TITLE AND APPROVAL SHEET

Project Title: Quality Assurance Project Plan- Runnins River Bacteria Monitoring (1999)

Lead Organization: RIDEM

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Preparation Date: 5/17/99

Project Manager/ QA Officer

Greg Goblick — Date
RIDEM

Project Officer:

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EPA Contact:

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Approval:

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PROJECT OBJECTIVE

This summer, the Rhode Island Department of Environmental Management (RIDEM) will conduct fecal coliform dry weather sampling in the Runnins River. This sampling aims to isolate individual areas of noncompliance. Additional sampling is needed to further pinpoint sources of fecal coliform pollution in various areas of the Runnins River. In addition, RIDEM will conduct coliphage testing to determine the origin of elevated fecal coliform levels. When sampling is complete RIDEM will be able to complete its Total Maximum Daily Load (TMDL) for pathogens under Section 303(d) of the Clean Water Act for the Runnins River. Figure 1 contains a locus map of the Runnins River watershed.

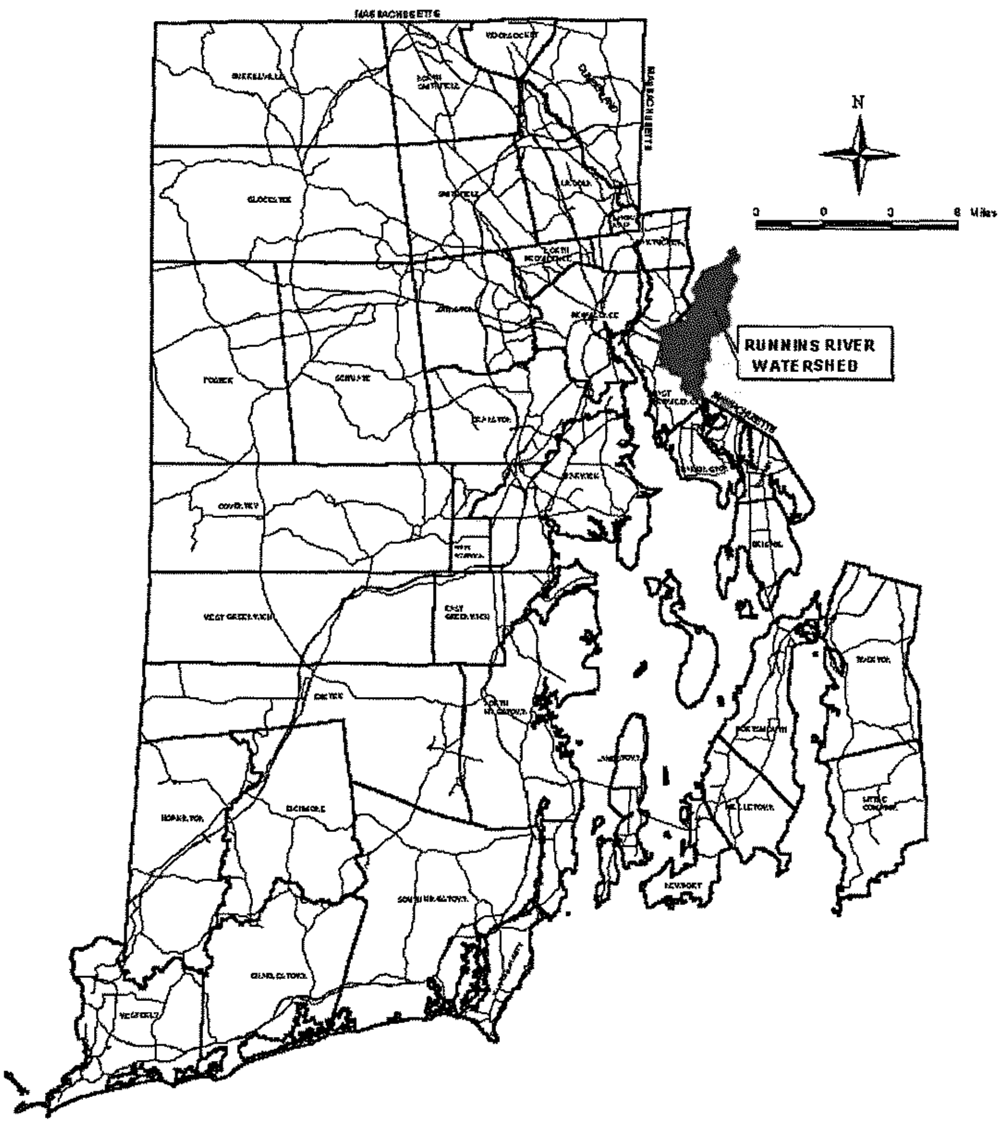


Figure 1 **Runnins River Watershed Locus Map**

BACKGROUND INFORMATION

The State of Rhode Island Department of Environmental Management has identified water quality impairments (pathogens, biodiversity impacts, hypoxia, and metals) in the Runnins River. Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting designated uses. TMDL development for pathogens is currently underway on the Runnins River.

The Runnins River is located in the Runnins River basin, a sub-basin of the Warren River watershed which covers an area of approximately 10.2 square miles (6,545 acres) and lies within the City of East Providence, Rhode Island and the Towns of Rehoboth and Seekonk, Massachusetts. The overall length of the Runnins River is approximately 7.5 miles. The headwaters to the Runnins River are in Rehoboth, however the river begins in Seekonk and flows generally in a southwesterly direction. Portions of the river form the boundary between East Providence, Rhode Island and Seekonk, Massachusetts. The Runnins River becomes the Barrington River downstream of the Mobil dam, then merges with the Palmer River to become the Warren River which empties into Narragansett Bay. The Barrington River, immediately downstream of the Runnins River is a valued shellfish resource.

The Town of Seekonk comprises the majority of the watershed (70%) while East Providence and Rehoboth contribute approximately 23% and 7% respectively. The northern portion of the watershed (north of Pleasant Street) is relatively undeveloped consisting mostly of wetlands and forested areas, as well as some residential and agricultural uses. (A United States Geological Survey (USGS) staff gage located at Pleasant Street, Seekonk, measured annual peak stages and flows from 1967 through 1983. Results of the analysis by the Army Core of Engineers for the 2, 10 50, and 100-year 24 hour events are peak flows of 97, 140, 190, and 220 cubic feet per second (cfs) respectively.) The average slope upstream of the gage is approximately 11 feet per mile for its 4.5-mile length. The average elevation in this region is approximately 87 feet above mean sea level.

Approximately one quarter of this area provides storage of runoff during rainfall events either in wetlands, lakes, or ponds. Downstream of the gage the watershed changes to mostly urban development. There is substantial storage provided just downstream of Pleasant Street by a large wetland area, the Grist Mill Pond and Burrs Pond; however, there is little storage past this point where commercial development is most concentrated. East Providence on the western side of the river is a mature urbanized area; Seekonk, on the eastern side of the river is a rapidly developing urbanized area with increasing impervious areas and runoff rates. The average slope of the river from Pleasant Street to the Mobil Dam (south of School Street) changes to approximately 13 feet per mile for its 3 miles length. The average elevation in this region is approximately 37 feet above mean sea level.

The downstream limit based on tidal hydrology of the Runnins River is the Mobil dam, which was built in the 1920's by the Mobil Corporation to divert water to a pump house for industrial use at the Mobil facility. The concrete dam is approximately 85 feet long and 2 feet wide, with a spillway crest estimated to be 4.5 feet NGVD (National Geodetic Vertical Datum). During normal tide ranges, the dam is the upstream limit of tidal influence; however during spring tides, the tidal influence will overtop the dam and can extend beyond Mink Street. According to the United States Army Core of Engineers, the tidal influence can be expected as far as elevation 10 feet NGVD, or just downstream from Highland Avenue (Route 6).

Soils in various areas of the watershed are generally considered undesirable for development (e.g., increased imperviousness and the use of septic systems) because of poor drainage characteristics and the effects of erosion on the river. The hydric soils in surrounding wetland areas are characterized as soils, which are capable of storing flood waters, and are not suitable for structures. In areas of concentrated commercial retail facilities and light industry, large areas of impervious cover increase stormwater, damage wetlands and reduce floodplain capacity. Increased volumes of runoff may also cause erosion of streambanks. In general, sediment deposition is significantly higher in wetlands receiving urban runoff. Sediments may carry pollutants as well as increase turbidity altering the wetlands' capacity to provide flood storage and efficient pollutant removal. Suspended or deposited sediments can increase the severity and persistence of bacterial contamination.

Another concern is the capacity of these poorly suited soils to properly handle the current as well as future hydraulic loading from commercial septic systems to the groundwater. The result of overburdening poorly suited soils is ineffective treatment of wastewater resulting in human pathogenic organisms impacting the river. Conventional septic systems do not remove nutrients and thus there is also concern of a nutrient impact on the river, which may account for dissolved oxygen depletion (the river is also listed on the 303(d) for nutrients and hypoxia).

PROJECT DESCRIPTION

Beginning in June 1999 and continuing throughout the summer, RIDEM will conduct three dry weather surveys. Three days of less than 0.03 inches of rainfall constitute dry weather. This number is based on the previous observation that minimal runoff would result and it has been used in previous surveys.

A total of thirty-two stations will be sampled in each survey. Grab samples will be taken for fecal coliform analysis. At three stations, replicate samples will be taken for quality control purposes to detect both natural variability in the environment and that caused by field sampling procedures. Also, RIDEM will take in-situ measurements of temperature, specific conductance, and salinity at the surface, middle, and bottom of the water column. All samples will be taken at low tide because this area of the Runnins River is in a tidal region. Taking samples at low tide ensures that only freshwater sources are captured.

During the first dry weather survey, in June, coliphage samples will also be collected. The Environmental Virology Laboratory at the University of North Carolina will analyze these samples. The coliphage samples will be both grab and composite samples. For the composite samples, one 500-mL autoclaved bottle will be filled every eight minutes for a period of one hour. At the completion of the sampling, the samples will be combined into a gallon sample container provided by the laboratory.

All field notebooks will include the station number, date and time that the sample was taken, sample type (grab, composite), type of analysis (fecal coliform, coliphage), specific conductance, and temperature. At some stations, salinity, stage, and stream discharge will also be recorded. Attachment C details crew assignments for dry weather sampling.

Field sampling and laboratory analytical SOP's are presented in Attachment A and B, respectively. A map of sampling locations is presented in Figures 2 and 3. Detailed information on each sampling station is presented in Table 1. Sample volumes, preservation, maximum holding times, and analytical methodologies are summarized in Table 2.

DATA USAGE

Coliform data will be used to identify pathogen source areas and to estimate loading (when combined with flow information). Coliphage data will be used to differentiate between human and nonhuman sources of contamination. In-situ measurements (temperature, specific conductance, salinity, and stream discharge) will be used as supporting information. All samples will be taken at low tide because this area of the Runnins River is in a tidal region. Taking samples at low tide ensures that only freshwater sources are captured.

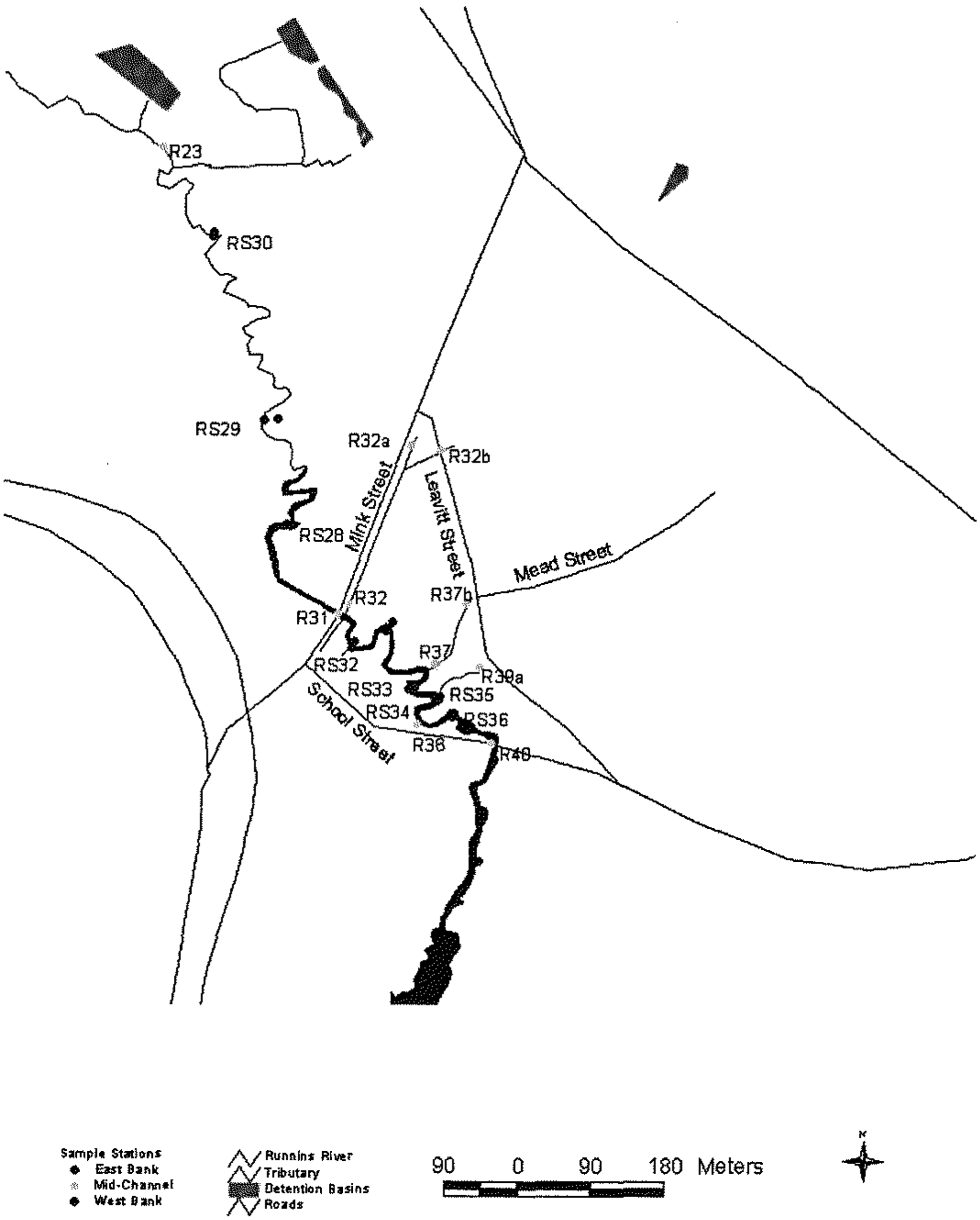


Figure 2 Runnins River Sampling Stations: Mink/School Street Triangle

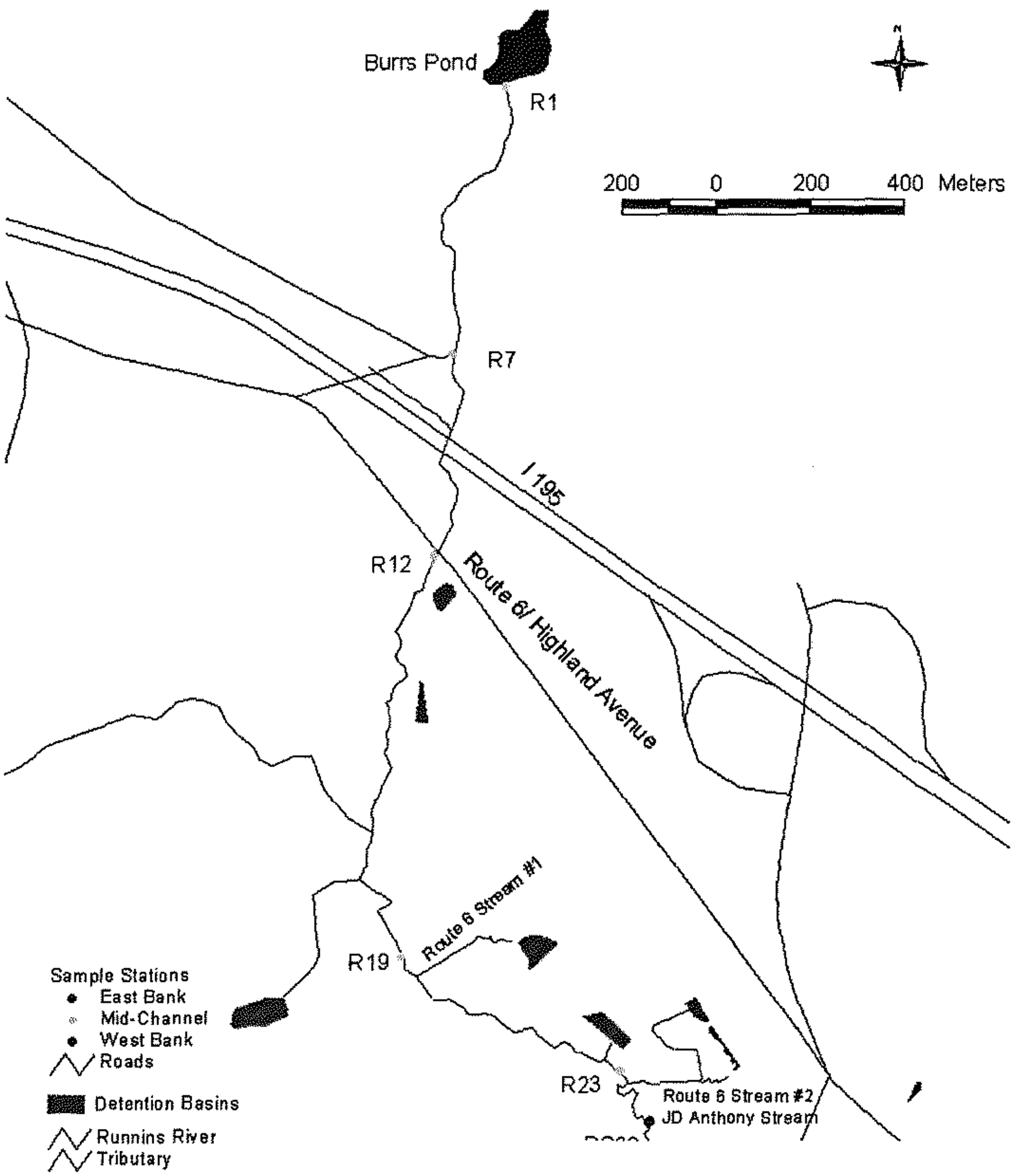


Figure 3 Runnins River Sampling Stations: Burrs Pond to JD Anthony's Stream

Table 1 Sampling Station Information.

T: Tidal; NT: Nontidal; FC: Fecal Coliform; Te: Temperature; S: Salinity; SC: Specific Conductance; St: Stage; D: Discharge; C: Grab Coliphage; C1: Composite Coliphage

Station ID	Name	Description	Parameters	T/ NT	Purpose
R1	Burrs Pond Dam	In-stream: just below dam	FC, Te, S, SC, St, D	NT	Determine water quality status of river as in enters the lower watershed (before ponds)
R7	County St. Bridge	In-stream; on downstream side of bridge	FC, Te, SC	NT	
R12	Route 6 Bridge	In-stream: on downstream side of bridge	FC, Te, S, SC, St	NT	
R19	Above Route 6 Stream #1	In-stream: just upstream where Rte. 6 stream #1 enters the river	FC, Te, S, SC	T	
R23	Above Route 6 Stream #2	In-stream: just upstream where Rte.6 stream #2 enters the river	FC, Te, S, SC	T	
RS28e	Above Mink Street East Bank	In-stream: 225 m south from station R23, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
RS28w	Above Mink Street West Bank	In-stream: 225 m south from station R23, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
RS29e	Above Mink Street East Bank	In-stream: 450 m south from station R23, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
RS29w	Above Mink Street West Bank	In-stream: 450 m south from station R23, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
RS30e	Above Mink Street East Bank	In-stream: 675 m south from station R23, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
RS30w	Above Mink Street West Bank	In-stream: 675 m south from station R23, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Rte.6 Stream #2 and Mink St
R31	Mink Street Bridge	In-stream: on upstream side of Mink Street Bridge	FC, Te, S, SC, St, C1	T	
RS32e	Below Mink Street East Bank	In-stream: 75 m s from Mink Street Bridge, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS32w	Below Mink Street West Bank	In-stream: 75 m s from Mink Street Bridge, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS33e	Below Mink Street East Bank	In-stream: 150 m s from Mink Street Bridge, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS33w	Below Mink Street West Bank	In-stream: 150 m s from Mink Street Bridge, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS34e	Below Mink Street East Bank	In-stream: 225 m s from Mink Street Bridge, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS34w	Below Mink Street West Bank	In-stream: 225 m s from Mink Street Bridge, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St

RS35e	Below Mink Street East Bank	In-stream: 300 m s from Mink Street Bridge, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS35w	Below Mink Street West Bank	In-stream: 300 m s from Mink Street Bridge, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS36e	Below Mink Street East Bank	In-stream: 375 m s from Mink Street Bridge, east bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
RS36w	Below Mink Street West Bank	In-stream: 375 m s from Mink Street Bridge, west bank of river	FC, Te, S, SC	T	Isolate fecal coliform source between Mink St and School St
R32	Mink Street Stream @ River	Tributary	FC, Te, S, SC	T	Determine fecal coliform loading from tributary
R32a	Mink Street Stormdrain	Tributary	FC, Te, S, SC, D, C	T	Determine fecal coliform loading from tributary
R32b	Leavitt North Stream @ Leavitt	Tributary	FC, Te, S, SC, D, C	T	Determine fecal coliform loading from tributary
R37	Meade Street Stream @ River	Tributary	FC, Te, S, SC, D	T	Determine fecal coliform loading from tributary
R37b	Meade Street Stream @ Leavitt	Tributary	FC, Te, S, SC, D, C	T	Determine fecal coliform loading from tributary
R38	Stormdrain on RI side	Tributary	FC, Te, S, SC	T	Determine fecal coliform loading from tributary
R39a	Leavitt South Stream @ Leavitt	Tributary	FC, Te, S, SC, D, C	T	Determine fecal coliform loading from tributary
R40	School Street Bridge	In-stream: on upstream side of School Street Bridge	FC, Te, S, SC, St, C1	T	Determine mass fecal coliform loading from Runnins to Hundred Acre Cove
B16	Monarch Drive	In-stream	C1	T	

Table 2 Sample Parameters and Characteristics

Parameter	Matrix	Sample volume/ (container)	Preservation	Maximum holding time	Method
Fecal coliform	Water	250 or 500 ml (plastic)	ice (4 C)	6 hours	Standard method 9213D
Coliphage	Water	1 gal (plastic)	ice (4 C)	30 hours	RNA serotyping
Specific Conductance	Water	in-situ	none	immediate	field meter YSI 85
Salinity	Water	in-situ	none	immediate	field meter YSI 85
Temperature	Water	in-situ	none	immediate	field meter YSI 85
Stream discharge	Water	in-situ	none	immediate	field meter Marsh McBirney Model 2000

PROJECT ORGANIZATION

RIDEM and EPA staff will collect Field samples.

Greg Goblick, Project Manager
RIDEM
235 Promenade Street
Providence, RI 02908-5767
(401) 222-4700

Alfred A. Basile, EPA Contact
U.S. EPA - Region 1
1 Congress Street
Boston, MA 02114-2023

Fecal coliform samples will be sent to BAL Laboratories for analysis (Standard Method 9213D). Coliphage samples will be sent to the Environmental Virology Laboratory at the University of North Carolina for analysis.

Kathleen Feldman, Lab Manager
BAL Laboratory
185 Frances Avenue
Cranston, RI 02910
(401) 785-0241

Doug Wait, Lab Manager
Environmental Virology Laboratory
University of North Carolina
Chapel Hill, NC 27599-7400
(919) 966-7317

Results of analyses will be delivered to Greg Goblick (RIDEM) to determine the validity of the data.

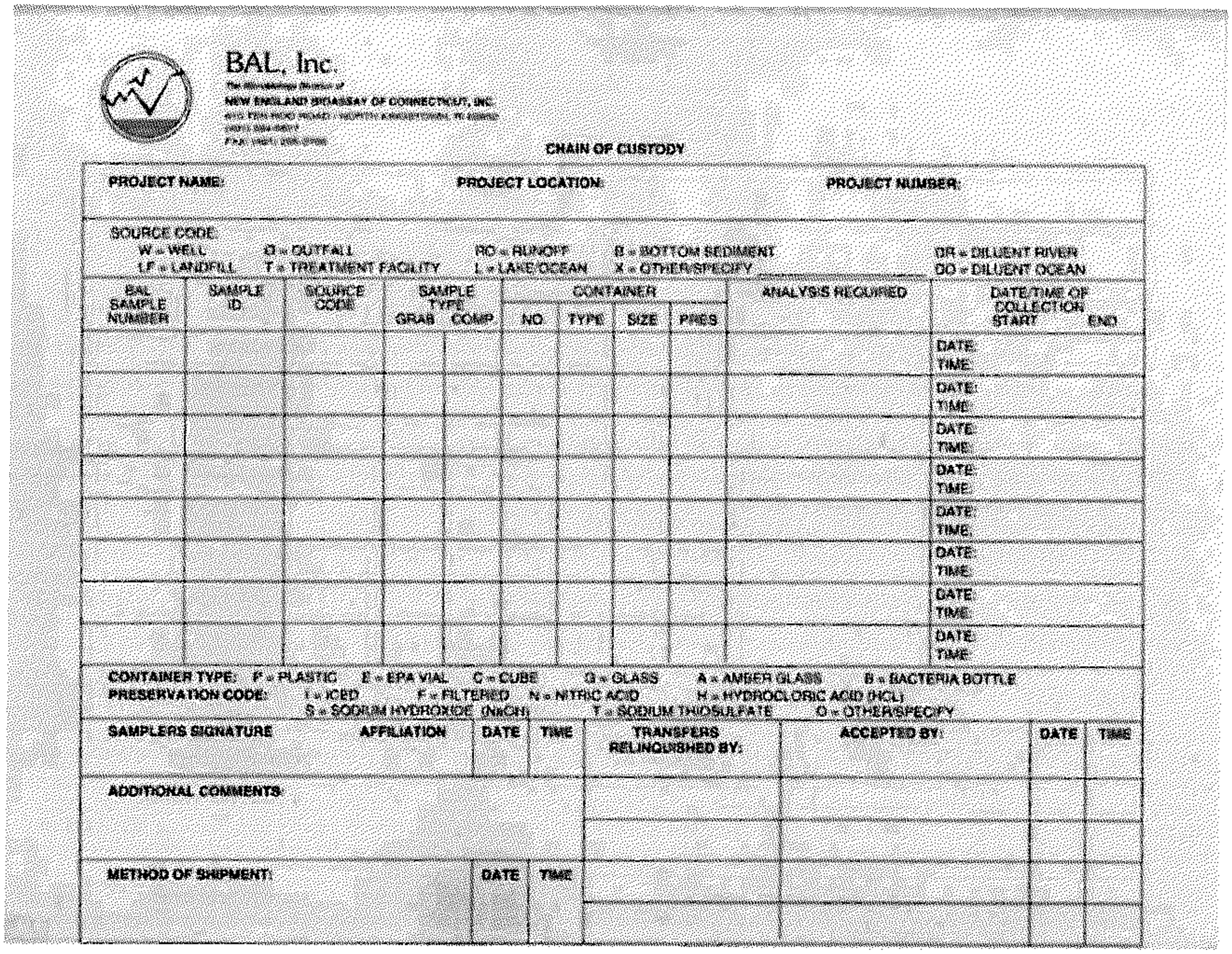
Greg Goblick, Project Manager
RIDEM
235 Promenade Street
Providence, RI 02908-5767
(401) 222-4700

CHAIN OF CUSTODY

Table 3 documents the history of each sample from collection to disposal. A chain of custody document will accompany samples to the laboratory. Figure 4 depicts the chain of custody form required by BAL Laboratory. All fields must be filled out by RIDEM with the exception of the BAL Sample Number, which is filled out by the laboratory staff.

Table 3 Chain of Custody

Sample Collection	RIDEM and EPA
Sample Delivery	RIDEM, EPA, and Federal Express
Sample Analysis	BAL Laboratories and UNC Environmental Virology Laboratory
Sample Archival	None
Sample Disposal	BAL Laboratories and UNC Environmental Virology Laboratory



BAL, Inc.

NEW ENGLAND BIOASSAY OF CONNECTICUT, INC.

CHAIN OF CUSTODY

PROJECT NAME: PROJECT LOCATION: PROJECT NUMBER:

SOURCE CODE:
W = WELL O = OUTFALL RO = RUNOFF B = BOTTOM SEDIMENT DR = DILUENT RIVER
LF = LANDFILL T = TREATMENT FACILITY L = LAKE/OCEAN X = OTHER/SPECIFY DO = DILUENT OCEAN

BAL SAMPLE NUMBER	SAMPLE ID	SOURCE CODE	SAMPLE TYPE		CONTAINER				ANALYSIS REQUIRED	DATE/TIME OF COLLECTION
			GRAB	COMP	NO.	TYPE	SIZE	PRES		START END
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:
										DATE: TIME:

CONTAINER TYPE: P = PLASTIC E = EPA VIAL C = CUBE G = GLASS A = AMBER GLASS B = BACTERIA BOTTLE
PRESERVATION CODE: I = ICED F = FILTERED N = NITRIC ACID H = HYDROCLORIC ACID (HCL)
S = SODIUM HYDROXIDE (NaOH) T = SODIUM THIOSULFATE O = OTHER/SPECIFY

SAMPLERS SIGNATURE	AFFILIATION	DATE	TIME	TRANSFERS RELINQUISHED BY:	ACCEPTED BY:	DATE	TIME
ADDITIONAL COMMENTS:							
METHOD OF SHIPMENT:		DATE	TIME				

Figure 4 Sample Chain of Custody Form

PROJECT SCHEDULE

Sampling
Three dry weather surveys will be conducted during the summer of 1999. The first survey is scheduled for June 8, 1999. Approximately 87 fecal coliform and 5 coliphage samples will be collected over the course of the study.

Deliverables
A final report will be generated within three months of the third and final survey.

QUALITY CONTROL AND DATA QUALITY INDICATORS

Table 4 Measurement performance criteria.

Data quality indicators	Acceptable criterion	QC sample
Precision Fecal coliform	20% RPD (relative percent difference)	Field duplicates for 10% of samples
Precision Coliphage	50% RSD (relative standard deviation)	Laboratory replicate analyses
Bias (contamination) Fecal coliform	No growth	Laboratory method blank
Accuracy Fecal coliform	20% must agree	Laboratory stock culture check
Completeness	95% of data collected is usable	

DATA VALIDATION

Measurement performance criteria (Table 4), any additional laboratory QA/QC, and holding time criteria will be used to determine the validity of the data.

DATA REPORTING

Upon completion of data validation, a report outlining the results of this investigation will be generated. The approximate time frame for report generation is three months after the third and final survey.

REFERENCES

American Public Health Association (APHA). 1995. Standard Methods for the Examination of Water and Wastewater, 19th edition. Washington, DC 20005.

Rantz et al. 1982. Measurement and computation of stream flow- Vol. 1: Measurement of stage and discharge. USGS water supply paper 2175.

ATTACHMENT A

Field Sampling SOP's

Fecal coliform and coliphage collection - SOP

1. The laboratories will provide autoclaved sample bottles.

2. Sample bottles will be labeled prior to sampling.

Sample Bottle Label

Station: Depth:
Date:
Time:
Initials:
Sample Type:
Remarks:

The station, date, and time fields should be labeled on the sample bottle.

3. Surface grab samples will be collected at each station using the sample bottles provided by the laboratories. In cases where laboratory sample bottles are too large to be fully submersed in the stream, a smaller pre-cleaned bottle will be used to transfer the sample into the larger container.

4. Avoid contaminating the samples by not allowing the sample water to come in contact with anything before it is placed in the bottle. Be careful not to bring the rims or caps of the sample bottles into contact with anything. Samples will be taken with a sample stick to avoid causing upstream disturbance prior to and during sampling.

5. Sample bottles will be filled with sample until the sample reaches between an inch to an inch and a half of the top of the sample bottle.

6. Once full, sample bottles will be capped and placed in a cooler with ice to maintain a temperature of 4°C.

7. Fecal coliform samples will be delivered to BAL Laboratories within 6 hours of collection. Coliphage samples will be shipped via overnight delivery to arrive at the UNC Virology Laboratory within 30 hours of collection. Fresh ice will be added to the cooler prior to dropping the cooler off at the nearest Federal Express delivery station.

8. For QA/QC purposes, duplicate fecal coliform samples will be randomly collected at 10% of the sampling stations (3 stations per sampling event).

Temperature, specific conductance, salinity - SOP

Equipment- YSI Model 85

Note: Field calibration is not necessary for the aforementioned parameters. However, from time to time it is wise to check the system calibration for conductivity. This should be accomplished in the laboratory by following the protocol provided in the YSI Model 85 manual.

Field Operation

1. Turn the meter on- the instrument will activate all segments of the display for a few seconds, which will be followed by a self-test procedure that will last for several more seconds. During this power on self-test sequence, the instrument's microprocessor is verifying that the instrument is working properly.

2. Select a measurement mode (dissolved oxygen %, dissolved oxygen mg/L, conductivity, specific conductance, or salinity). Temperature is always displayed. Selecting a measurement mode is accomplished by simply pressing and releasing the mode button. If the instrument is reading specific conductance (temperature compensated), the large numbers on the display will be followed by µS or mS. Additionally, the small portion of the display will show the °C flashing on and off. If the instrument is reading conductivity (NOT temperature compensated), the large numbers on the display will be followed by either a µS or an mS; however, the small portion of the display will show the °C NOT flashing.

3. Lower electrode to the desired depth (surface, middle, or bottom of the water column). When recording the bottom measurement, be sure to keep the electrode at least 0.5 ft above the bottom. Be sure not to disturb bottom substrates prior to or during measurement.

4. Record measurement

5. Cycle to the next measurement mode and record the next parameter. This step should be continued until measurements for all parameters are recorded.

6. Turn meter off and place electrode into storage chamber.

Note: If sampling sites are relatively close together, it is acceptable to leave the meter on until all measurements are recorded.

Stream discharge SOP

Stream discharge will be measured with the aid of a Marsh McBirney flow meter (model 2000), following protocol established by the United States Geological Survey (Rantz et al. 1982).

Stream discharge will be measured utilizing the velocity-area method. This method requires the physical measurement of the cross-sectional area and the velocity of the flowing water. Discharge is determined as the product of the area times the velocity. Velocity will be measured using a March-McBirney, Flow mate 2000, flow meter.

Measuring the average velocity of an entire cross section is impractical, so the method uses an incremental method. The width of the stream is divided into a number of increments; the size and number of the increments depends on the depth and velocity of the stream. The purpose is to divide the stream section into increments with approximately equal discharges. For each incremental width, the stream depth and average velocity of flow are measured. For each incremental width, the meter is placed at a depth where average velocity is expected to occur. That depth has been determined to be about 0.6 of the distance from the water surface to the streambed when depths are shallow. When a depth greater than three feet, the average velocity is best represented by averaging velocity readings at 0.2 and 0.8 of the distance from the water surface to the streambed. The product of the width, depth, and velocity of the section is the discharge through that increment of the cross section. The total of the incremental section discharges equals the discharge of the river.

ATTACHMENT B

Laboratory Analytical SOP's

Fecal Coliform SOP

BAL LABORATORY
185 Frances Avenue
Cranston, RI 02910

Coliphage SOP

Environmental Virology Laboratory
University of North Carolina
Chapel Hill, NC 27599-7400

ATTACHMENT C

Survey Schedules: Runnins River Dry Weather Survey
Crew Assignments

Crew Assignments

Fecal Coliform and Coliphage Testing

Survey Preparation: After loading the vehicles at RIDEM approximately one half hour before sampling begins, all crews will meet at the Mobil gas station on Mink Street to go over the survey schedule and begin surveying.

Crew 1: Greg and Brian*

Flow Gage Stations:

R32a, R32b, R37b, R39a, R31 (Stage), R40 (Stage)

Water Quality Stations:

RS32	Mink St. Stormdrain	tributary (fecal coliform, YSI)
RS32a	Mink St. Stormdrain	tributary (fecal coliform, YSI)
RS32b	Leavitt North Stream	tributary (fecal coliform, YSI)
R37b	Meade Street Stream @ Leavitt	tributary (fecal coliform, YSI)
R37	Meade Street Stream @ River	tributary (fecal coliform, YSI)
R39a	Leavitt South Stream @ Leavitt	tributary (fecal coliform, YSI)

1 duplicate sample

Crew 1 assignment:

1) Assist Bob with kayak sampling; 2) take the YSI from Bob and flow gage/sample; 3) meet at sample drop-off point (Mobil gas station - Mink Street) to collect all survey samples/fill out QA sheets/deliver to BAL.

Resources:

1 cooler with pre-labeled bottles
Marsh Mcbirney Flow Meter
Tape
Field notebook
QA sheets

Crew 2: Bob*

Water Quality Stations:

R40	School Street	Mid-Channel (fecal coliform)

* Table 1 gives detailed information on the parameters that should be tested at each station.

Crew 3 assignments:

1) Flow gage/ sample R1; 2) sample R7, R12, R19, R23 (coliphage sample collected at R23); 3) drop samples/flow equipment off at sample drop-off point (Mobil gas station - Mink Street); 4) Deliver bottles (Al - coliphage to Fed Ex/Heidi - fecal to BAL.

Resources:

Waders
Sample stick
2 coolers with pre-labeled bottles
Field notebook
Marsh Mcbirney
Tape
2 stakes

Crew 4: EPA staff*

Water Quality Samples

R40	School Street	Mid-Channel (composite coliphage)
R31	Mink Street	Mid-Channel (composite coliphage)
B16	Monarch Drive	Mid-Channel (composite coliphage)

Crew 4 assignments:

1) I crew member composite sample Mink Street (samples collected every 8 min./hr.) / 1 crew member composite sample School Street; 2) drive to Monarch Drive station, composite sample Monarch Drive Stream; 3) drop-off samples at Mobil Gas Station

Resources:

2 sample sticks
2 coolers with pre-labeled bottles
Field notebook

* Table 1 gives detailed information on the parameters that should be tested at each station.