Scientific Name**
LMB	Largemouth bass	*Micropterus salmoides*
BB	Brown bullhead	*Ameiurus nebulosus*
YB	Yellow bullhead	*Ameiurus natalis*
WP	White perch	*Morone americana*
YP	Yellow perch	*Perca flavescens*
B	Bluegill	*Lepomis macrochirus*
C	Common carp	*Cyprinus carpio*
WS	White sucker	*Catostomus commersoni*

Sample Type
I – Individual
C- Composite

Metal	**Method Detection Limits (mg/kg wet weight)**
Arsenic (As)	0.002
Cadmium (Cd)	0.03
Chromium (Cr)	0.03
Copper (Cu)	0.03
Lead (Pb)	0.05
Mercury (Hg)	0.0002
Selenium (Se)	0.002

Table A11-3
1993 Blackstone River
Results of PCB, Organochlorine Pesticide[1], and Lipids Analyses for Tupperware Impoundment

Sample Code	Species Code	Sample Type	% Lipids	PCB 1254 (mg/kg)	PCB 1260 (mg/kg)
BRF93-1	C	I	3.90	2.4	2.3
BRF93-2	LMB	I	0.20	Bdl	0.31
BRF93-3	LMB	I	0.13	Bdl	0.19
BRF93-4-6	LMB	C	0.12	Bdl	0.15
BRF93-7	CP	I	0.11	Bdl	Bdl
BRF93-8-11	BB	C	0.60	Bdl	Bdl
BRF93-12-16	B	C	0.21	Bdl	0.26
BRF93-17-20	YP	C	0.12	Bdl	Bdl
BRF93-21-23	WS	C	0.78	0.8	Bdl

Abbreviations: Bdl = below method detection limits

[1] The following organochlorine pesticides were below detection in all samples analyzed: Aldrin, BHC<Lindane, DDD, DDT, DDE, Dieldrin, Endosulfan, Endosulfan Sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Methoxychlor, Toxaphene, Chlordane, Hexachlorocyclopentadiene, Hexachlorobenzene, and Trifurlin.

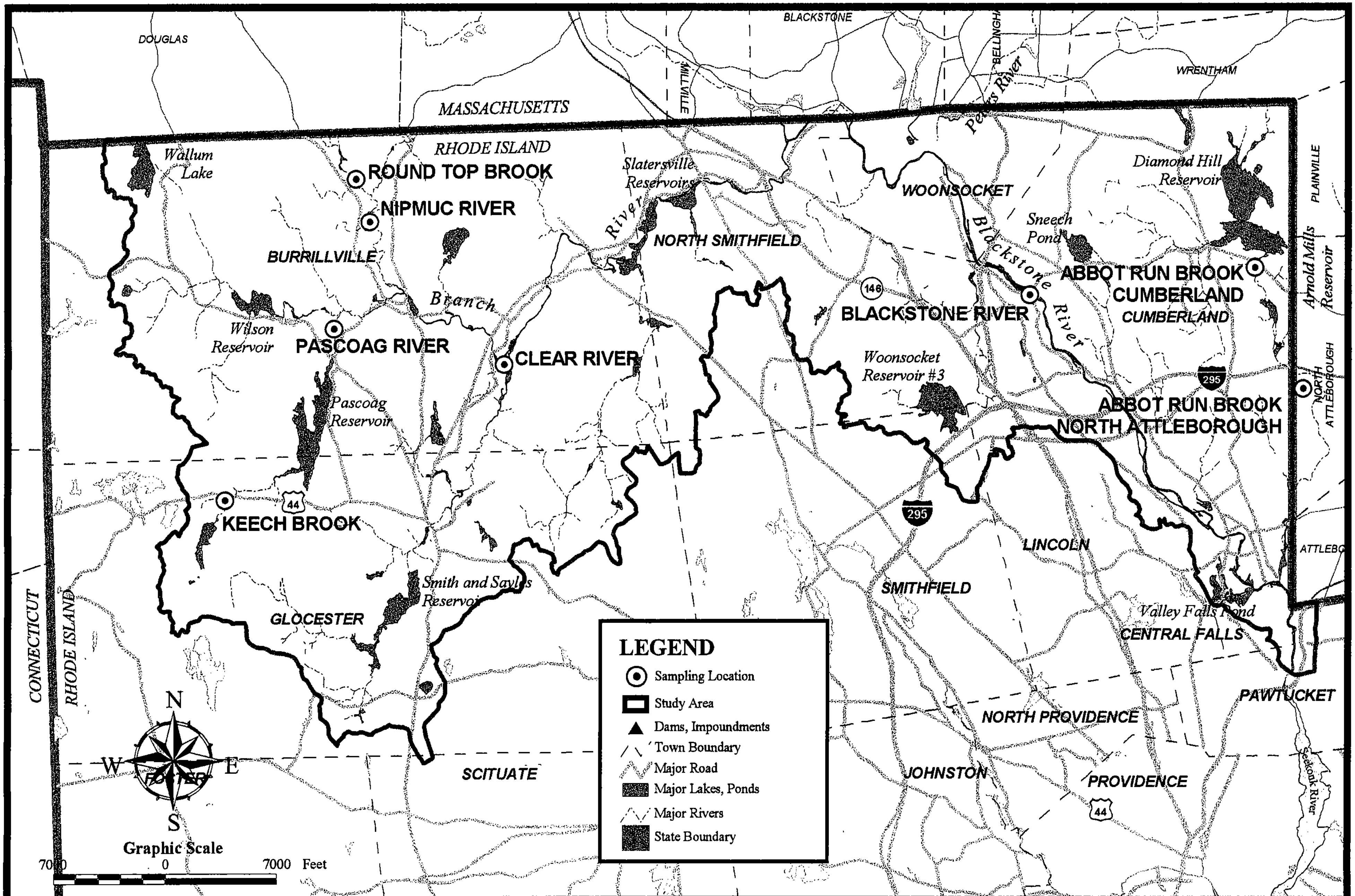
Species Code	**Common Name**	**Scientific Name**
LMB	Largemouth bass	*Micropterus salmoides*
BB	Brown bullhead	*Ameiurus nebulosus*
YB	Yellow bullhead	*Ameiurus natalis*
WP	White perch	*Morone americana*
YP	Yellow perch	*Perca flavescens*
B	Bluegill	*Lepomis macrochirus*
C	Common carp	*Cyprinus carpio*
WS	White sucker	*Catostomus commersoni*

Sample Type
I – Individual
C- Composite

Appendix 12

Rapid Bioassessment Screening of Rhode Island Freshwater Benthic Macro-invertebrates

(Gould, 1998; 1999; 2000)



The Louis Berger Group, Inc.

Rhode Island DEM

Figure A12-1
MONITORING STATIONS

Blackstone River - Water Quality

File: BW-SMPL.apr

Source: RIGIS, MASSGIS

May 2002

Table A12-1
Nipmuc River

Biological Protocol Ranking

	Count		
Organism	**1998**	**1999**	**2000**
Chimarra		9	37
Chironomidae		3	2
Coleoptera	3		
Diptera		1	
Ephemeroptera	9	13	
Hemiptera			1
Hydropsyche	73	36	41
Megaloptera	3	5	4
Odonata	1	7	1
Oligochaeta		1	4
Plecoptera	7	25	9
Porifera	1		
Sialidae			1
Simulidae	2		
Tipulidae	1		
Score Calculation			
Total Count	100	100	100
Taxa Richness	9	9	9
Shredders/Total	0.110	0.260	0.090
EPT Index	89	83	87
FBI	3.99	3.63	3.84
% Contribution	73.00%	36.00%	41.00%
Scrapers/Filter	0.180	0.280	0.010
Community Loss	0.950	0.950	0.930
Jaccard Coefficient	0.500	0.556	0.500
Total	**81%**	**75%**	**50%**

Table A12-2
Pascoag River

Biological Protocol Ranking

	Count		
Organism	**1998**	**1999**	**2000**
Chimarra		23	36
Coleoptera	3	8	19
Ephemeroptera		16	
Hemiptera			3
Hirudinea			1
Hydropsyche	89	46	24
Lepidoptera			1
Megaloptera	3		1
Odonata	3	22	5
Oligochaeta	2	2	1
Simulidae		6	
Stenonema			7
Tipulidae			2
Score Calculation			
Total Count	100	123	100
Taxa Richness	5	7	11
Shredders/Total	0.030	0.065	0.200
EPT Index	89	85	67
FBI	4.12	3.73	3.88
% Contribution	89.00%	37.40%	36.00%
Scrapers/Filter	0.030	0.390	0.360
Community Loss	0.980	0.789	0.930
Jaccard Coefficient	0.222	0.333	0.438
Total	**75%**	**75%**	**75%**

Table A12-3
Keech Brook

Biological Protocol Ranking

	Count		
Organism	**1998**	**1999**	**2000**
Amphipoda	1		
Chironomidae		38	34
Coleoptera		1	1
Ephemeroptera		1	
Hemiptera		2	
Hydropsyche	81	44	34
Megaloptera	12	14	5
Odonata	4		8
Oligochaeta	2		
Plecoptera			17
Tipulidae			1
Score Calculation			
Total Count	100	100	100
Taxa Richness	5	6	7
Shredders/Total	0.010	0.010	0.190
EPT Index	81	45	51
FBI	4.46	7.73	6.24
% Contribution	81.00%	44.00%	34.00%
Scrapers/Filter	0.000	0.090	0.030
Community Loss	0.980	0.970	0.940
Jaccard Coefficient	0.222	0.375	0.462
Total	**50%**	**44%**	**63%**

Table A12-4
Clear River

Biological Protocol Ranking

	Count		
Organism	**1998**	**1999**	**2000**
Amphipoda		1	2
Chimarra		20	
Coleoptera		10	1
Decapoda	1		2
Ephemeroptera	15		
Gastropoda	1	1	
Hemiptera			1
Hirudinea		3	1
Hydropsyche	66	40	29
Megalopetera			1
Odonata	1		4
Oligochaeta		4	1
Simulidae	16	7	29
Stenonema			29
Tipulidae		3	
Score Calculation			
Total Count	100	100	100
Taxa Richness	6	12	11
Shredders/Total	0.000	0.170	0.030
EPT Index	81	67	58
FBI	4.48	4.37	4.71
% Contribution	66.00%	40.00%	29.00%
Scrapers/Filter	0.480	0.340	1.020
Community Loss	0.970	0.970	0.920
Jaccard Coefficient	0.333	0.214	0.533
Total	**63%**	**81%**	**69%**

Table A12-5
Abbot Run Brook (North Attleboro)

Biological Protocol Ranking

Organism	1998	Count 1999	2000
Chimarra		20	
Chironomidae	1		1
Decapoda			1
Ephemeroptera	13		2
Hemiptera	3		
Hirudinea	3	2	2
Hydropsyche	66	26	68
Isopoda		5	
Megaloptera	3	1	3
Oligochaeta		1	11
Pelecypoda	10		11
Plecoptera	11	45	
Tipulidae			1
Score Calculation			
Total Count	110	100	100
Taxa Richness	8	7	9
Shredders/Total	0.100	0.500	0.010
EPT Index	90	91	70
FBI	4.69	2.84	5.11
% Contribution	60.00%	45.00%	68.00%
Scrapers/Filter	0.240	0.000	0.030
Community Loss	0.873	0.970	0.940
Jaccard Coefficient	0.400	0.333	0.400
Total	**81%**	**63%**	**50%**

Table A12-6
Abbot Run Brook (Cumberland)

Biological Protocol Ranking

Organism	1998	Count 1999	2000
Chimarra		31	9
Decapoda		1	
Ephemeroptera	90		42
Hydropsyche	10	62	34
Megaloptera			11
Oligochaeta		1	
Plecoptera		5	
Stenonema			4
Score Calculation			
Total Count	100	100	100
Taxa Richness	2	5	5
Shredders/Total	0.000	0.050	0.000
EPT Index	100	98	89
FBI	4.9	3.58	4.77
% Contribution	90.00%	62.00%	42.00%
Scrapers/Filter	9.000	0.000	0.980
Community Loss	0.980	0.980	0.970
Jaccard Coefficient	0.333	0.250	0.214
Total	**56%**	**50%**	**63%**

Table A12-7

Blackstone River

Biological Protocol Ranking

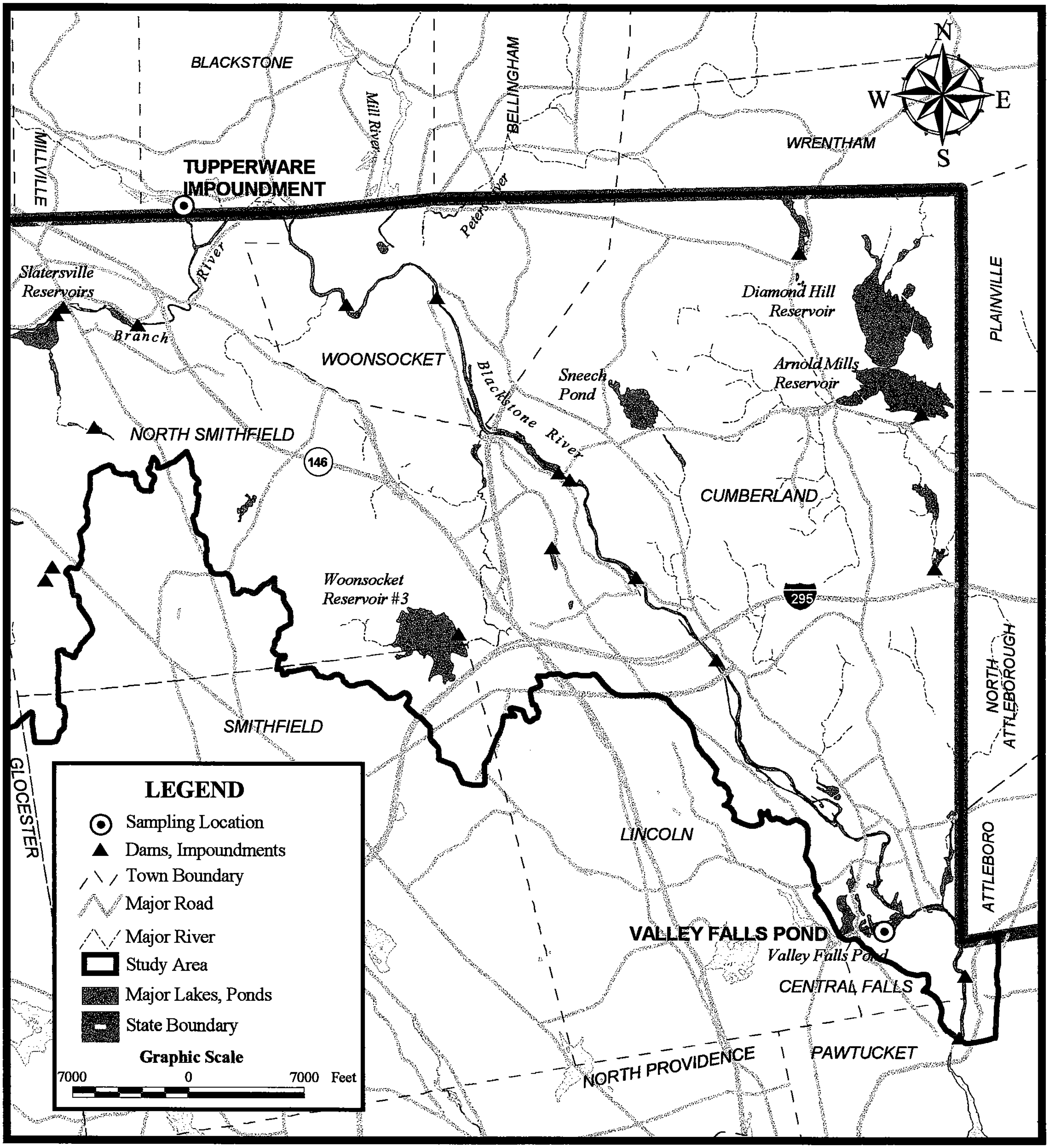
Organism	1998	1999	2000
	Count		
Amphipoda		1	
Chironomidae		7	8
Decapoda	1		
Ephemeroptera	16		20
Hirudinea	2	1	
Hydropsyche	79	91	46
Odonata			8
Pelecypoda			8
Stenonema			10
Tipulidae	1		
Score Calculatioı			
Total Count	98	100	100
Taxa Richness	6	4	6.00
Shredders/Total	0.010	0.010	0.00
EPT Index	95	91	76
FBI	4.36	4.62	5.00
% Contribution	79.00%	91.00%	46.00%
Scrapers/Filter	0.200	0.000	0.54
Community Loss	0.980	0.990	0.96
Jaccard Coefficient	0.200	0.125	0.29
Total	**69%**	**50%**	**63%**

Appendix 13

Dr. John King
University of Rhode Island

Sediment Core Data
- Tupperware Impoundment
- Valley Falls Pond

(Unpublished data)



The Louis Berger Group, Inc.

Rhode Island DEM

Source: RIGIS, MASSGIS

File: BW SMPL.apr | May 2002

Blackstone River Water Quality

Figure A13-1
URI SEDIMENT SAMPLING (Dr.King)

Table A13-1

Magnetic Susceptibility in Sediments
Tupperware Impoundment

DEPTH cm	Core TUPP1	Core TUPP2
2	14.7	
5	25.3	
8	30.5	
11	39.4	
14	44	
17	41.3	
20	35.8	
23	27.6	
26	22.8	
29	15.4	13.5
32	8.9	8.6
35	6.1	6.2
38	5.5	5.3
41	5.2	4.8
44	4.9	4.2
47	4.5	3.8
50	4	3.4
53	3.6	3.4
56	3.4	3.5
59	3.4	3.4
62	3.3	3.3
65	3.3	3.4
68	3.4	3.5
71	3.6	3.5
74	3.8	3.4
77	4.9	3.5
80		3.4
83		3.3
86		3.3
89		3.2
92		3.2
95		3
98		2.5

Source: Dr. John King, URI (unpublished data)

Note: No indications were given as to which core was chosen for trace metal analysis. Magnetic susceptibility was utilized as a field procedure to screen for polluted sediments. In general, polluted sediments register greater magnetic susceptibility than non-polluted sediments, i.e., give the sampler some selective capability as to which samples should be laboratory tested.

Table A13-2

Metal Concentrations in Sediments
Tupperware Impoundment

Sample Depth	Depth Range	Cadmium	Chromium	Copper	Lead	Nickel	Silver	Zinc	Manganese	Iron
cm	cm	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
1	0-2	73.9	478.0	630.0	450.0	230.0	1.5	1,560.0	407	26,200
3	2-4	43.4	243.0	450.0	240.0	130.0		1,040.0	306	17,600
5	4-6	31.6	186.0	240.0	180.0	120.0		775.0	279	15,000
7	6-8	24.1	223.0	330.0	220.0	100.0		968.0	187	14,600
9	8-10	42.2	470.0	900.0	570.0	110.0		2,140.0	387	32,200
11	10-12	23.5	327.0	580.0	400.0	60.0		1,380.0	246	24,800
13	12-14	25.6	353.0	700.0	450.0	60.0		1,480.0	293	26,200
15	14-16	27.8	368.0	730.0	480.0	68.0		1,530.0	313	26,500
17	16-18	9.6	229.0	450.0	350.0	40.0		801.0	206	19,800
19	18-20									
21	20-22	0.4	114.0	250.0	1,100.0	13.0		240.0	157	16,800
26	25-27	0.3	13.2	20.0	22.0	4.7		38.2	94	5,100
31	30-32									
36	35-37	0.0	6.0	3.6	3.1	3.3		10.4	70	3,900
41	40-42	0.0	4.5	1.5	2.7	2.5		7.8	59	2,800
51	50-52									
61	60-62	0.0	6.3	1.0	3.5	3.3		7.5	76	3,200
71	70-72									
81	80-82									
91	90-92	0.0	4.9	0.0	1.5	2.3		6.9	43	3,000
101	100-102	0.0	4.3	0.0	1.3	2.3		6.4	34	2,700

Source: Dr. John King, URI (unpublished data)

Table A13-3

Metal Concentrations in Sediments
Valley Falls Pond

Sample Depth cm	Cadmium ug/g	Copper ug/g	Chromium ug/g	Lead ug/g	Nickel ug/g	Silver ug/g	Zinc ug/g	Manganese ug/g	Iron ug/g
1	41.7	377.9	312.6	321.4	116.8	4.00	1,431.6	601	27,900
3	28.3	239.7	210.2	219.4	81.2	2.71	990.0	375	18,900
5	43.1	369.7	323.8	331.4	129.2	3.63	1,515.9	550	27,500
7	41.6	359.8	321.6	323.9	121.1	3.83	1,446.0	496	26,600
9	44.4	380.3	342.5	341.8	128.9	3.80	1,559.8	563	27,200
11	48.2	544.8	487.5	470.6	170.6	4.90	2,172.7	665	30,500
16	43.1	448.1	447.0	403.4	130.0	4.40	2,143.7	567	28,500
21	51.2	478.9	532.8	423.1	153.8	4.50	3,123.5	653	27,600
26	58.0	590.9	550.7	513.2	125.0	5.18	3,214.5	925	32,800
31	27.9	280.5	302.2	284.5	63.7	2.45	1,771.9	519	22,800
41	74.1	646.5	911.4	623.1	164.0	4.16	6,481.2	1,899	
51	86.3	620.9	1,025.2	627.7	123.4	3.07	7,422.8	1,976	63,200
71	40.3	614.5	958.7	637.0	74.2	0.76	4,926.5	637	34,900
81	6.1	487.3	949.0	616.2	50.9		1,939.0	401	22,000
83	6.1	435.8	866.8	555.8	46.8		1,660.0	383	21,900
91	4.8	474.8	871.9	739.8	95.7		876.4	271	22,300
113	0.1	12.2	26.6	6.0	7.7		30.8	211	10,400
123	0.2	12.3	24.8	7.5	6.7	0.18	34.2	183	9,600
143	0.1	6.5	13.5	2.6	6.0	0.21	22.8	116	6,400
153	0.2	7.0	11.9	2.8	5.8	0.20	21.4	114	5,700

Source: Dr. John King, URI (unpublished data)

Table A13-4

Nutrient Concentrations in Sediments
Valley Falls Pond

Sample Depth (cm)	Carbon (ug/mg)	Nitrogen (ug/mg)	Phosphorus (ug/g)
1	88.8	6.3	1,795
3	71.9	4.8	1,837
9	70.2	4.8	2,112
16	87.9	6.2	2,077
31	151	22.1	1,494
51	172.2	9.4	1,499

Source: Dr. John King, URI (unpublished data)

Appendix 14

RIPDES Permitted Discharges

Effluent Monitoring Data
January 1997 to October 2001

(Unpublished data)

RIPDES-Permitted Discharges:
Effluent Data, 1997 – 2001

(RIDEM, unpublished data)

Effluent discharge data are summarized for the following facilities that discharge constituents of concern (i.e., copper, lead, fecal coliform, nutrients):

- Atlantic Thermoplastics — Branch River
- Blackstone Smithfiled Corporation — Blackstone River
- Burrillville Wastewater Treatment Facility — Branch River
- Okonite Company — Blackstone River
- Osram Sylvania Products, Inc (2 outfalls) — Blackstone River
- Woonsocket Wastewater Treatment Facility — Blackstone River
- Zambarano Memorial Hospital — Clear River

The location of these facilities is presented in Figures 2-13A and 2-13B in the main text.

Table A14-1

Effluent Monitoring Data: *Atlantic Thermoplastics*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	6.95	12.02	14.69																	578	1,200
Minimum	5.50	0.21	0.60																	2	268
Maximum	7.60	84.00	100.00																	24,000	2,988
Concentrations - Weekly Average																					
Average		14.00	17.99																	*930*	
Minimum		3.00	2.00																	2	
Maximum		84.00	100.00																	24,000	
Concentrations - Maximum Daily																					
Average	7.73	14.00	17.99		25.09	1.09	12.20		5.42											930	
Minimum	7.00	3.00	2.00		0.20	0.01	0.02		0.05											2	
Maximum	8.50	84.00	100.00		77.90	12.60	46.80		9.25											24,000	
Loads (pounds/day)																					
Loads - Daily Average																					
Average		0.16	0.17																		
Minimum		0.01	0.01																		
Maximum		3.07	0.82																		
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Loads (kg/day)																					
Loads - Daily Average																					
Average		0.07	0.08																		
Minimum		0.00	0.00																		
Maximum		1.39	0.37																		
Loads - Daily Maximum																					
Average		0.00	0.00																		
Minimum		0.00	0.00																		
Maximum		0.0	0.0																		
Count	63	63	63	63	63	63	63		63											63	63

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table A14-2

Effluent Monitoring Data: *Blackstone Smithfield Corporation* *(Outfall 002)*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	7.63	31.75	19.61																	4,981	2,992
Minimum	7.60	3.00	2.28																	2	2,400
Maximum	7.70	160.00	57.00																	24,000	4,608
Concentrations - Weekly Average																					
Average			19.61																		
Minimum			2.28																		
Maximum			57.00																		
Concentrations - Maximum Daily																					
Average	7.81		19.61		10.46	2.02	4.21		2.93										1.19		3,659
Minimum	7.70		2.28		0.40	0.01	0.12		0.45										0.80		3,360
Maximum	8.10		57.00		39.80	13.00	27.30		20.00										2.00		4,800
Loads (pounds/day)																					
Loads - Daily Average																					
Average		0.78	0.52																		
Minimum		0.07	0.00																		
Maximum		3.84	1.59																		
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Loads (kg/day)																					
Loads - Daily Average																					
Average		0.35	0.24																		
Minimum		0.03	0.00																		
Maximum		1.74	0.72																		
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Count	48	48	48	48	48	48	48		48										48	48	48

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table A14-3

Effluent Monitoring Data: *Burrillville Wastewater Treatment Facility*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	6.40	5.78	10.27	16.27	7.61	0.74	5.26	10.29	0.70					22.38	1.31		0.28	32.12	10.00	28	830,000
Minimum	6.02	2.00	4.70	7.70	0.89	0.09	0.39	3.31	0.35					6.30	1.00		0.20	6.30	10.00	2	640,000
Maximum	6.81	16.00	32.70	24.87	20.60	1.62	11.95	23.00	1.56					74.30	2.40		0.50	73.40	10.00	149	1,220,000
Concentrations - Weekly Average																					
Average		8.10	14.03																	75	
Minimum		2.70	6.00																	3	
Maximum		17.80	49.50																	300	
Concentrations - Maximum Daily																					
Average	7.30	12.17	17.83	20.37	14.84		3.39	14.24	1.17	10.02	0.81			32.07	2.42		0.71	46.32	11.04	149	1,100,000
Minimum	6.84	3.90	7.50	9.60	1.70		0.01	5.60	0.69	0.10	0.10			9.00	1.00		0.20	8.00	10.00	8	700,000
Maximum	7.89	26.50	54.00	32.70	31.60		16.00	30.00	2.20	22.00	5.00			91.60	8.00		1.40	119.00	40.00	300	2,580,000
Loads (pounds/day)																					
Loads - Daily Average																					
Average		39.83	71.13						4.51												
Minimum		13.00	27.00						2.60												
Maximum		100.00	240.00						7.00												
Loads - Daily Maximum																					
Average		112.83	164.71																		
Minimum		34.00	48.00																		
Maximum		370.00	491.00																		
Loads (kg/day)																					
Loads - Daily Average																					
Average		18.04	32.22						2.04												
Minimum		5.89	12.23						1.18												
Maximum		45.30	108.72						3.17												
Loads - Daily Maximum																					
Average		51.11	74.61																		
Minimum		15.40	21.74																		
Maximum		167.6	222.4																		
Count	69	69	69	19	19	19	19	19	19	50	50			69	69		69	69	69	69	69

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table A14-4

Effluent Monitoring Data: *Okonite Co.*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	6.36																				80,000
Minimum	3.30																				30,000
Maximum	7.80																				140,000
Concentrations - Weekly Average																					
Average																					
Minimum																					
Maximum																					
Concentrations - Maximum Daily																					
Average	7.28													0.02							150,000
Minimum	6.90													0.02							60,000
Maximum	8.50													0.04							250,000
Loads (pounds/day)																					
Loads - Daily Average																					
Average																					
Minimum																					
Maximum																					
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Loads (kg/day)																					
Loads - Daily Average																					
Average																					
Minimum																					
Maximum																					
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Count	34													32							34

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table 14-5

Effluent Monitoring Data: ***Osram Sylvania Products, Inc.*** *(Outfall 001)*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	7.50											0.03	0.01		0.03		0.02				580,000
Minimum	7.00											0.03	0.01		0.02		0.00				460,000
Maximum	7.40											0.03	0.02		0.05		0.04				710,000
Concentrations - Weekly Average																					
Average																					
Minimum																					
Maximum																					
Concentrations - Maximum Daily																					
Average	7.55											0.03	0.02		0.03		0.02				
Minimum	7.30											0.03	0.01		0.02		0.01				
Maximum	7.90											0.03	0.02		0.05		0.04				
Loads (pounds/day)																					
Loads - Daily Average																					
Average			49.28																		
Minimum			39.08																		
Maximum			58.41																		
Loads - Daily Maximum																					
Average			65.44																		
Minimum			53.94																		
Maximum			78.16																		
Loads (kg/day)																					
Loads - Daily Average																					
Average			22.32																		
Minimum			17.70																		
Maximum			26.46																		
Loads - Daily Maximum																					
Average			29.64																		
Minimum			24.43																		
Maximum			35.41																		
Count	4	4	4									4	4		4		4				4

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table 14-6

Effluent Monitoring Data: *Osram Sylvania Products, Inc.* *(Outfall 200)*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Tin, Total	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	7.63																				330,000
Minimum	7.10																				
Maximum	8.00																				670,000
Concentrations - Weekly Average																					
Average																					
Minimum																					
Maximum																					
Concentrations - Maximum Daily																					
Average	8.07										0.99	14.00	2.87	13.87	37.43		3.09	29.26	16.55		530,000
Minimum	7.80										0.00	0.01	0.00	0.01	0.04		0.00	0.04	5.00		310,000
Maximum	8.40										9.00	60.00	10.00	43.00	123.00		30.00	94.00	80.00		1,820,000
Loads (pounds/day)																					
Loads - Daily Average																					
Average			43.09								0.31										
Minimum			8.01								0.26										
Maximum			454.59								0.36										
Loads - Daily Maximum																					
Average			57.96								0.52										
Minimum			9.36								0.38										
Maximum			504.40								0.64										
Loads (kg/day)																					
Loads - Daily Average																					
Average			19.52								0.14										
Minimum			3.63								0.12										
Maximum			205.93								0.16										
Loads - Daily Maximum																					
Average			26.26								0.24										
Minimum			4.24								0.17										
Maximum			228.49								0.29										
Count	3	3	152								15	15	15	15	14		14	14	11		151

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table A14-7

Final Effluent Monitoring Data: *Woonsocket Wastewater Treatment Facility*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	6.75	15.69	20.70	20.65	20.04	0.33	5.66	17.67	5.60	48.16	1.13	11.92	17.65	22.33	4.74	6.17	0.89	87.27	10.59	13	9,180,000
Minimum	5.60	6.00	2.40	6.50	0.50	0.05	4.07	2.10	0.40	10.00	0.30	9.50	10.00	6.90	1.00	2.90	0.20	16.00	0.07	2	5,230,000
Maximum	7.47	40.20	60.10	35.10	30.10	0.73	7.68	34.00	10.20	407.60	2.90	41.10	56.70	64.30	13.20	11.40	3.38	861.00	56.00	108	13,520,000
Concentrations - Weekly Average																					
Average		19.97	26.78																	*(1)*	
Minimum		8.00	3.00																	2	
Maximum		50.00	91.00																	80,038	
Concentrations - Maximum Daily																					
Average	7.38	32.57	43.22	36.59	28.51	0.54	1.32	33.22	9.38	144.40	1.83	12.61	32.69	45.26	8.52	10.38	1.59	280.71	45.16	4,818	
Minimum	6.94	10.00	5.00	9.00	2.00	0.00	0.01	4.30	0.70	10.00	0.50	10.00	10.00	13.00	1.00	4.20	0.20	39.00	0.25	2	
Maximum	10.00	130.00	132.00	75.00	43.00	4.50	11.40	74.00	19.20	1330.00	4.20	50.00	260.00	206.30	44.10	21.50	5.00	3780.00	430.00	240,000	
Loads (pounds/day)																					
Loads - Daily Average																					
Average		1,267	1,622																		
Minimum		393	114																		
Maximum		3,897	3,658																		
Loads - Daily Maximum																					
Average		3,368	4,360																		
Minimum		684	250																		
Maximum		14,236	14,004																		
Loads (kg/day)																					
Loads - Daily Average																					
Average		574	735																		
Minimum		178	52																		
Maximum		1,765	1,657																		
Loads - Daily Maximum																					
Average		1,526	1,975																		
Minimum		310	113																		
Maximum		6,449	6,344																		
Count	55	58	58	11	58	58	58	16	58	58	58	16	42	58	58	16	58	58	58	58	58

(1) Reported values was 1,550 col/100 ml, which does not appear to the reflected by the original data.

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Table A14-8

Effluent Monitoring Data: *Dr. U.E. Zambarano Memorial Hospital*

Data Period: January 31, 1997, to October 31, 2001

	pH	BOD5	TSS	Total Nitrogen	Ammonia (as N)	Nitrite (as N)	Nitrate (as N)	Kjeldahl Nitrogen (as N)	Total Phosphorus (as P)	Cyanide, total	Cadmium, total	Chromium (VI)	Chromium, total	Copper, total	Lead, total	Nickel, total	Silver, total	Zinc, total	Chlorine, Total Residual	Fecal Coliform	Flow
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	MPN/ 100 ml	gallons per day
Concentrations																					
Concentrations - Monthly Average																					
Average	6.57	4.84	5.96																0.89	4	50,000
Minimum	6.23	2.10	1.00																0.09	0	30,000
Maximum	7.03	16.30	35.00																1.30	66	70,000
Concentrations - Weekly Average																					
Average		5.88	7.66																3.11	22	
Minimum		2.10	1.00																0.10	0	
Maximum		26.00	65.00																128.00	1,100	
Concentrations - Maximum Daily																					
Average	7.06	16.98	7.68																1.81	22	80,000
Minimum	6.86	2.10	1.00																1.20	0	40,000
Maximum	7.38	690.00	65.00																2.20	1,100	90,000
Loads (pounds/day)																					
Loads - Daily Average																					
Average		2.13																			
Minimum		0.80																			
Maximum		7.20																			
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Loads (kg/day)																					
Loads - Daily Average																					
Average		0.96																			
Minimum		0.36																			
Maximum		3.26																			
Loads - Daily Maximum																					
Average																					
Minimum																					
Maximum																					
Count	122	122	122																122	122	122

Note: Values measured as ">" or "<" concentrations were averaged in data base using the actual detection limit.

Data Source: Rhode Island Department of Environmental Management

Appendix 15

The Blackstone River Initiative:
Water Quality Analysis of the Blackstone River
Under Wet and Dry Weather Conditions

(Wright et al., 2001)

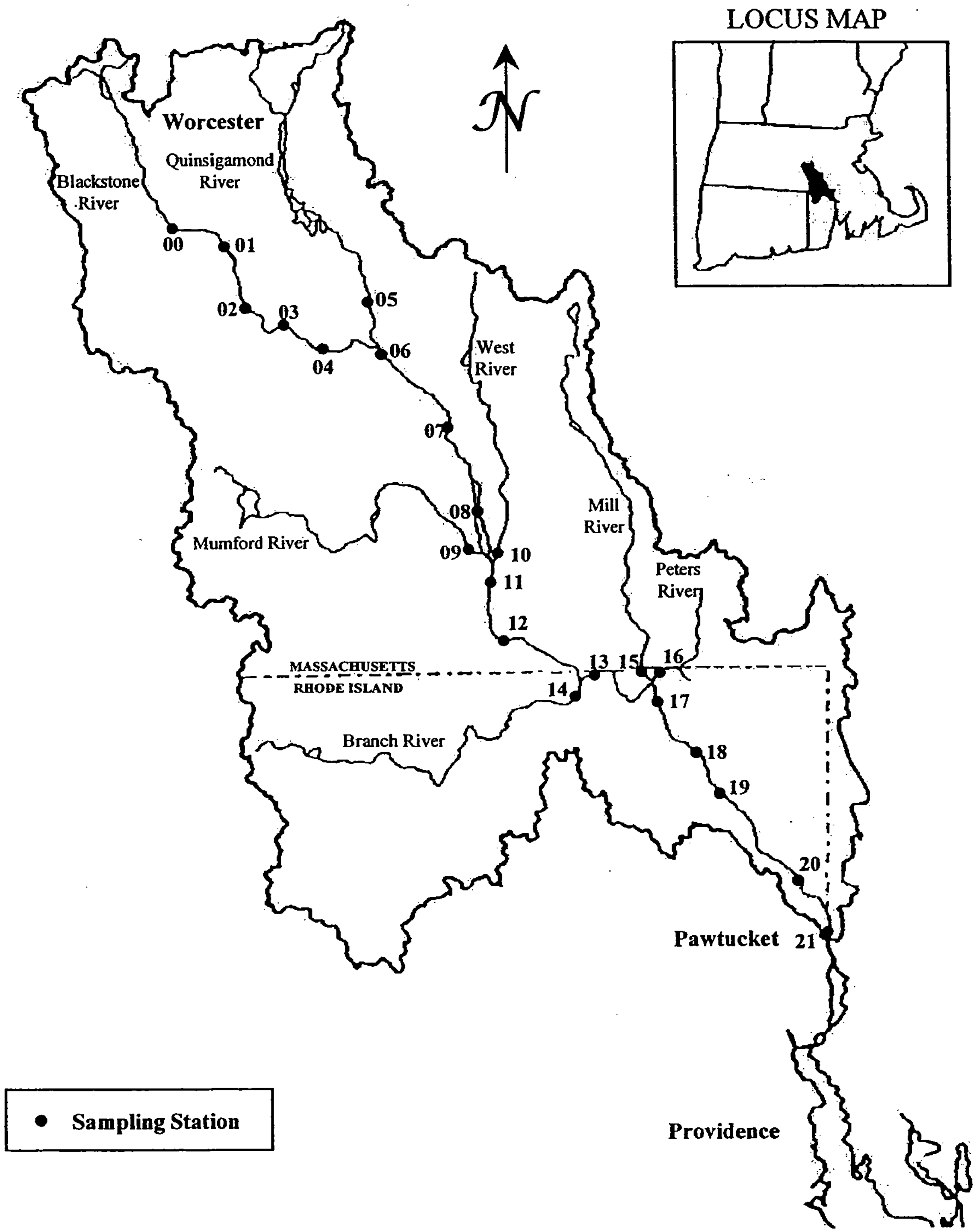


Figure A15-1 Sampling Station Location

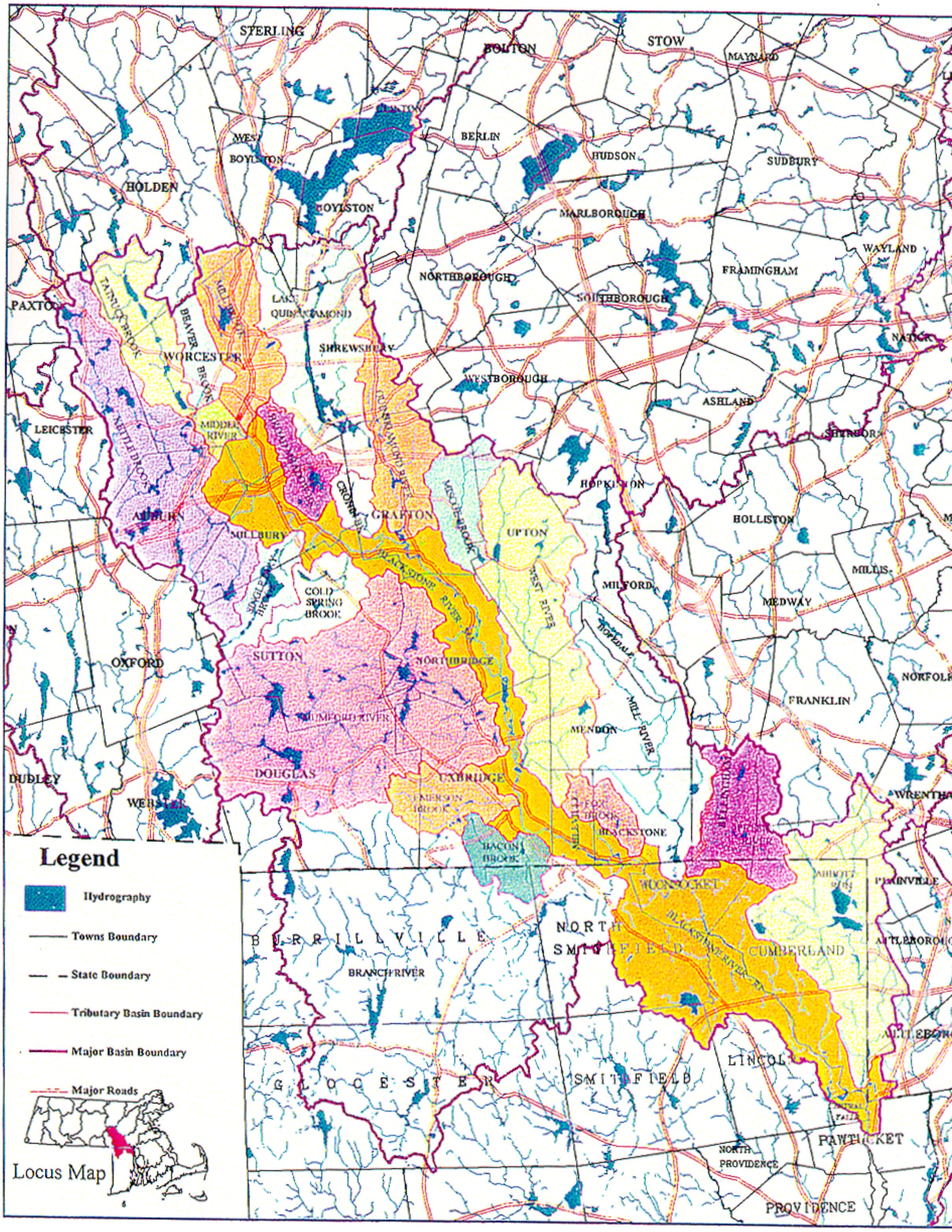


Figure 2.2 Blackstone River Watershed Sub-basins (Mass DEP/GIS Office)

Section A15-1

Dry Weather Data - Metals

River Stations

- Dissolved Cd
- Dissolved Cr
- Dissolved Cu
- Dissolved Ni
- Dissolved Pb

- Dissolved Cd
- Dissolved Cr
- Dissolved Cu
- Dissolved Ni
- Dissolved Pb

- Total Cd
- Total Cr
- Total Cu
- Total Ni
- Total Pb

- Partition Coefficients for Metals

Treatment Plant

- All metals

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Dissolved Cd Conc.(ppb), Avg. Hardness (ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.02	0.05	0.02	0.08	**0.04**	0.03	0.09	0	73.94	2.37	0.76
BLK02	2.49*	3.03*	3.45*	3.30*	**3.07***	0.42	3.74	2.4	66.35	2.1	0.7
BLK03	2.14*	1.88*	2.52*	1.54+	**2.02***	0.41	2.68	1.36	59.61	1.87	0.65
BLK04	1.33+	1.59+	1.04+	1.07+	**1.26+**	0.26	1.67	0.85	66.81	2.12	0.71
BLK05	0.02	0.02	0.02		**0.02**	0	0.02	0.02	52.23	1.61	0.58
BLK06	0.47	0.54	0.91+	0.77+	**0.67+**	0.2	1	0.35	60.27	1.89	0.65
BLK07	0.12	0.25	0.64	0.92	**0.48**	0.37	1.06	-0.1	55.95	1.73	0.61
BLK08	0.11	0.16	0.28	0.18	**0.18**	0.07	0.29	0.07	54	1.67	0.6
BLK09	0.02	0.02	0.02		**0.02**	0	0.02	0.02	19.16	0.52	0.26
BLK10	0.02	0.02	0.02	0.02	**0.02**	0	0.02	0.02	21.89	0.6	0.29
BLK11	0.23	0.23	0.28	0.43	**0.29**	0.09	0.44	0.14	45.74	1.38	0.52
BLK12	0.36	0.22	0.17	0.08	**0.21**	0.12	0.39	0.02	45.04	1.36	0.52
BLK13	0.12	0.13	0.15	0.19	**0.15**	0.03	0.19	0.09	40.42	1.2	0.48
BLK14	0.02	0.02	0.02	0.02	**0.02**	0	0.02	0.02	14.88	0.39	0.21
BLK15	0.02	0.02	0.09	0.02	**0.04**	0.04	0.09	-0.02	24.54	0.68	0.32
BLK16	0.25	0.02	0.23	0.18	**0.17**	0.1	0.34	0	35.74	1.05	0.43
BLK17	0.33	0.05	0.26	0.01	**0.16**	0.13	0.39	-0.02	40.34	1.2	0.48
BLK18	0.16	0.22	0.45	0.23	**0.27**	0.13	0.47	0.06	41.27	1.23	0.48
BLK19	0.12	0.13	0.22	0.18	**0.16**	0.05	0.24	0.09	41.32	1.23	0.48
BLK20	0.15	0.06	0.21	0.12	**0.14**	0.06	0.23	0.04	42.14	1.26	0.49
BLK21	0.02	0.02	0.13	0.17	**0.09**	0.08	0.21	-0.04	43.55	1.31	0.5

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.22	0.23	0.2		**0.22**	0.02	0.25	0.18	65.41	2.07	0.69
BLK02	3.27*	4.11*	3.87*	3.82*	**3.77***	0.36	4.33	3.2	55.15	1.7	0.6
BLK03	2.93*	2.94*	3.25*	3.32*	**3.11***	0.2	3.43	2.79	55.2	1.71	0.6
BLK04	2.10*	2.68*	2.78*	2.15*	**2.43***	0.35	2.99	1.87	54.34	1.67	0.6
BLK05		0.12	0.05	0.02	**0.06**	0.05	0.19	-0.06	44.17	1.33	0.51
BLK06	1.56+	1.43+	1.64*	2.09*	**1.68***	0.29	2.14	1.22	51.31	1.57	0.57
BLK07	0.72+	0.70+	0.74+	1.03+	**0.80+**	0.16	1.05	0.55	47.96	1.45	0.54
BLK08	1.29+	1.08+	1.30+	1.37*	**1.26+**	0.13	1.46	1.06	43.83	1.32	0.5
BLK09	0.02	0.31	0.07	0.02	**0.11**	0.14	0.33	-0.12	16.84	0.45	0.24
BLK10	0.08		0.17		**0.13**	0.06	0.7	-0.57	18.44	0.49	0.26
BLK11	0.42	0.74+	0.81+	0.67+	**0.66+**	0.17	0.93	0.38	35.61	1.04	0.43
BLK12	0.50+			0.53+	**0.52+**	0.02	0.71	-0.19	34.53	1	0.42
BLK13	0.54	0.4	0.99	0.25		0.32	1.05	0.04	30.22	0.87	0.37
BLK14	0.21	0.1	0.25+	0.02	**0.14**	0.1	0.31	-0.02	16.85	0.45	0.24
BLK15	0.08	0.02	0.02	0.02	**0.04**	0.03	0.08	-0.01	21.18	0.58	0.29
BLK16	0.16	0.05	0.12	0.17	**0.13**	0.05	0.21	0.04	28.41	0.81	0.36
BLK17	0.3	0.23	0.21	0.32	**0.27**	0.05	0.35	0.18	29.56	0.84	0.37
BLK18	0.76+	0.81+	0.73+	0.70+	**0.75+**	0.05	0.82	0.68	32.66	0.94	0.4
BLK19	0.57+	0.57+	0.92+		**0.69+**	0.2	1.19	0.18	35.39	1.04	0.43
BLK20	0.45	0.38	0.3	0.08	**0.30**	0.16	0.56	0.05	38.72	1.14	0.46
BLK21	0.42	0.33	0.24		**0.33**	0.09	0.55	-0.11	37.59	1.11	0.45

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.28	0.1	0.15	0.11	**0.16**	0.08	0.29	0.03	47.98	1.46	0.54
BLK02	0.52	1.17+	2.30*	2.60*	**1.65+**	0.97	3.19	0.1	53.94	1.66	0.59
BLK03	3.62*	0.87+	1.64*	2.10*	**2.06***	1.16	3.9	0.21	52.91	1.63	0.58
BLK04	1.01+	0.62+	1.47+	1.37+	**1.12+**	0.39	1.73	0.5	49.31	1.5	0.55
BLK05	0.09	0.05	0.05	0.05	**0.06**	0.02	0.09	0.02	39.59	1.17	0.47
BLK06	0.31	0.58+	1.03+	0.90+	**0.70+**	0.32	1.22	0.19	46.9	1.42	0.53
BLK07	1.01+	0.79+	0.86+	0.77+	**0.86+**	0.11	1.03	0.68	44.77	1.35	0.51
BLK08	1.04+	0.92+	0.90+	0.96+	**0.96+**	0.06	1.05	0.86	44.96	1.35	0.51
BLK09	0.02	0.02	0.02	0.02	**0.02**	0	0.02	0.02	13.63	0.35	0.2
BLK10	0.2	0.06	0.07	0.05	**0.09**	0.07	0.21	-0.01	17.57	0.47	0.25
BLK11	0.96+	0.61+	0.71+	0.57+	**0.71+**	0.18	0.99	0.43	33.24	0.96	0.41
BLK12	0.68+	0.38	0.89+	0.57+	**0.63+**	0.21	0.97	0.29	33.16	0.96	0.41
BLK13	0.63+	0.55+	0.67+	0.45+	**0.58+**	0.1	0.73	0.42	31.65	0.91	0.39
BLK14	0.09		0.02	0.02	**0.04**	0.04	0.14	-0.06	11.54	0.29	0.18
BLK15	0.05	0.05	0.12	0.05	**0.07**	0.04	0.13	0	18.83	0.51	0.26
BLK16	0.05	0.11	0.05		**0.07**	0.03	0.13	0	29.14	0.83	0.37
BLK17	0.47+		0.41+	0.41+	**0.43**	0.03	0.52	0.34	27.98	0.79	0.35
BLK18	0.49+	0.26	0.39+	0.15	**0.32+**	0.15	0.56	0.09	28.22	0.8	0.36
BLK19	0.49+	0.19	0.3	0.36	**0.34**	0.13	0.53	0.14	29.32	0.84	0.37
BLK20	0.39+	0.23	0.35	0.43+	**0.35**	0.09	0.49	0.21	29.49	0.84	0.37
BLK21	0.07	0.26	0.27	0.41+	**0.25**	0.14	0.47	0.03	30.35	0.87	0.38

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates violations according to the Fresh Water Aquatic Life Criteria;
"+" Indicates violations according to the Chronic Criterion.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Dissolved Cr Conc.(ppb), Avg.Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.4	2		1.4	**1.27**	0.81	3.27	-0.74	73.94	1168	148
BLK02	2.1	3.5	2.4	3.5	**2.88**	0.73	4.04	1.71	66.35	1070	136
BLK03	3	2	1.6	2.7	**2.33**	0.64	3.34	1.31	59.61	985	126
BLK04	2.1	1.5	2.1	2.7	**2.10**	0.49	2.88	1.32	66.81	1076	137
BLK05	0.1	0.1	0.1		**0.10**	0	0.1	0	52.23	882	114
BLK06	1.6	0.9	1.2	1.9	**1.40**	0.44	2.1	0.7	60.27	990	127
BLK07	1.1	0.4	1.1	2.9	**1.38**	1.07	3.08	-0.33	55.95	933	120
BLK08	1.3	0.8		1.4	**1.17**	0.32	1.97	0.37	54	906	117
BLK09	0.6	0.1	0.3	0.3	**0.33**	0.21	0.65	0	19.16	397	56
BLK10	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	21.89	441	61
BLK11	1.6	0.9	0.8	1.2	**1.13**	0.36	1.7	0.55	45.74	793	103
BLK12	2	0.6	0.9	0.7	**1.05**	0.65	2.08	0.02	45.04	783	102
BLK13	0.9	0.6	0.6	0.8	**0.73**	0.15	0.96	0.49	40.42	718	94
BLK14	0.1	0.5	0.1	0.4	**0.28**	0.21	0.6	-0.05	14.88	325	47
BLK15	0.2	0.1	0.1	0.1	**0.13**	0	0.1	0.1	24.54	482	66
BLK16	0.1		0.2	0.1	**0.13**	0.06	0.28	-0.01	35.74	651	86
BLK17	0.6	0.8	0.7	0.4	**0.63**	0.17	0.9	0.35	40.34	717	94
BLK18	0.4	1	1.1		**0.83**	0.38	1.77	-0.11	41.27	730	96
BLK19	0.3	0.9	0.5		**0.57**	0.31	1.33	-0.19	41.32	731	96
BLK20	0.3	0.3	0.6	0.4	**0.40**	0.14	0.63	0.17	42.14	743	97
BLK21	0.4	0.3	1.3	0.7	**0.68**	0.45	1.39	-0.04	43.55	762	100

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	3.4	5.9	11.2	4.3	**6.20**	3.49	11.75	0.65	65.41	1058	135
BLK02	4.3	3.3		6.9	**4.83**	1.86	9.45	0.22	55.15	922	119
BLK03	3.3	3	2.8	4.8	**3.48**	0.91	4.92	2.03	55.2	923	119
BLK04	2.1	2.9	2.9	2.9	**2.70**	0.4	3.34	2.06	54.34	911	117
BLK05	0.1	0.4	0.3	0.1	**0.23**	0.15	0.46	-0.01	44.17	771	101
BLK06	1.7		2.2	2.1	**2.00**	0.26	2.66	1.34	51.31	870	112
BLK07	1.4	2.2	1.7	1.4	**1.68**	0.38	2.28	1.07	47.96	824	107
BLK08	4.1	1.8	2.4	2.6	**2.73**	0.98	4.28	1.17	43.83	766	100
BLK09	0.6	0.7	0.4	0.7	**0.60**	0.14	0.83	0.37	16.84	358	51
BLK10	0.1	0.1	1		**0.40**	0.52	1.69	-0.89	18.44	385	55
BLK11	1.1	2.3	1.7	1.4	**1.63**	0.51	2.44	0.81	35.61	649	86
BLK12	1.1	1.3	1	1.4	**1.20**	0.18	1.49	0.91	34.43	633	84
BLK13	1.5	1.2	1.2	0.7	**1.15**	0.33	1.68	0.62	30.22	569	76
BLK14	0.5		0.3	0.6	**0.47**	0.15	0.85	0.09	16.85	359	51
BLK15	0.2	0.1	0.1	0.3	**0.18**	0.1	0.33	0.02	21.18	429	60
BLK16	0.2	0.1	0.1	0.5	**0.23**	0.19	0.53	-0.08	28.41	542	73
BLK17	0.8	0.6	0.8	0.8	**0.75**	0.1	0.91	0.59	29.56	559	75
BLK18	1.4	1.3	1		**1.23**	0.21	1.75	0.72	32.66	605	81
BLK19	0.6	1.1	1	1.1	**0.95**	0.24	1.33	0.57	35.39	646	86
BLK20	0.9	0.7	0.7	0.9	**0.80**	0.12	0.98	0.62	38.72	694	91
BLK21	0.9	0.7	0.6	0.8	**0.75**	0.13	0.95	0.54	37.59	678	89

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	1.6	1.1	2.1	1.6	**1.60**	0.41	2.25	0.95	47.98	808	107
BLK02	1.6	1	1.5	2.2	**1.58**	0.49	2.36	0.79	53.94	889	117
BLK03	1.7	0.8	1.1	2	**1.40**	0.55	2.27	0.53	52.91	876	115
BLK04	1.4	0.6	0.7	1.3	**1.00**	0.41	1.65	0.35	49.31	826	109
BLK05	0.1	0.1	0.1		**0.10**	0	0.1	0.1	39.59	690	93
BLK06	0.4	1	0.6	0.5	**0.63**	0.26	1.04	0.21	46.9	793	105
BLK07	2.1	0.9	0.7	0.9	**1.15**	0.64	2.17	0.13	44.77	763	102
BLK08	1.3	1	0.8	1.4	**1.13**	0.28	1.56	0.69	44.96	766	102
BLK09	0.4	0.4	0.3	0.4	**0.40**	0	0.41	0.38	13.63	288	45
BLK10			0.1	0.1	**0.10**	0	0.1	0	17.57	354	53
BLK11	3.4	0.9	1.1	0.6	**1.50**	1.28	3.54	-0.54	33.24	598	82
BLK12	1.6	0.8	1.8	0.2	**1.10**	0.74	2.28	-0.08	33.16	597	82
BLK13	1	0.7	0.6		**0.77**	0.21	1.28	0.25	31.65	575	79
BLK14	0.3	0.4	0.1	0.1	**0.23**	0.15	0.46	-0.01	11.54	252	40
BLK15	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	18.83	376	55
BLK16	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	29.14	537	75
BLK17	1.5	0.8	0.8	0.7	**0.95**	0.37	1.54	0.36	27.98	519	72
BLK18	0.9	0.8	0.5	0.7	**0.73**	0.17	1	0.45	28.22	523	73
BLK19	0.8	0.7	0.7	0.6	**0.70**	0.08	0.83	0.57	29.32	540	75
BLK20	0.6	0.7	1.3	0.5	**0.78**	0.36	1.35	0.2	29.49	542	75
BLK21	1.2	1.1	1.1	0.6	**1.00**	0.27	1.43	0.57	30.35	555	77

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates violaitons according to the Fresh Water Aquatic LIfe Criteria.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Dissolved Cu Conc.(ppb),Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	6.1	1.9	3	1.4	**3.10**	2.11	6.45	-0.25	73.94	11.34	7.77
BLK02	37.1	27.2	26.4	26.9	**29.40**	5.14	37.58	21.22	66.35	10.23	7.08
BLK03		22.1	25.2	21.4	**22.90**	2.02	27.92	17.88	59.91	9.3	6.49
BLK04	19.9	20.4	19.9	19.5	**19.93**	0.37	20.51	19.34	66.81	10.3	7.12
BLK05	0.1	0.1	0.1		**0.10**	0	0.1	0.1	52.23	8.17	5.77
BLK06	15.1	14.5	16.9	14.4	**15.23**	1.16	17.07	13.38	60.27	9.35	6.52
BLK07	7.9	8.6			**8.25**	0.49	12.7	-4.45	55.95	8.72	6.12
BLK08	7.5	8.3	10.2	7	**8.25**	1.41	10.49	6.01	54	8.43	5.93
BLK09	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	19.16	3.18	2.45
BLK10	1.3	0.1	0.1	0.1	**0.40**	0.6	1.35	-0.55	21.89	3.6	2.75
BLK11	5.1	6.4	8.5	7.6	**6.90**	1.48	9.25	4.55	45.74	7.21	5.15
BLK12	7.3	5.2	8.1	4.6	**6.30**	1.67	8.95	3.64	45.04	7.11	5.08
BLK13	5.2	4.1	7.1	2.8	**4.80**	1.82	7.7	1.9	40.42	6.42	4.63
BLK14	1.2	2.9		0.1	**1.40**	1.41	4.9	-2.1	14.88	2.5	1.97
BLK15	3.1	0.1	2.2	0.1	**1.38**	1.52	3.79	-1.04	24.54	4.01	3.03
BLK16	14.7	2.6	4.6	0.1	**5.50**	6.4	15.69	-4.69	35.74	5.71	4.17
BLK17	4.5	2.9	7.2	1.8	**4.10**	2.35	7.83	0.37	40.34	6.4	4.62
BLK18		3.7	10.3		**7.00**	4.67	48.93	-41.93	41.27	6.55	4.72
BLK19	3.8	3.2	6.6	5.4	**4.75**	1.54	7.21	2.29	41.32	6.55	4.73
BLK20	3.7	3.7	5.2	2.9	**3.88**	0.96	5.4	2.35	42.14	6.67	4.8
BLK21	3.4	3.7	5.1	3.8	**4.00**	0.75	5.2	2.8	43.55	6.89	4.94

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	6.3	5.3	6	9	**6.65**	1.62	9.23	4.07	65.41	10.1	7
BLK02	23.2	20.5	23.6	20.3	**21.90**	1.74	24.67	19.13	55.15	8.6	6.04
BLK03	22.4	18	26.6	19.1	**21.53**	3.87	27.68	15.37	55.2	8.61	6.05
BLK04	24.9	18.2	22.1	19.2	**21.10**	3.03	25.91	16.29	54.34	8.48	5.97
BLK05	0.1	0.3	2.5	0.1	**0.75**	1.17	2.61	-1.11	44.17	6.98	5
BLK06	18.5	20.6	20	18	**19.28**	1.23	21.23	17.32	51.31	8.03	5.69
BLK07	10.8	10.2	12.5	12.4	**11.48**	1.15	13.31	9.64	47.96	7.54	5.36
BLK08	15	10.3	17.7	16.4	**14.85**	3.23	19.98	9.72	43.83	6.93	4.96
BLK09	0.1	0.5	0.9	0.1	**0.40**	0.38	1.01	-0.21	16.84	2.81	2.19
BLK10	0.1	0.3	3.5	2.7	**1.65**	1.71	4.37	-1.07	18.44	3.06	2.37
BLK11	6	7.2	11.6	6.4	**7.80**	2.58	11.91	3.69	35.61	5.7	4.16
BLK12	7.2	11.3	8.8	5.8	**8.28**	2.36	12.03	4.52	34.53	5.53	4.05
BLK13	6	5.1	8.1	4.1	**5.83**	1.7	8.54	3.11	30.22	4.88	3.61
BLK14	1.5	2.3	1.8	1.5	**1.78**	0.38	2.38	1.17	16.85	2.81	2.19
BLK15	1.6	0.2	0.1	0.1	**0.50**	0.74	1.68	-0.67	21.18	3.49	2.67
BLK16	0.5			2.3	**1.40**	1.27	12.84	-11.44	28.41	4.61	3.43
BLK17	5.4	3.2	4.3	3.9	**4.20**	0.92	5.66	2.74	29.56	4.78	3.54
BLK18	9.5	6.7	5.5	6	**6.93**	1.79	9.77	4.08	32.66	5.25	3.86
BLK19	6.5	6.9	6.9		**6.77**	0.23	7.34	6.19	35.39	5.66	4.14
BLK20	7.8	5.5	5.5	5.6	**6.10**	0.06	5.68	5.39	38.72	6.16	4.47
BLK21	5.3	6.7	6.4	5.3	**5.93**	0.73	7.09	4.76	37.59	5.99	4.35

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	5.4	2.7	8.6	4.8	**5.38**	2.44	9.26	1.49	47.98	7.54	5.36
BLK02	12.3	8.8	15.4	14.5	**12.75**	2.94	17.42	8.08	53.94	8.42	5.93
BLK03	12.5	6.8	13.6	14.6	**11.88**	3.49	17.43	6.32	52.91	8.27	5.83
BLK04	12.3	5.6	13.5	15.8	**11.80**	4.38	18.77	4.83	49.31	7.74	5.49
BLK05	0.8	1.2	1.2	2.5	**1.43**	0.74	2.6	0.25	39.59	6.29	4.55
BLK06	8.2	8	10.8	10	**9.25**	1.37	11.43	7.07	46.9	7.38	5.26
BLK07	13.1	7.6	8.6	12.1	**10.35**	2.66	14.58	6.12	44.77	7.06	5.06
BLK08	11	11.3	10.2	10.2	**10.68**	0.56	11.57	9.78	44.96	7.09	5.08
BLK09	2	0.8	1	3.1	**1.73**	1.06	3.41	0.04	13.63	2.3	1.83
BLK10	1.5	1	1		**1.17**	0.29	1.88	0.45	17.57	2.93	2.27
BLK11	10.6	6.1	8	6.6	**7.83**	2.02	11.03	4.62	33.24	5.34	3.92
BLK12	7	5	10.9	6.8	**7.43**	2.49	11.38	3.47	33.16	5.32	3.91
BLK13	7.2	5.9		5.9	**6.33**	0.75	8.2	4.47	31.65	5.1	3.76
BLK14	3.6	3.8		1.8	**3.07**	1.1	5.8	0.33	11.54	1.97	1.59
BLK15	2	1.8		1.4	**1.73**	0.31	2.49	0.97	18.83	3.12	2.41
BLK16	2.5	2.1			**2.30**	0.28	4.84	-2.54	29.14	4.71	3.5
BLK17	5.1		5.6	6.1	**5.60**	0.5	6.84	4.36	27.98	4.54	3.38
BLK18	6	8.2	5.6	5.9	**6.43**	1.2	8.33	4.52	28.22	4.57	3.41
BLK19	4.4	5.3	5.8	6	**5.38**	0.71	6.51	4.24	29.32	4.74	3.52
BLK20	3.4	4.2		7.6	**5.07**	2.23	10.61	-0.47	29.49	4.77	3.54
BLK21	6.1	5.3	5.6	5.8	**5.70**	0.34	6.24	5.16	30.35	4.9	3.63

Blanks represent the statistical outlier (Grubbs & Beck) of total Cu; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Dissolved Pb Conc.(ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	1.9	0.5	0.7	1.1	**1.05**	0.62	2.04	0.06	73.94	27.8	0.54
BLK02	0.6	0.1	1.1	3	**1.20**	1.27	3.22	-0.82	66.35	24.22	0.47
BLK03	0.4	0.5	0.6	2.4	**0.98**	0.95	2.48	-0.53	59.91	21.27	0.42
BLK04	0.1	0.4	2.1	0.2	**0.70**	0.94	2.2	-0.8	66.81	24.43	0.48
BLK05	0.1	0.1	0.1	2.3	**0.65**	1.1	2.4	-1.1	52.23	17.86	0.35
BLK06	5.6	94.8	2.6	2	**26.25**	45.73	99	-46.5	60.27	21.43	0.42
BLK07	1.6	5.8	4.7	5.2	**4.33**	1.87	7.3	1.35	55.95	19.49	0.38
BLK08	1.8	3	4.2	0.9	**2.48**	1.44	4.76	0.19	54	18.63	0.36
BLK09	0.9	0.2	0.9	0.7	**0.68**	0.33	1.2	0.15	19.16	4.98	0.1
BLK10	0.8	1.2	1.6		**1.20**	0.4	2.19	0.21	21.89	5.91	0.12
BLK11	1.2	3.7	3.4	3.6	**2.98**	1.19	4.87	1.08	45.74	15.08	0.3
BLK12	2.8		2.6	5.7	**3.70**	1.73	8.01	-0.61	45.04	14.79	0.29
BLK13	1.5	1.3	2.1	0.8	**1.43**	0.54	2.28	0.57	40.42	12.89	0.25
BLK14		1.5	0.8	0.2	**0.83**	0.65	2.44	-0.78	14.88	3.61	0.07
BLK15	0.8			0.4	**0.60**	0.35	1.31	-0.44	24.54	6.83	0.13
BLK16	5.7	1.3	3.4	1.4	**2.95**	2.07	6.25	-0.35	35.74	11.02	0.22
BLK17	0.5	0.1	2.3	0.4	**0.83**	1	2.41	-0.76	40.34	12.85	0.25
BLK18	0.2	0.1	2	0.1	**0.60**	0.93	2.09	-0.89	41.27	13.23	0.26
BLK19	0.1	0.1	0.8	0.3	**0.33**	0.33	0.85	-0.2	41.32	13.26	0.26
BLK20			1.5	0.1	**0.80**	0.99	9.69	-8.89	42.14	13.59	0.27
BLK21	0.3	0.1	1.6	0.5	**0.63**	0.67	1.69	-0.44	43.55	14.17	0.28

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	2.5	4.5	4.5	4.2	**3.93**	0.96	5.45	2.4	65.41	23.78	0.46
BLK02	3.1	2.4		2.5	**2.67**	0.38	3.61	1.73	55.15	19.14	0.37
BLK03	1.2	3.2		1.2	**1.87**	1.15	4.74	-1	55.2	19.16	0.37
BLK04	4	4	6.6	1.5	**4.03**	2.08	7.34	0.71	54.34	18.78	0.37
BLK05		3.3	2.1	0.1	**1.83**	1.62	5.85	-2.18	44.17	14.43	0.28
BLK06	7.2	11.9	12.8	3.9	**8.95**	4.17	15.58	2.32	51.31	17.46	0.34
BLK07	5.7	11.5	21	4.6	**10.70**	7.5	22.64	-1.24	47.96	16.02	0.31
BLK08	13	9.4	24.5	11	**14.48**	6.48	25.36	3.59	43.83	14.29	0.28
BLK09	0.4	4.9	3.2	0.1	**2.15**	2.3	5.82	-1.52	16.84	4.23	0.08
BLK10		2.8	4.6	1.3	**2.90**	1.65	7	-1.2	18.44	4.75	0.09
BLK11	4.2	9.2		4.3	**5.90**	2.86	13	-1.2	35.61	10.97	0.21
BLK12	2.2	15.7	6	3	**6.73**	6.2	16.59	-3.14	34.53	10.55	0.21
BLK13	5.5			0.8	**3.15**	3.32	33.01	-29.86	30.22	8.9	0.17
BLK14	1.2	1.3	0.9	1.1	**1.13**	0.17	1.4	0.85	16.85	4.23	0.08
BLK15	1.1		0.2	0.2	**0.50**	0.52	1.79	-0.79	21.18	5.66	0.11
BLK16	1.7	0.8	1.7	4.3	**2.13**	1.51	4.53	-0.28	28.41	8.23	0.16
BLK17	1.5	1.3	1.5		**1.43**	0.12	1.72	1.15	29.56	8.66	0.17
BLK18	5.5	2.6	3.5	1.3	**3.23**	1.77	6.03	0.42	32.66	9.83	0.19
BLK19	2.5	5	5.1	0.1	**3.18**	2.38	6.96	-0.61	35.39	10.88	0.21
BLK20	2.3	0.4	2.1	0.1	**1.23**	1.14	3.03	-0.58	38.72	12.2	0.24
BLK21	2.9	2.2	0.7	0.1	**1.48**	1.3	3.54	-0.59	37.59	11.75	0.23

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.4	0.9	2.9	1.4	**1.40**	1.08	3.12	-0.32	47.98	16.02	0.31
BLK02	0.9	1.3	2	2.7	**1.73**	0.79	2.99	0.46	53.94	18.6	0.36
BLK03	0.3	0.6	1.4	1.4	**0.93**	0.56	1.82	0.03	52.91	18.15	0.35
BLK04	2.4	1.6	1.9	2.3	**2.05**	0.41	2.68	1.37	49.39	16.59	0.32
BLK05	0.7	0.7	0.4	1	**0.70**	0.24	1.09	0.31	39.59	12.55	0.24
BLK06	2.3	2.3		1.7	**2.10**	0.35	2.96	1.24	46.9	15.56	0.3
BLK07	6.1	2.9	2.7	3.3	**3.75**	1.58	6.26	1.23	44.77	14.67	0.29
BLK08	3.7	2.8	2.5	5.8	**3.70**	1.49	6.07	1.33	44.96	14.75	0.29
BLK09	2.4	1.1	1	0.6	**1.28**	0.78	2.52	0.03	13.63	3.23	0.06
BLK10	2.4	0.9	1.7	0.9	**1.48**	0.72	2.63	0.32	17.57	4.46	0.09
BLK11	5.2	1.8	3.4	1.8	**3.05**	1.62	5.63	0.47	33.24	10.04	0.2
BLK12	6.7	1.5	6.2	1.7	**4.03**	2.81	8.49	-0.44	33.16	10.01	0.2
BLK13	3	1.8	3.8	1.4	**2.50**	1.1	4.25	0.75	31.65	9.44	0.18
BLK14		1.2	0.7	0.3	**0.73**	0.45	1.85	-0.39	11.54	2.61	0.05
BLK15	2.5	0.8	0.4	0.5	**1.05**	0.98	2.61	0.51	18.83	4.87	0.09
BLK16	2.1	1.9	1.2	0.4	**1.40**	0.77	2.63	0.17	29.14	8.49	0.17
BLK17	9.4	1	1.4	2.3	**3.53**	3.98	9.85	-2.81	27.98	8.07	0.16
BLK18	3.1	1.7	1.1		**1.97**	1.03	4.52	-0.58	28.22	8.15	0.17
BLK19	2.2	1.5	1.1	1.4	**1.55**	0.47	2.29	0.81	29.32	8.56	0.17
BLK20	0.9	1	2.3	1.7	**1.48**	0.66	2.52	0.43	29.49	8.62	0.17
BLK21	2.1	1.2	1.1	1.9	**1.58**	0.5	2.37	0.78	30.35	8.94	0.17

Blanks represent the statistical outlier (Grubbs & Beck) of total Pb; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

Dissolved Ni Conc.(ppb), Avg.Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	2.8	3.1	3.4	4.6	**3.48**	0.79	4.73	2.22	73.94	934	104
BLK02	27.8	25.6		24.4	**25.93**	1.72	30.22	21.65	66.35	852	95
BLK03	20.9	20.6	21.3	17.8	**20.15**	1.59	22.68	17.62	59.61	781	87
BLK04		18.2	16.6	15.8	**16.87**	1.22	19.9	13.83	66.81	857	95
BLK05	0.1		0.1		**0.10**	0	0.1	0	52.23	696	77
BLK06	6.9	7.3	10.8	10.6	**8.90**	2.09	12.22	5.58	60.27	785	87
BLK07	5.4	7.5	8	7.3	**7.05**	1.14	8.86	5.24	55.95	738	82
BLK08	6.5	6.7	6.1	5.4	**6.17**	0.57	7.09	5.26	54	716	80
BLK09	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	19.16	298	33
BLK10	0.1	0.1	0.1	0.1	**0.10**	0	0.1	0.1	21.89	333	37
BLK11		5.4	5.1	6.1	**5.53**	0.51	6.81	4.26	45.74	622	69
BLK12	2.7	5.5	5.8	4.1	**4.53**	1.42	6.79	2.26	45.04	614	68
BLK13		4.9	5.1	4.5	**4.83**	0.31	5.59	4.07	40.42	560	62
BLK14	0.1	1.3	1.3	0.1	**0.70**	0.69	1.8	-0.4	14.88	241	27
BLK15	0.1	0.1		0.1	**0.10**	0	0.1	0.1	24.54	367	41
BLK16	1.7	1.3	2.7	0.1	**1.45**	1.08	3.16	-0.26	35.74	505	56
BLK17	4.3		4.5	3.9	**4.23**	0.31	4.99	3.47	40.34	559	62
BLK18	0.5	3.7		5.5	**3.23**	2.53	9.52	-3.06	41.27	570	63
BLK19		4.4	5	5.2	**4.87**	0.42	5.9	3.83	41.32	571	63
BLK20	1.9	3.9	4.1	3.9	**3.45**	1.04	5.1	1.8	42.14	580	65
BLK21	1.9	2.2	3.4	4.2	**2.92**	1.07	4.63	1.22	43.55	597	66

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	8.3	5.7	5.8	8.4	**7.05**	1.5	9.44	4.66	65.41	842	94
BLK02	38.5	32.8	38.3	50.3	**39.98**	7.37	51.7	28.25	55.15	728	81
BLK03	34.5	28.5	33.1	35.8	**32.97**	3.18	38.04	27.91	55.2	728	81
BLK04		28.7	30.3	30.2	**29.73**	0.9	31.96	27.51	54.34	719	80
BLK05	1.2	0.2	0.9	0.4	**0.68**	0.46	1.4	-0.05	44.17	604	66
BLK06	24.8		25	25.1	**24.97**	0.15	25.35	24.59	51.31	685	76
BLK07	18	16.7	19.1	20	**18.45**	1.42	20.72	16.18	47.96	647	72
BLK08	17.1	14.3	16.4		**15.93**	1.45	19.5	12.33	43.83	599	66
BLK09	0.1	0.1	0.3	0.6	**0.28**	0.24	0.66	-0.11	16.84	267	30
BLK10	0.1		0.7		**0.40**	0.42	4.21	-3.81	18.44	288	32
BLK11	8.6	9.5	10.9	10.5	**9.88**	1.03	11.52	8.23	35.61	503	56
BLK12	8.6	9.5	9.1		**9.07**	0.45	10.19	7.95	34.53	490	54
BLK13	8.4	6.4	6.6	7.2	**7.15**	0.9	8.58	5.72	30.22	438	48
BLK14	0.4		0.5	0.7	**0.53**	0.15	0.91	0.15	16.85	267	29
BLK15		0.6	0.1	0.1	**0.27**	0.29	0.98	-0.45	21.18	324	36
BLK16	0.1	0.1	0.1		**0.10**	0	0.1	0.1	28.41	416	46
BLK17	5.9		5.2	1.4	**4.17**	2.42	10.18	-1.88	29.56	429	48
BLK18	7.9	8.1	7	6.7	**7.43**	0.68	8.51	6.34	32.66	468	52
BLK19	9.3	8.5		8.6	**8.55**	0.07	9.19	-0.64	35.39	500	55
BLK20	9.3	8.9	8.3	9.2	**8.93**	0.45	9.64	8.21	38.72	540	60
BLK21	6.7	7.8	7.7	8.9	**7.78**	0.9	9.21	6.34	37.59	526	58

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	4.6	2	4.3	3.2	**3.53**	1.18	5.4	1.65	47.98	647	72
BLK02	11.3	5.7	11.2	13.4	**10.40**	3.29	15.64	5.16	53.94	714	79
BLK03	11.3		11.2	11.5	**11.33**	0.15	11.71	10.95	52.91	703	77
BLK04	10.5		10.7	10.7	**10.63**	0.12	10.92	10.35	49.31	662	74
BLK05	0.5	0.6			**0.55**	0.07	1.19	-0.64	39.59	550	60
BLK06	6.2	6.6	7.9	6.8	**6.88**	0.73	8.03	5.72	46.9	634	71
BLK07	7.1	6.9	7.5		**7.17**	0.31	7.93	6.41	44.77	610	67
BLK08	7.6		8.2	8.3	**8.03**	0.38	8.97	7.09	44.96	612	68
BLK09	0.1	0.1	0.7		**0.30**	0.3	1.16	-0.56	13.63	223	25
BLK10	0.1	0.1	0.5	0.7	**0.35**	0.3	0.83	-0.13	17.57	276	31
BLK11	5.5	0.9	8.8	6.5	**5.43**	3.32	10.7	0.15	33.24	474	53
BLK12	4.8	0.1	9	6.8	**5.18**	3.79	11.21	-0.86	33.16	473	53
BLK13	4.9	0.5	8.6	5.5	**4.88**	3.34	10.18	-0.43	31.65	455	50
BLK14		1.5	3.5	1.2	**2.07**	1.25	5.17	-1.04	11.54	194	22
BLK15	0.7	0.5		1.4	**0.87**	0.47	2.04	-0.31	18.83	293	3
BLK16		0.7	3.8	1.1	**1.87**	1.69	6.06	-2.32	29.14	424	47
BLK17	4	8.3	7.4	4.4	**6.03**	2.15	9.44	2.61	27.98	410	46
BLK18	3.7	4.9	7.8	4.2	**5.15**	1.83	8.07	2.23	28.22	413	46
BLK19	4.8	2.3	9.6	4.2	**5.23**	3.11	10.17	0.28	29.32	426	47
BLK20	4.8	2.4			**3.60**	1.7	18.85	-15.25	29.49	428	48
BLK21	4.7	2.1	10.2	4.4	**5.35**	3.44	10.82	-0.12	30.35	439	48

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates violations according to the Fresh Water Aquatic Life Criteria.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Particulate Cd Conc.(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	0.31	0.27	0.38	0.3	**0.32**	0.05	0.39	0.24
BLK02	0.6	1.31	0.07	0.24	**0.56**	0.55	1.43	-0.32
BLK03	0.43	0.66	0.35	0.85	**0.57**	0.23	0.93	0.21
BLK04	0.62	0.58	1.3	0.57	**0.77**	0.36	1.33	0.2
BLK05	0.08	0.03	0.08		**0.06**	0.03	0.13	-0.01
BLK06	0.72	0.39	0.3	0.29	**0.43**	0.2	0.75	0.1
BLK07	0.65	0.62	0.12	0.17	**0.39**	0.28	0.84	-0.06
BLK08	1.69	0.89	0.82	1.57	**1.24**	0.45	1.96	0.52
BLK09	0.03	0.14	0.18	0.1	**0.11**	0.06	0.21	0.01
BLK10	0.04	0	0.31		**0.12**	0.17	0.54	-0.3
BLK11	0.54	0.97	1.04	0.91	**0.87**	0.22	1.22	0.51
BLK12	0.28	0.4	0.22	0.37	**0.32**	0.08	0.45	0.19
BLK13	0.8	0.46	0.48	0.37	**0.53**	0.18	0.83	0.22
BLK14	0.16	0.05	0	0.09	**0.08**	0.07	0.18	-0.03
BLK15	0.03	0.04	0.04	0.07	**0.05**	0.02	0.07	0.02
BLK16	0.29	0.07	0.65	0.11	**0.28**	0.26	0.7	-0.14
BLK17	0.24	0.35	0.33	0.4	**0.33**	0.07	0.44	0.22
BLK18	0.42	0.33	0.1	0.34	**0.30**	0.14	0.52	0.08
BLK19	0.23	0.25	0.2	0.29	**0.24**	0.04	0.3	0.18
BLK20	0.2	0.18	0.09	0.24	**0.18**	0.06	0.28	0.08
BLK21	0.21	0.27	0.27	0.21	**0.24**	0.03	0.3	0.18

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	0.06	0.08	0.18		**0.11**	0.06	0.27	-0.05
BLK02	0.88	0.29	0.04	0.34	**0.39**	0.35	0.95	-0.18
BLK03	0.57	0.67	0.17	0.2	**0.40**	0.25	0.81	0
BLK04	0.73	0.07	0.68	0.39	**0.47**	0.3	0.95	-0.02
BLK05		0.01	0.04	0.09	**0.05**	0.04	0.15	-0.05
BLK06	0.17	0.07	0.16	0.29	**0.17**	0.09	0.32	0.03
BLK07	0.3	0.08	0.21	0.12	**0.18**	0.1	0.33	0.02
BLK08	0.79	0.35	0.4	0.66	**0.55**	0.21	0.88	0.22
BLK09	0	0.04	0.02	0.11	**0.04**	0.05	0.12	-0.03
BLK10	0	0	0.21		**0.11**	0.15	1.44	-1.33
BLK11	0.53	0.18	0.37	0.26	**0.34**	0.15	0.57	0.09
BLK12	0.28			0.33	**0.31**	0.04	0.31	0.31
BLK13	0.13	0.08	0.15	0.28	**0.16**	0.09	0.3	0.02
BLK14	0.02	0.01	0.09	0.35	**0.12**	0.16	0.37	-0.14
BLK15	0.08	0.1	0.06	0.33	**0.14**	0.02	0.13	0.03
BLK16	0	0.01	0.11		**0.04**	0.06	0.19	-0.11
BLK17	0.2	0.15	0.3	0.22	**0.22**	0.06	0.32	0.12
BLK18	0.13	0.27	0.09	0.54	**0.26**	0.2	0.58	-0.07
BLK19	0	0.16	0.01		**0.06**	0.09	0.28	-0.17
BLK20	0.11	0.09	0.19	0.22	**0.15**	0.06	0.25	0.05
BLK21	0.03	0.05	0.23		**0.10**	0.11	0.38	-0.17

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	0.14	0.04	0.08	0.24	**0.13**	0.09	0.26	-0.01
BLK02	0	0.18	0.55	0.54	**0.32**	0.27	0.75	-0.12
BLK03	0.2	0.34	1.04	0.62	**0.55**	0.37	1.14	-0.04
BLK04	0.84	0.71	0.64	0.63	**0.71**	0.1	0.86	0.55
BLK05	0.04	0.03	0.03	0.03	**0.03**	0	0.03	0.03
BLK06	2.48	0.48	0.45	0.53	**0.99**	1	2.57	-0.6
BLK07	0.07	0.39	0.34	0.51	**0.33**	0.19	0.62	0.03
BLK08	0.6	0.52	0.4	0.46	**0.50**	0.09	0.63	0.36
BLK09	0.1	0.07	0.06	0.11	**0.09**	0.02	0.12	0.05
BLK10	0.07	0.04	0.02	0	**0.03**	0.03	0.08	-0.02
BLK11	0.42	0.78	0.51	0.59	**0.57**	0.15	0.82	0.33
BLK12	0.5	0.91	0.27	0.48	**0.54**	0.27	0.97	0.11
BLK13	0.65	0.47	0.55	0.51	**0.55**	0.08	0.67	0.42
BLK14	0		0.04	0.08	**0.04**	0.04	0.14	-0.06
BLK15	0.03	0	0.1	0	**0.03**	0.05	0.11	-0.04
BLK16	0.03		0.09	0	**0.04**	0.05	0.15	-0.07
BLK17	0.04		0.3	0.27	**0.31**	0.04	0.41	0.21
BLK18	0.41	0.23	0.29	0.62	**0.39**	0.17	0.66	0.11
BLK19	0.07	0.23	0.26	0.28	**0.21**	0.1	0.36	0.06
BLK20	0.17	0.14	0.08	0.22	**0.15**	0.06	0.25	0.06
BLK21	0.48	0.1	0.16	0.19	**0.23**	0.17	0.5	-0.04

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Particulate Cr Conc.(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	4.1	2.8	3.6	3.6	**3.50**	0.54	4.38	2.66
BLK02	2.6	1.6	0.9	2.8	**1.98**	0.89	3.39	0.56
BLK03	0.4	1.7	0.2	1.6	**0.98**	0.78	2.22	-0.27
BLK04	1.7	0.9	1.1	1.6	**1.33**	0.39	1.94	0.71
BLK05	0	0.1	0		**0.03**	0.05	0.15	-0.09
BLK06	4.2	1.7	0.2	2.6	**2.17**	1.67	4.84	-0.49
BLK07	5.3	3	2.8	2.8	**3.48**	1.22	5.42	1.53
BLK08	23.2	6.1		24.9	**18.07**	10.4	43.9	-7.77
BLK09	0.3	0.4	0.6	1.1	**0.60**	0.36	1.17	0.03
BLK10	0.3	2.7	0.6	0.8	**1.10**	1.09	2.83	-0.63
BLK11	4.5	6.5	7.8	9	**6.95**	1.93	10.01	3.89
BLK12	0.8	1.6	0.8	1.8	**1.25**	0.53	2.09	0.41
BLK13	1.3	3.8	1.9	1.9	**2.22**	1.09	3.96	0.49
BLK14	0	0.4	0	0.4	**0.20**	0.23	0.57	-0.17
BLK15	0.3	0	0	0.2	**0.13**	0.15	0.36	-0.11
BLK16	0.5		1.9	0.6	**1.00**	0.78	2.94	-0.94
BLK17	0.9	0.2	0.5	1.2	**0.70**	0.44	1.4	0
BLK18	1.5	1.4	0.6		**1.17**	0.49	2.39	-0.06
BLK19	0.4	0.6	0.7		**0.57**	0.15	0.95	0.19
BLK20	0.8	0.7	0.4	0.7	**0.65**	0.17	0.93	0.37
BLK21	0.5	0.8	0.2	0.7	**0.55**	0.26	0.97	0.13

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	1.5	3.7	13.3	1.6	**5.03**	5.61	13.95	-3.9
BLK02	1.4	1.6		1.4	**1.47**	0.12	1.75	1.18
BLK03	1.6	1.5	1.4	1.2	**1.43**	0.17	1.7	1.15
BLK04	2.2	1.2	1	0.7	**1.27**	0.65	2.31	0.24
BLK05	0.6	1.2	0.7	0.3	**0.70**	0.37	1.3	0.1
BLK06	2.5		2	2.1	**2.20**	0.26	2.86	1.54
BLK07	3.9	2.4	1.4	1.8	**2.38**	1.1	4.12	0.63
BLK08	10.8	1.5	9	10.3	**7.90**	4.33	14.79	1.01
BLK09	0.8	1	1.2	0.5	**0.88**	0.3	1.35	0.4
BLK10	0.6	0.4	1		**0.66**	0.31	1.43	-0.1
BLK11	4.9	2	5	3.7	**3.90**	1.4	6.12	1.68
BLK12	2.1	2	2.1	1.7	**1.98**	0.19	2.28	1.67
BLK13	1.7	1.2	1.9	1.7	**1.63**	0.3	2.1	1.15
BLK14	0.6		0.5	0.6	**0.57**	0	0.6	0.6
BLK15	0.3	0.4	0.2	0.4	**0.33**	0.1	0.48	0.17
BLK16	0.4	0.2	0.3	0.4	**0.33**	0.1	0.48	0.17
BLK17	1.1	0.9	1.1	1.5	**1.15**	0.25	1.55	0.75
BLK18	1.8	0.7	0.8		**1.10**	0.61	2.61	-0.41
BLK19	1.2	1.4	1.2	0.6	**1.10**	0.35	1.65	0.55
BLK20	0.9	1.6	1.1	1.9	**1.38**	0.46	2.1	0.65
BLK21	0.8	1		0.9	**0.90**	0.1	1.15	0.65

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	1.2	1.7	2.1	4.1	**2.28**	1.27	4.3	0.25
BLK02	1.4	1.3	1.4	2.4	**1.63**	0.52	2.45	0.8
BLK03	1.3	1.7	2.1	2.2	**1.83**	0.41	2.48	1.17
BLK04	1.5	1.9	1.3	1.7	**1.60**	0.26	2.01	1.19
BLK05	0.1	0.1	0.1		**0.10**	0	0.1	0.1
BLK06	2	1.5	1.5	1.8	**1.70**	0.24	2.09	1.31
BLK07	1.4	2.2	1.6	2.6	**1.95**	0.55	2.83	1.07
BLK08	3.9	2.7	2.4	2.7	**2.93**	0.67	3.98	1.87
BLK09	0.5	0.7	0.7	0.5	**0.60**	0.12	0.78	0.42
BLK10	0.3	0.2	0.2		**0.23**	0.05	0.35	0.11
BLK11	1.8	4.5	3.5	3.8	**3.40**	1.15	5.22	1.58
BLK12	3	5.1	2.6	3.7	**3.60**	1.1	5.35	1.85
BLK13	3.7	3.1	3.6		**3.47**	0.32	4.27	2.67
BLK14	0.5	0.4	0.2	0.4	**0.38**	0.13	0.58	0.17
BLK15	0.3	0.2	0.1	0.1	**0.18**	0.09	0.31	0.03
BLK16	0.2	0.3	0.1	0	**0.18**	0.09	0.31	3
BLK17	1.9	2.4	1.9	2.7	**2.23**	0.39	2.85	1.6
BLK18	2.7	2.5	2	2.3	**2.38**	0.3	2.85	1.9
BLK19	2.7	1.6	1.7	1.6	**1.90**	0.53	2.74	1.05
BLK20	2.3	1.6	1.6	1.6	**1.78**	0.35	2.33	1.22
BLK21	2.5	0.1	1.4	1.6	**1.40**	0.99	2.98	-0.18

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Particulate Cu Conc.(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	8.9	4.8	3.9	7.3	**6.23**	2.29	9.87	2.58
BLK02	11.7	11.5	3.4	1.9	**7.13**	5.2	15.4	-1.15
BLK03		6.9	0.4	5.4	**4.23**	3.4	12.69	-4.22
BLK04	8.4	5.5	7	8.1	**7.25**	1.31	9.34	5.16
BLK05	1.2	1.5	1.1		**1.27**	0.21	1.78	0.75
BLK06	14.5	7.2	0.3	5.8	**6.95**	5.85	16.25	-2.35
BLK07	14.9	14.2			**14.55**	0.49	19	-4.45
BLK08	37.5	15.8	4.1	46.8	**26.05**	19.57	57.18	-5.08
BLK09	10.9	9.1	6.5	2.4	**7.22**	3.69	13.09	1.36
BLK10	39.7	1.3	10.6	23.3	**18.73**	16.64	45.2	-7.75
BLK11	10.6	16.6	17	18.1	**15.58**	3.39	20.95	10.2
BLK12	4.6	6.4	0.7	6.8	**4.63**	2.8	9.1	0.17
BLK13	3.6	5.8	7	5.7	**5.53**	1.41	7.77	3.28
BLK14	6.2	4.2		6.7	**5.70**	1.32	8.99	2.41
BLK15	1.7	3.6	2.1	2.3	**2.42**	0.82	3.73	1.12
BLK16	10.2	0.3	32.8	1.9	**11.30**	14.98	35.13	-12.53
BLK17	4.5	7.5	5.8	5.5	**5.83**	1.25	7.81	3.84
BLK18		7.5	0.4		**3.95**	5.02	49.06	-45.11
BLK19	3.7	3.6	2.5	1.7	**2.88**	0.95	4.39	1.36
BLK20	3.2	5	2.5	3	**3.42**	1.09	5.16	1.69
BLK21	3.3	4.9	3.4	2.9	**3.63**	0.88	5.02	2.23

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	3.6	2.3	5.5	1.1	**3.13**	1.88	6.12	0.13
BLK02	3.6	3.4	4.1	1.7	**3.20**	1.04	4.86	1.54
BLK03	5.9	4.4	4.2	3.6	**4.53**	0.98	6.08	2.97
BLK04	4.1	3	4.2	3.6	**3.73**	0.55	4.6	2.85
BLK05	2	3.1	0.7	0.9	**1.67**	1.11	3.44	-0.09
BLK06	7	1.7	6	6.5	**5.30**	2.43	9.17	1.43
BLK07	9.3	3.1	9.4	4	**6.45**	3.37	11.81	1.09
BLK08	21.8	5.7	12.2	8.8	**12.13**	6.97	23.22	1.03
BLK09	1.2	2.4	1.2	1.2	**1.50**	0.6	2.45	0.55
BLK10	0.9	1.2	1.3	0.7	**1.02**	0.28	1.46	0.59
BLK11	10.3	7.1	8.8	7.8	**8.50**	1.39	10.71	6.29
BLK12	4.6	0.9	6	5	**4.13**	2.23	7.67	0.58
BLK13	4.8	3.5	5.4	4	**4.43**	0.84	5.76	3.09
BLK14	1.9	0.2	0.3	3.7	**1.52**	1.65	4.14	-1.09
BLK15	3	3.2	0	6.5	**3.18**	2.66	7.4	-1.05
BLK16	2.6			0.3	**1.45**	1.63	16.06	-14.61
BLK17	1.9	2.8	3.1	4.4	**3.05**	1.03	4.7	1.4
BLK18	0.9	4	2.3	7.1	**3.58**	2.67	7.82	-0.67
BLK19	2.6	1.8	2.5		**2.30**	0.44	3.38	1.22
BLK20	1	3.8	5.1	3.4	**3.33**	1.71	6.05	0.6
BLK21	2.4	5	6	2.8	**4.05**	1.73	6.8	1.3

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	5.8	1.6	0.3	6.8	**3.63**	3.16	8.65	-1.4
BLK02	1.8	3.7	1.8	3	**2.58**	0.94	4.07	1.08
BLK03	4.3	2.3	5.2	4.9	**4.18**	1.3	6.25	2.1
BLK04	2.2	5.4	2.8	1.1	**2.88**	1.82	5.78	-0.03
BLK05	0.6	0	0.1		**0.23**	0.32	1.03	-0.57
BLK06	8.7	0.4	4.4	4.6	**4.53**	3.39	9.92	-0.87
BLK07	4.2	5.9	3.8	3.6	**4.38**	1.05	6.04	2.71
BLK08	8.9	5.1	4.2	7.6	**6.45**	2.18	9.91	2.99
BLK09	3.2	1.3	1.8	2.2	**2.13**	0.81	3.41	0.84
BLK10	0.1	0.7	1.3		**0.70**	0.6	2.19	-0.79
BLK11	5.7	14.9	6.3	12.3	**9.80**	4.52	16.99	2.61
BLK12	6	10.5	3.1	6.3	**6.48**	3.05	11.32	1.63
BLK13	5.7	6.4		6.6	**6.23**	0.47	7.41	5.06
BLK14	0.6	0.1		2.3	**1.00**	1.15	3.87	-1.87
BLK15	0.7	1		0.4	**0.70**	0.3	1.45	-0.05
BLK16	0.4	0.2			**0.30**	0.14	1.57	-1.27
BLK17	4.7		3.6	3.1	**3.80**	0.82	5.83	1.77
BLK18	7.3	0.6	1.8	5	**3.67**	3.05	8.52	-1.17
BLK19	2.8	2.1	4.2	2.9	**3.00**	0.88	4.39	1.61
BLK20		1.4		1.3	**1.97**	0.07	1.35	1.35
BLK21	0.3	1.5	4.3	2.7	**2.20**	1.71	4.92	-0.52

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Particulate Pb Conc.(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	3.1	3.4	0.7	6.1	**3.33**	2.21	6.84	-0.19
BLK02	2.9	3.1	0.2	1	**1.80**	1.43	4.07	-0.47
BLK03	3.1	2.4		0.9	**2.13**	1.12	4.93	-0.66
BLK04	2.9	3.7	6.7	4.8	**4.53**	1.65	7.14	1.91
BLK05	0.8	1.8	1.8	0.5	**1.23**	0.68	2.3	0.15
BLK06	53.1	23.2	0.2	11	**21.88**	22.84	58.21	-14.46
BLK07	15.1	268.2	93.7	7.7	**96.18**	121.11	288.85	-96.5
BLK08	21.8	13.9	0.6	31.6	**16.98**	13.1	37.82	-3.87
BLK09	0.2	3.1	7	2.1	**3.10**	2.86	7.66	-1.46
BLK10	2.6	1	2		**1.87**	0.81	3.87	-0.14
BLK11	8	12.1	49.9	28.4	**24.60**	19.03	54.88	-5.68
BLK12	2.3		0.3	0.4	**1.00**	1.13	3.8	-1.8
BLK13	10.9	9	16.1	14.9	**12.73**	3.33	18.03	7.42
BLK14	2.3	0.1	0.2	1.8	**1.10**	1.12	2.88	-0.68
BLK15	0.9			1.3	**1.10**	0.28	3.64	-2.54
BLK16	3.7	2.2	8.9	7.5	**5.58**	3.14	10.58	0.57
BLK17	3.2	3.9	2.2	4.3	**3.40**	0.92	4.86	1.94
BLK18	4.1	3.1	1.4	4.1	**3.17**	1.27	5.2	1.15
BLK19	2.1	1.9	1.7	2.2	**1.98**	0.22	2.33	1.62
BLK20			0.1	1.5	**0.80**	0.99	9.69	-8.89
BLK21	2.4	3.2	3.3	2.9	**2.95**	0.4	3.59	2.31

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	2.1	49.8	15.2	1.5	**17.15**	22.67	53.21	-18.91
BLK02	1.7	4.3		1.2	**2.40**	1.66	6.53	-1.73
BLK03	2.3	5.1		2	**3.13**	1.71	7.38	-1.11
BLK04	9.4	0.7	0.3	1	**2.85**	4.38	9.81	-4.11
BLK05		5	4.1	0.4	**3.17**	2.44	9.22	-2.89
BLK06	2	5.1	8.5	2.8	**4.60**	2.91	9.23	-0.03
BLK07	6	1.5	11	1.8	**5.07**	4.45	12.16	-2.01
BLK08	12.6	11	12.7	7.8	**11.02**	2.29	14.66	7.39
BLK09	0.7	1.2	1.9	0.9	**1.18**	0.53	2.01	0.34
BLK10		1	1.7		**1.35**	0.49	5.8	-4.45
BLK11	7.2	1.8		3.5	**4.17**	2.76	11.03	-2.69
BLK12	4.3	3.5	7.4	2.7	**4.48**	2.06	7.75	1.2
BLK13	2.7			5.4	**4.05**	1.91	21.2	-17.15
BLK14	1.6	1.2	1	2	**1.45**	0.44	2.16	0.74
BLK15	1		0.9	3.9	**1.93**	1.7	6.17	-2.3
BLK16	1.2	1.2	2.2	3.7	**2.08**	1.18	3.95	0.2
BLK17	3.5	3.2	4.3		**3.67**	0.57	5.08	2.25
BLK18	1.1	1.9	1.1	5.6	**2.43**	2.15	5.85	-1
BLK19	1.4	2.2	0.7	6.5	**2.70**	2.61	6.85	-1.45
BLK20	1.2	3	2.9	0	**1.78**	1.44	4.07	-0.52
BLK21	0.9	2.7	4.3	0	**1.98**	1.91	5.02	-1.07

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	2.2	3.4	3.1	6.2	**3.73**	1.73	6.47	0.98
BLK02	1.7	2	2.8	1.2	**1.93**	0.67	2.99	0.86
BLK03	2.4	2.3	8.3	3.3	**4.07**	2.85	8.6	-0.45
BLK04	1.5	2	3	2	**2.13**	0.63	3.13	1.12
BLK05	1.4	0.7	0.4	0.1	**0.65**	0.56	1.54	-0.24
BLK06	6	5.4		4.6	**5.33**	0.7	7.08	3.59
BLK07	3.7	3.8	6.1	3.7	**3.73**	0.06	3.88	3.59
BLK08	6.5	4.8	6.1	7.3	**6.18**	1.04	7.84	4.51
BLK09	0	4	3.9	3.7	**2.90**	1.94	5.98	-0.18
BLK10	2.2	2	1.5	1.5	**1.80**	0.36	2.37	1.23
BLK11	3.3	11.3	6	6.2	**6.70**	3.34	12.01	1.39
BLK12	0.7	9.4	4.6	5.9	**5.15**	3.59	10.87	-0.57
BLK13	5.2	7.9	10.6	5.5	**7.30**	2.51	11.29	3.31
BLK14		0.1	0.8	1.5	**0.80**	0.7	2.53	-0.94
BLK15	0.8	0.4	1.9	0.7	**0.95**	0.66	1.99	-0.09
BLK16	0.4	1.5	0	4.6	**1.63**	2.08	4.94	-1.69
BLK17	1.9	5.6	3	12.5	**5.75**	4.76	13.32	-1.82
BLK18	6.5	4.8	3.6		**4.96**	1.45	8.56	1.36
BLK19	1.5	2.9	2.5	4.3	**2.80**	1.16	4.65	0.95
BLK20	2.9	2.9	3.2	2.7	**2.92**	0.21	3.25	2.6
BLK21	2.9	2.9	3.2	2.7	**2.92**	0.21	3.25	2.6

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Particulate Ni Conc.(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	2.1	1.5	0.7	2.4	**1.67**	0.75	2.87	0.48
BLK02	5.1	4.5		2.7	**4.10**	1.25	7.2	1
BLK03	6.2	2.2	1.2	2.8	**3.10**	2.17	6.55	-0.35
BLK04	3.6	1	1.2	3	**2.20**	1.3	4.26	0.14
BLK05	0.1	1.3	0.1	0.3	**0.50**			
BLK06	2.8	4	0.2	1	**2.00**			
BLK07	2.2	1.8	0.1	2.8	**1.72**	1.16	3.57	-0.12
BLK08	5.8	2.6	0.6	7.9	**4.22**	3.25	9.4	-0.95
BLK09	0.1	1.8	1.1	1	**1.00**	0.7	2.11	-0.11
BLK10	0.1	1.4	7.5	3.4	**3.10**	3.23	8.24	-2.04
BLK11		3.1	2.7	0.5	**2.10**	1.4	5.58	-1.38
BLK12	1.2	2.4	1.4	2	**1.75**	0.55	2.63	0.87
BLK13	0.4	2.1	1.9	2.7	**1.78**	0.98	3.33	0.22
BLK14	0.1	0	0	1.8	**0.47**			
BLK15	0.1	0.8	0	1	**0.63**	0.47	1.81	-0.54
BLK16	3	0.2	6.5	0.7	**2.60**	2.87	7.17	-1.97
BLK17		2.5	5.7	2	**2.43**			
BLK18	2.4	1.2		0.5	**1.37**	0.96	3.75	-1.02
BLK19		0.7	0.6	0.3	**0.53**	0.21	1.05	0.02
BLK20	1.2	1.2	0	1.2	**0.90**			
BLK21	1.1	2.1	1.5	1.6	**1.57**	0.41	2.23	0.92

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	1.3	0.9	0.4	0.1	**0.68**	0.53	1.52	-0.17
BLK02	2.5	1.7	1.8	1.5	**1.88**	0.43	2.57	1.18
BLK03	6.9	2.8	1.1	5.3	**4.03**	2.58	8.13	-0.08
BLK04		2	2.3	1.5	**1.93**	0.4	2.94	0.93
BLK05	0.8	1	1	0.3	**0.78**	0.33	1.3	0.25
BLK06	1.8		1.1	0.7	**1.20**	0.56	2.58	-0.18
BLK07	1	0.4	2.6	1	**1.25**	0.94	2.75	-0.25
BLK08	2.2	1.7	1.7		**1.86**	0.28	2.56	1.17
BLK09	0.1	1	0.7	0.4	**0.55**	0.38	1.15	-0.05
BLK10	0.1		1.1		**0.60**	0.71	7.54	-6.99
BLK11	2.6	0.7	1.9	1.4	**1.65**	0.8	2.93	0.37
BLK12	1.9	0.5	1.3		**1.23**	0.7	2.98	-0.57
BLK13	0.7	1.2	1.1	1.4	**1.10**	0.29	1.57	0.63
BLK14	0		0	0.7	**0.23**	0	0	0
BLK15		0.2	0	1.5	**0.57**	0.81	2.59	-1.46
BLK16	0	0.1	0		**0.03**	0.06	0.18	-0.4
BLK17	1.3		2	6.1	**3.13**	2.59	9.58	-3.31
BLK18	1.5	1.2	0.3	3.3	**1.58**	1.26	3.58	-0.43
BLK19	0.9	0.6		0.7	**0.73**	0.15	1.11	0.35
BLK20	0.3	1	1.7	1.1	**1.03**	0.57	1.94	0.11
BLK21	1.2	5.2	3.8	1.2	**2.85**	1.99	6.01	-0.31

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"- RANGE"
BLK01	0.8	0.8	0.5	1.5	**0.90**	0.42	1.58	0.22
BLK02	0.8	2.8	1.5	0.4	**1.38**	1.05	3.05	-0.3
BLK03	1.8		1.7	1.7	**1.70**	0	1.7	1.7
BLK04	0.7		0.9	0.4	**0.67**	0.25	1.29	0.04
BLK05	0	0.1			**0.05**	0.07	0.69	-0.64
BLK06	2.2	1.8	1.3	2	**1.83**	0.39	2.44	1.21
BLK07	1.5	1.6	0.7		**1.27**	0.49	2.49	0.04
BLK08	1		0.9	1.3	**1.07**	0.21	1.58	0.55
BLK09	0	0	0		**0.00**	0	0	0
BLK10	0.1	0.1	0.3	1.2	**0.43**	0.53	1.26	-0.41
BLK11	1.1	5.3	1	1.8	**2.30**	2.03	5.53	-0.93
BLK12	1.1	3.6	0.7	0.6	**1.50**	1.42	3.75	-0.75
BLK13	1.2	2.2	2	1.9	**1.83**	0.43	2.52	1.13
BLK14		0.3	1.1	0.8	**0.73**	0.4	1.74	-0.27
BLK15	0.9	0.9		0.2	**0.67**	0.4	1.67	-0.34
BLK16		1.5	1.3	0.1	**0.97**	0.76	2.85	-0.91
BLK17	0.7	1.3	0.4	1	**0.85**	0.39	1.47	0.23
BLK18	2.3	1.5	0	0.9	**1.17**	0.97	2.72	-0.37
BLK19	0.7	0.3	0.1	0.9	**0.50**	0.37	1.08	-0.08
BLK20	0.7	0.4			**0.55**	0.21	2.46	-1.91
BLK21	0.5	0.4	2.5	0.2	**0.90**	1.07	2.61	-0.81

Blanks represent the statistical outlier (Grubbs & Beck) of total Cd; NS = Not Sampled;
Avg = Average value of all runs considered;
SD = Standard deviation; + Range & -Range = 95% Confidence interval.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Cd Conc.(ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.33	0.32	0.4	0.38	**0.36**		0.04	0.42	0.3	73.94	2.79	0.89
BLK02	3.09*	4.34*	3.52*	3.54*	**3.62***		0.52	4.45	2.79	66.35	2.47	0.82
BLK03	2.57*	2.54*	2.87*	2.39*	**2.59***		0.2	2.91	2.27	59.61	2.2	0.76
BLK04	1.97*	2.17*	2.34*	1.64*	**2.03***		0.3	2.51	1.54	66.81	2.49	0.83
BLK05	0.1	0.05	0.09	0.42	**0.17**	0.08	0.03	0.15	0.01	52.23	1.89	0.68
BLK06	1.19+	0.93+	1.21+	1.06+	**1.10+**		0.13	1.3	0.89	60.27	2.22	0.76
BLK07	0.77+	0.87+	0.76+	1.09+	**0.87+**		0.15	1.12	0.63	55.95	2.04	0.72
BLK08	1.80+	1.05+	1.10+	1.74+	**1.42+**		0.4	2.06	0.78	54	1.96	0.7
BLK09	0.05	0.16	0.2	0.12	**0.13**		0.06	0.23	0.03	19.16	0.61	0.31
BLK10	0.06	0.02	0.33	2.34	**0.69**	0.14	0.17	0.56	-0.28	21.89	0.71	0.34
BLK11	0.77+	1.20+	1.32+	1.34+	**1.16+**		0.27	1.58	0.73	45.74	1.62	0.61
BLK12	0.64+	0.62	0.39	0.45	**0.37**		0.12	0.72	0.33	45.04	1.6	0.61
BLK13	0.92+	0.59+	0.63+	0.56+	**0.68+**		0.17	0.93	0.41	40.42	1.41	0.56
BLK14	0.18	0.07	0.02	0.11	**0.10**		0.07	0.2	-0.01	14.88	0.46	0.25
BLK15	0.05	0.06	0.13	0.09	**0.08**		0.04	0.14	0.03	24.54	0.8	0.38
BLK16	0.54+	0.09	0.88+	0.29	**0.45**		0.34	0.99	-0.09	35.74	1.23	0.51
BLK17	0.57+	0.4	0.59+	0.5	**0.52**		0.09	0.65	0.38	40.34	1.41	0.56
BLK18	0.58+	0.55	0.55	0.57	**0.42**		0.01	0.59	0.54	41.27	1.45	0.57
BLK19	0.35	0.38	0.42	0.47	**0.41**		0.05	0.49	0.32	41.32	1.45	0.57
BLK20	0.35	0.24	0.3	0.36	**0.31**		0.06	0.4	0.22	42.14	1.48	0.58
BLK21	0.23	0.29	0.4	0.38	**0.33**		0.08	0.45	0.2	43.55	1.54	0.59

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.28	0.31	0.38		**0.32**		0.05	0.45	0.2	65.41	2.43	0.81
BLK02	4.15*	4.40*	3.91*	4.16*	**4.16***		0.2	4.47	3.84	55.15	2	0.71
BLK03	3.50*	3.61*	3.42*	3.52*	**3.51***		0.08	3.64	3.39	55.2	2.01	0.71
BLK04	2.83*	2.75*	3.46*	2.54*	**2.90***		0.4	3.53	2.26	54.34	1.97	0.7
BLK05		0.13	0.09	0.11	**0.11**		0.03	0.16	0.08	44.17	1.56	0.6
BLK06	1.73+	1.50+	1.82+	2.38*	**1.86***		0.37	2.45	1.26	51.31	1.86	0.67
BLK07	1.02+	0.78+	0.95+	1.15+	**0.98+**		0.15	1.22	0.73	47.96	1.71	0.64
BLK08	0.28	1.43+	1.70*	2.03*	**1.36+**		0.76	2.57	0.15	43.83	1.55	0.59
BLK09	0.02	0.35	0.09	0.13	**0.15**		0.14	0.37	-0.08	16.84	0.53	0.28
BLK10	0.08		0.38		**0.02**		0.21	2.14	-1.91	18.44	0.58	0.3
BLK11	0.95+	0.92+	1.18+	0.93+	**0.99+**		0.12	1.19	0.79	35.61	1.22	0.5
BLK12	0.78+		3.53	0.86+	**1.18**	0.82+	0.03	1.33	-0.51	34.53	1.18	0.49
BLK13	0.67+	0.48+	1.14*	0.53+	**0.71+**		0.3	1.18	0.23	30.22	1.02	0.44
BLK14	0.23	0.11	0.34+	0.37+	**0.26**		12	0.45	0.07	16.85	0.53	0.28
BLK15	0.16	0.12	0.08	0.35+	**0.18**		0.12	0.37	-0.01	21.18	0.68	0.34
BLK16	0.16	0.06	0.23	0.14	**0.15**		0.07	0.26	0.04	28.41	0.95	0.42
BLK17	0.50+	0.38	0.51+	0.52+	**0.48+**		0.07	0.59	0.37	29.56	0.99	0.44
BLK18	0.89+	1.08+	0.82+	1.24*	**1.01+**		0.19	1.31	0.71	32.66	1.11	0.47
BLK19	0.57+	0.73+	0.93+		**0.74+**		0.18	1.19	0.3	35.39	1.22	0.5
BLK20	0.56+	0.49	0.49	0.26	**0.45**		0.13	0.66	0.24	38.72	1.34	0.54
BLK21	0.45	0.38	0.47		**0.43**		0.05	0.55	0.32	37.59	1.3	0.53

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	0.42	0.14	0.23	0.35	**0.28**		0.12	0.48	0.09	47.98	1.71	0.64
BLK02	0.52	1.35+	2.85*	3.14*	**1.97***		1.24	3.94	-0.01	53.94	1.95	0.7
BLK03	3.82*	1.21+	2.68*	2.72*	**2.61***		1.07	4.31	0.9	52.91	1.91	0.69
BLK04	1.85*	1.13+	2.11*	2.00*	**1.77***		0.44	2.47	1.07	49.31	1.77	0.65
BLK05	0.09	0.02	0.02	0.02	**0.04**	0.02	0	0.02	0.02	39.59	1.38	0.55
BLK06	2.79*	1.06+	1.48+	1.43+	**1.69***		0.76	2.89	0.49	46.9	1.67	0.63
BLK07	1.08+	1.18+	1.14+	1.28+	**1.17+**		0.08	1.3	1.04	44.77	1.58	0.6
BLK08	1.64*	1.44+	1.30+	1.42+	**1.45+**		0.14	1.67	1.23	44.96	1.59	0.61
BLK09	0.12	0.09	0.08	0.13	**0.11**		0.02	0.14	0.07	13.63	0.41	0.24
BLK10	0.2	0.06	0.07	0.02	**0.09**		0.08	0.21	-0.04	17.57	0.55	0.29
BLK11	1.38*	1.39*	1.22*	1.16*	**1.29***		0.12	1.47	1.1	33.24	1.13	0.48
BLK12	1.18*	1.29*	1.16*	1.05+	**1.17***		0.1	1.33	1.01	33.16	1.13	0.48
BLK13	1.28*	1.02+	1.22*	0.96+	**1.12***		0.15	1.37	0.87	31.65	1.07	0.46
BLK14	0.09		0.06	0.1	**0.08**		0.02	0.14	0.03	11.54	0.34	0.21
BLK15	0.05	0.02	0.12	0.02	**0.05**		0.05	0.13	-0.02	18.83	0.6	0.31
BLK16	0.05		0.11	0.02	**0.06**		0.05	0.17	-0.05	29.14	0.98	0.43
BLK17	0.82+		0.71+	0.68+	**0.74+**		0.07	0.92	0.55	27.98	0.93	0.42
BLK18	0.90+	0.49+	0.68+	0.77+	**0.71+**		0.17	0.98	0.44	28.22	0.94	0.42
BLK19	0.56+	0.42	0.56+	0.64+	**0.55+**		0.09	0.69	0.4	29.32	0.98	0.43
BLK20	0.56+	0.37	0.43+	0.65+	**0.50+**		0.13	0.7	0.3	29.49	0.99	0.43
BLK21	0.55+	0.36	0.43	0.60+	**0.49+**		0.11	0.66	0.31	30.35	1.02	0.44

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled; Detection Limit = 0.05ug/L;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates violations according to the Fresh Water Aquatic Life Criteria;
"+" Indicates violations according to the Chronic Criterion.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Cr Conc.(ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	4.5	4.8		5	**4.77**		0.25	5.39	4.14	73.94	1372	173
BLK02	4.7	5.1	3.3	6.3	**4.85**		1.24	6.82	2.88	66.35	1257	159
BLK03	3.4	3.7	1.8	4.3	**3.30**		1.07	5	1.6	59.61	1157	147
BLK04	3.8	2.4	3.2	4.3	**3.43**		0.82	4.73	2.12	66.81	1264	160
BLK05	0.2	0.2	0.2		**0.20**		0	0.1	0.1	52.23	1036	133
BLK06	5.8	2.6	1.4	4.5	**3.58**		1.96	6.69	0.46	60.27	1163	148
BLK07	6.4	3.4	3.9	5.7	**4.85**		1.43	7.12	2.58	55.95	1095	140
BLK08	24.5	6.9		26.3	**19.23**		10.72	45.86	-7.4	54	1064	136
BLK09	0.9	0.5	0.9	1.4	**0.93**		0.37	1.51	0.34	19.16	465	64
BLK10	0.4	2.8	0.7	0.9	**1.20**		0.25	1.29	0.04	21.89	516	71
BLK11	6.1	7.4	8.6	10.2	**8.07**		1.75	10.85	5.3	45.74	931	120
BLK12	2.8	2.2	1.7	2.5	**2.30**		0.47	3.05	1.55	45.04	920	119
BLK13	2.2	4.4	2.5	2.7	**2.95**		0.25	3.09	1.84	40.42	843	110
BLK14	0.1	0.9	0.1	0.8	**0.48**		0.43	1.17	-0.22	14.88	381	54
BLK15	0.5	0.1	0.1	0.3	**0.25**		0.19	0.55	-0.05	24.54	565	76
BLK16	0.6		2.1	0.7	**1.13**		0.84	3.22	-0.95	35.74	764	100
BLK17	1.5	1	1.2	1.6	**1.33**		0.28	1.76	0.89	40.34	842	109
BLK18	1.9	2.4	1.7		**2.00**		0.36	2.9	1.1	41.27	857	111
BLK19	0.7	1.5	1.2		**1.13**		0.4	2.14	0.13	41.32	858	111
BLK20	1.1	1	1	1.1	**1.05**		0.06	1.14	0.96	42.14	872	113
BLK21	0.9	1.1	1.5	1.4	**1.23**		0.28	1.66	0.79	43.55	895	116

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	4.9	9.6	24.5	5.9	**11.23**		9.08	25.67	-3.22	65.41	1242	157
BLK02	5.7	4.9		8.3	**6.30**		1.78	10.72	1.88	55.15	1083	138
BLK03	4.9	4.5	4.2	6	**4.90**		0.79	6.15	3.65	55.2	1083	138
BLK04	4.3	4.1	3.9	3.6	**3.98**		0.3	4.45	3.5	54.34	1070	137
BLK05	0.7	1.6	1	0.4	**0.93**		0.51	1.74	0.11	44.17	905	117
BLK06	4.2	3.1	4.2	4.2	**3.93**		0.55	4.8	3.04	51.31	1021	131
BLK07	5.3	4.6	3.1	3.2	**4.05**		1.08	5.77	2.33	47.96	967	124
BLK08	14.9	3.3	11.4	12.9	**10.63**		5.09	18.72	2.53	43.83	900	116
BLK09	1.4	1.7	1.6	1.2	**1.48**		0.22	1.83	1.12	16.84	420	59
BLK10	0.7	0.5	2		**1.07**		0.81	3.09	-1.27	18.44	451	63
BLK11	6	4.3	6.7	5.1	**5.53**		1.05	7.19	3.86	35.61	761	100
BLK12	3.2	3.3	3.1	3.1	**3.18**		0.1	3.33	3.02	34.43	743	98
BLK13	3.2	2.4	3.1	2.4	**2.78**		0.43	3.47	2.08	30.22	668	89
BLK14	1.1		0.8	1.2	**1.03**		0.21	1.55	0.52	16.85	420	59
BLK15	0.5	0.5	0.3	0.7	**0.50**		0.16	0.76	0.24	21.18	503	69
BLK16	0.6	0.3	0.4	0.9	**0.55**		0.26	0.97	0.13	28.41	636	85
BLK17	1.9	1.5	1.9	2.3	**1.90**		0.33	2.42	1.38	29.56	656	87
BLK18	3.2	2	1.8	10.5	**4.38**	2.33	0.76	4.21	0.45	32.66	710	94
BLK19	1.8	2.5	2.2	1.7	**2.05**		0.37	2.64	1.46	35.39	758	99
BLK20	1.8	2.3	1.8	2.8	**2.17**		0.48	2.94	1.41	38.72	814	106
BLK21	1.7	1.7	0.7	1.7	**1.45**		0.5	2.25	0.65	37.59	795	104

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	2.8	2.8	4.2	5.7	**3.88**		1.38	6.08	1.67	47.98	966	124
BLK02	3	2.3	2.9	4.6	**3.20**		0.98	4.76	1.64	53.94	1062	136
BLK03	3	2.5	3.2	4.2	**3.22**		0.71	4.36	2.09	52.91	1046	134
BLK04	2.9	2.5	2	3	**2.60**		0.45	3.32	1.88	49.31	988	127
BLK05	0.2	0.2	0.2	0.1	**0.18**	0.2	0	0.2	0.2	39.59	828	108
BLK06	2.4	2.5	2.1	2.3	**2.33**		0.17	2.6	2.05	46.9	949	122
BLK07	3.5	3.1	2.4	3.5	**3.13**		0.52	3.95	2.3	44.77	914	118
BLK08	5.2	3.7	3.2	4.1	**4.05**		0.85	5.4	2.7	44.96	917	118
BLK09	0.9	1.1	1	0.9	**0.98**		0.1	1.13	0.82	13.63	355	51
BLK10	0.5		0.3	0.3	**0.37**		0.11	0.63	0.09	17.57	433	61
BLK11	5.2	5.4	4.6	4.4	**4.90**		0.48	5.66	4.14	33.24	720	95
BLK12	4.6	5.9	4.4	3.9	**4.70**		0.85	6.06	3.34	33.16	718	95
BLK13	4.7	3.8	4.2	13	**6.43**	4.23	0.45	5.35	3.11	31.65	692	92
BLK14	0.8	0.8	0.3	0.5	**0.60**		0.24	0.99	0.21	11.54	312	46
BLK15	0.4	0.3	0.2	0.2	**0.28**		0.09	0.41	0.13	18.83	458	64
BLK16	0.3	0.4	0.2	0.2	**0.28**		0.09	0.41	0.13	29.14	648	86
BLK17	3.4	3.2	2.7	3.4	**3.18**		0.33	3.7	2.65	27.98	627	84
BLK18	3.6	3.3	2.5	2	**2.85**		0.73	4.02	1.68	28.22	631	84
BLK19	3.5	2.3	2.4	2.2	**2.60**		0.61	3.57	1.63	29.32	651	87
BLK20	2.9	2.3	2.9	2.1	**2.55**		0.41	3.21	1.89	29.49	654	87
BLK21	3.7	1.2	2.5	2.2	**2.40**		1.03	4.04	0.76	30.35	669	89

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled; Detection Limit = 0.2ug/L;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates Stations Exceeding The Fresh Water Aquatic Life Criteria.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Cu Conc.(ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	15.00*	6.7	6.9	8.7	**9.32+**		3.89	15.51	3.14	73.94	13.34	9.14
BLK02	49.80*	38.70*	29.80*	28.80*	**36.78***		9.76	52.3	21.25	66.35	12.04	8.33
BLK03	45.8	29.00*	25.60*	26.80*	**31.80***	27.13*	1.72	31.42	22.85	59.91	10.94	7.63
BLK04	28.30*	25.90*	26.90*	27.60*	**27.17***		1.02	28.8	25.55	66.81	12.12	8.38
BLK05	1.3	1.6	1.2	5.4	**2.38**	1.37	0.21	1.88	0.85	52.23	9.61	6.79
BLK06	29.60*	21.70*	17.20*	20.20*	**22.18***		5.29	30.59	13.76	60.27	11	7.67
BLK07	22.80*	22.80*		21	**22.20***	22.80*	0	22.8	22.8	55.95	10.26	7.2
BLK08	45.50*	24.10*	14.30*	53.80*	**34.42***		18.35	63.61	5.24	54	9.92	6.98
BLK09	11.00*	9.20*	6.60*	2.5	**7.33***		3.69	13.19	1.46	19.16	3.74	2.88
BLK10	41.00*	1.4	10.70*	23.40*	**19.13***		17.15	46.4	-8.15	21.89	4.24	3.23
BLK11	15.70*	23.00*	25.50*	25.70*	**22.48***		4.68	29.92	15.03	45.74	8.48	6.06
BLK12	11.90*	11.60*	8.80*	11.40*	**10.93***		1.43	13.24	8.6	45.04	8.36	5.98
BLK13	8.80*	9.9	14.10*	8.50*	**10.33***		2.59	14.44	6.21	40.42	7.55	5.45
BLK14	7.40*	7.10*	1.8	6.80*	**5.78***	7.10*	0.3	7.85	6.35	14.88	2.94	2.32
BLK15	4.80*	3.70+	4.30+	2.4	**3.80+**		1.04	5.45	2.15	24.54	4.72	3.56
BLK16	24.90*	2.9	37.40*	2	**16.80***		17.34	44.39	-10.79	35.74	6.72	4.91
BLK17	9.00*	10.40*	13.00*	7.30+	**9.93***		2.41	13.76	6.09	40.34	7.53	5.44
BLK18	6.5	10.90*	10.70*		**9.37***	10.80*	0.14	10.8	10.8	41.27	7.7	5.55
BLK19	7.50+	6.80+	9.10*	7.10+	**7.63+**		1.02	9.25	6	41.32	7.71	5.56
BLK20	6.90+	8.70*	7.70+	5.90+	**7.30+**		1.19	9.19	5.41	42.14	7.85	5.65
BLK21	6.70+	8.60*	8.50*	6.70+	**7.63+**		1.07	9.33	5.92	43.55	8.1	5.81

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	9.90+	7.6	11.50+	10.10+	**9.78+**		1.62	12.34	7.21	65.41	11.88	8.23
BLK02	26.80*	23.90*	27.70*	22.00*	**25.10***		2.63	29.28	20.92	55.15	10.12	7.11
BLK03	28.30*	22.40*	30.80*	22.70*	**26.05***		4.17	32.68	19.42	55.2	10.13	7.12
BLK04	29.00*	21.20*	26.30*	22.80*	**24.83***		3.5	30.4	19.25	54.34	9.98	7.02
BLK05	2.1	3.4	3.2	1	**2.43**		1.11	4.19	0.66	44.17	8.21	5.88
BLK06	25.50*	22.30*	26.00*	24.50*	**24.58***		1.64	27.18	21.97	51.31	9.45	6.69
BLK07	20.10*	13.30*	21.90*	16.40*	**17.93***		3.84	24.04	11.81	47.96	8.87	6.31
BLK08	36.80*	16.00*	29.90*	25.20*	**26.98***		8.73	40.87	13.08	43.83	8.15	5.84
BLK09	1.3	2.90+	2.1	1.3	**1.9**		0.77	3.12	0.63	16.84	3.31	2.58
BLK10	1	1.5	4.80*	3.40+	**2.68**		1.75	5.47	-0.12	18.44	3.6	2.79
BLK11	16.30*	14.30*	20.40*	14.20*	**16.30***		2.9	20.91	11.69	35.61	6.7	4.89
BLK12	11.80*	12.20*	14.80*	10.80*	**12.40***		1.7	15.11	9.69	34.53	6.51	4.77
BLK13	10.80*	8.60*	13.50*	8.10*	**10.25***		2.46	14.17	6.33	30.22	5.74	4.25
BLK14	3.40*	2.5	2.1	5.20*	**3.30+**		1.38	5.49	1.11	16.85	3.31	2.58
BLK15	4.60*	3.30+	0.2	6.60*	**3.68+**		2.73	7.99	-0.69	21.18	4.11	3.14
BLK16	3.1			2.6	**2.85**		0.35	6.03	-3.18	28.41	5.42	4.03
BLK17	7.30*	6.00*	7.40*	8.30*	**7.25***		0.95	8.76	5.74	29.56	5.62	4.17
BLK18	10.40*	10.70*	7.80*	13.10*	**10.50***		2.17	13.95	7.05	32.66	6.18	4.54
BLK19	9.10*	8.70*	9.40*	12.4	**9.90***	9.07*	0.35	9.94	8.19	35.39	6.66	4.87
BLK20	8.80*	9.30*	10.60*	9.00*	**9.43***		0.81	10.71	8.14	38.72	7.25	5.26
BLK21	7.70*	11.70*	12.40*	8.10*	**9.98***		2.42	13.82	6.13	37.59	7.05	5.12

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	11.20*	4.30*	8.90*	11.60*	**9.00***		3.35	14.33	3.67	47.98	3.76	2.9
BLK02	14.10*	12.50*	17.20*	17.50*	**15.33***		2.43	19.19	11.46	53.94	4.41	3.35
BLK03	16.80*	9.10*	18.80*	19.50*	**16.05***		4.77	23.64	8.46	52.91	4.45	3.38
BLK04	14.50*	11.00*	16.30*	16.90*	**14.68***		2.65	18.9	10.45	49.39	4.05	3.1
BLK05	1.4	1.2	1.3	2.90*	**1.7**		0.8	2.97	0.43	39.59	3.42	2.66
BLK06	16.90*	8.40*	15.20*	14.60*	**13.78***		3.71	19.68	7.87	46.9	3.86	2.96
BLK07	17.30*	13.50*	12.40*	15.70*	**14.73***		2.2	18.22	11.23	44.77	3.79	2.92
BLK08	19.90*	16.40*	14.40*	17.80*	**17.13***		2.32	20.81	13.44	44.96	4.07	3.11
BLK09	5.20*	2.10*	2.80*	5.30*	**3.85***		1.64	6.46	1.24	13.63	1.7	1.41
BLK10	1.6	1.7	2.30*	9.3	**3.73***	1.87*	0.38	2.81	0.93	17.57	2.19	1.78
BLK11	16.30*	21.00*	14.30*	18.90*	**17.63***		2.93	22.29	12.96	33.24	3.32	2.59
BLK12	13.00*	15.50*	14.00*	13.10*	**13.90***		1.16	15.74	12.06	33.16	3.15	2.46
BLK13	12.90*	12.30*	20.3	12.50*	**14.50***	12.57*	0.31	13.33	11.81	31.65	2.83	2.24
BLK14	4.20*	3.90*		4.10*	**4.07***		0.15	4.45	3.69	11.54	2.32	1.14
BLK15	2.70*	2.80*	6.8	1.8	**3.53***	2.43*	0.55	3.8	1.07	18.83	2.32*	1.87
BLK16	2.90+	3.30*		1.6	**2.60+**	3.10+	0.89	4.81	0.39	29.14	3.18	2.49
BLK17	9.80*	19.8	9.20*	9.20*	**12.00***	9.40*	0.35	10.26	8.54	27.98	2.65	2.11
BLK18	13.30*	8.80*	7.40*	10.90*	**10.10***		2.57	14.19	6.01	28.22	3.09	2.43
BLK19	7.20*	7.40*	10.00*	8.90*	**8.38***		1.32	10.48	6.27	29.32	2.9	2.29
BLK20	4.80*	7.50*		8.90*	**7.07***		2.08	12.24	1.89	29.49	2.8	2.22
BLK21	6.40*	6.80*	9.90*	8.50*	**7.90***		1.61	10.47	5.33	30.35	3.25	2.54

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;Detection Limit = 0.2ug/L;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
***** Indicates violations according to the Fresh Water Aquatic Life Criteria;
"+" Indicates violations according to the Chronic Criterion.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Pb Conc. (ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg.Hardness	Acute	Chronic
BLK01	5.0	3.9	1.4	7.2	**4.38**		2.41	8.21	0.54	73.94	55.59	2.17
BLK02	3.5	3.2	1.3	4.0	**3.00**		1.18	4.88	1.12	66.35	48.43	1.89
BLK03	3.5	2.9	1.0	3.3	**2.68**	3.23+	0.31	3.99	2.47	59.91	42.53	1.66
BLK04	3.0	4.1	8.8	5.0	**5.23**		2.52	9.23	1.22	66.81	48.86	1.9
BLK05	0.9	1.9	1.9	2.8	**1.88**		0.78	3.11	0.64	52.23	35.72	1.39
BLK06	58.7	118.0	2.8	13.0	**48.13**		52.54	131.72	-35.47	60.27	42.85	1.67
BLK07	16.7	274.0	98.4	12.9	**100.50**		122.21	294.93	-93.93	55.95	38.98	1.52
BLK08	23.6	16.9	4.8	32.5	**19.45**		11.67	38.02	0.88	54	37.26	1.45
BLK09	1.1	3.3	7.9	2.8	**3.78**		2.91	8.4	-0.85	19.16	9.96	0.39
BLK10	3.4	2.2	3.6	29.6	**9.70**	3.07+	0.76	4.95	1.19	21.89	11.81	0.46
BLK11	9.2	15.8	53.3	32.0	**27.58**		19.64	58.83	-3.68	45.74	30.16	1.18
BLK12	5.1	19.8	2.9	6.1	**8.48**	4.70+	1.64	8.77	0.63	45.04	29.58	1.15
BLK13	12.4	10.3	18.2	15.7	**14.15**		3.5	19.71	8.59	40.42	25.77	1
BLK14	23.5	1.6	1.0	2.0	**7.03**	1.53+	0.5	2.78	0.28	14.88	7.22	0.28
BLK15	1.7	1.0		1.7	**1.47**		0.4	2.46	0.47	24.54	13.65	0.53
BLK16	9.4	3.5	12.3	8.9	**8.53**		3.67	14.36	2.69	35.74	22.03	0.86
BLK17	3.7	4.0	4.5	4.7	**4.23**		0.46	4.95	3.5	40.34	25.7	1
BLK18	4.3	3.2	3.4	4.2	**3.78**		0.56	4.66	2.89	41.27	26.46	1.03
BLK19	2.2	2.0	2.5	2.5	**2.30**		0.24	2.69	1.91	41.32	26.51	1.03
BLK20		1.7	1.6	1.6	**1.63**		0.05	1.75	1.51	42.14	27.18	1.06
BLK21	2.7	3.3	4.9	3.4	**3.58**		0.94	5.06	2.09	43.55	28.34	1.1

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	4.6	54.3	19.7	5.7	**21.08**		23.19	57.97	-15.82	65.41	47.56	1.85
BLK02	4.8	6.7	18.7	3.7	**8.48**	5.07+	1.52	8.84	1.3	55.15	38.28	1.49
BLK03	3.5	8.3	25.7	3.2	**10.18**	5.00+	2.86	12.11	-2.11	55.2	38.32	1.49
BLK04	13.4	4.7	6.9	2.5	**6.88**		4.71	14.36	-0.61	54.34	37.56	1.46
BLK05		8.3	6.2	0.5	**5.00**		4.04	15.03	-5.03	44.17	28.85	1.12
BLK06	9.2	17.0		6.7	**10.97**		6.78	24.33	2.77	51.31	34.91	1.36
BLK07	11.7	13.0	32.0	6.4	**15.78**		11.19	33.57	-2.02	47.96	32.04	1.25
BLK08	25.6	20.4	37.2	18.8	**25.50**		8.32	38.74	12.26	43.83	28.57	1.11
BLK09	1.1	6.1	5.1	1.0	**3.33**		2.66	7.56	-0.91	16.84	8.45	0.33
BLK10		4.8	6.3		**5.55**		2.68	10.72	-2.58	18.44	9.49	0.37
BLK11	11.4	11.0	26.9	7.8	**14.28**	10.07+	1.97	14.97	5.16	35.61	21.93	0.85
BLK12	6.5	19.2	13.4	5.7	**11.20**		6.36	21.31	1.09	34.53	21.09	0.82
BLK13	8.2		41.2	6.2	**18.53**	7.20+	1.41	7.2	7.2	30.22	17.8	0.69
BLK14	2.8	2.5	1.9	3.1	**2.58**		0.51	3.39	1.76	16.85	8.46	0.33
BLK15	2.1	48.8	1.1	4.1	**14.03**	2.43+	1.53	6.23	-1.36	21.18	11.32	0.44
BLK16	2.9	2.0	3.9	8.0	**4.20**		2.65	8.42	-0.02	28.41	16.45	0.65
BLK17	5.0	4.5	5.8	10.2	**6.38**	5.10+	0.66	6.73	3.47	29.56	17.31	0.67
BLK18	6.6	4.5	4.6	6.9	**5.65**		1.28	7.68	3.62	32.66	19.65	0.77
BLK19	3.9	7.2	5.8	6.6	**5.88**		1.44	8.16	3.59	35.39	21.76	0.85
BLK20	3.5	3.4	5.0	0.1	**3.00**		2.07	6.29	-0.29	38.72	24.4	0.95
BLK21	3.8	4.9	5.0	0.1	**3.45**		2.3	7.11	-0.21	37.59	23.5	0.92

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	2.6	4.3	6.0	7.6	**5.13**		2.16	8.56	1.69	47.98	32.05	1.25
BLK02	2.6	3.3	4.8	3.9	**3.65**		0.93	5.13	2.17	53.94	37.2	1.45
BLK03	2.7	2.9	9.7	4.7	**5.00**		3.26	10.19	-0.19	52.91	36.29	1.41
BLK04	3.9	3.5	4.9	4.3	**4.15**		0.6	5.1	3.2	49.39	33.18	1.29
BLK05	2.1	1.4	0.8	1.1	**1.35**		0.56	2.24	0.46	39.59	25.09	0.98
BLK06	8.3	7.7	33.6	6.3	**13.98**	7.43+	1.03	9.98	4.88	46.9	31.13	1.21
BLK07	9.8	6.7	8.8	7.0	**8.08**		1.48	10.43	5.72	44.77	29.34	1.14
BLK08	10.2	7.7	8.6	13.1	**9.90**		2.37	13.67	6.13	44.96	29.5	1.15
BLK09	2.4	5.1	4.9	4.3	**4.18**		1.23	6.13	2.22	13.63	6.46	0.25
BLK10	4.6	2.9	3.2	2.4	**3.28**		0.94	4.78	1.77	17.57	8.92	0.35
BLK11	8.5	13.1	9.4	8.0	**9.75**		2.31	13.42	6.08	33.24	20.08	0.78
BLK12	7.4	10.9	10.8	7.6	**9.18**		1.94	12.26	6.09	33.16	20.02	0.78
BLK13	8.2	9.7	14.4	6.9	**9.80**		3.27	15.01	4.59	31.65	18.87	0.74
BLK14	6.8	1.3	1.5	1.8	**2.85**	1.53+	0.25	2.16	0.91	11.54	5.22	0.2
BLK15	3.3	1.2	2.3	1.2	**2.00**		1.01	3.61	0.39	18.83	9.74	0.38
BLK16	2.5	3.4	1.2	5.0	**3.03**		1.6	5.57	0.48	29.14	16.99	0.66
BLK17	11.3	6.6	4.4	14.8	**9.28**		4.67	16.71	1.84	27.98	16.13	0.63
BLK18	9.6	6.5	4.7	29.8	**12.65**	6.90+	2.48	13.09	0.78	28.22	16.31	0.64
BLK19	3.7	4.4	3.6	5.7	**4.35**		0.97	5.89	2.81	29.32	17.12	0.67
BLK20	3.8	3.9	5.5	4.4	**4.40**		0.78	5.64	3.16	29.49	17.25	0.67
BLK21	5.1	3.0	3.0	4.6	**3.93**		1.09	5.66	2.19	30.35	17.89	0.7

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled; Detection Limit = 0.2mg/L;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Ni Conc.(ppb), Avg. Hardness(ppm), Fresh Water Aquatic Life Criteria(ppb)

Survey I, July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	4.9	4.6	4.1	7	**5.15**		1.28	7.18	3.12	73.94	1099	122
BLK02	32.9	30.1		27.1	**30.03**		2.9	37.24	22.83	66.35	1002	111
BLK03	27.1	22.8	22.5	20.6	**23.25**		2.75	27.62	18.88	59.61	919	102
BLK04	11.2	19.2	18.8	18.8	**17.00**	18.93	0.23	19.51	18.36	66.81	1008	112
BLK05	0.2	1.5	0.2		**0.63**		0.75	2.49	-1.22	52.23	819	91
BLK06	9.7	11.3	11	11.6	**10.90**		0.84	12.23	9.57	60.27	924	103
BLK07	7.6	9.3	8.1	10.1	**8.78**		1.14	10.58	6.97	55.95	868	96
BLK08	11.3	9.3	7.5	13.3	**10.35**		2.51	14.34	6.36	54	842	94
BLK09	0.1	1.9	1.3	1.1	**1.10**		0.75	2.29	-0.09	19.16	350	39
BLK10	0.1	1.5	7.6	3.5	**3.17**		3.26	8.37	-2.02	21.89	392	44
BLK11		8.5	7.8	6.8	**7.70**		0.85	9.82	5.58	45.74	732	81
BLK12	3.9	7.9	6.2	6.1	**6.03**		1.64	8.63	3.42	45.04	722	80
BLK13	3.5	7	7	7.2	**6.18**	7.07	0.12	7.35	6.78	40.42	659	73
BLK14	0.2	1.3	1.3	1.9	**1.17**		0.71	2.3	0.04	14.88	283	31
BLK15	0.2	0.9		1.1	**0.73**		0.47	1.9	-0.43	24.54	432	48
BLK16	4.7	1.5	9.2	0.8	**4.05**		3.83	10.14	-2.04	35.74	594	66
BLK17	6.5	8.7	6.5	6.5	**7.05**	6.5	0	6.5	6.5	40.34	658	73
BLK18	2.9	4.9		6	**4.60**		1.57	8.5	0.7	41.27	671	75
BLK19		5.9	5.6	5.8	**5.77**	5.77	0.15	6.15	5.39	41.32	672	75
BLK20	3.1	5.1	4.5	5.1	**4.45**		0.94	5.95	2.95	42.14	683	76
BLK21	3	4.3	4.9	5.8	**4.50**		1.17	6.37	1.17	43.55	702	78

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg. Hardness	Acute	Chronic
BLK01	9.6	6.6	6.2	8.5	**7.73**		1.6	10.28	5.17	65.41	990	110
BLK02	41	34.5	40.1	51.8	**41.85**		7.23	53.35	30.35	55.15	857	95
BLK03	41.4	31.3	34.2	41.1	**37.00**		5.05	45.03	28.97	55.2	857	95
BLK04	40.1	30.7	32.6	31.7	**33.78**	31.67	0.95	34.03	29.31	54.34	846	94
BLK05	2	1.2	1.9	0.7	**1.45**		0.61	2.43	0.47	44.17	710	78
BLK06	26.6		26.1	25.8	**26.17**		0.4	27.17	25.16	51.31	806	89
BLK07	19	17.1	21.7	21	**19.70**		2.08	23	16.4	47.96	761	85
BLK08	19.3	16	17.7		**17.70**		1.65	21.7	13.56	43.83	705	78
BLK09	0.1	1.1	1	1	**0.80**	1.03	0.06	1.18	0.89	16.84	314	35
BLK10	0.1		1.8		**0.95**		1.2	11.75	-10.8	18.44	339	38
BLK11	11.2	10.2	12.8	11.9	**11.53**		1.1	13.27	9.78	35.61	592	66
BLK12	10.5	10	10.4	13.8	**11.18**	10.3	0.26	10.96	9.64	34.53	576	64
BLK13	9.1	7.6	7.7	8.6	**8.25**		0.72	9.4	7.1	30.22	515	57
BLK14	0.4		0.5	1.4	**0.77**		0.55	2.13	-0.6	16.85	314	34
BLK15		0.8	0.2	1.6	**0.86**		0.7	2.61	-0.85	21.18	381	42
BLK16	0.2	0.2	0.2	0.6	**0.30**		0.2	0.62	-0.02	28.41	489	54
BLK17	7.2		7.2	7.5	**7.30**		0	7.2	7.2	29.56	505	56
BLK18	9.4	9.3	7.3	10	**9.00**		1.17	10.87	7.13	32.66	550	61
BLK19	10.2	9.1		9.3	**9.53**		0.59	10.99	8.08	35.39	588	65
BLK20	9.6	9.9	10	10.3	**9.95**		0.29	10.41	9.49	38.72	635	70
BLK21	7.9	13	11.5	10.1	**10.63**		2.17	14.08	7.17	37.59	619	68

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"- RANGE"	Avg.Hardness	Acute	Chronic
BLK01	5.4	2.8	4.8	4.7	**4.43**		1.13	6.22	2.63	47.98	761	85
BLK02	12.1	8.5	12.7	13.8	**11.77**		2.29	15.42	8.13	53.94	840	93
BLK03	13.1		12.9	13.2	**13.07**		0.15	13.45	12.69	52.91	827	91
BLK04	11.2	9.3	11.6	11.1	**10.80**	11.3	0.26	11.96	10.64	49.31	779	87
BLK05	0.5	0.7			**0.60**		0.14	1.87	-1.27	39.59	647	71
BLK06	8.4	8.4	9.2	8.8	**8.70**		0.38	9.31	8.09	46.9	746	83
BLK07	8.6	8.5	8.2		**8.43**		0.21	8.95	7.91	44.77	718	79
BLK08	8.6	5.2	9.1	9.6	**8.13**	9.1	0.5	10.34	7.86	44.96	720	80
BLK09	0.2	0.2	0.7	6.8	**1.93**	0.3	0.35	1.16	-0.56	13.63	262	29
BLK10	0.2	0.2	0.8	1.9	**0.78**		0.8	2.04	-0.49	17.57	325	36
BLK11	6.6	6.2	9.8	8.3	**7.73**		1.66	10.36	5.09	33.24	558	62
BLK12	5.9	3.7	9.7	7.4	**6.68**		2.53	10.69	2.66	33.16	557	62
BLK13	6.1	2.7	10.6	7.4	**6.70**		3.27	11.9	1.5	31.65	535	59
BLK14		1.8	4.6	2	**2.80**		1.56	6.68	-1.08	11.54	228	26
BLK15	1.6	1.4	6.7	1.6	**2.83**	1.53	0.12	1.82	1.25	18.83	345	3
BLK16		2.2	5.1	1.2	**2.83**		2.03	7.87	-2.2	29.14	499	55
BLK17	4.7	9.6	7.8	5.4	**6.88**		2.25	10.45	3.3	27.98	482	54
BLK18	6	6.4	7.8	5.1	**6.33**		1.12	8.11	4.54	28.22	486	54
BLK19	5.5	2.6	9.7	5.1	**5.73**		2.94	10.41	1.04	29.32	501	55
BLK20	5.5	2.8			**4.15**		1.91	21.31	-17.15	29.49	504	56
BLK21	5.2	2.5	12.7	4.6	**6.25**		4.45	13.33	-0.83	30.35	516	57

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled; Detection Limit = 0.2ug/L;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
* Indicates violations according to the Fresh Water Aquatic Life Criteria.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Partition Coefficient Values, Blackstone River Dry Weather Study

Partition Coefficient Values for Cd

	July, 1991- Survey I				*August ,1991- Survey II*				*October, 1991- Survey III*			
STN	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))
BLK01	0.04	0.32	2.2	3.64	0.22	0.11	3.45	0.14	0.16	0.13	3.45	0.24
BLK02	3.07	0.56	3.67	0.05	3.77	0.39	3.05	0.03	1.65	0.32	3.47	0.06
BLK03	2.02	0.57	1.05	0.27	3.11	0.4	1.3	0.1	2.06	0.55	4.5	0.06
BLK04	1.26	0.77	1.45	0.42	2.43	0.47	0.8	0.24	1.12	0.71	3.35	0.19
BLK06	0.67	0.43	3.9	0.16	1.68	0.17	2.35	0.04	0.7	0.99	4.4	0.32
BLK07	0.48	0.39	6.05	0.13	0.8	0.18	6.35	0.04	0.86	0.33	4.55	0.08
BLK08	0.18	1.24	11.6	0.59	1.26	0.55	9.1	0.05	0.96	0.5	6	0.09
BLK11	0.29	0.87	10.45	0.29	0.66	0.34	4.4	0.12	0.71	0.57	5.15	0.16
BLK12	0.21	0.32	6.65	0.23	0.52	0.31	3.8	0.16	0.63	0.54	3.75	0.23
BLK13	0.15	0.53	7.2	0.49	0.55	0.16	4.75	0.06	0.58	0.55	4.15	0.23
BLK17	0.16	0.33	8	0.26	0.27	0.22	4.15	0.2	0.43	0.2	3.8	0.12
BLK18	0.27	0.3	5.75	0.19	0.75	0.26	4	0.09	0.32	0.39	3.7	0.33
BLK19	0.16	0.24	6.9	0.22	0.69	0.06	4.9	0.02	0.34	0.21	3.3	0.19
BLK20	0.14	0.18	3.85	0.33	0.3	0.15	4.85	0.1	0.35	0.15	2.73	0.16
BLK21	0.09	0.24	5.5	0.48	0.33	0.1	6.2	0.05	0.25	0.23	2.8	0.33

Partition Coefficient Values for Cr

	July, 1991- Survey I				*August ,1991- Survey II*				*October, 1991- Survey III*			
STN	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))
BLK01	1.27	3.5	2.2	1.25	6.2	5.03	3.45	0.24	1.6	2.28	3.45	0.41
BLK02	2.88	1.98	3.67	0.19	4.83	1.47	3.05	0.1	1.58	1.63	3.47	0.3
BLK03	2.33	0.98	1.05	0.4	3.48	1.43	1.3	0.32	1.4	1.83	4.5	0.29
BLK04	2.1	1.33	1.45	0.44	2.7	1.27	0.8	0.59	1	1.6	3.35	0.48
BLK06	1.4	2.17	3.9	0.4	2	2.2	2.35	0.47	0.63	1.7	4.4	0.61
BLK07	1.39	3.48	6.05	0.41	1.68	2.38	6.35	0.22	1.15	1.95	4.55	0.37
BLK08	1.17	18.07	11.6	1.33	2.73	7.9	9.1	0.32	1.13	2.93	6	0.43
BLK11	1.13	6.95	10.45	0.59	1.63	3.9	4.4	0.54	1.5	3.4	5.15	0.44
BLK12	1.05	1.25	6.65	0.18	1.2	1.98	3.8	0.43	1.1	3.6	3.75	0.87
BLK13	0.73	2.22	7.2	0.42	1.15	1.63	4.75	0.3	0.77	3.47	4.15	1.09
BLK17	0.63	0.7	8	0.14	0.75	1.15	4.15	0.37	0.95	2.23	3.8	0.62
BLK18	0.83	1.17	5.75	0.25	1.23	1.1	4	0.22	0.73	2.38	3.7	0.88
BLK19	0.57	0.57	6.9	0.14	0.95	1.1	4.9	0.24	0.7	1.9	3.3	0.82
BLK20	0.4	0.65	3.85	0.42	0.8	1.38	4.85	0.36	0.78	1.78	2.73	0.84
BLK21	0.68	0.55	5.5	0.15	0.75	0.9	6.2	0.19	1	1.4	2.8	0.5

Partition Coefficient Values for Cu

	July, 1991- Survey I				*August ,1991- Survey II*				*October, 1991- Survey III*			
STN	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))
BLK01	3.1	6.23	2.2	0.91	6.65	3.13	3.45	0.14	5.38	3.63	3.45	0.2
BLK02	29.4	7.13	3.67	0.07	21.9	3.2	3.05	0.05	12.75	2.58	3.47	0.06
BLK03	22.9	4.23	1.05	0.18	21.52	4.53	1.3	0.16	11.88	4.18	4.5	0.08
BLK04	19.93	7.25	1.45	0.25	21.1	3.73	0.8	0.22	11.8	2.88	3.35	0.07
BLK06	15.23	6.95	3.9	0.12	19.28	5.3	2.35	0.12	9.25	4.53	4.4	0.11
BLK07	8.25	14.55	6.05	0.29	11.48	6.45	6.35	0.09	10.35	4.38	4.55	0.09
BLK08	8.25	26.05	11.6	0.27	14.85	12.13	9.1	0.09	10.68	6.45	6	0.1
BLK11	6.9	15.58	10.45	0.22	7.8	8.5	4.4	0.25	7.83	9.8	5.15	0.24
BLK12	6.3	4.63	6.65	0.11	8.28	4.13	3.8	0.13	7.43	6.48	3.75	0.23
BLK13	4.8	5.53	7.2	0.16	5.83	4.43	4.75	0.16	6.33	6.23	4.15	0.24
BLK17	4.1	5.83	8	0.18	4.2	3.05	4.15	0.17	5.6	3.8	3.8	0.18
BLK18	7	3.95	5.75	0.1	6.93	3.58	4	0.13	6.43	3.67	3.7	0.15
BLK19	4.75	2.88	6.9	0.09	6.5	2.3	4.9	0.07	5.38	3	3.3	0.17
BLK20	3.88	3.42	3.85	0.23	5.53	3.33	4.85	0.12	5.07	1.97	2.73	0.14
BLK21	4	3.63	5.5	0.17	5.93	4.05	6.2	0.11	5.7	2.2	2.8	0.14

A = Dissolved Concentration; B = Particulate Concentration; C = TSS Concentration; and kp = Partition Coefficient.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Partition Coefficient Values, Blackstone River Dry Weather Study

Partition Coefficient Values for Ni

	July, 1991- Survey I				*August ,1991- Survey II*				*October, 1991- Survey III*			
STN	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))
BLK01	3.48	1.67	2.2	0.22	7.05	0.68	3.45	0.03	3.53	0.9	3.45	0.07
BLK02	25.93	4.1	3.67	0.04	39.98	1.88	3.05	0.02	10.4	1.38	3.47	0.04
BLK03	20.15	3.1	1.05	0.15	32.97	4.03	1.3	0.09	11.33	1.7	4.5	0.03
BLK04	16.87	2.2	1.45	0.09	29.73	1.93	0.8	0.08	10.63	0.67	3.35	0.02
BLK06	8.9	2	3.9	0.06	24.97	1.2	2.35	0.02	6.88	1.83	4.4	0.06
BLK07	7.05	1.72	6.05	0.04	18.45	1.25	6.35	0.01	7.17	1.27	4.55	0.04
BLK08	6.17	4.22	11.6	0.06	15.93	1.86	9.1	0.01	8.03	1.07	6	0.02
BLK11	5.53	2.1	10.45	0.04	9.88	1.65	4.4	0.04	5.43	2.3	5.15	0.08
BLK12	4.53	1.75	6.65	0.06	9.07	1.23	3.8	0.04	5.18	1.5	3.75	0.08
BLK13	4.83	1.78	7.2	0.05	7.15	1.1	4.75	0.03	4.88	1.83	4.15	0.09
BLK17	4.23	2.43	8	0.07	4.17	3.13	4.15	0.18	6.03	0.85	3.8	0.04
BLK18	3.23	1.37	5.75	0.07	7.43	12.57	4	0.42	5.15	1.17	3.7	0.06
BLK19	4.87	0.53	6.9	0.02	8.55	0.73	4.9	0.02	5.23	0.5	3.3	0.03
BLK20	3.45	0.9	3.85	0.07	8.93	1.03	4.85	0.02	3.6	0.55	2.73	0.06
BLK21	2.92	1.57	5.5	0.1	7.78	2.85	6.2	0.06	5.35	0.9	2.8	0.06

Partition Coefficient Values for Pb

	July, 1991- Survey I				*August ,1991- Survey II*				*October, 1991- Survey III*			
STN	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))	A	B	C	kp = (B/(C*A))
BLK01	1.05	3.33	2.2	1.44	3.93	17.15	3.45	1.26	1.4	3.73	3.45	0.77
BLK02	1.2	1.8	3.67	0.41	2.67	2.4	3.05	0.29	1.73	1.93	3.47	0.32
BLK03	0.98	2.13	1.05	2.07	1.87	3.13	1.3	1.29	0.93	4.07	4.5	0.97
BLK04	0.7	4.53	1.45	4.46	4.03	2.85	0.8	0.88	2.03	2.13	3.35	0.31
BLK06	26.25	21.88	3.9	0.21	8.95	4.6	2.35	0.22	2.1	5.33	4.4	0.58
BLK07	4.33	96.18	6.05	3.67	10.7	5.07	6.35	0.07	3.75	3.73	4.55	0.22
BLK08	2.47	24.6	11.6	0.86	14.48	11.02	9.1	0.08	3.7	6.18	6	0.28
BLK11	2.98	1	10.45	0.03	5.9	4.17	4.4	0.16	3.05	6.7	5.15	0.43
BLK12	3.7	12.73	6.65	0.52	6.72	4.48	3.8	0.18	4.03	5.15	3.75	0.34
BLK13	1.43	3.4	7.2	0.33	3.15	4.05	4.75	0.27	2.5	7.3	4.15	0.7
BLK17	0.83	3.17	8	0.48	1.43	3.67	4.15	0.62	3.53	5.75	3.8	0.43
BLK18	0.6	1.98	5.75	0.57	3.23	2.43	4	0.19	1.97	4.96	3.7	0.68
BLK19	0.33	0.8	6.9	0.35	3.18	2.7	4.9	0.17	1.55	2.8	3.3	0.55
BLK20	0.8	2.95	3.85	0.96	1.23	1.78	4.85	0.3	1.48	2.92	2.73	0.72
BLK21	0.63	3.63	5.5	1.05	1.48	1.98	6.2	0.22	1.58	2.92	2.8	0.66

A = Dissolved Concentration; B = Particulate Concentration; C = TSS Concentration; and kp = Partition Coefficient.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Metal Concentrations (ppb)

UBWPAD Wastewater Secondary Effluent Post-Chlorination

Parameter	Survey	Day 1	Day 2	Day 3	Day 4	Day 5
Cd	1	4.6	4.4	4	4.1	4.2
	2	2.1	6.8	4.5	4.5	5.2
	3B			3.2	2.4	2.5
Cr	1	3.5	6.6	6	7.2	7.5
	2	5.7	5.1	3.6	6.9	4.5
	3B			2.1	1.5	2.7
Cu	1	45.6	43.5	59.4	45	61.1
	2	44.7	33	24.6	27.6	26.4
	3b			21.6	25.5	41.4
Ni	1	27.6	24	21.8	21	23.7
	2	163	94.8	76.8	66	52.2
	3b			17.1	23.2	25.8
Pb	1	5.4	5.9	6.2	6.8	6.9
	2	8.6	3.9	4.6	4.4	3.2
	3B			2.1	1.8	2.4

Woonsocket Wastewater Secondary Effluent Post-Chlorination

Parameter	Survey	Day 1	Day 2	Day 3	Day 4	Day 5
Cd	1	3.2	2.7	2.6	3	2.7
	2	4.8	4.8	3.3	5.2	5.9
	3B			ND	1.1	1.7
Cr	1	4.2	5.4	3.6	3.9	3.9
	2	14.7	9	5.7	0.9	4.8
	3B			ND	2.1	3.3
Cu	1	38.4	46.2	36.9	39	44.4
	2	33	43.5	39	147	39.9
	3b			7.5	9	20
Ni	1	205 (10.5)	223 (10.8)	256(18.0)	263 (9.0)	121 (13.8)
	2	168 (9.3)	196 (98.7)	222 (7.1)	255 (9.9)	210 (11.4)
	3b			16	69	79
Pb	1	3.9	5.1	3.9	6.3	4.2
	2	10.8	8.7	9.6	21	12.3
	3B			3	3.9	6

Values in parenthesis ( ) are Pre-Chlorination values

Section A15-2

Dry Weather Data - Non-Metals

River Stations

- Dissolved Oxygen
- BOD
- Chloride
- TSS
- VSS
- Ammonia
- Nitrate
- TKN
- Phosphate
- Chlorophyll

Treatment Plant

- BOD
- TSS
- VSS
- Ammonia
- Nitrate
- TKN
- Phosphate

BLACKSTONE RIVER WATER SAMPLE DATA ANALYSIS

Dissolved Oxygen Concentrations (mg/L)

July 1991

STN	RUN #1	RUN #2	RUN #3	RUN #4	RUN #5	RUN #6	RUN #7	RUN #8	**Avg**	M Avg	SD	"+ RANGE"	"- RANGE"
BLK01	6.4	7.7	7.8	6.4	6.4	7.1	8.3	6.5	**7.1**		0.77	7.72	6.43
BLK02	6.3	7.2	7.2	6.4	6.8	7.2	8.2	6.7	**7.0**		0.6	7.5	6.5
BLK03	7.5	7.9	8.0	7.4	7.3	7.9	7.9	7.5	**7.7**		0.28	7.91	7.44
BLK04	8.1	8.1	8.0	7.9	8.0	8.0	7.8	8.0	**8.0**		0.1	8.07	7.9
BLK05	6.0	6.8	7.0	5.5	5.7	6.5	6.8		**6.3**		0.59	6.83	5.83
BLK06	7.1	8.4	8.5	7.3	7.1	8.1	8.7	7.4	**7.8**		0.67	8.38	7.27
BLK07	7.3	7.6	10.0	9.2	7.9	10.5	12.7	8.8	**9.3**		1.8	10.75	7.75
BLK7.2						8.3	8.5		**8.4**		0.14	8.52	8.28
BLK08	6.1	9.8	13.0	6.9	6.0	10.2	12.9	7.9	**9.1**		2.83	11.47	6.73
BLK8.2						9.4	10.5		**10.0**		0.78	10.6	9.3
BLK09	5.4	7.1	8.0	8.6	5.5	6.1	10.0	8.8	**7.4**		1.69	8.85	6.03
BLK9.2	7.6	7.8	10.0	7.8	7.5	7.7	8.0	8.2	**8.1**		0.81	8.75	7.4
BLK10	6.3	6.9	7.0	6.0	6.3	6.5	7.5	6.2	**6.6**		0.5	7.01	6.17
BLK11	6.6	9.6	9.5	6.4	6.9	9.6	10.2	7.4	**8.3**		1.59	9.6	6.95
BLK12	6.9	11.2	11.5	8.2	7.0	12.0	11.8	8.4	**9.6**		2.21	11.47	7.78
BLK13	8.2	10.7	11.0	9.3	9.1	12.0	12.2	9.9	**10.3**		1.42	11.49	9.11
BLK14	7.2	7.7	7.8	6.9	7.0	8.0	7.9	7.1	**7.4**		0.44	7.81	7.08
BLK15	6.8	8.1	7.9	6.7	7.8	8.1	7.9	6.6	**7.5**		0.67	8.01	6.9
BLK16	5.1	4.9	6.2	4.9	5.2	5.3	6.7	5.4	**5.4**		0.65	5.98	4.89
BLK17	7.5	9.5	8.9	7.1	7.3	9.4	8.8	7.0	**8.2**		1.08	9.08	7.28
BLK18	8.0	8.0	7.9	8.0	8.1	8.0	8.0	7.0	**7.9**		0.37	8.17	7.55
BLK19	7.6	8.1	8.0	7.3	7.2	7.9	7.8	7.2	**7.6**		0.38	8.23	7.03
BLK20	5.6	8.1	9.1	6.4	5.3	8.5	10.2	6.4	**7.4**		1.58	9.95	4.92
BLK21	7.0	8.9	9.0	7.2	7.3	8.7	9.2	6.8	**8.0**		1.06	9.68	6.31

August 1991

STN	RUN #1	RUN #2	RUN #3	RUN #4	RUN #5	RUN #6	RUN #7	RUN #8	**Avg**	M Avg	SD	"+ RANGE"	"- RANGE"
BLK01	6.2	7.2	7.2	5.9	6.0	6.9	7.0	4.9	**6.4**		0.81	7.09	5.74
BLK02	6.2	10.2	7.5	6.3	6.0	7.2	7.4	6.4	**7.2**	6.71	0.63	7.3	6.13
BLK03	7.1	10.1	7.7	7.1	7.0	7.8	7.9	7.4	**7.8**	7.43	0.37	7.77	7.08
BLK04	7.8	10.2	7.8	7.4	7.2	7.7	8.0	7.7	**8.0**	7.66	0.27	7.91	7.41
BLK05	6.3	10.2	6.9	5.9	5.8	7.1	6.9	5.9	**6.9**	6.4	0.56	6.91	5.89
BLK06	7.2	10.0	8.1	7.0	6.8	7.9	8.3	7.4	**7.8**		1.02	8.69	6.98
BLK07	7.4	9.3	12.0	8.8	7.9	7.0	7.9	8.0	**8.5**		1.58	9.86	7.22
BLK7.2													
BLK08	6.2	10.0	10.3	6.2	5.6	7.9	9.4	6.3	**7.7**		1.92	9.34	6.13
BLK8.2						7.9	8.9		**8.4**		0.71	8.99	7.81
BLK09	4.7	9.6	9.0	5.6	4.4	5.7	8.2	6.8	**6.8**		1.98	8.41	5.09
BLK9.2	7.3	8.7	7.7	7.2	7.2	7.2	7.5	7.6	**7.6**		0.5	7.97	7.13
BLK10	6.0	6.2	5.8	5.8	5.6	5.8	5.9	5.9	**5.9**		0.18	6.02	5.73
BLK11	6.4	8.8	7.7	6.8	6.4	7.8	8.5	6.9	**7.4**		0.93	8.19	6.64
BLK12	6.3	9.3	9.3	6.9	6.2	7.5	9.7	7.7	**7.9**		1.4	9.04	6.69
BLK13	7.3	8.9	8.8	8.0	7.4	8.5	9.0	8.1	**8.3**		0.66	8.8	7.7
BLK14	6.9	7.5	7.8	6.6	6.8	7.2	7.7	6.8	**7.1**		1.75	8.6	5.67
BLK15	6.6	8.3	7.9	6.4	6.4	7.5	7.8	6.8	**7.2**		1.82	8.73	5.67
BLK16	6.4	6.1	6.4	5.6	5.6	5.8	5.8	5.1	**5.8**		1.44	7.03	4.62
BLK17	7.4	8.7	8.5	7.1	8.0	8.1	8.8	7.0	**7.9**		1.98	9.58	6.27
BLK18	7.7	7.4	7.8	7.8	7.6	7.5	7.4	7.5	**7.6**		1.82	9.1	6.05
BLK19	7.7	8.0	7.7	8.0	7.1	7.6	7.5	7.2	**7.6**		1.83	9.1	6.04
BLK20	6.2	9.1	9.0	6.5	5.5	6.5	8.3	6.4	**7.2**		2.03	8.85	5.46
BLK21	7.3	9.2	8.8	7.3	7.1	7.5	8.5	7.1	**7.8**		1.99	9.5	6.17

October 1991

STN	RUN #1	RUN #2	RUN #3	RUN #4	RUN #5	RUN #6	RUN #7	RUN #8	**Avg**	M Avg	SD	"+ RANGE"	"- RANGE"
BLK01	9.2	8.6	8.5	8.1	8.4	8.7	8.5	8.2	**8.5**		2.06	10.25	6.8
BLK02	8.0	7.9	7.9	7.7	7.6	8.1	7.7	7.6	**7.8**		1.88	9.39	6.24
BLK03	8.6	9.0	8.5	8.1	8.5	8.1	8.5	8.3	**8.5**		2.04	10.16	6.74
BLK04	9.1	9.2	8.8	8.8	8.8	9.0	8.8	8.9	**8.9**		2.15	10.72	7.13
BLK05	9.2	9.4	9.4	8.9	9.1	9.3	8.8	8.6	**9.1**		2.2	10.92	7.25
BLK06	8.8	9.0	8.7	8.6	8.5	8.3	8.7	8.3	**8.6**		2.08	10.35	6.88
BLK07	8.4	8.1	8.8	8.1	7.6	8.3	8.1	8.0	**8.2**		1.98	9.83	6.52
BLK7.2	9.1	9.0	8.9		8.7	8.7	8.6		**8.8**		2.31	10.77	6.9
BLK08	8.2	8.7	8.3	7.9	7.6	8.0	8.0	7.1	**8.0**		1.95	9.61	6.34
BLK8.2	8.5	8.9	8.5		8.0	8.4	8.4		**8.5**		2.22	10.3	6.6
BLK09	8.6	10.1	9.0	7.9	8.1	8.9	9.1	8.3	**8.8**		2.17	10.56	6.94
BLK9.2	9.3	9.4	8.9	8.7	8.9	9.2	9.1	9.0	**9.1**		2.18	10.89	7.24
BLK10	9.2	9.4	8.9	8.8	8.6	9.1	8.4	8.5	**8.9**		2.15	10.66	7.07
BLK11	8.7	9.0	8.6	8.4	8.2	9.0	8.4	8.3	**8.6**		2.07	10.31	6.84
BLK12	8.8	9.2	8.5	8.4	8.1	8.5	8.4	8.3	**8.5**		2.06	10.25	6.8
BLK13	8.7	8.7	8.8	8.5	8.0	8.7	8.3	8.3	**8.5**		2.05	10.22	6.78
BLK14	9.3	9.4	9.1	9.2	8.9	9.2	9.2	9.2	**9.2**	9.22	2.2	11	7.32
BLK15	9.3	9.4	9.2	9.0	9.2	9.4	9.1	9.1	**9.2**		2.21	11.06	7.35
BLK16	7.8	7.7	7.7	7.5	7.1	7.2	7.0	7.3	**7.4**		1.79	8.88	5.89
BLK17	9.4	10.0	9.0	8.8	9.1	9.0	9.1	8.9	**9.1**		2.21	10.99	7.29
BLK18	9.6	9.5	9.4	9.8	9.5	9.2	9.1	9.2	**9.4**		2.26	11.29	7.5
BLK19	9.6	9.7	9.1	9.2	9.3	9.2	9.3	9.3	**9.3**		2.25	11.2	7.45
BLK20	9.2	9.6	9.1	8.9	9.0	9.1	8.8	8.8	**9.1**		2.18	10.87	7.22
BLK21	9.6	9.6	9.4	9.2	9.5	9.1	9.0	8.9	**9.3**		2.24	11.14	7.4

Avg = Average value of 8 runs;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Biochemical Oxygen Demand Concentrations (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.5	0.5	1.15	1.4	**0.89**		0.46	1.62	0.16
BLK02	1	1.3	2	2.6	**1.73**		0.72	2.87	0.58
BLK03	1.65	1.2	1.1	1.3	**1.31**		0.24	1.69	0.93
BLK04	0.5	0.5	1.55	1.35	**0.98**		0.55	1.86	0.09
BLK05	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK06	0.5	0.5	1.6	1.4	**1.00**		0.58	1.93	0.07
BLK07	1.2	1.7	3.1	2.4	**2.10**		0.83	3.42	0.78
BLK08	1.55	2.6	4.3	1.95	**2.60**		1.21	4.53	0.67
BLK09	0.5	0.5	0.5	1	**0.63**		0.25	1.02	0.23
BLK10	0.5	0.5	1	0.5	**0.63**		0.25	1.02	0.23
BLK11	1.45	2.85	3.8	3.4	**2.88**		1.03	4.51	1.24
BLK12	1.9	3.45	4.25	3.4	**3.25**		0.98	4.81	1.69
BLK13	1.7	2.75	2.95	2.6	**2.50**		0.55	3.38	1.62
BLK14	0.5	1	1.1	1.25	**0.96**		0.32	1.48	0.45
BLK15	0.5	0.5	1.5	1.5	**1.00**		0.58	1.92	0.08
BLK16	0.5	0.5	1.2	1.6	**0.95**		0.54	1.82	0.08
BLK17	1.8	2.7	3.4	3	**2.73**		0.68	3.81	1.64
BLK18	2.7	3.25	3.9	3.35	**3.30**		0.49	4.08	2.52
BLK19	2.35	4.05	4.45	3.45	**3.58**		0.91	5.03	2.12
BLK20	1.3	1.7	2.3	2.35	**1.91**		0.5	2.71	1.11
BLK21	1.9	2.2	2.7	2.2	**2.25**		0.33	2.78	1.72

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	2.8	0.5	1.25	1.9	**1.61**		0.98	3.17	0.06
BLK02	2.95	1.1	1.7	2.65	**2.10**		0.85	3.46	0.74
BLK03	2.95	1.15	0.5	2.85	**1.86**		1.23	3.82	-0.09
BLK04	2.35	0.5	0.5	2.5	**1.46**		1.11	3.23	-0.31
BLK05	1.95	0.5	0.5	0.5	**0.86**		0.72	2.02	-0.29
BLK06	2.7	0.5	0.5	2.35	**1.51**		1.18	3.39	-0.36
BLK07	3	1.15	1.6	1.9	**1.91**		0.79	3.17	0.66
BLK08	2.9	1.35	1.55	3.25	**2.26**		0.95	3.78	0.75
BLK09	1.75	1.2	0.15	1.25	**1.09**		0.67	2.16	0.02
BLK10	2.1	0.5	0.5	1.1	**1.05**		0.75	2.25	-0.15
BLK11	2.55	0.5	0.5	2.1	**1.41**		1.07	3.11	-0.29
BLK12	2.25	1.5	1	1.85	**1.65**		0.53	2.49	0.81
BLK13	2.65	0.5	0.5	2.1	**1.44**		1.11	3.2	-0.32
BLK14	2.1	0.5	1.4	1.55	**1.39**		0.66	2.44	0.33
BLK15	2.9	0.5	1.4	2.3	**1.78**		1.05	3.45	0.1
BLK16	1.55	1.3	0.5	1.35	**1.18**		0.46	1.91	0.44
BLK17	2.3	2.25	1.2	1.7	**1.86**		0.52	2.69	1.04
BLK18	3.05	2.55	1.3	2.15	**2.26**		0.74	3.44	1.09
BLK19	3.1	2.9	1.9	2.55	**2.61**		0.53	3.45	1.77
BLK20	2.4	2.55	1.3	2.15	**2.10**		0.56	2.99	1.21
BLK21	2.55	2.65	1.8	2.15	**2.29**		0.39	2.91	1.67

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.4	1.6	0.5	1.5	**1.25**		0.51	2.06	0.44
BLK02	1.25	1.3	1.3	1	**1.21**		0.14	1.44	0.98
BLK03	1.1	2	1.45	1.4	**1.49**		0.38	2.08	0.89
BLK04	1.5	1.8	1.3	1.7	**1.58**		0.22	1.93	1.22
BLK05	0.5	1.2	0.5	0.5	**0.68**		0.35	1.23	0.12
BLK06	1.05	1.25	1.65	1.4	**1.34**		0.25	1.74	0.94
BLK07	1.5	1.8	1.05	0.5	**1.21**		0.57	2.11	0.31
BLK08	1.05	1.8	1.2	0.5	**1.14**		0.53	1.99	0.29
BLK09	0.5	1.4	0.5	0.5	**0.73**	0.5	0	0.5	0.5
BLK10	0.5	1.1	0.5	0.5	**0.65**	0.5	0	0.5	0.5
BLK11	0.5	1.3	0.5	0.5	**0.70**	0.5	0	0.5	0.5
BLK12	0.5	1.1	0.5	0.5	**0.65**	0.5	0	0.5	0.5
BLK13	1.05	0.5	1.15	0.5	**0.80**		0.35	1.35	0.25
BLK14	1.35	0.5	0.5	0.5	**0.71**	0.5	0	0.5	0.5
BLK15	1	0.5	0.5	1.2	**0.80**		0.36	1.37	0.23
BLK16	1.1	1.2	0.5	0.5	**0.83**		0.38	1.43	0.22
BLK17	0.5	1	0.5	1.2	**0.80**		0.36	1.37	0.23
BLK18	0.5	1	0.5	1.2	**0.80**		0.36	1.37	0.23
BLK19	1.45	1	0.5	1.3	**1.06**		0.42	1.73	0.4
BLK20	1.1	0.5	0.5	1.7	**0.95**		0.57	1.86	0.04
BLK21	2.4	0.5	2.75	1.7	**1.84**		0.99	3.42	0.26

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 1.00 mg/L; All values below the detection limit are considered as 0.50 mg/L

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Chloride Conc.(mg/L)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	114	114	114	148	**122.5**	114	0	114	114
BLK02	109	109	NS	100	**106.0**		5.2	114.27	97.73
BLK03	104	104.6	92	100	**100.2**		5.8	109.38	90.92
BLK04	97	105	92	100	**98.5**		5.45	107.17	89.83
BLK05	67	72.5	65	68	**68.1**		3.17	73.17	63.08
BLK06	82	82	74	92	**82.5**		7.37	94.23	70.77
BLK07	78	82	68	78	**76.5**		5.97	86	67
BLK08	75	78.5	71	74	**74.6**		3.09	79.54	69.71
BLK09	20	22	19	19	**20.0**		1.41	22.25	17.75
BLK10	46	48	35	43	**43.0**		5.72	52.09	33.91
BLK11	67	75	63	65	**67.5**		5.26	75.87	59.13
BLK12	70	75	60	65	**67.5**		6.45	77.77	57.23
BLK13	57	64	50	60	**57.8**		5.91	67.15	48.35
BLK14	22	24	20	21	**21.8**		1.71	24.47	19.03
BLK15	24	23.9	20	24	**23.0**	23.97	0.06	24.11	24.11
BLK16	34	36	30	48	**37.0**		7.75	49.32	24.68
BLK17	57	59	48	57	**55.3**	57.67	1.15	60.54	54.79
BLK18	79	78.6	65	68	**72.7**		7.21	84.12	61.18
BLK19	64	68.5	68	71	**67.9**		2.9	72.49	63.26
BLK20	52	56.5	50	63	**55.4**		5.76	64.55	46.2
BLK21	54	85	46	55	**60.0**		17.15	87.28	32.72

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	108	96.8	106	116.4	**106.8**		5.52	115.58	98.02
BLK02	104.4	90.4	96	112.8	**100.9**		9.8	116.49	85.31
BLK03	100	94	98.5	108.8	**100.3**		6.2	110.19	90.46
BLK04	96	90	95	108	**97.3**		7.63	109.39	85.11
BLK05	72.4	64.8	69.2	77.6	**71.0**		5.39	79.58	62.42
BLK06	90	76.8	84.8	100.4	**88.0**		9.89	103.74	72.26
BLK07	78	79	78	156	**97.8**	78.33	0.58	79.77	76.9
BLK08	76	72.4	72	140	**90.1**	73.47	2.2	78.95	68.73
BLK09	10	19.2	21	21.6	**18.0**		5.4	26.54	9.36
BLK10	45	40.8	42	49.2	**44.3**		3.74	50.21	38.29
BLK11	56	51.2	57	60	**56.1**		3.65	61.86	50.24
BLK12	57.2	48	53	61.6	**55.0**		5.81	64.2	45.7
BLK13	48	42	42	55.2	**46.8**		6.27	56.78	36.82
BLK14	30	27.6	26	28.8	**28.1**		1.71	30.82	25.38
BLK15	28.4	25.2	26.4	28.8	**27.2**		1.7	29.9	24.5
BLK16	38	32.4	34.4	40	**36.2**		3.43	41.66	30.74
BLK17	47.6	41.6	44	236	**92.3**	44.4	3.02	51.91	36.89
BLK18	62.4	54	54	60.4	**57.7**		4.35	64.62	50.78
BLK19	60	53.2	54	68	**58.8**		6.84	69.69	47.91
BLK20	68	59.6	60.4	67.6	**63.9**		4.52	71.09	56.71
BLK21	64	56.4	60	50	**57.6**		5.94	67.05	48.15

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	57	59	74	60	**62.5**	58.67	1.25	61.77	55.56
BLK02	71	78	93	81	**80.8**		4.19	87.42	74.08
BLK03	70	72	88	79	**77.3**	73.67	3.86	83.26	64.07
BLK04	70	68	82	94	**78.5**		6.18	88.34	68.66
BLK05	48	47	70	53	**54.5**		2.62	58.68	50.32
BLK06	66	61	71	59	**64.3**		4.66	71.66	56.84
BLK07	58	62	71	62	**63.3**		1.89	66.25	60.25
BLK08	58	59	69	62	**62.0**		1.7	64.7	59.3
BLK09	14	14.5	13	18	**14.9**		0.62	15.87	13.88
BLK10	26	26.5	29	28	**27.4**		1.19	29.27	25.48
BLK11	45	46	51	48	**47.5**		1.25	49.48	45.52
BLK12	44	45	50	48	**46.8**		2.38	50.54	42.96
BLK13	44	43	48	39	**43.5**		3.2	48.59	38.41
BLK14	12	13.5	14	13	**13.1**		0.74	14.3	11.95
BLK15	27.5	27.5	31	28	**28.5**	27.67	0.24	28.25	27.08
BLK16	25.5	27	29	34	**28.9**		1.43	31.16	26.59
BLK17	36	38	43	41	**39.5**		2.69	43.78	35.22
BLK18	40	40	48	46	**43.5**		3.57	49.18	37.82
BLK19	40	40	46	46	**43.0**		3	47.77	38.23
BLK20	NS	52	43	55	**37.5**		5.1	45.61	29.39
BLK21	49	41	44	54	**47.0**		4.95	54.88	39.12

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 1.00 mg/L; All values below 1.0 mg/L are considered as 0.50 mg/L

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

TSS Conc.(mg/L)

July Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	2.4	2.8	0.6	3	**2.20**		1.1	3.94	0.46
BLK02	4.6	3.6	3.6	3.8	**3.90**	3.67	0.12	3.95	3.38
BLK03	0.5	1.4	1.8	0.5	**1.05**		0.74	2.15	-0.2
BLK04	1.2	1.4	1.4	1.8	**1.45**		0.25	1.85	1.05
BLK05	1.6	0.6	0.3	0.6	**0.78**		0.57	1.68	-0.13
BLK06	6.6	1.8	3.2	4	**3.90**		2.02	7.11	0.69
BLK07	4.2	5.2	9.2	5.6	**6.05**		2.18	9.52	2.58
BLK08	5	6.8	18.4	16.2	**11.60**		6.68	22.23	0.97
BLK09	1.8	0.6	1.8	2.6	**1.70**		0.82	3.01	0.39
BLK10	2.2	1.2	1.2	2.8	**1.85**		0.79	3.11	0.59
BLK11	9.4	6.6	12.4	13.4	**10.45**		3.08	15.35	5.55
BLK12	5	9.4	7	5.2	**6.65**		2.04	9.9	3.4
BLK13	6.4	7.2	8.4	6.8	**7.20**		0.86	8.57	5.83
BLK14	1.6	2	0.6	1.4	**1.40**		0.59	2.34	0.46
BLK15	2.4	2.6	1.8	4	**2.70**		0.93	4.18	1.22
BLK16	5.4	5.4	3.4	7	**5.30**		1.47	7.65	2.95
BLK17	5.6	8.2	7.8	8	**7.40**	8	0.2	8.5	7.5
BLK18	8.6	2.6	6.4	5.4	**5.75**		2.49	9.71	1.79
BLK19	5.8	8	8.2	5.6	**6.90**		1.39	9.11	4.69
BLK20	3.8	3.2	4.8	3.6	**3.85**		0.68	4.93	2.77
BLK21	4.6	5	6.8	5.6	**5.50**		0.96	7.03	3.97

Aug Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	3	3.2	3.4	4.2	**3.45**		0.53	4.29	2.61
BLK02	4.8	3	3	1.4	**3.05**		1.39	5.26	0.84
BLK03	2	1	1.6	0.6	**1.30**		0.62	2.29	0.31
BLK04	1.8	2.6	1.8	1.8	**2.00**	1.8	0	1.8	1.8
BLK05	1.4	1.8	1.6	0.25	**1.26**		0.69	2.37	0.16
BLK06	3.6	2.8	1	2	**2.35**		1.11	4.12	0.58
BLK07	8.6	6.8	5.6	4.4	**6.35**		1.79	9.2	3.5
BLK08	3.8	6.2	17.8	8.6	**9.10**		6.12	18.84	-0.64
BLK09	1.6	1.6	1.4	1.2	**1.45**		0.19	1.75	1.15
BLK10	1.6	1.4	1.8	1	**1.45**		0.34	1.99	0.91
BLK11	5.2	6	2.4	4	**4.40**		1.57	6.89	1.91
BLK12	3.6	5.4	3	3.2	**3.80**		1.1	5.54	2.06
BLK13	5.4	4.4	4.8	4.4	**4.75**		0.47	5.5	4
BLK14	2	3.8	4	2.6	**3.10**		0.96	4.63	1.57
BLK15	3.8	5.2	6.2	4	**4.80**		1.12	6.58	3.02
BLK16	2	3.2	5.8	9	**5.00**		3.1	9.94	0.06
BLK17	3.4	4.2	4.4	4.6	**4.15**		0.53	4.99	3.31
BLK18	2.4	5.4	4	4.2	**4.00**		1.23	5.96	2.04
BLK19	4	5.8	6.8	3	**4.90**		1.72	7.63	2.17
BLK20	2.6	4.4	5.4	7	**4.85**		1.84	7.78	1.92
BLK21	4.8	7	6.2	6.8	**6.20**		0.99	7.78	4.62

Oct Survey 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	3.2	4	4.6	2	**3.45**		1.12	5.24	1.66
BLK02	3.4	3.6	5.4	3.4	**3.95**	3.47	0.12	3.75	3.18
BLK03	4.4	4.4	5.6	3.6	**4.50**		0.82	5.81	3.19
BLK04	3.8	3.2	4	2.4	**3.35**		0.72	4.49	2.21
BLK05	1.2	1	0.6	0.6	**0.85**		0.3	1.33	0.37
BLK06	4.2	5.4	11.8	3.6	**6.25**	4.4	0.92	6.68	2.12
BLK07	5	6.2	3.2	3.8	**4.55**		1.33	6.67	2.43
BLK08	7.4	8.4	3	5.2	**6.00**		2.41	9.83	2.17
BLK09	1.6	1.6	1.4	0.25	**1.21**	1.53	0.12	1.82	1.25
BLK10	1.8	1.8	1.2	1	**1.45**		0.41	2.11	0.79
BLK11	5.4	6.6	5	3.6	**5.15**		1.24	7.12	3.18
BLK12	3.4	6.6	2.2	2.78	**3.75**		1.96	6.87	0.63
BLK13	4.2	4.6	5.4	2.4	**4.15**		1.27	6.17	2.13
BLK14	3	3	1.6	1	**2.15**		1.01	3.76	0.54
BLK15	3.6	3	2	2	**2.65**		0.79	3.91	1.39
BLK16	3.4	2.4	1	2.2	**2.25**		0.98	3.82	0.68
BLK17	4	5	2.4	3.8	**3.80**		1.07	5.5	2.1
BLK18	4.6	4	3.4	2.8	**3.70**		0.77	4.93	2.47
BLK19	3.6	5	2.2	2.4	**3.30**		1.29	5.35	1.25
BLK20	NS	3.6	2.8	1.8	**2.73**		0.9	4.97	0.49
BLK21	4.2	3.6	2	1.4	**2.80**		1.32	4.89	0.71

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

VSS Concentrations (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.8	1.8	0.25	0.8	**0.91**	0.65	1.94	-0.12
BLK02		2	3	1.8	**2.27**	0.55	3.23	1.47
BLK03	0.6	0.6	1.4	0.25	**0.71**	0.49	1.49	-0.06
BLK04	0.25	0.25	0.8	0.8	**0.53**	0.32	1.03	0.02
BLK05	1.2	0.6	0.25	0.25	**0.58**	0.45	1.29	-0.14
BLK06	2.6	0.25	1.4	1	**1.31**	0.98	2.87	-0.25
BLK07	2	2.2	4.8	2.2	**2.80**	0.12	2.42	1.85
BLK08	2.6	4	6.6	4.2	**4.35**	1.66	6.99	1.71
BLK09	1	0.25	0.8	1.4	**0.86**	0.48	1.62	0.1
BLK10	1.2	0.8	1	0.8	**0.95**	0.19	1.25	0.65
BLK11	3.8	3.4	5.4	4.4	**4.25**	0.87	5.63	2.87
BLK12	2.6	5.4	4	1.8	**3.45**	1.59	5.97	0.93
BLK13	3.2	4.2	2	4.6	**3.50**	1.16	5.35	1.65
BLK14	1	1	0.25	0.8	**0.76**	0.35	1.33	0.2
BLK15	1.2	1	0.8	1.4	**1.10**	0.26	1.51	0.69
BLK16	2	2.2	1.8	2	**2.00**	0.16	2.26	1.74
BLK17		5	4.6	3.6	**4.40**	0.99	5.58	2.42
BLK18	4	2	2.8	2.2	**2.75**	0.9	4.18	1.32
BLK19	2.8	4.4	5	2.8	**3.75**	1.12	5.54	1.96
BLK20	1.8	2.2	3	1.2	**2.05**	0.75	3.25	0.85
BLK21	1.8	3	3.8	2.4	**2.75**	0.85	4.11	1.39

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.6	1.8	1.8	2	**1.80**	0.16	2.06	1.54
BLK02	2	2.6	2	1.2	**1.95**	0.57	2.86	1.04
BLK03	1	0.6	1.2	0.25	**0.76**	0.42	1.44	0.09
BLK04	0.8		1.4	1.6	**1.27**	0.34	1.79	0.71
BLK05	1	0.8	1	0.25	**0.76**	0.35	1.33	0.2
BLK06	1.8	1	0.6	1.8	**1.30**	0.6	2.25	0.35
BLK07	3.2	3.8	3.2	2.4	**3.15**	0.57	4.06	2.24
BLK08	1.2	3.6	4.6	4.2	**3.40**	1.52	5.82	0.98
BLK09	1.4	1.4	0.8	0.25	**0.96**	0.55	1.84	0.08
BLK10	0.8	0.8	0.6	0.6	**0.70**	0.12	0.88	0.52
BLK11	1.8	3.2	1.8	2.2	**2.25**	0.66	3.3	1.2
BLK12	1.4	3.4	2	1.6	**2.10**	0.9	3.53	0.67
BLK13	3	3	3.4	2.6	**3.00**	0.33	3.52	2.48
BLK14	1.4	2.6	2.2	2	**2.05**	0.5	2.85	1.25
BLK15	2.6	3.2	4.8	2.8	**3.35**	1	4.94	1.76
BLK16	1.2	1.8	3	3.6	**2.40**	1.1	4.14	0.66
BLK17	2.2	1.4	2.8	3.2	**2.40**	0.78	3.65	1.15
BLK18	1.4	2.8	3	2.8	**2.50**	0.12	3.15	2.58
BLK19	2.8	3.8	3.8	1.6	**3.00**	1.05	4.66	1.34
BLK20	2.2	1.6	1.8	3.6	**2.30**	0.9	3.73	0.87
BLK21	2.6	4.2	5	4	**3.95**	1	5.54	2.36

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.2	1.2	2.8	0.25	**1.36**	1.06	3.05	-0.32
BLK02	2.8	2		2	**2.27**	0.95	4.2	1.2
BLK03	2.6	2.4	3.8	1.6	**2.60**	0.91	4.05	1.15
BLK04	2.4	1	3	1.2	**1.90**	0.96	3.43	0.37
BLK05	1	0.8	0.25	0.25	**0.58**	0.38	1.19	-0.04
BLK06	2	2.6		2	**2.20**	0.35	3.06	1.34
BLK07	2.2	2.4	1.6	1.4	**1.90**	0.48	2.66	1.14
BLK08	2.8	3	2.4	1.8	**2.50**	0.53	3.34	1.66
BLK09	1.2	0.8	1.2	0.25	**0.86**	0.45	1.58	0.15
BLK10	1.4	1	1	0.8	**1.05**	0.25	1.45	0.65
BLK11	2.2	2.4	1.8	1.4	**1.95**	0.44	2.66	1.24
BLK12	1.8	1.8	1.4	1.2	**1.55**	0.3	2.03	1.07
BLK13	2	1.8	2.4	1	**1.80**	0.59	2.74	0.86
BLK14	2	1.2	1.4	0.8	**1.35**	0.5	2.15	0.55
BLK15	2.2	1.2	1.4	1.6	**1.60**	0.43	2.29	0.91
BLK16	2	0.8	0.8	1.4	**1.25**	0.57	2.16	0.34
BLK17	2	1.6	1.6	2	**1.80**	0.23	2.17	1.43
BLK18	2.6	1.4	2.2	2	**2.05**	0.5	2.85	1.25
BLK19	2.2	2	1.4	2	**1.90**	0.35	2.45	1.35
BLK20	NS	1.3	1.6	1.4	**1.43**	0.15	1.81	1.05
BLK21	2	1.2	1.2	1	**1.35**	0.12	1.42	0.85

Avg = Average value of 4 runs; NS = Not sampled;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 1.00 mg/L; All values below 1.0 mg/L are considered as 0.50 mg/L

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Nitrate as N Concentrations (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	**Avg**	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.654	0.509	0.995	0.445	**0.65**		0.246	1.041	0.26
BLK02	2.892	2.571	4.553	2.023	**3.01**	2.495	0.439	3.588	1.402
BLK03	4.032	3.64	4.158	3.891	**3.93**		0.222	4.284	3.577
BLK04	4.432	4.204	4.422	4.474	**4.38**	4.44	0.03	4.51	4.37
BLK05	0.132	0.082	0.203	4.058	**1.12**	0.139	0.061	0.29	-0.012
BLK06	2.778	2.639	4.422	0.072	**2.48**		1.797	5.336	-0.381
BLK07	2.744	2.852	3.63	3.683	**3.23**		0.498	4.02	2.435
BLK08	2.373	2.289	2.79	3.103	**2.64**		0.379	3.242	2.035
BLK09	0.149	0.136	0.151	3.182	**0.91**	0.145	0.008	0.166	0.125
BLK10	0.116	0.027	0.098	0.173	**0.10**		0.06	0.199	0.008
BLK11	1.699	1.523	2.666	1.744	**1.91**	1.655	0.117	1.946	1.365
BLK12	1.767	1.39	1.917	1.65	**1.68**		0.223	2.035	1.327
BLK13	1.565	1.5	1.732	1.461	**1.57**		0.12	1.755	1.374
BLK14	0.244	0.225	0.01	0.268	**0.19**	0.246	0.022	0.299	0.192
BLK15	0.379	0.293	0.203	0.392	**0.32**		0.088	0.456	0.177
BLK16	0.76	0.77	NS	0.772	**0.77**		0.006	0.781	0.754
BLK17	1.277	1.204	0.388	1.459	**1.08**	1.313	0.131	1.64	0.987
BLK18	1.232	1.17	1.469	1.411	**1.32**		0.142	1.547	1.094
BLK19	1.403	1.373	1.574	1.624	**1.49**		0.124	1.691	1.296
BLK20	1.637	1.711	1.743	1.98	**1.77**		0.148	2.004	1.532
BLK21	1.592	1.981	2.023	1.901	**1.87**		0.195	2.184	1.564

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	**Avg**	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.157	1.454	0.708	0.659	**0.75**		0.535	1.595	-0.106
BLK02	2.696	3.806	4.182	4.773	**3.86**		0.875	5.256	2.473
BLK03	4.28	3.634	3.57	5.214	**4.18**		0.764	5.389	2.96
BLK04	4.086	4.207	3.345	4.198	**3.96**	4.164	0.067	4.331	3.996
BLK05	0.026	0.135	0.129	0.117	**0.10**	0.13	0.01	0.15	0.1
BLK06	3.418	2.888	4.053	3.369	**3.43**		0.478	4.193	2.671
BLK07	4.197	2.544	4.24	2.859	**3.46**		0.885	4.869	2.051
BLK08	2.849	4.28	3.795	2.859	**3.45**		0.711	4.578	2.314
BLK09	2.455	0.135	0.644	0.085	**0.83**		1.113	2.6	-0.94
BLK10	0.978	0.192	0.01	0.085	**0.32**	0.1	0.09	0.32	-0.13
BLK11	1.405	1.454	1.995	1.201	**1.51**		0.339	2.053	0.974
BLK12	4.53	1.598	2.381	1.329	**2.46**	1.77	0.55	3.13	0.41
BLK13	0.967	0.823	2.381	0.946	**1.28**	0.912	0.078	1.105	0.719
BLK14	0.252	0.279	0.223	0.308	**0.27**		0.036	0.323	0.208
BLK15	0.252	0.249	0.172	0.89	**0.39**	0.22	0.05	0.34	0.11
BLK16	0.563	0.651	0.675	0.946	**0.71**		0.165	0.972	0.446
BLK17	0.785	0.823	0.819	1.137	**0.89**	0.81	0.02	0.86	0.76
BLK18	1.429	1.167	4.647	1.52	**2.19**	1.372	0.183	1.828	0.916
BLK19	1.76	1.511	1.572	1.966	**1.70**		0.205	2.029	1.376
BLK20	2.027	1.741	1.978	2.285	**2.01**		0.223	2.363	1.653
BLK21	1.672	1.626	1.717	2.413	**1.86**	1.67	0.05	1.78	1.56

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	**Avg**	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.552	0.24	2.19	0.736	**1.18**		0.864	2.554	-0.195
BLK02	1.237	1.88	2.617	1.985	**1.93**	1.701	0.405	2.708	0.693
BLK03	1.269	1.012	2.049	2.212	**1.64**		0.585	2.566	0.705
BLK04	1.127	1.301	1.481	2.212	**1.53**		0.477	2.289	0.771
BLK05	0.055	0.067	0.055	0.034	**0.05**		0.014	0.075	0.031
BLK06	1.315	0.954	0.974	1.327	**1.14**		0.206	1.471	0.814
BLK07	0.804	1.418	1.229	1.191	**1.16**		0.258	1.57	0.751
BLK08	1.226	0.897	1.397	1.191	**1.18**		0.208	1.508	0.847
BLK09	0.094	0.096	0.098	0.102	**0.10**		0.003	0.103	0.092
BLK10	0.01	0.029	0.041	0.034	**0.03**		0.013	0.05	0.007
BLK11	1.077	0.636	0.804	1.259	**0.94**		0.278	1.386	0.502
BLK12	2.116	0.665	0.634	1.599	**1.25**		0.729	2.413	0.094
BLK13	2.071	0.773	0.676	1.259	**1.20**		0.637	2.209	0.181
BLK14	0.242	0.164	0.154	0.202	**0.19**		0.04	0.254	0.127
BLK15	0.441	0.164	0.183	0.279	**0.27**		0.127	0.468	0.065
BLK16	0.69	0.434	0.424	0.539	**0.52**		0.124	0.718	0.325
BLK17	1.314	0.559	0.564	0.61	**0.76**	0.58	0.03	0.65	0.51
BLK18	0.618	1.022	0.706	0.766	**0.78**		0.174	1.054	0.502
BLK19	1.082	0.25	0.536	0.817	**0.67**		0.359	1.242	0.101
BLK20	0.386	0.154	0.507	0.299	**0.34**		0.149	0.573	0.1
BLK21	1.38	0.791	0.536	0.714	**0.86**		0.366	1.437	0.273

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Ammonia Concentrations as NH3 - N (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.14	0.17	0.24	0.24	**0.20**		0.05	0.27	0.12
BLK02	0.48	0.26	0.24	0.45	**0.36**		0.13	0.56	0.15
BLK03	0.29	0.21	0.11	0.18	**0.20**		0.07	0.32	0.08
BLK04	0.38	0.29	0.28	0.33	**0.32**		0.05	0.39	0.24
BLK05	0.07	0.07	0.01	0.08	**0.06**	0.07	0.01	0.09	0.05
BLK06	0.12	0.13	0.12	0.16	**0.13**		0.02	0.16	0.1
BLK07	0.22	0.16	0.05	0.08	**0.12**		0.08	0.24	0
BLK08	0.12	0.05	0.14	0.11	**0.11**		0.04	0.16	0.05
BLK09	0.09	0.04	0.01	0.06	**0.05**		0.03	0.1	0
BLK10	0.04	0.04	0.04	0.07	**0.05**	0.04	0	0.05	0.03
BLK11	0.06	0.06	0.1	0.02	**0.06**		0.03	0.11	0.01
BLK12	0.04	0.05	0.05	0.06	**0.05**		0.01	0.07	0.03
BLK13	0.05	0.06	0.05	0.09	**0.06**		0.02	0.09	0.03
BLK14	0.09	0.12	0.08	0.09	**0.09**	0.09	0	0.09	0.08
BLK15	0.06	0.04	0.05	0.05	**0.05**		0.01	0.07	0.04
BLK16	0.22	0.26	0.25	0.33	**0.27**		0.05	0.34	0.19
BLK17	0.06	0.05	0.05	0.09	**0.06**	0.05	0	0.06	0.04
BLK18	1.03	1.54	1.01	1.07	**1.16**	1.04	0.03	1.12	0.96
BLK19	1.03	0.6	0.77	0.99	**0.85**		0.2	1.16	0.53
BLK20	0.55	0.5	0.43	0.45	**0.48**		0.05	0.57	0.4
BLK21	0.33	0.31	0.36	0.25	**0.31**		0.04	0.38	0.24

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.37	0.65	0.01	0.01	**0.51**		0.65	1.54	-0.52
BLK02	1.61	0.73	0.01	0.01	**0.59**		0.76	1.8	-0.62
BLK03	1.66	0.75	0.03	0.01	**0.61**		0.78	1.85	-0.63
BLK04	1.72	1.13	0.02	0.01	**0.72**		0.85	2.07	-0.63
BLK05	0.49	0.32	0.09	0.01	**0.23**		0.22	0.58	-0.13
BLK06	1.21	0.58	0.69	0.01	**0.62**		0.49	1.41	-0.16
BLK07	0.58	0.93	0.42	0.01	**0.48**		0.38	1.09	-0.12
BLK08	0.13	0.78	0.32	0.01	**0.31**		0.34	0.85	-0.23
BLK09	0.26	0.46	0.15	0.01	**0.22**		0.19	0.52	-0.08
BLK10	0.55	0.18	0.13	0.13	**0.25**	0.15	0.03	0.22	0.08
BLK11	0.09	0.41	0.4	0.26	**0.29**		0.15	0.53	0.05
BLK12	0.13	0.33	0.37	0.27	**0.27**		0.11	0.44	0.1
BLK13	0.08	0.38	0.34	0.26	**0.27**		0.13	0.48	0.05
BLK14	0.22	0.62	0.25	0.01	**0.28**		0.25	0.68	-0.13
BLK15	0.09	0.26	0.26	0.39	**0.25**		0.12	0.45	0.05
BLK16	0.2	0.28	0.17	0.18	**0.21**	0.18	0.01	0.22	0.15
BLK17	0.01	0.22	0.1	0.14	**0.12**		0.09	0.25	-0.02
BLK18	0.88	1.25	0.22	0.74	**0.77**		0.43	1.45	0.1
BLK19	0.67	0.43	0.75	0.83	**0.67**		0.17	0.94	0.4
BLK20	0.49	0.34	0.04	0.43	**0.32**		0.2	0.64	0.01
BLK21	0.5	0.44	0.64	0.04	**0.40**		0.26	0.82	-0.01

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.15	0.11	0.15	0.17	**0.14**	0.15	0.01	0.18	0.13
BLK02	0.19	0.07	0.75	0.54	**0.39**	0.49	0.23	1.07	-0.08
BLK03	0.16	0.14	0.24	0.56	**0.28**	0.18	0.04	0.29	0.07
BLK04	0.18	0.2	0.32	0.46	**0.29**		0.11	0.46	0.11
BLK05	0.01	0.01	0.01	0.01	**0.01**		0	0.01	0.01
BLK06	0.21	0.13	0.4	0.16	**0.23**		0.11	0.39	0.06
BLK07	0.14	0.23	0.2	0.24	**0.20**		0.04	0.26	0.14
BLK08	0.07	0.15	0.21	0.18	**0.15**		0.05	0.24	0.07
BLK09	0.01	0.01	0.01	0.03	**0.01**		0.01	0.02	0
BLK10	0.01	0.01	0.01	0.01	**0.01**		0	0.01	0.01
BLK11	0.07	0.09	0.1	0.09	**0.09**		0.01	0.11	0.07
BLK12	0.08	0.12	0.09	0.12	**0.10**		0.02	0.13	0.08
BLK13	0.08	0.1	0.19	0.01	**0.09**		0.06	0.19	-0.01
BLK14	0.02	0.04	0.07	0.01	**0.04**	0.04	0.02	0.1	-0.01
BLK15	0.06	0.03	0.11	0.08	**0.07**		0.03	0.12	0.02
BLK16	0.06	0.06	0.05	0.04	**0.06**		0.01	0.07	0.04
BLK17	0.01	0.77	0.1	0.05	**0.23**	0.06	0.04	0.15	-0.04
BLK18	0.04	0.16	0.33	0.22	**0.19**		0.07	0.17	-0.17
BLK19	0.21	0.2	0.23	0.21	**0.21**		0.01	0.23	0.2
BLK20	0.17	0.01	0.21	0.17	**0.14**	0.18	0.02	0.23	0.13
BLK21	0.14	0.2	0.25	0.15	**0.19**		0.04	0.26	0.12

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

Rhode Island Stations

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Total Kjeldhal Nitrogen Concentrations (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	AVE	M AVE	SD	"+ RANGE"	"-RANGE"
BLK01	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK02	1.195	0.5	1.665	0.5	**0.97**	0.732	0.401	1.73	-0.266
BLK03	0.5	1.118	1.175	0.5	**0.82**		0.37	1.42	0.23
BLK04	1.055	0.5	0.5	0.5	**0.64**	0.5	0	0.5	0.5
BLK05	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK06	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK07	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK08	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK09	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK10	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK11	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK12	0.5	0.5	1.17	0.5	**0.67**	0.5	0	0.5	0.5
BLK13	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK14	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK15	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK16	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK17	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK18	2.89	1.598	1.665	2.6	**2.19**		0.65	3.23	1.15
BLK19	1.475	1.558	1.55	2.443	**1.76**	1.528	0.046	1.642	1.414
BLK20	0.5	0.5	1.125	0.5	**0.66**	0.5	0	0.5	0.5
BLK21	0.5	0.5	1.068	1.07	**0.79**		0.33	1.31	0.26

August 1991

STN	RUN #1	RUN #2	RUN #3	RUN #4	AVE	M AVE	SD	"+ RANGE"	"-RANGE"
BLK01	1.37	0.5	0.5	0.5	**0.72**	0.5	0	0.5	0.5
BLK02	1.616	0.5	0.5	0.5	**0.78**	0.5	0	0.5	0.5
BLK03	1.66	0.5	0.5	0.5	**0.79**	0.5	0	0.5	0.5
BLK04	1.724	1.125	0.02	0.015	**0.72**		0.85	2.07	-0.63
BLK05	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK06	1.212	0.5	0.5	0.5	**0.68**	0.5	0	0.5	0.5
BLK07	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK08	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK09	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK10	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK11	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK12	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK13	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK14	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK15	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK16	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK17	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK18	0.5	1.248	0.5	0.5	**0.69**	0.5	0	0.5	0.5
BLK19	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK20	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK21	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5

October 1991

STN	RUN#1	RUN#2	RUN#3	RUN#4	AVE	M AVE	SD	"+ RANGE"	"-RANGE"
BLK01	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK02	0.5	0.5	1.053	0.5	**0.64**	0.5	0	0.5	0.5
BLK03	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK04	0.5	0.5	0.5	1.019	**0.63**	0.5	0	0.5	0.5
BLK05	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK06	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK07	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK08	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK09	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK10	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK11	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK12	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK13	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK14	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK15	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK16	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK17	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK18	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK19	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5
BLK20	NS	0.5	0.5	0.5	**0.38**	0.5	0	0.5	0.5
BLK21	0.5	0.5	0.5	0.5	**0.50**		0	0.5	0.5

Detection Limit is 1.0 mg/L.

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Phosphate as PO4-P Concentrations (mg/L)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.023	0.01	0.01	0.01	**0.013**	0.01	0	0.01	0.01
BLK02	0.893	0.996	1.149	0.11	**0.787**		0.463	1.524	0.05
BLK03	0.893	0.855	1.067	0.931	**0.937**		0.092	1.083	0.79
BLK04	0.711	0.76	0.849	0.931	**0.813**		0.097	0.968	0.658
BLK05	0.082	0.034	0.083	0.876	**0.269**	0.066	0.028	0.136	-0.003
BLK06	0.637	0.432	0.466	0.055	**0.398**	0.512	0.11	0.785	0.238
BLK07	0.674	0.571	0.521	0.493	**0.565**		0.08	0.691	0.438
BLK08	0.527	0.477	0.411	0.439	**0.464**		0.05	0.543	0.384
BLK09	0.126	0.015	0.066	0.411	**0.155**		0.177	0.436	-0.127
BLK10	0.148	0.019	0.01	0.01	**0.047**	0.01	0.01	0.03	0
BLK11	0.381	0.241	0.193	0.104	**0.230**		0.116	0.414	0.046
BLK12	0.462	0.241	0.165	0.095	**0.241**		0.159	0.494	-0.012
BLK13	0.308	0.383	0.22	0.12	**0.258**		0.113	0.438	0.077
BLK14	0.01	0.05	0.138	0.01	**0.052**		0.06	0.148	-0.044
BLK15	0.02	0.05	0.083	0.01	**0.041**		0.033	0.093	-0.012
BLK16	0.025	0.05	NS	0.01	**0.021**		0.022	0.056	-0.013
BLK17	0.132	0.201	0.05	0.059	**0.111**		0.071	0.223	-0.002
BLK18	0.164	0.286	0.165	0.128	**0.186**		0.069	0.296	0.076
BLK19	0.188	0.258	0.193	0.065	**0.176**		0.081	0.304	0.048
BLK20	0.122	0.229	0.176	0.072	**0.150**		0.068	0.258	0.042
BLK21	0.102	0.201	0.165	0.01	**0.120**	0.156	0.05	0.281	0.031

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.051	0.01	0.01	0.01	**0.020**	0.01	0	0.01	0.01
BLK02	1.195	0.827	1.02	1.343	**1.096**		0.223	1.451	0.742
BLK03	1.038	0.673	1.02	1.456	**1.047**		0.32	1.557	0.537
BLK04	0.809	0.827	0.829	1.4	**0.966**	0.822	0.011	0.849	0.794
BLK05	0.01	0.01	0.01	0.063	**0.023**	0.01	0	0.01	0.01
BLK06	0.65	0.313	0.656	0.895	**0.629**		0.239	1.009	0.248
BLK07	0.315	0.077	0.144	0.586	**0.281**		0.227	0.642	-0.081
BLK08	0.01	0.036	0.01	0.417	**0.118**	0.019	0.015	0.056	-0.019
BLK09	0.01	0.01	0.01	0.041	**0.018**	0.01	0	0.01	0.01
BLK10	0.079	0.01	0.01	0.024	**0.031**	0.01	0.01	0.03	-0.01
BLK11	0.01	0.01	0.01	0.193	**0.056**	0.01	0	0.01	0.01
BLK12	0.087	0.01	0.01	0.165	**0.068**		0.074	0.186	-0.05
BLK13	0.01	0.01	0.01	0.12	**0.038**	0.01	0	0.01	0.01
BLK14	0.063	0.01	0.072	0.024	**0.042**		0.03	0.09	-0.005
BLK15	0.01	0.01	0.083	0.024	**0.032**	0.015	0.008	0.035	-0.005
BLK16	0.01	0.01	0.062	0.024	**0.027**		0.025	0.066	-0.013
BLK17	0.01	0.01	0.109	0.176	**0.076**		0.081	0.206	-0.053
BLK18	0.161	0.01	0.179	0.361	**0.178**		0.144	0.406	-0.051
BLK19	0.13	0.01	0.169	0.33	**0.160**		0.132	0.37	-0.05
BLK20	0.099	0.01	0.34	0.249	**0.175**		0.148	0.41	-0.061
BLK21	0.087	0.01	0.28	0.193	**0.143**		0.118	0.331	-0.046

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.048	0.157	0.195	0.068	**0.117**		0.07	0.229	0.005
BLK02	0.342	0.619	0.502	0.619	**0.521**		0.131	0.729	0.312
BLK03	0.342	0.526	0.489	0.619	**0.494**		0.115	0.677	0.311
BLK04	0.415	0.444	0.416	0.434	**0.427**		0.014	0.45	0.405
BLK05	0.01	0.022	0.024	0.01	**0.017**		0.008	0.029	0.004
BLK06	0.205	0.26	0.249	0.316	**0.258**		0.046	0.33	0.185
BLK07	0.161	0.2	0.205	0.205	**0.193**	0.2	0	0.21	0.2
BLK08	0.161	0.225	0.205	0.205	**0.199**		0.027	0.242	0.156
BLK09	0.01	0.022	0.01	0.103	**0.036**	0.014	0.007	0.031	-0.003
BLK10	0.01	0.022	0.01	0.01	**0.013**	0.01	0	0.01	0.01
BLK11	0.205	0.15	0.117	0.15	**0.156**		0.036	0.214	0.097
BLK12	0.249	0.15	0.117	0.15	**0.167**		0.057	0.257	0.076
BLK13	0.161	0.15	0.017	0.15	**0.120**	0.154	0.006	0.169	0.138
BLK14	0.01	0.031	0.01	0.01	**0.015**	0.01	0	0.01	0.01
BLK15	0.01	0.031	0.01	0.01	**0.015**	0.01	0	0.01	0.01
BLK16	0.01	0.031	0.01	0.032	**0.021**		0.012	0.041	0.001
BLK17	0.048	0.137	0.049	0.068	**0.076**	0.06	0.01	0.08	0.03
BLK18	0.048	0.138	0.137	0.068	**0.098**		0.047	0.172	0.024
BLK19	0.078	0.138	0.107	0.032	**0.089**		0.045	0.16	0.017
BLK20	0.078	0.155	0.078	0.068	**0.095**	0.07	0.01	0.09	0.06
BLK21	0.078	0.09	0.078	0.068	**0.079**		0.009	0.093	0.064

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 0.02 mg/L; All values below the detection limit are considered as 0.01 mg/L

BLACKSTONE RIVER WATER SAMPLES ANALYSIS RESULTS

Chlorophyll a Concentrations (ppb)

July 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	0.5		2.8		**1.65**		1.63	16.3	-13
BLK02	2		1.9		**1.95**		0.07	2.59	1.31
BLK03	2.1		2.3		**2.20**		0.14	3.47	0.93
BLK04	1		2		**1.50**		0.71	7.87	-4.87
BLK05	NS		NS		**0.00**		0	0	0
BLK06	3.2		3.7		**3.45**		0.35	6.63	0.27
BLK07	6.2		22		**14.10**		11.17	114.73	-86.53
BLK08	17		20.6		**18.80**		2.55	41.73	-4.13
BLK09	NS		NS		**0.00**		0	0	0
BLK10	NS		NS		**0.00**		0	0	0
BLK11	12.1		19.6		**15.85**		5.3	63.62	-31.92
BLK12	21		13		**17.00**		5.66	67.95	-33.95
BLK13	17.8		20.6		**19.20**		1.98	37.03	1.37
BLK14	NS		NS		**0.00**		0	0	0
BLK15	NS		NS		**0.00**		0	0	0
BLK16	1.9		5.6		**3.75**		2.62	27.32	-19.82
BLK17	NS		25.2		**12.60**		17.82	173.1	-147.9
BLK18	15		29.5		**22.25**		10.25	114.6	-70.1
BLK19	18		26.2		**22.10**		5.8	74.33	-30.13
BLK20	4.3		5.6		**4.95**		0.92	13.23	-3.33
BLK21	13.1		11.3		**12.20**		1.27	23.66	0.74

August 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	1.9		3		**2.45**		0.78	9.46	-4.56
BLK02	0.5		1		**0.75**		0.35	3.93	-2.43
BLK03	0.5		1		**0.75**		0.35	3.93	-2.43
BLK04	0.5		1		**0.75**		0.35	3.93	-2.43
BLK05	1.9		1.1		**1.50**		0.57	6.6	-3.6
BLK06	1		5.8		**3.40**		3.39	33.97	-27.17
BLK07	3.7		10.7		**7.20**		4.95	51.78	-37.38
BLK08	3.7		31.2		**17.45**		19.45	192.6	-157.7
BLK09	0.5		1.9		**1.20**		0.99	10.12	-7.72
BLK10	1.9		1		**1.45**		0.64	7.18	-4.28
BLK11	4		8		**6.00**		2.83	31.48	-19.48
BLK12	6.7		4.9		**5.80**		1.27	17.26	-5.66
BLK13	7		14		**10.50**		4.95	55.08	-34.08
BLK14	1		3.2		**2.10**		1.56	16.11	-11.91
BLK15	5.3		3.9		**4.60**		0.99	13.52	-4.32
BLK16	1		4.1		**2.55**		2.19	22.29	-17.19
BLK17	9.1		15		**12.05**		4.17	49.63	-25.53
BLK18	5		10.1		**7.55**		3.61	40.03	-24.93
BLK19	6		11.9		**8.95**		4.17	46.53	-28.63
BLK20	3		18.7		**10.85**		11.1	110.84	-89.14
BLK21	13.8		13.5		**13.65**		0.21	15.56	11.74

October 1991

STN.	RUN #1	RUN #2	RUN #3	RUN #4	Avg	M Avg	SD	"+ RANGE"	"-RANGE"
BLK01	2.8		1		**1.90**		1.27	13.36	-9.56
BLK02	2.9		1.1		**2.00**		1.27	13.46	-9.46
BLK03	1		0.5		**0.75**		0.35	3.93	-2.43
BLK04	1		1.1		**1.05**		0.07	1.69	0.41
BLK05	2.8		4.7		**3.75**		1.34	15.85	-8.35
BLK06	2		3.2		**2.60**		0.85	10.24	-5.04
BLK07	0.5		3.1		**1.80**		1.84	18.36	-14.76
BLK08	2.8		2		**2.40**		0.57	7.5	-2.7
BLK09	2		1		**1.50**		0.71	7.87	-4.87
BLK10	1		3.3		**2.15**		1.63	16.8	-12.5
BLK11	0.5		1.9		**1.20**		0.99	10.12	-7.72
BLK12	2		0.5		**1.25**		1.06	10.8	-8.3
BLK13	3.7		1		**2.35**		1.91	19.55	-14.85
BLK14	2		4		**3.00**		1.41	15.74	-9.74
BLK15	4		6		**5.00**		1.41	17.74	-7.74
BLK16	0.5		0.5		**0.50**		0	0.5	0.5
BLK17	2.9		3.1		**3.00**		0.14	4.27	1.73
BLK18	2.9		1		**1.95**		1.34	14.05	-10.15
BLK19	1.1		2		**1.55**		0.64	7.28	-4.18
BLK20	2.8		2		**2.40**		0.57	7.5	-2.7
BLK21	2.1		4		**3.05**		1.34	15.15	-9.05

Underlined values indicate the statistical outliers (Grubbs & Beck); NS = Not sampled;
Avg = Average value of 4 runs; M Avg = Modified average without outliers;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;
Detection limit is 0.10 ppb; All values below the detection limit are considered as 0.05 ppb0.05 mg/L
Rhode Island Stations

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **BOD5 Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	3.1	5	6.9	6.5	9.9				**6.28**	2.51	9.4	3.16
Woonsocket Final	4.2	7.5	3.7	NS	7.6				**5.75**	2.09	8.34	3.16
UBWPAD Secondary	3	1.75	1	3	5				**2.75**	1.52	4.64	0.86
UBWPAD Final	5	3.25	2	2.75	5				**3.60**	1.35	5.28	1.92

August 9-13, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	9.15	7.2	19.05	10.2	10.5				**11.22**	4.56	16.88	5.56
Woonsocket Final	8.4	7.5	14.4	12.15	6.15				**9.72**	3.44	13.98	5.46
UBWPAD Secondary	2.02	3.45	2.25	1.87	0.5				**2.02**	1.05	3.32	0.71
UBWPAD Final	3.75	4.58	5.7	3.9	NS				**4.48**	0.89	5.59	3.38

October 23-30, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	13.4	10.2	18.6	25.5	21.9	20.8	22	22	**19.30**	5.07	23.57	15.03
Woonsocket Final	11.9	8.7	7.65	13.5	18.5	14	20	16	**13.78**	4.36	17.45	10.12
UBWPAD Secondary	6.7	3.7	3.38	2.93	3.45	5.3	5.5	3.15	**4.26**	1.38	5.42	3.1
UBWPAD Final	2.9	1.73	3.23	1.88	2.48	4.5	3.15	4.7	**3.07**	1.09	3.99	2.15

Avg = Average value of all the days;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **TSS Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	7.2	10.4	5	11.4	8.8				**8.56**	2.81	12.05	5.07
Woonsocket Final	6	8.2	7.6		7				**5.76**	3.83	10.52	1
UBWPAD Secondary	2.4	1.8	2.4	2	1.8				**2.08**	0.28	2.43	1.73
UBWPAD Final		4.8	5						**1.96**	2.83	5.47	-1.55

August 9-13, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	16.4	14.6	8.8	7.6	29.4				**15.36**	10.01	27.78	2.94
Woonsocket Final	14.6	16.6	8.4	8.8	22.8				**14.24**	6.89	22.79	5.69
UBWPAD Secondary	1.4	4.4	1.8	0.6	3.2				**2.28**	1.65	4.33	0.23
UBWPAD Final	6	2.4	2.4	2.2					**2.60**	1.17	4.05	1.15

October 23-30, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	8	8.4	22.25	33.2	28.4	28.4	28.8	38.24	**22.00**	9.49	29.98	14.02
Woonsocket Final	16.86	16	15	20.4	24.4	13.14	23.6	26.36	**16.00**	5.18	20.35	11.65
UBWPAD Secondary	4.4	5.2	3.6	4.6	7.6	2	1.2	2.4	**3.90**	2.2	5.73	2.02
UBWPAD Final	8	2.8	5.8		4.6	2.8	3.6	3	**3.80**	1.8	5.34	2.31

Ave = Average value of all the days;
SD = Standard deviation; = Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **VSS Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	7.8	8	3.2	8.8	6.4				**6.84**	2.48	9.91	3.77
Woonsocket Final	4.8	6.2	7.2		5.2				**4.68**	3.21	8.66	0.7
UBWPAD Secondary	2	0	2.2	1.6	1				**1.36**	0.94	2.52	0.2
UBWPAD Final		4	3.8						**1.56**	2.25	4.36	-1.24

August 9-13, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	10.8	10.4	6.4	5.6	19.2				**10.48**	6.23	18.21	2.75
Woonsocket Final	10.8	12.2	5.2	4.8	15.2				**9.64**	5.17	16.06	3.22
UBWPAD Secondary	0.8	3.2	1	0.4	2.6				**1.60**	1.32	3.23	-0.03
UBWPAD Final	4.4	1.6	2	1.2					**1.84**	0.86	2.91	0.77

October 23-30, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	6.4	7	16.75	25.6	23.6	20.8	21.6	27.65	**22.00**	6.88	27.79	16.21
Woonsocket Final	14	12.89	13.25	17.6	19.2	9.43	17.6	20	**16.00**	3.9	19.28	12.72
UBWPAD Secondary	3.2	2.8	3	4	6	1.6	0.8	1.8	**2.90**	1.74	4.36	1.44
UBWPAD Final	6.8	2.4	4.6		3.8	1.8	3.2	2.2	**3.10**	1.49	4.36	1.84

Ave = Average value of all the days;
SD = Standard deviation; = Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **Dissolved Ammonia-N Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	26.6	33.8	28.2	21.5	21.4				**26.30**	5.17	32.72	19.88
Woonsocket Final	28.6	27.7	27.8	28.4	NS				**28.13**	0.44	28.67	27.58
UBWPAD Secondary	0.8	1	0.2	0.5	0.2				**0.54**	0.36	0.98	0.1
UBWPAD Final	1.1	0.6	0.1	0.2	0.2				**0.44**	0.42	0.96	-0.08

August 14-15, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	15.2	15	13.5	12	13.2				**13.78**	1.33	15.43	12.13
Woonsocket Final	12.9	9.5	12	16.8	14.3				**13.10**	2.71	16.46	9.74
UBWPAD Secondary	0.2	0.3	0.2	0.3	0.3				**0.26**	0.05	0.33	0.19
UBWPAD Final	0.2	0.6	0.1	0.1	NS				**0.25**	0.24	0.55	-0.05

October 2-3, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	6.5	10.8	13	13	6.1	12.1	10.5	8.9	**10.11**	2.72	12.4	7.82
Woonsocket Final	7.7	9.9	15.8	13.8	8.4	13.2	13.5	10.5	**11.60**	2.88	14.02	9.18
UBWPAD Secondary	0.5	0.4	0.2	1	0.4	0.3	0.4	0.2	**0.43**	0.25	0.64	0.21
UBWPAD Final	0.8	0.2	0.2	0.4	0.4	0.2	0.1	0.2	**0.17**	0.22	0.35	-0.02

Avg = Average of all the days;
SD = Standard deviation; +Range & -Range = 95% Confidence Interval

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **Dissolved Nitrate-N Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	0.4	0.4	0.4	0.3	0.3				**0.35**	0.07	0.44	0.27
Woonsocket Final	0.9	0.9	0.9	NS	1				**0.94**	0.06	1.01	0.87
UBWPAD Secondary	6.3	5.7	NS	6.6	6.3				**6.23**	0.38	6.7	5.76
UBWPAD Final	6.8	5.7	6.4	7.1	6.4				**6.48**	0.52	7.13	5.83

August 9-13, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	1.7	3.7	29.7	33.2	39.6				**21.57**	17.6	43.42	-0.27
Woonsocket Final	3.8	2	38.8	9.9	58.5				**22.61**	24.96	53.58	-8.37
UBWPAD Secondary	7.2	3.6	26.8	12.3	23.6				**14.69**	10.14	27.28	2.1
UBWPAD Final	6	26.3	30.9	8.8	31.6				**20.74**	12.34	36.05	5.42

September 23-30, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	**Avg**	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	NS	NS	NS	NS	NS	1.6	2.1	3.9	**2.52**	1.17	3.51	1.54
Woonsocket Final	NS	NS	NS	NS	NS	1.4	2.7	4.7	**2.94**	1.66	4.33	1.54
UBWPAD Secondary	NS	NS	NS	NS	NS	12	7.7	10.9	**10.16**	2.24	12.05	8.28
UBWPAD Final	NS	NS	NS	NS	NS	13.4	9.8	11.8	**11.67**	1.76	13.15	10.19

NS = Not sampled;
Avg = Average value of all the days;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **Total Kjeldahl-N Concentrations** (mg/L)

July 1991

STATION	DAY 1	DAY 2	DAY 3	DAY4	DAY5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	32.1	27.2	38.82	NS	24.34				**30.62**	6.34	38.48	22.75
Woonsocket Final	25.6	13.38	41.95	NS	42.09				**30.76**	13.93	48.05	13.46
UBWPAD Secondary	1.99	2.17	2.94	1.02	1.04				**1.83**	0.81	2.84	0.82
UBWPAD Final	2.47	2.17	1.61	1.14	1.48				**1.77**	0.54	2.44	1.11

August 1991

STATION	DAY 1	DAY 2	DAY 3	DAY4	DAY5				AVERAG	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	18.62	15.42	19.46	15.58	17.58				**17.33**	1.8	19.57	15.1
Woonsocket Final	13.72	17.08	18.76	17.18	17.78				**16.90**	1.9	19.26	14.54
UBWPAD Secondary	1.38	1.08	1.11	1.29	1.26				**1.22**	0.13	1.38	1.06
UBWPAD Final	2.26	1.79	1.44	1.4	1.3				**1.64**	0.39	2.13	1.15

October 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	AVERAG	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	9.31	8.7	7.73	NS	NS	15.05	13.05	11.1	**10.82**	2.8	13.18	8.46
Woonsocket Final	6.35	7.54	7.48	NS	NS	11.5	13.5	13.7	**10.01**	3.29	12.77	7.25
UBWPAD Secondary	0.5	0.5	0.5	NS	NS	0.5	0.5	0.5	**0.50**	0	0.5	0.5
UBWPAD Final	0.5	0.5	0.5	NS	NS	0.5	0.5	1.2	**0.62**	0.29	0.86	0.38

BLACKSTONE RIVER WWTF EFFLUENT ANALYSIS

Point Source Effluent **Dissolved PO4-P Concentrations** (mg/L)

July 5-9, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	3.64	2.64	3.47	3.14	1.3				**2.84**	0.94	4.01	1.67
Woonsocket Final	3.9	2.97	3.47	NS	3.14				**3.37**	0.41	3.88	2.86
UBWPAD Secondary	2.3	1.97	NS	2.53	1.39				**2.05**	1.01	3.3	0.79
UBWPAD Final	2.47	1.97	2.44	2.97	1.56				**2.28**	0.54	2.95	1.62

August 9-13, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5				Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	3.5	3.59	4.73	4.56	4.73				**4.22**	0.62	5	3.45
Woonsocket Final	3.68	3.68	4.47	0.01	4.91				**3.35**	1.94	5.76	0.94
UBWPAD Secondary	2.03	2.86	2.13	2.09	2.87				**2.40**	0.43	2.93	1.86
UBWPAD Final	2.15	2.97	1.89	2.18	2.61				**2.36**	0.43	2.89	1.83

September 23-30, 1991

STATION	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	Avg	SD	"+RANGE"	"-RANGE"
Woonsocket Secondary	NS	NS	NS	NS	NS	4.2	4.6	3.9	**4.23**	0.35	4.53	3.94
Woonsocket Final	NS	NS	NS	NS	NS	4.1	4.2	3.7	**4.00**	0.26	4.22	3.78
UBWPAD Secondary	NS	NS	NS	NS	NS	3.1	2.5	2.6	**2.73**	0.32	3	2.46
UBWPAD Final	NS	NS	NS	NS	NS	3.3	2.4	3.4	**3.03**	0.55	3.5	2.57

NS = Not sampled;
Avg = Average value of all the days;
SD = Standard deviation; + Range & -Range = 95% Confidence interval;

Section A15-3

Wet Weather Data - Storm 1

- all Data with Statistics -

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb ·	ppb	CFU/100mL	CFU/100mL
BWW00	Dry	P	9/22/92	1142	15.3	18.5	6.8	255	8.4	3.8	2.4	1.6	59.6	22.1	3.35	28	0.050	0.58	0.03	0.21	1.30	6.0	1.6	6.5	12	13,000	410
BWW00	Rain		9/22/92	2348	38.3	20.0	6.8	182	8.3	3.0	1.3	0.7	65.5	20.9	3.52	25	0.080	0.28	0.03	0.24	1.30	4.8	1.6	7.3	15	3,500	420
BWW00	Rain	3	9/23/92	250	172.0	20.0	6.1	132	6.4	6.6	3.4	1.8	45.5	12.1	2.31	19	0.220	0.41	0.02	0.81	4.20	7.4	3.6	32.6	50	3,000	500
BWW00	Rain	6	9/23/92	540	59.5	18.8	6.6	101	7.9	4.9	15.4	6.4	27.5	9.0	1.67	13	0.310	0.38	0.02	1.12	2.20	6.4	7.0	22.0	34	18,000	12,000
BWW00	24h	9	9/23/92	818	53.7	18.2	6.2	97	8.4	4.0	11.0	4.0	30.1	9.5	1.75	13	0.050	0.29	0.03	0.82	1.70	11.3	2.5	17.3	45	12,000	6,800
BWW00	24h	12	9/23/92	1115	43.1	18.3	6.2	124	9.1	1.8	7.4	3.0	35.1	12.8	2.29	17	0.060	0.18	0.02	0.17	1.40	5.4	2.0	10.4	18	4,300	1,700
BWW00	24h	16	9/23/92	1535	33.8	19.2	6.5	154	8.8	ND	6.8	2.8	44.3	16.2	2.90	22	0.110	0.15	0.03	0.15	1.10	4.7	1.5	8.9	16	2,800	190
BWW00	24h	24	9/23/92	2319	21.9	16.5	NA	183	8.9	1.5	5.6	1.6	54.2	19.6	3.28	26	0.120	0.16	ND	0.50	1.50	1.3	1.9	8.7	15	2,500	370
BWW00	48h	32	9/24/92	722	15.3	15.0	6.5	181	7.3	ND	8.0	2.6	49.1	19.7	3.43	26	0.050	0.16	ND	0.16	1.00	3.6	1.1	6.9	15	1,600	130
BWW00	48h	40	9/24/92	1516	21.9	16.0	6.7	196	7.3	1.3	3.2	2.6	58.7	19.5	3.23	26	0.350	0.16	0.03	0.08	0.60	2.4	0.9	3.9	10	760	76
DRY WEATHER (1 sample)					**15.3**	**18.5**	**6.8**	**255**	**8.4**	**3.8**	**2.4**	**1.6**	**59.6**	**22.1**	**3.35**	**28**	**0.050**	**0.58**	**0.03**	**0.21**	**1.30**	**6.0**	**1.6**	**6.5**	**12**	**13,000**	**410**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	7	9	9	9	9	9	9	9	9	7	9	9	9	9	9	9	9	9
Mean (*)					**51.1**	**18.0**	**6.4**	**150**	**8.0**	**3.3**	**6.9**	**2.8**	**45.6**	**15.5**	**2.71**	**21**	**0.150**	**0.24**	**0.03**	**0.45**	**1.67**	**5.3**	**2.5**	**13.1**	**24**	**3,520**	**648**
Minimum					15.3	15.0	6.1	97	6.4	1.3	1.3	0.7	27.5	9.0	1.67	13	0.050	0.15	0.02	0.08	0.60	1.3	0.9	3.9	10	760	76
Maximum					172.0	20.0	6.8	196	9.1	6.6	15.4	6.4	65.5	20.9	3.52	26	0.350	0.41	0.03	1.12	4.20	11.3	7.0	32.6	50	18,000	12,000
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**89.9**	**19.6**	**6.5**	**138**	**7.5**	**4.8**	**6.7**	**3.0**	**46.2**	**14.0**	**2.50**	**19**	**0.203**	**0.36**	**0.02**	**0.72**	**2.57**	**6.2**	**4.1**	**20.6**	**33**	**5,739**	**1,361**
Minimum					38.3	18.8	6.1	101	6.4	3.0	1.3	0.7	27.5	9.0	1.67	13	0.080	0.28	0.02	0.24	1.30	4.8	1.6	7.3	15	3,000	420
Maximum					172.0	20.0	6.8	182	8.3	6.6	15.4	6.4	65.5	20.9	3.52	25	0.310	0.41	0.03	1.12	4.20	7.4	7.0	32.6	50	18,000	12,000
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
Mean (*)					**38.1**	**18.1**	**6.3**	**140**	**8.8**	**2.4**	**7.7**	**2.9**	**40.9**	**14.5**	**2.56**	**20**	**0.085**	**0.20**	**0.03**	**0.41**	**1.43**	**5.7**	**2.0**	**11.3**	**24**	**4,360**	**949**
Minimum					21.9	16.5	6.2	97	8.4	1.5	5.6	1.6	30.1	9.5	1.75	13	0.050	0.15	0.02	0.15	1.10	1.3	1.5	8.7	15	2,500	190
Maximum					53.7	19.2	6.5	183	9.1	4.0	11.0	4.0	54.2	19.6	3.28	26	0.120	0.29	0.03	0.82	1.70	11.3	2.5	17.3	45	12,000	6,800
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
Mean (*)					**18.6**	**15.5**	**6.6**	**189**	**7.3**	**1.3**	**5.6**	**2.6**	**53.9**	**19.6**	**3.33**	**26**	**0.200**	**0.16**	**0.03**	**0.12**	**0.80**	**3.0**	**1.0**	**5.4**	**13**	**1,103**	**99**
Minimum					15.3	15.0	6.5	181	7.3		3.2	2.6	49.1	19.5	3.23	26	0.050	0.16	0.03	0.08	0.60	2.4	0.9	3.9	10	760	76
Maximum					21.9	16.0	6.7	196	7.3		8.0	2.6	58.7	19.7	3.43	26	0.350	0.16	0.03	0.16	1.00	3.6	1.1	6.9	15	1,600	130
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW01	Dry	P	9/22/92	1200	16.5	18.8	6.7	260	8.4	5.4	2.6	2.2	208.0	26.7	3.87	35	0.110	0.50	0.02	0.30	2.20	7.1	9.6	3.3	42	8,300	150
BWW01	Rain		9/23/92	5	41.2	19.8	6.4	240	7.5	10.3	3.4	2.4	188.0	23.5	3.97	34	0.420	0.61	0.06	0.43	4.90	1.3	3.5	11.8	43	11,000	6,800
BWW01	Rain	3	9/23/92	305	185.0	19.1	6.6	176	6.3	8.0	26.4	8.8	72.4	18.2	3.60	34	0.200	0.36	ND	0.50	5.00	14.8	4.3	21.6	55	17,000	5,600
BWW01	Rain	6	9/23/92	545	64.0	18.5	6.7	186	7.5	4.1	11.4	5.2	57.3	18.1	3.44	29	0.240	0.48	0.02	0.27	2.40	10.4	3.0	11.1	38	13,000	5,700
BWW01	24h	9	9/23/92	830	57.8	18.2	6.0	169	7.8	3.4	6.0	3.4	55.9	16.0	2.87	28	0.200	0.45	0.02	0.23	2.70	6.1	3.2	14.0	40	9,700	2,900
BWW01	24h	12	9/23/92	1130	46.4	18.5	6.2	270	8.8	2.8	5.2	2.8	94.9	17.3	3.66	51	0.270	0.53	0.02	0.31	5.40	8.4	4.6	13.9	54	6,700	1,700
BWW01	24h	16	9/23/92	1545	36.3	18.9	6.4	218	8.2	2.6	4.0	2.4	65.5	19.7	3.48	35	0.090	0.43	0.02	0.22	3.80	6.2	2.7	7.1	50	5,300	470
BWW01	24h	24	9/23/92	2331	23.5	16.4	NA	238	8.2	1.5	2.8	0.6	70.2	22.6	3.87	35	0.040	0.40	ND	0.16	3.50	4.7	3.6	3.8	40	6,600	370
BWW01	48h	32	9/24/92	733	16.5	14.8	6.6	242	7.2	1.0	3.8	1.8	74.1	23.8	3.89	37	0.080	0.35	ND	0.17	3.40	2.8	2.9	3.0	24	880	270
BWW01	48h	40	9/24/92	1531	23.5	16.0	6.9	328	7.2	2.5	2.2	2.2	82.1	25.0	4.01	41	0.450	0.39	ND	0.19	3.60	3.4	2.9	6.4	27	1,600	150
DRY WEATHER (1 sample)					**16.5**	**18.8**	**6.7**	**260**	**8.4**	**5.4**	**2.6**	**2.2**	**208.0**	**26.7**	**3.87**	**35**	**0.110**	**0.50**	**0.02**	**0.30**	**2.20**	**7.1**	**9.6**	**3.3**	**42**	**8,300**	**150**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	9	9	5	9	9	9	9	9	9	9	9
Mean (*)					**54.9**	**17.8**	**6.5**	**230**	**7.6**	**4.0**	**7.2**	**3.3**	**84.5**	**20.5**	**3.64**	**36**	**0.221**	**0.44**	**0.03**	**0.28**	**3.86**	**6.5**	**3.4**	**10.3**	**41**	**5,830**	**1,252**
Minimum					16.5	14.8	6.0	169	6.3	1.0	2.2	0.6	55.9	16.0	2.87	28	0.040	0.35	0.02	0.16	2.40	1.3	2.7	3.0	24	880	150
Maximum					185.0	19.8	6.9	328	8.8	10.3	26.4	8.8	188.0	25.0	4.01	51	0.450	0.61	0.06	0.50	5.40	14.8	4.6	21.6	55	17,000	6,800
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
Mean (*)					**96.7**	**19.1**	**6.5**	**201**	**7.1**	**7.5**	**13.7**	**5.5**	**105.9**	**19.9**	**3.67**	**32**	**0.287**	**0.48**	**0.04**	**0.40**	**4.10**	**8.8**	**3.6**	**14.8**	**45**	**13,446**	**6,010**
Minimum					41.2	18.5	6.4	176	6.3	4.1	3.4	2.4	57.3	18.1	3.44	29	0.200	0.36	0.02	0.27	2.40	1.3	3.0	11.1	38	11,000	5,600
Maximum					185.0	19.8	6.7	240	7.5	10.3	26.4	8.8	188.0	23.5	3.97	34	0.420	0.61	0.06	0.50	5.00	14.8	4.3	21.6	55	17,000	6,800
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
Mean (*)					**41.0**	**18.0**	**6.2**	**224**	**8.3**	**2.6**	**4.5**	**2.3**	**71.6**	**18.9**	**3.47**	**37**	**0.150**	**0.45**	**0.02**	**0.23**	**3.85**	**6.4**	**3.5**	**9.7**	**46**	**6,905**	**962**
Minimum					23.5	16.4	6.0	169	7.8	1.5	2.8	0.6	55.9	16.0	2.87	28	0.040	0.40	0.02	0.16	2.70	4.7	2.7	3.8	40	5,300	370
Maximum					57.8	18.9	6.4	270	8.8	3.4	6.0	3.4	94.9	22.6	3.87	51	0.270	0.53	0.02	0.31	5.40	8.4	4.6	14.0	54	9,700	2,900
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2	2
Mean (*)					**20.0**	**15.4**	**6.7**	**285**	**7.2**	**1.8**	**3.0**	**2.0**	**78.1**	**24.4**	**3.95**	**39**	**0.265**	**0.37**		**0.18**	**3.50**	**3.1**	**2.9**	**4.7**	**26**	**1,187**	**201**
Minimum					16.5	14.8	6.6	242	7.2	1.0	2.2	1.8	74.1	23.8	3.89	37	0.080	0.35		0.17	3.40	2.8	2.9	3.0	24	880	150
Maximum					23.5	16.0	6.9	328	7.2	2.5	3.8	2.2	82.1	25.0	4.01	41	0.450	0.39		0.19	3.60	3.4	2.9	6.4	27	1,600	270
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW02	Dry	P	9/22/92	1216	73.3	20.8	6.5	440	7.7	8.7	9.0	4.5	131.0	25.0	3.66	59	1.820	1.54	1.13	1.80	7.30	41.8	25.4	3.4	46	18	1
BWW02	Rain		9/23/92	25	107.4	20.4	6.5	333	7.3	8.0	4.2	3.0	136.0	26.2	3.47	61	2.950	1.47	1.13	2.20	15.70	42.7	29.8	5.5	55	3	<1
BWW02	Rain	3	9/23/92	330	268.2	20.5	6.2	240	6.8	8.3	7.8	5.6	87.4	23.6	3.56	55	2.270	0.68	0.59	1.09	18.70	3.3	4.6	31.9	108	1,400	<1
BWW02	Rain	6	9/23/92	615	155.9	19.5	6.5	271	7.1	7.1	14.2	5.6	95.4	21.0	3.52	44	1.730	0.78	0.74	0.14	8.30	1.8	2.7	13.4	58	4	<1
BWW02	24h	9	9/23/92	848	142.1	19.8	6.3	258	7.5	6.3	7.2	4.4	77.0	19.6	3.14	42	1.200	1.94	0.82	0.08	8.50	2.2	2.7	11.0	45	17	<1
BWW02	24h	12	9/23/92	1150	118.0	20.0	6.1	230	8.3	2.4	5.4	3.8	67.3	17.2	2.85	37	0.520	0.97	0.74	1.14	5.90	11.0	10.6	4.5	41	7	<1
BWW02	24h	16	9/23/92		88.9	20.0	6.2	251	7.8	2.7	5.8	3.4	75.7	17.4	2.82	40	0.560	1.21	0.82	0.13	5.10	11.7	2.9	5.3	51	28	<1
BWW02	24h	24	9/23/92	2346	49.6	17.5	NA	309	7.5	5.8	4.8	3.4	80.4	20.1	2.99	52	0.800	1.30	0.90	0.15	12.40	2.6	3.4	8.6	57	28	<1
BWW02	48h	32	9/24/92	755	49.6	16.5	6.3	319	8.0	1.2	NA	NA	77.9	21.9	3.47	53	ND	0.97	0.27	1.01	6.20	24.2	19.3	2.6	40	4	1
BWW02	48h	40	9/24/92	1545	80.7	18.2	6.5	332	8.0	2.5	5.8	4.2	93.6	23.9	3.38	57	1.220	1.34	0.27	1.52	5.70	41.7	25.0	3.8	59	5	<1
DRY WEATHER (1 sample)					**73.3**	**20.8**	**6.5**	**440**	**7.7**	**8.7**	**9.0**	**4.5**	**131.0**	**25.0**	**3.66**	**59**	**1.820**	**1.54**	**1.13**	**1.80**	**7.30**	**41.8**	**25.4**	**3.4**	**46**	**18**	**1**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	8	8	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9
Mean (*)					**117.8**	**19.2**	**6.3**	**283**	**7.6**	**4.9**	**6.9**	**4.2**	**87.9**	**21.2**	**3.24**	**49**	**1.406**	**1.18**	**0.70**	**0.83**	**9.61**	**15.7**	**11.2**	**9.6**	**57**	**15**	**<1**
Minimum					49.6	16.5	6.1	230	6.8	1.2	4.2	3.0	67.3	17.2	2.82	37	0.520	0.68	0.27	0.08	5.10	1.8	2.7	2.6	40	3	<1
Maximum					268.2	20.5	6.5	333	8.3	8.3	14.2	5.6	136.0	26.2	3.56	61	2.950	1.94	1.13	2.20	18.70	42.7	29.8	31.9	108	1,400	1
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**177.2**	**20.1**	**6.4**	**281**	**7.1**	**7.8**	**8.7**	**4.7**	**106.3**	**23.6**	**3.52**	**53**	**2.317**	**0.98**	**0.82**	**1.14**	**14.23**	**15.9**	**12.4**	**16.9**	**74**	**26**	**<1**
Minimum					107.4	19.5	6.2	240	6.8	7.1	4.2	3.0	87.4	21.0	3.47	44	1.730	0.68	0.59	0.14	8.30	1.8	2.7	5.5	55	3	<1
Maximum					268.2	20.5	6.5	333	7.3	8.3	14.2	5.6	136.0	26.2	3.56	61	2.950	1.47	1.13	2.20	18.70	42.7	29.8	31.9	108	1,400	<1
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)					**99.7**	**19.3**	**6.2**	**262**	**7.8**	**4.3**	**5.8**	**3.8**	**75.1**	**18.6**	**2.95**	**43**	**0.770**	**1.36**	**0.82**	**0.38**	**7.98**	**6.9**	**4.9**	**7.4**	**49**	**17**	**<1**
Minimum					49.6	17.5	6.1	230	7.5	2.4	4.8	3.4	67.3	17.2	2.82	37	0.520	0.97	0.74	0.08	5.10	2.2	2.7	4.5	41	7	<1
Maximum					142.1	20.0	6.3	309	8.3	6.3	7.2	4.4	80.4	20.1	3.14	52	1.200	1.94	0.90	1.14	12.40	11.7	10.6	11.0	57	28	<1
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	1	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
Mean (*)					**65.2**	**17.4**	**6.4**	**326**	**8.0**	**1.9**	**5.8**	**4.2**	**85.8**	**22.9**	**3.43**	**55**	**1.220**	**1.16**	**0.27**	**1.27**	**5.95**	**33.0**	**22.2**	**3.2**	**50**	**4**	**<1**
Minimum					49.6	16.5	6.3	319	8.0	1.2	5.8		77.9	21.9	3.38	53		0.97	0.27	1.01	5.70	24.2	19.3	2.6	40	4	<1
Maximum					80.7	18.2	6.5	332	8.0	2.5	5.8		93.6	23.9	3.47	57		1.34	0.27	1.52	6.20	41.7	25.0	3.8	59	5	1
WET WEATHER ***(Day 3)***																											

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW04	Dry	P	9/22/92	1238	79.0	20.0	6.8	455	8.7	8.3	5.0	4.2	106.0	23.7	3.59	62	0.810	1.75	1.11	1.09	8.20	43.6	23.8	3.0	41	610	4
BWW04	Rain		9/23/92	59	93.0	20.7	6.7	313	8.2	1.8	33.8	11.6	110.0	23.3	3.37	56	0.970	1.62	1.11	1.28	5.60	44.5	21.4	7.3	46	360	59
BWW04	Rain	3	9/23/92	400	182.0	20.0	6.7	310	8.6	8.6	35.8	15.2	104.0	18.5	3.07	56	1.160	1.80	1.15	2.60	17.00	69.1	32.2	18.2	86	1,600	120
BWW04	Rain	6	9/23/92	655	245.0	19.2	6.7	277	8.3	7.7	23.6	8.8	76.8	19.9	3.05	45	1.660	2.63	0.76	1.23	11.30	38.6	22.0	11.9	70	1,400	190
BWW04	24h	9	9/23/92	915	163.0	19.4	7.0	255	9.0	6.2	10.2	5.0	81.6	19.3	3.02	43	1.610	1.87	0.58	1.15	8.10	30.0	17.8	14.2	58	580	130
BWW04	24h	12	9/23/92	1215	144.0	20.0	6.5	270	9.2	1.1	7.6	4.8	79.3	19.9	3.20	44	1.430	1.87	0.67	0.92	5.90	27.5	17.5	8.4	44	150	23
BWW04	24h	16	9/23/92	1630	116.0	20.8	6.5	252	8.6	3.5	3.8	1.8	74.6	19.9	3.10	44	0.200	2.23	0.76	0.79	5.10	27.4	17.7	5.6	32	230	21
BWW04	24h	24	9/24/92	8	80.0	17.0	NA	253	9.1	3.4	2.4	1.6	73.2	18.0	2.85	38	ND	2.86	0.67	0.69	4.60	24.7	16.2	7.7	40	220	60
BWW04	48h	32	9/24/92	820	53.0	15.2	6.6	300	8.9	3.6	1.5	0.8	80.9	19.0	2.95	49	0.100	3.40	0.76	0.80	8.90	28.3	19.9	3.4	44	200	12
BWW04	48h	40	9/24/92	1605	66.0	17.2	6.7	316	8.7	2.2	2.8	2.8	88.8	22.2	3.22	51	ND	1.70	0.36	0.68	5.20	24.4	18.0	2.9	34	160	23
DRY WEATHER (1 sample)					**79.0**	**20.0**	**6.8**	**455**	**8.7**	**8.3**	**5.0**	**4.2**	**106.0**	**23.7**	**3.59**	**62**	**0.810**	**1.75**	**1.11**	**1.09**	**8.20**	**43.6**	**23.8**	**3.0**	**41**	**610**	**4**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	7	9	9	9	9	9	9	9	9	9	9
Mean (*)					**126.9**	**18.8**	**6.7**	**283**	**8.7**	**4.2**	**13.5**	**5.8**	**85.5**	**20.0**	**3.09**	**47**	**1.019**	**2.22**	**0.76**	**1.13**	**7.97**	**34.9**	**20.3**	**8.8**	**50**	**365**	**48**
Minimum					53.0	15.2	6.5	252	8.2	1.1	1.5	0.8	73.2	18.0	2.85	38	0.100	1.62	0.36	0.68	4.60	24.4	16.2	2.9	32	150	12
Maximum					245.0	20.8	7.0	316	9.2	8.6	35.8	15.2	110.0	23.3	3.37	56	1.660	3.40	1.15	2.60	17.00	69.1	32.2	18.2	86	1,600	190
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**173.3**	**20.0**	**6.7**	**300**	**8.4**	**6.0**	**31.1**	**11.9**	**96.9**	**20.6**	**3.16**	**52**	**1.263**	**2.02**	**1.01**	**1.70**	**11.30**	**50.7**	**25.2**	**12.5**	**67**	**931**	**110**
Minimum					93.0	19.2	6.7	277	8.2	1.8	23.6	8.8	76.8	18.5	3.05	45	0.970	1.62	0.76	1.23	5.60	38.6	21.4	7.3	46	360	59
Maximum					245.0	20.7	6.7	313	8.6	8.6	35.8	15.2	110.0	23.3	3.37	56	1.660	2.63	1.15	2.60	17.00	69.1	32.2	18.2	86	1,600	190
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Mean (*)					**125.8**	**19.3**	**6.7**	**258**	**9.0**	**3.6**	**6.0**	**3.3**	**77.2**	**19.3**	**3.04**	**42**	**1.080**	**2.21**	**0.67**	**0.89**	**5.93**	**27.4**	**17.3**	**9.0**	**44**	**258**	**44**
Minimum					80.0	17.0	6.5	252	8.6	1.1	2.4	1.6	73.2	18.0	2.85	38	0.200	1.87	0.58	0.69	4.60	24.7	16.2	5.6	32	150	21
Maximum					163.0	20.8	7.0	270	9.2	6.2	10.2	5.0	81.6	19.9	3.20	44	1.610	2.86	0.76	1.15	8.10	30.0	17.8	14.2	58	580	130
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
Mean (*)					**59.5**	**16.2**	**6.7**	**308**	**8.8**	**2.9**	**2.2**	**1.8**	**84.9**	**20.6**	**3.09**	**50**	**0.100**	**2.55**	**0.56**	**0.74**	**7.05**	**26.4**	**19.0**	**3.2**	**39**	**179**	**17**
Minimum					53.0	15.2	6.6	300	8.7	2.2	1.5	0.8	80.9	19.0	2.95	49	0.100	1.70	0.36	0.68	5.20	24.4	18.0	2.9	34	160	12
Maximum					66.0	17.2	6.7	316	8.9	3.6	2.8	2.8	88.8	22.2	3.22	51	0.100	3.40	0.76	0.80	8.90	28.3	19.9	3.4	44	200	23
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW05S	Dry	P	9/22/92	1312	4.5	20.7	7.3	215	10.2	NA	1.5	1.5	70.6	19.3	3.37	32	NA	0.22	0.02	ND	0.30	1.1	1.5	ND	ND	NA	NA
BWW05S	Rain		9/23/92	147	3.8	19.8	6.6	192	7.2	NA	1.7	1.3	74.4	18.7	3.22	30	NA	0.25	ND	0.17	ND	3.2	0.9	30.6	14	NA	NA
BWW05S	Rain	3	9/23/92	440	6.2	19.2	6.4	192	7.0	NA	1.4	1.0	75.0	18.9	3.33	32	NA	0.12	ND	ND	ND	3.1	1.2	2.7	ND	580	550
BWW05S	Rain	6	9/23/92	725	6.2	18.5	6.5	199	7.2	NA	1.4	1.2	60.9	19.0	3.42	30	NA	0.18	ND	ND	ND	2.2	0.9	1.2	ND	NA	NA
BWW05S	24h	9	9/23/92	945	7.9	18.8	6.5	199	9.2	NA	0.8	0.6	70.2	19.0	3.43	31	NA	0.13	0.02	ND	ND	1.3	1.0	2.0	ND	NA	NA
BWW05S	24h	12	9/23/92	1245	9.3	19.0	6.4	202	9.6	NA	1.6	1.0	67.4	19.2	3.41	32	NA	0.18	ND	ND	1.30	1.0	1.3	1.0	ND	NA	NA
BWW05S	24h	16	9/23/92	1645	9.3	19.3	6.3	198	8.6	NA	1.4	1.0	63.3	18.9	3.44	31	NA	0.17	ND	ND	0.90	1.5	0.8	ND	ND	NA	NA
BWW05S	24h	24	9/24/92	38	6.7	17.5	NA	216	8.0	NA	ND	ND	66.0	18.8	3.37	31	NA	0.11	ND	0.33	1.00	1.0	0.9	1.6	ND	NA	NA
BWW05S	48h	32	9/24/92	855	5.6	16.0	6.3	209	8.5	NA	2.5	2.5	63.4	19.3	3.41	32	NA	0.13	ND	ND	1.00	1.0	0.5	1.2	ND	NA	NA
BWW05S	48h	40	9/24/92	1639	5.1	17.5	6.9	201	8.9	NA	2.0	2.0	70.6	19.0	3.44	30	NA	NA	ND	ND	1.10	0.8	0.8	1.1	ND	NA	NA
DRY WEATHER (1 sample)					**4.5**	**20.7**	**7.3**	**215**	**10.2**		**1.5**	**1.5**	**70.6**	**19.3**	**3.37**	**32**		**0.22**	**0.02**		**0.30**	**1.1**	**1.5**				
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9		8	8	9	9	9	9		8	1	2	5	9	9	8	1	1	1
Mean (*)					**6.7**	**18.4**	**6.5**	**201**	**8.2**		**1.6**	**1.3**	**67.9**	**19.0**	**3.39**	**31**		**0.16**	**0.02**	**0.25**	**1.06**	**1.7**	**0.9**	**5.2**	**14**	**580**	**550**
Minimum					3.8	16.0	6.3	192	7.0		0.8	0.6	60.9	18.7	3.22	30		0.11		0.17	0.90	0.8	0.5	1.0			
Maximum					9.3	19.8	6.9	216	9.6		2.5	2.5	75.0	19.3	3.44	32		0.25		0.33	1.30	3.2	1.3	30.6			
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3		3	3	3	3	3	3		3		1		3	3	3	1	1	1
Mean (*)					**5.4**	**19.2**	**6.5**	**194**	**7.1**		**1.5**	**1.2**	**70.1**	**18.9**	**3.32**	**31**		**0.18**		**0.17**		**2.8**	**1.0**	**11.5**	**14**	**580**	**550**
Minimum					3.8	18.5	6.4	192	7.0		1.4	1.0	60.9	18.7	3.22	30		0.12				2.2	0.9	1.2			
Maximum					6.2	19.8	6.6	199	7.2		1.7	1.3	75.0	19.0	3.42	32		0.25				3.2	1.2	30.6			
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4		3	3	4	4	4	4		4	1	1	3	4	4	3			
Mean (*)					**8.3**	**18.7**	**6.4**	**204**	**8.9**		**1.3**	**0.9**	**66.7**	**19.0**	**3.41**	**31**		**0.15**	**0.02**	**0.33**	**1.07**	**1.2**	**1.0**	**1.5**			
Minimum					6.7	17.5	6.3	198	8.0		0.8	0.6	63.3	18.8	3.37	31		0.11			0.90	1.0	0.8	1.0			
Maximum					9.3	19.3	6.5	216	9.6		1.6	1.0	70.2	19.2	3.44	32		0.18			1.30	1.5	1.3	2.0			
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2		1			2	2	2	2			
Mean (*)					**5.4**	**16.8**	**6.6**	**205**	**8.7**		**2.3**	**2.3**	**67.0**	**19.2**	**3.43**	**31**		**0.13**			**1.05**	**0.9**	**0.7**	**1.2**			
Minimum					5.1	16.0	6.3	201	8.5		2.0	2.0	63.4	19.0	3.41	30					1.00	0.8	0.5	1.1			
Maximum					5.6	17.5	6.9	209	8.9		2.5	2.5	70.6	19.3	3.44	32					1.10	1.0	0.8	1.2			
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW06	Dry	P	9/22/92	1257	79.7	19.8	6.7	380	8.3	4.9	3.8	1.8	89.2	22.0	3.22	46	0.360	3.36	0.77	0.86	4.90	30.2	17.5	7.5	32	80	10
BWW06	Rain		9/23/92	119	67.4	20.5	6.7	303	7.8	8.4	7.5	5.3	105.0	21.0	3.00	53	0.370	3.40	0.89	1.26	8.20	43.9	20.7	33.5	47	330	170
BWW06	Rain	3	9/23/92	440	110.8	20.5	6.6	304	7.7	6.1	11.4	6.8	78.8	21.5	3.07	51	0.440	3.34	0.94	0.91	7.10	41.2	20.1	9.3	32	980	530
BWW06	Rain	6	9/23/92	715	110.8	19.2	6.5	313	7.8	2.9	9.8	3.8	75.9	21.3	3.01	52	0.500	3.58	0.90	1.06	7.60	38.1	20.1	8.6	40	560	430
BWW06	24h	9	9/23/92	935	141.3	19.2	6.3	316	8.5	5.3	9.4	3.8	95.9	20.8	2.83	52	0.830	3.75	0.94	1.21	10.00	40.2	22.1	10.0	51	990	230
BWW06	24h	12	9/23/92	1230	165.7	20.0	6.3	289	8.4	4.2	8.4	3.6	83.4	19.9	2.89	48	1.010	3.64	0.68	1.22	9.20	30.4	19.5	8.9	39	1,400	110
BWW06	24h	16	9/23/92	1700	165.7	20.1	6.5	262	8.7	3.9	7.0	2.0	73.4	19.7	2.76	42	0.460	3.34	0.59	0.88	6.20	25.2	16.2	7.5	35	460	99
BWW06	24h	24	9/23/92	20	120.2	17.5	NA	270	8.5	3.3	2.6	1.6	72.0	18.5	2.70	41	ND	3.05	0.64	0.82	5.50	26.0	16.0	9.1	42	310	61
BWW06	48h	32	9/24/92	835	100.0	15.7	6.5	260	8.7	2.4	7.0	3.5	76.3	18.3	2.68	39	0.220	2.81	0.55	0.92	4.80	23.0	14.4	6.5	30	35	46
BWW06	48h	40	9/24/92	1625	90.0	16.5	6.8	268	8.5	3.7	5.2	2.8	79.5	18.8	2.58	44	0.260	1.64	0.59	0.75	6.20	24.1	15.4	6.8	35	120	16
DRY WEATHER (1 sample)					**79.7**	**19.8**	**6.7**	**380**	**8.3**	**4.9**	**3.8**	**1.8**	**89.2**	**22.0**	**3.22**	**46**	**0.360**	**3.36**	**0.77**	**0.86**	**4.90**	**30.2**	**17.5**	**7.5**	**32**	**80**	**10**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9
Mean (*)					**119.1**	**18.8**	**6.5**	**287**	**8.3**	**4.5**	**7.6**	**3.7**	**82.2**	**20.0**	**2.84**	**47**	**0.511**	**3.17**	**0.75**	**1.00**	**7.20**	**32.5**	**18.3**	**11.1**	**39**	**376**	**118**
Minimum					67.4	15.7	6.3	260	7.7	2.4	2.6	1.6	72.0	18.3	2.58	39	0.220	1.64	0.55	0.75	4.80	23.0	14.4	6.5	30	35	16
Maximum					165.7	20.5	6.8	316	8.7	8.4	11.4	6.8	105.0	21.5	3.07	53	1.010	3.75	0.94	1.26	10.00	43.9	22.1	33.5	51	1,400	530
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**96.3**	**20.1**	**6.6**	**307**	**7.8**	**5.8**	**9.6**	**5.3**	**86.6**	**21.3**	**3.03**	**52**	**0.437**	**3.44**	**0.91**	**1.08**	**7.63**	**41.1**	**20.3**	**17.1**	**40**	**566**	**338**
Minimum					67.4	19.2	6.5	303	7.7	2.9	7.5	3.8	75.9	21.0	3.00	51	0.370	3.34	0.89	0.91	7.10	38.1	20.1	8.6	32	330	170
Maximum					110.8	20.5	6.7	313	7.8	8.4	11.4	6.8	105.0	21.5	3.07	53	0.500	3.58	0.94	1.26	8.20	43.9	20.7	33.5	47	980	530
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Mean (*)					**148.2**	**19.2**	**6.4**	**284**	**8.5**	**4.2**	**6.9**	**2.8**	**81.2**	**19.7**	**2.80**	**46**	**0.767**	**3.45**	**0.71**	**1.03**	**7.73**	**30.5**	**18.5**	**8.9**	**42**	**667**	**111**
Minimum					120.2	17.5	6.3	262	8.4	3.3	2.6	1.6	72.0	18.5	2.70	41	0.460	3.05	0.59	0.82	5.50	25.2	16.0	7.5	35	310	61
Maximum					165.7	20.1	6.5	316	8.7	5.3	9.4	3.8	95.9	20.8	2.89	52	1.010	3.75	0.94	1.22	10.00	40.2	22.1	10.0	51	1,400	230
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**95.0**	**16.1**	**6.7**	**264**	**8.6**	**3.1**	**6.1**	**3.2**	**77.9**	**18.6**	**2.63**	**42**	**0.240**	**2.23**	**0.57**	**0.84**	**5.50**	**23.6**	**14.9**	**6.7**	**33**	**65**	**27**
Minimum					90.0	15.7	6.5	260	8.5	2.4	5.2	2.8	76.3	18.3	2.58	39	0.220	1.64	0.55	0.75	4.80	23.0	14.4	6.5	30	35	16
Maximum					100.0	16.5	6.8	268	8.7	3.7	7.0	3.5	79.5	18.8	2.68	44	0.260	2.81	0.59	0.92	6.20	24.1	15.4	6.8	35	120	46
WET WEATHER ***(Day 3)***																											

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW07	Dry	P	9/22/92	1500	107.0	20.5	6.7	350	8.6	3.1	1.8	1.4	88.4	21.4	3.06	45	0.510	2.29	0.64	0.72	2.30	23.1	15.6	5.9	26	230	6
BWW07	Rain		9/22/92	130	95.0	21.0	6.7	332	9.2	3.2	6.2	2.8	83.1	21.3	3.09	44	1.080	3.05	0.68	0.75	2.60	23.2	15.0	6.6	23	280	29
BWW07	Rain	3	9/23/92	415	99.0	20.8	6.7	345	9.1	3.5	6.2	2.8	85.1	20.9	3.07	45	1.350	2.71	0.62	0.85	4.00	23.8	15.8	9.3	31	220	1,700
BWW07	Rain	6	9/23/92	715	101.0	19.5	6.5	338	8.4	2.3	8.8	2.6	74.8	20.8	3.22	47	1.130	2.88	0.64	0.73	3.50	21.0	14.7	7.8	34	5,300	50
BWW07	24h	9	9/23/92	1040	103.0	19.2	6.6	325	7.8	2.2	9.6	3.4	82.2	21.3	3.13	50	1.210	3.96	0.68	0.86	5.70	26.0	16.7	8.9	31	370	67
BWW07	24h	12	9/23/92	1405	104.0	19.8	6.5	335	9.2	2.8	9.0	4.8	80.0	21.6	3.10	47	1.790	3.93	0.65	0.70	5.40	23.9	16.8	8.0	28	330	34
BWW07	24h	16	9/23/92	1640	111.0	20.0	6.3	360	9.9	1.5	3.2	1.8	86.8	21.3	3.00	49	0.480	3.32	0.72	0.77	5.10	25.0	17.0	6.1	29	300	15
BWW07	24h	24	9/23/92	55	123.0	18.5	NA	330	9.4	2.1	12.4	4.8	89.9	20.1	3.09	48	0.280	3.16	0.65	0.93	7.70	28.3	16.8	11.4	35	380	13
BWW07	48h	32	9/24/92	850	120.0	16.5	6.4	290	8.1	2.2	11.0	2.4	78.9	20.2	3.05	48	0.580	2.69	0.65	0.99	8.20	26.6	17.1	11.0	32	590	56
BWW07	48h	40	9/24/92	1735	123.0	17.3	7.1	292	8.4	2.4	4.0	2.4	71.4	19.3	2.80	43	0.080	2.22	0.61	0.80	5.40	22.9	15.1	7.1	32	160	6
DRY WEATHER (1 sample)					**107.0**	**20.5**	**6.7**	**350**	**8.6**	**3.1**	**1.8**	**1.4**	**88.4**	**21.4**	**3.06**	**45**	**0.510**	**2.29**	**0.64**	**0.72**	**2.30**	**23.1**	**15.6**	**5.9**	**26**	**230**	**6**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)					**108.8**	**19.2**	**6.6**	**327**	**8.8**	**2.5**	**7.8**	**3.1**	**81.4**	**20.8**	**3.06**	**47**	**0.887**	**3.10**	**0.66**	**0.82**	**5.29**	**24.5**	**16.1**	**8.5**	**31**	**423**	**42**
Minimum					95.0	16.5	6.3	290	7.8	1.5	3.2	1.8	71.4	19.3	2.80	43	0.080	2.22	0.61	0.70	2.60	21.0	14.7	6.1	23	160	6
Maximum					123.0	21.0	7.1	360	9.9	3.5	12.4	4.8	89.9	21.6	3.22	50	1.790	3.96	0.72	0.99	8.20	28.3	17.1	11.4	35	5,300	1,700
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**98.3**	**20.4**	**6.6**	**338**	**8.9**	**3.0**	**7.1**	**2.7**	**81.0**	**21.0**	**3.13**	**45**	**1.187**	**2.88**	**0.65**	**0.78**	**3.37**	**22.7**	**15.2**	**7.9**	**29**	**689**	**135**
Minimum					95.0	19.5	6.5	332	8.4	2.3	6.2	2.6	74.8	20.8	3.07	44	1.080	2.71	0.62	0.73	2.60	21.0	14.7	6.6	23	220	29
Maximum					101.0	21.0	6.7	345	9.2	3.5	8.8	2.8	85.1	21.3	3.22	47	1.350	3.05	0.68	0.85	4.00	23.8	15.8	9.3	34	5,300	1,700
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)					**110.3**	**19.4**	**6.4**	**338**	**9.1**	**2.2**	**8.6**	**3.7**	**84.7**	**21.1**	**3.08**	**49**	**0.940**	**3.59**	**0.68**	**0.82**	**5.98**	**25.8**	**16.8**	**8.6**	**31**	**343**	**26**
Minimum					103.0	18.5	6.3	325	7.8	1.5	3.2	1.8	80.0	20.1	3.00	47	0.280	3.16	0.65	0.70	5.10	23.9	16.7	6.1	28	300	13
Maximum					123.0	20.0	6.6	360	9.9	2.8	12.4	4.8	89.9	21.6	3.13	50	1.790	3.96	0.72	0.93	7.70	28.3	17.0	11.4	35	380	67
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**121.5**	**16.9**	**6.7**	**291**	**8.3**	**2.3**	**7.5**	**2.4**	**75.2**	**19.8**	**2.93**	**46**	**0.330**	**2.46**	**0.63**	**0.90**	**6.80**	**24.8**	**16.1**	**9.1**	**32**	**307**	**18**
Minimum					120.0	16.5	6.4	290	8.1	2.2	4.0	2.4	71.4	19.3	2.80	43	0.080	2.22	0.61	0.80	5.40	22.9	15.1	7.1	32	160	6
Maximum					123.0	17.3	7.1	292	8.4	2.4	11.0	2.4	78.9	20.2	3.05	48	0.580	2.69	0.65	0.99	8.20	26.6	17.1	11.0	32	590	56
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW08	Dry	P	9/22/92	1440	109.0	21.0	6.7	338	9.9	3.0	6.2	2.6	90.3	19.6	3.00	42	0.460	2.62	0.65	0.83	5.70	23.9	15.3	9.0	33	110	6
BWW08	Rain		9/22/92	110	124.0	20.5	6.5	322	7.7	3.7	11.8	3.8	67.2	19.5	3.02	44	1.520	2.08	0.48	1.41	11.90	29.4	16.3	16.1	42	240	29
BWW08	Rain	3	9/23/92	350	129.0	20.0	6.8	315	7.1	5.2	18.2	6.0	83.2	18.9	2.95	44	1.600	2.32	0.67	1.23	9.90	32.1	16.8	14.8	46	230	100
BWW08	Rain	6	9/23/92	700	115.0	19.5	6.6	310	7.6	3.6	17.2	4.4	72.8	17.5	2.70	43	1.640	2.42	0.67	2.18	16.10	45.8	19.3	23.7	64	230	130
BWW08	24h	9	9/23/92	1005	111.0	19.0	6.4	320	7.7	1.9	11.0	3.6	80.1	20.3	3.16	46	1.270	2.62	0.65	0.99	7.10	27.5	15.8	12.2	46	60	26
BWW08	24h	12	9/23/92	1320	108.0	20.0	6.5	330	9.3	2.5	4.8	1.4	81.0	19.8	3.13	44	1.190	2.62	0.62	0.85	4.80	22.6	14.9	11.9	35	300	19
BWW08	24h	16	9/23/92	1620	125.0	20.0	6.4	312	9.3	2.1	3.4	1.9	77.2	20.6	2.99	44	0.720	2.89	0.61	0.65	3.50	19.2	13.5	5.5	31	120	30
BWW08	24h	24	9/23/92	40	130.0	17.5	NA	325	8.3	2.2	12.6	4.6	90.4	20.2	3.05	50	ND	3.02	0.67	1.03	8.70	29.3	17.4	11.1	39	240	48
BWW08	48h	32	9/24/92	825	136.0	16.0	6.4	290	8.5	2.1	10.0	2.4	85.8	19.1	2.96	49	0.080	2.69	0.70	1.02	9.00	30.1	18.1	11.7	42	200	18
BWW08	48h	40	9/24/92	1725	136.0	17.0	7.1	315	7.8	2.4	2.6	2.1	82.8	19.3	2.93	48	0.080	2.17	0.64	0.82	7.00	23.8	15.9	8.8	36	150	9
DRY WEATHER (1 sample)					**109.0**	**21.0**	**6.7**	**338**	**9.9**	**3.0**	**6.2**	**2.6**	**90.3**	**19.6**	**3.00**	**42**	**0.460**	**2.62**	**0.65**	**0.83**	**5.70**	**23.9**	**15.3**	**9.0**	**33**	**110**	**6**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9
Mean (*)					**123.8**	**18.8**	**6.6**	**315**	**8.1**	**2.9**	**10.2**	**3.4**	**80.1**	**19.5**	**2.99**	**46**	**1.013**	**2.54**	**0.63**	**1.13**	**8.67**	**28.9**	**16.4**	**12.9**	**42**	**180**	**33**
Minimum					108.0	16.0	6.4	290	7.1	1.9	2.6	1.4	67.2	17.5	2.70	43	0.080	2.08	0.48	0.65	3.50	19.2	13.5	5.5	31	60	9
Maximum					136.0	20.5	7.1	330	9.3	5.2	18.2	6.0	90.4	20.6	3.16	50	1.640	3.02	0.70	2.18	16.10	45.8	19.3	23.7	64	300	130
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**122.7**	**20.0**	**6.6**	**316**	**7.5**	**4.2**	**15.7**	**4.7**	**74.4**	**18.6**	**2.89**	**44**	**1.587**	**2.27**	**0.61**	**1.61**	**12.63**	**35.8**	**17.5**	**18.2**	**51**	**233**	**72**
Minimum					115.0	19.5	6.5	310	7.1	3.6	11.8	3.8	67.2	17.5	2.70	43	1.520	2.08	0.48	1.23	9.90	29.4	16.3	14.8	42	230	29
Maximum					129.0	20.5	6.8	322	7.7	5.2	18.2	6.0	83.2	19.5	3.02	44	1.640	2.42	0.67	2.18	16.10	45.8	19.3	23.7	64	240	130
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Mean (*)					**118.5**	**19.1**	**6.4**	**322**	**8.7**	**2.2**	**8.0**	**2.9**	**82.2**	**20.2**	**3.08**	**46**	**1.060**	**2.79**	**0.64**	**0.88**	**6.03**	**24.7**	**15.4**	**10.2**	**38**	**151**	**29**
Minimum					108.0	17.5	6.4	312	7.7	1.9	3.4	1.4	77.2	19.8	2.99	44	0.720	2.62	0.61	0.65	3.50	19.2	13.5	5.5	31	60	19
Maximum					130.0	20.0	6.5	330	9.3	2.5	12.6	4.6	90.4	20.6	3.16	50	1.270	3.02	0.67	1.03	8.70	29.3	17.4	12.2	46	300	48
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**136.0**	**16.5**	**6.7**	**303**	**8.2**	**2.3**	**6.3**	**2.3**	**84.3**	**19.2**	**2.95**	**49**	**0.080**	**2.43**	**0.67**	**0.92**	**8.00**	**27.0**	**17.0**	**10.3**	**39**	**173**	**13**
Minimum					136.0	16.0	6.4	290	7.8	2.1	2.6	2.1	82.8	19.1	2.93	48	0.080	2.17	0.64	0.82	7.00	23.8	15.9	8.8	36	150	9
Maximum					136.0	17.0	7.1	315	8.5	2.4	10.0	2.4	85.8	19.3	2.96	49	0.080	2.69	0.70	1.02	9.00	30.1	18.1	11.7	42	200	18
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW09	Dry	P	9/22/92	1415	11.5	21.0	6.3	108	10.4	1.9	1.8	1.4	42.4	6.7	1.70	10	0.060	0.16	0.02	0.05	0.80	2.9	0.7	0.9	ND	60	23
BWW09	Rain		9/22/92	50	12.0	22.0	5.9	105	9.4	1.4	2.0	2.0	42.0	6.5	1.66	11	0.050	0.14	0.02	0.24	0.60	2.0	ND	0.8	ND	96	22
BWW09	Rain	3	9/23/92	330	14.2	21.2	6.7	110	9.6	1.0	0.8	0.8	29.0	6.8	1.76	11	0.060	0.14	0.02	0.19	0.70	2.6	ND	2.3	ND	350	100
BWW09	Rain	6	9/23/92	630	14.8	19.8	6.5	105	9.5	ND	ND	ND	24.4	6.7	1.78	10	0.060	0.18	0.02	ND	0.90	1.1	ND	2.0	ND	200	54
BWW09	24h	9	9/23/92	1025	13.6	19.5	6.7	95	9.5	ND	2.0	1.0	25.5	6.8	1.75	10	0.060	0.14	0.02	ND	0.70	1.2	ND	2.3	ND	360	130
BWW09	24h	12	9/23/92	1330	12.5	20.0	6.2	95	10.3	1.4	2.0	2.0	26.3	6.5	1.65	9	0.070	0.10	0.02	ND	0.70	1.6	ND	1.0	ND	290	50
BWW09	24h	16	9/23/92	1600	12.0	20.5	6.2	100	10.5	ND	1.0	1.2	21.2	6.4	1.67	10	ND	0.74	ND	ND	0.70	1.1	ND	1.3	ND	120	30
BWW09	24h	24	9/23/92	22	11.5	18.0	NA	95	10.5	ND	1.4	0.6	27.2	6.6	1.71	10	ND	0.86	ND	ND	0.60	1.3	ND	0.9	ND	54	38
BWW09	48h	32	9/24/92	815	11.0	16.0	6.2	90	10.2	ND	4.2	2.2	25.7	6.8	1.78	11	ND	0.65	0.02	NND	0.70	1.1	ND	1.9	ND	79	39
BWW09	48h	40	9/24/92	1655	9.3	17.0	6.9	82	7.2	ND	2.0	1.0	27.2	6.4	1.65	10	ND	0.48	0.02	0.08	0.60	1.8	ND	0.9	ND	14	56
DRY WEATHER (1 sample)					**11.5**	**21.0**	**6.3**	**108**	**10.4**	**1.9**	**1.8**	**1.4**	**42.4**	**6.7**	**1.70**	**10**	**0.060**	**0.16**	**0.02**	**0.05**	**0.80**	**2.9**	**0.7**	**0.9**		**60**	**23**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	3	8	8	9	9	9	9	5	9	7	3	9	9		9		9	9
Mean (*)					**12.3**	**19.3**	**6.4**	**97**	**9.6**	**1.3**	**1.9**	**1.4**	**27.6**	**6.6**	**1.71**	**10**	**0.060**	**0.38**	**0.02**	**0.17**	**0.69**	**1.5**		**1.5**		**120**	**50**
Minimum					9.3	16.0	5.9	82	7.2	1.0	0.8	0.6	21.2	6.4	1.65	9	0.050	0.10	0.02	0.08	0.60	1.1		0.8		14	22
Maximum					14.8	22.0	6.9	110	10.5	1.4	4.2	2.2	42.0	6.8	1.78	11	0.070	0.86	0.02	0.24	0.90	2.6		2.3		360	130
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	2	3	3		3		3	3
Mean (*)					**13.7**	**21.0**	**6.4**	**107**	**9.5**	**1.2**	**1.4**	**1.4**	**31.8**	**6.7**	**1.73**	**11**	**0.057**	**0.15**	**0.02**	**0.22**	**0.73**	**1.9**		**1.7**		**189**	**49**
Minimum					12.0	19.8	5.9	105	9.4	1.0	0.8	0.8	24.4	6.5	1.66	10	0.050	0.14	0.02	0.19	0.60	1.1		0.8		96	22
Maximum					14.8	22.0	6.7	110	9.6	1.4	2.0	2.0	42.0	6.8	1.78	11	0.060	0.18	0.02	0.24	0.90	2.6		2.3		350	100
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	1	4	4	4	4	4	4	2	4	2		4	4		4		4	4
Mean (*)					**12.4**	**19.5**	**6.4**	**96**	**10.2**	**1.4**	**1.6**	**1.2**	**25.1**	**6.6**	**1.70**	**10**	**0.065**	**0.46**	**0.02**		**0.68**	**1.3**		**1.4**		**161**	**52**
Minimum					11.5	18.0	6.2	95	9.5		1.0	0.6	21.2	6.4	1.65	9	0.060	0.10	0.02		0.60	1.1		0.9		54	30
Maximum					13.6	20.5	6.7	100	10.5		2.0	2.0	27.2	6.8	1.75	10	0.070	0.86	0.02		0.70	1.6		2.3		360	130
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2		2	2	1	2	2		2		2	2
Mean (*)					**10.2**	**16.5**	**6.6**	**86**	**8.7**		**3.1**	**1.6**	**26.5**	**6.6**	**1.72**	**11**		**0.57**	**0.02**	**0.08**	**0.65**	**1.5**		**1.4**		**33**	**47**
Minimum					9.3	16.0	6.2	82	7.2		2.0	1.0	25.7	6.4	1.65	10		0.48	0.02		0.60	1.1		0.9		14	39
Maximum					11.0	17.0	6.9	90	10.2		4.2	2.2	27.2	6.8	1.78	11		0.65	0.02		0.70	1.8		1.9		79	56
WET WEATHER ***(Day 3)***																											

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW10S	Dry	P	9/22/92	1430	7.6	19.5	6.3	170	9.6	NA	2.3	1.9	62.4	8.2	1.96	25	NA	0.02	ND	0.05	0.30	2.0	ND	ND	ND	NA	NA
BWW10S	Rain		9/22/92	100	7.9	20.0	6.2	170	8.9	NA	4.0	3.5	47.0	7.9	1.93	24	NA	0.02	ND	0.14	0.40	4.3	0.7	1.4	ND	NA	NA
BWW10S	Rain	3	9/23/92	340	9.4	19.0	6.8	160	8.9	NA	2.8	1.8	55.5	7.9	1.85	22	NA	0.02	ND	0.05	0.30	1.7	ND	1.2	ND	NA	NA
BWW10S	Rain	6	9/23/92	645	9.1	18.0	6.1	150	8.9	NA	0.8	0.8	47.0	8.0	1.92	24	NA	0.02	ND	ND	0.30	1.4	ND	1.2	ND	NA	NA
BWW10S	24h	9	9/23/92	1010	9.1	17.5	6.7	140	8.9	NA	ND	ND	47.0	7.6	1.82	22	NA	0.05	0.02	ND	0.20	1.3	ND	0.8	ND	NA	NA
BWW10S	24h	12	9/23/92	1330	9.2	18.0	6.2	160	9.5	NA	3.8	2.2	51.6	7.9	1.93	23	NA	ND	ND	ND	0.30	3.0	ND	0.7	ND	NA	NA
BWW10S	24h	16	9/23/92	1550	9.2	18.0	6.0	150	10.0	NA	1.2	ND	45.6	7.7	1.86	22	NA	ND	ND	ND	0.20	1.3	0.6	0.5	ND	NA	NA
BWW10S	24h	24	9/23/92	30	9.2	16.0	NA	155	9.3	NA	9.2	2.8	51.7	8.3	2.06	25	NA	ND	ND	ND	ND	1.8	ND	1.1	ND	NA	NA
BWW10S	48h	32	9/24/92	825	8.7	14.8	6.2	150	9.4	NA	3.2	1.0	47.9	8.2	1.96	23	NA	ND	ND	ND	0.20	1.1	ND	ND	ND	NA	NA
BWW10S	48h	40	9/24/92	1705	8.9	16.1	6.9	145	7.0	NA	1.5	1.5	58.0	8.2	1.95	21	NA	ND	ND	ND	ND	1.5	ND	0.6	ND	NA	NA
DRY WEATHER (1 sample)					**7.6**	**19.5**	**6.3**	**170**	**9.6**		**2.3**	**1.9**	**62.4**	**8.2**	**1.96**	**25**		**0.02**		**0.05**	**0.30**	**2.0**					
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9		8	7	9	9	9	9		4	1	2	7	9	2	8			
Mean (*)					**9.0**	**17.5**	**6.4**	**153**	**9.0**		**3.3**	**1.9**	**50.1**	**8.0**	**1.92**	**23**		**0.03**	**0.02**	**0.10**	**0.27**	**1.9**	**0.7**	**0.9**			
Minimum					7.9	14.8	6.0	140	7.0		0.8	0.8	45.6	7.6	1.82	21		0.02		0.05	0.20	1.1	0.6	0.5			
Maximum					9.4	20.0	6.9	170	10.0		9.2	3.5	58.0	8.3	2.06	25		0.05		0.14	0.40	4.3	0.7	1.4			
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3		3	3	3	3	3	3		3		2	3	3	1	3			
Mean (*)					**8.8**	**19.0**	**6.4**	**160**	**8.9**		**2.5**	**2.0**	**49.8**	**7.9**	**1.90**	**23**		**0.02**		**0.10**	**0.33**	**2.5**	**0.7**	**1.3**			
Minimum					7.9	18.0	6.1	150	8.9		0.8	0.8	47.0	7.9	1.85	22		0.02		0.05	0.30	1.4		1.2			
Maximum					9.4	20.0	6.8	170	8.9		4.0	3.5	55.5	8.0	1.93	24		0.02		0.14	0.40	4.3		1.4			
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4		3	2	4	4	4	4		1	1		3	4	1	4			
Mean (*)					**9.2**	**17.4**	**6.3**	**151**	**9.4**		**4.7**	**2.5**	**49.0**	**7.9**	**1.92**	**23**		**0.05**	**0.02**		**0.23**	**1.9**	**0.6**	**0.8**			
Minimum					9.1	16.0	6.0	140	8.9		1.2	2.2	45.6	7.6	1.82	22					0.20	1.3		0.5			
Maximum					9.2	18.0	6.7	160	10.0		9.2	2.8	51.7	8.3	2.06	25					0.30	3.0		1.1			
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2					1	2		1			
Mean (*)					**8.8**	**15.5**	**6.6**	**148**	**8.2**		**2.4**	**1.3**	**53.0**	**8.2**	**1.96**	**22**					**0.20**	**1.3**		**0.6**			
Minimum					8.7	14.8	6.2	145	7.0		1.5	1.0	47.9	8.2	1.95	21						1.1					
Maximum					8.9	16.1	6.9	150	9.4		3.2	1.5	58.0	8.2	1.96	23						1.5					
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW11	Dry	P	9/22/92	1400	133.0	20.2	6.6	285	10.4	6.1	2.8	1.8	87.7	17.4	2.79	37	0.090	2.32	0.36	0.63	3.80	15.5	11.4	4.8	22	90	10
BWW11	Rain		9/22/92	40	142.0	21.0	6.6	252	8.7	2.3	6.0	2.2	64.0	16.0	2.61	39	0.150	2.04	0.36	0.74	5.30	17.2	11.6	6.6	26	270	140
BWW11	Rain	3	9/23/92	315	173.0	20.5	6.6	265	8.6	2.2	7.6	2.8	71.9	16.0	2.69	38	0.190	1.85	0.34	0.80	6.30	18.7	11.6	8.6	30	500	310
BWW11	Rain	6	9/23/92	615	160.0	20.0	6.6	265	8.5	2.0	11.2	3.6	59.1	15.7	2.60	36	0.520	1.93	0.35	0.79	6.10	21.8	11.3	12.7	35	510	230
BWW11	24h	9	9/23/92	950	155.0	19.2	6.4	245	8.7	1.1	4.2	2.4	66.3	16.3	2.57	38	0.700	1.22	0.36	0.67	3.90	15.0	9.9	5.9	28	160	190
BWW11	24h	12	9/23/92	1310	162.0	20.0	6.5	260	9.7	2.5	6.4	3.8	65.6	16.5	2.60	37	0.320	1.73	0.34	0.62	3.40	13.7	10.1	4.8	23	280	26
BWW11	24h	16	9/23/92	1540	155.0	20.0	6.2	255	9.7	1.8	3.6	2.0	63.6	16.3	2.75	36	0.310	1.75	0.35	0.60	3.40	13.8	11.1	4.9	23	120	29
BWW11	24h	24	9/23/92	10	148.0	18.0	NA	255	9.1	1.6	4.4	4.0	68.0	16.8	2.78	39	0.500	1.77	0.38	0.82	6.20	19.0	11.7	9.6	31	80	49
BWW11	48h	32	9/24/92	805	166.0	16.0	6.3	260	9.2	1.7	4.2	1.0	69.3	17.1	2.82	40	0.080	1.60	0.42	0.76	5.60	18.4	12.2	6.9	23	100	28
BWW11	48h	40	9/24/92	1645	177.0	17.0	6.8	288	6.5	2.0	3.8	2.4	82.1	17.6	2.85	44	0.200	NA	0.45	0.69	4.70	17.4	12.4	6.1	26	130	21
DRY WEATHER (1 sample)					**133.0**	**20.2**	**6.6**	**285**	**10.4**	**6.1**	**2.8**	**1.8**	**87.7**	**17.4**	**2.79**	**37**	**0.090**	**2.32**	**0.36**	**0.63**	**3.80**	**15.5**	**11.4**	**4.8**	**22**	**90**	**10**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9
Mean *(*)*					**159.8**	**19.1**	**6.5**	**261**	**8.7**	**1.9**	**5.7**	**2.7**	**67.8**	**16.5**	**2.70**	**39**	**0.330**	**1.74**	**0.37**	**0.72**	**4.99**	**17.2**	**11.3**	**7.3**	**27**	**194**	**70**
Minimum					142.0	16.0	6.2	245	6.5	1.1	3.6	1.0	59.1	15.7	2.57	36	0.080	1.22	0.34	0.60	3.40	13.7	9.9	4.8	23	80	21
Maximum					177.0	21.0	6.8	288	9.7	2.5	11.2	4.0	82.1	17.6	2.85	44	0.700	2.04	0.45	0.82	6.30	21.8	12.4	12.7	35	510	310
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**158.3**	**20.5**	**6.6**	**261**	**8.6**	**2.2**	**8.3**	**2.9**	**65.0**	**15.9**	**2.63**	**38**	**0.287**	**1.94**	**0.35**	**0.78**	**5.90**	**19.2**	**11.5**	**9.3**	**30**	**410**	**215**
Minimum					142.0	20.0	6.6	252	8.5	2.0	6.0	2.2	59.1	15.7	2.60	36	0.150	1.85	0.34	0.74	5.30	17.2	11.3	6.6	26	270	140
Maximum					173.0	21.0	6.6	265	8.7	2.3	11.2	3.6	71.9	16.0	2.69	39	0.520	2.04	0.36	0.80	6.30	21.8	11.6	12.7	35	510	310
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**155.0**	**19.3**	**6.4**	**254**	**9.3**	**1.8**	**4.7**	**3.1**	**65.9**	**16.5**	**2.68**	**38**	**0.458**	**1.62**	**0.36**	**0.68**	**4.23**	**15.4**	**10.7**	**6.3**	**26**	**144**	**51**
Minimum					148.0	18.0	6.2	245	8.7	1.1	3.6	2.0	63.6	16.3	2.57	36	0.310	1.22	0.34	0.60	3.40	13.7	9.9	4.8	23	80	26
Maximum					162.0	20.0	6.5	260	9.7	2.5	6.4	4.0	68.0	16.8	2.78	39	0.700	1.77	0.38	0.82	6.20	19.0	11.7	9.6	31	280	190
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
Mean *(*)*					**171.5**	**16.5**	**6.5**	**274**	**7.9**	**1.9**	**4.0**	**1.7**	**75.7**	**17.4**	**2.84**	**42**	**0.140**	**1.60**	**0.44**	**0.73**	**5.15**	**17.9**	**12.3**	**6.5**	**25**	**114**	**24**
Minimum					166.0	16.0	6.3	260	6.5	1.7	3.8	1.0	69.3	17.1	2.82	40	0.080		0.42	0.69	4.70	17.4	12.2	6.1	23	100	21
Maximum					177.0	17.0	6.8	288	9.2	2.0	4.2	2.4	82.1	17.6	2.85	44	0.200		0.45	0.76	5.60	18.4	12.4	6.9	26	130	28
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW13	Dry	P	9/22/92	1340	169.0	20.5	6.8	260	11.0	5.3	2.6	2.8	72.0	15.2	2.53	38	ND	1.79	0.33	0.47	3.50	13.0	8.9	4.0	17	270	25
BWW13	Rain		9/22/92	15	188.0	20.5	6.6	230	10.0	1.8	3.2	1.2	62.9	13.8	2.28	35	ND	1.63	0.27	0.37	2.80	10.4	8.1	3.2	16	600	400
BWW13	Rain	3	9/23/92	300	232.0	20.0	6.8	255	9.9	1.8	4.4	2.2	68.1	14.3	2.42	36	0.040	1.58	0.28	0.53	3.00	11.7	8.7	6.4	23	740	390
BWW13	Rain	6	9/23/92	550	214.0	19.5	6.5	245	10.2	1.3	2.8	1.0	56.7	13.8	2.43	34	ND	1.40	0.25	0.42	3.00	10.5	8.1	3.7	21	1,900	80
BWW13	24h	9	9/23/92	930	205.0	18.8	6.3	220	10.2	1.3	2.6	1.6	59.0	14.2	2.42	33	0.240	1.32	0.30	0.55	2.60	11.0	8.3	5.0	18	460	160
BWW13	24h	12	9/23/92	1250	209.0	19.2	6.4	215	10.5	1.8	5.2	1.4	60.4	13.4	2.46	33	ND	1.18	0.28	0.42	2.80	10.4	7.8	6.6	13	710	110
BWW13	24h	16	9/23/92	1525	200.0	20.2	6.3	235	10.8	1.3	3.4	3.2	55.2	13.8	2.42	35	0.020	1.15	0.28	0.43	2.50	10.8	9.4	3.4	16	520	49
BWW13	24h	24	9/23/92	2358	192.0	18.0	NA	220	10.1	1.2	4.2	2.8	56.6	13.2	2.38	31	0.050	1.07	0.28	0.40	2.60	10.3	7.6	3.5	19	390	75
BWW13	48h	32	9/24/92	850	210.0	16.5	6.2	190	10.6	1.3	4.0	1.6	50.6	12.6	2.24	30	ND	0.71	0.25	0.39	2.60	10.0	7.0	3.2	13	150	47
BWW13	48h	40	9/24/92	1625	218.0	18.0	6.7	258	8.6	1.3	4.0	3.0	68.0	15.9	2.62	37	0.100	1.10	0.31	0.47	3.20	12.0	8.9	3.9	18	90	30
DRY WEATHER (1 sample)					**169.0**	**20.5**	**6.8**	**260**	**11.0**	**5.3**	**2.6**	**2.8**	**72.0**	**15.2**	**2.53**	**38**		**1.79**	**0.33**	**0.47**	**3.50**	**13.0**	**8.9**	**4.0**	**17**	**270**	**25**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	5	9	9	9	9	9	9	9	9	9	9
Mean (*)					**207.6**	**19.0**	**6.5**	**230**	**10.1**	**1.5**	**3.8**	**2.0**	**59.7**	**13.9**	**2.41**	**34**	**0.090**	**1.24**	**0.28**	**0.44**	**2.79**	**10.8**	**8.2**	**4.3**	**17**	**450**	**101**
Minimum					188.0	16.5	6.2	190	8.6	1.2	2.6	1.0	50.6	12.6	2.24	30	0.020	0.71	0.25	0.37	2.50	10.0	7.0	3.2	13	90	30
Maximum					232.0	20.5	6.8	258	10.8	1.8	5.2	3.2	68.1	15.9	2.62	37	0.240	1.63	0.31	0.55	3.20	12.0	9.4	6.6	23	1,900	400
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	3	3	3
Mean (*)					**211.3**	**20.0**	**6.6**	**243**	**10.0**	**1.6**	**3.5**	**1.5**	**62.6**	**14.0**	**2.38**	**35**	**0.040**	**1.54**	**0.27**	**0.44**	**2.93**	**10.9**	**8.3**	**4.4**	**20**	**945**	**232**
Minimum					188.0	19.5	6.5	230	9.9	1.3	2.8	1.0	56.7	13.8	2.28	34		1.40	0.25	0.37	2.80	10.4	8.1	3.2	16	600	80
Maximum					232.0	20.5	6.8	255	10.2	1.8	4.4	2.2	68.1	14.3	2.43	36		1.63	0.28	0.53	3.00	11.7	8.7	6.4	23	1,900	400
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4
Mean (*)					**201.5**	**19.1**	**6.3**	**223**	**10.4**	**1.4**	**3.9**	**2.3**	**57.8**	**13.7**	**2.42**	**33**	**0.103**	**1.18**	**0.29**	**0.45**	**2.63**	**10.6**	**8.3**	**4.6**	**17**	**507**	**90**
Minimum					192.0	18.0	6.3	215	10.1	1.2	2.6	1.4	55.2	13.2	2.38	31	0.020	1.07	0.28	0.40	2.50	10.3	7.6	3.4	13	390	49
Maximum					209.0	20.2	6.4	235	10.8	1.8	5.2	3.2	60.4	14.2	2.46	35	0.240	1.32	0.30	0.55	2.80	11.0	9.4	6.6	19	710	160
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
Mean (*)					**214.0**	**17.3**	**6.5**	**224**	**9.6**	**1.3**	**4.0**	**2.3**	**59.3**	**14.3**	**2.43**	**34**	**0.100**	**0.91**	**0.28**	**0.43**	**2.90**	**11.0**	**8.0**	**3.6**	**16**	**116**	**38**
Minimum					210.0	16.5	6.2	190	8.6	1.3	4.0	1.6	50.6	12.6	2.24	30		0.71	0.25	0.39	2.60	10.0	7.0	3.2	13	90	30
Maximum					218.0	18.0	6.7	258	10.6	1.3	4.0	3.0	68.0	15.9	2.62	37		1.10	0.31	0.47	3.20	12.0	8.9	3.9	18	150	47
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW14	Dry	P	9/22/92	1530	32.8	21.8	6.6	102	10.0	ND	ND	ND	29.6	4.4	1.21	11	ND	0.45	0.03	0.06	0.80	2.9	1.3	ND	10	1,100	100
BWW14	Rain		9/22/92	150	42.0	21.0	6.4	100	8.9	1.8	6.0	3.5	27.8	4.0	1.09	11	ND	0.46	0.03	0.13	1.40	3.8	1.2	1.6	12	6,000	1,200
BWW14	Rain	3	9/23/92	440	54.7	20.5	6.7	95	9.6	1.6	2.8	1.4	22.5	4.2	1.09	13	0.360	0.43	0.02	0.07	1.00	2.8	0.5	1.1	11	2,100	1,400
BWW14	Rain	6	9/23/92	750	50.1	19.5	6.7	90	9.7	ND	1.6	1.0	22.0	4.2	1.13	12	0.120	0.38	0.02	ND	0.90	2.7	1.5	6.3	15	2,000	550
BWW14	24h	9	9/23/92	1100	46.1	19.5	6.6	85	10.1	ND	1.0	ND	23.9	4.2	1.12	12	0.060	0.36	0.02	ND	0.70	2.6	0.8	1.2	12	6,200	400
BWW14	24h	12	9/23/92	1430	42.8	19.8	6.1	85	10.4	ND	2.2	1.2	21.1	4.1	1.10	12	ND	0.35	0.02	ND	0.70	2.5	1.1	0.9	12	2,200	250
BWW14	24h	16	9/23/92	1650	41.5	20.5	6.2	85	10.6	1.1	1.0	1.0	18.4	4.1	1.12	13	0.090	0.34	0.02	0.06	1.10	2.1	0.7	1.4	12	890	260
BWW14	24h	24	9/23/92	120	40.6	18.0	NA	90	9.8	ND	2.4	0.8	21.3	4.1	1.14	13	0.090	0.33	0.02	0.07	1.10	2.9	1.4	2.1	16	280	110
BWW14	48h	32	9/24/92	910	39.8	16.5	6.2	82	10.3	ND	4.4	1.6	20.1	4.3	1.15	12	0.050	0.32	0.02	0.14	1.00	2.3	ND	1.0	10	2,400	99
BWW14	48h	40	9/24/92	1755	36.4	17.2	6.3	84	8.2	ND	1.0	1.0	23.5	4.3	1.17	14	0.050	0.33	0.02	ND	1.10	1.9	1.1	1.2	11	330	110
DRY WEATHER (1 sample)					**32.8**	**21.8**	**6.6**	**102**	**10.0**				**29.6**	**4.4**	**1.21**	**11**		**0.45**	**0.03**	**0.06**	**0.80**	**2.9**	**1.3**		**10**	**1,100**	**100**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	3	9	8	9	9	9	9	7	9	9	5	9	9	8	9	9	9	9
Mean (*)					**43.8**	**19.2**	**6.4**	**88**	**9.7**	**1.5**	**2.5**	**1.4**	**22.3**	**4.2**	**1.12**	**12**	**0.117**	**0.37**	**0.02**	**0.09**	**1.00**	**2.6**	**1.0**	**1.9**	**12**	**1,598**	**313**
Minimum					36.4	16.5	6.1	82	8.2	1.1	1.0	0.8	18.4	4.0	1.09	11	0.050	0.32	0.02	0.06	0.70	1.9	0.5	0.9	10	280	99
Maximum					54.7	21.0	6.7	100	10.6	1.8	6.0	3.5	27.8	4.3	1.17	14	0.360	0.46	0.03	0.14	1.40	3.8	1.5	6.3	16	6,200	1,400
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	2	3	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3
Mean (*)					**48.9**	**20.3**	**6.6**	**95**	**9.4**	**1.7**	**3.5**	**2.0**	**24.1**	**4.1**	**1.10**	**12**	**0.240**	**0.42**	**0.02**	**0.10**	**1.10**	**3.1**	**1.1**	**3.0**	**13**	**2,932**	**974**
Minimum					42.0	19.5	6.4	90	8.9	1.6	1.6	1.0	22.0	4.0	1.09	11	0.120	0.38	0.02	0.07	0.90	2.7	0.5	1.1	11	2,000	550
Maximum					54.7	21.0	6.7	100	9.7	1.8	6.0	3.5	27.8	4.2	1.13	13	0.360	0.46	0.03	0.13	1.40	3.8	1.5	6.3	15	6,000	1,400
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	1	4	3	4	4	4	4	3	4	4	2	4	4	4	4	4	4	4
Mean (*)					**42.8**	**19.5**	**6.3**	**86**	**10.2**	**1.1**	**1.7**	**1.0**	**21.2**	**4.1**	**1.12**	**13**	**0.080**	**0.35**	**0.02**	**0.07**	**0.90**	**2.5**	**1.0**	**1.4**	**13**	**1,358**	**231**
Minimum					40.6	18.0	6.1	85	9.8		1.0	0.8	18.4	4.1	1.10	12	0.060	0.33	0.02	0.06	0.70	2.1	0.7	0.9	12	280	110
Maximum					46.1	20.5	6.6	90	10.6		2.4	1.2	23.9	4.2	1.14	13	0.090	0.36	0.02	0.07	1.10	2.9	1.4	2.1	16	6,200	400
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2
Mean (*)					**38.1**	**16.9**	**6.3**	**83**	**9.3**		**2.7**	**1.3**	**21.8**	**4.3**	**1.16**	**13**	**0.050**	**0.33**	**0.02**	**0.14**	**1.05**	**2.1**	**1.1**	**1.1**	**11**	**890**	**104**
Minimum					36.4	16.5	6.2	82	8.2		1.0	1.0	20.1	4.3	1.15	12	0.050	0.32	0.02		1.00	1.9		1.0	10	330	99
Maximum					39.8	17.2	6.3	84	10.3		4.4	1.6	23.5	4.3	1.17	14	0.050	0.33	0.02		1.10	2.3		1.2	11	2,400	110
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW15S	Dry	P	9/22/92		6.3	22.0	6.8	165	8.4	NA	2.0	2.4	44.6	7.7	2.19	22	NA	0.47	0.02	0.23	0.80	1.6	2.0	7.4	ND	NA	NA
BWW15S	Rain		9/22/92		5.8	21.0	6.5	160	7.9	NA	2.6	2.0	33.7	7.5	2.02	20	NA	0.46	ND	0.41	0.80	2.2	1.1	5.6	17	NA	NA
BWW15S	Rain	3	9/23/92		12.4	20.0	6.7	150	8.6	NA	4.2	2.6	39.4	7.2	1.82	20	NA	0.43	ND	0.05	0.50	1.3	0.7	1.3	ND	NA	NA
BWW15S	Rain	6	9/23/92		12.4	21.0	6.1	150	8.7	NA	2.2	1.4	33.5	7.2	1.85	19	NA	0.41	ND	0.07	0.60	1.7	1.0	1.8	ND	NA	NA
BWW15S	24h	9	9/23/92		12.4	19.0	6.6	150	8.8	NA	2.8	2.2	34.5	7.4	1.86	19	NA	0.43	ND	0.07	0.60	1.4	1.1	1.9	ND	NA	NA
BWW15S	24h	12	9/23/92		10.2	20.5	6.2	162	9.4	NA	4.0	1.6	32.4	7.4	1.86	19	NA	0.43	ND	ND	0.60	1.3	0.8	1.4	ND	NA	NA
BWW15S	24h	16	9/23/92		8.7	19.5	6.7	150	8.3	NA	5.4	4.0	30.4	7.5	1.91	20	NA	0.41	ND	ND	0.40	1.4	1.0	1.6	ND	NA	NA
BWW15S	24h	24	9/23/92		16.7	17.9	NA	150	7.9	NA	NA	NA	39.1	7.4	1.88	19	NA	0.41	ND	ND	NA	2.8	2.8	NA	NA	NA	NA
BWW15S	48h	32	9/24/92		16.7	15.8	6.8	145	7.4	NA	3.5	3.5	32.9	7.5	1.90	20	NA	0.41	ND	ND	0.50	1.8	2.4	2.9	ND	NA	NA
BWW15S	48h	40	9/24/92		15.0	19.0	6.9	135	9.4	NA	4.6	3.8	36.9	7.2	1.86	20	NA	0.34	ND	ND	0.50	1.8	2.6	1.7	ND	NA	NA
DRY WEATHER (1 sample)					**6.3**	**22.0**	**6.8**	**165**	**8.4**		**2.0**	**2.4**	**44.6**	**7.7**	**2.19**	**22**		**0.47**	**0.02**	**0.23**	**0.80**	**1.6**	**2.0**	**7.4**			
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9		8	8	9	9	9	9		9		4	8	9	9	8	1		
Mean (*)					**12.3**	**19.3**	**6.6**	**150**	**8.5**		**3.7**	**2.6**	**34.8**	**7.4**	**1.88**	**20**		**0.41**		**0.15**	**0.56**	**1.7**	**1.5**	**2.3**	**17**		
Minimum					5.8	15.8	6.1	135	7.4		2.2	1.4	30.4	7.2	1.82	19		0.34		0.05	0.40	1.3	0.7	1.3			
Maximum					16.7	21.0	6.9	162	9.4		5.4	4.0	39.4	7.5	2.02	20		0.46		0.41	0.80	2.8	2.8	5.6			
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3		3	3	3	3	3	3		3		3	3	3	3	3	1		
Mean (*)					**10.2**	**20.7**	**6.4**	**153**	**8.4**		**3.0**	**2.0**	**35.5**	**7.3**	**1.90**	**20**		**0.43**		**0.18**	**0.63**	**1.7**	**0.9**	**2.9**	**17**		
Minimum					5.8	20.0	6.1	150	7.9		2.2	1.4	33.5	7.2	1.82	19		0.41		0.05	0.50	1.3	0.7	1.3			
Maximum					12.4	21.0	6.7	160	8.7		4.2	2.6	39.4	7.5	2.02	20		0.46		0.41	0.80	2.2	1.1	5.6			
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4		3	3	4	4	4	4		4		1	3	4	4	3			
Mean (*)					**12.0**	**19.2**	**6.5**	**153**	**8.6**		**4.1**	**2.6**	**34.1**	**7.4**	**1.88**	**19**		**0.42**		**0.07**	**0.53**	**1.7**	**1.4**	**1.6**			
Minimum					8.7	17.9	6.2	150	7.9		2.8	1.6	30.4	7.4	1.86	19		0.41			0.40	1.3	0.8	1.4			
Maximum					16.7	20.5	6.7	162	9.4		5.4	4.0	39.1	7.5	1.91	20		0.43			0.60	2.8	2.8	1.9			
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2		2			2	2	2	2			
Mean (*)					**15.9**	**17.4**	**6.9**	**140**	**8.4**		**4.1**	**3.7**	**34.9**	**7.4**	**1.88**	**20**		**0.38**			**0.50**	**1.8**	**2.5**	**2.3**			
Minimum					15.0	15.8	6.8	135	7.4		3.5	3.5	32.9	7.2	1.86	20		0.34			0.50	1.8	2.4	1.7			
Maximum					16.7	19.0	6.9	145	9.4		4.6	3.8	36.9	7.5	1.90	20		0.41			0.50	1.8	2.6	2.9			
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW16	Dry	P	9/22/92	1400	2.4	20.0	6.2	180	8.4	3.3	15.0	4.0	45.2	10.4	2.58	23	ND	0.43	0.03	ND	1.10	4.6	2.9	5.4	20	5,600	790
BWW16	Rain		9/22/92		3.6	20.0	6.3	180	6.4	3.4	16.2	5.8	37.0	10.3	2.33	12	0.260	0.88	0.02	ND	1.10	6.1	2.9	9.2	16	410	530
BWW16	Rain	3	9/23/92	245	13.2	20.0	6.5	100	7.2	3.7	17.0	6.2	22.6	4.8	1.84	22	ND	0.62	0.04	0.25	2.00	6.6	3.4	19.0	37	1,700	2,100
BWW16	Rain	6	9/23/92	625	11.0	18.0	6.1	155	7.3	ND	2.8	1.6	29.7	9.0	1.98	19	ND	0.72	0.02	ND	0.80	2.1	1.7	3.7	10	3,800	4,400
BWW16	24h	9	9/23/92	1020	7.2	18.0	6.1	132	7.6	1.2	4.0	2.0	30.7	8.5	1.90	17	0.060	0.64	0.02	ND	0.80	3.7	1.0	4.0	ND	39,000	1,800
BWW16	24h	12	9/23/92	1400	10.5	19.0	6.0	140	7.9	1.1	3.6	2.2	24.2	7.8	1.74	15	ND	0.60	0.02	ND	1.20	3.0	ND	4.7	10	32,000	830
BWW16	24h	16	9/23/92	1830	6.3	18.5	6.4	120	6.0	1.6	6.0	3.5	20.2	6.6	1.47	12	ND	0.54	0.02	ND	0.90	2.7	2.0	4.9	ND	7,800	1,600
BWW16	24h	24	9/23/92	2350	4.0	16.0	NA	125	5.2	1.5	6.8	2.6	29.2	7.5	1.72	14	ND	0.51	0.02	ND	0.80	2.9	2.9	3.7	ND	3,100	1,500
BWW16	48h	32	9/24/92	800	4.0	13.4	6.1	138	6.0	1.0	5.8	3.2	31.1	8.8	1.96	16	0.070	0.51	0.02	ND	0.80	1.7	2.0	3.8	ND	1,600	1,000
BWW16	48h	40	9/24/92	1410	4.0	16.2	6.8	138	8.4	2.0	1.8	1.6	39.8	9.6	2.11	18	ND	0.51	0.02	ND	0.80	1.9	2.0	2.1	ND	300	48
DRY WEATHER (1 sample)					**2.4**	**20.0**	**6.2**	**180**	**8.4**	**3.3**	**15.0**	**4.0**	**45.2**	**10.4**	**2.58**	**23**		**0.43**	**0.03**		**1.10**	**4.6**	**2.9**	**5.4**	**20**	**5,600**	**790**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					9	9	8	9	9	8	9	9	9	9	9	9	3	9	9	1	9	9	8	9	4	9	9
Mean (*)					**7.1**	**17.7**	**6.3**	**136**	**6.9**	**1.9**	**7.1**	**3.2**	**29.4**	**8.1**	**1.89**	**16**	**0.130**	**0.61**	**0.02**	**0.25**	**1.02**	**3.4**	**2.2**	**6.1**	**18**	**3,231**	**981**
Minimum					3.6	13.4	6.0	100	5.2	1.0	1.8	1.6	20.2	4.8	1.47	12	0.060	0.51	0.02		0.80	1.7	1.0	2.1	10	300	48
Maximum					13.2	20.0	6.8	180	8.4	3.7	17.0	6.2	39.8	10.3	2.33	22	0.260	0.88	0.04		2.00	6.6	3.4	19.0	37	39,000	4,400
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	2	3	3	3	3	3	3	1	3	3	1	3	3	3	3	3	3	3
Mean (*)					**9.3**	**19.3**	**6.3**	**145**	**7.0**	**3.6**	**12.0**	**4.5**	**29.8**	**8.0**	**2.05**	**18**	**0.260**	**0.74**	**0.03**	**0.25**	**1.30**	**4.9**	**2.7**	**10.6**	**21**	**1,384**	**1,698**
Minimum					3.6	18.0	6.1	100	6.4	3.4	2.8	1.6	22.6	4.8	1.84	12		0.62	0.02		0.80	2.1	1.7	3.7	10	410	530
Maximum					13.2	20.0	6.5	180	7.3	3.7	17.0	6.2	37.0	10.3	2.33	22		0.88	0.04		2.00	6.6	3.4	19.0	37	3,800	4,400
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	1	4	4		4	4	3	4	1	4	4
Mean (*)					**7.0**	**17.9**	**6.2**	**129**	**6.7**	**1.4**	**5.1**	**2.6**	**26.1**	**7.6**	**1.71**	**15**	**0.060**	**0.57**	**0.02**		**0.93**	**3.1**	**2.0**	**4.3**	**10**	**13,180**	**1,376**
Minimum					4.0	16.0	6.0	120	5.2	1.1	3.6	2.0	20.2	6.6	1.47	12		0.51	0.02		0.80	2.7	1.0	3.7		3,100	830
Maximum					10.5	19.0	6.4	140	7.9	1.6	6.8	3.5	30.7	8.5	1.90	17		0.64	0.02		1.20	3.7	2.9	4.9		39,000	1,800
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	1	2	2		2	2	2	2		2	2
Mean (*)					**4.0**	**14.8**	**6.4**	**138**	**7.2**	**1.5**	**3.8**	**2.4**	**35.5**	**9.2**	**2.04**	**17**	**0.070**	**0.51**	**0.02**		**0.80**	**1.8**	**2.0**	**3.0**		**693**	**219**
Minimum					4.0	13.4	6.1	138	6.0	1.0	1.8	1.6	31.1	8.8	1.96	16		0.51	0.02		0.80	1.7	2.0	2.1		300	48
Maximum					4.0	16.2	6.8	138	8.4	2.0	5.8	3.2	39.8	9.6	2.11	18		0.51	0.02		0.80	1.9	2.0	3.8		1,600	1,000
WET WEATHER *(Day 3)*																											

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW17	Dry	P	9/22/92	1345	161.7	23.0	7.0	280	9.8	1.0	1.4	0.6	99.2	15.4	3.25	40	ND	1.57	0.27	0.34	2.60	10.0	9.5	5.3	18	420	22
BWW17	Rain		9/22/92	2340	162.7	22.0	6.7	280	8.5	1.6	3.8	1.6	67.9	14.9	2.94	36	ND	1.54	0.30	0.35	2.90	10.4	9.4	5.6	18	510	230
BWW17	Rain	3	9/23/92	240	291.9	20.0	6.7	220	9.6	3.1	9.8	4.0	54.2	12.0	2.44	28	ND	1.39	0.26	0.51	4.10	12.6	8.9	10.2	32	8,500	2,800
BWW17	Rain	6	9/23/92	530	250.0	19.5	6.7	215	10.1	2.9	6.4	2.8	48.5	12.0	2.46	29	ND	1.36	0.24	0.49	3.70	11.8	8.5	9.4	39	1,700	4,400
BWW17	24h	9	9/23/92	930	205.3	19.0	6.2	235	9.4	ND	3.0	2.0	55.5	13.5	2.64	31	0.080	1.36	0.23	0.39	2.80	9.0	6.8	5.3	16	810	400
BWW17	24h	12	9/23/92	1330	213.5	19.5	6.9	248	10.4	1.0	4.6	1.8	56.0	13.3	2.64	30	0.050	1.18	NA	0.28	2.30	8.5	7.1	4.0	17	660	96
BWW17	24h	16	9/23/92		215.2	19.0	6.7	232	8.3	1.1	6.0	2.4	47.2	12.4	2.50	28	ND	1.18	0.21	0.31	2.30	7.8	5.7	5.2	19	620	70
BWW17	24h	24	9/23/92	2345	208.5	17.5	NA	218	10.6	1.4	7.5	5.0	62.3	13.9	2.72	31	ND	1.44	0.21	0.44	3.40	11.8	8.3	5.4	25	410	92
BWW17	48h	32	9/24/92	1000	209.3	16.0	6.7	210	9.5	1.8	4.6	2.2	56.3	13.6	2.63	31	0.120	1.44	0.22	0.38	2.50	9.5	6.6	4.3	19	5,400	52
BWW17	48h	40	9/24/92	1605	289.4	18.0	6.9	211	9.2	1.6	1.4	0.8	58.4	13.0	2.48	29	0.090	1.34	0.26	0.38	2.70	10.8	6.1	6.4	18	720	32
DRY WEATHER (1 sample)					**161.7**	**23.0**	**7.0**	**280**	**9.8**	**1.0**	**1.4**	**0.6**	**99.2**	**15.4**	**3.25**	**40**		**1.57**	**0.27**	**0.34**	**2.60**	**10.0**	**9.5**	**5.3**	**18**	**420**	**22**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	8	9	9	9	9	9	9	4	9	8	9	9	9	9	9	9	9	9
Mean (*)					**227.3**	**18.9**	**6.7**	**230**	**9.5**	**1.8**	**5.2**	**2.5**	**56.3**	**13.2**	**2.61**	**30**	**0.085**	**1.36**	**0.24**	**0.39**	**2.97**	**10.2**	**7.5**	**6.2**	**23**	**1,163**	**219**
Minimum					162.7	16.0	6.2	210	8.3	1.0	1.4	0.8	47.2	12.0	2.44	28	0.050	1.18	0.21	0.28	2.30	7.8	5.7	4.0	16	410	32
Maximum					291.9	22.0	6.9	280	10.6	3.1	9.8	5.0	67.9	14.9	2.94	36	0.120	1.54	0.30	0.51	4.10	12.6	9.4	10.2	39	8,500	4,400
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3		3	3	3	3	3	3	3	3	3	3
Mean (*)					**234.9**	**20.5**	**6.7**	**238**	**9.4**	**2.5**	**6.7**	**2.8**	**56.9**	**13.0**	**2.61**	**31**		**1.43**	**0.27**	**0.45**	**3.57**	**11.6**	**8.9**	**8.4**	**30**	**1,946**	**1,415**
Minimum					162.7	19.5	6.7	215	8.5	1.6	3.8	1.6	48.5	12.0	2.44	28		1.36	0.24	0.35	2.90	10.4	8.5	5.6	18	510	230
Maximum					291.9	22.0	6.7	280	10.1	3.1	9.8	4.0	67.9	14.9	2.94	36		1.54	0.30	0.51	4.10	12.6	9.4	10.2	39	8,500	4,400
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	3	4	4	4	4	4	4	2	4	3	4	4	4	4	4	4	4	4
Mean (*)					**210.6**	**18.8**	**6.6**	**233**	**9.7**	**1.2**	**5.3**	**2.8**	**55.3**	**13.3**	**2.63**	**30**	**0.065**	**1.29**	**0.22**	**0.36**	**2.70**	**9.3**	**7.0**	**5.0**	**19**	**607**	**125**
Minimum					205.3	17.5	6.2	218	8.3	1.0	3.0	1.8	47.2	12.4	2.50	28	0.050	1.18	0.21	0.28	2.30	7.8	5.7	4.0	16	410	70
Maximum					215.2	19.5	6.9	248	10.6	1.4	7.5	5.0	62.3	13.9	2.72	31	0.080	1.44	0.23	0.44	3.40	11.8	8.3	5.4	25	810	400
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**249.4**	**17.0**	**6.8**	**211**	**9.4**	**1.7**	**3.0**	**1.5**	**57.4**	**13.3**	**2.56**	**30**	**0.105**	**1.39**	**0.24**	**0.38**	**2.60**	**10.2**	**6.4**	**5.4**	**19**	**1,972**	**41**
Minimum					209.3	16.0	6.7	210	9.2	1.6	1.4	0.8	56.3	13.0	2.48	29	0.090	1.34	0.22	0.38	2.50	9.5	6.1	4.3	18	720	32
Maximum					289.4	18.0	6.9	211	9.5	1.8	4.6	2.2	58.4	13.6	2.63	31	0.120	1.44	0.26	0.38	2.70	10.8	6.6	6.4	19	5,400	52
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW18	Dry	P	9/22/92	1450	181.0	22.0	6.5	380	6.9	1.6	4.2	3.0	103.0	16.4	2.73	60	4.200	1.38	0.48	0.47	2.00	12.5	7.0	4.2	33	120	12
BWW18	Rain		9/22/92	35	205.0	21.0	6.5	390	6.5	3.3	1.2	1.0	80.8	15.8	2.76	51	1.600	1.41	0.36	0.64	2.70	11.3	7.1	4.7	34	120	8
BWW18	Rain	3	9/23/92	325	250.0	21.0	6.5	345	7.3	1.7	4.8	2.6	86.4	15.4	2.76	51	2.400	1.36	0.36	0.50	2.00	10.1	6.1	2.9	30	59	18
BWW18	Rain	6	9/23/92	700	210.0	20.0	6.8	360	7.3	1.7	4.0	1.8	82.8	15.7	2.77	53	3.200	1.36	0.41	0.40	2.20	12.3	7.3	4.4	32	140	54
BWW18	24h	9	9/23/92	1055	226.0	20.0	6.3	390	7.6	1.3	10.5	7.0	91.2	15.0	2.64	55	2.120	1.41	0.55	0.45	2.40	15.3	7.0	4.9	39	310	47
BWW18	24h	12	9/23/92	1442	226.0	20.5	6.3	383	7.7	1.4	6.0	3.6	91.5	15.9	2.70	55	1.960	1.46	0.56	0.40	1.90	12.9	6.2	3.6	33	420	80
BWW18	24h	16	9/23/92	1910	186.0	19.5	6.5	281	6.3	1.9	3.6	2.0	70.4	13.1	2.48	42	3.500	1.25	0.38	0.38	2.20	12.3	4.0	6.0	35	1,700	190
BWW18	24h	24	9/23/92	25	226.0	18.5	NA	292	6.0	1.7	5.2	3.6	72.0	12.3	2.35	37	1.760	1.20	0.36	0.39	1.90	11.1	5.4	5.3	40	1,300	110
BWW18	48h	32	9/24/92	820	226.0	17.9	6.6	260	7.7	1.8	4.8	2.8	78.6	13.3	2.41	47	1.970	1.20	0.36	0.39	2.50	11.0	5.2	9.6	40	14	3
BWW18	48h	40	9/24/92	1645	315.0	18.2	6.7	255	7.1	1.4	2.8	2.0	82.5	14.3	2.51	43	2.130	1.31	0.30	0.35	1.90	10.0	4.0	3.4	34	58	4
DRY WEATHER (1 sample)					**181.0**	**22.0**	**6.5**	**380**	**6.9**	**1.6**	**4.2**	**3.0**	**103.0**	**16.4**	**2.73**	**60**	**4.200**	**1.38**	**0.48**	**0.47**	**2.00**	**12.5**	**7.0**	**4.2**	**33**	**120**	**12**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)					**230.0**	**19.6**	**6.5**	**328**	**7.1**	**1.8**	**4.8**	**2.9**	**81.8**	**14.5**	**2.60**	**48**	**2.293**	**1.33**	**0.40**	**0.43**	**2.19**	**11.8**	**5.8**	**5.0**	**35**	**183**	**27**
Minimum					186.0	17.9	6.3	255	6.0	1.3	1.2	1.0	70.4	12.3	2.35	37	1.600	1.20	0.30	0.35	1.90	10.0	4.0	2.9	30	14	3
Maximum					315.0	21.0	6.8	390	7.7	3.3	10.5	7.0	91.5	15.9	2.77	55	3.500	1.46	0.56	0.64	2.70	15.3	7.3	9.6	40	1,700	190
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**221.7**	**20.7**	**6.6**	**365**	**7.0**	**2.2**	**3.3**	**1.8**	**83.3**	**15.6**	**2.76**	**52**	**2.400**	**1.38**	**0.38**	**0.51**	**2.30**	**11.2**	**6.8**	**4.0**	**32**	**100**	**20**
Minimum					205.0	20.0	6.5	345	6.5	1.7	1.2	1.0	80.8	15.4	2.76	51	1.600	1.36	0.36	0.40	2.00	10.1	6.1	2.9	30	59	8
Maximum					250.0	21.0	6.8	390	7.3	3.3	4.8	2.6	86.4	15.8	2.77	53	3.200	1.41	0.41	0.64	2.70	12.3	7.3	4.7	34	140	54
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)					**216.0**	**19.6**	**6.4**	**337**	**6.9**	**1.6**	**6.3**	**4.1**	**81.3**	**14.1**	**2.54**	**47**	**2.335**	**1.33**	**0.46**	**0.41**	**2.10**	**12.9**	**5.7**	**5.0**	**37**	**732**	**94**
Minimum					186.0	18.5	6.3	281	6.0	1.3	3.6	2.0	70.4	12.3	2.35	37	1.760	1.20	0.36	0.38	1.90	11.1	4.0	3.6	33	310	47
Maximum					226.0	20.5	6.5	390	7.7	1.9	10.5	7.0	91.5	15.9	2.70	55	3.500	1.46	0.56	0.45	2.40	15.3	7.0	6.0	40	1,700	190
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**270.5**	**18.1**	**6.7**	**258**	**7.4**	**1.6**	**3.8**	**2.4**	**80.6**	**13.8**	**2.46**	**45**	**2.050**	**1.26**	**0.33**	**0.37**	**2.20**	**10.5**	**4.6**	**6.5**	**37**	**28**	**3**
Minimum					226.0	17.9	6.6	255	7.1	1.4	2.8	2.0	78.6	13.3	2.41	43	1.970	1.20	0.30	0.35	1.90	10.0	4.0	3.4	34	14	3
Maximum					315.0	18.2	6.7	260	7.7	1.8	4.8	2.8	82.5	14.3	2.51	47	2.130	1.31	0.36	0.39	2.50	11.0	5.2	9.6	40	58	4
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW20	Dry	P	9/22/92	1520	210.0	22.0	6.6	325	9.1	1.2	1.3	0.7	101.0	16.1	2.78	45	0.320	1.80	0.21	0.32	1.20	9.4	4.2	3.4	20	61	9
BWW20	Rain		9/22/92	100	226.0	21.0	6.4	355	6.7	2.0	1.6	0.8	92.8	16.1	2.76	47	0.540	1.90	0.19	0.28	1.20	9.5	3.5	4.0	25	48	24
BWW20	Rain	3	9/23/92	345	253.0	21.0	6.5	335	6.1	1.5	1.2	1.2	79.4	15.8	2.75	47	0.420	1.88	0.21	0.35	1.40	9.4	4.0	5.7	38	230	120
BWW20	Rain	6	9/23/92	720	241.0	19.0	6.5	315	6.7	1.9	2.8	1.2	68.8	15.7	2.71	48	0.580	1.83	0.26	0.29	1.40	10.3	4.6	3.2	23	270	160
BWW20	24h	9	9/23/92	1120	259.0	19.0	6.2	315	8.7	1.5	2.0	1.8	77.9	15.8	2.62	46	0.720	1.85	0.21	0.30	1.30	10.0	5.7	3.3	25	180	11
BWW20	24h	12	9/23/92	1515	265.0	20.5	6.4	345	9.9	1.7	4.8	3.6	82.4	16.2	2.67	51	0.920	1.95	0.26	0.30	1.30	10.3	5.2	4.3	26	87	12
BWW20	24h	16	9/23/92		215.0	19.0	6.5	351	7.5	1.6	2.0	1.6	78.4	15.8	2.69	54	0.410	2.06	0.32	0.43	2.10	11.6	5.4	2.8	23	86	28
BWW20	24h	24	9/23/92	45	247.0	18.0	NA	391	5.9	1.7	3.6	2.6	88.7	15.5	2.65	52	0.620	2.10	0.28	0.36	2.30	11.7	4.8	3.7	27	77	13
BWW20	48h	32	9/24/92	845	271.0	16.8	6.6	290	6.8	1.6	4.6	2.6	83.0	15.6	2.58	51	0.210	2.36	0.28	0.38	2.30	11.4	5.3	5.1	27	72	15
BWW20	48h	40	9/24/92	1710	253.0	18.5	6.7	317	8.4	2.2	2.8	2.0	96.0	15.6	2.52	54	0.740	2.10	0.38	0.33	2.30	11.6	5.1	2.8	22	51	10
DRY WEATHER (1 sample)					**210.0**	**22.0**	**6.6**	**325**	**9.1**	**1.2**	**1.3**	**0.7**	**101.0**	**16.1**	**2.78**	**45**	**0.320**	**1.80**	**0.21**	**0.32**	**1.20**	**9.4**	**4.2**	**3.4**	**20**	**61**	**9**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean *(*)*					**247.8**	**19.2**	**6.5**	**335**	**7.4**	**1.7**	**2.8**	**1.9**	**83.0**	**15.8**	**2.66**	**50**	**0.573**	**2.00**	**0.27**	**0.34**	**1.73**	**10.6**	**4.8**	**3.9**	**26**	**101**	**25**
Minimum					215.0	16.8	6.2	290	5.9	1.5	1.2	0.8	68.8	15.5	2.52	46	0.210	1.83	0.19	0.28	1.20	9.4	3.5	2.8	22	48	10
Maximum					271.0	21.0	6.7	391	9.9	2.2	4.8	3.6	96.0	16.2	2.76	54	0.920	2.36	0.38	0.43	2.30	11.7	5.7	5.7	38	270	160
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**240.0**	**20.3**	**6.5**	**335**	**6.5**	**1.8**	**1.9**	**1.1**	**80.3**	**15.9**	**2.74**	**47**	**0.513**	**1.87**	**0.22**	**0.31**	**1.33**	**9.7**	**4.0**	**4.3**	**29**	**144**	**77**
Minimum					226.0	19.0	6.4	315	6.1	1.5	1.2	0.8	68.8	15.7	2.71	47	0.420	1.83	0.19	0.28	1.20	9.4	3.5	3.2	23	48	24
Maximum					253.0	21.0	6.5	355	6.7	2.0	2.8	1.2	92.8	16.1	2.76	48	0.580	1.90	0.26	0.35	1.40	10.3	4.6	5.7	38	270	160
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**246.5**	**19.1**	**6.4**	**351**	**8.0**	**1.6**	**3.1**	**2.4**	**81.9**	**15.8**	**2.66**	**51**	**0.668**	**1.99**	**0.27**	**0.35**	**1.75**	**10.9**	**5.3**	**3.5**	**25**	**101**	**15**
Minimum					215.0	18.0	6.2	315	5.9	1.5	2.0	1.6	77.9	15.5	2.62	46	0.410	1.85	0.21	0.30	1.30	10.0	4.8	2.8	23	77	11
Maximum					265.0	20.5	6.5	391	9.9	1.7	4.8	3.6	88.7	16.2	2.69	54	0.920	2.10	0.32	0.43	2.30	11.7	5.7	4.3	27	180	28
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean *(*)*					**262.0**	**17.7**	**6.7**	**304**	**7.6**	**1.9**	**3.7**	**2.3**	**89.5**	**15.6**	**2.55**	**53**	**0.475**	**2.23**	**0.33**	**0.36**	**2.30**	**11.5**	**5.2**	**4.0**	**25**	**61**	**12**
Minimum					253.0	16.8	6.6	290	6.8	1.6	2.8	2.0	83.0	15.6	2.52	51	0.210	2.10	0.28	0.33	2.30	11.4	5.1	2.8	22	51	10
Maximum					271.0	18.5	6.7	317	8.4	2.2	4.6	2.6	96.0	15.6	2.58	54	0.740	2.36	0.38	0.38	2.30	11.6	5.3	5.1	27	72	15
WET WEATHER *(Day 3)*																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW21	Dry	P	9/22/92	1540	239.0	23.0	6.6	320	9.1	ND	5.0	4.5	76.0	15.6	2.64	44	0.420	1.60	0.21	0.30	1.70	8.8	3.8	3.1	19	270	7
BWW21	Rain		9/22/92	125	250.0	22.0	6.8	310	8.8	1.9	1.3	0.7	68.6	15.9	2.77	43	0.410	1.57	0.17	1.23	2.00	9.1	3.9	5.0	22	180	110
BWW21	Rain	3	9/23/92	420	253.0	21.0	6.6	320	8.1	2.1	2.8	1.4	73.2	16.2	2.87	43	0.540	1.49	0.12	0.37	2.30	9.8	4.5	20.2	25	11,000	1,100
BWW21	Rain	6	9/23/92	745	241.0	19.0	6.5	280	9.1	1.6	4.0	2.0	70.6	15.3	2.66	40	0.500	1.42	0.10	0.26	2.20	10.6	5.0	16.8	42	8,000	1,800
BWW21	24h	9	9/23/92	1155	259.0	20.0	6.3	310	9.6	ND	2.6	1.4	71.4	15.2	2.68	45	0.580	1.66	0.13	0.20	1.90	8.9	3.6	4.3	24	400	56
BWW21	24h	12	9/23/92	1545	265.0	21.0	6.2	323	9.8	1.1	2.6	2.0	75.4	15.4	2.59	45	0.360	1.79	0.16	0.21	1.70	9.2	4.2	3.9	21	580	36
BWW21	24h	16	9/23/92	2005	215.0	19.0	6.7	313	8.9	1.7	2.6	1.6	73.9	15.4	2.70	41	0.220	1.88	0.18	0.27	1.80	8.6	5.2	3.1	25	600	44
BWW21	24h	24	9/23/92	145	247.0	18.7	NA	318	8.1	1.5	3.0	1.8	77.0	15.8	2.69	44	0.110	1.47	0.18	0.26	2.10	10.5	5.5	3.8	24	1,700	38
BWW21	48h	32	9/24/92	900	271.0	16.9	6.6	290	8.9	1.4	1.8	1.2	86.1	16.3	2.72	49	0.080	2.28	0.23	0.35	2.20	11.1	5.7	4.4	25	210	22
BWW21	48h	40	9/24/92	1730	253.0	17.8	6.8	300	9.0	1.4	2.0	1.4	89.5	16.1	2.65	49	0.430	2.13	0.26	0.39	2.60	16.6	4.8	3.0	25	80	23
DRY WEATHER (1 sample)					**239.0**	**23.0**	**6.6**	**320**	**9.1**		**5.0**	**4.5**	**76.0**	**15.6**	**2.64**	**44**	**0.420**	**1.60**	**0.21**	**0.30**	**1.70**	**8.8**	**3.8**	**3.1**	**19**	**270**	**7**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					9	9	8	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)					**250.4**	**19.5**	**6.6**	**307**	**8.9**	**1.6**	**2.5**	**1.5**	**76.2**	**15.7**	**2.70**	**44**	**0.359**	**1.74**	**0.17**	**0.39**	**2.09**	**10.5**	**4.7**	**7.2**	**26**	**735**	**90**
Minimum					215.0	16.9	6.2	280	8.1	1.1	1.3	0.7	68.6	15.2	2.59	40	0.080	1.42	0.10	0.20	1.70	8.6	3.6	3.0	21	80	22
Maximum					271.0	22.0	6.8	323	9.8	2.1	4.0	2.0	89.5	16.3	2.87	49	0.580	2.28	0.26	1.23	2.60	16.6	5.7	20.2	42	11,000	1,800
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**248.0**	**20.7**	**6.6**	**303**	**8.7**	**1.9**	**2.7**	**1.4**	**70.8**	**15.8**	**2.77**	**42**	**0.483**	**1.49**	**0.13**	**0.62**	**2.17**	**9.8**	**4.5**	**14.0**	**30**	**2,511**	**602**
Minimum					241.0	19.0	6.5	280	8.1	1.6	1.3	0.7	68.6	15.3	2.66	40	0.410	1.42	0.10	0.26	2.00	9.1	3.9	5.0	22	180	110
Maximum					253.0	22.0	6.8	320	9.1	2.1	4.0	2.0	73.2	16.2	2.87	43	0.540	1.57	0.17	1.23	2.30	10.6	5.0	20.2	42	11,000	1,800
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	3	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)					**246.5**	**19.7**	**6.4**	**316**	**9.1**	**1.4**	**2.7**	**1.7**	**74.4**	**15.5**	**2.67**	**44**	**0.318**	**1.70**	**0.16**	**0.24**	**1.88**	**9.3**	**4.6**	**3.8**	**24**	**697**	**43**
Minimum					215.0	18.7	6.2	310	8.1	1.1	2.6	1.4	71.4	15.2	2.59	41	0.110	1.47	0.13	0.20	1.70	8.6	3.6	3.1	21	400	36
Maximum					265.0	21.0	6.7	323	9.8	1.7	3.0	2.0	77.0	15.8	2.70	45	0.580	1.88	0.18	0.27	2.10	10.5	5.5	4.3	25	1,700	56
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)					**262.0**	**17.4**	**6.7**	**295**	**9.0**	**1.4**	**1.9**	**1.3**	**87.8**	**16.2**	**2.69**	**49**	**0.255**	**2.21**	**0.25**	**0.37**	**2.40**	**13.9**	**5.3**	**3.7**	**25**	**130**	**22**
Minimum					253.0	16.9	6.6	290	8.9	1.4	1.8	1.2	86.1	16.1	2.65	49	0.080	2.13	0.23	0.35	2.20	11.1	4.8	3.0	25	80	22
Maximum					271.0	17.8	6.8	300	9.0	1.4	2.0	1.4	89.5	16.3	2.72	49	0.430	2.28	0.26	0.39	2.60	16.6	5.7	4.4	25	210	23
WET WEATHER ***(Day 3)***																											

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I
BWW23 is the UBWPAD wastewater treatment facility in Worcester.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW23	Dry	P	9/22/92	1119		NA	6.2	480	NA	6.5	6.2	6.2	118.0	19.5	2.57	68	1.340	4.75	1.97	2.22	9.00	68.2	45.4	3.9	47	120	<1
BWW23	Rain		9/22/92	2337		NA	6.2	371	NA	12.0	NA	NA	108.0	19.0	2.42	68	4.320	5.09	2.04	2.49	9.70	71.9	46.1	4.3	60	7	<1
BWW23	Rain	3	9/23/92	200		22.5	6.1	398	6.4	13.4	9.8	9.4	100.0	19.9	2.50	66	3.460	4.53	2.09	2.41	20.90	74.1	46.7	3.3	60	2,000	36
BWW23	Rain	6	9/23/92	515		21.0	6.4	358	6.9	4.9	8.2	6.6	81.3	19.6	2.45	59	4.120	2.87	1.97	2.25	12.30	60.1	40.2	2.4	54	56	<1
BWW23	24h	9	9/23/92	802		NA	5.9	322	NA	4.8	6.4	3.6	80.7	18.2	2.24	53	1.800	3.43	1.54	2.07	10.70	55.8	33.9	5.7	57	110	<1
BWW23	24h	12	9/23/92	1100		NA	6.0	267	NA	4.6	6.8	5.6	67.5	15.9	1.99	46	1.500	3.37	1.40	1.46	8.60	47.9	30.0	2.3	50	14	1
BWW23	24h	16	9/23/92	1509		21.0	5.8	312	7.8	4.7	6.6	5.0	76.4	15.9	2.02	43	2.100	4.26	1.40	1.64	8.40	47.5	27.7	2.3	59	97	<1
BWW23	24h	24	9/23/92	2304		NA	NA	368	NA	5.9	6.8	5.8	88.3	15.7	2.15	65	1.140	5.64	1.54	1.93	21.90	58.6	34.6	2.7	56	210	1
BWW23	48h	32	9/24/92	703		20.0	6.1	402	NA	2.4	4.8	3.2	94.0	19.7	2.37	75	0.460	4.42	0.68	2.11	10.60	48.9	38.9	2.0	61	36	<1
BWW23	48h	40	9/24/92	1454		NA	6.1	435	NA	2.6	8.8	7.4	100.0	22.5	2.64	69	1.860	4.18	0.54	2.37	7.40	55.7	39.4	2.4	66	43	<1
DRY WEATHER (1 sample)							**6.2**	**480**		**6.5**	**6.2**	**6.2**	**118.0**	**19.5**	**2.57**	**68**	**1.340**	**4.75**	**1.97**	**2.22**	**9.00**	**68.2**	**45.4**	**3.9**	**47**	**120**	**<1**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count						4	8	9	3	9	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)						**21.1**	**6.1**	**359**	**7.0**	**6.1**	**7.3**	**5.8**	**88.5**	**18.5**	**2.31**	**60**	**2.307**	**4.20**	**1.47**	**2.08**	**12.28**	**57.8**	**37.5**	**3.0**	**58**	**70**	**1**
Minimum						20.0	5.8	267	6.4	2.4	4.8	3.2	67.5	15.7	1.99	43	0.460	2.87	0.54	1.46	7.40	47.5	27.7	2.0	50	7	<1
Maximum						22.5	6.4	435	7.8	13.4	9.8	9.4	108.0	22.5	2.64	75	4.320	5.64	2.09	2.49	21.90	74.1	46.7	5.7	66	2,000	1
WET WEATHER ***(during rain)***																											
Count						2	3	3	2	3	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)						**21.8**	**6.3**	**376**	**6.7**	**10.1**	**9.0**	**8.0**	**96.4**	**19.5**	**2.46**	**64**	**3.967**	**4.16**	**2.03**	**2.38**	**14.30**	**68.7**	**44.3**	**3.3**	**58**	**92**	**3**
Minimum						21.0	6.1	358	6.4	4.9	8.2	6.6	81.3	19.0	2.42	59	3.460	2.87	1.97	2.25	9.70	60.1	40.2	2.4	54	7	<1
Maximum						22.5	6.4	398	6.9	13.4	9.8	9.4	108.0	19.9	2.50	68	4.320	5.09	2.09	2.49	20.90	74.1	46.7	4.3	60	2,000	36
WET WEATHER ***(Day 1 after rain)***																											
Count						1	3	4	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)						**21.0**	**5.9**	**317**	**7.8**	**5.0**	**6.7**	**5.0**	**78.2**	**16.4**	**2.10**	**52**	**1.635**	**4.18**	**1.47**	**1.78**	**12.40**	**52.5**	**31.6**	**3.3**	**56**	**75**	**1**
Minimum							5.8	267		4.6	6.4	3.6	67.5	15.7	1.99	43	1.140	3.37	1.40	1.46	8.40	47.5	27.7	2.3	50	14	<1
Maximum							6.0	368		5.9	6.8	5.8	88.3	18.2	2.24	65	2.100	5.64	1.54	2.07	21.90	58.6	34.6	5.7	59	210	1
WET WEATHER ***(Day 2 after rain)***																											
Count						1	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)						**20.0**	**6.1**	**419**		**2.5**	**6.8**	**5.3**	**97.0**	**21.1**	**2.51**	**72**	**1.160**	**4.30**	**0.61**	**2.24**	**9.00**	**52.3**	**39.2**	**2.2**	**64**	**39**	**<1**
Minimum							6.1	402		2.4	4.8	3.2	94.0	19.7	2.37	69	0.460	4.18	0.54	2.11	7.40	48.9	38.9	2.0	61	36	<1
Maximum							6.1	435		2.6	8.8	7.4	100.0	22.5	2.64	75	1.860	4.42	0.68	2.37	10.60	55.7	39.4	2.4	66	43	<1
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

Page A15-64

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM I
BWW24 is the Woonsocket wastewater treatment facility.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW24	Dry	P	9/22/92	1445		NA	6.9	782	NA	9.8	6.8	6.2	520.0	8.4	1.50	343	34.3	0.64	4.21	1.66	4.80	33.2	5.2	9.4	90	5	1
BWW24	Rain		9/22/92	100		NA	6.7	820	NA	14.0	66.0	52.0	526.0	7.7	1.10	336	23.7	1.01	5.97	2.89	7.40	68.9	6.4	21.6	146	<1	<1
BWW24	Rain	3	9/23/92			NA	6.6	765	NA	12.5	24.6	18.2	483.0	8.6	1.30	320	30.0	0.43	4.39	2.91	7.40	71.2	6.3	21.3	145	<1	<1
BWW24	Rain	6	9/23/92			NA	6.5	777	NA	5.9	17.2	12.0	498.0	8.5	1.40	321	25.3	0.10	5.89	1.04	4.90	23.5	5.1	6.7	75	<1	<1
BWW24	24h	9	9/23/92			NA	6.7	798	NA	3.7	9.0	6.5	500.0	8.1	1.42	318	20.3	0.32	5.27	1.16	3.90	22.2	4.8	5.8	69	<1	<1
BWW24	24h	12	9/23/92			NA	6.9	825	NA	8.1	30.5	23.0	518.0	11.5	1.58	325	23.0	0.63	2.81	1.87	5.90	27.4	4.9	6.8	77	<1	<1
BWW24	24h	16	9/23/92	1430		NA	6.9	752	NA	4.9	17.0	14.0	504.0	16.2	1.60	330	31.0	0.36	2.45	1.66	5.20	23.6	2.7	5.3	81	14,000	120
BWW24	24h	24	9/23/92	145		NA	NA	722	NA	3.9	30.5	23.0	509.0	16.8	1.57	322	16.3	0.45	2.45	1.65	6.40	32.4	4.0	9.0	89	2	<1
BWW24	48h	32	9/24/92	845		NA	6.6	746	NA	3.9	42.5	31.0	500.0	16.3	1.65	318	17.7	0.88	2.28	2.41	6.50	49.7	3.4	12.3	92	<1	<1
BWW24	48h	40	9/24/92	1815		NA	6.7	812	NA	4.8	3.4	2.6	492.0	23.7	1.79	330	21.3	0.42	3.51	2.37	8.00	48.9	4.0	11.2	89	<1	<1
DRY WEATHER (1 sample)							**6.9**	**782**		**9.8**	**6.8**	**6.2**	**520.0**	**8.4**	**1.50**	**343**	**34.300**	**0.64**	**4.21**	**1.66**	**4.80**	**33.2**	**5.2**	**9.4**	**90**	**5**	**1**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count							8	9		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)							**6.7**	**780**		**6.9**	**26.7**	**20.3**	**503.3**	**13.0**	**1.49**	**324**	**23.2**	**0.51**	**3.89**	**2.00**	**6.18**	**40.9**	**4.6**	**11.1**	**96**	**3**	**2**
Minimum							6.5	722		3.7	3.4	2.6	483.0	7.7	1.10	318	16.3	0.10	2.28	1.04	3.90	22.2	2.7	5.3	69	<1	<1
Maximum							6.9	825		14.0	66.0	52.0	526.0	23.7	1.79	336	31.0	1.01	5.97	2.91	8.00	71.2	6.4	21.6	146	14,000	120
WET WEATHER *(during rain)*																											
Count							3	3		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)							**6.6**	**787**		**10.8**	**35.9**	**27.4**	**502.3**	**8.3**	**1.27**	**326**	**26.3**	**0.51**	**5.42**	**2.28**	**6.57**	**54.5**	**5.9**	**16.5**	**122**	**<1**	**<1**
Minimum							6.5	765		5.9	17.2	12.0	483.0	7.7	1.10	320	23.7	0.10	4.39	1.04	4.90	23.5	5.1	6.7	75	<1	<1
Maximum							6.7	820		14.0	66.0	52.0	526.0	8.6	1.40	336	30.0	1.01	5.97	2.91	7.40	71.2	6.4	21.6	146	<1	<1
WET WEATHER *(Day 1 after rain)*																											
Count							3	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1
Mean (*)							**6.8**	**774**		**5.2**	**21.8**	**16.6**	**507.8**	**13.2**	**1.54**	**324**	**22.7**	**0.44**	**3.25**	**1.59**	**5.35**	**26.4**	**4.1**	**6.7**	**79**	**13**	**3**
Minimum							6.7	722		3.7	9.0	6.5	500.0	8.1	1.42	318	16.3	0.32	2.45	1.16	3.90	22.2	2.7	5.3	69	<1	<1
Maximum							6.9	825		8.1	30.5	23.0	518.0	16.8	1.60	330	31.0	0.63	5.27	1.87	6.40	32.4	4.9	9.0	89	14,000	120
WET WEATHER *(Day 2 after rain)*																											
Count							2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)							**6.7**	**779**		**4.4**	**23.0**	**16.8**	**496.0**	**20.0**	**1.72**	**324**	**19.5**	**0.65**	**2.90**	**2.39**	**7.25**	**49.3**	**3.7**	**11.8**	**91**	**<1**	**<1**
Minimum							6.6	746		3.9	3.4	2.6	492.0	16.3	1.65	318	17.7	0.42	2.28	2.37	6.50	48.9	3.4	11.2	89	<1	<1
Maximum							6.7	812		4.8	42.5	31.0	500.0	23.7	1.79	330	21.3	0.88	3.51	2.41	8.00	49.7	4.0	12.3	92	<1	<1
WET WEATHER *(Day 3)*																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM I

BWW25 is a direct discharge from NBC's Bucklin Point wastewater facility (Seekonk River).

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW25	Dry	P	9/22/92	1605		24.0	6.6	100	3.5	8.8	18.7	12.7	156.2	14.7	1.99	108	2.0	2.40	6.25	0.17	5.00	15.7	97.2	5.2	82	47	<1
BWW25	Rain		9/22/92	140		23.0	6.7	510	3.2	15.3	21.3	20.7	171.0	18.3	2.27	111	3.2	1.33	5.49	0.46	6.30	26.5	128.8	9.7	130	210	8
BWW25	Rain	3	9/23/92			23.0	6.4	500	2.2	10.9	47.5	15.4	119.0	16.1	2.07	103	8.2	0.15	5.64	0.14	4.50	19.6	118.8	6.1	85	800	21
BWW25	Rain	6	9/23/92	815		23.0	6.4	495	2.3	8.6	17.4	16.8	85.8	12.0	1.62	79	6.0	0.04	5.03	0.17	4.30	19.2	95.6	7.4	70	5	<1
BWW25	24h	9	9/23/92	1210		22.0	6.4	380	2.8	6.3	15.8	13.8	65.0	9.2	1.26	62	7.2	0.03	4.27	0.14	3.40	17.4	78.3	6.7	58	80	<1
BWW25	24h	12	9/23/92	1615		21.0	6.3	368	2.3	6.4	24.4	16.9	60.1	10.1	1.30	57	1.8	1.44	3.67	0.19	4.60	18.0	69.0	10.6	68	76	4
BWW25	24h	16	9/23/92	2230		19.5	6.5	420	3.1	7.9	7.4	6.2	71.2	11.5	1.45	70	1.2	3.44	3.51	0.13	5.40	20.2	74.6	9.7	75	39	<1
BWW25	24h	24	9/23/92	120		20.8	NA	481	1.8	4.7	17.5	15.0	85.1	11.0	1.40	86	1.8	1.08	3.97	0.23	5.30	22.5	89.4	7.3	76	180	1
BWW25	48h	32	9/24/92	930		20.4	6.5	450	2.3	3.7	17.8	15.6	91.3	11.0	1.52	96	0.4	2.26	3.51	0.13	5.10	18.9	86.1	7.0	78	350	4
BWW25	48h	40	9/24/92	1747		21.0	6.5	390	2.0	4.2	18.4	17.1	103.0	15.8	1.86	96	3.600	0.86	3.67	0.24	3.80	16.0	73.4	5.4	74	<1	<1
DRY WEATHER (1 sample)						**24.0**	**6.6**	**100**	**3.5**	**8.8**	**18.7**	**12.7**	**156.2**	**14.7**	**1.99**	**108**	**2.000**	**2.40**	**6.25**	**0.17**	**5.00**	**15.7**	**97.2**	**5.2**	**82**	**47**	**<1**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count						9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean (*)						**21.5**	**6.5**	**444**	**2.4**	**7.6**	**20.8**	**15.3**	**94.6**	**12.8**	**1.64**	**84**	**3.7**	**1.18**	**4.31**	**0.20**	**4.74**	**19.8**	**90.4**	**7.8**	**79**	**61**	**2**
Minimum						19.5	6.3	368	1.8	3.7	7.4	6.2	60.1	9.2	1.26	57	0.4	0.03	3.51	0.13	3.40	16.0	69.0	5.4	58	<1	<1
Maximum						23.0	6.7	510	3.2	15.3	47.5	20.7	171.0	18.3	2.27	111	8.2	3.44	5.64	0.46	6.30	26.5	128.8	10.6	130	800	21
WET WEATHER ***(during rain)***																											
Count						3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)						**23.0**	**6.5**	**502**	**2.6**	**11.6**	**28.7**	**17.6**	**125.3**	**15.5**	**1.99**	**98**	**5.8**	**0.51**	**5.39**	**0.26**	**5.03**	**21.8**	**114.4**	**7.7**	**95**	**94**	**6**
Minimum						23.0	6.4	495	2.2	8.6	17.4	15.4	85.8	12.0	1.62	79	3.2	0.04	5.03	0.14	4.30	19.2	95.6	6.1	70	5	<1
Maximum						23.0	6.7	510	3.2	15.3	47.5	20.7	171.0	18.3	2.27	111	8.2	1.33	5.64	0.46	6.30	26.5	128.8	9.7	130	800	21
WET WEATHER ***(Day 1 after rain)***																											
Count						4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)						**20.8**	**6.4**	**412**	**2.5**	**6.3**	**16.3**	**13.0**	**70.4**	**10.5**	**1.35**	**69**	**3.0**	**1.50**	**3.86**	**0.17**	**4.68**	**19.5**	**77.8**	**8.6**	**69**	**81**	**1**
Minimum						19.5	6.3	368	1.8	4.7	7.4	6.2	60.1	9.2	1.26	57	1.2	0.03	3.51	0.13	3.40	17.4	69.0	6.7	58	39	<1
Maximum						22.0	6.5	481	3.1	7.9	24.4	16.9	85.1	11.5	1.45	86	7.2	3.44	4.27	0.23	5.40	22.5	89.4	10.6	76	180	4
WET WEATHER ***(Day 2 after rain)***																											
Count						2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mean (*)						**20.7**	**6.5**	**420**	**2.2**	**4.0**	**18.1**	**16.4**	**97.2**	**13.4**	**1.69**	**96**	**2.0**	**1.56**	**3.59**	**0.19**	**4.45**	**17.5**	**79.8**	**6.2**	**76**	**19**	**2**
Minimum						20.4	6.5	390	2.0	3.7	17.8	15.6	91.3	11.0	1.52	96	0.4	0.86	3.51	0.13	3.80	16.0	73.4	5.4	74	<1	<1
Maximum						21.0	6.5	450	2.3	4.2	18.4	17.1	103.0	15.8	1.86	96	3.6	2.26	3.67	0.24	5.10	18.9	86.1	7.0	78	350	4
WET WEATHER ***(Day 3)***																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

Section A15-4

Wet Weather Data - Storm 2

- all Data with Statistics -

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos /cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU /100mL	CFU /100mL
BWW00	Dry	P	11/2/92	1510	72	7.2	6.7	181	11.6	1.2	1.6	1.0	55.2	17.5	1.59	28	0.03	0.14	0.02	0.08	0.57	3.0	1.8	2.3	9	1,700	76
BWW00	Rain		11/2/92	2315	72	6.3	6.5	190	10.8	NA	2.2	ND	52.0	17.9	1.53	29	0.04	0.14	0.02	0.13	2.67	3.7	1.2	3.8	15	NA	NA
BWW00	Rain	3	11/3/92	215	65	6.0	6.6	192	11.8	1.5	2.4	1.2	66.1	17.6	1.63	27	0.03	0.16	0.01	ND	0.67	3.6	1.9	6.1	10	1,800	320
BWW00	Rain	6	11/3/92	455	172	6.0	6.7	205	11.6	10.5	5.5	2.2	66.6	17.2	1.55	27	0.05	0.20	0.01	ND	0.91	7.0	1.4	6.3	20	8,900	620
BWW00	Rain	9	11/3/92	745	228	10.9	6.3	128	10.9	11.6	65.0	37.0	44.9	9.6	0.78	17	0.16	0.36	0.06	0.12	4.49	22.7	4.5	41.1	68	9,300	4,200
BWW00	Rain	12	11/3/92	1105	163	NA	6.5	105	NA	10.8	19.2	9.6	30.4	6.7	0.55	10	0.20	0.02	0.16	0.07	2.40	14.2	3.4	21.8	45	8,300	9,100
BWW00	Rain	16	11/3/92	1507	193	6.7	6.4	130	11.2	4.2	9.2	5.2	49.3	11.8	1.10	19	0.09	0.12	0.09	0.05	1.43	8.4	2.1	11.5	36	4,300	6,300
BWW00	24h	20	11/3/92	1855	116	6.9	6.6	142	11.4	NA	3.0	1.6	55.8	12.1	1.39	NA	0.05	0.08	0.05	0.08	NA	NA	NA	NA	NA	NA	NA
BWW00	24h	24	11/3/92	2250	113	6.8	6.4	158	10.8	4.6	1.6	ND	60.9	13.8	1.38	24	0.01	0.04	0.01	ND	0.74	4.6	1.4	5.0	20	190	360
BWW00	24h	28	11/4/92	245	128	6.8	6.4	164	10.9	NA	3.4	1.8	62.1	14.4	1.37	24	0.06	0.07	0.01	ND	0.70	4.6	2.1	4.5	20	NA	NA
BWW00	24h	32	11/4/92	653	126	6.0	6.4	160	11.6	2.5	2.6	1.4	53.4	14.4	1.35	25	ND	0.07	0.01	ND	0.94	3.9	1.7	5.3	23	3,000	480
BWW00	24h	36	11/4/92	1048	126	7.0	6.5	162	11.4	NA	2.2	1.2	61.1	11.6	1.22	25	0.05	0.02	0.01	ND	1.03	3.8	2.1	4.3	15	NA	NA
BWW00	24h	40	11/4/92	1446	121	8.0	6.6	160	10.9	2.2	2.4	1.0	57.2	14.9	1.12	27	ND	0.08	0.01	ND	0.11	2.8	1.5	5.1	10	1,100	220
BWW00	48h	44	11/4/92	1842	121	8.5	7.0	158	9.9	NA	1.6	1.4	48.6	15.0	1.30	24	0.04	0.09	0.01	ND	0.75	5.2	1.9	6.4	21	NA	NA
BWW00	48h	48	11/4/92	2253	113	7.5	7.1	164	10.4	2.6	1.4	1.0	65.3	14.7	1.32	26	0.01	0.12	ND	ND	0.69	4.0	2.0	5.7	15	2,500	290
BWW00	72h	72	11/5/92	1555	57	9.8	NA	364	7.4	ND	3.5	2.8	62.4	15.0	1.28	27	0.07	0.09		ND	0.64	3.7	1.9	4.1	16	1,400	170
DRY WEATHER (1 sample)					**72.0**	**7.2**	**6.7**	**181**	**11.6**	**1.2**	**1.6**	**1.0**	**55.2**	**17.5**	**1.59**	**28**	**0.030**	**0.14**	**0.02**	**0.08**	**0.57**	**3.0**	**1.8**	**2.3**	**9**	**1,700**	**76**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	13	14	14	13	9	14	12	14	14	14	13	12	14	13	5	13	13	13	13	13	9	9
Mean (*)					**132.6**	**7.2**	**6.6**	**158**	**11.0**	**5.6**	**8.7**	**5.4**	**55.3**	**13.7**	**1.26**	**23**	**0.066**	**0.11**	**0.04**	**0.09**	**1.35**	**6.8**	**2.1**	**9.8**	**24**	**2,727**	**931**
Minimum					65.0	6.0	6.3	105	9.9	1.5	1.4	1.0	30.4	6.7	0.55	10	0.010	0.02	0.01	0.05	0.11	2.8	1.2	3.8	10	190	220
Maximum					228.0	10.9	7.1	205	11.8	11.6	65.0	37.0	66.6	17.9	1.63	29	0.200	0.36	0.16	0.13	4.49	22.7	4.5	41.1	68	9,300	9,100
WET WEATHER ***(during rain)***																											
Count					6	5	6	6	5	5	6	5	6	6	6	6	6	6	6	4	6	6	6	6	6	5	5
Mean (*)					**148.8**	**7.2**	**6.5**	**158**	**11.3**	**7.7**	**17.3**	**11.0**	**51.6**	**13.5**	**1.19**	**22**	**0.095**	**0.17**	**0.06**	**0.09**	**2.10**	**9.9**	**2.4**	**15.1**	**32**	**5,561**	**2,167**
Minimum					65.0	6.0	6.3	105	10.8	1.5	2.2	1.2	30.4	6.7	0.55	10	0.030	0.02	0.01	0.05	0.67	3.6	1.2	3.8	10	1,800	320
Maximum					228.0	10.9	6.7	205	11.8	11.6	65.0	37.0	66.6	17.9	1.63	29	0.200	0.36	0.16	0.13	4.49	22.7	4.5	41.1	68	9,300	9,100
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	5	4	6	6	1	5	5	5	5	5	3	3
Mean (*)					**121.7**	**6.9**	**6.5**	**158**	**11.2**	**3.1**	**2.5**	**1.4**	**58.4**	**13.5**	**1.31**	**25**	**0.043**	**0.06**	**0.02**	**0.08**	**0.70**	**3.9**	**1.8**	**4.8**	**18**	**856**	**336**
Minimum					113.0	6.0	6.4	142	10.8	2.2	1.6	1.0	53.4	11.6	1.12	24	0.010	0.02	0.01		0.11	2.8	1.4	4.3	10	190	220
Maximum					128.0	8.0	6.6	164	11.6	4.6	3.4	1.8	62.1	14.9	1.39	27	0.060	0.08	0.05		1.03	4.6	2.1	5.3	23	3,000	480
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	1		2	2	2	2	2	1	1
Mean (*)					**117.0**	**8.0**	**7.0**	**161**	**10.2**	**2.6**	**1.5**	**1.2**	**57.0**	**14.8**	**1.31**	**25**	**0.025**	**0.11**	**0.01**		**0.72**	**4.6**	**2.0**	**6.1**	**18**	**2,500**	**290**
Minimum					113.0	7.5	7.0	158	9.9		1.4	1.0	48.6	14.7	1.30	24	0.010	0.09			0.69	4.0	1.9	5.7	15		
Maximum					121.0	8.5	7.1	164	10.4		1.6	1.4	65.3	15.0	1.32	26	0.040	0.12			0.75	5.2	2.0	6.4	21		
WET WEATHER ***(Day 3)*** (1 sample)					**57.0**	**9.8**		**364**	**7.4**		**3.5**	**2.8**	**62.4**	**15.0**	**1.28**	**27**	**0.070**	**0.09**			**0.64**	**3.7**	**1.9**	**4.1**	**16**	**1,400**	**170**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW01	Dry	P	11/2/92	1530	77	8.0	6.6	368	11	6.9	12.2	5.0	122.0	33.2	3.28	62	0.18	0.41	0.01	ND	3.81	8.1	4.0	4.5	52	1,700	500
BWW01	Rain		11/2/92	2335	77	7.4	6.6	272	10.8	NA	5.0	2.8	102.0	24.3	2.51	47	0.32	0.33	0.01	0.06	2.77	7.9	4.4	11.1	32	NA	NA
BWW01	Rain	3	11/3/92	230	71	7.0	6.6	262	11.6	4.6	5.6	3.6	106.0	22.5	2.30	43	0.16	0.32	0.01	0.20	6.34	9.2	4.1	4.6	34	3,500	400
BWW01	Rain	6	11/3/92	515	185	7.0	6.9	202	11.5	11.1	21.2	18.0	98.8	17.2	1.77	32	0.35	0.23	0.02	0.18	6.56	22.9	5.8	21.7	88	7,100	4,600
BWW01	Rain	9	11/3/92	820	245	NA	6.8	165	10.9	9.1	29.2	10.0	68.6	13.3	1.41	26	0.17	0.41	0.04	0.14	4.84	19.9	4.7	26.2	75	8,000	5,200
BWW01	Rain	12	11/3/92	1120	175	NA	6.5	135	NA	10.9	31.8	12.0	45.9	8.5	0.86	19	0.13	0.16	0.10	0.16	3.41	18.5	5.0	26.7	1.6	13,000	8,900
BWW01	Rain	16	11/3/92	1519	208	7.0	6.4	152	11.2	9.3	30.2	10.6	63.2	10.6	1.14	24	0.07	0.24	0.08	0.09	2.90	12.6	9.5	15.0	60	7,900	6,500
BWW01	24h	20	11/3/92	1905	125	7.2	6.4	175	11.1	NA	11.6	8.0	68.7	12.8	1.46	28	0.21	0.22	0.03	0.06	2.27	10.0	6.1	9.1	49	NA	NA
BWW01	24h	24	11/3/92	2305	122	7.2	6.5	180	10.6	5.0	2.8	ND	67.5	14.8	1.64	29	0.11	0.18	0.01	0.06	2.35	7.5	3.4	7.4	39	2,100	1,100
BWW01	24h	28	11/4/92	300	138	7.3	6.5	202	10.7	NA	3.6	1.8	79.6	16.3	1.70	29	0.09	0.16	0.01	ND	1.37	5.9	3.0	8.2	36	NA	NA
BWW01	24h	32	11/4/92	702	135	7.0	6.5	192	11	3.0	3.4	1.0	65.4	16.6	1.74	30	0.10	0.11	0.03	ND	1.24	4.4	2.0	3.8	36	2,900	770
BWW01	24h	36	11/4/92	1058	135	8.0	6.4	200	10.4	NA	3.8	2.2	78.7	16.6	1.74	31	0.13	0.17	0.01	ND	3.91	4.8	2.1	5.7	33	NA	NA
BWW01	24h	40	11/4/92	1500	130	8.1	6.6	194	10.6	2.7	3.2	1.8	75.4	17.3	1.74	35	0.22	0.16	0.01	ND	1.75	4.5	3.0	3.2	37	2,600	600
BWW01	48h	44	11/4/92	1900	130	8.5	6.8	223	9.6	NA	1.8	1.6	90.8	16.8	1.59	35	0.18	NA	NA	0.07	1.81	3.1	4.6	2.0	30	NA	NA
BWW01	48h	48	11/4/92	2305	122	8.0	7.1	202	10.2	1.8	2.4	1.6	83.2	16.8	1.69	33	0.22	0.30	0.01	0.09	1.93	2.8	3.4	2.4	34	2,500	260
BWW01	72h	72	11/5/92		62	9.8	NA	122	7	NA	3.7	3.0	85.7	17.8	1.72	36	0.23	0.31	0.01	0.14	4.42	4.4	4.2	3.5	39	400	270
DRY WEATHER (1 sample)					**77.0**	**8.0**	**6.6**	**368**	**11.0**	**6.9**	**12.2**	**5.0**	**122.0**	**33.2**	**3.28**	**62**	**0.180**	**0.41**	**0.01**		**3.81**	**8.1**	**4.0**	**4.5**	**52**	**1,700**	**500**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	12	14	14	13	9	14	13	14	14	14	14	14	13	13	10	14	14	14	14	14	9	9
Mean (*)					**142.7**	**7.5**	**6.6**	**197**	**10.8**	**6.4**	**11.1**	**5.8**	**78.1**	**16.0**	**1.66**	**32**	**0.176**	**0.23**	**0.03**	**0.11**	**3.10**	**9.6**	**4.4**	**10.5**	**42**	**4,533**	**1,611**
Minimum					71.0	7.0	6.4	135	9.6	1.8	1.8	1.0	45.9	8.5	0.86	19	0.070	0.11	0.01	0.06	1.24	2.8	2.0	2.0	2	2,100	260
Maximum					245.0	8.5	7.1	272	11.6	11.1	31.8	18.0	106.0	24.3	2.51	47	0.350	0.41	0.10	0.20	6.56	22.9	9.5	26.7	88	13,000	8,900
WET WEATHER ***(during rain)***																											
Count					6	4	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**160.2**	**7.1**	**6.6**	**198**	**11.2**	**9.0**	**20.5**	**9.5**	**80.8**	**16.1**	**1.67**	**32**	**0.200**	**0.28**	**0.04**	**0.14**	**4.47**	**15.2**	**5.6**	**17.6**	**48**	**7,278**	**3,537**
Minimum					71.0	7.0	6.4	135	10.8	4.6	5.0	2.8	45.9	8.5	0.86	19	0.070	0.16	0.01	0.06	2.77	7.9	4.1	4.6	2	3,500	400
Maximum					245.0	7.4	6.9	272	11.6	11.1	31.8	18.0	106.0	24.3	2.51	47	0.350	0.41	0.10	0.20	6.56	22.9	9.5	26.7	88	13,000	8,900
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	6	6	2	6	6	6	6	6	3	3
Mean (*)					**130.8**	**7.5**	**6.5**	**191**	**10.7**	**3.6**	**4.7**	**3.0**	**72.6**	**15.7**	**1.67**	**30**	**0.143**	**0.17**	**0.02**	**0.06**	**2.15**	**6.2**	**3.3**	**6.2**	**38**	**2,511**	**798**
Minimum					122.0	7.0	6.4	175	10.4	2.7	2.8	1.0	65.4	12.8	1.46	28	0.090	0.11	0.01	0.06	1.24	4.4	2.0	3.2	33	2,100	600
Maximum					138.0	8.1	6.6	202	11.1	5.0	11.6	8.0	79.6	17.3	1.74	35	0.220	0.22	0.03	0.06	3.91	10.0	6.1	9.1	49	2,900	1,100
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1
Mean (*)					**126.0**	**8.3**	**6.9**	**213**	**9.9**	**1.8**	**2.1**	**1.6**	**87.0**	**16.8**	**1.64**	**34**	**0.200**	**0.30**	**0.01**	**0.08**	**1.87**	**3.0**	**4.0**	**2.2**	**32**	**2,500**	**260**
Minimum					122.0	8.0	6.8	202	9.6	1.8	1.8	1.6	83.2	16.8	1.59	33	0.180			0.07	1.81	2.8	3.4	2.0	30		
Maximum					130.0	8.5	7.1	223	10.2	1.8	2.4	1.6	90.8	16.8	1.69	35	0.220			0.09	1.93	3.1	4.6	2.4	34		
WET WEATHER ***(Day 3)*** (1 sample)					**62.0**	**9.8**		**122**	**7.0**		**3.7**	**3.0**	**85.7**	**17.8**	**1.72**	**36**	**0.230**	**0.31**	**0.01**	**0.14**	**4.42**	**4.4**	**4.2**	**3.5**	**39**	**400**	**270**

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW02	Dry	P	11/2/92	1553	107	11.3	6.7	390	9.4	4.1	9.0	6.6	117.0	25.2	4.41	70	5.32	0.80	0.83	1.63	7.66	15.2	15.6	4.7	48	15,000	2,800
BWW02	Rain		11/2/92	2355	107	11.0	6.6	370	8.9	NA	3.8	2.6	107.0	24.0	3.74	64	7.09	0.42	0.65	1.38	6.03	10.9	15.2	2.9	31	NA	NA
BWW02	Rain	3	11/3/92	245	130	10.0	6.7	346	9.8	6.5	6.4	3.0	111.0	22.7	2.87	59	6.94	0.30	0.61	1.35	5.36	11.2	13.9	3.2	36	10,000	15,000
BWW02	Rain	6	11/3/92	535	245	7.0	6.8	330	9.8	11.5	24.0	10.8	108.0	19.9	2.66	56	3.70	0.21	0.71	2.04	11.79	24.2	16.1	16.1	76	35,000	5,000
BWW02	Rain	9	11/3/92	825	453	9.4	6.5	235	9.4	9.8	72.6	62.7	72.6	12.6	1.59	38	3.78	0.19	0.46	1.73	10.85	27.0	12.6	28.8	88	22,000	6,000
BWW02	Rain	12	11/3/92	1130	264	NA	6.6	190	NA	10.4	22.4	10.4	61.5	11.4	1.32	25	2.80	0.29	0.35	1.32	5.45	21.3	9.2	19.7	70	600	12,000
BWW02	Rain	16	11/3/92	1533	268	8.2	6.2	175	10	5.8	12.5	7.3	56.6	10.0	1.14	25	2.55	0.32	0.46	1.04	6.56	19.0	10.8	16.0	54	43,000	22,000
BWW02	24h	20	11/3/92	1916	222	7.1	6.4	201	10.9	NA	14.0	7.8	66.3	11.5	1.52	30	3.00	0.38	0.43	1.04	7.66	16.1	13.4	10.3	42	NA	NA
BWW02	24h	24	11/3/92	2320	177	9.0	6.5	211	10.5	9.8	8.6	3.2	69.7	13.7	1.83	34	3.56	0.32	0.40	0.71	6.10	12.3	12.2	5.9	33	17,000	8,700
BWW02	24h	28	11/4/92	310	150	8.4	6.5	220	9.5	NA	7.8	4.0	89.0	15.1	2.06	36	1.73	0.32	0.27	0.55	4.66	10.4	10.1	5.0	27	NA	NA
BWW02	24h	32	11/4/92	713	142	8.0	6.5	215	10	4.8	4.2	ND	68.3	16.5	2.16	36	2.66	0.17	0.21	0.46	3.61	7.6	8.2	4.1	21	28,000	4,300
BWW02	24h	36	11/4/92	1109	142	10.0	6.6	252	9.4	NA	5.2	3.4	83.0	17.0	2.12	42	3.67	0.17	0.30	0.84	4.67	10.5	13.6	5.2	23	NA	NA
BWW02	24h	40	11/4/92	1520	156	10.5	6.6	240	9.3	4.9	3.4	2.0	82.0	17.9	2.28	42	4.42	0.17	0.27	0.54	3.76	7.1	10.3	2.7	16	16,000	2,200
BWW02	48h	44	11/4/92	1920	156	10.4	6.9	225	8	NA	3.0	2.4	87.6	17.9	2.14	41	4.08	0.39	0.02	0.62	5.65	8.9	12.3	4.0	23	NA	NA
BWW02	48h	48	11/4/92	2317	177	10.2	6.9	230	9.1	5.5	1.4	1.4	95.9	18.1	2.17	46	5.52	0.17	0.30	0.50	6.85	7.5	12.2	2.7	16	31,000	1,900
BWW02	72h	72	11/5/92		103	11.1	NA	290	6.5	3.3	1.8	ND	96.6	19.4	2.61	45	5.51	0.22	0.05	0.63	5.48	8.4	13.1	3.5	16	11,000	470
DRY WEATHER (1 sample)					**107.0**	**11.3**	**6.7**	**390**	**9.4**	**4.1**	**9.0**	**6.6**	**117.0**	**25.2**	**4.41**	**70**	**5.320**	**0.80**	**0.83**	**1.63**	**7.66**	**15.2**	**15.6**	**4.7**	**48**	**15,000**	**2,800**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	13	14	14	13	9	14	13	14	14	14	14	14	14	14	14	14	14	14	14	14	9	9
Mean (*)					**199.2**	**9.2**	**6.6**	**246**	**9.6**	**7.7**	**13.5**	**9.3**	**82.8**	**16.3**	**2.11**	**41**	**3.964**	**0.27**	**0.39**	**1.01**	**6.36**	**13.9**	**12.2**	**9.0**	**40**	**15,335**	**6,422**
Minimum					107.0	7.0	6.2	175	8.0	4.8	1.4	1.4	56.6	10.0	1.14	25	1.730	0.17	0.02	0.46	3.61	7.1	8.2	2.7	16	600	1,900
Maximum					453.0	11.0	6.9	370	10.9	11.5	72.6	62.7	111.0	24.0	3.74	64	7.090	0.42	0.71	2.04	11.79	27.0	16.1	28.8	88	43,000	22,000
WET WEATHER ***(during rain)***																											
Count					6	5	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**244.5**	**9.1**	**6.6**	**274**	**9.6**	**8.8**	**23.6**	**16.1**	**86.1**	**16.8**	**2.22**	**45**	**4.477**	**0.29**	**0.54**	**1.48**	**7.67**	**18.9**	**13.0**	**14.5**	**59**	**11,472**	**10,351**
Minimum					107.0	7.0	6.2	175	8.9	5.8	3.8	2.6	56.6	10.0	1.14	25	2.550	0.19	0.35	1.04	5.36	10.9	9.2	2.9	31	600	5,000
Maximum					453.0	11.0	6.8	370	10.0	11.5	72.6	62.7	111.0	24.0	3.74	64	7.090	0.42	0.71	2.04	11.79	27.0	16.1	28.8	88	43,000	22,000
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)					**164.8**	**8.8**	**6.5**	**223**	**9.9**	**6.5**	**7.2**	**4.1**	**76.4**	**15.3**	**2.00**	**37**	**3.173**	**0.26**	**0.31**	**0.69**	**5.08**	**10.7**	**11.3**	**5.5**	**27**	**19,675**	**4,350**
Minimum					142.0	7.1	6.4	201	9.3	4.8	3.4	2.0	66.3	11.5	1.52	30	1.730	0.17	0.21	0.46	3.61	7.1	8.2	2.7	16	16,000	2,200
Maximum					222.0	10.5	6.6	252	10.9	9.8	14.0	7.8	89.0	17.9	2.28	42	4.420	0.38	0.43	1.04	7.66	16.1	13.6	10.3	42	28,000	8,700
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**166.5**	**10.3**	**6.9**	**228**	**8.6**	**5.5**	**2.2**	**1.9**	**91.8**	**18.0**	**2.16**	**44**	**4.800**	**0.28**	**0.16**	**0.56**	**6.25**	**8.2**	**12.3**	**3.4**	**20**	**31,000**	**1,900**
Minimum					156.0	10.2	6.9	225	8.0		1.4	1.4	87.6	17.9	2.14	41	4.080	0.17	0.02	0.50	5.65	7.5	12.2	2.7	16		
Maximum					177.0	10.4	6.9	230	9.1		3.0	2.4	95.9	18.1	2.17	46	5.520	0.39	0.30	0.62	6.85	8.9	12.3	4.0	23		
WET WEATHER ***(Day 3)*** (1 sample)					**103.0**	**11.1**		**290**	**6.5**	**3.3**	**1.8**		**96.6**	**19.4**	**2.61**	**45**	**5.510**	**0.22**	**0.05**	**0.63**	**5.48**	**8.4**	**13.1**	**3.5**	**16**	**11,000**	**470**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW04	Dry	P	11/2/92	1620	108	10.0	6.5	285	10.4	2.7	3.6	2.0	85.8	20.7	4.14	51	3.46	NA	0.90	1.55	3.97	10.9	11.8	1.9	29	9,800	670
BWW04	Rain		11/3/92	20	108	10.0	6.7	355	10	NA	3.4	2.4	114.0	24.7	4.50	48	5.00	1.21	0.68	1.60	5.02	13.7	12.9	5.8	42	NA	NA
BWW04	Rain	3	11/3/92	305	135	9.5	6.6	352	10.2	6.0	5.6	2.8	120.0	23.8	4.05	44	6.65	0.45	0.79	1.56	4.94	11.6	14.2	3.2	36	13,000	1,800
BWW04	Rain	6	11/3/92	605	220	9.0	6.8	342	11.5	12.6	22.8	9.0	122.0	23.0	4.52	50	2.90	0.07	0.67	1.82	5.62	13.9	14.9	7.2	47	8,300	1,300
BWW04	Rain	9	11/3/92	850	320	10.2	6.7	305	10.2	10.5	73.9	64.3	102.0	14.2	2.85	40	4.24	0.45	0.58	5.18	27.50	60.6	27.7	39.1	115	25,000	3,900
BWW04	Rain	12	11/3/92	1155	380	NA	6.5	220	NA	10.4	37.7	16.7	70.3	9.5	2.02	23	2.27	0.25	0.42	4.14	23.60	58.5	20.6	51.3	136	31,000	7,100
BWW04	Rain	16	11/3/92	1553	320	8.0	6.5	174	10.9	10.8	7.8	5.0	66.8	11.7	2.31	18	5.42	0.37	0.42	1.76	5.90	20.9	10.3	18.2	57	38,000	10,000
BWW04	24h	20	11/3/92	1993	273	8.2	6.5	171	11	NA	5.8	5.6	53.2	8.9	2.14	18	2.25	0.37	0.58	0.98	5.65	18.0	9.3	13.4	51	NA	NA
BWW04	24h	24	11/3/92	2345	231	8.7	6.6	170	10.5	10.9	12.6	6.4	59.9	11.6	2.65	20	2.74	NA	0.49	1.08	5.57	14.7	11.3	8.5	43	61,000	12,000
BWW04	24h	28	11/4/92	330	202	9.0	6.7	205	10.6	NA	8.6	6.4	72.8	13.8	2.58	19	1.84	0.62	0.42	0.76	5.04	12.4	11.6	5.8	28	NA	NA
BWW04	24h	32	11/4/92	736	172	8.0	6.6	210	11	7.9	6.6	3.4	62.4	14.9	2.78	20	2.15	0.32	0.34	0.66	3.81	9.3	9.7	4.2	32	22,000	4,400
BWW04	24h	36	11/4/92	1127	142	8.5	6.7	208	11	NA	6.2	3.0	77.8	12.6	3.05	23	1.40	0.31	0.27	0.55	2.86	8.4	8.2	7.5	26	NA	NA
BWW04	24h	40	11/4/92	1535	142	10.8	6.7	216	10.1	7.9	5.0	2.8	69.3	16.8	3.20	28	2.85	0.37	0.34	0.72	3.22	9.4	11.2	3.9	22	16,000	1,400
BWW04	48h	44	11/4/92	1935	165	10.4	6.9	210	9.5	NA	3.2	2.0	36.0	16.2	2.70	20	1.34	0.31	0.23	0.43	2.41	5.7	10.0	1.5	18	NA	NA
BWW04	48h	48	11/4/92	2338	191	10.0	7.0	222	9.8	6.1	3.8	2.8	89.1	17.2	3.00	25	4.32	0.42	0.27	0.56	NA	8.5	NA	3.8	25	17,000	1,400
BWW04	72h	72	11/5/92		108	11.9	NA	252	7.8	4.0	1.4	1.2	88.0	17.8	3.26	26	2.77	0.49	0.16	0.60	3.29	7.2	11.2	3.5	18	6,300	1,900
DRY WEATHER (1 sample)					**108.0**	**10.0**	**6.5**	**285**	**10.4**	**2.7**	**3.6**	**2.0**	**85.8**	**20.7**	**4.14**	**51**	**3.460**		**0.90**	**1.55**	**3.97**	**10.9**	**11.8**	**1.9**	**29**	**9,800**	**670**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					14	13	14	14	13	9	14	14	14	14	14	14	14	13	14	14	13	14	13	14	14	9	9
Mean (*)					**214.4**	**9.3**	**6.7**	**240**	**10.5**	**9.2**	**14.5**	**9.5**	**79.7**	**15.6**	**3.03**	**28**	**3.241**	**0.42**	**0.46**	**1.56**	**7.78**	**19.0**	**13.2**	**12.4**	**48**	**21,902**	**3,438**
Minimum					108.0	8.0	6.5	170	9.5	6.0	3.2	2.0	36.0	8.9	2.02	18	1.340	0.07	0.23	0.43	2.41	5.7	8.2	1.5	18	8,300	1,300
Maximum					380.0	10.8	7.0	355	11.5	12.6	73.9	64.3	122.0	24.7	4.52	50	6.650	1.21	0.79	5.18	27.50	60.6	27.7	51.3	136	61,000	12,000
WET WEATHER *(during rain)*																											
Count					6	5	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**247.2**	**9.3**	**6.7**	**291**	**10.6**	**10.1**	**25.2**	**16.7**	**99.2**	**17.8**	**3.38**	**37**	**4.413**	**0.47**	**0.59**	**2.68**	**12.10**	**29.9**	**16.8**	**20.8**	**72**	**19,972**	**3,650**
Minimum					108.0	8.0	6.5	174	10.0	6.0	3.4	2.4	66.8	9.5	2.02	18	2.270	0.07	0.42	1.56	4.94	11.6	10.3	3.2	36	8,300	1,300
Maximum					380.0	10.2	6.8	355	11.5	12.6	73.9	64.3	122.0	24.7	4.52	50	6.650	1.21	0.79	5.18	27.50	60.6	27.7	51.3	136	38,000	10,000
WET WEATHER *(Day 1 after rain)*																											
Count					6	6	6	6	6	3	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	3	3
Mean (*)					**193.7**	**8.9**	**6.6**	**197**	**10.7**	**8.9**	**7.5**	**4.6**	**65.9**	**13.1**	**2.73**	**21**	**2.205**	**0.40**	**0.41**	**0.79**	**4.36**	**12.0**	**10.2**	**7.2**	**34**	**27,794**	**4,197**
Minimum					142.0	8.0	6.5	170	10.1	7.9	5.0	2.8	53.2	8.9	2.14	18	1.400	0.31	0.27	0.55	2.86	8.4	8.2	3.9	22	16,000	1,400
Maximum					273.0	10.8	6.7	216	11.0	10.9	12.6	6.4	77.8	16.8	3.20	28	2.850	0.62	0.58	1.08	5.65	18.0	11.6	13.4	51	61,000	12,000
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	1	1
Mean (*)					**178.0**	**10.2**	**7.0**	**216**	**9.7**	**6.1**	**3.5**	**2.4**	**62.6**	**16.7**	**2.85**	**23**	**2.830**	**0.37**	**0.25**	**0.50**	**2.41**	**7.1**	**10.0**	**2.7**	**22**	**17,000**	**1,400**
Minimum					165.0	10.0	6.9	210	9.5		3.2	2.0	36.0	16.2	2.70	20	1.340	0.31	0.23	0.43		5.7		1.5	18		
Maximum					191.0	10.4	7.0	222	9.8		3.8	2.8	89.1	17.2	3.00	25	4.320	0.42	0.27	0.56		8.5		3.8	25		
WET WEATHER *(Day 3)* (1 sample)					**108.0**	**11.9**	**NA**	**252**	**7.8**	**4.0**	**1.4**	**1.2**	**88.0**	**17.8**	**3.26**	**26**	**2.770**	**0.49**	**0.16**	**0.60**	**3.29**	**7.2**	**11.2**	**3.5**	**18**	**6,300**	**1,900**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW05S	Dry	P	11/2/92	1655	2	8.0	6.7	202	1.6	NA	1.0	ND	66.6	19.4	2.60	28	NA	0.11	ND	ND	0.27	1.5	ND	ND	9	NA	NA
BWW05S	Rain		11/3/92	100	3	6.6	6.7	210	9.5	NA	ND	ND	72.3	19.5	2.63	29	ND	0.12	ND	ND	0.29	2.2	0.9	1.9	10	NA	NA
BWW05S	Rain	3	11/3/92	325	3	6.0	6.7	210	10.2	NA	ND	ND	71.6	19.3	2.71	27	NA	0.12	ND	0.06	0.29	2.8	0.7	3.1	2	NA	NA
BWW05S	Rain	6	11/3/92	625	4	6.0	6.9	199	10.6	NA	ND	ND	80.1	18.7	2.74	27	NA	0.12	ND	ND	ND	1.0	ND	2.1	6	NA	NA
BWW05S	Rain	9	11/3/92	925	8	10.0	6.5	195	10	NA	8.0	3.4	78.2	18.2	2.58	26	NA	0.11	ND	ND	ND	1.4	ND	0.8	6	NA	NA
BWW05S	Rain	12	11/3/92		11	NA	6.4	203	NA	NA	ND	ND	82.4	18.4	2.52	27	NA	0.07	ND	0.20	0.46	4.1	ND	2.9	3	NA	NA
BWW05S	Rain	16	11/3/92	1607	14	6.9	6.7	212	11.1	NA	1.2	ND	90.6	18.5	2.44	27	NA	0.05	ND	ND	ND	1.2	ND	2.1	7	NA	NA
BWW05S	24h	20	11/3/92	2000	15	6.5	6.7	195	10.8	NA	1.6	1.4	81.9	17.2	2.55	27	NA	0.05	ND	ND	ND	0.8	ND	1.5	ND	NA	NA
BWW05S	24h	24	11/4/92	5	16	6.8	6.7	198	10.6	NA	1.8	1.6	78.8	17.5	2.44	31	NA	0.02	ND	ND	0.58	1.6	1.5	ND	20	NA	NA
BWW05S	24h	28	11/4/92	355	16	6.8	6.7	201	10.4	NA	1.2	ND	85.6	18.3	2.45	29	NA	0.02	ND	ND	NA	1.4	2.2	NA	ND	NA	NA
BWW05S	24h	32	11/4/92	805	16	6.5	6.7	200	11.2	NA	1.0	ND	69.2	18.0	2.25	28	NA	0.02	ND	ND	0.49	1.0	1.1	2.8	ND	NA	NA
BWW05S	24h	36	11/4/92	1154	15	7.0	6.5	198	10	NA	ND	ND	82.6	17.8	2.30	25	NA	0.02	ND	ND	0.39	1.4	0.7	4.7	4	NA	NA
BWW05S	24h	40	11/4/92	1610	15	8.0	6.8	202	10.6	NA	1.4	1.0	82.3	18.6	2.50	30	NA	ND	ND	ND	0.42	2.0	0.6	2.9	6	NA	NA
BWW05S	48h	44	11/4/92	2010	15	8.0	6.9	206	9.6	NA	ND	ND	85.5	18.6	2.48	27	NA	0.02	ND	ND	0.64	1.8	3.0	7.0	ND	NA	NA
BWW05S	48h	48	11/4/92	2353	15	7.5	7.1	196	10.2	NA	ND	ND	86.4	18.4	2.57	28	NA	0.02	ND	ND	0.55	1.0	2.1	0.9	3	NA	NA
BWW05S	72h	72	11/5/92		16	9.0	NA	182	7.2	NA	1.0	ND	81.8	18.6	2.42	30	NA		ND	ND	0.50	1.0	1.2	1.0	ND	NA	NA
DRY WEATHER (1 sample)					**2.0**	**8.0**	**6.7**	**202**	**1.6**		**1.0**		**66.6**	**19.4**	**2.60**	**28**		**0.11**			**0.27**	**1.5**			**9**		
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	13	14	14	13		7	4	14	14	14	14		13		2	9	14	9	12	10		
Mean *(*)*					**11.9**	**7.1**	**6.7**	**202**	**10.4**		**2.3**	**1.9**	**80.5**	**18.4**	**2.51**	**28**		**0.06**		**0.13**	**0.46**	**1.7**	**1.4**	**2.7**	**7**		
Minimum					3.0	6.0	6.4	195	9.5		1.0	1.0	69.2	17.2	2.25	25		0.02		0.06	0.29	0.8	0.6	0.8	2		
Maximum					16.0	10.0	7.1	212	11.2		8.0	3.4	90.6	19.5	2.74	31		0.12		0.20	0.64	4.1	3.0	7.0	20		
WET WEATHER ***(during rain)***																											
Count					6	5	6	6	5		2	1	6	6	6	6		6		2	3	6	2	6	6		
Mean *(*)*					**7.2**	**7.1**	**6.7**	**205**	**10.3**		**4.6**	**3.4**	**79.2**	**18.8**	**2.60**	**27**		**0.10**		**0.13**	**0.35**	**2.1**	**0.8**	**2.2**	**6**		
Minimum					3.0	6.0	6.4	195	9.5		1.2	3.4	71.6	18.2	2.44	26		0.05		0.06	0.29	1.0	0.7	0.8	2		
Maximum					14.0	10.0	6.9	212	11.1		8.0	3.4	90.6	19.5	2.74	29		0.12		0.20	0.46	4.1	0.9	3.1	10		
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6		5	3	6	6	6	6		5			4	6	5	4	3		
Mean *(*)*					**15.5**	**6.9**	**6.7**	**199**	**10.6**		**1.4**	**1.3**	**80.1**	**17.9**	**2.42**	**28**		**0.03**			**0.47**	**1.4**	**1.2**	**3.0**	**10**		
Minimum					15.0	6.5	6.5	195	10.0		1.0	1.0	69.2	17.2	2.25	25		0.02			0.39	0.8	0.6	1.5	4		
Maximum					16.0	8.0	6.8	202	11.2		1.8	1.6	85.6	18.6	2.55	31		0.05			0.58	2.0	2.2	4.7	20		
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2				2	2	2	2		2			2	2	2	2	1		
Mean *(*)*					**15.0**	**7.8**	**7.0**	**201**	**9.9**				**86.0**	**18.5**	**2.53**	**28**		**0.02**			**0.60**	**1.4**	**2.6**	**4.0**	**3**		
Minimum					15.0	7.5	6.9	196	9.6				85.5	18.4	2.48	27		0.02			0.55	1.0	2.1	0.9			
Maximum					15.0	8.0	7.1	206	10.2				86.4	18.6	2.57	28		0.02			0.64	1.8	3.0	7.0			
WET WEATHER ***(Day 3)*** (1 sample)					**16.0**	**9.0**		**182**	**7.2**		**1.0**		**81.8**	**18.6**	**2.42**	**30**					**0.50**	**1.0**	**1.2**	**1.0**			

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW06	Dry	P	11/2/92	1637	111	8.9	6.6	282	10.3	2.3	3.2	2.4	81.8	20.0	1.85	40	4.25	1.75	0.71	1.40	2.48	13.0	12.3	2.8	27	1,700	220
BWW06	Rain		11/2/92	40	153	9.0	6.7	355	9.8	NA	3.6	ND	81.3	20.2	2.00	42	4.77	1.86	0.77	1.57	3.27	14.5	11.4	5.5	43	NA	NA
BWW06	Rain	3	11/3/92	345	175	9.5	6.5	299	10.4	5.1	5.2	2.8	91.3	20.6	1.98	40	4.83	1.04	0.68	NA	2.90	14.5	12.0	5.5	32	3,700	290
BWW06	Rain	6	11/3/92	640	194	9.0	6.7	326	11.5	12.2	6.2	3.6	119.0	22.9	1.93	50	3.02	1.54	0.55	1.38	3.39	13.1	10.4	10.6	43	5,100	100
BWW06	Rain	9	11/3/92	910	240	10.0	6.8	310	10	5.3	1.6	1.2	112.0	21.3	1.90	47	3.89	1.22	0.61	1.40	4.25	12.9	11.3	5.4	33	8,500	2,500
BWW06	Rain	12	11/3/92	1220	286	NA	6.7	295	NA	10.6	51.3	18.0	95.9	15.1	1.60	41	6.17	0.29	0.46	3.64	20.00	50.8	19.7	37.7	102	38,000	2,400
BWW06	Rain	16	11/3/92	1617	334	8.7	6.6	220	10.5	8.0	20.8	18.4	81.4	14.6	1.40	30	3.79	0.35	0.40	1.95	7.49	23.7	11.8	19.2	54	26,000	7,100
BWW06	24h	20	11/3/92	1946	286	8.2	6.7	185	11	NA	5.6	4.2	63.5	11.7	1.27	21	2.90	0.75	NA	1.36	4.29	18.0	8.2	14.8	48	NA	NA
BWW06	24h	24	11/4/92	20	245	8.0	6.7	178	10.4	NA	2.0	ND	45.0	11.1	1.40	19	2.01	0.58	0.36	1.12	4.30	15.6	8.6	16.2	42	24,000	11,000
BWW06	24h	28	11/4/92	340	217	8.5	6.7	190	10.4	NA	11.4	5.2	65.8	12.0	1.53	22	1.71	0.40	0.33	1.05	5.11	13.8	8.2	15.1	39	NA	NA
BWW06	24h	32	11/4/92	757	179	8.0	6.5	200	10.8	8.7	6.6	3.4	59.5	13.7	1.40	25	3.00	0.55	0.30	0.96	4.77	12.9	9.0	8.2	36	36,000	6,200
BWW06	24h	36	11/4/92	1142	141	8.5	6.5	198	10.6	NA	8.4	3.4	72.5	14.2	1.63	26	1.63	0.44	0.30	0.81	4.02	11.2	8.4	19.4	38	NA	NA
BWW06	24h	40	11/4/92	1600	141	9.3	6.8	203	10.2	7.4	6.4	3.0	73.2	15.5	1.50	28	2.03	0.52	0.21	0.70	3.12	10.3	7.9	7.4	34	11,000	810
BWW06	48h	44	11/4/92	1955	179	9.9	6.8	210	9.5	NA	6.0	2.2	81.4	16.3	2.03	28	2.80	0.58	0.24	0.69	3.34	9.7	8.8	6.6	27	NA	NA
BWW06	48h	48	11/4/92	5	245	9.8	7.0	225	9.2	6.9	2.8	1.6	86.8	16.9	1.63	31	2.52	0.41	0.24	0.71	3.23	10.5	8.2	6.1	28	8,400	1,000
BWW06	72h	72	11/5/92		126	10.8	NA	230	7	4.2	1.4	ND	84.7	16.5	1.66	30	1.40	0.52	0.18	0.60	3.57	8.9	7.0	6.2	22	1,400	390
DRY WEATHER (1 sample)					**111.0**	**8.9**	**6.6**	**282**	**10.3**	**2.3**	**3.2**	**2.4**	**81.8**	**20.0**	**1.85**	**40**	**4.250**	**1.75**	**0.71**	**1.40**	**2.48**	**13.0**	**12.3**	**2.8**	**27**	**1,700**	**220**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					14	13	14	14	13	8	14	12	14	14	14	14	14	14	13	13	14	14	14	14	14	9	9
Mean (*)					**215.4**	**9.0**	**6.7**	**242**	**10.3**	**8.0**	**9.9**	**5.6**	**80.6**	**16.1**	**1.66**	**32**	**3.219**	**0.75**	**0.42**	**1.33**	**5.25**	**16.5**	**10.3**	**12.7**	**43**	**13,257**	**1,599**
Minimum					141.0	8.0	6.5	178	9.2	5.1	1.6	1.2	45.0	11.1	1.27	19	1.630	0.29	0.21	0.69	2.90	9.7	7.9	5.4	27	3,700	100
Maximum					334.0	10.0	7.0	355	11.5	12.2	51.3	18.4	119.0	22.9	2.03	50	6.170	1.86	0.77	3.64	20.00	50.8	19.7	37.7	102	38,000	11,000
WET WEATHER *(during rain)*																											
Count					6	5	6	6	5	5	6	5	6	6	6	6	6	6	6	5	6	6	6	6	6	5	5
Mean (*)					**230.3**	**9.2**	**6.7**	**301**	**10.4**	**8.2**	**14.8**	**8.8**	**96.8**	**19.1**	**1.80**	**42**	**4.412**	**1.05**	**0.58**	**1.99**	**6.88**	**21.6**	**12.8**	**14.0**	**51**	**10,965**	**1,043**
Minimum					153.0	8.7	6.5	220	9.8	5.1	1.6	1.2	81.3	14.6	1.40	30	3.020	0.29	0.40	1.38	2.90	12.9	10.4	5.4	32	3,700	100
Maximum					334.0	10.0	6.8	355	11.5	12.2	51.3	18.4	119.0	22.9	2.00	50	6.170	1.86	0.77	3.64	20.00	50.8	19.7	37.7	102	38,000	7,100
WET WEATHER *(Day 1 after rain)*																											
Count					6	6	6	6	6	2	6	5	6	6	6	6	6	6	5	6	6	6	6	6	6	3	3
Mean (*)					**201.5**	**8.4**	**6.7**	**192**	**10.6**	**8.1**	**6.7**	**3.8**	**63.3**	**13.0**	**1.46**	**24**	**2.213**	**0.54**	**0.30**	**1.00**	**4.27**	**13.6**	**8.4**	**13.5**	**40**	**21,182**	**3,809**
Minimum					141.0	8.0	6.5	178	10.2	7.4	2.0	3.0	45.0	11.1	1.27	19	1.630	0.40	0.21	0.70	3.12	10.3	7.9	7.4	34	11,000	810
Maximum					286.0	9.3	6.8	203	11.0	8.7	11.4	5.2	73.2	15.5	1.63	28	3.000	0.75	0.36	1.36	5.11	18.0	9.0	19.4	48	36,000	11,000
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**212.0**	**9.9**	**6.9**	**218**	**9.4**	**6.9**	**4.4**	**1.9**	**84.1**	**16.6**	**1.83**	**30**	**2.660**	**0.50**	**0.24**	**0.70**	**3.29**	**10.1**	**8.5**	**6.4**	**28**	**8,400**	**1,000**
Minimum					179.0	9.8	6.8	210	9.2		2.8	1.6	81.4	16.3	1.63	28	2.520	0.41	0.24	0.69	3.23	9.7	8.2	6.1	27		
Maximum					245.0	9.9	7.0	225	9.5		6.0	2.2	86.8	16.9	2.03	31	2.800	0.58	0.24	0.71	3.34	10.5	8.8	6.6	28		
WET WEATHER *(Day 3)* (1 sample)					**126.0**	**10.8**		**230**	**7.0**	**4.2**	**1.4**		**84.7**	**16.5**	**1.66**	**30**	**1.400**	**0.52**	**0.18**	**0.60**	**3.57**	**8.9**	**7.0**	**6.2**	**22**	**1,400**	**390**

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW07	Dry	P	11/02/92	1730	100	7.4	6.8	255	8.5	2.7	3.4	2.4	83.3	19.6	1.38	46	2.57	1.72	0.69	1.46	3.89	13.2	13.5	3.5	38	1,200	78
BWW07	Rain		11/03/92	5	100	7.5	6.6	250	12.2	NA	2.8	2.0	96.6	19.5	1.41	45	3.51	1.66	0.66	1.31	3.92	13.3	12.9	3.8	39	NA	NA
BWW07	Rain	3	11/03/92	305	120	8.0	6.7	245	8.3	4.4	4.0	1.6	86.1	19.2	1.47	41	2.92	1.72	0.69	1.41	3.89	13.3	13.2	4.7	45	2,100	40
BWW07	Rain	6	11/03/92	600	149	8.0	6.6	248	9.2	3.0	4.8	2.6	88.2	19.1	1.38	37	2.67	1.77	0.66	1.31	3.52	12.7	12.6	5.2	37	2,200	130
BWW07	Rain	9	11/03/92	930	225	8.2	6.6	232	11.4	2.5	3.0	2.2	92.2	18.9	1.43	43	2.65	1.43	0.66	1.31	3.48	13.3	12.0	4.8	31	3,800	970
BWW07	Rain	12	11/03/92	1255	302	8.5	6.6	238	9.1	2.6	5.4	2.4	92.3	19.0	1.40	38	4.40	1.57	0.62	1.31	3.64	14.2	12.8	5.0	33	1,200	280
BWW07	Rain	16	11/03/92	1630	367	9.6	6.5	302	8.9	6.6	9.0	3.4	95.5	21.1	1.61	49	3.10	NA	0.52	1.42	4.96	15.8	10.2	6.5	43	5,000	500
BWW07	24h	20	11/03/92	1950	339	10.0	6.4	283	9.6	NA	3.6	2.6	93.9	19.4	1.07	45	3.73	0.63	0.39	0.49	1.23	15.4	6.2	NA	24	NA	NA
BWW07	24h	24	11/03/92	2345	290	9.6	6.9	230	8.6	7.9	3.4	ND	67.8	14.9	1.22	37	4.56	0.63	0.32	1.38	5.13	16.5	7.8	11.6	42	20,000	2,600
BWW07	24h	28	11/04/92	400	235	9.2	6.6	190	8.4	NA	9.6	6.4	74.8	14.3	1.18	33	1.55	NA	0.29	1.28	4.35	16.0	8.6	10.2	47	NA	NA
BWW07	24h	32	11/04/92	755	221	9.5	6.7	180	8.6	8.8	11.0	5.7	58.3	13.6	1.15	30	2.66	0.66	0.29	1.16	4.10	14.7	8.2	9.3	48	17,000	2,600
BWW07	24h	36	11/04/92	1120	215	10.0	6.5	175	9.6	NA	7.4	3.2	62.4	12.6	1.10	28	2.26	0.63	0.25	1.72	4.35	15.0	9.9	8.8	48	NA	NA
BWW07	24h	40	11/04/92	1430	205	10.8	6.7	180	8.5	7.8	4.2	2.8	62.0	12.8	1.11	27	1.64	0.54	0.32	0.88	4.41	12.0	8.5	7.4	50	11,000	6,400
BWW07	48h	44	11/04/92	1955	200	9.9	6.7	183	NA	NA	11.4	6.0	46.1	14.0	1.18	29	1.26	0.54	0.32	1.00	4.94	13.3	8.8	7.2	45	NA	NA
BWW07	48h	48	11/04/92	2315	208	10.3	6.7	205	9.8	5.9	4.0	2.0	74.1	14.0	1.15	30	1.25	NA	0.25	1.11	3.29	9.3	8.5	6.3	54	16,000	2,400
BWW07	72h	72	11/05/92	1645	183	11.2	NA	235	7.75	3.6	5.7	3.0	78.4	15.8	1.34	33	1.16	NA	NA	1.10	4.19	12.6	8.9	8.0	53	4,900	410
DRY WEATHER (1 sample)					**100.0**	**7.4**	**6.8**	**255**	**8.5**	**2.7**	**3.4**	**2.4**	**83.3**	**19.6**	**1.38**	**46**	**2.570**	**1.72**	**0.69**	**1.46**	**3.89**	**13.2**	**13.5**	**3.5**	**38**	**1,200**	**78**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					14	14	14	14	13	9	14	13	14	14	14	14	14	11	14	14	14	14	14	13	14	9	9
Mean *(*)*					**226.9**	**9.2**	**6.6**	**224**	**9.4**	**5.5**	**6.0**	**3.3**	**77.9**	**16.6**	**1.28**	**37**	**2.726**	**1.07**	**0.45**	**1.22**	**3.94**	**13.9**	**10.0**	**7.0**	**42**	**5,695**	**748**
Minimum					100.0	7.5	6.4	175	8.3	2.5	2.8	1.6	46.1	12.6	1.07	27	1.250	0.54	0.25	0.49	1.23	9.3	6.2	3.8	24	1,200	40
Maximum					367.0	10.8	6.9	302	12.2	8.8	11.4	6.4	96.6	21.1	1.61	49	4.560	1.77	0.69	1.72	5.13	16.5	13.2	11.6	54	20,000	6,400
WET WEATHER *(during rain)*																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	5	5
Mean *(*)*					**210.5**	**8.3**	**6.6**	**253**	**9.9**	**3.8**	**4.8**	**2.4**	**91.8**	**19.5**	**1.45**	**42**	**3.208**	**1.63**	**0.64**	**1.35**	**3.90**	**13.8**	**12.3**	**5.0**	**38**	**2,538**	**234**
Minimum					100.0	7.5	6.5	232	8.3	2.5	2.8	1.6	86.1	18.9	1.38	37	2.650	1.43	0.52	1.31	3.48	12.7	10.2	3.8	31	1,200	40
Maximum					367.0	9.6	6.7	302	12.2	6.6	9.0	3.4	96.6	21.1	1.61	49	4.400	1.77	0.69	1.42	4.96	15.8	13.2	6.5	45	5,000	970
WET WEATHER *(Day 1 after rain)*																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	5	6	6	6	6	6	5	6	3	3
Mean *(*)*					**250.8**	**9.9**	**6.6**	**206**	**8.9**	**8.2**	**6.5**	**4.1**	**69.9**	**14.6**	**1.14**	**33**	**2.733**	**0.62**	**0.31**	**1.15**	**3.93**	**14.9**	**8.2**	**9.5**	**43**	**15,522**	**3,511**
Minimum					205.0	9.2	6.4	175	8.4	7.8	3.4	2.6	58.3	12.6	1.07	27	1.550	0.54	0.25	0.49	1.23	12.0	6.2	7.4	24	11,000	2,600
Maximum					339.0	10.8	6.9	283	9.6	8.8	11.0	6.4	93.9	19.4	1.22	45	4.560	0.66	0.39	1.72	5.13	16.5	9.9	11.6	50	20,000	6,400
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	1	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1
Mean *(*)*					**204.0**	**10.1**	**6.7**	**194**	**9.8**	**5.9**	**7.7**	**4.0**	**60.1**	**14.0**	**1.17**	**30**	**1.255**	**0.54**	**0.29**	**1.06**	**4.12**	**11.3**	**8.7**	**6.8**	**50**	**16,000**	**2,400**
Minimum					200.0	9.9	6.7	183			4.0	2.0	46.1	14.0	1.15	29	1.250		0.25	1.00	3.29	9.3	8.5	6.3	45		
Maximum					208.0	10.3	6.7	205			11.4	6.0	74.1	14.0	1.18	30	1.260		0.32	1.11	4.94	13.3	8.8	7.2	54		
WET WEATHER *(Day 3)* (1 sample)					**183.0**	**11.2**		**235**	**7.8**	**3.6**	**5.7**	**3.0**	**78.4**	**15.8**	**1.34**	**33**	**1.160**			**1.10**	**4.19**	**12.6**	**8.9**	**8.0**	**53**	**4,900**	**410**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW08	Dry	P	11/02/92	1705	206	7.0	6.4	255	8.3	1.3	3.4	1.8	84.6	19.5	2.23	50	1.65	2.00	0.63	1.55	4.83	14.0	14.3	4.1	38	1,400	91
BWW08	Rain		11/02/92	2315	160	7.2	6.5	245	10	NA	7.5	2.5	92.8	19.3	2.22	47	2.47	1.95	0.58	1.56	4.88	14.9	13.9	5.0	47	NA	NA
BWW08	Rain	3	11/03/92	245	105	7.2	6.6	238	7.8	2.6	1.2	ND	88.0	18.8	2.13	48	2.12	2.00	0.55	1.63	4.99	14.7	14.0	5.4	48	910	70
BWW08	Rain	6	11/03/92	545	139	7.5	6.5	220	7.7	3.4	7.8	3.6	97.4	18.4	2.14	47	2.17	1.83	0.61	1.61	4.74	14.9	13.5	5.9	47	760	40
BWW08	Rain	9	11/03/92	915	171	8.0	6.7	230	12	2.5	6.0	2.4	96.6	18.3	2.08	45	2.14	1.60	0.65	1.49	4.29	15.3	13.1	6.9	41	3,000	55
BWW08	Rain	12	11/03/92	1225	211	8.2	6.8	232	10.1	3.4	7.8	3.0	94.8	17.8	2.10	45	2.82	1.60	0.61	1.65	5.08	18.8	12.7	7.3	49	5,000	220
BWW08	Rain	16	11/03/92	1600	269	8.9	6.4	268	9	8.5	19.8	8.2	83.0	16.3	1.99	43	3.48	1.57	0.61	2.38	13.55	33.0	14.9	18.5	61	1,800	390
BWW08	24h	20	11/03/92	1935	393	9.4	6.5	292	9.4	NA	1.8	1.4	94.7	19.3	2.16	48	3.31	1.49	0.58	2.13	11.39	25.6	13.4	15.1	50	NA	NA
BWW08	24h	24	11/03/92	2330	436	9.5	6.9	290	9.6	2.4	2.2	ND	97.3	18.4	2.09	48	2.95	0.86	0.43	2.09	9.44	22.0	12.9	12.7	45	3,200	780
BWW08	24h	28	11/04/92	350	286	9.5	6.7	232	8.75	NA	22.2	7.4	86.6	16.1	1.90	41	1.97	0.69	0.36	1.83	7.44	20.8	12.3	13.6	48	NA	NA
BWW08	24h	32	11/04/92	745	282	9.0	6.7	202	8.7	8.8	12.4	5.2	66.1	14.7	1.66	33	2.93	0.69	0.34	1.68	6.65	19.6	10.4	13.1	42	19,000	3,800
BWW08	24h	36	11/04/92	1110	286	10.0	6.5	190	8.6	NA	10.6	3.8	67.8	13.6	1.54	30	2.69	0.58	0.34	1.35	4.15	15.5	9.4	9.4	39	NA	NA
BWW08	24h	40	11/04/92	1420	283	10.5	6.7	135	7.7	8.2	8.6	4.3	64.6	13.3	1.55	28	2.55	0.57	0.35	2.15	4.91	17.1	9.0	12.3	56	16,000	2,300
BWW08	48h	44	11/04/92	1945	287	9.7	6.6	180	8.7	NA	11.8	3.8	56.9	12.6	1.49	28	2.11	0.52	0.35	1.41	6.44	16.7	9.8	14.0	45	NA	NA
BWW08	48h	48	11/04/92	2305	269	9.2	6.6	196	8.3	6.3	4.2	2.0	77.2	13.4	1.62	30	2.20	NA	0.30	1.57	2.83	12.2	10.1	17.4	36	15,000	3,300
BWW08	72h	72	11/05/92	1625	279	11.0	NA	228	7.75	3.5	11.7	9.7	80.5	16.4	1.93	34	1.05	NA	NA	0.81	3.52	10.1	8.6	5.6	28	4,700	580
DRY WEATHER (1 sample)					**206.0**	**7.0**	**6.4**	**255**	**8.3**	**1.3**	**3.4**	**1.8**	**84.6**	**19.5**	**2.23**	**50**	**1.650**	**2.00**	**0.63**	**1.55**	**4.83**	**14.0**	**14.3**	**4.1**	**38**	**1,400**	**91**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	9	14	12	14	14	14	14	14	13	14	14	14	14	14	14	14	9	9
Mean (*)					**255.5**	**8.8**	**6.6**	**225**	**9.0**	**5.1**	**8.9**	**4.0**	**83.1**	**16.4**	**1.91**	**40**	**2.565**	**1.23**	**0.48**	**1.75**	**6.48**	**18.7**	**12.1**	**11.2**	**47**	**4,017**	**406**
Minimum					105.0	7.2	6.4	135	7.7	2.4	1.2	1.4	56.9	12.6	1.49	28	1.970	0.52	0.30	1.35	2.83	12.2	9.0	5.0	36	760	40
Maximum					436.0	10.5	6.9	292	12.0	8.8	22.2	8.2	97.4	19.3	2.22	48	3.480	2.00	0.65	2.38	13.55	33.0	14.9	18.5	61	19,000	3,800
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**175.8**	**7.8**	**6.6**	**239**	**9.4**	**4.1**	**8.4**	**3.9**	**92.1**	**18.1**	**2.11**	**46**	**2.533**	**1.76**	**0.60**	**1.72**	**6.26**	**18.6**	**13.7**	**8.2**	**49**	**1,796**	**106**
Minimum					105.0	7.2	6.4	220	7.7	2.5	1.2	2.4	83.0	16.3	1.99	43	2.120	1.57	0.55	1.49	4.29	14.7	12.7	5.0	41	760	40
Maximum					269.0	8.9	6.8	268	12.0	8.5	19.8	8.2	97.4	19.3	2.22	48	3.480	2.00	0.65	2.38	13.55	33.0	14.9	18.5	61	5,000	390
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)					**327.7**	**9.7**	**6.6**	**224**	**8.8**	**6.5**	**9.6**	**4.4**	**79.5**	**15.9**	**1.82**	**38**	**2.733**	**0.81**	**0.40**	**1.87**	**7.33**	**20.1**	**11.2**	**12.7**	**47**	**9,908**	**1,896**
Minimum					282.0	9.0	6.5	135	7.7	2.4	1.8	1.4	64.6	13.3	1.54	28	1.970	0.57	0.34	1.35	4.15	15.5	9.0	9.4	39	3,200	780
Maximum					436.0	10.5	6.9	292	9.6	8.8	22.2	7.4	97.3	19.3	2.16	48	3.310	1.49	0.58	2.15	11.39	25.6	13.4	15.1	56	19,000	3,800
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1
Mean (*)					**278.0**	**9.5**	**6.6**	**188**	**8.5**		**8.0**	**2.9**	**67.1**	**13.0**	**1.56**	**29**	**2.155**	**0.52**	**0.33**	**1.49**	**4.64**	**14.5**	**10.0**	**15.7**	**41**	**15,000**	**3,300**
Minimum					269.0	9.2	6.6	180	8.3		4.2	2.0	56.9	12.6	1.49	28	2.110		0.30	1.41	2.83	12.2	9.8	14.0	36		
Maximum					287.0	9.7	6.6	196	8.7		11.8	3.8	77.2	13.4	1.62	30	2.200		0.35	1.57	6.44	16.7	10.1	17.4	45		
WET WEATHER ***(Day 3)*** (1 sample)					**279.0**	**11.0**		**228**	**7.8**	**3.5**	**11.7**	**9.7**	**80.5**	**16.4**	**1.93**	**34**	**1.050**			**0.81**	**3.52**	**10.1**	**8.6**	**5.6**	**28**	**4,700**	**580**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW09	Dry	P	11/02/92	1640	34	7.0	6.5	72	9.4	ND	ND	ND	55.2	7.3	0.86	5	0.01	0.12	ND	ND	0.42	2.3	ND	ND	3	3	3
BWW09	Rain		11/02/92	2315	34	6.5	6.7	65	10.2	NA	ND	ND	26.0	6.3	0.77	5	ND	0.13	0.01	ND	0.78	0.7	ND	0.9	7	NA	NA
BWW09	Rain	3	11/03/92	230	34	7.2	6.7	65	8.7	1.0	2.4	ND	21.4	6.2	0.73	4	ND	0.17	0.01	ND	0.83	1.4	ND	0.7	12	70	30
BWW09	Rain	6	11/03/92	505	44	7.5	6.7	70	10.9	1.9	2.8	1.2	30.2	6.2	0.74	4	ND	0.15		ND	0.80	0.8	ND	1.0	9	60	11
BWW09	Rain	9	11/03/92	845	61	8.0	6.5	60	11.2	ND	2.0	1.4	26.0	5.9	0.70	5	ND	0.16	0.01	ND	0.83	1.0	ND	2.1	15	200	96
BWW09	Rain	12	11/03/92	1205	77	8.2	6.6	65	10.5	2.7	2.2	1.4	27.0	5.7	0.70	5	0.05	0.15	0.01	ND	0.97	1.1	ND	2.4	11	350	130
BWW09	Rain	16	11/03/92	1530	86	8.3	6.5	71	10.2	3.8	1.4	1.0	28.7	5.5	0.64	ND	ND	0.14	0.01	ND	0.93	1.4	ND	1.2	16	170	250
BWW09	24h	20	11/03/92	1900	104	8.2	6.5	70	9.8	NA	2.8	2.6	26.5	5.1	0.63	4	ND	0.12		ND	1.09	1.0	ND	0.8	12	NA	NA
BWW09	24h	24	11/03/92	2300	97	8.5	6.7	70	10.4	2.0	1.0	ND	22.8	4.2	0.63	2	ND	0.09		ND	0.95	1.2	ND	1.6	14	260	200
BWW09	24h	28	11/04/92	325	104	9.0	6.6	62	8	NA	2.8	1.8	28.3	4.4	0.58	3	0.05	0.11		ND	0.83	1.2	ND	1.1	17	NA	NA
BWW09	24h	32	11/04/92	715	104	9.0	6.8	62	10.1	1.5	1.7	1.3	22.3	4.7	0.58	2	ND	0.11		ND	0.92	1.2	ND	8.9	15	130	180
BWW09	24h	36	11/04/92	1040	104	9.0	6.6	60	9.8	NA	1.6	ND	24.1	4.2	0.54	ND	0.06	0.04		ND	0.60	1.1	ND	3.9	8	NA	NA
BWW09	24h	40	11/04/92	1405	104	10.5	6.8	60	8.7	ND	1.6	1.2	23.7	4.5	0.52	ND	ND	0.09		ND	0.51	1.3	ND	1.2	14	90	83
BWW09	48h	44	11/04/92	1917	100	8.7	6.3	60	9.3	NA	1.2	1.0	23.0	4.4	0.51	ND	0.02	0.07		ND	0.49	1.5	ND	1.4	13	NA	NA
BWW09	48h	48	11/04/92	2250	93	9.1	6.7	73	9	ND	ND	ND	22.7	4.1	0.53	ND	ND	0.38		0.05	0.28	1.3	ND	0.8	16	140	83
BWW09	72h	72	11/05/92	1600	74	9.4	NA	68	8.35	ND	ND	ND	20.2	4.1	0.46	ND	0.01	NA	NA	0.09	0.24	0.9	ND	1.3	12	190	61
DRY WEATHER (1 sample)					**34.0**	**7.0**	**6.5**	**72**	**9.4**				**55.2**	**7.3**	**0.86**	**5**	**0.010**	**0.12**			**0.42**	**2.3**			**3**	**3**	**3**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	6	12	9	14	14	14	9	4	14	14	1	14	14		14	14	9	9
Mean (*)					**81.9**	**8.4**	**6.6**	**65**	**9.8**	**2.2**	**2.0**	**1.4**	**25.2**	**5.1**	**0.63**	**4**	**0.045**	**0.14**	**0.00**	**0.05**	**0.77**	**1.2**		**2.0**	**13**	**140**	**86**
Minimum					34.0	6.5	6.3	60	8.0	1.0	1.0	1.0	21.4	4.1	0.51	2	0.020	0.04			0.28	0.7		0.7	7	60	11
Maximum					104.0	10.5	6.8	73	11.2	3.8	2.8	2.6	30.2	6.3	0.77	5	0.060	0.38	0.01		1.09	1.5		8.9	17	350	250
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	4	5	4	6	6	6	5	1	6	6		6	6		6	6	5	5
Mean (*)					**56.0**	**7.6**	**6.6**	**66**	**10.3**	**2.4**	**2.2**	**1.3**	**26.6**	**6.0**	**0.71**	**5**	**0.050**	**0.15**	**0.01**		**0.86**	**1.1**		**1.4**	**12**	**138**	**63**
Minimum					34.0	6.5	6.5	60	8.7	1.0	1.4	1.0	21.4	5.5	0.64	4		0.13			0.78	0.7		0.7	7	60	11
Maximum					86.0	8.3	6.7	71	11.2	3.8	2.8	1.4	30.2	6.3	0.77	5		0.17	0.01		0.97	1.4		2.4	16	350	250
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	2	6	4	6	6	6	4	2	6	6		6	6		6	6	3	3
Mean (*)					**102.8**	**9.0**	**6.7**	**64**	**9.5**	**1.8**	**1.9**	**1.7**	**24.6**	**4.5**	**0.58**	**3**	**0.055**	**0.09**			**0.82**	**1.2**		**2.9**	**13**	**145**	**144**
Minimum					97.0	8.2	6.5	60	8.0	1.5	1.0	1.2	22.3	4.2	0.52	2	0.050	0.04			0.51	1.0		0.8	8	90	83
Maximum					104.0	10.5	6.8	70	10.4	2.0	2.8	2.6	28.3	5.1	0.63	4	0.060	0.12			1.09	1.3		8.9	17	260	200
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		1	1	2	2	2		1	2	2	1	2	2		2	2	1	1
Mean (*)					**96.5**	**8.9**	**6.5**	**67**	**9.2**		**1.2**	**1.0**	**22.9**	**4.2**	**0.52**		**0.020**	**0.23**		**0.05**	**0.39**	**1.4**		**1.1**	**15**	**140**	**83**
Minimum					93.0	8.7	6.3	60	9.0		1.2	1.0	22.7	4.1	0.51			0.07			0.28	1.3		0.8	13	140	83
Maximum					100.0	9.1	6.7	73	9.3		1.2	1.0	23.0	4.4	0.53			0.38			0.49	1.5		1.4	16	140	83
WET WEATHER ***(Day 3)*** (1 sample)					**74.0**	**9.4**		**68**	**8.4**				**20.2**	**4.1**	**0.46**		**0.010**			**0.09**	**0.24**	**0.9**		**1.3**	**12**	**190**	**61**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Chloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW10S	Dry	P	11/02/92	1655	13	6.8	6.6	127	9.1	NA	ND	ND	93.6	6.3	1.03	10	NA	0.10	0.01	0.05	0.45	1.0	ND	0.8	4	NA	NA
BWW10S	Rain		11/02/92	2325	13	6.5	6.4	115	12.2	NA	ND	ND	66.5	7.4	1.21	26	0.10		ND	ND	ND	1.1	ND	0.5	6	NA	NA
BWW10S	Rain	3	11/03/92	235	13	7.0	6.7	112	8.3	NA	1.6	1.6	59.9	7.4	1.21	26	NA	0.02	0.01	ND	ND	0.9	ND	1.0	7	NA	NA
BWW10S	Rain	6	11/03/92	515	14	6.8	6.6	118	9.1	NA	ND	ND	70.4	7.3	1.19	25	NA	0.22	ND	ND	ND	1.4	ND	1.7	6	NA	NA
BWW10S	Rain	9	11/03/92	900	18	7.0	6.7	110	8.8	NA	1.6	ND	64.5	7.1	1.12	25	NA	0.39	ND	ND	ND	1.0	ND	1.5	9	NA	NA
BWW10S	Rain	12	11/03/92	1215	19	7.8	6.7	110	10.6	NA	1.2	ND	58.6	6.6	1.10	24	NA	0.02	ND	ND	ND	1.0	ND	1.0	12	NA	NA
BWW10S	Rain	16	11/03/92	1545	21	7.8	6.8	120	11.2	NA	ND	ND	67.4	6.8	1.08	25	NA	0.02	ND	ND	ND	0.9	ND	0.7	8	NA	NA
BWW10S	24h	20	11/03/92	1915	20	7.5	6.6	130	9.6	NA	3.0	1.8	59.6	6.7	1.11	24	NA	0.02	ND	ND	ND	0.9	ND	1.0	7	NA	NA
BWW10S	24h	24	11/03/92	2315	21	7.5	6.7	130	9.8	NA	ND	ND	59.4	5.9	1.09	25	NA		ND	ND	ND	1.7	ND	1.0	10	NA	NA
BWW10S	24h	28	11/04/92	330	22	8.2	6.7	115	8.8	NA	1.2	1.0	67.6	6.3	1.12	25	NA	0.03	ND	ND	ND	0.9	ND	2.1	7	NA	NA
BWW10S	24h	32	11/04/92	730	23	9.0	6.7	122	8.1	NA	ND	ND	57.2	6.6	1.10	24	NA	0.02	ND	0.07	ND	1.0	ND	0.9	8	NA	NA
BWW10S	24h	36	11/04/92	1055	23	9.0	6.6	125	8.1	NA	1.2	ND	61.7	NA	1.04	24	NA	0.01	ND	ND	ND	0.6	ND	0.4	5	NA	NA
BWW10S	24h	40	11/04/92	1410	25	9.8	6.7	125	8.3	NA	ND	ND	62.3	6.4	1.09	24	NA	0.04	ND	ND	0.49	1.5	ND	0.8	7	NA	NA
BWW10S	48h	44	11/04/92	1927	27	8.1	6.6	127	9.1	NA	1.8	1.2	62.7	6.6	1.06	24	NA	0.03	ND	ND	0.41	1.1	ND	0.6	4	NA	NA
BWW10S	48h	48	11/04/92	2255	27	8.3	6.7	133	8.4	NA	ND	ND	65.1	6.1	1.03	22	NA	0.08	0.04	0.19	0.60	1.9	ND	0.9	9	NA	NA
BWW10S	72h	72	11/05/92	1610	29	9.7	NA	138	8.3	NA	2.7	2.3	57.1	6.3	1.04	23	NA	NA	NA	0.10	0.42	1.4	ND	0.8	5	NA	NA
DRY WEATHER (1 sample)					**13.0**	**6.8**	**6.6**	**127**	**9.1**				**93.6**	**6.3**	**1.03**	**10**		**0.10**	**0.01**	**0.05**	**0.45**	**1.0**		**0.8**	**4**		
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14		7	4	14	13	14	14	1	14	2	2	3	14		14	14		
Mean (*)					**20.4**	**7.9**	**6.7**	**121**	**9.3**		**1.7**	**1.4**	**63.1**	**6.7**	**1.11**	**25**	**0.100**	**0.06**	**0.03**	**0.13**	**0.50**	**1.1**		**1.0**	**8**		
Minimum					13.0	6.5	6.4	110	8.1		1.2	1.0	57.2	5.9	1.03	22			0.01	0.07	0.41	0.6		0.4	4		
Maximum					27.0	9.8	6.8	133	12.2		3.0	1.8	70.4	7.4	1.21	26		0.39	0.04	0.19	0.60	1.9		2.1	12		
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6		3	1	6	6	6	6	1	6	1			6		6	6		
Mean (*)					**16.3**	**7.2**	**6.7**	**114**	**10.0**		**1.5**	**1.6**	**64.6**	**7.1**	**1.15**	**25**	**0.100**	**0.11**	**0.01**			**1.1**		**1.1**	**8**		
Minimum					13.0	6.5	6.4	110	8.3		1.2		58.6	6.6	1.08	24						0.9		0.5	6		
Maximum					21.0	7.8	6.8	120	12.2		1.6		70.4	7.4	1.21	26		0.39				1.4		1.7	12		
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6		3	2	6	5	6	6		6		1	1	6		6	6		
Mean (*)					**22.3**	**8.5**	**6.7**	**125**	**8.8**		**1.8**	**1.4**	**61.3**	**6.4**	**1.09**	**24**		**0.02**		**0.07**	**0.49**	**1.1**		**1.0**	**7**		
Minimum					20.0	7.5	6.6	115	8.1		1.2	1.0	57.2	5.9	1.04	24						0.6		0.4	5		
Maximum					25.0	9.8	6.7	130	9.8		3.0	1.8	67.6	6.7	1.12	25		0.04				1.7		2.1	10		
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		1	1	2	2	2	2		2	1	1	2	2		2	2		
Mean (*)					**27.0**	**8.2**	**6.7**	**130**	**8.8**		**1.8**	**1.2**	**63.9**	**6.3**	**1.05**	**23**		**0.06**	**0.04**	**0.19**	**0.51**	**1.5**		**0.8**	**7**		
Minimum					27.0	8.1	6.6	127	8.4				62.7	6.1	1.03	22		0.03			0.41	1.1		0.6	4		
Maximum					27.0	8.3	6.7	133	9.1				65.1	6.6	1.06	24		0.08			0.60	1.9		0.9	9		
WET WEATHER ***(Day 3)*** (1 sample)					**29.0**	**9.7**		**138**	**8.3**		**2.7**	**2.3**	**57.1**	**6.3**	**1.04**	**23**				**0.10**	**0.42**	**1.4**		**0.8**	**5**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW11	Dry	P	11/02/92	1630	252	6.8	6.4	191	8.9	2.3	4.2	2.6	64.3	14.5	2.07	37	0.61	NA	0.31	0.73	3.73	12.5	7.4	3.5	28	120	5
BWW11	Rain		11/02/92	2305	207	7.0	6.6	168	12.2	NA	4.2	2.6	42.3	14.0	2.00	34	0.73	2.06	0.30	0.68	3.08	10.6	7.0	2.6	28	NA	NA
BWW11	Rain	3	11/03/92	210	152	7.5	6.6	160	7.8	1.7	2.4	1.6	55.8	13.0	1.94	33	0.63	2.05	0.25	0.57	2.68	9.0	5.7	2.1	27	250	30
BWW11	Rain	6	11/03/92	450	198	7.5	6.6	152	10.8	2.3	3.5	2.5	71.4	12.9	1.91	31	0.66	1.10	0.26	0.58	2.72	9.4	6.3	2.4	25	260	40
BWW11	Rain	9	11/03/92	830	250	8.0	6.7	152	7.6	2.7	3.8	3.0	64.2	12.6	1.84	30	0.66	2.22	0.25	0.64	2.90	10.2	6.4	3.6	24	310	80
BWW11	Rain	12	11/03/92	1155	307	8.2	6.8	155	13.6	3.5	8.6	2.6	66.6	12.4	1.84	30	0.82	0.95	0.26	0.80	4.67	13.8	6.5	5.7	40	370	300
BWW11	Rain	16	11/03/92	1520	376	8.8	6.7	182	9.7	6.3	16.0	6.3	62.0	11.4	1.73	30	1.15	1.03	0.30	1.30	8.58	22.0	8.1	10.9	47	680	160
BWW11	24h	20	11/03/92	1845	517	9.1	6.6	195	8	NA	23.0	6.0	69.2	12.1	1.72	32	0.88	1.05	0.34	1.56	11.09	22.4	9.5	14.3	55	NA	NA
BWW11	24h	24	11/03/92	2240	553	8.2	6.7	210	9	6.0	39.0	11.5	63.9	10.3	1.47	34	1.41	1.40	0.39	2.38	19.34	41.3	12.5	28.5	71	1,300	180
BWW11	24h	28	11/04/92	315	412	9.0	6.6	205	9.1	NA	14.0	9.0	81.7	13.8	1.78	36	1.15	1.13	0.30	2.22	8.31	19.6	9.2	12.2	43	NA	NA
BWW11	24h	32	11/04/92	710	409	9.5	6.6	185	8.3	6.2	1.4	ND	64.7	12.9	1.83	33	1.94	0.80	0.25	1.96	6.02	15.4	7.7	9.4	36	5,100	730
BWW11	24h	36	11/04/92	1035	413	9.8	6.6	165	10.2	NA	8.2	3.0	61.3	11.1	1.67	30	2.10	0.70	0.23	1.21	5.14	14.3	6.4	8.8	36	NA	NA
BWW11	24h	40	11/04/92	1400	412	10.5	6.6	158	8.2	5.0	8.4	2.8	59.1	10.6	1.54	26	1.60	0.70	0.23	1.08	4.25	13.4	7.2	8.4	31	6,200	890
BWW11	48h	44	11/04/92	1905	414	9.1	6.7	140	8.4	NA	8.0	3.6	55.6	9.4	1.33	22	1.07	0.67	0.21	0.56	6.74	16.1	6.5	11.6	42	NA	NA
BWW11	48h	48	11/04/92	2240	389	9.3	6.7	147	8.7	4.0	1.2	ND	54.3	9.2	1.48	20	1.19	1.67	0.19	0.64	1.99	7.5	5.3	7.6	42	8,800	460
BWW11	72h	72	11/05/92	1540	382	10.2	NA	155	8.25	NA	2.8	1.6	48.2	10.4	1.55	23	0.72	NA	NA	0.63	3.49	9.8	5.6	10.3	33	4,700	410
DRY WEATHER (1 sample)					**252.0**	**6.8**	**6.4**	**191**	**8.9**	**2.3**	**4.2**	**2.6**	**64.3**	**14.5**	**2.07**	**37**	**0.610**		**0.31**	**0.73**	**3.73**	**12.5**	**7.4**	**3.5**	**28**	**120**	**5**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	9	14	12	14	14	14	14	14	14	14	14	14	14	14	14	14	9	9
Mean (*)					**357.8**	**8.7**	**6.6**	**170**	**9.4**	**4.2**	**10.1**	**4.5**	**62.3**	**11.8**	**1.72**	**30**	**1.142**	**1.25**	**0.27**	**1.16**	**6.25**	**16.1**	**7.5**	**9.2**	**39**	**1,070**	**185**
Minimum					152.0	7.0	6.6	140	7.6	1.7	1.2	1.6	42.3	9.2	1.33	20	0.630	0.67	0.19	0.56	1.99	7.5	5.3	2.1	24	250	30
Maximum					553.0	10.5	6.8	210	13.6	6.3	39.0	11.5	81.7	14.0	2.00	36	2.100	2.22	0.39	2.38	19.34	41.3	12.5	28.5	71	8,800	890
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**248.3**	**7.8**	**6.7**	**162**	**10.3**	**3.3**	**6.4**	**3.1**	**60.4**	**12.7**	**1.88**	**31**	**0.775**	**1.57**	**0.27**	**0.76**	**4.11**	**12.5**	**6.7**	**4.6**	**32**	**348**	**86**
Minimum					152.0	7.0	6.6	152	7.6	1.7	2.4	1.6	42.3	11.4	1.73	30	0.630	0.95	0.25	0.57	2.68	9.0	5.7	2.1	24	250	30
Maximum					376.0	8.8	6.8	182	13.6	6.3	16.0	6.3	71.4	14.0	2.00	34	1.150	2.22	0.30	1.30	8.58	22.0	8.1	10.9	47	680	300
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)					**452.7**	**9.4**	**6.6**	**186**	**8.8**	**5.7**	**15.7**	**6.5**	**66.7**	**11.8**	**1.67**	**32**	**1.513**	**0.96**	**0.29**	**1.74**	**9.03**	**21.1**	**8.8**	**13.6**	**45**	**3,451**	**489**
Minimum					409.0	8.2	6.6	158	8.0	5.0	1.4	2.8	59.1	10.3	1.47	26	0.880	0.70	0.23	1.08	4.25	13.4	6.4	8.4	31	1,300	180
Maximum					553.0	10.5	6.7	210	10.2	6.2	39.0	11.5	81.7	13.8	1.83	36	2.100	1.40	0.39	2.38	19.34	41.3	12.5	28.5	71	6,200	890
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**401.5**	**9.2**	**6.7**	**144**	**8.6**	**4.0**	**4.6**	**3.6**	**55.0**	**9.3**	**1.41**	**21**	**1.130**	**1.17**	**0.20**	**0.60**	**4.37**	**11.8**	**5.9**	**9.6**	**42**	**8,800**	**460**
Minimum					389.0	9.1	6.7	140	8.4		1.2		54.3	9.2	1.33	20	1.070	0.67	0.19	0.56	1.99	7.5	5.3	7.6	42		
Maximum					414.0	9.3	6.7	147	8.7		8.0		55.6	9.4	1.48	22	1.190	1.67	0.21	0.64	6.74	16.1	6.5	11.6	42		
WET WEATHER ***(Day 3)*** (1 sample)					**382.0**	**10.2**		**155**	**8.3**		**2.8**	**1.6**	**48.2**	**10.4**	**1.55**	**23**	**0.720**		**NA**	**0.63**	**3.49**	**9.8**	**5.6**	**10.3**	**33**	**4,700**	**410**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW13	Dry	P	11/02/92	1610	321	6.5	6.9	140	9.9	ND	3.4	2.0	53.1	10.9	1.52	27	0.12	1.28	0.16	0.43	2.21	7.8	5.5	2.7	15	79	23
BWW13	Rain		11/02/92	2240	274	6.8	6.8	138	11.8	NA	2.4	1.4	57.3	11.2	1.56	26	0.22	0.62	0.17	0.52	2.18	8.5	5.4	3.1	22	NA	NA
BWW13	Rain	3	11/03/92	150	222	7.0	6.6	140	8	1.1	2.4	2.0	55.1	11.2	1.57	28	0.17	0.62	0.18	0.49	2.50	8.2	5.3	5.6	26	100	40
BWW13	Rain	6	11/03/92	430	273	7.5	6.6	135	9.7	2.1	4.7	2.7	59.8	10.9	1.50	26	0.20	0.81	0.17	0.39	2.11	6.7	5.1	2.4	20	50	5
BWW13	Rain	9	11/03/92	800	353	7.5	6.6	125	8.6	1.4	2.8	1.8	55.1	10.0	1.46	25	0.13	0.56	0.16	0.44	2.14	6.5	4.8	3.3	17	140	63
BWW13	Rain	12	11/03/92	1135	408	8.2	6.6	120	10.6	2.9	2.2	1.0	53.3	9.5	1.35	22	0.30	0.47	0.14	0.48	2.09	6.3	4.0	3.9	29	240	98
BWW13	Rain	16	11/03/92	1500	483	9.0	6.7	149	10.7	3.5	2.8	1.6	61.5	10.4	1.51	26	0.49	NA	0.17	0.44	2.58	7.8	4.8	3.8	17	110	68
BWW13	24h	20	11/03/92	1830	635	8.7	6.7	160	9	NA	4.0	3.2	56.2	11.1	1.51	27	0.38	1.46	0.18	0.46	3.75	8.6	5.6	3.9	19	NA	NA
BWW13	24h	24	11/03/92	2220	676	8.0	6.8	150	7.8	2.5	1.6	ND	55.8	7.3	1.47	26	0.48	0.65	0.18	0.42	3.46	8.3	4.7	4.0	21	230	72
BWW13	24h	28	11/04/92	300	542	9.0	6.6	145	8.15	NA	8.0	2.8	57.7	9.2	1.43	26	0.47	1.43	0.18	0.56	4.65	11.9	5.5	7.5	24	NA	NA
BWW13	24h	32	11/04/92	650	540	9.5	6.8	155	9.4	3.3	1.6	ND	54.0	10.3	1.44	26	1.37	5.07	0.25	0.55	4.65	11.7	5.4	7.0	28	800	220
BWW13	24h	36	11/04/92	1015	545	9.8	6.7	162	9.9	NA	7.0	2.8	58.2	8.3	1.42	28	1.18	1.41	0.25	0.70	5.23	13.3	5.9	14.4	21	NA	NA
BWW13	24h	40	11/04/92	1340	545	10.5	6.6	165	8.8	2.9	5.8	2.4	63.7	11.3	1.50	28	1.97	2.88	0.24	0.59	3.77	10.0	4.7	6.3	20	1,500	170
BWW13	48h	44	11/04/92	1850	547	9.2	6.7	151	10.6	NA	8.8	3.5	62.9	10.8	1.52	27	1.66	1.36	0.20	0.56	4.90	12.4	5.8	7.7	18	NA	NA
BWW13	48h	48	11/04/92	2230	520	10.0	6.8	145	8.3	3.0	2.0	1.6	60.3	9.3	1.15	23	1.53	1.29	0.14	0.49	1.57	6.5	3.5	9.2	25	1,900	330
BWW13	72h	72	11/05/92	1525	497	10.0	NA	133	8.1	2.1	3.7	3.0	43.2	7.8	1.21	18	0.56	NA	NA	0.52	5.08	12.1	4.1	10.2	27	2,100	2,100
DRY WEATHER (1 sample)					**321.0**	**6.5**	**6.9**	**140**	**9.9**		**3.4**	**2.0**	**53.1**	**10.9**	**1.52**	**27**	**0.120**	**1.28**	**0.16**	**0.43**	**2.21**	**7.8**	**5.5**	**2.7**	**15**	**79**	**23**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	9	14	12	14	14	14	14	14	13	14	14	14	14	14	14	14	9	9
Mean (*)					**468.8**	**8.6**	**6.7**	**146**	**9.4**	**2.5**	**4.0**	**2.2**	**57.9**	**10.1**	**1.46**	**26**	**0.754**	**1.43**	**0.19**	**0.51**	**3.26**	**9.1**	**5.0**	**5.9**	**22**	**277**	**75**
Minimum					222.0	6.8	6.6	120	7.8	1.1	1.6	1.0	53.3	7.3	1.15	22	0.130	0.47	0.14	0.39	1.57	6.3	3.5	2.4	17	50	5
Maximum					676.0	10.5	6.8	165	11.8	3.5	8.8	3.5	63.7	11.3	1.57	28	1.970	5.07	0.25	0.70	5.23	13.3	5.9	14.4	29	1,900	330
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	5	5
Mean (*)					**335.5**	**7.7**	**6.6**	**135**	**9.9**	**2.2**	**2.9**	**1.8**	**57.0**	**10.5**	**1.49**	**26**	**0.252**	**0.62**	**0.17**	**0.46**	**2.27**	**7.3**	**4.9**	**3.7**	**22**	**113**	**38**
Minimum					222.0	6.8	6.6	120	8.0	1.1	2.2	1.0	53.3	9.5	1.35	22	0.130	0.47	0.14	0.39	2.09	6.3	4.0	2.4	17	50	5
Maximum					483.0	9.0	6.8	149	11.8	3.5	4.7	2.7	61.5	11.2	1.57	28	0.490	0.81	0.18	0.52	2.58	8.5	5.4	5.6	29	240	98
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	4	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)					**580.5**	**9.3**	**6.7**	**156**	**8.8**	**2.9**	**4.7**	**2.8**	**57.6**	**9.6**	**1.46**	**27**	**0.975**	**2.15**	**0.21**	**0.55**	**4.25**	**10.6**	**5.3**	**7.2**	**22**	**651**	**139**
Minimum					540.0	8.0	6.6	145	7.8	2.5	1.6	2.4	54.0	7.3	1.42	26	0.380	0.65	0.18	0.42	3.46	8.3	4.7	3.9	19	230	72
Maximum					676.0	10.5	6.8	165	9.9	3.3	8.0	3.2	63.7	11.3	1.51	28	1.970	5.07	0.25	0.70	5.23	13.3	5.9	14.4	28	1,500	220
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**533.5**	**9.6**	**6.7**	**148**	**9.5**	**3.0**	**5.4**	**2.6**	**61.6**	**10.1**	**1.34**	**25**	**1.595**	**1.33**	**0.17**	**0.53**	**3.24**	**9.5**	**4.7**	**8.5**	**22**	**1,900**	**330**
Minimum					520.0	9.2	6.7	145	8.3		2.0	1.6	60.3	9.3	1.15	23	1.530	1.29	0.14	0.49	1.57	6.5	3.5	7.7	18		
Maximum					547.0	10.0	6.8	151	10.6		8.8	3.5	62.9	10.8	1.52	27	1.660	1.36	0.20	0.56	4.90	12.4	5.8	9.2	25		
WET WEATHER ***(Day 3)*** (1 sample)					**497.0**	**10.0**		**133**	**8.1**	**2.1**	**3.7**	**3.0**	**43.2**	**7.8**	**1.21**	**18**	**0.560**			**0.52**	**5.08**	**12.1**	**4.1**	**10.2**	**27**	**2,100**	**2,100**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW14	Dry	P	11/02/92	1800	68	7.2	6.9	61	8.6	ND	1.4	ND	20.4	4.4	0.49	3	0.08	0.37	ND	ND	0.64	2.2	ND	1.3	7	320	120
BWW14	Rain		11/03/92	30	66	8.0	6.8	60	12.8	NA	ND	ND	24.7	4.1	0.49	3	0.08	0.38	ND	ND	0.33	1.8	ND	1.0	10	NA	NA
BWW14	Rain	3	11/03/92	330	68	7.5	6.8	60	8.8	1.4	1.6	1.4	22.2	4.1	0.49	3	0.06	0.37	ND	ND	0.54	1.7	ND	1.4	16	400	70
BWW14	Rain	6	11/03/92	630	74	8.0	6.8	60	7.9	2.1	2.8	1.0	28.4	4.1	0.45	3	0.11	0.42	ND	0.06	1.65	2.3	ND	7.8	8	380	110
BWW14	Rain	9	11/03/92	1000	101	8.2	6.7	60	10.6	1.4	2.4	1.6	26.9	4.1	0.47	2	0.07	0.31	ND	0.05	0.62	1.9	ND	1.8	9	440	140
BWW14	Rain	12	11/03/92	1325	99	8.5	6.7	60	9.8	1.6	1.8	1.0	26.8	4.0	0.46	3	0.14	0.42	ND	0.06	0.47	1.9	ND	1.5	11	210	190
BWW14	Rain	16	11/03/92	1700	105	9.0	6.8	69	11.3	3.0	2.7	NA	27.9	4.0	0.47	4	0.10	0.33	ND	ND	0.21	1.7	ND	0.9	2	130	97
BWW14	24h	20	11/03/92	2220	116	9.3	6.7	70	10.4	NA	2.8	2.2	24.8	3.7	0.44	4	0.06	0.32	ND	ND	NA	1.7	0.6	1.2	4	NA	NA
BWW14	24h	24	11/04/92	15	121	9.1	6.5	68	9.4	2.0	ND	ND	23.1	3.2	0.46	3	0.08	0.33	ND	ND	0.45	1.5	0.6	1.2	5	80	53
BWW14	24h	28	11/04/92	430	127	9.0	6.7	62	10	NA	1.6	1.2	27.1	3.4	0.46	3	0.17	0.28	ND	ND	0.23	1.8	ND	1.2	4	NA	NA
BWW14	24h	32	11/04/92	830	129	9.0	6.7	65	9.7	1.5	4.7	4.0	23.7	3.7	0.45	3	0.03	0.38	ND	ND	0.36	1.9	1.0	2.2	ND	170	2,600
BWW14	24h	36	11/04/92	1145	129	9.5	6.6	65	9.5	NA	1.8	1.4	25.4	3.2	0.44	3	0.17	0.32	ND	0.05	0.73	1.8	ND	2.0	ND	NA	NA
BWW14	24h	40	11/04/92	1505	130	10.5	6.8	70	8.2	1.6	1.2	1.0	27.0	3.6	0.43	2	0.03	0.31	ND	0.05	0.47	2.1	0.7	1.5	ND	170	160
BWW14	48h	44	11/04/92	2030	130	10.6	6.4	71	NA	NA	1.2	1.0	26.2	3.6	0.43	4	0.13	0.33	ND	ND	0.45	1.5	ND	1.2	5	NA	NA
BWW14	48h	48	11/04/92	2340	128	9.5	6.9	85	8.7	ND	1.0	ND	27.2	3.7	0.43	3	0.05	0.32	ND	ND	0.31	1.6	1.0	0.8	6	60	40
BWW14	72h	72	11/05/92	1730	113	10.0	NA	82	9	ND	1.6	1.6	24.5	3.7	0.43	9	0.15	NA	NA	0.08	0.27	2.3	1.1	1.7	5	380	850
DRY WEATHER (1 sample)					**68.0**	**7.2**	**6.9**	**61**	**8.6**		**1.4**		**20.4**	**4.4**	**0.49**	**3**	**0.080**	**0.37**			**0.64**	**2.2**		**1.3**	**7**	**320**	**120**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					14	14	14	14	13	8	12	10	14	14	14	14	14	14		5	13	14	5	14	11	9	9
Mean (*)					**108.8**	**9.0**	**6.7**	**66**	**9.8**	**1.8**	**2.1**	**1.6**	**25.8**	**3.7**	**0.46**	**3**	**0.091**	**0.34**		**0.05**	**0.52**	**1.8**	**0.8**	**1.8**	**7**	**185**	**137**
Minimum					66.0	7.5	6.4	60	7.9	1.4	1.0	1.0	22.2	3.2	0.43	2	0.030	0.28		0.05	0.21	1.5	0.6	0.8	2	60	40
Maximum					130.0	10.6	6.9	85	12.8	3.0	4.7	4.0	28.4	4.1	0.49	4	0.170	0.42		0.06	1.65	2.3	1.0	7.8	16	440	2,600
WET WEATHER *(during rain)*																											
Count					6	6	6	6	6	5	5	4	6	6	6	6	6	6		3	6	6		6	6	5	5
Mean (*)					**85.5**	**8.2**	**6.8**	**62**	**10.2**	**1.9**	**2.3**	**1.3**	**26.2**	**4.1**	**0.47**	**3**	**0.093**	**0.37**		**0.06**	**0.64**	**1.9**		**2.4**	**9**	**283**	**115**
Minimum					66.0	7.5	6.7	60	7.9	1.4	1.6	1.0	22.2	4.0	0.45	2	0.060	0.31		0.05	0.21	1.7		0.9	2	130	70
Maximum					105.0	9.0	6.8	69	12.8	3.0	2.8	1.6	28.4	4.1	0.49	4	0.140	0.42		0.06	1.65	2.3		7.8	16	440	190
WET WEATHER *(Day 1 after rain)*																											
Count					6	6	6	6	6	3	5	5	6	6	6	6	6	6		2	5	6	4	6	3	3	3
Mean (*)					**125.3**	**9.4**	**6.7**	**67**	**9.5**	**1.7**	**2.4**	**2.0**	**25.2**	**3.5**	**0.45**	**3**	**0.090**	**0.32**		**0.05**	**0.45**	**1.8**	**0.7**	**1.6**	**4**	**132**	**280**
Minimum					116.0	9.0	6.5	62	8.2	1.5	1.2	1.0	23.1	3.2	0.43	2	0.030	0.28		0.05	0.23	1.5	0.6	1.2	4	80	53
Maximum					130.0	10.5	6.8	70	10.4	2.0	4.7	4.0	27.1	3.7	0.46	4	0.170	0.38		0.05	0.73	2.1	1.0	2.2	5	170	2,600
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	1		2	1	2	2	2	2	2	2			2	2	1	2	2	1	1
Mean (*)					**129.0**	**10.1**	**6.7**	**78**	**8.7**		**1.1**	**1.0**	**26.7**	**3.6**	**0.43**	**4**	**0.090**	**0.33**			**0.38**	**1.6**	**1.0**	**1.0**	**6**	**60**	**40**
Minimum					128.0	9.5	6.4	71			1.0		26.2	3.6	0.43	3	0.050	0.32			0.31	1.5		0.8	5		
Maximum					130.0	10.6	6.9	85			1.2		27.2	3.7	0.43	4	0.130	0.33			0.45	1.6		1.2	6		
WET WEATHER *(Day 3)* (1 sample)					**113.0**	**10.0**		**82**	**9.0**		**1.6**	**1.6**	**24.5**	**3.7**	**0.43**	**9**	**0.150**			**0.08**	**0.27**	**2.3**	**1.1**	**1.7**	**5**	**380**	**850**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Chloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW15S	Dry	P	11/02/92	1600	10	8.5	6.3	125	5.8	NA	2.2	ND	47.0	8.5	1.07	21	0.31	0.55	ND	ND	0.60	1.7	0.5	1.0	10	NA	NA
BWW15S	Rain		11/02/92	2225	9	5.0	6.6	127	6.5	NA	3.0	1.6	54.1	8.0	1.04	20	0.33	0.55		0.07	ND	5.6	0.9	3.1	9	NA	NA
BWW15S	Rain	3	11/03/92	145	10	7.0	6.7	122	7	NA	2.4	NA	44.3	8.5	1.06	20	0.35	0.54	ND	ND	0.70	1.1	1.0	1.6	14	NA	NA
BWW15S	Rain	6	11/03/92	435	11	8.7	6.6	121	7.2	NA	ND	ND	48.8	8.4	1.07	21	0.32	0.54	ND	ND	0.51	1.0	ND	1.2	5	NA	NA
BWW15S	Rain	9	11/03/92	800	20	9.0	6.7	120	7.3	NA	4.0	3.0	51.3	8.2	1.06	19	0.45	NA		0.09	0.48	1.5	ND	3.3	9	NA	NA
BWW15S	Rain	12	11/03/92	1135	22	9.5	6.7	128	7.2	NA	3.8	1.6	53.9	8.2	1.07	19	0.36	0.87	0.02	ND	0.24	1.1	0.8	6.1	10	NA	NA
BWW15S	Rain	16	11/03/92	1500	20	10.0	6.7	130	6.9	NA	5.4	2.6	58.7	8.1	1.00	20	0.36	0.46	0.08	0.05	0.38	1.2	0.7	2.8	11	NA	NA
BWW15S	24h	20	11/03/92	1855	16	11.2	6.7	122	6	NA	4.4	3.0	52.4	8.1	1.03	21	0.36	0.43	0.01	0.05	0.35	1.2	0.8	3.4	4	NA	NA
BWW15S	24h	24	11/03/92	2210	18	11.1	6.4	125	6.7	NA	2.4	1.6	50.7	7.1	1.01	20	0.26	0.43		ND	0.21	1.4	1.0	2.0	6	NA	NA
BWW15S	24h	28	11/04/92	250	22	7.5	6.7	120	7.8	NA	4.0	1.8	55.9	7.6	1.03	20	0.37	0.47	ND	ND	0.28	1.5	0.7	1.4	7	NA	NA
BWW15S	24h	32	11/04/92	640	24	9.0	6.5	121	8.65	NA	3.4	1.6	46.9	8.2	0.99	21	0.39	0.48	ND	ND	0.54	1.2	0.7	1.4	5	NA	NA
BWW15S	24h	36	11/04/92	1018	24	9.5	6.5	120	7.7	NA	2.6	1.2	52.4	7.6	1.09	20	0.39	0.49	0.01	ND	0.29	1.1	0.8	1.1	8	NA	NA
BWW15S	24h	40	11/04/92	1445	23	10.5	6.6	128	7.1	NA	2.4	1.4	56.2	7.9	1.06	17	0.34	0.49	0.01	ND	ND	0.8	1.2	0.9	4	NA	NA
BWW15S	48h	44	11/04/92	1845	31	10.8	6.9	132	8.6	NA	2.8	1.2	54.7	8.2	1.07	18	0.35	0.49	0.01	ND	ND	1.2	ND	1.4	4	NA	NA
BWW15S	48h	48	11/04/92	2215	21	11.0	6.7	127	8.8	NA	2.8	1.4	60.0	8.1	1.09	20	0.33	0.48	ND	0.14	ND	4.5	1.5	1.5	5	NA	NA
BWW15S	72h	72	11/05/92	1450	18	9.5	NA	148	8.7	NA	2.0	1.4	52.9	8.2	1.11	18	0.26	NA	NA	0.25	ND	1.7	ND	1.0	4	NA	NA
DRY WEATHER (1 sample)					**10.0**	**8.5**	**6.3**	**125**	**5.8**		**2.2**		**47.0**	**8.5**	**1.07**	**21**	**0.310**	**0.55**			**0.60**	**1.7**	**0.5**	**1.0**	**10**		
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14		13	12	14	14	14	14	14	13	9	5	10	14	11	14	14		
Mean (*)					**19.4**	**9.3**	**6.6**	**125**	**7.4**		**3.3**	**1.8**	**52.9**	**8.0**	**1.05**	**20**	**0.354**	**0.52**	**0.02**	**0.08**	**0.40**	**1.7**	**0.9**	**2.2**	**7**		
Minimum					9.0	5.0	6.4	120	6.0		2.4	1.2	44.3	7.1	0.99	17	0.260	0.43		0.05	0.21	0.8	0.7	0.9	4		
Maximum					31.0	11.2	6.9	132	8.8		5.4	3.0	60.0	8.5	1.09	21	0.450	0.87	0.08	0.14	0.70	5.6	1.5	6.1	14		
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6		5	4	6	6	6	6	6	5	4	3	5	6	4	6	6		
Mean (*)					**15.3**	**8.2**	**6.7**	**125**	**7.0**		**3.7**	**2.2**	**51.9**	**8.2**	**1.05**	**20**	**0.362**	**0.59**	**0.03**	**0.07**	**0.46**	**1.9**	**0.9**	**3.0**	**10**		
Minimum					9.0	5.0	6.6	120	6.5		2.4	1.6	44.3	8.0	1.00	19	0.320	0.46		0.05	0.24	1.0	0.7	1.2	5		
Maximum					22.0	10.0	6.7	130	7.3		5.4	3.0	58.7	8.5	1.07	21	0.450	0.87	0.08	0.09	0.70	5.6	1.0	6.1	14		
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6		6	6	6	6	6	6	6	6	4	1	5	6	6	6	6		
Mean (*)					**21.2**	**9.8**	**6.6**	**123**	**7.3**		**3.2**	**1.8**	**52.4**	**7.7**	**1.04**	**20**	**0.352**	**0.47**	**0.01**	**0.05**	**0.33**	**1.2**	**0.9**	**1.7**	**6**		
Minimum					16.0	7.5	6.4	120	6.0		2.4	1.2	46.9	7.1	0.99	17	0.260	0.43			0.21	0.8	0.7	0.9	4		
Maximum					24.0	11.2	6.7	128	8.7		4.4	3.0	56.2	8.2	1.09	21	0.390	0.49	0.01		0.54	1.5	1.2	3.4	8		
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	2	2	2	2	2	2	2	1	1		2	1	2	2		
Mean (*)					**26.0**	**10.9**	**6.8**	**130**	**8.7**		**2.8**	**1.3**	**57.4**	**8.1**	**1.08**	**19**	**0.340**	**0.49**	**0.01**	**0.14**		**2.9**	**1.5**	**1.5**	**5**		
Minimum					21.0	10.8	6.7	127	8.6		2.8	1.2	54.7	8.1	1.07	18	0.330	0.48				1.2		1.4	4		
Maximum					31.0	11.0	6.9	132	8.8		2.8	1.4	60.0	8.2	1.09	20	0.350	0.49				4.5		1.5	5		
WET WEATHER ***(Day 3)*** (1 sample)					**18.0**	**9.5**		**148**	**8.7**		**2.0**	**1.4**	**52.9**	**8.2**	**1.11**	**18**	**0.260**			**0.25**		**1.7**		**1.0**	**4**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW16	Dry	P	11/02/92	1540	6	6.5	6.3	135	6.25	3.1	2.0	1.6	36.8	10.3	1.21	19	0.28	0.75	0.03	0.39	ND	3.9	0.9	1.9	16	46,000	3,000
BWW16	Rain		11/02/92	2235	6	6.3	6.6	115	6.8	NA	90.4	31.2	44.8	9.5	1.05	18	0.54	0.75	0.07	0.15	ND	3.5	0.6	8.6	24	NA	NA
BWW16	Rain	3	11/03/92	130	6	6.0	6.7	112	6.8	3.3	2.0	1.0	42.2	9.9	1.20	18	0.17	0.81	0.03	0.14	ND	2.4	ND	4.3	25	59,000	8,700
BWW16	Rain	6	11/03/92	420	8	5.9	6.5	110	6.5	4.8	45.2	15.6	45.6	9.9	1.14	18	0.19	0.82	0.04	0.17	ND	3.1	ND	5.9	23	45,000	1,700
BWW16	Rain	9	11/03/92	740	30	6.0	6.8	80	7.25	6.0	ND	ND	28.9	7.0	0.70	12	0.18	0.54	0.09	0.37	ND	7.3	1.6	5.4	67	62,000	12,000
BWW16	Rain	12	11/03/92	1120	28	7.0	6.7	118	6.1	3.7	3.0	2.0	43.1	9.2	1.08	16	0.19	0.75	0.04	0.10	ND	2.0	0.6	2.9	15	44,000	3,800
BWW16	Rain	16	11/03/92	1445	28	8.0	6.7	102	6.2	7.6	3.8	3.0	38.3	7.8	0.81	14	0.01	0.63	0.04	0.11	ND	5.7	0.6	8.7	24	79,000	4,800
BWW16	24h	20	11/03/92	1840	20	11.0	6.7	91	6.5	NA	6.8	4.8	32.5	7.3	0.86	13	0.14	0.48	0.01	0.07	4.93	3.8	9.0	3.6	21	NA	NA
BWW16	24h	24	11/03/92	2200	21	11.3	6.4	100	6.9	6.0	1.4	ND	33.6	7.1	0.98	12	ND	0.52	0.01	0.12	ND	3.7	0.5	8.3	18	42,000	2,800
BWW16	24h	28	11/04/92	240	18	8.0	6.7	90	7.4	NA	2.5	1.7	38.5	8.1	1.01	13	0.13	0.45	0.01	0.10	ND	3.1	0.5	6.0	8	NA	NA
BWW16	24h	32	11/04/92	630	18	7.8	6.4	96	8.1	3.0	2.0	1.5	33.7	8.8	1.05	12	ND	0.42	0.01	ND	ND	1.6	ND	4.1	4	26,000	1,500
BWW16	24h	36	11/04/92	1010	16	8.2	6.6	108	7.6	NA	2.4	2.0	37.1	8.3	1.10	15	0.51	0.40	0.03	0.07	ND	1.8	1.0	1.5	8	NA	NA
BWW16	24h	40	11/04/92	1430	16	10.0	6.6	112	6.2	3.1	2.0	1.4	40.4	8.5	1.02	14	0.05	0.47	0.01	ND	ND	1.8	0.9	2.3	5	26,000	1,600
BWW16	48h	44	11/04/92	1830	14	9.2	7.0	120	6.7	NA	7.2	4.8	32.7	8.5	1.03	15	0.21	0.45	0.01	0.07	0.14	1.7	1.1	2.6	3	NA	NA
BWW16	48h	48	11/04/92	2200	11	10.0	6.5	115	7	2.4	ND	ND	43.2	7.7	0.85	14	0.03	0.74	0.01	0.24	1.07	2.1	ND	2.9	82	14,000	2,200
BWW16	72h	72	11/05/92	1425	11	9.8	NA	NA	7	2.3	2.2	1.6	38.4	8.0	0.98	15	0.34	NA	NA	ND	0.46	1.7	ND	1.8	5	29,000	3,400
DRY WEATHER (1 sample)					**6.0**	**6.5**	**6.3**	**135**	**6.3**	**3.1**	**2.0**	**1.6**	**36.8**	**10.3**	**1.21**	**19**	**0.280**	**0.75**	**0.03**	**0.39**		**3.9**	**0.9**	**1.9**	**16**	**46,000**	**3,000**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	9	12	11	14	14	14	14	12	14	14	12	3	14	10	14	14	9	9
Mean (*)					**17.1**	**8.2**	**6.6**	**105**	**6.9**	**4.4**	**14.1**	**6.3**	**38.2**	**8.4**	**0.99**	**15**	**0.196**	**0.59**	**0.03**	**0.14**	**2.05**	**3.1**	**1.6**	**4.8**	**23**	**39,374**	**3,311**
Minimum					6.0	5.9	6.4	80	6.1	2.4	1.4	1.0	28.9	7.0	0.70	12	0.010	0.40	0.01	0.07	0.14	1.6	0.5	1.5	3	14,000	1,500
Maximum					30.0	11.3	7.0	120	8.1	7.6	90.4	31.2	45.6	9.9	1.20	18	0.540	0.82	0.09	0.37	4.93	7.3	9.0	8.7	82	79,000	12,000
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	5	5	6	6	6	6	6	6	6	6		6	4	6	6	5	5
Mean (*)					**17.7**	**6.5**	**6.7**	**106**	**6.6**	**5.1**	**28.9**	**10.6**	**40.5**	**8.9**	**1.00**	**16**	**0.213**	**0.72**	**0.05**	**0.17**		**4.0**	**0.9**	**6.0**	**30**	**56,430**	**5,035**
Minimum					6.0	5.9	6.5	80	6.1	3.3	2.0	1.0	28.9	7.0	0.70	12	0.010	0.54	0.03	0.10		2.0	0.6	2.9	15	44,000	1,700
Maximum					30.0	8.0	6.8	118	7.3	7.6	90.4	31.2	45.6	9.9	1.20	18	0.540	0.82	0.09	0.37		7.3	1.6	8.7	67	79,000	12,000
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	4	6	6	4	1	6	5	6	6	3	3
Mean (*)					**18.2**	**9.4**	**6.6**	**100**	**7.1**	**4.0**	**2.9**	**2.3**	**36.0**	**8.0**	**1.00**	**13**	**0.208**	**0.46**	**0.01**	**0.09**	**4.93**	**2.6**	**2.4**	**4.3**	**11**	**30,507**	**1,887**
Minimum					16.0	7.8	6.4	90	6.2	3.0	1.4	1.4	32.5	7.1	0.86	12	0.050	0.40	0.01	0.07		1.6	0.5	1.5	4	26,000	1,500
Maximum					21.0	11.3	6.7	112	8.1	6.0	6.8	4.8	40.4	8.8	1.10	15	0.510	0.52	0.03	0.12		3.8	9.0	8.3	21	42,000	2,800
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	1	1
Mean (*)					**12.5**	**9.6**	**6.8**	**118**	**6.9**	**2.4**	**7.2**	**4.8**	**38.0**	**8.1**	**0.94**	**15**	**0.120**	**0.60**	**0.01**	**0.16**	**0.61**	**1.9**	**1.1**	**2.8**	**43**	**14,000**	**2,200**
Minimum					11.0	9.2	6.5	115	6.7				32.7	7.7	0.85	14	0.030	0.45	0.01	0.07	0.14	1.7		2.6	3		
Maximum					14.0	10.0	7.0	120	7.0				43.2	8.5	1.03	15	0.210	0.74	0.01	0.24	1.07	2.1		2.9	82		
WET WEATHER ***(Day 3)*** (1 sample)					**11.0**	**9.8**			**7.0**	**2.3**	**2.2**	**1.6**	**38.4**	**8.0**	**0.98**	**15**	**0.340**				**0.46**	**1.7**		**1.8**	**5**	**29,000**	**3,400**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW17	Dry	P	11/02/92	1545	259	7.3	6.3	164	11.4	ND	2.0	1.4	50.2	12.0	2.13	28	0.12	2.13	0.19	0.52	2.05	8.0	4.9	2.4	17	110	43
BWW17	Rain		11/02/92	2230	286	NA	6.6	140	12	NA	1.6	1.2	54.1	11.5	2.12	27	0.10	1.58	0.18	0.41	1.81	8.9	4.7	2.7	33	NA	NA
BWW17	Rain	3	11/03/92	135	282	7.2	6.7	140	11.4	1.7	1.4	1.2	58.9	11.1	1.98	26	0.10	1.44	0.16	0.35	1.92	6.8	4.7	2.6	27	120	40
BWW17	Rain	6	11/03/92	415	288	7.5	6.6	135	11.8	2.5	3.8	2.2	63.9	11.2	1.99	26	0.08	1.51	0.18	0.41	2.12	8.7	4.7	3.5	18	640	310
BWW17	Rain	9	11/03/92	730	310	8.0	6.9	125	8.8	3.2	3.6	1.8	56.3	10.3	1.82	24	ND	1.37	0.16	0.34	2.30	9.2	4.0	5.1	27	1,200	1,100
BWW17	Rain	12	11/03/92	1105	328	8.2	6.7	135	10.5	2.3	2.0	1.2	59.7	11.0	1.90	26	0.11	NA	0.17	0.34	1.97	7.0	4.7	5.3	24	990	390
BWW17	Rain	16	11/03/92	1440	365	8.2	6.7	150	10.8	4.0	2.6	1.4	65.5	11.0	1.89	26	0.18	1.44	0.18	0.38	1.99	7.6	5.0	3.4	NA	200	780
BWW17	24h	20	11/03/92	1810	445	8.3	6.5	152	10.8	NA	1.6	ND	54.9	10.7	1.91	25	0.17	1.31	0.16	0.38	2.09	7.4	5.9	3.3	13	NA	NA
BWW17	24h	24	11/03/92	2200	529	8.0	6.6	145	10	2.5	5.3	2.2	50.1	8.9	1.80	24	0.21	1.17	0.16	0.36	1.75	7.0	4.2	12.4	12	750	170
BWW17	24h	28	11/04/92	245	675	9.0	6.7	150	8.75	NA	6.8	4.0	63.8	10.6	1.93	27	0.48	1.86	0.19	0.51	2.52	9.9	6.0	3.4	12	NA	NA
BWW17	24h	32	11/04/92	625	693	9.0	6.8	145	8.3	2.2	4.2	1.5	52.3	10.5	1.77	26	0.37	1.27	0.16	0.52	2.87	8.2	5.4	5.8	19	340	160
BWW17	24h	36	11/04/92	1000	663	9.5	6.6	150	9.7	NA	5.0	2.0	57.3	10.0	1.64	27	0.68	1.31	0.19	0.64	3.24	9.4	5.6	6.1	15	NA	NA
BWW17	24h	40	11/04/92	1320	640	10.2	6.7	160	8.2	2.5	4.4	2.0	63.4	11.0	1.75	27	0.16	1.51	0.24	0.68	3.31	10.5	6.3	5.7	24	870	330
BWW17	48h	44	11/04/92	1835	660	10.0	6.9	175	10.4	NA	4.8	2.2	67.1	11.8	1.94	28	1.20	1.34	0.25	0.70	3.09	10.8	6.6	5.5	19	NA	NA
BWW17	48h	48	11/04/92	2215	606	10.2	6.7	175	9.2	NA	1.4	ND	74.4	11.7	1.90	28	NA	2.60	0.21	0.54	1.66	6.8	5.7	1.5	17	1,200	350
BWW17	72h	72	11/05/92	1500	569	10.0	NA	150	8	1.9	8.7	1.3	46.9	8.9	1.47	20	0.74	NA	NA	1.04	3.07	9.5	5.0	9.3	27	2,000	820
DRY WEATHER (1 sample)					**259.0**	**7.3**	**6.3**	**164**	**11.4**		**2.0**	**1.4**	**50.2**	**12.0**	**2.13**	**28**	**0.120**	**2.13**	**0.19**	**0.52**	**2.05**	**8.0**	**4.9**	**2.4**	**17**	**110**	**43**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	13	14	14	14	8	14	12	14	14	14	14	12	13	14	14	14	14	14	14	13	9	9
Mean (*)					**483.6**	**8.7**	**6.7**	**148**	**10.0**	**2.6**	**3.5**	**1.9**	**60.1**	**10.8**	**1.88**	**26**	**0.320**	**1.52**	**0.19**	**0.47**	**2.33**	**8.4**	**5.3**	**4.7**	**20**	**553**	**287**
Minimum					282.0	7.2	6.5	125	8.2	1.7	1.4	1.2	50.1	8.9	1.64	24	0.080	1.17	0.16	0.34	1.66	6.8	4.0	1.5	12	120	40
Maximum					693.0	10.2	6.9	175	12.0	4.0	6.8	4.0	74.4	11.8	2.12	28	1.200	2.60	0.25	0.70	3.31	10.8	6.6	12.4	33	1,200	1,100
WET WEATHER ***(during rain)***																											
Count					6	5	6	6	6	5	6	6	6	6	6	6	5	5	6	6	6	6	6	6	5	5	5
Mean (*)					**309.8**	**7.8**	**6.7**	**138**	**10.9**	**2.7**	**2.5**	**1.5**	**59.7**	**11.0**	**1.95**	**26**	**0.114**	**1.47**	**0.17**	**0.37**	**2.02**	**8.0**	**4.6**	**3.8**	**26**	**449**	**334**
Minimum					282.0	7.2	6.6	125	8.8	1.7	1.4	1.2	54.1	10.3	1.82	24	0.080	1.37	0.16	0.34	1.81	6.8	4.0	2.6	18	120	40
Maximum					365.0	8.2	6.9	150	12.0	4.0	3.8	2.2	65.5	11.5	2.12	27	0.180	1.58	0.18	0.41	2.30	9.2	5.0	5.3	33	1,200	1,100
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)					**607.5**	**9.0**	**6.7**	**150**	**9.3**	**2.4**	**4.5**	**2.3**	**57.0**	**10.3**	**1.80**	**26**	**0.345**	**1.41**	**0.18**	**0.52**	**2.63**	**8.7**	**5.6**	**6.1**	**16**	**605**	**208**
Minimum					445.0	8.0	6.5	145	8.2	2.2	1.6	1.5	50.1	8.9	1.64	24	0.160	1.17	0.16	0.36	1.75	7.0	4.2	3.3	12	340	160
Maximum					693.0	10.2	6.8	160	10.8	2.5	6.8	4.0	63.8	11.0	1.93	27	0.680	1.86	0.24	0.68	3.31	10.5	6.3	12.4	24	870	330
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2		2	1	2	2	2	2	1	2	2	2	2	2	2	2	2	1	1
Mean (*)					**633.0**	**10.1**	**6.8**	**175**	**9.8**		**3.1**	**2.2**	**70.8**	**11.7**	**1.92**	**28**	**1.200**	**1.97**	**0.23**	**0.62**	**2.38**	**8.8**	**6.2**	**3.5**	**18**	**1,200**	**350**
Minimum					606.0	10.0	6.7	175	9.2		1.4		67.1	11.7	1.90	28		1.34	0.21	0.54	1.66	6.8	5.7	1.5	17		
Maximum					660.0	10.2	6.9	175	10.4		4.8		74.4	11.8	1.94	28		2.60	0.25	0.70	3.09	10.8	6.6	5.5	19		
WET WEATHER ***(Day 3)*** (1 sample)					**569.0**	**10.0**		**150**	**8.0**	**1.9**	**8.7**	**1.3**	**46.9**	**8.9**	**1.47**	**20**	**0.740**			**1.04**	**3.07**	**9.5**	**5.0**	**9.3**	**27**	**2,000**	**820**

ND = Not Detected   NM= Not Measured   NS= No Sample   NA = Not Analyzed   (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW18	Dry	P	11/02/92	1630	295	8.0	6.1	170	8.1	2.1	3.0	2.8	56.8	12.4	1.50	32	0.80	2.74	0.18	0.42	1.66	8.5	5.0	2.6	20	120	12
BWW18	Rain		11/02/92	2315	272	8.5	6.7	171	7.2	NA	1.8	1.4	57.0	12.2	1.57	33	0.42	1.72	0.30	0.36	1.46	7.4	4.3	2.5	33	NA	NA
BWW18	Rain	3	11/03/92	205	265	8.5	6.8	190	6.9	2.2	3.8	2.2	71.8	12.4	1.97	34	1.87	1.62	0.31	0.39	1.60	8.9	5.1	3.0	22	630	46
BWW18	Rain	6	11/03/92	500	272	6.2	6.5	178	7.4	3.2	3.2	2.2	77.2	12.3	1.50	35	1.36	1.72	0.31	0.41	1.94	9.2	4.8	4.1	20	960	77
BWW18	Rain	9	11/03/92	830	451	8.2	6.5	180	6.45	3.3	2.2	1.8	71.8	11.6	1.60	35	0.98	1.55	0.36	0.71	2.72	10.2	4.8	8.3	36	930	130
BWW18	Rain	12	11/03/92	1200	395	8.5	6.7	175	6.6	2.6	1.8	1.0	73.5	11.3	1.89	32	1.06	1.51	0.31	0.41	1.71	8.5	4.3	3.0	29	280	24
BWW18	Rain	16	11/03/92	1510	500	8.7	6.6	172	6.7	4.1	3.0	1.0	75.2	11.4	1.69	32	1.52	1.48	0.26	0.37	1.53	8.6	4.0	2.7	17	310	80
BWW18	24h	20	11/03/92	1915	451	9.0	6.6	179	9.7	NA	5.6	3.4	67.1	10.8	1.79	34	1.62	1.23	0.26	0.37	1.94	9.0	4.4	3.9	20	NA	NA
BWW18	24h	24	11/03/92	2220	526	9.0	6.4	181	6.1	5.3	8.8	4.8	69.1	9.7	1.64	35	1.19	NA	0.31	0.50	2.26	10.6	4.1	6.0	22	1,300	570
BWW18	24h	28	11/04/92	305	597	8.0	6.6	163	7.55	NA	10.6	6.6	71.4	10.0	1.71	32	0.75	1.51	0.28	0.57	1.92	12.0	4.9	4.3	20	NA	NA
BWW18	24h	32	11/04/92	655	767	8.0	6.5	152	8.25	3.0	3.4	1.0	56.8	10.2	1.64	29	1.24	NA	NA	0.51	3.36	10.0	4.5	5.1	21	1,000	56
BWW18	24h	36	11/04/92	1030	712	8.5	6.5	160	7.2	NA	6.0	2.8	62.2	10.4	2.10	29	0.82	1.31	0.23	0.52	2.87	9.0	5.2	4.5	17	NA	NA
BWW18	24h	40	11/04/92	1500	712	9.8	6.6	162	6.4	3.1	7.4	3.8	68.5	10.4	1.61	30	1.30	1.12	0.25	0.59	3.04	11.3	4.9	4.7	18	560	130
BWW18	48h	44	11/04/92	1900	730	10.2	6.9	184	8.4	NA	11.6	6.0	39.5	NA	1.70	33	0.74	1.15	0.31	0.64	3.00	11.8	5.6	4.8	23	NA	NA
BWW18	48h	48	11/04/92	2230	628	9.7	6.8	191	8.6	3.5	22.5	15.5	80.0	11.3	1.56	31	1.52	1.47	0.33	0.46	1.31	7.7	5.3	1.3	19	990	170
BWW18	72h	72	11/05/92	1500	568	10.0	NA	200	8.2	2.9	1.6	ND	62.4	9.5	1.60	28	2.06	NA	NA	0.62	2.53	11.1	3.8	5.2	16	2,100	830
DRY WEATHER (1 sample)					**295.0**	**8.0**	**6.1**	**170**	**8.1**	**2.1**	**3.0**	**2.8**	**56.8**	**12.4**	**1.50**	**32**	**0.800**	**2.74**	**0.18**	**0.42**	**1.66**	**8.5**	**5.0**	**2.6**	**20**	**120**	**12**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	14	14	14	14	9	14	14	14	13	14	14	14	12	13	14	14	14	14	14	14	9	9
Mean (*)					**519.9**	**8.6**	**6.6**	**174**	**7.4**	**3.4**	**6.6**	**3.8**	**67.2**	**11.1**	**1.71**	**32**	**1.171**	**1.45**	**0.29**	**0.49**	**2.19**	**9.6**	**4.7**	**4.2**	**23**	**689**	**95**
Minimum					265.0	6.2	6.4	152	6.1	2.2	1.8	1.0	39.5	9.7	1.50	29	0.420	1.12	0.23	0.36	1.31	7.4	4.0	1.3	17	280	24
Maximum					767.0	10.2	6.9	191	9.7	5.3	22.5	15.5	80.0	12.4	2.10	35	1.870	1.72	0.36	0.71	3.36	12.0	5.6	8.3	36	1,300	570
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**359.2**	**8.1**	**6.6**	**178**	**6.9**	**3.1**	**2.6**	**1.6**	**71.1**	**11.9**	**1.70**	**34**	**1.202**	**1.60**	**0.31**	**0.44**	**1.83**	**8.8**	**4.6**	**3.9**	**26**	**547**	**62**
Minimum					265.0	6.2	6.5	171	6.5	2.2	1.8	1.0	57.0	11.3	1.50	32	0.420	1.48	0.26	0.36	1.46	7.4	4.0	2.5	17	280	24
Maximum					500.0	8.7	6.8	190	7.4	4.1	3.8	2.2	77.2	12.4	1.97	35	1.870	1.72	0.36	0.71	2.72	10.2	5.1	8.3	36	960	130
WET WEATHER ***(Day 1 after rain)***																											
Count					6	6	6	6	6	3	6	6	6	6	6	6	6	4	5	6	6	6	6	6	6	3	3
Mean (*)					**627.5**	**8.7**	**6.5**	**166**	**7.5**	**3.8**	**7.0**	**3.7**	**65.9**	**10.2**	**1.75**	**32**	**1.153**	**1.29**	**0.27**	**0.51**	**2.57**	**10.3**	**4.7**	**4.7**	**20**	**900**	**161**
Minimum					451.0	8.0	6.4	152	6.1	3.0	3.4	1.0	56.8	9.7	1.61	29	0.750	1.12	0.23	0.37	1.92	9.0	4.1	3.9	17	560	56
Maximum					767.0	9.8	6.6	181	9.7	5.3	10.6	6.6	71.4	10.8	2.10	35	1.620	1.51	0.31	0.59	3.36	12.0	5.2	6.0	22	1,300	570
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**679.0**	**10.0**	**6.8**	**188**	**8.5**	**3.5**	**17.1**	**10.8**	**59.8**	**11.3**	**1.63**	**32**	**1.130**	**1.31**	**0.32**	**0.55**	**2.16**	**9.8**	**5.5**	**3.1**	**21**	**990**	**170**
Minimum					628.0	9.7	6.8	184	8.4		11.6	6.0	39.5		1.56	31	0.740	1.15	0.31	0.46	1.31	7.7	5.3	1.3	19		
Maximum					730.0	10.2	6.9	191	8.6		22.5	15.5	80.0		1.70	33	1.520	1.47	0.33	0.64	3.00	11.8	5.6	4.8	23		
WET WEATHER ***(Day 3)*** (1 sample)					**568.0**	**10.0**		**200**	**8.2**	**2.9**	**1.6**		**62.4**	**9.5**	**1.60**	**28**	**2.060**			**0.62**	**2.53**	**11.1**	**3.8**	**5.2**	**16**	**2,100**	**830**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW20	Dry	P	11/02/92	1655	328	8.5	6.3	185	8.5	1.8	2.8	2.0	61.5	12.9	1.40	32	0.54	1.80	0.23	0.35	1.36	6.9	3.7	2.2	17	140	3
BWW20	Rain		11/02/92	2335	302	8.0	6.6	180	7.2	NA	2.4	1.6	80.0	12.7	1.35	33	0.56	1.71	0.19	0.35	1.39	7.1	4.3	2.7	32	NA	NA
BWW20	Rain	3	11/03/92	230	294	8.0	6.7	180	6.65	2.5	2.0	1.4	75.8	13.1	1.41	33	0.70	1.40	0.20	0.35	1.42	7.2	3.9	2.7	15	290	11
BWW20	Rain	6	11/03/92	530	302	8.0	6.6	173	7.7	3.0	4.2	2.2	81.0	13.0	1.38	34	0.79	1.40	0.23	0.23	0.93	6.9	4.7	3.3	20	120	9
BWW20	Rain	9	11/03/92	900	500	8.7	6.6	187	6.9	2.4	4.0	2.2	73.5	12.5	1.49	32	0.47	1.40	0.23	0.28	0.88	6.7	5.6	2.7	23	390	45
BWW20	Rain	12	11/03/92	1230	439	9.0	6.4	178	6.9	3.7	4.7	3.3	70.5	13.0	1.68	30	0.72	1.77	0.23	0.43	1.26	7.5	4.2	4.2	28	120	73
BWW20	Rain	16	11/03/92	1530	554	9.0	6.5	178	6.9	4.7	2.6	1.0	73.5	12.3	1.48	30	0.80	1.77	0.22	0.44	1.07	9.8	7.7	3.6	23	90	34
BWW20	24h	20	11/03/92	1940	500	9.9	6.5	180	7.3	NA	4.2	2.4	69.5	12.5	1.46	31	1.15	1.70	0.27	0.41	1.05	6.9	4.8	2.9	13	NA	NA
BWW20	24h	24	NS	NS	584	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BWW20	24h	28	11/04/92	330	663	8.1	6.6	172	7.9	NA	9.6	4.4	74.8	10.5	1.35	31	0.32	NA	0.32	0.55	2.37	9.7	7.0	6.0	29	NA	NA
BWW20	24h	32	11/04/92	710	852	8.2	6.5	170	7.6	5.0	12.6	7.6	62.0	10.3	1.36	32	1.10	1.46	0.28	0.64	3.12	11.4	6.1	7.9	26	590	290
BWW20	24h	36	11/04/92	1055	790	9.0	6.6	180	7	NA	13.8	6.8	69.1	10.1	1.33	31	0.69	0.82	0.25	0.71	2.80	10.2	7.0	8.2	32	NA	NA
BWW20	24h	40	11/04/92	1510	790	10.5	6.6	162	6.6	4.6	8.6	4.6	70.8	10.3	1.24	30	0.56	1.33	0.29	0.46	2.42	11.4	6.8	5.7	24	760	120
BWW20	48h	44	11/04/92	1925	810	9.1	6.9	160	7.4	NA	8.2	4.2	69.0	10.4	1.37	28	0.68	1.36	0.27	0.52	1.82	8.9	6.0	5.4	26	NA	NA
BWW20	48h	48	11/04/92	2300	697	9.8	6.8	170	7.6	3.0	3.8	2.2	74.1	10.7	1.27	28	0.93	1.33	0.23	0.37	0.95	5.6	6.1	1.8	26	150	3
BWW20	72h	72	11/05/92	1755	630	10.5	NA	210	8	4.1	7.0	6.0	71.5	11.9	1.34	31	1.48	NA	NA	0.62	2.47	8.9	7.9	5.4	26	840	86
DRY WEATHER (1 sample)					**328.0**	**8.5**	**6.3**	**185**	**8.5**	**1.8**	**2.8**	**2.0**	**61.5**	**12.9**	**1.40**	**32**	**0.540**	**1.80**	**0.23**	**0.35**	**1.36**	**6.9**	**3.7**	**2.2**	**17**	**140**	**3**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					14	13	13	13	13	8	13	13	13	13	13	13	13	12	13	13	13	13	13	13	13	8	8
Mean (*)					**576.9**	**8.9**	**6.6**	**175**	**7.2**	**3.6**	**6.2**	**3.4**	**72.6**	**11.7**	**1.40**	**31**	**0.728**	**1.45**	**0.25**	**0.44**	**1.65**	**8.4**	**5.7**	**4.4**	**24**	**237**	**32**
Minimum					294.0	8.0	6.4	160	6.6	2.4	2.0	1.0	62.0	10.1	1.24	28	0.320	0.82	0.19	0.23	0.88	5.6	3.9	1.8	13	90	3
Maximum					852.0	10.5	6.9	187	7.9	5.0	13.8	7.6	81.0	13.1	1.68	34	1.150	1.77	0.32	0.71	3.12	11.4	7.7	8.2	32	760	290
WET WEATHER ***(during rain)***																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**398.5**	**8.5**	**6.6**	**179**	**7.0**	**3.3**	**3.3**	**2.0**	**75.7**	**12.8**	**1.47**	**32**	**0.673**	**1.58**	**0.22**	**0.35**	**1.16**	**7.5**	**5.1**	**3.2**	**24**	**171**	**26**
Minimum					294.0	8.0	6.4	173	6.7	2.4	2.0	1.0	70.5	12.3	1.35	30	0.470	1.40	0.19	0.23	0.88	6.7	3.9	2.7	15	90	9
Maximum					554.0	9.0	6.7	187	7.7	4.7	4.7	3.3	81.0	13.1	1.68	34	0.800	1.77	0.23	0.44	1.42	9.8	7.7	4.2	32	390	73
WET WEATHER ***(Day 1 after rain)***																											
Count					6	5	5	5	5	2	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	2	2
Mean (*)					**696.5**	**9.1**	**6.6**	**173**	**7.3**	**4.8**	**9.8**	**5.2**	**69.2**	**10.7**	**1.35**	**31**	**0.764**	**1.33**	**0.28**	**0.55**	**2.35**	**9.9**	**6.3**	**6.1**	**25**	**670**	**187**
Minimum					500.0	8.1	6.5	162	6.6	4.6	4.2	2.4	62.0	10.1	1.24	30	0.320	0.82	0.25	0.41	1.05	6.9	4.8	2.9	13	590	120
Maximum					852.0	10.5	6.6	180	7.9	5.0	13.8	7.6	74.8	12.5	1.46	32	1.150	1.70	0.32	0.71	3.12	11.4	7.0	8.2	32	760	290
WET WEATHER ***(Day 2 after rain)***																											
Count					2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**753.5**	**9.5**	**6.9**	**165**	**7.5**	**3.0**	**6.0**	**3.2**	**71.6**	**10.6**	**1.32**	**28**	**0.805**	**1.35**	**0.25**	**0.45**	**1.39**	**7.3**	**6.1**	**3.6**	**26**	**150**	**3**
Minimum					697.0	9.1	6.8	160	7.4		3.8	2.2	69.0	10.4	1.27	28	0.680	1.33	0.23	0.37	0.95	5.6	6.0	1.8	26		
Maximum					810.0	9.8	6.9	170	7.6		8.2	4.2	74.1	10.7	1.37	28	0.930	1.36	0.27	0.52	1.82	8.9	6.1	5.4	26		
WET WEATHER ***(Day 3)*** (1 sample)					**630.0**	**10.5**		**210**	**8.0**	**4.1**	**7.0**	**6.0**	**71.5**	**11.9**	**1.34**	**31**	**1.480**			**0.62**	**2.47**	**8.9**	**7.9**	**5.4**	**26**	**840**	**86**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW21	Dry	P	11/02/92	1715	294	8.0	6.3	175	8.6	ND	1.4	1.0	67.7	12.7	1.82	29	0.73	1.91	0.32	0.31	0.72	5.1	3.2	3.7	19	96	17
BWW21	Rain		11/02/92	2355	311	8.0	6.6	192	7.6	NA	2.4	2.0	63.6	13.1	2.10	28	0.33	1.82	0.25	0.39	0.64	5.9	4.5	6.0	36	NA	NA
BWW21	Rain	3	11/03/92	245	302	8.3	6.7	191	7.3	1.6	3.0	2.2	79.3	12.9	1.85	29	1.07	1.52	0.22	0.30	0.75	5.0	4.8	9.0	18	200	20
BWW21	Rain	6	11/03/92	545	208	8.0	6.6	171	8	2.7	3.6	2.2	80.1	13.0	1.80	30	0.89	1.61	0.22	0.28	0.42	5.7	6.0	10.1	19	60	40
BWW21	Rain	9	11/03/92	925	410	8.5	6.8	172	7.15	3.3	5.3	4.3	69.9	12.5	1.92	26	0.56	1.56	0.20	0.40	2.26	8.2	5.4	2.7	26	15,000	4,300
BWW21	Rain	12	11/03/92	1250	458	9.2	6.6	185	7.2	2.4	3.4	1.2	74.7	12.7	1.86	28	0.94	1.78	0.18	0.29	1.69	7.4	4.6	3.9	25	5,100	540
BWW21	Rain	16	11/03/92	1545	458	9.0	6.6	190	7.3	4.3	2.0	1.2	66.4	12.9	2.09	28	0.94	1.83	0.20	0.35	1.06	7.6	5.0	2.9	19	1,700	550
BWW21	24h	20	11/03/92	2000	446	9.2	6.6	182	6.8	NA	1.8	1.0	70.3	13.0	1.77	27	1.18	1.83	0.17	0.44	0.82	6.7	4.5	3.0	20	NA	NA
BWW21	24h	24	NS	NS	564	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BWW21	24h	28	11/04/92	345	684	8.7	6.5	170	8.25	NA	2.0	1.0	72.5	11.7	1.94	26	0.50	NA	0.17	0.43	0.74	6.7	5.5	4.9	21	NA	NA
BWW21	24h	32	11/04/92	730	890	8.5	6.4	180	8	4.9	2.2	1.0	64.5	11.7	1.88	27	0.89	1.68	0.26	0.63	1.67	8.0	4.2	5.0	27	340	88
BWW21	24h	36	11/04/92	1115	820	9.5	6.5	174	7.2	NA	12.2	5.2	68.0	10.2	1.76	27	0.62	1.45	0.25	0.65	2.62	9.5	5.3	7.3	23	NA	NA
BWW21	24h	40	11/04/92	1535	820	10.8	6.6	185	6.85	5.1	10.3	4.8	75.4	10.3	1.70	27	0.62	1.56	0.25	0.72	2.82	10.9	5.8	10.9	34	800	140
BWW21	48h	44	11/04/92	2000	799	9.2	7.0	180	9.2	NA	9.6	5.0	71.0	10.5	1.76	27	0.76	1.62	0.24	0.63	2.25	10.7	4.3	7.2	35	NA	NA
BWW21	48h	48	11/04/92	2315	956	10.2	6.9	177	8.7	3.9	2.4	ND	76.7	10.2	1.75	27	0.67	1.75	0.25	0.68	2.11	8.8	5.6	5.9	30	630	73
BWW21	72h	72	11/05/92	1820	702	13.0	NA	205	8.55	4.4	4.0	1.6	72.0	11.4	1.80	26	1.33	NA	NA	0.73	1.92	9.2	5.0	6.8	31	980	410
DRY WEATHER (1 sample)					**294.0**	**8.0**	**6.3**	**175**	**8.6**	**ND**	**1.4**	**1.0**	**67.7**	**12.7**	**1.82**	**29**	**0.730**	**1.91**	**0.32**	**0.31**	**0.72**	**5.1**	**3.2**	**3.7**	**19**	**96**	**17**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					14	13	13	13	13	8	13	12	13	13	13	13	13	12	13	13	13	13	13	13	13	8	8
Mean (*)					**580.4**	**9.0**	**6.6**	**181**	**7.7**	**3.5**	**4.6**	**2.6**	**71.7**	**11.9**	**1.86**	**27**	**0.767**	**1.67**	**0.22**	**0.48**	**1.53**	**7.8**	**5.0**	**6.1**	**26**	**848**	**176**
Minimum					208.0	8.0	6.4	170	6.8	1.6	1.8	1.0	63.6	10.2	1.70	26	0.330	1.45	0.17	0.28	0.42	5.0	4.2	2.7	18	60	20
Maximum					956.0	10.8	7.0	192	9.2	5.1	12.2	5.2	80.1	13.1	2.10	30	1.180	1.83	0.26	0.72	2.82	10.9	6.0	10.9	36	15,000	4,300
WET WEATHER *(during rain)*																											
Count					6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)					**357.8**	**8.5**	**6.6**	**184**	**7.4**	**2.9**	**3.3**	**2.2**	**72.3**	**12.9**	**1.94**	**28**	**0.788**	**1.69**	**0.21**	**0.34**	**1.14**	**6.6**	**5.1**	**5.8**	**24**	**1,093**	**252**
Minimum					208.0	8.0	6.6	171	7.2	1.6	2.0	1.2	63.6	12.5	1.80	26	0.330	1.52	0.18	0.28	0.42	5.0	4.5	2.7	18	60	20
Maximum					458.0	9.2	6.8	192	8.0	4.3	5.3	4.3	80.1	13.1	2.10	30	1.070	1.83	0.25	0.40	2.26	8.2	6.0	10.1	36	15,000	4,300
WET WEATHER *(Day 1 after rain)*																											
Count					6	5	5	5	5	2	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	2	2
Mean (*)					**704.0**	**9.3**	**6.5**	**178**	**7.4**	**5.0**	**5.7**	**2.6**	**70.1**	**11.4**	**1.81**	**27**	**0.762**	**1.63**	**0.22**	**0.57**	**1.73**	**8.4**	**5.1**	**6.2**	**25**	**522**	**111**
Minimum					446.0	8.5	6.4	170	6.8	4.9	1.8	1.0	64.5	10.2	1.70	26	0.500	1.45	0.17	0.43	0.74	6.7	4.2	3.0	20	340	88
Maximum					890.0	10.8	6.6	185	8.3	5.1	12.2	5.2	75.4	13.0	1.94	27	1.180	1.83	0.26	0.72	2.82	10.9	5.8	10.9	34	800	140
WET WEATHER *(Day 2 after rain)*																											
Count					2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)					**877.5**	**9.7**	**6.9**	**179**	**9.0**	**3.9**	**6.0**	**5.0**	**73.9**	**10.4**	**1.76**	**27**	**0.715**	**1.69**	**0.25**	**0.66**	**2.18**	**9.8**	**5.0**	**6.6**	**33**	**630**	**73**
Minimum					799.0	9.2	6.9	177	8.7		2.4		71.0	10.2	1.75	27	0.670	1.62	0.24	0.63	2.11	8.8	4.3	5.9	30		
Maximum					956.0	10.2	7.0	180	9.2		9.6		76.7	10.5	1.76	27	0.760	1.75	0.25	0.68	2.25	10.7	5.6	7.2	35		
WET WEATHER *(Day 3)* (1 sample)					**702.0**	**13.0**		**205**	**8.6**	**4.4**	**4.0**	**1.6**	**72.0**	**11.4**	**1.80**	**26**	**1.330**			**0.73**	**1.92**	**9.2**	**5.0**	**6.8**	**31**	**980**	**410**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

BWW22 is the CSO facility in Worcester.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW22	Dry	P	11/3/92	735		NA	NA	NA	NA	68.2	18.0	11.2	76.0	4.1	3.11	20	3.20	1.56	0.09	0.40	4.20	15.0	8.8	26.0	82	400,000	24,000
BWW22	Rain		11/3/92	930		NA	NA	NA	NA	76.3	33.6	22.8	40.6	7.7	0.58	16	1.28	1.43	0.23	0.25	4.90	13.0	6.0	35.0	103	190,000	84,000
BWW22	Rain	3	11/3/92							43.9	20.0	16.0	26.2	18.9	0.23	12	0.35	1.24	0.31	0.20	3.80	22.0	4.3	22.0	98		
BWW22	Rain	6																									
BWW22	Rain	9																									
BWW22	Rain	12																									
BWW22	Rain	16																									
BWW22	24h	20																									
BWW22	24h	24																									
BWW22	24h	28																									
BWW22	24h	32																									
BWW22	24h	36																									
BWW22	24h	40																									
BWW22	48h	44																									
BWW22	48h	48																									
BWW22	72h	72																									
DRY WEATHER (1 sample)						**NA**	**NA**	**NA**	**NA**	**68.2**	**18.0**	**11.2**	**76.0**	**4.1**	**3.11**	**20**	**3.200**	**1.56**	**0.09**	**0.40**	**4.20**	**15.0**	**8.8**	**26.0**	**82**	**400,000**	**24,000**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count																											
Mean (*)																											
Minimum																											
Maximum																											
WET WEATHER ***(during rain)***																											
Count										2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)										**60.1**	**26.8**	**19.4**	**33.4**	**13.3**	**0.41**	**14**	**0.815**	**1.34**	**0.27**	**0.23**	**4.35**	**17.5**	**5.2**	**28.5**	**101**	**190,000**	**84,000**
Minimum										43.9	20.0	16.0	26.2	7.7	0.23	12	0.350	1.24	0.23	0.20	3.80	13.0	4.3	22.0	98		
Maximum										76.3	33.6	22.8	40.6	18.9	0.58	16	1.280	1.43	0.31	0.25	4.90	22.0	6.0	35.0	103		
WET WEATHER ***(Day 1 after rain)***																											
Count																											
Mean (*)																											
Minimum																											
Maximum																											
WET WEATHER ***(Day 2 after rain)***																											
Count																											
Mean (*)																											
Minimum																											
Maximum																											
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM II
BWW23 is the UBWPAD wastewater treatment facility in Worcester.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW23	Dry	P	11/2/92	1455		NA	6.6	384	NA	9.5	12.5	8.0	95.5	21.2	1.96	59	13.10	1.70	1.15	2.88	2.44	17.9	17.9	1.6	24	29,000	4,900
BWW23	Rain		11/2/92	2255		NA	6.6	470	NA	NA	3.8	2.0	143.0	19.7	1.72	74	17.70	0.68	1.53	2.66	8.60	15.4	26.3	1.9	36	NA	NA
BWW23	Rain	3	11/3/92	155		NA	6.7	520	NA	16.9	7.4	6.0	120.0	20.0	2.05	75	20.60	0.34	1.30	2.82	7.67	15.5	30.1	1.9	40	12,000	8,500
BWW23	Rain	6	11/3/92	435		NA	6.7	520	NA	23.0	16.8	13.8	132.0	19.3	2.06	74	12.70	0.18	1.45	2.75	5.63	15.5	27.7	4.3	39	120,000	13,000
BWW23	Rain	9	11/3/92	727		NA	6.6	435	NA	22.0	8.8	5.6	121.0	19.1	1.83	63	7.38	0.63	1.45	2.38	4.20	13.0	22.0	2.4	35	100,000	11,000
BWW23	Rain	12	11/3/92	1030		NA	6.7	480	NA	21.5	12.0	4.6	79.9	14.8	1.59	38	12.60	0.38	1.30	1.77	3.42	14.9	17.1	3.1	29	120,000	16,000
BWW23	Rain	16	11/3/92	1457		NA	6.4	260	NA	27.5	12.4	11.2	73.8	11.8	1.55	32	12.70	0.43	1.45	1.63	11.30	19.1	15.5	4.7	35	120,000	13,000
BWW23	24h	20	11/3/92	1843		NA	6.6	295	NA	NA	5.2	4.8	72.5	12.2	1.27	39	12.00	0.18	1.61	1.63	13.60	20.5	21.8	4.3	40	NA	NA
BWW23	24h	24	11/3/92	2230		NA	6.6	292	NA	20.1	3.6	ND	77.3	12.1	1.49	42	12.50	0.08	1.45	1.49	12.80	21.7	23.0	2.7	36	39,000	13,000
BWW23	24h	28	11/4/92	230		NA	6.7	321	NA	NA	4.7	NA	87.8	14.1	1.62	NS	12.80	0.05	1.45	1.56	10.90	22.0	25.9	3.2	36	NA	NA
BWW23	24h	32	11/4/92	635		NA	6.6	338	NA	19.0	10.0	6.5	84.3	15.5	1.54	48	12.50	0.03	1.22	1.59	10.10	16.2	28.8	3.6	33	100,000	14,000
BWW23	24h	36	11/4/92	1034		NA	6.6	360	NA	NA	9.0	7.0	96.3	16.6	1.55	48	8.10	0.05	0.84	2.02	8.43	16.7	26.9	4.5	38	NA	NA
BWW23	24h	40	11/4/92	1433		NA	6.7	NA	NA	20.0	6.6	5.4	115.0	17.6	1.86	54	12.70	0.06	0.99	2.45	12.40	15.6	23.0	4.1	39	90,000	12,000
BWW23	48h	44	11/4/92	1830		NA	6.8	NA	NA	NA	8.0	7.0	120.0	18.2	1.90	55	13.30	0.01	1.22	2.52	13.90	17.9	28.0	1.8	32	NA	NA
BWW23	48h	48	11/4/92	2240		NA	NA	NA	NA	12.8	11.4	8.9	137.0	18.6	1.58	62	17.60	0.01	1.30	2.35	20.20	16.3	31.7	2.5	28	110,000	18,000
BWW23	72h	72	11/5/92			17.0	NA	NA	5.4	NA	3.0	NA	123.0	22.1	1.94	62	12.50	0.61	0.24	2.66	31.50	14.0	45.5	3.2	27	21,000	5,600
DRY WEATHER (1 sample)							**6.6**	**384**		**9.5**	**12.5**	**8.0**	**95.5**	**21.2**	**1.96**	**59**	**13.100**	**1.70**	**1.15**	**2.88**	**2.44**	**17.9**	**17.9**	**1.6**	**24**	**29,000**	**4,900**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count							13	11		9	14	12	14	14	14	13	14	14	14	14	14	14	14	14	14	9	9
Mean (*)							**6.6**	**390**		**20.3**	**8.6**	**6.9**	**104.3**	**16.4**	**1.69**	**54**	**13.227**	**0.22**	**1.33**	**2.12**	**10.23**	**17.2**	**24.8**	**3.2**	**35**	**75,537**	**12,907**
Minimum							6.4	260		12.8	3.6	2.0	72.5	11.8	1.27	32	7.380	0.01	0.84	1.49	3.42	13.0	15.5	1.8	28	12,000	8,500
Maximum							6.8	520		27.5	16.8	13.8	143.0	20.0	2.06	75	20.600	0.68	1.61	2.82	20.20	22.0	31.7	4.7	40	120,000	18,000
WET WEATHER ***(during rain)***																											
Count							6	6		5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
Mean (*)							**6.6**	**448**		**22.2**	**10.2**	**7.2**	**111.6**	**17.5**	**1.80**	**59**	**13.947**	**0.44**	**1.41**	**2.34**	**6.80**	**15.6**	**23.1**	**3.1**	**36**	**73,004**	**12,038**
Minimum							6.4	260		16.9	3.8	2.0	73.8	11.8	1.55	32	7.380	0.18	1.30	1.63	3.42	13.0	15.5	1.9	29	12,000	8,500
Maximum							6.7	520		27.5	16.8	13.8	143.0	20.0	2.06	75	20.600	0.68	1.53	2.82	11.30	19.1	30.1	4.7	40	120,000	16,000
WET WEATHER ***(Day 1 after rain)***																											
Count							6	5		3	6	4	6	6	6	5	6	6	6	6	6	6	6	6	6	3	3
Mean (*)							**6.6**	**321**		**19.7**	**6.5**	**5.9**	**88.9**	**14.7**	**1.56**	**46**	**11.767**	**0.08**	**1.26**	**1.79**	**11.37**	**18.8**	**24.9**	**3.7**	**37**	**70,540**	**12,974**
Minimum							6.6	292		19.0	3.6	4.8	72.5	12.1	1.27	39	8.100	0.03	0.84	1.49	8.43	15.6	21.8	2.7	33	39,000	12,000
Maximum							6.7	360		20.1	10.0	7.0	115.0	17.6	1.86	54	12.800	0.18	1.61	2.45	13.60	22.0	28.8	4.5	40	100,000	14,000
WET WEATHER ***(Day 2 after rain)***																											
Count							1			1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)							**6.8**			**12.8**	**9.7**	**8.0**	**128.5**	**18.4**	**1.74**	**59**	**15.450**	**0.01**	**1.26**	**2.44**	**17.05**	**17.1**	**29.9**	**2.2**	**30**	**110,000**	**18,000**
Minimum											8.0	7.0	120.0	18.2	1.58	55	13.300	0.01	1.22	2.35	13.90	16.3	28.0	1.8	28		
Maximum											11.4	8.9	137.0	18.6	1.90	62	17.600	0.01	1.30	2.52	20.20	17.9	31.7	2.5	32		
WET WEATHER ***(Day 3)*** (1 sample)						**17.0**			**5.4**		**3.0**		**123.0**	**22.1**	**1.94**	**62**	**12.500**	**0.61**	**0.24**	**2.66**	**31.50**	**14.0**	**45.5**	**3.2**	**27**	**21,000**	**5,600**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

BWW24 is the Woonsocket wastewater treatment facility.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW24	Dry	P	11/2/92	2100		NA	6.5	1,300	NA	33.9	202.0	151.0	379.0	9.8	0.97	236	29.00	0.21	4.70	0.80	2.55	40.6	4.4	19.1	232	70	10
BWW24	Rain		11/2/92	2340		NA	6.6	1,390	NA	NA	78.0	78.0	371.0	9.9	1.55	226	22.30	0.03	4.18	0.48	1.49	24.8	3.6	8.5	121	NA	NA
BWW24	Rain	3	11/3/92	300		NA	6.7	1,320	NA	11.2	23.0	21.0	421.0	11.4	1.77	223	32.70	0.05	3.58	0.25	1.50	7.4	4.8	3.2	63	<1	<1
BWW24	Rain	6	11/3/92	600		NA	6.7	1,200	NA	12.0	23.0	21.0	489.0	12.1	1.56	238	18.40	0.04	2.91	0.23	6.74	8.5	3.2	3.3	55	2	1
BWW24	Rain	9	11/3/92	915		NA	6.5	1,350	NA	64.9	297.0	239.0	449.0	9.7	1.07	240	19.20	0.08	3.13	1.50	3.87	48.3	5.0	19.5	275	48,000	3,000
BWW24	Rain	12	11/3/92			NA	6.5	1,290	NA	82.5	281.0	227.0	477.0	9.2	0.76	242	20.50	0.84	3.43	1.30	3.66	55.7	5.4	17.4	311	69,000	14,000
BWW24	Rain	16	11/3/92			NA	6.4	1,300	NA	51.4	194.0	150.0	486.0	8.5	0.83	262	24.00	0.07	4.18	1.14	3.03	53.0	4.4	14.5	248	3	70
BWW24	24h	20	11/3/92	1850		NA	6.4	1,395	NA	NA	113.0	90.0	465.0	9.5	0.94	255	25.20	0.04	4.77	0.70	2.91	41.6	4.1	15.0	236	NA	NA
BWW24	24h	24	11/3/92	145		NA	6.4	1,380	NA	NA	160.0	100.0	454.0	8.8	1.58	254	33.60	0.03	4.77	0.16	0.62	7.3	3.6	2.8	47	610	3
BWW24	24h	28	11/4/92	545		NA	6.7	1,410	NA	NA	15.0	12.0	475.0	10.6	1.58	267	28.00	0.03	3.43	0.11	0.33	4.6	4.1	2.5	45	NA	NA
BWW24	24h	32	11/4/92	905		NA	6.7	1,480	NA	69.0	350.0	290.0	456.0	9.1	0.91	287	24.80	0.31	3.21	0.63	2.69	61.9	5.6	22.7	367	79,000	15,000
BWW24	24h	36	11/4/92	1200		NA	6.5	1,450	NA	NA	338.0	143.0	508.0	9.3	0.87	280	28.90	0.21	4.85	1.30	5.30	53.7	4.4	21.0	328	NA	NA
BWW24	24h	40	11/4/92	1540		NA	6.6	NA	NA	71.0	206.0	171.0	746.0	9.8	0.58	296	26.70	0.02	7.16	1.01	5.11	43.0	4.2	17.9	255	230	13
BWW24	48h	44	11/4/92			NA	6.7	NA	NA	NA	16.4	13.4	659.0	8.3	0.50	297	25.80	0.01	6.19	0.69	3.98	26.5	5.0	11.4	180	NA	NA
BWW24	48h	48	11/4/92			NA	6.6	NA	NA	39.0	227.0	185.0	587.0	8.4	0.71	289	26.40	0.01	5.96	0.65	3.87	26.1	4.8	10.5	169	1	1
BWW24	72h	72	11/5/92	1400		21.0	NA	1,200	6	NA	235.0	194.0	603.0	NA	NA	NA	29.80	NA	NA	NA	NA	NA	NA	NA	NA	10	15
DRY WEATHER (1 sample)							**6.5**	**1,300**		**33.9**	**202.0**	**151.0**	**379.0**	**9.8**	**0.97**	**236**	**29.000**	**0.21**	**4.70**	**0.80**	**2.55**	**40.6**	**4.4**	**19.1**	**232**	**70**	**10**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count							14	11		8	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	8	8
Mean (*)							**6.6**	**1,360**		**50.1**	**165.8**	**124.3**	**503.1**	**9.6**	**1.09**	**261**	**25.464**	**0.13**	**4.41**	**0.73**	**3.22**	**33.0**	**4.4**	**12.2**	**193**	**182**	**49**
Minimum							6.4	1,200		11.2	15.0	12.0	371.0	8.3	0.50	223	18.400	0.01	2.91	0.11	0.33	4.6	3.2	2.5	45	<1	<1
Maximum							6.7	1,480		82.5	350.0	290.0	746.0	12.1	1.77	297	33.600	0.84	7.16	1.50	6.74	61.9	5.6	22.7	367	79,000	15,000
WET WEATHER ***(during rain)***																											
Count							6	6		5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	4
Mean (*)							**6.6**	**1,308**		**44.4**	**149.3**	**122.7**	**448.8**	**10.1**	**1.26**	**239**	**22.850**	**0.19**	**3.57**	**0.82**	**3.38**	**33.0**	**4.4**	**11.1**	**179**	**115**	**78**
Minimum							6.4	1,200		11.2	23.0	21.0	371.0	8.5	0.76	223	18.400	0.03	2.91	0.23	1.49	7.4	3.2	3.2	55	2	1
Maximum							6.7	1,390		82.5	297.0	239.0	489.0	12.1	1.77	262	32.700	0.84	4.18	1.50	6.74	55.7	5.4	19.5	311	69,000	14,000
WET WEATHER ***(Day 1 after rain)***																											
Count							6	5		2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	3	3
Mean (*)							**6.6**	**1,423**		**70.0**	**197.0**	**134.3**	**517.3**	**9.5**	**1.08**	**273**	**27.867**	**0.11**	**4.70**	**0.65**	**2.83**	**35.4**	**4.3**	**13.7**	**213**	**2,230**	**84**
Minimum							6.4	1,380		69.0	15.0	12.0	454.0	8.8	0.58	254	24.800	0.02	3.21	0.11	0.33	4.6	3.6	2.5	45	230	3
Maximum							6.7	1,480		71.0	350.0	290.0	746.0	10.6	1.58	296	33.600	0.31	7.16	1.30	5.30	61.9	5.6	22.7	367	79,000	15,000
WET WEATHER ***(Day 2 after rain)***																											
Count							2			1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Mean (*)							**6.7**			**39.0**	**121.7**	**99.2**	**623.0**	**8.3**	**0.61**	**293**	**26.100**	**0.01**	**6.08**	**0.67**	**3.93**	**26.3**	**4.9**	**11.0**	**175**	**1**	**1**
Minimum							6.6				16.4	13.4	587.0	8.3	0.50	289	25.800	0.01	5.96	0.65	3.87	26.1	4.8	10.5	169		
Maximum							6.7				227.0	185.0	659.0	8.4	0.71	297	26.400	0.01	6.19	0.69	3.98	26.5	5.0	11.4	180		
WET WEATHER ***(Day 3)*** (1 sample)						**21.0**		**1,200**	**6.0**		**235.0**	**194.0**	**603.0**				**29.800**									**10**	**15**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM II

BWW25 is a direct discharge from NBC's Bucklin Point wastewater facility (Seekonk River).

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW25	Dry	P	11/02/92	1735		15.0	6.7	490	2.8	8.9	14.4	12.6	165.0	14.5	1.50	82	14.10	3.69	3.76	0.25	4.98	20.5	111.0	10.6	63	110	<1
BWW25	Rain		11/03/92	10		15.5	6.8	610	5	NA	17.0	17.0	183.0	19.9	1.70	106	17.90	1.38	4.76	0.36	4.02	21.7	112.0	11.3	72	NA	NA
BWW25	Rain	3	11/03/92	310		16.2	6.7	720	3.8	15.9	15.6	13.6	190.0	21.9	1.71	111	25.90	1.36	4.76	0.34	4.01	25.9	106.0	7.9	95	200	<1
BWW25	Rain	6	11/03/92	600		15.8	6.8	750	2	34.8	36.4	32.0	167.0	20.8	1.79	122	15.60	1.40	5.23	0.42	6.78	34.6	101.0	7.4	104	1,800	46
BWW25	Rain	9	11/03/92	945		14.0	6.7	580	3.05	66.4	146.0	117.0	164.0	15.5	1.79	98	10.30	1.20	4.56	0.43	17.30	87.2	88.5	24.9	200	3,000	210
BWW25	Rain	12	11/03/92	1330		13.2	6.6	412	2.7	15.0	15.6	14.6	128.0	15.4	1.23	75	9.78	1.48	3.10	0.21	4.24	16.9	55.2	5.0	59	140	3
BWW25	Rain	16	11/03/92	1600		12.8	6.6	360	2.65	76.0	112.0	50.0	118.0	13.9	0.93	60	9.93	1.88	2.03	0.34	17.10	86.8	72.8	24.0	189	1,400	110
BWW25	24h	20	11/03/92	2015		14.0	6.5	410	3.5	NA	28.3	23.0	88.9	20.8	1.03	60	19.60	1.48	2.43	0.32	6.16	24.2	53.7	9.1	107	NA	NA
BWW25	24h	24		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BWW25	24h	28	11/04/92	410		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BWW25	24h	32	11/04/92	740		12.9	6.4	462	2.6	9.6	3.4	ND	113.0	20.4	1.19	81	10.30	0.28	3.10	0.26	40.10	30.5	53.5	7.7	86	11	25
BWW25	24h	36	11/04/92	1125		15.2	6.4	450	2.55	NA	21.4	18.8	136.0	20.1	1.55	83	6.45	0.22	2.36	0.20	6.00	35.2	73.4	7.7	90	NA	NA
BWW25	24h	40	11/04/92	1550		16.5	6.6	550	2.35	10.9	17.2	14.8	146.0	19.5	1.86	88	10.30	0.32	3.10	0.29	5.44	37.0	73.6	12.9	82	320	9
BWW25	48h	44	11/04/92	2050		16.5	6.8	600	2.8	NA	15.5	13.5	153.0	19.6	1.90	98	15.60	NA	3.63	0.23	4.15	32.3	65.9	4.3	107	NA	NA
BWW25	48h	48	11/04/92	2340		17.1	6.9	600	1.9	9.1	20.0	15.6	167.0	18.0	1.58	95	16.70	NA	4.16	0.22	11.80	53.4	35.0	72.3	372	240	2
BWW25	72h	72	11/05/92	1900		15.0	NA	820	2	NA	3.3	2.7	157.0	NA	1.94	NA	19.30	NA	NA	NA	NA	NA	NA	NA	NA	1,600	14
DRY WEATHER (1 sample)						**15.0**	**6.7**	**490**	**2.8**	**8.9**	**14.4**	**12.6**	**165.0**	**14.5**	**1.50**	**82**	**14.100**	**3.69**	**3.76**	**0.25**	**4.98**	**20.5**	**111.0**	**10.6**	**63**	**110**	**<1**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count						12	12	12	12	8	12	11	12	12	12	12	12	10	12	12	12	12	12	12	12	8	7
Mean (*)						**15.0**	**6.6**	**542**	**2.9**	**29.7**	**37.4**	**30.0**	**146.2**	**18.8**	**1.52**	**90**	**14.030**	**1.10**	**3.60**	**0.30**	**10.59**	**40.5**	**74.2**	**16.2**	**130**	**340**	**20**
Minimum						12.8	6.4	360	1.9	9.1	3.4	13.5	88.9	13.9	0.93	60	6.450	0.22	2.03	0.20	4.01	16.9	35.0	4.3	59	11	2
Maximum						17.1	6.9	750	5.0	76.0	146.0	117.0	190.0	21.9	1.90	122	25.900	1.88	5.23	0.43	40.10	87.2	112.0	72.3	372	3,000	210
WET WEATHER ***(during rain)***																											
Count						6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	4
Mean (*)						**14.6**	**6.7**	**572**	**3.2**	**41.6**	**57.1**	**40.7**	**158.3**	**17.9**	**1.53**	**95**	**14.902**	**1.45**	**4.07**	**0.35**	**8.91**	**45.5**	**89.3**	**13.4**	**120**	**733**	**42**
Minimum						12.8	6.6	360	2.0	15.0	15.6	13.6	118.0	13.9	0.93	60	9.780	1.20	2.03	0.21	4.01	16.9	55.2	5.0	59	140	3
Maximum						16.2	6.8	750	5.0	76.0	146.0	117.0	190.0	21.9	1.79	122	25.900	1.88	5.23	0.43	17.30	87.2	112.0	24.9	200	3,000	210
WET WEATHER ***(Day 1 after rain)***																											
Count						4	4	4	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2
Mean (*)						**14.7**	**6.5**	**468**	**2.8**	**10.3**	**17.6**	**18.9**	**121.0**	**20.2**	**1.41**	**78**	**11.663**	**0.58**	**2.75**	**0.27**	**14.43**	**31.7**	**63.6**	**9.4**	**91**	**59**	**15**
Minimum						12.9	6.4	410	2.4	9.6	3.4	14.8	88.9	19.5	1.03	60	6.450	0.22	2.36	0.20	5.44	24.2	53.5	7.7	82	11	9
Maximum						16.5	6.6	550	3.5	10.9	28.3	23.0	146.0	20.8	1.86	88	19.600	1.48	3.10	0.32	40.10	37.0	73.6	12.9	107	320	25
WET WEATHER ***(Day 2 after rain)***																											
Count						2	2	2	2	1	2	2	2	2	2	2	2		2	2	2	2	2	2	2	1	1
Mean (*)						**16.8**	**6.8**	**600**	**2.4**	**9.1**	**17.8**	**14.6**	**160.0**	**18.8**	**1.74**	**97**	**16.150**		**3.90**	**0.23**	**7.98**	**42.9**	**50.5**	**38.3**	**240**	**240**	**2**
Minimum						16.5	6.8	600	1.9		15.5	13.5	153.0	18.0	1.58	95	15.600		3.63	0.22	4.15	32.3	35.0	4.3	107		
Maximum						17.1	6.9	600	2.8		20.0	15.6	167.0	19.6	1.90	98	16.700		4.16	0.23	11.80	53.4	65.9	72.3	372		
WET WEATHER ***(Day 3)*** (1 sample)						**15.0**		**820**	**2.0**		**3.3**	**2.7**	**157.0**		**1.94**		**19.300**									**1,600**	**14**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

Section A15-5

Wet Weather Data - Storm 3

- all Data with Statistics -

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Chloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW00	Dry	P	10/12/93	730	38	9.5	6.7	178	9.0	4.6	2.6	0.5	54.7	18	3.47	33	0.040	0.25	0.01	0.38	0.35	0.9	1.4	7.7	5	1,100	290
BWW00	Rain	0	10/12/93	1230	38	9.5	6.8	169	10.4	2.3	1.2	1.0	61.8	16	2.96	33	0.056	0.25	0.01	0.35	0.50	3.7	1.5	3.0	11	930	520
BWW00	Rain	9	10/12/93	2025	530	9.0	6.3	72	10.6	12.3	73.0	21.6	16.9	6	1.06	9	0.068	0.30	0.01	0.56	14.40	44.0	7.3	89.2	90	52,000	13,000
BWW00	Rain	12	10/13/93	30	407	10.4	6.3	71	10.4	4.0	24.2	8.6	14.6	8	1.53	12	0.066	0.21	0.01	0.60	12.00	21.0	5.0	56.2	10	14,000	16,000
BWW00	24h	16	10/13/93	420	140	9.0	6.5	147	11.0	1.4	12.0	3.8	38.5	11	2.26	22	0.066	0.16	0.01	0.12	1.06	4.9	2.9	8.1	25	4,700	4,900
BWW00	24h	20	10/13/93	840	128	7.0	6.6	160	10.0	2.1	4.0	2.0	50.5	11	2.61	28	0.012	0.16	0.01	0.08	0.78	3.2	1.5	5.8	15	2,300	1,800
BWW00	24h	24	10/13/93	1219	122	9.0	6.8	160	11.2	2.1	1.8	1.0	98.1	13	2.33	26	0.016	0.21	0.01	0.33	1.03	3.4	1.8	4.9	19	8,200	1,800
BWW00	24h	28	10/13/93	1626	109	9.5	6.9	190	11.3	4.6	4.8	2.2	53.2	13	2.76	27	0.014	0.16	0.01	0.07	0.91	2.8	1.1	3.9	16	2,700	750
BWW00	48h	32	10/13/93	2018	48	10.0	6.8	130	11.8	1.3	3.4	1.8	54.3	13	2.59	28	0.020	0.16	0.01	ND	0.40	5.2	ND	3.7	5	NS	NS
BWW00	48h	36	10/14/93	35	100	9.0	6.7	135	10.2	3.3	2.0	1.0	54.1	13	2.62	26	0.006	0.16	0.01	ND	0.64	2.9	1.6	5.3	15	2,100	590
BWW00	48h	44	10/14/93	830	76	8.0	6.8	140	11.2	1.6	1.8	1.6	55.2	13	3.00	27	0.024	0.16	0.01	0.09	0.78	2.7	ND	2.6	5	NS	NS
BWW00	48h	52	10/14/93	1609	76	9.2	6.8	NA	10.9	1.6	2.2	1.6	48.1	13	3.15	28	0.014	0.16	0.01	0.07	0.51	2.9	2.8	2.5	12	NS	NS
BWW00	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**38**	**9.5**	**6.7**	**178**	**9.0**	**4.6**	**2.6**	**0.5**	**54.7**	**18**	**3.47**	**33**	**0.040**	**0.25**	**0.01**	**0.38**	**0.35**	**0.9**	**1.4**	**7.7**	**5**	**1,100**	**290**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					11	11	11	10	11	11	11	11	11	11	11	11	11	11	11	9	11	11	9	11	11	8	8
Mean *(*)*					**161**	**9.1**	**6.7**	**137**	**10.8**	**3.3**	**11.9**	**4.2**	**49.6**	**12**	**2.44**	**24**	**0.033**	**0.19**	**0.01**	**0.25**	**3.00**	**8.8**	**2.8**	**16.8**	**20**	**4,915**	**2,291**
Minimum					38	7.0	6.3	71	10.0	1.3	1.2	1.0	14.6	6	1.06	9	0.006	0.16	0.01	0.07	0.40	2.7	1.1	2.5	5	930	520
Maximum					530	10.4	6.9	190	11.8	12.3	73.0	21.6	98.1	16	3.15	33	0.068	0.30	0.01	0.60	14.40	44.0	7.3	89.2	90	52,000	16,000
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**325**	**9.6**	**6.4**	**104**	**10.5**	**6.2**	**32.8**	**10.4**	**31.1**	**10**	**1.85**	**18**	**0.063**	**0.25**	**0.01**	**0.50**	**8.97**	**22.9**	**4.6**	**49.5**	**37**	**8,781**	**4,765**
Minimum					38	9.0	6.3	71	10.4	2.3	1.2	1.0	14.6	6	1.06	9	0.056	0.21	0.01	0.35	0.50	3.7	1.5	3.0	10	930	520
Maximum					530	10.4	6.8	169	10.6	12.3	73.0	21.6	61.8	16	2.96	33	0.068	0.30	0.01	0.60	14.40	44.0	7.3	89.2	90	52,000	16,000
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**125**	**8.6**	**6.7**	**164**	**10.9**	**2.5**	**5.7**	**2.3**	**60.1**	**12**	**2.49**	**26**	**0.027**	**0.17**	**0.01**	**0.15**	**0.95**	**3.6**	**1.8**	**5.7**	**19**	**3,933**	**1,858**
Minimum					109	7.0	6.5	147	10.0	1.4	1.8	1.0	38.5	11	2.26	22	0.012	0.16	0.01	0.07	0.78	2.8	1.1	3.9	15	2,300	750
Maximum					140	9.5	6.9	190	11.3	4.6	12.0	3.8	98.1	13	2.76	28	0.066	0.21	0.01	0.33	1.06	4.9	2.9	8.1	25	8,200	4,900
WET WEATHER *(Day 2 after rain)*																											
Count					4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	2	4	4	2	4	4	1	1
Mean *(*)*					**75**	**9.1**	**6.8**	**135**	**11.0**	**2.0**	**2.4**	**1.5**	**52.9**	**13**	**2.84**	**27**	**0.016**	**0.16**	**0.01**	**0.08**	**0.58**	**3.4**	**2.2**	**3.5**	**9**	**2,100**	**590**
Minimum					48	8.0	6.7	130	10.2	1.3	1.8	1.0	48.1	13	2.59	26	0.006	0.16	0.01	0.07	0.40	2.7	1.6	2.5	5		
Maximum					100	10.0	6.8	140	11.8	3.3	3.4	1.8	55.2	13	3.15	28	0.024	0.16	0.01	0.09	0.78	5.2	2.8	5.3	15		
WET WEATHER *(Day 3)* (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW01	Dry	P	10/12/93	740	41	10.0	6.7	258	9.0	5.2	0.8	0.5	81.6	23	4.42	48	0.295	0.50	0.01	0.27	0.70	3.5	2.7	2.6	29	1,500	390
BWW01	Rain	0	10/12/93	1240	41	9.8	6.7	230	10.0	3.1	0.5	0.5	89.9	21	3.75	51	0.200	0.50	0.01	0.37	0.70	1.2	2.3	3.2	23	2,100	600
BWW01	Rain	9	10/12/93	2050	570	9.0	6.5	110	10.6	13.7	53.4	15.8	28.8	8	1.68	20	0.050	0.37	0.01	0.43	6.90	30.4	6.4	53.4	71	16,000	7,100
BWW01	Rain	12	10/13/93	40	438	11.0	6.3	92	11.0	4.2	43.4	10.0	21.8	10	2.20	22	0.050	0.29	0.01	0.62	14.00	26.0	7.5	46.0	123	12,000	9,000
BWW01	24h	16	10/13/93	430	150	9.0	6.5	142	11.0	2.0	14.4	4.4	38.7	12	4.20	30	0.035	0.33	0.01	0.63	3.09	14.1	7.7	19.0	42	5,300	5,800
BWW01	24h	20	10/13/93	854	138	7.2	6.6	162	11.0	2.3	5.4	2.6	55.0	11	2.75	28	0.060	0.33	0.01	0.17	1.30	5.8	2.6	9.7	37	2,600	2,500
BWW01	24h	24	10/13/93	1229	131	9.0	6.9	182	11.0	4.6	13.0	5.4	54.5	14	2.55	29	0.045	0.37	0.01	0.73	3.89	21.4	5.6	67.2	413	6,700	2,500
BWW01	24h	28	10/13/93	1634	117	10.0	6.9	209	10.8	5.2	3.6	4.4	57.8	14	2.81	31	0.085	0.41	0.01	0.07	1.44	3.1	1.7	1.8	111	3,100	580
BWW01	48h	32	10/13/93	2026	52	10.0	6.7	155	11.4	2.2	2.2	1.4	66.4	14	2.72	34	0.045	0.25	0.01	ND	1.09	2.8	ND	3.9	5	NS	NS
BWW01	48h	36	10/14/93	45	108	9.0	6.5	150	9.0	2.4	3.0	1.4	63.0	14	2.94	31	0.045	0.37	0.01	ND	1.64	3.3	2.6	5.6	12	1,600	560
BWW01	48h	44	10/14/93	840	82	7.0	7.0	180	10.8	2.0	4.8	2.4	65.9	14	3.36	35	0.050	0.29	0.01	ND	1.32	17.9	4.5	2.8	20	NS	NS
BWW01	48h	52	10/14/93	1618	82	9.5	6.7	188	10.4	NA	1.8	1.8	63.4	14	3.59	36	0.150	0.09	0.01	0.24	1.90	3.1	2.3	3.0	5	NS	NS
BWW01	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**41**	**10.0**	**6.7**	**258**	**9.0**	**5.2**	**0.8**	**0.5**	**81.6**	**23**	**4.42**	**48**	**0.295**	**0.50**	**0.01**	**0.27**	**0.70**	**3.5**	**2.7**	**2.6**	**29**	**1,500**	**390**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	11	8	11	11	10	11	11	8	8
Mean *(*)*					**174**	**9.1**	**6.7**	**164**	**10.6**	**4.2**	**13.2**	**4.6**	**55.0**	**13**	**2.96**	**32**	**0.074**	**0.33**	**0.01**	**0.41**	**3.39**	**11.7**	**4.3**	**19.6**	**78**	**4,553**	**2,147**
Minimum					41	7.0	6.3	92	9.0	2.0	0.5	0.5	21.8	8	1.68	20	0.035	0.09	0.01	0.07	0.70	1.2	1.7	1.8	5	1,600	560
Maximum					570	11.0	7.0	230	11.4	13.7	53.4	15.8	89.9	21	4.20	51	0.200	0.50	0.01	0.73	14.00	30.4	7.7	67.2	413	16,000	9,000
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**350**	**9.9**	**6.5**	**144**	**10.5**	**7.0**	**32.4**	**8.8**	**46.8**	**13**	**2.54**	**31**	**0.100**	**0.39**	**0.01**	**0.47**	**7.20**	**19.2**	**5.4**	**34.2**	**72**	**7,388**	**3,372**
Minimum					41	9.0	6.3	92	10.0	3.1	0.5	0.5	21.8	8	1.68	20	0.050	0.29	0.01	0.37	0.70	1.2	2.3	3.2	23	2,100	600
Maximum					570	11.0	6.7	230	11.0	13.7	53.4	15.8	89.9	21	3.75	51	0.200	0.50	0.01	0.62	14.00	30.4	7.5	53.4	123	16,000	9,000
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**134**	**8.8**	**6.7**	**174**	**11.0**	**3.5**	**9.1**	**4.2**	**51.5**	**13**	**3.08**	**30**	**0.056**	**0.36**	**0.01**	**0.40**	**2.43**	**11.1**	**4.4**	**24.4**	**151**	**4,113**	**2,141**
Minimum					117	7.2	6.5	142	10.8	2.0	3.6	2.6	38.7	11	2.55	28	0.035	0.33	0.01	0.07	1.30	3.1	1.7	1.8	37	2,600	580
Maximum					150	10.0	6.9	209	11.0	5.2	14.4	5.4	57.8	14	4.20	31	0.085	0.41	0.01	0.73	3.89	21.4	7.7	67.2	413	6,700	5,800
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	1	4	4	3	4	4	1	1
Mean *(*)*					**81**	**8.9**	**6.7**	**168**	**10.4**	**2.2**	**3.0**	**1.8**	**64.7**	**14**	**3.15**	**34**	**0.073**	**0.25**	**0.01**	**0.24**	**1.49**	**6.8**	**3.1**	**3.8**	**11**	**1,600**	**560**
Minimum					52	7.0	6.5	150	9.0	2.0	1.8	1.4	63.0	14	2.72	31	0.045	0.09	0.01	0.24	1.09	2.8	2.3	2.8	5		
Maximum					108	10.0	7.0	188	11.4	2.4	4.8	2.4	66.4	14	3.59	36	0.150	0.37	0.01	0.24	1.90	17.9	4.5	5.6	20		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW02	Dry	P	10/12/93	750	ERR	13.0	6.4	322	7.9	6.8	6.4	1.8	98.8	20	4.28	63	0.400	3.56	0.74	0.37	1.47	11.8	11.5	3.0	17	1,200	130
BWW02	Rain	0	10/12/93	1255	ERR	13.8	6.5	285	8.6	4.8	1.2	0.5	103.0	16	3.46	67	0.170	3.89	0.92	0.50	1.25	13.3	13.4	1.2	20	400	240
BWW02	Rain	9	10/12/93	2120	829	10.5	6.5	155	10.1	13.5	39.0	12.6	59.9	10	2.59	38	0.345	0.89	0.20	1.16	12.80	40.8	12.3	68.0	98	13,000	130
BWW02	Rain	12	10/13/93	50	ERR	12.5	6.3	120	12.5	5.0	37.4	12.6	37.6	9	2.32	26	0.710	0.89	0.26	1.05	10.00	42.0	13.0	24.7	43	350	170
BWW02	24h	16	10/13/93	445	ERR	10.0	6.4	178	10.5	2.8	17.0	6.4	45.1	9	2.26	29	0.235	1.28	0.26	0.67	3.71	15.7	11.5	15.0	43	8,000	6,200
BWW02	24h	20	10/13/93	905	ERR	9.8	6.2	182	10.0	4.5	7.2	3.6	52.4	9	2.00	34	0.105	1.45	0.26	0.33	2.36	13.9	8.7	6.4	37	2,100	1,600
BWW02	24h	24	10/13/93	1245	ERR	11.0	6.5	172	9.4	3.8	3.6	2.6	58.1	11	1.87	35	0.140	1.83	0.23	0.52	2.30	13.2	9.5	6.7	21	2,800	1,300
BWW02	24h	28	10/13/93	1644	ERR	11.5	6.7	235	10.1	6.8	13.8	11.4	60.9	13	2.81	35	0.085	1.75	0.23	0.33	3.13	14.1	8.8	21.1	15	2,800	340
BWW02	48h	32	10/13/93	2040	ERR	12.0	6.5	188	9.8	4.1	2.2	0.5	70.9	12	2.04	46	0.090	2.14	0.33	0.30	2.71	13.4	9.6	3.3	28	NS	NS
BWW02	48h	36	10/14/93	55	ERR	11.0	6.3	200	9.0	4.2	2.8	1.6	72.6	12	2.21	47	0.110	2.01	0.33	0.17	3.32	13.4	11.4	2.7	26	900	510
BWW02	48h	44	10/14/93	852	ERR	10.5	6.7	205	9.6	1.3	2.4	2.6	77.2	11	2.59	48	0.060	1.73	0.33	0.21	2.26	12.2	10.6	2.7	12	NS	NS
BWW02	48h	52	10/14/93	1628	ERR	13.0	6.6	250	9.1	1.3	1.4	1.4	76.8	13	3.74	45	0.350	1.44	0.26	0.40	2.32	13.9	11.3	1.9	25	NS	NS
BWW02	72h	72	10/15/02																								
DRY WEATHER (1 sample)						**13.0**	**6.4**	**322**	**7.9**	**6.8**	**6.4**	**1.8**	**98.8**	**20**	**4.28**	**63**	**0.400**	**3.56**	**0.74**	**0.37**	**1.47**	**11.8**	**11.5**	**3.0**	**17**	**1,200**	**130**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					1	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	8	8
Mean *(*)*					**829**	**11.4**	**6.5**	**197**	**9.9**	**4.7**	**11.6**	**5.1**	**65.0**	**11**	**2.54**	**41**	**0.218**	**1.75**	**0.33**	**0.51**	**4.20**	**18.7**	**10.9**	**14.0**	**33**	**1,958**	**574**
Minimum					829	9.8	6.2	120	8.6	1.3	1.2	0.5	37.6	9	1.87	26	0.060	0.89	0.20	0.17	1.25	12.2	8.7	1.2	12	350	130
Maximum					829	13.8	6.7	285	12.5	13.5	39.0	12.6	103.0	16	3.74	67	0.710	3.89	0.92	1.16	12.80	42.0	13.4	68.0	98	13,000	6,200
WET WEATHER *(during rain)*																											
Count					1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**829**	**12.3**	**6.4**	**187**	**10.4**	**7.8**	**25.9**	**8.6**	**66.8**	**12**	**2.79**	**44**	**0.408**	**1.89**	**0.46**	**0.90**	**8.02**	**32.0**	**12.9**	**31.3**	**54**	**1,221**	**174**
Minimum						10.5	6.3	120	8.6	4.8	1.2	0.5	37.6	9	2.32	26	0.170	0.89	0.20	0.50	1.25	13.3	12.3	1.2	20	350	130
Maximum						13.8	6.5	285	12.5	13.5	39.0	12.6	103.0	16	3.46	67	0.710	3.89	0.92	1.16	12.80	42.0	13.4	68.0	98	13,000	240
WET WEATHER *(Day 1 after rain)*																											
Count						4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*						**10.6**	**6.4**	**192**	**10.0**	**4.5**	**10.4**	**6.0**	**54.1**	**11**	**2.24**	**33**	**0.141**	**1.58**	**0.25**	**0.46**	**2.88**	**14.2**	**9.6**	**12.3**	**29**	**3,388**	**1,447**
Minimum						9.8	6.2	172	9.4	2.8	3.6	2.6	45.1	9	1.87	29	0.085	1.28	0.23	0.33	2.30	13.2	8.7	6.4	15	2,100	340
Maximum						11.5	6.7	235	10.5	6.8	17.0	11.4	60.9	13	2.81	35	0.235	1.83	0.26	0.67	3.71	15.7	11.5	21.1	43	8,000	6,200
WET WEATHER *(Day 2 after rain)*																											
Count						4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*						**11.6**	**6.5**	**211**	**9.4**	**2.7**	**2.2**	**1.5**	**74.4**	**12**	**2.65**	**47**	**0.153**	**1.83**	**0.31**	**0.27**	**2.65**	**13.2**	**10.7**	**2.7**	**23**	**900**	**510**
Minimum						10.5	6.3	188	9.0	1.3	1.4	0.5	70.9	11	2.04	45	0.060	1.44	0.26	0.17	2.26	12.2	9.6	1.9	12		
Maximum						13.0	6.7	250	9.8	4.2	2.8	2.6	77.2	13	3.74	48	0.350	2.14	0.33	0.40	3.32	13.9	11.4	3.3	28		
WET WEATHER *(Day 3)* (1 sample)																											

ND = Not Detected　　NM= Not Measured　　NS= No Sample　　NA = Not Analyzed　　(*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW04	Dry	P	10/12/93	810	109	11.0	6.7	249	9.2	7.0	3.0	1.4	80.6	16	3.18	50	0.160	2.80	0.48	0.41	1.82	11.6	8.1	3.0	17	210	160
BWW04	Rain	0	10/12/93	1315	109	11.2	6.9	240	10.5	3.1	0.5	0.5	89.2	15	3.10	52	0.134	2.07	0.41	0.45	0.85	6.5	7.6	1.3	20	1,000	110
BWW04	Rain	9	10/12/93	2155	746	11.1	6.5	240	10.5	13.5	129.2	36.2	63.4	3	ND	ND	0.240	1.75	0.22	NA	NA	NA	NA	NA	5	16,000	5,900
BWW04	Rain	12	10/13/93	120	541	12.5	6.5	155	12.5	5.0	74.0	23.4	52.1	5	2.04	28	0.654	0.77	0.19	1.10	18.00	36.0	8.5	24.0	12	20	30
BWW04	24h	16	10/13/93	505	378	10.0	6.6	179	11.5	2.8	26.6	26.0	48.8	6	2.11	30	0.482	0.86	0.28	0.59	4.16	22.0	9.5	20.9	56	3,200	1,700
BWW04	24h	20	10/13/93	921	246	8.5	6.6	160	11.2	4.5	8.2	3.4	50.1	7	1.75	30	0.244	0.94	0.25	0.51	3.24	13.9	9.7	12.6	48	4,100	1,600
BWW04	24h	24	10/13/93	1300	271	10.0	6.7	180	10.8	3.8	4.4	3.6	53.2	11	2.03	33	0.090	1.22	0.22	0.18	0.47	5.8	5.9	ND	5	2,000	830
BWW04	24h	28	10/13/93	1700	277	12.0	6.9	212	10.9	6.8	6.2	2.4	58.5	12	2.80	35	0.122	1.18	0.25	0.27	1.71	11.5	7.7	4.9	5	700	310
BWW04	48h	32	10/13/93	2100	230	10.0	6.8	160	10.9	4.1	6.0	2.6	60.9	12	2.50	36	0.214	1.30	0.25	0.38	1.79	12.5	6.2	9.3	61	NS	NS
BWW04	48h	36	10/14/93	105	215	10.0	6.6	210	9.4	4.2	4.2	1.4	64.9	11	2.62	39	0.142	1.59	0.29	0.17	2.60	11.3	8.5	4.6	38	1,100	420
BWW04	48h	44	10/14/93	908	173	9.0	7.0	185	10.6	1.3	2.6	2.2	71.2	12	3.06	43	0.160	1.34	0.25	0.31	1.92	9.8	7.9	3.0	19	NS	NS
BWW04	48h	52	10/14/93	1645	187	11.8	6.8	220	10.2	NS	2.0	2.0	73.8	13	3.00	37	0.144	1.71	0.39	0.34	2.32	11.8	12.7	31.2	17	NS	NS
BWW04	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**109**	**11.0**	**6.7**	**249**	**9.2**	**7.0**	**3.0**	**1.4**	**80.6**	**16**	**3.18**	**50**	**0.160**	**2.80**	**0.48**	**0.41**	**1.82**	**11.6**	**8.1**	**3.0**	**17**	**210**	**160**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	10	10	11	11	11	10	10	10	10	9	11	8	8
Mean *(*)*					**307**	**10.6**	**6.7**	**195**	**10.8**	**4.9**	**24.0**	**9.4**	**62.4**	**10**	**2.50**	**36**	**0.239**	**1.34**	**0.27**	**0.43**	**3.71**	**14.1**	**8.4**	**12.4**	**26**	**1,263**	**524**
Minimum					109	8.5	6.5	155	9.4	1.3	0.5	0.5	48.8	3	1.75	28	0.090	0.77	0.19	0.17	0.47	5.8	5.9	1.3	5	20	30
Maximum					746	12.5	7.0	240	12.5	13.5	129.2	36.2	89.2	15	3.10	52	0.654	2.07	0.41	1.10	18.00	36.0	12.7	31.2	61	16,000	5,900
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	2	2	3	3	3	2	2	2	2	2	3	3	3
Mean *(*)*					**465**	**11.6**	**6.6**	**212**	**11.2**	**7.2**	**67.9**	**20.0**	**68.2**	**8**	**2.57**	**40**	**0.343**	**1.53**	**0.27**	**0.78**	**9.43**	**21.3**	**8.1**	**12.7**	**12**	**684**	**269**
Minimum					109	11.1	6.5	155	10.5	3.1	0.5	0.5	52.1	3	2.04	28	0.134	0.77	0.19	0.45	0.85	6.5	7.6	1.3	5	20	30
Maximum					746	12.5	6.9	240	12.5	13.5	129.2	36.2	89.2	15	3.10	52	0.654	2.07	0.41	1.10	18.00	36.0	8.5	24.0	20	16,000	5,900
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4
Mean *(*)*					**293**	**10.1**	**6.7**	**183**	**11.1**	**4.5**	**11.4**	**8.9**	**52.7**	**9**	**2.17**	**32**	**0.235**	**1.05**	**0.25**	**0.39**	**2.40**	**13.3**	**8.2**	**12.8**	**29**	**2,070**	**915**
Minimum					246	8.5	6.6	160	10.8	2.8	4.4	2.4	48.8	6	1.75	30	0.090	0.86	0.22	0.18	0.47	5.8	5.9	4.9	5	700	310
Maximum					378	12.0	6.9	212	11.5	6.8	26.6	26.0	58.5	12	2.80	35	0.482	1.22	0.28	0.59	4.16	22.0	9.7	20.9	56	4,100	1,700
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**201**	**10.2**	**6.8**	**194**	**10.3**	**3.2**	**3.7**	**2.1**	**67.7**	**12**	**2.80**	**39**	**0.165**	**1.49**	**0.30**	**0.30**	**2.16**	**11.4**	**8.8**	**12.0**	**34**	**1,100**	**420**
Minimum					173	9.0	6.6	160	9.4	1.3	2.0	1.4	60.9	11	2.50	36	0.142	1.30	0.25	0.17	1.79	9.8	6.2	3.0	17		
Maximum					230	11.8	7.0	220	10.9	4.2	6.0	2.6	73.8	13	3.06	43	0.214	1.71	0.39	0.38	2.60	12.5	12.7	31.2	61		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW05S	Dry	P	10/12/93	835	8	10.0	NA	200	8.2	NA	ND	ND	57.5	18	4.02	40	0.048	0.04	ND	0.22	0.25	ND	0.8	1.6	ND	NS	NS
BWW05S	Rain	0	10/12/93	1348	9	10.5	6.7	218	9.9	NA	0.8	ND	78.6	17	3.90	40	0.005	0.04	ND	0.16	ND	ND	1.6	ND	ND	NS	NS
BWW05S	Rain	9	10/12/93	1235	20	10.1	6.6	225	10.4	NA	0.6	ND	70.1	12	2.87	39	0.010	0.03	ND	0.23	ND	1.4	1.5	1.6	ND	NS	NS
BWW05S	Rain	12	10/13/93	200	21	12.5	6.7	232	12.5	NA	1.4	1.2	73.3	13	3.10	38	0.013	0.03	ND	0.10	0.32	1.0	1.2	2.0	ND	NS	NS
BWW05S	24h	16	10/13/93	540	26	10.0	6.6	230	10.0	NA	2.4	1.4	78.1	14	3.99	40	0.017	0.03	ND	ND	0.29	0.7	0.8	1.1	ND	NS	NS
BWW05S	24h	20	10/13/93	952	27	8.2	6.7	198	10.1	NA	ND	ND	74.2	12	3.49	38	0.012	0.03	ND	ND	0.45	ND	1.1	3.0	ND	NS	NS
BWW05S	24h	24	10/13/93	1325	30	10.0	6.7	181	10.4	NA	1.2	ND	73.2	14	3.29	38	0.035	0.03	ND	ND	0.37	0.5	1.0	0.7	ND	NS	NS
BWW05S	24h	28	10/13/93	1723	29	11.0	6.8	248	10.5	NA	4.0	1.4	75.6	12	2.79	41	ND	0.03	ND	ND	0.21	ND	ND	ND	ND	NS	NS
BWW05S	48h	32	10/13/93	2128	27	10.0	6.8	192	10.8	NA	2.2	ND	76.6	14	3.30	40	0.063	0.03	ND	ND	0.33	ND	ND	1.4	ND	NS	NS
BWW05S	48h	36	10/14/93	145	25	9.0	6.7	203	10.0	NA	ND	ND	75.3	14	3.33	37	0.048	0.03	ND	ND	0.62	0.6	0.8	2.1	ND	NS	NS
BWW05S	48h	44	10/14/93	920	23	9.0	6.4	205	10.0	NA	2.4	2.0	78.8	11	2.91	43	0.031	0.03	ND	0.06	0.22	0.7	ND	1.5	ND	NS	NS
BWW05S	48h	52	10/14/93	1713	22	10.2	6.7	190	10.2	NA	ND	ND	83.6	12	3.13	42	0.062	0.03	ND	ND	0.51	0.8	0.7	0.6	NS	NS	NS
BWW05S	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**8**	**10.0**		**200**	**8.2**				**57.5**	**18**	**4.02**	**40**	**0.048**	**0.04**		**0.22**	**0.25**		**0.8**	**1.6**			
WET WEATHER (All data: Rain, Days 1 and 2 after rain)																											
Count					11	11	11	11	11		8	4	11	11	11	11	10	11		4	9	7	8	9			
Mean (*)					**23**	**10.0**	**6.7**	**211**	**10.4**		**1.9**	**1.5**	**76.1**	**13**	**3.28**	**40**	**0.030**	**0.03**		**0.14**	**0.37**	**0.8**	**1.1**	**1.6**			
Minimum					9	8.2	6.4	181	9.9		0.6	1.2	70.1	11	2.79	37	0.005	0.03		0.06	0.21	0.5	0.7	0.6			
Maximum					30	12.5	6.8	248	12.5		4.0	2.0	83.6	17	3.99	43	0.063	0.04		0.23	0.62	1.4	1.6	3.0			
WET WEATHER (during rain)																											
Count					3	3	3	3	3		3	1	3	3	3	3	3	3		3	1	2	3	2			
Mean (*)					**17**	**11.0**	**6.7**	**225**	**10.9**		**0.9**	**1.2**	**74.0**	**14**	**3.29**	**39**	**0.009**	**0.03**		**0.16**	**0.32**	**1.2**	**1.4**	**1.8**			
Minimum					9	10.1	6.6	218	9.9		0.6	1.2	70.1	12	2.87	38	0.005	0.03		0.10		1.0	1.2	1.6			
Maximum					21	12.5	6.7	232	12.5		1.4	1.2	78.6	17	3.90	40	0.013	0.04		0.23		1.4	1.6	2.0			
WET WEATHER (Day 1 after rain)																											
Count					4	4	4	4	4		3	2	4	4	4	4	3	4			4	2	3	3			
Mean (*)					**28**	**9.8**	**6.7**	**214**	**10.2**		**2.5**	**1.4**	**75.3**	**13**	**3.39**	**39**	**0.021**	**0.03**			**0.33**	**0.6**	**1.0**	**1.6**			
Minimum					26	8.2	6.6	181	10.0		1.2	1.4	73.2	12	2.79	38	0.012	0.03			0.21	0.5	0.8	0.7			
Maximum					30	11.0	6.8	248	10.5		4.0	1.4	78.1	14	3.99	41	0.035	0.03			0.45	0.7	1.1	3.0			
WET WEATHER (Day 2 after rain)																											
Count					4	4	4	4	4		2	1	4	4	4	4	4	4		1	4	3	2	4			
Mean (*)					**24**	**9.6**	**6.6**	**198**	**10.3**		**2.3**	**2.0**	**78.6**	**13**	**3.17**	**41**	**0.051**	**0.03**		**0.06**	**0.42**	**0.7**	**0.8**	**1.4**			
Minimum					22	9.0	6.4	190	10.0		2.2		75.3	11	2.91	37	0.031	0.03			0.22	0.6	0.7	0.6			
Maximum					27	10.2	6.8	205	10.8		2.4		83.6	14	3.33	43	0.063	0.03			0.62	0.8	0.8	2.1			
WET WEATHER (Day 3) (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW06	Dry	P	10/12/93	825	98	10.8	6.7	240	8.2	5.2	0.6	0.5	76.8	16	3.56	48	0.162	2.30	0.54	0.38	0.38	7.2	7.7	5.0	12	420	56
BWW06	Rain	0	10/12/93	1332	98	10.3	6.7	220	10.4	3.0	2.0	1.0	86.7	14	3.35	51	0.095	2.54	0.54	0.38	0.45	8.0	7.6	2.5	18	140	90
BWW06	Rain	9	10/12/93	1215	229	10.8	6.8	269	9.1	3.8	7.4	1.0	73.5	11	2.74	50	0.093	2.02	0.50	0.48	3.00	17.0	9.5	11.7	15	710	3,500
BWW06	Rain	12	10/13/93	140	456	14.0	6.7	271	14.0	4.6	99.2	28.8	75.2	9	2.50	36	0.155	2.59	0.54	0.64	6.25	28.0	10.0	23.0	22	4,100	2,900
BWW06	24h	16	10/13/93	525	456	10.0	6.6	200	11.5	4.0	29.4	11.2	52.8	7	2.47	33	0.319	1.06	0.29	0.75	8.14	35.8	12.2	37.9	79	6,100	1,600
BWW06	24h	20	10/13/93	--	216	7.0	6.7	155	10.3	6.7	15.2	5.8	53.9	8	2.37	32	0.346	1.06	0.32	0.52	3.77	19.0	9.5	14.6	53	3,300	830
BWW06	24h	24	10/13/93	1313	244	10.0	6.6	183	10.8	5.3	6.4	4.2	51.9	11	2.21	32	0.345	1.67	0.32	0.85	2.88	15.7	9.9	11.7	32	2,800	1,000
BWW06	24h	28	10/13/93	1712	229	11.5	6.8	200	10.8	5.2	12.4	8.4	53.8	10	2.63	31	0.084	1.12	0.25	0.41	1.74	12.3	8.3	6.3	26	2,100	370
BWW06	48h	32	10/13/93	2113	229	10.0	6.8	150	10.8	3.3	12.2	10.2	58.2	12	2.62	34	0.086	1.23	0.24	0.36	1.76	11.8	6.4	1.5	22	NS	NS
BWW06	48h	36	10/14/93	130	260	9.0	6.8	180	9.4	3.8	5.8	3.2	60.3	13	3.09	39	0.079	1.34	0.24	0.32	2.85	15.2	7.8	24.9	57	1,900	290
BWW06	48h	44	10/14/93	932	224	9.0	6.7	201	9.8	1.2	5.4	3.4	70.3	12	3.52	43	0.102	1.40	NA	0.39	2.13	10.8	7.5	4.5	23	NS	NS
BWW06	48h	52	10/14/93	1701	110	10.4	6.7	210	10.6	NS	2.6	2.6	73.8	12	2.93	62	0.073	1.45	0.24	0.26	2.03	8.7	7.7	3.6	5	NS	NS
BWW06	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**98**	**10.8**	**6.7**	**240**	**8.2**	**5.2**	**0.6**	**0.5**	**76.8**	**16**	**3.56**	**48**	**0.162**	**2.30**	**0.54**	**0.38**	**0.38**	**7.2**	**7.7**	**5.0**	**12**	**420**	**56**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	10	11	11	11	11	11	11	8	8
Mean *(*)*					**250**	**10.2**	**6.7**	**204**	**10.7**	**4.1**	**18.0**	**7.3**	**64.6**	**11**	**2.77**	**40**	**0.162**	**1.59**	**0.35**	**0.49**	**3.18**	**16.6**	**8.8**	**12.9**	**32**	**1,759**	**775**
Minimum					98	7.0	6.6	150	9.1	1.2	2.0	1.0	51.9	7	2.21	31	0.073	1.06	0.24	0.26	0.45	8.0	6.4	1.5	5	140	90
Maximum					456	14.0	6.8	271	14.0	6.7	99.2	28.8	86.7	14	3.52	62	0.346	2.59	0.54	0.85	8.14	35.8	12.2	37.9	79	6,100	3,500
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**261**	**11.7**	**6.7**	**253**	**11.2**	**3.8**	**36.2**	**10.3**	**78.5**	**11**	**2.86**	**46**	**0.114**	**2.38**	**0.53**	**0.50**	**3.23**	**17.7**	**9.0**	**12.4**	**18**	**741**	**970**
Minimum					98	10.3	6.7	220	9.1	3.0	2.0	1.0	73.5	9	2.50	36	0.093	2.02	0.50	0.38	0.45	8.0	7.6	2.5	15	140	90
Maximum					456	14.0	6.8	271	14.0	4.6	99.2	28.8	86.7	14	3.35	51	0.155	2.59	0.54	0.64	6.25	28.0	10.0	23.0	22	4,100	3,500
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**286**	**9.6**	**6.7**	**185**	**10.9**	**5.3**	**15.9**	**7.4**	**53.1**	**9**	**2.42**	**32**	**0.274**	**1.23**	**0.30**	**0.63**	**4.13**	**20.7**	**10.0**	**17.6**	**48**	**3,298**	**837**
Minimum					216	7.0	6.6	155	10.3	4.0	6.4	4.2	51.9	7	2.21	31	0.084	1.06	0.25	0.41	1.74	12.3	8.3	6.3	26	2,100	370
Maximum					456	11.5	6.8	200	11.5	6.7	29.4	11.2	53.9	11	2.63	33	0.346	1.67	0.32	0.85	8.14	35.8	12.2	37.9	79	6,100	1,600
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	1	1
Mean *(*)*					**206**	**9.6**	**6.7**	**185**	**10.2**	**2.8**	**6.5**	**4.9**	**65.7**	**12**	**3.04**	**45**	**0.085**	**1.36**	**0.24**	**0.33**	**2.19**	**11.6**	**7.4**	**8.6**	**27**	**1,900**	**290**
Minimum					110	9.0	6.7	150	9.4	1.2	2.6	2.6	58.2	12	2.62	34	0.073	1.23	0.24	0.26	1.76	8.7	6.4	1.5	5		
Maximum					260	10.4	6.8	210	10.8	3.8	12.2	10.2	73.8	13	3.52	62	0.102	1.45	0.24	0.39	2.85	15.2	7.8	24.9	57		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW07	Dry	P	10/12/93	1015	144	10.0	6.8	300	8.8	6.5	4.8	1.2	75.2	15	3.49	50	0.053	2.28	0.39	0.43	2.41	14.2	9.5	4.9	22	260	75
BWW07	Rain	0	10/12/93	1440	144	10.0	6.7	300	8.8	2.1	6.8	4.2	87.1	14	3.27	50	0.050	2.28	0.43	0.47	0.64	10.5	8.5	4.7	24	290	70
BWW07	Rain	9	10/12/93	2325	201	10.0	6.8	280	9.5	2.2	8.2	6.0	76.5	11	2.81	50	0.105	2.32	0.43	0.38	2.20	17.2	9.5	5.4	14	1,100	86
BWW07	Rain	12	10/13/93	315	421	10.5	6.7	275	9.8	3.0	6.6	4.0	83.2	12	3.37	48	0.115	2.44	0.43	0.35	3.84	24.0	10.5	7.1	10	510	310
BWW07	24h	16	10/13/93	645	570	9.5	6.7	270	10.6	4.3	18.6	5.8	75.2	11	3.35	45	0.166	2.60	0.39	0.67	8.11	30.2	12.9	19.2	49	5,200	420
BWW07	24h	20	10/13/93	1250	300	11.0	6.8	180	9.6	7.4	14.8	19.2	58.5	9	2.47	33	0.255	1.18	0.25	0.44	4.00	19.0	9.2	23.1	57	3,400	480
BWW07	24h	24	10/13/93	1600	278	10.0	6.7	221	14.4	6.3	11.0	5.4	57.8	11	2.37	35	0.401	1.26	0.25	0.49	3.77	18.1	9.0	12.1	45	2,000	200
BWW07	24h	28	10/13/93	1815	287	10.0	6.7	230	12.3	6.5	8.4	3.0	56.9	12	2.51	34	0.303	1.22	0.29	0.42	3.72	17.9	9.0	12.0	37	1,600	380
BWW07	48h	32	10/13/93	2230	265	10.0	6.6	142	12.4	4.2	11.0	4.8	56.6	11	2.39	34	0.280	1.18	0.29	0.33	3.78	16.8	10.2	11.5	27	NS	NS
BWW07	48h	36	10/14/93	245	249	9.0	6.6	170	13.0	2.9	8.0	3.6	55.8	10	2.46	31	0.105	1.14	0.25	0.45	3.56	17.9	9.0	9.2	30	2,300	400
BWW07	48h	44	10/14/93	1300	238	10.5	6.7	208	10.0	2.0	4.2	2.8	63.8	12	3.30	37	0.069	1.30	0.22	0.40	1.92	10.2	6.4	7.4	23	NS	NS
BWW07	48h	52	10/14/93	1805	144	11.0	6.7	220	10.8	NA	8.4	3.6	71.8	12	3.30	39	0.078	0.41	0.11	0.50	3.15	12.1	8.7	8.8	24	NS	NS
BWW07	72h	72	10/15/93	1135	144	11.0	NA	240	10.0	NA	7.2	3.8	75.7	12	3.00	36	NA	1.26	0.11	0.38	3.45	14.7	29.1	7.6	34	NS	NS
DRY WEATHER (1 sample)					**144**	**10.0**	**6.8**	**300**	**8.8**	**6.5**	**4.8**	**1.2**	**75.2**	**15**	**3.49**	**50**	**0.053**	**2.28**	**0.39**	**0.43**	**2.41**	**14.2**	**9.5**	**4.9**	**22**	**260**	**75**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	8	8
Mean *(*)*					**281**	**10.1**	**6.7**	**227**	**11.0**	**4.1**	**9.6**	**5.7**	**67.6**	**11**	**2.87**	**40**	**0.175**	**1.58**	**0.30**	**0.45**	**3.52**	**17.6**	**9.4**	**11.0**	**31**	**1,465**	**241**
Minimum					144	9.0	6.6	142	8.8	2.0	4.2	2.8	55.8	9	2.37	31	0.050	0.41	0.11	0.33	0.64	10.2	6.4	4.7	10	290	70
Maximum					570	11.0	6.8	300	14.4	7.4	18.6	19.2	87.1	14	3.37	50	0.401	2.60	0.43	0.67	8.11	30.2	12.9	23.1	57	5,200	480
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**255**	**10.2**	**6.7**	**285**	**9.4**	**2.4**	**7.2**	**4.7**	**82.3**	**12**	**3.15**	**49**	**0.090**	**2.35**	**0.43**	**0.40**	**2.23**	**17.2**	**9.5**	**5.7**	**16**	**546**	**123**
Minimum					144	10.0	6.7	275	8.8	2.1	6.6	4.0	76.5	11	2.81	48	0.050	2.28	0.43	0.35	0.64	10.5	8.5	4.7	10	290	70
Maximum					421	10.5	6.8	300	9.8	3.0	8.2	6.0	87.1	14	3.37	50	0.115	2.44	0.43	0.47	3.84	24.0	10.5	7.1	24	1,100	310
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**359**	**10.1**	**6.7**	**225**	**11.7**	**6.1**	**13.2**	**8.4**	**62.1**	**11**	**2.68**	**37**	**0.281**	**1.57**	**0.30**	**0.51**	**4.90**	**21.3**	**10.0**	**16.6**	**47**	**2,743**	**352**
Minimum					278	9.5	6.7	180	9.6	4.3	8.4	3.0	56.9	9	2.37	33	0.166	1.18	0.25	0.42	3.72	17.9	9.0	12.0	37	1,600	200
Maximum					570	11.0	6.8	270	14.4	7.4	18.6	19.2	75.2	12	3.35	45	0.401	2.60	0.39	0.67	8.11	30.2	12.9	23.1	57	5,200	480
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**224**	**10.1**	**6.7**	**185**	**11.6**	**3.0**	**7.9**	**3.7**	**62.0**	**11**	**2.86**	**35**	**0.133**	**1.01**	**0.22**	**0.42**	**3.10**	**14.3**	**8.6**	**9.2**	**26**	**2,300**	**400**
Minimum					144	9.0	6.6	142	10.0	2.0	4.2	2.8	55.8	10	2.39	31	0.069	0.41	0.11	0.33	1.92	10.2	6.4	7.4	23		
Maximum					265	11.0	6.7	220	13.0	4.2	11.0	4.8	71.8	12	3.30	39	0.280	1.30	0.29	0.50	3.78	17.9	10.2	11.5	30		
WET WEATHER ***(Day 3)*** (1 sample)					**144**	**11.0**		**240**	**10.0**		**7.2**	**3.8**	**75.7**	**12**	**3.00**	**36**		**1.26**	**0.11**	**0.38**	**3.45**	**14.7**	**29.1**	**7.6**	**34**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW08	Dry	P	10/12/93	955	152	10.0	6.9	300	9.0	4.1	8.2	2.2	76.5	16	3.51	51	0.105	2.45	0.36	0.45	0.37	7.0	7.7	5.1	21	130	37
BWW08	Rain	0	10/12/93	1425	229	10.0	6.9	300	9.2	2.6	7.8	3.8	87.4	14	3.39	50	0.047	2.54	0.39	0.87	3.73	17.9	10.2	8.1	34	190	140
BWW08	Rain	9	10/12/93	2315	127	10.0	6.7	262	8.4	2.1	9.6	3.0	74.4	11	2.80	49	0.179	2.35	0.36	0.47	2.40	6.4	8.7	7.5	30	270	87
BWW08	Rain	12	10/13/93	255	184	10.5	6.7	260	9.4	2.3	9.6	4.4	77.7	13	3.24	45	0.098	2.45	0.39	0.43	6.83	7.4	8.5	10.1	24	310	170
BWW08	24h	16	10/13/93	630	364	10.0	6.7	275	10.0	2.8	62.6	12.8	81.1	8	2.52	45	0.095	2.54	0.43	0.65	47.60	97.0	22.5	68.0	146	1,900	250
BWW08	24h	20	10/13/93	1210	414	11.0	6.7	210	9.6	6.7	25.6	8.0	65.4	9	2.69	41	0.288	1.87	0.36	0.66	7.82	31.0	11.5	22.0	71	4,600	730
BWW08	24h	24	10/13/93	1545	352	10.0	6.6	240	12.4	7.2	14.2	2.4	60.7	11	2.42	36	0.314	1.68	NA	0.60	5.79	22.7	10.8	17.1	52	3,400	380
BWW08	24h	28	10/13/93	1810	332	10.0	6.6	229	11.8	4.1	13.6	8.4	59.2	12	2.73	36	0.307	1.49	0.32	0.46	4.75	20.4	10.2	14.1	45	2,900	1,200
BWW08	48h	32	10/13/93	2215	294	10.0	6.6	152	13.0	4.5	12.2	3.6	60.2	8	2.59	35	0.164	1.40	0.32	0.46	4.78	19.7	10.1	14.6	40	NS	NS
BWW08	48h	36	10/14/93	220	301	8.5	6.7	190	12.4	4.3	9.6	4.2	57.7	10	2.37	33	0.190	1.25	0.29	0.52	4.58	17.8	9.9	12.8	47	2,000	620
BWW08	48h	44	10/14/93	1250	283	10.0	6.9	190	11.1	1.1	9.0	3.0	60.8	11	3.08	34	0.110	1.05	NA	0.49	1.88	11.3	6.8	6.8	26	NS	NS
BWW08	48h	52	10/14/93	1755	283	10.0	6.8	205	10.6	NA	8.2	3.2	68.7	10	3.16	39	0.020	0.83	0.11	0.49	3.15	12.2	9.0	22.9	26	NS	NS
BWW08	72h	72	10/15/93	1120	266	10.5	NA	230	10.2	NA	5.6	3.0	72.1	12	2.88	38	NA	0.25	0.11	0.26	2.84	14.2	15.1	6.9	26	NS	NS
DRY WEATHER (1 sample)					**152**	**10.0**	**6.9**	**300**	**9.0**	**4.1**	**8.2**	**2.2**	**76.5**	**16**	**3.51**	**51**	**0.105**	**2.45**	**0.36**	**0.45**	**0.37**	**7.0**	**7.7**	**5.1**	**21**	**130**	**37**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	9	11	11	11	11	11	11	8	8
Mean *(*)*					**287**	**10.0**	**6.7**	**228**	**10.7**	**3.8**	**16.5**	**5.2**	**68.5**	**11**	**2.82**	**40**	**0.165**	**1.77**	**0.33**	**0.55**	**8.48**	**24.0**	**10.7**	**18.5**	**49**	**1,134**	**319**
Minimum					127	8.5	6.6	152	8.4	1.1	7.8	2.4	57.7	8	2.37	33	0.020	0.83	0.11	0.43	1.88	6.4	6.8	6.8	24	190	87
Maximum					414	11.0	6.9	300	13.0	7.2	62.6	12.8	87.4	14	3.39	50	0.314	2.54	0.43	0.87	47.60	97.0	22.5	68.0	146	4,600	1,200
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**180**	**10.2**	**6.7**	**274**	**9.0**	**2.3**	**9.0**	**3.7**	**79.8**	**13**	**3.14**	**48**	**0.108**	**2.45**	**0.38**	**0.59**	**4.32**	**10.6**	**9.1**	**8.6**	**29**	**251**	**127**
Minimum					127	10.0	6.7	260	8.4	2.1	7.8	3.0	74.4	11	2.80	45	0.047	2.35	0.36	0.43	2.40	6.4	8.5	7.5	24	190	87
Maximum					229	10.5	6.9	300	9.4	2.6	9.6	4.4	87.4	14	3.39	50	0.179	2.54	0.39	0.87	6.83	17.9	10.2	10.1	34	310	170
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
Mean *(*)*					**365**	**10.3**	**6.7**	**239**	**11.0**	**5.2**	**29.0**	**7.9**	**66.6**	**10**	**2.59**	**40**	**0.251**	**1.90**	**0.37**	**0.59**	**16.49**	**42.8**	**13.8**	**30.3**	**79**	**3,047**	**537**
Minimum					332	10.0	6.6	210	9.6	2.8	13.6	2.4	59.2	8	2.42	36	0.095	1.49	0.32	0.46	4.75	20.4	10.2	14.1	45	1,900	250
Maximum					414	11.0	6.7	275	12.4	7.2	62.6	12.8	81.1	12	2.73	45	0.314	2.54	0.43	0.66	47.60	97.0	22.5	68.0	146	4,600	1,200
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	1	1
Mean *(*)*					**290**	**9.6**	**6.8**	**184**	**11.8**	**3.3**	**9.8**	**3.5**	**61.9**	**10**	**2.80**	**35**	**0.121**	**1.13**	**0.24**	**0.49**	**3.60**	**15.3**	**9.0**	**14.3**	**35**	**2,000**	**620**
Minimum					283	8.5	6.6	152	10.6	1.1	8.2	3.0	57.7	8	2.37	33	0.020	0.83	0.11	0.46	1.88	11.3	6.8	6.8	26		
Maximum					301	10.0	6.9	205	13.0	4.5	12.2	4.2	68.7	11	3.16	39	0.190	1.40	0.32	0.52	4.78	19.7	10.1	22.9	47		
WET WEATHER ***(Day 3)*** (1 sample)					**266**	**10.5**		**230**	**10.2**		**5.6**	**3.0**	**72.1**	**12**	**2.88**	**38**		**0.25**	**0.11**	**0.26**	**2.84**	**14.2**	**15.1**	**6.9**	**26**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW09	Dry	P	10/12/93	945	17	10.0	7.0	150	9.8	1.7	1.6	ND	19.3	7	2.31	13	ND	0.13	0.26	0.21	0.18	ND	0.7	0.8	ND	34	53
BWW09	Rain	0	10/12/93	1400	23	10.0	6.6	120	9.4	1.2	2.2	0.6	23.3	6	2.28	14	0.028	0.13	0.23	0.05	0.37	ND	ND	1.1	ND	41	56
BWW09	Rain	9	10/12/93	2250	39	10.0	6.4	90	9.4	ND	2.0	ND	20.1	7	1.88	13	ND	0.13	0.33	0.05	ND	ND	0.8	2.1	ND	82	54
BWW09	Rain	12	10/13/93	225	41	10.0	6.8	90	10.4	1.6	3.0	1.2	17.3	5	2.20	12	ND	0.13	0.26	ND	0.26	ND	ND	1.3	ND	200	160
BWW09	24h	16	10/13/93	605	37	10.0	6.9	100	10.0	1.3	3.0	2.0	19.3	6	2.41	13	ND	0.13	0.26	0.20	2.15	0.5	0.7	1.4	ND	430	120
BWW09	24h	20	10/13/93	1140	18	10.0	6.9	75	9.8	1.7	1.6	1.2	21.0	6	2.03	12	ND	0.13	0.26	ND	0.53	ND	0.9	0.7	ND	290	170
BWW09	24h	24	10/13/93	1530	30	10.0	6.6	111	14.0	1.1	4.0	7.0	22.2	8	1.85	13	ND	0.08	0.24	ND	0.48	1.6	ND	1.6	ND	270	60
BWW09	24h	28	10/13/93	1745	30	10.0	6.2	105	12.2	1.7	3.0	3.0	22.5	7	2.08	12	ND	0.08	0.24	0.06	0.76	1.0	0.6	1.6	ND	140	49
BWW09	48h	32	10/13/93	2200	26	10.5	6.6	162	13.2	1.0	11.2	10.2	21.5	6	1.99	13	ND	0.08	0.24	0.05	0.83	ND	1.3	0.9	ND	NS	NS
BWW09	48h	36	10/14/93	200	26	9.0	6.7	80	13.2	1.8	1.2	ND	21.2	6	2.00	12	ND	0.08	0.24	ND	0.85	1.7	ND	1.9	ND	82	61
BWW09	48h	44	10/14/93	1230	27	11.0	6.8	215	11.0	ND	1.4	1.4	23.5	5	2.42	14	ND	0.08	0.24	0.06	0.49	1.7	ND	2.2	ND	NS	NS
BWW09	48h	52	10/14/93	1735	25	10.0	6.8	80	10.8	NA	1.0	1.0	24.7	5	2.36	13	ND	0.08	0.24	0.05	0.95	1.2	ND	0.9	ND	NS	NS
BWW09	72h	72	10/15/93	1105	27	10.5	NA	85	10.3	NA	3.8	1.2	22.7	5	2.14	12	ND	NA	NA	ND	0.62	1.9	2.7	1.4	ND	NS	NS
DRY WEATHER (1 sample)					**17**	**10.0**	**7.0**	**150**	**9.8**	**1.7**	**1.6**		**19.3**	**7**	**2.31**	**13**		**0.13**	**0.26**	**0.21**	**0.18**		**0.7**	**0.8**		**34**	**53**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	8	11	9	11	11	11	11	1	11	11	7	10	6	5	11		8	8
Mean *(*)*					**29**	**10.0**	**6.7**	**112**	**11.2**	**1.4**	**3.1**	**3.1**	**21.5**	**6**	**2.14**	**13**	**0.028**	**0.10**	**0.25**	**0.07**	**0.77**	**1.3**	**0.9**	**1.4**		**150**	**81**
Minimum					18	9.0	6.2	75	9.4	1.0	1.0	0.6	17.3	5	1.85	12		0.08	0.23	0.05	0.26	0.5	0.6	0.7		41	49
Maximum					41	11.0	6.9	215	14.0	1.8	11.2	10.2	24.7	8	2.42	14		0.13	0.33	0.20	2.15	1.7	1.3	2.2		430	170
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	2	3	2	3	3	3	3		3	3	2	2		1	3		3	3
Mean *(*)*					**34**	**10.0**	**6.6**	**100**	**9.7**	**1.4**	**2.4**	**0.9**	**20.2**	**6**	**2.12**	**13**		**0.13**	**0.27**	**0.05**	**0.32**		**0.8**	**1.5**		**88**	**79**
Minimum					23	10.0	6.4	90	9.4	1.2	2.0	0.6	17.3	5	1.88	12		0.13	0.23	0.05	0.26			1.1		41	54
Maximum					41	10.0	6.8	120	10.4	1.6	3.0	1.2	23.3	7	2.28	14		0.13	0.33	0.05	0.37			2.1		200	160
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4		4	4	2	4	3	3	4		4	4
Mean *(*)*					**28**	**10.0**	**6.7**	**98**	**11.5**	**1.4**	**2.9**	**3.3**	**21.3**	**7**	**2.09**	**13**		**0.11**	**0.25**	**0.13**	**0.98**	**1.0**	**0.7**	**1.3**		**262**	**88**
Minimum					18	10.0	6.2	75	9.8	1.1	1.6	1.2	19.3	6	1.85	12		0.08	0.24	0.06	0.48	0.5	0.6	0.7		140	49
Maximum					37	10.0	6.9	111	14.0	1.7	4.0	7.0	22.5	8	2.41	13		0.13	0.26	0.20	2.15	1.6	0.9	1.6		430	170
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	2	4	3	4	4	4	4		4	4	3	4	3	1	4		1	1
Mean *(*)*					**26**	**10.1**	**6.7**	**134**	**12.1**	**1.4**	**3.7**	**4.2**	**22.7**	**6**	**2.19**	**13**		**0.08**	**0.24**	**0.05**	**0.78**	**1.5**	**1.3**	**1.5**		**82**	**61**
Minimum					25	9.0	6.6	80	10.8	1.0	1.0	1.0	21.2	5	1.99	12		0.08	0.24	0.05	0.49	1.2		0.9			
Maximum					27	11.0	6.8	215	13.2	1.8	11.2	10.2	24.7	6	2.42	14		0.08	0.24	0.06	0.95	1.7		2.2			
WET WEATHER ***(Day 3)*** (1 sample)					**27**	**10.5**		**85**	**10.3**		**3.8**	**1.2**	**22.7**	**5**	**2.14**	**12**					**0.62**	**1.9**	**2.7**	**1.4**			

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW10S	Dry	P	10/12/93	945	9	8.5	6.6	250	8.2	NA	1.0	ND	62.9	10	2.77	38	0.006	ND	ND	0.19	ND	0.7	1.4	2.6	ND	NS	NS
BWW10S	Rain	0	10/12/93	1405	9	9.0	6.4	200	8.3	NA	1.0	ND	69.3	10	2.83	39	0.020	ND	ND	0.06	ND	ND	1.2	0.9	ND	NS	NS
BWW10S	Rain	9	10/12/93	2300	12	10.0	6.1	190	8.2	NA	5.2	2.0	59.5	9	2.35	36	0.046	ND	ND	0.08	ND	ND	ND	2.9	ND	NS	NS
BWW10S	Rain	12	10/13/93	235	13	10.0	6.3	200	8.8	NA	2.8	2.6	61.0	8	2.52	35	0.037	ND	ND	ND	0.26	1.4	ND	2.2	ND	NS	NS
BWW10S	24h	16	10/13/93	610	13	9.5	6.4	195	9.0	NA	4.0	1.6	59.9	10	2.74	36	0.015	ND	ND	0.10	1.10	1.5	ND	2.9	ND	NS	NS
BWW10S	24h	20	10/13/93	1150	12	10.0	6.5	170	8.8	NA	1.2	ND	64.3	8	2.34	34	0.015	ND	ND	ND	0.20	0.6	ND	0.5	12	NS	NS
BWW10S	24h	24	10/13/93	1540	13	10.0	6.6	212	11.3	NA	2.4	12.0	63.1	10	2.19	35	0.037	ND	ND	0.06	ND	1.0	ND	2.8	ND	NS	NS
BWW10S	24h	28	10/13/93	1745	12	10.0	6.0	209	11.0	NA	1.6	1.6	64.2	8	2.43	35	0.004	ND	ND	ND	ND	ND	ND	0.7	ND	NS	NS
BWW10S	48h	32	10/13/93	2200	12	9.0	6.3	165	13.0	NA	2.6	2.4	64.8	9	2.44	36	0.016	ND	ND	ND	0.32	ND	0.8	1.2	ND	NS	NS
BWW10S	48h	36	10/14/93	200	12	8.0	6.1	175	11.8	NA	1.8	1.0	61.5	8	2.32	34	0.060	ND	ND	ND	0.84	ND	ND	3.0	ND	NS	NS
BWW10S	48h	44	10/14/93	1230	12	9.0	6.7	165	9.8	NA	2.8	2.2	65.6	9	2.90	39	0.022	ND	ND	ND	ND	0.5	ND	0.9	ND	NS	NS
BWW10S	48h	52	10/14/93	1735	13	10.0	6.5	175	10.0	NA	1.0	ND	70.9	7	2.71	35	0.013	ND	ND	ND	0.34	0.9	0.6	2.3	ND	NS	NS
BWW10S	72h	72	10/15/93	1105	14	10.5	NA	185	10.6	NA	0.6	ND	62.7	7	2.40	36	NA	ND	ND	ND	0.34	1.7	1.7	3.2	ND	NS	NS
DRY WEATHER (1 sample)					**9**	**8.5**	**6.6**	**250**	**8.2**		**1.0**		**62.9**	**10**	**2.77**	**38**	**0.006**			**0.19**		**0.7**	**1.4**	**2.6**			
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11		11	8	11	11	11	11	11			4	6	6	3	11	1		
Mean *(*)*					**12**	**9.5**	**6.3**	**187**	**10.0**		**2.4**	**3.2**	**64.0**	**9**	**2.52**	**36**	**0.026**			**0.08**	**0.51**	**1.0**	**0.9**	**1.8**	**12**		
Minimum					9	8.0	6.0	165	8.2		1.0	1.0	59.5	7	2.19	34	0.004			0.06	0.20	0.5	0.6	0.5			
Maximum					13	10.0	6.7	212	13.0		5.2	12.0	70.9	10	2.90	39	0.060			0.10	1.10	1.5	1.2	3.0			
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3		3	2	3	3	3	3	3			2	1	1	1	3			
Mean *(*)*					**11**	**9.7**	**6.3**	**197**	**8.4**		**3.0**	**2.3**	**63.3**	**9**	**2.57**	**37**	**0.034**			**0.07**	**0.26**	**1.4**	**1.2**	**2.0**			
Minimum					9	9.0	6.1	190	8.2		1.0	2.0	59.5	8	2.35	35	0.020			0.06				0.9			
Maximum					13	10.0	6.4	200	8.8		5.2	2.6	69.3	10	2.83	39	0.046			0.08				2.9			
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4		4	3	4	4	4	4	4			2	2	3		4	1		
Mean *(*)*					**12**	**9.9**	**6.4**	**197**	**10.0**		**2.3**	**5.1**	**62.9**	**9**	**2.43**	**35**	**0.018**			**0.08**	**0.65**	**1.0**		**1.7**	**12**		
Minimum					12	9.5	6.0	170	8.8		1.2	1.6	59.9	8	2.19	34	0.004			0.06	0.20	0.6		0.5			
Maximum					13	10.0	6.6	212	11.3		4.0	12.0	64.3	10	2.74	36	0.037			0.10	1.10	1.5		2.9			
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4		4	3	4	4	4	4	4				3	2	2	4			
Mean *(*)*					**12**	**9.0**	**6.4**	**170**	**11.2**		**2.1**	**1.9**	**65.7**	**8**	**2.59**	**36**	**0.028**				**0.50**	**0.7**	**0.7**	**1.9**			
Minimum					12	8.0	6.1	165	9.8		1.0	1.0	61.5	7	2.32	34	0.013				0.32	0.5	0.6	0.9			
Maximum					13	10.0	6.7	175	13.0		2.8	2.4	70.9	9	2.90	39	0.060				0.84	0.9	0.8	3.0			
WET WEATHER ***(Day 3)*** (1 sample)					**14**	**10.5**		**185**	**10.6**		**0.6**		**62.7**	**7**	**2.40**	**36**					**0.34**	**1.7**	**1.7**	**3.2**			

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW11	Dry	P	10/12/93	910	202	10.0	6.7	350	6.5	5.2	5.8	2.0	73.7	15	2.65	50	0.011	2.11	0.33	0.51	0.44	6.9	8.5	5.8	15	110	38
BWW11	Rain	0	10/12/93	1330	149	10.0	6.8	300	9.1	2.1	2.8	1.8	80.3	14	3.37	51	0.014	2.49	0.30	0.51	1.47	6.4	8.9	4.2	20	99	47
BWW11	Rain	9	10/12/93	2230	372	10.0	6.6	255	9.0	1.4	6.0	3.2	70.3	10	2.80	43	0.039	2.24	0.30	0.41	3.60	14.0	10.0	10.9	25	230	75
BWW11	Rain	12	10/13/93	215	143	10.0	6.6	240	10.8	2.3	5.2	2.8	69.0	12	3.04	41	0.011	0.34	0.30	0.37	3.44	9.6	6.3	25.2	27	330	390
BWW11	24h	16	10/13/93	550	188	10.0	6.6	240	9.4	1.5	8.4	3.8	73.3	13	3.40	43	0.026	0.34	0.23	0.39	4.04	13.5	7.3	6.8	24	200	170
BWW11	24h	20	10/13/93	1115	341	10.0	6.6	250	9.8	3.2	42.4	10.8	78.9	10	3.03	46	0.084	0.34	0.23	1.04	16.43	41.2	13.1	25.8	74	400	310
BWW11	24h	24	10/13/93	1510	494	10.5	6.6	265	11.7	3.2	35.4	25.8	70.1	13	2.78	43	0.104	0.34	NA	0.74	8.64	29.2	11.7	15.2	45	1,200	340
BWW11	24h	28	10/13/93	1725	460	10.0	6.6	252	13.5	5.2	6.0	6.0	65.5	11	2.83	39	0.175	0.34	0.23	0.53	6.65	21.9	10.6	12.7	42	1,900	270
BWW11	48h	32	10/13/93	2135	346	10.0	6.7	160	12.4	4.5	14.2	5.2	65.3	11	2.60	36	0.231	0.34	0.26	0.43	5.90	25.1	9.7	15.2	44	NS	NS
BWW11	48h	36	10/14/93	145	288	9.0	6.7	200	11.8	4.5	12.6	4.8	60.8	11	2.57	35	0.122	0.34	0.26	0.23	5.45	21.6	9.9	57.4	57	1,100	350
BWW11	48h	44	10/14/93	1215	267	10.0	6.7	185	10.1	4.0	10.0	3.8	58.4	10	3.00	34	0.209	0.43	0.26	0.56	2.75	12.2	7.4	8.9	37	NS	NS
BWW11	48h	52	10/14/93	1720	235	10.5	6.6	180	10.3	NA	5.2	2.8	65.0	10	2.85	35	0.113	0.08	0.29	1.06	3.56	12.1	8.0	15.8	27	NS	NS
BWW11	72h	72	10/15/93	1100	228	10.5	NA	200	10.0	NA	2.2	1.2	65.3	9	2.84	36	NA	0.08	0.22	0.40	4.42	13.7	8.5	7.9	72	NS	NS
DRY WEATHER (1 sample)					**202**	**10.0**	**6.7**	**350**	**6.5**	**5.2**	**5.8**	**2.0**	**73.7**	**15**	**2.65**	**50**	**0.011**	**2.11**	**0.33**	**0.51**	**0.44**	**6.9**	**8.5**	**5.8**	**15**	**110**	**38**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	10	11	11	11	11	11	11	8	8
Mean *(*)*					**298**	**10.0**	**6.6**	**230**	**10.7**	**3.2**	**13.5**	**6.4**	**68.8**	**11**	**2.93**	**41**	**0.103**	**0.69**	**0.27**	**0.57**	**5.63**	**18.8**	**9.4**	**18.0**	**38**	**444**	**198**
Minimum					143	9.0	6.6	160	9.0	1.4	2.8	1.8	58.4	10	2.57	34	0.011	0.08	0.23	0.23	1.47	6.4	6.3	4.2	20	99	47
Maximum					494	10.5	6.8	300	13.5	5.2	42.4	25.8	80.3	14	3.40	51	0.231	2.49	0.30	1.06	16.43	41.2	13.1	57.4	74	1,900	390
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**221**	**10.0**	**6.7**	**265**	**9.6**	**1.9**	**4.7**	**2.6**	**73.2**	**12**	**3.07**	**45**	**0.021**	**1.69**	**0.30**	**0.43**	**2.84**	**10.0**	**8.4**	**13.4**	**24**	**196**	**111**
Minimum					143	10.0	6.6	240	9.0	1.4	2.8	1.8	69.0	10	2.80	41	0.011	0.34	0.30	0.37	1.47	6.4	6.3	4.2	20	99	47
Maximum					372	10.0	6.8	300	10.8	2.3	6.0	3.2	80.3	14	3.37	51	0.039	2.49	0.30	0.51	3.60	14.0	10.0	25.2	27	330	390
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
Mean *(*)*					**371**	**10.1**	**6.6**	**252**	**11.1**	**3.3**	**23.1**	**11.6**	**72.0**	**12**	**3.01**	**43**	**0.097**	**0.34**	**0.23**	**0.68**	**8.94**	**26.5**	**10.7**	**15.1**	**46**	**654**	**264**
Minimum					188	10.0	6.6	240	9.4	1.5	6.0	3.8	65.5	10	2.78	39	0.026	0.34	0.23	0.39	4.04	13.5	7.3	6.8	24	200	170
Maximum					494	10.5	6.6	265	13.5	5.2	42.4	25.8	78.9	13	3.40	46	0.175	0.34	0.23	1.04	16.43	41.2	13.1	25.8	74	1,900	340
WET WEATHER *(Day 2 after rain)*																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**284**	**9.9**	**6.7**	**181**	**11.2**	**4.3**	**10.5**	**4.2**	**62.4**	**11**	**2.76**	**35**	**0.169**	**0.30**	**0.27**	**0.57**	**4.42**	**17.8**	**8.8**	**24.3**	**41**	**1,100**	**350**
Minimum					235	9.0	6.6	160	10.1	4.0	5.2	2.8	58.4	10	2.57	34	0.113	0.08	0.26	0.23	2.75	12.1	7.4	8.9	27		
Maximum					346	10.5	6.7	200	12.4	4.5	14.2	5.2	65.3	11	3.00	36	0.231	0.43	0.29	1.06	5.90	25.1	9.9	57.4	57		
WET WEATHER *(Day 3)* (1 sample)					**228**	**10.5**		**200**	**10.0**		**2.2**	**1.2**	**65.3**	**9**	**2.84**	**36**		**0.08**	**0.22**	**0.40**	**4.42**	**13.7**	**8.5**	**7.9**	**72**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW13	Dry	P	10/12/93	905	228	8.8	6.9	250	10.5	2.4	4.6	1.6	68.8	15	3.46	46	0.056	2.25	0.36	0.32	0.30	6.1	7.4	5.1	12	67	41
BWW13	Rain	0	10/12/93	1305	177	10.5	6.9	300	9.6	2.1	2.4	1.6	76.7	13	3.61	49	0.051	2.29	0.36	0.82	1.17	9.5	9.8	1.3	14	130	32
BWW13	Rain	9	10/12/93	2205	423	10.0	6.7	220	9.4	1.2	3.6	3.2	63.9	9	2.26	43	0.042	1.85	0.30	0.40	1.40	3.3	7.1	4.0	5	360	300
BWW13	Rain	12	10/13/93	148	186	11.0	6.7	240	10.2	2.7	3.6	3.0	69.3	11	3.07	42	0.068	1.85	0.30	0.26	1.82	7.4	7.2	4.0	11	380	120
BWW13	24h	16	10/13/93	530	223	10.0	6.7	250	10.2	1.9	5.2	2.6	72.0	12	3.36	42	0.039	1.77	0.24	0.30	2.63	9.2	8.3	4.8	18	90	75
BWW13	24h	20	10/13/93	1057	378	10.0	6.7	205	10.2	1.5	4.4	2.0	67.3	10	2.79	40	0.012	1.81	NA	0.21	2.40	9.5	7.7	4.0	15	290	83
BWW13	24h	24	10/13/93	1455	580	10.0	6.9	270	12.9	1.6	4.4	3.2	66.5	13	2.84	43	0.053	1.85	0.30	0.55	3.76	13.4	8.9	11.8	20	130	71
BWW13	24h	28	10/13/93	1710	530	10.0	6.8	250	12.4	2.4	3.8	3.8	64.7	12	3.01	40	0.038	1.77	0.30	0.27	3.99	14.7	8.9	6.2	23	130	90
BWW13	48h	32	10/13/93	2120	495	10.0	6.7	170	13.5	2.0	13.4	8.6	68.3	11	2.64	40	0.028	1.77	0.30	0.14	3.50	13.0	8.7	ND	5	NS	NS
BWW13	48h	36	10/14/93	135	379	9.0	6.7	220	12.8	2.1	4.4	2.6	68.6	11	2.82	39	0.060	1.85	0.30	0.13	2.87	12.2	7.8	6.6	26	230	190
BWW13	48h	44	10/14/93	1200	320	10.0	6.9	215	11.6	3.3	12.0	6.2	65.4	12	3.20	38	0.181	1.65	0.30	0.56	3.95	14.1	7.9	10.7	37	NS	NS
BWW13	48h	52	10/14/93	1710	299	10.0	6.9	180	10.5	NA	8.2	4.2	66.3	10	2.90	35	0.193	1.85	0.30	0.86	3.73	12.6	7.8	13.3	18	NS	NS
BWW13	72h	72	10/15/93	1045	259	10.5	NA	175	10.7	NA	3.4	3.0	55.0	8	2.42	37	NA	1.13	0.30	ND	0.74	4.1	9.1	4.0	5	NS	NS
DRY WEATHER (1 sample)					**228**	**8.8**	**6.9**	**250**	**10.5**	**2.4**	**4.6**	**1.6**	**68.8**	**15**	**3.46**	**46**	**0.056**	**2.25**	**0.36**	**0.32**	**0.30**	**6.1**	**7.4**	**5.1**	**12**	**67**	**41**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	10	11	11	11	11	10	11	8	8
Mean *(*)*					**363**	**10.0**	**6.8**	**229**	**11.2**	**2.1**	**5.9**	**3.7**	**68.1**	**11**	**2.95**	**41**	**0.070**	**1.85**	**0.30**	**0.41**	**2.84**	**10.8**	**8.2**	**6.7**	**17**	**191**	**98**
Minimum					177	9.0	6.7	170	9.4	1.2	2.4	1.6	63.9	9	2.26	35	0.012	1.65	0.24	0.13	1.17	3.3	7.1	1.3	5	90	32
Maximum					580	11.0	6.9	300	13.5	3.3	13.4	8.6	76.7	13	3.61	49	0.193	2.29	0.36	0.86	3.99	14.7	9.8	13.3	37	380	300
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**262**	**10.5**	**6.8**	**253**	**9.7**	**2.0**	**3.2**	**2.6**	**70.0**	**11**	**2.98**	**45**	**0.054**	**2.00**	**0.32**	**0.49**	**1.46**	**6.7**	**8.0**	**3.1**	**10**	**261**	**105**
Minimum					177	10.0	6.7	220	9.4	1.2	2.4	1.6	63.9	9	2.26	42	0.042	1.85	0.30	0.26	1.17	3.3	7.1	1.3	5	130	32
Maximum					423	11.0	6.9	300	10.2	2.7	3.6	3.2	76.7	13	3.61	49	0.068	2.29	0.36	0.82	1.82	9.5	9.8	4.0	14	380	300
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
Mean *(*)*					**428**	**10.0**	**6.8**	**244**	**11.4**	**1.9**	**4.5**	**2.9**	**67.6**	**12**	**3.00**	**41**	**0.036**	**1.80**	**0.28**	**0.33**	**3.20**	**11.7**	**8.5**	**6.7**	**19**	**145**	**79**
Minimum					223	10.0	6.7	205	10.2	1.5	3.8	2.0	64.7	10	2.79	40	0.012	1.77	0.24	0.21	2.40	9.2	7.7	4.0	15	90	71
Maximum					580	10.0	6.9	270	12.9	2.4	5.2	3.8	72.0	13	3.36	43	0.053	1.85	0.30	0.55	3.99	14.7	8.9	11.8	23	290	90
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	1	1
Mean *(*)*					**373**	**9.8**	**6.8**	**196**	**12.1**	**2.5**	**9.5**	**5.4**	**67.2**	**11**	**2.89**	**38**	**0.116**	**1.78**	**0.30**	**0.42**	**3.51**	**13.0**	**8.1**	**10.2**	**22**	**230**	**190**
Minimum					299	9.0	6.7	170	10.5	2.0	4.4	2.6	65.4	10	2.64	35	0.028	1.65	0.30	0.13	2.87	12.2	7.8	6.6	5		
Maximum					495	10.0	6.9	220	13.5	3.3	13.4	8.6	68.6	12	3.20	40	0.193	1.85	0.30	0.86	3.95	14.1	8.7	13.3	37		
WET WEATHER ***(Day 3)*** (1 sample)					**259**	**10.5**		**175**	**10.7**		**3.4**	**3.0**	**55.0**	**8**	**2.42**	**37**		**1.13**	**0.30**		**0.74**	**4.1**	**9.1**	**4.0**	**5**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW14	Dry	P	10/12/93	1035	41	11.5	6.9	150	9.1	2.2	2.6	1.0	23.5	5	1.67	17	0.011	0.08	ND	0.21	ND	ND	0.8	1.1	ND	1,800	210
BWW14	Rain	0	10/12/93	1520	43	11.5	6.5	150	9.4	1.7	1.0	ND	28.3	4	1.68	16	0.045	0.08	ND	0.06	ND	ND	0.9	0.9	ND	1,300	1,000
BWW14	Rain	9	10/12/93	2350	62	10.0	6.4	100	9.4	1.3	2.8	1.6	25.0	6	1.41	14	0.081	0.08	ND	0.19	0.60	ND	0.6	2.8	ND	1,100	740
BWW14	Rain	12	10/13/93	345	58	12.0	6.7	110	9.8	2.0	2.8	2.4	27.1	5	1.69	17	0.065	0.08	ND	ND	0.30	1.0	0.9	0.2	ND	460	280
BWW14	24h	16	10/13/93	705	54	11.5	6.7	105	10.5	1.2	5.6	4.8	22.0	5	1.63	16	0.050	0.35	ND	0.09	1.29	1.3	0.1	2.8	ND	5,800	1,300
BWW14	24h	20	10/13/93	--	48	12.0	6.7	90	9.8	1.2	2.0	1.0	24.7	6	1.44	14	0.072	0.35	ND	ND	0.71	1.0	ND	2.3	ND	1,200	240
BWW14	24h	24	10/13/93	1615	45	10.0	6.6	111	12.4	1.2	2.0	1.6	25.0	6	1.34	14	0.016	0.35	ND	ND	0.65	1.0	ND	1.2	ND	460	79
BWW14	24h	28	10/13/93	1830	45	10.0	6.8	115	12.8	2.2	20.2	13.6	25.6	5	1.49	13	0.033	0.35	ND	ND	0.95	1.3	0.8	1.1	ND	370	190
BWW14	48h	32	10/13/93	2245	45	11.0	6.7	165	13.4	1.5	2.0	1.2	24.7	4	1.46	14	0.066	0.35	ND	ND	0.91	0.7	1.0	1.7	ND	NS	NS
BWW14	48h	36	10/14/93	300	45	10.0	6.7	85	12.8	1.3	1.0	1.0	25.8	4	1.46	16	0.098	0.35	ND	ND	0.68	1.1	ND	1.4	ND	230	120
BWW14	48h	44	10/14/93	1320	45	12.0	6.9	82	10.5	ND	4.4	1.8	26.3	6	1.76	16	0.075	0.35	ND	ND	0.58	1.4	ND	1.1	ND	NS	NS
BWW14	48h	52	10/14/93	1820	45	12.0	6.9	340	10.3	NA	1.8	1.4	27.6	4	1.61	16	0.058	0.48	ND	ND	0.87	1.5	ND	1.1	ND	NS	NS
BWW14	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**41**	**11.5**	**6.9**	**150**	**9.1**	**2.2**	**2.6**	**1.0**	**23.5**	**5**	**1.67**	**17**	**0.011**	**0.08**		**0.21**			**0.8**	**1.1**		**1,800**	**210**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					11	11	11	11	11	9	11	10	11	11	11	11	11	11		3	10	9	6	11		8	8
Mean *(*)*					**49**	**11.1**	**6.7**	**132**	**11.0**	**1.5**	**4.1**	**3.0**	**25.6**	**5**	**1.54**	**15**	**0.060**	**0.29**		**0.11**	**0.75**	**1.1**	**0.7**	**1.5**		**807**	**322**
Minimum					43	10.0	6.4	82	9.4	1.2	1.0	1.0	22.0	4	1.34	13	0.016	0.08		0.06	0.30	0.7	0.1	0.2		230	79
Maximum					62	12.0	6.9	340	13.4	2.2	20.2	13.6	28.3	6	1.76	17	0.098	0.48		0.19	1.29	1.5	1.0	2.8		5,800	1,300
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	2	3	3	3	3	3	3		2	2	1	3	3		3	3
Mean *(*)*					**55**	**11.2**	**6.5**	**120**	**9.5**	**1.7**	**2.2**	**2.0**	**26.8**	**5**	**1.59**	**16**	**0.064**	**0.08**		**0.13**	**0.45**	**1.0**	**0.8**	**1.3**		**870**	**592**
Minimum					43	10.0	6.4	100	9.4	1.3	1.0	1.6	25.0	4	1.41	14	0.045	0.08		0.06	0.30		0.6	0.2		460	280
Maximum					62	12.0	6.7	150	9.8	2.0	2.8	2.4	28.3	6	1.69	17	0.081	0.08		0.19	0.60		0.9	2.8		1,300	1,000
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4		1	4	4	2	4		4	4
Mean *(*)*					**48**	**10.9**	**6.7**	**105**	**11.4**	**1.5**	**7.5**	**5.3**	**24.3**	**6**	**1.48**	**14**	**0.043**	**0.35**		**0.09**	**0.90**	**1.2**	**0.5**	**1.9**		**1,043**	**262**
Minimum					45	10.0	6.6	90	9.8	1.2	2.0	1.0	22.0	5	1.34	13	0.016	0.35		0.09	0.65	1.0	0.1	1.1		370	79
Maximum					54	12.0	6.8	115	12.8	2.2	20.2	13.6	25.6	6	1.63	16	0.072	0.35		0.09	1.29	1.3	0.8	2.8		5,800	1,300
WET WEATHER *(Day 2 after rain)*																											
Count					4	4	4	4	4	2	4	4	4	4	4	4	4	4			4	4	1	4		1	1
Mean *(*)*					**45**	**11.3**	**6.8**	**168**	**11.8**	**1.4**	**2.3**	**1.4**	**26.1**	**5**	**1.57**	**16**	**0.074**	**0.38**			**0.76**	**1.2**	**1.0**	**1.3**		**230**	**120**
Minimum					45	10.0	6.7	82	10.3	1.3	1.0	1.0	24.7	4	1.46	14	0.058	0.35			0.58	0.7		1.1			
Maximum					45	12.0	6.9	340	13.4	1.5	4.4	1.8	27.6	6	1.76	16	0.098	0.48			0.91	1.5		1.7			
WET WEATHER *(Day 3)* (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW15S	Dry	P	10/12/93	840	o Flow	9.8	5.8	138	5.3	NA	8.0	3.2	32.2	13	2.74	20	0.674	1.30	ND	0.18	ND	1.6	0.5	0.9	ND	NS	NS
BWW15S	Rain	0	10/12/93	1315	o Flow	11.5	5.9	138	6.3	NA	4.2	2.4	39.8	10	2.75	22	0.845	1.32	ND	ND	ND	ND	1.2	1.0	16	NS	NS
BWW15S	Rain	9	10/12/93	2145	o Flow	11.0	6.2	125	7.6	NA	43.2	15.6	30.4	8	2.10	19	1.090	1.14	ND	0.05	ND	ND	0.5	2.7	ND	NS	NS
BWW15S	Rain	12	10/13/93	130	o Flow	11.0	6.0	131	7.4	NA	3.8	3.0	29.9	9	2.52	19	0.626	1.32	ND	0.05	0.37	1.5	0.6	2.0	ND	NS	NS
BWW15S	24h	16	10/13/93	515	o Flow	10.0	6.1	135	4.7	NA	6.4	2.0	31.1	7	2.44	19	0.978	1.30	ND	0.05	1.64	0.5	0.5	4.1	ND	NS	NS
BWW15S	24h	20	10/13/93	1105	o Flow	11.0	5.9	180	6.4	NA	10.4	2.8	32.2	8	2.24	18	1.120	1.35	ND	0.05	0.37	2.6	ND	5.1	ND	NS	NS
BWW15S	24h	24	10/13/93	1410	o Flow	13.5	6.3	138	7.8	NA	7.4	4.6	33.8	8	2.05	20	NA	1.38	ND	0.07	ND	0.7	ND	1.3	ND	NS	NS
BWW15S	24h	28	10/13/93	1905	o Flow	10.8	6.3	148	8.1	NA	6.2	4.0	34.9	9	2.39	18	1.030	1.65	ND	ND	0.66	ND	0.8	0.8	ND	NS	NS
BWW15S	48h	32	10/13/93	2210	o Flow	9.9	6.1	135	7.0	NA	28.0	26.4	34.5	9	2.46	19	0.820	1.89	ND	ND	0.30	0.5	1.5	2.2	ND	NS	NS
BWW15S	48h	36	10/14/93	220	o Flow	8.5	6.2	130	5.2	NA	2.2	1.6	33.0	8	2.37	20	0.960	1.52	ND	ND	0.27	ND	ND	1.4	ND	NS	NS
BWW15S	48h	44	10/14/93	1105	o Flow	9.9	6.4	130	6.0	NA	9.2	3.0	36.2	7	2.60	20	0.982	1.36	ND	ND	0.35	1.0	1.2	0.8	ND	NS	NS
BWW15S	48h	52	10/14/93	1705	o Flow	12.0	5.9	150	8.0	NA	7.4	3.4	38.9	7	2.59	19	0.970	1.56	ND	ND	0.33	0.9	ND	3.8	ND	NS	NS
BWW15S	72h	72	10/15/93	1030		11.0	NA	160	4.7	NA	6.6	3.4	36.0	8	2.47	19	NA	1.81	ND	ND	0.47	1.3	3.5	1.8	ND	NS	NS
DRY WEATHER (1 sample)					**No Flow**	**9.8**	**5.8**	**138**	**5.3**		**8.0**	**3.2**	**32.2**	**13**	**2.74**	**20**	**0.674**	**1.30**		**0.18**	**ND**	**1.6**	**0.5**	**0.9**			
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count						11	11	11	11		11	11	11	11	11	11	10	11		5	8	7	7	11	1		
Mean *(*)*						**10.8**	**6.1**	**140**	**6.8**		**11.7**	**6.3**	**34.1**	**8**	**2.41**	**19**	**0.942**	**1.44**		**0.05**	**0.54**	**1.1**	**0.9**	**2.3**	**16**		
Minimum						8.5	5.9	125	4.7		2.2	1.6	29.9	7	2.05	18	0.626	1.14		0.05	0.27	0.5	0.5	0.8			
Maximum						13.5	6.4	180	8.1		43.2	26.4	39.8	10	2.75	22	1.120	1.89		0.07	1.64	2.6	1.5	5.1			
WET WEATHER ***(during rain)***																											
Count						3	3	3	3		3	3	3	3	3	3	3	3		2	1	1	3	3	1		
Mean *(*)*						**11.2**	**6.0**	**131**	**7.1**		**17.1**	**7.0**	**33.4**	**9**	**2.46**	**20**	**0.854**	**1.26**		**0.05**	**0.37**	**1.5**	**0.8**	**1.9**	**16**		
Minimum						11.0	5.9	125	6.3		3.8	2.4	29.9	8	2.10	19	0.626	1.14		0.05			0.5	1.0			
Maximum						11.5	6.2	138	7.6		43.2	15.6	39.8	10	2.75	22	1.090	1.32		0.05			1.2	2.7			
WET WEATHER ***(Day 1 after rain)***																											
Count						4	4	4	4		4	4	4	4	4	4	3	4		3	3	3	2	4			
Mean *(*)*						**11.3**	**6.1**	**150**	**6.8**		**7.6**	**3.4**	**33.0**	**8**	**2.28**	**19**	**1.043**	**1.42**		**0.06**	**0.89**	**1.3**	**0.7**	**2.8**			
Minimum						10.0	5.9	135	4.7		6.2	2.0	31.1	7	2.05	18	0.978	1.30		0.05	0.37	0.5	0.5	0.8			
Maximum						13.5	6.3	180	8.1		10.4	4.6	34.9	9	2.44	20	1.120	1.65		0.07	1.64	2.6	0.8	5.1			
WET WEATHER ***(Day 2 after rain)***																											
Count						4	4	4	4		4	4	4	4	4	4	4	4			4	3	2	4			
Mean *(*)*						**10.1**	**6.1**	**136**	**6.6**		**11.7**	**8.6**	**35.7**	**8**	**2.51**	**20**	**0.933**	**1.58**			**0.31**	**0.8**	**1.4**	**2.1**			
Minimum						8.5	5.9	130	5.2		2.2	1.6	33.0	7	2.37	19	0.820	1.36			0.27	0.5	1.2	0.8			
Maximum						12.0	6.4	150	8.0		28.0	26.4	38.9	9	2.60	20	0.982	1.89			0.35	1.0	1.5	3.8			
WET WEATHER ***(Day 3)*** (1 sample)						**11.0**		**160**	**4.7**		**6.6**	**3.4**	**36.0**	**8**	**2.47**	**19**		**1.81**			**0.47**	**1.3**	**3.5**	**1.8**			

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW16	Dry	P	10/12/93	855	2	8.8	6.1	152	6.3	6.8	3.4	1.8	39.9	10	3.24	24	0.028	0.59	ND	0.23	ND	2.2	0.5	1.3	ND	63	800
BWW16	Rain	0	10/12/93	1305	2	9.3	6.1	155	7.1	3.5	3.0	1.8	45.2	11	3.26	26	0.023	0.59	ND	ND	ND	0.5	1.4	3.8	ND	84	570
BWW16	Rain	9	10/12/93	2125	7	10.0	6.3	100	8.4	6.4	44.0	18.0	34.4	8	2.50	22	ND	0.51	ND	0.11	ND	3.2	1.5	7.5	15	1,000	3,600
BWW16	Rain	12	10/13/93	120	4	9.5	6.3	130	6.8	4.0	3.4	2.6	33.9	8	2.75	22	0.029	0.51	ND	0.06	0.32	2.4	1.7	3.3	18	1,200	7,300
BWW16	24h	16	10/13/93	520	4	8.0	6.1	142	7.0	4.0	16.8	6.2	37.0	11	3.35	24	0.005	0.51	ND	0.26	0.65	1.5	0.1	7.3	ND	460	1,000
BWW16	24h	20	10/13/93	1045	4	9.0	6.2	190	8.1	4.4	9.0	6.6	39.7	8	2.73	21	0.054	0.59	ND	0.12	0.33	1.9	0.8	4.4	13	94,000	600
BWW16	24h	24	10/13/93	1425	4	10.4	6.2	135	7.5	5.9	3.2	2.6	33.3	9	2.34	22	0.041	0.46	ND	0.06	0.20	2.6	1.0	4.6	ND	71,000	1,000
BWW16	24h	28	10/13/93	1655	3	9.5	6.3	120	7.3	6.8	53.4	18.2	31.7	8	2.42	20	0.047	0.59	ND	0.08	0.94	3.8	1.4	5.6	18	60,000	1,100
BWW16	48h	32	10/13/93	2105	3	8.5	6.4	105	8.4	6.1	56.0	54.8	29.4	8	2.27	17	ND	0.51	ND	0.05	0.51	2.0	2.2	2.7	ND	NS	NS
BWW16	48h	36	10/14/93	115	3	7.3	6.4	115	7.8	5.7	13.0	7.6	25.8	7	2.41	17	0.058	0.42	ND	ND	1.17	3.0	1.1	6.8	21	13,000	3,800
BWW16	48h	44	10/14/93	1140	3	8.2	6.5	120	8.6	4.5	2.0	1.6	32.3	8	3.05	20	0.051	0.42	ND	ND	0.47	1.7	1.1	2.0	ND	NS	NS
BWW16	48h	52	10/14/93	1635	5	10.0	6.4	360	7.6	NA	3.6	2.0	36.8	10	3.40	21	0.050	0.42	ND	ND	0.61	1.9	0.9	4.8	ND	NS	NS
BWW16	72h	72	10/15/93	1000	7	11.0	NA	155	8.5	NA	2.4	2.2	42.6	7	2.86	18	NA	0.38	ND	ND	ND	1.3	3.1	2.6	ND	NS	NS
DRY WEATHER (1 sample)					**2**	**8.8**	**6.1**	**152**	**6.3**	**6.8**	**3.4**	**1.8**	**39.9**	**10**	**3.24**	**24**	**0.028**	**0.59**		**0.23**		**2.2**	**0.5**	**1.3**		**63**	**800**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	9	11		7	9	11	11	11	5	8	8
Mean *(*)*					**4**	**9.1**	**6.3**	**152**	**7.7**	**5.1**	**18.9**	**11.1**	**34.5**	**9**	**2.77**	**21**	**0.040**	**0.50**		**0.11**	**0.58**	**2.2**	**1.2**	**4.8**	**17**	**4,708**	**1,573**
Minimum					2	7.3	6.1	100	6.8	3.5	2.0	1.6	25.8	7	2.27	17	0.005	0.42		0.05	0.20	0.5	0.1	2.0	13	84	570
Maximum					7	10.4	6.5	360	8.6	6.8	56.0	54.8	45.2	11	3.40	26	0.058	0.59		0.26	1.17	3.8	2.2	7.5	21	94,000	7,300
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	2	3		2	1	3	3	3	2	3	3
Mean *(*)*					**4**	**9.6**	**6.3**	**128**	**7.4**	**4.6**	**16.8**	**7.5**	**37.8**	**9**	**2.84**	**23**	**0.026**	**0.54**		**0.09**	**0.32**	**2.0**	**1.5**	**4.9**	**17**	**465**	**2,465**
Minimum					2	9.3	6.1	100	6.8	3.5	3.0	1.8	33.9	8	2.50	22	0.023	0.51		0.06	0.32	0.5	1.4	3.3	15	84	570
Maximum					7	10.0	6.3	155	8.4	6.4	44.0	18.0	45.2	11	3.26	26	0.029	0.59		0.11	0.32	3.2	1.7	7.5	18	1,200	7,300
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4		4	4	4	4	4	2	4	4
Mean *(*)*					**3**	**9.2**	**6.2**	**147**	**7.5**	**5.3**	**20.6**	**8.4**	**35.4**	**9**	**2.71**	**22**	**0.037**	**0.54**		**0.13**	**0.53**	**2.5**	**0.8**	**5.5**	**16**	**20,717**	**901**
Minimum					3	8.0	6.1	120	7.0	4.0	3.2	2.6	31.7	8	2.34	20	0.005	0.46		0.06	0.20	1.5	0.1	4.4	13	460	600
Maximum					4	10.4	6.3	190	8.1	6.8	53.4	18.2	39.7	11	3.35	24	0.054	0.59		0.26	0.94	3.8	1.4	7.3	18	94,000	1,100
WET WEATHER *(Day 2 after rain)*																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	3	4		1	4	4	4	4	1	1	1
Mean *(*)*					**4**	**8.5**	**6.4**	**175**	**8.1**	**5.4**	**18.7**	**16.5**	**31.1**	**8**	**2.78**	**19**	**0.053**	**0.44**		**0.05**	**0.69**	**2.2**	**1.3**	**4.1**	**21**	**13,000**	**3,800**
Minimum					3	7.3	6.4	105	7.6	4.5	2.0	1.6	25.8	7	2.27	17	0.050	0.42		0.05	0.47	1.7	0.9	2.0	21		
Maximum					5	10.0	6.5	360	8.6	6.1	56.0	54.8	36.8	10	3.40	21	0.058	0.51		0.05	1.17	3.0	2.2	6.8	21		
WET WEATHER *(Day 3)* (1 sample)					**7**	**11.0**		**155**	**8.5**		**2.4**	**2.2**	**42.6**	**7**	**2.86**	**18**		**0.38**				**1.3**	**3.1**	**2.6**			

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW17	Dry	P	10/12/93	840	165	11.0	6.9	300	10.6	2.3	4.2	2.4	63.9	13	3.28	44	0.021	2.09	0.06	0.38	2.00	9.9	6.9	3.7	14	1,900	64
BWW17	Rain	0	10/12/93	1300	172	11.5	6.8	300	9.6	2.7	1.8	1.0	75.8	13	3.23	43	0.025	2.09	0.06	0.22	ND	4.7	7.4	4.4	11	550	48
BWW17	Rain	9	10/12/93	2130	204	10.0	6.7	180	9.2	2.2	30.6	4.0	47.0	9	2.13	27	0.031	1.41	0.04	0.29	3.30	14.0	5.6	44.8	57	12,000	6,100
BWW17	Rain	12	10/13/93	120	246	11.0	6.8	250	10.4	2.4	3.6	2.8	69.6	13	3.17	43	0.032	2.17	0.06	0.26	2.69	10.5	8.0	17.5	22	1,600	840
BWW17	24h	16	10/13/93	520	207	10.0	6.8	245	10.0	1.8	11.8	2.4	73.0	13	3.70	45	0.030	2.25	0.06	0.30	2.86	10.1	8.4	5.2	10	880	540
BWW17	24h	20	10/13/93	1045	223	11.0	6.7	220	11.2	2.9	6.2	2.6	73.3	10	2.85	42	0.077	2.13	0.06	0.32	1.95	9.2	7.0	4.5	18	760	360
BWW17	24h	24	10/13/93	1425	420	10.0	6.8	263	13.4	1.8	5.4	4.2	65.2	11	2.70	43	0.079	1.93	0.06	0.24	1.72	9.6	8.0	4.3	10	430	150
BWW17	24h	28	10/13/93	1655	797	10.0	6.8	256	13.0	2.3	5.6	6.4	67.6	12	3.10	43	0.013	1.85	0.06	0.22	2.41	10.6	8.6	5.2	21	490	220
BWW17	48h	32	10/13/93	2105	551	10.0	6.7	172	13.2	2.0	11.2	4.4	70.9	12	2.88	40	0.085	1.85	0.06	0.19	2.32	9.5	8.2	5.9	5	NS	NS
BWW17	48h	36	10/14/93	115	416	9.0	6.7	225	13.8	2.2	10.2	3.6	68.4	11	2.78	40	0.016	1.77	0.09	0.09	2.41	10.2	7.5	5.5	24	150	374
BWW17	48h	44	10/14/93	1140	416	10.0	6.8	210	10.6	1.4	4.9	4.4	68.6	11	3.30	41	ND	1.77	0.09	0.36	2.40	10.5	7.1	5.6	20	NS	NS
BWW17	48h	52	10/14/93	1635	406	10.0	6.8	230	11.8	NA	5.8	1.4	78.4	9	3.32	40	0.005	1.85	0.04	0.32	3.08	13.4	8.4	9.6	12	NS	NS
BWW17	72h	72	10/15/93	1000	280	10.5	NA	220	10.8	NA	5.6	1.3	60.9	10	2.52	38	ND	1.48	0.06	0.21	2.35	11.6	8.1	7.8	12	NS	NS
DRY WEATHER (1 sample)					**165**	**11.0**	**6.9**	**300**	**10.6**	**2.3**	**4.2**	**2.4**	**63.9**	**13**	**3.28**	**44**	**0.021**	**2.09**	**0.06**	**0.38**	**2.00**	**9.9**	**6.9**	**3.7**	**14**	**1,900**	**64**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	10	11	11	11	10	11	11	11	11	8	8
Mean *(*)*					**369**	**10.2**	**6.7**	**232**	**11.5**	**2.2**	**8.8**	**3.4**	**68.9**	**11**	**3.01**	**41**	**0.039**	**1.92**	**0.06**	**0.26**	**2.51**	**10.2**	**7.7**	**10.2**	**19**	**829**	**395**
Minimum					172	9.0	6.7	172	9.2	1.4	1.8	1.0	47.0	9	2.13	27	0.005	1.41	0.04	0.09	1.72	4.7	5.6	4.3	5	150	48
Maximum					797	11.5	6.8	300	13.8	2.9	30.6	6.4	78.4	13	3.70	45	0.085	2.25	0.09	0.36	3.30	14.0	8.6	44.8	57	12,000	6,100
WET WEATHER *(during rain)*																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
Mean *(*)*					**207**	**10.8**	**6.7**	**243**	**9.7**	**2.4**	**12.0**	**2.6**	**64.1**	**12**	**2.84**	**38**	**0.029**	**1.89**	**0.05**	**0.26**	**3.00**	**9.7**	**7.0**	**22.2**	**30**	**2,194**	**627**
Minimum					172	10.0	6.7	180	9.2	2.2	1.8	1.0	47.0	9	2.13	27	0.025	1.41	0.04	0.22	2.69	4.7	5.6	4.4	11	550	48
Maximum					246	11.5	6.8	300	10.4	2.7	30.6	4.0	75.8	13	3.23	43	0.032	2.17	0.06	0.29	3.30	14.0	8.0	44.8	57	12,000	6,100
WET WEATHER *(Day 1 after rain)*																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**412**	**10.3**	**6.8**	**246**	**11.9**	**2.2**	**7.3**	**3.9**	**69.8**	**12**	**3.09**	**43**	**0.050**	**2.04**	**0.06**	**0.27**	**2.24**	**9.9**	**8.0**	**4.8**	**15**	**613**	**283**
Minimum					207	10.0	6.7	220	10.0	1.8	5.4	2.4	65.2	10	2.70	42	0.013	1.85	0.06	0.22	1.72	9.2	7.0	4.3	10	430	150
Maximum					797	11.0	6.8	263	13.4	2.9	11.8	6.4	73.3	13	3.70	45	0.079	2.25	0.06	0.32	2.86	10.6	8.6	5.2	21	880	540
WET WEATHER *(Day 2 after rain)*																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**447**	**9.8**	**6.8**	**209**	**12.4**	**1.9**	**8.0**	**3.5**	**71.6**	**11**	**3.07**	**40**	**0.035**	**1.81**	**0.07**	**0.24**	**2.55**	**10.9**	**7.8**	**6.7**	**15**	**150**	**374**
Minimum					406	9.0	6.7	172	10.6	1.4	4.9	1.4	68.4	9	2.78	40	0.005	1.77	0.04	0.09	2.32	9.5	7.1	5.5	5		
Maximum					551	10.0	6.8	230	13.8	2.2	11.2	4.4	78.4	12	3.32	41	0.085	1.85	0.09	0.36	3.08	13.4	8.4	9.6	24		
WET WEATHER *(Day 3)* (1 sample)					**280**	**10.5**		**220**	**10.8**		**5.6**	**1.3**	**60.9**	**10**	**2.52**	**38**		**1.48**	**0.06**	**0.21**	**2.35**	**11.6**	**8.1**	**7.8**	**12**		

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW18	Dry	P	10/12/93	915	240	13.0	6.6	270	9.1	2.3	4.6	2.8	74.0	13	3.16	49	0.010	2.58	0.46	0.50	1.40	12.2	6.8	3.7	14	220	28
BWW18	Rain	0	10/12/93	1410	280	13.0	6.5	282	10.3	1.9	4.0	1.6	79.3	12	3.22	50	0.025	2.62	0.46	0.31	1.20	6.3	5.2	4.4	23	360	30
BWW18	Rain	9	10/12/93	2215	218	12.0	6.5	222	9.7	0.5	3.6	1.4	66.5	9	2.68	43	0.020	2.46	0.36	0.29	1.00	4.4	5.9	4.5	15	4,800	160
BWW18	Rain	12	10/13/93	140	280	12.0	6.7	285	9.0	2.3	11.8	3.4	74.5	11	3.20	48	0.035	2.79	0.41	0.30	1.75	13.6	6.9	4.5	20	1,600	130
BWW18	24h	16	10/13/93	530	236	11.8	6.6	255	9.5	1.3	6.2	2.6	76.8	12	3.41	48	0.020	2.91	0.52	0.34	2.17	11.0	6.7	6.9	26	1,500	77
BWW18	24h	20	10/13/93	1120	302	12.7	6.6	291	10.0	1.9	5.4	3.2	80.9	10	2.69	49	0.500	2.87	0.46	0.31	2.16	11.8	6.4	6.0	21	1,400	250
BWW18	24h	24	10/13/93	1505	403	12.5	6.5	245	9.4	3.5	5.6	3.6	70.4	10	2.58	43	0.485	2.58	0.41	0.30	2.14	13.7	7.6	7.6	27	10,000	950
BWW18	24h	28	10/13/93	1935	682	11.5	6.8	225	10.0	2.3	11.2	7.4	78.4	12	3.03	53	0.185	2.58	0.46	0.23	2.47	12.4	8.1	6.5	22	1,400	390
BWW18	48h	32	10/13/93	2305	429	10.5	6.7	265	11.2	2.3	10.2	6.6	81.8	11	2.88	49	0.165	2.25	0.35	0.24	2.08	10.7	7.7	5.6	5	NS	NS
BWW18	48h	36	10/14/93	240	420	10.5	6.8	240	10.3	1.8	4.9	3.2	73.5	11	2.72	46	0.240	2.00	0.30	0.09	2.03	10.0	7.7	4.9	22	260	79
BWW18	48h	44	10/14/93	830	338	9.3	6.9	240	9.6	0.5	5.8	3.2	75.9	11	3.08	49	0.275	2.00	NA	0.22	0.46	6.5	7.1	5.7	15	NS	NS
BWW18	48h	52	10/14/93	1845	395	11.0	6.8	340	10.2	NA	5.6	2.6	87.3	11	3.22	49	0.265	2.00	0.25	0.08	2.09	11.2	7.5	6.5	5	NS	NS
BWW18	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**240**	**13.0**	**6.6**	**270**	**9.1**	**2.3**	**4.6**	**2.8**	**74.0**	**13**	**3.16**	**49**	**0.010**	**2.58**	**0.46**	**0.50**	**1.40**	**12.2**	**6.8**	**3.7**	**14**	**220**	**28**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	10	11	11	11	11	11	11	8	8
Mean *(*)*					**362**	**11.5**	**6.7**	**263**	**9.9**	**1.8**	**6.8**	**3.5**	**76.8**	**11**	**2.97**	**48**	**0.201**	**2.46**	**0.40**	**0.25**	**1.78**	**10.1**	**7.0**	**5.7**	**18**	**1,464**	**156**
Minimum					218	9.3	6.5	222	9.0	0.5	3.6	1.4	66.5	9	2.58	43	0.020	2.00	0.25	0.08	0.46	4.4	5.2	4.4	5	260	30
Maximum					682	13.0	6.9	340	11.2	3.5	11.8	7.4	87.3	12	3.41	53	0.500	2.91	0.52	0.34	2.47	13.7	8.1	7.6	27	10,000	950
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**259**	**12.3**	**6.6**	**263**	**9.7**	**1.6**	**6.5**	**2.1**	**73.4**	**11**	**3.03**	**47**	**0.027**	**2.62**	**0.41**	**0.30**	**1.32**	**8.1**	**6.0**	**4.5**	**19**	**1,404**	**85**
Minimum					218	12.0	6.5	222	9.0	0.5	3.6	1.4	66.5	9	2.68	43	0.020	2.46	0.36	0.29	1.00	4.4	5.2	4.4	15	360	30
Maximum					280	13.0	6.7	285	10.3	2.3	11.8	3.4	79.3	12	3.22	50	0.035	2.79	0.46	0.31	1.75	13.6	6.9	4.5	23	4,800	160
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**406**	**12.1**	**6.6**	**254**	**9.7**	**2.2**	**7.1**	**4.2**	**76.6**	**11**	**2.93**	**48**	**0.298**	**2.74**	**0.46**	**0.30**	**2.24**	**12.2**	**7.2**	**6.8**	**24**	**2,329**	**291**
Minimum					236	11.5	6.5	225	9.4	1.3	5.4	2.6	70.4	10	2.58	43	0.020	2.58	0.41	0.23	2.14	11.0	6.4	6.0	21	1,400	77
Maximum					682	12.7	6.8	291	10.0	3.5	11.2	7.4	80.9	12	3.41	53	0.500	2.91	0.52	0.34	2.47	13.7	8.1	7.6	27	10,000	950
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	1	1
Mean *(*)*					**396**	**10.3**	**6.8**	**271**	**10.3**	**1.5**	**6.6**	**3.9**	**79.6**	**11**	**2.98**	**48**	**0.236**	**2.06**	**0.30**	**0.16**	**1.67**	**9.6**	**7.5**	**5.7**	**12**	**260**	**79**
Minimum					338	9.3	6.7	240	9.6	0.5	4.9	2.6	73.5	11	2.72	46	0.165	2.00	0.25	0.08	0.46	6.5	7.1	4.9	5		
Maximum					429	11.0	6.9	340	11.2	2.3	10.2	6.6	87.3	11	3.22	49	0.275	2.25	0.35	0.24	2.09	11.2	7.7	6.5	22		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW20	Dry	P	10/12/93	940	255	12.0	6.6	272	9.2	3.1	3.8	1.8	79.3	13	3.12	53	0.170	2.01	0.44	0.30	0.91	9.8	5.2	4.1	5	120	52
BWW20	Rain	0	10/12/93	1435	300	13.0	6.7	252	11.1	1.4	2.0	1.0	87.1	12	3.22	52	0.190	1.96	0.40	0.20	ND	4.5	4.9	3.3	10	120	21
BWW20	Rain	9	10/12/93	2245	231	12.0	6.7	265	10.9	0.5	11.8	4.0	72.1	9	2.51	48	0.265	2.09	0.40	0.27	2.30	10.0	5.6	6.0	18	480	340
BWW20	Rain	12	10/13/93	205	300	12.3	6.7	250	9.4	2.0	5.0	2.8	72.0	11	3.02	46	0.305	2.01	0.37	0.22	1.67	10.7	5.3	4.0	11	770	700
BWW20	24h	16	10/13/93	555	250	11.8	6.7	250	9.5	0.5	5.6	2.4	71.7	12	3.49	44	0.270	1.96	0.33	0.20	1.38	11.7	6.0	4.4	18	190	120
BWW20	24h	20	10/13/93	1145	323	12.6	6.7	280	13.2	2.0	9.0	2.6	73.9	10	2.69	44	0.565	2.22	0.40	0.21	1.55	10.5	5.7	5.5	22	440	120
BWW20	24h	24	10/13/93	1610	437	12.6	6.7	240	10.7	1.6	6.0	4.2	70.3	10	2.66	45	0.205	2.33	0.44	0.20	1.41	10.6	6.3	4.1	5	630	90
BWW20	24h	28	10/13/93	2005	746	11.0	6.7	235	8.2	3.1	26.4	6.4	66.8	12	3.12	44	0.250	2.47	0.41	0.31	2.05	15.4	8.0	9.4	23	890	400
BWW20	48h	32	10/13/93	2335	464	11.0	6.7	205	12.0	2.1	12.0	4.4	77.6	11	3.04	46	0.080	2.85	0.78	0.25	1.90	13.1	7.6	7.5	16	NS	NS
BWW20	48h	36	10/14/93	310	455	11.3	6.7	255	10.5	1.9	8.0	3.6	76.3	11	2.83	49	0.190	2.82	0.89	0.10	2.41	13.0	6.7	6.7	28	1,900	540
BWW20	48h	44	10/14/93	915	363	10.0	6.7	225	10.3	1.4	9.4	4.4	76.9	11	3.49	49	0.345	2.41	0.89	0.18	1.83	10.9	6.6	6.2	23	NS	NS
BWW20	48h	52	10/14/93	1900	427	11.5	6.7	260	10.6	NA	6.8	1.4	85.2	11	3.24	49	0.315	1.87	0.84	0.07	2.33	14.9	7.9	9.6	11	NS	NS
BWW20	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**255**	**12.0**	**6.6**	**272**	**9.2**	**3.1**	**3.8**	**1.8**	**79.3**	**13**	**3.12**	**53**	**0.170**	**2.01**	**0.44**	**0.30**	**0.91**	**9.8**	**5.2**	**4.1**	**5**	**120**	**52**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	11	11	10	11	11	11	11	8	8
Mean *(*)*					**391**	**11.7**	**6.7**	**247**	**10.6**	**1.6**	**9.3**	**3.4**	**75.4**	**11**	**3.03**	**47**	**0.271**	**2.27**	**0.56**	**0.20**	**1.88**	**11.4**	**6.4**	**6.1**	**17**	**501**	**185**
Minimum					231	10.0	6.7	205	8.2	0.5	2.0	1.0	66.8	9	2.51	44	0.080	1.87	0.33	0.07	1.38	4.5	4.9	3.3	5	120	21
Maximum					746	13.0	6.7	280	13.2	3.1	26.4	6.4	87.1	12	3.49	52	0.565	2.85	0.89	0.31	2.41	15.4	8.0	9.6	28	1,900	700
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
Mean *(*)*					**277**	**12.4**	**6.7**	**256**	**10.5**	**1.3**	**6.3**	**2.6**	**77.1**	**11**	**2.92**	**49**	**0.253**	**2.02**	**0.39**	**0.23**	**1.99**	**8.4**	**5.3**	**4.4**	**13**	**354**	**171**
Minimum					231	12.0	6.7	250	9.4	0.5	2.0	1.0	72.0	9	2.51	46	0.190	1.96	0.37	0.20	1.67	4.5	4.9	3.3	10	120	21
Maximum					300	13.0	6.7	265	11.1	2.0	11.8	4.0	87.1	12	3.22	52	0.305	2.09	0.40	0.27	2.30	10.7	5.6	6.0	18	770	700
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean *(*)*					**439**	**12.0**	**6.7**	**251**	**10.4**	**1.8**	**11.8**	**3.9**	**70.7**	**11**	**2.99**	**44**	**0.323**	**2.25**	**0.40**	**0.23**	**1.60**	**12.1**	**6.5**	**5.9**	**17**	**465**	**151**
Minimum					250	11.0	6.7	235	8.2	0.5	5.6	2.4	66.8	10	2.66	44	0.205	1.96	0.33	0.20	1.38	10.5	5.7	4.1	5	190	90
Maximum					746	12.6	6.7	280	13.2	3.1	26.4	6.4	73.9	12	3.49	45	0.565	2.47	0.44	0.31	2.05	15.4	8.0	9.4	23	890	400
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**427**	**11.0**	**6.7**	**236**	**10.9**	**1.8**	**9.1**	**3.5**	**79.0**	**11**	**3.15**	**48**	**0.233**	**2.49**	**0.85**	**0.15**	**2.12**	**13.0**	**7.2**	**7.5**	**20**	**1,900**	**540**
Minimum					363	10.0	6.7	205	10.3	1.4	6.8	1.4	76.3	11	2.83	46	0.080	1.87	0.78	0.07	1.83	10.9	6.6	6.2	11		
Maximum					464	11.5	6.7	260	12.0	2.1	12.0	4.4	85.2	11	3.49	49	0.345	2.85	0.89	0.25	2.41	14.9	7.9	9.6	28		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow cfs	Temperature deg C	pH	Conductivity mmhos/cm	Dissolved Oxygen mg/L	BOD mg/L	TSS mg/L	VSS mg/L	Cloride mg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	NH3-N mg/L	NO2+NO3-N mg/L	PO4-P mg/L	Cadmium ppb	Chromium ppb	Copper ppb	Nickel ppb	Lead ppb	Zinc ppb	Fecal Coliform CFU/100mL	E. coli CFU/100mL
BWW21	Dry	P	10/12/93	1000	254	12.8	6.5	260	9.7	2.3	5.0	2.0	74.6	12	3.02	54	0.006	1.98	0.39	0.34	0.92	8.4	5.0	3.6	5	19	15
BWW21	Rain	0	10/12/93	1500	264	13.0	6.8	295	11.1	2.0	3.0	1.6	89.6	11	3.20	52	0.357	2.07	0.41	0.29	1.20	9.0	4.8	5.9	12	13	31
BWW21	Rain	9	10/12/93	2315	385	12.8	6.7	260	11.8	1.0	8.0	3.4	75.3	9	2.52	49	0.199	2.03	0.41	0.23	1.46	9.4	4.1	6.8	20	2,500	6,100
BWW21	Rain	12	10/13/93	230	314	12.0	6.9	243	9.8	2.3	31.4	21.8	78.7	10	3.01	47	0.050	2.07	0.37	0.21	1.54	9.6	5.5	5.4	24	6,900	1,900
BWW21	24h	16	10/13/93	615	290	12.0	6.8	255	10.0	1.0	1.8	1.0	73.0	12	3.30	47	0.100	2.17	0.42	0.19	1.38	7.3	4.5	3.8	16	1,100	390
BWW21	24h	20	10/13/93	1205	314	12.8	6.7	269	13.8	1.6	6.2	2.2	74.8	9	2.66	43	0.070	2.21	0.42	0.19	1.55	9.6	4.3	6.9	15	1,200	260
BWW21	24h	24	10/13/93	1645	302	12.8	6.9	235	10.2	1.6	3.2	2.8	66.2	10	2.67	46	0.054	2.13	0.36	0.18	1.41	7.9	5.1	4.9	5	650	71
BWW21	24h	28	10/13/93	2045	485	11.8	6.8	220	10.2	2.3	9.8	5.6	61.8	13	2.91	43	0.046	2.25	0.36	0.17	2.05	9.9	6.0	4.5	5	610	90
BWW21	48h	32	10/13/93	10	668	11.9	6.8	250	12.1	2.1	6.2	1.4	73.3	112	2.95	46	0.132	2.61	0.42	0.16	1.90	10.1	5.0	5.6	5	NS	NS
BWW21	48h	36	10/14/93	315	558	11.3	6.8	231	11.1	1.8	11.0	7.2	68.6	11	2.89	42	0.110	2.65	0.42	0.31	2.41	11.3	6.1	6.8	29	650	390
BWW21	48h	44	10/14/93	935	429	10.5	7.0	248	10.4	1.5	9.0	4.8	73.2	11	3.56	48	0.120	2.81	0.48	0.28	1.83	9.8	6.0	5.8	22	NS	NS
BWW21	48h	52	10/14/93	1920	402	12.0	6.8	265	10.6	NA	7.4	3.2	88.4	10	3.50	48	0.043	1.57	0.36	0.41	2.33	12.5	6.6	6.9	20	NS	NS
BWW21	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**254**	**12.8**	**6.5**	**260**	**9.7**	**2.3**	**5.0**	**2.0**	**74.6**	**12**	**3.02**	**54**	**0.006**	**1.98**	**0.39**	**0.34**	**0.92**	**8.4**	**5.0**	**3.6**	**5**	**19**	**15**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					11	11	11	11	11	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	8	8
Mean (*)					**401**	**12.1**	**6.8**	**252**	**11.0**	**1.7**	**8.8**	**5.0**	**74.8**	**20**	**3.02**	**46**	**0.116**	**2.23**	**0.40**	**0.24**	**1.73**	**9.7**	**5.3**	**5.8**	**16**	**725**	**312**
Minimum					264	10.5	6.7	220	9.8	1.0	1.8	1.0	61.8	9	2.52	42	0.043	1.57	0.36	0.16	1.20	7.3	4.1	3.8	5	13	31
Maximum					668	13.0	7.0	295	13.8	2.3	31.4	21.8	89.6	112	3.56	52	0.357	2.81	0.48	0.41	2.41	12.5	6.6	6.9	29	6,900	6,100
WET WEATHER ***(during rain)***																											
Count					3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean (*)					**321**	**12.6**	**6.8**	**266**	**10.9**	**1.8**	**14.1**	**8.9**	**81.2**	**10**	**2.91**	**49**	**0.202**	**2.06**	**0.40**	**0.24**	**1.40**	**9.3**	**4.8**	**6.0**	**19**	**608**	**711**
Minimum					264	12.0	6.7	243	9.8	1.0	3.0	1.6	75.3	9	2.52	47	0.050	2.03	0.37	0.21	1.20	9.0	4.1	5.4	12	13	31
Maximum					385	13.0	6.9	295	11.8	2.3	31.4	21.8	89.6	11	3.20	52	0.357	2.07	0.41	0.29	1.54	9.6	5.5	6.8	24	6,900	6,100
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)					**348**	**12.4**	**6.8**	**245**	**11.1**	**1.6**	**5.3**	**2.9**	**69.0**	**11**	**2.89**	**45**	**0.068**	**2.19**	**0.39**	**0.18**	**1.60**	**8.7**	**5.0**	**5.0**	**10**	**851**	**160**
Minimum					290	11.8	6.7	220	10.0	1.0	1.8	1.0	61.8	9	2.66	43	0.046	2.13	0.36	0.17	1.38	7.3	4.3	3.8	5	610	71
Maximum					485	12.8	6.9	269	13.8	2.3	9.8	5.6	74.8	13	3.30	47	0.100	2.25	0.42	0.19	2.05	9.9	6.0	6.9	16	1,200	390
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean (*)					**514**	**11.4**	**6.8**	**249**	**11.1**	**1.8**	**8.4**	**4.2**	**75.9**	**36**	**3.23**	**46**	**0.101**	**2.41**	**0.42**	**0.29**	**2.12**	**10.9**	**5.9**	**6.3**	**19**	**650**	**390**
Minimum					402	10.5	6.8	231	10.4	1.5	6.2	1.4	68.6	10	2.89	42	0.043	1.57	0.36	0.16	1.83	9.8	5.0	5.6	5		
Maximum					668	12.0	7.0	265	12.1	2.1	11.0	7.2	88.4	112	3.56	48	0.132	2.81	0.48	0.41	2.41	12.5	6.6	6.9	29		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III
BWW22 is the CSO facility in Worcester.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW22	Dry	P	10/12/93																								
BWW22	Rain	0	10/12/93	2111		11.0	6.1	120	NA	51.7	67.3	24.0	30.5	4	0.83	16	1.500	0.21	0.34	0.62	0.77	10.6	9.9	2.9	100	13,000	7,800
BWW22	Rain	3	10/12/93	2132		10.0	6.3	80	NA	41.7	96.0	38.3	44.4	ND	0.25	15	0.670	0.17	0.34	0.88	7.89	67.1	11.0	57.6	127	90	46
BWW22	Rain	6	10/12/93	2152		9.5	6.2	60	NA	24.7	83.2	33.6	11.3	1	0.39	12	0.220	0.17	0.29	0.25	0.93	38.4	3.5	2.0	77	40	110
BWW22	Rain	9	10/12/93	2212		8.0	6.2	50	NA	7.8	73.4	22.4	17.3	1	0.37	8	0.360	0.17	0.23	0.20	0.35	13.8	2.9	2.9	60	52,000	18,000
BWW22	Rain	12	10/12/93	2312		8.5	6.3	60	NA	16.7	47.4	13.8	NA	2	0.41	14	0.070	0.17	0.29	0.10	ND	9.7	ND	ND	68	ND	ND
BWW22	24h	16	10/12/93	12		8.0	6.1	85	NA	6.8	52.0	26.2	NA	2	0.38	12	0.640	0.17	0.23	0.12	ND	ND	ND	ND	52	ND	ND
BWW22	24h	20	10/13/93																								
BWW22	24h	24	10/13/93																								
BWW22	24h	28	10/13/93																								
BWW22	48h	32	10/13/93																								
BWW22	48h	36	10/14/93																								
BWW22	48h	44	10/14/93																								
DRY WEATHER (1 sample)																											
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count						6	6	6		6	6	6	4	5	6	6	6	6	6	6	4	5	4	4	6	4	4
Mean *(*)*						**9.2**	**6.2**	**76**		**24.9**	**69.9**	**26.4**	**25.9**	**2**	**0.44**	**13**	**0.577**	**0.18**	**0.29**	**0.36**	**2.49**	**27.9**	**6.8**	**16.4**	**81**	**1,249**	**918**
Minimum						8.0	6.1	50		6.8	47.4	13.8	11.3	1	0.25	8	0.070	0.17	0.23	0.10	0.35	9.7	2.9	2.0	52	40	46
Maximum						11.0	6.3	120		51.7	96.0	38.3	44.4	4	0.83	16	1.500	0.21	0.34	0.88	7.89	67.1	11.0	57.6	127	52,000	18,000
WET WEATHER ***(during rain)***																											
Count						5	5	5		5	5	5	4	4	5	5	5	5	5	5	4	5	4	4	5	4	4
Mean *(*)*						**9.4**	**6.2**	**74**		**28.5**	**73.5**	**26.4**	**25.9**	**2**	**0.45**	**13**	**0.564**	**0.18**	**0.30**	**0.41**	**2.49**	**27.9**	**6.8**	**16.4**	**86**	**1,249**	**918**
Minimum						8.0	6.1	50		7.8	47.4	13.8	11.3	1	0.25	8	0.070	0.17	0.23	0.10	0.35	9.7	2.9	2.0	60	40	46
Maximum						11.0	6.3	120		51.7	96.0	38.3	44.4	4	0.83	16	1.500	0.21	0.34	0.88	7.89	67.1	11.0	57.6	127	52,000	18,000
WET WEATHER ***(Day 1 after rain)***																											
Count						1	1	1		1	1	1		1	1	1	1	1	1	1					1		
Mean *(*)*						**8.0**	**6.1**	**85**		**6.8**	**52.0**	**26.2**		**2**	**0.38**	**12**	**0.640**	**0.17**	**0.23**	**0.12**					**52**		
Minimum																											
Maximum																											
WET WEATHER ***(Day 2 after rain)***																											
Count																											
Mean *(*)*																											
Minimum																											
Maximum																											
WET WEATHER ***(Day 3)*** (1 sample)					**#REF!**	**8.0**	**6.1**	**50**	**0.0**	**7.8**	**47.4**	**13.8**	**11.3**	**1**	**0.25**	**8**	**0.070**	**0.17**	**0.23**	**0.10**	**0.35**	**9.7**	**2.9**	**2.0**	**60**	**40**	**46**

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III
BWW23 is the UBWPAD wastewater treatment facility in Worcester.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW23	Dry	P	10/12/93	715		NA	6.2	290	NA	10.3	2.6	ND	93.3	14	3.33	65	1.740	7.32	1.65	0.23	3.86	30.0	24.9	0.8	16	30	4
BWW23	Rain	0	10/12/93	1210		19.0	6.1	300	NA	7.2	1.6	1.4	105.0	13	3.35	69	0.070	4.16	1.60	0.18	1.30	22.4	19.5	1.5	16	55	1
BWW23	Rain	9	10/12/93	2130	33	14.0	6.1	335	NA	13.0	8.2	6.8	101.0	10	3.02	23	1.640	4.50	1.93	0.91	6.07	32.2	26.1	2.2	28	90	33
BWW23	Rain	12	10/13/93	0	69	NA	6.3	385	NA	29.5	6.4	5.4	109.0	10	2.85	26	0.800	4.73	1.98	1.20	4.50	26.0	25.0	2.0	26	35	250
BWW23	24h	16	10/13/93	405	75	NA	6.1	312	NA	17.0	3.8	3.0	76.1	8	2.52	55	2.080	4.50	1.34	0.70	4.39	24.4	23.6	3.4	35	21	16
BWW23	24h	20	10/13/93	815	30	16.0	6.1	310	NA	6.9	5.6	3.8	63.5	8	1.85	43	0.146	6.65	0.99	0.61	3.39	24.0	21.9	1.1	21	120	13
BWW23	24h	24	10/13/93	1200	42	15.0	6.0	255	NA	7.9	1.4	ND	63.9	10	2.24	42	0.632	NA	NA	0.42	2.74	25.3	21.0	1.3	15	37	ND
BWW23	24h	28	10/13/93	1613	36	16.5	6.2	302	NA	10.3	5.2	4.8	68.7	10	2.51	53	0.846	9.02	0.99	0.41	3.60	29.1	20.3	1.3	23	26	4
BWW23	48h	32	10/13/93	2005	31	NA	6.2	290	NA	8.0	1.8	ND	80.5	8	2.18	63	0.172	5.07	1.10	0.40	6.17	30.4	24.8	1.1	15	NS	NS
BWW23	48h	36	10/14/93	20	33	17.5	6.2	280	NA	8.6	7.8	6.8	84.4	10	2.60	69	0.156	4.62	1.16	0.67	6.77	33.4	31.0	3.4	38	190	2
BWW23	48h	44	10/14/93	800		17.0	6.4	300	NA	4.5	3.6	3.4	91.1	11	3.25	70	0.064	4.62	1.10	0.56	4.09	25.7	24.9	3.0	20	NS	NS
BWW23	48h	52	10/14/93	1557		18.0	6.1	315	NA	NA	2.6	2.0	112.0	11	3.27	73	0.904	4.62	1.04	0.66	4.15	71.1	26.1	1.8	15	NS	NS
BWW23	72h	72	10/15/02																								
DRY WEATHER (1 sample)							**6.2**	**290**		**10.3**	**2.6**		**93.3**	**14**	**3.33**	**65**	**1.740**	**7.32**	**1.65**	**0.23**	**3.86**	**30.0**	**24.9**	**0.8**	**16**	**30**	**4**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					8	8	11	11		10	11	9	11	11	11	11	11	10	10	11	11	11	11	11	11	8	7
Mean *(*)*					**44**	**16.6**	**6.2**	**308**		**11.3**	**4.4**	**4.2**	**86.8**	**10**	**2.69**	**53**	**0.683**	**5.25**	**1.32**	**0.61**	**4.29**	**31.3**	**24.0**	**2.0**	**23**	**55**	**10**
Minimum					30	14.0	6.0	255		4.5	1.4	1.4	63.5	8	1.85	23	0.064	4.16	0.99	0.18	1.30	22.4	19.5	1.1	15	21	1
Maximum					75	19.0	6.4	385		29.5	8.2	6.8	112.0	13	3.35	73	2.080	9.02	1.98	1.20	6.77	71.1	31.0	3.4	38	190	250
WET WEATHER ***(during rain)***																											
Count					2	2	3	3		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean *(*)*					**51**	**16.5**	**6.2**	**340**		**16.6**	**5.4**	**4.5**	**105.0**	**11**	**3.07**	**39**	**0.837**	**4.46**	**1.84**	**0.76**	**3.96**	**26.9**	**23.5**	**1.9**	**23**	**56**	**20**
Minimum					33	14.0	6.1	300		7.2	1.6	1.4	101.0	10	2.85	23	0.070	4.16	1.60	0.18	1.30	22.4	19.5	1.5	16	35	1
Maximum					69	19.0	6.3	385		29.5	8.2	6.8	109.0	13	3.35	69	1.640	4.73	1.98	1.20	6.07	32.2	26.1	2.2	28	90	250
WET WEATHER ***(Day 1 after rain)***																											
Count					4	3	4	4		4	4	3	4	4	4	4	4	3	3	4	4	4	4	4	4	4	3
Mean *(*)*					**46**	**15.8**	**6.1**	**295**		**10.5**	**4.0**	**3.9**	**68.1**	**9**	**2.28**	**48**	**0.926**	**6.72**	**1.11**	**0.54**	**3.53**	**25.7**	**21.7**	**1.8**	**24**	**39**	**9**
Minimum					30	15.0	6.0	255		6.9	1.4	3.0	63.5	8	1.85	42	0.146	4.50	0.99	0.41	2.74	24.0	20.3	1.1	15	21	4
Maximum					75	16.5	6.2	312		17.0	5.6	4.8	76.1	10	2.52	55	2.080	9.02	1.34	0.70	4.39	29.1	23.6	3.4	35	120	16
WET WEATHER ***(Day 2 after rain)***																											
Count					2	3	4	4		3	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1
Mean *(*)*					**32**	**17.5**	**6.2**	**296**		**7.0**	**4.0**	**4.1**	**92.0**	**10**	**2.83**	**69**	**0.324**	**4.73**	**1.10**	**0.57**	**5.30**	**40.2**	**26.7**	**2.3**	**22**	**190**	**2**
Minimum					31	17.0	6.1	280		4.5	1.8	2.0	80.5	8	2.18	63	0.064	4.62	1.04	0.40	4.09	25.7	24.8	1.1	15		
Maximum					33	18.0	6.4	315		8.6	7.8	6.8	112.0	11	3.27	73	0.904	5.07	1.16	0.67	6.77	71.1	31.0	3.4	38		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS
Water Quality Data For STORM III
BWW24 is the Woonsocket wastewater treatment facility.

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW24	Dry	P	10/12/93			NA	3.5	690	NA	29.0	29.2	22.0	224.0	7	3.65	217	NA	9.27	6.86	1.84	5.28	97.1	10.6	31.4	324	ND	18
BWW24	Rain	0	10/12/93			NA	4.2	720	NA	21.7	34.4	23.2	308.0	5	2.84	158	0.498	8.88	6.14	2.73	4.31	72.5	7.3	30.0	191	ND	ND
BWW24	Rain	9	10/12/93			NA	5.1	720	NA	11.5	30.8	11.4	281.0	5	2.65	236	0.528	14.65	5.11	1.76	5.37	72.2	6.9	27.0	134	4	2
BWW24	Rain	12	10/13/93			NA	5.2	800	NA	13.0	25.2	23.6	314.0	4	2.51	229	0.530	14.65	5.11	1.64	7.20	84.0	7.1	24.5	106	6	ND
BWW24	24h	16	10/13/93			NA	5.1	1,100	NA	9.0	26.4	18.8	399.0	4	2.55	282	0.374	13.74	5.01	1.66	6.58	75.8	7.3	21.4	124	36	52
BWW24	24h	20	10/13/93			NA	5.6	1,080	NA	15.4	41.3	27.3	386.0	4	1.93	299	0.256	13.74	5.01	1.66	7.28	84.7	5.8	26.7	134	30	48
BWW24	24h	24	10/13/93			NA	5.7	1,150	NA	20.6	30.8	27.6	359.0	5	1.85	300	0.426	13.52	5.22	1.42	7.49	84.3	6.7	22.8	112	8	50
BWW24	24h	28	10/13/93			NA	5.7	1,400	NA	29.0	33.7	22.5	364.0	3	2.09	272	0.416	13.52	4.81	1.40	7.98	82.5	8.0	20.6	108	31	40
BWW24	48h	32	10/13/93			NA	5.7	1,200	NA	13.2	25.6	20.8	373.0	2	2.00	309	0.236	13.52	4.39	1.08	7.64	72.4	6.8	22.8	77	NS	NS
BWW24	48h	36	10/14/93			NA	5.7	880	NA	12.1	30.4	23.2	374.0	2	1.97	303	0.356	13.52	4.81	1.62	7.69	74.3	6.0	21.2	105	ND	ND
BWW24	48h	44	10/14/93			NA	5.6	800	NA	6.0	13.3	2.4	393.0	2	2.50	297	0.202	13.50	4.81	1.78	6.38	71.1	6.4	20.5	109	NS	NS
BWW24	48h	52	10/14/93																								
BWW24	72h	72	10/15/02																								
DRY WEATHER (1 sample)							**3.5**	**690**		**29.0**	**29.2**	**22.0**		**7**	**3.65**	**217**		**9.27**	**6.86**	**1.84**	**5.28**	**97.1**	**10.6**	**31.4**	**324.0**		**18**
WET WEATHER *(All data: Rain, Days 1 and 2 after rain)*																											
Count							10	10		10	10	10	10	10	d	10	10	10	10	10	10	10	10	10	10	6	5
Mean (*)							**5.3**	**985**		**15.2**	**29.2**	**20.1**	**355.1**	**4**	**2.29**	**269**	**0.382**	**13.32**	**5.04**	**1.68**	**6.79**	**77.4**	**6.8**	**23.8**	**120**	**14**	**25**
Minimum							4.2	720		6.0	13.3	2.4	281.0	2	1.85	158	0.202	8.88	4.39	1.08	4.31	71.1	5.8	20.5	77	4	2
Maximum							5.7	1,400		29.0	41.3	27.6	399.0	5	2.84	309	0.530	14.65	6.14	2.73	7.98	84.7	8.0	30.0	191	36	52
WET WEATHER *(during rain)*																											
Count							3	3		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	1
Mean (*)							**4.8**	**747**		**15.4**	**30.1**	**19.4**	**301.0**	**5**	**2.67**	**208**	**0.519**	**12.73**	**5.45**	**2.04**	**5.63**	**76.2**	**7.1**	**27.2**	**144**	**5**	**2**
Minimum							4.2	720		11.5	25.2	11.4	281.0	4	2.51	158	0.498	8.88	5.11	1.64	4.31	72.2	6.9	24.5	106	4	2
Maximum							5.2	800		21.7	34.4	23.6	314.0	5	2.84	236	0.530	14.65	6.14	2.73	7.20	84.0	7.3	30.0	191	6	2
WET WEATHER *(Day 1 after rain)*																											
Count							4	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean (*)							**5.5**	**1,183**		**18.5**	**33.1**	**24.1**	**377.0**	**4**	**2.11**	**288**	**0.368**	**13.63**	**5.01**	**1.54**	**7.33**	**81.8**	**7.0**	**22.9**	**120**	**23**	**47**
Minimum							5.1	1,080		9.0	26.4	18.8	359.0	3	1.85	272	0.256	13.52	4.81	1.40	6.58	75.8	5.8	20.6	108	8	40
Maximum							5.7	1,400		29.0	41.3	27.6	399.0	5	2.55	300	0.426	13.74	5.22	1.66	7.98	84.7	8.0	26.7	134	36	52
WET WEATHER *(Day 2 after rain)*																											
Count							3	3		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
Mean (*)							**5.7**	**960**		**10.4**	**23.1**	**15.5**	**380.0**	**2**	**2.16**	**303**	**0.265**	**13.51**	**4.67**	**1.49**	**7.24**	**72.6**	**6.4**	**21.5**	**97**		
Minimum							5.6	800		6.0	13.3	2.4	373.0	2	1.97	297	0.202	13.50	4.39	1.08	6.38	71.1	6.0	20.5	77		
Maximum							5.7	1,200		13.2	30.4	23.2	393.0	2	2.50	309	0.356	13.52	4.81	1.78	7.69	74.3	6.8	22.8	109		
WET WEATHER *(Day 3)* (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

BLACKSTONE RIVER WET WEATHER WATER SAMPLES ANALYSIS RESULTS

Water Quality Data For STORM III

BWW25 is a direct discharge from NBC's Bucklin Point wastewater facility (Seekonk River).

Station	Weather (Dry, rain, days after rain)	Run	Date	Time	Flow	Temperature	pH	Conductivity	Dissolved Oxygen	BOD	TSS	VSS	Cloride	Calcium	Magnesium	Sodium	NH3-N	NO2+NO3-N	PO4-P	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Fecal Coliform	E. coli
					cfs	deg C		mmhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	ppb	ppb	ppb	ppb	ppb	CFU/100mL	CFU/100mL
BWW25	Dry	P	10/12/93	1020	23	18.0	6.6	550	5.2	15.0	10.0	6.0	87.1	21	2.99	77	23.200	0.86	1.83	0.21	1.21	9.9	27.1	2.7	16	1	1
BWW25	Rain	0	10/12/93	1515	24	17.0	6.6	520	5.0	26.2	9.0	3.8	95.0	17	3.01	77	20.600	0.78	1.95	0.08	1.17	4.5	19.8	3.2	25	90	9
BWW25	Rain	9	10/12/93	2323		19.0	6.9	600	2.4	8.0	35.6	33.2	116.0	7	2.49	98	25.100	ND	5.64	0.35	3.04	12.8	31.6	9.2	50	900	93
BWW25	Rain	12	10/13/93	240	16	18.0	6.8	595	4.6	14.5	20.4	18.8	112.0	5	2.49	94	12.500	ND	5.64	0.08	4.36	16.0	30.0	4.0	21	180	51
BWW25	24h	16	10/13/93	620	12	17.8	6.4	500	4.5	9.0	10.0	7.2	108.0	12	3.04	85	8.940	ND	3.25	ND	3.24	9.9	24.7	3.5	24	82	3
BWW25	24h	20	10/13/93	1220	24	17.3	6.6	550	3.6	7.9	8.4	6.2	85.6	10	1.90	73	10.500	0.14	1.22	0.05	2.61	8.2	23.5	3.4	25	110	8
BWW25	24h	24	10/13/93	1700	21	16.5	6.7	435	3.1	10.6	43.2	19.2	80.6	12	1.87	75	12.200	0.14	0.67	0.08	2.47	13.2	24.4	3.2	18	32	1
BWW25	24h	28	10/13/93	2115	22	17.5	6.8	420	3.0	15.0	12.9	10.7	93.4	16	2.22	88	12.500	ND	0.85	ND	2.79	15.3	24.4	2.7	23	110	17
BWW25	48h	32	10/13/93	35	16	16.5	6.8	500	3.6	6.7	31.2	28.0	119.0	15	2.20	99	12.200	ND	0.91	ND	3.16	12.5	33.7	3.2	12	NS	NS
BWW25	48h	36	10/14/93	335	14	17.3	6.9	658	2.9	8.9	6.8	4.2	119.0	16	2.24	102	16.800	ND	0.97	0.06	3.68	12.6	34.4	2.9	37	40	3
BWW25	48h	44	10/14/93	950	23	15.5	6.8	500	2.7	6.0	12.9	12.4	122.0	17	2.60	103	NA	0.34	0.91	0.05	3.42	12.4	30.5	2.5	46	NS	NS
BWW25	48h	52	10/14/93	1930	23	18.0	6.6	720	2.3	NA	11.0	10.0	149.0	15	2.68	117	18.000	0.34	0.97	0.22	8.14	14.0	30.9	7.3	37	NS	NS
BWW25	72h	72	10/15/02																								
DRY WEATHER (1 sample)					**23**	**18.0**	**6.6**	**550**	**5.2**	**15.0**	**10.0**	**6.0**	**87.1**	**21**	**2.99**	**77**	**23.200**	**0.86**	**1.83**	**0.21**	**1.21**	**9.9**	**27.1**	**2.7**	**16**	**1**	**1**
WET WEATHER ***(All data: Rain, Days 1 and 2 after rain)***																											
Count					10	11	11	11	11	10	11	11	11	11	11	11	10	5	11	8	11	11	11	11	11	8	8
Mean (*)					**19**	**17.3**	**6.7**	**545**	**3.4**	**11.3**	**18.3**	**14.0**	**109.1**	**13**	**2.43**	**92**	**14.934**	**0.35**	**2.09**	**0.12**	**3.46**	**11.9**	**28.0**	**4.1**	**29**	**108**	**9**
Minimum					12	15.5	6.4	420	2.3	6.0	6.8	3.8	80.6	5	1.87	73	8.940	0.14	0.67	0.05	1.17	4.5	19.8	2.5	12	32	1
Maximum					24	19.0	6.9	720	5.0	26.2	43.2	33.2	149.0	17	3.04	117	25.100	0.78	5.64	0.35	8.14	16.0	34.4	9.2	50	900	93
WET WEATHER ***(during rain)***																											
Count					2	3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	3	3
Mean (*)					**20**	**18.0**	**6.8**	**572**	**4.0**	**16.2**	**21.7**	**18.6**	**107.7**	**10**	**2.66**	**90**	**19.400**	**0.78**	**4.41**	**0.17**	**2.86**	**11.1**	**27.1**	**5.5**	**32**	**244**	**35**
Minimum					16	17.0	6.6	520	2.4	8.0	9.0	3.8	95.0	5	2.49	77	12.500	0.78	1.95	0.08	1.17	4.5	19.8	3.2	21	90	9
Maximum					24	19.0	6.9	600	5.0	26.2	35.6	33.2	116.0	17	3.01	98	25.100	0.78	5.64	0.35	4.36	16.0	31.6	9.2	50	900	93
WET WEATHER ***(Day 1 after rain)***																											
Count					4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	2	4	4	4	4	4	4	4
Mean (*)					**20**	**17.3**	**6.6**	**476**	**3.5**	**10.6**	**18.6**	**10.8**	**91.9**	**13**	**2.26**	**80**	**11.035**	**0.14**	**1.50**	**0.07**	**2.78**	**11.7**	**24.3**	**3.2**	**23**	**75**	**4**
Minimum					12	16.5	6.4	420	3.0	7.9	8.4	6.2	80.6	10	1.87	73	8.940	0.14	0.67	0.05	2.47	8.2	23.5	2.7	18	32	1
Maximum					24	17.8	6.8	550	4.5	15.0	43.2	19.2	108.0	16	3.04	88	12.500	0.14	3.25	0.08	3.24	15.3	24.7	3.5	25	110	17
WET WEATHER ***(Day 2 after rain)***																											
Count					4	4	4	4	4	3	4	4	4	4	4	4	3	2	4	3	4	4	4	4	4	1	1
Mean (*)					**19**	**16.8**	**6.8**	**595**	**2.9**	**7.2**	**15.5**	**13.7**	**127.3**	**16**	**2.43**	**105**	**15.667**	**0.34**	**0.94**	**0.11**	**4.60**	**12.9**	**32.4**	**4.0**	**33**	**40**	**3**
Minimum					14	15.5	6.6	500	2.3	6.0	6.8	4.2	119.0	15	2.20	99	12.200	0.34	0.91	0.05	3.16	12.4	30.5	2.5	12		
Maximum					23	18.0	6.9	720	3.6	8.9	31.2	28.0	149.0	17	2.68	117	18.000	0.34	0.97	0.22	8.14	14.0	34.4	7.3	46		
WET WEATHER ***(Day 3)*** (1 sample)																											

ND = Not Detected NM= Not Measured NS= No Sample NA = Not Analyzed (*) Geometric mean for Fecal Coliform and E. Coli

Section A15-6

Wet Weather Events
Rainfall Characteristics

- all Storms -

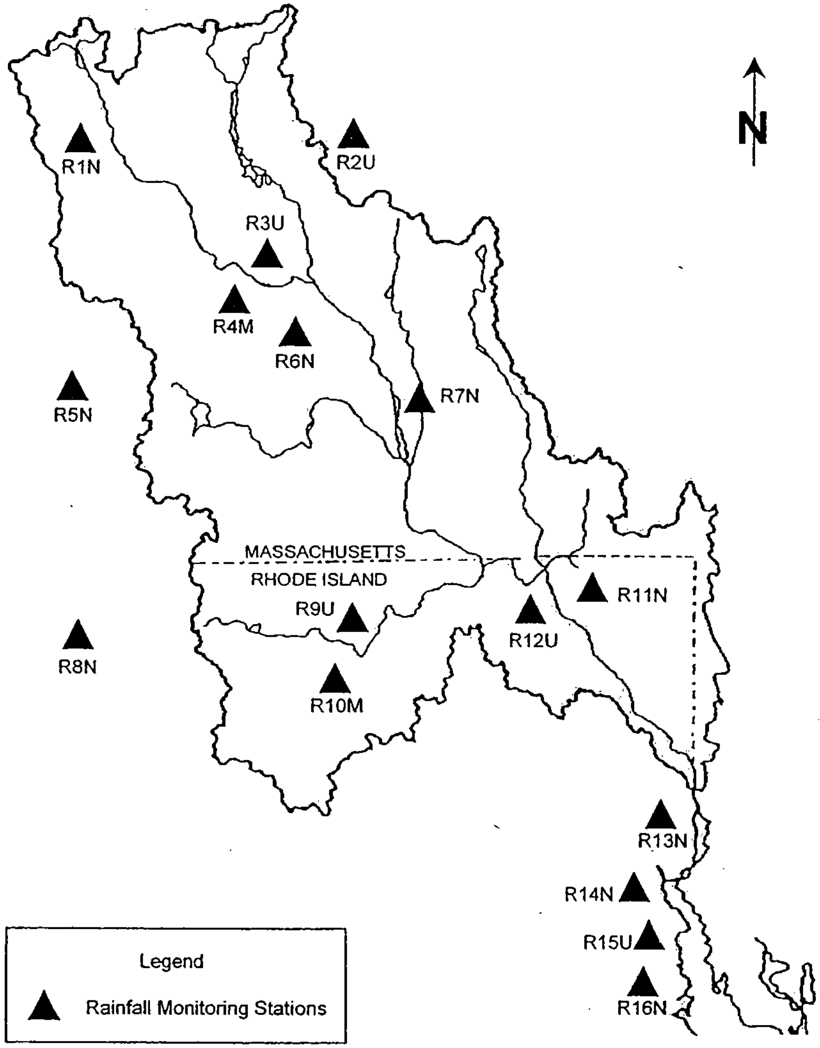


Figure A15-6-1 Raingage Locations for the Blackstone River Wet Weather Studies

Table A15-6-1 Precipitation Log of Three Storms for the Blackstone River Wet Weather Studies

Gage Name	Location	Maintained By	Type	Rainfall in inches		
				Storm 1	Storm 2	Storm 3
R1N	Worcester Airport, MA	NWS	1	0.44	0.98	1.30
R2U	Westborough WWTF, MA	URI	1	NA	0.83	0.85
R3U	Millbury WWTF, MA	URI	1	NA	0.77	NA
R4M	Millbury WWTF, MA	WWTF	2	0.66	0.62	NA
R5N	Buffumville, MA	NWS	2	0.63	0.99	1.15
R6N	Northbridge, MA	NWS	2	0.54	0.94	0.69
R7N	West Hill Dam, MA	NWS	2	0.53	0.89	0.90
R8N	Putnam, CT	NWS	2	0.63	0.84	1.15
R9U	Burriville WWTF, RI	URI	1	NA	0.85	NA
R10M	Burriville WWTF, RI	WWTF	2	0.74	NA	0.48
R11N	Woonsocket, RI	NWS	2	0.56	0.86	0.61
R12U	Woonsocket WWTF, RI	URI	1	0.46	0.78	NA
R13M	Bucklin Pt. WWTF, RI	WWTF	2	0.49	NA	NA
R14S	Providence, RI	RIDEM	2	0.51	NA	NA
R15U	Fields Point WWTF, RI	URI	1	0.62	0.76	NA
R16N	TF Green Airport, RI	NWS	1	0.62	0.80	0.27

R1N: R = Rainfall; 1 = Station ID; N = National Weather Service (NWS); U = URI; S = State; and M = Municipal; RIDEM = RI Department of Environmental Management; Type 1 = Continuous Recorder; Type 2 = Daily Total; NA = Not Available.

Table A15-6-2
Average Rainfall Characteristics

Characteristic	Storm 1	Storm 2	Storm 3
TR (inch)	0.56	0.88	0.81
D (hrs)	6.0	16.0	8.5
ADP (days)	11.0	8.0	8.0
PI (in/hr)	0.20 (R12U)	0.23 (R1N)	0.52 (R1N)
AI (in/hr)	0.09	0.06	0.10

TR = Total Rainfall Based on Thiessen Method;
D = Rainfall Duration; ADP = Anticedent Dry Period;
PI = Peak Intensity (R1N = Station ID); AI = Average Intensity

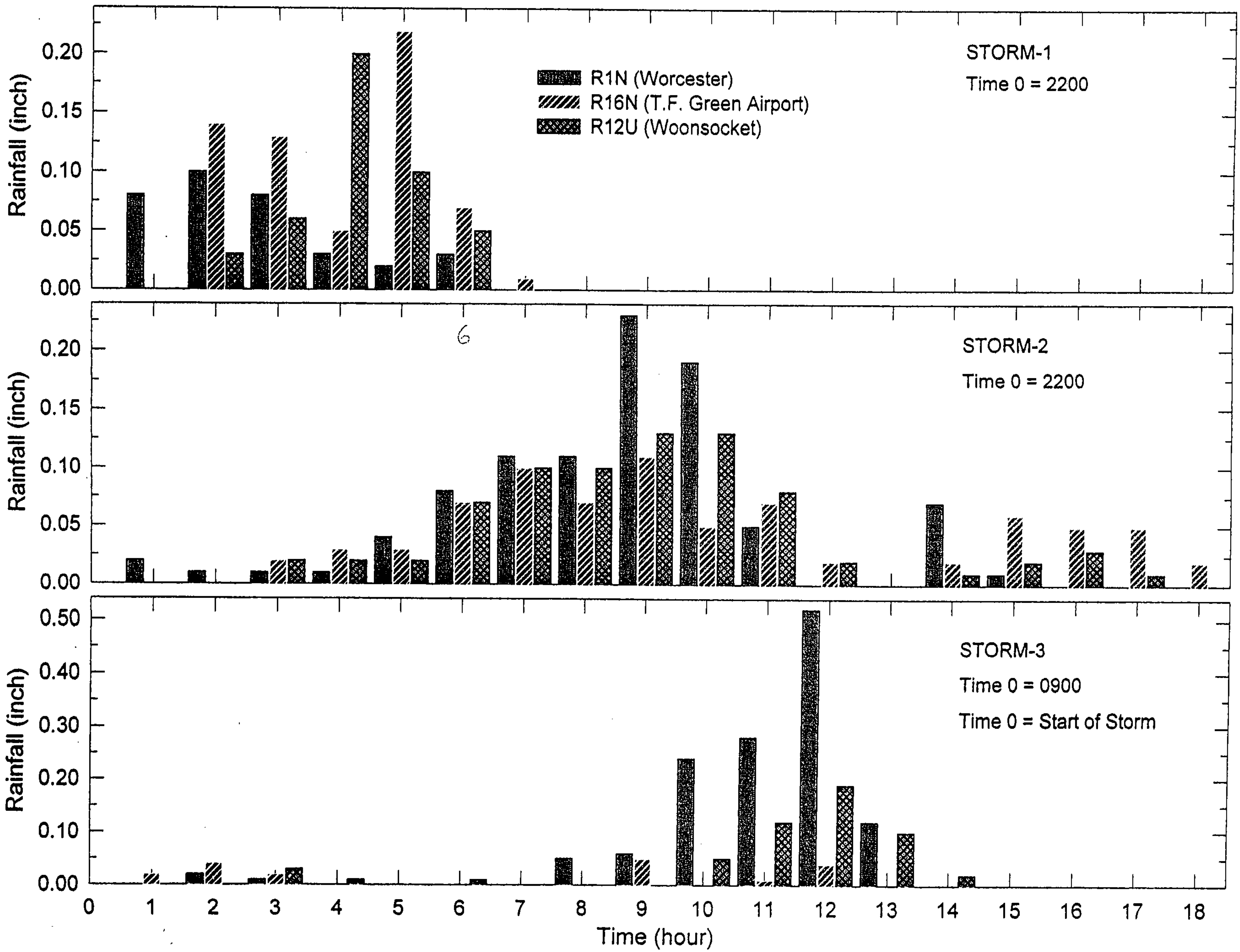


Figure A15-6-2 Rainfall For Blackstone River Wet Weather Studies

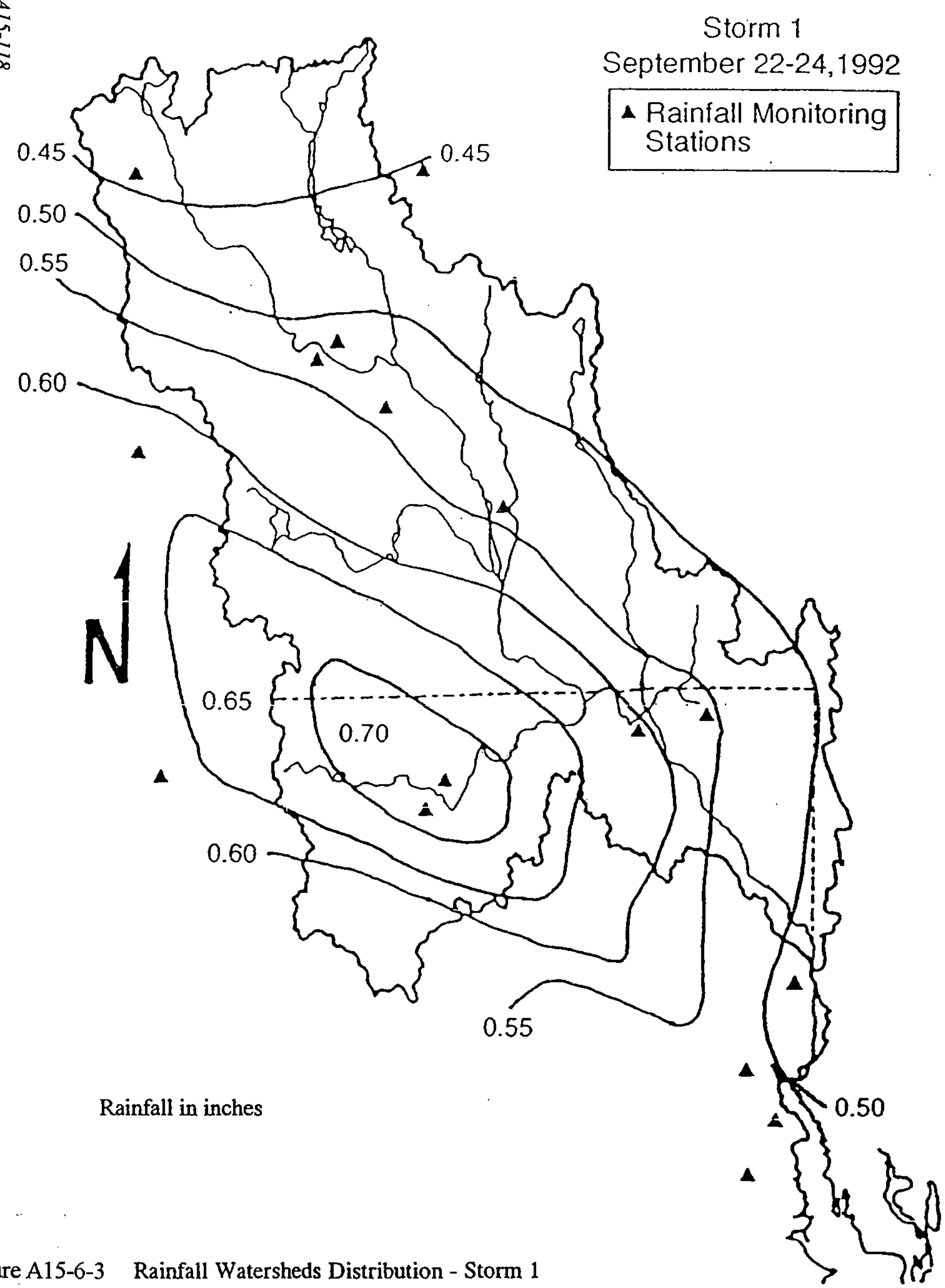


Figure A15-6-3 Rainfall Watersheds Distribution - Storm 1

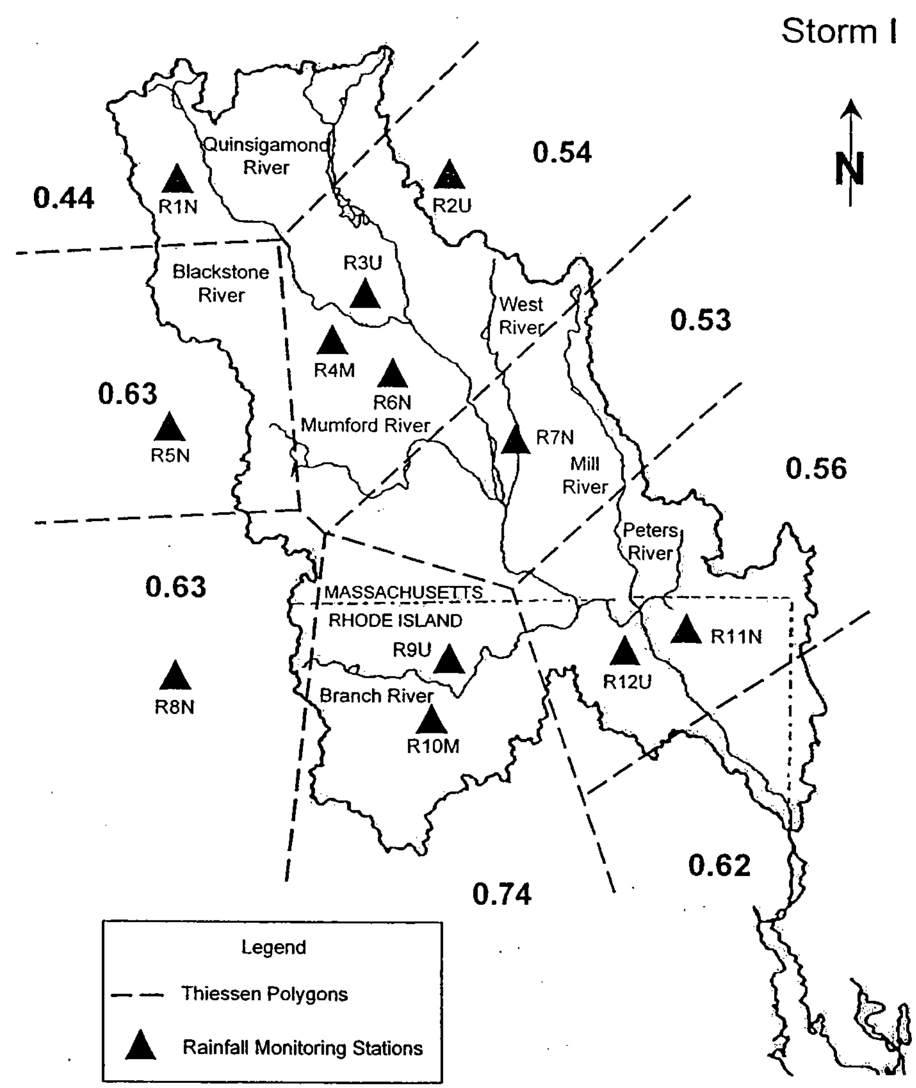


Figure A15-6-4 Thiessen Polygons - Storm 1

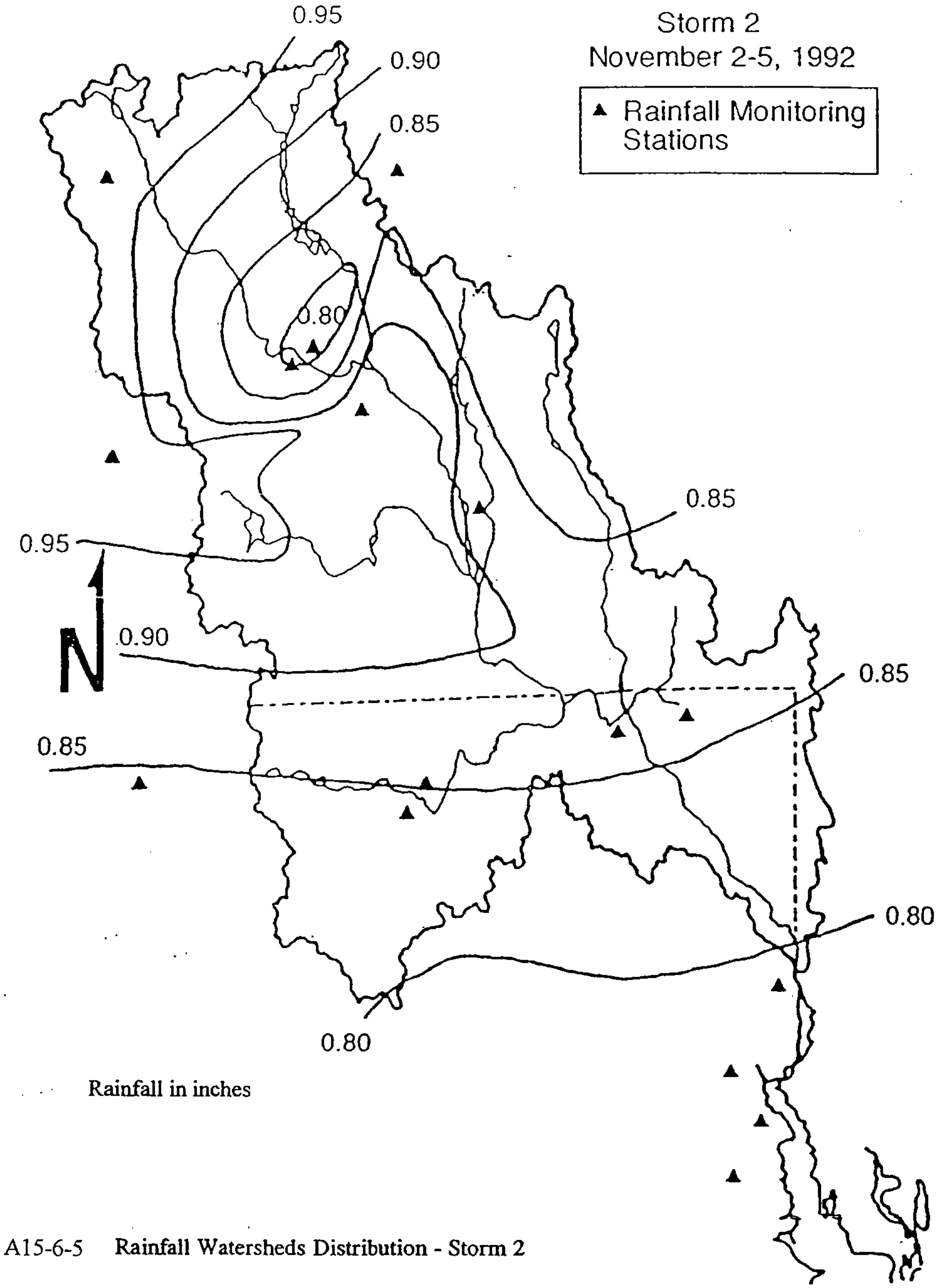


Figure A15-6-5 **Rainfall Watersheds Distribution - Storm 2**

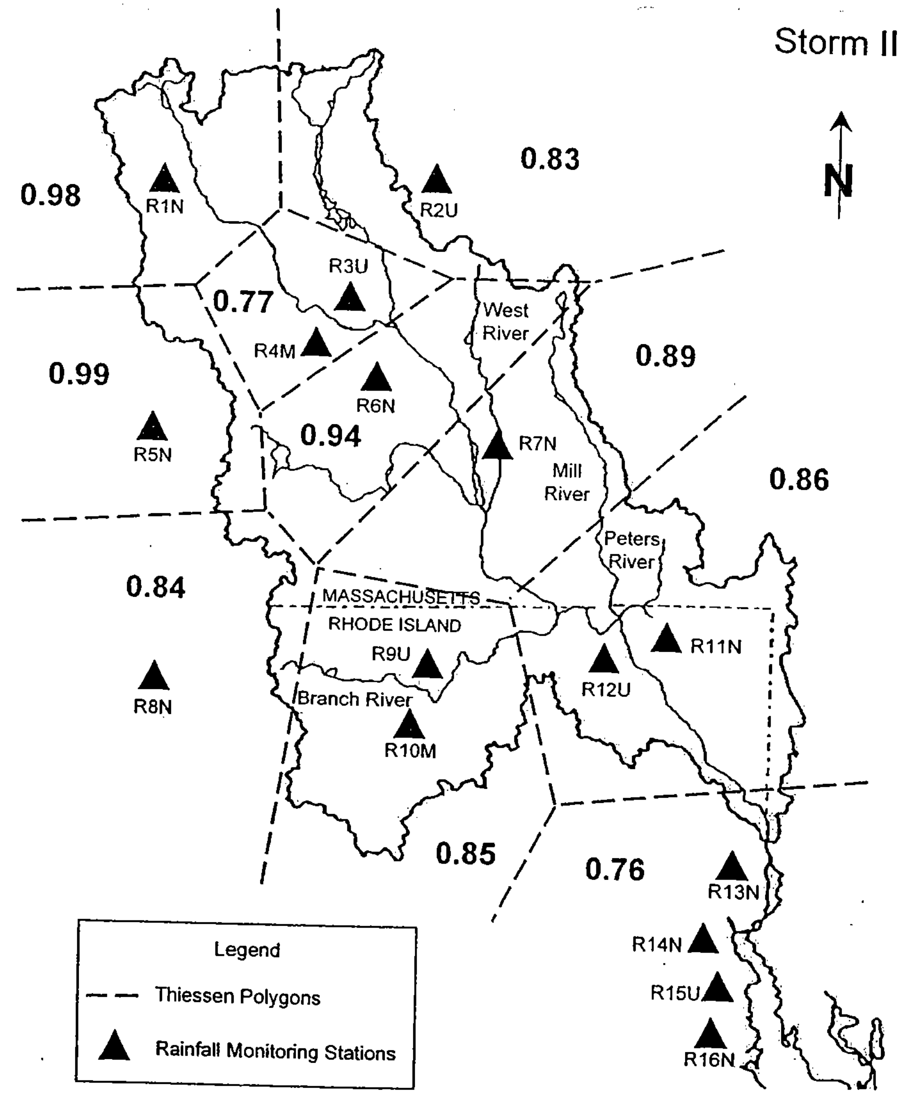


Figure A15-6-6 **Thiessen Polygons - Storm 2**

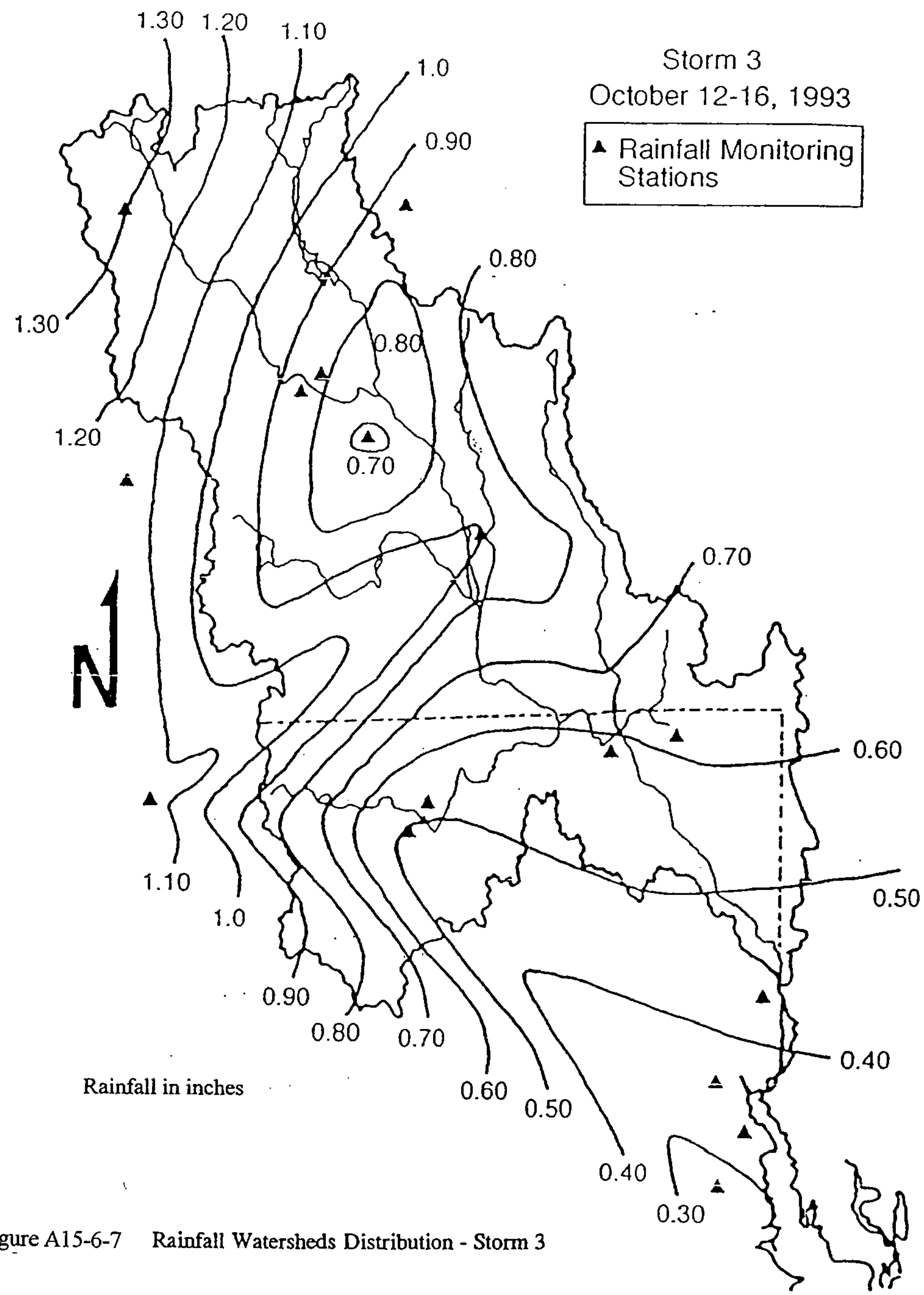


Figure A15-6-7 Rainfall Watersheds Distribution - Storm 3

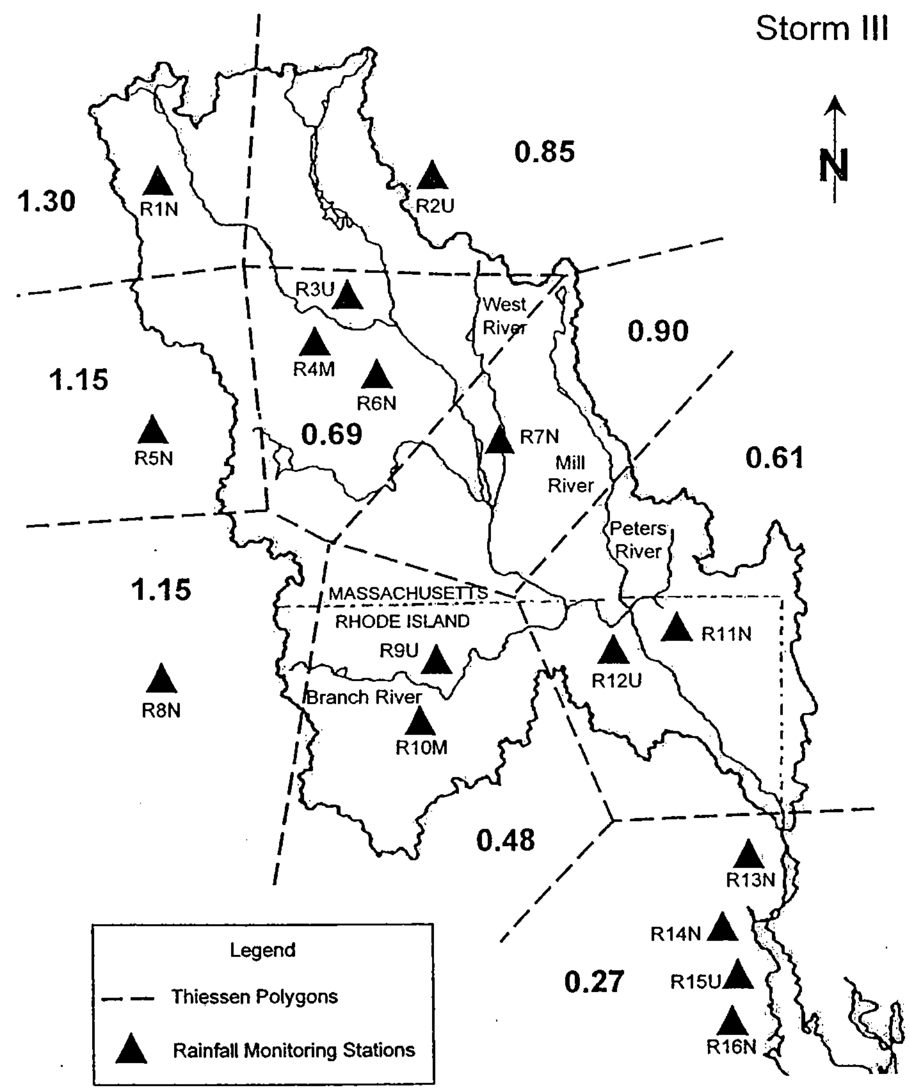


Figure A15-6-8 Thiessen Polygons - Storm 3

Table A15-6-3 Summary Table of Rainfall for Individual Subwatersheds

Station	Area	Rainfall (inch)		
	(square mile)	Storm 1	Storm 2	Storm 3
BWW00	60.5	0.494	0.955	1.253
BWW01	15.5	0.440	0.857	1.300
BWW02	6.2	0.461	0.784	1.129
BWW04	16.7	0.534	0.792	0.864
BWW05	34.2	0.473	0.857	0.944
BWW06	16.5	0.540	0.848	0.713
BWW07	6.0	0.540	0.940	0.690
BWW08	6.1	0.533	0.907	0.827
BWW09	68.5	0.560	0.928	0.881
BWW10	37.4	0.535	0.899	0.827
BWW11	2.3	0.530	0.890	0.900
BWW14	93.1	0.723	0.850	0.513
BWW13	13.4	0.617	0.861	0.665
BWW15	23.0	0.525	0.883	0.820
BWW16	11.6	0.510	0.860	0.610
BWW17	20.0	0.510	0.860	0.603
BWW18	12.2	0.510	0.860	0.610
BWW20	13.6	0.495	0.860	0.610
BWW21	23.3	0.502	0.844	0.594

Table A15-6-4 Summary Table of Rainfall for Cumulative Subwatersheds

Station	Area	Rainfall (inch)		
	(square mile)	Storm 1	Storm 2	Storm 3
BWW00	60.5	0.494	0.955	1.253
BWW01	75.9	0.483	0.935	1.263
BWW02	82.1	0.481	0.923	1.253
BWW04	98.8	0.490	0.901	1.187
BWW06	149.5	0.492	0.885	1.079
BWW07	155.5	0.493	0.887	1.064
BWW08	161.6	0.495	0.888	1.055
BWW11	269.8	0.517	0.900	0.978
BWW13	376.3	0.572	0.886	0.852
BWW17	430.9	0.565	0.884	0.832
BWW18	443.1	0.563	0.883	0.826
BWW20	456.7	0.561	0.883	0.819
BWW21	480.0	0.558	0.881	0.809

Section A15-7

Wet Weather Events
Flow Characteristics

- all Storms -

Table A15-7-1 Hydrograph Characteristics - Storm 1

Station	Wet Volume (10^6 cf)	Total Volume (10^6 cf)	N (hrs)
BWW00	3.63	5.77	36.2
BWW01	3.63	5.82	36.0
BWW02	4.07	15.5	37.3
BWW04	5.31	16.9	38.0
BWW05	0.43	1.03	34.2
BWW06	9.39	20.7	39.6
BWW07	5.36	27.0	39.8
BWW08	4.20	34.7	39.9
BWW09	0.10	1.63	36.6
BWW10	0.07	1.34	34.5
BWW11	1.37	24.4	42.0
BWW13	2.91	31.1	43.4
BWW14	1.46	6.45	37.8
BWW15	1.24	2.54	32.8
BWW16	0.44	0.80	30.7
BWW17	5.60	35.4	44.0
BWW18	3.43	36.1	44.1
BWW20	5.32	48.3	44.3
BWW21	6.41	56.1	44.5

Table A15-7-2 Hydrograph Characteristics - Storm 2

Station	Wet Volume (10^6 cf)	Total Volume (10^6 cf)	N (hrs)
BWW00	8.09	22.6	36.2
BWW01	8.66	23.9	36.0
BWW02	11.7	34.4	37.3
BWW04	15.0	39.4	38.0
BWW05	1.39	2.75	34.2
BWW06	17.4	44.5	39.6
BWW07	19.6	46.4	39.8
BWW08	26.1	62.1	39.9
BWW09	7.45	17.4	36.6
BWW10			34.5
BWW11	35.5	88.7	42.0
BWW13	43.1	116	43.4
BWW14	11.2	31.3	37.8
BWW15	2.75	5.57	32.8
BWW16	1.31	2.68	30.7
BWW17	49.7	145	44.0
BWW18	68.3	155	44.1
BWW20	75.3	172	44.3
BWW21	85.1	179	44.5

Table A15-7-3 Hydrograph Characteristics - Storm 3

Station	Wet Volume (10^6 cf)	Total Volume (10^6 cf)	N (hrs)
BWW00	21.5	30.2	36.2
BWW01	22.7	32.5	36.0
BWW02	29.6	41.9	37.3
BWW04	30.4	53.6	38.0
BWW05	2.24	4.58	34.2
BWW06	27.0	47.5	39.6
BWW07	25.2	55.6	39.8
BWW08	23.7	65.2	39.9
BWW09	1.63	5.39	36.6
BWW10	0.27	1.91	34.5
BWW11	30.2	73.6	42.0
BWW13	31.2	90.7	43.4
BWW14	1.18	8.40	37.8
BWW15	0.26	0.63	32.8
BWW16	0.25	0.53	30.7
BWW17	39.0	91.6	44.0
BWW18	27.7	73.1	44.1
BWW20	28.3	107	44.3
BWW21	34.4	113	44.5

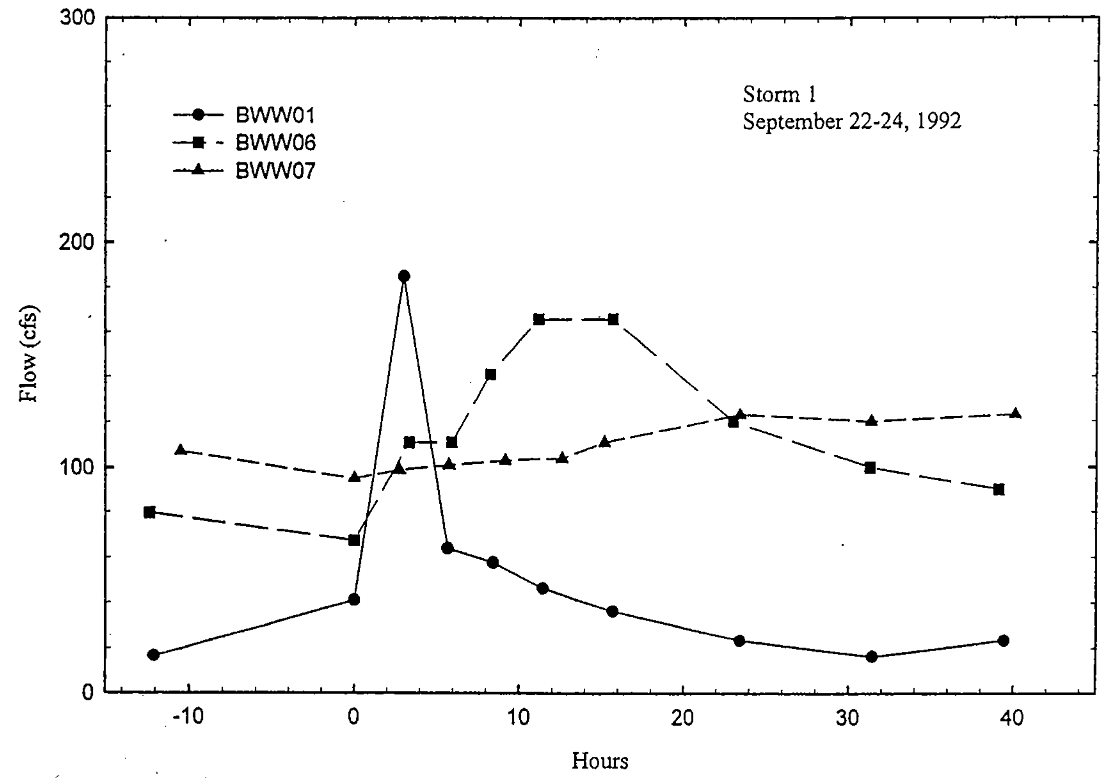


Figure A15-7-1 Hydrograph Comparison - Storm 1

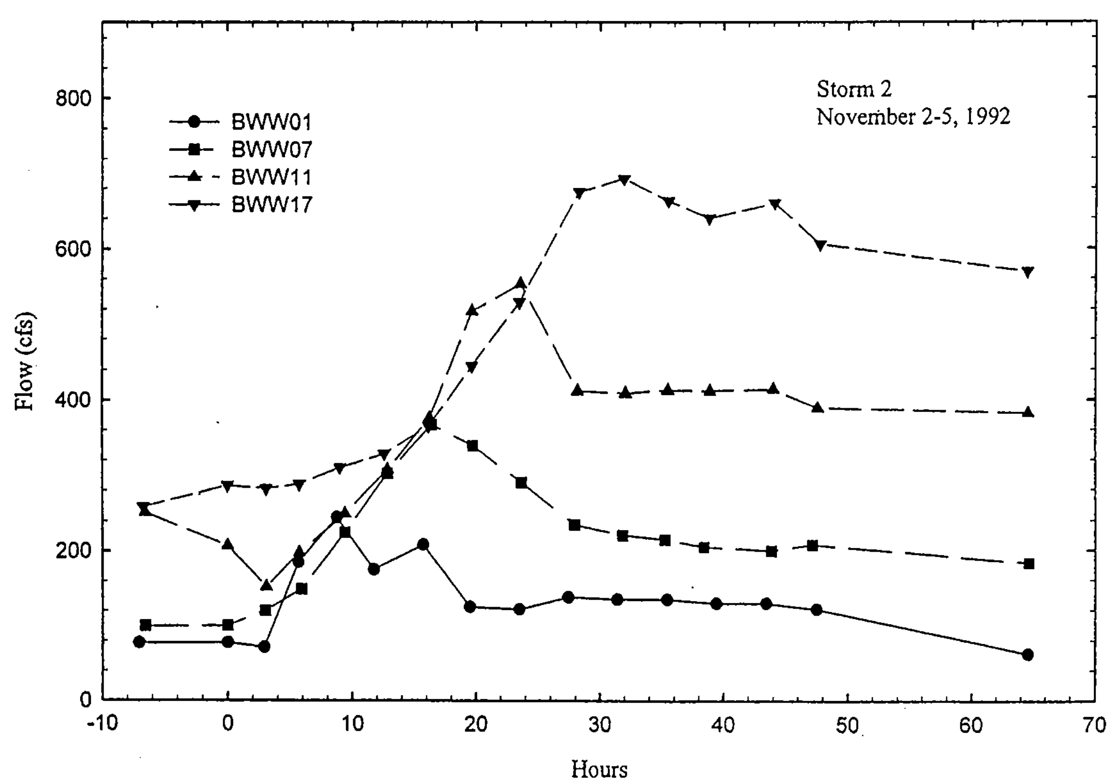


Figure A15-7-2 Hydrograph Comparison - Storm 2

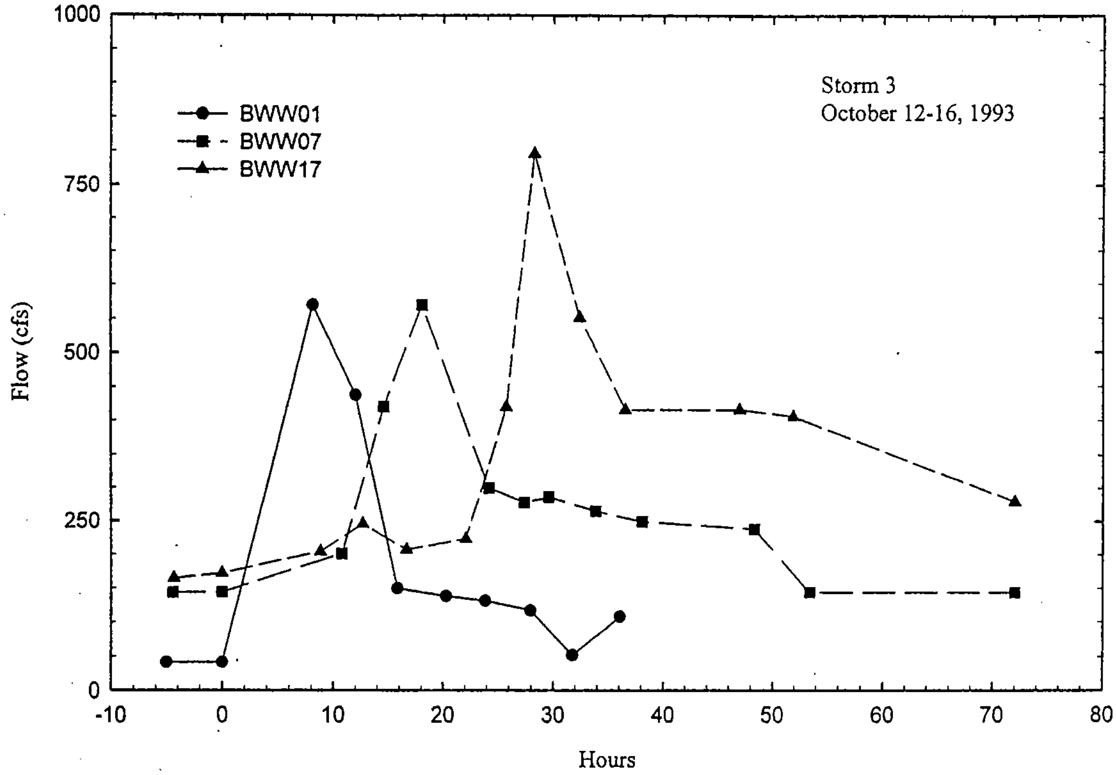


Figure A15-7-3 Hydrograph Comparison - Storm 3

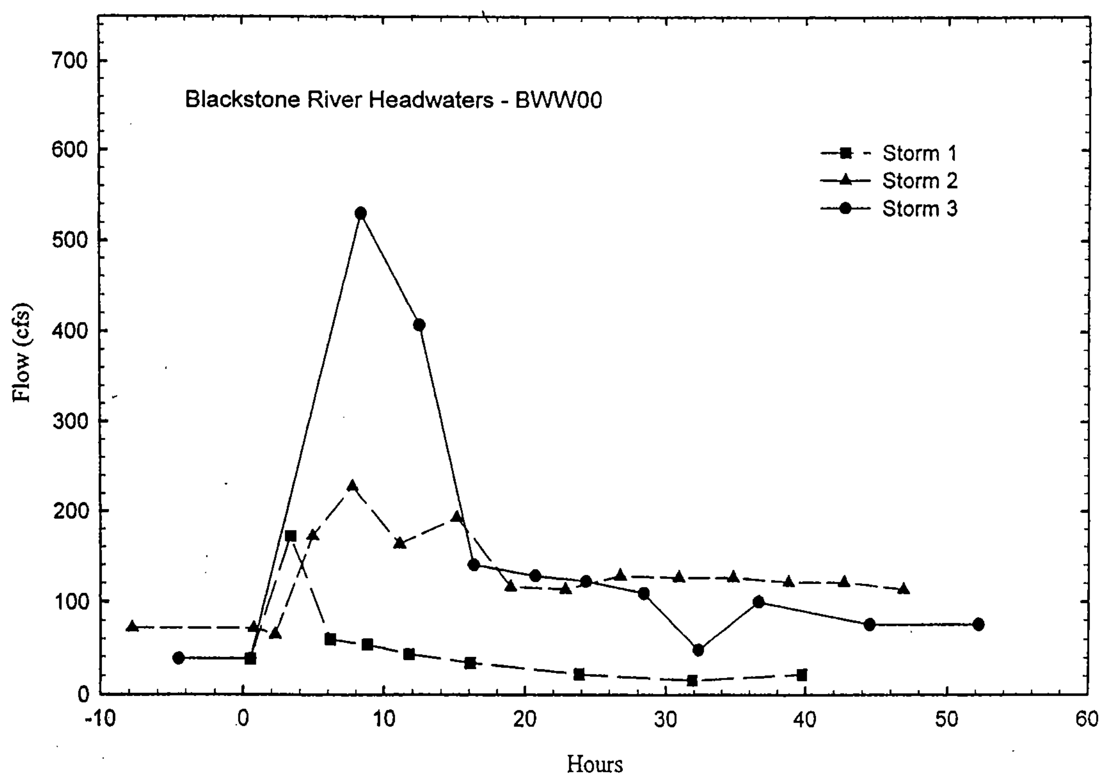


Figure A15-7-4 Hydrograph Comparison - Headwaters

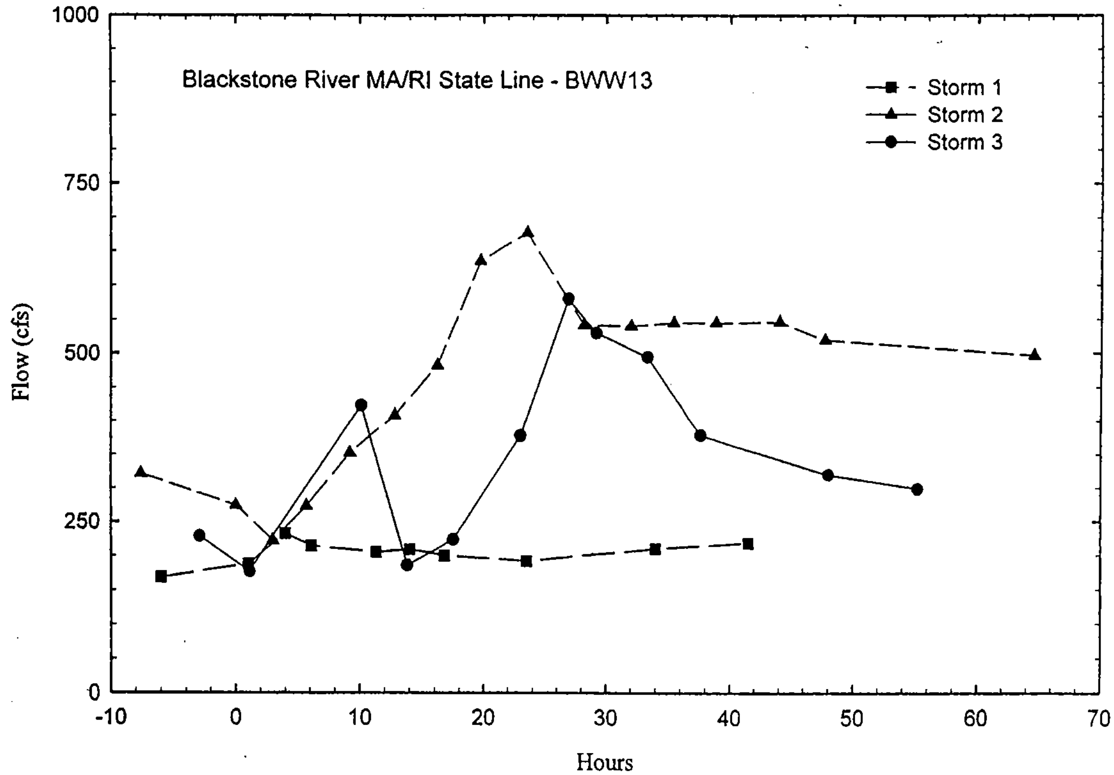


Figure A15-7-5 .Hydrograph Comparison - State Line

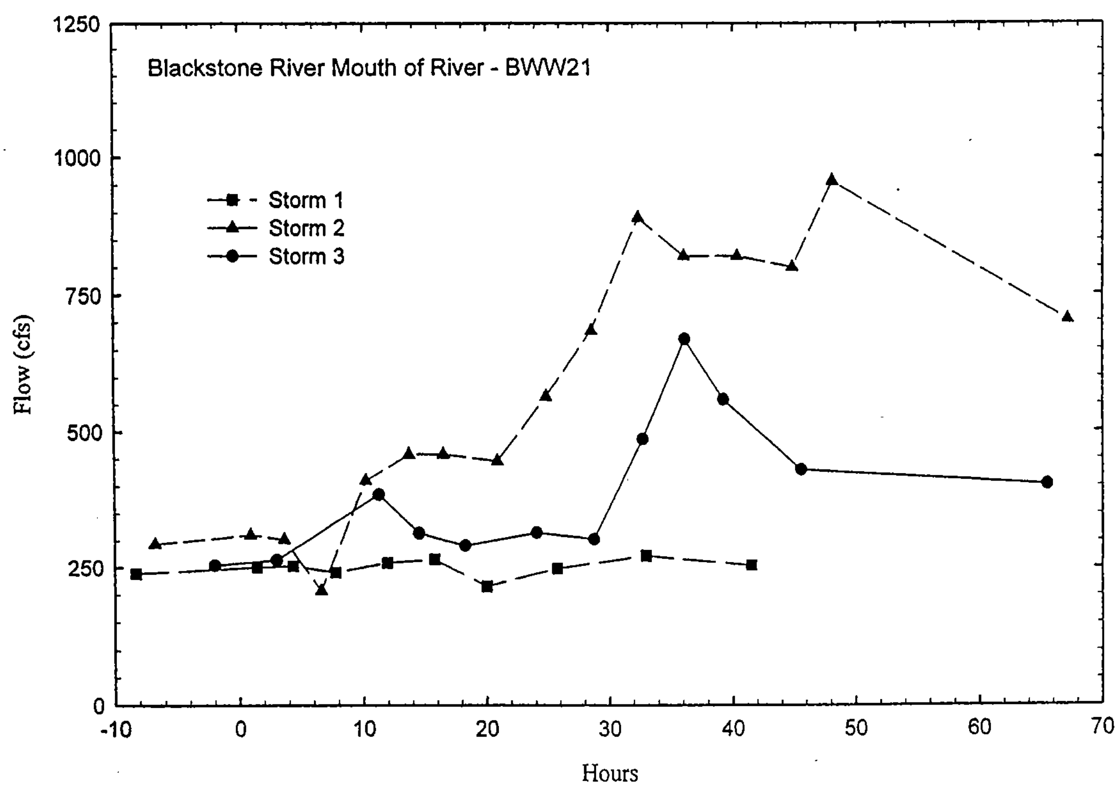


Figure A15-7-6 Hydrograph Comparison - Mouth of River

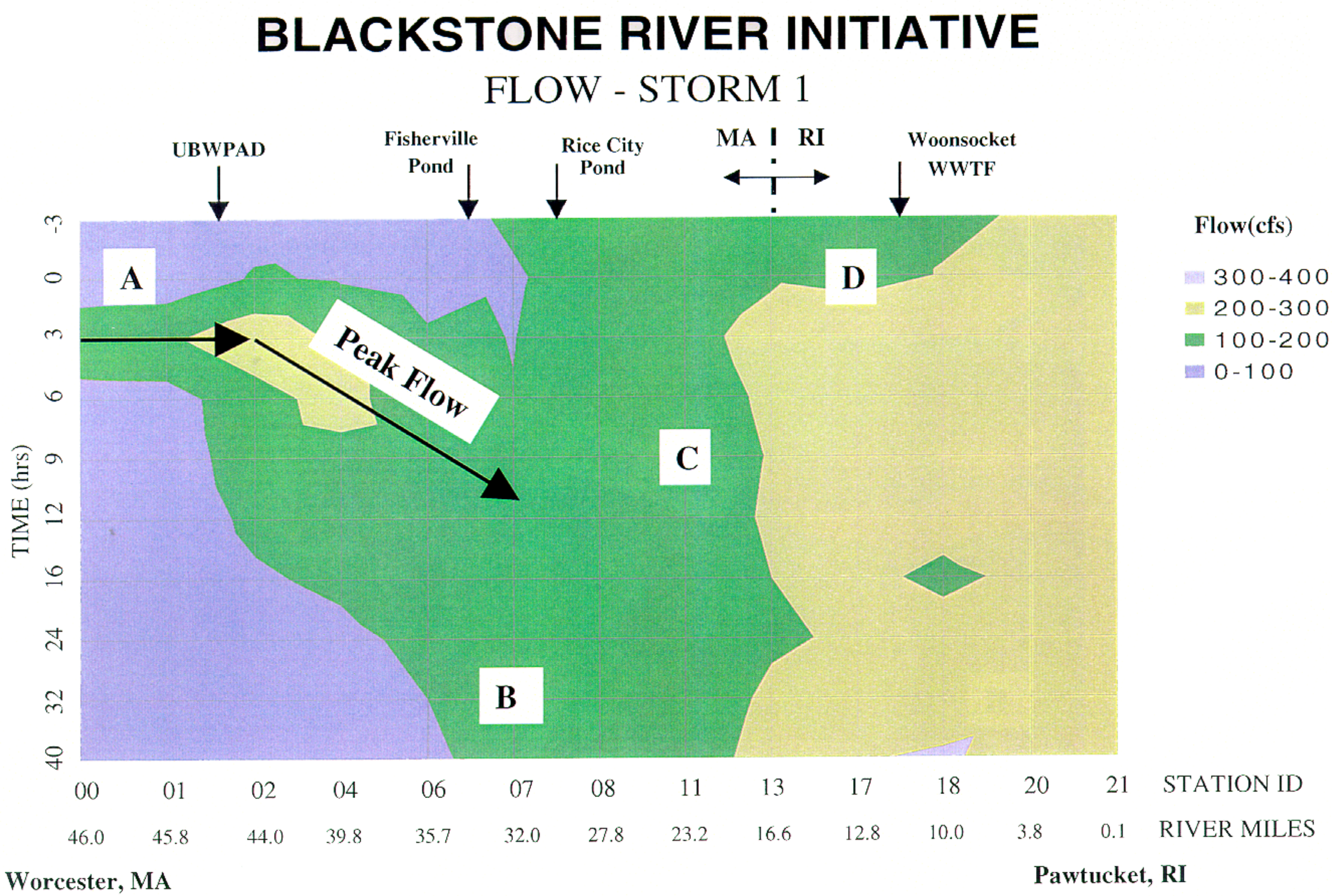


Figure A15-7-9 Contour Plot of Flow for Storm 1, September 22-24, 1992

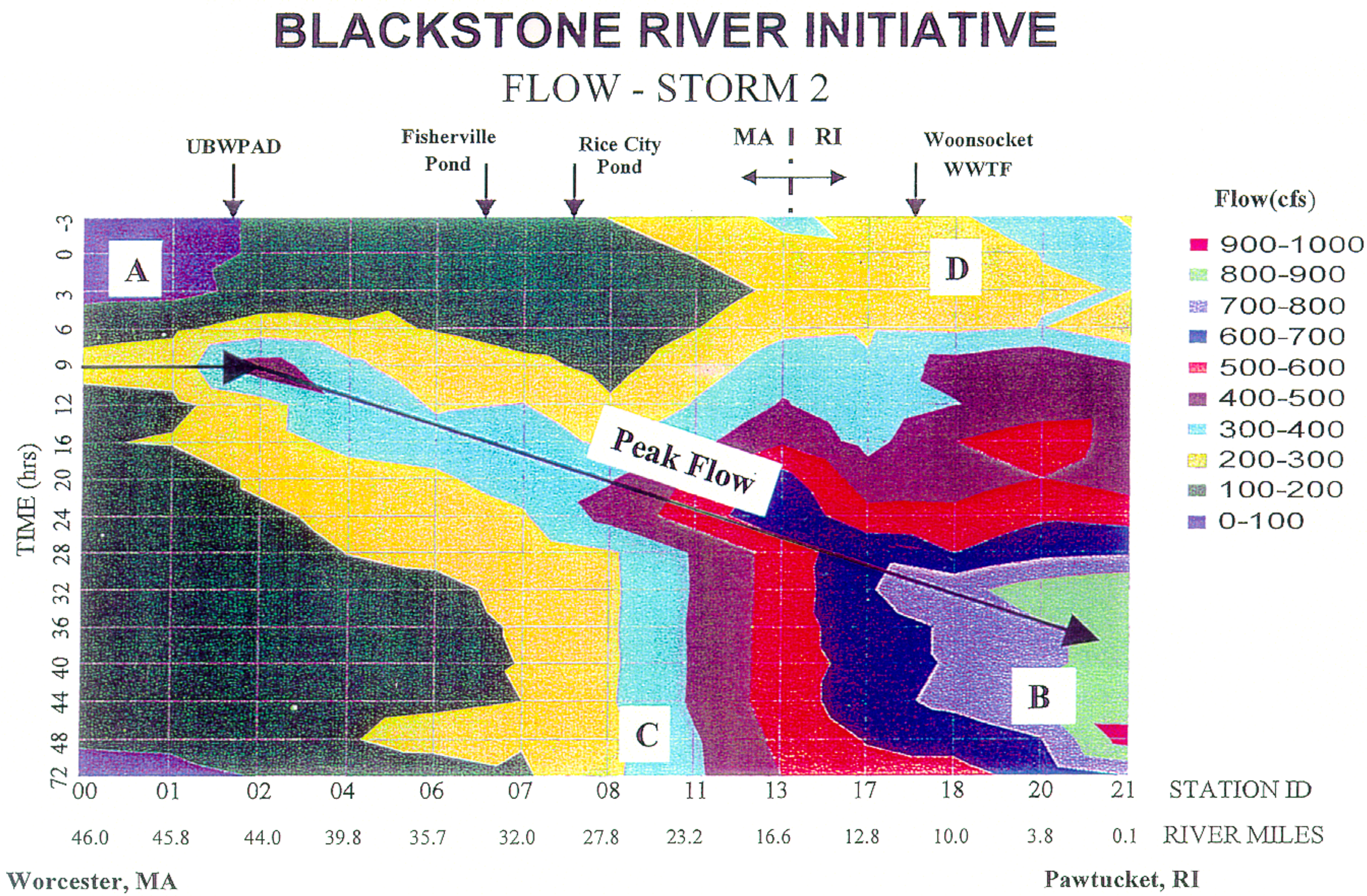


Figure A15-7-8 Contour Plot of Flow for Storm 2, November 2-5, 1992

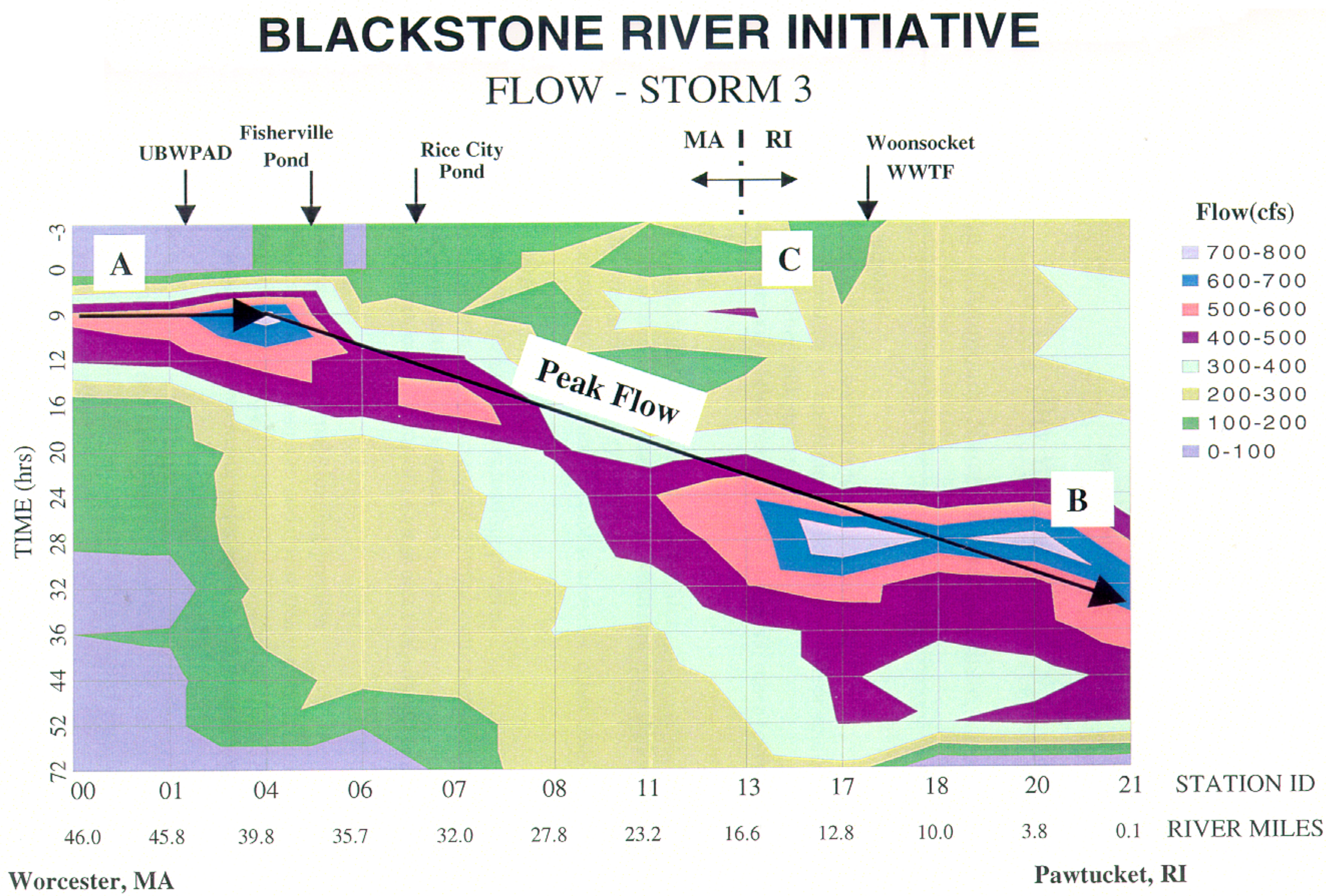


Figure A15-7-7 Contour Plot of Flow for Storm 3, October 12-16, 1993

Section A15-8

Dry Weather Data

- Loading of Ammonia, Nitrate, Orthophosphate, Copper, Lead -

- **Ammonia**
  - Concentration and mass loading profiles
  - Point source vs. upstream and downstream river stations
  - Dry weather ranking system
  - Comparison of two major point sources vs. other sources

- **Nitrate**
  - Concentration and mass loading profiles
  - Point source vs. upstream and downstream river stations
  - Dry weather ranking system
  - Comparison of two major point sources vs. other sources

- **Orthophosphate**
  - Concentration and mass loading profiles
  - Point source vs. upstream and downstream river stations
  - Dry weather ranking system
  - Comparison of two major point sources vs. other sources

- **Copper**
  - Concentration and mass loading profiles
  - Point source vs. upstream and downstream river stations
  - Dry weather ranking system
  - Comparison of two major point sources vs. other sources

- **Lead**
  - Concentration and mass loading profiles
  - Point source vs. upstream and downstream river stations
  - Dry weather ranking system
  - Comparison of two major point sources vs. other sources

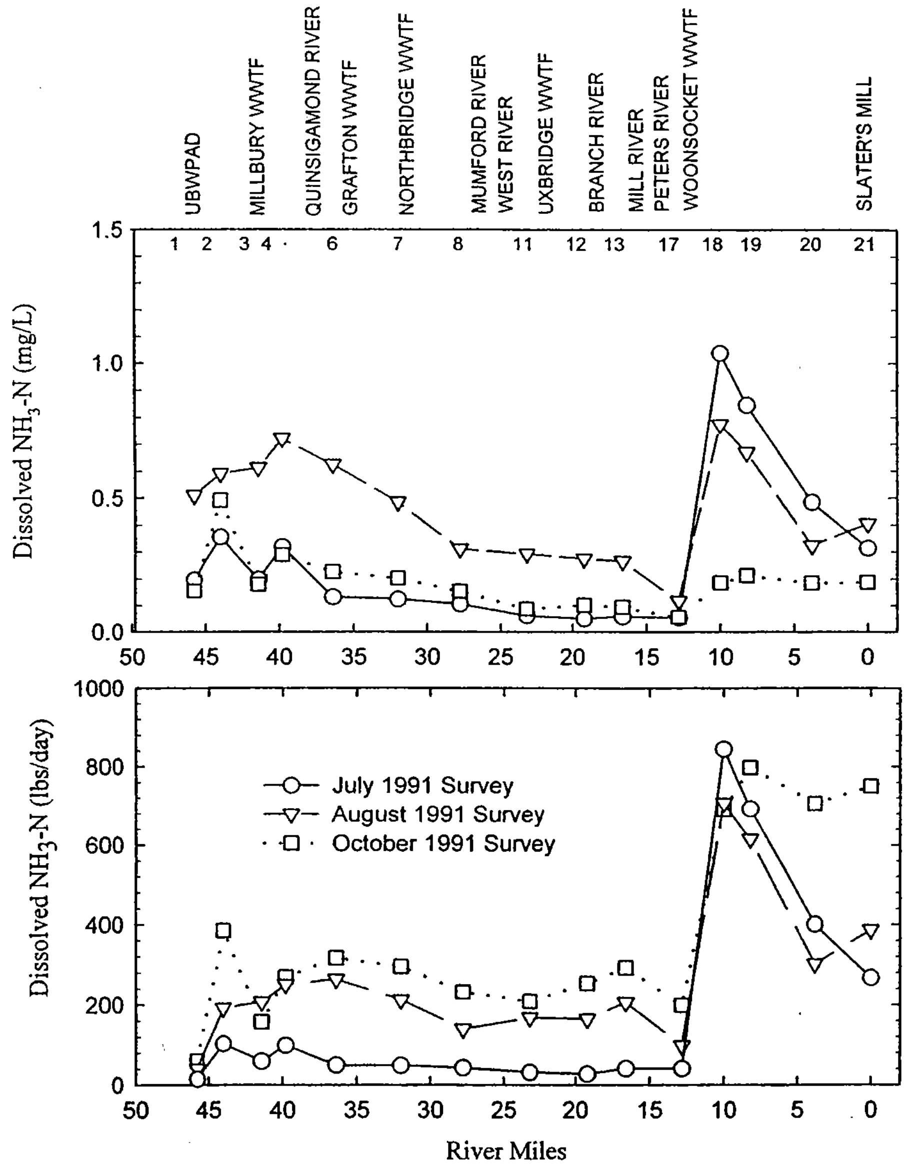


Figure A15-8-1 Ammonia Concentration and Mass Loading Profiles

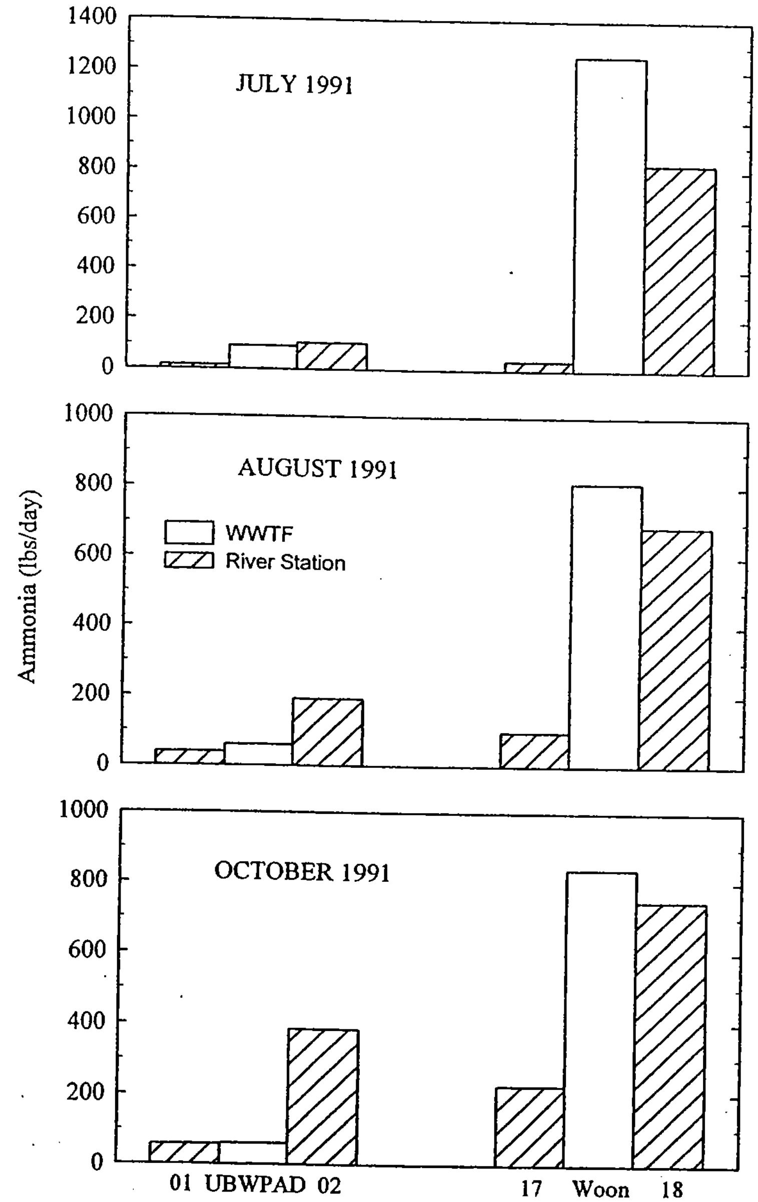


Figure A15-8-2 Point Source Versus Upstream and Downstream River Stations for Ammoni

Table A15-8-1 Ammonia Dry Weather System Ranking

Rank	Survey 1			Survey 2			Survey 3		
	Source	Load	%	Source	Load	%	Source	Load	%
1	Woon	1258	88.9	Woon	812	67.4	Woon	838	52.8
2	UBWPAD	91.1	6.4	BLK01-02	92.2	7.7	BLK01-02	266	16.8
3	BLK03-04	39.4	2.8	BLK20-21	85.5	7.1	BLK03-04	112	7.1
4	BLK14	12.2	0.9	UBWPAD	60.1	5.0	BLK18-19	108	6.8
5	BLK09	3.6	0.3	BLK14	45.8	3.8	UBWPAD	59.3	3.7
6	BLK05	3.4	0.2	BLK03-04	44.2	3.7	BLK20-21	44.5	2.8
7	BLK16	3.3	0.2	BLK09	16.9	1.4	BLK11-12	45.0	2.8
8	BLK10	1.6	0.1	BLK02-03	15.1	1.3	BLK04-06	43.6	2.7
9	BLK12-13	1.5	0.1	BLK05	12.8	1.1	BLK14	25.3	1.6
10	BLK15	1.3	0.1	BLK15	6.5	0.5	BLK12-13	13.6	0.9
11				BLK10	6.3	0.5	BLK15	13.1	0.8
12				BLK08-11	4.5	0.4	BLK09	7.7	0.5
13				BLK16	2.4	0.2	BLK16	5.2	0.3
14							BLK05	3.5	0.2
15							BLK10	3.0	0.2
Total		1415			1204			1588	

Woon = Woonsocket WWTF; Load in lbs/day

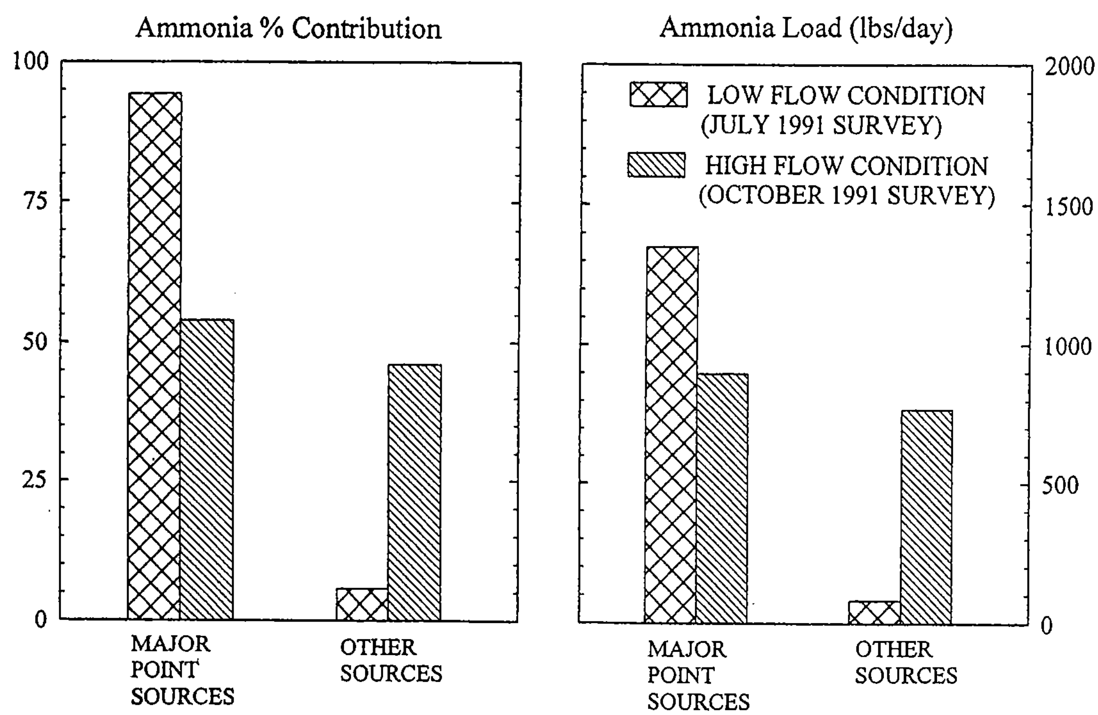


Figure A15-8-3 Comparison of the Two Major Point Sources Versus the Other Sources for Ammonia

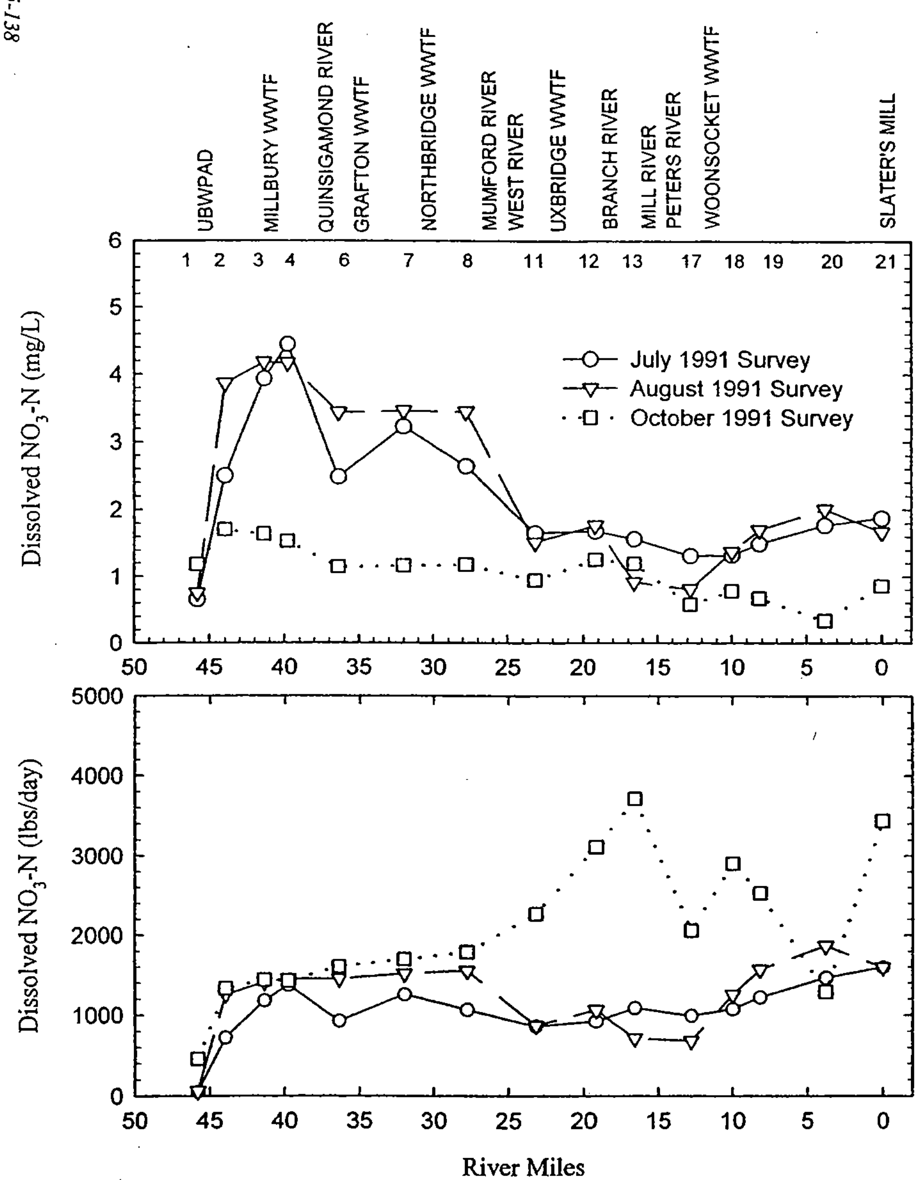


Figure A15-8-4 Nitrates as N Concentration and Mass Loading Profiles

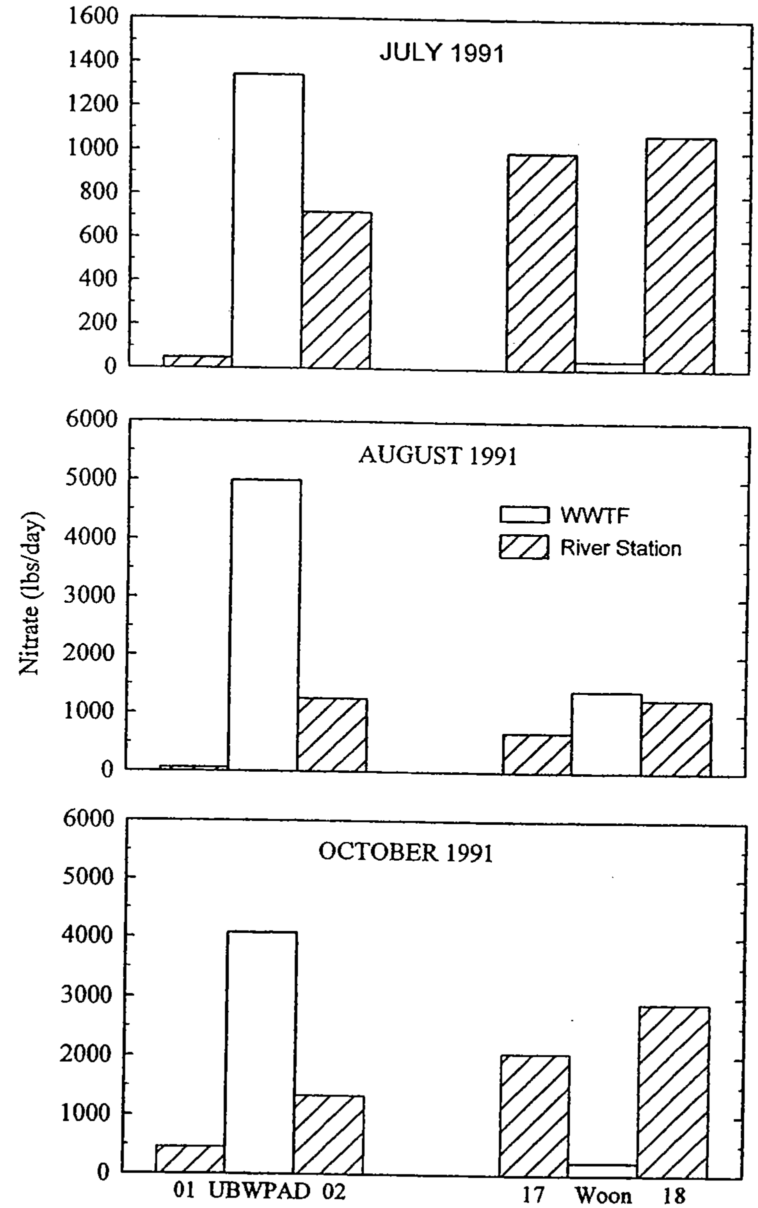


Figure A15-8-5 Point Source Versus Upstream and Downstream River Stations for Nitrate

Table A15-8-2 Nitrate Dry Weather System Ranking

Rank	Survey 1			Survey 2			Survey 3		
	Source	Load	%	Source	Load	%	Source	Load	%
1	UBWPAD	1341	41.3	UBWPAD	4986	64.8	UBWPAD	4070	40.7
2	BLK02-03	462.2	14.2	Woon	1401	18.2	BLK20-21	2148	21.5
3	BLK06-07	330.5	10.2	BLK18-19	310.9	4.0	BLK11-12	845.8	8.5
4	BLK19-20	240.2	7.4	BLK19-20	299.8	3.9	BLK17-18	631.5	6.3
5	BLK03-04	194.4	6.0	BLK11-12	198.3	2.6	BLK12-13	490.0	4.9
6	BLK18-19	148.2	4.6	BLK02-03	156.5	2.0	BLK01	452.5	4.5
7	BLK20-21	133.9	4.1	BLK06-07	66.8	0.9	BLK08-11	415.4	4.2
8	BLK12-13	133.4	4.1	BLK09	64.4	0.8	Woon	212.3	2.1
9	BLK11-12	62.1	1.9	BLK01	57.3	0.7	BLK04-06	159.8	1.6
10	BLK01	48.3	1.5	BLK14	44.2	0.6	BLK14	109.6	1.1
11	Woon	42.1	1.3	BLK03-04	41.1	0.5	BLK02-03	105.7	1.1
12	BLK17-18	39.7	1.2	BLK07-08	38.0	0.5	BLK06-07	95.4	1.0
13	BLK14	35.0	1.1	BLK16	9.3	0.1	BLK07-08	88.9	0.9
14	BLK09	10.6	0.3	BLK05	7.1	0.1	BLK09	54.4	0.5
15	BLK16	9.5	0.3	BLK15	5.8	0.1	BLK15	49.9	0.5
16	BLK15	7.7	0.2	BLK10	4.1	0.1	BLK16	49.3	0.5
17	BLK05	6.7	0.2				BLK05	18.5	0.2
18	BLK10	4.1	0.1				BLK10	8.67	0.1
19									
Total		3250			7691			10006	

Woon = Woonsocket WWTF; Load in lbs/day

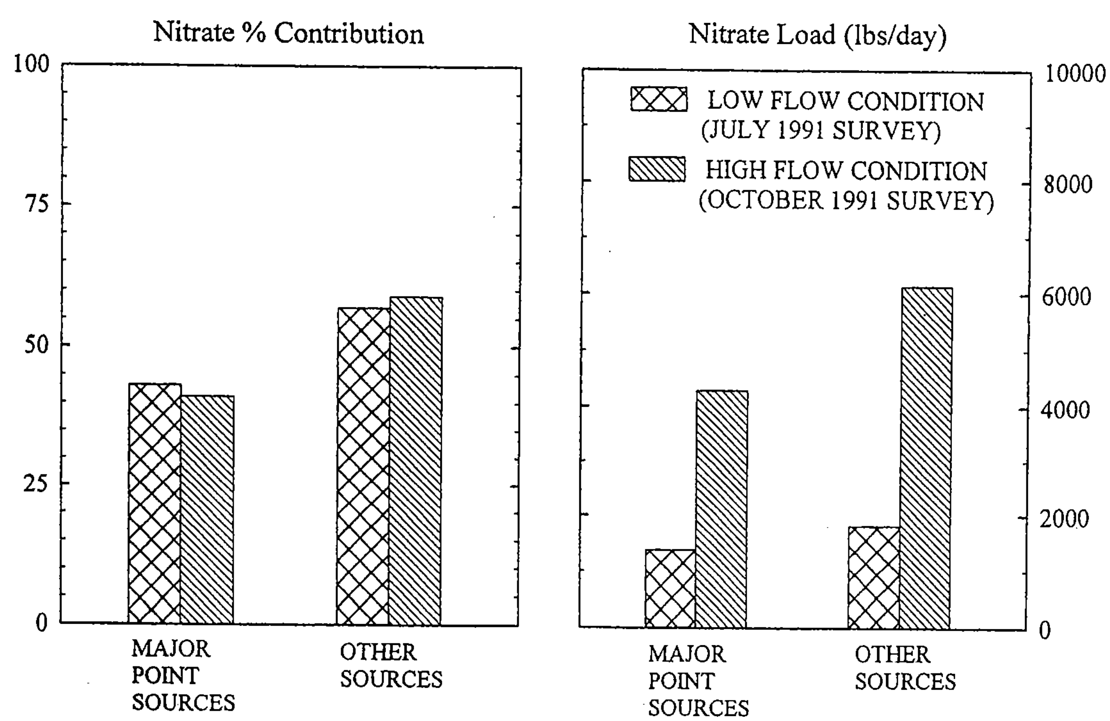


Figure A15-8-6 Comparison of the Two Major Point Sources Versus the Other Sources for Nitrate

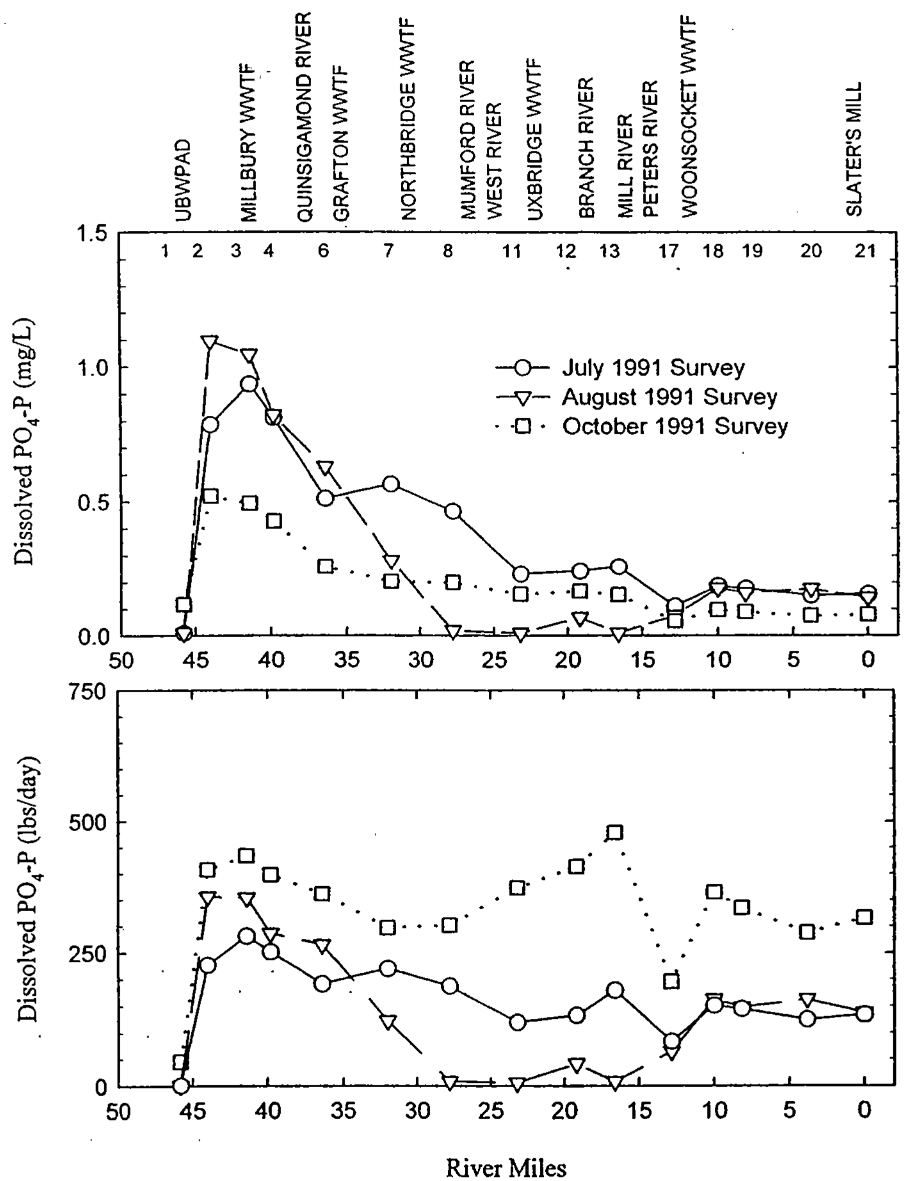


Figure A15-8-7 **Orthophosphate as P Concentration and Mass Loading Profiles**

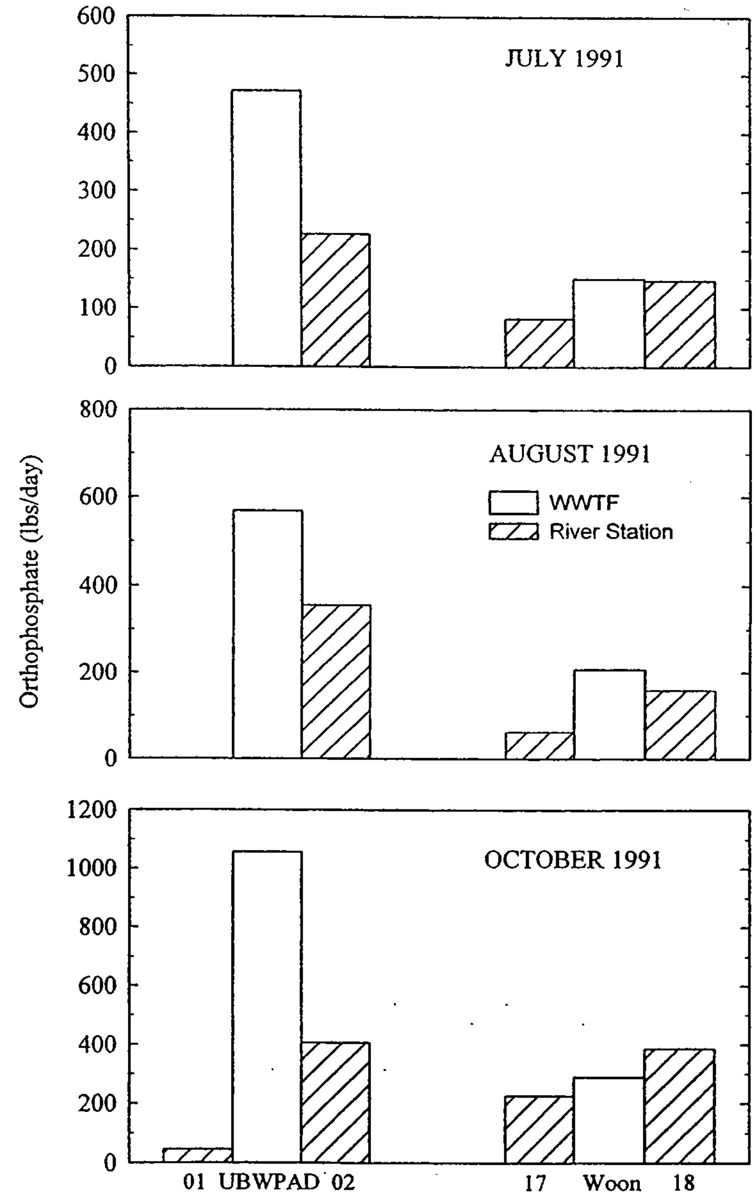


Figure A15-8-8 **Point Source Versus Upstream and Downstream River Stations for Orthophosphate**

Table A15-8-3 Orthophosphate Dry Weather System Ranking

Rank	Survey 1			Survey 2			Survey 3		
	Source	Load	%	Source	Load	%	Source	Load	%
1	UBWPAD	476	59.8	UBWPAD	567	63.6	UBWPAD	1057	64.6
2	Woon	151	19.0	Woon	208	23.3	Woon	289	17.7
3	BLK02-03	54.7	6.9	BLK13-17	55.4	6.2	BLK08-11	60.4	3.7
4	BLK12-13	40.2	5.0	BLK11-12	35.2	4.0	BLK12-13	59.3	3.6
5	BLK06-07	28.5	3.6	BLK19-20	15.2	1.7	BLK01	44.9	2.7
6	BLK11-12	12.7	1.6	BLK14	7.03	0.8	BLK11-12	40.1	2.5
7	BLK09	11.2	1.4	BLK09	0.78	0.1	BLK20-21	28.1	1.7
8	BLK20-21	8.98	1.1	BLK01	0.77	0.1	BLK02-03	26.7	1.6
9	BLK14	7.39	0.9	BLK10	0.63	0.1	BLK09	7.81	0.5
10	BLK05	3.20	0.4	BLK05	0.56	0.1	BLK05	5.78	0.4
11	BLK15	0.99	0.1	BLK15	0.39	0.04	BLK14	5.75	0.4
12	BLK01	0.74	0.1	BLK16	0.35	0.04	BLK07-08	4.91	0.3
13	BLK10	0.52	0.1				BLK10	3.04	0.2
14	BLK16	0.26	0.03				BLK16	1.96	0.1
15							BLK15	1.87	0.1
Total		796			891			1637	

Woon = Woonsocket WWTF; Load in lbs/day

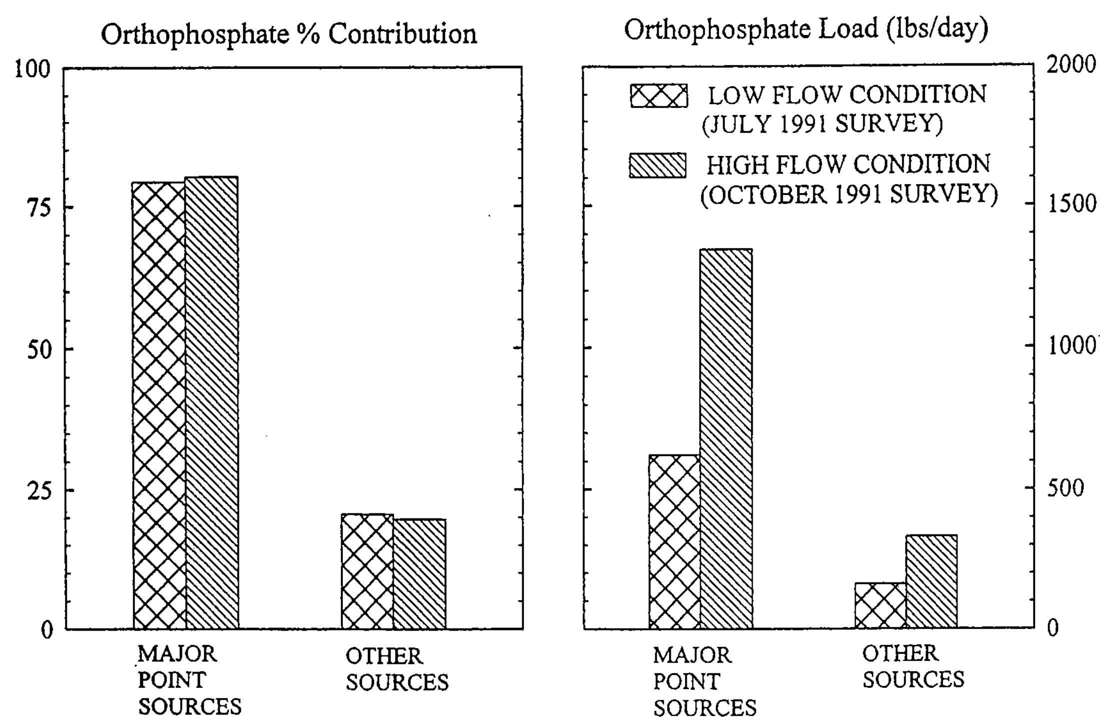


Figure A15-8-9 Comparison of the Two Major Point Sources Versus the Other Sources for Orthophosphate

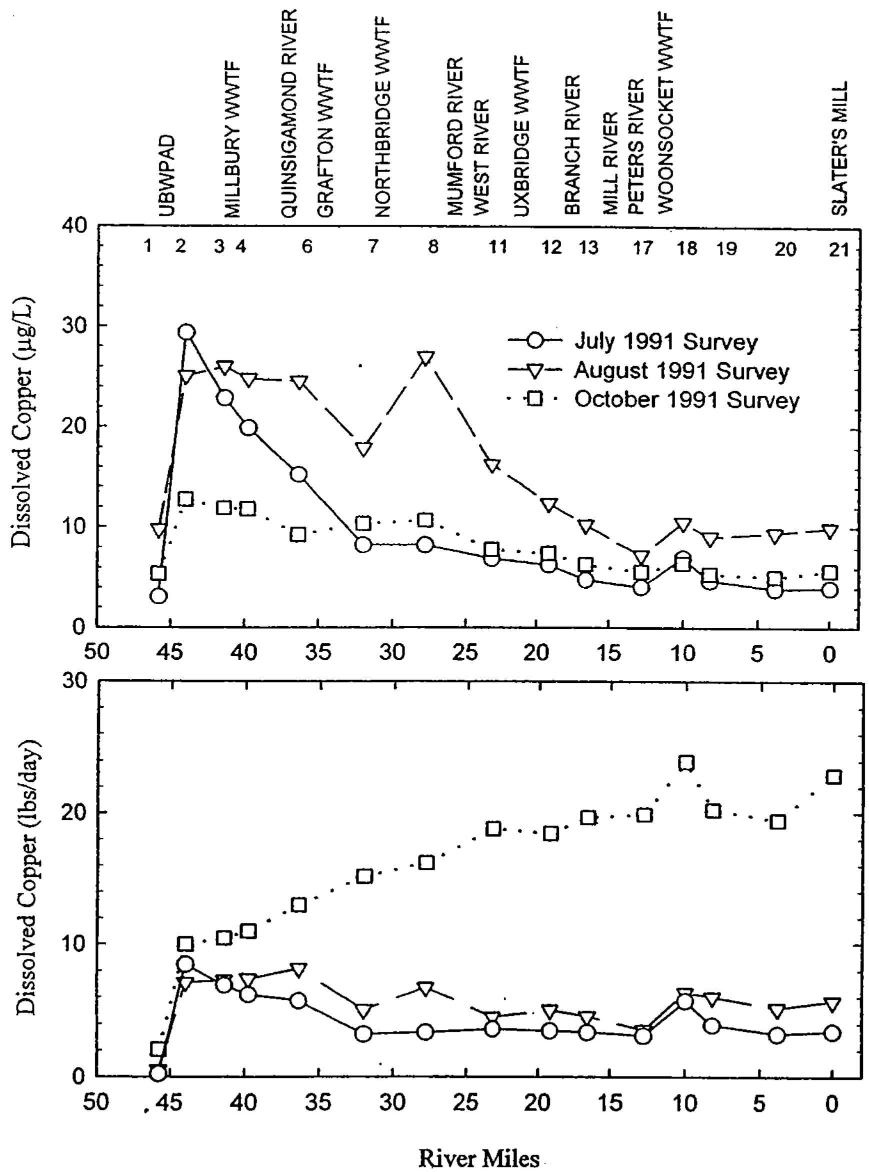


Figure A15-8-10 Dissolved Copper Concentration and Mass Loading Profiles

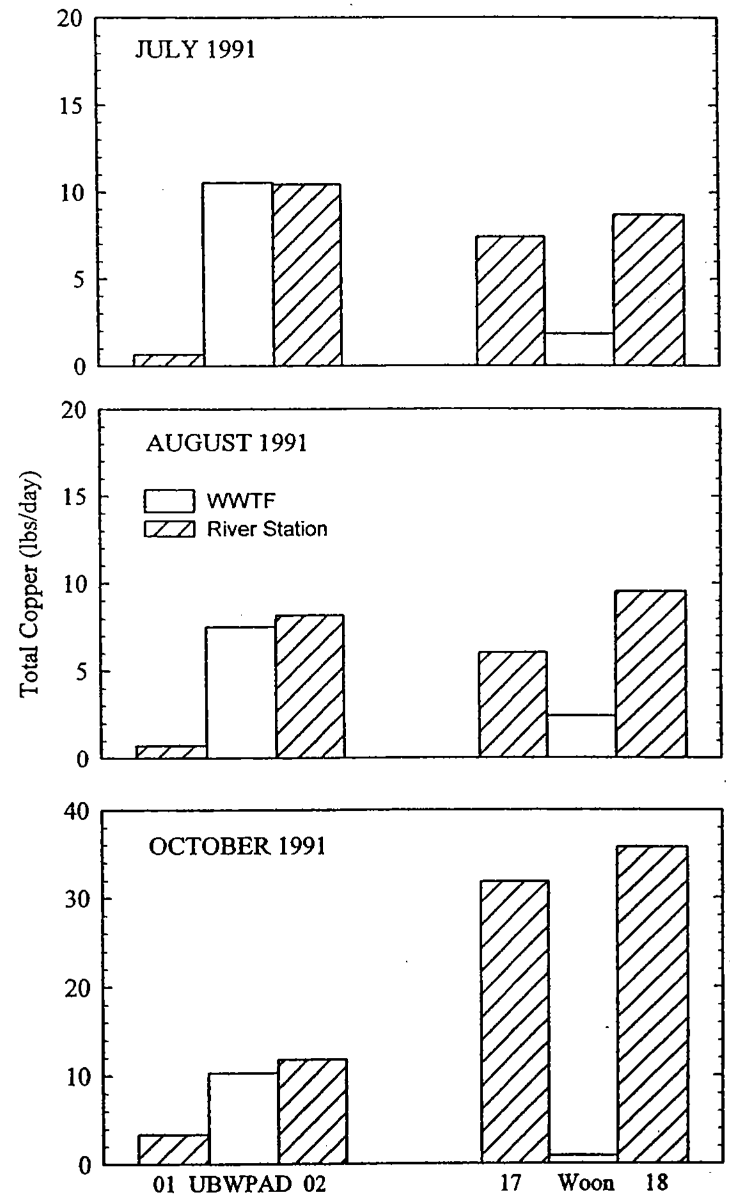


Figure A15-8-11 Point Source Versus Upstream and Downstream River Stations for Total Copper

Table A15-8-4 Copper Dry Weather System Ranking

Rank	Survey 1			Survey 2			Survey 3		
	Source	Load	%	Source	Load	%	Source	Load	%
1	UBWPAD	10.54	47.2	UBWPAD	7.52	36.5	BLK08-11	13.60	23.2
2	BLK07-08	5.05	22.6	BLK07-08	4.31	20.9	UBWPAD	10.29	17.5
3	Woon	1.83	8.2	Woon	2.41	11.7	BLK04-06	5.07	8.6
4	BLK14	1.01	4.5	BLK04-06	1.57	7.6	BLK20-21	4.66	7.9
5	BLK10	0.76	3.4	BLK17-18	1.11	5.4	BLK07-08	4.44	7.6
6	BLK01	0.69	3.1	BLK20-21	0.77	3.7	BLK01	3.45	5.9
7	BLK06-07	0.59	2.6	BLK01	0.75	3.7	BLK17-18	3.33	5.7
8	BLK09	0.53	2.4	BLK02-03	0.66	3.2	BLK14	2.34	4.0
9	BLK20-21	0.46	2.1	BLK14	0.55	2.7	BLK06-07	2.22	3.8
10	BLK03-04	0.26	1.2	BLK19-20	0.42	2.0	BLK12-13	2.20	3.8
11	BLK16	0.21	0.9	BLK09	0.15	0.7	BLK09	2.15	3.7
12	BLK12-13	0.20	0.9	BLK05	0.14	0.7	BLK02-03	2.10	3.6
13	BLK05	0.12	0.5	BLK10	0.11	0.5	Woon	0.88	1.5
14	BLK15	0.09	0.4	BLK15	0.10	0.5	BLK05	0.60	1.0
15				BLK16	0.04	0.2	BLK10	0.57	1.0
16							BLK15	0.46	0.8
17							BLK16	0.29	0.5
Total		22.3			20.6			58.7	

Woon = Woonsocket WWTF; Load in lbs/day

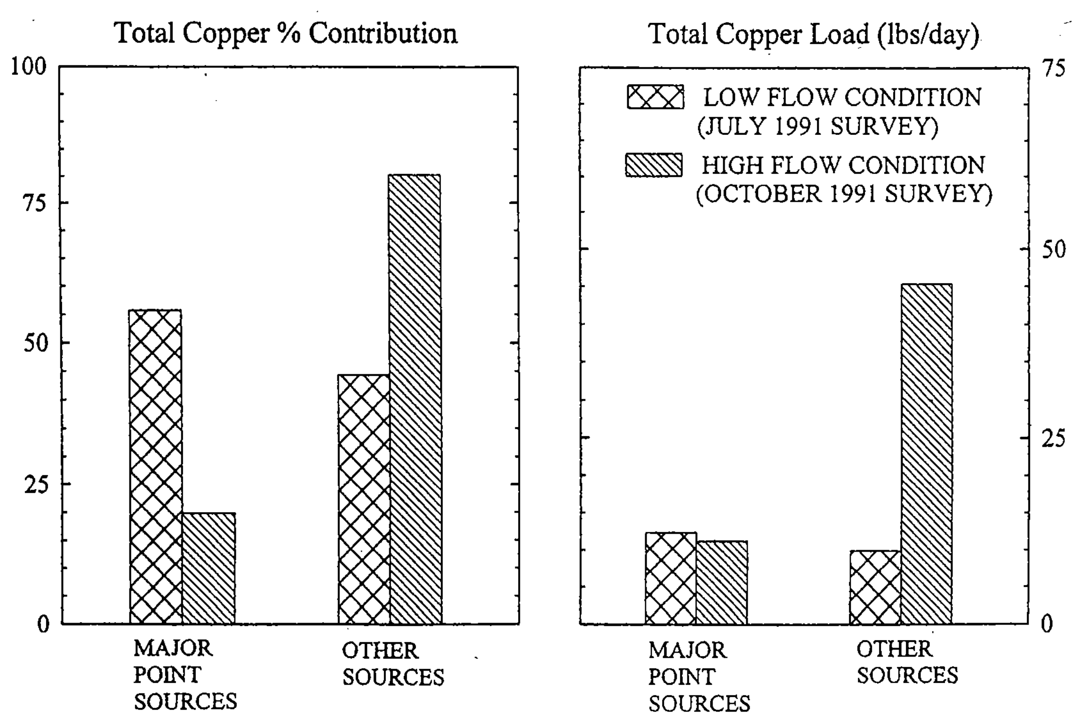


Figure A15-8-12 Comparison of the Two Major Point Sources Versus the Other Sources for Total Copper

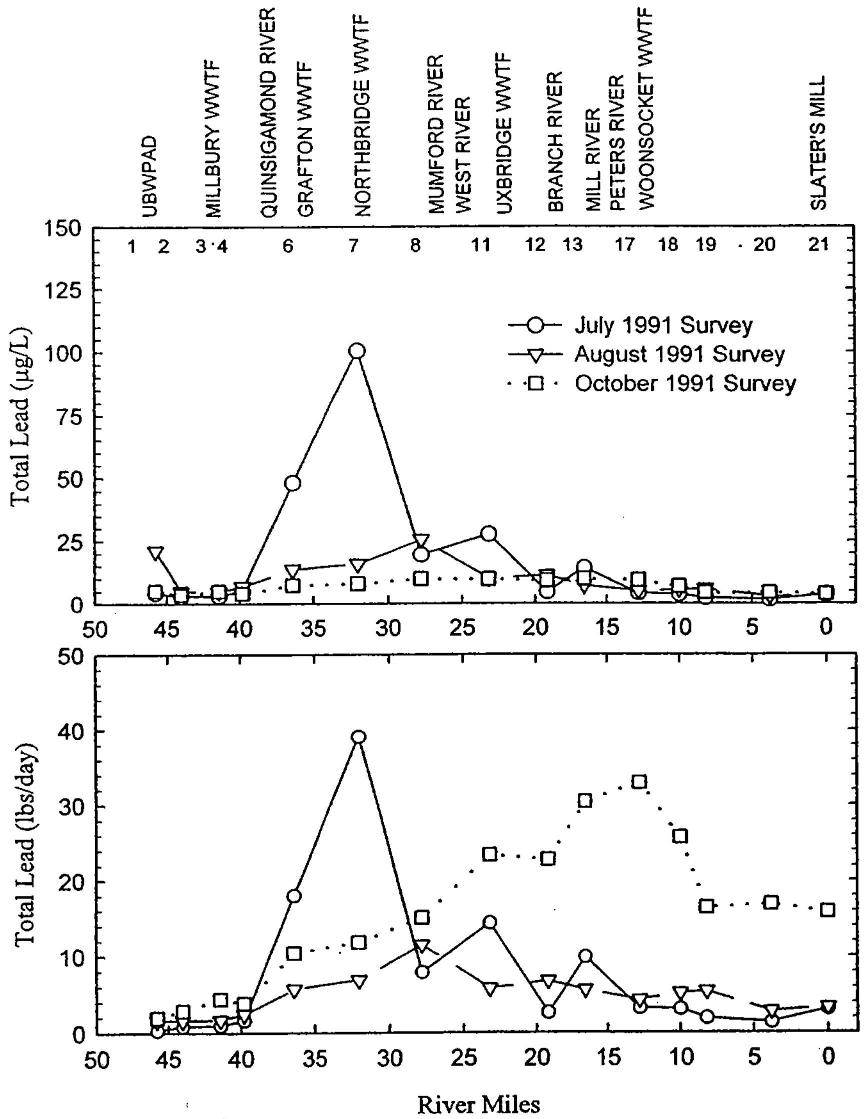


Figure A15-8-13 **Total Lead Concentration and Mass Loading Profiles**

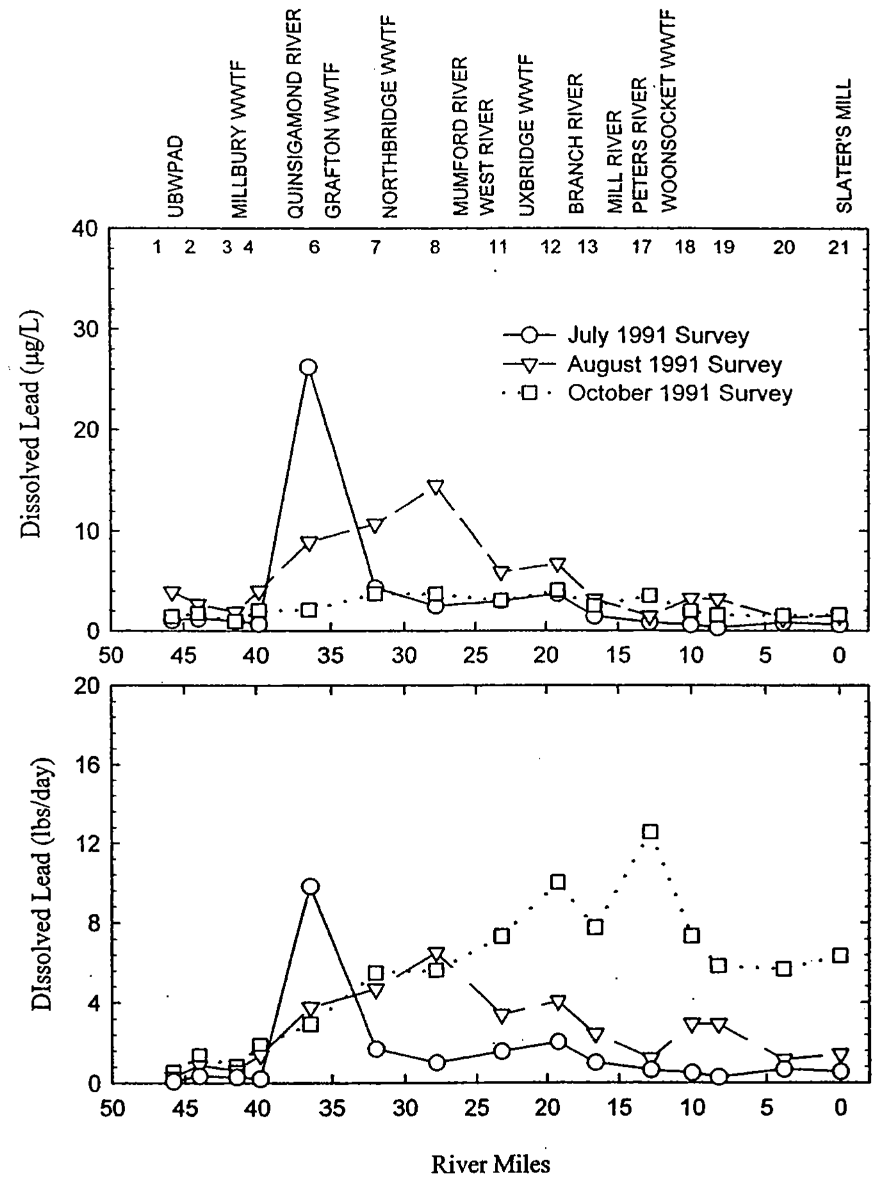


Figure A15-8-14 **Dissolved Lead Concentration and Mass Loading Profiles**

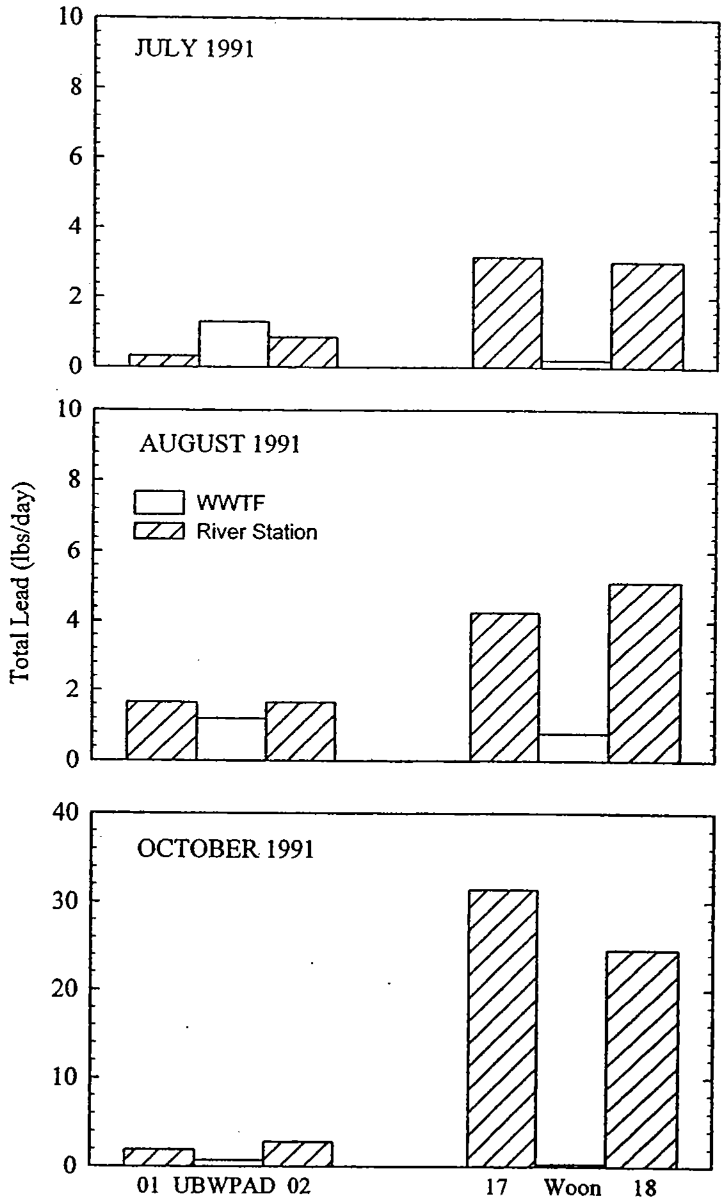


Figure A15-8-15 **Point Source Versus Upstream and Downstream River Stations for Total Lead**

Table A15-8-5 Lead Dry Weather System Ranking

Rank	Survey 1			Survey 2			Survey 3		
	Source	Load	%	Source	Load	%	Source	Load	%
1	BLK06-07	21.1	38.0	BLK07-08	4.58	28.2	BLK12-13	6.77	19.4
2	BLK04-06	16.3	29.2	BLK04-06	3.03	18.7	BLK04-06	6.09	17.4
3	BLK12-13	7.07	12.7	BLK01	1.62	10.0	BLK08-11	5.05	14.5
4	BLK08-11	6.07	10.9	UBWPAD	1.19	7.3	BLK07-08	3.20	9.2
5	BLK20-21	1.70	3.1	BLK06-07	1.19	7.3	BLK09	2.33	6.7
6	UBWPAD	1.29	2.3	BLK11-12	0.98	6.0	BLK01	1.97	5.6
7	BLK03-04	0.65	1.2	Woon	0.88	5.4	BLK13-17	1.86	5.3
8	BLK01	0.33	0.6	BLK03-04	0.71	4.4	BLK02-03	1.54	4.4
9	BLK09	0.28	0.5	BLK20-21	0.51	3.1	BLK06-07	1.40	4.0
10	BLK14	0.22	0.4	BLK14	0.43	2.6	BLK10	1.00	2.9
11	Woon	0.21	0.4	BLK05	0.28	1.7	BLK14	0.88	2.5
12	BLK10	0.12	0.2	BLK09	0.26	1.6	UBWPAD	0.73	2.1
13	BLK02-03	0.11	0.2	BLK18-19	0.24	1.5	BLK19-20	0.49	1.4
14	BLK16	0.11	0.2	BLK10	0.17	1.1	BLK05	0.47	1.4
15	BLK05	0.09	0.2	BLK15	0.06	0.4	BLK15	0.37	1.1
16	BLK15	0.04	0.1	BLK16	0.06	0.3	Woon	0.31	0.9
17				BLK02-03	0.04	0.3	BLK16	0.29	0.8
18				BLK17-18	0.01	0.1	BLK01-02	0.16	0.4
Total		55.7			16.2			34.9	

Woon = Woonsocket WWTF; Load in lbs/day

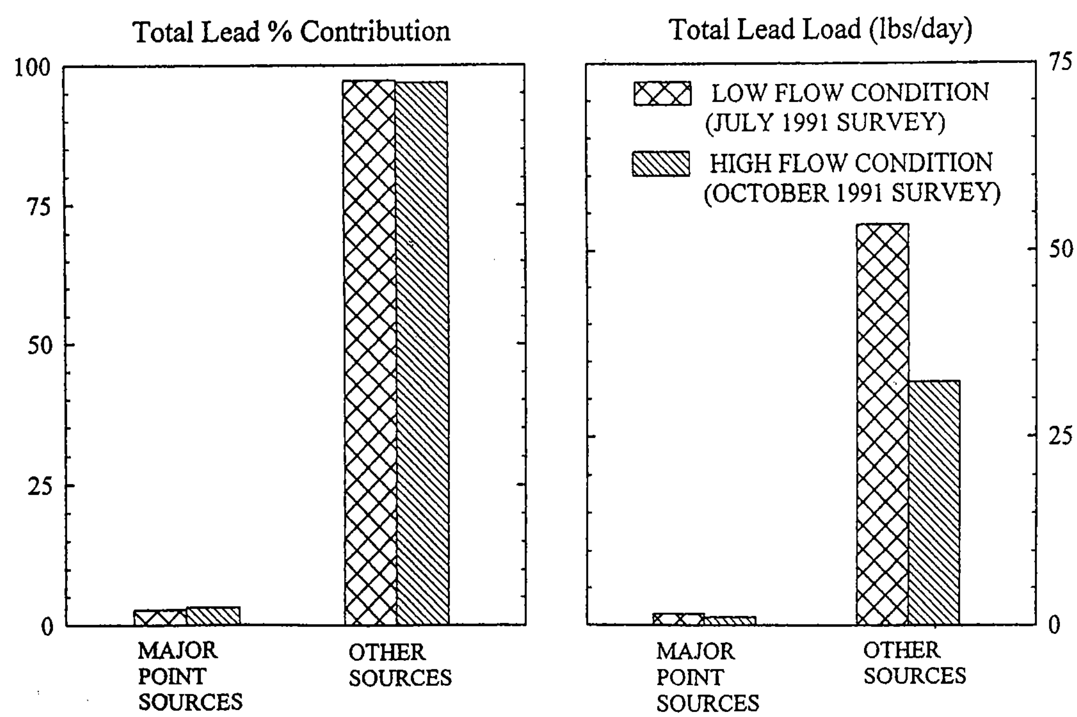


Figure A15-8-16 **Comparison of the Two Major Point Sources Versus the Other Sources for Total Lead**

Section A15-9

QUAL2E Model Data

- Ammonia, Nitrate, Orthophosphate, Copper, Lead -

- **Ammonia**
  - Concentrations of point sources and tributaries
  - Simulations for July 10-11, 1991
  - Simulations for August14-15, 1991
  - Simulations for October 2-3, 1991

- **Nitrate**
  - Simulations for July 10-11, 1991
  - Simulations for August14-15, 1991
  - Simulations for October 2-3, 1991

- **Orthophosphate**
  - Simulations for July 10-11, 1991
  - Simulations for August14-15, 1991
  - Simulations for October 2-3, 1991

- **Copper**
  - Profiles for July 10-11, 1991
  - Profiles for August14-15, 1991
  - Profiles for October 2-3, 1991

- **Lead**
  - Profiles for July 10-11, 1991
  - Profiles for August14-15, 1991
  - Profiles for October 2-3, 1991

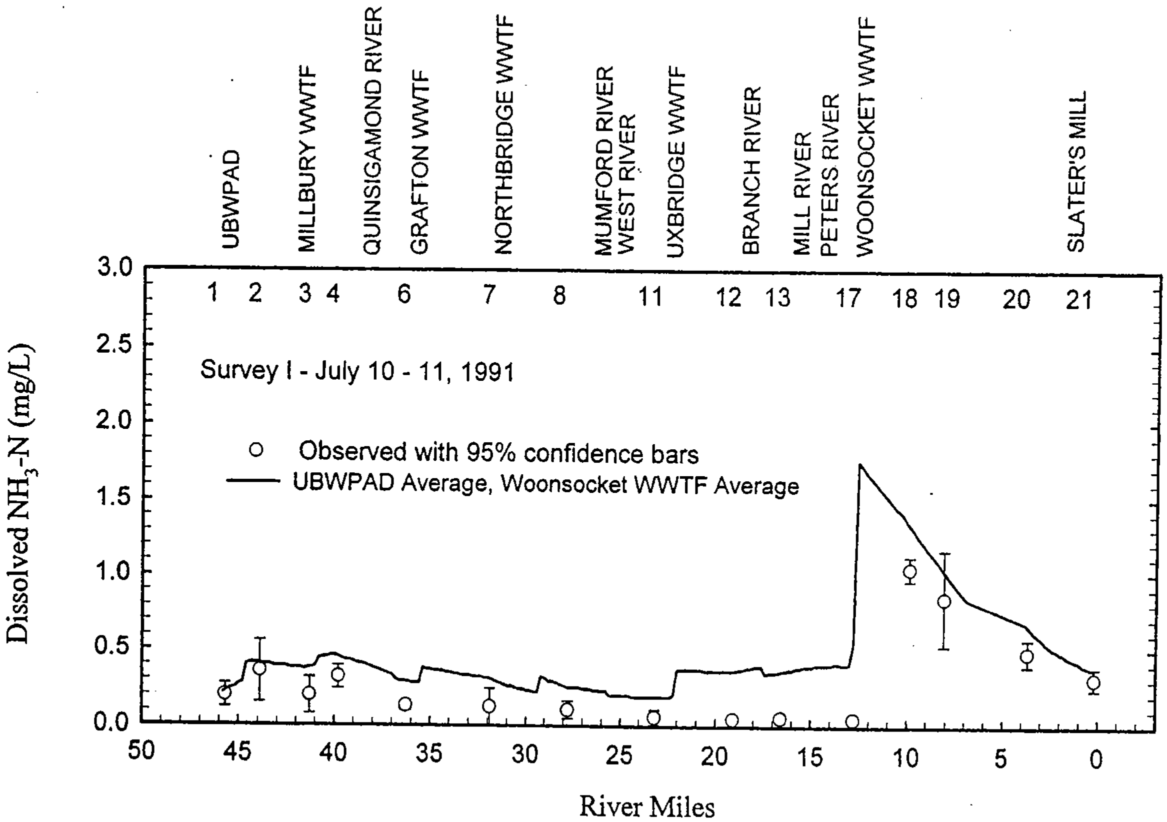


Figure A15-9-1 Dissolved Ammonia Simulations for July 10 - 11, 1991

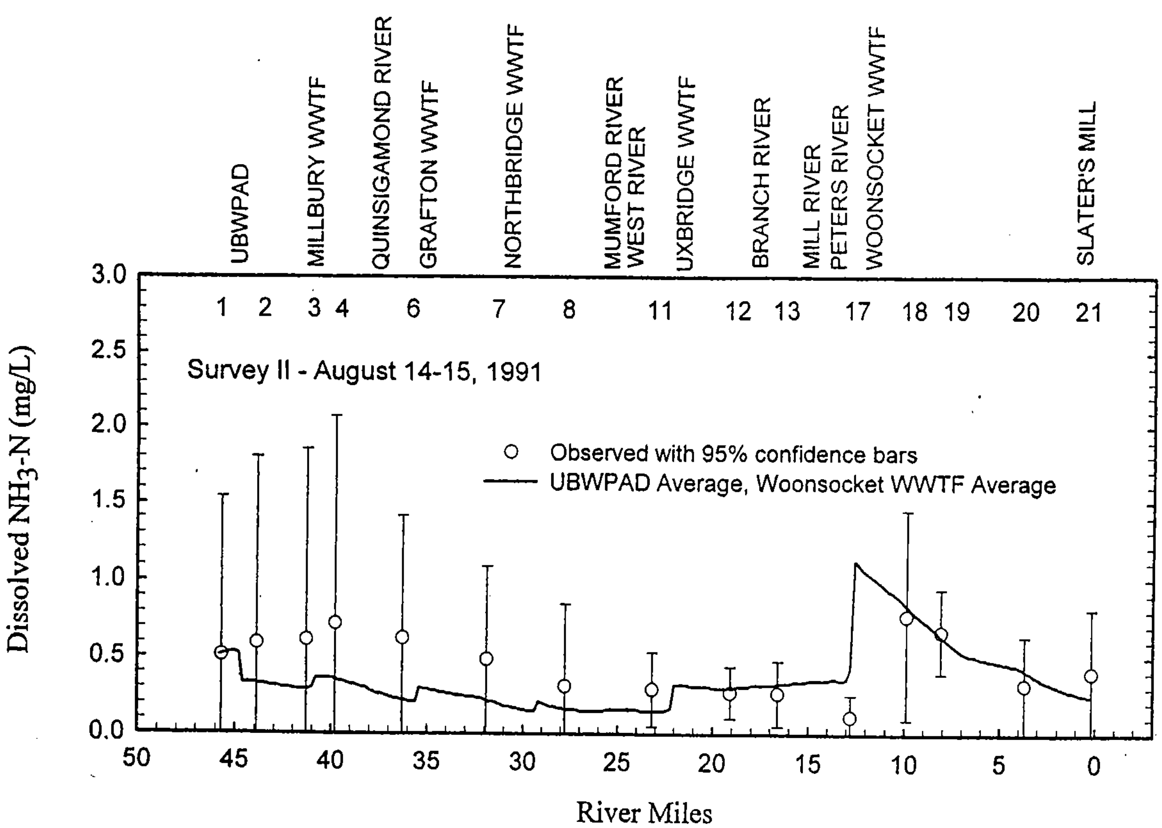


Figure A15-9-2 Dissolved Ammonia Simulations for August 14-15, 1991

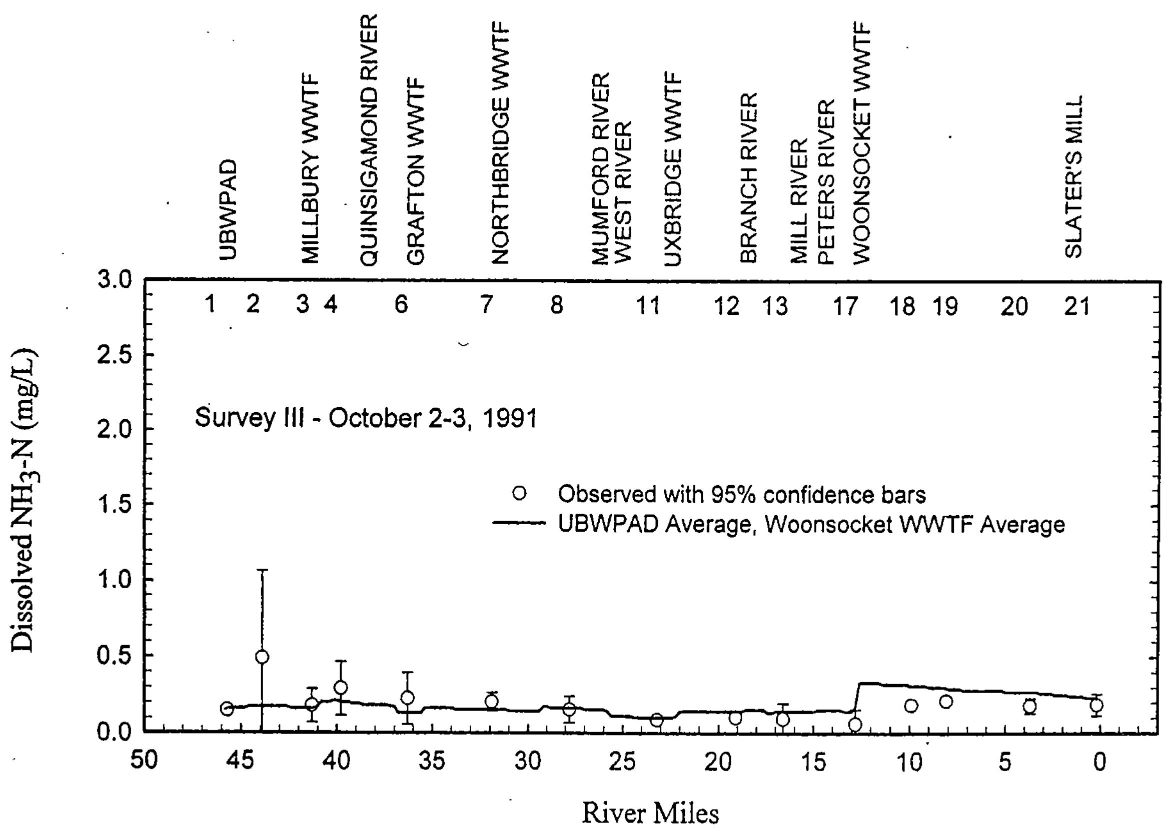


Figure A15-9-3 Dissolved Ammonia Simulations for October 2-3, 1991

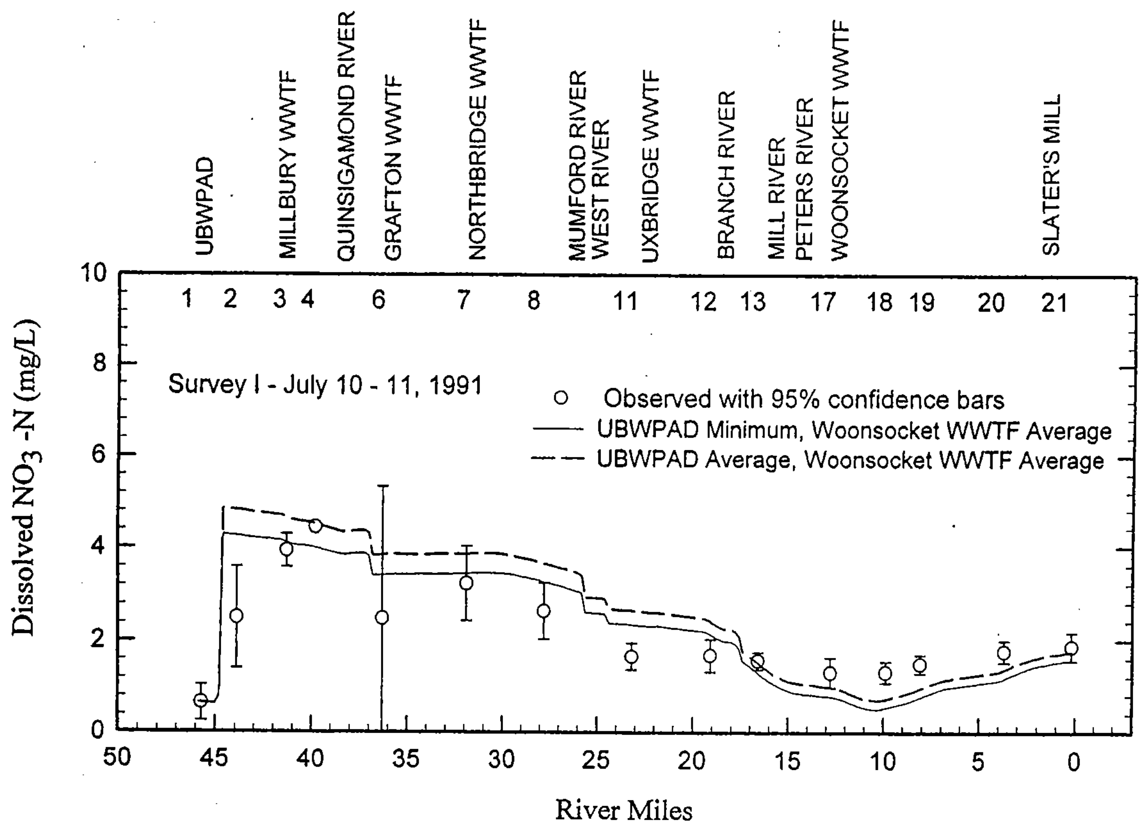


Figure A15-9-4 Dissolved Nitrate Simulations for July 10 - 11, 1991

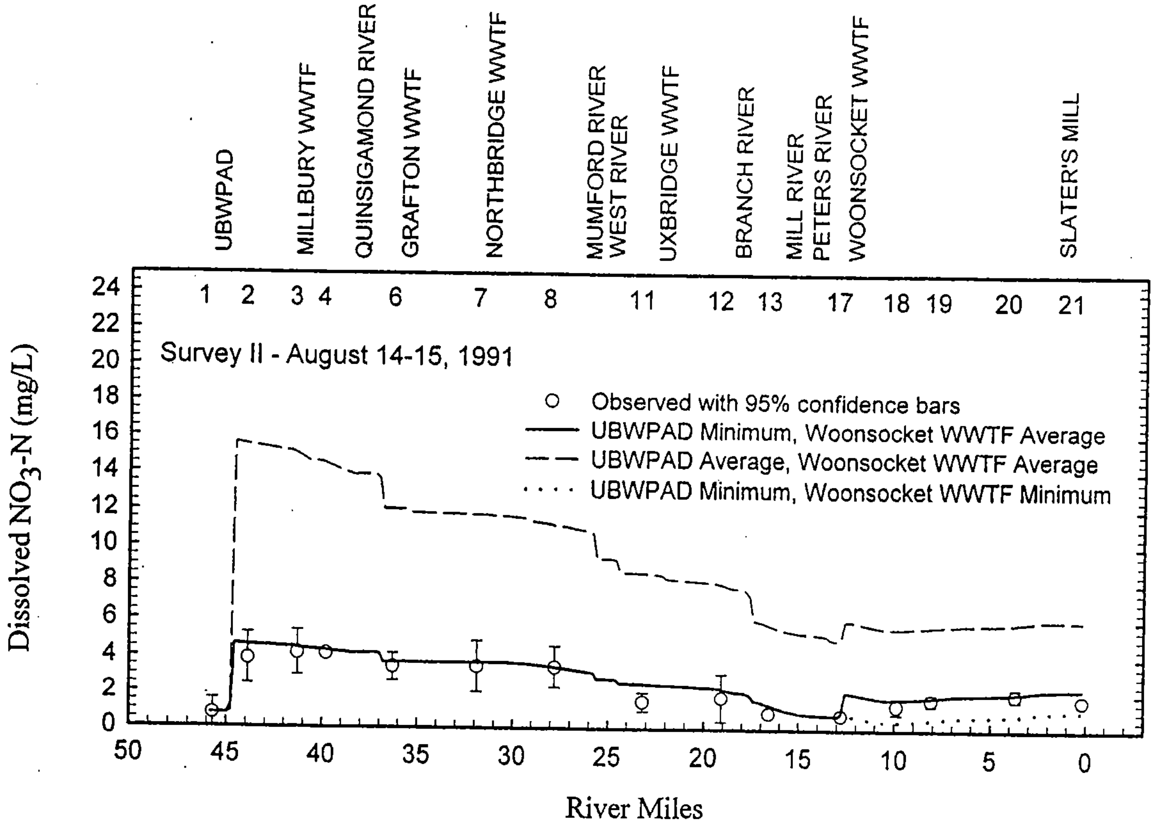


Figure A15-9-5 Dissolved Nitrate Simulations for August 14-15, 1991

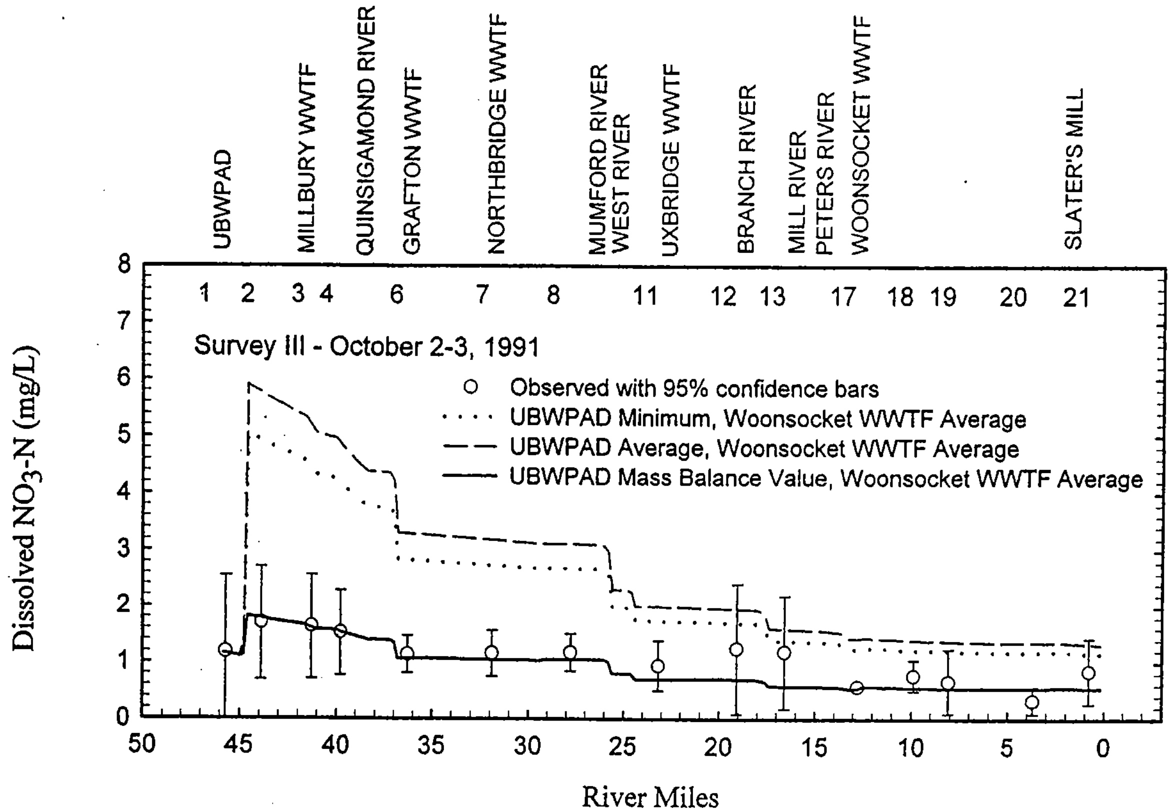


Figure A15-9-6 Dissolved Nitrate Simulations for October 2-3, 1991

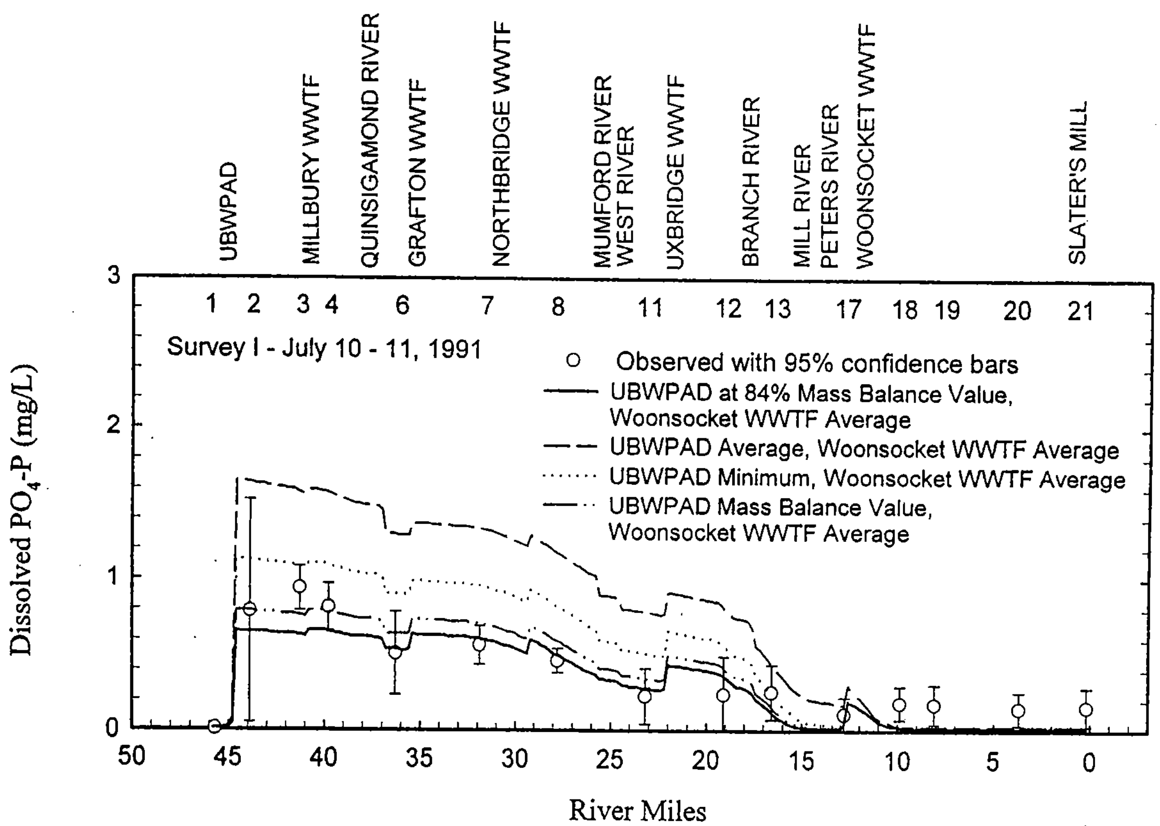


Figure A15-9-7 Dissolved Orthophosphate Simulations for July 10 - 11, 1991

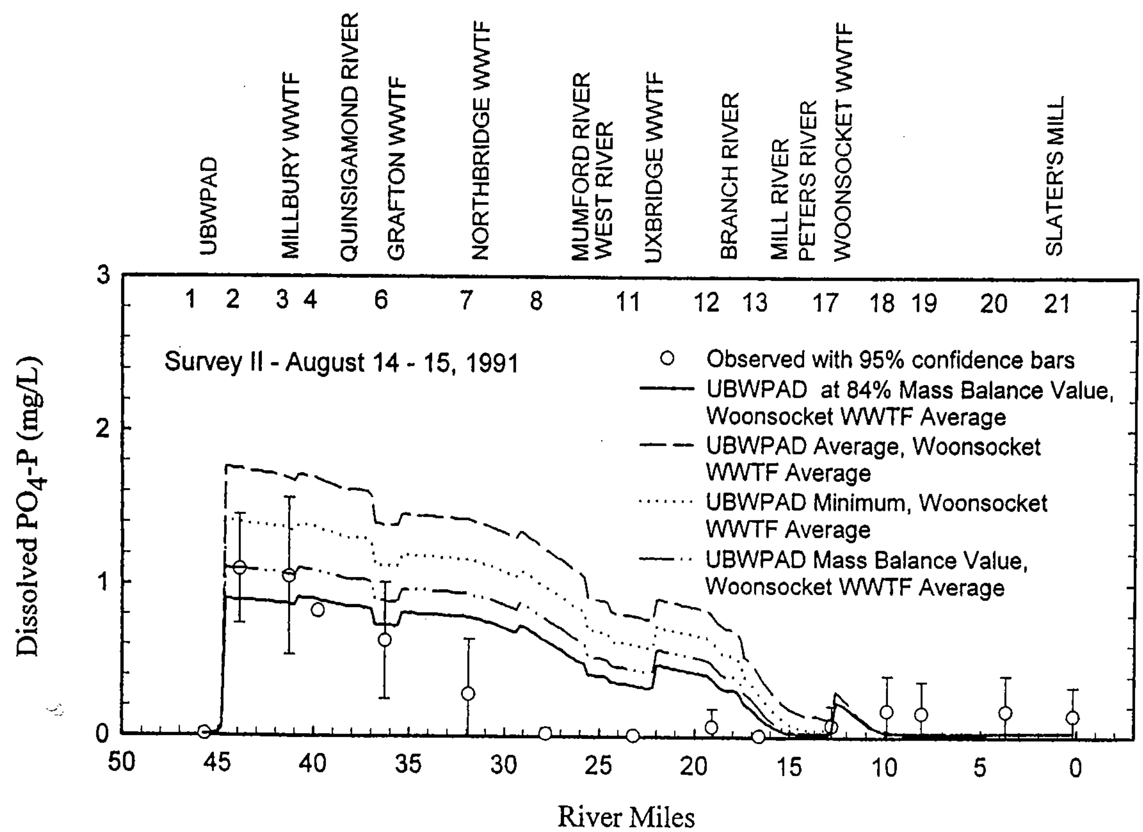


Figure A15-9-8 Dissolved Orthophosphate Simulations for August 14-15, 1991

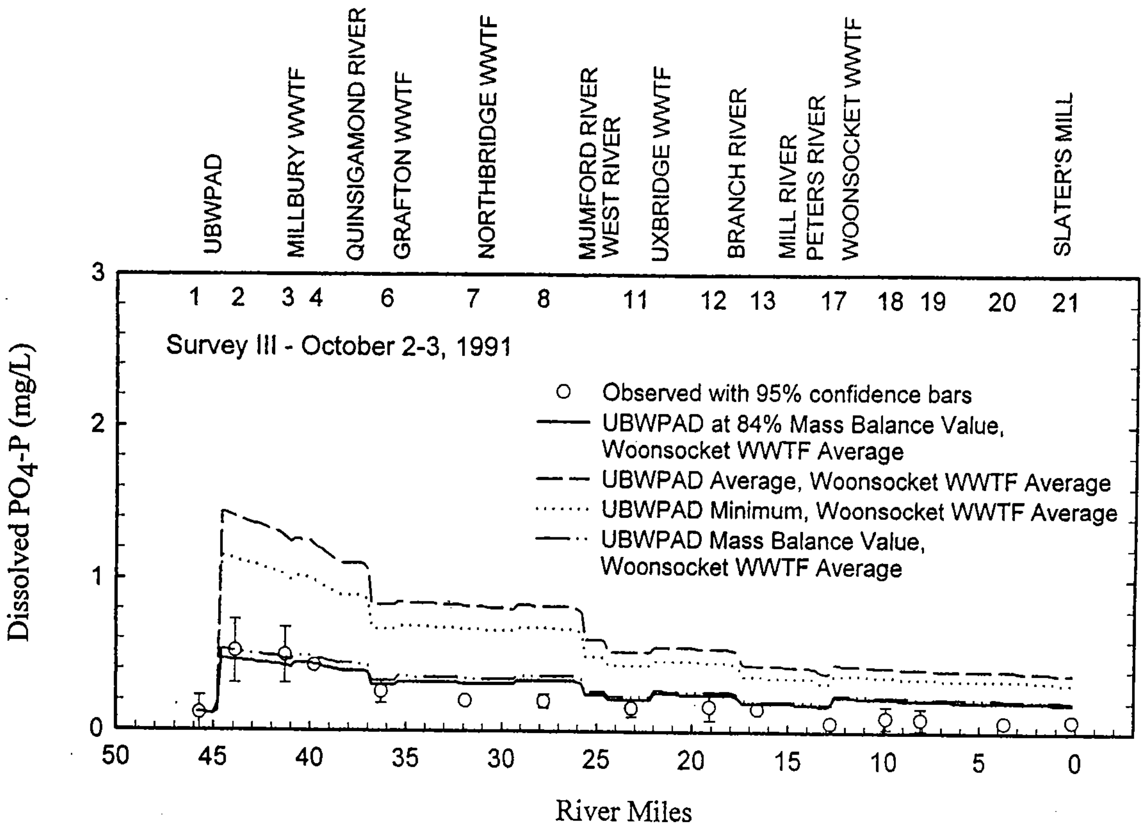


Figure A15-9-9 Dissolved Orthophosphate Simulations for October 2-3, 1991

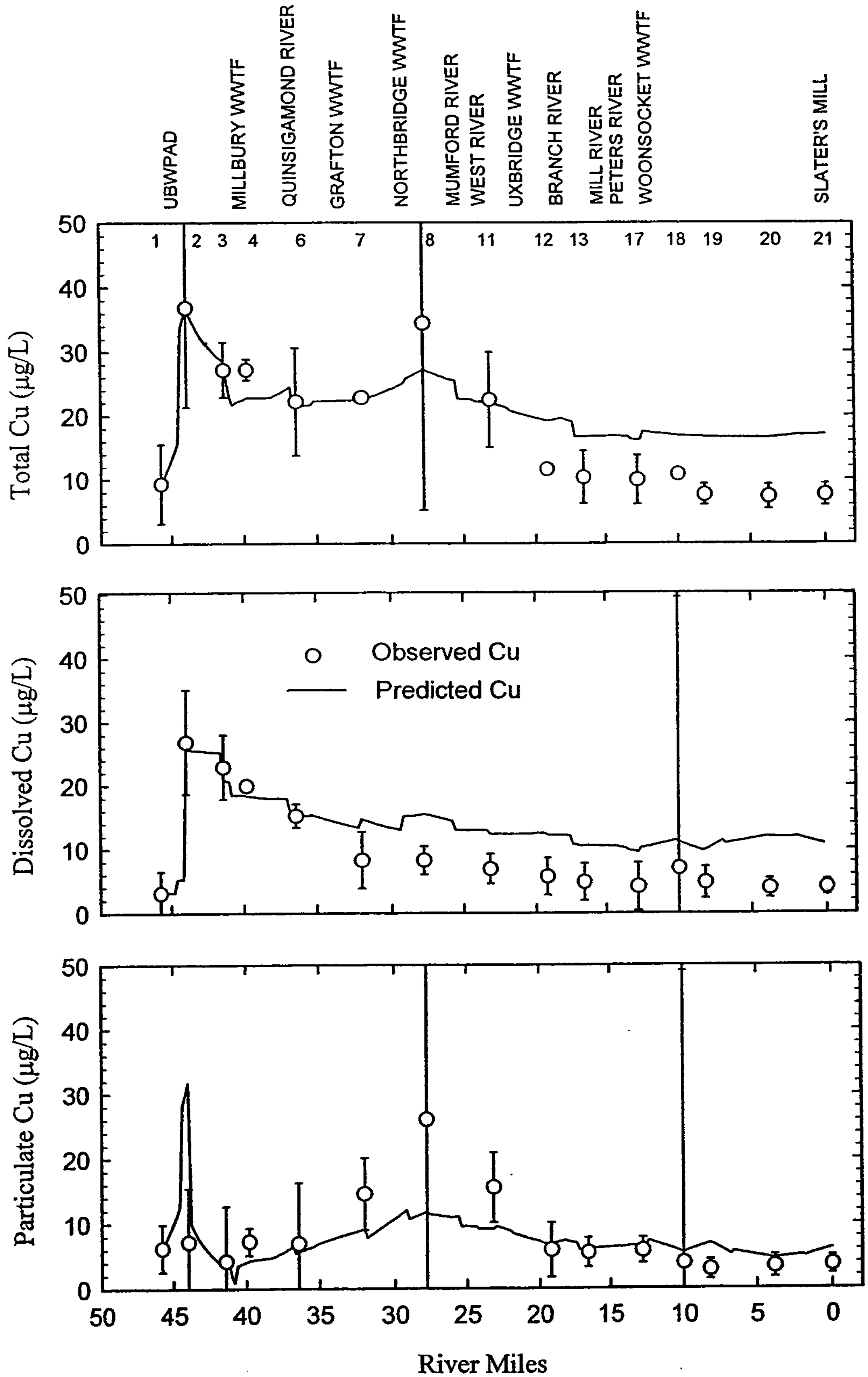


Figure A15-9-10 Copper Profiles for July 10-11, 1991

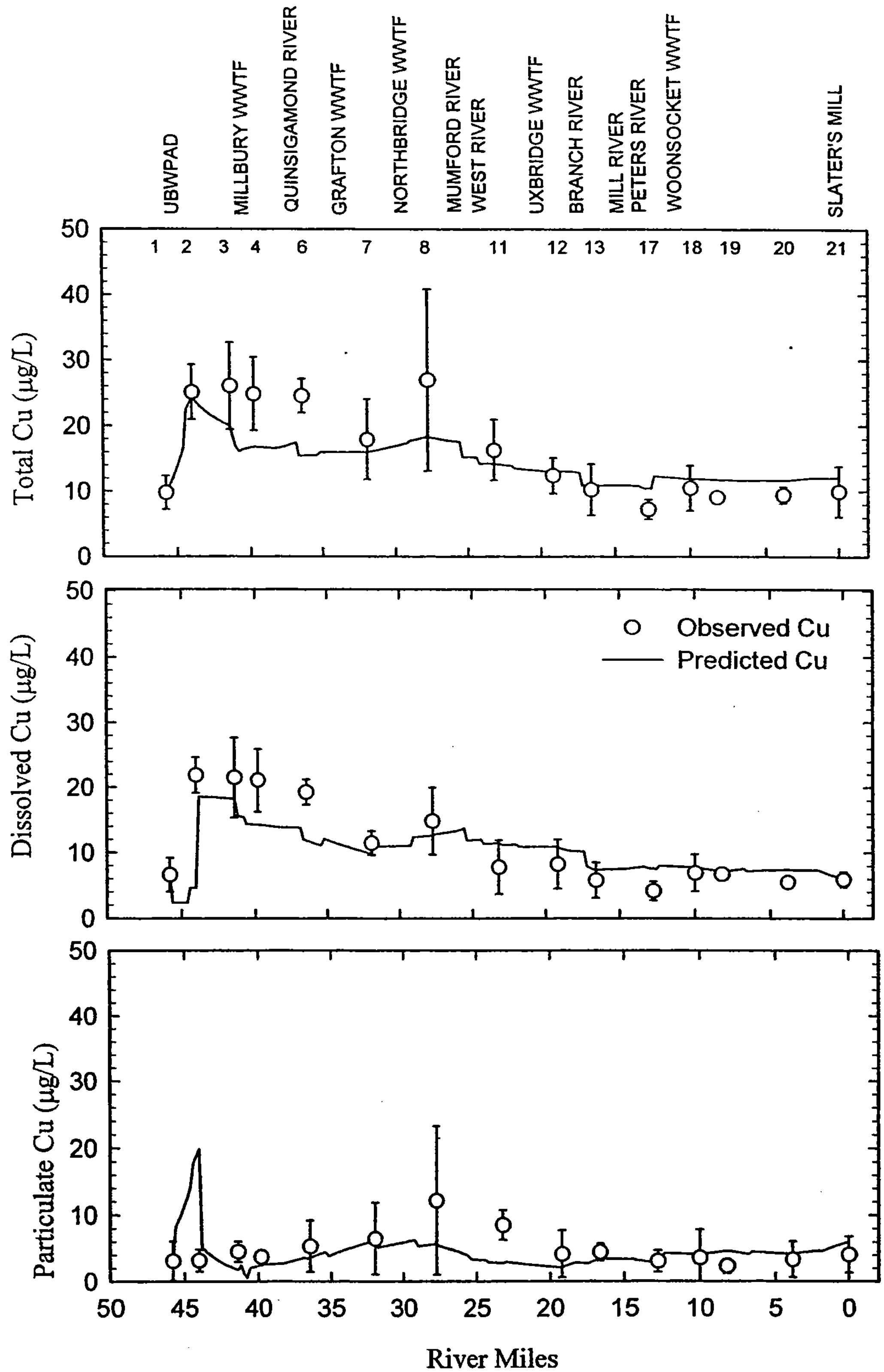


Figure A15-9-11 **Copper Profiles for August 14-15, 1991**

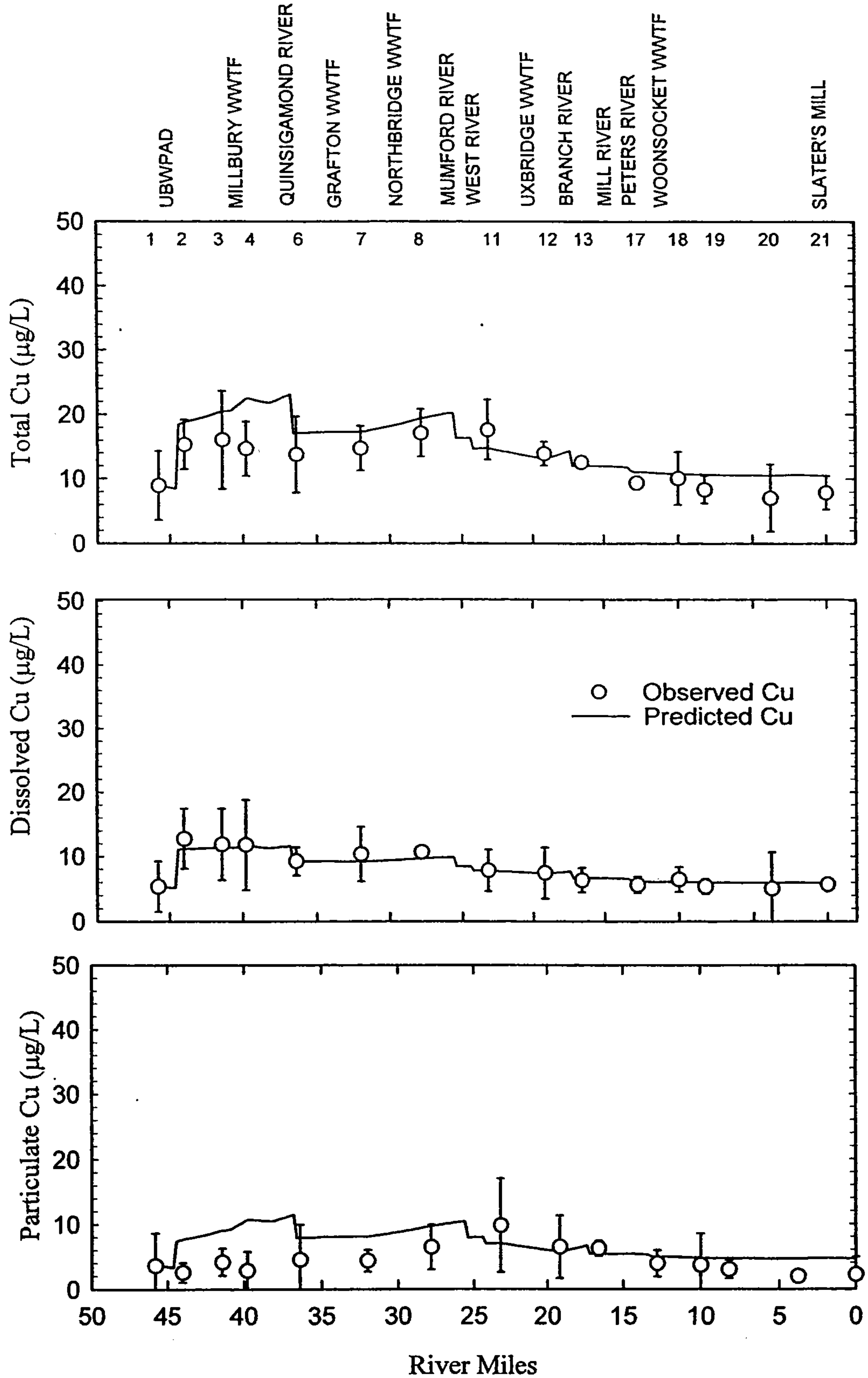


Figure A15-9-12 **Copper Profiles for October 2-3, 1991**

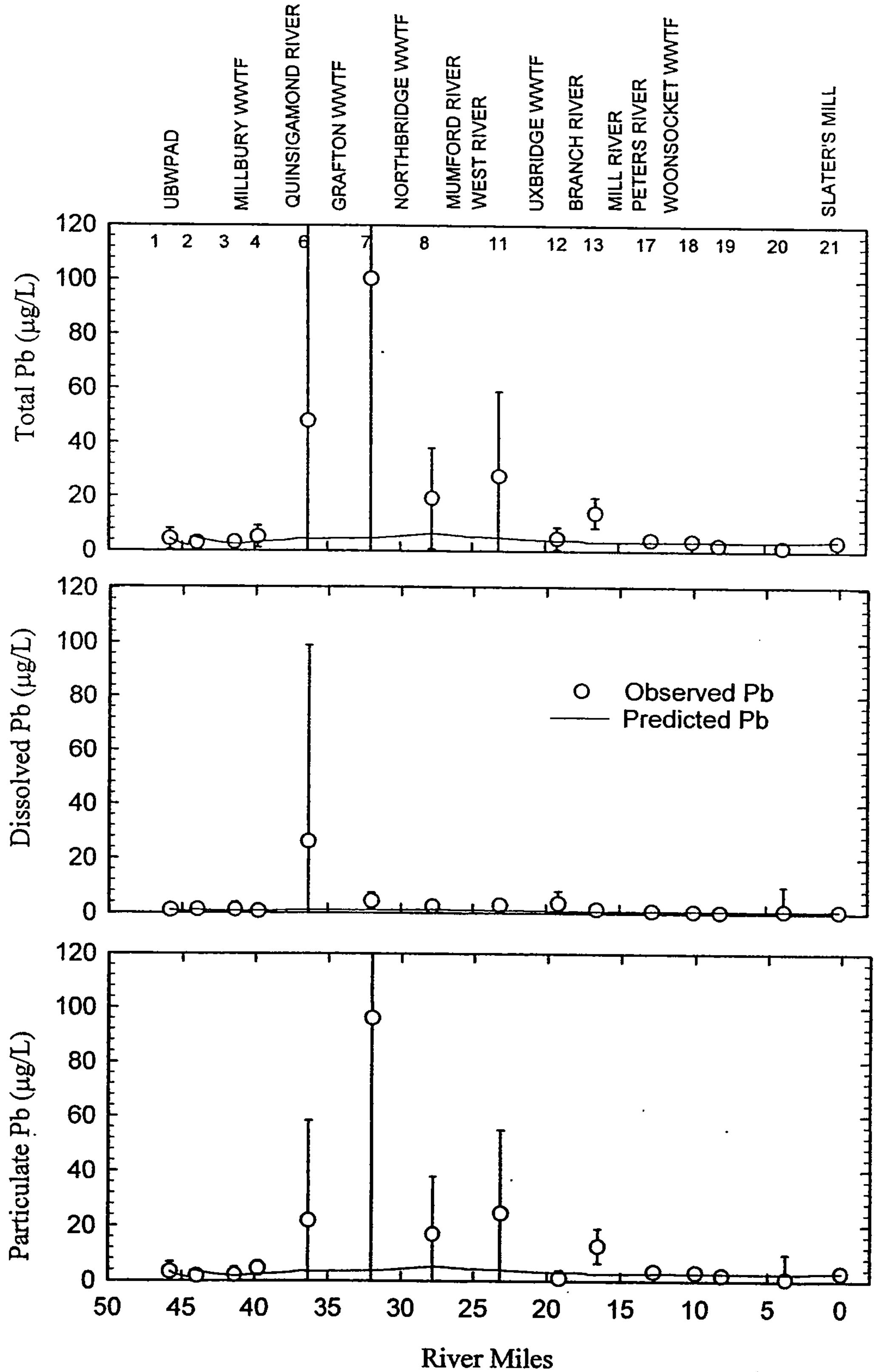


Figure A15-9-13 **Lead Profiles for July 10-11, 1991**

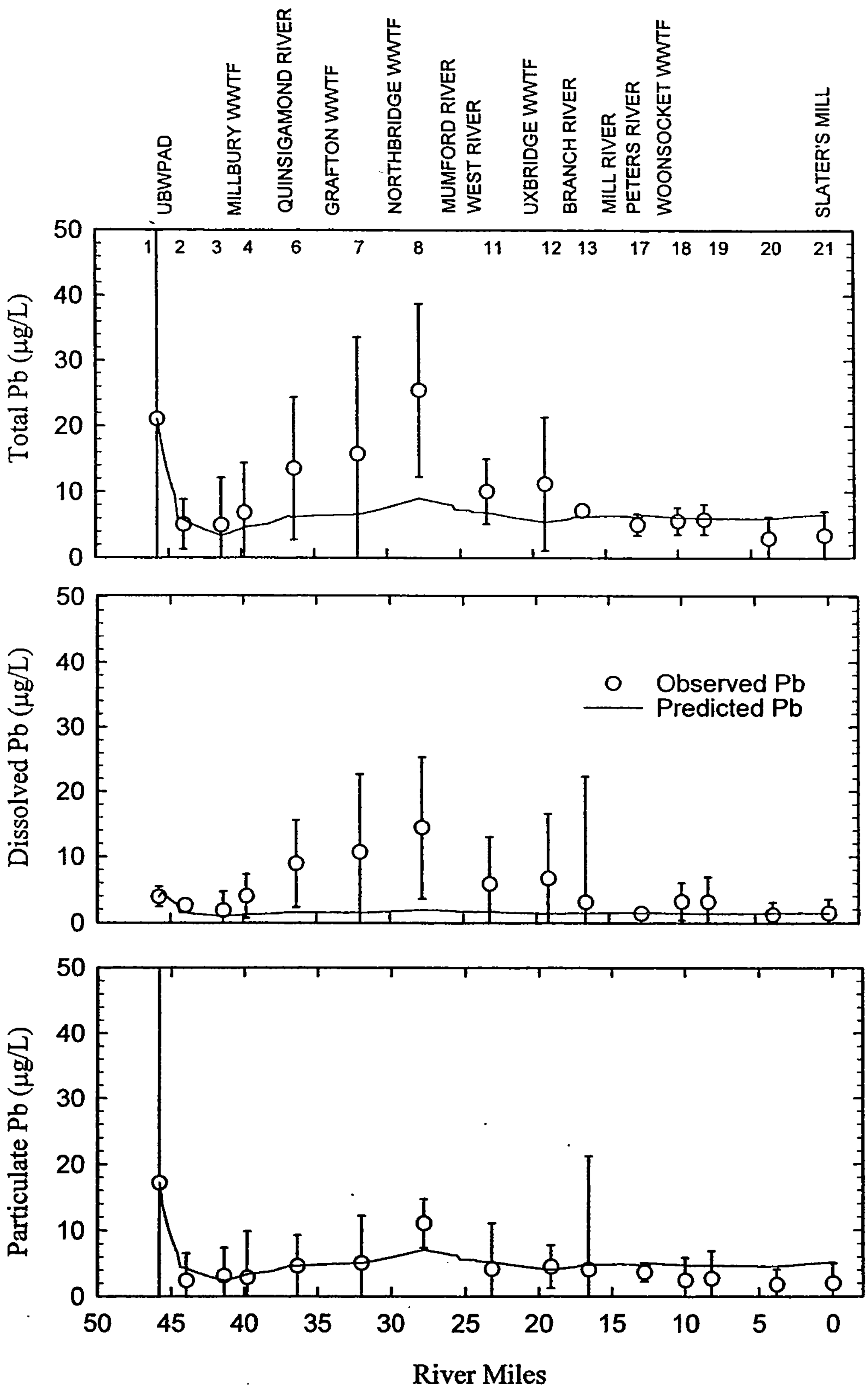


Figure A15-9-14 **Lead Profiles for August 14-15, 1991**

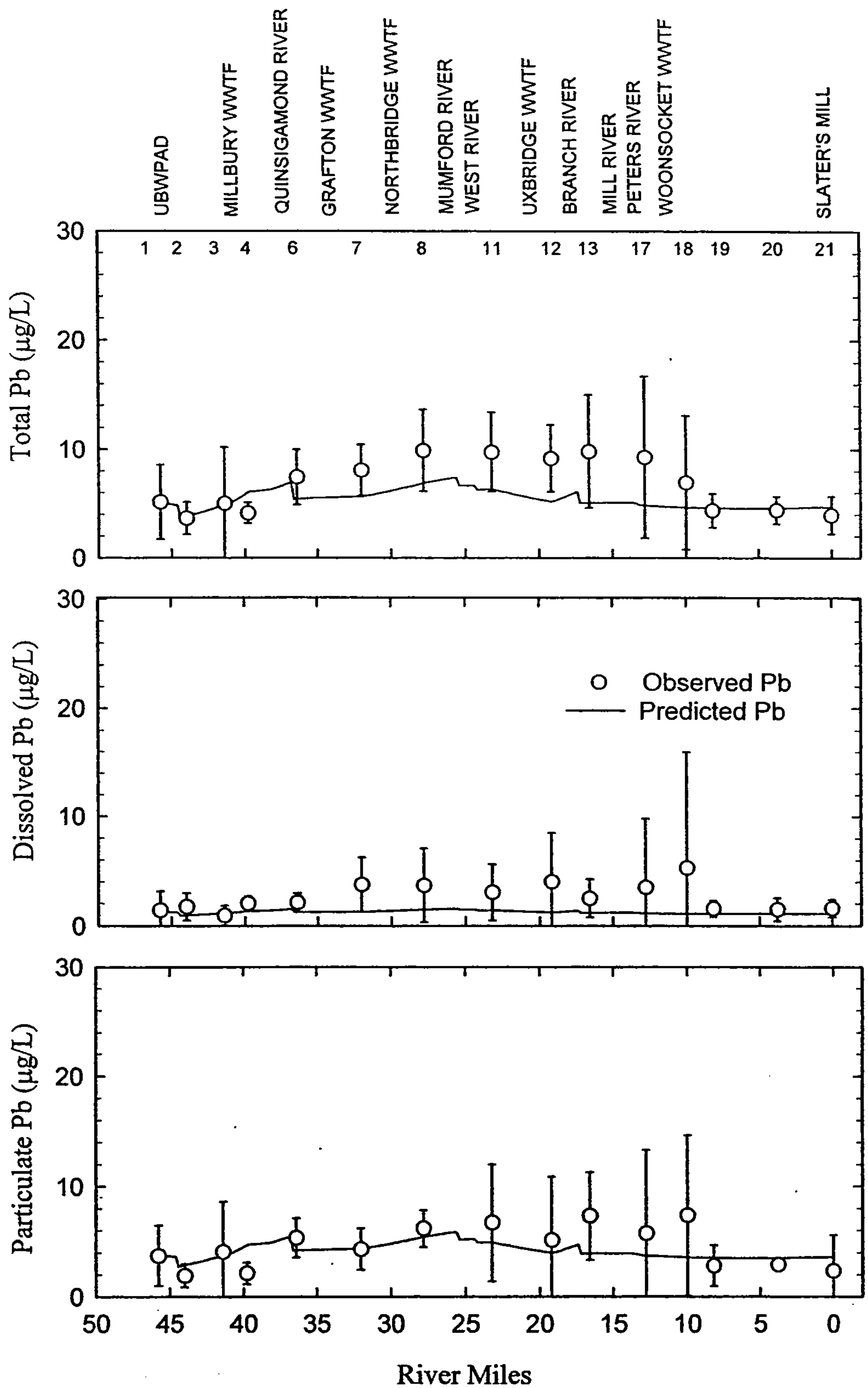


Figure A15-9-15 **Lead Profiles for October 2-3, 1991**

Section A15-10

Wet Weather Data

- Event Mean Concentrations -

- Event Mean Concentrations for Storm 1
- Event Mean Concentrations for Storm 2
- Event Mean Concentrations for Storm 3
- Event Mean Concentration Plots for Ammonia and Nitrate
- Event Mean Concentration Plots for Orthophosphate, Fecal Coliform, and E.coli
- Event Mean Concentration Plots for TSS, VSS, and Lead
- Event Mean Concentration Plots for Cadmium, Chromium, and Copper
- Event Mean Concentration Plots for Nickel, Zinc, BOD

Table A15-10-1 Event Mean Concentration (EMC) For Storm 1

Station	Cd	Cr	Cu	Ni	Pb	Zn	EC
	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	CFU/100mL
BWW00	0.61	2.47	6.45	3.10	19.7	33.5	2690
BWW01	0.35	4.08	9.36	3.89	14.2	46.4	3850
BWW02	0.90	10.8	14.3	10.4	13.2	64.1	0.55
BWW04	1.26	8.99	38.3	21.4	10.1	55.4	88.5
BWW06	1.00	7.15	31.8	18.3	9.83	38.5	173
BWW07	0.81	5.11	24.5	16.1	8.28	30.3	182
BWW08	1.10	8.40	28.4	16.4	12.4	41.3	41.5
BWW11	0.71	4.89	17.1	11.3	7.12	26.8	105
BWW13	0.45	2.86	11.0	8.28	4.34	17.5	139
BWW17	0.39	2.98	10.4	7.61	6.36	22.8	958
BWW18	0.43	2.16	11.8	5.85	4.82	35.0	49.1
BWW20	0.33	1.69	10.5	4.80	3.87	25.8	40.2
BWW21	0.38	2.05	10.4	4.62	6.76	25.1	319

Station	BOD_5	NH_3-N	NO_3-N	PO_4-P	TSS	VSS	FC
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL
BWW00	4.16	0.17	0.32	0.02	6.41	2.76	6190
BWW01	5.42	0.22	0.43	0.02	13.1	5.10	11400
BWW02	5.99	1.54	1.14	0.73	7.55	4.50	340
BWW04	5.25	1.04	2.14	0.80	16.0	6.88	735
BWW06	4.33	0.49	3.25	0.74	7.40	3.42	607
BWW07	2.48	0.81	3.00	0.65	7.28	2.93	784
BWW08	2.85	0.83	2.54	0.64	9.80	3.30	189
BWW11	2.24	0.31	1.77	0.37	5.47	2.61	228
BWW13	1.75	0.05	1.29	0.28	3.67	2.07	594
BWW17	1.67	0.04	1.37	0.24	5.04	2.39	2230
BWW18	1.73	2.42	1.33	0.41	4.70	2.94	394
BWW20	1.67	0.55	1.99	0.26	2.74	1.86	117
BWW21	1.34	0.37	1.73	0.17	2.75	1.78	2290

Table A15-10-2 Event Mean Concentration (EMC) For Storm 2

Station	Cd	Cr	Cu	Ni	Pb	Zn	EC
	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	CFU/100mL
BWW00	0.05	1.45	7.80	2.23	11.4	27.6	2780
BWW01	0.09	3.27	10.6	4.60	11.9	45.3	3570
BWW02	1.12	7.02	15.9	12.3	11.7	46.9	8160
BWW04	1.85	9.07	23.0	13.9	15.9	56.3	4840
BWW06	1.41	5.62	17.5	10.5	13.2	43.7	3500
BWW07	1.20	3.93	14.1	9.72	7.36	41.6	1580
BWW08	1.72	6.69	18.6	11.8	11.4	45.0	1250
BWW11	1.23	6.91	17.2	7.68	10.6	41.1	350
BWW13	0.51	3.52	9.46	5.00	6.31	21.8	328
BWW17	0.54	2.49	8.68	5.39	5.21	19.3	402
BWW18	0.51	2.33	9.87	4.72	4.28	21.3	215
BWW20	0.48	1.85	8.73	6.05	4.79	24.6	88.8
BWW21	0.54	1.68	8.21	4.97	5.97	26.4	516

Station	BOD_5	NH_3-N	NO_3-N	PO_4-P	TSS	VSS	FC
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL
BWW00	6.30	0.07	0.12	0.04	11.8	6.51	4900
BWW01	7.19	0.17	0.24	0.03	13.6	6.32	5800
BWW02	7.80	3.87	0.28	0.41	19.6	13.9	22200
BWW04	9.13	3.21	0.43	0.47	17.8	11.8	26100
BWW06	7.54	3.27	0.74	0.42	10.7	5.51	17400
BWW07	5.37	2.75	0.94	0.43	6.05	3.09	8350
BWW08	4.89	2.49	1.07	0.45	8.83	3.83	7240
BWW11	4.51	1.17	1.23	0.27	11.4	4.24	3030
BWW13	2.62	0.79	1.50	0.18	4.10	2.07	764
BWW17	2.48	0.44	1.63	0.19	4.11	1.76	836
BWW18	3.31	1.20	1.45	0.28	6.83	3.93	895
BWW20	3.76	0.79	1.44	0.26	7.04	4.05	409
BWW21	4	0.79	1.69	0.23	4.81	2.33	2110

Table A15-10-3 Event Mean Concentration (EMC) For Storm 3

Station	Cd	Cr	Cu	Ni	Pb	Zn	EC
	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	CFU/100mL
BWW00	0.36	7.28	19.2	3.94	41.1	35.8	9120
BWW01	0.40	6.12	19.1	5.35	33.5	91.6	5590
BWW02	0.79	7.60	29.0	11.6	30.6	52.7	781
BWW04	0.50	4.41	14.9	8.32	10.4	22.6	2040
BWW06	0.53	3.89	19.4	9.19	16.4	36.2	1510
BWW07	0.46	4.06	19.3	10.6	11.7	32.6	315
BWW08	0.54	8.83	25.6	11.4	19.1	51.0	486
BWW11	0.57	5.93	20.0	9.74	16.8	41.7	239
BWW13	0.36	2.77	10.6	8.24	6.17	16.5	120
BWW17	0.25	2.34	10.4	7.84	8.17	17.2	722
BWW18	0.25	1.85	10.7	7.18	5.74	17.9	282
BWW20	0.21	1.74	11.9	6.61	6.41	16.7	291
BWW21	0.24	1.77	9.81	5.34	5.68	15.0	1090

Station	BOD_5	NH_3-N	NO_3-N	PO_4-P	TSS	VSS	FC
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL
BWW00	5.66	0.05	0.22	0.01	28.8	9.15	22200
BWW01	6.60	0.06	0.34	0.01	28.5	8.33	9850
BWW02	7.19	0.35	1.35	0.28	24.2	8.61	5910
BWW04	6.38	0.29	1.34	0.26	44.5	15.5	5280
BWW06	4.21	0.18	1.61	0.35	26.0	9.49	3170
BWW07	4.36	0.18	1.72	0.31	10.3	5.61	2350
BWW08	4.13	0.17	1.64	0.30	17.2	5.27	2250
BWW11	3.53	0.11	0.69	0.26	14.5	7.35	807
BWW13	2.02	0.06	1.81	0.30	5.93	3.80	201
BWW17	2.12	0.03	1.87	0.06	7.79	3.71	1490
BWW18	1.98	0.21	2.44	0.39	7.08	3.96	2460
BWW20	1.95	0.26	2.31	0.57	10.5	3.61	728
BWW21	1.79	0.11	2.27	0.40	8.64	4.70	1480

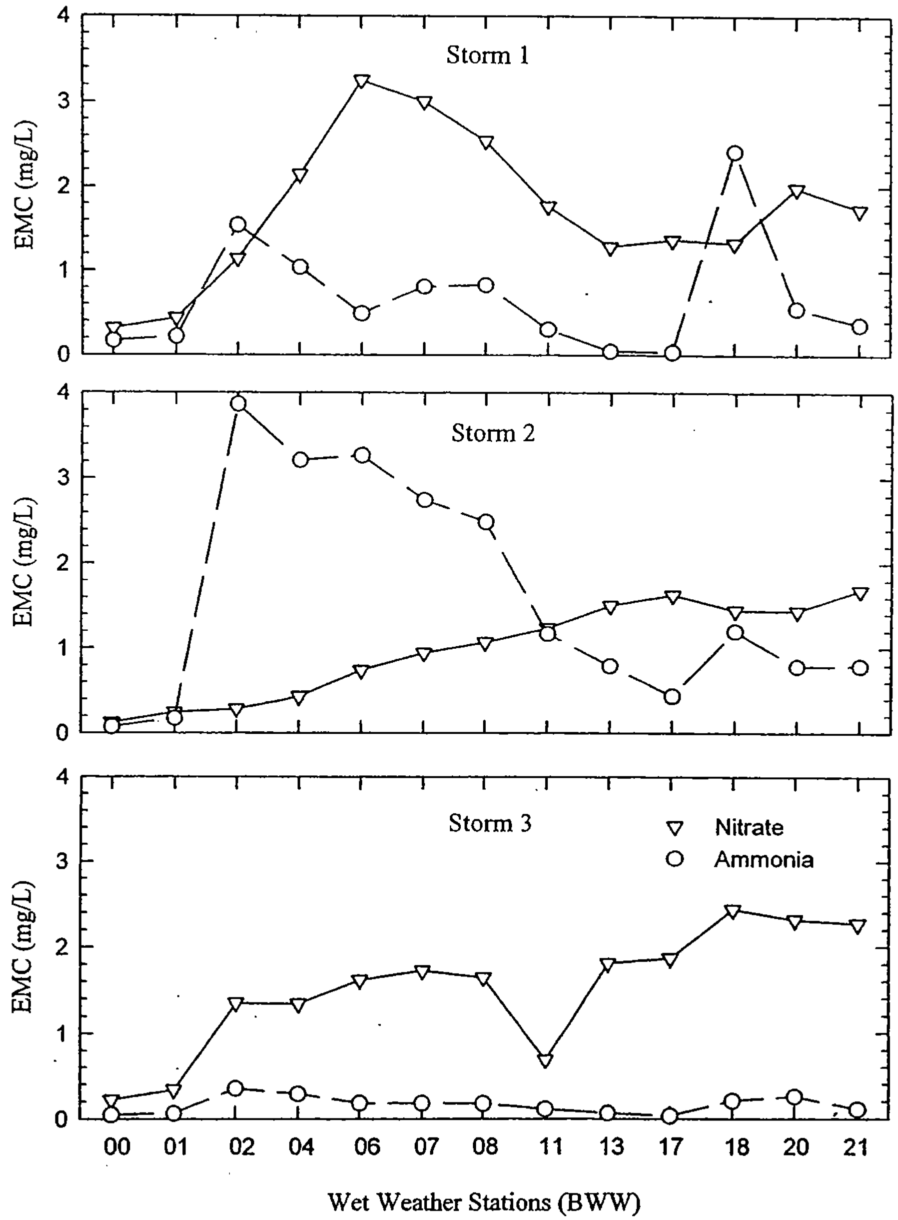


Figure A15-10-1 EMC plots for NO_3-N and NH_3-N for Storm 1, Storm 2, and Storm 3

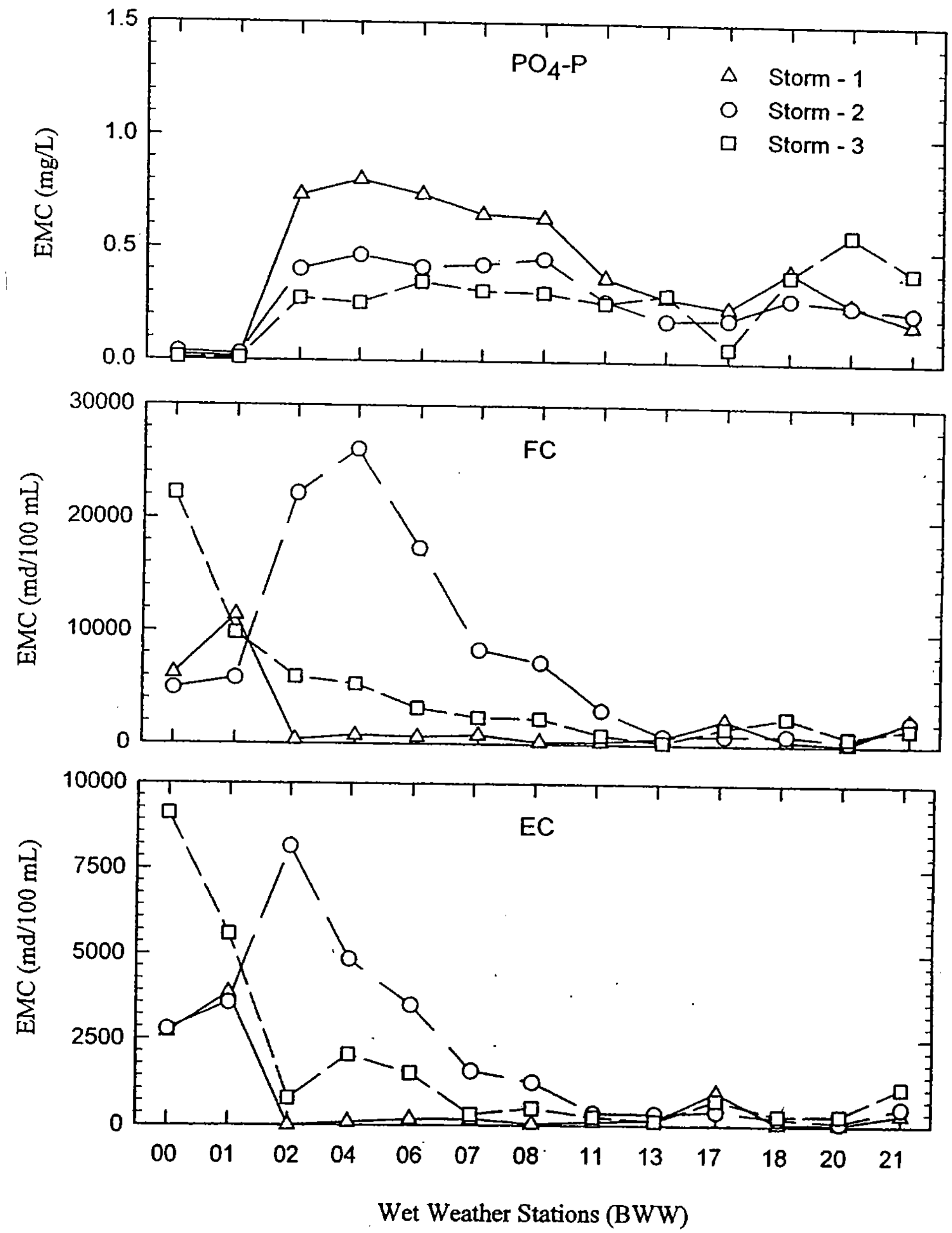


Figure A15-10-2 EMC plots for PO_4-P, FC, and EC for Storm 1, Storm 2, and Storm 3

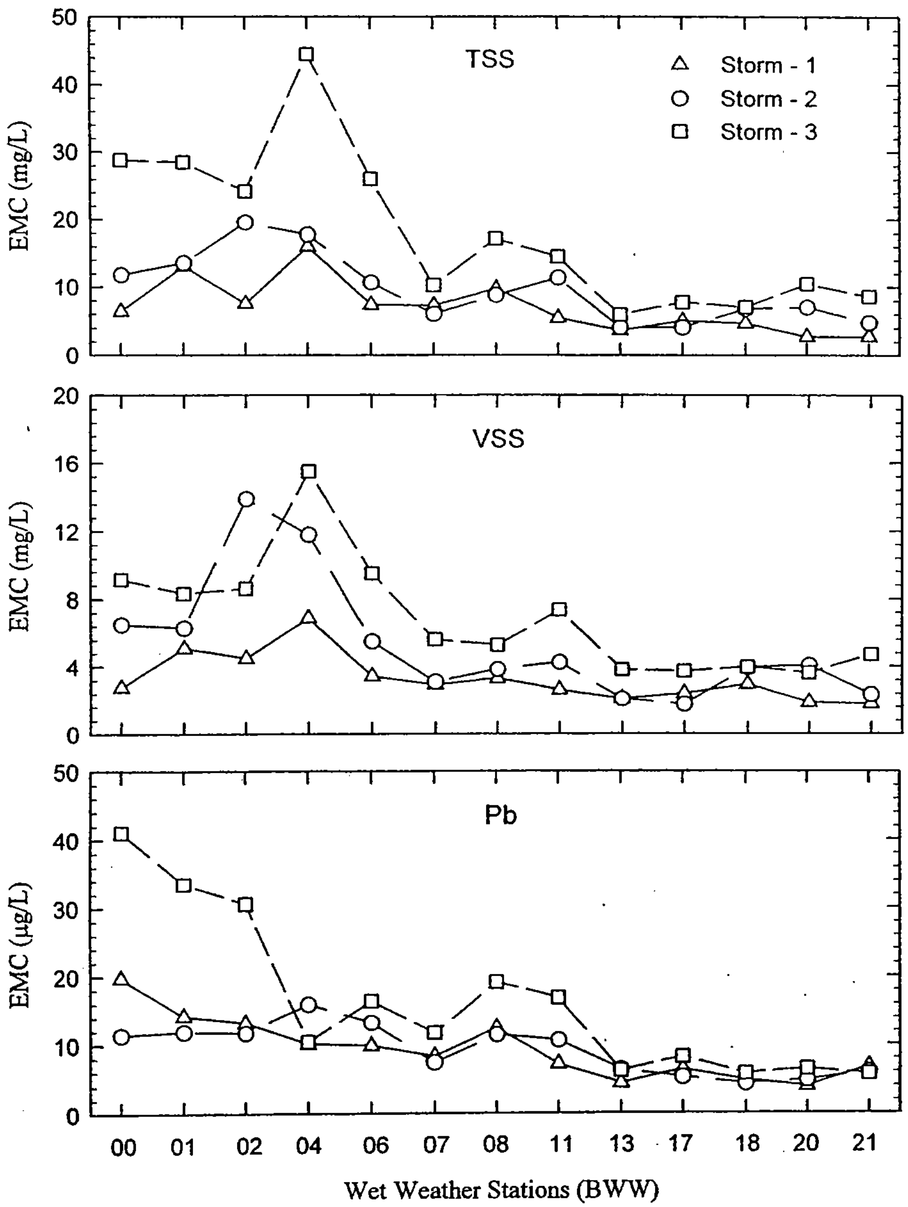


Figure A15-10-3 EMC plots for TSS, VSS and Pb for Storm 1, Storm 2, and Storm 3

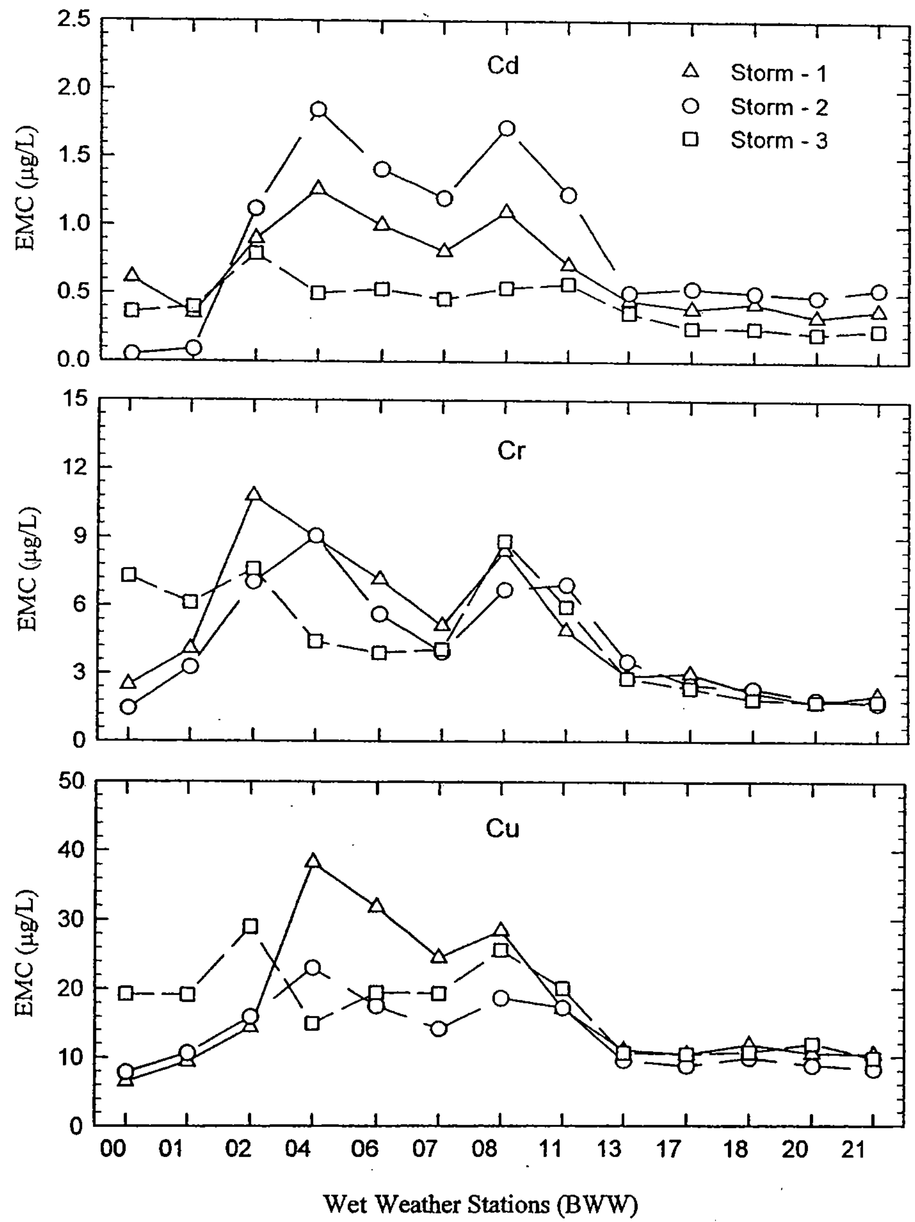


Figure A15-10-4 EMC plots for Cd, Cr, and Cu for Storm 1, Storm 2, and Storm 3

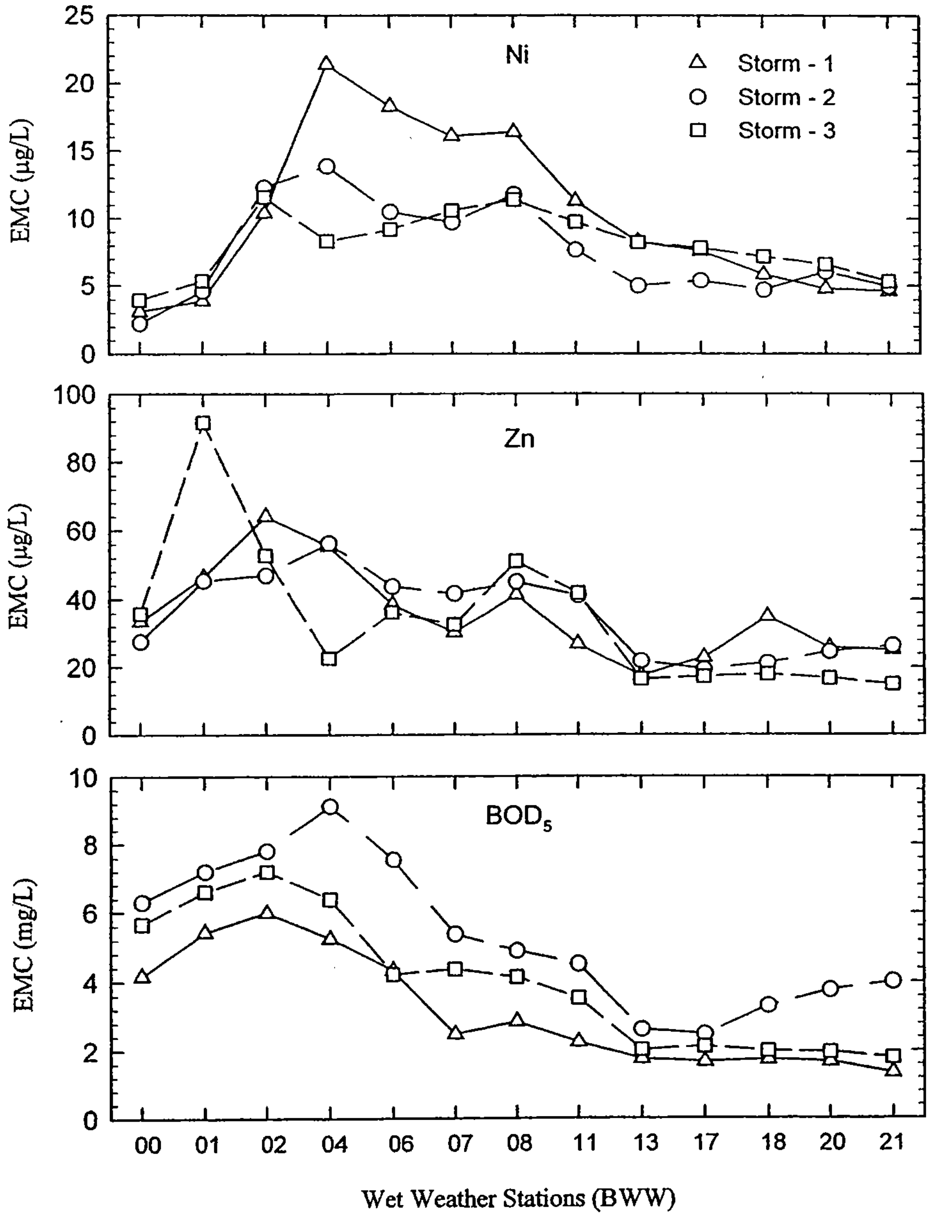


Figure A15-10-5 EMC plots for Ni, Zn, and BOD_5 for Storm 1, Storm 2, and Storm 3

Section A15-11

Wet Weather Data

- Load Calculations -

- Average of all storms for wet loads as percent of total
- Average of all stations for wet loads as percent of total
- Wet load comparison between two major point sources and other sources along the river (in %)
- Total load comparison between two major point sources and other sources along the river (in %)
- Comparison between wet and total load for two major point sources and other sources along the river (in %)

Table A15-11-1 Average of all Storms for Wet Loads as Percent of Total Load

Station	Cd	Cr	Cu	Ni	Pb	Zn	BOD_5	EC	FC	NH_3-N	NO_3-N	PO_4-P	TSS	VSS
Blackstone River Stations														
BWW00	81.3	93.1	90.8	84.6	87.5	85.9	85.9	96.9	87.9	86.9	77.9	83.0	91.6	91.7
BWW01	84.9	74.3	84.3	69.7	88.1	80.4	86.9	96.4	81.0	64.9	56.3	81.2	93.6	81.8
BWW02	85.8	75.2	82.3	62.1	84.6	72.1	69.3	75.9	90.0	73.4	51.9	77.7	76.0	74.9
BWW04	73.1	81.2	75.2	48.8	88.9	69.9	80.8	90.2	84.9	80.6	43.7	62.8	94.3	91.4
BWW06	56.4	66.9	58.6	42.8	73.2	64.2	67.6	94.2	94.7	67.4	53.9	44.3	79.0	71.2
BWW07	38.6	59.1	50.1	37.2	63.3	54.9	58.2	88.4	87.7	67.4	34.5	47.2	69.3	65.5
BWW08	51.2	61.9	56.4	40.6	63.3	49.4	63.2	84.9	75.7	70.0	32.2	43.4	67.1	66.0
BWW11	54.0	60.2	56.8	43.2	67.0	59.1	58.4	88.1	82.1	81.6	45.9	39.2	66.9	72.7
BWW13	64.8	52.5	44.0	31.8	62.0	55.8	49.3	82.5	79.5	85.2	54.2	36.4	54.0	65.6
BWW17	52.6	51.5	52.3	40.9	56.2	54.2	60.0	95.9	85.9	82.1	40.5	42.1	72.7	74.4
BWW18	53.8	55.7	48.8	34.8	51.0	47.6	59.1	90.4	83.6	69.3	32.1	40.3	55.6	69.9
BWW20	49.0	61.4	51.0	50.4	55.2	55.5	59.4	93.0	77.3	62.4	38.0	52.7	71.4	72.9
BWW21	52.2	53.1	46.1	47.9	62.0	60.3	69.3	95.3	95.8	70.9	42.2	48.3	64.6	72.2
Tributaries														
BWW05	71.1	82.7	69.3	72.4	72.7	56.4					36.4	65.6	58.4	73.9
BWW09	72.1	61.2	74.5	43.9	68.3	43.2	60.9	68.9	72.0	55.9	55.4	45.4	64.3	77.3
BWW10	44.3	71.7	54.9	48.0	57.9	34.3					47.4	50.2	69.0	83.9
BWW14	53.8	57.1	51.2	59.2	50.2	36.8	66.0	81.5	75.4	81.3	40.7	22.9	63.3	62.6
BWW15	63.4	60.9	57.1	44.0	58.3	35.1					47.9	50.0	73.3	77.3
BWW16	71.0	63.8	64.2	68.6	70.2	81.5	67.9	83.9	90.9	71.4	49.3	62.4	77.2	66.2

Table A15-11-2 Average of all Stations for each Storm for Wet Loads as Percent of Total Load

Storm	Cd	Cr	Cu	Ni	Pb	Zn	EC
Storm 1	51.9	48.0	41.9	35.1	53.4	45.5	86.8
Storm 2	65.9	68.8	65.1	49.3	73.4	63.6	90.5
Storm 3	66.3	78.5	76.8	62.1	81.5	77.6	93.2
Average	61.4	65.1	61.3	48.8	69.4	62.2	90.2

Storm	BOD_5	NH_3-N	NO_3-N	PO_4-P	TSS	VSS	FC
Storm 1	48.3	75.1	37.2	41.9	56.5	68.7	76.6
Storm 2	78.2	69.5	49.0	64.6	81.7	68.8	85.9
Storm 3	73.7	77.4	53.1	54.7	82.5	86.4	92.7
Average	66.7	74.0	46.4	53.7	73.5	74.6	85.1

Table A15-11-3 Wet Load Comparison Between the Two Major Point Sources and the Other Sources along the River

Storm	Cd		Cr		Cu		Pb	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	32.7	67.3	55.8	44.2	53.9	46.2	13.2	86.8
2	15.0	85.0	15.1	84.9	16.2	83.8	4.38	95.6
3	20.9	79.1	9.53	90.5	28.0	72.0	4.38	95.6

Storm	Ni		Zn		TSS		FC	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	69.6	30.4	48.3	51.7	23.3	76.7	2.72	97.3
2	28.9	71.1	15.0	85.0	28.4	71.6	68.2	31.8
3	35.6	64.5	14.3	85.7	7.42	92.6	0.26	99.7

Storm	NH_3-N		NO_3-N		PO_4-P		BOD_5	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	58.6	41.4	41.3	58.7	72.3	27.7	36.2	63.8
2	68.0	32.0	1.89	98.1	77.2	22.8	26.2	73.9
3	31.1	68.9	54.5	45.5	39.3	60.7	39.6	60.4

Two Major Point Sources = UBWPAD + Woonsocket WWTF; Other Sources = Tributaries + Small Point Sources + Nonpoint Sources (for instance, runoff, resuspension and groundwater).

Table A15-11-4 Total Load Comparison Between the Two Major Point Sources and the Other Sources along the River

Storm	Cd		Cr		Cu		Pb	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	18.8	81.2	40.2	59.8	35.7	64.3	6.11	93.9
2	15.3	84.7	12.8	87.2	11.6	88.4	4.87	95.1
3	15.3	84.7	6.29	93.7	18.8	81.2	1.97	98.0

Storm	Ni		Zn		TSS		FC	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	41.7	58.3	24.9	75.1	16.9	83.1	1.85	98.2
2	29.7	70.4	13.9	86.1	19.2	80.8	66.2	33.8
3	30.3	69.8	8.66	91.3	2.42	97.6	0.07	99.9

Storm	NH_3-N		NO_3-N		PO_4-P		BOD_5	
	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources	Two Major Point Sources	Other Sources
1	49.2	50.8	27.2	72.8	81.1	18.9	39.4	60.6
2	82.6	17.4	1.57	98.4	59.4	40.6	35.8	64.2
3	20.1	80.0	31.5	68.5	35.9	64.1	25.9	74.1

Two Major Point Sources = UBWPAD + Woonsocket WWTF; Other Sources = Tributaries + Small Point Sources + Nonpoint Sources (for instance, runoff, resuspension and groundwater).

Table A15-11-5 A Comparison Between Wet and Total Load for the Two Major Point Sources and the Other Sources along the River in Percent

Survey Load	Cd Two Major Point Sources	Cd Other Sources	Cr Two Major Point Sources	Cr Other Sources	Cu Two Major Point Sources	Cu Other Sources	Pb Two Major Point Sources	Pb Other Sources
Wet	22.9	77.1	26.8	73.2	32.7	67.3	7.33	92.7
Total	16.5	83.5	19.8	80.2	22.1	78.0	4.32	95.7

Survey Load	Ni Two Major Point Sources	Ni Other Sources	Zn Two Major Point Sources	Zn Other Sources	TSS Two Major Point Sources	TSS Other Sources	FC Two Major Point Sources	FC Other Sources
Wet	44.7	55.3	25.9	74.1	19.7	80.3	23.7	76.3
Total	33.9	66.1	15.8	84.2	12.8	87.2	22.7	77.3

Survey Load	NH_3-N Two Major Point Sources	NH_3-N Other Sources	NO_3-N Two Major Point Sources	NO_3-N Other Sources	PO_4-P Two Major Point Sources	PO_4-P Other Sources	BOD_5 Two Major Point Sources	BOD_5 Other Sources
Wet	52.6	47.4	32.6	67.5	62.9	37.1	34.0	66.0
Total	50.6	49.4	20.1	79.9	58.8	41.2	33.7	66.3

Two Major Point Sources = UBWPAD + Woonsocket WWTF; Other Sources = Tributaries + Small Point Sources + Nonpoint Sources (for instance, runoff, resuspension and groundwater).

Section A15-12

Metals in Sediments

- **Copper** in Blackstone River sediments
- **Lead** in Blackstone River sediments

- **Total Copper** in sediment pore water and *C. dubia* and Fathead Minnow Mortality
- **Total Lead** in sediment pore water and *C. dubia* and Fathead Minnow Mortality

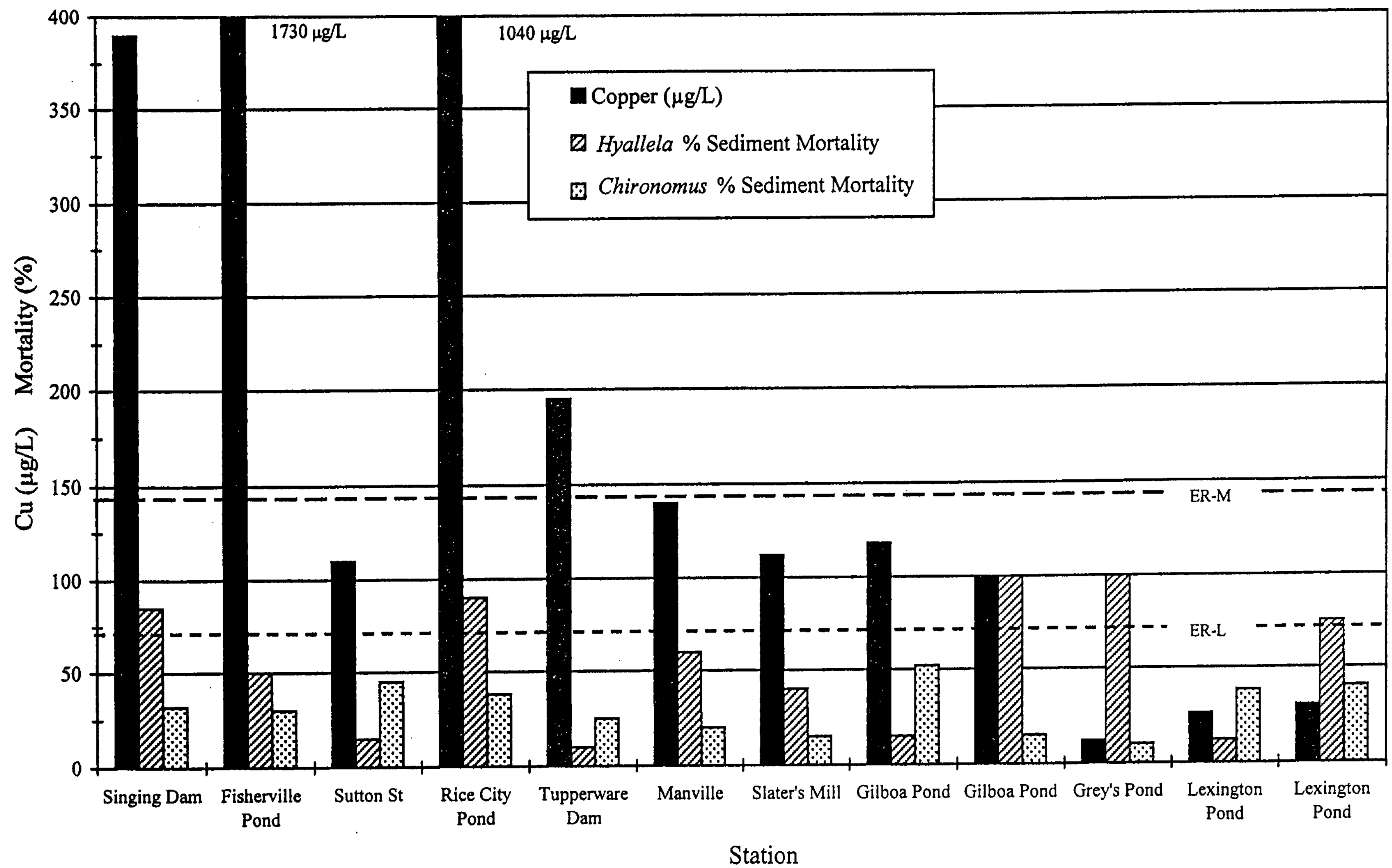


Figure A15-12-1 Copper in Blackstone River Sediments

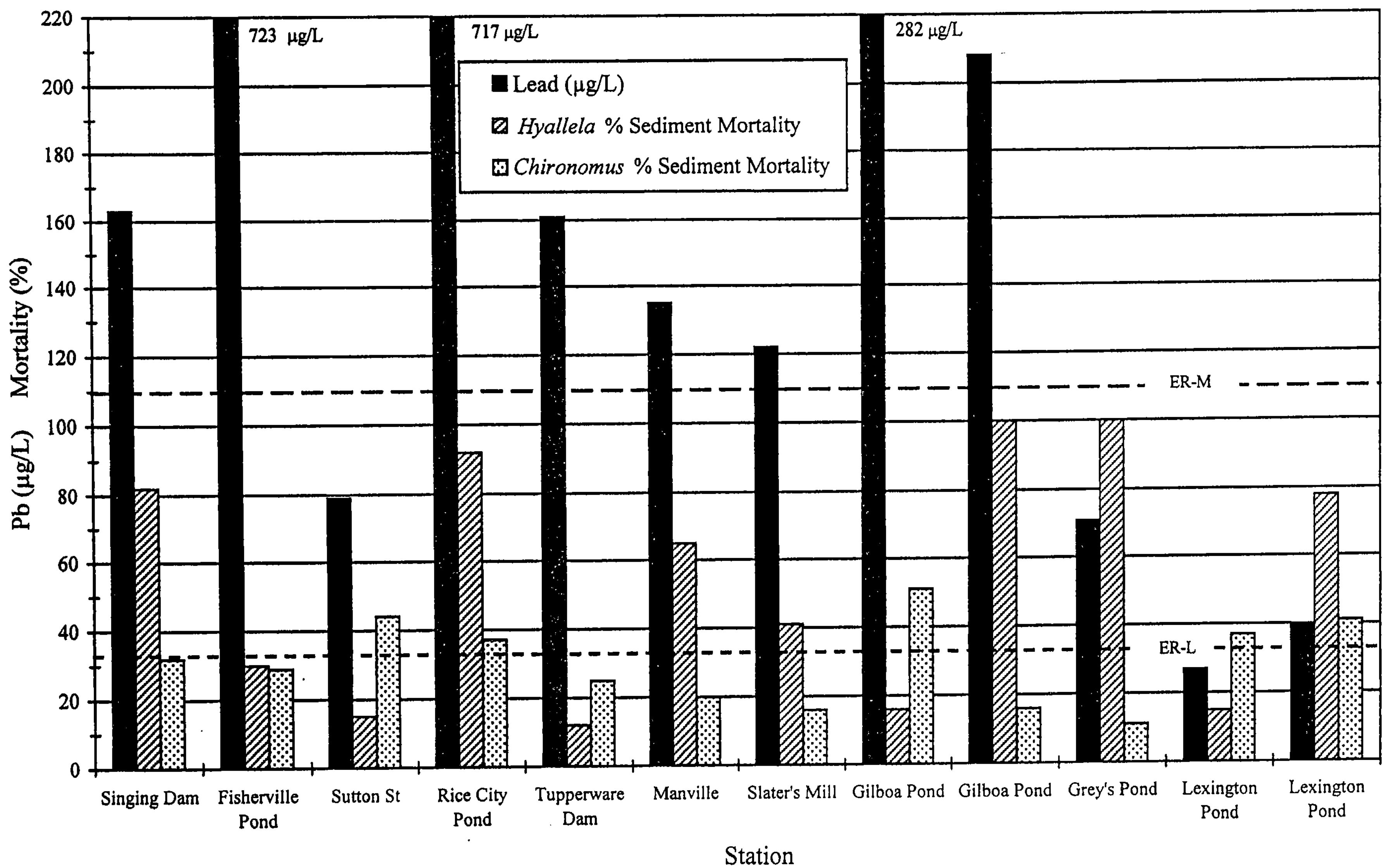


Figure A15-12-2 Lead in Blackstone River Sediments

Total Copper in Sediment Pore Water and *C. dubia* and Fathead Minnow Mortality

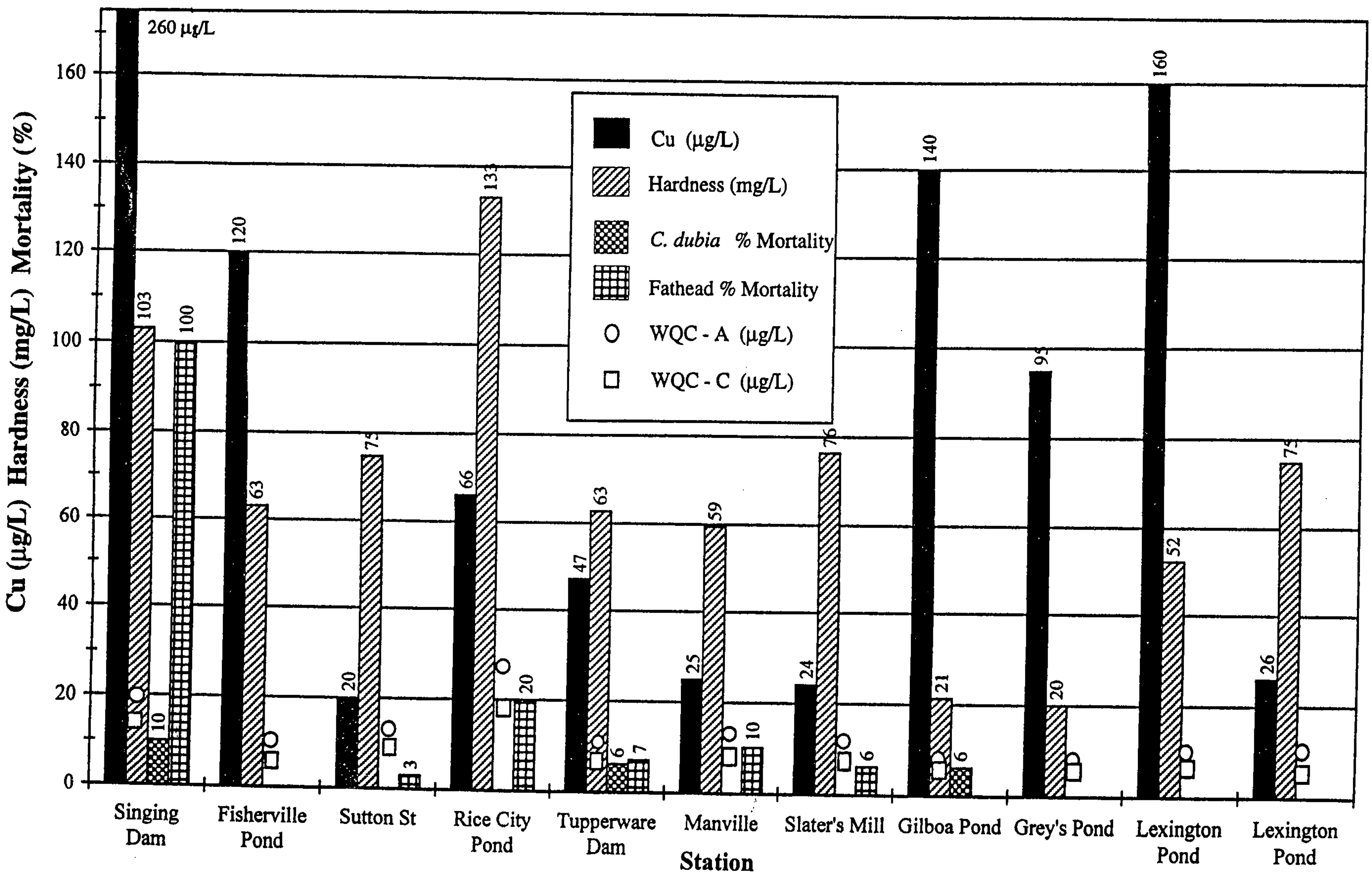


Figure A15-12-3 Total Copper in Sediment Pore Water and *C. dubia* and Fathead Minnow Mortality

Total Lead in Sediment Pore Water and *C. dubia* and Fathead Minnow Mortality

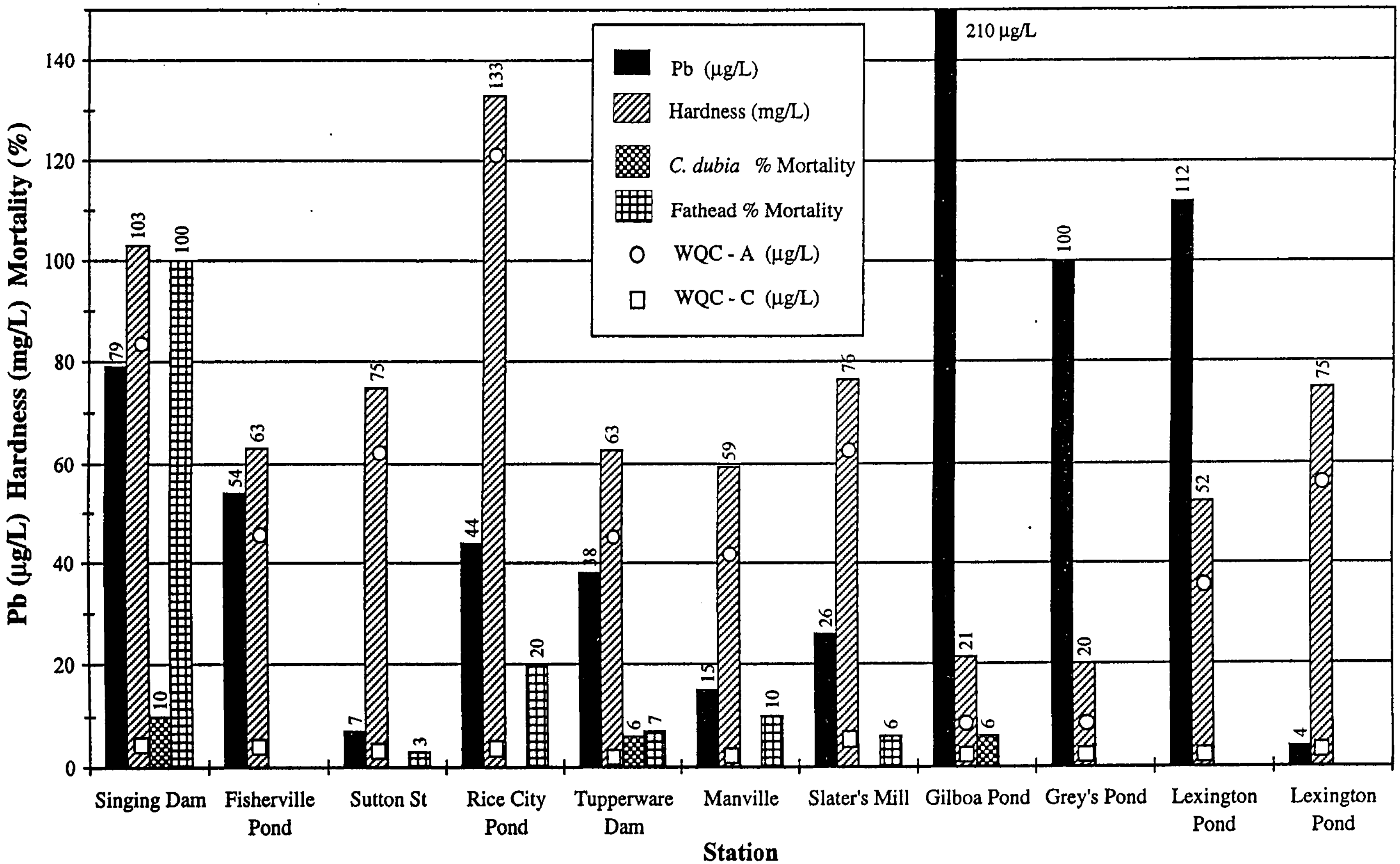


Figure A15-12-4 Total Lead in Sediment Pore Water and *C. dubia* and Fathead Minnow Mortality

Blackstone River Initiative:

Water Quality Analysis of the Blackstone River Under Wet and Dry Weather Conditions

May 2001

by

Raymond M. Wright[1] Ph.D., P.E., Peter M. Nolan[2], David Pincumbe[3], Elaine Hartman[4], and Oran J. Viator[1]

[1] Civil and Environmental Engineering, University of Rhode Island, Kingston, RI; [2] Office of Environmental Measurement and Evaluation, EPA New England Regional Laboratory, Lexington, MA; [3] Office of Ecosystem Protection, EPA Region I, Boston, MA; [4] Massachusetts Department of Environmental Protection, Worcester, MA

Executive Summary

Rivers have long been important to the growth of a region. In the northeast United States early in the 19th century, industry quickly grew relying on the rivers for storage, diversion and hydro power. However, the downside to the industrial growth was the system of impoundments, which were created by the construction of dams. These effectively eliminated movement of fish along the river and provided ideal locations for settlement of contaminants, thereby establishing a series of layered landfills behind the dams. With the loss of most of this industry, there is a real concern about the dams and impoundments that have been left behind, and their current and potential impact on water quality.

Although in the last 20 years there have been major successes with regards to the reduction of municipal and industrial wastewater loadings into our rivers, present conditions still create a challenging system for restoration, with many of the major influences associated with rainfall including direct stormwater runoff, combined sewerage overflows, failed septic systems, hydraulically inadequate wastewater treatment facilities, and resuspension and movement of contaminated river sediments. It was the goal of this study to address these issues and specifically answer the following questions:

1. What is the water quality of a river for dry weather, steady state conditions?
2. Where and how does wet weather impact the water quality of a river?
3. What are the major sources of wet and dry weather pollution in a watershed?
4. What is the relative importance between point and nonpoint sources of pollution in a watershed, for both dry and wet weather conditions?
5. How do the water quality issues differ between wet and dry weather?
6. How can the information generated in this study be used to forecast annual pollutant loading rates?

In order to accomplish the goals of this study the United States Environmental Protection Agency (EPA) established the Blackstone River Initiative (BRI) as a multi-phased, interagency, interstate project to conduct the sampling, assessment, and modeling work necessary for restoration of the river system.

The objectives of the study were as follows:

- Describe the steady state, dry weather water quality conditions in a watershed, including the river, major tributaries, and major wastewater discharges;

- Measure sediment oxygen demand;

- Determine the toxicity of ambient water, sediments, and wastewater discharges;

- Calibrate and validate a dissolved oxygen and trace metal model for the river;

- Utilize the models and the field data to estimate the relative contribution of dry weather point and nonpoint pollutant sources;

- Utilize the models to predict annual dry weather loadings of selected constituents to Narragansett Bay;

- Describe the wet weather water quality conditions in a watershed to include the river, major tributaries, and major wastewater discharges;

- Identify and rank the major wet weather pollutant "hot spots" in the watershed;

- Determine the toxicity of ambient water under wet weather conditions and compare the results with criteria based toxicity;

- Determine the relative importance between wet weather nonpoint and point source pollutant loadings;

- Determine the wet weather loading rate of pollutants, especially nitrogen, to Narragansett Bay; and

- Forecast annual wet weather loading rates.

The report includes: (1) a general description of a watershed wide wet and dry weather water quality study that will serve as a guideline for similar studies; (2) a detailed evaluation of the Blackstone Rivers watershed hydrology and river hydraulics; (3) the dry weather data interpretation; (4) dissolved oxygen and trace metal models including their calibration and validation; (5) the wet weather data interpretation involving the evaluation of nonpoint and point pollutant flows, system pollutant rankings and the development of annual loading rates; and (6) the special extension to the BRI involving the detailed study of Rice City Pond. This report also includes an appendix that is contained on a computer readable CD that includes; all data from the dry and wet weather surveys and input and output files, the executable code, and a users manual for the dissolved oxygen and trace metal models.

For the dry weather surveys there were 15 stations along the Blackstone River and 6 on major tributaries. Dry weather stations are coded with the prefix BLK and wet weather stations are coded with the prefix BWW.

In addition to the river stations, two point source dischargers were sampled during the dry weather surveys: the Upper Blackstone Water Pollution Abatement District (UBWPAD) and Woonsocket Wastewater Treatment Facility (WWTF). For the wet weather study five point source discharges were sampled. These included, from upstream to downstream, three direct discharges to the Blackstone River including the CSO facility in Worcester, UBWPAD, and Woonsocket WWTF, and two direct discharges to the Seekonk River below the mouth of the Blackstone River including Bucklin Point Narragansett Bay Commission Facility (BP NBC) and the BP NBC by-pass.

The dry weather program consisted of three 48 hour surveys in 1991 on July 10-11, August 14-15, and October 2-3. Analyses included five-day biochemical oxygen demand (CBOD), total suspended solids (TSS), volatile suspended solids (VSS), chloride, dissolved ammonia-nitrogen (NH_3 -N), dissolved nitrate-nitrogen (NO_3-N), dissolved orthophosphorous (PO_4-P), total and dissolved metals (cadmium, chromium, copper, lead, and nickel), hardness (calcium and magnesium), fecal coliform, chlorophyll *a*, and toxicity. Field measurements included dissolved oxygen, temperature, pH, and conductivity.

Effluent analyses were conducted on 24-hour composite samples collected daily for five days prior to the water quality surveys. Wastewater samples were handled and analyzed for the same parameters as the river samples.

Effluent samples were also collected from the two largest dischargers as well as from10 other dischargers in the Blackstone River Basin as part of the toxicity testing at these facilities. The two additional facilities tested in RI were Okonite Industries and GTE. In MA, the eight additional facilities tested were: Uxbridge WWTF, Northbridge WWTF, Millbury WWTF, Guilford Industries in Douglas, Douglas WWTF, Grafton WWTF, New England Plating in Worcester, and Worcester Spinning and Finishing in Leicester. Samples were not collected concurrently with the river surveys conducted during this study. Instead, the facilities were sampled once each during the summer of 1991, either during June or August, except for the two largest facilities, which were sampled in both July and August. As part of this testing, the samples were analyzed by a separate laboratory under contract to the EPA for aluminum, cadmium, calcium, chromium, copper, lead, magnesium, nickel, zinc, ammonia, total solids, TSS, total organic carbon, and alkalinity.

The wet weather program consisted of three storms. A total of 16 samples were taken at each station for each storm. Field measurements included temperature, pH, conductivity and DO. Laboratory chemical analysis included TSS, VSS, CBOD, chloride, sodium, dissolved NH_3-N, dissolved NO_3 –N, dissolved PO_4-P, total trace metals (cadmium, chromium, copper, lead, nickel and zinc), hardness (calcium and magnesium), fecal coliform and *E. coli*. Toxicity testing was performed on samples representing first flush and peak flow for each station and discharge. Samples at the five point source dischargers were collected at the same frequency as the river samples and analyzed for the same set of constituents given above.

Results of the Dry Weather Surveys

The interpretation of the ambient chemistry included a system ranking, where the major point sources, tributaries and headwater loads were separated from individual reach gains. An accounting of the two major point versus the other sources of pollutants was made by constituent by survey. The following observations may be made from the data.

The loadings from the headwaters, as defined by BLK01, are small relative to other sources along the Blackstone River with the exception of chromium and fecal coliform.

The flow in the river at the point of the UBWPAD discharge was very low, offering little dilution. Therefore, the characteristics of the effluent often determined the characteristics of the river at this point. The ratio of the UBWPAD flow to stream flow was 3:1 during the July/August low flow surveys and about 1:1 in October. The UBWPAD is the single largest dry weather source of nitrate, phosphorus, cadmium, nickel and copper to the Blackstone River. Based on a comparison of mass loadings between the UBWPAD and BLK01, the UBWPAD clearly dominates the Blackstone River at its point of discharge, especially with regards to all three nutrients and three of the trace metals (cadmium, nickel, and copper).

High dilution at the point of Woonsocket's discharge makes it difficult to determine the relative importance of this discharge based solely on concentration profiles. The ratio of the Woonsocket WWTF flow to stream flow was 1:16 during the July/August surveys and 1:50 in October. It is clear that the Woonsocket WWTF is the single largest dry weather source of ammonia to the Blackstone River.

Chlorinated wastewater and instream residual chlorine from the UBWPAD has reduced bacteria levels in the river at the next downstream station (BLK02) to near zero. There were also elevated counts in the headwaters and at several locations along the mainstem.

The summer profile includes large daily swings in DO that are evident in the impoundments. A comparison of the 1991 data for the UBWPAD with data from 1973 (before secondary treatment) and 1980 (before nitrification) shows a substantial reduction in instream CBOD and ammonia at the facility with a resulting improvement in DO in the reaches below its discharge. Even with large daily swings of oxygen, few exceedences for DO outside of water quality standards were evident in either the mainstem or the tributaries. Nitrification is evident below the Woonsocket WWTF with a sharp decrease in ammonia, a comparable increase in nitrate, and a loss of oxygen.

Three distinct profiles emerge from the evaluation of the five trace metals. The dominant source is either (a) UBWPAD, (b) resuspending sediments; or (c) a combination of both. The majority of the Blackstone River impoundments act as settling basins for solids and metals from point and nonpoint sources at low flows. These impoundments then become significant sources of these constituents with resuspension of deposited material during higher flows. It is not clear, based on the dry weather data, what phenomena is causing the rapid dissolved metal losses for several of the trace metals including cadmium, copper and nickel in the reaches below UBWPAD.

Violations of acute and chronic criteria in water column samples for cadmium, copper and lead could be seen throughout the mainstem Blackstone River and along several tributaries. During the low flow study, although the water quality criteria were exceeded for a number of metals, only one toxic endpoint occurred along the mainstem. These results have prompted site specific criteria studies for the Blackstone River in Massachusetts. It has also underscored the importance of toxicity testing to be performed in conjunction with metals testing for determination of water quality impacts and issuance of permits to municipalities and industry. With regards to sediment toxicity testing, toxicity was only evidenced by the *Hyallela azteca* in the Rice City Pond sample. *Chironomus tentans* survived fairly well in this sediment (64 and 82% survival in July and August). In July, when metal concentrations were measured, survival of *Hyallela* and *Chironomus* were 70 and 72% in the Fisherville Dam sediment sample. Higher mortality of one or both species occurred in the samples from Singing Dam, Manville Dam, and Slater's Mill, and Gilboa and Grey's Pond, the background samples.

The study included the monitoring of the two largest point sources in the watershed, defined as the "major point sources" in the analyses. All other sources, including the small point discharges, tributaries, and reach nonpoint sources, were included in the term "other sources". The Woonsocket WWTF was the major source of ammonia and the UBWPAD was the major source of phosphorus. The single largest source of nitrate to the river was the UBWPAD in both low and high flow conditions. The major sources of TSS, chromium and lead to the river were from other sources, regardless of the flow condition. Under low flow, the stretch of river that was most significant included Fisherville Pond and Rice City Pond (BLK06-08). This reflected the resuspension of sediments within the impoundments. For high flow, the highest loading came from the reaches just below Rice City Pond (BLK08-13). In part, this reflected the resuspension and transport of sediments from Rice City Pond. The major sources for cadmium and copper for the low flow surveys were from the point sources (primarily UBWPAD). For high flow, the nonpoint sources contributed more mass, with the highest loading from Rice City Pond and the reach immediately below it (BLK07-11). The major sources of nickel for the low flow surveys were from the point sources (primarily UBWPAD). For high flow, the nonpoint sources contributed more mass, with the highest loading in the last reach in the river (BLK20-21).

QUAL2E has been used to model dissolved oxygen in the Blackstone River from Worcester, MA to its discharge into the Seekonk River in Pawtucket, RI. The major tributaries and point sources have been included in the model. The model has been used to address daily variations of dissolved oxygen. The major sources and sinks contributing to the DO balances have been accounted for in the model including CBOD and Nitrogenous BOD (NBOD) consumption, Sediment Oxygen Demand (SOD); reaeration; and algal productivity and respiration. The following conclusions were determined from this analysis:

The model has been calibrated using the data collected in July and October 1991. The model was also successfully validated using the data collected in August 1991 and two independent data sets: one collected in Massachusetts in 1980 and one in Rhode Island in 1987.

High levels of primary productivity in the Blackstone River result in impaired water quality associated with significant daily swings of dissolved oxygen. The river reaches most dramatically impaired are just above and below the MA/RI state line. High primary productivity is a result of phosphorus additions from the municipal wastewater facilities on the river. The major sources of phosphorus are from the UBWPAD and Woonsocket WWTF. The impoundments along the river reduce velocities and increase the time of travel in the river reaches directly behind the dams. These conditions compound the problems presented by high levels of phosphorus by providing the appropriate hydraulic conditions for the growth of algae.

The river reaches with the highest nitrification rates are directly below the Woonsocket WWTF. Instream nitrification governs the oxygen profiles in these reaches and causes a DO sag below Woonsocket's discharge that often extends to the mouth of the river in Pawtucket, RI.

The 19 impoundments along the river are sediment traps. The sediments behind these impoundments may be the single largest sink of oxygen in that reach. This is especially true in the upstream reaches where productivity and instream nitrification are relatively small compared with the lower reaches.

Based on a comparison of data from the early 1980s and this study and the model application, it was clear that the advanced wastewater treatment implemented in the mid-1980s at UBWPAD made a significant improvement to the DO concentration in the river. The improvements are directly associated with a reduction in the facility's discharge of CBOD and ammonia.

A one-dimensional, steady state model, called Pawtoxic, has been used to describe the fate and transport of trace metals in the Blackstone River. The major tributaries and point sources have been included in the model. The model has the option to simulate a maximum of three conservative elements, total suspended solids, and five nonconservative elements. The model adopts a simple approach to describe the fate and transport of metals in a river. The model is based on two simplified equations involving net sediment transport and metal partitioning.

Empirical relationships between average stream velocities and net sediment transport coefficients were developed for most river reaches. Where relationships are significant, these equations provide the modeler with the ability to establish the net sediment transport coefficient at other stream velocities, and therefore, at other flows such as the waste load allocation flow.

Empirical relationships between metal partition coefficients and suspended solids were expanded from equations from the literature to include the TSS range from 0-10 mg/L. The equations provide the modeler with the ability to establish new partition coefficients as suspended solids concentrations change in the river.

The model has been calibrated to the flows observed in the three dry weather surveys of 1991. The model was validated with flow measurements from 6 independent measurements conducted by USGS and the successful simulation of a conservative constituent.

The model was calibrated for suspended solids using the data collected in July and October 1991. The model was also successfully validated using the data from August 1991 and other independent surveys from 1980, 1985, 1988, 1991 and 1992. The model adequately describes TSS concentrations over the range of environmental conditions encountered (0-10 mg/L TSS). This is not to say that the model simulates the natural system on a micro scale. Rather, the model's description of the external attributes of the environment agrees well with the description obtained by making field measurements of the natural system.

Rapid decreases in dissolved metal concentrations for Cd, Cu, and Ni occurred in the reaches below the UBWPAD through BLK06 in July and August. Model calibration for these metals required adjustments to the net sediment transport and metal partitioning coefficients in these reaches.

Two hypotheses were discussed to explain this rapid loss. Both focused on the uniqueness of the high effluent-to-river ratios for flow and trace metal mass loadings in the low flow surveys of 1991. Data suggests phenomena other than settling may be occurring in these reaches. Lead had the highest variability of any metal in the reaches between BLK06 and BLK11, especially in Rice City Pond. The highest Pb concentrations observed in these reaches could not be simulated with the steady state model. The model successfully simulated the trace metal profiles for Cd, Cr, Cu and Ni below BLK06 to the end of the river and for Pb from BLK11 to the end of the river in the low flow surveys. The model successfully simulated all metals for the October high flow survey.

Results of the Wet Weather Surveys

During the course of the wet weather data interpretation, one fact became very clear. The location of Worcester in the headwaters of the Blackstone River had a strong influence on the river's water quantity and quality during and after a storm. The magnitude and extent of the impact were directly associated with the rainfall characteristics and the pre-storm flows.

Three storm events were monitored. Storm 1 (September 22-24, 1992) was a short, relatively light, well distributed rainfall. Storm 2 (November 2-5, 1992) was a long, moderate, well-distributed rainfall. Storm 3 (October 12-14, 1993) was a short, intense rainfall with several localized thunderstorms. Storm 3 was not well distributed and had the heaviest rainfalls in the northern part of the watershed.

Storm 1 - The runoff from Worcester resulted in a hydrograph that ranged from a base flow of 15 cubic feet per second (cfs) to 185 cfs. This hydrograph was eventually attenuated in Fisherville Pond. In general, all flows returned to pre-storm conditions within a 40-hour period.

The peak flow at BWW21 was 302 cfs.

Storm 2 - The flows from the headwaters, including the UBWPAD, were highest between the 6-12 hour runs. This peak arrived at Rice City Pond at 20-24 hours and at the mouth of the river between 36 and 48 hours. The peak flow at BWW21 was 890 cfs.

Storm 3 - The flows from the headwaters reflect the intense thunderstorms that resulted in over an inch of rainfall in less than 5 hours. The headwater flows reached BWW08 between 16-20 hours and BWW21 at 28-36 hours. The peak flow at BWW21 was 646 cfs.

UBWPAD's ability to provide nitrification is inhibited under high storm flows. The facility discharges significant levels of ammonia during these conditions. UBWPAD exceeded their permit conditions in two out of three storms. These violations coincided with the maximum runoff and river flows. Compared to the other metals, lead's (Pb) major source appears to be in the headwaters (above BWW00). In fact, the headwater EMCs are typically the highest concentration along the entire river. A consistent increase of lead does appear between BWW07 and BWW08 in Rice City Pond and is probably due to sediment resuspension. The other 5 metals (Cd, Cr, Cu, Ni and Zn) have similar EMC profiles in that there appears to be two distinct peaks. The first occurs in the reaches below UBWPAD and is associated with the wastewater facilities discharge and possibly other nonpoint sources of metals. A secondary peak consistently occurs around BWW08; again the probable cause is sediment resuspension within Rice City Pond. The fecal coliform concentrations and loads at the headwaters are the highest in the entire watershed. The maximum concentrations coincide with peak runoff flows. In relatively moderate flows, the residual chlorine from UBWPAD provides instream disinfection and prevents the passage of the headwater concentrations. This is not the case at high peak flows, where dilution in the facility and in the river reduces the chlorine residual, and instream disinfection does not occur.

Higher storm flows resulted in lower hardness concentrations. Lower hardness values resulted in stricter acute and chronic criteria. At the same time, higher flows typically caused higher metal concentrations. The result was a short-term violation of acute criteria. High flows moving through Rice City Pond cause violations in the reaches at and below the dam due to resuspension. Cu is continually violated both with respect to chronic and acute criteria in dry and wet weather, starting at station BWW02. Pb chronic violations occur for both dry and wet weather. Cd violations are more limited, but also begin in and around BWW02. Ni and Cr had no acute or chronic violations for either dry or wet weather. More stations had violations under wet weather than dry weather, and the number of violations increased with larger storms.

Toxicity was observed in 35 out of 118 occasions during wet weather testing. Toxicity in the first flush of the storm accounted for 14 toxic endpoints. The remaining 21 toxic end-points occurred in the samples collected during the peak of the storm. Toxicity occurred at the same stations for the most part during first flush and peak of the storm. Six stations had recurrent toxicity in the peak storm conditions, thus the larger number of toxic endpoints observed during peak rain. Only two stations were toxic for first flush and non-toxic during peak. Forty percent of all toxic endpoints occurred in the first two miles of the river in the Greater Worcester area. Toxicity occurred in all of the dechlorinated WWTF effluents at least once and in the combined sewer outfalls. The effluent of the Woonsocket WWTF was toxic during all three wet weather events (three times during peak flow and once during first flush). The effluent of the Narragansett Bay Commission Bucklin Point WWTF was also toxic during all three storm events. All peak samples were toxic, and two of three first flush samples were toxic. This may indicate bypassing during rain events. The chlorine concentrations in the effluents were extremely high, and if left in the test solutions, would have caused acute toxicity. River stations BWW01, 02, 05, and 11 on the Blackstone River and 09 on the Mumford River (a tributary receiving municipal and industrial wastewater) experienced significant toxicity on more than one occasion. By comparison to wet weather toxicity, testing conducted during low flow conditions (near the 7Q10) indicate that there is no significant toxicity in the water column of the Blackstone River. Only one toxic endpoint occurred in the mainstem during dry weather testing. Compared with other tributaries, the Mumford River had the most toxic endpoints; Two were observed in dry weather and two during wet weather. Little difference was observed between toxicity occurring in first flush and peak storm samples. Toxicity was much more prevalent during wet weather conditions. Acute toxicity, the more significant measure of toxicity, was the predominant endpoint during wet weather toxicity testing.

The area under the mass loading curve defined the total pollutant load at a station. The wet load was separated from the dry load (base load) for each constituent at each station for each storm. The relative importance of the wet load was defined as a percentage of wet to total load. All constituents had more than 50% of the total load as wet load, except for Ni and dissolved NO_3-N. The trend of higher wet load as the storm intensity increases is true for all constituents, except dissolved NH_3-N. The headwaters had the highest percent wet load for most of the constituents. The percent of wet load at each station generally decreases as one moves downstream.

Similar to the dry weather analysis, the point sources were defined as the two "major point sources" and the "other sources" included the small point sources, tributaries, runoff and reach contributions. The result is the ability to compare the relative importance of the two major point sources and the other sources in the watershed. The system ranking includes a comparison by individual reach.

It is obvious, based on the analysis of the concentration data, that wet weather loadings may dominate the river for days after the event, depending on the size of the storm and the constituent. Specifically, wet weather can result in violations in effluents (ammonia/UBWPAD) and in river reaches (fecal coliform criteria and acute and chronic criteria for trace metals). In all cases, violations under wet weather were greater in magnitude, frequency and location.

Often times, more than one factor magnified the impact of wet weather. For instance, during the height of the storm, instream hardness decreases due to dilution, thereby lowering the acute criteria concentrations. The more stringent criteria typically coincided with maximum instream concentrations due to peak flows. The results were instream violations.

In general, the major nonpoint sources of wet weather pollutants appear to be runoff related (new materials) although for several reaches sediment resuspension (old materials) was significant. The headwaters did prove to be significant for several constituents. Pollutants associated with wet weather may come from either new sources (runoff induced) or old sources (river sediments). The water quality data coupled with stream flows allowed for the calculation of mass loading curves. Each mass loading curve was integrated to obtain the total load for each station for each storm. The total mass was divided by the time of the event to obtain the total loading for that constituent for each station. Baseline loading rates were estimated for each pollutograph from the initial (pre-storm) sample and the final (post-storm) samples. These rates were multiplied by the time of the event to obtain the total dry load for that station. The wet load per station per constituent was determined by subtracting the dry load from the total load. The data indicate clearly that with only minor exceptions, more wet load entered the river during these periods than dry load.

Based on the loading estimates, an estimate of pollutant gain or loss by reach was made. Net pollutant changes in a reach help to identify locations of major pollutant sources. A comparison of point and nonpoint pollutant sources was made. The results of this evaluation also provided insight into the relative importance of each reach through a system ranking. A system ranking was made using the net gains for each reach and loads from the point sources, headwaters and tributaries. The result was a determination of reach hot spots.

The information collected during the wet weather sampling program provided insights into the behavior of the sources during varying storm conditions. A relationship was developed between rainfall and wet loadings using the data collected during the three storms and previous wet weather data available for the state line (BWW13) and end of river (BWW21). These equations were used to estimate the annual wet loading rates for the Blackstone River.

Similarly, dry weather predictions were estimated based on empirical relationships developed for flow and concentration. The dry weather data was first used to calibrate and validate models to describe trace metal and dissolved oxygen fate and transport. The dry weather models were used to estimate baseline mass loadings under steady state flows. The relationships developed were then used to estimate the annual dry weather contributions at MA/RI state line (BWW13) and end of the river (BWW21).

Annual loading rates to the Providence River were developed for several constituents. Of the five major tributaries to the Providence River, the Blackstone River is the major source of most pollutants.