CSO LONG TERM CONTROL PLAN

SRF PROJECT NO. CS-330106-05

APPENDICES

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

April 2005

Prepared by:
Underwood Engineers, Inc.
Portsmouth, New Hampshire
1110

CSO LONG TERM CONTROL PLAN
CITY OF PORTSMOUTH, NH

APPENDICES
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NPDES Permit

RECEIVED 1-28-85

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

January 22, 1985

Mr. Calvin A. Canney
City Manager
700 Islington Street
Portsmouth, New Hampshire 03801

Re: NPDES Application No. NH0100234

Mr. Canney:

Enclosed is your final National Pollutant Discharge Elimination System (NPDES) permit issued pursuant to the referenced application. The Environmental Permit Regulations, at 40 C.F.R. §124.15, 48 Fed. Reg. 14271 (April 1, 1983), require this permit to become effective on the date specified in the permit.

Also enclosed is a copy of the Agency's response to the comments received on the draft permit and information relative to hearing requests and stays of NPDES permits.

We appreciate your cooperation throughout the development of this permit. Should you have any questions concerning the permit, feel free to contact John R. Healey, of my staff at 617/223-5470.

Sincerely,

Edward K. McSweeney

Edward K. McSweeney, Chief
Compliance Branch (WR/C)

Enclosures

cc: State Water Pollution Control Agency
All Interested Parties

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"),

City of Portsmouth

is authorized to discharge from a facility located at

Pierce Island and Seacrest Village
Portsmouth, New Hampshire

to receiving waters named

Piscataqua River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on the date of signature.

This permit and the authorization to discharge expire at midnight, five years from data of issuance.

This permit supercedes the permit issued on September 3, 1982.

This permit consists of 10 pages in Part I including effluent limitations, monitoring requirements, etc., and 19 pages in Part II including General Conditions and Definitions.

Signed this 18th day of January, 1985

David A. Fierra

Director
Water Management Division
Environmental Protection Agency
Boston, MA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning effective date and lasting through July 1, 1988 the permittee is authorized to discharge from outfall serial number 001 (Pierce Island WWTF).

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Average Monthly	Average Weekly	(specify units) Average Monthly	Average Weekly	Maximum Daily	Monitoring Requirement Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)						Continuous	Daily Avg. Max., Min.
BOD[1]			150 mg/l			1/month	Composite
TSS[1]			192 mg/l 125			1/month	Composite
Settleable Solids			.05			1/day	Grab
pH			(See Part I, A.1.2)			1/day	Grab
Chlorine Residual			(See Part I, F.1.c)			1/day	Grab
Total Coliform					70/100ml	1/month	Grab

1 The permitee shall analyze the influent and effluent for BOD and TSS.

The permittee shall maintain at least the present level of treatment and effluent quality.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. During the period beginning effective date and lasting through July 1, 1988 the permittee is authorized to discharge from outfall serial number 002 (Seacrest Village WWTF).

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations					Monitoring Requirement	
	kg/day (lbs/day)		(specify units)				
	Average Monthly	Average Weekly	Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)						Continuous	Daily Avg. Max., Min.
BOD			150 mg/l			1/month	Composite
TSS			192 mg/l			1/month	Composite
Settleable Solids						1/day	Grab
pH			(See Part I, A.1.a)			1/day	Grab
Chlorine Residual			(See Part I, F.1.b)			1/day	Grab
Total Coliform					70/100ml	1/month	Grab

[1] The permitee shall analyze the influent and effluent for BOD and TSS.

The permittee shall maintain at least the present level of treatment and effluent quality.

PART I

A EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

3. During the period beginning July 1, 1988 and lasting through expiration, the permittee is authorized to discharge from outfall serial number 001 (Latitude 43°04'24"N, Longitude 70°44'23"W).

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Average Monthly	Average Weekly	(specify units) Average Monthly	Average Weekly	Maximum Daily	Monitoring Requirement Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)			(4.5)			Continuous	Daily Avg. Max., Min.
BOD	2559(5630)		150 mg/l			weekly	Composite
TSS	2132(4691)		125 mg/l			weekly	Composite
Settleable Solids					0.5 ml/l	daily	Grab
pH			(See Part I, A.1.a)			daily	Grab
Chlorine Residual			(See Part I, F.1.b)			1/day	Grab
Total Coliform					70/100ml	weekly	Grab
*Priority Pollutants - metal							

*Before the expiration of this permit the discharge shall be analyzed for the toxic and priority pollutants outlined in Tables II and III of Appendix D of Part 122, 48 Federal Register 14176, April 1, 1983. The name and model number of the instrumentation used and detection limits of each pollutant shall be included in the monitoring report.

a. The pH of the effluent shall not be less than 6.5 nor greater than 8.0 at any time, unless these values are exceeded due to natural causes or as a result of the approved treatment processes.

b. The discharge shall not cause visible discoloration of the receiving waters.

c. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.

d. When the effluent discharged for a period of 90 consecutive days exceeds 80 percent of the designed flow, the permittee shall submit to the permitting authorities a projection of loadings up to the time when the design capacity of the treatment facility will be reached, and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans.

2. All POTWs must provide adequate notice to the Director of the following:

a. Any new introduction of pollutants into that POTW from an indirect discharger in a primary industry category discharging process water; and

b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For purposes of this paragraph, adequate notice shall include information on:

(1) the quality and quantity of effluent introduced into the POTW; and

(2) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Development of Limitations for Industrial Users:

a. Pollutants introduced into POTW's by a nondomestic source (user) shall not Pass Through the POTW or Interfere with the operation or performance of the works.

b. All POTW's shall, in cases where pollutants contributed by User(s) result in Interference or Pass-Through, and such violation is likely to recur, develop and enforce specific effluent limits for Industrial User(s), and all other users, as appropriate, which together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure renewed and continued compliance with the POTW's NPDES permit or sludge use or disposal practices. Specific effluent limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond.

c. Where specific prohibitions or limits on pollutants or pollutant parameters are developed by a POTW in accordance with paragraph (b) above such limits shall be deemed Pretreatment Standards for the purposes of section 307(d) of the Act.

d. If, within 30 days after notice of an Interference or Pass Through violation has been sent by EPA to the POTW, and to persons or groups who have requested such notice, the POTW fails to commence appropriate enforcement action to correct the violation, EPA may take appropriate enforcement action.

B. COMBINED SEWER OVERFLOW REQUIREMENTS

1. From the effective date of this permit, the permittee is authorized to discharge from combined sewer overflows(CSOs) (003-010, 012) as listed in attachment A of this permit, provided the discharges receive Best Practicable Treatment . Best Practicable Treatment (BPT),at a minimum, is the most economical treatment necessary so that the discharge does not violate the water quality standards of the receiving water and contains no septage or holding tank waste.

2. CSO numbers 003 through 009 shall be eliminatd as described in section D.

3. A monitoring program adequate to evaluate compliance with paragraph 1 above shall be developed for CSO numbers 010 and 0~~13~~. 12 The monitoring program shall be designed to:

   a. Adequately assess compliance or non-compliance with water quality standards for the receiving water during wet and dry weather and low flow coditions.

   b. Provide an assessment of individual overflow impacts on the receiving water.

   c. Provide sampling locations,frequencies, and parameters necessary to obtain representative results and comparison with water quality standards.

   d. Provide for reporting of results to EPA and the State periodically, but no less frequent than annually.

3. Within two months of the effective date of this permit,the permittee shall submit a proposed monitoring program to EPA and the State for review and approval. Upon approval, the permit will be modified to incorporate this program.

C. ADDITIONAL MONITORING REQUIREMENTS

The Permittee shall implement the water quality monitoring program as described below. The primary objective of this program is to characterize conditions at the existing outfall site, monitor for discharge related ecosystem impacts, and assess the appropriateness of the permit requirements.

1. Water Quality Monitoring Program:

The objective of this program is to determine compliance with water quality standards and the criteria in Section 301(h) of the Clean Water Act.

a. Sampling.

(1) Using standard monitoring and quality control procedures, the parameters listed below shall be measured at the surface and bottom at two sampling stations; one just beyond the ZID boundary and the other outside the influence of the discharge, or any other discharge, to be used as a control site. The control shall be located at the same water depth and over the same substrate type as the station just beyond the ZID boundary. The station just beyond the ZID boundary Shall be placed on the downcurrent boundary of the ZID. The measured parameters shall be:

dissolved oxygen	turbidity
pH	total coliform bacteria
salinity	suspended solids
temperature	BOD
total residual chlorine	

If no significant differences are noted between these two stations after two sampling episodes, the control station will be eliminated.

(2) Water quality sampling shall be conducted annually during a summertime ebb slack tide.

b. Monitoring reports.

(1) Monitoring reports shall note any observed surfacing of the effluent plume in a visible boil, the presence of floatable material, and any surface film, sheen, or discoloration.

(2) These reports shall be submitted at the end of each sampling period as specified in Part E, Reporting Requirements. The water quality monitoring reports shall contain a narrative description of the sampling procedures and locations, a map of the stations sampled and a copy of all data collected during each sampling period.

D. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations and/or conditions specified for discharges in accordance with the following schedule:

   a. By February 1, 1984, begin design of upgrade of treatment facility.

   b. By September 1, 1985, complete design of upgrade of treatment facility.

   c. By July 1, 1988,complete constuction of upgrade of treatment facility.

   d. Submit reports on the progress of construction on June 1, 1986 , June 1,1987 , December 1, 1987 , and April 1, 1988.

2. Within 6 months of the effective date of this permit the Permittee shall develop and submit to EPA a Municipal Compliance Plan (MCP). Upon approval by EPA, the permit will be modified to incorporate the approved schedule. Enclosure I identifies the information to be included in the MCP.

3. Eliminate CSO numbers 003 through 009 by April 1, 1986.

   a. Submit a progress report on the elimination of CSOs to EPA and the State by September 1, 1985.

4. The permittee shall develop a public education program designed to minimize the entrance of nonindustrial toxic pollutants and pesticides into its POTW.

   a. Within 180 days from the effective date of this permit, the Permittee shall notify each user of the sewer system of the need to minimize the entrance of nonindustrial toxic pollutants and pesticides into the treatment system.

   b. A report shall be submitted annually by December 31 summarizing the actions being undertaken to control nonindustrial sources of toxic pollutants and pesticides.

E. REPORTING REQUIREMENTS

1. Effluent Monitoring:

Monitoring results obtained during the previous month shall be summarized for each month and reported on separate Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the month following the completed reporting period.

Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Director and the State at the following addresses:

Permit Compliance Section
Compliance Branch
Water Management Division
Environmental Protection Agency
JFK Federal Building
Boston, MA 02203

The state agency is:

New Hampshire Water Supply and
Pollution Control Commission
Hazen Drive - P.O. Box 95
Concord, New Hampshire 03301

2. Additional Monitoring:

The water quality monitoring reports shall be submitted by September 30 of each year.

F. STATE PERMIT CONDITIONS

1. The permittee shall comply with the following conditions which are included as State Certification requirements.

   a. Pursuant to State Law N.H. RSA 149:8, II(a), changes in volume or character of pollutants received by Publicly Owned Treatment Works (POTW) (sewage system, treatment facility, and/or apurtenances) of 5000 gallons per day and/or 50 population equivalents and greater required submittal for approval of a "discharge permit request form" to the New Hampshire Water Supply and Pollution Control Commission at least 30 days before the proposed changes are to take place.

   b. The total chlorine residual of the effluent shall not result in any demonstrable harm to aquatic life or violate any water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards, the permittee being so notified.

   c. The permittee shall not at any time, either alone or in conjunction with any person or persons, cause directly or indirectly the discharge of any waste into the said receiving waters except that has been treated in such a manner as will not lower the Class B quality or interfere with the uses assigned to said waters by the New Hampshire Legislature (Chapter 311, Laws of 1967).

ATTACHMENT A

RGE NO.	LOCATION	TYPE OF DISCHARGE	COMPOSITION OF DISCHARGE	RECEIVING WATER
01	Pierce Island WWTF	Outfall	Treated Wastewater	Piscataqua River
02	Seacrest Village WWTF	Outfall	Treated Wastewater	Piscataqua River
03	Maplewood Avenue at Route 1	Combined Discharge	Sanitary/Stormwater	North Pond
04	Leslie Drive	Combined Discharge	Sanitary/Stormwater	North Pond
05	Cutts Street at Leslie Drive	Combined Discharge	Sanitary/Stormwater	North Pond
07	Preble Way at Ranger Way	Combined Discharge	Sanitary/Stormwater	Piscataqua River
008	Crescent Way near Saratoga Way	Combined Discharge	Sanitary/Stormwater	Piscataqua River
009	Marcy Street near New Castle Avenue	Combined Discharge	Sanitary/Stormwater	Piscataqua River
010	Parrott Avenue near Rogers Street	Combined Overflow	Sanitary/Stormwater	Piscataqua Ri r
012	Marcy Street	Combined Overflow	Sanitary/Stormwater	Piscataqua River

ENCLOSURE I

The Permittee ia required to develop a Municipal Compliance Plan(MCP) identifying how and when it will come into compliance with the requirements of the CWA by July 1, 1988. The MCP must idetify:

A. The treatment technology needed to achieve compliance, and estimates of its capital requirements and operation, maintainance, and replacement (OM&R) costs.

B. The financial mechanism to be used for POTW construction and for generating adequate revenues for OM&R.

C. A proposed fixed date compliance schedule, including, at a minimum, the milestones by which construction will be started, completed, operational level attained, and compliance achieved with applicable effluent limits.

D. Any appropriate interim steps, such as improved O&M procedures or the upgrade of existing facilities that will insure progress toward compliance with permit requirements.

Please answer the following questions and complete Table I showing the earliest dates by which Portsmouth's wastewater treatment facility will be in compliance with the final effluent limitations. These questions should be answered based on the assumption EPA construction grants will not be available. State in detail any facts or circumstances which will prevent Portsmouth from completing construction of the required facilities by July 1, 1988.

MUNICIPAL WASTEWATER TREATMENT FACILITY

Financial Capability Analysis Guide

Facility Name: ______________________________

Mailing Address: ______________________________

City: ______________________________ Zip __________

Contact(s): ______________________________

Phone Number(s): ______________________________

These sheets can be used as an aid in conventional financial analysis. Information to answer these questions should be contained in the Facility Plan or the Municipal Compliance Plan. Additional assistance can be found in the Financial Capability Guidebook, which is available from the U.S. Department of Commerce, National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161

What is the nature of the proposed facilities? (Check more than one, if applicable.)

- The proposed facilities include: [ ] Collection System [ ] Treatment Plant [ ] Outfalls
- The proposed facilities will be: [ ] New [ ] An expansion [ ] An upgrade
- Entities to be served include: [ ] County [ ] Municipality [ ] Industry [ ] Sewer District

---

What roles and responsibilities will local governments have?

Cooperative arrangements between various entities may be required to meet the management needs of wastewater treatment facilities. What agency will:

- Own the facilities? ______________________________
- Operate the facilities ? ______________________________
- Finance the facilities ? ______________________________
- Will there be financial contributions by: [ ] Other agencies [ ] Industries

  Other agencies: ______________________________

  Industries: ______________________________
- Have participating agencies been asked to review:

  [ ] A Facility Plan [ ] A population projection [ ] Service area boundaries

° Have agreements been sought between the operating agency and:

[ ] Participating agencies [ ] Other agencies [ ] Industry

How much will the proposed facilities cost at today's prices?

The following figures should be the estimated costs for construction, and operation, maintenance, and replacement (OM&R) of the proposed facilities. Dollar amounts should be uninflated and reflect today's prices.

° Estimated planning, design, and construction costs: $ ______

° Estimated annual (OM&R) costs: $ ______

How will the facilities be financed?

° What amount will have to be borrowed? $ ______

° How will you finance this amount? What financing method will you use?

Method(s)	Amount Financed	Interest Rate	Term of Maturity	Annual Debt Service Payment
General Obligation Bond	$ ______	______ %	______	$ ______
Revenue Bond	$ ______	______ %	______	$ ______
Loan	$ ______	______ %	______	$ ______
Total:	$ ______		Total:	$ ______

° Estimated, total, annual costs:

Net existing OM&R:	$ ______
Existing annual debt service:	$ ______
OM&R for proposed facilities:	$ ______
Debt service for proposed facilities:	$ ______
Total:	$ ______

° Sources and amounts of funding for estimated, total, annual costs:

Sewer charges:	$ ______
Surcharge:	$ ______
Connection fees:	$ ______
Betterment assessments:	$ ______
Other assessments:	$ ______
Transfers from other funds:	$ ______
Other sources:	$ ______
Total:	$ ______

What are the annual costs per household?

- Total estimated annual wastewater facilities charges: $ ______
- Nonresidential share of the total annual charges: $ ______
- Residential share of the total annual charges: $ ______
- Number of households: No. ______ x
- Annual costs per household for:
  - Wastewater collection and treatment: $ ______ +
  - Other: $ ______ =
- Total annual costs per household: $ ______

What is the community's debt history?

	Rating	Date of Rating
• Community's most recent general obligation bond rating:	______	______
Previous rating:	______	______
• Community's most recent revenue bond rating:	______	______
Previous rating:	______	______

• Outstanding debt:		• Total overall net debt due (including new issues) within next 5 years:
. General obligation bonds	$ ______	$ ______
. Revenue bonds	$ ______	$ ______
. Gross direct debt	$ ______	$ ______
. Direct net debt	$ ______	$ ______
. Overlapping net debt	$ ______	$ ______
. Overall net debt	$ ______	$ ______
. Other debt	$ ______	$ ______
. New debt for other capital improvements	$ ______	$ ______
Total:	$ ______	$ ______

- Briefly describe any limits on debt that apply to your community.

______

______

______

______

______

- What % of your debt limit is currently used? ______

What is the community's financial condition?

Indicator	Value
° Annual rate of change in population:	____ %
° Current operating surplus/deficit as a % of current expenses:	____ %
° Real property tax collection rate:	____ %
° Property tax revenues as % of full market value of real property:	____ %
° Overall net debt as a % of full market value of real property:	____ %
° Overall net debt outstanding as a % of personal income:	____ %
° Direct net debt per capita:	$ ____
° Overall net debt per capita:	$ ____
° % direct, net debt outstanding due within next five years:	____ %
° Operating ratio:	____ %
° Coverage ratio:	____ %

- What is the overall financial impact of the proposed wastewater treatment facilities?

This is a series of questions that will help provide information about your community's current financial condition. The answers to these questions will help demonstrate the cumulative financial impacts of constructing the proposed facilities on top of previous financial commitments.

- Does your community plan to rely on new population growth to help finance the proposed treatment facilities and to meet other local obligations? If so, are the population projections realistic? Do historic population trends (eg., previous five years) support population projections? ____

- Over the past five years, what has happened to your community's taxable assessed property valuation relative to its population? ____

- Does your community rely on sources of revenue other than real property taxes? If so, are there discernible trends for these revenues? ____

- What is the total current outstanding indebtedness of your community? ____

- How much additional debt can your community legally incur? ____

- Does your community have a user charge system? If so, do the revenues generated cover total expenditures, including debt retirement and 'set asides' for capital reserves? ____________________

- Does your community have a capital reserve fund for betterments, expansions, improvements, or reconstruction? What is the current balance? What are the projected annual credits to this fund? ____________________

- What capital improvements were included in the most recent bond issue? What new capital improvements are planned? ____________________

- If your community is financially incapable of bringing its POTW into compliance by July 1988, when will it regain its capacity to generate capital? How will that capacity be reserved for the exclusive use of its POTW?

TABLE I

Work	Date completed or to be completed
1. Employ engineer to plan project	
2. Approve Planning, including obtaining State approval	
3. Complete Plans & Specfications	
4. Approve Plans & Specifications including obtaining necessary State (and EPA) approvals	
5. Commence any required condemnations proceedings	
6. Obtain possessions of condemmed property	
7. Complete financing, including awarding of State and Federal grants if any, and sale of evidence of indebtedness	
8. Advertise for bid	
9. Award construction contract	
10. Commence construction	
11. (Reserved for additional target dates - to be added after review of plans, specifications, and construction contract)	
12. Progress reports on construction and equipment fabrication	(specific dates)
13. Complete construction	
14. Commence Operations	
15. Attain permit effluent limits	

Appendix 2-2

CONSENT DECREE
CIVIL No. 89-234-D

ADMINISTRATIVE ORDER 02-15

U.S. Department of Justice

United States Attorney

District of New Hampshire

Federal Building
P. O. Box 480
Concord, New Hampshire 03302-0480
603/225-1552

November 14, 1990

James Starr, Clerk
United States District Court
55 Pleasant Street
Concord, NH 03301

Re: United States v. City of Portsmouth, N.H.
Civil No. 89-234-S, U.S.D.C., D.N.H.

Dear Mr. Starr:

Enclosed please find for filing in the above-entitled action the United States' Notice of Lodging of Consent Decree and lodged Consent Decree.

Please ask the Court not to sign the Consent Decree until the thirty-day public comment period required by Department of Justice policy, 28 C.F.R. § 50.7, has expired. Counsel for the United States will notify the Court when the public comment period has expired.

Thank you for your cooperation.

Very truly yours,

JEFFREY R. HOWARD
United States Attorney

By: Nancy E. Hart
Nancy E. Hart
Assistant U.S. Attorney

NEH:djr

cc: Steven Houran, Esq.
Robert P. Sullivan, Esq.

Enclosure

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW HAMPSHIRE

United States of America, Plaintiff, v. City of Portsmouth, New Hampshire, Defendant.	Civil No. 89-234-S

UNITED STATES' NOTICE OF LODGING OF CONSENT DECREE

Plaintiff, the United States of America, notifies the Court that it is today lodging a Consent Decree in this case pending solicitation and consideration of public comments, as required by Department of Justice policy, 28 C.F.R. § 50.7.

In accordance with the Department of Justice policy, 28 C.F.R. § 50.7, the Department of Justice will publish in the Federal Register a notice of the lodging of this Consent Decree. The notice will solicit public comments on the Consent Decree for a period of thirty (30) days from the date of publication. After the close of the comment period, the United States will evaluate any comments received and advise the Court as to whether the United States will request that the Consent Decree be entered.

The United States asks the Court to take no action with respect to the lodged Consent Decree until the United States requests entry or otherwise advises the Court.

Respectfully submitted,

JEFFREY R. HOWARD
United States Attorney

By:
Nancy E. Hart
Assistant U. S. Attorney

November 14, 1990

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing Notice has been mailed, postage prepaid, this date to:

Steven Houran
Senior Assistant Attorney General
State of New Hampshire
25 Capitol Street
Concord, NH 03301

Robert P. Sullivan
City Attorney
P.O. Box 628
Portsmouth, NH 03801

Nancy E. Hart, AUSA

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW HAMPSHIRE

United States of America, Plaintiff, v. City of Portsmouth, New Hampshire, Defendant.	)	Civil No. 89-234-D

CONSENT DECREE

The United States of America ("United States"), on behalf of the United States Environmental Protection Agency ("EPA"), and the State of New Hampshire filed separate Complaints against the City of Portsmouth, New Hampshire ("Portsmouth") for repeated and continuing violations of the Clean Water Act ("the Act"), 33 U.S.C. § 1251 et seq., its National Pollutant Discharge Elimination System ("NPDES") permit issued by EPA pursuant to Section 402 of the Act, 33 U.S.C. § 1342, and of New Hampshire RSA Ch. 149.

Portsmouth is a political subdivision of New Hampshire, duly chartered and formed within the laws of New Hampshire and is a "municipality" and "person" within the meaning of Sections 502(4) and 502(5) of the Act, 33 U.S.C. §§ 1362(4) and 1362(5). Portsmouth owns and operates a 1.5 million gallon per day (average design flow) wastewater treatment plant at Pierce Island ("the treatment plant") and associated sewer lines.

The United States, City of Portsmouth, and State of New Hampshire, without adjudication of the facts or the law, agree that settlement of this matter is in the public interest and that entry of this Decree without further litigation, is an appropriate resolution to this dispute, and the parties consent to the entry of this Decree.

NOW, THEREFORE, IT IS HEREBY ORDERED, ADJUDGED AND DECREED as follows:

STATEMENT OF THE CLAIM.

1. The Complaint of the United States states a claim pursuant to Sections 309(b) and (d) of the Clean Water Act, 33 U.S.C. §§ 1319(b) and (d), for injunctive relief and civil penalties against the City of Portsmouth, New Hampshire. The State of New Hampshire intervened in this action as a plaintiff and asserts claims pursuant to New Hampshire RSA 149:8, III-a, and RSA 149:19. The United States preserves its claim against the State of New Hampshire under Section 309(e) of the Act, 33 U.S.C. § 1319(e), which provides that the State shall be liable for payment of any judgment, or any expenses incurred as a result of complying with any judgment entered against the City to the extent that the laws of the State prevent the City from raising the revenues needed to comply with such judgment. The State of New Hampshire reserves all defenses in the event the United States brings any claim pursuant to Section 309(e).

JURISDICTION AND VENUE.

2. Jurisdiction is vested in this Court pursuant to 28 U.S.C. §§ 1331, 1345, and 1355 and Section 309(b) of the Act, 33 U.S.C. § 1319(b). Venue is proper in this judicial district pursuant to 28 U.S.C. § 1391(b) and Section 309(b) of the Act, 33

U.S.C. § 1319(b), because this is the judicial district where Portsmouth is located and where the alleged violations occurred.

APPLICATION

3. The provisions of this Consent Decree shall be binding upon the United States, the State of New Hampshire, and City of Portsmouth, and upon Portsmouth's officers, directors, managers, agents, trustees, servants, employees, successors, assigns, attorneys, and all persons, firms, and corporations acting under, through, or on behalf of Portsmouth. No later than thirty (30) days prior to transfer of ownership, operation, or other interest in the Portsmouth Wastewater Treatment Plant, Portsmouth shall give written notice and a copy of this Consent Decree to any successors in interest. Portsmouth shall condition the transfer of ownership, operation, other interests, or any contract related to the performance of the Consent Decree upon the successful execution of the terms and conditions of this Decree. Portsmouth shall notify in writing the United States Attorney for the District of New Hampshire, the United States Environmental Protection Agency, Region I, the United States Department of Justice, the Department of Environmental Services of the State of New Hampshire ("DES") and the Attorney General of the State of New Hampshire of any successor-in-interest at least thirty (30) days prior to any transfer and that notice and a copy of the Decree has been given to the successor-in-interest by Portsmouth.

OBJECTIVES.

4. It is the express purpose of the parties in consenting to this Decree to further the objectives of the Clean Water Act, as enunciated at Section 101 of the Act, 33 U.S.C. § 1251. All plans, studies, construction, remedial maintenance, monitoring programs, and other obligations of the Decree, or resulting from the activities resulting from this Decree, shall have the objectives of causing Portsmouth to come into and remain in full compliance with the Clean Water Act, including compliance with the terms and conditions of its NPDES Permit, renewals or amendments to that Permit, and the provisions of applicable Federal and State laws and regulations governing discharges from Portsmouth's wastewater treatment plant.

DEFINITIONS.

5. Unless otherwise defined herein, the terms used in this Consent Decree shall have the meaning given to those terms in the Clean Water Act, 33 U.S.C. § 1251 et seq., the regulations promulgated thereunder, 40 C.F.R. § 401.11, and in the applicable NPDES Permit.

CONSTRUCTION SCHEDULE.

6.A. Portsmouth shall undertake a program to achieve and thereafter maintain compliance with the Clean Water Act and its NPDES Permit by completing the construction of the upgraded wastewater treatment facility as set forth below. Portsmouth shall complete each required task on or before the deadline set forth in the following schedule:

	Task	Deadline
a.	Portsmouth shall revise Design Plans and Specifications for the upgraded wastewater treatment plant and submit to the State for final approval.	September 7, 1989
b.	Portsmouth shall submit final Design Plans and Specifications to the State for a new primary effluent filter and ancillary equipment for approval.	September 7, 1989
c.	Portsmouth shall advertise for bids from prospective contractors for the construction of its upgraded wastewater treatment plant, including the new primary effluent filter, requesting that bids be received by December 8, 1989.	October 8, 1989
d.	Portsmouth shall award the contract for construction of its upgraded wastewater treatment plant.	January 15, 1990
e.	Portsmouth shall commence construction of its upgraded waterwater treatment plant.	January 22, 1990
f.	Portsmouth shall accept wastewater flow and initiate operation of its upgraded wastewater treatment plant, including treatment of full flow. Portsmouth shall substantially complete construction of the upgraded treatment plant. "[S]ubstantially complete construction" means to complete in all respects so as to be capable of and begin accepting entry of and treating full flow.	October 25, 1991

g. Portsmouth shall achieve full operation of the upgraded wastewater treatment plant and achieve and maintain compliance with the final effluent limits, monitoring requirements, and conditions set forth in this Decree, its applicable NPDES Permit, and the Clean Water Act. Portsmouth shall cease discharging untreated wastewater unless bypassing is explicitly permitted pursuant to 40 C.F.R. 122.41(m) and then subject to the conditions therein. — February 25, 1992

6.B. Portsmouth may request extension(s) of the deadline in paragraph 6.A.f., not to exceed 12 weeks total, for change orders subject to approval by the State. The deadline in paragraph 6Af shall not be extended beyond 12 weeks total, i.e., to no later than January 22, 1992, and the requested extension(s) must be approved by the State. Any such extension(s) of the deadline in paragraph 6.A.f. shall not change the deadline in 6.A.g.

INTERIM EFFLUENT LIMITS

7. Portsmouth shall, at a minimum, comply with the following interim effluent limits and requirements from the date of entry of this Decree until February 25, 1992.

Pollutant	Limitation Maximum Daily	Limitation Average Monthly	Monitoring Requirements Frequency	Monitoring Requirements Sample Type
Flow	--	--	Continuous	Report average daily & maximum daily
BOD	--	25% removal	1/week	24-hour Composite
TSS	--	30% removal	1/week	24-hour Composite
pH	6.0 - 8.0 or as naturally occurring	--	1/day	Grab
Chlorine-TRC	--	--	1/day	Grab
Total Coliform	--	--	1/week	Grab
Oil & Grease	--	--	1/month	Grab

Both treated and untreated ("bypass") flow shall be measured at the treatment facility and reported separately on the Discharge Monitoring Report ("DMR"). The BOD and TSS average monthly percent removals shall be at least 25% and 30% respectively. The average monthly percent removal is to be computed as a running average for twelve months ending with the month being reported. The running average will be calculated commencing with September 1989. Samples for the determination of BOD and TSS percent removal shall be taken of the influent and effluent, allowing for appropriate detention time before sampling the effluent. The depth of sludge in the clarifier shall be measured five times per week and reported monthly. The depth shall be the average of four measurements at representative points in the clarifier with the results averaged.

FINAL COMPLIANCE

8. On and after February 25, 1992, Portsmouth shall comply with all final effluent limits and monitoring requirements set forth in its applicable NPDES Permit. On and after February 22, 1992, Portsmouth shall not bypass its treatment facility and discharge untreated wastewater unless the bypass is explicitly permitted pursuant to 40 C.F.R. 122.41(m) and then subject to the conditions therein.

COMBINED SEWER OVERFLOWS ("CSOs")

9. The parties to this agreement understand that Portsmouth has been and is currently unable to meet the water quality standards for its combined sewer overflow (CSO) outfalls 010A and 010B, in violation of Portsmouth's NPDES permit and the Act. Furthermore, the parties recognize that dry weather overflows may occur at CSO outfalls 010A and 010B, in violation of Portsmouth's NPDES permit and the Act. Therefore, Portsmouth shall complete the following actions on or before the specified dates, as initial steps towards bringing its CSOs into compliance with its permit and the Act. Plans and schedules submitted under this section may, when approved by the United States Attorney, EPA, and the State, be filed by the United States Attorney, EPA, or the State as a stipulation by Portsmouth and the parties, together with a motion that they be incorporated into this Decree. If Portsmouth fails to make any submission required

under this section to the satisfaction of the United States Attorney, EPA, or the State, then the United States Attorney, EPA, or the State may, in addition to seeking any other relief, submit a proposed schedule or plan to the Court for incorporation into this Decree.

a. The City shall perform a hydraulic analysis of that segment of its sewer system beginning at South Mill Pond and concluding at the Mechanic Street Pumping Station. The purpose of the analysis is to determine the system's capability and capacity to prevent dry weather overflows and CSO discharges. The Report shall be submitted to the United States Attorney, EPA, and the State of New Hampshire by January 1, 1991.

b. A draft CSO Monitoring Plan and Scope of Services ("CSO Plan") to determine the extent of water quality impacts shall be developed and submitted by Portsmouth to the United States Attorney, EPA and the State of New Hampshire for review and approval on or before May 1, 1990. The CSO Plan shall be of sufficient scope to allow development of a facilities plan that assesses a range of alternative CSO abatement measures and dry weather overflows ("DWO") elimination measures. The CSO Plan shall include, but not be limited to, quantity and quality monitoring of CSO discharges, modeling, manpower requirements and their concomitant costs. Portsmouth shall implement the CSO Plan as approved by the U.S. Attorney, EPA, and the State of New Hampshire. In any event, Portsmouth shall measure flow continuously beginning no later than April 1, 1990 at CSOs 010A and 010B (South Mill Pond) for any dry weather discharges and during storm events; and shall report the results on a monthly basis as part of its Discharge Monitoring Report. The intensity and duration of the storm, as well as the extent and duration of any discharges, shall also be reported and included with the Discharge Monitoring Report.

c. By January 1, 1991, Portsmouth shall submit to the United States Attorney, EPA, and the State for their review and approval, a CSO Facilities Plan which evaluates the specific causes of the dry and wet weather overflows and CSO violations at outfalls 010A and 010B. The CSO Facilities Plan shall recommend corrective measures to eliminate the violations. Portsmouth's CSO Facilities Plan shall include an implementation schedule for achieving water quality standards at its CSO outfalls, and for the elimination of dry weather overflows. Upon receiving written approval of its CSO Facilities Plan and implementation schedule from the United States Attorney, EPA, and the State, Portsmouth shall implement the schedule. Portsmouth may base its proposed implementation schedule on an anticipated approval date with proposed adjustments in the schedule in the event the approval of the United States and the State of New Hampshire has not been obtained by the anticipated date.

d. Portsmouth shall permanently cease any and all dry weather discharges from its CSO outfalls by no later than February 25, 1992, unless (a) both the United States and the State of New Hampshire approve a later date or (b) the Court, in accordance with the procedures set forth below, establishes a later date for the cessation of dry weather discharges from Portsmouth's CSO outfalls. If, upon submission of the CSO Facilities Plan referred to in paragraph 9.c above, Portsmouth seeks a later date than February 25, 1992 for the termination of dry weather discharges from its CSO outfalls and either the United States or the State of New Hampshire does not approve the later date, the date for Portsmouth's termination of dry weather discharges from its CSO outfalls shall remain February 25, 1992 unless Portsmouth files a petition with the Court for resolution of the dispute within thirty (30) days of receipt of the final disapproval by the United States and/or the State of New Hampshire. The petition shall set out the nature of the dispute with a proposal for its resolution. The United States and/or the State of New Hampshire, whichever disapproves Portsmouth's proposed change in date, will have thirty days in which to respond with its proposal. In any such dispute, Portsmouth shall have the burden of proving that the proposal of the United States and/or the State of New Hampshire, whichever disapproves Portsmouth's proposed change in date, is unreasonable and that Portsmouth's proposal will achieve compliance with the terms and conditions of its NPDES permit, the Act and implementing regulations as expeditiously as possible

e. No later than sixty (60) days after approval by the United States Attorney, EPA and the State of the Report required in paragraph 9.c., supra, Portsmouth shall award the contract for final design to implement the required corrective measures as outlined in the approved Report. Portsmouth shall notify the United States Attorney, EPA, and the State that such final design has commenced.

f. If by February 1, 1991, the parties are unable to agree on the nature of the CSO abatement projects with regard to Portsmouth's achievement of water quality standards at its CSO outfalls or a schedule for their implementation, then the United States or the State of New Hampshire may move this Court to order that a proposed project, schedule or plan for achievement of water quality standards at Portsmouth's CSO outfalls be incorporated as part of this Modified Decree.

FUNDING

10. Performance of the terms of this Consent Decree by Portsmouth is not contingent on the receipt of any federal or state grant or loan funds or any source of funds. In addition, performance is not excused by the lack of any federal or state grant or loan funds or any other source of funds, nor is performance excused by any delay in the processing of any application for any federal or state grant or loan funds.

Copies of Monthly reports?

REPORTING

11.A. On or before the fifteenth (15th) day of each calendar month, following the calendar month in which this Consent Decree is entered, and continuing until termination of this Decree, Portsmouth shall submit in writing to the United States Attorney for the District of New Hampshire, EPA, the

Department of Environmental Services for the State of New Hampshire, and the New Hampshire Attorney General's Office a report containing the following information:

a. The status and progress of construction and other projects under this Decree;

b. The results of sampling, monitoring, testing and evaluation set forth or referred to in paragraphs 7 or 8, as applicable, and 9.b. of this Decree;

c. A statement as to compliance or non-compliance with each requirement of this Decree, including the construction schedule contained in paragraph 6; the interim or final effluent limits as applicable, and the monitoring, testing and evaluation requirements as applicable in paragraphs 7, 8 and paragraph 9; where there is non-compliance with any provision of this Decree, the report shall include an explanation of such non-compliance, a statement of any corrective action taken or to be taken, and the timing of such corrective action. The report shall also include a projection of the work to be performed pursuant to this Decree during the succeeding six months. The report shall also include the detailing of any change orders submitted by Portsmouth to the State in connection with which the City requests, pursuant to paragraph 6.B, time extension(s) to the deadline in paragraph 6.A.f. not to exceed 12 weeks total, i.e., to no later than

January 22, 1992. Notification to the United States Attorney, EPA and the State of New Hampshire pursuant to this paragraph of any anticipated delay will not excuse the delay.

(d) Portsmouth shall perform the Additional Monitoring Requirements as set forth in Parts I.C and E of its NPDES Permit and report the results thereof.

12. In addition, within ten (10) days immediately following the deadline date of any requirement pursuant to the construction schedule contained in paragraph 6 of this Consent Decree, Portsmouth shall notify the United States Attorney, EPA and the State of New Hampshire, in writing, of compliance or non-compliance with said requirement, the reason(s) for any non-compliance, and a plan for preventing non-compliance in the future.

13. Each report submitted pursuant to paragraphs 11 and 12 above shall be signed by a responsible official of Portsmouth and shall contain the following certification by that officer:

> "I certify that the information contained in or accompanying this report is true, accurate, and complete. As to any identified portions of this report for which I cannot personally verify its truth and accuracy, I certify as the official having supervisory responsibility for the person(s) who, acting under my authority, made the verification, that this information is true, accurate and complete."

14. All submissions required by this Consent Decree to be sent by Portsmouth to the United States Attorney, EPA, DES and

the Attorney General of the State of New Hampshire, shall be made in writing to the following addresses, respectively:

United States Attorney
District of New Hampshire
P.O. Box 480
Concord, New Hampshire 03302-0480

Permit Compliance Section (WCC-2103)
U.S. Environmental Protection Agency
Region I
John F. Kennedy Federal Building
Boston, Massachusetts 02203

New Hampshire Office Of The Attorney General
Environmental Protection Bureau
State House Annex
25 Capitol Street
Concord, NH 03301

New Hampshire Department of Environmental Services
Water Quality and Permit Compliance Bureau,
Administrator
Hazen Drive
P.O. Box 95
Concord, New Hampshire 03302-0095

15. The aforementioned reporting requirements do not relieve Portsmouth of its obligation to submit any other reports or information required by the Act, the regulations promulgated under the Act, its applicable NPDES permit or the New Hampshire statute.

FORCE MAJEURE

16. If Portsmouth, or any entity controlled by Portsmouth, including its contractors and consultants, fails to comply with any provision of this Consent Decree, Portsmouth shall notify the Court, the United States Attorney for the District of New Hampshire, EPA, the New Hampshire Department of Environmental Services and the Attorney General of the State of New Hampshire,

in writing within ten (10) days of such non-compliance. The notice shall describe in detail: (a) the anticipated duration of the non-compliance; (b) the precise cause or causes of the non-compliance; (c) the measures taken and prospective measures to prevent or minimize the non-compliance; and (d) the timetable for the implementation of the corrective measures. Portsmouth shall also notify the Court, the United States Attorney, EPA, the New Hampshire Department of Environmental Services and the Attorney General of the State of New Hampshire in accordance with the requirements of this section within ten (10) days of when Portsmouth has reason to believe that non-compliance with any provision of this Consent Decree is likely to occur. Portsmouth shall adopt all reasonable measures to avoid or minimize non-compliance. Failure by Portsmouth to comply with the notice requirements of this paragraph shall render paragraphs 17 through 21 regarding force majeure void and of no effect as to the particular incident involved and shall constitute a waiver of Portsmouth's right to request an extension of time for its obligations under this Consent Decree based on the incident.

17. If the United States and the State of New Hampshire agree that Portsmouth's failure to comply with a provision of this Consent Decree has been or will be caused entirely by circumstances beyond the control of the City of Portsmouth and of any entity controlled by or under the common control of Portsmouth, including Portsmouth's consultants and contractors, and that Portsmouth could not have reasonably foreseen and

prevented such noncompliance, the parties shall stipulate in writing to an extension of time for performance of such requirement, not to exceed the actual delay resulting from such circumstances, and stipulated penalties shall not be due for such delay.

18. If the parties are unable to agree whether Portsmouth's failure to comply with a provision of this Decree was caused entirely by circumstances beyond the control of and without the fault of Portsmouth and of any entity controlled by Portsmouth, or on the number of days of noncompliance that were caused by such circumstances, the matter may be submitted by any party to the Court for resolution. If the Court then determines that the failure to comply was caused entirely by circumstances beyond the control of Portsmouth and of any entity controlled by Portsmouth, including Portsmouth's consultants and contractors, and it is determined that Portsmouth or any entity controlled by Portsmouth could not have foreseen and prevented such noncompliance, and that Portsmouth or any entity controlled by Portsmouth took all reasonable measures to avoid or minimize such noncompliance, Portsmouth shall be excused as to the failure to comply for the period of time the noncompliance continued due to such circumstances.

19. Portsmouth shall bear the burden of proof in establishing that: (a) the non-compliance was caused entirely by circumstances beyond the control of Portsmouth and of any entity controlled by Portsmouth, including its contractors and

consultants; (b) that Portsmouth or any entity controlled by Portsmouth could not have reasonably foreseen and prevented such non-compliance; (c) that Portsmouth or any entity controlled by Portsmouth took all reasonable measures to avoid or minimize such non-compliance and (d) the number of days of non-compliance that were caused by such circumstances.

20. Unanticipated or increased costs or expenses associated with the implementation of actions called for by this Consent Decree or changed financial circumstances or failure to obtain funds or decrease in revenues, shall not, in any event, serve as a basis for changes in this Consent Decree or extensions of time under this Consent Decree.

21. The United States and the State of New Hampshire reserve any and all legal and equitable remedies available to enforce the provisions of this Decree and applicable law.

PENALTY FOR PAST VIOLATIONS

22. Portsmouth shall pay a civil penalty in the amount of $100,000 to the United States in satisfaction of civil penalty claims for Portsmouth's violations of the Clean Water Act as alleged in the Complaint through the date of entry of this Decree. Within thirty (30) days after the date of entry of this Decree, payment shall be tendered to the United States Attorney for the District of New Hampshire, 55 Pleasant Street, Room 439, Post Office Box 480, Concord, New Hampshire 03302-0480, in the form of a certified check made payable to "Treasurer of the United States of America". In the event of failure to make

timely payment, interest will be charged in accordance with statutory judgment interest rate established pursuant to 28 U.S.C. § 1961 from the time the payment is due until such payment is made. The United States is not precluded from any other remedy available to it to accomplish payment.

STIPULATED PENALTIES

23. The failure of Portsmouth to comply with any requirement of this Decree shall obligate Portsmouth to pay stipulated penalties as follows:

(a) Five hundred dollars ($500.00) per day per violation for the first thirty (30) days of violation, seven hundred and fifty dollars ($750.00) per day per violation for the next thirty (30) days, and one thousand dollars ($1,000.00) per day per violation for any days beyond sixty (60) days for each violation of a deadline date in the construction schedule set forth in paragraph 6 of this Decree.

(b) Three hundred dollars ($300.00) per day for each violation by Portsmouth of each and any daily maximum discharge limit set forth or referenced in paragraphs 7 or 8 of this Decree.

(c) Two thousand dollars ($2,000.00) per month per violation for each violation of each and any average monthly effluent limit set forth or referenced in paragraphs 7 or 8.

(d) One thousand dollars ($1,000.00) per day for each violation of the bypass prohibition set forth in paragraph 8.

(e) Two hundred and fifty dollars ($250.00) per day for each failure to properly and timely submit notifications, reports or plans (other than the CSO Facilities Plan covered by 9(f)) or perform sampling or fulfill monitoring obligations as required under this Consent Decree.

(f) One thousand dollars ($1,000.00) per day for failure to properly and timely submit the CSO Facilities Plan required under paragraph 9.c. of this Consent Decree.

(g) One thousand dollars ($1,000.00) per day for each violation of the dry weather discharge prohibition set forth in paragraph 9.d. of this Consent Decree.

24. Stipulated penalties shall be paid automatically without demand on or before the fifteenth (15th) day of the month following the month in which the violation(s) occurred. The payment shall be made by certified check, payable to "Treasurer of the United States of America" and tendered to the United States Attorney for the District of New Hampshire, 55 Pleasant Street, Room 439, P.O. Box 480, Concord, New Hampshire 03302-0480. Each such check shall be accompanied by a letter describing the basis for each penalty. Copies of all such letters shall also be mailed to the Environmental Protection Agency and the State.

25. In the event that a stipulated penalty is not paid on time, as required by the preceding paragraph, such penalty shall be subject to interest at the statutory judgment rate established pursuant to 28 U.S.C. § 1961 from the date the penalty was due until payment is made.

RIGHT OF ENTRY

26. Until termination of the provisions of this Consent Decree, the United States Attorney, EPA, the State of New Hampshire and their representatives including the Department of Environmental Services ("DES"), contractors and consultants and attorneys for the United States and State of New Hampshire, shall have the authority to enter any facility covered by this Decree,

at all times, upon proper presentation of credentials, for the purposes of:

(a) monitoring the progress of activities required by this Decree;

(b) verifying any data or information submitted in accordance with the terms of this Decree;

(c) obtaining any samples or, on request, splits of any samples taken by Portsmouth or its consultants; and

(d) assessing Portsmouth's compliance with this Decree.

This provision in no way limits or otherwise affects any right of entry held by the United States or the State of New Hampshire pursuant to applicable federal or state laws, regulations or permits.

NOT A PERMIT

27. This Decree is not and shall not be interpreted to be a permit or a modification of Portsmouth's NPDES Permit, issued pursuant to section 402 of the Clean Water Act, 33 U.S.C. § 1342, or State statute or permit, nor shall it in any way relieve Portsmouth of its obligation to obtain permits and comply with the requirements of any applicable discharge permit or with any other federal or state law or regulation. Any new permit or modication of its existing permit, must be complied with by Portsmouth in accordance with applicable federal and state laws and regulations.

OBLIGATION TO COMPLY

28. The pendency of any proceedings concerning the issuance, reissuance or modification of any discharge permit shall not affect, postpone, or diminish Portsmouth's duties and liabilities as set forth in this Consent Decree. Furthermore, notwithstanding any other provisions of this Decree, the obligation to achieve and maintain complete compliance with the terms, provisions, and requirements of this Decree, the Act and the applicable regulations and permits rests solely with the City of Portsmouth.

NON-WAIVER PROVISION

29. By this Decree, neither the United States nor the State of New Hampshire waive any rights or remedies available to it for any violation by Portsmouth of the Act and associated regulations or permit conditions. Furthermore, this Decree in no way affects the ability of the United States or the State of New Hampshire to bring an action for further relief pursuant to federal or state law for any violations not specifically alleged in the Complaint. This Decree in no way affects or relieves Portsmouth of responsibility to comply with any other federal, state or local laws or regulations.

30. Nothing herein shall be construed to limit the power of the United States, or the State of New Hampshire consistent with their respective authorities to undertake any action against any person, including Portsmouth, in response to conditions which may

present an imminent and substantial endangerment to the public health, welfare or the environment.

COST OF SUIT

31. Portsmouth, the United States and the State of New Hampshire shall each bear its own costs and attorney's fees in this action. Should Portsmouth violate the terms and conditions of this Decree, then Portsmouth shall be liable to the United States for any costs and attorney's fees incurred by the United States in any actions against Portsmouth for non-compliance with this Consent Decree and, similarly, Portsmouth shall be liable to the State of New Hampshire for any costs and attorney's fees incurred by the State of New Hampshire in any actions against Portsmouth for non-compliance with the Consent Decree.

PUBLIC COMMENT

32. The parties agree and acknowledge that final approval by the United States and entry of this Decree is subject to the requirements of 28 C.F.R. § 50.7, which provides for notice and opportunity for public comment. Portsmouth and the State consent to the entry of this Decree without further notice. The United States consents to the entry of this Decree, subject to publication of notice thereof in the Federal Register, pursuant to 28 C.F.R. § 50.7, and an opportunity to consider comments thereon.

SEVERABILITY

33. The provisions of this Consent Decree shall be severable. Should any provision be declared by a court of

competent jurisdiction to be inconsistent with federal or state law, and therefore unenforceable, the remaining provisions of this Decree shall remain in full force and effect.

RETENTION OF JURISDICTION

34. The Court shall retain jurisdiction to enforce, including by contempt order, the terms and conditions of this Consent Decree, to make modifications necessary to effectuate compliance with the Act, this Decree, applicable NPDES permits, and any applicable federal regulations and to resolve all disputes arising hereunder as may be necessary for the construction or execution of this Decree.

TERMINATION OF THIS DECREE

35. When Portsmouth has paid all outstanding penalties, completed all remedial measures specified herein, and achieved full compliance with all requirements, including the final effluent limits of its applicable NPDES Permit, for a period of one year continuously to the satisfaction of the United States Attorney, Environmental Protection Agency, and State of New Hampshire, then any party may move for termination of this Decree.

JUDGMENT IS HEREBY ENTERED IN ACCORDANCE WITH THE FOREGOING CONSENT DECREE THIS ____________ DAY OF ________________, 1989.

Dated:______________________ ______________________________
United States District Judge

CONSENTED TO:

FOR THE UNITED STATES OF AMERICA:

Dated: November 14, 1990

JEFFREY R. HOWARD
United States Attorney
District of New Hampshire
P.O. Box 480
Concord, NH 03302-0480

Dated: 11·11·90

Richard B. Stewart
Assistant Attorney General
Land & Natural Resources Division
U.S. Department of Justice
10th & Pennsylvania Ave., NW
Washington, DC 20530

Dated: November 14, 1990

Nancy E. Hart
Assistant U.S. Attorney
District of New Hampshire
P.O. Box 480
Concord, NH 03302-0480

Dated: November 5, 1990

James M. Strock
Assistant Administrator For
Enforcement ~~and Compliance~~
~~Monitoring~~
Environmental Protection Agency
401 "M" Street
Washington, DC 20460

Dated: 6/14/90

Joshua Secunda, Assistant Regiona
Counsel
Environmental Protection Agency
Region I
JFK Federal Building
Boston, MA 02203-2211

FOR THE STATE OF NEW HAMPSHIRE:

Dated: May 28, 1990

Geoffrey M. Huntington

John P. Arnold Attorney General
State of New Hampshire by
Geoffrey Huntington
Assistant Attorney General
State of New Hampshire
25 Capitol Street
Concord, NH 03301

FOR THE CITY OF PORTSMOUTH, NEW HAMPSHIRE:

Dated: May 15, 1990

Robert P. Sullivan

Robert P. Sullivan
City Attorney
126 Daniel Street
Portsmouth, NH 03801

Dated: 5/15/90

Calvin A. Canney

Calvin Canney
City Manager
126 Daniel Street
Portsmouth, NH
Pursuant to authority delegated by
the City Council of the City of
Portsmouth

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
ONE CONGRESS STREET
SUITE 1100, SEW
BOSTON, MASSACHUSETTS 02114-2023

KAP

[redacted]

CERTIFIED MAIL RETURN RECEIPT REQUESTED

July 11, 2002

JUL 1 8 2002

John P. Bohenko, City Manager
Office of City Manager
Portsmouth City Hall
1 Junkins Avenue
Portsmouth, NH 03801

Re: Adminstrative Order No. 02-15
NPDES Permit No. NH0100234

Dear Mr. Bohenko:

The City of Portsmouth's wastewater discharges from the Peirce Island wastewater treatment facility and untreated overflows from the combined sewer system are regulated under NPDES Permit No. NH0100234 ("Permit"). Among other requirements of the Permit, overflows from the combined sewers may not cause violations of New Hampshire water quality standards. The City, through its own discharge and receiving water monitoring, has identified combined sewer overflows as causing violations of those standards.

Enclosed is an Administrative Order issued pursuant to Section 309(a)(3) of the Clean Water Act, 33 U.S.C. §1319(a)(3). The Order requires the City to address the violations of the above mentioned Permit. Specifically, the City has violated bacterial limits for both shellfish harvesting and for swimming.

The Order requires the City to:

1. **By August 1, 2002 submit a final Long Term Control Plan ("LTCP") for CSOs outlining the steps and schedule by which the City will come into compliance with its permit and the New Hampshire water quality standards;**

2. **By August 1, 2002 submit an update of the Portsmouth Nine Minimum Controls for Combined Sewer Overflows previously submitted January 14, 1997;**

LINCOLN AVE PROJECT

3. **By February 28, 2003, complete the Preliminary Design Report ("Report") for the combined sewer area. The Report will identify and map each of the projects to be conducted and contain a schedule for final design and construction for each project; and**

4. **By March 3, 2003, advertise bids for the construction of the Area #1 Project in the vicinity of Outfalls 010A and 010B.**

Violation of this Order may subject the City to further enforcement action under Section 309 of the Clean Water Act, in which injunctive relief and or penalties may be sought.

If you have any questions concerning the terms of this Order, please contact Eric Hall of the Water Technical Unit at 617-918-1880.

Sincerely,

Sam Silverman

Samuel Silverman, Acting Director
Office of Environmental Stewardship

cc: Sharon Ducharme, NH DES
Gretchen Rule, NH DES
David Allen, City Engineer
W. Steven Clifton, P.E., Underwood Engineers

Appendix 3-1

AMBIENT WATER QUALITY BASELINE SAMPLING

EXHIBIT F-1
AMBIENT BASELINE - AUGUST 16 AND 17, 1990

PECK
ENVIRONMENTAL
LABORATORY, INC.

Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
TEL.: (207) 985-6116
FAX: (207) 985-2611

Whitman & Howard
Attn: Randolph Johnson
45 Williams Street
Wellsley MA 02181

PO #

Date Received: 8-17-90

Lab Number: 900835

Date Reported: 8-31-90

IDENTIFICATION CSO Abatement Baseline Study 8/16 - 8/17 Sampled By: Client

PARAMETER SAMPLE DESIGNATION

□ Temperature
□ Salinity

PARAMETER	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5
Dissolved Oxygen	8.5	9.2	8.7	8.8	8.8
pH Units	7.66	7.92	7.92	7.91	7.90
Biological Oxygen Demand	3.7	<2.0	<2.0	<2.0	<2.0
Total Suspended Solids	51	37	47	26	34
Volatile Suspended Solids	40	30	40	21	29
Total Kjeldahl Nitrogen	0.40	<0.1	<0.1	<0.1	<0.1
Oil & Grease	5.5	22	7.0	8.0	5.0
Total Coliform col/100 mls	400	300	60	40	150
Fecal Coliform col/100 mls	0	20	10	<10	50
Cadmium	0.17	0.18	0.16	0.14	0.16
Chromium	0.04	0.02	0.03	0.04	0.04
Copper	0.08	0.09	0.07	0.06	0.07
Mercury	<0.002	<0.002	<0.002	<0.002	<0.00
Nickel	0.48	0.43	0.39	0.35	0.40
Lead	0.26	0.28	0.29	0.25	0.23
Zinc	0.15	0.19	0.14	0.15	0.16

Pesticides see attached reports
Volatile Organics see attached reports

The Metals, Pesticides and Volatile Organics data was derived from the grab samples taken at Noon on August 16. All other parameters were analyzed from the composite.

INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

PECK
ENVIRONMENTAL
LABORATORY, INC.

Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
(207) 985-6116

VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900835-1

Date Received: 8/17/90
Date Analyzed: 8/30/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station 1 (Noon Grab)

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	8.99	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-7-90

Reviewed By: KM
(Director of Organics)

Approved For Release By: [signature]
(Laboratory Director)

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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900835-2

Date Received: 8/17/90
Date Analyzed: 8/30/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station 2 (Noon Grab)

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-7-90

Reviewed By: KM
(Director of Organics)

Approved For Release By: J. Gagnon
(Laboratory Director)

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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900835-3

Date Received: 8/17/90
Date Analyzed: 8/30/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station 3 (Noon Grab)

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-7-90

Reviewed By: KM
(Director of Organics)

Approved For Release By: R. Hagner
(Laboratory Director)

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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900835-4

Date Received: 8/17/90
Date Analyzed: 8/30/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station 4 (Noon Grab)

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-7-90

Reviewed By: KM
(Director of Organics)

Approved For Release By: R. Gagne
(Laboratory Director)

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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900835-5

Date Received: 8/17/90
Date Analyzed: 8/30/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station 5 (Noon Grab)

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-7-90

Reviewed By: KM
(Director of Organics)

Approved For Release By: R. Hoggin
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard

Date Received: 8/17/90

Lab #: 900835

Date Analyzed: 9/05/90

Sample Description: Station 1

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in water (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-05-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: L. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard

Date Received: 8/17/90

Lab #: 900835

Date Analyzed: 9/05/90

Sample Description: Station 2

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in water (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-05-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Hogan
(Laboratory Director)

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(207) 985-6116

PESTICIDES

Client: Whitman & Howard

Date Received: 8/17/90

Lab #: 900835

Date Analyzed: 9/05/90

Sample Description: Station 3

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in water (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-05-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard

Date Received: 8/17/90

Lab #: 900835

Date Analyzed: 9/05/90

Sample Description: Station 4

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in water (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-05-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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(207) 985-6116

PESTICIDES

Client: Whitman & Howard

Date Received: 8/17/90

Lab #: 900835

Date Analyzed: 9/05/90

Sample Description: Station 5

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in water (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 9-05-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

EXHIBIT F-7
AMBIENT BASELINE - DECEMBER 11 AND 12, 1990

Whitman & Howard

Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

LABORATORY NUMBER: MA008

December 19, 1990
WH #4857

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study - Baseline

SAMPLES: Station #1 Parrott Avenue
Station #2 Junkins Upper
Station #3 Junkins Lower
Station #4 Marcy Upstream
Station #5 Marcy Downstream

SAMPLE COLLECTION DATE: 12/11-12/12/90 (Composite Sample)

Results of Analysis:

		Station #1	Station #2	Station #3
pH		7.9	7.9	7.6
DO,	mg/L	9.4	9.2	9.5
Total Coliform,	#/100 mL	340	240	128
Fecal Coliform,	#/100 mL	148	38	19
Oil & Grease,	mg/L	2.2	1.8	<1.0
Total Suspended Solids,	mg/L	13	8	7
Total Volatile Suspended Solids,	mg/L	10	6	4
TKN,	mg/L	0.58	0.50	0.50
BOD,	mg/L	3	2	2

		Station #4	Station #5
pH		7.5	7.1
DO,	mg/L	9.5	9.4
Total Coliform,	#/100 mL	159	404
Fecal Coliform,	#/100 mL	25	115
Oil & Grease,	mg/L	1.2	1.0
Total Suspended Solids,	mg/L	5	6
Total Volatile Suspended Solids,	mg/L	3	3
TKN,	mg/L	0.31	0.35
BOD,	mg/L	<1	<1

Analyzed by
Chih-Chung Liu

Established 1869

W&H

Appendix 3-2

GREAT BAY COAST WATCH AND NHDES MONITORING

Site T09

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T09, Lower Piscataqua River

Nash, C. (2001)

site	sampdate	samptime	watrtemp	salinity	do	ph	Graph data estfc	truefc	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain	tidstage	corrttas
			oC	ppt	mg/L	s.u.	#/100mL	#/100mL						inches		
T09 summary Feb88 - Dec99	average		9.4	29	8.4	7.7	233	248			0.3	9.4		0.6		
	stdev		5.6	2.8	2.1	0.4	766	789			0.8	0.9		0.8		
	max		21.0	34	9.8	8.1	5400	5400			1.9	11.8		4.1		
	min		0.0	20	6.9	6.2	1.8	1.8			-1.8	7.4		0.0		
	count		95	37	2	34	97	91			97	97		97		
T09	2/22/1988	10:26 AM	1	nodata	nodata	nodata	95	95	8:35 AM	0:20	-1.1	10.1	Greenland	0.18	MH	8:55 AM
T09	3/28/1988	1:19 PM	5	nodata	nodata	nodata	3500	3500	2:10 PM	0:20	1.1	8.5	Greenland	2.36	L	2:30 PM
T09	4/25/1988	1:15 PM	7	nodata	nodata	nodata	310	310	1:28 PM	0:20	1.4	8.2	Greenland	0.21	L	1:48 PM
T09	5/16/1988	1:40 PM	11	nodata	nodata	nodata	11	11	12:20 PM	0:20	-0.2	9.1	Greenland	0.05	L	12:40 PM
T09	6/27/1988	2:27 PM	12	nodata	nodata	nodata	17	17	3:34 PM	0:20	1.1	7.7	Greenland	0.79	L	3:54 PM
T09	7/25/1988	2:29 PM	21	nodata	nodata	nodata	230	230	2:04 PM	0:20	1.3	7.4	Greenland	4.14	L	2:24 PM
T09	9/12/1988	9:27 AM	14	nodata	nodata	nodata	49	49	6:36 AM	0:20	0.3	9.1	Greenland	0	MH	6:56 AM
T09	10/31/1988	10:22 AM	10	nodata	nodata	nodata	79	79	9:27 AM	0:20	1.5	7.9	Greenland	0.06	L	9:47 AM
T09	11/28/1988	9:19 AM	7	nodata	nodata	nodata	3500	3500	8:01 AM	0:20	1.1	8.2	Greenland	1.01	L	8:21 AM
T09	12/19/1988	3:01 PM	4	nodata	nodata	nodata	140	140	1:46 PM	0:20	-0.7	9.8	Greenland	0	L	2:06 PM
T09	1/30/1989	12:02 PM	4	nodata	nodata	nodata	11	11	10:50 AM	0:20	1.5	8.4	Greenland	0.45	L	11:10 AM
T09	2/27/1989	10:53 AM	2	nodata	nodata	nodata	5400	5400	9:11 AM	0:20	1.1	8.7	Greenland	0.46	MH	9:31 AM
T09	3/27/1989	9:41 AM	1	nodata	nodata	nodata	460	460	7:56 AM	0:20	0.6	9.2	Greenland	1.38	MH	8:16 AM
T09	4/24/1989	10:20 AM	4	nodata	nodata	nodata	2400	2400	7:53 AM	0:20	0.3	9.6	Greenland	0	MH	8:13 AM
T09	5/15/1989	12:40 PM	13	nodata	nodata	nodata	49	49	2:30 PM	0:20	1.4	8.4	Greenland	1.72	L	2:50 PM
T09	7/17/1989	11:58 AM	16	nodata	nodata	nodata	130	130	10:57 AM	0:20	1.4	8.2	Greenland	1.12	L	11:17 AM
T09	8/14/1989	2:12 PM	19	nodata	nodata	nodata	230	230	3:23 PM	0:20	1.5	8	Greenland	1.45	L	3:43 PM
T09	9/25/1989	1:55 PM	17	nodata	nodata	nodata	130	130	2:41 PM	0:20	1.3	8.6	Greenland	0.63	L	3:01 PM
T09	10/23/1989	11:08 AM	10	nodata	nodata	nodata	170	170	1:19 PM	0:20	1.5	8.5	Greenland	2.91	ML	1:39 PM
T09	4/2/1990	9:25 AM	4	nodata	nodata	nodata	230	230	11:31 AM	0:20	0.1	9.9	Greenland	0.68	L	11:51 AM
T09	5/7/1990	3:10 PM	11	nodata	nodata	nodata	49	49	4:39 PM	0:20	1	8.9	Greenland	0.79	L	4:59 PM
T09	7/23/1990	10:00 AM	15	nodata	nodata	nodata	49	49	6:34 AM	0:20	-1.1	9.8	Greenland	1.37	MH	6:54 AM
T09	9/10/1990	11:00 AM	17	nodata	nodata	nodata	490	490	9:17 AM	0:20	0.2	9.5	Greenland	0.32	MH	9:37 AM
T09	3/5/1991	11:07 AM	3	nodata	nodata	nodata	490	490	8:09 AM	0:20	0	9.8	Greenland	1.7	MH	8:29 AM
T09	4/22/1991	10:46 AM	8	nodata	nodata	nodata	490	490	12:29 PM	0:20	0.2	9.7	Greenland	3.8	L	12:49 PM
T09	6/3/1991	11:57 AM	18	nodata	nodata	nodata	6.1	6.1	9:43 AM	0:20	0.8	9.2	Greenland	0.44	MH	10:03 AM
T09	7/8/1991	1:20 PM	16	nodata	nodata	nodata	490	490	2:07 PM	0:20	0.8	8.6	Greenland	0.74	L	2:27 PM
T09	9/23/1991	10:00 AM	15	nodata	nodata	nodata	170	170	11:19 AM	0:20	0.4	9.5	Greenland	2.01	L	11:39 AM
T09	10/28/1991	10:18 AM	9	nodata	nodata	nodata	230	230	7:55 AM	0:20	0.6	9.1	Greenland	0.06	MH	8:15 AM
T09	12/2/1991	1:25 PM	7	nodata	nodata	nodata	130	130	2:15 PM	0:20	-0.1	10	Greenland	0.03	L	2:35 PM
T09	5/4/1992	9:00 AM	7	nodata	nodata	nodata	23	23	6:47 AM	0:20	-0.7	10.5	Greenland	0.74	MH	7:07 AM
T09	6/1/1992	9:28 AM	9	nodata	nodata	nodata	490	490	11:54 AM	0:20	-0.6	9.3	Greenland	1.51	ML	12:14 PM
T09	7/6/1992	11:30 AM	13	nodata	nodata	nodata	79	79	10:29 AM	0:20	-0.5	10.2	Greenland	0.74	L	10:49 AM
T09	10/26/1992	9:05 AM	7	nodata	nodata	nodata	17	17	10:44 AM	0:20	-0.6	11.4	Greenland	0.43	L	11:04 AM
T09	11/30/1992	9:15 AM	6	nodata	nodata	nodata	33	33	8:52 AM	0:20	1.6	8.4	Greenland	1.34	L	9:12 AM
T09	12/14/1992	9:10 AM	3	nodata	nodata	nodata	49	49	7:44 AM	0:20	0.1	9.5	Greenland	1.68	L	8:04 AM

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T09, Lower Piscataqua River

Nash, C. (2001)

site	sampdate	samptime	watrtemp oC	salinity ppt	do mg/L	ph s.u.	Graph data estfc #/100mL	truefc #/100mL	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain inches	tidstage	corrttas
T09	3/2/1993	10:15 AM	1	nodata	nodata	nodata	1.8	1.8	11:07 AM	0:20	0.9	8.9	Greenland	0	L	11:27 AM
T09	4/6/1993	8:25 AM	1	nodata	nodata	nodata	6.8	6.8	11:18 AM	0:20	-1.6	11	Greenland	0.18	ML	11:38 AM
T09	5/4/1993	8:26 AM	9	nodata	nodata	nodata	2	2	10:08 AM	0:20	-1	10.2	Greenland	0	L	10:28 AM
T09	6/8/1993	7:07 AM	11	nodata	nodata	nodata	13	13	8:39 AM	0:20	-0.3	10.3	Greenland	0.81	L	8:59 AM
T09	7/6/1993	8:18 AM	16	nodata	nodata	nodata	33	33	7:30 AM	0:20	-0.3	10.4	Greenland	0	L	7:50 AM
T09	9/14/1993	1:50 PM	16	nodata	nodata	nodata	17	17	3:58 PM	0:20	-0.3	9.8	Greenland	0.16	L	4:18 PM
T09	10/19/1993	9:35 AM	9	nodata	nodata	nodata	2	2	8:16 AM	0:20	-0.2	10.1	Greenland	0.06	L	8:36 AM
T09	12/7/1993	11:28 AM	3	nodata	nodata	nodata	22	22	10:54 AM	0:20	0.5	9.5	Greenland	1.76	L	11:14 AM
T09	4/5/1994	12:53 PM	4	nodata	nodata	nodata	2	2	2:09 PM	0:20	0.5	9.3	Greenland	0.18	L	2:29 PM
T09	6/7/1994	4:49 PM	15	nodata	nodata	nodata	11	11	4:47 PM	0:20	1.4	8.6	Greenland	0.02	L	5:07 PM
T09	7/19/1994	2:43 PM	19	nodata	nodata	nodata	1.8	<1.8	2:26 PM	0:20	0.4	9	Greenland	0.08	L	2:46 PM
T09	8/16/1994	1:57 PM	19	nodata	nodata	nodata	1.8	1.8	1:12 PM	0:20	0.7	8.8	Greenland	0.82	L	1:32 PM
T09	9/20/1994	7:10 AM	12	nodata	nodata	nodata	110	110	6:01 AM	0:20	0	10	Greenland	0.53	L	6:21 AM
T09	10/18/1994	6:15 AM	9	nodata	nodata	nodata	23	23	4:55 AM	0:20	0.3	9.6	Greenland	0	L	5:15 AM
T09	11/29/1994	1:00 PM	5	nodata	nodata	nodata	130	130	1:17 PM	0:20	-0.2	10.1	Greenland	0.75	L	1:37 PM
T09	6/19/1995	10:24 AM	12	nodata	nodata	nodata	14	14	11:03 AM	0:18	-0.2	10	Greenland	0.23	L	11:23 AM
T09	7/5/1995	11:44 AM	19	nodata	nodata	nodata	49	49	10:43 AM	0:18	0.4	9.2	Greenland	0.04	L	11:03 AM
T09	10/31/1995	10:35 AM	11	nodata	nodata	nodata	11	11	10:40 AM	0:18	0.6	9.3	Greenland	1.04	L	11:00 AM
T09	11/28/1995	8:25 AM	8	nodata	nodata	nodata	2	2	9:18 AM	0:20	0.2	9.8	Greenland	0	L	9:38 AM
T09	12/19/1995	11:17 AM	7	nodata	nodata	nodata	1.8	<1.8	2:17 PM	0:20	-0.5	10.4	Greenland	1.13	ML	2:37 PM
T09	1/30/1996	12:04 PM	1	nodata	nodata	nodata	14	14	1:44 PM	0:18	0.7	9	Greenland	0.95	L	2:04 PM
T09	2/27/1996	11:05 AM	3	nodata	nodata	nodata	1.8	<1.8	12:04 PM	0:18	1.1	8.7	Greenland	0.64	L	12:24 PM
T09	3/26/1996	9:55 AM	nodata	nodata	nodata	nodata	13	13	10:17 AM	0:18	0.9	8.9	Greenland	0.03	L	10:37 AM
T09	2/18/1997	1:10 PM	7.5	30	nodata	nodata	4.5	4.5	2:48 PM	0:20	0.9	9.8	Greenland	0.15	L	3:08 PM
T09	3/11/1997	5:45 AM	6	28	nodata	6.2	33	33	6:27 AM	0:20	-1.8	11.4	Greenland	0.51	L	6:47 AM
T09	4/28/1997	8:37 AM	7	20	9.8	nodata	49	49	9:45 AM	0:20	-0.2	10.1	Greenland	1.31	L	10:05 AM
T09	6/24/1997	7:04 AM	13.1	30.4	6.9	nd	170	170	8:24 AM	0:20	-1.2	11.1	Greenland	0	L	8:44 AM
T09A	3/28/1998	1:24 PM	5	nodata	nodata	nodata	1.8	<1.8	2:10 PM	0:20	1.1	8.5	Greenland	2.36	L	2:30 PM
T09	4/27/1998	4:30 PM	10	26	nodata	7.5	2	2	6:33 PM	0:20	-1.2	11	Greenland	1.14	L	6:53 PM
T09	5/19/1998	9:37 AM	15	25	nodata	7.7	6.8	6.8	11:38 AM	0:20	0.2	9.6	Greenland	0	L	11:58 AM
T09	6/8/1998	2:54 PM	15	28	nodata	6.6	2	2	4:51 PM	0:20	1.2	8.7	Greenland	0.2	L	5:11 PM
T09	7/28/1998	7:24 AM	lost therm.	29	nodata	6.8	33	33	9:11 AM	0:20	0.3	9.6	Greenland	0.06	L	9:31 AM
T09	11/16/1998	2:28 PM	11	31	nodata	7.8	79	79	3:27 PM	0:20	0.4	9.5	Greenland	0	L	3:47 PM
T09	2/2/1999	6:15 AM	2	28	nodata	7.75	17	17	5:56 AM	0:05	-0.3	9.7	Greenland	0.84	L	6:16 AM
T09DUP	2/2/1999	6:15 AM	0	28	nodata	7.64	14	14	5:56 AM	0:05	-0.3	9.7	Greenland	0.84	L	5:56 AM
T09	2/8/1999	9:26 AM	2	26	nodata	7.79	4.5	4.5	10:45 AM	0:20	1.3	8.5	Greenland	0.26	L	11:05 AM
T09	2/21/1999	10:55 AM	16	31	nodata	7.91	33	33	8:38 AM		-0.7	10.3	Greenland	0.09	MH	8:58 AM
T09	2/22/1999	8:30 AM	0	26	nodata	7.75	13	13	9:38 AM	0:20	-0.4	10.2	Greenland	0.69	L	9:58 AM
T09	3/8/1999	8:16 AM	0	28	nodata	7.64	79	79	9:05 AM	0:20	0.9	8.9	Greenland	1.44	L	9:25 AM
T09	3/16/1999	2:45 PM	5	28	nodata	7.86	33	33	4:00 PM	0:20	-0.6	9.8	Greenland	1.18	L	4:20 PM
T09	3/23/1999	8:14 AM	3	28	nodata	7.72	17	17	9:24 AM	0:20	-0.7	10.6	Greenland	0.46	L	9:44 AM

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T09, Lower Piscataqua River

Nash, C. (2001)

site	sampdate	samptime	watrtemp	salinity	do	ph	Graph data estfc	truefc	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain	tidstage	corrttas
			oC	ppt	mg/L	s.u.	#/100mL	#/100mL						inches		
T09	4/6/1999	8:17 AM	5.5	26	nodata	7.85	7.8	7.8	9:28 AM		0.7	9.2	Greenland	0.02	L	9:48 AM
T09	4/12/1999	4:07 PM	8	27	nodata	8	17	17	2:47 PM		0.5	9.1	Greenland	0	L	3:07 PM
T09-dup	4/12/1999	4:07 PM	8	27	nodata	7.98	23	23	2:47 PM		0.5	9.1	Greenland	0	MH	2:47 PM
T09	4/20/1999	10:49 AM	10	29	nodata	7.88	1.8	<1.8	9:10 AM		-1.4	11.3	Greenland	0.39	MH	9:30 AM
T09	5/10/1999	8:40 AM	10.5	29	nodata	7.61	1.8	<1.8	1:09 PM		0.7	9	Greenland	0.73	ML	1:29 PM
T09	5/4/1999	7:54 AM	8	30	nodata	7.93	49	49	8:19 AM		0.3	9.6	Greenland	0.71	L	8:39 AM
T09	5/18/1999	12:16 PM	12	30	nodata	7.93	2	2	7:59 AM		-1.8	11.8	Greenland	0	MH	8:19 AM
T09	6/8/1999	10:58 AM	14	31	nodata	8.02	1.8	1.8	12:33 PM		0.4	9.6	Greenland	0	L	12:53 PM
T09	6/21/1999	10:55 AM	16	31	nodata	7.91	33	33	12:24 PM		0.7	9.2	Greenland	0	L	12:44 PM
T09	6/22/1999	11:38 AM	16.5	31	nodata	7.97	1.8	1.8	1:20 PM		1	9.2	Greenland	0	L	1:40 PM
T09	7/19/1999	9:19 AM	21	21	nodata	7.97	13	13	10:49 AM		0.4	9.4	Greenland	0.88	L	11:09 AM
T09	8/17/1999	8:36 AM	16.7	34	nodata	7.85	350	350	10:07 AM		0.7	9.2	Greenland	0.14	L	10:27 AM
T09	9/28/1999	6:05 AM	16	29	nodata	7.7	79	79	7:29 AM		-0.7	10.6	Greenland	0.1	L	7:49 AM
T09	10/13/1999	8:00 AM	13	32	nodata	7.76	7.8	7.8	8:06 AM		1	9.1	Greenland	0.38	L	8:26 AM
T09	11/1/1999	12:10 PM	14	30	nodata	7.98	79	79	11:13 AM		0.9	9.2	Greenland	0	L	11:33 AM
T09	11/15/1999	9:55 AM	8.5	30	nodata	8.04	350	350	9:28 AM		1.9	8.1	Greenland	0.84	L	9:48 AM
T09	11/29/1999	8:35 AM	9	30	nodata	7.93	31	31	9:47 AM		0.6	9.5	Greenland	0.49	L	10:07 AM
T09	12/13/1999	7:20 AM	5	30	nodata	7.86	14	14	8:07 AM		1.5	8.3	Greenland	0	L	8:27 AM
T09	12/20/1999	12:45 PM	4	31	nodata	7.88	4	4	2:39 PM		-1	9.7	Greenland	0	L	2:59 PM
T09	12/28/1999	8:10 AM	2	32	nodata	8.08	23	23	9:24 AM		0.3	9.6	Greenland	0	L	9:44 AM

Note: See summary statistics Feb 1988 to Dec 1999 top of table.

Site T10

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T10, Downstream of Peirce Island WWTP

Nash, C. (2001)

site	sampdate	samptime	watrtemp oC	salinity ppt	do mg/L	ph s.u.	Graph data estfc #/100mL	truefc #/100mL	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain inches	tidstage	corrttas
T10 summary Feb88 - Dec99	average		8.8	29	7.8	7.8	472	128			0.2	9.5		0.7		
	stdev		5.4	3.5	2.6	0.3	2371	389			0.9	0.9		0.8		
	max		19.0	33	9.6	8.1	16000	3500			1.9	11.8		4.1		
	min		-2.0	15	5.9	6.3	1.8	1.8			-1.8	7.4		0.0		
	count		91	32	2	28	91	86			91	91		91		
T10	2/22/1988	10:33 AM	1	nodata	nodata	nodata	22	22	8:35 AM	0:20	-1.1	10.1	Greenland	0.18	MH	8:55 AM
T10	3/28/1988	1:10 PM	4	nodata	nodata	nodata	330	330	2:10 PM	0:20	1.1	8.5	Greenland	2.36	L	2:30 PM
T10	5/16/1988	1:21 PM	9	nodata	nodata	nodata	6.1	6.1	12:20 PM	0:20	-0.2	9.1	Greenland	0.05	L	12:40 PM
T10	6/27/1988	2:16 PM	10	nodata	nodata	nodata	130	130	3:34 PM	0:20	1.1	7.7	Greenland	0.79	L	3:54 PM
T10	7/25/1988	2:23 PM	19	nodata	nodata	nodata	170	170	2:04 PM	0:20	1.3	7.4	Greenland	4.14	L	2:24 PM
T10	9/12/1988	9:36 AM	16	nodata	nodata	nodata	70	70	6:36 AM	0:20	0.3	9.1	Greenland	0	MH	6:56 AM
T10	10/31/1988	10:29 AM	9	nodata	nodata	nodata	230	230	9:27 AM	0:20	1.5	7.9	Greenland	0.06	L	9:47 AM
T10	11/28/1988	9:34 AM	7	nodata	nodata	nodata	79	79	8:01 AM	0:20	1.1	8.2	Greenland	1.01	MH	8:21 AM
T10	12/19/1988	3:09 PM	2	nodata	nodata	nodata	79	79	1:46 PM	0:20	-0.7	9.8	Greenland	0	L	2:06 PM
T10	1/30/1989	12:10 PM	4	nodata	nodata	nodata	49	49	10:50 AM	0:20	1.5	8.4	Greenland	0.45	L	11:10 AM
T10	2/27/1989	11:02 AM	2	nodata	nodata	nodata	16000	>16000	9:11 AM	0:20	1.1	8.7	Greenland	0.46	MH	9:31 AM
T10	3/27/1989	9:50 AM	1	nodata	nodata	nodata	16000	>16000	7:56 AM	0:20	0.6	9.2	Greenland	1.38	MH	8:16 AM
T10	4/24/1989	10:30 AM	3	nodata	nodata	nodata	790	790	7:53 AM	0:20	0.3	9.6	Greenland	0	MH	8:13 AM
T10	5/15/1989	12:30 PM	9	nodata	nodata	nodata	330	330	2:30 PM	0:20	1.4	8.4	Greenland	1.72	L	2:50 PM
T10	7/17/1989	12:00 PM	16	nodata	nodata	nodata	110	110	10:57 AM	0:20	1.4	8.2	Greenland	1.12	L	11:17 AM
T10	8/14/1989	2:05 PM	18	nodata	nodata	nodata	330	330	3:23 PM	0:20	1.5	8	Greenland	1.45	L	3:43 PM
T10	9/25/1989	1:45 PM	14	nodata	nodata	nodata	230	230	2:41 PM	0:20	1.3	8.6	Greenland	0.63	L	3:01 PM
T10	10/23/1989	11:00 AM	10	nodata	nodata	nodata	34	34	1:19 PM	0:20	1.5	8.5	Greenland	2.91	ML	1:39 PM
T10	4/2/1990	9:15 AM	4	nodata	nodata	nodata	140	140	11:31 AM	0:20	0.1	9.9	Greenland	0.68	ML	11:51 AM
T10	5/7/1990	3:00 PM	10	nodata	nodata	nodata	330	330	4:39 PM	0:20	1	8.9	Greenland	0.79	L	4:59 PM
T10	7/23/1990	10:06 AM	15	nodata	nodata	nodata	140	140	6:34 AM	0:20	-1.1	9.8	Greenland	1.37	MH	6:54 AM
T10	9/10/1990	11:10 AM	17	nodata	nodata	nodata	230	230	9:17 AM	0:20	0.2	9.5	Greenland	0.32	MH	9:37 AM
T10	3/5/1991	11:15 AM	3	nodata	nodata	nodata	130	130	8:09 AM	0:20	0	9.8	Greenland	1.7	MH	8:29 AM
T10	4/22/1991	10:35 AM	8	nodata	nodata	nodata	170	170	12:29 PM	0:20	0.2	9.7	Greenland	3.8	L	12:49 PM
T10	6/3/1991	12:05 PM	18	nodata	nodata	nodata	79	79	9:43 AM	0:20	0.8	9.2	Greenland	0.44	MH	10:03 AM
T10	7/8/1991	1:10 PM	16	nodata	nodata	nodata	490	490	2:07 PM	0:20	0.8	8.6	Greenland	0.74	L	2:27 PM
T10	9/23/1991	10:07 AM	16	nodata	nodata	nodata	220	220	11:19 AM	0:20	0.4	9.5	Greenland	2.01	L	11:39 AM
T10	10/28/1991	10:25 AM	9	nodata	nodata	nodata	330	330	7:55 AM	0:20	0.6	9.1	Greenland	0.06	MH	8:15 AM
T10	12/2/1991	1:15 PM	7	nodata	nodata	nodata	79	79	2:15 PM	0:20	-0.1	10	Greenland	0.03	L	2:35 PM
T10	5/4/1992	9:05 AM	7	nodata	nodata	nodata	22	22	6:47 AM	0:20	-0.7	10.5	Greenland	0.74	MH	7:07 AM
T10	6/1/1992	9:40 AM	9	nodata	nodata	nodata	330	330	11:54 AM	0:20	-0.6	9.3	Greenland	1.51	ML	12:14 PM
T10	7/6/1992	11:37 AM	13	nodata	nodata	nodata	17	17	10:29 AM	0:20	-0.5	10.2	Greenland	0.74	L	10:49 AM
T10	10/26/1992	9:10 AM	7	nodata	nodata	nodata	11	11	10:44 AM	0:20	-0.6	11.4	Greenland	0.43	L	11:04 AM
T10	11/30/1992	9:00 AM	6	nodata	nodata	nodata	23	23	8:52 AM	0:20	1.6	8.4	Greenland	1.34	L	9:12 AM
T10	12/14/1992	9:25 AM	3	nodata	nodata	nodata	11	11	7:44 AM	0:20	0.1	9.5	Greenland	1.68	MH	8:04 AM

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T10, Downstream of Peirce Island WWTP

Nash, C. (2001)

site	sampdate	samptime	watrtemp oC	salinity ppt	do mg/L	ph s.u.	Graph data estfc #/100mL	truefc #/100mL	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain inches	tidstage	corrttas
T10	3/2/1993	10:00 AM	1	nodata	nodata	nodata	7.8	7.8	11:07 AM	0:20	0.9	8.9	Greenland	0	L	11:27 AM
T10	4/6/1993	8:35 AM	1	nodata	nodata	nodata	49	49	11:18 AM	0:20	-1.6	11	Greenland	0.18	ML	11:38 AM
T10	5/4/1993	8:33 AM	9	nodata	nodata	nodata	4	4	10:08 AM	0:20	-1	10.2	Greenland	0	L	10:28 AM
T10	6/8/1993	6:55 AM	11	nodata	nodata	nodata	17	17	8:39 AM	0:20	-0.3	10.3	Greenland	0.81	L	8:59 AM
T10	7/6/1993	8:30 AM	16	nodata	nodata	nodata	33	33	7:30 AM	0:20	-0.3	10.4	Greenland	0	L	7:50 AM
T10	9/14/1993	1:40 PM	16	nodata	nodata	nodata	49	49	3:58 PM	0:20	-0.3	9.8	Greenland	0.16	ML	4:18 PM
T10	10/19/1993	9:45 AM	9	nodata	nodata	nodata	17	17	8:16 AM	0:20	-0.2	10.1	Greenland	0.06	L	8:36 AM
T10	12/7/1993	11:36 AM	3	nodata	nodata	nodata	23	23	10:54 AM	0:20	0.5	9.5	Greenland	1.76	L	11:14 AM
T10	1/11/1994	4:15 PM	-2	nodata	nodata	nodata	17	17	4:40 PM	0:20	-1.2	10.8	Greenland	0.56	L	5:00 PM
T10	4/5/1994	12:46 PM	4	nodata	nodata	nodata	130	130	2:09 PM	0:20	0.5	9.3	Greenland	0.18	L	2:29 PM
T10	6/7/1994	4:58 PM	15	nodata	nodata	nodata	7.8	7.8	4:47 PM	0:20	1.4	8.6	Greenland	0.02	L	5:07 PM
T10	7/19/1994	2:58 PM	19	nodata	nodata	nodata	49	49	2:26 PM	0:20	0.4	9	Greenland	0.08	L	2:46 PM
T10	8/16/1994	2:08 PM	19	nodata	nodata	nodata	49	49	1:12 PM	0:20	0.7	8.8	Greenland	0.82	L	1:32 PM
T10	9/20/1994	7:17 AM	12	nodata	nodata	nodata	33	33	6:01 AM	0:20	0	10	Greenland	0.53	L	6:21 AM
T10	10/18/1994	6:22 AM	9	nodata	nodata	nodata	13	13	4:55 AM	0:20	0.3	9.6	Greenland	0	L	5:15 AM
T10	11/29/1994	1:06 PM	5	nodata	nodata	nodata	3500	3500	1:17 PM	0:20	-0.2	10.1	Greenland	0.75	L	1:37 PM
T10	6/19/1995	10:16 AM	12	nodata	nodata	nodata	46	46	11:03 AM	0:18	-0.2	10	Greenland	0.23	L	11:23 AM
T10	7/5/1995	11:57 AM	19	nodata	nodata	nodata	17	17	10:43 AM	0:18	0.4	9.2	Greenland	0.04	L	11:03 AM
T10	10/31/1995	10:20 AM	11	nodata	nodata	nodata	4	4	10:40 AM	0:18	0.6	9.3	Greenland	1.04	L	11:00 AM
T10	11/28/1995	8:15 AM	8	nodata	nodata	nodata	6.8	6.8	9:18 AM	0:20	0.2	9.8	Greenland	0	L	9:38 AM
T10	12/19/1995	11:07 AM	7	nodata	nodata	nodata	2	2	2:17 PM	0:20	-0.5	10.4	Greenland	1.13	ML	2:37 PM
T10	1/30/1996	11:57 AM	0	nodata	nodata	nodata	23	23	1:44 PM	0:18	0.7	9	Greenland	0.95	L	2:04 PM
T10	2/27/1996	11:55 AM	3	nodata	nodata	nodata	21	21	12:04 PM	0:18	1.1	8.7	Greenland	0.64	L	12:24 PM
T10	3/26/1996	9:42 AM	6	nodata	nodata	nodata	11	11	10:17 AM	0:18	0.9	8.9	Greenland	0.03	L	10:37 AM
T10	1/14/1997	7:10 AM	4	28	nodata	nodata	2	2	8:56 AM	0:20	-0.5	10.3	Greenland	0.64	L	9:16 AM
T10	2/18/1997	12:55 PM	5	30	nodata	nodata	1.8	<1.8	2:48 PM	0:20	0.9	9.8	Greenland	0.15	L	3:08 PM
T10	3/11/1997	5:35 AM	6	31	nodata	6.3	31	31	6:27 AM	0:20	-1.8	11.4	Greenland	0.51	L	6:47 AM
T10	4/28/1997	8:08 AM	7.5	24	9.6	nodata	14	14	9:45 AM	0:20	-0.2	10.1	Greenland	1.31	L	10:05 AM
T10	6/24/1997	6:51 AM	12	30.8	5.9	nd	17	17	8:24 AM	0:20	-1.2	11.1	Greenland	0	L	8:44 AM
T10	2/2/1999	5:57 AM	2	27	nodata	7.83	95	95	5:56 AM	0:05	-0.3	9.7	Greenland	0.84	L	6:16 AM
T10	2/8/1999	9:15 AM	1.5	28	nodata	7.63	33	33	10:45 AM	0:20	1.3	8.5	Greenland	0.26	L	11:05 AM
T10	2/21/1999	10:40 AM	15.5	31	nodata	8.05	17	17	8:38 AM		-0.7	10.3	Greenland	0.09	MH	8:58 AM
T10	2/22/1999	8:19 AM	0.5	27	nodata	7.81	22	22	9:38 AM	0:20	-0.4	10.2	Greenland	0.69	L	9:58 AM
T10	3/8/1999	8:02 AM	0.5	28	nodata	7.63	33	33	9:05 AM	0:20	0.9	8.9	Greenland	1.44	L	9:25 AM
T10	3/16/1999	2:34 PM	3	27	nodata	7.73	4.5	4.5	4:00 PM	0:20	-0.6	9.8	Greenland	1.18	L	4:20 PM
T10	3/23/1999	8:01 AM	4	28	nodata	7.56	7.8	7.8	9:24 AM	0:20	-0.7	10.6	Greenland	0.46	L	9:44 AM
T10	4/6/1999	8:08 AM	6	26	nodata	7.66	11	11	9:28 AM		0.7	9.2	Greenland	0.02	L	9:48 AM
T10	4/12/1999	4:14 PM	7	25	nodata	7.95	46	46	2:47 PM		0.5	9.1	Greenland	0	L	3:07 PM
T10	4/20/1999	10:57 AM	8.5	27	nodata	7.91	17	17	9:10 AM		-1.4	11.3	Greenland	0.39	MH	9:30 AM

NHDES Watershed Management Bureau, Shellfish Program

Fecal Coliform Levels, Monitoring Site T10, Downstream of Peirce Island WWTP

Nash, C. (2001)

site	sampdate	samptime	watrtemp oC	salinity ppt	do mg/L	ph s.u.	Graph data estfc #/100mL	truefc #/100mL	prtlndtt	tidsitec	lowtideh	prevtidh	rainsttn	total rain inches	tidstage	corrttas
T10	5/4/1999	7:45 AM	9	30	nodata	7.93	130	130	8:19 AM		0.3	9.6	Greenland	0.71	L	8:39 AM
T10	5/10/1999	8:26 AM	11	28	nodata	7.22	1.8	1.8	1:09 PM		0.7	9	Greenland	0.73	ML	1:29 PM
T10	5/18/1999	12:30 PM	12	30	nodata	7.78	2	2	7:59 AM		-1.8	11.8	Greenland	0	MH	8:19 AM
T10-dup	5/18/1999	12:30 PM	12	30	nodata	7.91	1.8	<1.8	7:59 AM		-1.8	11.8	Greenland	0	MH	7:59 AM
T10	6/8/1999	10:45 AM	11.5	31	nodata	8.06	23	23	12:33 PM		0.4	9.6	Greenland	0	L	12:53 PM
T10	6/21/1999	10:40 AM	15.5	31	nodata	8.05	17	17	12:24 PM		0.7	9.2	Greenland	0	L	12:44 PM
T10	6/22/1999	11:24 AM	14	32	nodata	7.97	13	13	1:20 PM		1	9.2	Greenland	0	L	1:40 PM
T10	7/19/1999	9:09 AM	10	22	nodata	7.91	23	23	10:49 AM		0.4	9.4	Greenland	0.88	L	11:09 AM
T10	8/17/1999	8:28 AM	15.2	33	nodata	7.87	170	170	10:07 AM		0.7	9.2	Greenland	0.14	L	10:27 AM
T10	9/28/1999	5:55 AM	15	30	nodata	7.7	33	33	7:29 AM		-0.7	10.6	Greenland	0.1	L	7:49 AM
T10	10/13/1999	7:47 AM	13	32	nodata	7.79	170	170	8:06 AM		1	9.1	Greenland	0.38	L	8:26 AM
T10	11/1/1999	12:20 PM	12.5	28	nodata	7.87	49	49	11:13 AM		0.9	9.2	Greenland	0	L	11:33 AM
T10	11/15/1999	10:00 AM	9	29	nodata	7.98	11	11	9:28 AM		1.9	8.1	Greenland	0.84	L	9:48 AM
T10	11/29/1999	8:26 AM	9	15	nodata	7.64	79	79	9:47 AM		0.6	9.5	Greenland	0.49	L	10:07 AM
T10	12/13/1999	7:15 AM	5	30	nodata	7.85	33	33	8:07 AM		1.5	8.3	Greenland	0	L	8:27 AM
T10	12/20/1999	12:35 PM	4	32	nodata	7.94	1.8	<1.8	2:39 PM		-1	9.7	Greenland	0	L	2:59 PM
T10	12/28/1999	8:03 AM	2	32	nodata	8.08	8.3	8.3	9:24 AM		0.3	9.6	Greenland	0	L	9:44 AM

Note: See summary statistics Feb 1988 to Dec 1999 top of table.

Appendix 3-3

CSO ABATEMENT PROGRAM MONITORING

WHITMAN & HOWARD (1991)

EXHIBIT C-1
WET WEATHER EVENT NO. 1 - SEPTEMBER 15, 1990

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #1 - SEPTEMBER 15,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols
10:30 AM		0			0.0	48		0.0	200		0.0	120		0.0	35		0.0	7.20e+006		1.40e+006	
	15		0.7	4,922			2.0			8.2			4.9			1.4			1.34e+012		2.61e+011
10:45 AM		1			0.9	48		378.3	200		1,576.3	120		945.8	35		275.8	7.20e+006		1.40e+006	
	15		3.9	26,292			10.5			43.9			26.3			7.7			7.17e+012		1.39e+012
11:00 AM		6			4.1	48		1,642.5	200		6,843.8	120		4,106.3	35		1,197.7	7.20e+006		1.40e+006	
	15		11.0	73,766			29.5			123.0			73.8			21.5			2.01e+013		3.91e+012
11:15 AM		16			10.1	48		4,027.2	200		16,780.1	120		10,068.0	35		2,936.5	7.20e+006		1.40e+006	
	15		17.5	118,125			47.3			197.0			118.2			34.5			3.22e+013		6.26e+012
11:30 AM		20			12.6	48		5,052.0	200		21,050.2	120		12,630.1	35		3,683.8	7.20e+006		1.40e+006	
	15		26.0	175,052			78.1			255.5			138.0			46.0			4.54e+013		7.75e+012
11:45 AM		32			21.0	59		10,328.3	150		26,258.5	69		12,078.9	28		4,901.6	6.50e+006		9.40e+005	
	15		30.3	203,698			143.6			314.3			137.6			52.7			4.70e+013		6.32e+012
12:00 PM		28			18.1	110		16,623.3	220		33,246.6	93		14,054.2	34		5,138.1	5.70e+006		7.00e+005	
	15		27.5	185,052			142.8			277.8			115.8			47.8			3.85e+013		5.46e+012
12:15 PM		27			17.4	75		10,890.0	140		20,327.9	57		8,276.4	28		4,065.6	5.30e+006		8.60e+005	
	15		24.0	161,771			90.4			175.4			78.9			40.5			3.89e+013		6.61e+012
12:30 PM		21			13.7	59		6,716.6	120		13,660.9	60		6,830.5	32		3,642.9	7.40e+006		1.30e+006	
	15		18.7	126,198			55.8			104.2			50.0			28.9			3.20e+013		4.32e+012
12:45 PM		16			10.6	47		4,147.1	78		6,882.5	35		3,088.3	23		2,029.5	6.00e+006		5.10e+005	
	15		14.0	94,234			39.3			53.0			23.6			17.3			1.94e+013		2.87e+012
1:00 PM		12			7.5	53		3,320.9	57		3,571.5	25		1,566.5	21		1,315.8	4.90e+006		1.10e+006	
	15		8.8	58,948			23.4			27.5			11.3			7.0			1.14e+013		2.26e+012
1:15 PM		6			3.8	42		1,332.8	55		1,745.4	21		666.4	7.3		231.7	5.30e+006		9.30e+005	
	15		3.9	25,948			8.8			12.4			4.8			2.0			5.94e+012		8.05e+011
1:30 PM		2			1.2	39		382.8	60		589.0	23		225.8	11.5		112.9	6.80e+006		7.10e+005	
	15		1.5	10,276			3.3			5.1			2.0			1.0			2.65e+012		2.76e+011
1:45 PM		1			0.8	39		258.9	60		398.3	23		152.7	11.5		76.3	6.80e+006		7.10e+005	
	15		0.6	4,146			1.3			2.1			0.8			0.4			1.07e+012		1.11e+011
2:00 PM		0			0.0	39		0.0	60		0.0	23		0.0	11.5		0.0	6.80e+006		7.10e+005	
TOTAL	210			1,268,427			676.0			1,599.5			785.9			308.7			3.03e+014		4.86e+01
AVERAGE					8.7	63.9			151.2			74.3			29.2			6.31e+006		1.01e+006	
MAXIMUM					21.0	110			220			120			35			7.40e+006		1.40e+006	

FILENAME:PORTQL
REV.12/14/90
ROL

EXHIBIT C-2
WET WEATHER EVENT NO. 2 - SEPTEMBER 23,1990

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #3 - OCTOBER 9,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
7:45 AM		0			0.0	60		0.0	142		0.0	92		0.0	3.25		0.0	4.80e+007		1.90e+006	
	15		2.9	19,542			9.8			23.1			15.0			0.5			3.55e+013		1.41e+012
8:00 AM		6			3.8	60		1,877.5	142		4,443.4	92		2,878.8	3.25		101.7	4.80e+007		1.90e+006	
	15		11.2	75,531			37.8			89.5			58.0			2.0			1.37e+014		5.43e+012
8:15 AM		17			10.8	60		5,379.3	142		12,731.0	92		8,248.3	3.25		291.4	4.80e+007		1.90e+006	
	15		16.8	113,229			56.7			134.1			86.9			3.1			2.06e+014		8.14e+012
8:30 AM		17			11.0	60		5,499.4	142		13,015.2	92		8,432.4	3.25		297.9	4.80e+007		1.90e+006	
	15		18.6	125,156			62.6			148.2			96.0			3.4			2.27e+014		9.00e+012
8:45 AM		20			13.0	60		6,525.2	142		15,443.0	92		10,005.3	3.25		353.4	4.80e+007		1.90e+006	
	15		23.0	154,583			77.4			183.1			118.6			4.2			2.81e+014		1.11e+013
9:00 AM		26			16.6	60		8,326.7	142		19,706.4	92		12,767.5	3.25		451.0	4.80e+007		1.90e+006	
	15		25.0	168,333			84.2			199.4			129.2			4.6			3.06e+014		1.21e+013
9:15 AM		24			15.7	60		7,846.3	142		18,569.5	92		12,031.0	3.25		425.0	4.80e+007		1.90e+006	
	15		22.7	152,656			76.4			180.8			117.1			4.1			2.77e+014		1.10e+013
9:30 AM		21			13.6	60		6,820.5	142		16,141.7	92		10,458.0	3.25		369.4	4.80e+007		1.90e+006	
	15		19.4	130,469			65.3			154.5			100.1			3.5			2.37e+014		9.38e+012
9:45 AM		18			11.4	60		5,714.6	142		13,524.5	92		8,762.3	3.25		309.5	4.80e+007		1.90e+006	
	15		14.5	97,703			48.9			115.7			75.0			2.6			1.78e+014		7.03e+012
10:00 AM		11			7.3	60		3,672.4	142		8,691.4	92		5,631.1	3.25		198.9	4.80e+007		1.90e+006	
	15		9.6	64,964			32.5			76.9			49.8			1.8			1.18e+014		4.67e+012
10:15 AM		8			5.1	60		2,569.1	142		6,080.1	92		3,939.2	3.25		139.2	4.80e+007		1.90e+006	
	15		6.6	44,714			22.4			53.0			34.3			1.2			8.12e+013		3.22e+012
10:30 AM		5			3.5	60		1,726.9	142		4,087.0	92		2,647.9	3.25		93.5	4.80e+007		1.90e+006	
	15		6.3	42,344			21.2			50.1			32.5			1.1			7.69e+013		3.05e+012
10:45 AM		7			4.7	60		2,341.4	142		5,541.2	92		3,590.1	3.25		126.8	4.80e+007		1.90e+006	
	15		4.2	28,167			14.1			33.4			21.6			0.8			5.12e+013		2.03e+012
11:00 AM		1			0.7	60		364.8	142		863.3	92		559.3	3.25		19.8	4.80e+007		1.90e+006	
	15		0.6	4,047			2.0			4.8			3.1			0.1			7.35e+012		2.91e+011
11:15 AM		0			0.0	60		24.0	142		56.8	92		36.8	3.25		1.3	4.80e+007		1.90e+006	
	15		0.0	286			0.1			0.3			0.2			0.0			5.20e+011		2.06e+010
11:30 AM		0			0.0	60		3.5	142		8.3	92		5.4	3.25		0.2	4.80e+007		1.90e+006	
	15		0.0	42			0.0			0.0			0.0			0.0			7.57e+010		3.00e+009
11:45 AM		0			0.0	60		0.5	142		1.2	92		0.8	3.25		0	4.80e+007		1.90e+006	
	15		0.0	5			0.0			0.0			0.0			0.0			9.46e+009		3.75e+008
12:00 AM					0.0	60		0.0	142		0.0	92		0.0	3.25		0.0	4.80e+007		1.90e+006	
TOTAL	255			1,221,771			611.4			1,446.9			937.4			33.1			2.22e+015		8.79e+013
AVERAGE					6.9	60.0			142.0			92.0			3.3			4.80e+007		1.90e+006	
MAXIMUM					16.6	60			142			92			3.3			4.80e+007		1.90e+006	

FILENAME:PORTQL2
REV.12/14/90
ROL

EXHIBIT C-3
WET WEATHER EVENT NO. 3 - OCTOBER 9, 1990

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #2 - SEPTEMBER 23,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	(avg.cfs)	(gal.)	(mgd)	BOD5 (mg/l)	(lbs)	(lbs/day)	TSS (mg/l)	(lbs)	(lbs/day)	VSS (mg/l)	(lbs)	(lbs/day)	TKN (mg/l)	(lbs)	(lbs/day)	TOTAL COLIFORM (col./100mls)	load (cols.)	FECAL COLIFORM (col./100mls)	load (col
12:00 AM		0			0.0	32		0.0	76		0.0	48		0.0	3.22		0.0	9.60e+006		3.00e+005	
	15		9.9	66,406			21.9			42.6			24.9			2.0			2.55e+013		5.78e+01
12:15 AM		20			12.8	47		4,997.7	78		8,294.1	42		4,466.1	3.92		416.8	1.07e+007		1.60e+005	
	15		22.1	148,802			58.3			96.8			52.1			4.9			6.03e+013		9.01e+01
12:30 AM		24			15.8	47		6,201.1	78		10,291.2	42		5,541.4	3.92		517.2	1.07e+007		1.60e+005	
	15		21.4	143,750			56.3			93.5			50.4			4.7			5.82e+013		8.71e+01
12:45 AM		18			11.8	47		4,617.5	78		7,663.1	42		4,126.3	3.92		385.1	1.07e+007		1.60e+005	
	15		14.5	97,896			38.4			63.7			34.3			3.2			3.97e+013		5.93e+01
1:00 AM		11			7.0	47		2,750.1	78		4,564.0	42		2,457.6	3.92		229.4	1.07e+007		1.60e+005	
	15		8.6	57,865			22.7			37.6			20.3			1.9			2.34e+013		3.50e+01
1:15 AM		6			4.1	47		1,604.8	78		2,663.2	42		1,434.0	3.92		133.8	1.07e+007		1.60e+005	
	30		11.7	157,958			61.9			102.8			55.3			5.2			6.40e+013		9.57e+01
1:45 AM		17			11.1	47		4,339.2	78		7,201.3	42		3,877.6	3.92		361.9	1.07e+007		1.60e+005	
	15		16.8	113,281			44.4			73.7			39.7			3.7			4.59e+013		6.86e+01
2:00 AM		17			10.7	47		4,186.3	78		6,947.6	42		3,741.0	3.92		349.2	1.07e+007		1.60e+005	
	15		12.1	81,766			32.1			53.2			28.6			2.7			3.31e+013		4.95e+01
2:15 AM		8			5.0	47		1,967.3	78		3,265.0	42		1,758.1	3.92		164.1	1.07e+007		1.60e+005	
	15		4.1	27,427			10.8			17.8			9.6			0.9			1.11e+013		1.66e+01
2:30 AM		0			0.2	47		96.8	78		160.7	42		86.5	3.92		8.1	1.07e+007		1.60e+005	
	15		0.2	1,368			0.5			0.9			0.5			0.0			5.54e+011		8.29e+0
2:45 AM		0			0.0	47		6.2	78		10.2	42		5.5	3.92		0.5	1.07e+007		1.60e+005	
	15		0.0	82			0.0			0.1			0.0			0.0			3.31e+010		4.95e+0
3:00 AM		0			0.0	47		0.0	78		0.0	42		0.0	3.92		0.0	1.07e+007		1.60e+005	
TOTAL	180			896,601			347.3			582.7			315.7			29.1			3.62e+014		5.61e+0
AVERAGE					7.2	46.4			77.9			42.2			3.9			1.07e+007		1.65e+005	
MAXIMUM					15.8	47			78			48			3.9			1.07e+007		3.00e+005	

FILENAME:PORTQL1
REV.12/14/90
ROL

EXHIBIT C-4
WET WEATHER EVENT NO. 4 - OCTOBER 13, 1990

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

CSO #4 p 1/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
11:00 AM		0			0.0	132		0.0	133		0.0	57		0.0	7.56		0.0	6.10e+007		1.10e+006	
	15		5.0	33,859			37.3			37.6			16.1			2.1			7.82e+013		1.41e+012
11:15 AM		10			6.5	132		7,156.8	133		7,211.0	57		3,090.4	7.56		409.9	6.10e+007		1.10e+006	
	15		8.3	56,120			61.8			62.2			26.7			3.5			1.30e+014		2.34e+012
11:30 AM		7			4.3	132		4,705.2	133		4,740.8	57		2,031.8	7.56		269.5	6.10e+007		1.10e+006	
	15		6.7	44,802			49.3			49.7			21.3			2.8			1.03e+014		1.87e+012
11:45 AM		7			4.3	132		4,764.6	133		4,800.7	57		2,057.4	7.56		272.9	6.10e+007		1.10e+006	
	15		6.5	43,677			48.1			48.4			20.8			2.8			1.01e+014		1.82e+012
12:00 PM		6			4.1	132		4,467.4	133		4,501.2	57		1,929.1	7.56		255.9	6.10e+007		1.10e+006	
	15		5.6	37,568			43.2			55.1			23.8			2.5			1.00e+014		1.56e+012
12:15 PM		5			3.2	144		3,789.0	219		5,762.5	95		2,499.7	8.4		221.0	8.00e+007		1.10e+006	
	15		5.9	39,557			49.5			122.6			50.3			2.8			1.25e+014		1.57e+012
12:30 PM		7			4.4	156		5,776.6	524		19,403.5	210		7,776.2	8.68		321.4	8.70e+007		1.00e+006	
	15		6.1	40,948			51.2			207.3			82.0			3.0			1.76e+014		1.47e+012
12:45 PM		5			3.4	144		4,109.7	690		19,692.2	270		7,705.7	8.96		255.7	1.40e+008		9.00e+005	
	15		5.3	36,005			35.1			240.2			96.1			2.9			1.56e+014		1.23e+012
1:00 PM		5			3.5	90		2,620.3	910		26,494.6	370		10,772.5	10.6		308.6	8.90e+007		9.00e+005	
	15		5.4	36,172			27.2			274.5			111.6			3.2			1.22e+014		1.23e+012
1:15 PM		5			3.5	90		2,592.6	910		26,213.8	370		10,658.4	10.6		305.3	8.90e+007		9.00e+005	
	15		2.8	18,859			14.6			134.5			54.3			1.8			6.39e+013		6.07e+011
1:30 PM		0			0.2	96		133.7	800		1,114.2	320		445.7	12		16.7	9.00e+007		8.00e+005	
	15		1.4	9,219			7.4			61.5			24.6			0.9			3.14e+013		2.79e+011
1:45 PM		2			1.6	96		1,283.4	800		10,695.2	320		4,278.1	12		160.4	9.00e+007		8.00e+005	
	15		7.5	50,438			39.8			313.4			122.0			4.9			1.23e+014		1.43e+012
2:00 PM		13			8.1	93		6,267.8	690		46,502.9	260		17,522.8	11.5		775.0	3.90e+007		7.00e+005	
	15		18.1	121,776			94.5			700.8			264.1			11.7			1.80e+014		3.23e+012
2:15 PM		24			15.3	93		11,867.0	690		88,045.4	260		33,176.5	11.5		1,467.4	3.90e+007		7.00e+005	
	15		23.8	160,469			124.5			923.4			348.0			15.4			2.37e+014		4.25e+012
2:30 PM		24			15.5	93		12,029.9	690		89,253.8	260		33,631.9	11.5		1,487.6	3.90e+007		7.00e+005	
	15		22.8	153,802			119.3			885.1			333.5			14.8			2.27e+014		4.08e+012
2:45 PM		22			14.0	93		10,874.2	690		80,679.5	260		30,401.0	11.5		1,344.7	3.90e+007		7.00e+005	
	15		21.0	141,094			105.9			782.5			294.2			13.7			1.12e+015		5.34e+012
3:00 PM		20			13.1	87		9,483.3	640		69,762.4	240		26,160.9	11.8		1286	3.80e+008		1.30e+006	
	15		22.6	152,240			110.5			812.6			304.7			15.0			2.19e+015		7.49e+012
3:15 PM		25			16.2	87		11,725.4	640		86,255.6	240		32,345.9	11.8		1,590.3	3.80e+008		1.30e+006	
	15		26.1	175,469			127.3			936.6			351.2			17.3			2.52e+015		8.63e+012
3:30 PM		27			17.5	87		12,719.4	640		93,568.1	240		35,088.0	11.8		1,725.2	3.80e+008		1.30e+006	
	15		27.7	186,354			135.2			994.7			373.0			18.3			2.68e+015		9.17e+012
3:45 PM		28			18.3	87		13,241.8	640		97,411.2	240		36,529.2	11.8		1,796.0	3.80e+008		1.30e+006	
	15		26.8	180,156			130.7			788.8			300.5			17.7			1.67e+015		9.21e+012
4:00 PM		25			16.3	87		11,856.0	410		55,873.0	160		21,804.1	11.8		1,608.1	1.10e+008		1.40e+006	
	15		24.0	161,615			117.3			552.6			215.7			15.9			6.73e+014		8.56e+012
4:15 PM		23			14.7	87		10,658.8	410		50,231.0	160		19,602.3	11.8		1,445.7	1.10e+008		1.40e+006	
	15		19.9	133,802			97.1			457.5			178.5			13.2			5.57e+014		7.09e+012
4:30 PM		17			11.0	87		7,981.4	410		37,613.4	160		14,678.4	11.8		1,082.5	1.10e+008		1.40e+006	
	15		14.5	97,469			70.7			333.3			130.1			9.6			4.06e+014		5.17e+012
4:45 PM		12			7.7	87		5,597.1	410		26,377.3	160		10,293.6	11.8		759.2	1.10e+008		1.40e+006	
	15		11.5	77,422			59.1			230.9			100.1			7.1			6.15e+014		2.49e+012
[illegible] PM		11			[illegible]	36		[illegible]	460		27,434.1	150		3,945.9	10.2		538.3	3.10e+008		3.00e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO #4 p2/9

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	(avg.cfs)	(gal.)	(mgd)	BOD5 (mg/l)	(lbs)	(lbs/day)	TSS (mg/l)	(lbs)	(lbs/day)	VSS (mg/l)	(lbs)	(lbs/day)	TKN (mg/l)	(lbs)	(lbs/day)	TOTAL COLIFORM (col./100mls)	load (cols.)	FECAL COLIFORM (col./100mls)	load (cols.)
	15		9.8	66,052			52.9			253.4			82.6			5.6			7.75e+014		7.50e+011
5:15 PM		9			5.5	96		4,428.3	460		21,219.1	150		6,919.3	10.2		470.5	3.10e+008		3.00e+005	
	15		8.8	59,073			47.3			226.6			73.9			5.0			6.93e+014		6.71e+011
5:30 PM		9			5.8	96		4,652.5	460		22,293.3	150		7,269.6	10.2		494.3	3.10e+008		3.00e+005	
	15		19.7	132,818			106.3			509.5			166.2			11.3			1.56e+015		1.51e+012
5:45 PM		30			19.7	96		15,764.6	460		75,538.7	150		24,632.2	10.2		1,675.0	3.10e+008		3.00e+005	
	15		33.6	226,510			158.7			859.5			311.7			16.2			1.72e+015		4.29e+012
6:00 PM		37			23.8	72		14,291.4	450		89,321.4	180		35,728.6	7		1,389.4	9.10e+007		7.00e+005	
	15		33.9	228,333			137.1			856.9			342.8			13.3			7.87e+014		6.05e+012
6:15 PM		31			20.0	72		12,033.6	450		75,210.1	180		30,084.0	7		1,169.9	9.10e+007		7.00e+005	
	15		28.6	192,813			115.8			723.6			289.5			11.3			6.64e+014		5.11e+012
6:30 PM		26			17.0	72		10,196.2	450		63,725.9	180		25,490.4	7		991.3	9.10e+007		7.00e+005	
	15		25.5	171,771			103.1			644.7			257.9			10.0			5.92e+014		4.55e+012
6:45 PM		25			16.0	72		9,607.7	450		60,048.0	180		24,019.2	7		934.1	9.10e+007		7.00e+005	
	15		26.1	175,990			114.5			447.7			198.1			9.7			7.69e+014		5.00e+012
7:00 PM		28			17.8	84		12,463.0	160		23,739.0	90		13,353.2	6.16		914.0	1.40e+008		8.00e+005	
	15		25.7	173,125			121.3			231.0			129.9			8.9			9.17e+014		5.24e+012
7:15 PM		24			15.5	84		10,823.7	160		20,616.5	90		11,596.8	6.16		793.7	1.40e+008		8.00e+005	
	15		23.5	157,917			110.6			210.7			118.5			8.1			8.37e+014		4.78e+012
7:30 PM		23			14.9	84		10,417.3	160		19,842.5	90		11,161.4	6.16		763.9	1.40e+008		8.00e+005	
	15		20.4	137,188			96.1			183.1			103.0			7.0			7.27e+014		4.15e+012
7:45 PM		18			11.5	84		8,035.4	160		15,305.6	90		8,609.4	6.16		589.3	1.40e+008		8.00e+005	
	15		16.4	110,354			58.4			98.9			57.5			5.7			3.34e+014		1.88e+012
8:00 PM		15			9.7	43		3,485.1	55		4,457.6	35		2,836.7	6.16		499.3	2.00e+007		1.00e+005	
	15		16.0	107,438			38.5			49.3			31.4			5.5			8.13e+013		4.07e+011
8:15 PM		17			10.9	43		3,912.5	55		5,004.4	35		3,184.6	6.16		560.5	2.00e+007		1.00e+005	
	15		19.4	130,469			46.8			59.8			38.1			6.7			9.88e+013		4.94e+011
8:30 PM		22			14.1	43		5,070.9	55		6,486.0	35		4,127.5	6.16		726.4	2.00e+007		1.00e+005	
	15		23.5	157,969			56.7			72.5			46.1			8.1			1.20e+014		5.98e+011
8:45 PM		25			16.2	43		5,806.1	55		7,426.4	35		4,725.9	6.16		831.8	2.00e+007		1.00e+005	
	15		24.1	162,552			58.3			74.6			47.4			8.4			1.23e+014		6.15e+011
9:00 PM		23			15.0	43		5,386.5	55		6,889.7	35		4,384.3	6.16		771.6	2.00e+007		1.00e+005	
	15		26.9	180,781			64.8			82.9			52.8			9.3			1.37e+014		6.84e+011
9:15 PM		30			19.7	43		7,061.2	55		9,031.8	35		5,747.5	6.16		1,011.6	2.00e+007		1.00e+005	
	15		35.5	239,219			85.8			109.7			69.8			12.3			1.81e+014		9.06e+011
9:30 PM		41			26.2	43		9,410.2	55		12,036.3	35		7,659.5	6.16		1,348.1	2.00e+007		1.00e+005	
	15		40.0	269,583			96.7			123.7			78.7			13.8			2.04e+014		1.02e+012
9:45 PM		39			25.5	43		9,152.0	55		11,706.0	35		7,449.3	6.16		1,311.1	2.00e+007		1.00e+005	
	15		38.9	261,927			93.9			120.1			76.5			13.5			1.98e+014		9.92e+011
10:00 PM		38			24.8	43		8,883.0	55		11,362.0	35		7,230.4	6.16		1,272.5	2.00e+007		1.00e+005	
	15		36.9	248,229			89.0			113.9			72.5			12.8			1.88e+014		9.40e+011
10:15 PM		35			22.9	43		8,208.8	55		10,499.6	35		6,681.6	6.16		1,176.0	2.00e+007		1.00e+005	
	15		34.9	234,948			84.3			107.8			68.6			12.1			1.78e+014		8.89e+011
10:30 PM		34			22.2	43		7,968.5	55		10,192.3	35		6,486.0	6.16		1,141.5	2.00e+007		1.00e+005	
	15		34.3	230,833			82.8			105.9			67.4			11.9			1.75e+014		8.74e+011
10:45 PM		34			22.1	43		7,925.5	55		10,137.3	35		6,451.0	6.16		1,135.4	2.00e+007		1.00e+005	
	15		36.5	245,677			38.1			112.7			71.7			12.6			1.86e+014		9.30e+011
11:00 PM		39			25.1	43		8,990.6	55		11,499.6	35		7,317.9	6.16		1,238.0	2.00e+007		1.00e+005	
	15		38.6	259,344			93.2			119.2			75.8			13.3			1.97e+014		9.84e+011

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO #4 p 3/9

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
11:15 PM		38			24.8	43		8,900.9	55		11,384.9	35		7,245.0	6.16		1,275.1	2.00e+007		1.00e+005	
	15		37.5	252,604			90.6			115.9			73.7			13.0			1.91e+014		9.56e+011
11:30 PM		37			23.7	43		8,492.1	55		10,862.0	35		6,912.2	6.16		1,216.5	2.00e+007		1.00e+005	
	15		37.9	255,417			91.6			117.2			74.6			13.1			1.93e+014		9.67e+011
11:45 PM		39			25.4	43		9,094.6	55		11,632.6	35		7,402.6	6.16		1,302.9	2.00e+007		1.00e+005	
	15		38.0	255,833			91.7			117.4			74.7			13.1			1.94e+014		9.68e+011
12:00 AM		37			23.8	43		8,520.8	55		10,898.7	35		6,935.5	6.16		1,220.7	2.00e+007		1.00e+005	
	15		36.6	246,094			88.3			112.9			71.8			12.6			1.86e+014		9.32e+011
12:15 AM		36			23.5	43		8,424.0	55		10,774.9	35		6,856.7	6.16		1,206.8	2.00e+007		1.00e+005	
	15		36.4	245,365			88.0			112.5			71.6			12.6			1.86e+014		9.29e+011
12:30 AM		37			23.6	43		8,470.6	55		10,834.5	35		6,894.7	6.16		1,213.5	2.00e+007		1.00e+005	
	15		35.6	239,531			85.9			109.9			69.9			12.3			1.81e+014		9.07e+011
12:45 AM		35			22.4	43		8,022.3	55		10,261.1	35		6,529.8	6.16		1,149.2	2.00e+007		1.00e+005	
	15		34.8	234,063			83.9			107.4			68.3			12.0			1.77e+014		8.86e+011
1:00 AM		35			22.6	43		8,094.1	55		10,352.9	35		6,588.2	6.16		1,159.5	2.00e+007		1.00e+005	
	15		35.5	238,698			85.6			109.5			69.7			12.3			1.81e+014		9.04e+011
1:15 AM		36			23.3	43		8,341.5	55		10,669.4	35		6,789.6	6.16		1,195.0	2.00e+007		1.00e+005	
	15		37.4	251,979			90.4			115.6			73.6			12.9			1.91e+014		9.54e+011
1:30 AM		39			25.1	43		9,008.5	55		11,522.5	35		7,332.5	6.16		1,290.5	2.00e+007		1.00e+005	
	15		37.6	253,333			90.9			116.2			73.9			13.0			1.92e+014		9.59e+011
1:45 AM		36			23.5	43		8,434.7	55		10,788.6	35		6,865.5	6.16		1,208.3	2.00e+007		1.00e+005	
	15		38.7	260,677			93.5			119.6			76.1			13.4			1.97e+014		9.87e+011
2:00 AM		41			26.5	43		9,514.2	55		12,169.3	35		7,744.1	6.16		1,363.0	2.00e+007		1.00e+005	
	15		41.0	275,990			99.0			126.6			80.6			14.2			2.09e+014		1.04e+012
2:15 AM		41			26.5	43		9,489.1	55		12,137.2	35		7,723.7	6.16		1,359.4	2.00e+007		1.00e+005	
	15		40.3	271,198			97.3			124.4			79.2			13.9			2.05e+014		1.03e+012
2:30 AM		40			25.6	43		9,184.3	55		11,747.3	35		7,475.6	6.16		1,315.7	2.00e+007		1.00e+005	
	15		40.0	269,375			96.6			123.6			78.6			13.8			2.04e+014		1.02e+012
2:45 AM		40			26.1	43		9,363.6	55		11,976.7	35		7,621.5	6.16		1,341.4	2.00e+007		1.00e+005	
	15		40.5	272,552			97.7			125.0			79.6			14.0			2.06e+014		1.03e+012
3:00 AM		41			26.2	43		9,403.0	55		12,027.1	35		7,653.6	6.16		1,347.0	2.00e+007		1.00e+005	
	15		39.8	268,073			96.1			123.0			78.3			13.8			2.03e+014		1.01e+012
3:15 AM		39			25.3	43		9,055.2	55		11,582.2	35		7,370.5	6.16		1,297.2	2.00e+007		1.00e+005	
	15		39.1	262,917			94.3			120.6			76.7			13.5			1.99e+014		9.95e+011
3:30 AM		39			25.2	43		9,048.0	55		11,573.0	35		7,364.6	6.16		1,296.2	2.00e+007		1.00e+005	
	15		38.5	258,906			92.8			118.8			75.6			13.3			1.96e+014		9.80e+011
3:45 AM		38			24.5	43		8,779.0	55		11,229.0	35		7,145.7	6.16		1,257.6	2.00e+007		1.00e+005	
	15		37.4	252,031			90.4			115.6			73.6			12.9			1.91e+014		9.54e+011
4:00 AM		37			23.9	43		8,574.6	55		10,967.5	35		6,979.3	6.16		1,228.4	2.00e+007		1.00e+005	
	15		36.7	246,771			88.5			113.2			72.0			12.7			1.87e+014		9.34e+011
4:15 AM		36			23.5	43		8,416.8	55		10,765.7	35		6,850.9	6.16		1,205.8	2.00e+007		1.00e+005	
	15		35.8	240,990			86.4			110.5			70.3			12.4			1.82e+014		9.12e+011
4:30 AM		35			22.8	43		8,176.5	55		10,458.4	35		6,655.3	6.16		1,171.3	2.00e+007		1.00e+005	
	15		35.1	236,302			84.7			108.4			69.0			12.1			1.79e+014		8.95e+011
4:45 AM		35			22.6	43		8,094.1	55		10,352.9	35		6,588.2	6.16		1,159.5	2.00e+007		1.00e+005	
	15		35.0	235,938			84.6			108.2			68.9			12.1			1.79e+014		8.93e+011
5:00 AM		35			22.7	43		8,151.4	55		10,426.3	35		6,634.9	6.16		1,167.7	2.00e+007		1.00e+005	
	15		35.0	235,625			84.5			108.1			68.8			12.1			1.78e+014		8.92e+011
5:15 AM		35			22.5	43		8,072.5	55		10,325.3	35		6,570.7	6.16		1,156.4	2.00e+007		1.00e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO# 4 p4/9

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
	15		34.4	231,302			82.9			106.1			67.5			11.9			1.75e+014		8.76e+011
5:30 AM		34			21.9	43		7,853.8	55		10,045.5	35		6,392.6	6.16		1,125.1	2.00e+007		1.00e+005	
	15		32.9	221,563			79.5			101.6			64.7			11.4			1.68e+014		8.39e+011
5:45 AM		32			20.6	43		7,401.9	55		9,467.6	35		6,024.8	6.16		1,060.4	2.00e+007		1.00e+005	
	15		32.0	215,729			77.4			99.0			63.0			11.1			1.63e+014		8.17e+011
6:00 AM		32			20.8	43		7,452.1	55		9,531.8	35		6,065.7	6.16		1,067.6	2.00e+007		1.00e+005	
	15		32.2	216,823			77.8			99.5			63.3			11.1			1.64e+014		8.21e+011
6:15 AM		32			20.9	43		7,477.2	55		9,563.9	35		6,086.1	6.16		1,071.2	2.00e+007		1.00e+005	
	15		32.2	216,875			77.8			99.5			63.3			11.1			1.64e+014		8.21e+011
6:30 AM		32			20.8	43		7,455.7	55		9,536.4	35		6,068.6	6.16		1,068.1	2.00e+007		1.00e+005	
	15		31.7	213,594			76.6			98.0			62.3			11.0			1.62e+014		8.09e+011
6:45 AM		31			20.2	43		7,251.3	55		9,274.9	35		5,902.2	6.16		1,038.8	2.00e+007		1.00e+005	
	15		31.4	211,146			75.7			96.9			61.6			10.8			1.60e+014		7.99e+011
7:00 AM		31			20.3	43		7,287.2	55		9,320.8	35		5,931.4	6.16		1,043.9	2.00e+007		1.00e+005	
	15		31.0	208,958			74.9			95.8			61.0			10.7			1.58e+014		7.91e+011
7:15 AM		31			19.8	43		7,100.7	55		9,082.3	35		5,779.6	6.16		1,017.2	2.00e+007		1.00e+005	
	15		30.7	206,927			74.2			94.9			60.4			10.6			1.57e+014		7.83e+011
7:30 AM		31			19.9	43		7,147.3	55		9,141.9	35		5,817.6	6.16		1,023.9	2.00e+007		1.00e+005	
	15		29.8	200,625			71.9			92.0			58.6			10.3			1.52e+014		7.59e+011
7:45 AM		29			18.6	43		6,666.7	55		8,527.2	35		5,426.4	6.16		955.1	2.00e+007		1.00e+005	
	15		29.0	195,104			70.0			89.5			57.0			10.0			1.48e+014		7.39e+011
8:00 AM		29			18.9	43		6,767.2	55		8,655.7	35		5,508.2	6.16		969.4	2.00e+007		1.00e+005	
	15		29.1	195,729			70.2			89.8			57.1			10.1			1.48e+014		7.41e+011
8:15 AM		29			18.7	43		6,709.8	55		8,582.3	35		5,461.4	6.16		961.2	2.00e+007		1.00e+005	
	15		28.4	191,146			68.5			87.7			55.8			9.8			1.45e+014		7.24e+011
8:30 AM		28			18.0	43		6,451.6	55		8,252.0	35		5,251.3	6.16		924.2	2.00e+007		1.00e+005	
	15		26.9	180,885			64.9			83.0			52.8			9.3			1.37e+014		6.85e+011
8:45 AM		26			16.7	43		6,003.3	55		7,678.6	35		4,886.4	6.16		860.0	2.00e+007		1.00e+005	
	15		25.9	174,479			62.6			80.0			50.9			9.0			1.32e+014		6.60e+011
9:00 AM		26			16.8	43		6,010.5	55		7,687.8	35		4,892.2	6.16		861.0	2.00e+007		1.00e+005	
	15		26.1	176,042			63.1			80.8			51.4			9.0			1.33e+014		6.66e+011
9:15 AM		26			17.0	43		6,110.9	55		7,816.2	35		4,974.0	6.16		875.4	2.00e+007		1.00e+005	
	15		25.9	174,271			62.5			79.9			50.9			9.0			1.32e+014		6.60e+011
9:30 AM		25			16.4	43		5,888.5	55		7,531.9	35		4,793.0	6.16		843.6	2.00e+007		1.00e+005	
	15		24.8	166,719			59.8			76.5			48.7			8.6			1.26e+014		6.31e+011
9:45 AM		24			15.6	43		5,590.9	55		7,151.1	35		4,550.7	6.16		800.9	2.00e+007		1.00e+005	
	15		24.6	165,313			59.3			75.8			48.3			8.5			1.25e+014		6.26e+011
10:00 AM		25			16.2	43		5,791.7	55		7,408.0	35		4,714.2	6.16		829.7	2.00e+007		1.00e+005	
	15		24.3	163,306			58.8			75.2			47.8			8.4			1.24e+014		6.20e+011
10:15 AM		24			15.3	43		5,494.1	55		7,027.3	35		4,471.9	6.16		787.1	2.00e+007		1.00e+005	
	15		23.0	155,156			55.6			71.2			45.3			8.0			1.17e+014		5.87e+011
10:30 AM		22			14.5	43		5,189.2	55		6,637.4	35		4,223.8	6.16		743.4	2.00e+007		1.00e+005	
	15		22.4	150,938			54.1			69.2			44.1			7.3			1.14e+014		5.71e+011
10:45 AM		22			14.5	43		5,203.6	55		6,655.7	35		4,235.5	6.16		745.4	2.00e+007		1.00e+005	
	15		22.5	151,146			54.2			69.3			44.1			7.3			1.14e+014		5.72e+011
11:00 AM		22			14.5	43		5,203.6	55		6,655.7	35		4,235.5	6.16		745.4	2.00e+007		1.00e+005	
	15		21.9	147,760			53.0			67.8			43.1			7.6			1.12e+014		5.59e+011
11:15 AM		21			13.9	43		4,970.5	55		6,357.6	35		4,045.7	6.16		712.0	2.00e+007		1.00e+005	
	15		21.1	141,771			50.8			65.0			41.4			7.3			1.07e+014		5.37e+011

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO#4 p5/9

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
11:30 AM		21			13.4	43		4,791.2	55		6,128.2	35		3,899.8	6.16		686.4	2.00e+007		1.00e+005	
	15		19.8	133,594			47.9			61.3			39.0			6.9			1.01e+014		5.06e+011
11:45 AM		19			12.3	43		4,407.4	55		5,637.4	35		3,587.5	6.16		631.4	2.00e+007		1.00e+005	
	15		19.4	130,781			46.9			60.0			38.2			6.7			9.90e+013		4.95e+011
12:00 PM		20			12.8	43		4,597.5	55		5,880.5	35		3,742.2	6.16		658.6	2.00e+007		1.00e+005	
	15		19.4	130,781			46.9			60.0			38.2			6.7			9.90e+013		4.95e+011
12:15 PM		19			12.3	43		4,407.4	55		5,637.4	35		3,587.5	6.16		631.4	2.00e+007		1.00e+005	
	15		18.4	123,698			44.4			56.7			36.1			6.4			9.37e+013		4.68e+011
12:30 PM		18			11.5	43		4,109.8	55		5,256.7	35		3,345.2	6.16		588.8	2.00e+007		1.00e+005	
	15		17.7	119,010			42.7			54.6			34.7			6.1			9.01e+013		4.51e+011
12:45 PM		18			11.4	43		4,084.7	55		5,224.6	35		3,324.7	6.16		585.2	2.00e+007		1.00e+005	
	15		17.3	116,771			41.9			53.6			34.1			6.0			8.84e+013		4.42e+011
1:00 PM		17			11.0	43		3,955.6	55		5,059.5	35		3,219.7	6.16		566.7	2.00e+007		1.00e+005	
	15		17.2	115,885			41.6			53.2			33.8			6.0			8.77e+013		4.39e+011
1:15 PM		17			11.2	43		4,023.7	55		5,146.6	35		3,275.1	6.16		576.4	2.00e+007		1.00e+005	
	15		17.5	118,073			42.3			54.2			34.5			6.1			8.94e+013		4.47e+011
1:30 PM		18			11.5	43		4,106.2	55		5,252.1	35		3,342.3	6.16		588.2	2.00e+007		1.00e+005	
	15		17.7	119,063			42.7			54.6			34.8			6.1			9.01e+013		4.51e+011
1:45 PM		18			11.4	43		4,091.9	55		5,233.8	35		3,330.6	6.16		586.2	2.00e+007		1.00e+005	
	15		17.8	119,740			42.9			54.9			35.0			6.2			9.07e+013		4.53e+011
2:00 PM		18			11.6	43		4,152.8	55		5,311.7	35		3,380.2	6.16		594.9	2.00e+007		1.00e+005	
	15		17.6	118,802			42.6			54.5			34.7			6.1			8.99e+013		4.50e+011
2:15 PM		17			11.2	43		4,027.3	55		5,151.2	35		3,278.0	6.16		576.9	2.00e+007		1.00e+005	
	15		17.0	114,688			41.1			52.6			33.5			5.9			8.68e+013		4.34e+011
2:30 PM		17			10.8	43		3,869.5	55		4,949.4	35		3,149.6	6.16		554.3	2.00e+007		1.00e+005	
	15		16.5	111,406			40.0			51.1			32.5			5.7			8.43e+013		4.22e+011
2:45 PM		16			10.6	43		3,801.4	55		4,862.2	35		3,094.1	6.16		544.6	2.00e+007		1.00e+005	
	15		16.6	111,615			40.0			51.2			32.6			5.7			8.45e+013		4.23e+011
3:00 PM		17			10.8	43		3,883.9	55		4,967.7	35		3,161.3	6.16		556.4	2.00e+007		1.00e+005	
	15		16.0	108,016			38.7			49.5			31.5			5.5			8.18e+013		4.09e+011
3:15 PM		15			9.9	43		3,553.6	55		4,545.3	35		2,892.4	6.16		509.1	2.00e+007		1.00e+005	
	15		15.4	103,391			37.1			47.4			30.2			5.3			7.83e+013		3.91e+011
3:30 PM		15			9.9	43		3,565.4	55		4,560.4	35		2,902.1	6.16		510.8	2.00e+007		1.00e+005	
	15		14.5	97,391			34.9			44.7			28.4			5.0			7.37e+013		3.69e+011
3:45 PM		14			8.8	43		3,140.4	55		4,016.8	35		2,556.2	6.16		449.9	2.00e+007		1.00e+005	
	15		13.5	91,010			32.6			41.7			26.6			4.7			6.89e+013		3.45e+011
4:00 PM		13			8.7	43		3,126.1	55		3,998.5	35		2,544.5	6.16		447.8	2.00e+007		1.00e+005	
	15		13.4	90,193			32.3			41.4			26.3			4.6			6.83e+013		3.41e+011
4:15 PM		13			8.6	43		3,084.1	55		3,944.8	35		2,510.3	6.16		441.8	2.00e+007		1.00e+005	
	15		13.3	89,365			32.0			41.0			26.1			4.6			6.77e+013		3.38e+011
4:30 PM		13			8.6	43		3,069.1	55		3,925.6	35		2,498.1	6.16		439.7	2.00e+007		1.00e+005	
	15		13.0	87,828			31.5			40.3			25.6			4.5			6.65e+013		3.32e+011
4:45 PM		13			8.3	43		2,978.3	55		3,809.5	35		2,424.2	6.16		426.7	2.00e+007		1.00e+005	
	15		12.6	84,755			30.4			38.9			24.7			4.4			6.42e+013		3.21e+011
5:00 PM		12			8.0	43		2,857.5	55		3,654.9	35		2,325.9	6.16		409.4	2.00e+007		1.00e+005	
	15		12.2	81,391			29.4			37.6			23.9			4.2			6.23e+013		3.10e+011
5:15 PM		12			7.8	43		2,781.8	55		3,558.1	35		2,264.3	6.16		398.5	2.00e+007		1.00e+005	
	15		11.8	[illegible]			28.6			36.6			23.3			4.1			6.04e+013		3.02e+011
5:30 PM		12			[illegible]	43		[illegible]	55		3,463.5	35		2,204.1	6.16		[illegible]	2.00e+007		1.00e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

CSO#4/p6/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	(avg.cfs)	(gal.)	(mgd)	BOD5 (mg/l)	(lbs)	(lbs/day)	TSS (mg/l)	(lbs)	(lbs/day)	VSS (mg/l)	(lbs)	(lbs/day)	TKN (mg/l)	(lbs)	(lbs/day)	TOTAL COLIFORM (col./100mls)	load (cols.)	FECAL COLIFORM (col./100mls)	load (cols.)
	15		11.6	78,229			28.1			35.9			22.8			4.0			5.92e+013		2.96e+011
5:45 PM		12			7.5	43		2,678.5	55		3,426.0	35		2,180.2	6.16		383.7	2.00e+007		1.00e+005	
	15		11.5	77,542			27.8			35.6			22.6			4.0			5.87e+013		2.94e+011
6:00 PM		11			7.4	43		2,660.6	55		3,403.1	35		2,165.6	6.16		381.1	2.00e+007		1.00e+005	
	15		11.4	76,802			27.5			35.2			22.4			3.9			5.81e+013		2.91e+011
6:15 PM		11			7.3	43		2,627.6	55		3,360.9	35		2,138.8	6.16		376.4	2.00e+007		1.00e+005	
	15		11.1	74,516			26.7			34.2			21.8			3.8			5.64e+013		2.82e+011
6:30 PM		11			7.0	43		2,503.2	55		3,201.7	35		2,037.5	6.16		358.6	2.00e+007		1.00e+005	
	15		11.1	74,760			26.8			34.3			21.8			3.8			5.66e+013		2.83e+011
6:45 PM		11			7.4	43		2,644.5	55		3,382.5	35		2,152.5	6.16		378.8	2.00e+007		1.00e+005	
	15		10.7	72,068			25.8			33.1			21.0			3.7			5.46e+013		2.73e+011
7:00 PM		10			6.5	43		2,317.8	55		2,964.6	35		1,886.5	6.16		332.0	2.00e+007		1.00e+005	
	15		10.4	69,740			25.0			32.0			20.4			3.6			5.28e+013		2.64e+011
7:15 PM		11			6.9	43		2,484.2	55		3,177.4	35		2,022.0	6.16		355.9	2.00e+007		1.00e+005	
	15		10.8	72,620			26.0			33.3			21.2			3.7			5.50e+013		2.75e+011
7:30 PM		11			7.0	43		2,516.1	55		3,218.2	35		2,048.0	6.16		360.4	2.00e+007		1.00e+005	
	15		10.8	72,969			26.2			33.5			21.3			3.7			5.52e+013		2.76e+011
7:45 PM		11			7.0	43		2,508.2	55		3,208.1	35		2,041.5	6.16		359.3	2.00e+007		1.00e+005	
	15		10.2	68,594			24.6			31.5			20.0			3.5			5.19e+013		2.60e+011
8:00 PM		10			6.2	43		2,214.8	55		2,832.9	35		1,802.8	6.16		317.3	2.00e+007		1.00e+005	
	15		10.0	67,203			24.1			30.8			19.6			3.5			5.09e+013		2.54e+011
8:15 PM		10			6.7	43		2,412.4	55		3,085.7	35		1,963.6	6.16		345.6	2.00e+007		1.00e+005	
	15		10.3	69,453			24.9			31.9			20.3			3.6			5.26e+013		2.63e+011
8:30 PM		10			6.6	43		2,369.8	55		3,031.1	35		1,928.9	6.16		339.5	2.00e+007		1.00e+005	
	15		10.1	68,193			24.5			31.3			19.9			3.5			5.16e+013		2.58e+011
8:45 PM		10			6.5	43		2,325.7	55		2,974.7	35		1,893.0	6.16		333.2	2.00e+007		1.00e+005	
	15		10.5	70,865			25.4			32.5			20.7			3.6			5.37e+013		2.68e+011
9:00 PM		11			7.1	43		2,553.7	55		3,266.4	35		2,078.6	6.16		365.8	2.00e+007		1.00e+005	
	15		11.4	76,948			27.6			35.3			22.5			4.0			5.83e+013		2.91e+011
9:15 PM		12			7.7	43		2,744.5	55		3,510.4	35		2,233.9	6.16		393.2	2.00e+007		1.00e+005	
	15		11.9	80,260			28.8			36.8			23.4			4.1			6.08e+013		3.04e+011
9:30 PM		12			7.8	43		2,781.8	55		3,558.1	35		2,264.3	6.16		398.5	2.00e+007		1.00e+005	
	15		12.4	83,661			30.0			38.4			24.4			4.3			6.33e+013		3.17e+011
9:45 PM		13			8.3	43		2,978.7	55		3,810.0	35		2,424.5	6.16		426.7	2.00e+007		1.00e+005	
	15		13.0	87,755			31.5			40.3			25.6			4.5			6.64e+013		3.32e+011
10:00 PM		13			8.5	43		3,063.7	55		3,918.7	35		2,493.7	6.16		438.9	2.00e+007		1.00e+005	
	15		12.8	86,229			30.9			39.6			25.2			4.4			6.53e+013		3.26e+011
10:15 PM		12			8.0	43		2,873.6	55		3,675.6	35		2,339.0	6.16		411.7	2.00e+007		1.00e+005	
	15		12.7	85,781			30.8			39.3			25.0			4.4			6.49e+013		3.25e+011
10:30 PM		13			8.5	43		3,032.8	55		3,879.2	35		2,468.6	6.16		434.5	2.00e+007		1.00e+005	
	15		13.3	89,401			32.1			41.0			26.1			4.6			6.77e+013		3.38e+011
10:45 PM		13			8.7	43		3,122.9	55		3,994.4	35		2,541.9	6.16		447.4	2.00e+007		1.00e+005	
	15		13.7	92,500			33.2			42.4			27.0			4.8			7.00e+013		3.50e+011
11:00 PM		14			9.1	43		3,246.2	55		4,152.2	35		2,642.3	6.16		465.0	2.00e+007		1.00e+005	
	15		13.5	90,615			32.5			41.6			26.5			4.7			6.86e+013		3.43e+011
11:15 PM		13			8.3	43		2,993.0	55		3,828.3	35		2,436.2	6.16		428.8	2.00e+007		1.00e+005	
	15		13.4	90,330			32.4			41.5			26.4			4.6			6.84e+013		3.42e+011
11:30 PM		14			9.0	43		3,230.1	55		4,131.5	35		2,629.1	6.16		462.7	2.00e+007		1.00e+005	
	15		10.2	68,391			24.5			31.4			20.0			3.5			5.13e+013		2.56e+011

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

CSO#4 p7/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	(avg.cfs)	(gal.)	(mgd)	BOD5 (mg/l)	(lbs)	(lbs/day)	TSS (mg/l)	(lbs)	(lbs/day)	VSS (mg/l)	(lbs)	(lbs/day)	TKN (mg/l)	(lbs)	(lbs/day)	TOTAL COLIFORM (col./100mls)	load (cols.)	FECAL COLIFORM (col./100mls)	load (cols.
11:45 PM		6			4.1	43		1,478.9	55		1,891.7	35		1,203.8	6.16		211.9	2.00e+007		1.00e+005	
	15		5.9	39,448			14.1			18.1			11.5			2.0			2.99e+013		1.49e+011
12:00 AM		5			3.5	43		1,237.2	55		1,582.5	35		1,007.1	6.16		177.2	2.00e+007		1.00e+005	
	15		6.9	46,219			16.6			21.2			13.5			2.4			3.50e+013		1.75e+011
12:15 AM		8			5.4	43		1,945.2	55		2,488.0	35		1,583.3	6.16		278.7	2.00e+007		1.00e+005	
	15		9.3	62,609			22.5			28.7			18.3			3.2			4.74e+013		2.37e+011
12:30 AM		10			6.6	43		2,365.8	55		3,026.0	35		1,925.7	6.16		338.9	2.00e+007		1.00e+005	
	15		9.8	66,026			23.7			30.3			19.3			3.4			5.00e+013		2.50e+011
12:45 AM		9			6.1	43		2,180.4	55		2,788.9	35		1,774.8	6.16		312.4	2.00e+007		1.00e+005	
	15		9.1	61,042			21.9			28.0			17.8			3.1			4.62e+013		2.31e+011
1:00 AM		9			5.6	43		2,022.6	55		2,587.1	35		1,646.3	6.16		289.8	2.00e+007		1.00e+005	
	15		8.0	54,125			19.4			24.8			15.8			2.8			4.10e+013		2.05e+011
1:15 AM		7			4.8	43		1,704.2	55		2,179.7	35		1,387.1	6.16		244.1	2.00e+007		1.00e+005	
	15		7.5	50,448			18.1			23.1			14.7			2.6			3.82e+013		1.91e+011
1:30 AM		8			4.9	43		1,769.4	55		2,263.2	35		1,440.2	6.16		253.5	2.00e+007		1.00e+005	
	15		7.3	49,422			17.7			22.7			14.4			2.5			3.74e+013		1.87e+011
1:45 AM		7			4.6	43		1,633.5	55		2,089.4	35		1,329.6	6.16		234.0	2.00e+007		1.00e+005	
	15		7.0	47,089			16.9			21.6			13.7			2.4			3.57e+013		1.78e+011
2:00 AM		7			4.5	43		1,608.8	55		2,057.7	35		1,309.5	6.16		230.5	2.00e+007		1.00e+005	
	15		7.3	48,823			17.5			22.4			14.3			2.5			3.70e+013		1.85e+011
2:15 AM		8			4.9	43		1,752.9	55		2,242.1	35		1,426.8	6.16		251.1	2.00e+007		1.00e+005	
	15		7.6	51,073			18.3			23.4			14.9			2.6			3.87e+013		1.93e+011
2:30 AM		8			4.9	43		1,763.7	55		2,255.9	35		1,435.6	6.16		252.7	2.00e+007		1.00e+005	
	15		7.3	49,432			17.7			22.7			14.4			2.5			3.74e+013		1.87e+011
2:45 AM		7			4.6	43		1,640.0	55		2,097.6	35		1,334.9	6.16		234.9	2.00e+007		1.00e+005	
	15		7.2	48,380			17.4			22.2			14.1			2.5			3.66e+013		1.83e+011
3:00 AM		7			4.7	43		1,691.3	55		2,163.2	35		1,376.6	6.16		242.3	2.00e+007		1.00e+005	
	15		7.1	48,094			17.2			22.1			14.0			2.5			3.64e+013		1.82e+011
3:15 AM		7			4.5	43		1,620.2	55		2,072.4	35		1,318.8	6.16		232.1	2.00e+007		1.00e+005	
	15		7.0	47,130			16.9			21.6			13.8			2.4			3.57e+013		1.78e+011
3:30 AM		7			4.5	43		1,624.9	55		2,078.4	35		1,322.6	6.16		232.8	2.00e+007		1.00e+005	
	15		7.2	48,349			17.3			22.2			14.1			2.5			3.66e+013		1.83e+011
3:45 AM		7			4.8	43		1,704.2	55		2,179.7	35		1,387.1	6.16		244.1	2.00e+007		1.00e+005	
	15		8.1	54,635			19.6			25.1			15.9			2.8			4.14e+013		2.07e+011
4:00 AM		9			5.7	43		2,057.8	55		2,632.0	35		1,674.9	6.16		294.8	2.00e+007		1.00e+005	
	15		9.4	63,453			22.8			29.1			18.5			3.3			4.80e+013		2.40e+011
4:15 AM		10			6.4	43		2,311.3	55		2,956.3	35		1,881.3	6.16		331.1	2.00e+007		1.00e+005	
	15		10.2	68,995			24.7			31.6			20.1			3.5			5.22e+013		2.61e+011
4:30 AM		11			6.8	43		2,439.3	55		3,120.1	35		1,985.5	6.16		349.4	2.00e+007		1.00e+005	
	15		10.2	68,938			24.7			31.6			20.1			3.5			5.22e+013		2.61e+011
4:45 AM		10			6.4	43		2,307.4	55		2,951.3	35		1,878.1	6.16		330.5	2.00e+007		1.00e+005	
	15		7.9	53,146			19.1			24.4			15.5			2.7			4.02e+013		2.01e+011
5:00 AM		6			3.8	43		1,352.0	55		1,729.3	35		1,100.5	6.16		193.7	2.00e+007		1.00e+005	
	15		6.8	45,589			16.3			20.9			13.3			2.3			3.45e+013		1.73e+011
5:15 AM		8			5.0	43		1,787.0	55		2,235.7	35		1,454.5	6.16		256.0	2.00e+007		1.00e+005	
	15		8.3	55,128			20.1			25.3			16.4			2.9			4.25e+013		2.13e+011
5:30 AM		9			5.8	43		2,081.3	55		2,662.8	35		1,694.5	6.16		298.2	2.00e+007		1.00e+005	
	15		8.8	59,063			21.2			27.1			17.2			3.0			4.47e+013		2.24e+011
5:45 AM		9			5.5	43		1,985.0	55		2,538.9	35		1,615.7	6.16		234.4	2.00e+007		1.00e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

CSO#4 p8/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
	15		8.6	57,766			20.7			26.5			16.9			3.0			4.37e+013		2.19e+011
6:00 AM		9			5.6	43		1,992.5	55		2,548.5	35		1,621.8	6.16		285.4	2.00e+007		1.00e+005	
	15		8.7	58,849			21.1			27.0			17.2			3.0			4.46e+013		2.23e+011
6:15 AM		9			5.7	43		2,059.6	55		2,634.3	35		1,676.4	6.16		295.0	2.00e+007		1.00e+005	
	15		8.7	58,271			20.9			26.7			17.0			3.0			4.41e+013		2.21e+011
6:30 AM		8			5.4	43		1,952.7	55		2,497.6	35		1,589.4	6.16		279.7	2.00e+007		1.00e+005	
	15		8.7	58,891			21.1			27.0			17.2			3.0			4.46e+013		2.23e+011
6:45 AM		9			5.9	43		2,102.2	55		2,688.9	35		1,711.1	6.16		301.2	2.00e+007		1.00e+005	
	15		9.3	62,406			22.4			28.6			18.2			3.2			4.72e+013		2.36e+011
7:00 AM		9			6.1	43		2,194.8	55		2,807.2	35		1,786.4	6.16		314.4	2.00e+007		1.00e+005	
	15		10.0	67,344			24.2			30.9			19.7			3.5			5.10e+013		2.55e+011
7:15 AM		11			6.8	43		2,442.2	55		3,123.7	35		1,987.8	6.16		349.9	2.00e+007		1.00e+005	
	15		10.7	71,766			25.7			32.9			20.9			3.7			5.43e+013		2.72e+011
7:30 AM		11			7.0	43		2,499.2	55		3,196.7	35		2,034.3	6.16		358.0	2.00e+007		1.00e+005	
	15		11.0	74,083			26.6			34.0			21.6			3.8			5.61e+013		2.80e+011
7:45 AM		11			7.3	43		2,601.8	55		3,327.9	35		2,117.7	6.16		372.7	2.00e+007		1.00e+005	
	15		10.9	73,708			26.4			33.8			21.5			3.8			5.58e+013		2.79e+011
8:00 AM		11			6.9	43		2,473.4	55		3,163.7	35		2,013.2	6.16		354.3	2.00e+007		1.00e+005	
	15		10.6	71,328			25.6			32.7			20.8			3.7			5.40e+013		2.70e+011
8:15 AM		11			6.8	43		2,437.9	55		3,118.2	35		1,984.3	6.16		349.2	2.00e+007		1.00e+005	
	15		10.9	73,052			26.2			33.5			21.3			3.8			5.53e+013		2.77e+011
8:30 AM		11			7.2	43		2,592.1	55		3,315.5	35		2,109.9	6.16		371.3	2.00e+007		1.00e+005	
	15		11.9	80,297			28.8			36.8			23.4			4.1			6.08e+013		3.04e+011
8:45 AM		13			8.2	43		2,936.7	55		3,756.3	35		2,390.4	6.16		420.7	2.00e+007		1.00e+005	
	15		12.6	84,958			30.5			39.0			24.8			4.4			6.43e+013		3.22e+011
9:00 AM		13			8.1	43		2,913.1	55		3,726.0	35		2,371.1	6.16		417.3	2.00e+007		1.00e+005	
	15		13.4	90,391			32.4			41.5			26.4			4.6			6.84e+013		3.42e+011
9:15 AM		14			9.2	43		3,310.8	55		4,234.7	35		2,694.8	6.16		474.3	2.00e+007		1.00e+005	
	15		14.8	99,594			35.7			45.7			29.1			5.1			7.54e+013		3.77e+011
9:30 AM		15			9.9	43		3,546.8	55		4,536.5	35		2,886.9	6.16		508.1	2.00e+007		1.00e+005	
	15		15.0	101,271			36.3			46.5			29.6			5.2			7.67e+013		3.83e+011
9:45 AM		15			9.6	43		3,426.3	55		4,382.4	35		2,788.8	6.16		490.8	2.00e+007		1.00e+005	
	15		14.4	97,010			34.8			44.5			28.3			5.0			7.34e+013		3.67e+011
10:00 AM		14			9.1	43		3,253.4	55		4,161.3	35		2,648.1	6.16		466.1	2.00e+007		1.00e+005	
	15		12.2	82,219			29.5			37.7			24.0			4.2			6.22e+013		3.11e+011
10:15 AM		10			6.7	43		2,407.8	55		3,079.7	35		1,959.8	6.16		344.9	2.00e+007		1.00e+005	
	15		9.5	63,703			22.8			29.2			18.6			3.3			4.82e+013		2.41e+011
10:30 AM		9			5.5	43		1,978.5	55		2,530.6	35		1,610.4	6.16		283.4	2.00e+007		1.00e+005	
	15		8.2	55,073			19.8			25.3			16.1			2.8			4.17e+013		2.08e+011
10:45 AM		8			5.1	43		1,813.5	55		2,319.6	35		1,476.1	6.16		259.8	2.00e+007		1.00e+005	
	15		7.7	52,078			18.7			23.9			15.2			2.7			3.94e+013		1.97e+011
11:00 AM		8			4.9	43		1,772.3	55		2,266.9	35		1,442.6	6.16		253.9	2.00e+007		1.00e+005	
	15		11.0	73,818			26.5			33.9			21.5			3.8			5.59e+013		2.79e+011
11:15 AM		14			9.2	43		3,310.4	55		4,234.3	35		2,694.5	6.16		474.2	2.00e+007		1.00e+005	
	15		13.9	93,464			33.5			42.9			27.3			4.8			7.08e+013		3.54e+011
11:30 AM		13			8.7	43		3,125.0	55		3,997.1	35		2,543.6	6.16		447.7	2.00e+007		1.00e+005	
	15		11.1	74,755			26.8			34.3			21.8			3.8			5.66e+013		2.83e+011
11:45 AM		9			5.6	43		2,022.3	55		2,586.6	35		1,646.0	6.16		289.7	2.00e+007		1.00e+005	
	15		7.0	47,232			17.0			21.7			13.8			2.4			3.55e+013		1.73e+011

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO#4 p 9/9

WET WEATHER EVENT #4 - OCTOBER 13-15,1990

OVERFLOW TIME	TIME INTERVAL	OVERFLOW Q				BOD5			TSS			VSS			TKN			TOTAL COLIFORM		FECAL COLIFORM	
	(min)	(cfs)	(avg.cfs)	(gal.)	(mgd)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(col./100mls)	load (cols.)	(col./100mls)	load (cols
12:00 PM		5			3.4	43		1,234.0	55		1,578.4	35		1,004.4	6.16		176.8	2.00e+007		1.00e+005	
	15		6.1	41,240			14.8			18.9			12.0			2.1			3.12e+013		1.56e+011
12:15 PM		7			4.5	43		1,605.5	55		2,053.6	35		1,306.8	6.16		230.0	2.00e+007		1.00e+005	
	15		10.2	68,849			24.7			31.6			20.1			3.5			5.21e+013		2.61e+011
12:30 PM		14			8.7	43		3,135.1	55		4,010.0	35		2,551.8	6.16		449.1	2.00e+007		1.00e+005	
	15		9.8	65,781			23.6			30.2			19.2			3.4			4.98e+013		2.49e+011
12:45 PM		6			3.9	43		1,394.3	55		1,783.4	35		1,134.9	6.16		199.7	2.00e+007		1.00e+005	
	15		4.4	29,354			10.5			13.5			8.6			1.5			2.22e+013		1.11e+011
1:00 PM		3			1.7	43		626.9	55		801.8	35		510.2	6.16		89.8	2.00e+007		1.00e+005	
	15		1.4	9,245			3.3			4.2			2.7			0.5			7.00e+012		3.50e+010
1:15 PM		0			0.0	43		9.7	55		12.4	35		7.9	6.16		1.4	2.00e+007		1.00e+005	
	15		0.0	161			0.1			0.1			0.0			0.0			1.22e+011		6.11e+008
1:30 PM		0			0.0	43		1.4	55		1.8	35		1.2	6.16		0.2	2.00e+007		1.00e+005	
	15		0.0	21			0.0			0.0			0.0			0.0			1.58e+010		7.89e+007
1:45 PM		0			0.0	43			55			35			6.16			2.00e+007		1.00e+005	
TOTALS	3,045			25,353,177			10,628.8			25,086.7			12,201.5			1,411.1			4.09e+016		2.16e+014
AVERAGE					12.0	50.3			118.6			57.7			6.7			4.26e+007		2.25e+005	
MAXIMUM					26.5	156			910			370			12.0			3.80e+008		1.40e+006	

FILENAME:PORTQL3
REV.12/14/90
ROL

EXHIBIT C-5
WET WEATHER EVENT NO. 5 - OCTOBER 23, 1990

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO#5 p1/9

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
2:30 PM		0			0.0	72		0.0	36		0.0	26		0.0	5.6		0.0	4.20e+007		6.00e+005	
	15		2.0	13,615			8.2			4.1			3.0			0.6			2.16e+013		3.09e+011
2:45 PM		4			2.6	72		1,569.7	36		784.8	26		566.8	5.6		122.1	4.20e+007		6.00e+005	
	15		4.7	31,802			19.1			9.5			6.9			1.5			5.06e+013		7.22e+011
3:00 PM		5			3.5	72		2,096.9	36		1,048.4	26		757.2	5.6		163.1	4.20e+007		6.00e+005	
	15		6.3	42,198			25.3			12.7			9.2			2.0			6.71e+013		9.58e+011
3:15 PM		7			4.6	72		2,768.2	36		1,384.1	26		999.6	5.6		215.3	4.20e+007		6.00e+005	
	15		7.2	48,682			29.2			14.6			10.6			2.3			7.74e+013		1.11e+012
3:30 PM		7			4.7	72		2,844.5	36		1,422.2	26		1,027.2	5.6		221.2	4.20e+007		6.00e+005	
	15		10.1	67,823			40.7			20.4			14.7			3.2			1.08e+014		1.54e+012
3:45 PM		13			8.3	72		4,975.0	36		2,487.5	26		1,796.5	5.6		386.9	4.20e+007		6.00e+005	
	15		13.0	87,339			52.4			26.2			18.9			4.1			1.39e+014		1.98e+012
4:00 PM		13			8.5	72		5,094.5	36		2,547.2	26		1,839.7	5.6		396.2	4.20e+007		6.00e+005	
	15		14.7	99,083			59.5			29.7			21.5			4.6			1.58e+014		2.25e+012
4:15 PM		16			10.5	72		6,329.1	36		3,164.5	26		2,285.5	5.6		492.3	4.20e+007		6.00e+005	
	15		15.7	105,500			63.4			31.7			22.9			4.9			1.68e+014		2.40e+012
4:30 PM		15			9.7	72		5,834.3	36		2,917.1	26		2,106.8	5.6		453.8	4.20e+007		6.00e+005	
	15		13.7	92,542			55.6			27.8			20.1			4.3			1.47e+014		2.10e+012
4:45 PM		12			8.1	72		4,835.1	36		2,417.5	26		1,746.0	5.6		376.1	4.20e+007		6.00e+005	
	15		11.5	77,156			46.3			23.2			16.7			3.6			1.23e+014		1.75e+012
5:00 PM		10			6.8	72		4,060.4	36		2,030.2	26		1,466.3	5.6		315.8	4.20e+007		6.00e+005	
	15		9.3	62,849			37.7			18.9			13.6			2.9			9.99e+013		1.43e+012
5:15 PM		8			5.3	72		3,185.5	36		1,592.8	26		1,150.3	5.6		247.8	4.20e+007		6.00e+005	
	15		7.4	49,771			29.9			14.9			10.8			2.3			7.91e+013		1.13e+012
5:30 PM		7			4.3	72		2,552.6	36		1,276.3	26		921.8	5.6		198.5	4.20e+007		6.00e+005	
	15		9.6	64,938			39.0			19.5			14.1			3.0			1.03e+014		1.47e+012
5:45 PM		13			8.2	72		4,934.1	36		2,467.1	26		1,781.8	5.6		383.8	4.20e+007		6.00e+005	
	15		7.6	50,990			30.6			15.3			11.1			2.4			8.11e+013		1.16e+012
6:00 PM		2			1.6	72		944.6	36		472.3	26		341.1	5.6		73.5	4.20e+007		6.00e+005	
	15		1.2	8,203			4.9			2.5			1.8			0.4			1.30e+013		1.86e+011
6:15 PM		0			0.0	72		1.2	36		0.6	26		0.4	5.6		0.1	4.20e+007		6.00e+005	
	15		4.7	31,964			19.2			9.6			6.9			1.5			5.08e+013		7.26e+011
6:30 PM		9			6.1	72		3,683.9	36		1,842.0	26		1,330.3	5.6		287	4.20e+007		6.00e+005	
	15		8.7	58,833			35.3			17.7			12.8			2.7			9.35e+013		1.34e+012
6:45 PM		8			5.2	72		3,099.1	36		1,549.5	26		1,119.1	5.6		241.0	4.20e+007		6.00e+005	
	15		10.0	67,245			40.4			20.2			14.6			3.1			1.07e+014		1.53e+012
7:00 PM		12			7.8	72		4,653.7	36		2,326.9	26		1,680.5	5.6		362.0	4.20e+007		6.00e+005	
	15		13.0	87,281			52.4			26.2			18.9			4.1			1.39e+014		1.98e+012
7:15 PM		14			9.0	72		5,409.1	36		2,704.6	26		1,953.3	5.6		420.7	4.20e+007		6.00e+005	
	15		12.9	86,917			52.2			26.1			18.8			4.1			1.38e+014		1.97e+012
7:30 PM		12			7.7	72		4,611.7	36		2,305.8	26		1,665.3	5.6		358.7	4.20e+007		6.00e+005	
	15		11.6	78,349			47.0			23.5			17.0			3.7			1.25e+014		1.78e+012
7:45 PM		11			7.4	72		4,421.3	36		2,210.7	26		1,596.6	5.6		343.9	4.20e+007		6.00e+005	
	15		11.8	79,115			47.5			23.8			17.2			3.7			1.26e+014		1.80e+012
8:00 PM		12			7.3	72		4,700.0	36		2,350.0	26		1,697.2	5.6		365.6	4.20e+007		6.00e+005	
	15		12.8	36,005			51.6			25.8			18.6			4.0			1.37e+014		1.95e+012
8:15 PM		13			3.7	72		5,215.3	36		2,607.9	26		1,883.5	5.6		405.7	4.20e+007		6.00e+005	
	15		14.0	94,026			56.5			28.2			20.4			4.4			1.49e+014		2.14e+012
[illegible] PM		14			[illegible]	[illegible]		5,624.7	36		2,812.3	26		2,031.1	5.6		437.5	4.20e+007		6.00e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

CSO #5 p2/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
	15		14.9	100,557			60.4			30.2			21.8			4.7			1.60e+014		2.28e+012
8:45 PM		15			9.9	72		5,968.8	36		2,984.4	26		2,155.4	5.6		464.2	4.20e+007		6.00e+005	
	15		16.8	113,021			67.9			33.9			24.5			5.3			1.80e+014		2.57e+012
9:00 PM		18			11.8	72		7,061.6	36		3,530.8	26		2,550.0	5.6		549.2	4.20e+007		6.00e+005	
	15		19.0	127,760			79.9			77.8			40.5			4.8			1.62e+014		2.56e+012
9:15 PM		20			12.8	78		8,307.1	110		11,715.2	50		5,325.1	3.36		357.8	2.50e+007		4.60e+005	
	15		19.4	130,521			89.8			112.1			52.3			4.3			1.19e+014		2.47e+012
9:30 PM		19			12.3	87		8,917.4	96		9,839.9	46		4,714.9	4.48		459.2	2.30e+007		5.40e+005	
	15		17.7	119,271			86.5			93.5			45.8			4.7			8.58e+013		2.51e+012
9:45 PM		16			10.6	87		7,698.4	92		8,140.8	46		4,070.4	5.04		446.0	1.50e+007		5.70e+005	
	15		14.6	98,224			72.5			94.2			40.1			4.6			7.06e+013		2.27e+012
10:00 PM		13			8.2	90		6,191.7	138		9,493.9	52		3,577.4	6.16		423.8	2.30e+007		6.50e+005	
	15		12.8	86,344			64.8			99.4			37.4			4.4			7.52e+013		2.12e+012
10:15 PM		13			8.3	90		6,251.7	138		9,586.0	52		3,612.1	6.16		427.9	2.30e+007		6.50e+005	
	15		11.7	79,026			62.3			147.0			40.2			4.2			7.48e+013		1.53e+012
10:30 PM		11			6.8	99		5,650.8	308		17,580.3	70		3,995.5	6.44		367.6	2.70e+007		3.70e+005	
	15		9.6	64,677			53.4			166.1			37.8			3.5			6.61e+013		9.06e+011
10:45 PM		9			5.6	99		4,602.2	308		14,318.0	70		3,254.1	6.44		299.4	2.70e+007		3.70e+005	
	15		7.2	48,682			40.8			89.7			24.8			2.4			5.44e+013		8.02e+011
11:00 PM		6			3.8	102		3,209.6	134		4,216.6	52		1,636.3	5.32		167.4	3.20e+007		5.00e+005	
	15		6.2	41,943			35.7			46.9			18.2			1.9			5.08e+013		7.94e+011
11:15 PM		7			4.3	102		3,640.9	134		4,783.2	52		1,856.2	5.32		189.9	3.20e+007		5.00e+005	
	15		6.3	42,651			36.3			47.7			18.5			1.9			5.17e+013		8.07e+011
11:30 PM		6			3.9	102		3,325.3	134		4,368.5	52		1,695.3	5.32		173.4	3.20e+007		5.00e+005	
	15		10.0	67,026			57.0			74.9			29.1			3.0			8.12e+013		1.27e+012
11:45 PM		14			9.0	102		7,622.1	134		10,013.3	52		3,885.8	5.32		397.5	3.20e+007		5.00e+005	
	15		7.1	47,536			40.4			53.1			20.6			2.1			5.76e+013		9.00e+011
12:00 AM		0			0.2	102		142.1	134		186.6	52		72.4	5.32		7.4	3.20e+007		5.00e+005	
	15		0.1	875			0.7			1.0			0.4			0.0			1.06e+012		1.66e+010
12:15 AM		0			0.0	102		0.9	134		1.1	52		0.4	5.32		0.0	3.20e+007		5.00e+005	
	15		1.1	7,130			6.0			4.7			2.1			0.3			7.56e+012		1.01e+011
12:30 AM		2			1.4	99		1,129.5	24		273.8	18		205.4	5.32		60.7	2.40e+007		2.50e+005	
	15		5.8	39,255			32.4			7.9			5.9			1.7			3.57e+013		3.71e+011
12:45 AM		10			6.2	99		5,093.5	24		1,234.8	18		926.1	5.32		273.7	2.40e+007		2.50e+005	
	15		14.4	96,766			79.9			19.4			14.5			4.3			8.79e+013		9.16e+011
1:00 AM		19			12.4	99		10,246.4	24		2,484.0	18		1,863.0	5.32		550.6	2.40e+007		2.50e+005	
	15		21.3	143,698			118.6			59.9			45.5			6.5			1.17e+014		1.58e+012
1:15 AM		23			15.2	99		12,533.5	76		9,621.7	58		7,342.9	5.6		709.0	1.90e+007		3.30e+005	
	15		22.6	152,083			125.6			96.4			73.6			7.1			1.09e+014		1.90e+012
1:30 AM		22			14.0	99		11,575.8	76		8,886.4	58		6,781.8	5.6		654.8	1.90e+007		3.30e+005	
	15		20.1	135,208			111.6			85.7			65.4			6.3			9.72e+013		1.69e+012
1:45 AM		18			11.9	99		9,858.4	76		7,568.0	58		5,775.6	5.6		557.6	1.90e+007		3.30e+005	
	15		19.3	129,844			107.2			82.3			62.8			6.1			9.34e+013		1.62e+012
2:00 AM		20			13.0	99		10,725.3	76		8,233.6	58		6,283.5	5.6		606.7	1.90e+007		3.30e+005	
	15		24.4	164,219			135.6			104.1			79.4			7.7			1.18e+014		2.05e+012
2:15 AM		29			13.5	99		15,307.7	76		11,751.4	58		8,968.2	5.6		865.9	1.90e+007		3.30e+005	
	15		28.0	188,231			155.5			119.3			91.1			3.8			1.35e+014		2.35e+012
2:30 AM		27			17.6	99		14,539.9	76		11,161.9	58		8,518.3	5.6		822.5	1.90e+007		3.30e+005	
	15		27.8	187,283			128.7			179.4			101.4			3.7			3.15e+014		2.51e+012

CITY OF PORTSMOUTH
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WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.
2:45 AM		28			18.3	66		10,078.6	154		23,516.6	72		10,994.8	5.6		855.2	7.00e+007		3.80e+005	
	15		29.4	198,177			109.1			254.5			119.0			9.3			5.25e+014		2.85e+012
3:00 AM		31			19.7	66		10,865.7	154		25,353.3	72		11,853.5	5.6		921.9	7.00e+007		3.80e+005	
	15		29.9	201,146			110.7			258.3			120.8			9.4			5.33e+014		2.89e+012
3:15 AM		29			18.9	66		10,392.3	154		24,248.7	72		11,337.1	5.6		881.8	7.00e+007		3.80e+005	
	15		27.7	186,198			102.5			239.1			111.8			8.7			4.93e+014		2.68e+012
3:30 AM		26			16.9	66		9,285.9	154		21,667.2	72		10,130.1	5.6		787.9	7.00e+007		3.80e+005	
	15		25.3	170,260			93.7			218.7			102.2			8.0			4.51e+014		2.45e+012
3:45 AM		24			15.8	66		8,708.0	154		20,318.6	72		9,499.6	5.6		738.9	7.00e+007		3.80e+005	
	15		24.3	163,385			89.9			209.8			98.1			7.6			4.33e+014		2.35e+012
4:00 AM		24			15.6	66		8,559.3	154		19,971.8	72		9,337.5	5.6		726.2	7.00e+007		3.80e+005	
	15		24.1	162,552			89.5			208.8			97.6			7.6			4.31e+014		2.34e+012
4:15 AM		24			15.7	66		8,619.9	154		20,113.1	72		9,403.5	5.6		731.4	7.00e+007		3.80e+005	
	15		24.6	165,417			91.1			212.5			99.3			7.7			4.38e+014		2.38e+012
4:30 AM		25			16.1	66		8,862.1	154		20,678.2	72		9,667.7	5.6		751.9	7.00e+007		3.80e+005	
	15		25.7	172,865			95.2			222.0			103.8			8.1			4.58e+014		2.49e+012
4:45 AM		26			17.1	66		9,407.0	154		21,949.7	72		10,262.2	5.6		798.2	7.00e+007		3.80e+005	
	15		26.9	180,990			99.6			232.5			108.7			8.5			4.80e+014		2.60e+012
5:00 AM		27			17.7	66		9,720.8	154		22,681.8	72		10,604.5	5.6		824.8	7.00e+007		3.80e+005	
	15		28.4	191,198			105.2			245.6			114.8			8.9			5.07e+014		2.75e+012
5:15 AM		29			19.1	66		10,485.9	154		24,467.1	72		11,439.1	5.6		889.7	7.00e+007		3.80e+005	
	15		30.4	204,740			112.7			263.0			122.9			9.6			5.43e+014		2.95e+012
5:30 AM		31			20.3	66		11,151.9	154		26,021.1	72		12,165.7	5.6		946.2	7.00e+007		3.80e+005	
	15		30.7	206,875			113.9			265.7			124.2			9.7			5.48e+014		2.98e+012
5:45 AM		30			19.5	66		10,711.6	154		24,993.6	72		11,685.3	5.6		908.9	7.00e+007		3.80e+005	
	15		33.1	222,656			122.6			286.0			133.7			10.4			5.90e+014		3.20e+012
6:00 AM		36			23.3	66		12,819.7	154		29,912.7	72		13,985.2	5.6		1,087.7	7.00e+007		3.80e+005	
	15		33.6	226,510			124.7			290.9			136.0			10.6			6.00e+014		3.26e+012
6:15 AM		31			20.2	66		11,118.9	154		25,944.1	72		12,129.7	5.6		943.4	7.00e+007		3.80e+005	
	15		28.1	189,427			104.3			243.3			113.7			8.8			5.02e+014		2.72e+012
6:30 AM		25			16.2	66		8,900.6	154		20,768.1	72		9,709.8	5.6		755.2	7.00e+007		3.80e+005	
	15		26.0	175,156			96.4			225.0			105.2			8.2			4.64e+014		2.52e+012
6:45 AM		27			17.5	66		9,610.7	154		22,424.9	72		10,484.4	5.6		815.5	7.00e+007		3.80e+005	
	15		33.1	223,073			122.8			286.5			134.0			10.4			5.91e+014		3.21e+012
7:00 AM		39			25.4	66		13,964.7	154		32,584.2	72		15,234.2	5.6		1,184.9	7.00e+007		3.80e+005	
	15		38.9	261,823			144.1			336.3			157.2			12.2			6.94e+014		3.77e+012
7:15 AM		39			24.9	66		13,706.0	154		31,980.6	72		14,952.0	5.6		1,162.9	7.00e+007		3.80e+005	
	15		37.6	253,177			139.4			325.2			152.0			11.8			6.71e+014		3.64e+012
7:30 AM		37			23.7	66		13,050.9	154		30,452.2	72		14,237.4	5.6		1,107.4	7.00e+007		3.80e+005	
	15		35.6	239,635			131.9			307.8			143.9			11.2			6.35e+014		3.45e+012
7:45 AM		35			22.3	66		12,274.8	154		28,641.2	72		13,390.7	5.6		1,041.5	7.00e+007		3.80e+005	
	15		33.5	225,781			124.3			290.0			135.6			10.5			5.98e+014		3.25e+012
8:00 AM		33			21.1	66		11,586.8	154		27,035.8	72		12,640.1	5.6		983.1	7.00e+007		3.80e+005	
	15		31.4	211,563			116.5			271.7			127.0			9.9			5.61e+014		3.04e+012
8:15 AM		30			19.6	66		10,772.1	154		25,134.9	72		11,751.4	5.6		914.0	7.00e+007		3.80e+005	
	15		29.5	198,542			109.3			255.0			119.2			9.3			5.26e+014		2.86e+012
8:30 AM		29			18.6	66		10,210.7	154		23,824.9	72		11,138.9	5.6		866.4	7.00e+007		3.80e+005	
	15		27.5	185,104			101.9			237.7			111.2			8.6			4.90e+014		2.66e+012
8:45 AM		26			17.0	66		9,352.0	154		21,821.5	72		10,202.2	5.6		793.5	7.00e+007		3.80e+005	

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CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL	OVERFLOW Q				BOD5			TSS			VSS			TKN			TOTAL COLIFORM		FECAL COLIFORM	
	(min)	(cfs)	(avg.cfs)	(gal.)	(mgd)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(col./100mls)	load (cols.)	(col./100mls)	load (cols.
	15		26.0	174,948			96.3			224.7			105.1			8.2			4.64e+014		2.52e+012
9:00 AM		26			16.6	66		9,137.3	154		21,320.4	72		9,968.0	5.6		775.3	7.00e+007		3.80e+005	
	15		24.5	164,844			90.7			211.7			99.0			7.7			4.37e+014		2.37e+012
9:15 AM		23			15.1	66		8,284.1	154		19,329.6	72		9,037.2	5.6		702.9	7.00e+007		3.80e+005	
	15		22.8	153,542			84.5			197.2			92.2			7.2			4.07e+014		2.21e+012
9:30 AM		22			14.4	66		7,942.8	154		18,533.3	72		8,664.9	5.6		673.9	7.00e+007		3.80e+005	
	15		21.2	142,656			78.5			183.2			85.7			6.7			3.78e+014		2.05e+012
9:45 AM		20			13.0	66		7,133.7	154		16,645.3	72		7,782.2	5.6		605.3	7.00e+007		3.80e+005	
	15		20.2	135,677			74.7			174.3			81.5			6.3			3.60e+014		1.95e+012
10:00 AM		20			13.1	66		7,205.3	154		16,812.3	72		7,860.3	5.6		611.4	7.00e+007		3.80e+005	
	15		19.7	132,448			72.9			170.1			79.5			6.2			3.51e+014		1.91e+012
10:15 AM		19			12.3	66		6,792.4	154		15,849.0	72		7,409.9	5.6		576.3	7.00e+007		3.80e+005	
	15		17.9	120,312			66.2			154.5			72.2			5.6			3.19e+014		1.73e+012
10:30 AM		17			10.8	66		5,922.7	154		13,819.7	72		6,461.2	5.6		502.5	7.00e+007		3.80e+005	
	15		17.0	114,375			63.0			146.9			68.7			5.3			3.03e+014		1.65e+012
10:45 AM		17			11.2	66		6,164.9	154		14,384.8	72		6,725.4	5.6		523.1	7.00e+007		3.80e+005	
	15		17.1	115,208			63.4			148.0			69.2			5.4			3.05e+014		1.66e+012
11:00 AM		17			10.9	66		6,010.8	154		14,025.2	72		6,557.2	5.6		510.0	7.00e+007		3.80e+005	
	15		16.6	111,667			61.5			143.4			67.1			5.2			2.96e+014		1.61e+012
11:15 AM		16			10.5	66		5,790.6	154		13,511.5	72		6,317.0	5.6		491.3	7.00e+007		3.80e+005	
	15		16.4	110,365			60.7			141.7			66.3			5.2			2.92e+014		1.59e+012
11:30 AM		17			10.7	66		5,873.2	154		13,704.1	72		6,407.1	5.6		498.3	7.00e+007		3.80e+005	
	15		16.5	111,354			61.3			143.0			66.9			5.2			2.95e+014		1.60e+012
11:45 AM		17			10.7	66		5,895.2	154		13,755.5	72		6,431.1	5.6		500.2	7.00e+007		3.80e+005	
	15		16.4	110,417			60.8			141.8			66.3			5.2			2.93e+014		1.59e+012
12:00 PM		16			10.5	66		5,774.1	154		13,472.9	72		6,299.0	5.6		489.9	7.00e+007		3.80e+005	
	15		16.3	109,948			60.5			141.2			66.0			5.1			2.91e+014		1.58e+012
12:15 PM		16			10.6	66		5,845.7	154		13,639.9	72		6,377.1	5.6		496.0	7.00e+007		3.80e+005	
	15		16.3	109,427			60.2			140.5			65.7			5.1			2.90e+014		1.57e+012
12:30 PM		16			10.4	66		5,719.1	154		13,344.5	72		6,239.0	5.6		485.3	7.00e+007		3.80e+005	
	15		15.8	106,083			58.4			136.2			63.7			5.0			2.81e+014		1.53e+012
12:45 PM		15			10.0	66		5,492.3	154		12,815.3	72		5,991.6	5.6		466.0	7.00e+007		3.80e+005	
	15		15.4	103,839			57.2			133.4			62.4			4.8			2.75e+014		1.49e+012
1:00 PM		15			10.0	66		5,481.8	154		12,790.9	72		5,980.2	5.6		465.1	7.00e+007		3.80e+005	
	15		15.3	102,906			56.6			132.2			61.8			4.8			2.73e+014		1.48e+012
1:15 PM		15			9.8	66		5,393.8	154		12,585.4	72		5,884.1	5.6		457.7	7.00e+007		3.80e+005	
	15		14.7	98,708			54.3			126.8			59.3			4.6			2.62e+014		1.42e+012
1:30 PM		14			9.2	66		5,038.2	154		11,755.7	72		5,496.2	5.6		427.5	7.00e+007		3.80e+005	
	15		14.4	97,057			53.4			124.7			58.3			4.5			2.57e+014		1.40e+012
1:45 PM		15			9.5	66		5,219.3	154		12,178.3	72		5,693.8	5.6		442.8	7.00e+007		3.80e+005	
	15		14.5	97,870			53.9			125.7			58.8			4.6			2.59e+014		1.41e+012
2:00 PM		14			9.3	66		5,124.0	154		11,956.1	72		5,589.9	5.6		434.8	7.00e+007		3.80e+005	
	15		14.4	96,641			53.2			124.1			58.0			4.5			2.56e+014		1.39e+012
2:15 PM		14			9.2	66		5,089.4	154		11,875.2	72		5,552.0	5.6		431.8	7.00e+007		3.80e+005	
	15		14.3	96,052			52.9			123.4			57.7			4.5			2.55e+014		1.38e+012
2:30 PM		14			9.2	66		5,061.8	154		11,811.0	72		5,522.0	5.6		429.5	7.00e+007		3.80e+005	
	15		14.1	94,507			52.2			121.3			56.9			4.4			2.51e+014		1.36e+012
2:45 PM		14			9.0	66		4,957.8	154		11,568.2	72		5,408.5	5.6		420.7	7.00e+007		3.80e+005	
	15		10.9	73,130			40.3			93.9			43.9			3.4			1.94e+014		1.05e+012

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CSO #5 p5/9

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (col
3:00 PM		8			5.0	66		2,770.9	154		6,465.5	72		3,022.8	5.6		235.1	7.00e+007		3.80e+005	
	15		8.9	59,917			33.0			77.0			36.0			2.8			1.59e+014		8.62e+011
3:15 PM		10			6.5	66		3,561.3	154		8,309.8	72		3,885.1	5.6		302.2	7.00e+007		3.80e+005	
	15		10.0	67,297			37.0			86.4			40.4			3.1			1.78e+014		9.68e+011
3:30 PM		10			6.5	66		3,550.9	154		8,285.4	72		3,873.7	5.6		301.3	7.00e+007		3.80e+005	
	15		10.9	73,688			40.6			94.6			44.2			3.4			1.95e+014		1.06e+012
3:45 PM		12			7.7	66		4,236.7	154		9,885.7	72		4,621.9	5.6		359.5	7.00e+007		3.80e+005	
	15		12.9	86,516			47.6			111.1			52.0			4.0			2.29e+014		1.24e+012
4:00 PM		14			8.9	66		4,906.6	154		11,448.8	72		5,352.7	5.6		416.3	7.00e+007		3.80e+005	
	15		13.5	90,818			50.0			116.6			54.5			4.2			2.41e+014		1.31e+012
4:15 PM		13			8.5	66		4,691.4	154		10,946.6	72		5,117.9	5.6		398.1	7.00e+007		3.80e+005	
	15		13.6	91,589			50.4			117.6			55.0			4.3			2.43e+014		1.32e+012
4:30 PM		14			9.1	66		4,988.1	154		11,638.9	72		5,441.5	5.6		423.2	7.00e+007		3.80e+005	
	30		13.0	175,490			96.6			225.4			105.4			8.2			4.65e+014		2.52e+012
5:00 PM		12			7.8	66		4,285.2	154		9,998.7	72		4,674.7	5.6		363.6	7.00e+007		3.80e+005	
	15		12.1	81,682			45.0			104.9			49.0			3.8			2.16e+014		1.17e+012
5:15 PM		12			7.9	66		4,347.4	154		10,143.9	72		4,742.6	5.6		368.9	7.00e+007		3.80e+005	
	15		12.8	85,911			47.3			110.3			51.6			4.0			2.28e+014		1.24e+012
5:30 PM		13			8.6	66		4,732.1	154		11,041.6	72		5,162.3	5.6		401.5	7.00e+007		3.80e+005	
	15		12.8	86,344			47.5			110.9			51.8			4.0			2.29e+014		1.24e+012
5:45 PM		12			8.0	66		4,393.1	154		10,250.5	72		4,792.4	5.6		372.7	7.00e+007		3.80e+005	
	15		12.5	84,458			46.5			108.5			50.7			3.9			2.24e+014		1.21e+012
6:00 PM		13			8.2	66		4,532.9	154		10,576.7	72		4,945.0	5.6		384.6	7.00e+007		3.80e+005	
	15		12.0	80,625			44.4			103.6			48.4			3.8			2.14e+014		1.16e+012
6:15 PM		11			7.2	66		3,987.9	154		9,305.2	72		4,350.5	5.6		338.4	7.00e+007		3.80e+005	
	15		11.1	75,042			41.3			96.4			45.1			3.5			1.99e+014		1.08e+012
6:30 PM		11			7.2	66		3,942.8	154		9,199.9	72		4,301.2	5.6		334.5	7.00e+007		3.80e+005	
	15		11.2	75,063			41.3			96.4			45.1			3.5			1.99e+014		1.08e+012
6:45 PM		11			7.2	66		3,990.1	154		9,310.3	72		4,352.9	5.6		338.6	7.00e+007		3.80e+005	
	15		11.0	74,250			40.9			95.4			44.6			3.5			1.97e+014		1.07e+012
7:00 PM		11			7.0	66		3,856.9	154		8,999.5	72		4,207.6	5.6		327.3	7.00e+007		3.80e+005	
	15		10.4	70,313			38.7			90.3			42.2			3.3			1.86e+014		1.01e+012
7:15 PM		10			6.5	66		3,574.0	154		8,339.3	72		3,898.9	5.6		303.2	7.00e+007		3.80e+005	
	15		9.6	64,870			35.7			83.3			39.0			3.0			1.72e+014		9.33e+011
7:30 PM		9			6.0	66		3,281.7	154		7,657.4	72		3,580.1	5.6		278.4	7.00e+007		3.80e+005	
	15		10.0	67,021			36.9			86.1			40.2			3.1			1.78e+014		9.64e+011
7:45 PM		11			6.9	66		3,801.3	154		8,869.8	72		4,146.9	5.6		322.5	7.00e+007		3.80e+005	
	15		10.2	68,583			37.8			88.1			41.2			3.2			1.82e+014		9.87e+011
8:00 PM		10			6.3	66		3,446.9	154		8,042.7	72		3,760.2	5.6		292.5	7.00e+007		3.80e+005	
	15		9.3	62,448			34.4			80.2			37.5			2.9			1.65e+014		8.98e+011
8:15 PM		9			5.7	66		3,152.9	154		7,356.8	72		3,439.5	5.6		267.5	7.00e+007		3.80e+005	
	15		8.8	58,927			32.4			75.7			35.4			2.8			1.56e+014		8.48e+011
8:30 PM		9			5.6	66		3,074.8	154		7,174.4	72		3,354.3	5.6		260.9	7.00e+007		3.80e+005	
	15		8.3	56,115			30.9			72.1			33.7			2.6			1.49e+014		8.07e+011
8:45 PM		8			5.2	66		2,855.7	154		6,663.3	72		3,115.3	5.6		242.3	7.00e+007		3.80e+005	
	15		8.4	56,750			31.2			72.9			34.1			2.7			1.50e+014		8.16e+011
9:00 PM		9			5.7	66		3,141.9	154		7,331.1	72		3,427.5	5.6		266.6	7.00e+007		3.80e+005	
	15		8.8	59,344			32.7			76.2			35.6			2.9			1.57e+014		8.54e+011
9:15 PM		9			5.7	66		3,129.8	154		7,302.9	72		3,414.3	5.6		265.6	7.00e+007		3.80e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

CSO#5 p6/9

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
	15		8.6	58,141			32.0			74.7			34.9			2.7			1.54e+014		8.36e+011
9:30 PM		8			5.5	66		3,014.8	154		7,034.4	72		3,288.8	5.6		255.8	7.00e+007		3.80e+005	
	15		8.9	60,042			33.0			77.1			36.1			2.8			1.59e+014		8.64e+011
9:45 PM		9			6.1	66		3,330.7	154		7,771.7	72		3,633.5	5.6		282.6	7.00e+007		3.80e+005	
	15		9.3	62,281			34.3			80.0			37.4			2.9			1.65e+014		8.96e+011
10:00 PM		9			5.9	66		3,251.4	154		7,586.7	72		3,547.0	5.6		275.9	7.00e+007		3.80e+005	
	15		10.0	67,609			37.2			86.8			40.6			3.2			1.79e+014		9.73e+011
10:15 PM		11			7.1	66		3,893.8	154		9,085.6	72		4,247.8	5.6		330.4	7.00e+007		3.80e+005	
	15		14.0	93,979			51.7			120.7			56.4			4.4			2.49e+014		1.35e+012
10:30 PM		17			11.0	66		6,038.3	154		14,089.4	72		6,587.3	5.6		512.3	7.00e+007		3.80e+005	
	15		17.3	116,198			64.0			149.2			69.8			5.4			3.08e+014		1.67e+012
10:45 PM		18			11.3	66		6,242.0	154		14,564.6	72		6,809.4	5.6		529.6	7.00e+007		3.80e+005	
	15		17.8	119,583			65.8			153.6			71.8			5.6			3.17e+014		1.72e+012
11:00 PM		18			11.6	66		6,396.1	154		14,924.3	72		6,977.6	5.6		542.7	7.00e+007		3.80e+005	
	15		17.5	118,125			65.0			151.7			70.9			5.5			3.13e+014		1.70e+012
11:15 PM		17			11.1	66		6,087.9	154		14,205.0	72		6,641.3	5.6		516.5	7.00e+007		3.80e+005	
	15		15.1	101,635			55.9			130.5			61.0			4.7			2.69e+014		1.46e+012
11:30 PM		13			8.5	66		4,653.4	154		10,858.0	72		5,076.5	5.6		394.8	7.00e+007		3.80e+005	
	15		14.2	95,750			52.7			123.0			57.5			4.5			2.54e+014		1.38e+012
11:45 PM		15			9.9	66		5,465.9	154		12,753.7	72		5,962.8	5.6		463.8	7.00e+007		3.80e+005	
	15		15.8	106,406			58.6			136.7			63.9			5.0			2.82e+014		1.53e+012
12:00 AM		16			10.5	66		5,779.6	154		13,485.8	72		6,305.0	5.6		490.4	7.00e+007		3.80e+005	
	15		16.5	110,885			61.0			142.4			66.6			5.2			2.94e+014		1.60e+012
12:15 AM		17			10.8	66		5,939.2	154		13,858.2	72		6,479.2	5.6		503.9	7.00e+007		3.80e+005	
	15		16.6	111,510			61.4			143.2			67.0			5.2			2.95e+014		1.60e+012
12:30 AM		16			10.6	66		5,845.7	154		13,639.9	72		6,377.1	5.6		496.0	7.00e+007		3.80e+005	
	15		16.1	108,073			59.5			138.8			64.9			5.0			2.86e+014		1.55e+012
12:45 AM		16			10.1	66		5,576.0	154		13,010.6	72		6,082.9	5.6		473.1	7.00e+007		3.80e+005	
	15		15.5	104,438			57.5			134.1			62.7			4.9			2.77e+014		1.50e+012
1:00 AM		15			9.9	66		5,461.5	154		12,743.4	72		5,958.0	5.6		463.4	7.00e+007		3.80e+005	
	15		15.1	101,708			56.0			130.6			61.1			4.8			2.70e+014		1.46e+012
1:15 AM		15			9.6	66		5,287.5	154		12,337.6	72		5,768.2	5.6		448.6	7.00e+007		3.80e+005	
	15		15.0	100,771			55.5			129.4			60.5			4.7			2.67e+014		1.45e+012
1:30 AM		15			9.7	66		5,362.4	154		12,512.2	72		5,849.9	5.6		455.0	7.00e+007		3.80e+005	
	15		14.6	98,234			54.1			126.2			59.0			4.6			2.60e+014		1.41e+012
1:45 AM		14			9.1	66		5,019.5	154		11,712.1	72		5,475.8	5.6		425.9	7.00e+007		3.80e+005	
	15		14.5	97,557			53.7			125.3			58.6			4.6			2.59e+014		1.40e+012
2:00 AM		15			9.6	66		5,290.8	154		12,345.3	72		5,771.8	5.6		448.9	7.00e+007		3.80e+005	
	15		14.7	99,125			54.6			127.3			59.5			4.6			2.63e+014		1.43e+012
2:15 AM		15			9.4	66		5,185.1	154		12,098.7	72		5,656.5	5.6		440.0	7.00e+007		3.80e+005	
	15		14.7	98,927			54.5			127.1			59.4			4.6			2.62e+014		1.42e+012
2:30 AM		15			9.6	66		5,269.9	154		12,296.5	72		5,749.0	5.6		447.1	7.00e+007		3.80e+005	
	15		14.7	98,833			54.4			126.9			59.3			4.6			2.62e+014		1.42e+012
2:45 AM		15			9.4	66		5,175.2	154		12,075.6	72		5,645.7	5.6		439.1	7.00e+007		3.80e+005	
	15		14.4	97,120			53.5			124.7			58.3			4.5			2.57e+014		1.40e+012
3:00 AM		14			9.2	66		5,088.8	154		11,373.9	72		5,551.4	5.6		431.3	7.00e+007		3.80e+005	
	15		14.1	94,502			52.2			121.8			56.9			4.4			2.51e+014		1.36e+012
3:15 AM		14			9.0	66		4,930.3	154		11,504.0	72		5,378.5	5.6		418.3	7.00e+007		3.80e+005	
	15		14.0	94,443			52.0			121.3			56.7			4.4			2.50e+014		1.36e+012

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO #5 p7/9

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	(mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
3:30 AM		14			9.2	66		5,050.8	154		11,785.3	72		5,510.0	5.6		428.6	7.00e+007		3.80e+005	
	15		14.2	95,667			52.7			122.9			57.4			4.5			2.53e+014		1.38e+012
3:45 AM		14			9.2	66		5,059.6	154		11,805.8	72		5,519.6	5.6		429.3	7.00e+007		3.80e+005	
	15		14.2	95,458			52.5			122.6			57.3			4.5			2.53e+014		1.37e+012
4:00 AM		14			9.1	66		5,028.8	154		11,733.9	72		5,486.0	5.6		426.7	7.00e+007		3.80e+005	
	15		14.0	94,354			51.9			121.2			56.7			4.4			2.50e+014		1.36e+012
4:15 AM		14			9.0	66		4,943.0	154		11,533.6	72		5,392.3	5.6		419.4	7.00e+007		3.80e+005	
	15		13.6	91,714			50.5			117.8			55.1			4.3			2.43e+014		1.32e+012
4:30 AM		13			8.6	66		4,749.7	154		11,082.7	72		5,181.5	5.6		403.0	7.00e+007		3.80e+005	
	15		13.2	88,849			48.9			114.1			53.4			4.1			2.35e+014		1.28e+012
4:45 AM		13			8.4	66		4,640.2	154		10,827.2	72		5,062.0	5.6		393.7	7.00e+007		3.80e+005	
	15		13.2	88,672			48.8			113.9			53.2			4.1			2.35e+014		1.28e+012
5:00 AM		13			8.6	66		4,731.0	154		11,039.1	72		5,161.1	5.6		401.4	7.00e+007		3.80e+005	
	15		13.6	91,271			50.2			117.2			54.8			4.3			2.42e+014		1.31e+012
5:15 AM		14			8.9	66		4,914.9	154		11,468.1	72		5,361.7	5.6		417.0	7.00e+007		3.80e+005	
	15		13.9	93,333			51.4			119.9			56.0			4.4			2.47e+014		1.34e+012
5:30 AM		14			9.0	66		4,949.0	154		11,547.7	72		5,398.9	5.6		419.9	7.00e+007		3.80e+005	
	15		13.7	92,318			50.8			118.6			55.4			4.3			2.45e+014		1.33e+012
5:45 AM		14			8.7	66		4,807.5	154		11,217.6	72		5,244.6	5.6		407.9	7.00e+007		3.80e+005	
	15		13.3	89,432			49.2			114.9			53.7			4.2			2.37e+014		1.29e+012
6:00 AM		13			8.4	66		4,644.1	154		10,836.1	72		5,066.2	5.6		394.0	7.00e+007		3.80e+005	
	15		13.3	89,526			49.3			115.0			53.8			4.2			2.37e+014		1.29e+012
6:15 AM		14			8.8	66		4,817.5	154		11,240.7	72		5,255.4	5.6		408.8	7.00e+007		3.80e+005	
	15		13.2	88,969			49.0			114.3			53.4			4.2			2.36e+014		1.28e+012
6:30 AM		13			8.3	66		4,585.2	154		10,698.7	72		5,002.0	5.6		389.0	7.00e+007		3.80e+005	
	15		13.2	89,193			49.1			114.6			53.6			4.2			2.36e+014		1.28e+012
6:45 AM		14			8.8	66		4,841.1	154		11,295.9	72		5,281.2	5.6		410.8	7.00e+007		3.80e+005	
	15		13.3	89,635			49.3			115.1			53.8			4.2			2.38e+014		1.29e+012
7:00 AM		13			8.4	66		4,632.0	154		10,807.9	72		5,053.0	5.6		393.0	7.00e+007		3.80e+005	
	15		13.2	88,542			48.7			113.7			53.2			4.1			2.35e+014		1.27e+012
7:15 AM		13			8.6	66		4,725.5	154		11,026.2	72		5,155.1	5.6		401.0	7.00e+007		3.80e+005	
	15		13.2	89,099			49.0			114.4			53.5			4.2			2.36e+014		1.28e+012
7:30 AM		13			8.5	66		4,690.8	154		10,945.3	72		5,117.3	5.6		398.0	7.00e+007		3.80e+005	
	15		13.3	89,594			49.3			115.1			53.8			4.2			2.37e+014		1.29e+012
7:45 AM		13			8.7	66		4,777.8	154		11,148.2	72		5,212.2	5.6		405.4	7.00e+007		3.80e+005	
	15		13.2	88,688			48.8			113.9			53.3			4.1			2.35e+014		1.28e+012
8:00 AM		13			8.3	66		4,595.1	154		10,721.8	72		5,012.8	5.6		389.9	7.00e+007		3.80e+005	
	15		12.8	86,453			47.6			111.0			51.9			4.0			2.29e+014		1.24e+012
8:15 AM		13			8.3	66		4,541.7	154		10,597.3	72		4,954.6	5.6		385.4	7.00e+007		3.80e+005	
	15		13.2	88,828			48.9			114.1			53.3			4.1			2.35e+014		1.28e+012
8:30 AM		14			8.8	66		4,846.1	154		11,307.5	72		5,286.6	5.6		411.2	7.00e+007		3.80e+005	
	15		13.5	90,943			50.1			116.8			54.6			4.2			2.41e+014		1.31e+012
8:45 AM		13			8.7	66		4,765.2	154		11,118.7	72		5,198.4	5.6		404.3	7.00e+007		3.80e+005	
	15		12.9	87,099			47.9			111.9			52.3			4.1			2.31e+014		1.25e+012
9:00 AM		12			8.1	66		4,439.8	154		10,359.6	72		4,843.5	5.6		376.7	7.00e+007		3.80e+005	
	15		12.9	86,776			47.8			111.5			52.1			4.1			2.30e+014		1.25e+012
9:15 AM		13			8.6	66		4,731.0	154		11,039.1	72		5,161.1	5.6		401.4	7.00e+007		3.80e+005	
	15		12.9	86,633			47.7			111.3			52.1			4.0			2.30e+014		1.25e+012
9:30 AM		12			8.1	66		4,431.0	154		10,339.1	72		4,833.9	5.6		376.0	7.00e+007		3.80e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO #5, 8/9

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL	OVERFLOW Q				BOD5			TSS			VSS			TKN			TOTAL COLIFORM		FECAL COLIFORM	
	(min)	(cfs)	(avg.cfs)	(gal.)	(mgd)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(mg/l)	(lbs)	(lbs/day)	(col./100mls)	load (cols.)	(col./100mls)	load (cols.)
	15		11.9	80,292			44.2			103.1			48.2			3.7			2.13e+014		1.15e+012
9:45 AM		11			7.4	66		4,054.5	154		9,460.6	72		4,423.1	5.6		344.0	7.00e+007		3.80e+005	
	15		11.6	78,156			43.0			100.4			46.9			3.7			2.07e+014		1.12e+012
10:00 AM		12			7.6	66		4,205.4	154		9,812.5	72		4,587.7	5.6		356.8	7.00e+007		3.80e+005	
	15		11.9	80,271			44.2			103.1			48.2			3.7			2.13e+014		1.15e+012
10:15 AM		12			7.8	66		4,278.0	154		9,982.0	72		4,666.9	5.6		363.0	7.00e+007		3.80e+005	
	15		11.9	80,229			44.2			103.0			48.2			3.7			2.13e+014		1.15e+012
10:30 AM		12			7.6	66		4,201.0	154		9,802.2	72		4,582.9	5.6		356.4	7.00e+007		3.80e+005	
	15		11.5	77,448			42.6			99.5			46.5			3.6			2.05e+014		1.11e+012
10:45 AM		11			7.2	66		3,984.1	154		9,296.2	72		4,346.3	5.6		338.0	7.00e+007		3.80e+005	
	15		11.9	80,052			44.1			102.8			48.1			3.7			2.12e+014		1.15e+012
11:00 AM		13			8.1	66		4,476.2	154		10,444.4	72		4,883.1	5.6		379.8	7.00e+007		3.80e+005	
	15		13.0	87,323			48.1			112.2			52.4			4.1			2.31e+014		1.26e+012
11:15 AM		13			8.6	66		4,752.5	154		11,089.2	72		5,184.5	5.6		403.2	7.00e+007		3.80e+005	
	15		13.5	91,026			50.1			116.9			54.7			4.3			2.41e+014		1.31e+012
11:30 AM		14			8.8	66		4,867.5	154		11,357.6	72		5,310.0	5.6		413.0	7.00e+007		3.80e+005	
	15		14.1	94,823			52.2			121.8			56.9			4.4			2.51e+014		1.36e+012
11:45 AM		14			9.4	66		5,153.8	154		12,025.5	72		5,622.3	5.6		437.3	7.00e+007		3.80e+005	
	15		14.3	96,010			52.8			123.3			57.7			4.5			2.54e+014		1.38e+012
12:00 PM		14			9.1	66		4,993.0	154		11,650.4	72		5,447.0	5.6		423.7	7.00e+007		3.80e+005	
	15		14.1	95,161			52.4			122.2			57.1			4.4			2.52e+014		1.37e+012
12:15 PM		14			9.2	66		5,064.0	154		11,816.1	72		5,524.4	5.6		429.7	7.00e+007		3.80e+005	
	15		13.9	93,849			51.7			120.5			56.4			4.4			2.49e+014		1.35e+012
12:30 PM		14			8.8	66		4,854.3	154		11,326.8	72		5,295.6	5.6		411.9	7.00e+007		3.80e+005	
	15		13.3	89,510			49.3			115.0			53.7			4.2			2.37e+014		1.29e+012
12:45 PM		13			8.4	66		4,605.5	154		10,746.2	72		5,024.2	5.6		390.8	7.00e+007		3.80e+005	
	15		13.2	88,875			48.9			114.1			53.4			4.2			2.36e+014		1.28e+012
1:00 PM		13			8.7	66		4,787.2	154		11,170.1	72		5,222.4	5.6		406.2	7.00e+007		3.80e+005	
	15		13.6	91,292			50.3			117.3			54.8			4.3			2.42e+014		1.31e+012
1:15 PM		14			8.8	66		4,860.9	154		11,342.2	72		5,302.8	5.6		412.4	7.00e+007		3.80e+005	
	15		13.8	93,094			51.2			119.6			55.9			4.3			2.47e+014		1.34e+012
1:30 PM		14			9.0	66		4,977.6	154		11,614.5	72		5,430.1	5.6		422.3	7.00e+007		3.80e+005	
	15		13.9	93,323			51.4			119.9			56.0			4.4			2.47e+014		1.34e+012
1:45 PM		14			8.9	66		4,885.2	154		11,398.7	72		5,329.3	5.6		414.5	7.00e+007		3.80e+005	
	15		13.2	89,063			49.0			114.4			53.5			4.2			2.36e+014		1.28e+012
2:00 PM		13			8.2	66		4,527.4	154		10,563.9	72		4,938.9	5.6		384.1	7.00e+007		3.80e+005	
	15		13.0	87,818			48.3			112.8			52.7			4.1			2.33e+014		1.26e+012
2:15 PM		13			8.6	66		4,753.6	154		11,091.7	72		5,185.7	5.6		403.3	7.00e+007		3.80e+005	
	15		12.1	81,729			45.0			105.0			49.1			3.8			2.17e+014		1.18e+012
2:30 PM		11			7.1	66		3,883.9	154		9,062.4	72		4,237.0	5.6		329.5	7.00e+007		3.80e+005	
	15		8.8	59,021			32.5			75.8			35.4			2.8			1.56e+014		8.49e+011
2:45 PM		7			4.3	66		2,353.7	154		5,491.9	72		2,567.7	5.6		199.7	7.00e+007		3.80e+005	
	15		12.5	84,406			46.5			108.4			50.7			3.9			2.24e+014		1.21e+012
3:00 PM		18			11.9	66		6,566.7	154		15,322.4	72		7,163.7	5.6		557.2	7.00e+007		3.80e+005	
	15		9.6	64,880			35.7			33.3			39.0			3.0			1.72e+014		9.33e+011
3:15 PM		1			0.5	66		290.1	154		676.9	72		316.5	5.6		24.6	7.00e+007		3.80e+005	
	15		0.4	2,745			1.5			3.5			1.6			0.1			7.27e+012		3.95e+010
3:30 PM		0			0.0	66		0.0	154		0.0	72		0.0	5.6		0.0	7.00e+007		3.80e+005	

CITY OF PORTSMOUTH
CSO ABATEMENT PROJECT
CSO LOADINGS

CSO#5 p9/9

WET WEATHER EVENT #5 - OCTOBER 23-25,1990

OVERFLOW TIME	TIME INTERVAL (min)	OVERFLOW Q (cfs)	OVERFLOW Q (avg.cfs)	OVERFLOW Q (gal.)	OVERFLOW Q (mgd)	BOD5 (mg/l)	BOD5 (lbs)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs)	TSS (lbs/day)	VSS (mg/l)	VSS (lbs)	VSS (lbs/day)	TKN (mg/l)	TKN (lbs)	TKN (lbs/day)	TOTAL COLIFORM (col./100mls)	TOTAL COLIFORM load (cols.)	FECAL COLIFORM (col./100mls)	FECAL COLIFORM load (cols.)
TOTALS	2,940			20,075,172			11,650.9			23,065.6			10,997.0			934.2			4.75e+016		3.06e+014
AVERAGE					9.8	69.6			137.8			65.7			5.6			6.26e+007		4.03e+005	
MAXIMUM					25.4	102			308			72			6.4			7.00e+007		6.50e+005	

FILENAME:PORTQL4
REV.12/14/90
ROL

Appendix 3-3 (cont)

CSO ABATEMENT PROGRAM MONITORING

AMBIENT WATER QUALITY SAMPLING DURING CSO EVENTS

AMBIENT WATER SAMPLING DURING

EXHIBIT F-2
WET WEATHER EVENT NO. 1 - SEPTEMBER 15, 1990

Table 1-8 *Summary of problem areas identified in previous studies (1977-2004)*

2004 Site	2003 Area or Item	2002 Proj	1999 Proj	1977 Proj	Sewer System Problem Description	Status June 2004*
			CS-1		Gosling Road Area surcharging, root problems	Cleaning, root removal ~ 2001
			CS-2	2	Atlantic Heights PS backups, high I/I	Repairs completed per 1985 W/H Contract 2
			CS-3		Marsh Lane PS tidal inflow	Completed
			CS-4		Woodlawn Circle at Hillcrest Drive surcharging	Some separation completed.
			CS-5		Onyx Lane / Opal Ave root problems	**To be addressed separately from LTCP**
H	Action Item 3		CS-6	4	Dennett, Thornton, Sparhawk, Burkitt St Surcharging, illicit connections	**Rehab 2003. Continued eval with NHDES.**
			CS-7	4	Dennett and Stark St sewer surcharging	**Same as CS-6**
CSO 003	Action Item 2	3	CS-8		Maplewood to Dennett St surcharges, illicit connect.	**Ongoing maintenance, cont'd eval w/NHDES**
			CS-9		Panaway Manor / Sherburne Rd high I/I	Separation completed 2001
			CS-10		Sherburne Rd Area and Holly Lane high I/I	Separation completed 2001
	Borthwick planning	2	CS-11		Borthwick Av from Bartlett to Gray Building, grease problems, high I/I	**Ongoing maintenance, Borthwick planning area LTCP**
			CS-12		Essex Av / Sheffield area high I/I	Essex - Sheffield study completed 2001
			CS-13	4	Thaxter / Fells Street flooding, sewer backups	Rehab completed 2001
	Islington Planning		CS-14		Albany, Cass, Lovell St flooding, sewer backups	**Islington planning area / LTCP**
F	Action Item 1, Lincoln Cont #2		CS-15		Bartlett St @ RR Trussel, surcharging, flooding, bacterial loading to North Mill Pond	**Lincoln Ave Contract #2 (2004-2005)**
			CS-16	5	Streets from Islington St to North Mill Pond surcharging	Box sewer cleaning 2000. Islington planning/LTCP
			CS-17		Brewster St sewer backups	Box sewer cleaning 2000. Islington planning/LTCP
	Areas 2,5		CS-18		Madison, Union, Cabot (Middle St ends) surcharging	**Areas 2 and 5 of LTCP**
	Area 4,4A		CS-19	6	Willard, Ash, Orchard sewer backups	**Area 4/4A of LTCP**
	Area 4,4A		CS-20	6	Lincoln Av Middle St end - regular flooding	**Area 4/4A of LTCP**
	Lincoln Cont #1		CS-21	6	Lincoln, Richards Av end - regular flooding	**Lincoln Ave Contract #1 construct 2004**
	Area 2,2A		CS-22	7	Miller Avenue at Rockland regular flooding	**Area 2/2A of LTCP**

PECK
ENVIRONMENTAL
LABORATORY, INC.

Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
TEL.: (207) 985-6116
FAX: (207) 985-2611

RECEIVED
OCT 19 1990
WHITMAN & HOWARD, INC.

Whitman & Howard
Attn: Steve Friedman
45 Williams Street
Wellsley MA 02181

PO #

Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER SAMPLE DESIGNATION

	Sta 1 10:30 am	Sta 1 11:30 am	Sta 1 12:50 pm	Sta 1 1:50 pm
Biological Oxygen Demand	5.3	21	15	9.0
Dissolved Oxygen	6.2	5.0	5.8	6.4
pH Units	7.5	7.5	7.5	7.3
Fecal colonies/100 mls	20	330,000	260,000	130,000
Coliform colonies/100 mls	500	5,000,000	4,500,000	2,300,000
Total Suspended Solids	88	130	83	85
Volatile Suspended Solids	58	73	49	55
Total Kjeldahl Nitrogen	0.17	4.4	3.5	3.1/3.0*
Oil & Grease	2.5	2.5	3.0	3.5
Zinc	---	0.14	---	---
Cadmium	---	0.09	---	---
Chromium	---	<0.005	---	---
Copper	---	0.032	---	---
Mercury	---	<0.002	---	---
Nickel	---	0.34	---	---
Lead	---	0.49	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

R. Magnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

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IDENTIFICATION CSO's/Holding Pond Water

PARAMETER	SAMPLE DESIGNATION			
	Sta 1 2:45 pm	Sta 1 3:55 pm	Sta 2 10:50 am	Sta 2 12:06 pm
Biological Oxygen Demand	<4.0	<4.0	<4.0	<4.0
Dissolved Oxygen	7.1	6.3	6.3	6.8
pH Units	7.8	7.8	7.9	7.9
Fecal colonies/100 mls	880	2,500	140	180
Coliform colonies/100 mls	63,000	29,000	600	1,500
Total Suspended Solids	90	71	76	57
Volatile Suspended Solids	62	54	55	44
Total Kjeldahl Nitrogen	<0.1	1.4	0.43	1.3
Oil & Grease	1.5	2.3	1.5	1.5
Zinc	---	---	---	0.11
Cadmium	---	---	---	0.15
Chromium	---	---	---	<0.005
Copper	---	---	---	0.12
Mercury	---	---	---	<0.002
Nickel	---	---	---	0.49
Lead	---	---	---	0.58
Pesticides	see attached report			
Volatile Organics	see attached report			

Karen Gervais
INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

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Sampled By: Client

PARAMETER SAMPLE DESIGNATION

PARAMETER	Sta 2 1:10 pm	Sta 2 1:55 pm	Sta 2 2:50 pm	Sta 2 4:05 pm
Biological Oxygen Demand	20	12	15	16
Dissolved Oxygen	6.1	5.9	5.8	5.9
pH Units	7.6	7.7	7.5	7.6
Fecal colonies/100 mls	37,000	98,000	160,000	140,000
Coliform colonies/100 mls	6,800,000	2,500,000	6,200,000	5,400,000
Total Suspended Solids	63	75	49	57
Volatile Suspended Solids	43	53	33	36
Total Kjeldahl Nitrogen	3.4	2.8	3.8	4.2
Oil & Grease	5.5	17	4.5	5.0
Zinc	---	---	---	---
Cadmium	---	---	---	---
Chromium	---	---	---	---
Copper	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Lead	---	---	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

Karin Gervais
INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

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IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER — SAMPLE DESIGNATION

PARAMETER	Sta 3 10:55 am	Sta 3 12:12 pm	Sta 3 1:14 pm	Sta 3 2:00 pm
Biological Oxygen Demand	<4.0	<4.0	<4.0	<4.0
Dissolved Oxygen	7.2	8.0	8.2	7.8
pH Units	7.8	7.9	8.0	7.9
Fecal colonies/100 mls	10	210	10,000	70
Coliform colonies/100 mls	1,000	10,000	47,000	5,000
Total Suspended Solids	30	41	37	35
Volatile Suspended Solids	22	32	29	26
Total Kjeldahl Nitrogen	0.23	0.83	0.78	0.41
Oil & Grease	3.5	4.0	3.0	31
Zinc	---	0.12	---	---
Cadmium	---	0.15	---	---
Chromium	---	<0.005	---	---
Copper	---	0.14/0.18*	---	---
Mercury	---	<0.002	---	---
Nickel	---	0.45	---	---
Lead	---	0.59	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
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45 Williams Street
Wellsley MA 02181

Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER SAMPLE DESIGNATION

PARAMETER	Sta 3 2:55 pm	Sta 3 4:01 pm	Sta 4 11:00 am	Sta 4 12:24 pm
Biological Oxygen Demand	<4.0	<4.0	<4.0	<4.0
Dissolved Oxygen	7.6	7.1	7.2	7.6
pH Units	8.0	7.8	7.9	7.9
Fecal colonies/100 mls	40	70	2,500	230
Coliform colonies/100 mls	500	1,000	4,000	7,000
Total Suspended Solids	39	45	46	50
Volatile Suspended Solids	29	34	35	39
Total Kjeldahl Nitrogen	0.15	0.20	0.11	<0.1
Oil & Grease	1.5	22	1.0/3.0*	1.5
Zinc	---	---	---	0.12
Cadmium	---	---	---	0.17
Chromium	---	---	---	<0.005
Copper	---	---	---	0.17
Mercury	---	---	---	<0.002
Nickel	---	---	---	0.47
Lead	---	---	---	0.63
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

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TEL.: (207) 985-6116
FAX: (207) 985-2611

PO #

Whitman & Howard
Attn: Steve Friedman
45 Williams Street
Wellsley MA 02181

Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER — SAMPLE DESIGNATION

PARAMETER	Sta 4 1:20 pm	Sta 4 2:05 pm	Sta 4 3:00 pm	Sta 4 4:10 pm
Biological Oxygen Demand	<4.0	<4.0	17	<4.0
Dissolved Oxygen	7.4	7.7	8.0	7.8
pH Units	7.9	7.8	7.8	7.9
Fecal colonies/100 mls	140	100	30	40
Coliform colonies/100 mls	10,000	4,000	1,000	2,000
Total Suspended Solids	37	38	31	43
Volatile Suspended Solids	28	29	23	34
Total Kjeldahl Nitrogen	<0.1	<0.1	0.29	<0.1
Oil & Grease	<1.0	<1.0	2.0	3.0
Zinc	---	---	---	---
Cadmium	---	---	---	---
Chromium	---	---	---	---
Copper	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Lead	---	---	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

Karen Gervais
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WHITMAN & HOWARD, INC.

Whitman & Howard
Attn: Steve Friedman
45 Williams Street
Wellsley MA 02181

Date Received: 9-15-90
Lab Number: 900951
Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER	SAMPLE DESIGNATION			
	Sta 5 11:05 am	Sta 5 12:35 pm	Sta 5 1:25 pm	Sta 5 2:10 pm
Biological Oxygen Demand	<4.0	<4.0	<4.0	<4.0
Dissolved Oxygen	7.4	7.8	7.8	8.0
pH Units	7.7	7.8	7.8	7.9
Fecal colonies/100 mls	<1,000	60	30	40
Coliform colonies/100 mls	1,000	3,000	11,000	1,000
Total Suspended Solids	37	36	28	26
Volatile Suspended Solids	27	27	21	19
Total Kjeldahl Nitrogen	0.81	0.14	0.47	0.76
Oil & Grease	5.0	2.5	2.0	3.0
Zinc	---	0.12	---	---
Cadmium	---	0.18	---	---
Chromium	---	<0.005	---	---
Copper	---	0.18/0.19*	---	---
Mercury	---	<0.002	---	---
Nickel	---	0.50	---	---
Lead	---	0.70	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

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PO #

Whitman & Howard
Attn: Steve Friedman
45 Williams Street
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Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER — SAMPLE DESIGNATION

	Sta 5 3:05 pm	Sta 5 4:15 pm	CSO A-1	CSO A-3
Biological Oxygen Demand	<4.0	<4.0/<4.0*	48	59
Dissolved Oxygen	7.8	7.6	2.0	0.4
pH Units	7.9	7.9	6.5	6.5
Fecal colonies/100 mls	20	40	1,400,000	940,000
Coliform colonies/100 mls	20	4,000	7,200,000	6,500,000
Total Suspended Solids	34	27	200	150
Volatile Suspended Solids	26	20	120	69
Total Kjeldahl Nitrogen	0.56	<0.1	35	28
Oil & Grease	2.0	2.0	---	---
Zinc	---	---	---	---
Cadmium	---	---	---	---
Chromium	---	---	---	---
Copper	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Lead	---	---	---	---

Pesticides see attached report
Volatile Organics see attached report

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

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PO #

Whitman & Howard
Attn: Steve Friedman
45 Williams Street
Wellsley MA 02181

Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

IDENTIFICATION CSO's/Holding Pond Water

Sampled By: Client

PARAMETER	SAMPLE DESIGNATION			
	CSO A-5	CSO A-7	CSO A-9	CSO A-11
Biological Oxygen Demand	110	69/80*	59	47
Dissolved Oxygen	0.1	0.1	1.1	0.1
pH Units	6.7	6.8	7.0	6.8
Fecal colonies/100 mls	700,000	860,000	1,300,000	510,000
Coliform colonies/100 mls	5,700,000	5,300,000	7,400,000	6,000,000
Total Suspended Solids	220	140	120	78
Volatile Suspended Solids	93	57	60	35
Total Kjeldahl Nitrogen	34	28	32	23
Oil & Grease	---	---	---	---
Zinc	---	---	---	---
Cadmium	---	---	---	---
Chromium	---	---	---	---
Copper	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Lead	---	---	---	---
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

Ruth A. Gagnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

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Date Received: 9-15-90

Lab Number: 900951

Date Reported: 10-12-90

Sampled By: Client

IDENTIFICATION CSO's/Holding Pond Water

PARAMETER — SAMPLE DESIGNATION

PARAMETER	CSO A-13	CSO A-15	CSO A-17	CSO Noncon-vent
Biological Oxygen Demand	53	42	39	---
Dissolved Oxygen	1.2	1.6	2.5	---
pH Units	6.9	6.8	6.6	---
Fecal colonies/100 mls	1,100,000	930,000	710,000	---
Coliform colonies/100 mls	4,900,000	5,300,000	6,800,000	---
Total Suspended Solids	57	55	60	---
Volatile Suspended Solids	25	21	23	---
Total Kjeldahl Nitrogen	21	7.3	11/12*	---
Oil & Grease	---	---	---	---
Zinc	---	---	---	0.11
Cadmium	---	---	---	0.01
Chromium	---	---	---	<0.005
Copper	---	---	---	0.11/0.1[illegible]
Mercury	---	---	---	<0.00[illegible]
Nickel	---	---	---	<0.04
Lead	---	---	---	<0.0[illegible]
Pesticides	see attached report			
Volatile Organics	see attached report			

* Duplicate Analysis

Karen Gervais
INORGANIC DIRECTOR

R. Gagnon
DIRECTOR APPROVAL

METHODS: "Standard Methods for the Examination of Water and Wastewater" or other EPA approved methodologies unless otherwise designated.

Result expressed in ppm (parts per million) unless otherwise designated. < = Less Than

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PESTICIDES

Client:	Whitman & Howard	Date Received:	9/15/90
Lab #:	900951	Date Analyzed:	9/27/90

Sample Description: Station 1

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard
Lab #: 900951
Date Received: 9/15/90
Date Analyzed: 9/27/90

Sample Description: Station 1 Duplicate

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Duplicate Correlation = 100%

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard
Lab #: 900951

Date Received: 9/15/90
Date Analyzed: 9/27/90

Sample Description: Station 2

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard
Lab #: 900951

Date Received: 9/15/90
Date Analyzed: 9/27/90

Sample Description: Station 3

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard — Date Received: 9/15/90
Lab #: 900951 — Date Analyzed: 9/27/90

Sample Description: Station 4

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard
Lab #: 900951
Date Received: 9/15/90
Date Analyzed: 9/27/90

Sample Description: Station 5

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

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PESTICIDES

Client: Whitman & Howard
Lab #: 900951

Date Received: 9/15/90
Date Analyzed: 9/27/90

Sample Description: CSO

The analytical procedure used at Peck Environmental Laboratory, Inc. is EPA Method 608 for PCB's in soil (40 CFR Part 136, Appendix A).

Compound	Concentration (ppm)	Detection Limit (ppm)
Aldrin	LTDL	1.0
alpha-BHC	LTDL	1.0
beta-BHC	LTDL	1.0
delta-BHC	LTDL	1.0
gamma-BHC (Lindane)	LTDL	1.0
Chlordane	LTDL	1.0
4,4'-DDD	LTDL	1.0
4,4'-DDE	LTDL	1.0
4,4'-DDT	LTDL	1.0
Dieldrin	LTDL	1.0
Endosulfan I	LTDL	1.0
Endosulfan II	LTDL	1.0
Endosulfan sulfate	LTDL	1.0
Endrin	LTDL	1.0
Heptachlor	LTDL	1.0
Heptachlor epoxide	LTDL	1.0
Toxaphene	LTDL	1.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-15-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved for Release By: R. Gagnon
(Laboratory Director)

PECK ENVIRONMENTAL LABORATORY, INC.
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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900951-1

Date Received: 9/15/90
Date Analyzed: 10/1/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station #1

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	0.526	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	9.62	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-04-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved For Release By: R Gagnon
(Laboratory Director)

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Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900951-3

Date Received: 9/15/90
Date Analyzed: 10/1/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station #3

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-04-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved For Release By: L. Gagnon
(Laboratory Director)

PECK ENVIRONMENTAL LABORATORY, INC.
Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900951-4

Date Received: 9/15/90
Date Analyzed: 10/1/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station #4

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-04-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved For Release By: R. Gagnon
(Laboratory Director)

PECK ENVIRONMENTAL LABORATORY, INC.
Route 1, Arundel, Maine 04046
Mailing Address: P.O. Box 947, Kennebunk, Maine 04043
(207) 985-6116

VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900951-5
Date Received: 9/15/90
Date Analyzed: 10/1/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: Station #5

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	LTDL	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	LTDL	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	LTDL	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-04-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved For Release By: R. Gagnon
(Laboratory Director)

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VOLATILE ORGANICS ANALYSIS
(Method 624)

Client: Whitman & Howard
Lab Number: 900951-6

Date Received: 9/15/90
Date Analyzed: 10/1/90

The analytical procedure employed by Peck Environmental Laboratory, Inc. is a validated modification of 40 CFR Part 136, Appendix A, Method 624 - Purgeables by GC/MS. This method is specific for analysis of low level volatile organics in water as well as liquid or solid wastes.

SAMPLE DESCRIPTION: CSO NONCONVENT

Compound	Concentration (ug/l) parts / billion	Detection Limit (ug/l) parts / billion
Benzene	LTDL	0.5
Bromodichloromethane	LTDL	0.5
Bromoform	LTDL	1.0
Bromomethane	LTDL	2.0
Carbon tetrachloride	LTDL	0.5
Chlorobenzene	LTDL	0.5
Chloroethane	LTDL	2.0
2-Chloroethylvinyl ether	LTDL	2.0
Chloroform	0.707	0.5
Chloromethane	LTDL	5.0
Dibromochloromethane	LTDL	0.5
1,2-Dichlorobenzene	LTDL	0.5
1,3-Dichlorobenzene	LTDL	0.5
1,4-Dichlorobenzene	1.16	0.5
1,1-Dichloroethane	LTDL	0.5
1,2-Dichloroethane	LTDL	0.5
1,1-Dichloroethene	LTDL	0.5
trans-1,2-Dichloroethene	LTDL	0.5
1,2-Dichloropropane	LTDL	0.5
cis-1,3-Dichloropropene	LTDL	1.0
trans-1,3-Dichloropropene	LTDL	1.0
Ethyl benzene	LTDL	0.5
Methylene Chloride	LTDL	1.0
1,1,2,2-Tetrachloroethane	LTDL	1.0
Tetrachloroethene	LTDL	0.5
Toluene	10.6	0.5
1,1,1-Trichloroethane	LTDL	0.5
1,1,2-Trichloroethane	LTDL	1.0
Trichloroethene	LTDL	0.5
Trichlorofluoromethane	LTDL	1.0
Vinyl Chloride	LTDL	2.0

LTDL = Less Than Detection Limit

Date Reviewed: 10-04-90

Reviewed By: Kenneth Moore
(Director of Organics)

Approved For Release By: R. Gagnon
(Laboratory Director)

AMBIENT WATER SAMPLING DURING

EXHIBIT F-3
WET WEATHER EVENT NO. 2 - SEPTEMBER 23, 1990

Whitman & Howard
Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

Laboratory Number: MA008

October 2, 1990
WH #4754

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study

SAMPLES: Bottle ID #21/22
#23/24

SAMPLE COLLECTION DATE: September 23, 1990

GREAT BAY
STATION 5

Results of Analysis:

		# 21/22	# 23/24
Total Suspended Solids,	mg/L	76	78
Volital Suspended Solids,	mg/L	48	42
BOD,	mg/L	32	47
TKN,	mg/L	3.22	3.92
Total Coliform,	#/100 ml	9.6×10^{6}	10.7×10^{6}
Fecal Coliform,	#/100 ml	3.0×10^{5}	1.6×10^{5}

Analyzed by David Hughes
David Hughes

Established 1869

Whitman & Howard, Inc. 45 William Street, Wellesley, Massachusetts 02181-4050 (617) 237-5000

W&H

AMBIENT WATER SAMPLING DURING

EXHIBIT F-4
WET WEATHER EVENT NO. 3 - OCTOBER 9, 1990

Whitman & Howard
Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

Laboratory Number: MA008

November 13, 1990
WH #4777

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study

SAMPLE COLLECTION DATE: October 9, 1990

Results of Analysis:

I. Station CSO

		10:42 AM
pH,		6.8
DO,	mg/L	4.1
Total Coliform,	#/100 ml	4.8×10^7
Fecal Coliform,	#/100 ml	1.9×10^6
Oil & Grease,	mg/L	-
Total Suspended Solids,	mg/L	147
Volatile Suspended Solids,	mg/L	92
TKN,	mg/L	3.25
BOD,	mg/L	60

II. Station #1

		9:10 AM	10:45 AM	11:45 AM
pH,		7.4	7.3	7.3
DO,	mg/L	7.2	7.6	7.1
Total Coliform,	#/100 ml	2.0×10^5	2.9×10^5	1.8×10^6
Fecal Coliform,	#/100 ml	1.2×10^4	1.4×10^4	2.3×10^4
Oil & Grease,	mg/L	3.2	5.5	7.4
Total Suspended Solids,	mg/L	101	72	89
Volatile Suspended Solids,	mg/L	34	28	31
TKN,	mg/L	0.69	0.69	0.48
BOD,	mg/L	13	15	12

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		12:45 PM	1:45 PM	2:45 PM
pH,		7.2	7.2	7.3
DO,	mg/L	6.7	7.2	7.6
Total Coliform,	#/100 ml	$2.8x10^6$	$6.0x10^6$	$3.8x10^6$
Fecal Coliform,	#/100 ml	$3.0x10^3$	$4.9x10^4$	$5.2x10^4$
Oil & Grease,	mg/L	11.8	32.6	7.3
Total Suspended Solids,	mg/L	72	60	69
Volatile Suspended Solids,	mg/L	35	25	25
TKN,	mg/L	0.57	0.52	0.62
BOD,	mg/L	9	12	6

III. Station #2

		9:20 AM	10:50 AM	11:49 AM
pH,		7.5	7.4	7.4
DO,	mg/L	8.2	7.2	7.4
Total Coliform,	#/100 ml	$1.7x10^4$	$6.2x10^5$	$4.8x10^6$
Fecal Coliform,	#/100 ml	300	$5.2x10^4$	$4.5x10^4$
Oil & Grease,	mg/L	3.2	4.0	3.9
Total Suspended Solids,	mg/L	115	67	88
Volatile Suspended Solids,	mg/L	37	28	34
TKN,	mg/L	0.55	0.33	0.33
BOD,	mg/L	11	8	9

		12:50 PM	1:55 PM	2:50 PM
pH,		7.7	7.6	7.6
DO,	mg/L	7.8	7.4	7.3
Total Coliform,	#/100 ml	$2.2x10^6$	$7.8x10^5$	$4.0x10^5$
Fecal Coliform,	#/100 ml	$2.7x10^4$	$2.7x10^4$	$1.0x10^4$
Oil & Grease,	mg/L	1.6	<1.0	3.9
Total Suspended Solids,	mg/L	66	87	90
Volatile Suspended Solids,	mg/L	25	36	36
TKN,	mg/L	0.27	0.23	0.27
BOD,	mg/L	8	8	7

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IV. Station #3

		9:25 AM	10:55 AM	11:55 AM
pH,		7.7	7.7	7.8
DO,	mg/L	7.4	7.8	8.2
Total Coliform,	#/100 ml	1.8×10^3	6.6×10^4	5.0×10^4
Fecal Coliform,	#/100 ml	212	3.4×10^4	5.1×10^3
Oil & Grease,	mg/L	5.6	3.1	2.8
Total Suspended Solids,	mg/L	86	93	83
Volatile Suspended Solids,	mg/L	22	27	22
TKN,	mg/L	0.25	0.21	0.15
BOD,	mg/L	7	3	5

		12:55 PM	1:55 PM	2:55 PM
pH,		7.8	7.9	7.8
DO,	mg/L	8.7	8.8	8.4
Total Coliform,	#/100 ml	2.0×10^4	6.0×10^4	9.0×10^4
Fecal Coliform,	#/100 ml	2.5×10^3	5.4×10^3	2.4×10^3
Oil & Grease,	mg/L	1.6	1.1	3.3
Total Suspended Solids,	mg/L	76	63	72
Volatile Suspended Solids,	mg/L	25	21	27
TKN,	mg/L	0.19	0.19	0.19
BOD,	mg/L	2	1	4

V. Station #4

		9:35 AM	11:00 AM	12:00 Noon
pH,		7.8	7.8	7.9
DO,	mg/L	7.8	8.1	8.3
Total Coliform,	#/100 ml	3.4×10^4	1.4×10^3	510
Fecal Coliform,	#/100 ml	20	8	95
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	102	112	109
Volatile Suspended Solids,	mg/L	21	27	33
TKN,	mg/L	0.27	0.23	0.17
BOD,	mg/L	6	4	3

		1:00 PM	2:00 PM	3:00 PM
pH,		7.9	8.0	7.9
DO,	mg/L	8.4	8.7	8.2
Total Coliform,	#/100 ml	170	210	410
Fecal Coliform,	#/100 ml	55	65	120
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	92	115	92
Volatile Suspended Solids,	mg/L	20	11	7
TKN,	mg/L	0.19	0.15	0.15
BOD,	mg/L	2	2	1

VI. Station #5

		9:40 AM	11:05 AM	12:05 Noon
pH,		7.6	7.7	7.7
DO,	mg/L	8.0	8.1	8.2
Total Coliform,	#/100 ml	340	5.5×10^3	7.3×10^3
Fecal Coliform,	#/100 ml	40	520	748
Oil & Grease,	mg/L	2.2	<1.0	1.2
Total Suspended Solids,	mg/L	98	105	99
Volatile Suspended Solids,	mg/L	40	42	18
TKN,	mg/L	0.30	0.26	0.26
BOD,	mg/L	5	3	3

		1:05 PM	2:05 PM	3:05 PM
pH,		7.8	7.8	7.8
DO,	mg/L	8.4	8.3	8.3
Total Coliform,	#/100 ml	900	720	1.8×10^3
Fecal Coliform,	#/100 ml	230	160	178
Oil & Grease,	mg/L	<1.0	<1.0	1.8
Total Suspended Solids,	mg/L	95	97	100
Volatile Suspended Solids,	mg/L	40	39	44
TKN,	mg/L	0.23	0.23	0.23
BOD,	mg/L	1	3	1

Analyzed by David Hughes
David Hughes

Whitman & Howard
Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

Laboratory Number: MA008

November 16, 1990
WH #4784

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study

SAMPLE COLLECTION DATE: October 13, 1990

Results of Analysis:

I. Station CSO

		12:00 NOON	12:15 PM	12:30 PM
pH,		6.6	6.6	6.5
DO,	mg/L	0.65	0.5	1.05
Total Coliform,	#/100 ml	$6.1x10^7$	$8.0x10^7$	$8.7x10^7$
Fecal Coliform,	#/100 ml	$1.1x10^6$	$1.1x10^6$	$1.0x10^6$
Oil & Grease,	mg/L	8.4	---	---
Total Suspended Solids,	mg/L	133	219	524
Volatile Suspended Solids,	mg/L	57	95	210
TKN,	mg/L	7.56	8.40	8.68
BOD,	mg/L	132	144	156

		12:45 PM	1:00 PM	1:30 PM
pH,		6.5	6.5	6.5
DO,	mg/L	0.7	1.7	2.25
Total Coliform,	#/100 ml	$1.4x10^8$	$8.9x10^7$	$9.0x10^7$
Fecal Coliform,	#/100 ml	$9.0x10^5$	$9.0x10^5$	$8.0x10^5$
Oil & Grease,	mg/L	--	8.4	--
Total Suspended Solids,	mg/L	690	910	800
Volatile Suspended Solids,	mg/L	270	370	320
TKN,	mg/L	8.96	10.6	12.0
BOD,	mg/L	144	90	96

Established 1869

W&H

		2:00 PM	3:00 PM	4:00 PM
pH,		6.5	6.6	6.6
DO,	mg/L	2.0	1.5	1.0
Total Coliform,	#/100 ml	3.9×10^7	3.8×10^8	1.1×10^8
Fecal Coliform,	#/100 ml	7.0×10^5	1.3×10^6	1.4×10^6
Oil & Grease,	mg/L	--	5.07	--
Total Suspended Solids,	mg/L	690	640	410
Volatile Suspended Solids,	mg/L	260	240	160
TKN,	mg/L	11.5	11.8	11.8
BOD,	mg/L	93	87	87

		5:00 PM	6:00 PM	7:00 PM
pH,		6.6	6.6	6.6
DO,	mg/L	2.0	0.65	1.3
Total Coliform,	#/100 ml	3.1×10^8	9.1×10^7	1.4×10^8
Fecal Coliform,	#/100 ml	3.0×10^5	7.0×10^5	8.0×10^5
Oil & Grease,	mg/L	--	--	3.3
Total Suspended Solids,	mg/L	460	450	160
Volatile Suspended Solids,	mg/L	150	180	90
TKN,	mg/L	10.2	7.0	6.16
BOD,	mg/L	96	72	84

		8:00 PM
pH,		6.7
DO,	mg/L	2.4
Total Coliform,	#/100 ml	2.0×10^7
Fecal Coliform,	#/100 ml	1.0×10^5
Oil & Grease,	mg/L	--
Total Suspended Solids,	mg/L	55
Volatile Suspended Solids,	mg/L	35
TKN,	mg/L	--
BOD,	mg/L	43

II. STATION #1

		12:00 NOON	1:00 PM	2:00 PM
pH,		7.7	7.6	7.5
DO,	mg/L	9.3	9.3	8.5
Total Coliform,	#/100 ml	1.0×10^4	5.0×10^5	1.6×10^6
Fecal Coliform,	#/100 ml	100	2.9×10^4	6.4×10^4
Oil & Grease,	mg/L	12.9	1.2	5.8
Total Suspended Solids,	mg/L	77	92	86
Volatile Suspended Solids,	mg/L	23	25	26
TKN,	mg/L	--	--	--
BOD,	mg/L	18	8	9

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		3:02 PM	4:02 PM	5:00 PM
pH,		7.4	7.2	7.1
DO,	mg/L	8.0	7.2	6.4
Total Coliform,	#/100 ml	$7.2x10^6$	$1.9x10^7$	$1.8x10^8$
Fecal Coliform,	#/100 ml	$1.5x10^5$	$4.1x10^5$	$3.8x10^5$
Oil & Grease,	mg/L	<1.0	8.2	3.2
Total Suspended Solids,	mg/L	83	71	60
Volatile Suspended Solids,	mg/L	28	30	28
TKN,	mg/L	--	--	--
BOD,	mg/L	15	21	36

		6:00 PM	7:00 PM	7:59 PM
pH,		7.0	7.0	6.9
DO,	mg/L	6.5	4.6	5.0
Total Coliform,	#/100 ml	$3.1x10^8$	$3.4x10^8$	$4.7x10^8$
Fecal Coliform,	#/100 ml	$3.6x10^5$	$2.3x10^5$	$3.3x10^5$
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	66	81	49
Volatile Suspended Solids,	mg/L	27	27	19
TKN,	mg/L	--	--	--
BOD,	mg/L	30	33	34

III. STATION #2

		12:11 PM	1:06 PM	2:05 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.4	9.4	8.8
Total Coliform,	#/100 ml	6,000	2,000	4,000
Fecal Coliform,	#/100 ml	220	90	340
Oil & Grease,	mg/L	2.2	4.9	2.0
Total Suspended Solids,	mg/L	97	99	99
Volatile Suspended Solids,	mg/L	31	32	33
TKN,	mg/L	--	--	--
BOD,	mg/L	8	8	8

		3:06 PM	4:12 PM	5:06 PM
pH,		7.7	7.4	7.4
DO,	mg/L	9.2	7.7	7.6
Total Coliform,	#/100 ml	9,000	$4.5x10^6$	$4.2x10^6$
Fecal Coliform,	#/100 ml	1,340	$4.9x10^4$	$2.4x10^4$
Oil & Grease,	mg/L	<1.0	1.6	5.1
Total Suspended Solids,	mg/L	89	72	69
Volatile Suspended Solids,	mg/L	29	30	32
TKN,	mg/L	--	--	--
BOD,	mg/L	9	8	16

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		6:10 PM	7:04 PM	8:07 PM
pH,		7.0	7.0	6.9
DO,	mg/L	6.1	4.7	4.0
Total Coliform,	#/100 ml	$1.4x10^7$	$1.0x10^7$	$5.1x10^6$
Fecal Coliform,	#/100 ml	$6.9x10^4$	$7.4x10^4$	$6.4x10^4$
Oil & Grease,	mg/L	4.0	--	--
Total Suspended Solids,	mg/L	70	69	66
Volatile Suspended Solids,	mg/L	33	29	27
TKN,	mg/L	--	--	--
BOD,	mg/L	22	26	33

IV. STATION #3

		12:14 PM	1:09 PM	2:10 PM
pH,		7.7	7.7	7.8
DO,	mg/L	9.6	9.4	9.4
Total Coliform,	#/100 ml	$1.3x10^4$	$1.2x10^4$	8,000
Fecal Coliform,	#/100 ml	150	30	50
Oil & Grease,	mg/L	2.6	3.0	1.8
Total Suspended Solids,	mg/L	73	95	79
Volatile Suspended Solids,	mg/L	17	20	18
TKN,	mg/L	--	--	--
BOD,	mg/L	4	4	5

		3:08 PM	4:13 PM	5:08 PM
pH,		7.8	7.8	7.8
DO,	mg/L	9.8	9.4	9.8
Total Coliform,	#/100 ml	230	770	1,300
Fecal Coliform,	#/100 ml	140	510	800
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	91	181	79
Volatile Suspended Solids,	mg/L	23	33	18
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	5

		6:13 PM	7:06 PM	8:09 PM
pH,		7.7	7.6	7.5
DO,	mg/L	8.8	7.8	7.5
Total Coliform,	#/100 ml	$4.7x10^4$	$4.3x10^5$	$1.3x10^6$
Fecal Coliform,	#/100 ml	$8.1x10^3$	$5.9x10^4$	$1.8x10^5$
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	72	68	60
Volatile Suspended Solids,	mg/L	13	18	14
TKN,	mg/L	--	--	--
BOD,	mg/L	6	6	8

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V. STATION #4

		12:20 PM	1:16 PM	2:15 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.2	9.7	8.9
Total Coliform,	#/100 ml	240	450	320
Fecal Coliform,	#/100 ml	8	64	38
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	87	89	103
Volatile Suspended Solids,	mg/L	17	24	31
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	5

		3:15 PM	4:20 PM	5:15 PM
pH,		7.7	7.6	7.8
DO,	mg/L	9.2	9.2	9.4
Total Coliform,	#/100 ml	310	120	650
Fecal Coliform,	#/100 ml	14	7	148
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	83	108	84
Volatile Suspended Solids,	mg/L	28	41	18
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	4

		6:20 PM	7:13 PM	8:16 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.1	8.5	8.6
Total Coliform,	#/100 ml	2,200	9,400	5,500
Fecal Coliform,	#/100 ml	305	1,760	765
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	95	78	91
Volatile Suspended Solids,	mg/L	19	23	34
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	5

VI. STATION #5

		2:21 PM	12:22 PM	1:20 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.2	9.2	9.5
Total Coliform,	#/100 ml	5,3000	$3.3x10^5$	$1.0x10^5$
Fecal Coliform,	#/100 ml	256	2,160	2,080
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	107	106	99
Volatile Suspended Solids,	mg/L	29	25	22
TKN,	mg/L	--	--	--
BOD,	mg/L	4	3	5

W&H

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		3:19 PM	4:35 PM	5:18 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.4	9.5	8.8
Total Coliform,	#/100 ml	$1.1x10^5$	5,900	5,000
Fecal Coliform,	#/100 ml	1,064	476	444
Oil & Grease,	mg/L	1.8	<1.0	2.3
Total Suspended Solids,	mg/L	84	94	79
Volatile Suspended Solids,	mg/L	23	25	20
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	5

		6:25 PM	7:20 PM	8:23 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.0	8.6	8.8
Total Coliform,	#/100 ml	$1.1x10^4$	9,4000	5,900
Fecal Coliform,	#/100 ml	2,088	800	928
Oil & Grease,	mg/L	1.2	--	--
Total Suspended Solids,	mg/L	106	99	59
Volatile Suspended Solids,	mg/L	24	26	16
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	3

Analyzed by David Hughes
David Hughes

W&H

AMBIENT WATER SAMPLING DURING

EXHIBIT F-5
WET WEATHER EVENT NO. 4 - OCTOBER 13, 1990

Whitman & Howard

Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

Laboratory Number: MA008

November 16, 1990
WH #4784

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study

SAMPLE COLLECTION DATE: October 13, 1990

Results of Analysis:

I. Station CSO

		12:00 NOON	12:15 PM	12:30 PM
pH,		6.6	6.6	6.5
DO,	mg/L	0.65	0.5	1.05
Total Coliform,	#/100 ml	$6.1x10^7$	$8.0x10^7$	$8.7x10^7$
Fecal Coliform,	#/100 ml	$1.1x10^6$	$1.1x10^6$	$1.0x10^6$
Oil & Grease,	mg/L	8.4	---	---
Total Suspended Solids,	mg/L	133	219	524
Volatile Suspended Solids,	mg/L	57	95	210
TKN,	mg/L	7.56	8.40	8.68
BOD,	mg/L	132	144	156

		12:45 PM	1:00 PM	1:30 PM
pH,		6.5	6.5	6.5
DO,	mg/L	0.7	1.7	2.25
Total Coliform,	#/100 ml	$1.4x10^8$	$8.9x10^7$	$9.0x10^7$
Fecal Coliform,	#/100 ml	$9.0x10^5$	$9.0x10^5$	$8.0x10^5$
Oil & Grease,	mg/L	--	8.4	--
Total Suspended Solids,	mg/L	690	910	800
Volatile Suspended Solids,	mg/L	270	370	320
TKN,	mg/L	8.96	10.6	12.0
BOD,	mg/L	144	90	96

Established 1869

Whitman & Howard

		2:00 PM	3:00 PM	4:00 PM
pH,		6.5	6.6	6.6
DO,	mg/L	2.0	1.5	1.0
Total Coliform,	#/100 ml	$3.9x10^7$	$3.8x10^8$	$1.1x10^8$
Fecal Coliform,	#/100 ml	$7.0x10^5$	$1.3x10^6$	$1.4x10^6$
Oil & Grease,	mg/L	--	5.07	--
Total Suspended Solids,	mg/L	690	640	410
Volatile Suspended Solids,	mg/L	260	240	160
TKN,	mg/L	11.5	11.8	11.8
BOD,	mg/L	93	87	87

		5:00 PM	6:00 PM	7:00 PM
pH,		6.6	6.6	6.6
DO,	mg/L	2.0	0.65	1.3
Total Coliform,	#/100 ml	$3.1x10^8$	$9.1x10^7$	$1.4x10^8$
Fecal Coliform,	#/100 ml	$3.0x10^5$	$7.0x10^5$	$8.0x10^5$
Oil & Grease,	mg/L	--	--	3.3
Total Suspended Solids,	mg/L	460	450	160
Volatile Suspended Solids,	mg/L	150	180	90
TKN,	mg/L	10.2	7.0	6.16
BOD,	mg/L	96	72	84

		8:00 PM
pH,		6.7
DO,	mg/L	2.4
Total Coliform,	#/100 ml	$2.0x10^7$
Fecal Coliform,	#/100 ml	$1.0x10^5$
Oil & Grease,	mg/L	--
Total Suspended Solids,	mg/L	55
Volatile Suspended Solids,	mg/L	35
TKN,	mg/L	--
BOD,	mg/L	43

II. STATION #1

		12:00 NOON	1:00 PM	2:00 PM
pH,		7.7	7.6	7.5
DO,	mg/L	9.3	9.3	8.5
Total Coliform,	#/100 ml	$1.0x10^4$	$5.0x10^5$	$1.6x10^6$
Fecal Coliform,	#/100 ml	100	$2.9x10^4$	$6.4x10^4$
Oil & Grease,	mg/L	12.9	1.2	5.8
Total Suspended Solids,	mg/L	77	92	86
Volatile Suspended Solids,	mg/L	23	25	26
TKN,	mg/L	--	--	--
BOD,	mg/L	18	8	9

W&H

		3:02 PM	4:02 PM	5:00 PM
pH,		7.4	7.2	7.1
DO,	mg/L	8.0	7.2	6.4
Total Coliform,	#/100 ml	$7.2x10^6$	$1.9x10^7$	$1.8x10^8$
Fecal Coliform,	#/100 ml	$1.5x10^5$	$4.1x10^5$	$3.8x10^5$
Oil & Grease,	mg/L	<1.0	8.2	3.2
Total Suspended Solids,	mg/L	83	71	60
Volatile Suspended Solids,	mg/L	28	30	28
TKN,	mg/L	--	--	--
BOD,	mg/L	15	21	36

		6:00 PM	7:00 PM	7:59 PM
pH,		7.0	7.0	6.9
DO,	mg/L	6.5	4.6	5.0
Total Coliform,	#/100 ml	$3.1x10^8$	$3.4x10^8$	$4.7x10^8$
Fecal Coliform,	#/100 ml	$3.6x10^5$	$2.3x10^5$	$3.3x10^5$
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	66	81	49
Volatile Suspended Solids,	mg/L	27	27	19
TKN,	mg/L	--	--	--
BOD,	mg/L	30	33	34

III. STATION #2

		12:11 PM	1:06 PM	2:05 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.4	9.4	8.8
Total Coliform,	#/100 ml	6,000	2,000	4,000
Fecal Coliform,	#/100 ml	220	90	340
Oil & Grease,	mg/L	2.2	4.9	2.0
Total Suspended Solids,	mg/L	97	99	99
Volatile Suspended Solids,	mg/L	31	32	33
TKN,	mg/L	--	--	--
BOD,	mg/L	8	8	8

		3:06 PM	4:12 PM	5:06 PM
pH,		7.7	7.4	7.4
DO,	mg/L	9.2	7.7	7.6
Total Coliform,	#/100 ml	9,000	$4.5x10^6$	$4.2x10^6$
Fecal Coliform,	#/100 ml	1,340	$4.9x10^4$	$2.4x10^4$
Oil & Grease,	mg/L	<1.0	1.6	5.1
Total Suspended Solids,	mg/L	89	72	69
Volatile Suspended Solids,	mg/L	29	30	32
TKN,	mg/L	--	--	--
BOD,	mg/L	9	8	16

		6:10 PM	7:04 PM	8:07 PM
pH,		7.0	7.0	6.9
DO,	mg/L	6.1	4.7	4.0
Total Coliform,	#/100 ml	$1.4x10^7$	$1.0x10^7$	$5.1x10^6$
Fecal Coliform,	#/100 ml	$6.9x10^4$	$7.4x10^4$	$6.4x10^4$
Oil & Grease,	mg/L	4.0	--	--
Total Suspended Solids,	mg/L	70	69	66
Volatile Suspended Solids,	mg/L	33	29	27
TKN,	mg/L	--	--	--
BOD,	mg/L	22	26	33

IV. STATION #3

		12:14 PM	1:09 PM	2:10 PM
pH,		7.7	7.7	7.8
DO,	mg/L	9.6	9.4	9.4
Total Coliform,	#/100 ml	$1.3x10^4$	$1.2x10^4$	8,000
Fecal Coliform,	#/100 ml	150	30	50
Oil & Grease,	mg/L	2.6	3.0	1.8
Total Suspended Solids,	mg/L	73	95	79
Volatile Suspended Solids,	mg/L	17	20	18
TKN,	mg/L	--	--	--
BOD,	mg/L	4	4	5

		3:08 PM	4:13 PM	5:08 PM
pH,		7.8	7.8	7.8
DO,	mg/L	9.8	9.4	9.8
Total Coliform,	#/100 ml	230	770	1,300
Fecal Coliform,	#/100 ml	140	510	800
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	91	181	79
Volatile Suspended Solids,	mg/L	23	33	18
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	5

		6:13 PM	7:06 PM	8:09 PM
pH,		7.7	7.6	7.5
DO,	mg/L	8.8	7.8	7.5
Total Coliform,	#/100 ml	$4.7x10^4$	$4.3x10^5$	$1.3x10^6$
Fecal Coliform,	#/100 ml	$8.1x10^3$	$5.9x10^4$	$1.8x10^5$
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	72	68	60
Volatile Suspended Solids,	mg/L	13	18	14
TKN,	mg/L	--	--	--
BOD,	mg/L	6	6	8

Whitman & Howard

Portsmouth CSO

V. STATION #4

		12:20 PM	1:16 PM	2:15 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.2	9.7	8.9
Total Coliform,	#/100 ml	240	450	320
Fecal Coliform,	#/100 ml	8	64	38
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	87	89	103
Volatile Suspended Solids,	mg/L	17	24	31
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	5

		3:15 PM	4:20 PM	5:15 PM
pH,		7.7	7.6	7.8
DO,	mg/L	9.2	9.2	9.4
Total Coliform,	#/100 ml	310	120	650
Fecal Coliform,	#/100 ml	14	7	148
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	83	108	84
Volatile Suspended Solids,	mg/L	28	41	18
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	4

		6:20 PM	7:13 PM	8:16 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.1	8.5	8.6
Total Coliform,	#/100 ml	2,200	9,400	5,500
Fecal Coliform,	#/100 ml	305	1,760	765
Oil & Grease,	mg/L	<1.0	--	--
Total Suspended Solids,	mg/L	95	78	91
Volatile Suspended Solids,	mg/L	19	23	34
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	5

VI. STATION #5

		2:21 PM	12:22 PM	1:20 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.2	9.2	9.5
Total Coliform,	#/100 ml	5,3000	3.3×10^5	1.0×10^5
Fecal Coliform,	#/100 ml	256	2,160	2,080
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	107	106	99
Volatile Suspended Solids,	mg/L	29	25	22
TKN,	mg/L	--	--	--
BOD,	mg/L	4	3	5

Whitman & Howard

		3:19 PM	4:35 PM	5:18 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.4	9.5	8.8
Total Coliform,	#/100 ml	$1.1x10^5$	5,900	5,000
Fecal Coliform,	#/100 ml	1,064	476	444
Oil & Grease,	mg/L	1.8	<1.0	2.3
Total Suspended Solids,	mg/L	84	94	79
Volatile Suspended Solids,	mg/L	23	25	20
TKN,	mg/L	--	--	--
BOD,	mg/L	4	5	5

		6:25 PM	7:20 PM	8:23 PM
pH,		7.7	7.7	7.7
DO,	mg/L	9.0	8.6	8.8
Total Coliform,	#/100 ml	$1.1x10^4$	9,4000	5,900
Fecal Coliform,	#/100 ml	2,088	800	928
Oil & Grease,	mg/L	1.2	--	--
Total Suspended Solids,	mg/L	106	99	59
Volatile Suspended Solids,	mg/L	24	26	16
TKN,	mg/L	--	--	--
BOD,	mg/L	5	5	3

Analyzed by David Hughes
David Hughes

AMBIENT WATER SAMPLING DURING

EXHIBIT F-6
WET WEATHER EVENT NO. 5 - OCTOBER 23, 1990

Whitman & Howard
Environmental Engineers, Scientists, and Planners

LABORATORY REPORT

Laboratory Number: MA008

November 28, 1990
WH #4801

CLIENT: Portsmouth, NH

PROJECT: Combined Sewer Overflow Study

SAMPLE COLLECTION DATE: October 23/24, 1990

Results of Analysis:

A. GENERAL CHEMISTRY

1. Station CSO

		8:40 PM	9:15 PM	9:30 PM
pH,		6.4	6.4	6.4
DO,	mg/L	4.4	4.8	4.5
Total Coliform,	#/100 ml	$4.2x10^7$	$2.5x10^7$	$2.3x10^7$
Fecal Coliform,	#/100 ml	$6.0x10^5$	$4.6x10^5$	$5.4x10^5$
Oil & Grease,	mg/L	1.4	-	-
Total Suspended Solids,	mg/L	36	110	96
Total Volatile Suspended Solids,	mg/L	26	50	46
TKN,	mg/L	5.60	3.36	4.48
BOD,	mg/L	72	78	87

		9:45 PM	10:00 PM	10:30 PM
pH,		6.6	6.6	6.6
DO,	mg/L	3.8	4.1	4.9
Total Coliform,	#/100 ml	$1.5X10^7$	$2.3X10^7$	$2.7X10^7$
Fecal Coliform,	#/100 ml	$5.7X10^5$	$6.5X10^5$	$3.7X10^5$
Oil & Grease,	mg/L	-	-	-
Total Suspended Solids,	mg/L	92	138	308
Total Volatile Suspended Solids,	mg/L	46	52	70
TKN,	mg/L	5.04	6.16	6.44
BOD,	mg/L	87	90	99

		11:00 PM	12:25 PM	1:15 AM
pH,		6.6	6.7	6.7
DO,	mg/L	5.3	6.1	6.1
Total Coliform,	#/100 ml	$3.2X10^7$	$2.4X10^7$	$1.9X10^7$
Fecal Coliform,	#/100 ml	$5.0X10^5$	$2.5X10^5$	$3.3X10^5$
Oil & Grease,	mg/L	-	-	5.5
Total Suspended Solids,	mg/L	134	24	76
Total Volatile Suspended Solids,	mg/L	52	18	58
TKN,	mg/L	5.32	5.32	5.60
BOD,	mg/L	102	99	99

Established 1869

W&H

Whitman & Howard

		2:45 PM
pH,		6.8
DO,	mg/L	6.4
Total Coliform,	#/100 ml	$7.0X10^7$
Fecal Coliform,	#/100 ml	$3.8X10^5$
Oil & Grease,	mg/L	-
Total Suspended Solids,	mg/L	154
Total Volatile Suspended Solids,	mg/L	72
TKN,	mg/L	5.60
BOD,	mg/L	66

2. Station #1

		9:00 PM	10:00 PM	10:40 PM	11:15 PM
pH,		6.9	7.0	7.0	7.0
DO,	mg/L	6.8	7.9	8.2	7.6
Total Coliform,	#/100 ml	$2.7X10^6$	$3.3X10^6$	$2.5X10^6$	$4.0X10^6$
Fecal Coliform,	#/100 ml	$1.4X10^5$	$2.2X10^5$	$1.8X10^5$	$1.8X10^5$
Oil & Grease,	mg/L	2.0	<1.0	<1.0	2.2
Total Suspended Solids,	mg/L	19	15	15	16
Total Volatile Suspended Solids,	mg/L	12	9	12	11
TKN,	mg/L	2.00	1.88	1.35	0.96
BOD,	mg/L	12	9	10	11

		12:50 PM	1:42 AM	2:40 AM
pH,		7.0	7.1	7.0
DO,	mg/L	8.2	9.7	8.1
Total Coliform,	#/100 ml	$9.0X10^6$	$7.0X10^6$	$5.0X10^6$
Fecal Coliform,	#/100 ml	$2.3X10^5$	$2.1X10^5$	$2.2X10^5$
Oil & Grease,	mg/L	3.3	<1.0	2.5
Total Suspended Solids,	mg/L	21	20	36
Total Volatile Suspended Solids,	mg/L	14	15	22
TKN,	mg/L	0.87	0.96	0.96
BOD,	mg/L	11	10	13

3. Station #2

		9:35 PM	10:55 PM	12:00 MIDNIGHT
pH,		6.9	6.9	7.0
DO,	mg/L	5.8	7.7	7.7
Total Coliform,	#/100 ml	$1.2X10^7$	$1.5X10^7$	$1.2X10^7$
Fecal Coliform,	#/100 ml	$1.3X10^5$	$1.7X10^5$	$2.1X10^5$
Oil & Grease,	mg/L	<1.0	2.2	<1.0
Total Suspended Solids,	mg/L	15	19	17
Total Volatile Suspended Solids,	mg/L	8	15	13
TKN,	mg/L	1.44	1.35	1.34
BOD,	mg/L	11	9	10

W&H

Whitman & Howard

		12:55 AM	1:45 AM	2:50 AM
pH,		7.0	7.0	7.1
DO,	mg/L	7.2	7.6	8.8
Total Coliform,	#/100 ml	$4.9X10^6$	$5.3X10^6$	$3.2X10^6$
Fecal Coliform,	#/100 ml	$2.0X10^5$	$2.3X10^5$	$1.7X10^5$
Oil & Grease,	mg/L	<1.0	1.8	<1.0
Total Suspended Solids,	mg/L	16	16	15
Total Volatile Suspended Solids,	mg/L	11	8	8
TKN,	mg/L	1.05	1.08	0.86
BOD,	mg/L	10	10	11

4. Station #3

		9:38 PM	11:00 PM	12:05 AM
pH,		7.3	7.5	7.5
DO,	mg/L	8.9	9.3	9.1
Total Coliform,	#/100 ml	$1.7X10^5$	$3.1X10^5$	$1.6X10^5$
Fecal Coliform,	#/100 ml	$2.1X10^4$	$6.5X10^3$	$5.5X10^3$
Oil & Grease,	mg/L	3.8	2.0	2.3
Total Suspended Solids,	mg/L	6	6	5
Total Volatile Suspended Solids,	mg/L	2	2	1
TKN,	mg/L	1.20	1.50	1.25
BOD,	mg/L	6	3	5

		12:58 AM	1:50 AM	2:52 AM
pH,		7.4	7.5	7.4
DO,	mg/L	8.8	9.1	8.8
Total Coliform,	#/100 ml	$2.9X10^5$	$9.4X10^4$	$3.7X10^6$
Fecal Coliform,	#/100 ml	$3.7X10^4$	$3.5X10^3$	$5.0X10^4$
Oil & Grease,	mg/L	1.4	-	2.2
Total Suspended Solids,	mg/L	12	11	14
Total Volatile Suspended Solids,	mg/L	6	5	7
TKN,	mg/L	1.15	0.86	0.77
BOD,	mg/L	5	3	4

5. Station #4

		9:47 PM	11:05 PM	12:06 PM
pH,		7.5	7.5	7.6
DO,	mg/L	8.5	8.8	8.9
Total Coliform,	#/100 ml	1,200	2,000	1,500
Fecal Coliform,	#/100 ml	80	72	116
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	6	15	11
Total Volatile Suspended Solids,	mg/L	3	2	3
TKN,	mg/L	1.15	0.69	0.96
BOD,	mg/L	2	3	3

W&H

		12:58 AM	1:50 AM	2:52 AM
pH,		7.6	7.6	7.6
DO,	mg/L	9.2	9.2	9.4
Total Coliform,	#/100 ml	2,000	2,500	2,200
Fecal Coliform,	#/100 ml	154	330	150
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	18	14	12
Total Volatile Suspended Solids,	mg/L	5	4	4
TKN,	mg/L	0.86	0.77	0.77
BOD,	mg/L	2	2	2

6. Station #5

		9:50 PM	11:10 PM	12:10 AM
pH,		7.4	7.5	7.5
DO,	mg/L	8.7	8.9	8.5
Total Coliform,	#/100 ml	$1.4X10^3$	$1.9X10^3$	$4.6X10^4$
Fecal Coliform,	#/100 ml	120	138	1,290
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	21	6	16
Total Volatile Suspended Solids,	mg/L	1	3	5
TKN,	mg/L	1.05	0.92	0.96
BOD,	mg/L	2	2	2

		1:07 AM	2:00 AM	3:05 AM
pH,		7.5	7.6	7.7
DO,	mg/L	9.3	8.7	8.8
Total Coliform,	#/100 ml	$2.9X10^4$	$1.3X10^4$	$1.1X10^4$
Fecal Coliform,	#/100 ml	910	510	650
Oil & Grease,	mg/L	<1.0	<1.0	<1.0
Total Suspended Solids,	mg/L	17	16	16
Total Volatile Suspended Solids,	mg/L	5	6	6
TKN,	mg/L	0.67	0.77	0.67
BOD,	mg/L	2	2	2

B. METALS ANALYSIS

		CSO 8:40 PM
Cadmium,	mg/L	0.004
Chromium,	mg/L	<0.01
Copper,	mg/L	0.02
Lead,	mg/L	0.009
Mercury,	mg/L	0.001
Nickel,	mg/L	<0.01
Zinc,	mg/L	0.03

Whitman & Howard

C. SETTABLE SOLIDS ANALYSIS

	CSO 9:05 PM	CSO 11:05 PM
5 minutes	0.4 ml	<0.1 ml
10 minutes	0.6 ml	<0.1 ml
15 minutes	0.7 ml	<0.1 ml
20 minutes	0.8 ml	<0.1 ml
25 minutes	0.9 ml	<0.1 ml
30 minutes	0.9 ml	
35 minutes	0.85 ml	
40 minutes	0.9 ml	

Analyzed by David Hughes
David Hughes

W&H

ALPHA ANALYTICAL LABORATORIES
CERTIFICATE OF ANALYSIS

MA 086   NH 198958-A   CT PH-0574   NY 11148

Laboratory Sample Number: 905734.1 (CSO A,B) **Date Received:** 10/25/90

Sample Matrix: Water **Date Reported:** 11/08/90

Condition of Samples: Satisfactory **Field Prep:** None

Number & Type of Containers: Two VOA vials and one glass jar

Analysis Requested: Volatile Organics and Pesticides

PARAMETER	RESULT	UNITS	MDL	REF*	METHOD	DATES EXT/PREP	DATES ANALYSIS
Volatile Organics ***	ND	ug/L	**	1	8260	---	11/08/90
Pesticides ***	ND	ug/L	0.2	1	8080	10/31/90	11/02/90

Volatile Organics	%Surrogate Recovery
1,2-Dichloroethane-d4	107%
Toluene-d8	99%
4-Bromofluorobenzene	86%

COMMENTS: * Complete list of References found in Addendum I
** A list of volatile organics and pesticides analyzed for and their detection limits accompanies this report.
*** All compounds were below the detection limits except those listed above.

ALPHA ANALYTICAL LABS
VOLATILE ORGANICS ANALYSIS by GC/MS
METHOD 8260

Alpha Job Number: 905734 Date Reported: 11/8/90
Alpha Sample Number(s): 905734.1
Method Detection Limit: See Below

COMPOUNDS	
Methylene chloride	140 ug/Kg
1,1-Dichloroethane	235 ug/Kg
Chloroform	80 ug/Kg
Carbon tetrachloride	140 ug/Kg
1,2-Dichloropropane	300 ug/Kg
Dibromochloromethane	155 ug/Kg
1,1,2-Trichloroethane	250 ug/Kg
2-Chloroethylvinyl ether	500 ug/Kg
Tetrachloroethene	205 ug/Kg
Chlorobenzene	300 ug/Kg
Trichlorofluoromethane	250 ug/Kg
1,2-Dichloroethane	140 ug/Kg
1,1,1-Trichloroethane	190 ug/Kg
Bromodichloromethane	110 ug/Kg
trans-1,3-Dichloropropene	250 ug/Kg
cis-1,3-Dichloropropene	250 ug/Kg
Bromoform	235 ug/Kg
1,1,2,2-Tetrachloroethane	345 ug/Kg
Benzene	300 ug/Kg
Toluene	300 ug/Kg
Ethyl benzene	360 ug/Kg
Xylenes	500 ug/Kg
Chloromethane	400 ug/Kg
Bromomethane	350 ug/Kg
Vinyl chloride	325 ug/Kg
Chloroethane	375 ug/Kg
1,1-Dichloroethene	140 ug/Kg
Trans-1,2-dichloroethene	80 ug/Kg
Cis-1,2-dichloroethene	80 ug/Kg
Trichloroethene	95 ug/Kg
Dibromomethane	235 ug/Kg
1,4-Dichloro-2-butane	500 ug/Kg
Ethanol	5,000 ug/Kg
Iodomethane	325 ug/Kg
1,2,3-Trichloropropane	300 ug/kg
Styrene	500 ug/Kg
Dichlorodifluoromethane	5,000 ug/Kg
Acetone	5,000 ug/Kg
Carbon disulfide	1,000 ug/Kg
2-Butanone	1,500 ug/Kg
Vinyl acetate	1,500 ug/Kg
4-Methyl-2-pentanone	1,000 ug/Kg
2-Hexanone	1,000 ug/Kg

ALPHA ANALYTICAL LABS
PESTICIDE ANALYSIS by GC
METHOD 608/8080

Alpha Job Number: 905734 Date Reported: 11/8/90
Alpha Sample Number(s): 905734.1
Method Detection Limit: 0.2 ug/L

COMPOUND
Alpha BHC
Lindane (gamma BHC)
Beta BHC
Delta BHC
Heptachlor
Alachlor
Atrazine
Aldrin
Heptachlor epoxide
Endrin
Endrin aldehyde
Endrin ketone
Dieldrin
p,p'-DDE
p,p'-DDD
p,p'-DDT
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Methoxychlor
Chlordane
Toxaphene

ALPHA ANALYTICAL LABS
ADDENDUM I
REFERENCES

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22. Klute, A. 1986, "Methods of Soil Analysis, Part 1", Methods 15-2.2 and 15-5.1. American Society of Agronomy, Madison, WI.

23. Exhibit No. 1. Petroleum Oils by Gas Chromatography. Alley Young & Baumartner, Inc., Consulting Engineers, PO Box 2036, Brentwood, TN 37024.

Appendix 3-4

BENCH SCALE TESTING METHODS AND RESULTS

Portsmouth, NH CSO Study

Bench Scale Testing Plan for Portsmouth , NH CSO Evaluations

Introduction

This plan presents the methods for conducting a bench scale test for determining the disinfection dose and contact time necessary for disinfecting overflows from the Combined Sewer Overflows (CSOs) for Portsmouth, NH. Prior bench scale tests have shown that as many as three CSO events will require bench scale testing, but no less than two CSO events should be sampled and tested.

Testing Plan

For each CSO, five gallons of wastewater will be collected during a CSO event and transported to the testing facility for bench-scale testing and sample analyses. Care should be taken to obtain representative solids (e.g., the heavy solids in the lower channel) when acquiring the sample.

At each event sampling, a pre-dosing sample will be taken from the five-gallon sample for water quality and bacteria analyses. These samples will be used to characterize the CSO. These samples include:

- Total Suspended Solids (TSS),
- Biological Oxygen Demand (BOD),
- Ammonia (NH_3),
- Chemical Oxygen Demand (COD),
- Fecal coliform (F. coli.), and
- Total Residual Chlorine (TRC).

A total of approximately 1.5 liters should be required for these analyses. Analytical testing parameters and sampling frequencies are shown in Table 1.

Table 1. Analytical testing parameters and frequency.

PARAMETER		Number of Events	Samples/ Event	Total Number of Samples
Pre-Dose Sample				
	TSS	3	1	3
	BOD	3	1	3
	NH3	3	1	3
	COD	3	1	3
	F.Coli.	3	2	6
	TRC	3	2	6
Post-Dosing Sample				
	F.Coli.	3	12	36
	TRC	3	12	36

Analytical testing shall be conducted in accordance with Standard Methods, 19th Edition
Standard QA/QC and ELAP procedures to be followed.
Bacteria samples will be tested at dosages of 10, 20, and 30 mg/l
and at contact times of 5, 10, 20, and 30 minutes

The remaining sample of CSO will be used for the bench scale test as follows:

- 3 sub-sample volumes of approximately 4 liters each will be transferred into testing jars configured with mixers (See Figure 1).
- The mixers will be actuated (at an appropriate setting to rigorously blend the sub-sample) prior to dosing and sustained for up to 15-seconds after dosing. The mixers setting should then be set to the lowest speed to allow gentle stirring to aid molecular diffusion. If a low speed setting is not possible, the mixers should be turned off, removed, and the samples gently stirred every 2-3 minutes.
- Sodium hypochlorite will be added at dosages of approximately 10, 20, and 30 mg/l as Cl_2.
- Discrete samples for each sub-sample will be obtained at t = 5, 10, 20, and 30-minutes (Figure 1). These samples will be analyzed for fecal coliform and TRC.
- Following each test run the sampling container and sub-sample testing jars should be cleaned and rinsed in preparation for the next sample and bench-scale test.

Pending results from the initial bench-scale test, the number of disinfection dosages tested and the contact times at which discrete sampling is performed may be increased.

Sample Handing

Sample documentation is necessary to keep a precise record of sample collection and sample handling. Like any laboratory sampling effort, a field sampling effort should also employ a sampling journal to record all necessary information to assure a high quality program. The following is a partial list that should be used as a guide for documenting field-sampling efforts:

- Unique Sample or Log Number - a unique identification number should be recorded for each sample for purposes of tracking and analysis.
- Date and Time of Sample Collection - date and time (usually recorded as military time - 24 hour clock) of all samples, including aliquot size for composite samples should be recorded.
- Source of Sample - a facility name and specific location should be noted.
- Name of Sampling Personnel - the name(s) and initials of all person(s) collecting samples should be indicated to allow specific questions to be addressed to the proper individuals.
- Sample Type - each sample should indicate grab or composite, volume, and frequency.
- Preservation Techniques Used - any chemical preservatives should be indicated by type and amount.
- Analysis Required - each parameter that will be analyzed in the sample should be recorded.
- Field Analysis - all analyses accomplished in the field should be explicitly recorded at the time of measurement.
- Comments - any other relevant comments should be included that will help explain any inconsistencies after analyses are received from the laboratory.

Samples must be preserved if immediate analysis is not possible. To ensure that the samples remain representative of the waste stream from which they were sampled, preservation techniques are used to minimize changes in sampled pollutant concentrations. The sample preservation requirements and maximum holding times specified by the analytical lab should be followed.

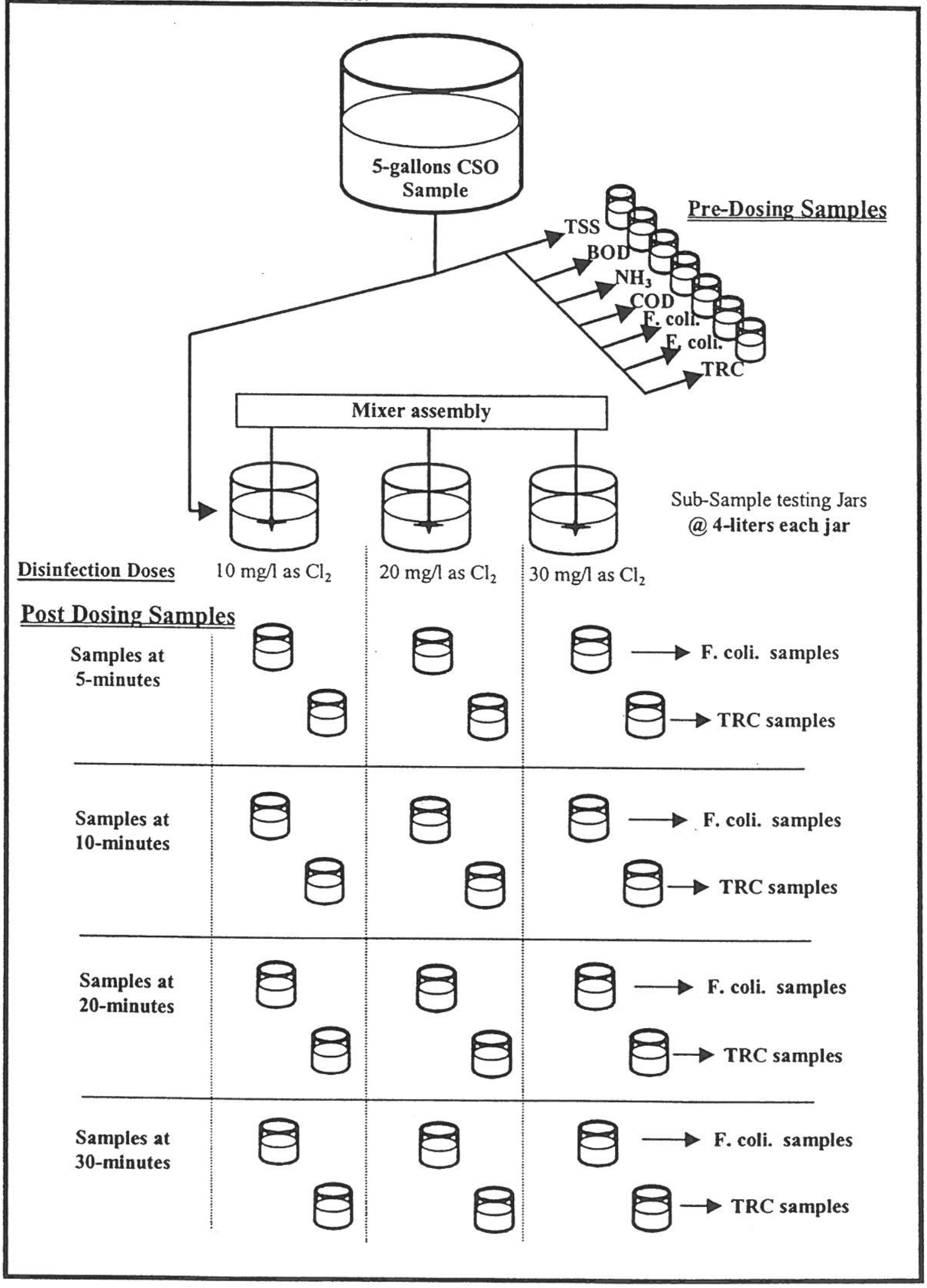
Analytical procedures

Water quality samples for TSS, BOD, COD, NH_3, fecal coliform, and TRC analytical testing should be conducted in accordance with Standard Methods, 19th edition, and the analytical laboratory's certified procedures. Standard quality assurance/quality control (QA/QC) and Environmental Laboratory Accreditation Program (ELAP) procedures should be followed.

Data Reporting

Field sheets, analytical data, and rainfall data reports should be prepared and submitted to Moffa & Associates during the bench-scale testing project.

Figure 1. Bench Scale Test Schematic.



Settling Column Method

1) Pour sample (1-3 gallons) into German column (See Figure B.1) and note temperature. Prescreen if need to remove large objects (#10 sieve).
2) Settle for 2 hours. After time elapses, withdraw accumulated sludge from bottom (about 100-150 ml.). The TSS of this sample represents "settleable solids present".
3) Sample interior supernatant and analyze for TSS. This number gives you non-settleable solids of original CSO sample.
4) Pour out contents of column and fill with tap water including the upper reservoir on top. Note temperature.
5) Take sludge and mix with water until you get a uniform slurry (200-300ml.).
6) Put sludge into top of column. This is time zero, T_0.
7) Note time, T_1, when first particle hits the bottom (i.e., the first particle or particle cloud arriving at the bottom of the settling column).
8) Samples are then withdrawn at logarithmic spaced intervals from the bottom of this section through a tube. The idea is to just take enough sample having the arrived mass in each interval. Analyze for TSS.
9) Say Mi equals the arrived mass in time i. Now sum of Mi equals total settleable solids noted in first time step. Therefore, the percent (%) settleable solids in each interval is simply:

$$([Mi/ \Sigma\ Mi] * 100).$$

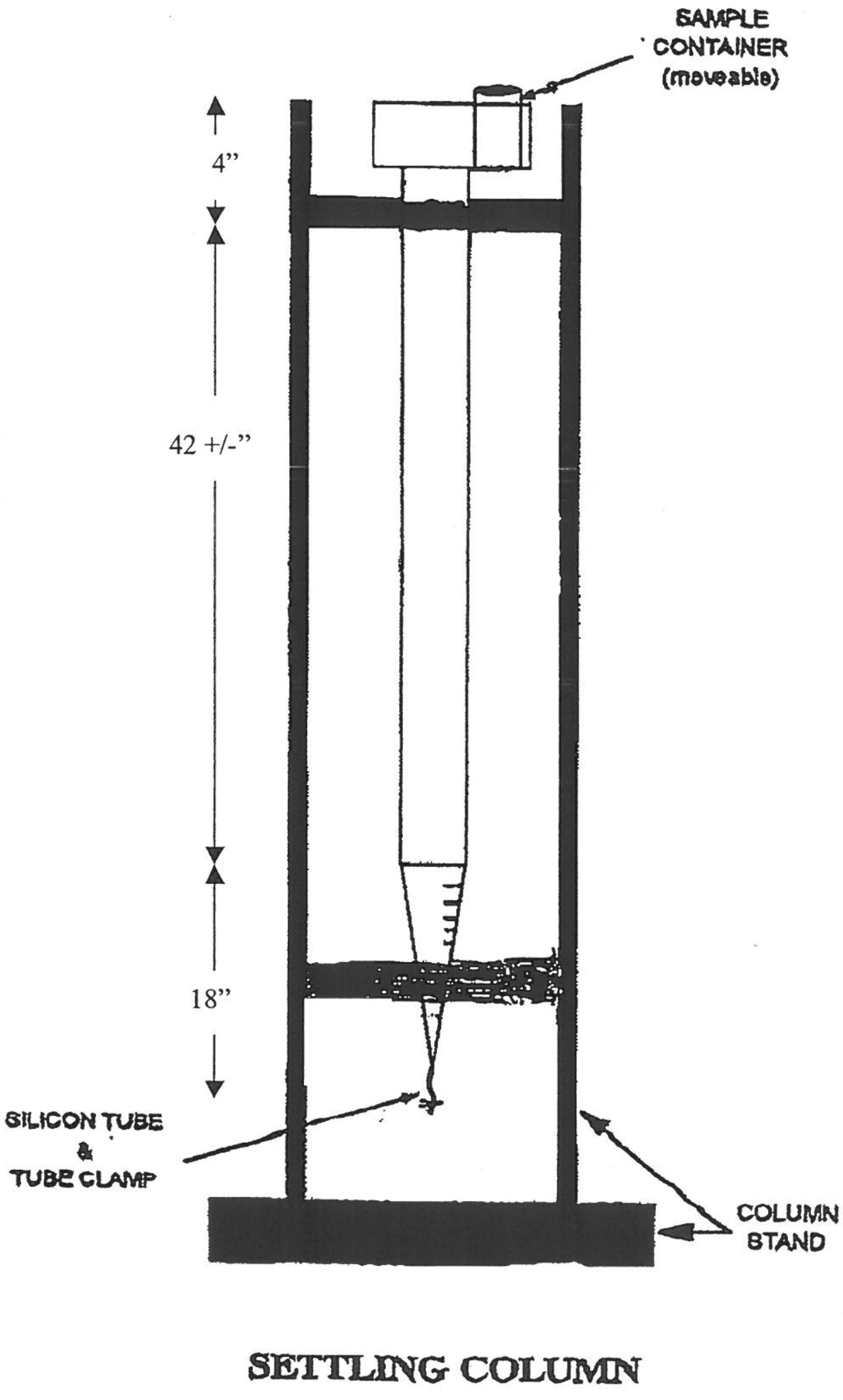


Figure B.1 German (Brombach) Settling Column

Underwood Engineers, Inc.

Civil~Environmental~Structural

INTEROFFICE MEMORANDUM

25 Vaughan Mall, Unit 1, Portsmouth, New Hampshire 03801-4012

DATE: January 7, 2002

TO: **PHR**

FROM: **HCG**

SUBJECT: **891 LTCP**

BENCH-SCALE CHLORINATION EVALUATION

A bench-scale chlorination evaluation was performed to determine chlorination/dechlorination doses necessary to achieve bacteria kills for a range of contact times. Three separate CSO events were evaluated. An outside laboratory performed the sample analyses.

The tests for water quality and bacteria analyses were performed on a sample collected from the "first flush" of a CSO event. The analytical tests included Total Suspended Solids (TSS), 5-Day Biological Oxygen Demand (BOD_5), Ammonia (NH3), Chemical Oxygen Demand (COD), Fecal Coliform (F. Coli), and Total Residual Chlorine (TRC). Testing methods are shown in Table 1. The results of the TRC and F. Coli tests are used to determine the range of chlorine dosage needed to disinfect the "first flush" from the CSO.

Table 1. Laboratory Testing methods

Constituent	Con-tainer	Size	Preservative	Hold Time	EPA Method
BOD_5	G	500 mL	cold	6/48h	405.1 5-day BOD test
COD	G	250 mL	H_2SO_4	7/28d	410.1 Titrimetric, Mid level
NH_3	P,G	w/COD	H_2SO_4	7/28d	350.3
Solids	P,G		cold		AWWA 209E Volumetric
TRC	P,G	100 mL	cold	0.5h	Standard Methods 408 B
Fecal*		100 mL	cold	6/30h	922D
TSS	P,G	250 mL	cold	7d	160.2

G:\REALNUM\800'S\891\Ltcp report\891Chlormemo.doc

The samples were collected at CSO 010A from the overflow discharging over the weir inside the manhole. The grab sample, taken at "first flush" using a bucket, was transferred immediately to carboys for transport to the testing facility. The grab sample was split for the bench-scale disinfection test and for a settling characteristics test.

Pre-dose samples for the primary contaminants of concern were taken. The remaining portion of the same sample was used for the bench scale disinfection test. The sample was transferred to testing jars configured with mixers. The mixers were actuated for rigorous mixing to blend the sub-samples and sustained for up to 15-seconds after dosing. The mixers were then set on low speed to allow gentle stirring to aid molecular diffusion. Sodium hypochlorite was added at dosages of 10, 20, and 30 mg/L as Cl_2. Discrete samples for each sub-sample were obtained at t=5, 10, 20, and 30-minutes. These samples were analyzed for F. Coli and TRC. The test procedure is attached. The procedure for the 6/17/01 and 9/21/01 test sequences was modified. The CSO sample was allowed to settle for 15 minutes. The decanted liquid was used for the bench-scale disinfection dosage tests.

Standard protocol for field sampling and chain of custody were followed. Preservation techniques and holding times appropriate for the analyses were implemented in accordance with Standard Methods, 19th edition, and the analytical laboratory's certified procedures.

The results of the CSO sampling program for the three wet-weather events are summarized in Table 2. The water level monitoring equipment for the 6/17/01 and 9/21/01 CSO events malfunctioned so flow data was not available for those events. The Fecal Coliform test results on samples from the 6/02/01 were below detection level.

Table 2. CSO Water Quality and Bacteria test results.

Event Date	Avg Flow (mgd)	BOD_5 (mg/L)	TSS (mg/L)	F Coliform (CFU/100mL)	COD (mg/L)	Ammonia (mg/L as N)
6/02/01	0.07	290	153*	<10	600	1.5
6/17/01		105	50	145000	220	0.9
9/21/01		62	189	149000**	113	ND

*TSS was measured on the decanted sample.
**This corresponds to the decanted sample from the blender.

During the CSO sampling program, low concentrations of BOD_5 and TSS were found, which indicates that a large percentage of the CSO volume was stormwater related. As can be seen in Table 2, the concentration of BOD_5 for two of the three events was less than the typical medium-strength domestic wastewater BOD_5 concentration of 220 mg/L (M & E, 1991).

The average TSS concentration ranged between 50 mg/L and 189 mg/L. This concentration is also less than the typical medium-strength domestic wastewater TSS concentration of 220 mg/L (M & E, 1991).

The TRC results are shown in Table 3. The results for 6/2/01 show that chlorine residual was consumed at the 10 mg/L dosage. Chlorine residual remained in the raw samples that were dosed at 20 and 30 mg/L and all the decanted samples that were tested. The results of the F. Coli tests performed on the bench-scale jar test samples generated on 6/17/01 and on 9/21/01 were all below the detection limit of 10 CFU/100mL.

Table 3. Total Residual Chlorine Results for Each Bench-Scale Jar Test Sequence

Test Date 6/2/01	Dosage (mg/L)	TRC at t=5 min	TRC at t=10 min	TRC at t=20 min	TRC at t=30 min
	10	0.0	0.0	0.0	0.0
	20	4.0	n/a	1.8	1.6
	30	18	10	7.8	6.6

Test Date 6/17/01	Dosage (mg/L)	TRC at t=10 min	TRC at t=20 min	TRC at t=30 min
	10	n/a	3.6	3.8
	20	9.0	9.0	7.8
	30	16.8	18.1	18.6

Test Date 9/21/01	Dosage (mg/L)	TRC at t=5 min	TRC at t=10 min	TRC at t=15 min
	5	3.0	3.0	3.0
	10	6.4	6.2	6.1
	15	6.9	7.0	6.4
	5*	2.0	3.0	2.8

*The samples were pureed in a blender just prior to testing for TRC.

In summary, the use of sodium hypochlorite at dosages in the range of 5-20mg/L with, or without, preliminary settling provided bacteria kills within 5 minutes of contact time.

BACTERIAL ANALYSIS REPORT

ESI STUDY No.: 9840
Client: Underwood Engineers, Incorporated
Program: Portsmouth CSO Study

Sample Collection: Date: September 21, 2001
Sample Analysis: Date: September 21, 2001
Analyst: Amy Planz

FECAL COLIFORM ANALYSIS

Sample ID	ESI #	Time Collected	Time Filtered	Result (CFU/100 mL)	Detection Limit (CFU/100 mL)	Method Number (Std. Methods)
5mg/L 10min.	9840-1	1050	1529	0	10	9222 D
5mg/L 5min.	9840-2	1050	1535	0	10	9222 D
5mg/L 15min.	9840-3	1050	1540	0	10	9222 D
10mg/L 5min.	9840-4	1050	1544	0	10	9222D
10mg/L 10min.	9840-5	1050	1549	0	10	9222 D
10mg/L 15min.	9840-6	1050	1554	0	10	9222 D
15mg/L 5min.	9840-7	1050	1605	0	10	9222 D
Decant Blend	9840-8	1050	1610	149000	10	9222 D
15mg/L 15min.	9840-9	1050	1613	0	10	9222 D
5mg/L 5min.	9840-10	1050	1615	0	10	9222 D
5mg/L 10min.	9840-11	1050	1622	0	10	9222 D
5mg/L 15min.	9840-12	1050	1625	0	10	9222 D
Raw CSO	9840-13	1050	1630	0	10	9222 D
Decant CSO	9840-14	1050	1634	0	10	9222 D
15mg/L 10min.	9840-15	1050	1638	0	10	9222 D
Raw CSO Blend	9840-16	1050	1643	143000	10	9222 D

LAH:ajp

Authorized Signature: Kenneth A. Simon
EnviroSystems, Incorporated

Date

FILE No.806 10/02 '01 AM 09:51 ID:ENVIROSYSTEMS FAX:6039263521 PAGE 3

CHAIN OF CUSTODY RECORD

ESI STUDY # 9840

ENVIROSYSTEMS, INCORPORATED

One Lafayette Road, P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

PAGE 1 OF 2

P.O. #

CLIENT: Underwood Engineers, Inc

CONTACT: Peter Rice

PROJECT NAME: Portsmouth LTCP

REPORT TO: Peter Rice

ADDRESS: 25 Vaughan Mall

PHONE: 436-6192

INVOICE TO: Underwood Engineers, Inc

ADDRESS: Portsmouth NH 03801

SAMPLED BY: HCG

ESI SAMPLE #	FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	COMPOSITE (YES/NO)	TIME SAMPLED	SAMPLE MATRIX	CONTAINER #/VOL/TYPE	DID YOU FIELD PRESERVE	NOTES / ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
	1. 5mg/L 10 min	9/21/01	NO	10:50AM	WW	Whirl Pak 100mL	Y.	Full dilution range
	#2 5 mg/L 5 min							
	#3 5 mg/L 15 min							
	#4 10 mg/L 5 min							
	#5 10 mg/L 10 min							
	#6 10 mg/L 15 min							
	#7 15 mg/L 5 min							
	#8 Decant Blend							
	#9 15 mg/L 15 min							
	#10 5 mg/L 5 min							

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
HC Gallagher	9/21/01	11:26	[signature]	9/21/01	1425

COMMENTS:

A CHAIN OF CUSTODY IS REQUIRED WITH EACH SET OF SAMPLES

CHAIN OF CUSTO[illegible]Y RECORD

ENVIROSYSTEMS, INCORPORATED

One Lafayette Road, P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

ESI STUDY # 9840

PAGE 2 OF 2

CLIENT: Underwood Engineers, Inc

CONTACT: Peter Rice

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REPORT TO: Peter Rice

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PHONE: 436-6192

INVOICE TO: Underwood Engineers, Inc

ADDRESS: Portsmouth NH 03801

SAMPLED BY: HCG

ESI SAMPLE #	FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	COMPOSITE (YES/NO)	TIME SAMPLED	SAMPLE MATRIX	CONTAINER #/VOL/TYPE	DID YOU FIELD PRESERVE	NOTES / ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
	#11 5 mg/L 10 min	9/21/01	NO	10:15 A	WW	whirl pac 100 mL	Y	Full dilution range
	#12 5 mg/L 15 min							
	#13 Raw CSO							
	#14 Decant CSO							
	#15 15 mg/L 10 min							
	#16 Raw CSO Blank							

RELINQUISHED BY: HCGallagher	DATE: 9/21/01 TIME: 14/26	RECEIVED BY: [signature]	DATE: 9/21/01 TIME: 1425
RELINQUISHED BY:	DATE: TIME:	RECEIVED BY:	DATE: TIME:
RELINQUISHED BY:	DATE: TIME:	RECEIVED BY:	DATE: TIME:

COMMENTS:

A CHAIN OF CUSTODY IS REQUIRED WITH EACH SET OF SAMPLES

copy.

RL Resource Laboratories

124 Heritage Avenue Unit 10
Portsmouth, NH 03801

Voice: 603-436-2001
FAX: 603-430-2100

Laboratory Report

RECEIVED
OCT 18 2001
BY UNDERWOOD ENGINEERS, INC.

Underwood Engineers, Inc.
25 Vaughan Mall
Portsmouth, NH 03801

PO Number: None
Lab Number: 3585
Date Received: 09/21/01

Project: Portsmouth LTCP

Attached please find results for analyses performed on samples received on 09/21/01.

Samples were received in acceptable condition and under chain of custody. Unless otherwise noted in the attached report, the following criteria were met.

Instruments used in analysis were calibrated with the appropriate frequency and to the specifications of the referenced methods.

Analytes in blanks were below levels effecting sample results.

Matrix effects as monitored by matrix spike recovery or unusual physical properties were not apparent.

Accuracy and precision as monitored by laboratory control sample analyses were within acceptance limits.

If you have any questions regarding the enclosed report, please contact the laboratory at (603)436-2001 as we would be glad to assist you.

RESOURCE LABORATORIES

Authorized Signature

10/17/01
Date

Total number of pages 4

Report No: 3585
Project: Portsmouth LTCP

Parameter Biochemical Oxygen Demand
Matrix: Water

Sample ID	Lab ID	Result		Quant Limit	Units	Date of Analysis	Method/Reference
BOD #1	3585-01	62	*	5	mg/L	09/26/01 1335	405.1 EPA 600/4/79/020
BOD #2	3585-02	14	*	5	mg/L	09/26/01 1335	405.1 EPA 600/4/79/020

*Note: BOD Samples were over-diluted, qualify result as an estimate. Actual result may be higher.

Report No: 3585
Project: Portsmouth LTCP

Sample ID: COD
Matrix: Water

Parameter	Lab ID	Result	Quant Limit	Units	Date of Analysis	Method/Reference
Chemical Oxygen Demand	3585-03	113	5	mg/L	09/28/01	410.1 EPA 600/4/79/020

Parameter	Lab ID	Result	Quant Limit	Units	Date of Analysis	Method/Reference
Ammonia	3585-04	ND	0.1	mg/L as N	10/09/01	350.3 EPA 600/4/79/020

6 '7

3585 UA81

RL Resource Laboratories, LLC
124 Heritage Avenue
Portsmouth, NH 03801

Voice: 603-436-2001
FAX: 603-430-2100

CHAIN OF CUSTODY DOCUMENTATION

Client: Underwood Engineers	Contact: Peter Rice	Project Name: Portsmouth LTCP	PAGE 1 OF 1
Report To: Peter Rice	Address: 25 Vaughan Mall		Phone/FAX: 436-6192
Invoice To: Underwood Engineers	Address: Portsmouth, NH		P.O.# Quote #

PROTOCOL: ____RCRA ____SDWA ____NPDES ____NHDES PETROLEUM FUND ____OTHER:

Lab Number: (assigned by laboratory)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab/composite (G/C)	Container Size (mL)	Container Type (P/G/T)	Field Preservation	Matrix S=Soil W=Water	Analyses Requested: Special Instructions:
3585-01	BOD #1	9/21/01	10:50AM	HCG	G	500	P	—	W	BOD
-02	BOD #2					500	P	—	W	BOD
-03	COD #3					125	P	H_2SO_4	W	COD
-04	#4					250	P	H_2SO_4	W	NH_3

Relinquished By: HC Gallagher	Date: 9/21/01	Time: 1:49 PM	Received By: [signature]	Date: 9.21.01	Time: 1:50pm
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

ESI

EnviroSystems, Inc.
P.O. Box 778, One Lafayette Road
Hampton, N.H. 03843-0778
(603) 926-3345 • (603) 926-3521 Fax
E-mail ESI @ www.envirosystems.com

June 19, 2001

Mr. Peter Rice
Underwood Engineers, Incorporated
25 Vaughan Mall
Portsmouth, New Hampshire 03801

Dear Mr. Rice;

Please find attached a copy of our report covering results of bacteriological analysis of water samples collected on June 17, 2001.

Samples were received in acceptable condition and under chain of custody. Equipment used in the analysis was calibrated and operated within limits specified by the reference methods. Analytes in blanks were below levels that would impact sample results. Accuracy and precision as monitored by laboratory control analyses were within acceptance limits.

As I indicated in my telephone conversation of yesterday, one sample container appeared to be mislabeled. The sample is marked with an "*" in the data table.

If you have any questions or comments please do not hesitate to call.

Sincerely,

EnviroSystems, Incorporated

Ken Simon

Kenneth A. Simon
President

Attachment
Report 9606-01-06

BACTERIAL ANALYSIS REPORT

ESI STUDY No.: 9606
Client: Underwood Engineers, Incorporated
Program: Portsmouth CSO Study

Sample Collection: Date: June 17, 2001
Sample Analysis: Date: June 17, 2001
Analyst: Ken Simon

FECAL COLIFORM ANALYSIS

Sample ID	ESI #	Time Collected	Time Filtered	Result (CFU/100 mL)	Detection Limit (CFU/100 mL)	Method Number
"Raw 1"	9606-10	1630	2155	145000	1000	9222 D
"Raw 2"	9606-11	1715	2200	77000	1000	9222 D
1 : 10	9606-1	1745	2205	<10	10	9222 D
1 : 10 Dup	9606-1d	1745	2210	<10	10	9222D
2 : 10	9606-2	1745	2218	<10	10	9222 D
3 : 10	9606-3	1745	2225	<10	10	9222 D
1 : 20	9606-4	1755	2230	<10	10	9222 D
2 : 20	9606-5	1755	2235	<10	10	9222 D
2 : 20*	9606-6	1755	2240	<10	10	9222 D
1 : 30	9606-7	1805	2247	<10	10	9222 D
2 : 30	9606-8	1805	2250	<10	10	9222 D
3 : 30	9606-9	1805	2255	<10	10	9222 D
3 : 30 Dup	9606-9d	1805	2300	10	10	9222 D

NOTES:

* Sample container labeled as "2:20" with a time of 1755; the initial label on the sample container, but was struck out, was "2:30" with a time of 1805. From chain of custody this sample container appears to be for sample "3 : 20".

Authorized Signature: [signature] 6/15/01
EnviroSystems, Incorporated Date

CHAIN OF CUSTODY RECORD

ENVIROSYSTEMS, INCORPORATED

One Lafayette Road, P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345 Fax # (603) 926-3521

ESI STUDY # 9606

PAGE 1 OF 2

CLIENT: Underwood Engineers	CONTACT: Peter Rice	PROJECT NAME: Portsmouth CSO	P.O. #
REPORT TO: Peter Rice	ADDRESS: 25 Vaughan Mall		PHONE: 436-6192
INVOICE TO: 〃	ADDRESS: Portsmouth, NH 03801		SAMPLED BY: PAR/HCG

ESI SAMPLE #	FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	COMPOSITE (YES/NO)	TIME SAMPLED	SAMPLE MATRIX	CONTAINER #/VOL/TYPE	DID YOU FIELD PRESERVE	NOTES / ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
-1	~~1-10~~ 1-10	6/17/01	NO	4:30	water			
-2	~~2-10~~ 2-10	〃	〃	〃	〃			
-3	~~3-10~~ 3-10	〃	〃	〃	〃			
-4	~~1-20~~ 1-20	〃	〃	〃	〃			
-5	~~2-20~~ 2-20	〃	〃	〃	〃			
-6	3-20	〃	〃	〃	〃			
-7	1-30	〃	〃	〃	〃			
-8	2-30	〃	〃	〃	〃			
-9	3-30	〃	〃	〃	〃			
-10	Raw 1	〃	〃	〃	〃			

RELINQUISHED BY: Peter Rice	DATE: 6/17/01	TIME: 8:23	RECEIVED BY: [signature]	DATE: 6/17/01	TIME: 2023
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:

COMMENTS:

A CHAIN OF CUSTODY IS REQUIRED WITH EACH SET OF SAMPLES

Portsmouth, NH CSO Modeling Report

Underwood Engineers Inc.
Portsmouth, New Hampshire

August 2002

Moffa & Associates
A Unit of Brown and Caldwell

Appendix 4-1 Table of Contents

List of Tables and Figures

Tables

Figures

Appendices

Section 1 - Introduction

Underwood Engineers, Inc. retained Moffa & Associates, a unit of Brown and Caldwell (MBC) of Syracuse, NY to mathematically model the combined sewer system of Portsmouth, NH tributary to the Pierce Island Wastewater Treatment Plant and also to perform an engineering study of the major combined sewer overflows (CSO). The purpose of this engineering study of the combined sewer overflows (CSO) in the city of Portsmouth, NH is to:

- Characterize the hydrologic parameters of the combined sewered areas tributary to the CSO's and the Pierce Island Waste Water Treatment Plant (WWTP)
- Develop a calibrated mathematical model of the combined sewer collection system tributary to the Pierce Island WWTP
- Estimate the quantities of intercepted wastewater and to determine overflow characteristics at each CSO
- Determine the intensity/duration of a minimum storm event that will cause an overflow to occur
- Determine the average annual number of CSO events and the average annual CSO discharge volume
- Develop feasible abatement strategies for sewer system remediation that will be used to determine a cost/benefit analysis

MBC utilized the Environmental Protection Agency (USEPA) Storm Water Management Model, [SWMM] Version 4.4GU (Huber and Dickinson, 1989; Roesner, Aldrich and Dickinson, 1989, Camp Dresser & McKee and Oregon State University,1999) to construct the model. A SWMM model was previously developed for the Facility Plan developed in 1990 (and updated as part of this current effort. SWMM incorporates complicated hydraulic model that should only be utilized by individuals experienced in urban hydrology and with considerable experience in hydraulics.

SWMM consists of five basic components or blocks that may be used together or separately to model a system. The five blocks are Runoff, Transport, Extended Transport (Extran), Storage Transport (S/T), and Receiving Water (Receive). The Runoff and Extran blocks were used for this study.

1.1 Collection System

This study involved creating a mathematical model of the combined sewer system tributary to the Pierce Island Wastewater Treatment Plant. The modeled collection system contains approximately 560 acres of combined sewer area tributary to the Mechanic Street Pumping Station. The Pierce Island Wastewater

Treatment plant receives all of its flow via the Mechanic Street Pumping Station and as a result is currently the primary limiting segment for flow to the plant.

Three main sewers included in the model consist of the Mechanic Street Basin Interceptor, which begins at the discharge of the Lafayette Rd. pumping station and extends 9,986 feet to the Mechanic St. pumping station. The second main sewer is for the Box Sewer Basin Interceptor, which begins at the head of North Mill Pond and extends 5,100 feet to the Deer St. Pumping station. The third main sewer connects the Deer St. Pumping Station (DSPS) outlet to the Mechanic St. Pumping Station (MSPS). This sewer also collects a small amount of CSO from local drainage areas.

The maximum capacity of the MSPS in the model is 18.5 mgd. The MSPS was designed for a rate of 22 mgd. The maximum capacity of the DSPS in the model is 9.3 mgd. It was designed to pump at a rate of 12 mgd. These capacities are based on the peak rates measured at the Mechanic St. and Deer St. stations during the monitoring period (April to July 2000)and were used for model calibration..

The three major combined sewer overflows (CSO) that exist within the system are: CSO 10 A, CSO 10B and the Deer St. CSO. Of these overflows, CSO 10A and CSO 10B discharge into the South Mill Pond while the Deer St. CSO discharges into the Piscataqua River. CSO 10B is upstream from CSO 10A, but are relatively close together and generally discharge simultaneously. For this analysis, CSO 10A and 10B were considered, as one overflow structure and are identified as "10A/10B"; however, the overflows were modeled separately. The Deer St. CSO was identified as "DS". An additional CSO exists near Marcy Street. This CSO, called CSO #12 is manually operated. It is only opened as a bypass during extreme wet-weather conditions. On a historical basis, the occurrences of this CSO's operation has been very infrequent. As such, this CSO was not included in the modeling portion of this study. A map of the collection system showing the overflow locations is shown in Figure 4-2 of the CSO Long Term Control Plan Portsmouth, New Hampshire.

Of the total 560 acres of combined sewer area, approximately 160 acres are tributary to the Deer St. pumping station and approximately 400 acres are tributary to the Mechanic Street Basin Interceptor, which flows directly into the MSPS. For the modeling effort, the CSO tributary area was divided into 21 subcatchments, each having distinct hydrologic characteristics. A map of the CSO area and the location of the subcatchments is shown in Figure 4-3 of the CSO Long Term Control Plan Portsmouth, New Hampshire.

Section 2 - Model Development

2.1 Surface Runoff Model Development (Runoff Block of SWMM)

The Runoff block of SWMM was utilized to estimate stormwater runoff hydrographs, and sewer infiltration hydrographs from rainfall hyetographs. The Runoff block uses a nonlinear reservoir method to calculate its results.

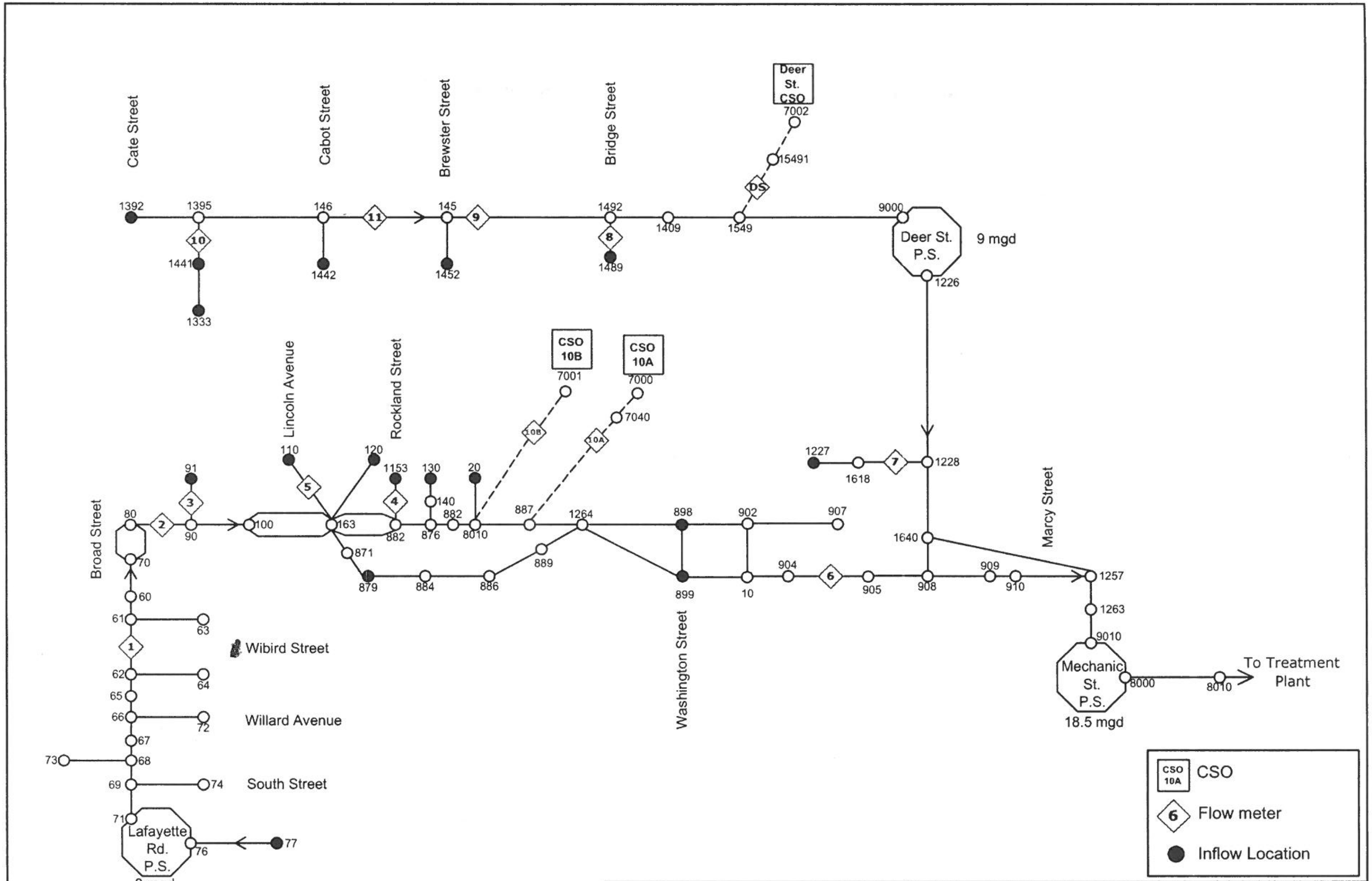
For this project, the surface runoff model was developed for the entire combined sewer area tributary to the Mechanic St. Pumping Station. Data collected from aerial photos and topographic maps were utilized to identify these characteristics representing the sewershed areas in the model. These data include: ground surface area, average ground slope, roughness, percent impervious area, surface storage, soil infiltration, and characteristic width. The subcatchment data used in the Portsmouth hydrologic modelare shown in Table 2.1 with their associated sewer system inflow locations (inlet manholes) as shown in Figure 2.1.

Table 2.1 *CSO Tributary Area Data*

Subcatchment Number	Model Inlet Number	Ground Surface Area (Acres)	Percent Impervious	Average Ground Slope
011	1392	32.0	2	0.030
012	1441	23.0	2	0.013
013	1333	52.0	60	0.010
014	1442	19.5	50	0.020
015	1452	20.0	40	0.010
016	1489	11.8	65	0.020
030	1227	11.5	75	0.028
036	77	11.2	4	0.030
037	74	17.6	4	0.040
038	73	24.7	5	0.012
039	72	15.4	7	0.001
040	64	30.0	5	0.016
050	63	54.4	20	0.006
060	91	72.0	6	0.013
070	110	19.0	22	0.017
080	120	22.6	40	0.021
081	1153	30.0	45	0.004
090	130	25.7	15	0.010
110	20	11.3	15	0.030
120	898	21.7	95	0.018
130	879	18.2	15	0.020
140	899	16.0	95	0.020
Total CSO Tributary Area		**560**		

Deer St ~160 a

Mech St ~ 400a



NOT TO SCALE	Portsmouth, New Hampshire	Date: **July 2002**
Moffa & Associates A Division of Brown and Caldwell	Modeled Collection System Schematic	Figure: 2.1

USERS\ADDdata1\Portsmouth\Sewer Schematic.dwg

After close examination of the metered flow data, it was found that during significant storm events, considerable infiltration and inflow of groundwater occurs within the combined sewer system for the City of Portsmouth, NH following rainfall periods. In order to calculate infiltration and inflow (I/I) of groundwater into the modeled pipe system, the I/I response function of Runoff was utilized at subcatchments where I/I was measured. The I/I response captures a portion of the rainwater infiltrated into the soil and routes it into the collection system. The amount captured is represented by triangular unit hydrographs that are defined by the modeler. The resulting runoff / runoff-infiltration hydrographs are then input into EXTRAN and are part of the calibration described later in this report.

2.2 Combined Sewer System Model Development (EXTRAN Block)

The EXtended TRANsport (EXTRAN) block of the SWMM was utilized to perform hydraulic flow routing of the sewer system in order to estimate flow rates and volumes within the collection system. The Extran block uses the explicit finite-difference solution of the complete St. Venant equations. It receives hydrographs developed from the Runoff block and performs dynamic routing of the stormwater flows throughout the storm drainage system and to the points of outfall such as receiving waters or treatment plants. The hydrographs are specific to each subcatchment and are therefore input at their associated inlets. Extran is capable of simulating backwater effects, surcharging, pressure flow and looped connections.

The Extran block represents the collection system as a series of conduits (sewers) and junctions (manholes) The collection system model is a simplified representation of the actual system. The model does not include all junctions along modeled sewers. Junctions that are included are either located at a significant diameter and/or slope change or are nodes where flow from specific subcatchments has been input. The simplification minimizes computer run-time while still maintaining the hydraulic integrity of the system. Enough detail has been included to provide sufficient hydraulic characteristics to describe the system's response to varying rainfall conditions.

The sewers which have been included in the model of the combined sewer areas are shown in Figure 2.1. Besides the main intercepting sewers, some of the smaller diameter pipes upstream of the interceptor, have also been included in the model. In other words, the Extran model extends partially into the subcatchment areas. This allows the model to better represent attenuated flow values and to identify flow contributions at each of the metered locations.

Sanitary flow or dry-weather flow was also included in the model. Since the diurnal patterns of dry-weather flow have less effect than wet weather on CSO, only the average dry-weather flow rate was used. These data were extracted from the monitored data at each of the metered locations and were input into the model. Flow monitoring will be discussed further in the next section.

Three pump stations were represented in the model, these include: the Mechanic Street Pump Station, the Deer Street Pump Station. and Lafayette Road Pump Station.. The pumping capacities of these stations used in the model were determined by evaluating flow meter data at the stations during the monitoring period.

In this sewer system, CSO 10A and the Deer Street CSO have weirs installed. The use of weirs in the Extran block has historically caused numerical instability during periods of pipe surcharge. For this modeling effort, overflow weirs have been represented, not as a separate hydraulic structure, but as an equivalent pipe. This approach provides nearly identical results and eliminates the problem of weir-related numerical instability. Shorter pipe lengths can also induce instability during model simulation. In order to circumvent this problem, longer, hydraulically equivalent pipes are used in the model. The method for calculating these equivalent pipes is discussed in detail in the SWMM manual.

2.3 Flow and Rainfall Monitoring

The monitoring program conducted by Utility Pipeline Services, Inc. (UPS) included continuous measurement of flow, velocity and depth at fifteen separate locations. The locations are shown on the collection map in Figure 4-2 of the CSO Long Term Control Plan fro Portsmouth, NH by UEI. As part of the study, flow and depth were monitored at the three CSO's all of which have permanent continuous monitoring programs implemented. The monitoring for the additional twelve meters was begun on April 19, 2000. All of meters were removed on June 14, 2000 except Flow Meter #6 which was removed on August 7, 2000. Data were collected in fifteen-minute intervals. Marcy St manhole (not the bypass)

Rainfall was measured with continuous recording devices in minimum increments of 0.01 inch, in time increments of 15 minutes. Rainfall was measured from one location within the system, at the Pierce Island Wastewater Treatment Plant.

2.4 Model Calibration and Validation

The purpose of model calibration and validation is to adjust the model so that it simulates actual field conditions during a variety of storm conditions. The calibration procedure takes into consideration the volume and peak rate of the event as well as the shape of the hydrograph. After the model is calibrated to a specific storm, it is validated by simulating one or more additional storms and comparing model and measured results. If the model does not perform adequately, the model is adjusted until the best possible fit is achieved.

2.4.1 Calibration Storms

Each storm event chosen for calibration caused an overflow event at one or more of the major CSO's. All storm events chosen caused an overflow at CSO 10A. The calibration storm events occurred on April 21, 2000, May 13, 2000, May 24, 2000, June 6, 2000, June 12, 2000 and July 16, 2000 and are summarized in Table 2.2. All events except for the June 12 event caused an overflow at CSO 10B. Three events, April 21, May 24 and July 16, caused an overflow at the Deer St. CSO.

Table 2.2 *Summary of Calibration Storms*

Date	Total Rainfall (in.)	Duration (hrs:min)	Peak 15 Minute Intensity (in/hr)	CSO @ Deer St	CSO @ 10B	CSO @ 10A
04/21/00	4.28	43:15	0.44	Yes	Yes	Yes
05/13/00	0.46	3:00	0.68	No		
05/24/00	0.99	11:30	0.44	Yes		
06/06/00	1.34	21:30	0.40	No		
06/12/00	0.42	5:15	0.48	No	No	
07/16/00	2.32	10:00	1.16	Yes	Yes	

These storm events represent a variety of rainfall types. By performing model calibration to a diverse group of events, the model can more accurately estimate hydraulic characteristics for any individual event simulation as well as estimate volumetric quantities for continuous simulation. The model calibration graphs are found in Appendix B. A summary of the peak flows and volumes calculated for each metered location is found in Table 2.3

Rainstorm events vary in velocity, direction and surface area, which will effect a subcatchment in a non-uniform manner. For example, a storm may approach the rainfall gauge before reaching other areas of the subcatchment. This condition becomes noticeable when calibrating to these types of events. When rainfall data collected at one location, such as in this study, is input into the model, it distributes this rain

Table 2.3 - *SWMM Calibration Summary*

STORM DATE	ORCHARD STREET - MH# 855 FLOW METER #1				BROAD STREET - MH# 863 FLOW METER #2				MILLER AVENUE - MH# 865 FLOW METER #3				ROCKLAND STREET - MH# 1153 FLOW METER #4				LINCOLN STREET - MH# 1177 FLOW METER #5			
	Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed	
	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)
04/21/00	3.8	5.282	3.6	4.193	6.0	7.789	5.9	6.006	1.4	1.130	1.7	1.254	Depth 45.0 in.	N/A	Depth 38.8 in	N/A	1.2	0.834	1.2	0.740
05/13/00	2.5	0.426	2.9	0.376	5.2	0.626	5.0	0.563	2.2	0.092	1.6	0.088	2.1	0.123	3.0	0.180	1.8	0.055	1.4	0.054
05/24/00	2.4	0.870	2.4	0.821	5.0	1.362	5.1	1.265	1.1	0.166	1.3	0.191	2.3	0.407	3.2	0.403	N/A	N/A	1.2	0.120
06/06/00	2.6	1.565	2.4	1.409	5.2	2.340	4.8	2.077	1.4	0.314	1.2	0.323	2.1	0.594	2.9	0.602	1.0	0.132	1.1	0.174
06/12/00	1.7	0.416	2.4	0.478	4.3	0.682	4.4	0.583	1.2	0.097	1.3	0.094	1.7	0.143	2.4	0.172	1.7	0.054	1.1	0.050
07/16/00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	**13.0**	**8.56**	**13.7**	**7.28**	**25.7**	**12.80**	**25.2**	**10.49**	**7.3**	**1.80**	**7.0**	**1.95**	**8.2**	**1.27**	**11.4**	**1.36**	**5.8**	**1.07**	**5.9**	**1.14**
Difference from measured			**5%**	**-15%**			**-2%**	**-18%**			**-4%**	**8%**			**40%**	**7%**			**1%**	**6%**

STORM DATE	MARCY STREET - MH# 905 FLOW METER #6				COURT STREET - MH# 1225 FLOW METER #7				BRIDGE STREET - MH# 1492 FLOW METER #8				ROCK STREET EXTENSION FLOW METER #9				JEWELL COURT FLOW METER #10			
	Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed	
	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)
04/21/00	10.7	13.347	10.7	13.481	2.1	0.952	2.0	1.025	1.8	0.843	2.1	0.975	14.8	14.187	16.1	14.967	6.6	4.393	7.0	4.520
05/13/00	10.0	1.338	10.1	1.587	2.2	0.079	2.5	0.103	2.9	0.097	2.5	0.104	14.1	1.166	11.9	1.207	9.0	0.326	8.0	0.375
05/24/00	11.2	2.711	11.5	3.219	2.2	0.267	2.1	0.267	2.2	0.229	2.1	0.223	11.4	2.613	12.2	2.780	6.1	0.711	7.4	0.837
06/06/00	9.5	3.870	10.5	6.005	2.1	0.408	2.0	0.319	2.1	0.366	1.8	0.316	13.9	4.626	12.8	4.546	7.2	1.015	7.0	1.218
06/12/00	9.3	1.575	9.2	1.749	2.0	0.110	1.9	0.094	1.9	0.105	1.8	0.096	13.2	1.308	10.2	1.359	4.8	0.109	6.1	0.340
07/16/00	9.2	3.639	11.2	5.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	**60.0**	**26.48**	**63.3**	**31.11**	**10.6**	**1.82**	**10.4**	**1.81**	**10.9**	**1.64**	**10.3**	**1.72**	**67.4**	**23.90**	**63.3**	**24.86**	**33.7**	**6.55**	**35.5**	**7.29**
Difference from measured			**6%**	**17%**			**-2%**	**0%**			**-5%**	**5%**			**-6%**	**4%**			**5%**	**11%**

STORM DATE	BARTLET STREET - MH# 1457 FLOW METER #11				CSO 10A FLOW METER #887				CSO 10B FLOW METER #883				CSO 10A & 10B COMBINED				DEER ST. CSO FLOW METER #1549			
	Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed		Measured		Computed	
	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)
04/21/00	11.5	11.410	11.2	10.524	6.8	3.407	7.6	3.662	5.5	0.978	7.8	1.500	12.2	4.385	15.5	5.162	7.6	3.154	9.1	3.571
05/13/00	12.0	0.821	8.0	0.765	3.5	0.127	0.0	0.000	1.9	0.038	0.0	0.000	5.4	0.165	0.0	0.000	0.0	0.000	0.0	0.000
05/24/00	9.1	1.861	8.0	1.754	2.6	0.224	3.5	0.210	1.1	0.015	0.0	0.000	3.7	0.239	3.5	0.210	0.9	0.030	0.4	0.008
06/06/00	11.6	2.897	8.4	2.900	1.5	0.029	0.4	0.014	1.8	0.049	0.0	0.000	2.8	0.078	0.4	0.014	0.0	0.000	0.0	0.000
06/12/00	11.6	0.886	6.8	0.839	2.3	0.047	0.0	0.000	0.0	0.000	0.0	0.000	2.3	0.047	0.0	0.000	0.0	0.000	0.0	0.000
07/16/00	N/A	N/A	N/A	N/A	13.6	0.961	13.4	1.170	13.6	0.589	25.9	1.212	26.6	1.550	39.2	2.4	9.3	0.644	18.0	1.8
TOTAL	**55.9**	**17.88**	**42.4**	**16.78**	**30.4**	**4.80**	**25.0**	**5.06**	**23.8**	**1.67**	**33.7**	**2.71**	**52.9**	**6.46**	**58.6**	**7.77**	**17.8**	**3.83**	**27.5**	**5.40**
Difference from measured			**-24%**	**-6%**			**-18%**	**5%**			**41%**	**63%**			**11%**	**20%**			**54%**	**41%**

uniformly over the entire modeled system. This can cause the model to predict peak flow and volumes higher then the metered flow data for some locations. The following discussion provides a summary of each event used in model calibration.

2.4.1.1 April 21, 2000 Event

Of the six calibration storms, this event had the longest duration with over 3 hours of rain. It also had the highest total rain volume of 4.28 inches and had a peak 15-minute intensity of 0.44 in/hr and caused the greatest discharge volume at all three CSO's. In evaluating the overflow calibration graphs, the model over-predicted the discharge volume by estimating higher flow rates at the beginning of the storm. This difference may be attributed to rainfall variability and is shown in the graphs for all three CSO's in Appendix A. Despite this over-prediction at the start of the storm, the model closely estimated the peak flow for the majority of the storm event. More importantly, the model accurately estimated the volume of discharge from the CSO's for the entire event.

2.4.1.2 May 13, 2000 Event

This event had the shortest duration of the six storms and the second to smallest intensity at 0.42 in/hr. It caused a combined peak flow of 5.4 mgd (measured) from 10A/10B. The model predicted no overflow at CSO's 10A and 10 B. This storm did not produce overflow at the Deer St. CSO as was predicted by the model.

2.4.1.3 May 24, 2000 Event

This event had over an 11-hour duration, a peak 15 minute intensity of 0.44 in/hr and caused overflows to occur at all CSO's. The measured combined peak flow for 10A/10B was 3.7 mgdand the volume discharge was measured at 0.24 MG. The model computed a peak of 3.5 mgdand a volume of 0.21 MG for this storm.

2.4.1.4 June 6, 2000 Event

This rainfall event had the second longest duration of the calibration storms with over 21 hours, but had the lowest intensity of all the calibration storms at 0.4 in/hr. The event caused a combined overflow at 10A/10B of 2.8 mgd. The model predicted an overflow of 0.5 mgd. CSO 10A produced a measured volume discharge 0.029 MG. The model predicted a slightly lower volume of flow at 0.014 MG.

2.4.1.5 June 12, 2000 Event

This event had the smallest amount of total rainfall volume at 0.42 inches and a medium duration of just over 5 hours. This event caused the smallest measured discharge volume of 0.05 MG for the combined flow of 10A & 10B. The model predicted no overflow to occur for this storm event. This storm did not produce overflow at the DS CSO as was predicted by the model.

2.4.1.6 July 17, 2000 Event

This event had the highest peak 15 minute intensity at 1.16 in/hr, had a duration of 10 hours and caused the overflow to occur at all three CSO's. This event also caused the highest measured 15-minute peak discharge from all three CSO's. The measured peak from 10A/10B and DS was 26.8 and 9.3 mgd respectively. The model predicted a peak discharge of 39.2 and 18.0 mgd from 10A/10B and DS, respectively.

The volume discharge measured at 10A/10B and DS was 1.6 and 0.6 MG, the model calculated the volume discharge to be 2.4 and 1.8 MG for 10A/10B and DS respectively. The model also predicted the highest peak discharge and volume for this storm.

2.4.1.7 Conclusion

The model calibration graphs shown in Appendix A demonstrate model calibration and validation over a broad range of rainfall conditions including storm duration, intensity and volume. The modeled flow generally matched the metered locations with differences likely resulting from rainfall variability and meter limitations. The calibration summary on Table 2.3 shows that the model predicted ~~acceptably~~ conservatively the combined volumetric discharge of CSO 10A & 10B as well as for the Deer St. CSO. The model success is measured by evaluating the difference in the combined volumetric flow for all metered events during the study period.

The July 17, 2000 was the only event that the model highly over-predicted flow at the Deer Street CSO. The Deer St CSO calibration graphs for the 4/21 and the 5/24 events demonstrate model validation. It should be noted that since only three of the six events caused overflow discharge from the Deer St. CSO there are less data available for the total discharge volumes to "balance" between over and under-predictions.

Section 3 - Development of Hyetographs

3.1 Design Storms

A two-hour duration was selected and return frequencies were chosen to be six-month, one year, two-year, five-year, and ten-year. These storms were developed using the Keifer-Chu method and from data collected from the Weather Bureau's Technical Report No. 40. These data are shown in Table 3.1 below

Table 3.1 *Design Storm Rainfall Intensities for Portsmouth, NH.*

Time (min)	1/2 Year [1]	1 Year	2 Year	5 Year	10 Year
	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)
0-15	0.1 x 0.25	0.3	0.3	0.4	0.4
15-30	0.2 "	0.3	0.4	0.4	0.5
30-45	0.2 "	0.4	0.4	0.5	0.7
45-60	0.4 "	0.8	0.8	1.1	1.2
60-75	0.9 "	1.8	2.5	3.2	3.7
75-90	0.2 "	0.4	0.5	0.7	1.2
90-105	0.2 "	0.3	0.4	0.4	0.7
105-120	0.1 "	0.3	0.4	0.4	0.5
120-135	0.1 "	0.2	0.3	0.4	0.4
Total Volume (in)	**0.6**	**1.2**	**1.5**	**1.9**	**2.3**

[1] 1/2 Year Storm developed by taking 1/2 the intensities of the 1 Year Storm.

3.1.1 Projections of Design Storms

Hyetographs for the five design storms have been input into the calibrated model. The results of these simulations are shown in Appendix B. These figures present the rainfall hyetograph and resulting overflow hydrographs at 10A/10B and DS. Table 3.2 summarizes these data on a peak rate basis.

Keifer, C.J. & H. H. Chu (1957). Synthe Storm Pattern for Drainage Design, ASCE Proc, Journal of Hydraulics Div, Aug 1957.

Table 3.2 *Existing Design Storm Overflow Data* [1]. *(SWMM)*

1/2 - Year Design Storm				1-Year Design Storm			
CSO 10A/10B		Deer St. CSO		CSO 10A/10B		Deer St. CSO	
Q max (mgd) (2)	Volume (MG)	Q max (mgd) (2)	Volume (MG)	Q max (mgd) (2)	Volume (MG)	Q max (mgd) (2)	Volume (MG)
0.6	**0.02**	**0.0**	**0**	**35.9**	**1.2**	**18.7**	**0.5**
2-Year Design Storm				**5-Year Design Storm**			
CSO 10A/10B		**Deer St. CSO**		**CSO 10A/10B**		**Deer St. CSO**	
Q max (mgd) (2)	**Volume (MG)**	**Q max (mgd) (2)**	**Volume (MG)**	**Q max (mgd) (2)**	**Volume (MG)**	**Q max (mgd) (2)**	**Volume (MG)**
40.7	**1.5**	**19.0**	**0.6**	**46.1**	**2.0**	**19.0**	**0.9**

Notes:

1. Results are based on sythetic design storms developed by the Keif~~f~~er-Chu method.

2. Peak flow represents the sum of the maximum flow from CSO 10A and 10B

The model results showed that the ½-year design storm will begin to cause overflow to occur at CSO 10A. The CSO 10B and the DS CSO will activate at a 1 year design storm. Therefore, CSO will occur at 10B and at DS at a storm frequency between the ½ and 1-year storm.
It is important to note that the collection system has a finite hydraulic capacity that limits the upper level of design storms that should be considered for abatement. For example, the maximum rate of CSO discharge from 10A and 10B remains constant from somewhere between the 2-year and the 5-year design storm up to the higher level storms. The corresponding combined 10A/10B peak overflow was determined to be approximately 45.9 mgd. Similarly, the Deer St. CSO has a limiting capacity of approximately 18.7 mgd.

3.2 Evaluation of Long-Term Rainfall Data

In order to evaluate the characteristics of CSO in the Portsmouth system over a typical or average year, it was necessary to obtain long-term (hourly) rainfall data. The data are analyzed and used as input to the SWMM model for determining overflow frequency and volumes.

Forty-Eight years of rainfall data (1950 to 1998) from National Weather Service Office in Durham, New Hampshire were obtained and analyzed. Evaluation of the data and discussions with the National Weather

Portsmouth Average Year Rainfall = 44 inches

Service (NWS) determined that a significant portion of the data set is incomplete. As an example, data analyses resulted in an average yearly rainfall of approximately 30 in; however, the actual yearly average is approximately 44 inches. Further discussions with the NWS identified that the station is not a first-order station and as a result could have significant data gaps. It was determined that five inconsecutive years of data could be used for continuous simulation modeling. The years selected represent near-average rainfall conditions. The five years chosen were 1968, 1988, 1989, 1990 and 1993. Based on these data, the volume of rainfall produced and number of events that occurred in these years were considered close to an average year.

Typically, long-term simulation is performed using the Runoff and Transport Blocks of SWMM. The Transport block of SWWM uses relatively simpler means to route flows through a sewer network and is better able to handle the large rainfall data inputs required. As a result of the simpler numerical algorithms, the Transport block is not capable of simulating surcharged and generally more complicated hydraulic conditions. Development of a simplified Transport model for the Portsmouth, NH collection system was attempted; however, the model could not be successfully developed to simulate the results of the calibrated Extran model discussed previously. This is a result of the influence the Deer St. and Mechanic St. Pumping Stations have on the collection system. These pumping stations limit flow and cause surcharge conditions that cannot be reflected in the Transport model. As a result, the Extran model was used to simulate the five years of data discussed above.

Simulation of long-term rainfall data (e.g., years) in Extran is very time consuming and requires significant computer resources; however, this was deemed the best method of predicting these long-term conditions for the Portsmouth collection system. It is important to note that this method of simulation provides the most advanced method of predicting the systems response to rainfall over long periods of time. The computer run times to necessary to complete these simulations were on the order of days.

The results of the long-term simulation for the existing collection system are summarized below in Table 3.3 for the existing CSOs.

Table 3.3. *Existing Average Year Overflow Data (SWMM).*

Average Year [1] Cumulative Vol.			
CSO 10A/10B		Deer St. CSO	
Q max (mgd)	Volume (MG)	Q max (mgd)	Volume (MG)
47	9.4	19	3.7

Notes:

1. Results are based on continuous simulation using rainfall from 1968, 1988,1989,1990 & 1993.

Average year rainfall for Portsmouth area ~44 inches/year

Section 4 - CSO Abatement Alternatives Evaluation

A number of CSO abatement alternatives have been identified and evaluated using the previously described calibrated SWMM model for Portsmouth. These evaluations were developed to characterize the benefits associated with different abatement alternatives using different modeling approaches; namely, design storm and continuous simulation. Design storms are used to evaluate a system's response to a specific storm condition. The 1-year, 2-year, and 5-year design storms have been chosen for this analysis. Continuous simulation is used to evaluate the system's response to extended periods of rainfall to develop an annual profile of CSO that occurs.

The CSO abatement alternatives selected for Portsmouth are listed below:

- Sewer separation
- High-rate satellite treatment
- Upgraded pumping stations
- Storage

These alternatives have been combined into more comprehensive alternatives to achieve the necessary CSO reductions to meet water quality compliance. These are identified below and described further in the following sections.

- Alternative A
  - Targeted sewer separation at select locations
  - Upgrade of Deer St. Pumping Station
  - High-rate satellite treatment (10/10B)
- Alternative B
  - Targeted sewer separation at select locations
  - Upgrade Deer St. Pumping Station
  - Upgrade Mechanic St. Pumping Station
- Alternative C
  - Targeted sewer separation at select locations
  - Upgrade Deer St. Pumping Station/ Convey flow directly to treatment plant
  - Upgrade Mechanic St. Pumping Station
- Alternative D
  - Targeted sewer separation at select locations
  - Upgrade Deer St. Pumping Station
  - Storage facility for CSO 10A/10B

- Alternative E
    - Targeted sewer separation at select locations
    - Upgrade of Deer St. Pumping Station
    - Upgrade Mechanic St. Pumping Station

It should be noted that the areas identified for targeted sewer separation are identical for Alternatives A, B, C, and D. For Alternative E targeted sewer separation includes those areas identified in A, B, C, and D plus additional areas. These areas are listed in the following sections.

4.1 Alternative A

This alternative includes targeted sewer separation in areas identified by UEI. The areas that were represented in the Alternative A model are listed in Table 4.1. The CSO Area Remaining depicted in Table 4.1 was also represented in the models for Alternatives B, C, and D.

Table 4.1: *Sewershed Areas for Alternatives A, B, C, and D*

Sewershed Number	Existing CSO Tributary Area (Acres)	Alternative A,B,C, & D	
		Effective Area Separated (Acres)	**Estimated Pecent Effectiveness of Sewer Separation**
011	32.0	24.0	75%
012	23.0	Not Separated	Not Separated
013	52.0	46.8	90%
014	19.5	9.8	50%
015	20.0	10.0	50%
016	11.8	Not Separated	Not Separated
030	11.5	Not Separated	Not Separated
036	11.2	8.4	75%
037	17.6	13.2	75%
038	24.7	18.5	75%
039	15.4	11.6	75%
040	30.0	22.5	75%
050	54.4	40.8	75%
060	72.0	Not Separated	Not Separated -15%
070	19.0	Not Separated	Not Separated
080	22.6	Not Separated	Not Separated
081	30.0	22.5	75%
090	25.7	12.9	50%
110	11.3	5.7	50%
120	21.7	10.9	50%
130	18.2	Not Separated 13.7	Not Separated -75%
140	16.0	8.0	50%
Total Area	**559.6**	**265.6**	**47%**

Deer St Basin

Mechanic St Basin

It was assumed that sewer separation was ~~25-75%~~ 0-90% effective, in other words, a percentage of each of the contributing area identified would be eliminated or removed from the combined sewer system and redirected to separate storm sewers. The level of success assumed for each of the areas were developed by UEI and MBC. For Alternative A, B, C and D, approximately 266 acres were effectively separated. It was also assumed that sewer separation areas would include the installation of new sanitary pipes thereby eliminating infiltration of groundwater into the system. As such, the infiltration components of the sewer separated areas were modified in the model to represent this assumption.

The modeling results of this alternative are summarized as follows:

- CSO 10A and 10B: For an average year, the combined overflow volume from CSO 10A and 10B would be reduced by 81% when compared with the existing discharges simulated. Combined with the DS CSO reduction, a total reduction of CSO volume of 86% would be achieved. CSO discharge occurred at the 1-year design storm intensity, however, discharge volume was reduced by 64%. If a high-rate treatment facility were designed to treat the remaining CSO, the peak 1-year design storm influent would be 14.9 mgd.

- DS CSO: For continuous simulation, overflow events were eliminated for all 5 years modeled. Overflow events were eliminated up to and including a 5-year design storm. Based on the hydraulic limitations of the overflow structure it was determined that the maximum peak flow for the DS CSO is 19 mgd Therefore, this is the maximum rate that a satellite facility would need to treat CSO from Deer St.

- System-Wide: Based on the five years of rainfall, used in this analysis, the average annual number of overflow events was reduced from 12.2 to 3.4.

4.2 Alternative B

For this alternative targeted sewer separation was represented as in Alternative A. The DSPS capacity was increased to 12 mgd. The capacity of the MSPS was increased until overflow was eliminated for a 1-year design storm. The required MSPS capacity was found to be 36.2 mgd. In order to convey the additional flow to the MSPS, additional pipes were necessary between CSO 10A and the MSPS. The pipes range in diameter between 24" and 48".

The modeling results of this alternative are summarized as follows:

- CSO 10A & 10B: For continuous simulations, most of the 5 years did not have overflow events. The overflow events were eliminated up to and including a 2-year design storm. In comparison to existing conditions, the volume of overflow for was reduced by 76% for a 5-year design storm .

- DS CSO: Overflow events were eliminated for an average year. Overflow events were also eliminated up to and including the 5-year design storm.

- System-Wide: Based on the five years of rainfall, used in this analysis, the average annual number of overflow events was reduced from 12.2 to 0.8.

4.3 Alternative C

For this alternative, sewer separation was assumed as in Alternative A. The DSPS was increased from 9.3 mgd to 12 mgd. Additionally, the outfall from the DSPS was diverted to the wastewater treatment facility, bypassing the MSPS. This pipeline was represented in the model as a 1300' long , 36" diameter pipe was modeled between the outfall and the plant.

The capacity of the MSPS was increased to 22 mgd. As in alternative B, additional 24" to 48" diameter pipes were added between the outfall and the MSPS. It should be noted that these conveyances have not been optimized for maximum efficiency.

The modeling results of this alternative are summarized as follows:

- <u>CSO 10A & 10B:</u> For continuous simulations for the 5 years modeled, most did not have overflow events. The overflow events were eliminated up to and including a 2-year design storm. In comparison with existing conditions, the volume of overflow generated by a 5-year design storm was reduced by 72%.

- <u>DS CSO</u>: Based on the 5 years modeled, the average annual overflows were eliminated. Overflow events were eliminated up to and including the 5-year design storm. .

- <u>System-Wide</u>: The average annual number of overflow events was reduced from 12.2 to 0.4.

4.4 Alternative D

As in Alternative A, targeted sewer separation was assumed. The DSPS capacity was increased to 12mgd. A storage facility was modeled to contain discharge from CSO 10A & 10B. The storage facility detention tank was sized to accommodate a 1-year design storm, with pump-back to the combined sewer. The required tank volume was found to be 0.75 MG. If the facility capacity is reached, relief is provided by an outfall pipe which discharges to the Pond.

The modeling results of this alternative are summarized as follows:

- <u>CSO 10A and 10B</u>: In comparison to existing conditions, the volume of CSO was reduced by 94% in an average year. Overflow was eliminated for up to and including the 1-year design storm and the overflow volume was reduced by 98% for the 2-year storm.

- DS CSO: Based on the 5 years modeled, the overflow events for an average year were eliminated. Overflow events were eliminated up to and including a 5-year design storm.

- System-Wide: In comparison to existing conditions, the system-wide volumetric discharge reduction is 95%. The average annual number of overflow events was reduced from 12.2 to 0.8.

4.5 Alternative E

This alternative includes targeted sewer separation in areas identified by UEI. The areas that were represented in the Alternative E model are shown in Table 4.2.

Table 4.2: *Sewershed Areas for Alternative E*

Sewershed Number	Existing CSO Tributary Area (Acres)	Alternative E	
		Effective Area Separated (Acres)	Estimated Pecent Effectiveness of Sewer Separation
011	32.0	24.0	75%
012	23.0	Not Separated	Not Separated
013	52.0	46.8	90%
014	19.5	9.8	50%
015	20.0	10.0	50%
016	11.8	Not Separated	Not Separated
030	11.5	8.6	75%
036	11.2	8.4	75%
037	17.6	13.2	75%
038	24.7	18.5	75%
039	15.4	11.6	75%
040	30.0	22.5	75%
050	54.4	40.8	75%
060	72.0	10.8	15%
070	19.0	Not Separated	Not Separated
080	22.6	Not Separated	Not Separated
081	30.0	22.5	75%
090	25.7	12.9	50%
110	11.3	5.7	50%
120	21.7	10.9	50%
130	18.2	13.7	75%
140	16.0	8.0	50%
Total Area	**559.6**	**298.7**	**53%**

It was assumed that sewer separation was 25-75% successful, in other words, a percentage of each of the contributing area identified would be eliminated or removed from the combined sewer system and redirected to separate storm sewers. The level of success assumed for each of the areas were developed by UEI. For Alternative E, it was assumed that approximately 299 acres were effectively separated . It was also assumed that sewer separation areas would include the installation of new sanitary pipes thereby eliminating infiltration of groundwater into the system. As such, the infiltration components of the sewer separated areas were systematically adjusted in the model to represent this assumption.

For Alternative E in the model, the capacity of the MSPS was increased to 22 mgd. The capacity of the DSPS was also increased to 12.5 mgd

The modeling results of this alternative are summarized as follows:

- <u>CSO 10A and 10B</u>: In an average year, the model demonstrated that the combined overflow volume from CSO 10A and 10B would be reduced by 94% over the existing simulated discharges. Combined with the DS CSO reduction of 100%, a total reduction of CSO volume of 96% would be achieved. CSO discharge occurred at the 1-year design storm intensity, however, discharge volume was reduced by 96%.

- <u>DS CSO:</u> Overflow events ~~were~~ did not occur in an average year. Overflow events were eliminated up to and including a 5-year design storm.

- <u>System-Wide:</u> In an average year a total reduction of CSO volume of 96% would be achieved as compared to the existing discharge conditions. Based on the five years of rainfall, used in this analysis, the average annual number of overflow events was reduced from 12.2 to 2.0.

A summary of the abatement modeling results for all four alternatives is shown in Table 4.3.

Table 4.3 - *Abatement Alternatives Summary*

PORTSMOUTH, NH CSO STUDY

Alternative No. / Outline	Sewer System Upgrades		Remaining CSO							
			Design Storms						Average Year [1] Cumulative	
	New Pump Station Capacity	Off-Line Storage	1-Year		2-Year		5-Year			
			Peak Flow (mgd) [2]	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Peak Flow (mgd)	Volume (MG)	Average Peak Flow (mgd)	Average Yearly Volume (MG)
A										
-Targeted Sewer Separation [3]										
- Upgrade Deer St. Pumping Station	12 MGD									
- High Rate Satellite Treatment (10A & 10B) [4]			15.2	0.41	28.8	0.84	36.6	1.44	17.3	1.77
B										
-Targeted Sewer Separation [3]										
- Upgrade Deer St. Pumping Station	12 MGD									
- Upgrade the Mechanic St. Pumping Station [5]	36 MGD									
- Untreated CSO (10A/10B)			0.0	0.00	0.6	0.01	27.4	0.50	1.2	0.04
C										
-Targeted Sewer Separation [3]										
- Upgrade Deer St. Pumping Station/ Convey Flow from the Deer St. Pumping Station Directly to the WWTP	12 MGD									
- Upgrade the Mechanic St. Pumping Station	22 MGD									
- Untreated CSO (10A/10B)			0.0	0.00	0.0	0.00	28.6	0.57	1.7	0.05
D										
-Targeted Sewer Separation [3]										
- Upgrade Deer St. Pumping Station	12 MGD									
- Storage Facility for 10A/10B CSO		0.75 MG								
- Untreated CSO (10A/10B)			0.0	0.00	1.1	0.03	22.5	0.64	7.7	0.60
E										
-Targeted Sewer Separation [3]										
- Upgrade Deer St. Pumping Station	12.5 MGD									
- Upgrade the Mechanic St. Pumping Station	22 MGD									
- Untreated CSO (10A/10B)			1.3	0.05	15.1	0.44	31.3	1.09	10.8	0.57

Notes:

1. Results are based on continuous simulation using rainfall from 1968,1988,1989,1990 & 1993. Average Peak Flow based on five model years of data. with approx 44 inches total rainfall/year.
2. Peak flow represents the sum of the maximum flow from 10A an 10B. No overflow occurred at the Deer St. CSO from up to and including the 5-yr design storm.
3. Sewer separation areas as part of Alternatives A, B, C and D identical. Additional areas were separated for Alternative E. See Section 4.5
4. High rate treatment required for remaining CSO.
5. New capacity requirement based on the elimination of the 1-Year design storm CSO. MSPS

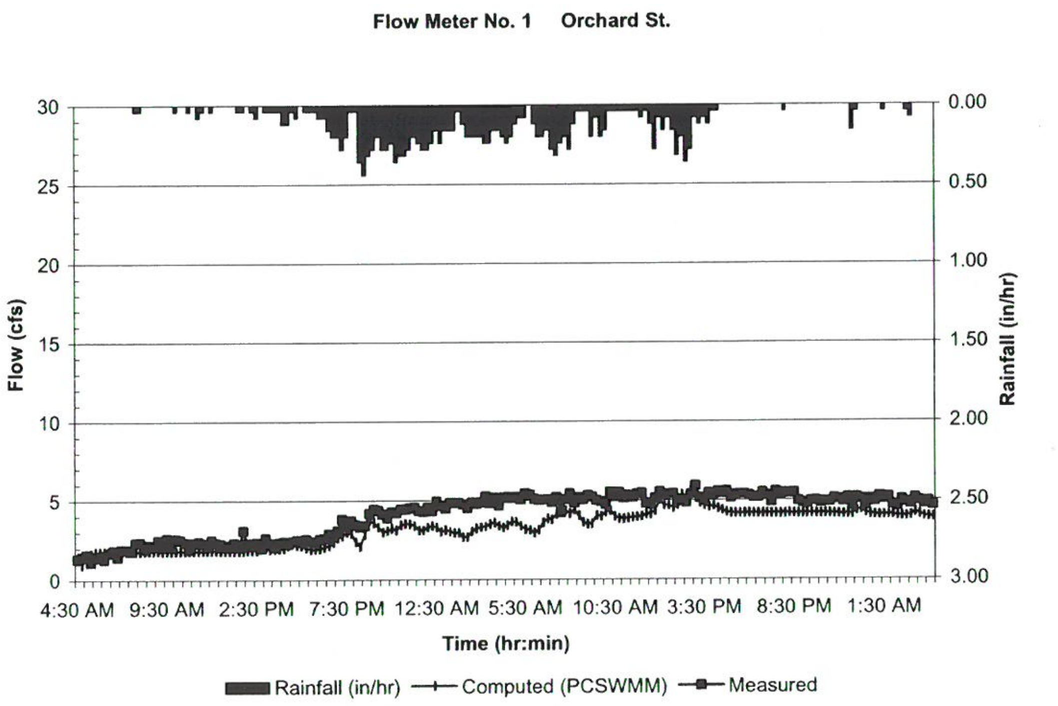
Section 5 - Conclusions

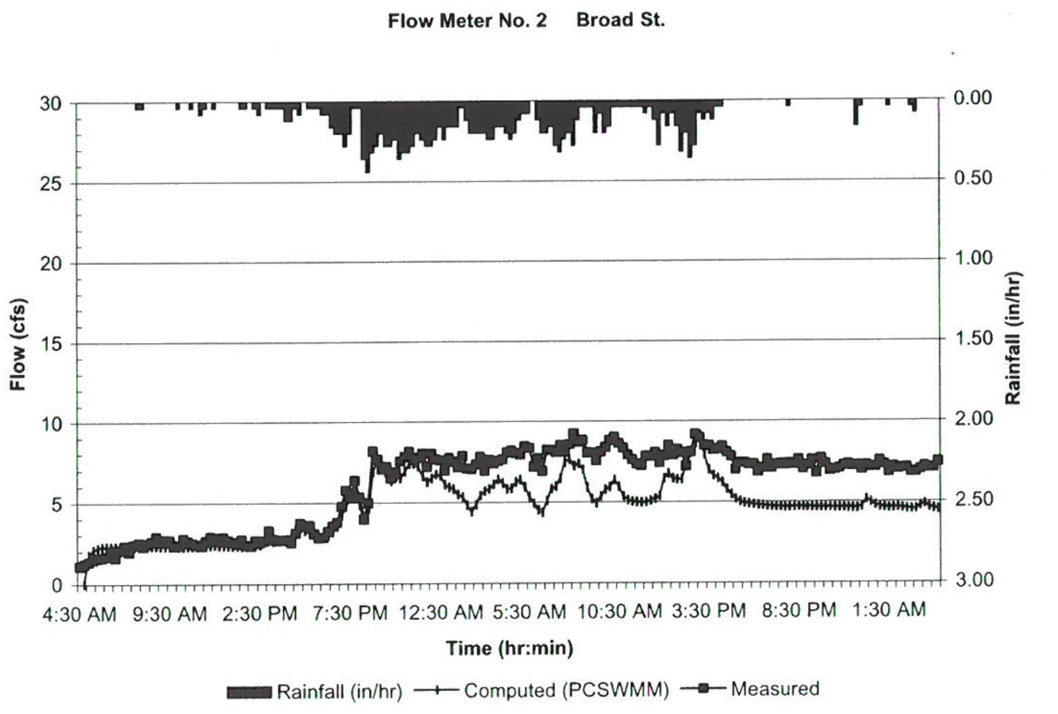
The hydrologic/hydraulic model of the Portsmouth CSO collection system has been updated and successfully calibrated to a number of rain storms with varying intensity and durations. A total of fifteen flow monitoring points and one rainfall monitoring locations were used in this effort. The calibrated model was used to project a range of design storms namely, ½, 1, 2, 5-year design storms, for the existing collection system. In addition, the model was used to project annual average CSO based on running the detail Extran model of the system for five years of continuous rain data (1968, 1988, 1989, 1990, 1993). These results identified the frequency and peak rates of CSO that occur at the CSO locations. Based on these modeling results, the CSO's become active at or above the 1/2-year, 2-hour design storm.

The model was also used to project the resulting discharges based on a combination of abatement alternatives including sewer separation, pumping station improvements, high-rate satellite treatment and offline storage. These results can be effectively used to determine cost/benefit analyses associated with CSO abatement for the City of Portsmouth.

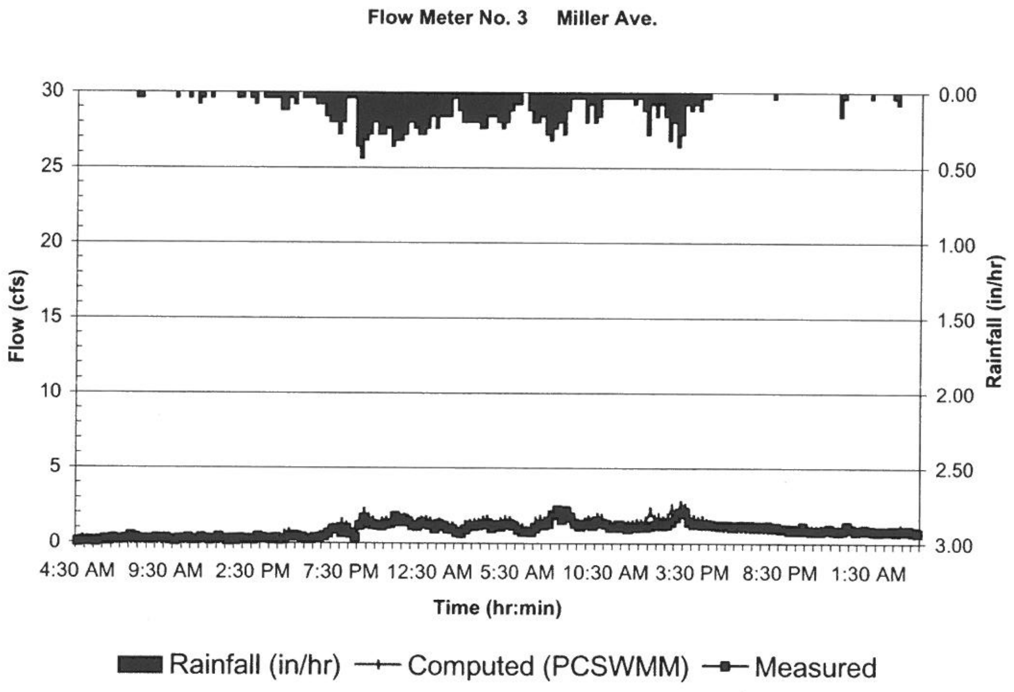
Appendix A
SWMM Calibration Graphs

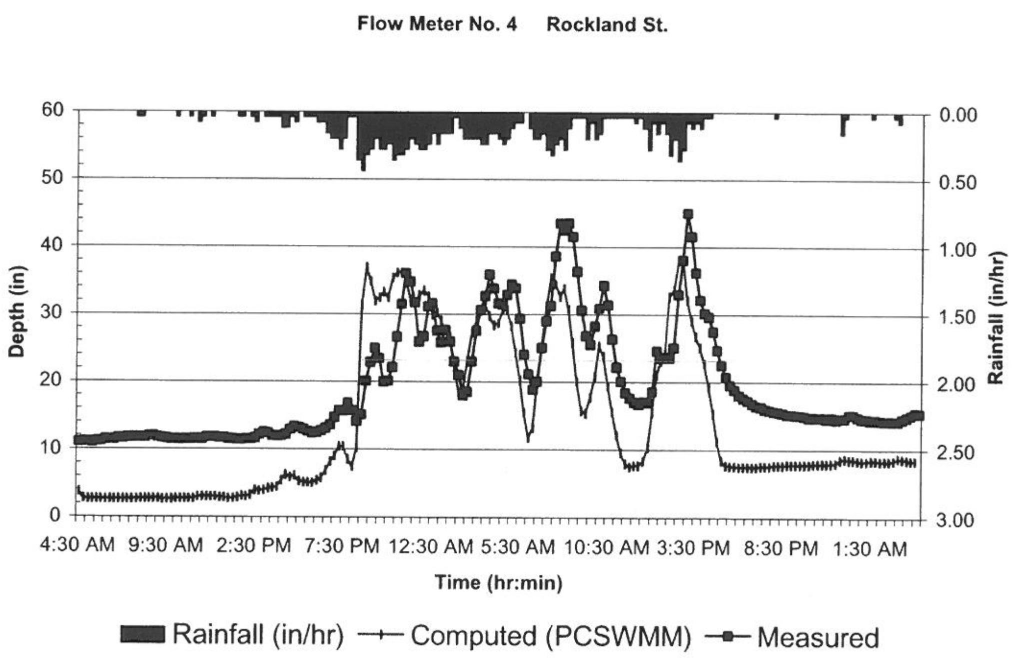
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000





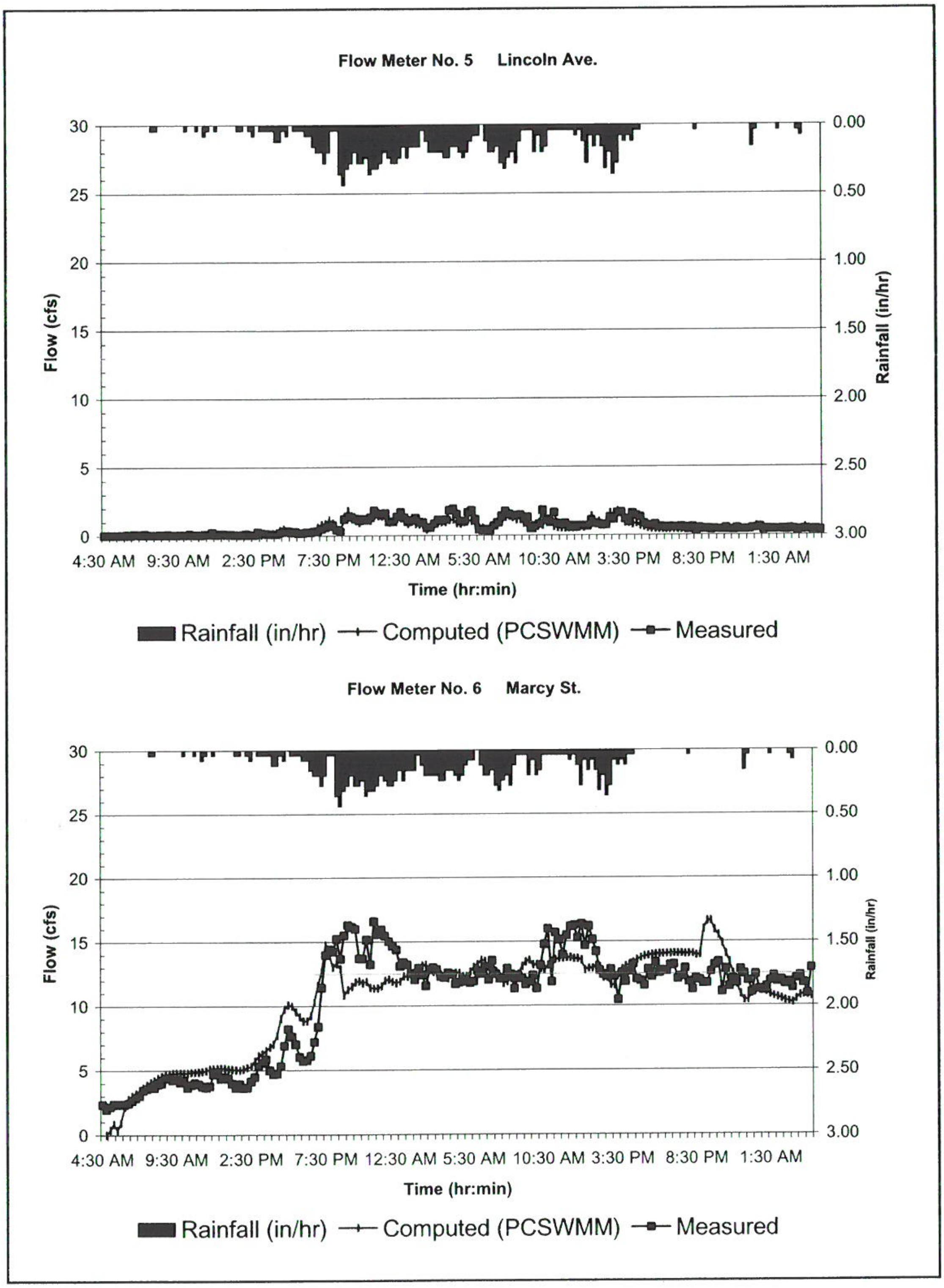
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000



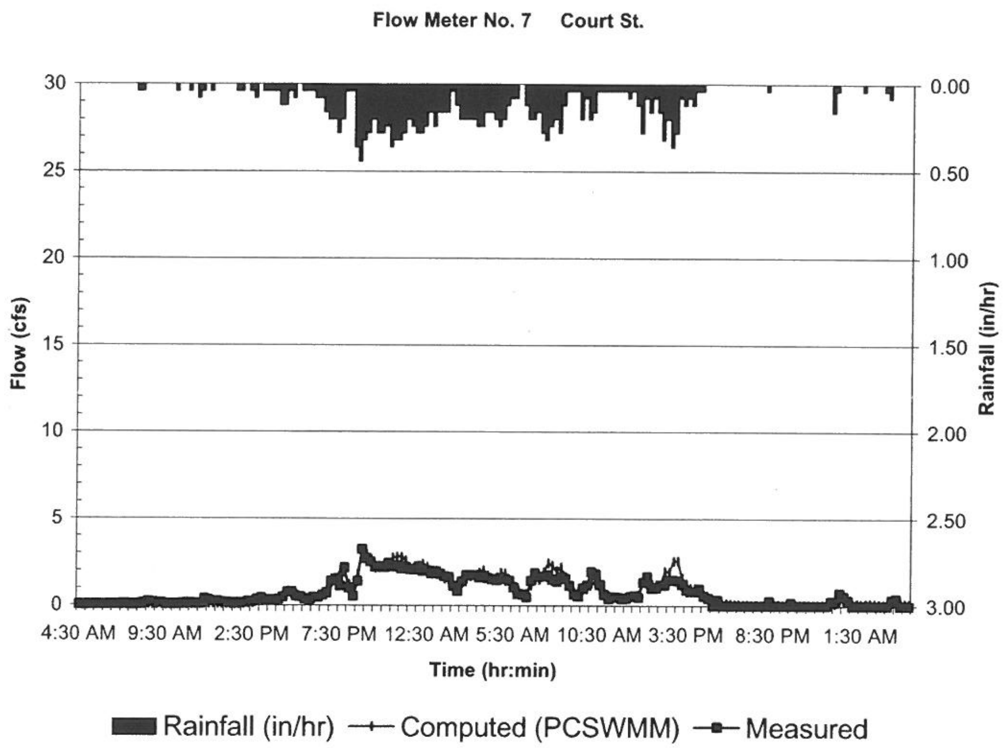


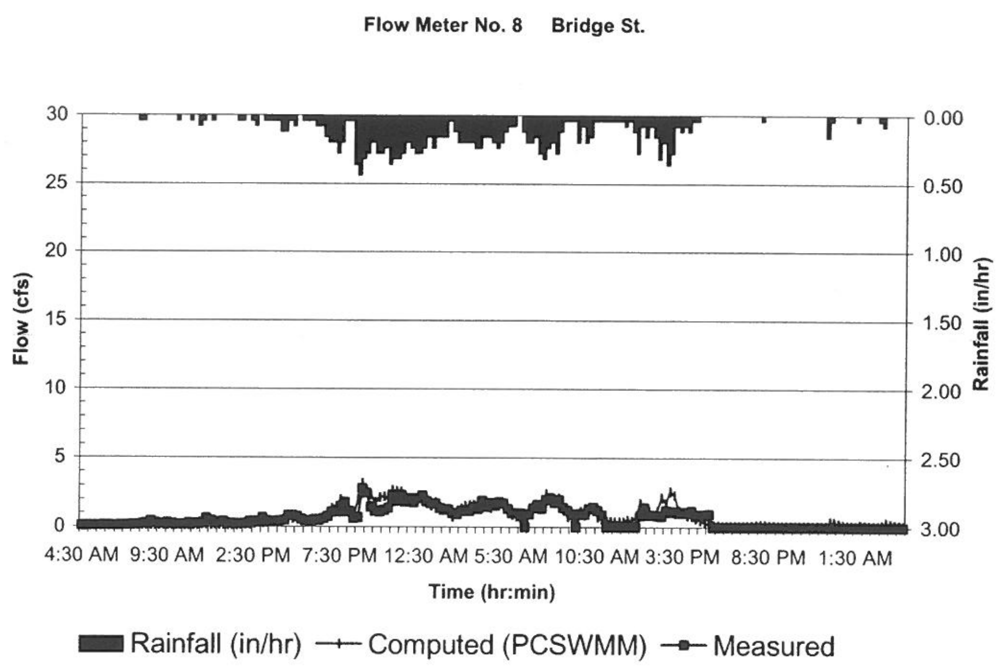
Note: Poor monitored flow data available. Calibration performed with depth comparison.

PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000



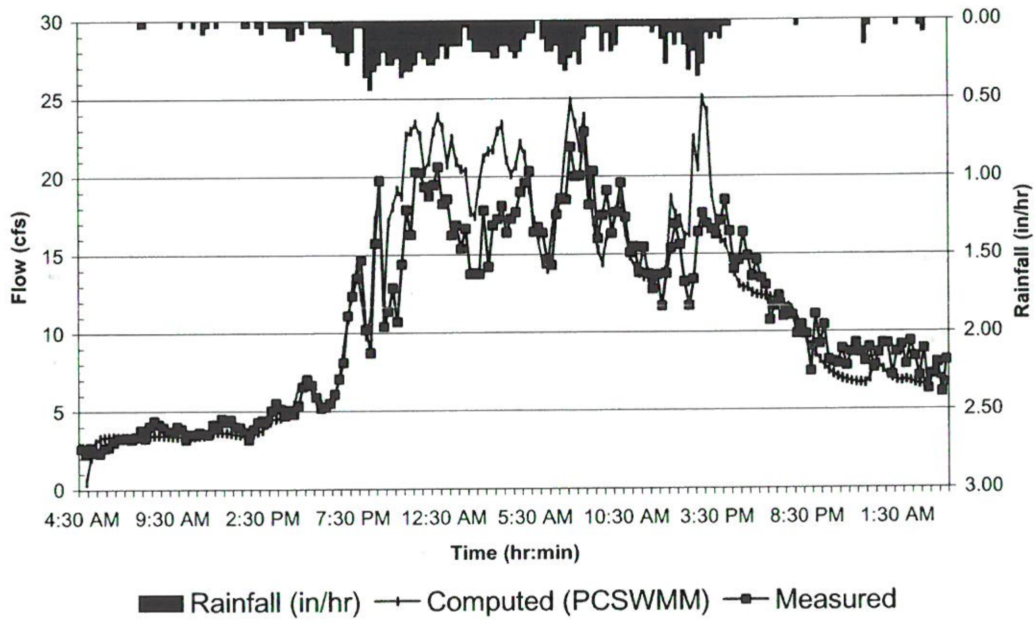
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000



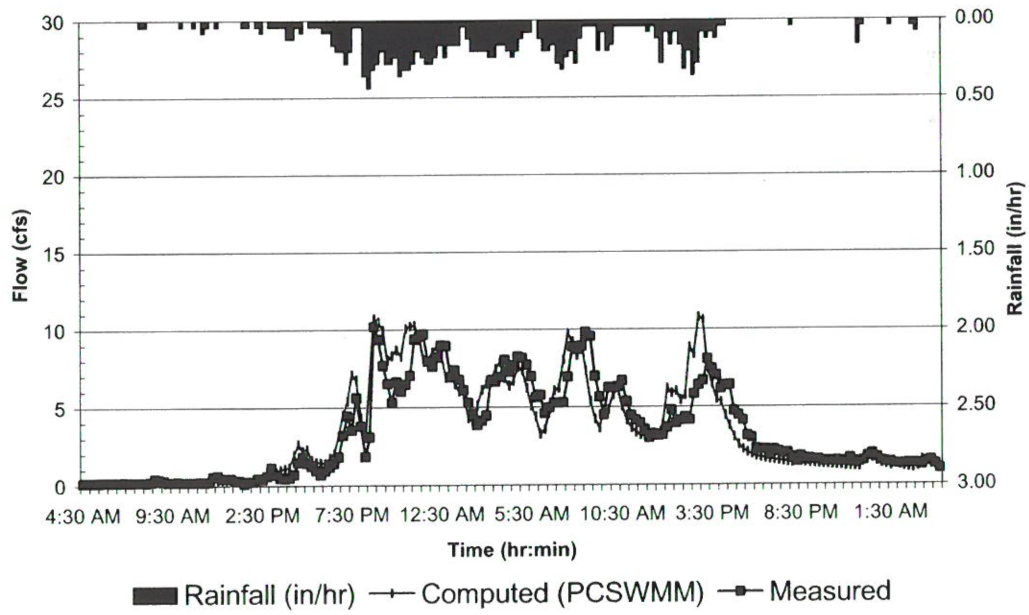


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000

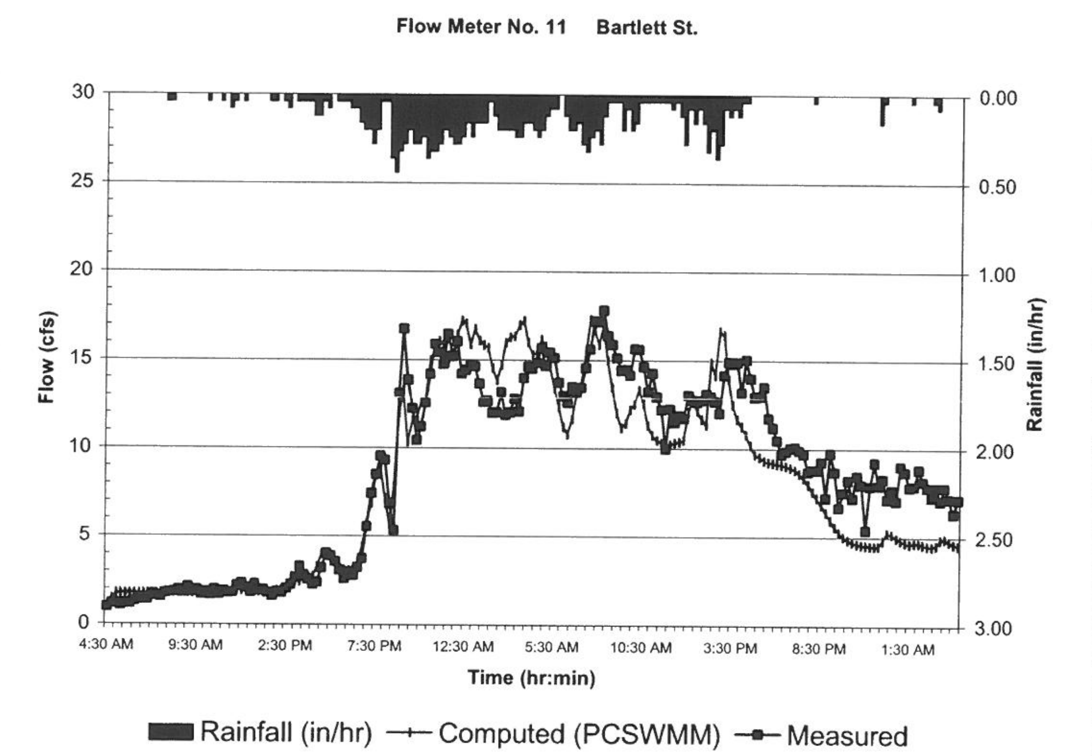
Flow Meter No. 9 Rock St. Extension



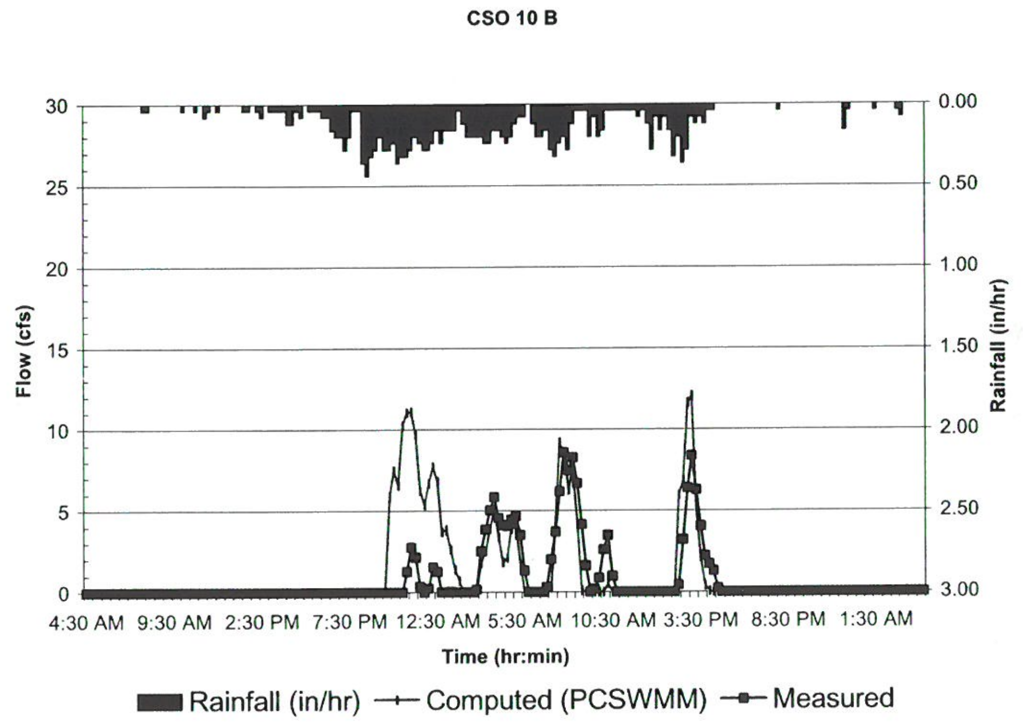
Flow Meter No. 10 Jewell Ct.

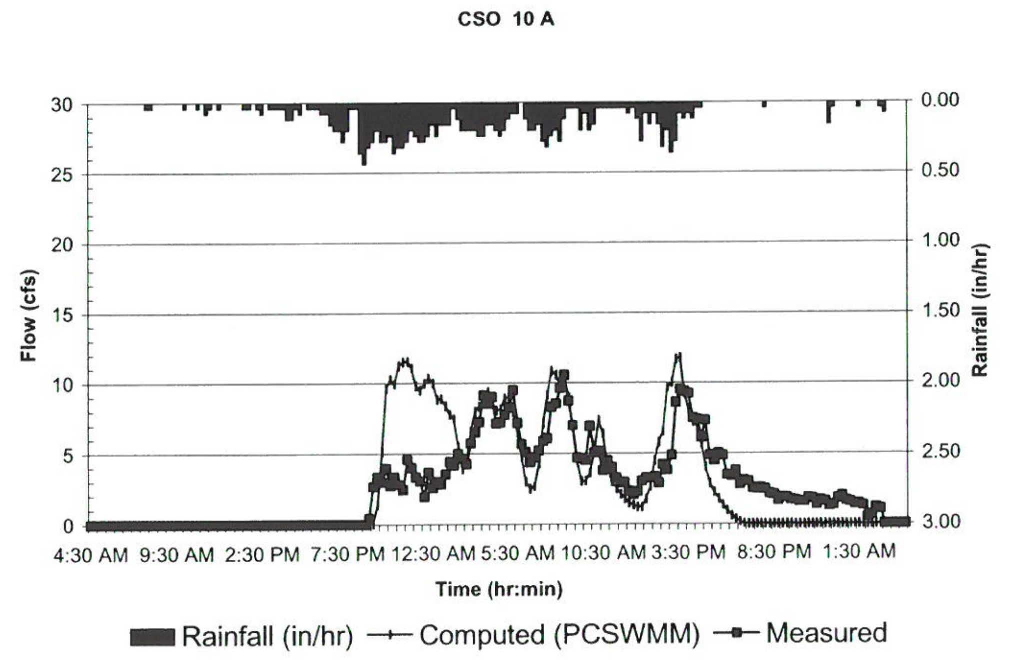


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000

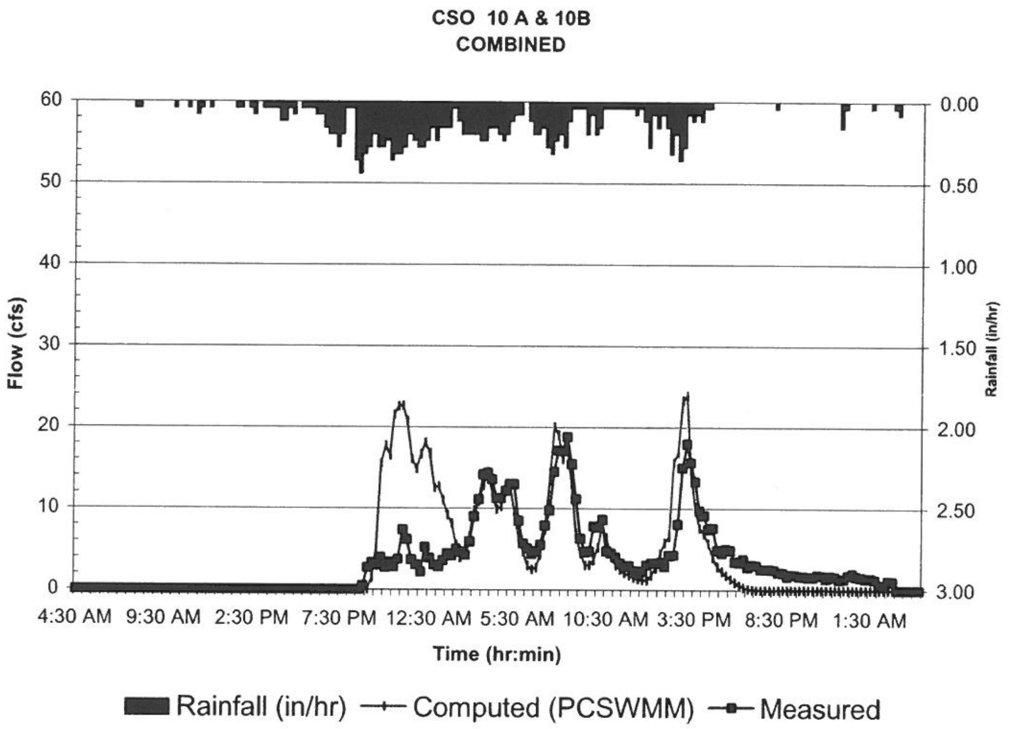


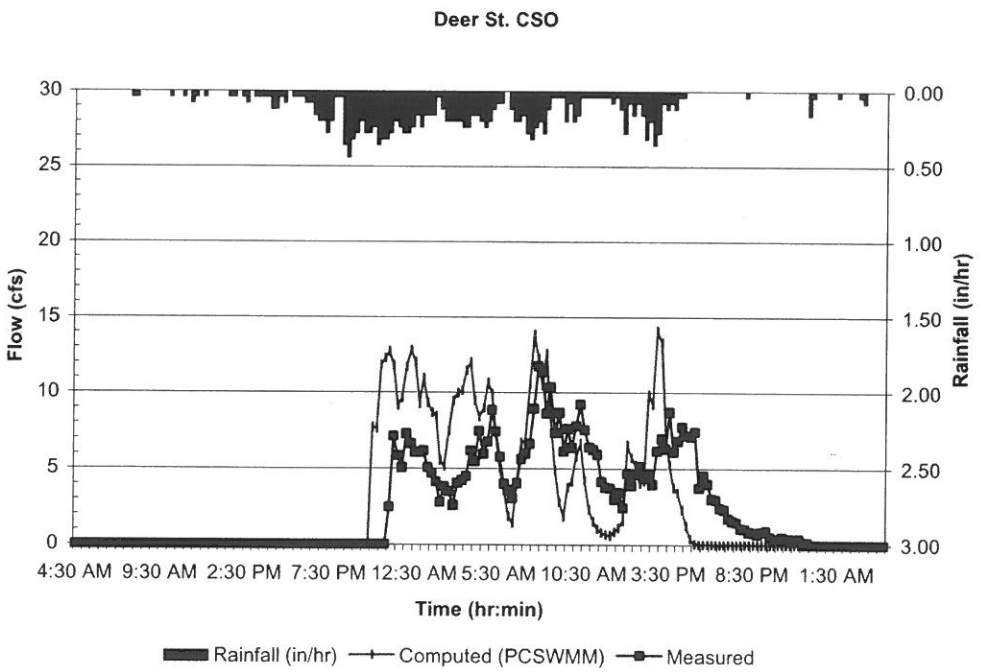
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000



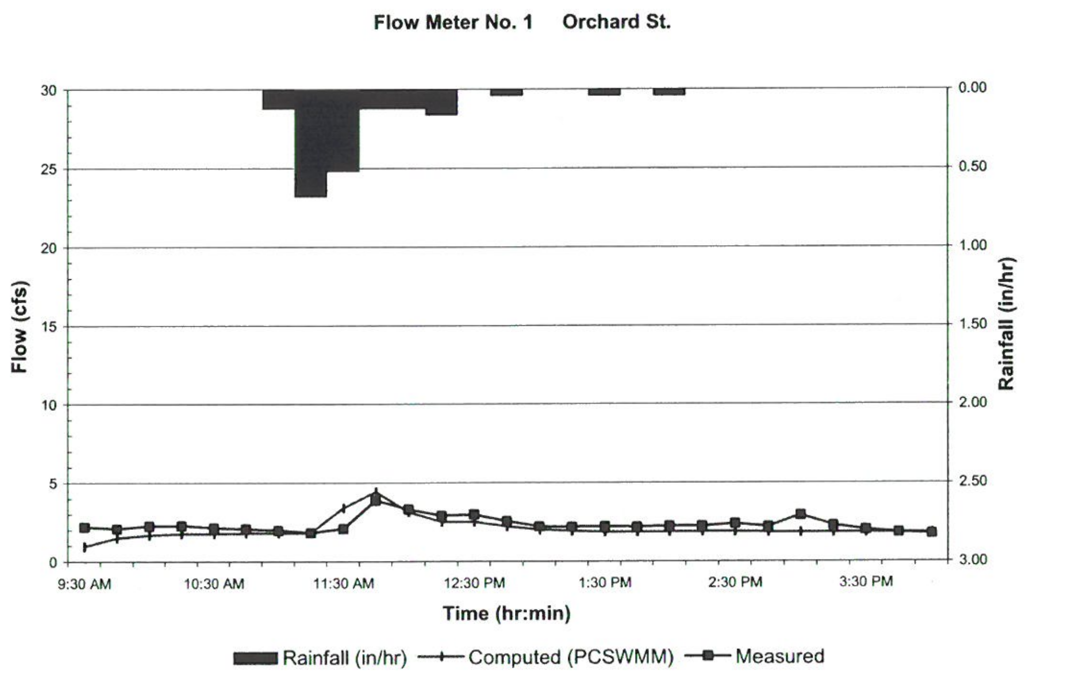


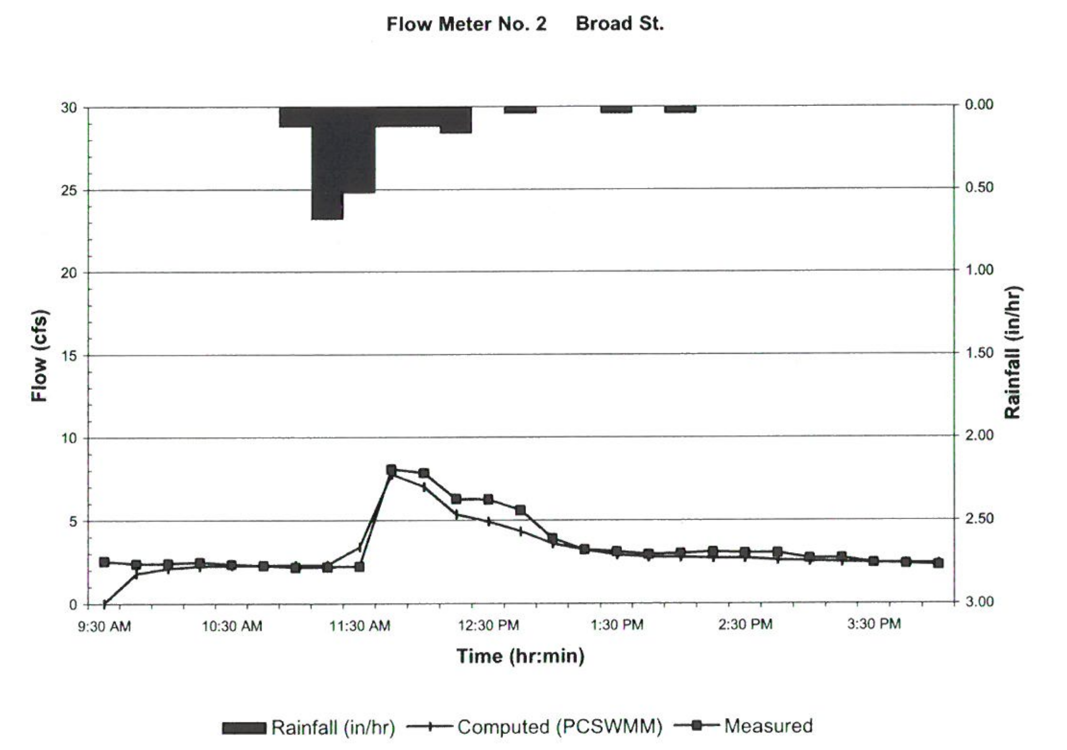
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
APRIL 21, 2000



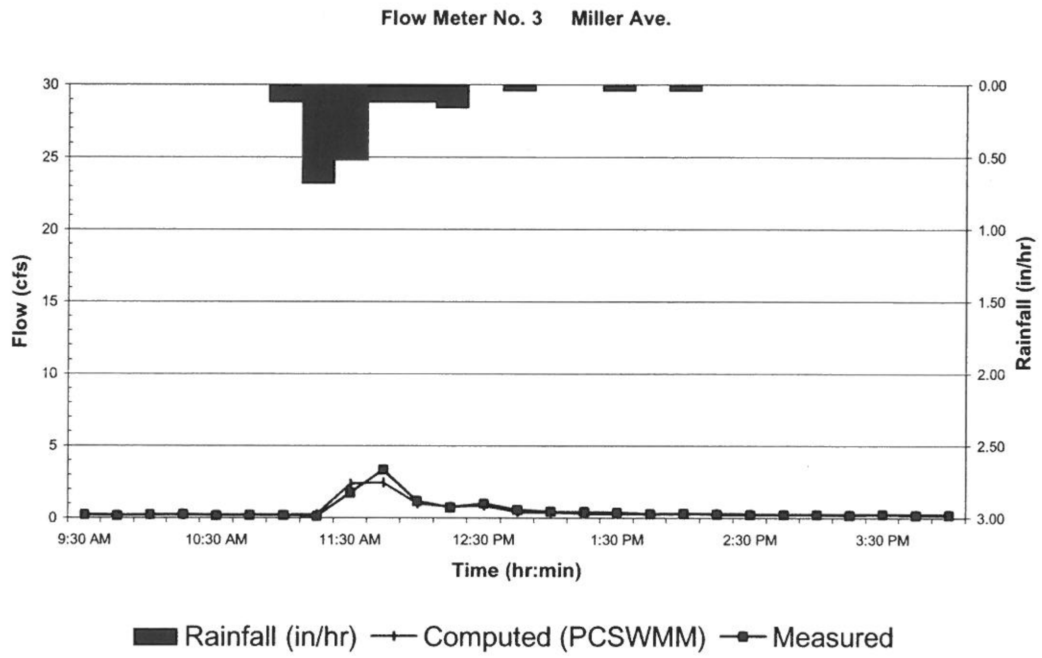


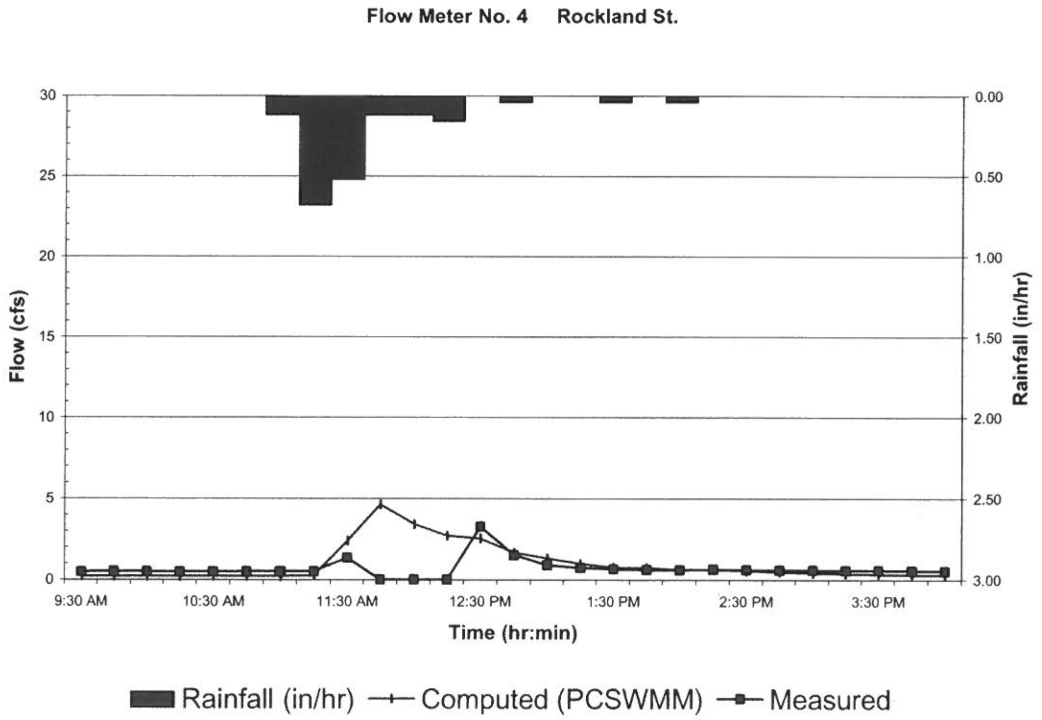
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



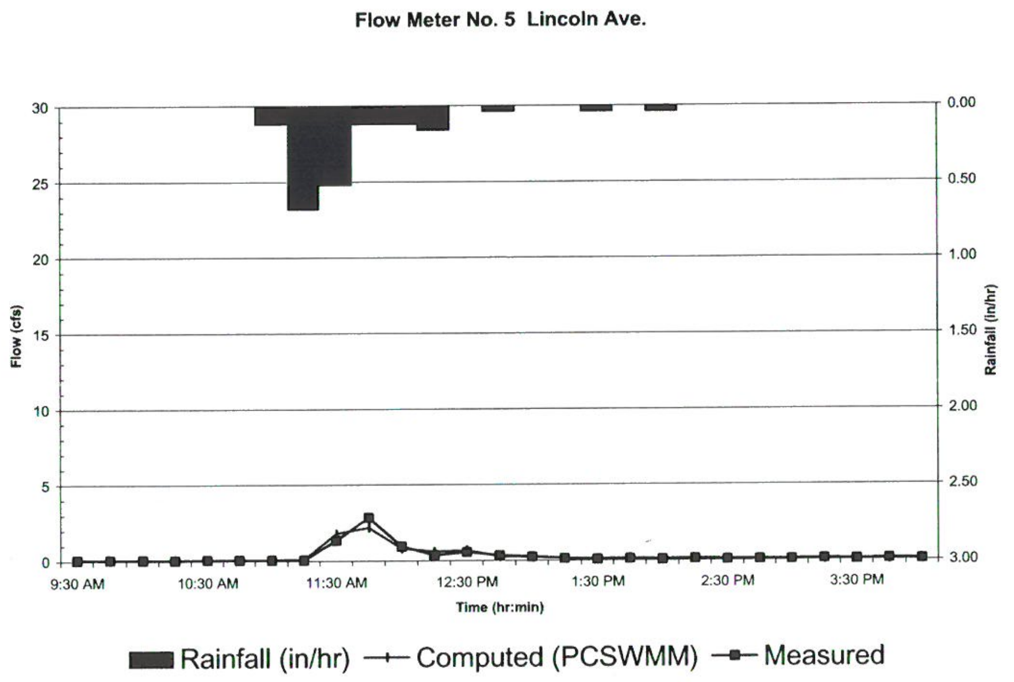


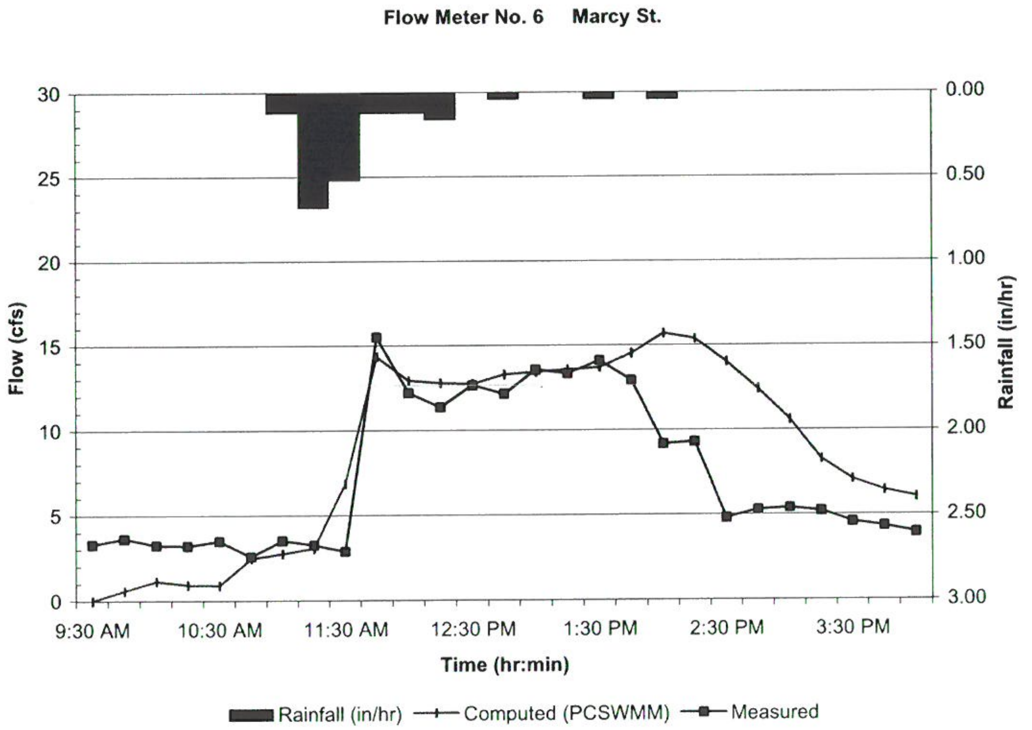
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



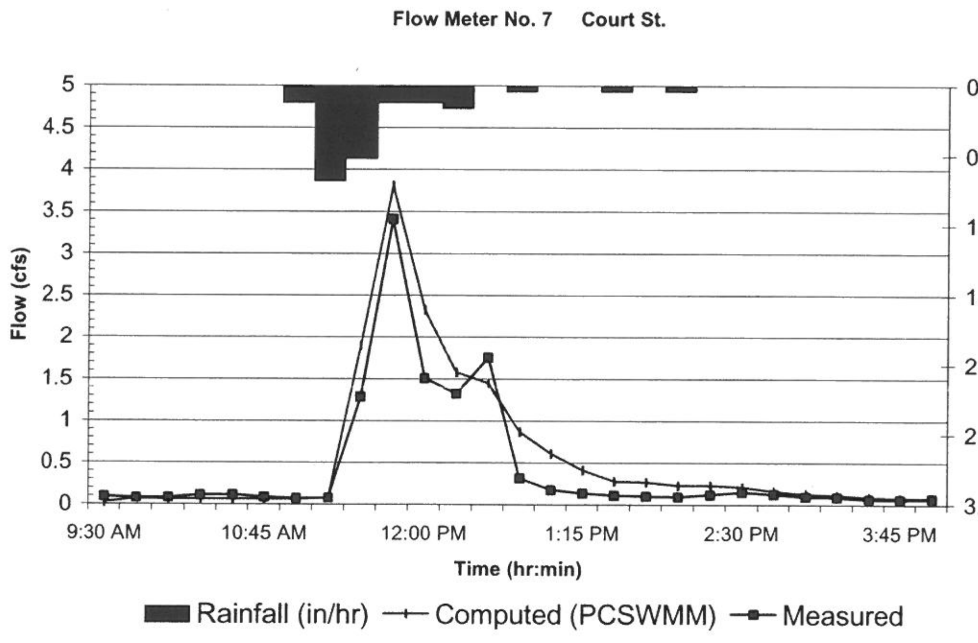


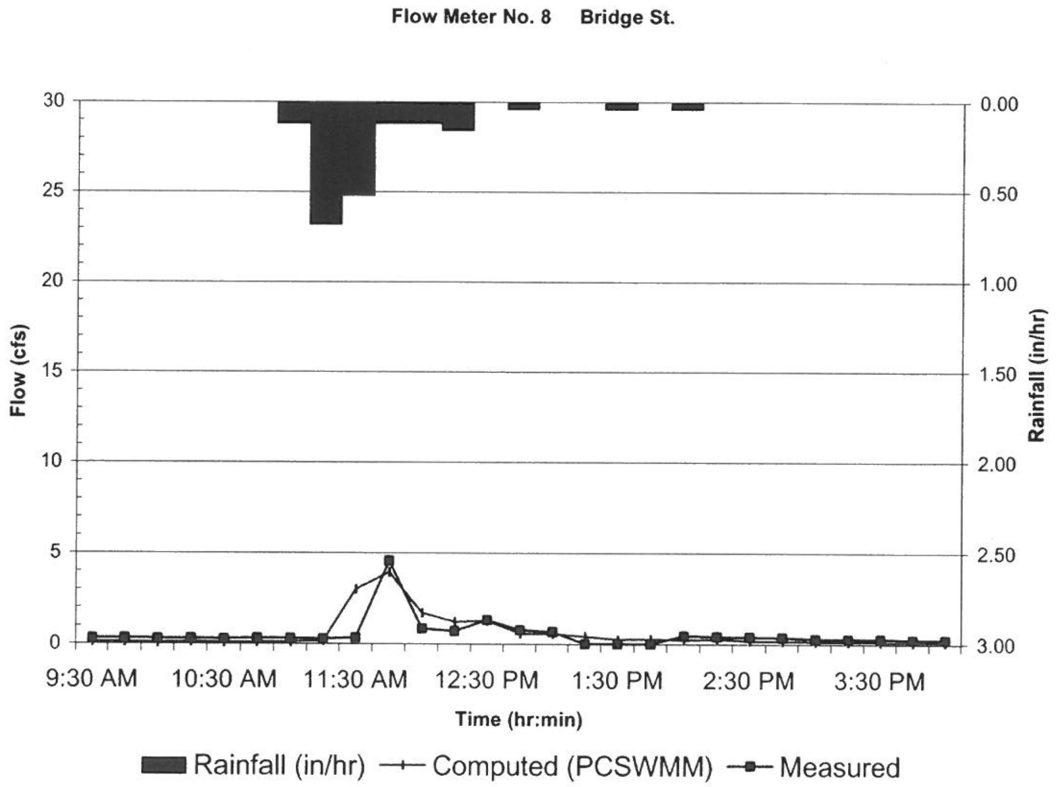
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



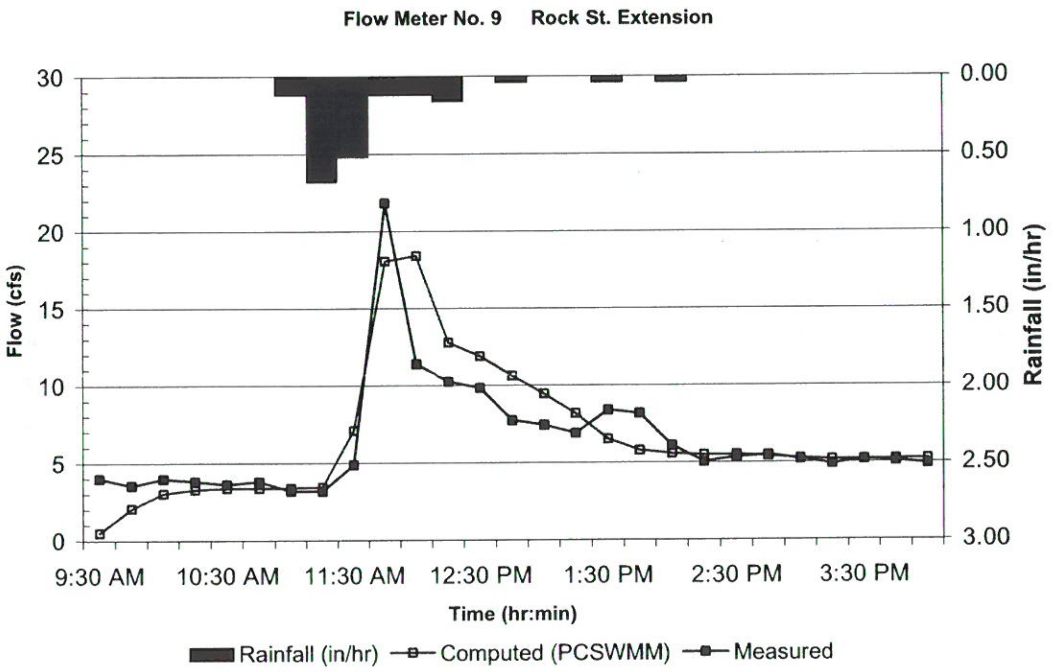


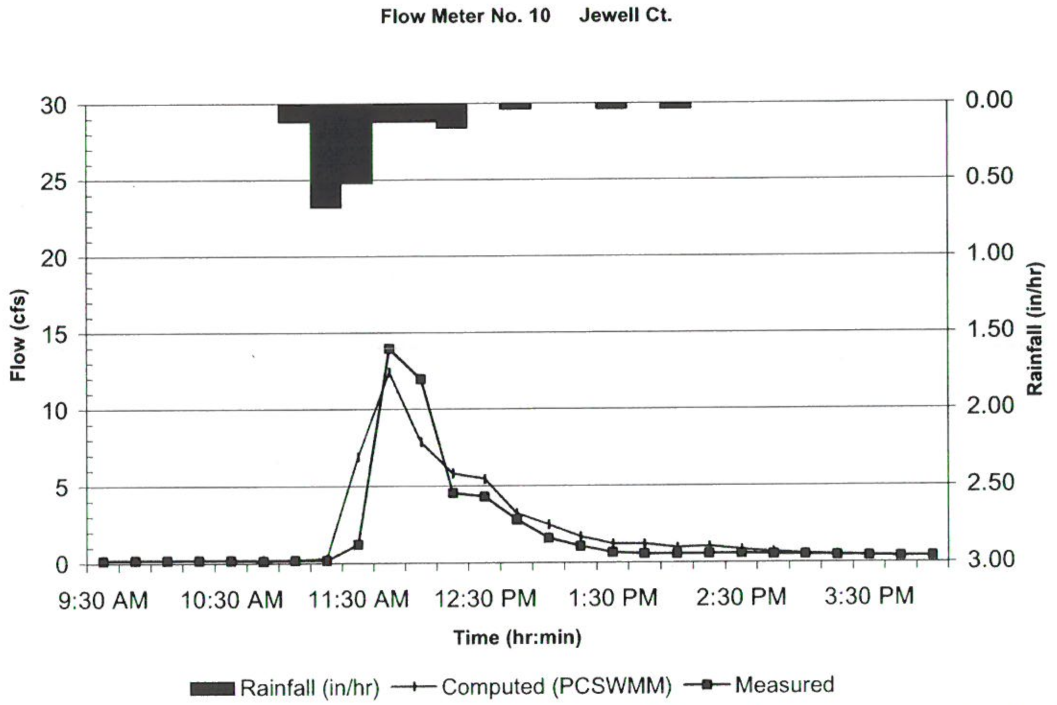
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



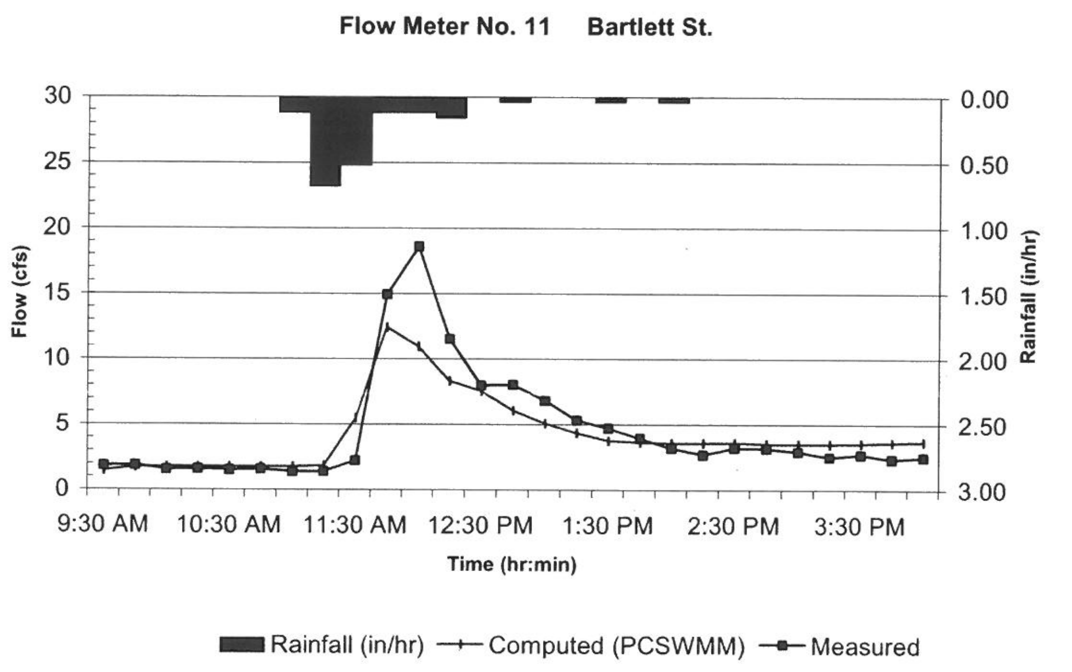


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000

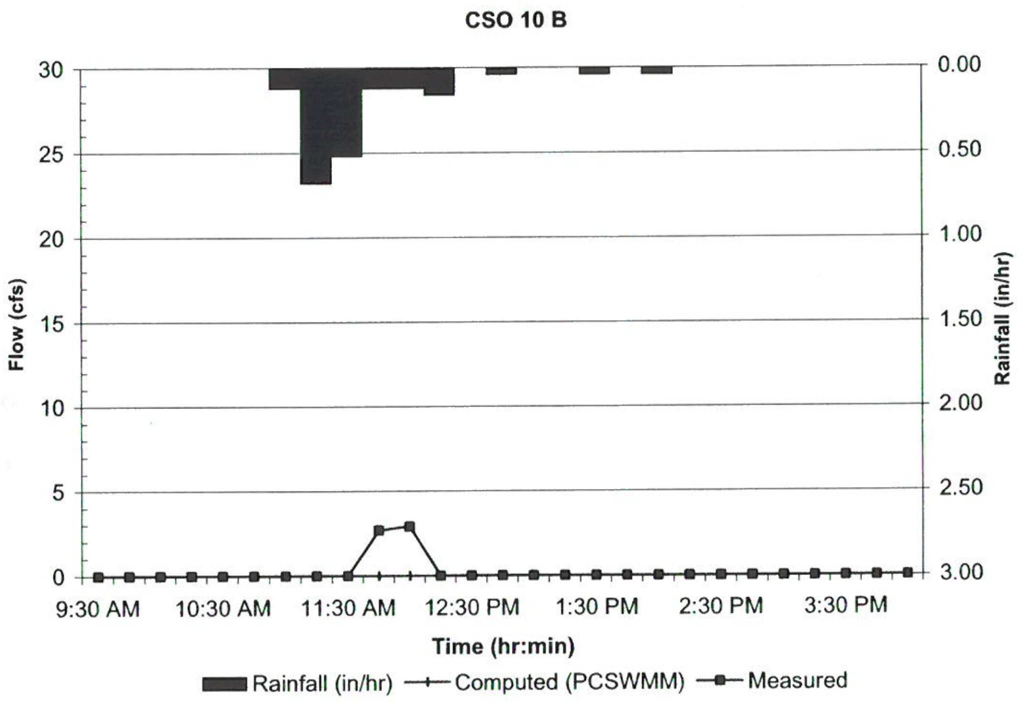


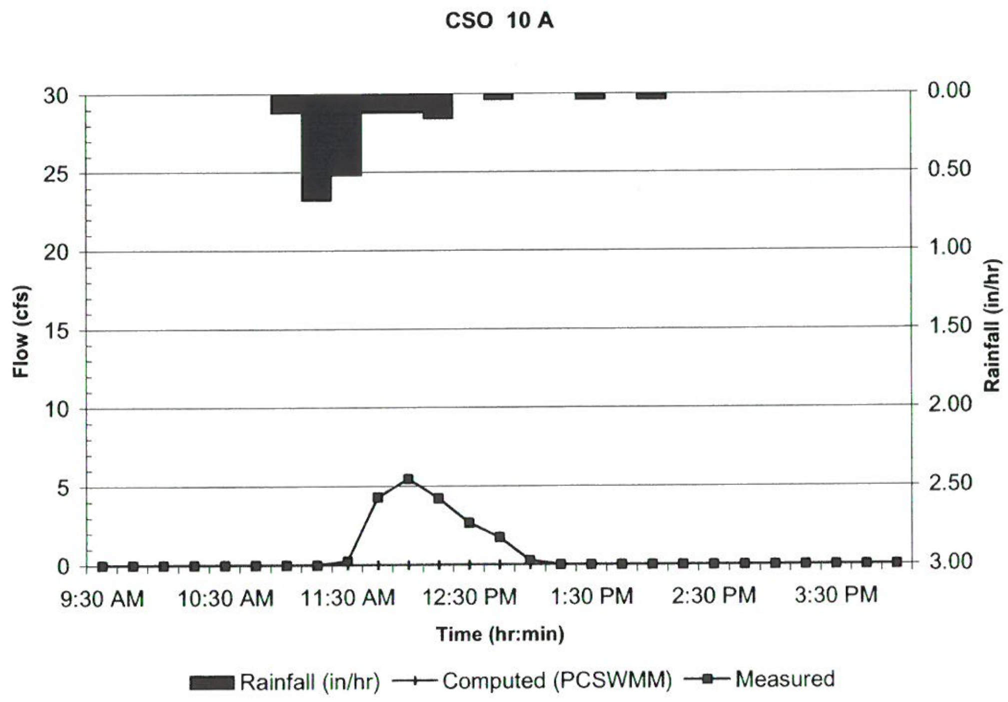


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



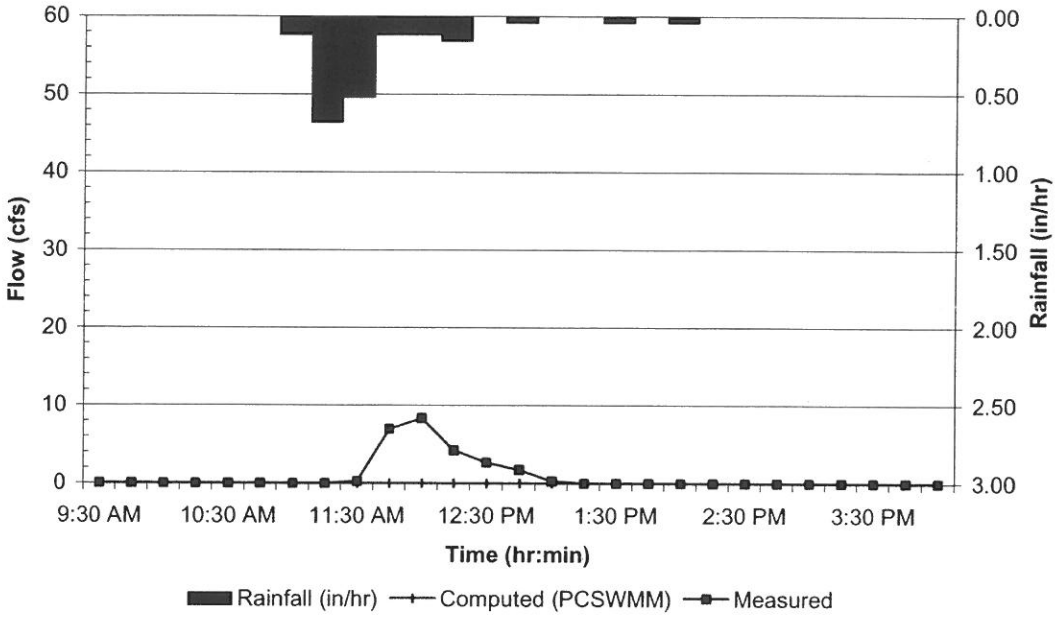
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000



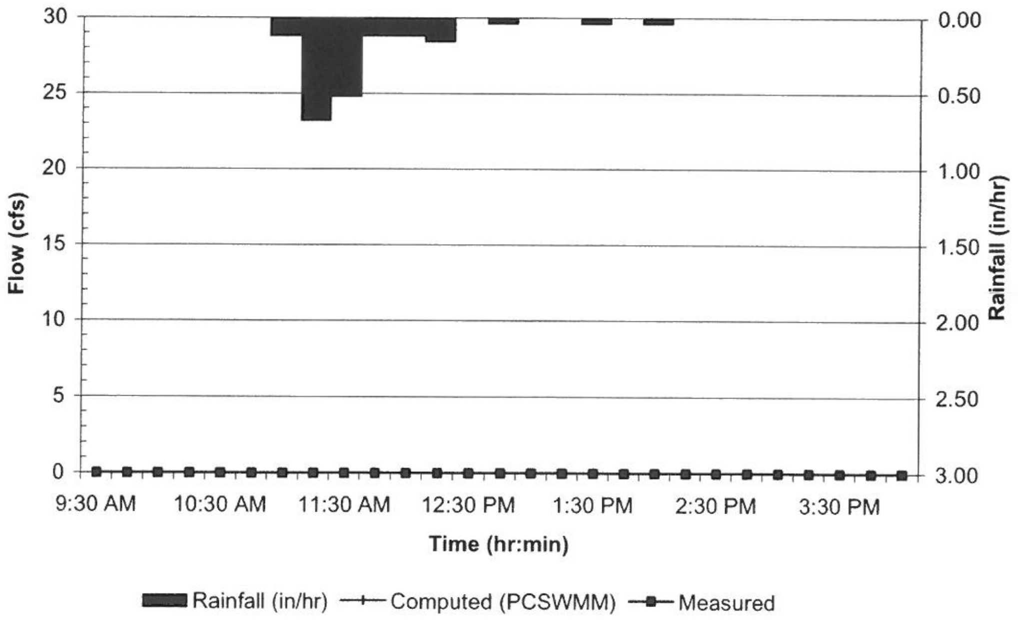


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 13, 2000

CSO 10 A & 10B
COMBINED

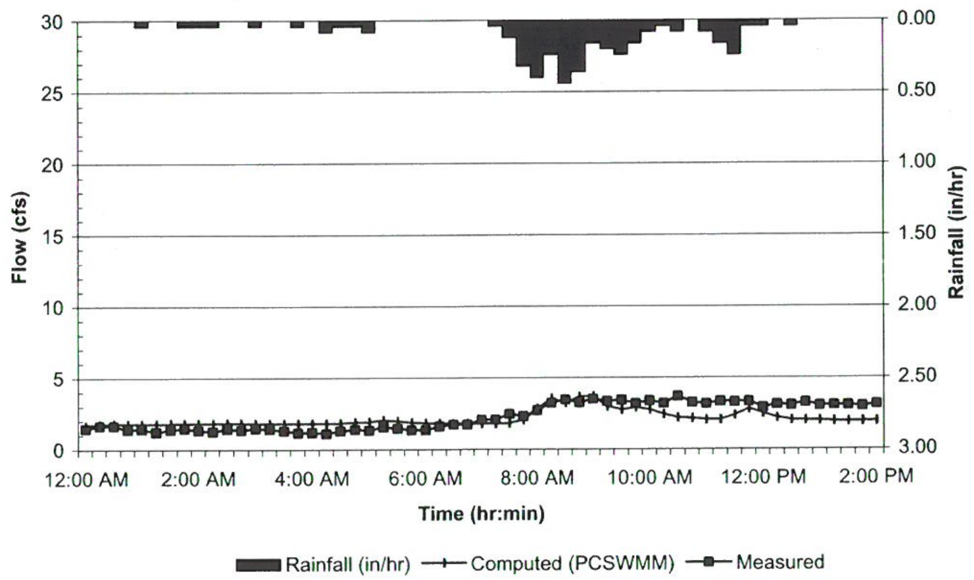


Deer St. CSO

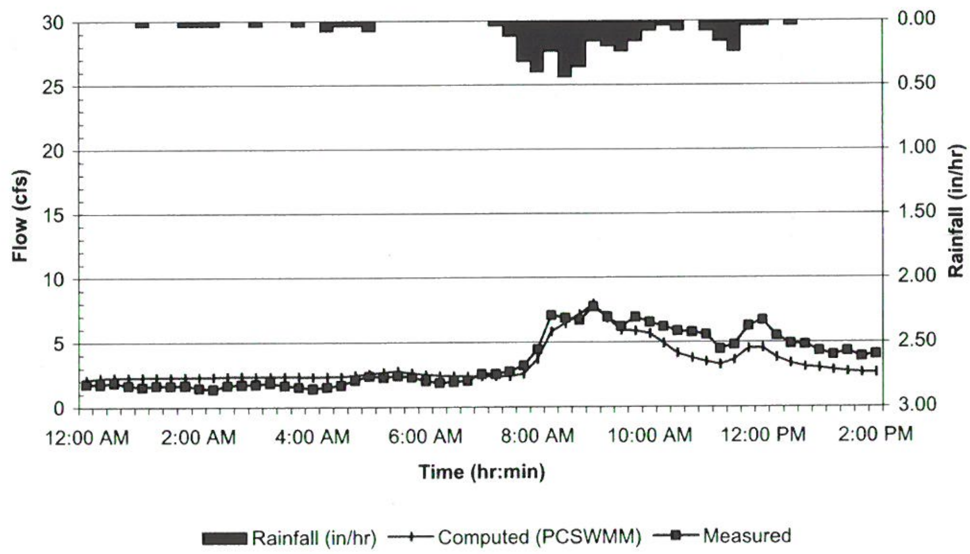


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

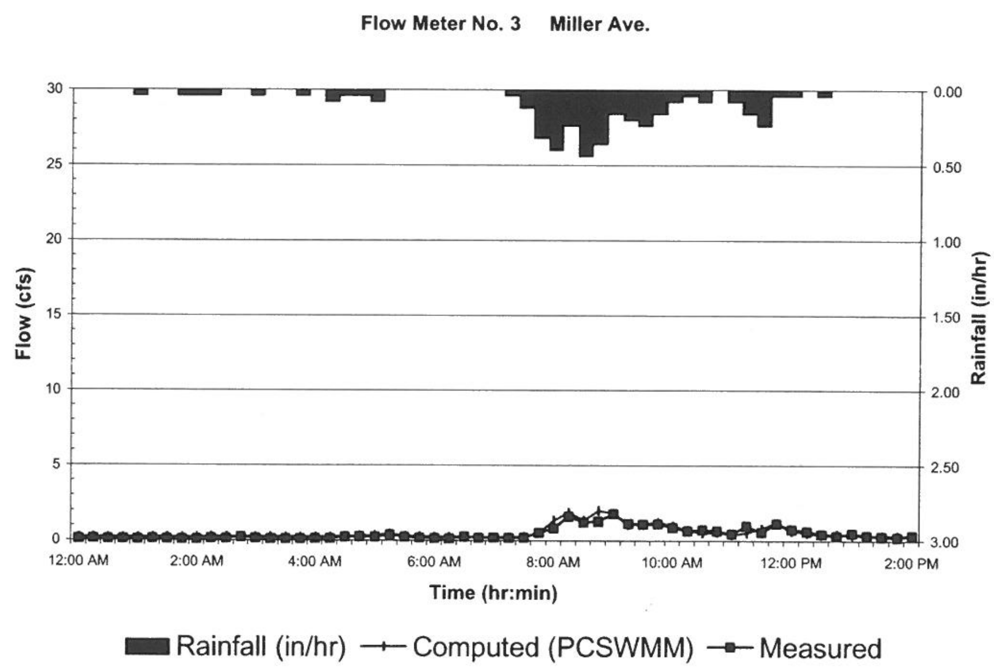
Flow Meter No. 1 Orchard St.

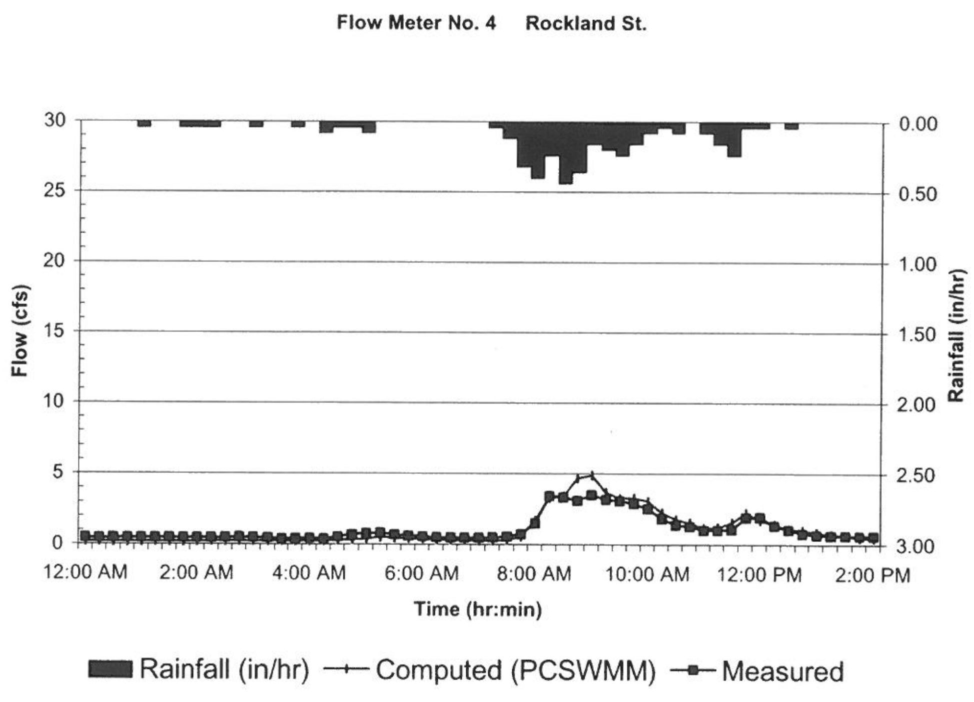


Flow Meter No. 2 Broad St.

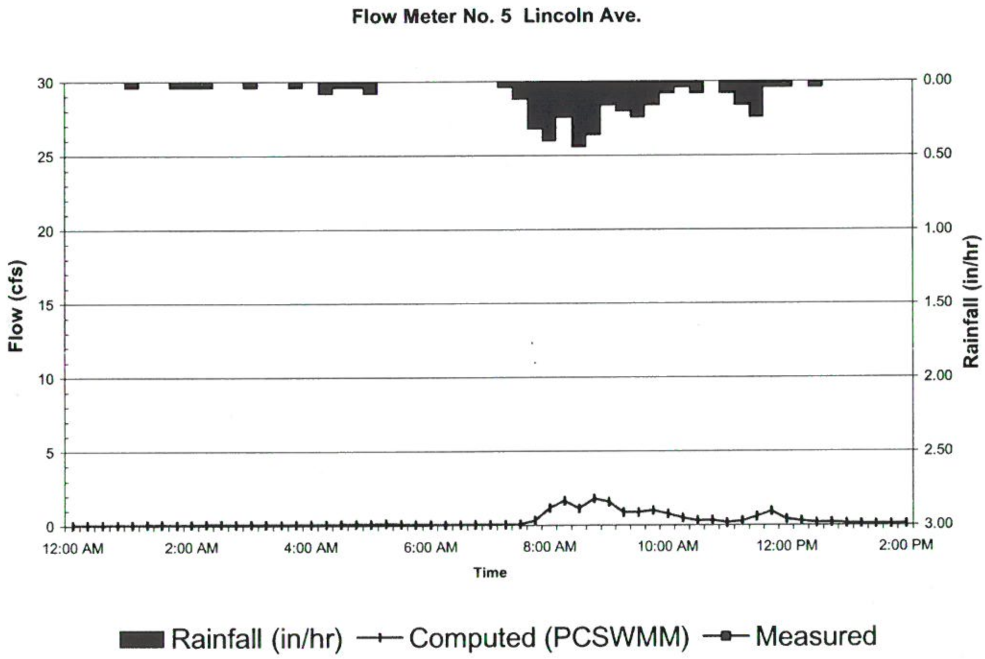


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

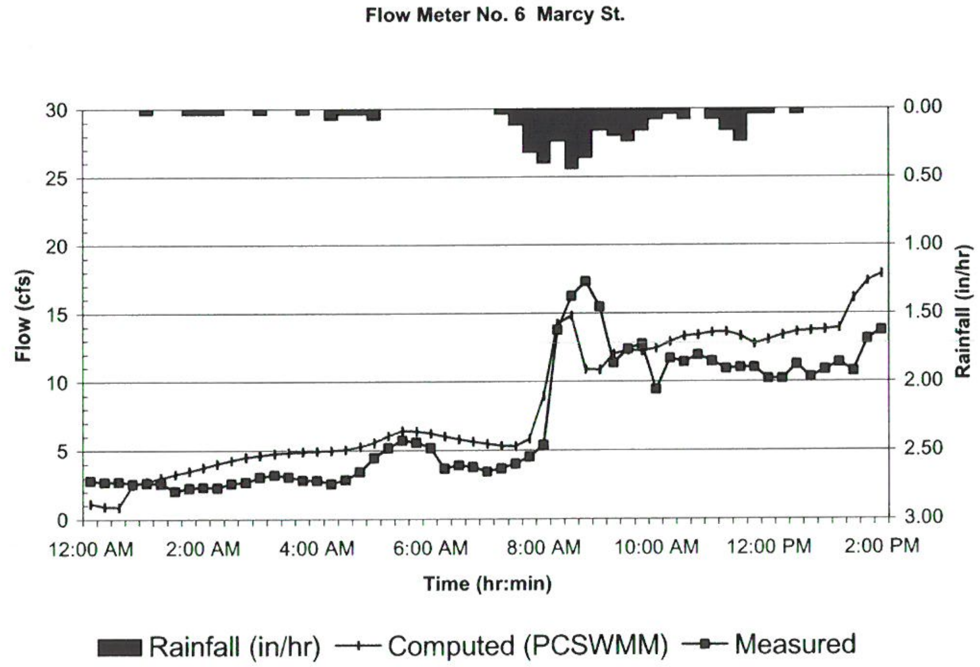




PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

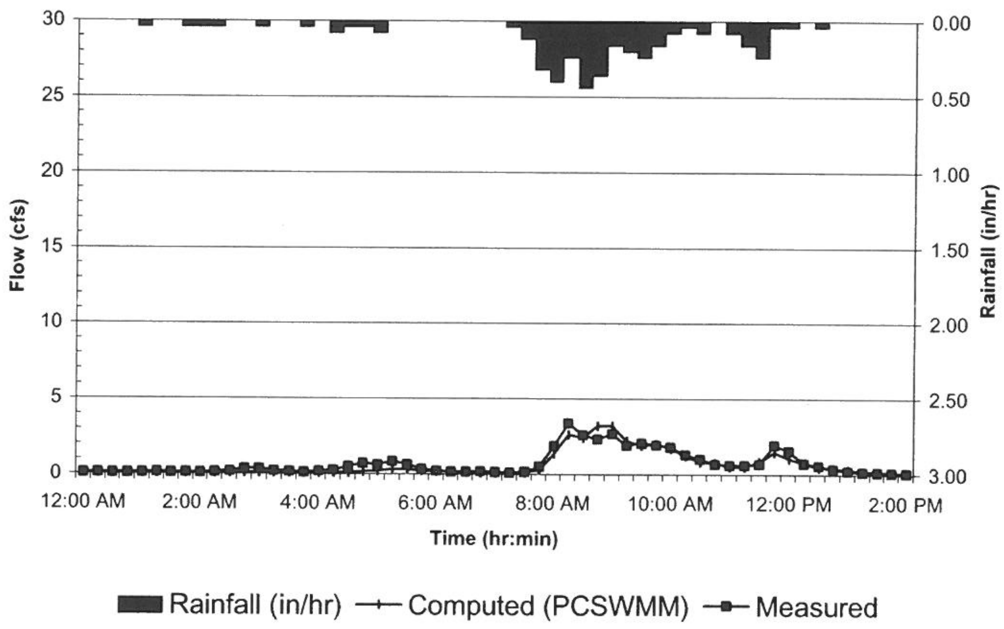


No Flow Data Available

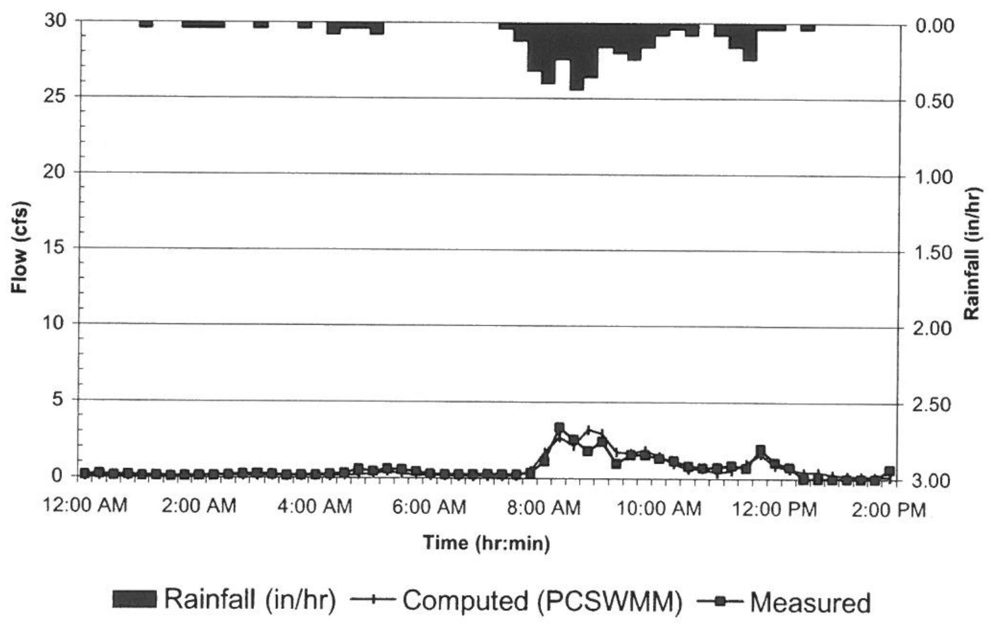


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

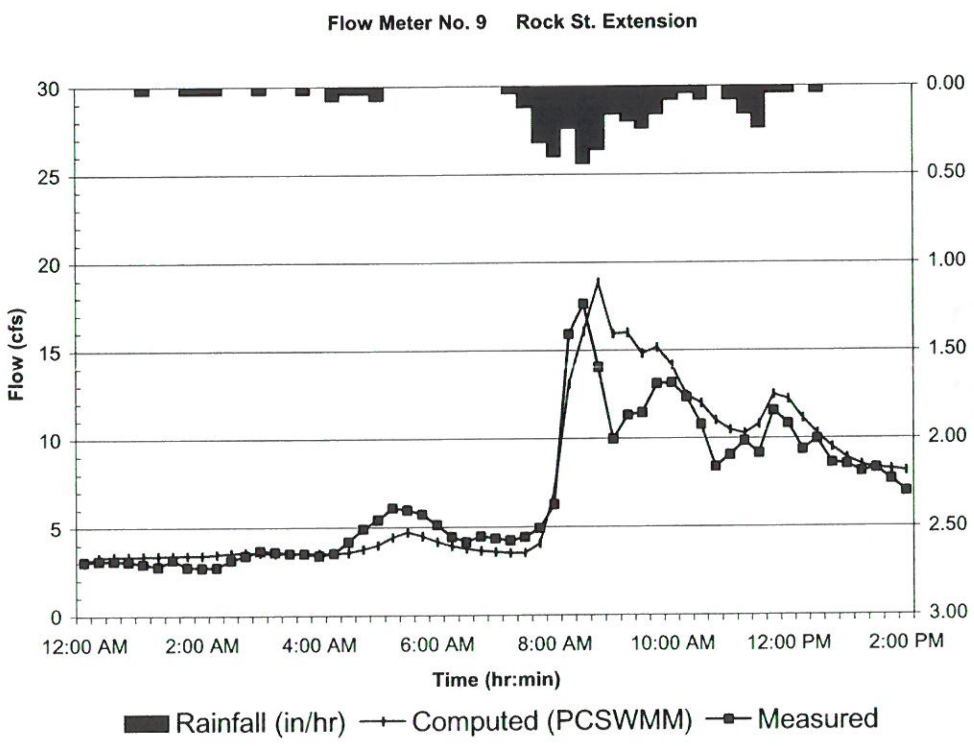
Flow Meter No. 7 Court St.

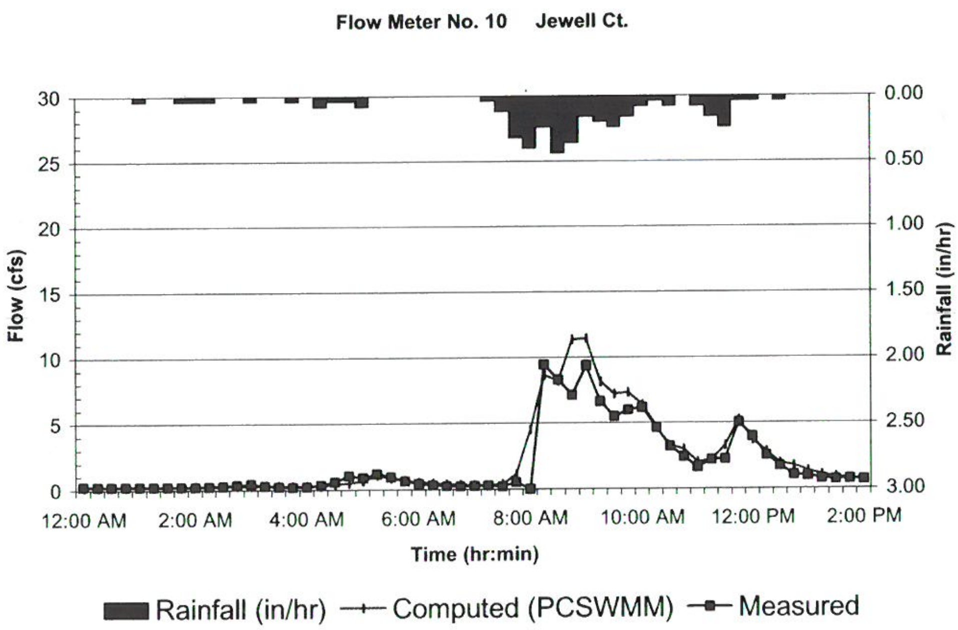


Flow Meter No. 8 Bridge St.

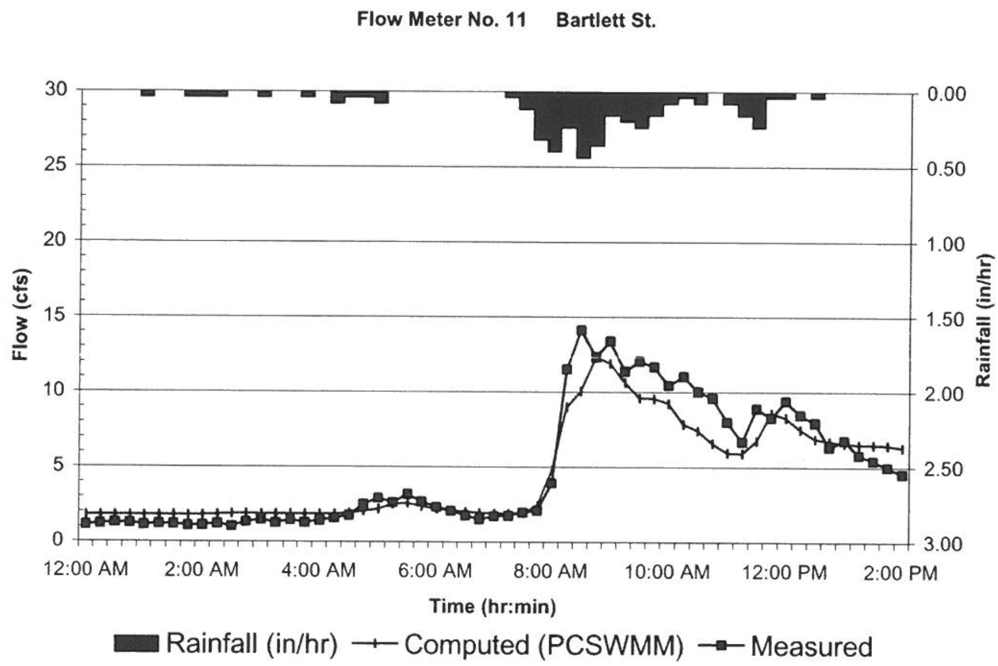


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

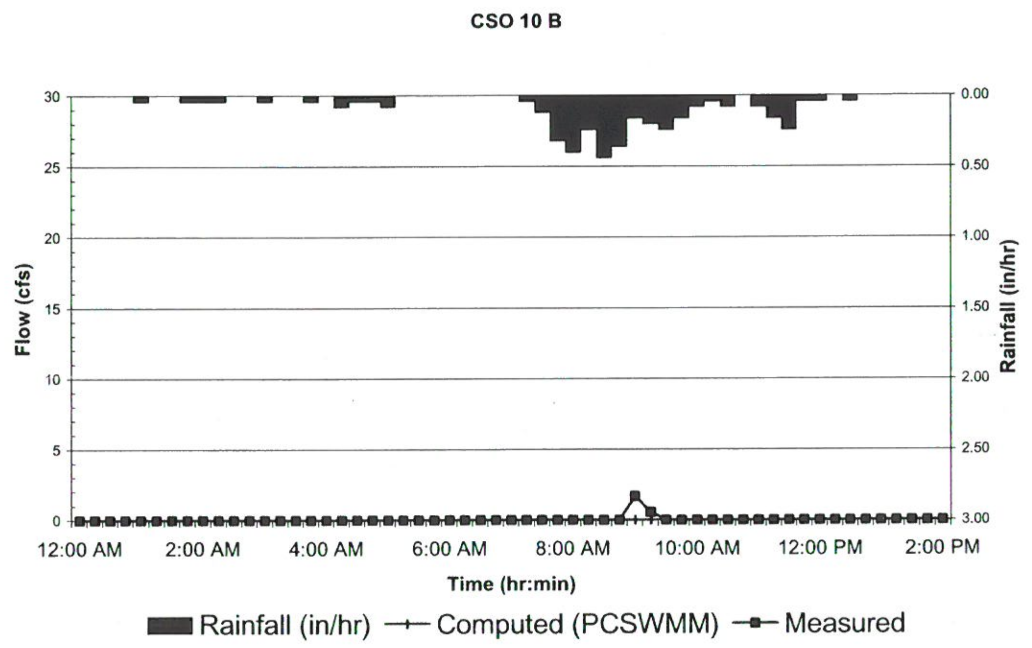


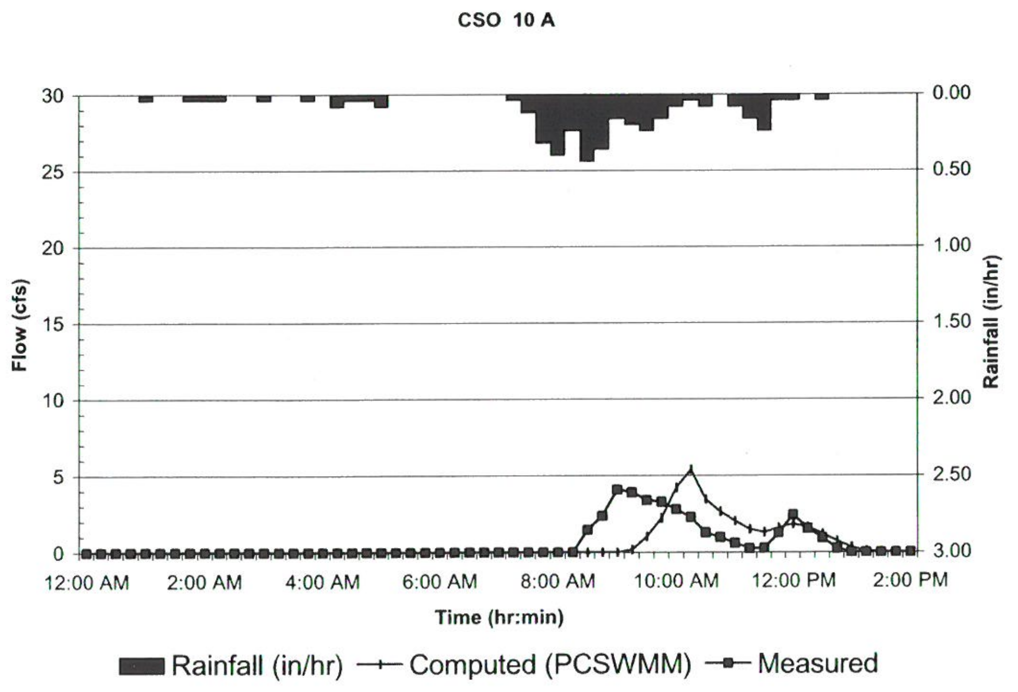


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000

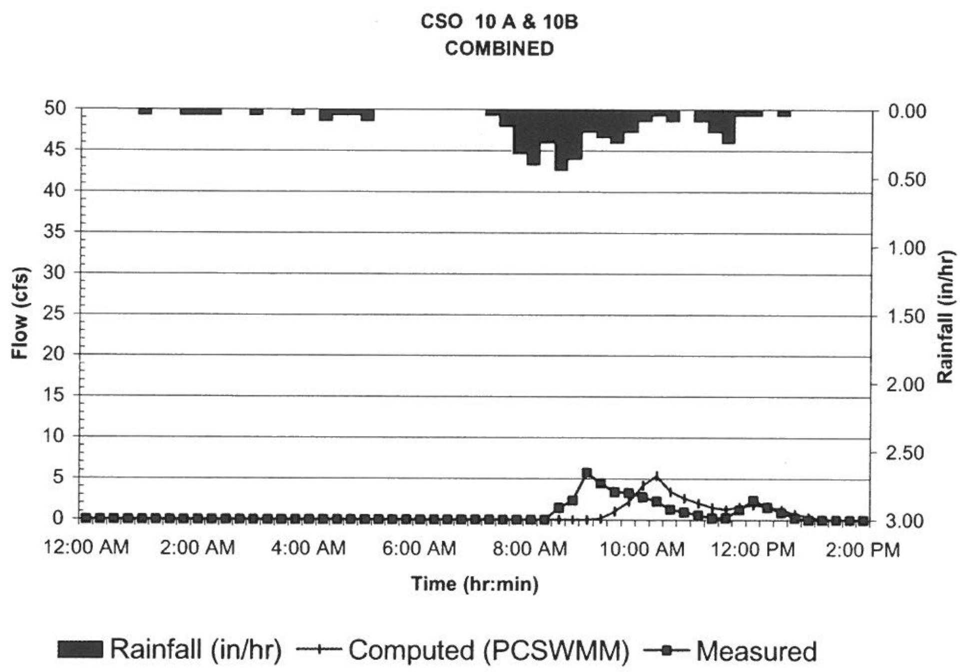


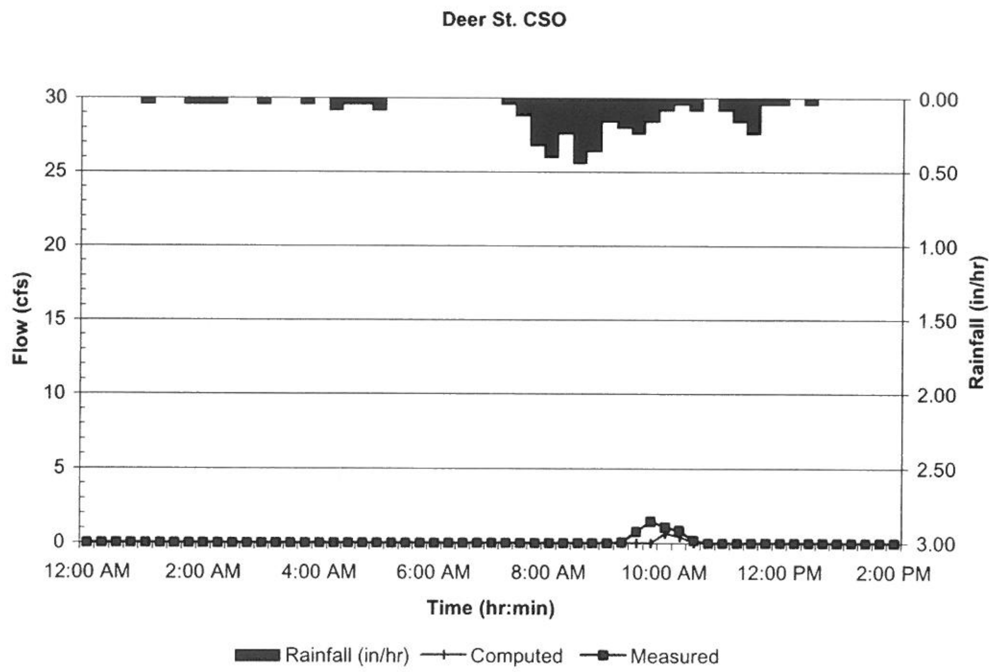
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000



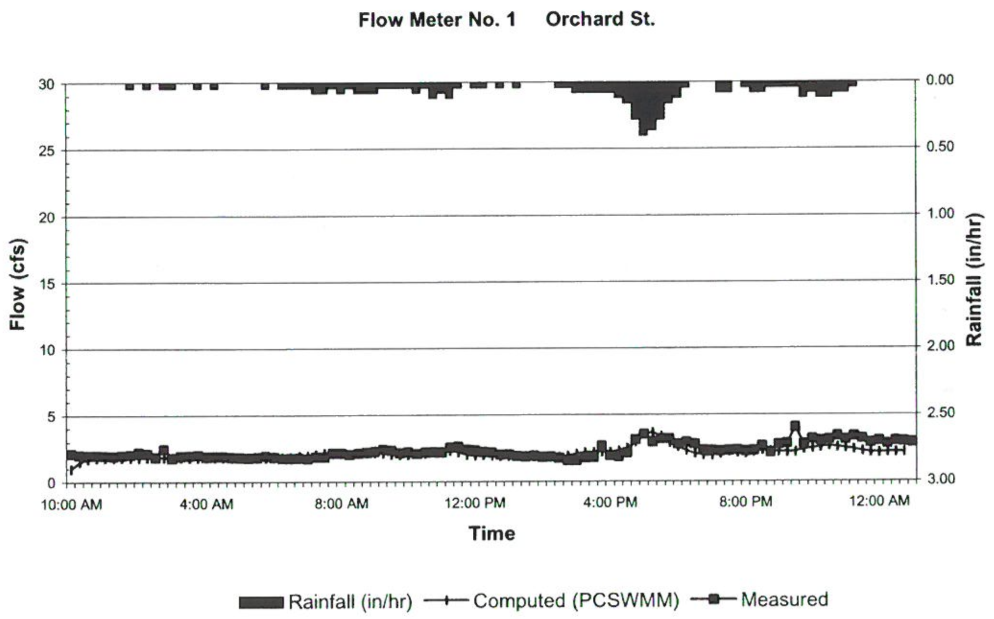


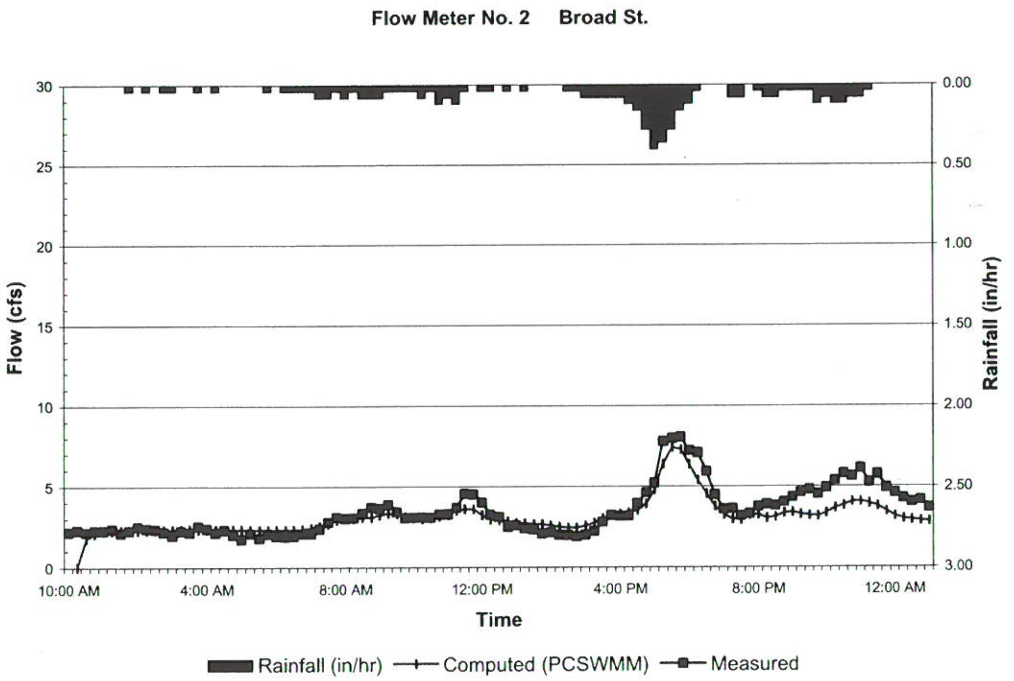
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
MAY 24, 2000



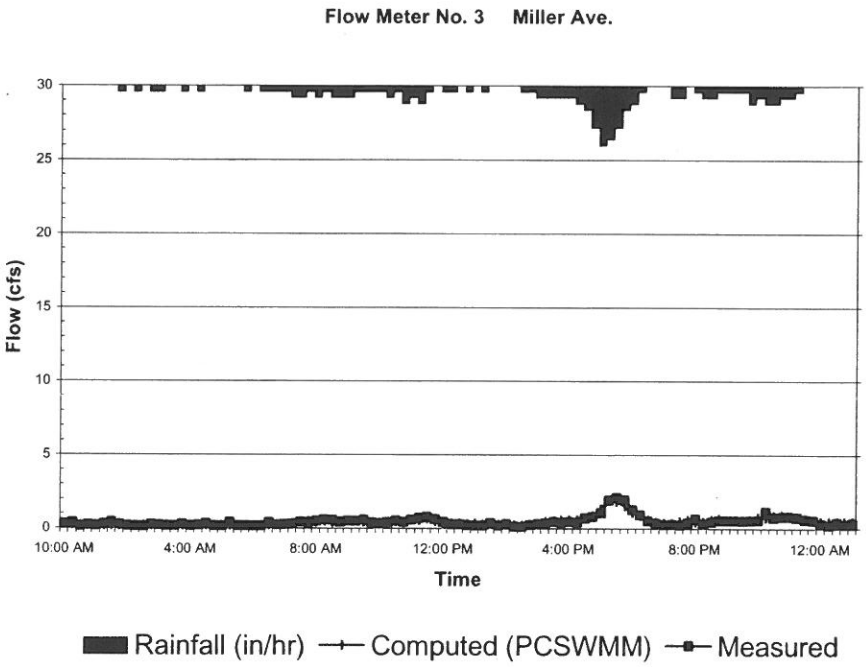


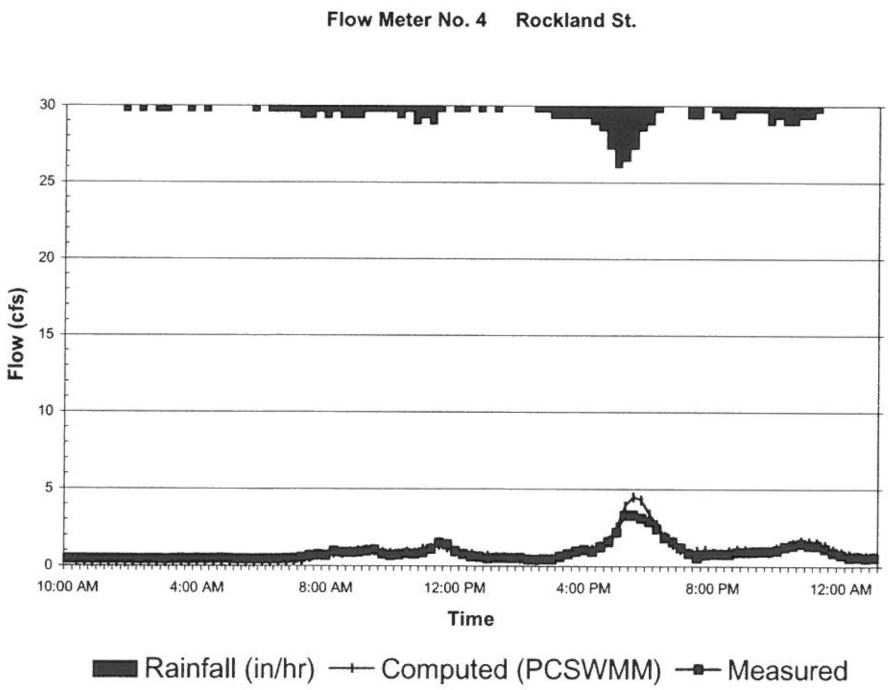
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000



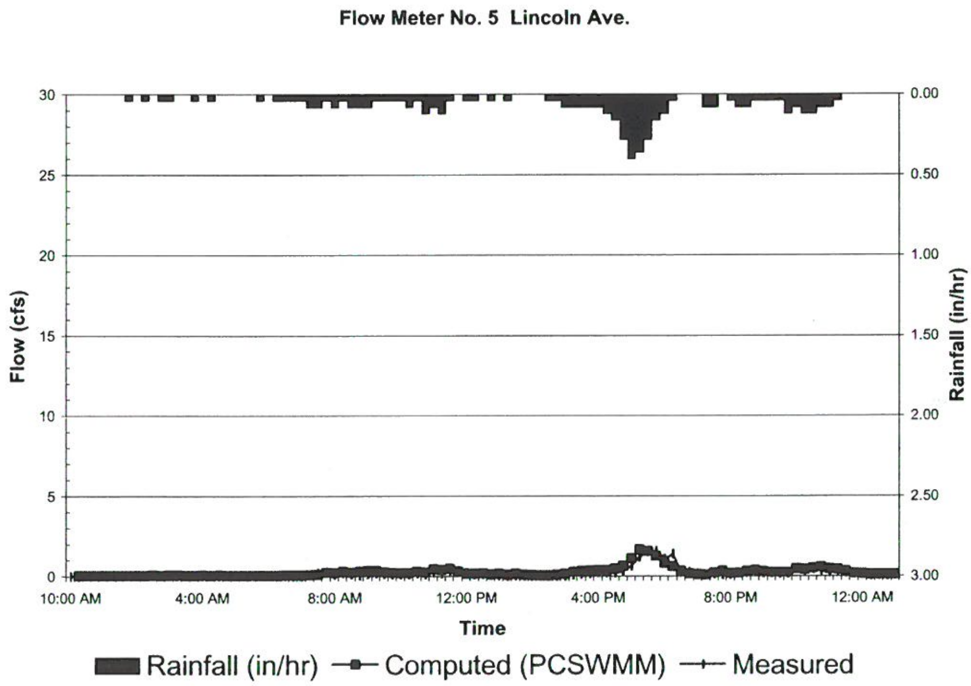


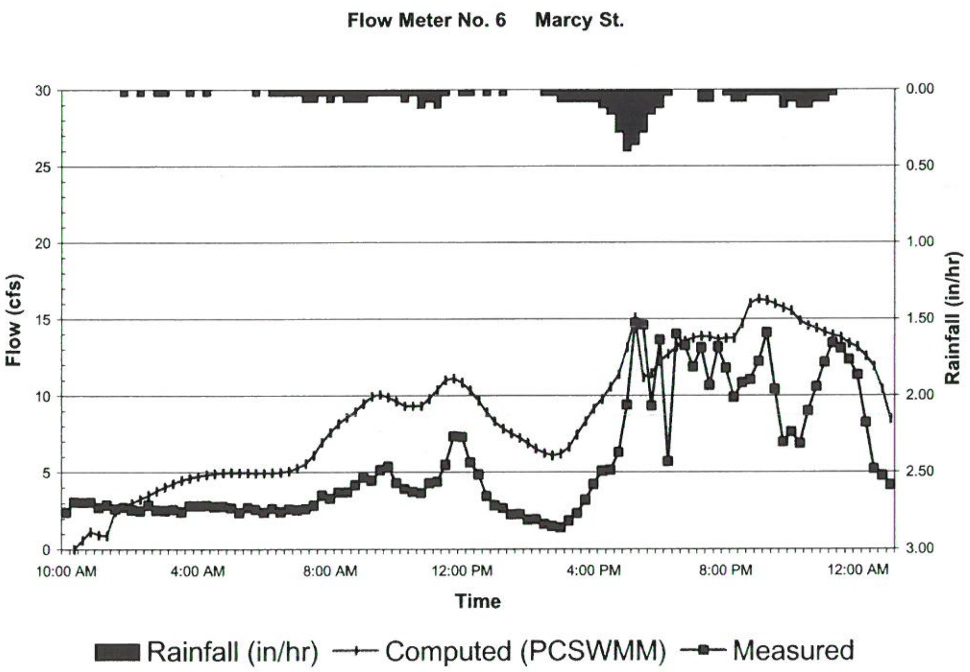
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000



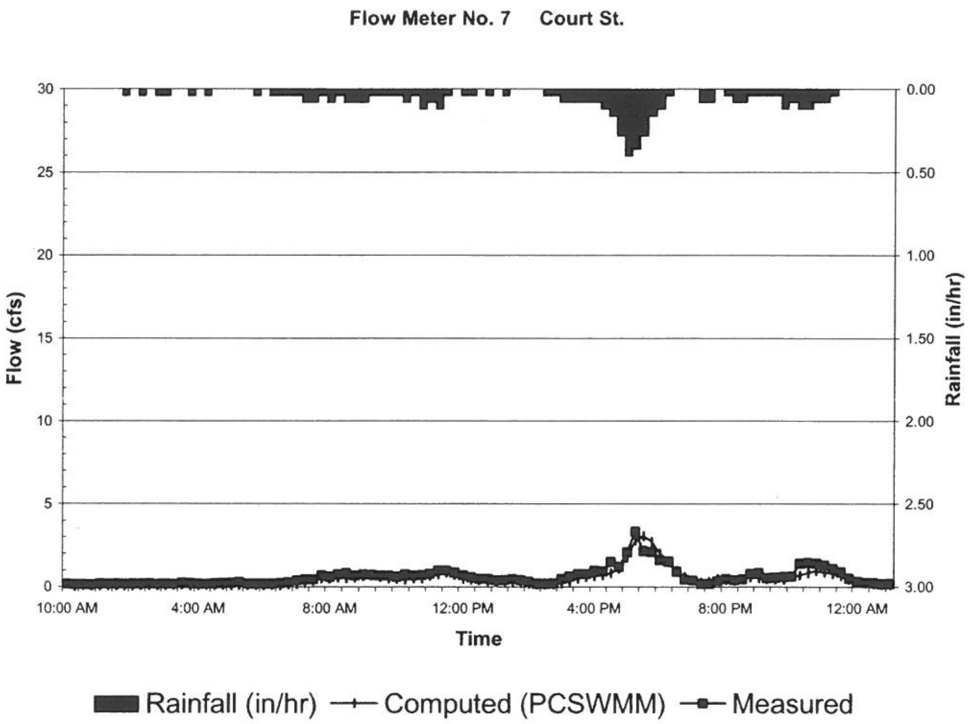


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000

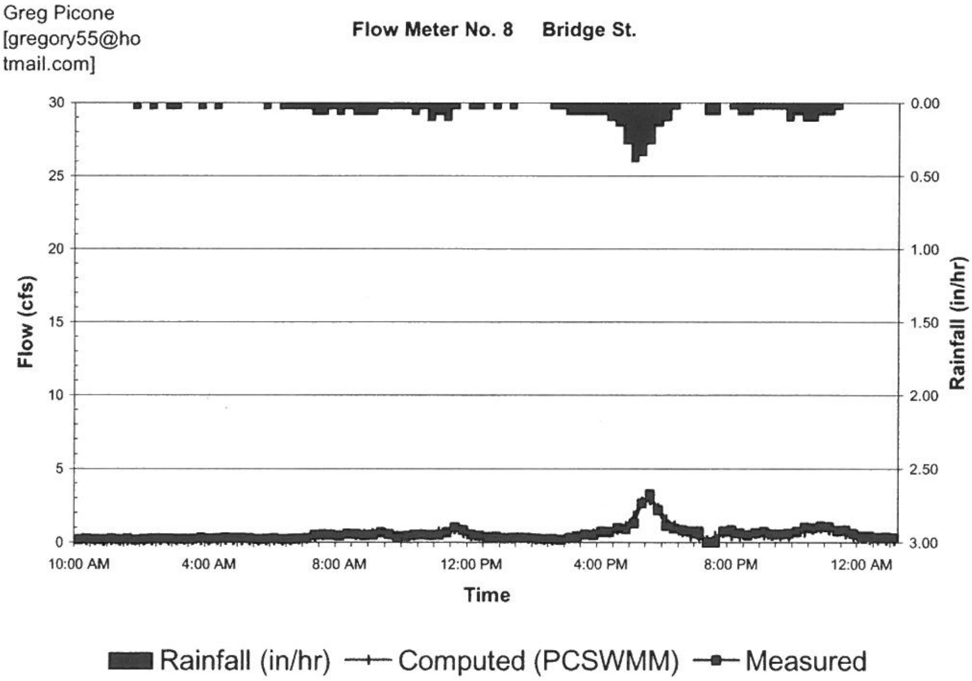




PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000

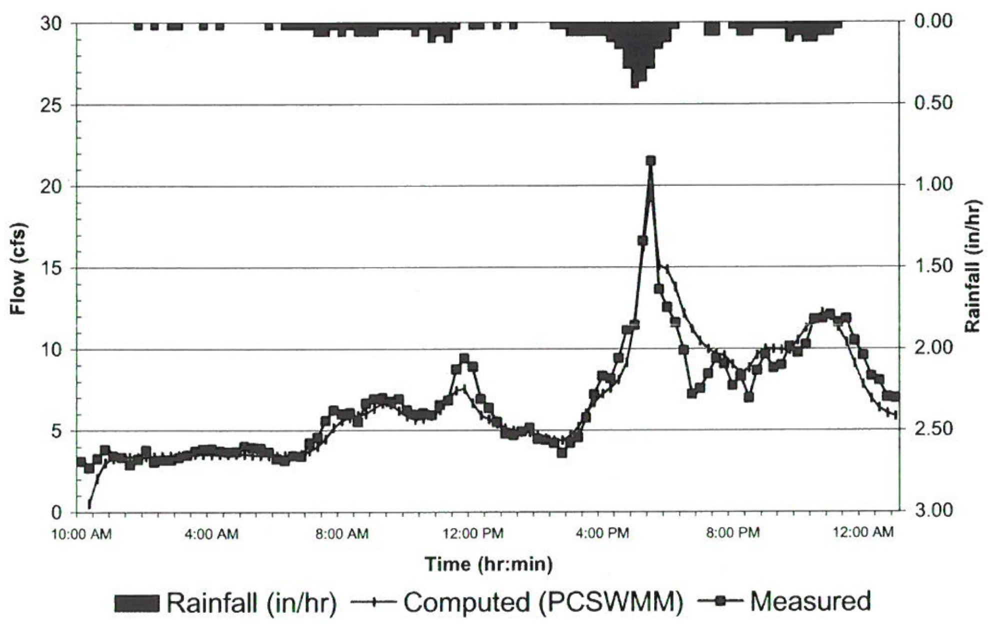


Greg Picone
[gregory55@ho
tmail.com]

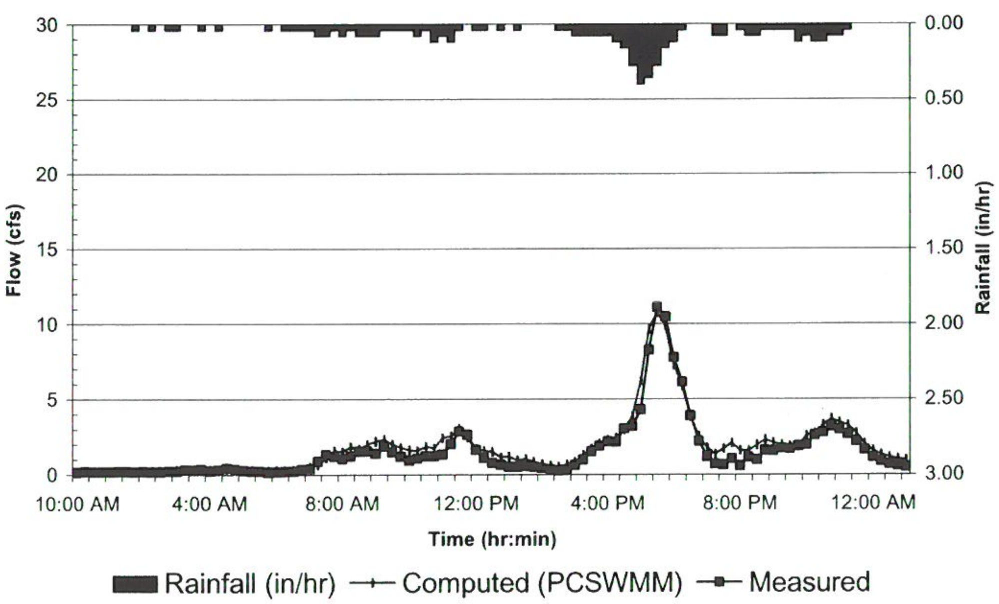


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000

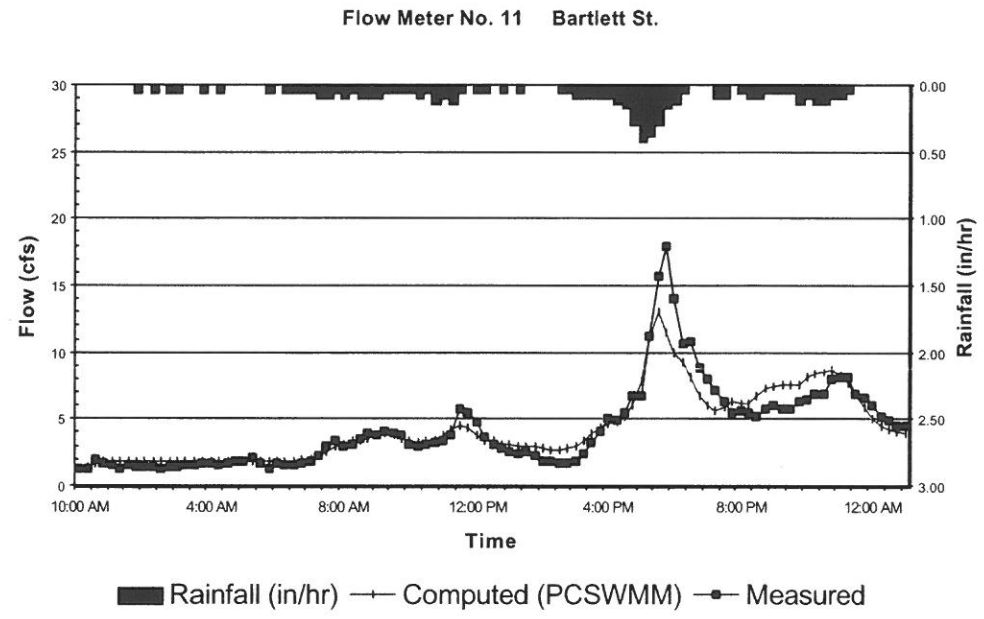
Flow Meter No. 9 Rock St. Extension



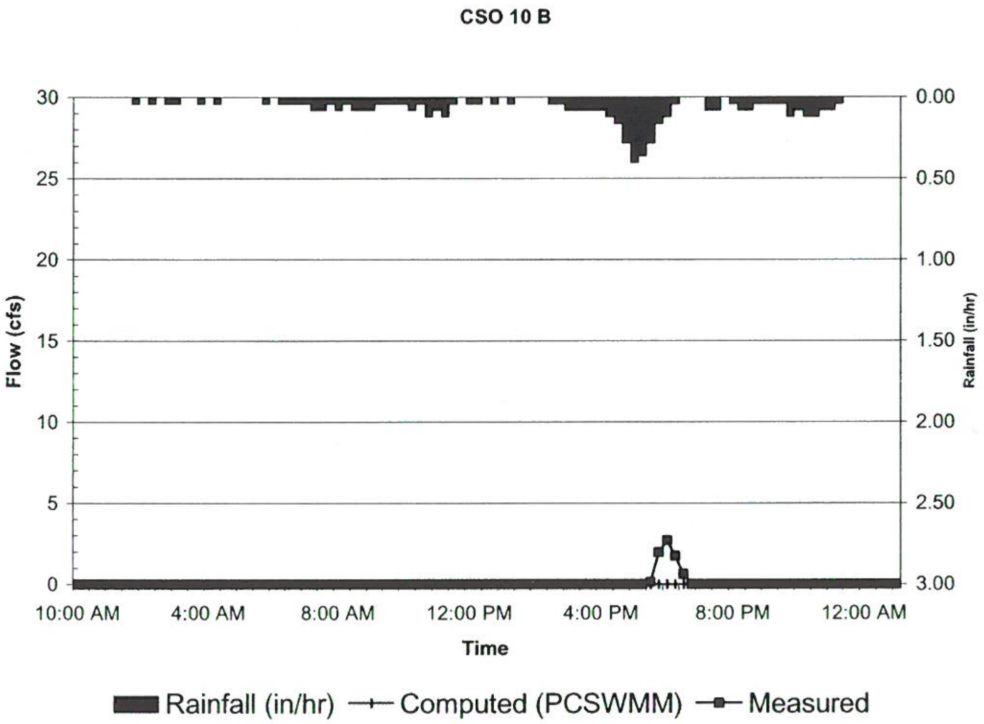
Flow Meter No. 10 Jewell Ct.

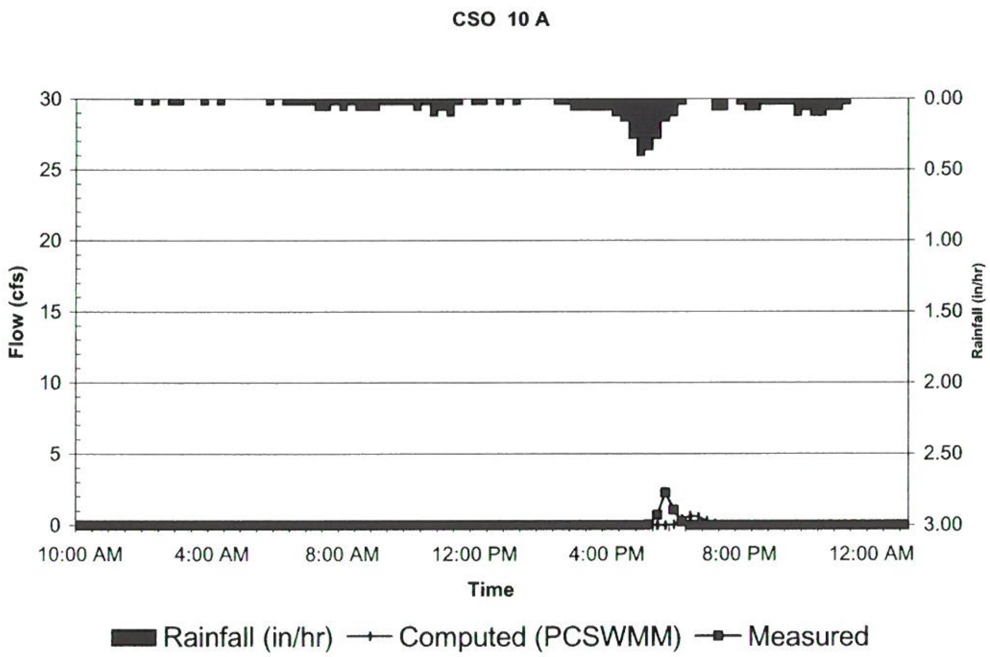


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000

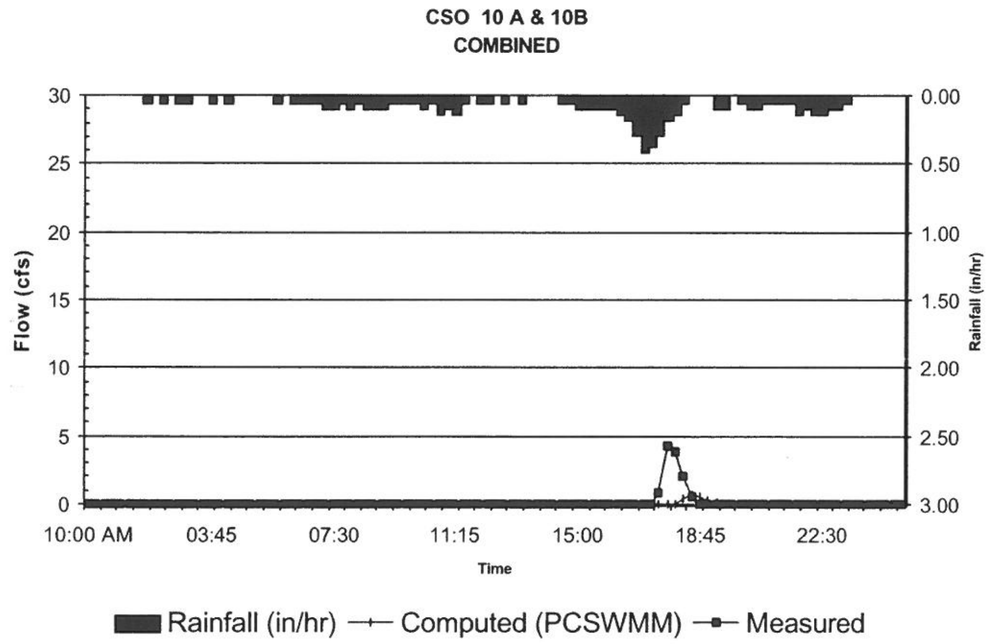


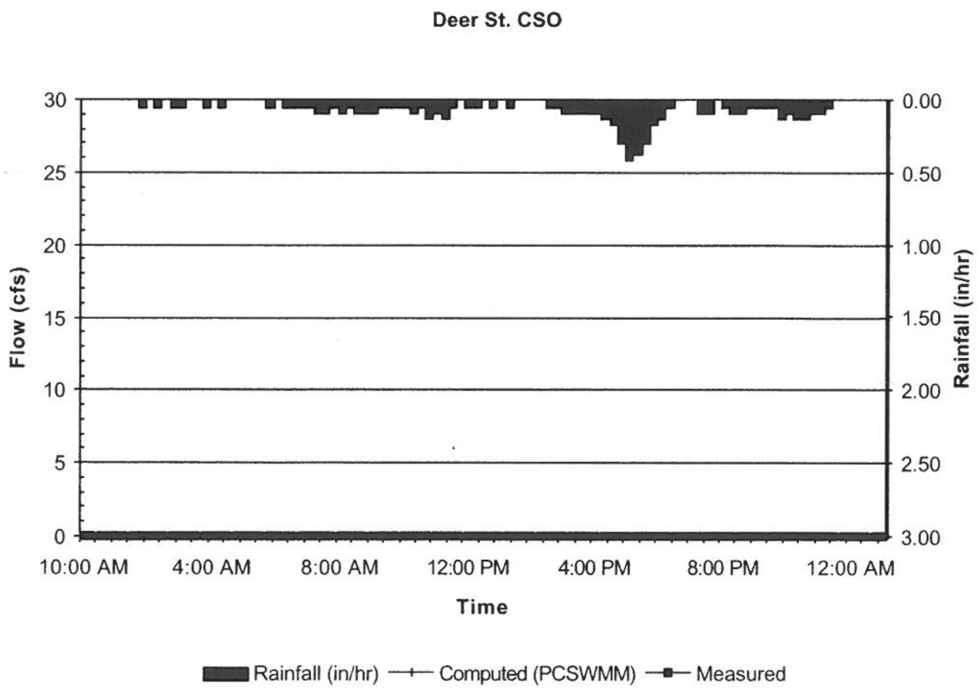
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000



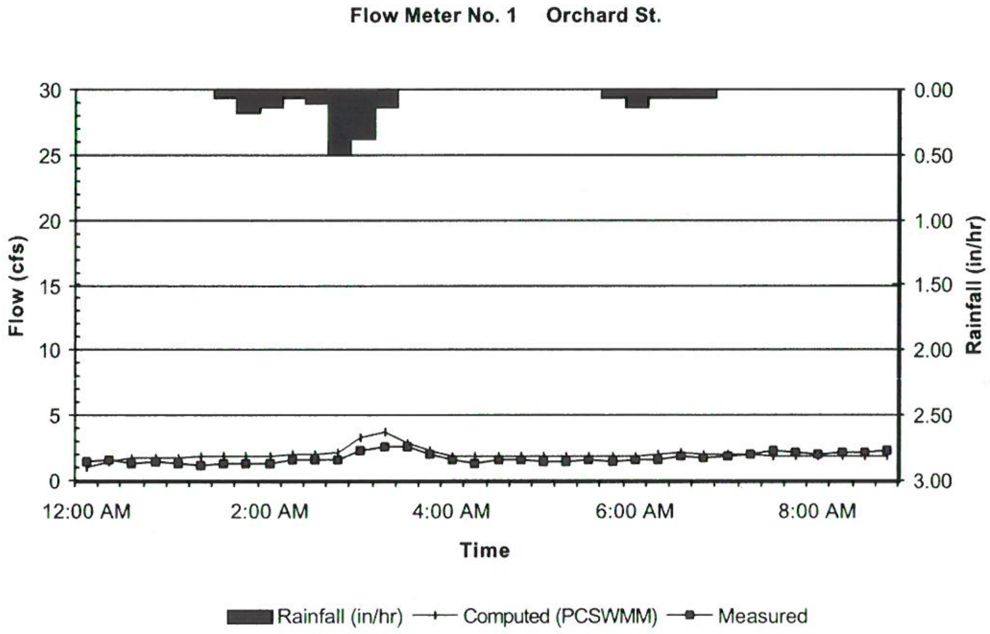


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 6, 2000

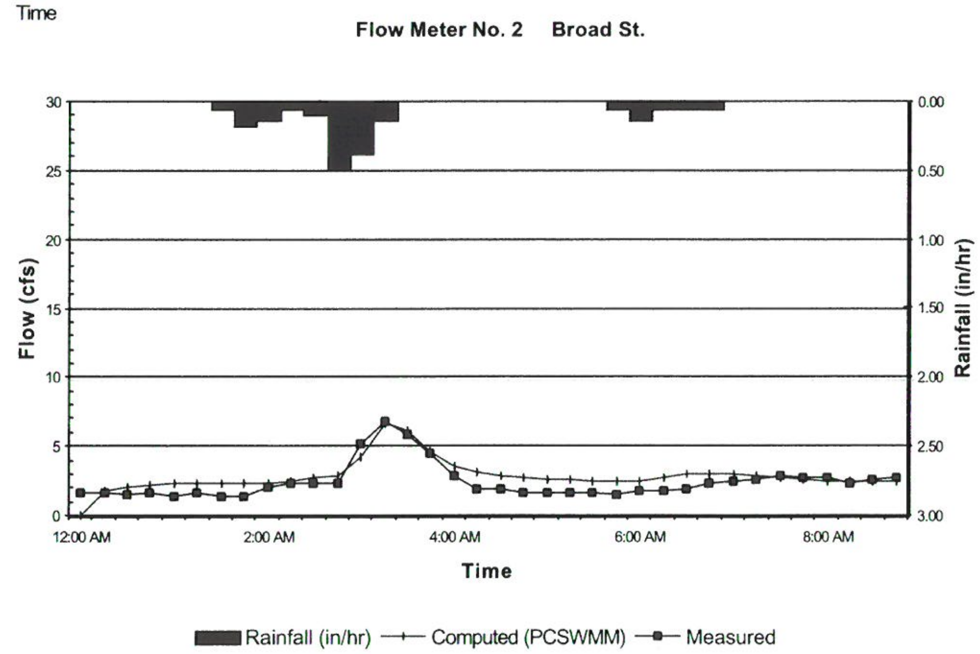




PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000

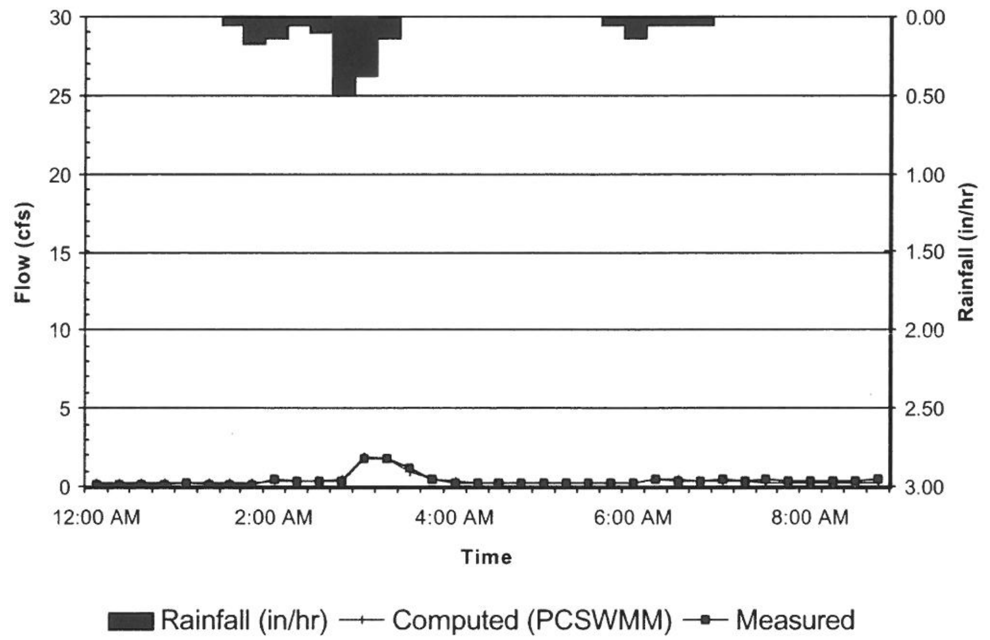


Time

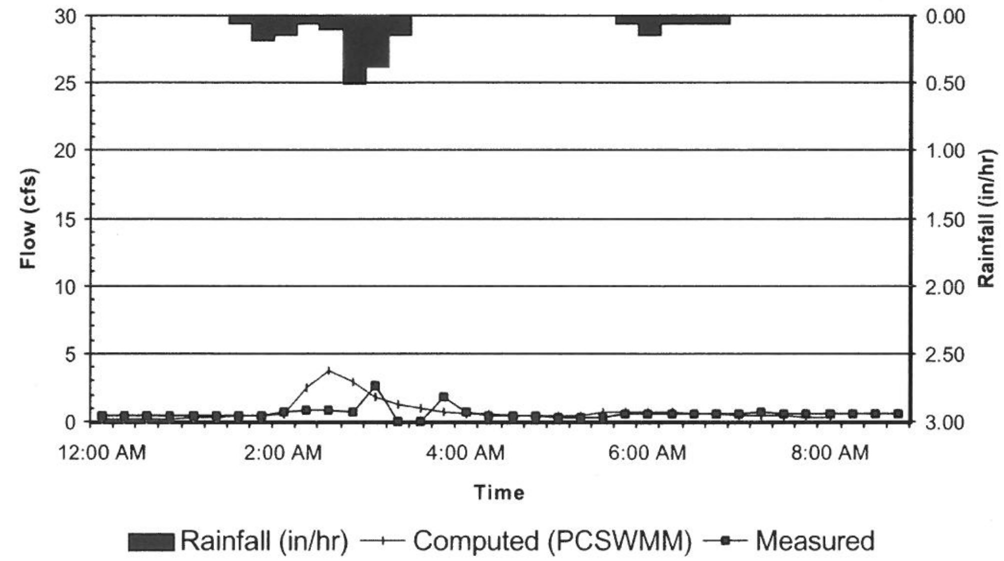


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000

Flow Meter No. 3 Miller Ave.



Flow Meter No. 4 Rockland St.



PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000

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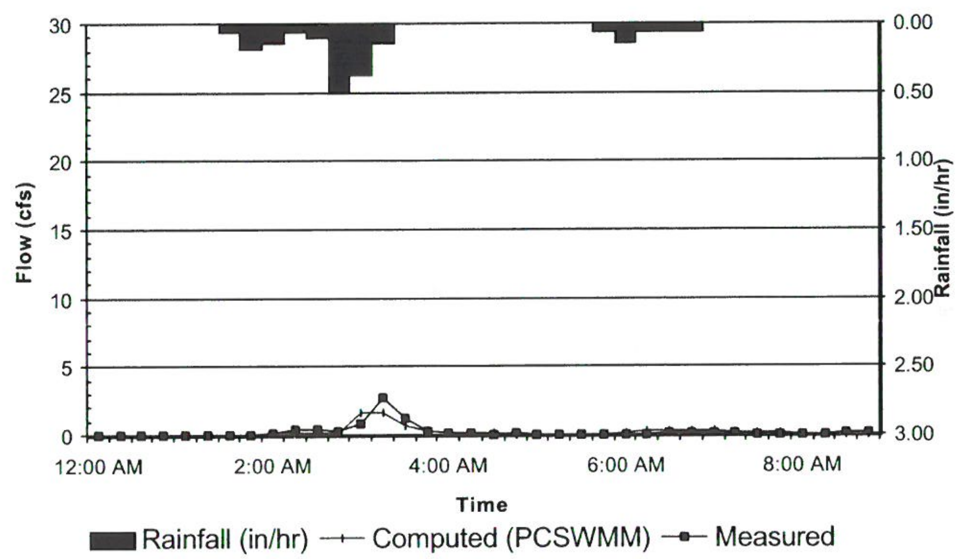

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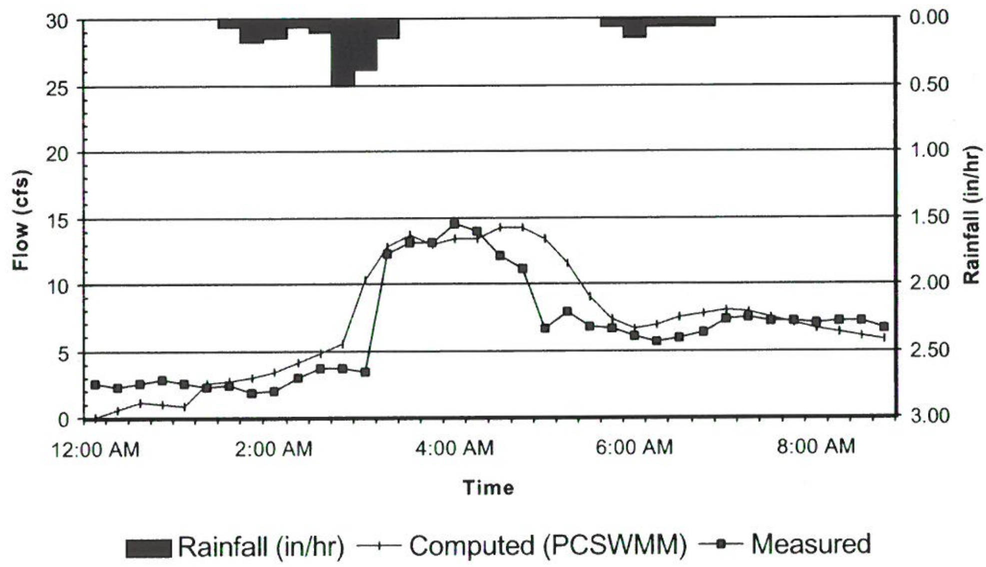
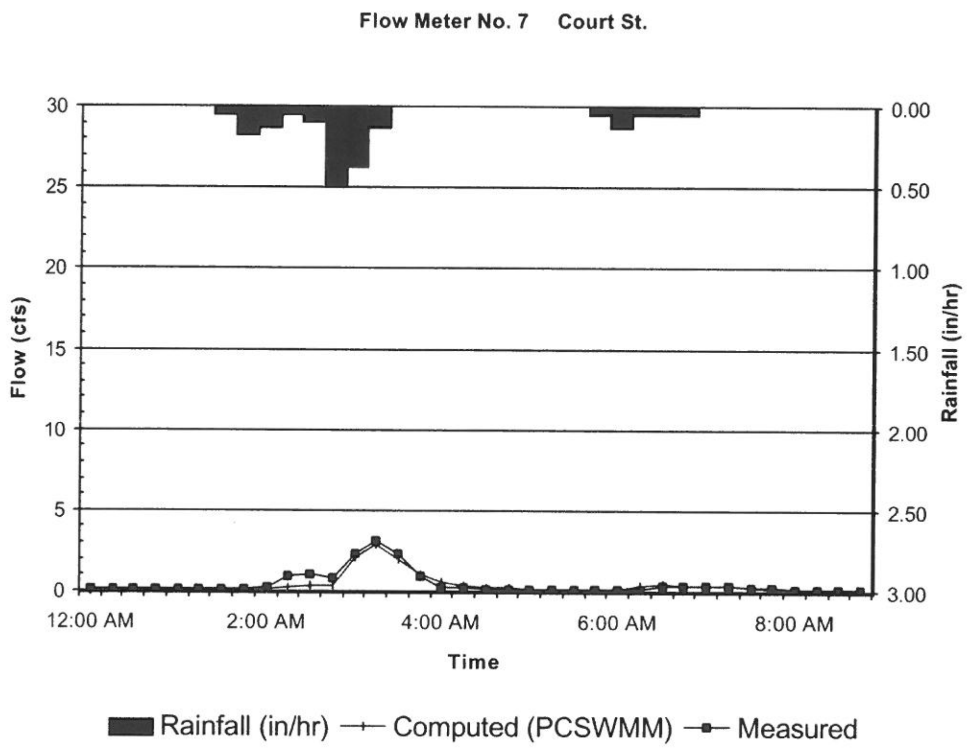
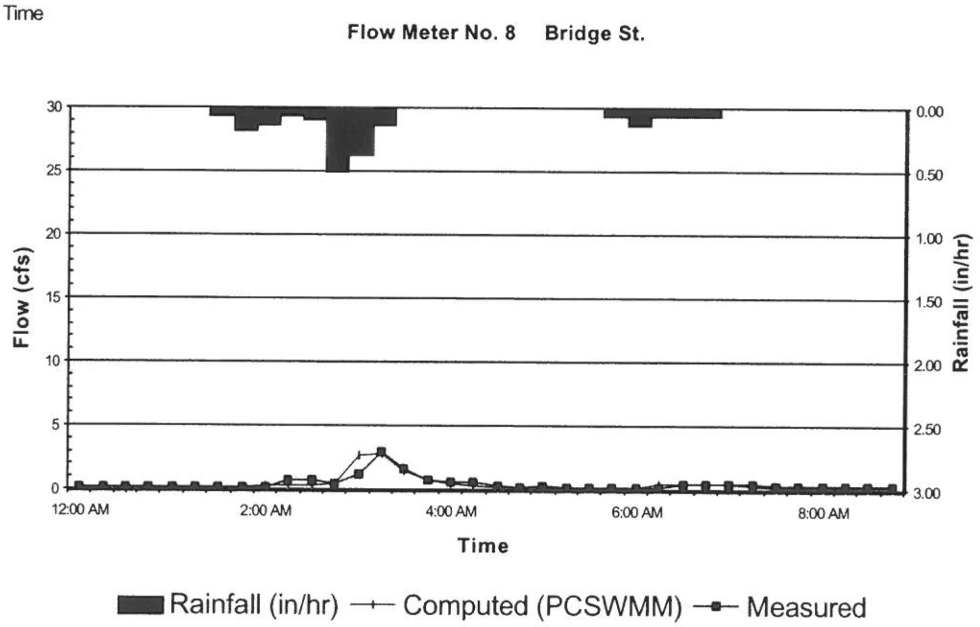


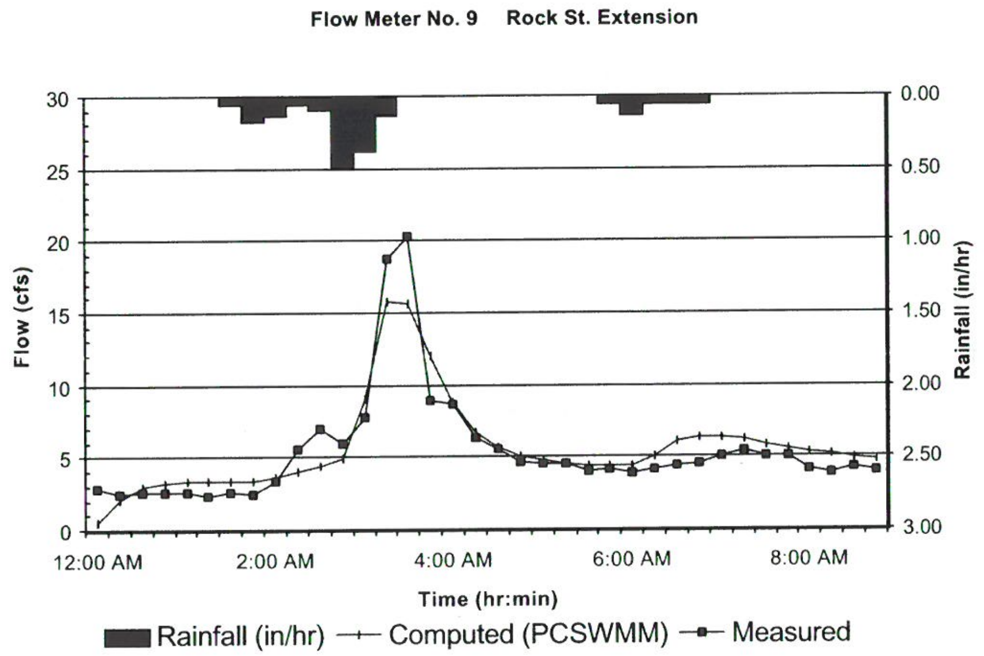
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000

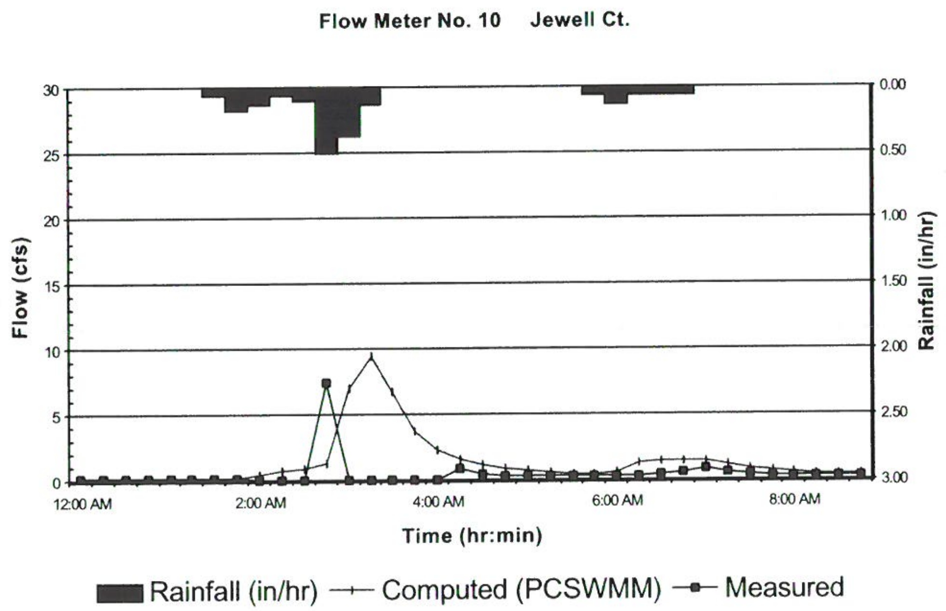


Time

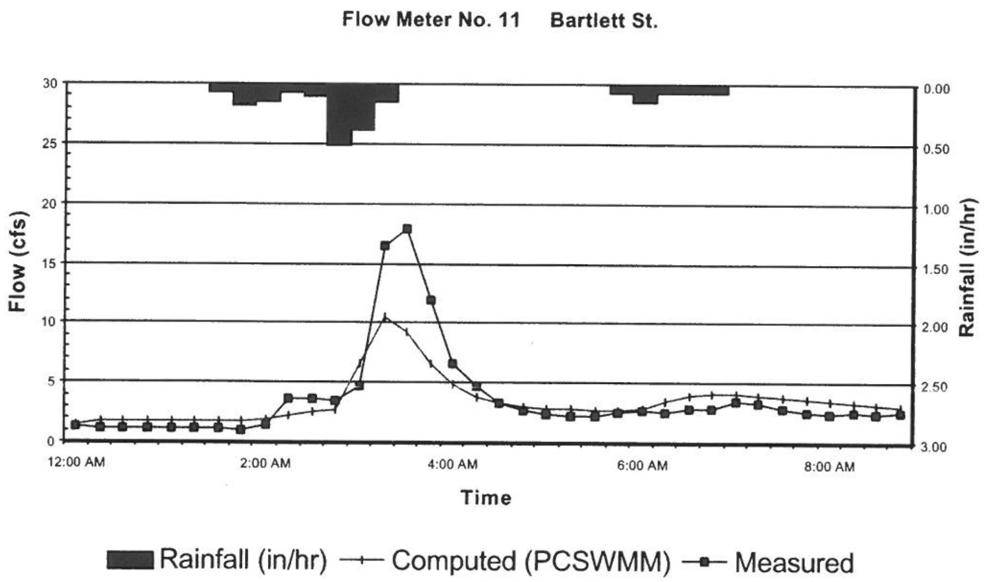


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000

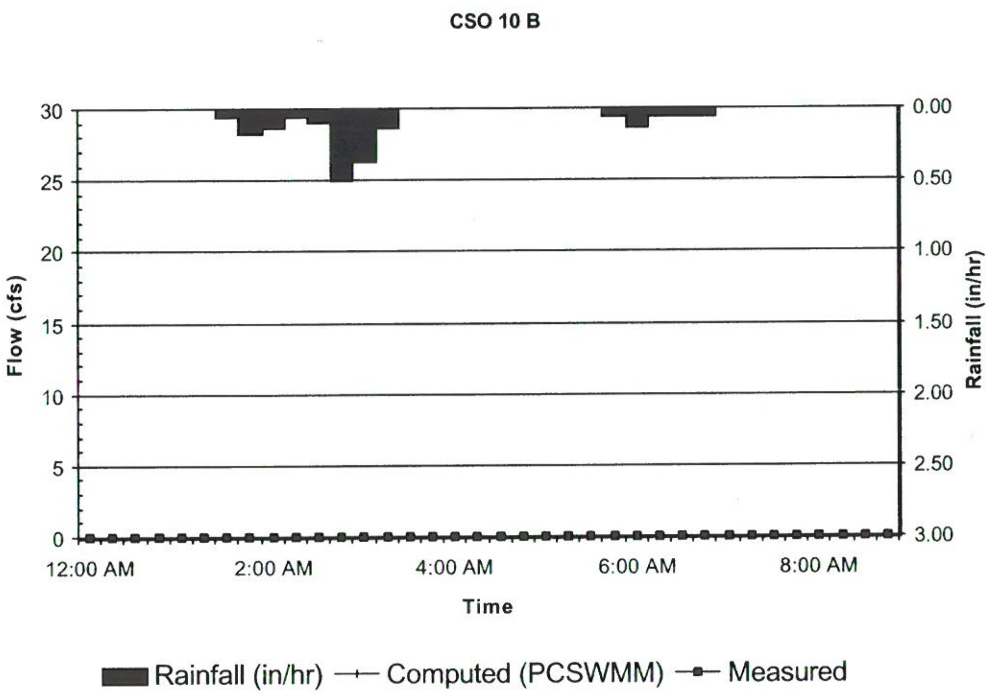


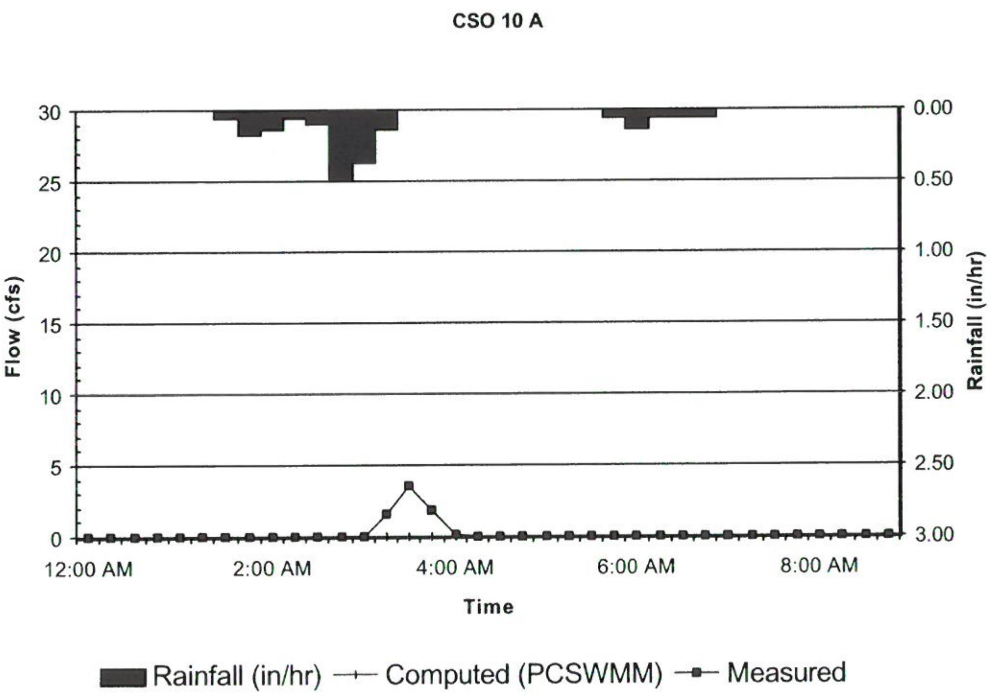


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000



PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JUNE 12, 2000





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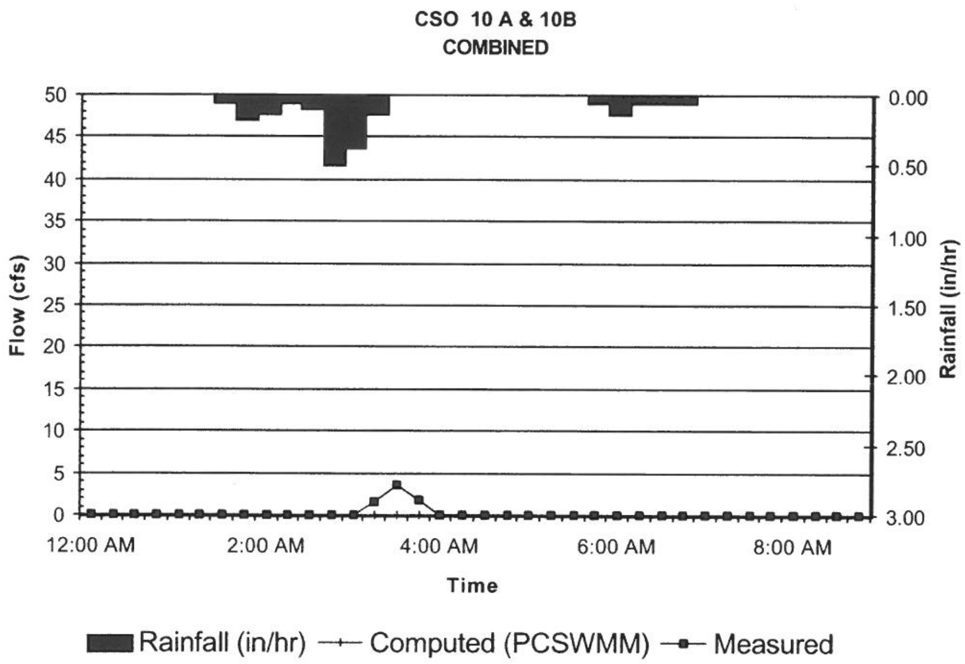
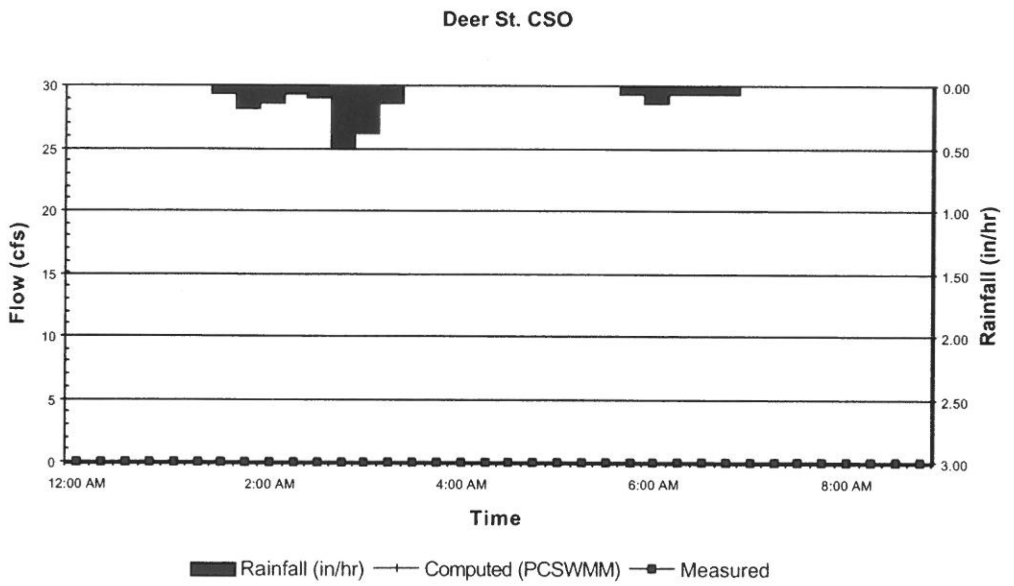
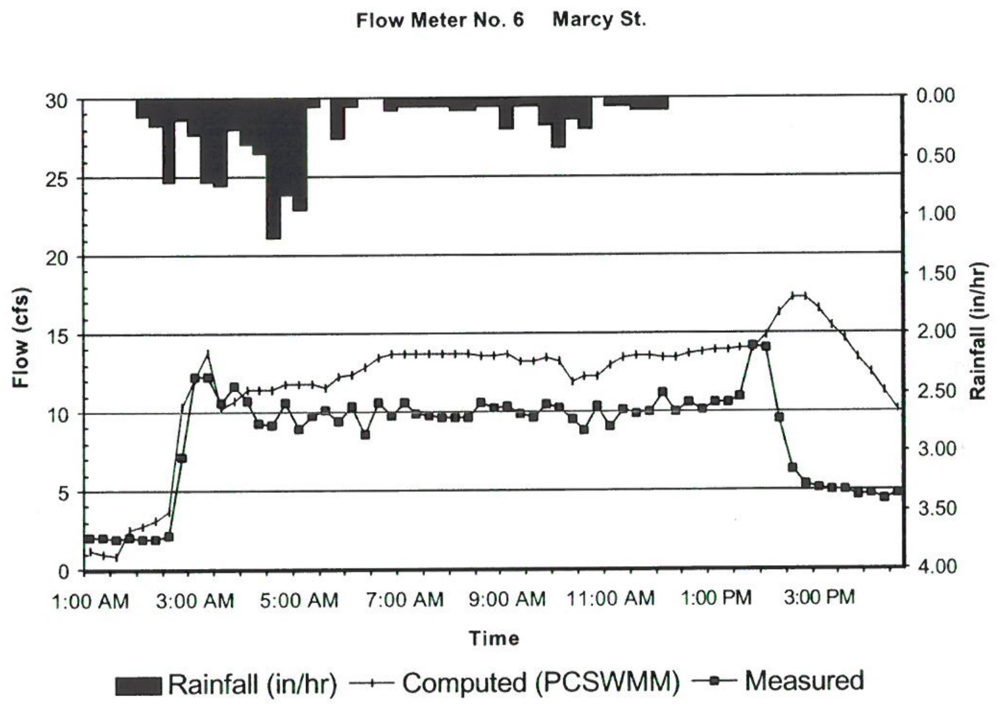
SWMM CALIBRATION
JUNE 12, 2000

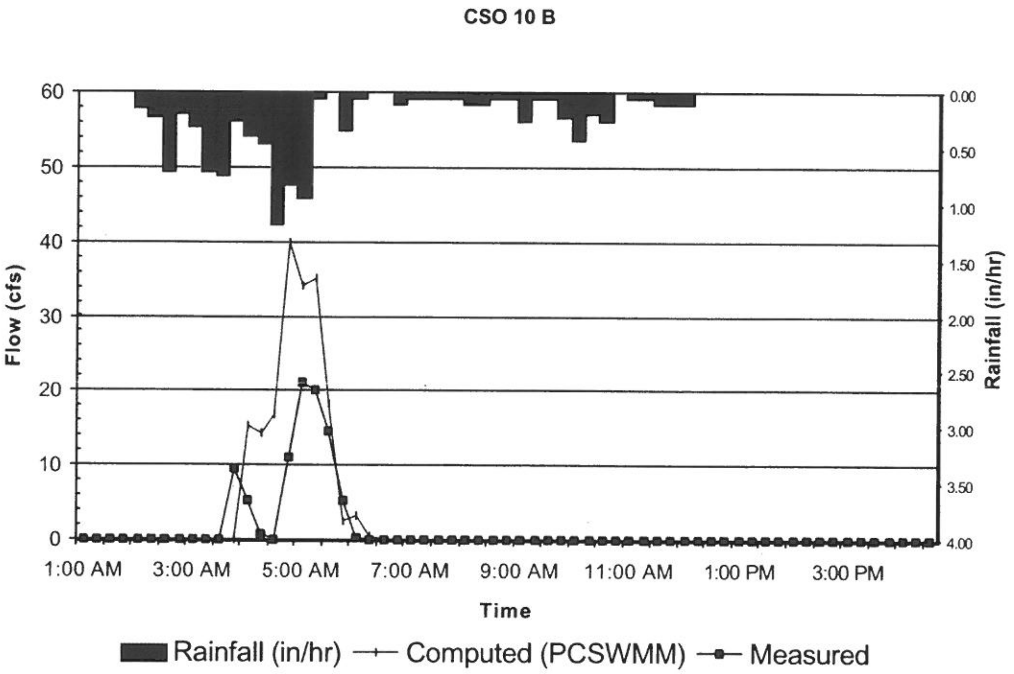


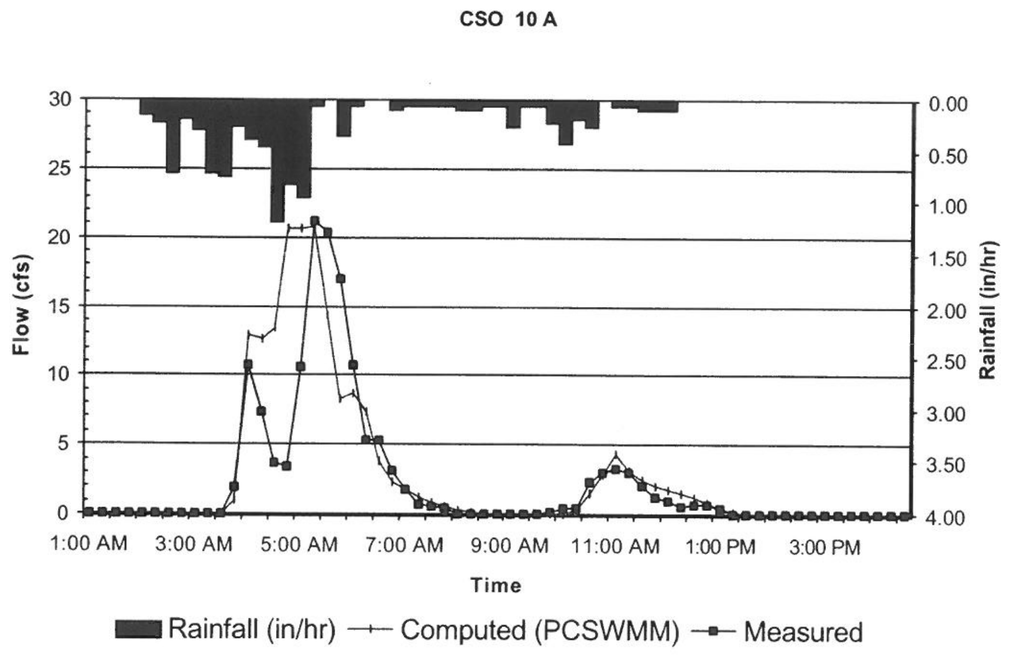


PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JULY 16, 2000

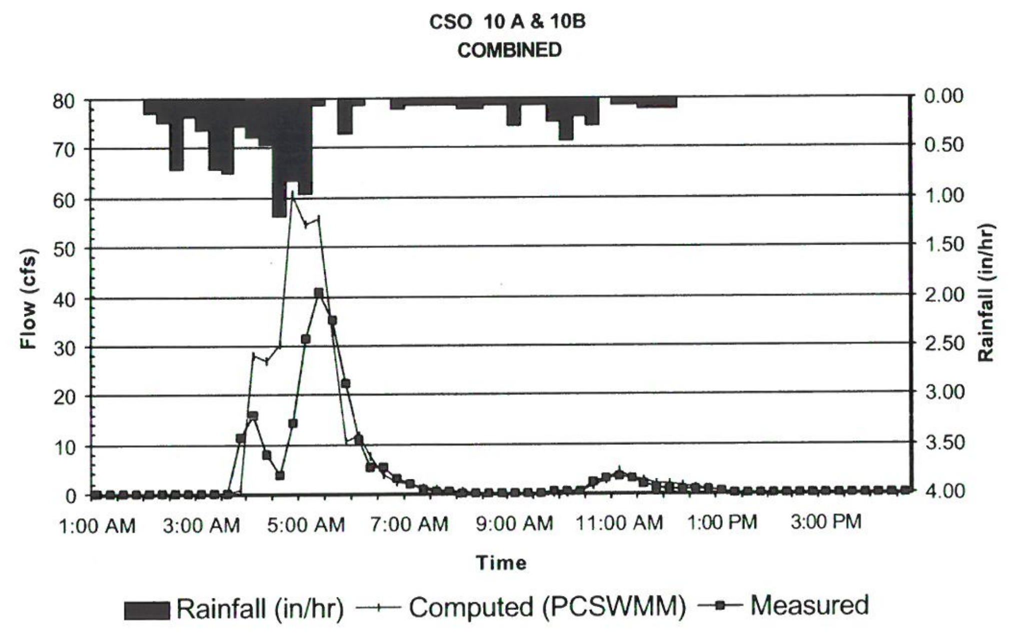


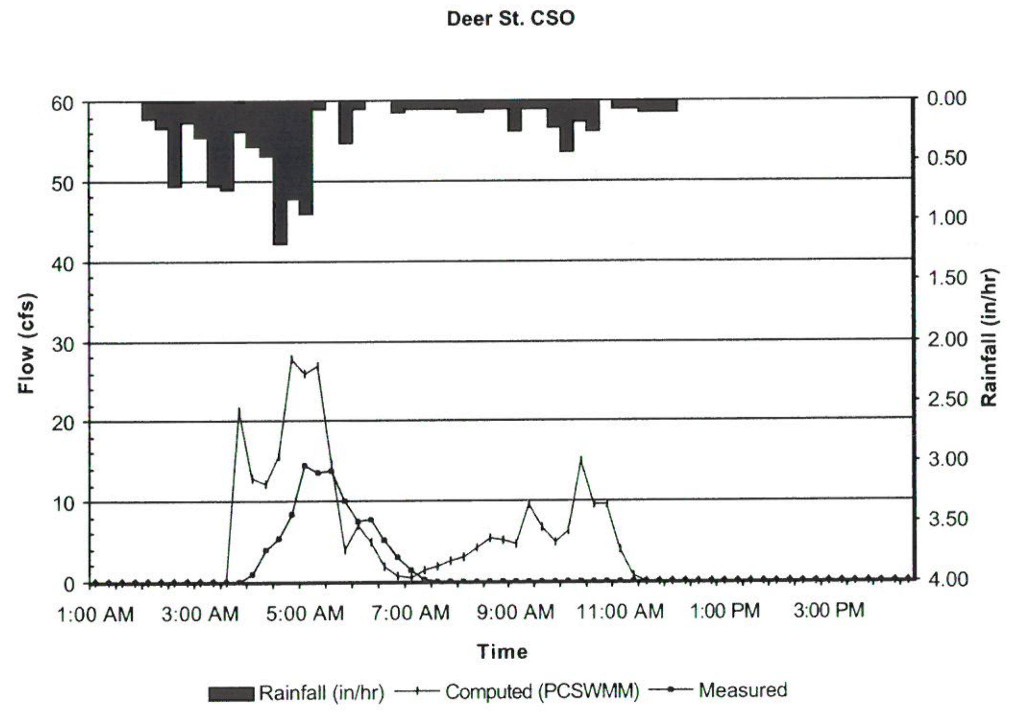
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JULY 16, 2000





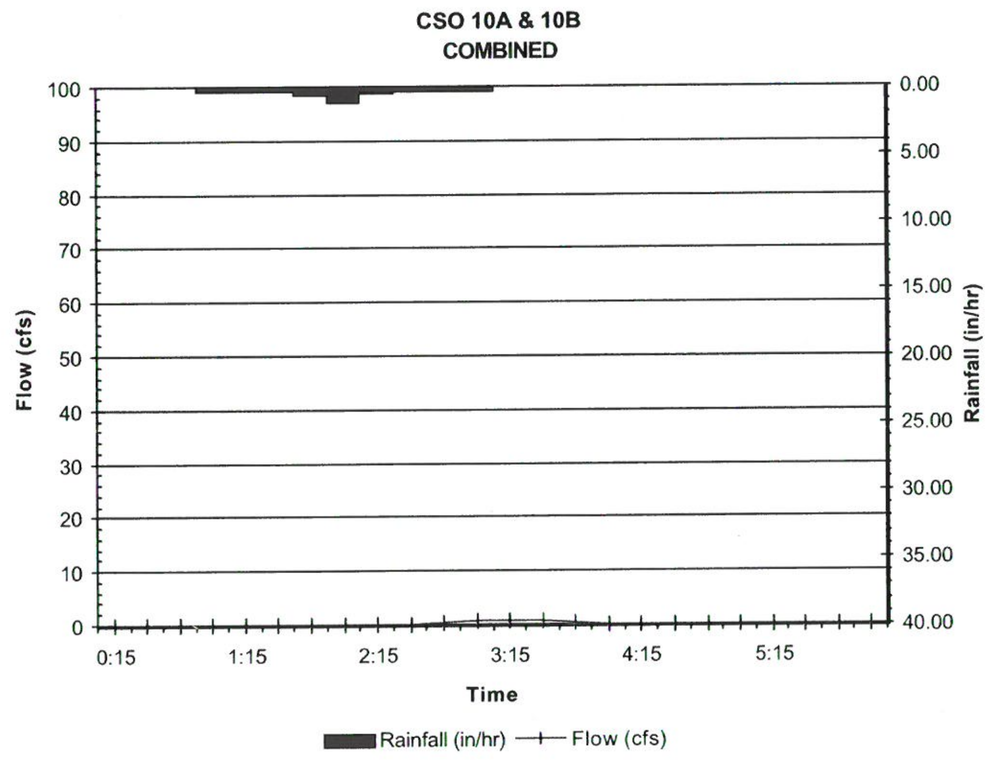
PORTSMOUTH, NH CSO STUDY
SWMM CALIBRATION
JULY 16, 2000

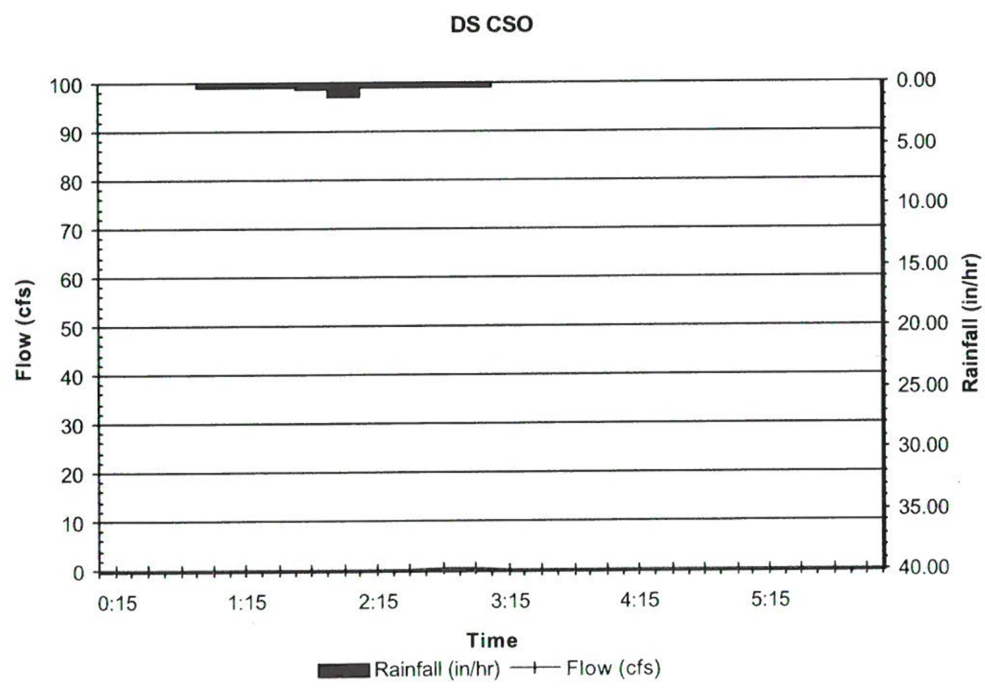




Appendix B
SWMM Design Storm Graphs
Existing System

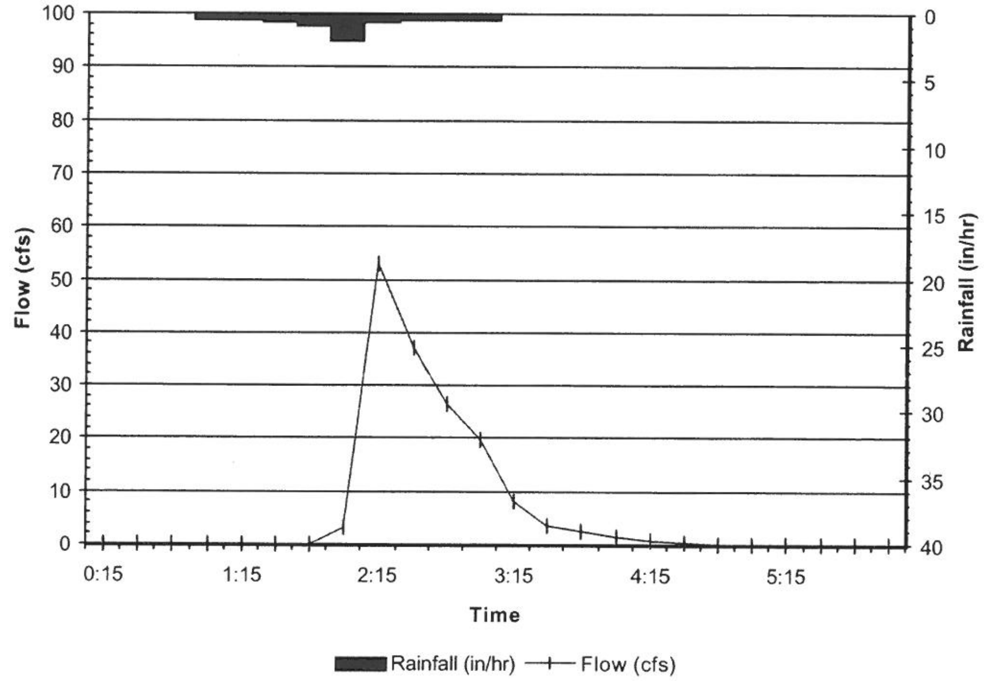
PORTSMOUTH, NH CSO STUDY
SWMM
1/2 YEAR DESIGN STORM



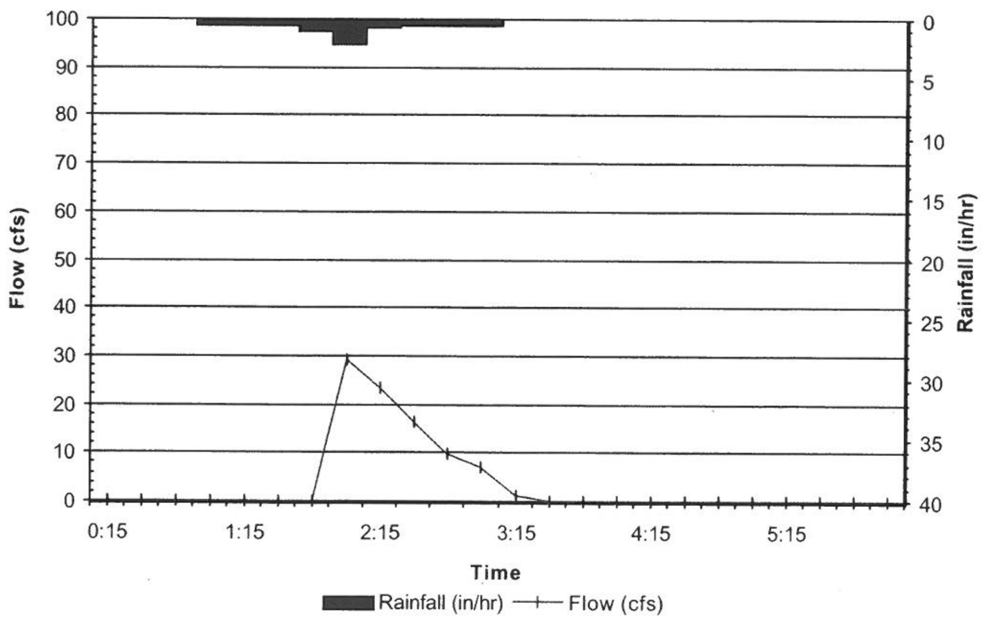


PORTSMOUTH, NH CSO STUDY
SWMM
1 YEAR DESIGN STORM

CSO 10A & 10B COMBINED



DS CSO



Appendix 4-1

HYDRAULIC MODELING REPORT

RL Resource Laboratories, LLC
124 Heritage Avenue
Portsmouth, NH 03801

3219

6287

Voice: 603-436-2001
FAX: 603-430-2100

CHAIN OF CUSTODY DOCUMENTATION

Client: Underwood Engineers	Contact: Holly Gallagher	Project Name: CSO LTCP	PAGE 1 OF 1
Report To:	Address: 25 Vaughan Mall		Phone/FAX: 436-6192
Invoice To: Underwood Engineers	Address: Portsmouth NH 03801		P.O.# Quote #

PROTOCOL: ___RCRA ___SDWA X NPDES ___NHDES PETROLEUM FUND ___OTHER:

Lab Number: (assigned by laboratory)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab/composite (G/C)	Container Size (mL)	Container Type (P/G/T)	Field Preservation	Matrix S=Soil W=Water	Analyses Requested: Special Instructions:
3219-01	0162B	6/2/01	9:35	HCG	G	500	P	NONE	W	BOD
-02	0162A	6/2/01	9:35	HCG	G	250	P	H_2SO_4	W	COD
-03	0162A								W	NH_3

Relinquished By: Holly C Gallagher	Date: 6/4/01	Time: ~~7:25 Am~~ 900 RP	Received By: [signature]	Date: 6/4/01	Time: 900
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Comments:

Report No: 3219
Project: CSO LTCP

Sample ID: 0162B
Matrix: Water

Parameter	Lab ID	Result	Qualify	Quant Limit	Units	Date of Analysis	Method/Reference
Biochemical Oxygen Demand	3219-01	290	B3,H2	5	mg/L	06/04/01 14:15	405.1 EPA 600/4/79/020
Chemical Oxygen Demand	3219-02	600		5	mg/L	06/01/01	410.1 EPA 600/4/79/020
Ammonia	3219-03	1.5		0.1	mg/L as N	06/14/01	350.3 EPA 600/4/79/020

B3: Residual DO for BOD was lower than the recomended level.
H2: Sample received past holding time.

891.09
Copy

RL Resource Laboratories

124 Heritage Avenue Unit 10
Portsmouth, NH 03801

Voice: 603-436-2001
FAX: 603-430-2100

Laboratory Report

Underwood Engineers, Inc.
25 Vaughan Mall
Portsmouth, NH 03801

PO Number: None
Lab Number: 3219
Date Received: 06/04/01
Date Reported: 06/19/01

RECEIVED
JUN 20 2001
BY UNDERWOOD ENGINEERS, INC.

Project: CSO LTCP

Attached please find results for analyses performed on samples received on 06/04/01.

Samples were received in acceptable condition and under chain of custody.

Instruments used in analysis were calibrated with the appropriate frequency and to the specifications of the referenced methods.

Analytes in blanks were below levels effecting sample results.

Matrix effects as monitored by matrix spike recovery or unusual physical properties were not apparent.

Accuracy and precision as monitored by laboratory control sample analyses were within acceptance limits.

RESOURCE LABORATORIES

Authorized Signature

6/19/01
Date

3 pages

Sample ID: 2 COD
Matrix: Water

Parameter	Lab ID	Result	Quant Limit	Units	Date of Analysis	Method/Reference
Chemical Oxygen Demand	3270-02	220	5	mg/L	06/19/01	410.1 EPA 600/4/79/020

Sample ID: 3 NH3
Matrix: Water

Parameter	Lab ID	Result	Quant Limit	Units	Date of Analysis	Method/Reference
Ammonia	3270-03	0.9	0.1	mg/L as N	06/21/01	350.3 EPA 600/4/79/020

Portsmouth, NH 03801

FAX: 603-430-2100

Laboratory Report

Underwood Engineers, Inc.
25 Vaughan Mall
Portsmouth, NH 03801

PO Number: None
Lab Number: 3270
Date Received: 06/18/01
Date Reported: 06/25/01

Project: 89103 CSO LTCP

Attached please find results for analyses performed on samples received on 06/18/01.

Samples were received in acceptable condition and under chain of custody.

Instruments used in analysis were calibrated with the appropriate frequency and to the specifications of the referenced methods.

Analytes in blanks were below levels effecting sample results.

Matrix effects as monitored by matrix spike recovery or unusual physical properties were not apparent.

Accuracy and precision as monitored by laboratory control sample analyses were within acceptance limits.

RESOURCE LABORATORIES

Authorized Signature ______________________ Date ______________

Total number of pages ______________

Report No: 3270
Project: 89103 CSO LTCP

Sample ID: 1 BOD
Matrix: Water

Parameter	Lab ID	Result	Quant Limit	Units	Date of Analysis	Method/Reference
Biochemical Oxygen Demand	3270-01	105	5	mg/L	06/18/01 12:30	405.1 EPA 600/4/79/020

CHAIN OF CUSTODY RECORD

ENVIROSYSTEMS, INCORPORATED

One Lafayette Road, P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

ESI STUDY #

PAGE 2 OF 2

CLIENT: Underwood Engineers	CONTACT: Peter Rice	PROJECT NAME: Portsmouth CSO	P.O. #
REPORT TO: Peter Rice	ADDRESS: 25 Vaughan Mall		PHONE: 436 6192
INVOICE TO: "	ADDRESS: Portsmouth, NH 03801		SAMPLED BY: MHB/HCG

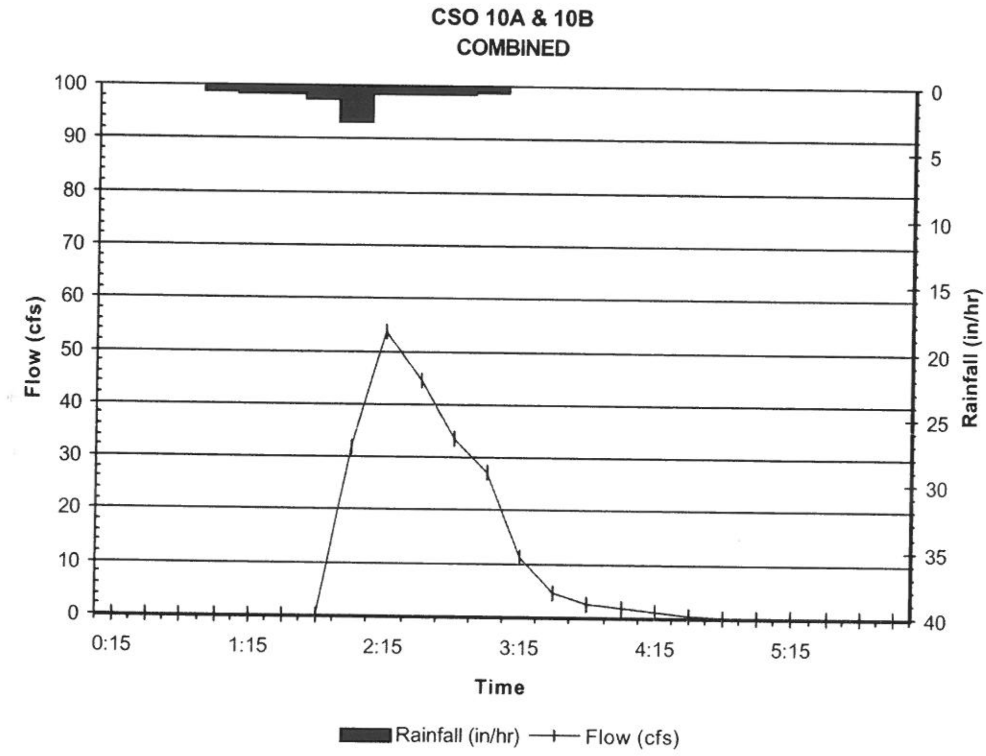
ESI SAMPLE #	FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	COMPOSITE (YES/NO)	TIME SAMPLED	SAMPLE MATRIX	CONTAINER #/VOL/TYPE	DID YOU FIELD PRESERVE	NOTES / ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
-11	Raw #2	6/17/01	NO	4:30				

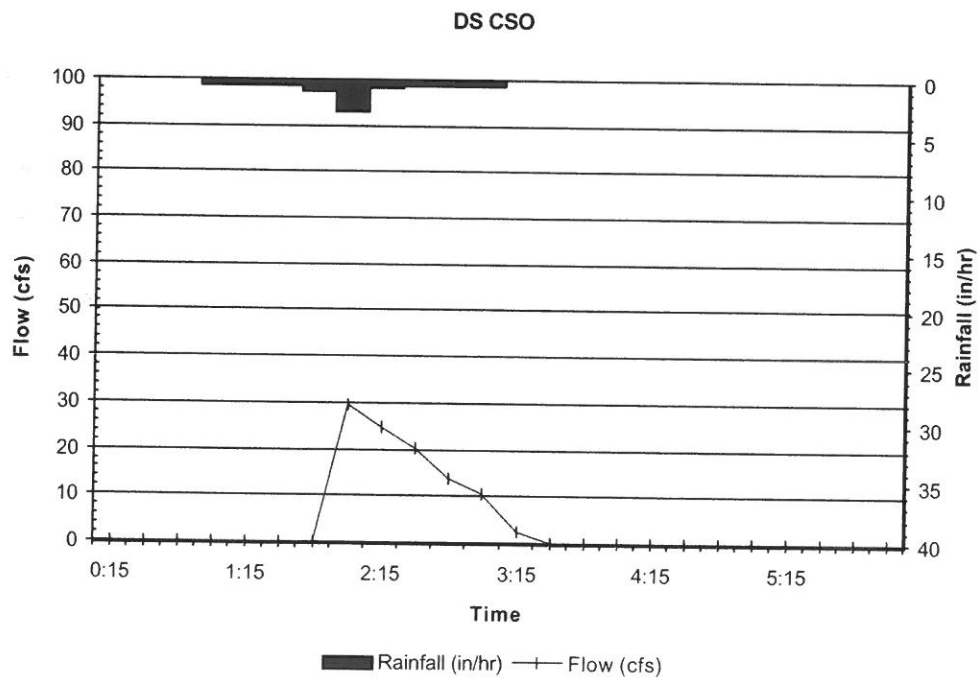
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
[signature]	6/17/01	8:23	[signature]	6/17/01	2023

COMMENTS:

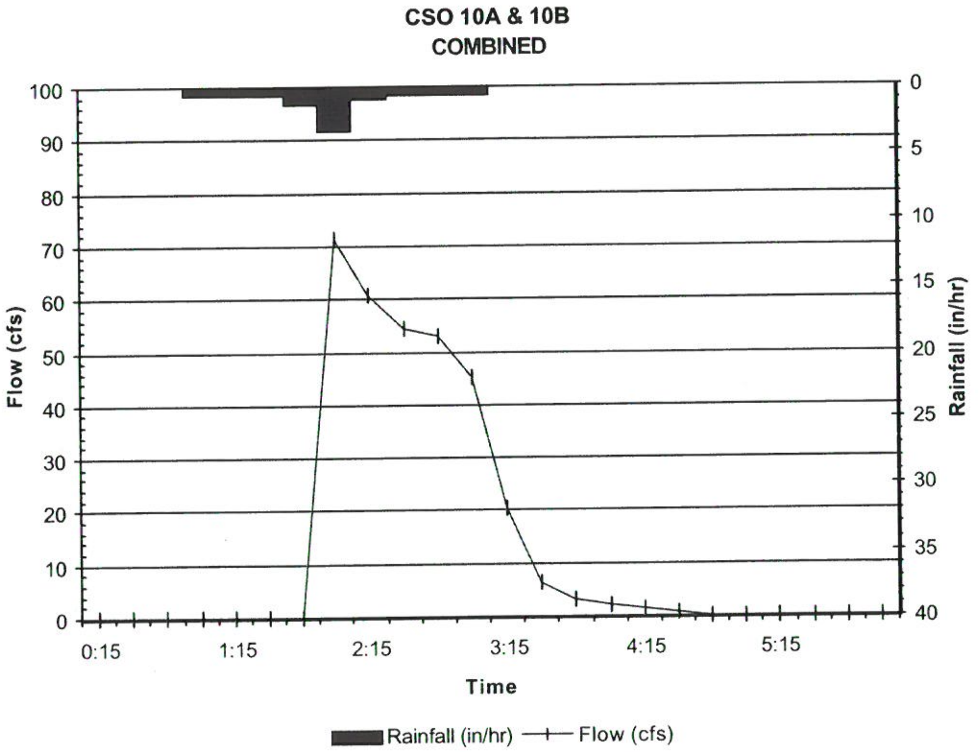
A CHAIN OF CUSTODY IS REQUIRED WITH EACH SET OF SAMPLES

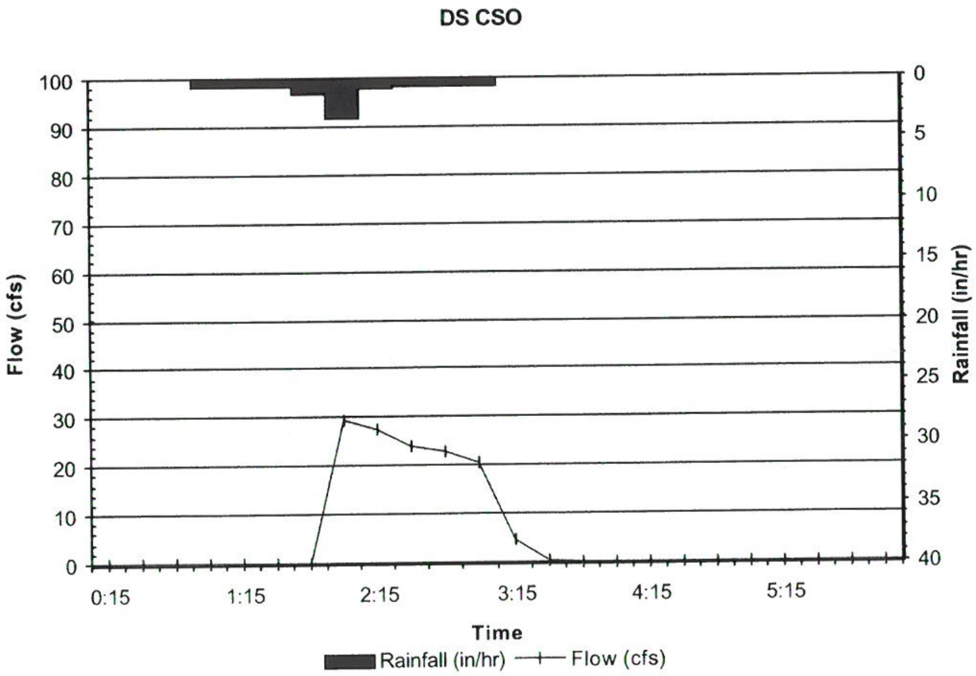
PORTSMOUTH, NH CSO STUDY
SWMM
2 YEAR DESIGN STORM





PORTSMOUTH, NH CSO STUDY
SWMM
5 YEAR DESIGN STORM





Appendix 5-1

OPINION OF COSTS FOR ABATEMENT TECHNOLOGIES

Sewer Separation Projects - LTCP projects
Opinion of Cost

Ref: UEI (2003) Preliminary Design of Lincoln Area Sewer Separation, City of Portsmouth, NH. Draft Dec, 2003.

Project **LTCP, Portsmouth, NH**
Updated **Dec 2003 (ENR (6782)**

Area No.	Description	Approx. Project Length, ft	Approx. Area, acres	Estimated LTCP Sewer Cost, $Millions*			
	Targeted Separation (Lincoln Area projects)						
1	Parrot, Rockland, Sherburne, Lincoln Ave Interceptors	2,600	32	$ 1.05			
1A	Collectors along Rockland, Kent, Elwyn, McNabb, Sherburne, Lincoln Ave	3,600	24	$ 1.02			
2	Middle, Miller, Rockland, Lincoln, South Street Interceptors	5,500	28	$ 2.13			
2A	Collectors along Madison, Lovell, Union, Austin, Coffin, Cabot, Middle, Chauncy, Highland, Merrimac, Broad, Rockland, Miller and Lincoln Ave	4,500	33	$ 1.45			
3	Lincoln, Union, Willow, Spring, Broad, Bersum Interceptors	4,500	23	$ 1.47			
3A	Collectors along Wibird, Lincoln, Union, Hawthorne & Broad	1,400	15	$ 0.44			
4	Lincoln, Wibird, Hawthorne, Orchard, Ash, Willard, Lafayette Interceptors	4,900	22	$ 2.02			
4A	Collectors along Boss, Thaxter, Lawrence, Kensington, Middle, Lafayette, Mendum, Park, Orchard, Wibird, Willard, Marston, Ash, Orchard, and South Streets	11,600	53	$ 3.41			
5	Richards and Parrot Ave Interceptors	2,200	9	$ 0.54			
5A	Collectors along Austin, Winter, Summer, Middle Streets	1,000	12	$ 0.29			
--	Islington Street Planning Area	13,400	84	$ 4.22			
--	Court Street Planning Area	6,300	11	$ 2.22			
--	Borthwick Avenue Planning Area	3,700	n/a	$ 1.11			
					ft	**acres**	**$ Millions**
	Subtotal Lincoln - Eligible Sewer/Drain work				**65,200**	**346**	**$ 21.37**
	Average unit prices based on Lincoln area				**$ 500**	**$ 62,000**	

Area	Description	Approx. Project Length, ft	Approx. Area, acres	Estimated LTCP Sewer Cost, $Millions*	Range based on Lincoln prices @ $500/ft	Range based on Lincoln prices @ $62k/ac	
	Additional Areas for Complete Separation						
A	Washington Street	4,400	35	$ 2.2	$ 2.2	$ 2.2	
B	Congress Street	4,300	20	$ 2.2	$ 2.2	$ 1.2	
C	Bridge Street	1,900	5	$ 1.0	$ 1.0	$ 0.3	
D	Sparhawk Street	1,200	10	$ 0.6	$ 0.6	$ 0.6	
E	Maplewood Avenue	1,600	15	$ 0.8	$ 0.8	$ 0.9	
F	Cottage Street	3,500	25	$ 1.8	$ 1.8	$ 1.6	
G	Hillside Drive	2,000	30	$ 1.0	$ 1.0	$ 1.9	
					ft	**acres**	**$ Millions**
	Additional remaining for Complete Separation				**18,900**	**140**	**9.45**
	Total				84,100	486	30.82

Notes: *- Includes costs for sewer and drain projects eligible to be funded under the SRF wastewater program.
- The City may elect to implement additional sewer or drainage work concurrent with the LTCP projects.
- Total project costs include contingency (20%) and engineering (20%)
- Additional costs not included above that are recommended to be implemented along with targeted or complete separation include:
  - Treatment of separated storm water
  - Upgrades to sewage pumping stations
  - Other infrastructure improvements including ineligible sewer / drainage, water, sidewalks, curbing, roads, etc., as needed.

CSO Screen at South Mill Pond (Romag Option)
Opinion of Cost
46 mgd

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL	% of total
GENERAL						
Contractor admin, bonds, insurance etc.	1	LS	$25,000	$25,000		
Mobilization	1	LS	$25,000	$25,000		
Subtotal					$50,000	9%
SITEWORK						
Excavation	600	cu.yd.	$15	$9,000		
Bypass Pumping System	1	LS	$15,000	$15,000		
Dewatering	21	days	$200	$4,200		
Paving 2.5 inch base course	500	SY	$10	$5,000		
Paving 1 inch wearing course	500	SY	$4	$2,000		
F&I Construction Fabric	200	SY	$4	$800		
Uniformed Police Officer	200	Hrs	$35	$7,000		
Uniformed Flagger	200	Hrs	$20	$4,000		
F & I Siltation Fence	200	LF	$3	$600		
Sewer Line Relocation	300	LF	$150	$45,000		
Structural Fill	100	cu.yd.	$15	$1,500		
Ledge	50	CY	$100	$5,000		
Underground electrical	300	LF	$30	$9,000		
Manholes	3	EA	$5,000	$15,000		
Outfall structure	1	LS	$25,000	$25,000		
Secure CSO 10B	1	LS	$10,000	$10,000		
Subtotal					$168,100	31%
CONCRETE						
Diversion structure	50	CY	$400	$20,000		
Misc pads, coring, etc.	10	CY	$400	$4,000		
Subtotal					$24,000	4%
MASONRY						
Building	300	SF	$100	$30,000		
					$30,000	6%
METALS						
Hatches	3	EA	$5,000	$15,000		
					$15,000	3%
WOOD AND PLASTICS						
Misc baffles, weirs	1	LS	$1,000	$1,000		
					$1,000	0%
FINISHES						
Paint piping, etc.	1	LS	$2,000	$2,000		
					$2,000	0%
EQUIPMENT						
Overflow screen	1	LS	$150,000	$150,000		
Installation	1	LS	$20,000	$20,000		
Subtotal					$170,000	32%

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL	% of total
INSTRUMENTATION						
Level sensor	1	EA	$2,500	$2,500		
Radio telemetry	1	EA	$20,000	$20,000		
Installation	1	LS	$10,000	$10,000		
	Subotal				$32,500	6%
MECHANICAL						
Pipe - hydraulic tubing, etc.	1	LS	$5,000	$5,000		
HVAC	1	LS	$5,000	$5,000		
	Subtotal				$10,000	2%
ELECTRICAL						
Entrance	1	LS	$5,000	$5,000		
MCC	1	LS	$10,000	$10,000		
Lighting	1	LS	$5,000	$5,000		
Wiring, equipment controls	1	LS	$5,000	$5,000		
Misc electrical	1	LS	$10,000	$10,000		
(adjust for about 15%)	Subtotal				$35,000	7%
TOTAL ITEMIZED COSTS					$537,600	100%
	10 % Contractor Overhead and Profit				$53,760	
	40 % Engineering and Contingency				$215,040	
TOTAL PROJECT COST				(2001 Dollars)	$810,000	
(Land acquisition, legal, administration, etc. not included)				(2003 Dollars)	$858,600	

REF: Unit Costs from Means (2001) Construction Cost Data and vendor equpment quotes.

Rapid Treatment at Deer Street
Opinion of Cost
18.7 MGD peak rate
One 36 foot unit

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
GENERAL					
Contractor admin, bonds, insurance et(	1	LS	$80,000	$80,000	
Mobilization	1	LS	$120,000	$120,000	
	Subtotal				$200,000
SITEWORK					
Excavation	3000	cu.yd.	$16	$48,000	
Sheeting	4000	sq.ft	$15	$61,400	
Dewatering	190	days	$250	$47,500	
Piles	1500	LF	$15	$22,500	
Paving 2.5 inch base course	500	SY	$10	$5,000	
Paving 1 inch wearing course	500	SY	$4	$2,000	
F&I Construction Fabric	1000	SY	$4	$4,000	
Uniformed Police Officer	500	Hrs	$35	$17,500	
Uniformed Flagger	500	Hrs	$20	$10,000	
F & I Siltation Fence	500	LF	$3	$1,500	
Sewer Line Relocation	300	LF	$150	$45,000	
Yard piping	300	LF	$300	$90,000	
Structural Fill	500	CY	$15	$7,500	
Ledge	1000	CY	$100	$100,000	
Underground electrical	300	LF	$30	$9,000	
Loam and seed	1	LS	$20,000	$20,000	
Landscaping	1	LS	$30,000	$30,000	
Outfall structure	1	LS	$25,000	$25,000	
	Subtotal				$545,900
CONCRETE					
Diversion structure	50	CY	$500	$25,000	
Vortex chambers	200	CY	$500	$100,000	
D-box	25	CY	$500	$12,500	
Chlorine contact tank	250	CY	$500	$125,000	
Misc pads, coring, etc.	50	CY	$500	$25,000	
	Subtotal				$287,500
Masonry					
Building	600	SF	$300	$180,000	
					$180,000
METALS					
Aluminum grating	1	LS	$10,000	$10,000	
Misc	1	LS	$30,000	$30,000	
Hatches	6	EA	$3,000	$18,000	
					$58,000
WOOD AND PLASTICS					
Misc baffles, weirs	1	LS	$5,000	$5,000	
					$5,000
FINISHES					
Paint piping, etc.	1	LS	$10,000	$10,000	
					$10,000

Rapid Treatment at Deer Street
Opinion of Cost
18.7 MGD peak rate
One 36 foot unit

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
EQUIPMENT					
Bar screen	1	EA	$25,000	$25,000	
Vortex Separators	1	LS	$180,000	$180,000	
Chemical Induction Mixer	2	EA	$30,000	$60,000	
Hypochlorite feed system	1	LS	$20,000	$20,000	
Bisulfite feed system	1	LS	$20,000	$20,000	
Sludge pumps	4	EA	$30,000	$120,000	
Odor control	1	LS	$150,000	$150,000	
	Subtotal				$575,000
INSTRUMENTATION					
Chlorine residual analyzer	1	EA	$5,000	$5,000	
Flow measurement	1	EA	$8,000	$8,000	
Level monitor	1	EA	$5,000	$5,000	
Chemical tank level monitor	2	EA	$5,000	$10,000	
SCADA system	1	LS	$20,000	$20,000	
Radio telemetry	1	EA	$20,000	$20,000	
	Subotal				$68,000
MECHANICAL					
Pipe	1	LS	$20,000	$20,000	
Valves	1	LS	$30,000	$30,000	
Hangers and installation	1	LS	$5,000	$5,000	
HVAC	1	LS	$15,000	$15,000	
	Subtotal				$70,000
ELECTRICAL					
Entrance	1	LS	$50,000	$50,000	
MCC	1	LS	$100,000	$100,000	
Lighting	1	LS	$20,000	$20,000	
Wiring	1	LS	$50,000	$50,000	
(adjust for about 15%)	Subtotal				$220,000
TOTAL ITEMIZED COSTS					$2,219,400
	10 % Contractor Overhead and Profit				$221,940
	40 % Engineering and Contingency				$887,760
				(2001 Dollars)	$3,329,100
				(2003 Dollars)	$3,530,000

PROJECT COST SUMMARY

1) Vortex Separator	2.1 M
2) Chlor/Declor Disinfection	1.43 M
	3.53 M

REF: Unit Costs from Means (2001) Construction Cost Data and equipment vendor quotes

Rapid Treatment at South Mill Pond
Opinion of Cost
46 MGD peak rate
Two 43 foot units

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
GENERAL					
Contractor admin, bonds, insurance et	1	LS	$100,000	$100,000	
Mobilization	1	LS	$120,000	$120,000	
	Subtotal				$220,000
SITEWORK					
Excavation	6100	cu.yd.	$16	$97,600	
Sheeting	6000	sq.ft	$15	$92,100	
Dewatering	190	days	$250	$47,500	
Piles	3000	LF	$15	$45,000	
Paving 2.5 inch base course	500	SY	$10	$5,000	
Paving 1 inch wearing course	500	SY	$4	$2,000	
F&I Construction Fabric	1000	SY	$4	$4,000	
Uniformed Police Officer	500	Hrs	$35	$17,500	
Uniformed Flagger	500	Hrs	$20	$10,000	
F & I Siltation Fence	500	LF	$3	$1,500	
Sewer Line Relocation	300	LF	$150	$45,000	
Yard piping	300	LF	$300	$90,000	
Structural Fill	500	CY	$15	$7,500	
Ledge	1000	CY	$100	$100,000	
Underground electrical	300	LF	$30	$9,000	
Loam and seed	1	LS	$20,000	$20,000	
Landscaping	1	LS	$30,000	$30,000	
Outfall structure	1	LS	$75,000	$75,000	
	Subtotal				$698,700
CONCRETE					
Diversion structure	50	CY	$500	$25,000	
Vortex chambers	390	CY	$500	$195,000	
D-box	25	CY	$500	$12,500	
Chlorine contact tank	400	CY	$500	$200,000	
Misc pads, coring, etc.	150	CY	$500	$75,000	
	Subtotal				$507,500
Masonry					
Building	600	SF	$350	$210,000	
					$210,000
METALS					
Aluminum grating	1	LS	$10,000	$10,000	
Misc	1	LS	$50,000	$50,000	
Hatches	6	EA	$3,000	$18,000	
					$78,000
WOOD AND PLASTICS					
Misc baffles, weirs	1	LS	$5,000	$5,000	
					$5,000

Rapid Treatment at South Mill Pond
Opinion of Cost
46 MGD peak rate
Two 43 foot units

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
FINISHES					
Paint piping, etc.	1	LS	$10,000	$10,000	
					$10,000
EQUIPMENT					
Bar screen	1	EA	$25,000	$25,000	
Vortex Separators	1	LS	$400,000	$400,000	
Chemical Induction Mixer	2	EA	$30,000	$60,000	
Hypochlorite feed system	1	LS	$20,000	$20,000	
Bisulfite feed system	1	LS	$20,000	$20,000	
Sludge pumps	4	EA	$30,000	$120,000	
Odor control	1	LS	$150,000	$150,000	
	Subtotal				$795,000
INSTRUMENTATION					
Chlorine residual analyzer	1	EA	$5,000	$5,000	
Flow measurement	1	EA	$8,000	$8,000	
Level monitor	1	EA	$5,000	$5,000	
Chemical tank level monitor	2	EA	$5,000	$10,000	
SCADA system	1	LS	$20,000	$20,000	
Radio telemetry	1	EA	$20,000	$20,000	
	Subotal				$68,000
MECHANICAL					
Pipe	1	LS	$10,000	$10,000	
Valves	1	LS	$10,000	$10,000	
Hangers and installation	1	LS	$5,000	$5,000	
HVAC	1	LS	$15,000	$15,000	
	Subtotal				$40,000
ELECTRICAL					
Entrance	1	LS	$50,000	$50,000	
MCC	1	LS	$100,000	$100,000	
Lighting	1	LS	$20,000	$20,000	
Wiring	1	LS	$50,000	$50,000	
(adjust for about 15%)	Subtotal				$220,000
TOTAL ITEMIZED COSTS					$2,852,200
	10 % Contractor Overhead and Profit				$285,220
	40 % Engineering and Contingency				$1,140,880

PROJECT COST SUMMARY

Vortex Separator	2.7 M
Chlor/Dechlor Disinfection	1.84 M
	4.54 M

(2001 Dollars) $4,278,300

(2003 Dollars) $4,530,000

REF: Unit Costs from Means (2001) Construction Cost Data and from equipment vendor quotes.

In-line Storage Deer Street and South Mill Pond
8 ft x 10 ft Culvert

Project: LTCP, Portsmouth, NH
Updated: December 03 (ENR 6782)

Item	Unit	Unit Price	Deer Street 1,600 ft, 0.85 MG		South Mill Pond 3,000 ft, 1.9 MG	
			Quantity	Amount	Quantity	Amount
Storage Tanks /Piping:						
Box Culvert	LF	$500	1600	$800,000	3000	$1,500,000
F&I 12" PVC SDR 35 sewer pipe	LF	$80	100	$8,000	150	$12,000
F&I 30" RCP sewer pipe	LF	$250	600	$150,000	1000	$250,000
F&I 18" CDPT Drain Pipe	LF	$60	100	$6,000	200	$12,000
F&I 4' Diameter SMH	VF	$225	60	$13,500	120	$27,000
Relocate 8" Watermain (allowance)	LS	$30,000	1	$30,000	1	$30,000
Corner Structures	Each	$100,000	5	$500,000	5	$500,000
Cleaning bob cat	LS	$100,000	1	$100,000	1	$100,000
Sluice gates	Each	$8,000	2	$16,000	2	$16,000
Subtotal				**$1,623,500**		**$2,447,000**
Site:						
Moblization	LS	$150,000	1	$150,000	1	$150,000
Subcontractor Moblization	LS	$100,000	1	$100,000	1	$100,000
Equipment	LS	$80,000	1	$80,000	2	$160,000
Excavation	CY	$9	500	$4,250	1000	$8,500
Structural Fill	CY	$15	100	$1,500	200	$3,000
F&I Full Width Pavement Reclamation	SY	$2	9300	$20,925	15000	$33,750
2-1/2" Base Course	SY	$8	9300	$76,725	15000	$123,750
1" Wearing Course	SY	$4	9300	$32,550	15000	$52,500
Cold Planing Existing Pavement	SY	$15	500	$7,500	750	$11,250
Ledge Removal, assumed	CY	$80	2000	$160,000	2000	$160,000
Trench Excavation	CY	$10	15000	$150,000	20000	$200,000
F&I Additional Screened Gravel	CY	$18	2700	$48,600	2700	$48,600
Test Pits	Ea	$400	20	$8,000	30	$12,000
F&I Construction Fabric	SY	$4	2000	$8,000	3000	$12,000
Uniformed Police Officer	Hr	$35	1600	$56,000	1600	$56,000
Uniformed Flagger	Hr	$20	1600	$32,000	1600	$32,000
F & I Siltation Fence	LF	$3	500	$1,500	1000	$3,000
Dewatering	days	$1,750	120	$210,000	160	$280,000
Pile Supports	LF	$14	8000	$112,000	8000	$112,000
Subtotal				**$1,259,550**		**$1,558,350**
Other:						
Contractor Costs			7%	$88,169	7%	$109,085
Overhead & Profit			10%	$125,955	10%	$155,835
Construction Total:				**$1,473,674**		**$1,823,270**
Engineering and Contingency			40%	$589,469	40%	$729,308
		Total Cost 2001 dollars		**$2,063,000**		**$2,553,000**
		Total Cost 2003 dollars		**$5,830,000**		**$7,214,000**
		Total Estimated for In-line Storage				$13,044,000

Offline Storage at Deer Street
Opinion of Cost
0.85 MG

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
GENERAL					
Contractor admin, bonds, insurance etc	1	LS	$100,000	$100,000.00	
Mobilization	1	LS	$200,000	$200,000.00	
Subtotal					$300,000
SITEWORK					
Excavation	9000	cu.yd.	$15.00	$135,000.00	
Sheeting	8000	sq.ft	$15.35	$122,800.00	
Dewatering	300	days	$200.00	$60,000.00	
Piles	5000	LF	$13.50	$67,500.00	
Paving 2.5 inch base course	750	SY	$10.00	$7,500.00	
Paving 1 inch wearing course	750	SY	$4.00	$3,000.00	
F&I Construction Fabric	1000	SY	$4.00	$4,000.00	
Uniformed Police Officer	500	Hrs	$35.00	$17,500.00	
Uniformed Flagger	500	Hrs	$20.00	$10,000.00	
F & I Siltation Fence	500	LF	$3.00	$1,500.00	
Sewer Line Relocation	300	LF	$150.00	$45,000.00	
Yard piping	100	LF	$300.00	$30,000.00	
Structural Fill	1100	cu.yd.	$15.00	$16,500.00	
Ledge	2,000	CY	$100	$200,000	
Underground electrical	500	LF	$30	$15,000	
Loam and seed	1	LS	$10,000	$10,000	
Landscaping	1	LS	$50,000	$50,000	
Sidewalk repairs	1	LS	$10,000	$10,000	
Manholes	2	EA	$10,000	$20,000	
Outfall structure	1	LS	$20,000	$20,000	
Subtotal					$845,300
CONCRETE					
Diversion structure	75	CY	$500	$37,500	
Tank slab, 18"	680	CY	$500	$340,000	
Tank walls, 12"	150	CY	$500	$75,000	
Precast concrete plank top, 12"	12,270	SF	$50	$613,500	
CCT	500	CY	$500	$250,000	
Subtotal					$1,316,000
MASONRY					
Building	1,200	SF	$300	$360,000	
					$360,000
METALS					
Aluminum grating	1	LS	$20,000	$20,000	
Stairs	1	LS	$10,000	$10,000	
Hatches	8	EA	$5,000	$40,000	
					$70,000
FINISHES					
Paint piping, etc.	1	LS	$10,000	$10,000	
					$10,000

Offline Storage at Deer Street
Opinion of Cost
0.85 MG

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
EQUIPMENT					
Overflow screen	1	LS	$25,000	$25,000	
Flushing gates	4	EA	$25,000	$100,000	
Pumps	3	EA	$55,000	$165,000	
Controls	1	LS	$45,000	$45,000	
Odor control	1	LS	$100,000	$100,000	
Subtotal					$435,000
INSTRUMENTATION					
Flow measurement	1	EA	$10,000	$10,000	
Chlorine residual analyzer	1	EA	$10,000	$10,000	
Chemical tank level monitor	2	EA	$5,000	$10,000	
Level monitor	2	EA	$10,000	$20,000	
SCADA system	1	LS	$20,000	$20,000	
Radio telemetry	1	EA	$20,000	$20,000	
Subotal					$90,000
MECHANICAL					
Pipe	1	LS	$15,000	$15,000	
Valves	1	LS	$10,000	$10,000	
Hangers and installation	1	LS	$10,000	$10,000	
HVAC	1	LS	$30,000	$30,000	
Subtotal					$65,000
ELECTRICAL					
Entrance	1	LS	$20,000	$20,000	
MCC	1	LS	$40,000	$40,000	
Lighting	1	LS	$10,000	$10,000	
Wiring	1	LS	$40,000	$40,000	
Subtotal					$110,000
TOTAL ITEMIZED COSTS					$3,601,300
10 % Contractor Overhead and Profit					$360,130
40 % Engineering and Contingency					$1,440,520

TOTAL PROJECT COST
(Land acquisition, legal, administration, etc. not included)

(2001 Dollars)	$5,400,000
(2003 Dollars)	$5,720,000
$ / Gallon	$6.7

REF: Unit costs taken from Means (2001) Construction Cost Data and equipment vendors quotes

Offline Storage at South Mill Pond
Opinion of Cost
1.9 MG

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
GENERAL					
Contractor admin, bonds, insurance etc	1	LS	$100,000	$100,000.00	
Mobilization	1	LS	$300,000	$300,000.00	
Subtotal					$400,000
SITEWORK					
Excavation	18250	cu.yd.	$15.00	$273,750.00	
Sheeting	18000	sq.ft	$15.35	$276,300.00	
Dewatering	300	days	$200.00	$60,000.00	
Piles	15000	LF	$13.50	$202,500.00	
Paving 2.5 inch base course	1000	SY	$10.00	$10,000.00	
Paving 1 inch wearing course	1000	SY	$4.00	$4,000.00	
F&I Construction Fabric	1000	SY	$4.00	$4,000.00	
Uniformed Police Officer	1000	Hrs	$35.00	$35,000.00	
Uniformed Flagger	1000	Hrs	$20.00	$20,000.00	
F & I Siltation Fence	1000	LF	$3.00	$3,000.00	
Sewer Line Relocation	300	LF	$150.00	$45,000.00	
Yard piping	100	LF	$300.00	$30,000.00	
Structural Fill	3500	cu.yd.	$15.00	$52,500.00	
Selective demolition	1	LS	$20,000	$20,000	
Ledge	1,000	CY	$100	$100,000	
Underground electrical	1,200	LF	$30	$36,000	
Loam and seed	1	LS	$40,000	$40,000	
Landscaping	1	LS	$150,000	$150,000	
Sidewalk repairs	1	LS	$10,000	$10,000	
Manholes	3	EA	$10,000	$30,000	
Outfall structure	1	LS	$50,000	$50,000	
Subtotal					$1,452,050
CONCRETE					
Diversion structure	100	CY	$500	$50,000	
Tank slab, 18"	1,380	CY	$500	$690,000	
Tank walls, 12"	200	CY	$500	$100,000	
Precast concrete plank top, 12"	24,700	SF	$50	$1,235,000	
Wetwell	75	CY	$500	$37,500	
CCT	500	CY	$500	$250,000	
Misc pads, coring, etc.	50	CY	$500	$25,000	
Subtotal					$2,387,500
MASONRY					
Building	2,400	SF	$300	$720,000	
					$720,000
METALS					
Aluminum grating	1	LS	$20,000	$20,000	
Misc	1	LS	$20,000	$20,000	
Stairs	1	LS	$10,000	$10,000	
Hatches	12	EA	$5,000	$60,000	
					$110,000
FINISHES					
Paint piping, etc.	1	LS	$20,000	$20,000	

Offline Storage at South Mill Pond
Opinion of Cost
1.9 MG

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

ITEM	QTY	UNIT	UNIT COST	AMOUNT	SUBTOTAL
					$20,000
EQUIPMENT					
Overflow screen	1	LS	$75,000	$75,000	
Flushing gates	8	EA	$25,000	$200,000	
Pumps	3	EA	$100,000	$300,000	
Controls	1	LS	$100,000	$100,000	
Odor control	1	LS	$200,000	$200,000	
Cleaning equipment	1	LS	$100,000	$100,000	
Misc equipment	1	LS	$100,000	$100,000	
Subtotal					$1,075,000
INSTRUMENTATION					
Flow measurement	1	EA	$10,000	$10,000	
Chlorine residual analyzer	1	EA	$10,000	$10,000	
Chemical tank level monitor	2	EA	$5,000	$10,000	
Level monitor	3	EA	$10,000	$30,000	
SCADA system	1	LS	$50,000	$50,000	
Radio telemetry	1	EA	$20,000	$20,000	
Subotal					$130,000
MECHANICAL					
Pipe	1	LS	$20,000	$20,000	
Valves	1	LS	$10,000	$10,000	
Hangers and installation	1	LS	$10,000	$10,000	
HVAC	1	LS	$50,000	$50,000	
Subtotal					$90,000
ELECTRICAL					
Entrance	1	LS	$20,000	$20,000	
MCC	1	LS	$50,000	$50,000	
Lighting	1	LS	$10,000	$10,000	
Wiring	1	LS	$50,000	$50,000	
(adjust for about 15%) Subtotal					$130,000
TOTAL ITEMIZED COSTS					$6,514,550
10 % Contractor Overhead and Profit					$651,455
40 % Engineering and Contingency					$2,605,820
TOTAL PROJECT COST (Land acquisition, legal, administration, etc. not included)				**(2001 Dollars)**	$9,771,825
				(2003 Dollars)	$10,360,000
				$ / Gallon	$5.5

OFFLINE STORAGE SUMMARY

1) Deer Street (0.85 MG)	5.7 M
2) South Mill Pond (1.9 MG)	10.3M
Total:	16.0 M

REF: Unit costs from Means (2001) Construction Cost Data and Equipment vendor quotes

Restoration of Deer Street Pumping Station
Opinion of Cost

Project: LTCP, Portsmouth NH
Updated: March, 2004

Ref: UEI (2004). Design of Deer Street PS Upgrades, File 1023. Portsmouth, NH

ITEM	Quantity	Unit	Unit Cost	AMOUNT	Totals
General Requirements	1	LS	$60,000	$60,000	$60,000
Bypass Pumping	1	LS	$40,000	$40,000	$40,000
Demolition	1	LS	$60,000	$60,000	$60,000
Buried Tank Removal	1	LS	$15,000	$15,000	$15,000
Site Work / Landscaping					
Paving	1	LS	$5,000	$5,000	
Landscaping	1	LS	$8,500	$8,500	
Sidewalk	1	LS	$15,000	$15,000	
Sign	1	LS	$10,000	$10,000	
Street Lighting	1	LS	$12,500	$12,500	
Subtotal Site Work					$51,000
Structural					
Building modifications	1	LS	$75,000	$75,000	
Building expansion	375	SF	$175	$65,625	
Roof structure	625	SF	$50	$31,250	
Crane and hoist	1	LS	$7,500	$7,500	
Wet well	1	LS	$15,000	$15,000	
Subtotal Structural					$194,000
Mechanical Equipment and Piping					
Relocation Bypass FM connection	1	LS	$15,000	$15,000	
Bar Racks / Grinder	1	ea	$15,000	$15,000	
Pumps, 200 HP	3	ea	$61,000	$183,000	
Carbon Odor Control System	1	ea	$61,000	$61,000	
Exhaust Fan, 7.5 HP, 1500 cfm	1	ea	$5,000	$5,000	
12" FRP exhaust duct	1	LS	$7,500	$7,500	
Allowance for piping and valves	1	LS	$40,000	$40,000	
Flow meter	1	LS	$7,500	$7,500	
New Water Supply Line	1	LS	$2,500	$2,500	
Subtotal Mechanical					$337,000
Electrical / Instrumentation					
Temporary Power	1	LS	$10,000	$10,000	
New Buried Service	1	LS	$30,000	$30,000	
Electrical					
New 1200 Amp Electric Service	1	LS	$35,000	$35,000	
Automatic Transfer Switch	1	LS	$20,000	$20,000	
Generator Breaker / feeder breakers to each MCC	1	LS	$30,000	$30,000	
New Generator 480V-3ph w/800gal tank	1	LS	$120,000	$120,000	
New Variable Frequency Drives	3	EA	$30,000	$90,000	
New Motor Control Center	1	LS	$40,000	$40,000	
SCADA and Instrumentation	1	LS	$75,000	$75,000	
Miscellaneous Electrical	1	LS	$35,000	$35,000	
Subtotal Electrical / Instrumentation					$485,000
Subtotal				**$1,242,000**	**$1,242,000**
Contractor OH&P			15%	$186,300	
Contingency			20%	$248,400	
Estimated Total Construction Cost				**$1,677,000**	
Engineering and Administration Services			25%	$310,500	
Estimated Total Project Cost				**$1,990,000**	***Say, $2 million***

Note: Unit costs from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Restoration of Deer Street Pumping Station and New Force Main to WWTP
Opinion of Cost

Ref: UEI (2004). Design of Deer Street PS Upgrades, File 1023. Portsmouth, NH
UEI (2002). LTCP report August 2002, Appendix 5-1, File 891, Portsmouth, NH

Project: LTCP, Portsmouth, NH
Updated: March 2004

ITEM	Quantity	Unit	Unit Cost	AMOUNT
Estimated Construction Cost				
Including contractor OHP, contingency (20%) and engineering (25%)				
1. Restoration of design capacity to 12 mgd	1	LS	$2,000,000	$2,000,000
Costs presented previously				
3. New Force Main from Deer St to WWTP				
Bridge Modifications	1	LS	$300,000	$300,000
New force main (12 mgd) to WWTP	6700	LF	$500	$3,350,000
Modifications to WWTP headworks	1	LS	$300,000	$300,000
Estimated Total Project Cost				**$5,950,000**
			Say,	**$ 6 million**

Note: Unit costs from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Expansion of Mechanic Street Pumping Station to 36 mgd
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: March 2004

ITEM	Quantity	Unit	Unit Cost	AMOUNT
1. Reconfiguration to Triplex Pumping Station (22 mgd)				
General	1	LS	$75,000	$75,000
Site work and demolition	1	LS	$100,000	$100,000
Building Improvements	1	LS	$115,000	$115,000
Equipment (pumps, VFDs, air handling, odor control)	1	LS	$425,000	$425,000
Electrical (new generator, transfer switch, misc)	1	LS	$160,000	$160,000
Instrumentation upgrades	1	LS	$50,000	$50,000
Piping and valves (allowance)	1	LS	$50,000	$50,000
Subtotal				$975,000
Contractor OHP			10%	$97,500
Subtotal				$1,072,500
Contingency			20%	$214,500
Engineering			20%	$214,500
Total for reconfiguration to triplex station				$1,502,000
2. Additional for 36 mgd pumps, upgraded electrical and instrumentation	1	LS	$1,000,000	$1,000,000
3. Upgrade to 30" Force Main to WWTP				
Bridge Modifications	1	LS	$300,000	$300,000
New force main (36 mgd) to WWTP	3000	LF	$550	$1,650,000
Miscellaneous	1	LS	$50,000	$50,000
Estimated Total Project Cost				**$4,502,000**
			Say,	**$4.5 million**

Note: Unit costs from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Expansion of WWTP to 36 mgd
Opinion of Cost
Summary (See attached detail, 4 pages)

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

ITEM	1-year storm event flows	2-year storm event flows	5-year storm event flows
	Estimated Construction cost, Millions of Dollars		
Headworks	$ 0.80	$ 1.14	$ 2.44
New Clarifier (76 ft diameter)	$ 1.10	$ 1.91	$ 3.12
Chlorine Contact Tank	$ 0.99	$ 1.06	$ 1.48
New Outfall	$ 1.75	$ 1.92	$ 2.12
Estimated Total Project Cost, Dec 2003 $	**$ 4.64**	**$ 6.03**	**$ 9.16**
Say,			***$ 9 million***

Note: Unit costs from Means (2001) Construction Cost Index Data and vendor equipment quotes.

WWTP Expansion to 36 mgd
Headworks Cost

Projec LTCP, Portsmouth NH
Updat Dec. 2003 (ENR 6782)

One Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Bar Screen	2	each	$75,000.00	$150,000
Wash Press	1	each	$90,000.00	$90,000
Walls	80	CY	$500.00	$40,000
Slab	100	CY	$400.00	$40,000
Piping	1	LS	$15,000.00	$15,000
Splitter Box	1	LS	$51,000.00	$51,000
By-pass Pumping	1	LS	$20,000.00	$20,000
MOV	3	ls	$5,500.00	$16,500
Stop gates	2	lf	$8,000.00	$16,000
Brick	2112	sf	$8.00	$16,896
Concrete Blocks	2376	each	$1.50	$3,564
Roofing	1680	sf	$10.00	$16,800
Precast Plank	1680	sf	$15.00	$25,200
Flashing	80	lf	$25.00	$2,000
Windows	4	each	$1,500.00	$6,000
Doors	2	each	$2,500.00	$5,000
			Sub-Total:	**$513,960**
Site:				
Excavation	1200	cu.yd.	$8.50	$10,200
Structural Fill	235	cu.yd.	$15.00	$3,525
			Sub-Total:	**$13,725**
Other:				
Contractor Costs	7%		$527,685.00	$36,938
Overhead & Profit	10%		$527,685.00	$52,769
Electrical	13%		$527,685.00	$68,599
Mechanical	13%		$527,685.00	$68,599
			Sub-Total:	**$226,905**
			Total Cost (2001 $)	**$754,590**
			Total Cost (2003 $)	**$800,000**

Two Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Bar Screen	2	each	$125,000.00	$250,000
Wash Press	1	each	$110,000.00	$110,000
Walls	120	CY	$500.00	$60,000
Slab	150	CY	$400.00	$60,000
Piping	1	LS	$25,000.00	$25,000
Splitter Box	1	LS	$75,000.00	$75,000
By-pass Pumping	1	LS	$35,000.00	$35,000
MOV	3	ls	$5,500.00	$16,500
Stop gates	2	lf	$8,000.00	$16,000
Brick	2500	sf	$8.00	$20,000
Concrete Blocks	3000	each	$1.50	$4,500
Roofing	2000	sf	$10.00	$20,000
Precast Plank	2000	sf	$15.00	$30,000
Flashing	120	lf	$25.00	$3,000
Windows	6	each	$1,500.00	$9,000
Doors	2	each	$2,500.00	$5,000
			Sub-Total:	**$739,000**
Site:				
Excavation	1500	cu.yd.	$8.50	$12,750
Structural Fill	350	cu.yd.	$15.00	$5,250
			Sub-Total:	**$18,000**
Other:				
Contractor Costs	7%		$757,000.00	$52,990
Overhead & Profit	10%		$757,000.00	$75,700
Electrical	13%		$757,000.00	$98,410
Mechanical	13%		$757,000.00	$98,410
			Sub-Total:	**$325,510**
			Total Cost (2001 $)	**$1,082,510**
			Total Cost (2003 $)	**$1,150,000**

Three Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Bar Screen	3	each	$200,000.00	$600,000
Wash Press	2	each	$110,000.00	$220,000
Walls	250	CY	$500.00	$125,000
Slab	300	CY	$400.00	$120,000
Piping	1	LS	$50,000.00	$50,000
Splitter Box	1	LS	$125,000.00	$125,000
By-pass Pumpin	1	LS	$50,000.00	$50,000
MOV	5	ls	$5,500.00	$27,500
Stop gates	8	lf	$8,000.00	$64,000
Brick	5000	sf	$8.00	$40,000
Concrete Block:	6000	each	$1.50	$9,000
Roofing	5000	sf	$10.00	$50,000
Precast Plank	5000	sf	$15.00	$75,000
Flashing	250	lf	$25.00	$6,250
Windows	8	each	$1,500.00	$12,000
Doors	3	each	$2,500.00	$7,500
			Sub-Total:	**$1,581,250**
Site:				
Excavation	2500	cu.yd.	$8.50	$21,250
Structural Fill	500	cu.yd.	$15.00	$7,500
			Sub-Total:	**$28,750**
Other:				
Contractor Cost:	7%		$1,610,000.00	$112,700
Overhead & Pro	10%		$1,610,000.00	$161,000
Electrical	13%		$1,610,000.00	$209,300
Mechanical	13%		$1,610,000.00	$209,300
			Sub-Total:	**$692,300**
			Total Cost (2001 $)	**$2,302,300**
			Total Cost (2003 $)	**$2,440,000**

REF: Unit costs from Means (2001) Construction Cost Data and equipment vendor quotes

WWTP Expansion to 36 mgd
New 76 Foot Clarifier (1 Year Storm Flows)

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Equipment	1	each	$75,000	$75,000
Walls	260	CY	$500	$130,000
Slab	420	CY	$400	$168,000
Piping	1	LS	$15,000	$15,000
Splitter Box Modifications	1	LS	$51,000	$51,000
By-pass Pumping	1	LS	$20,000	$20,000
Sluice Gates	2	lf	$8,000	$16,000
			Sub-Total:	**$475,000**
Site:				
Excavation	7300	CY	$9	$62,050
Structural Fill	240	CY	$15	$3,600
			Sub-Total:	**$65,650**
Other:				
Mobilization	7%			$38,000
Overhead & Profit	10%			$54,000
Electrical				$70,000
Mechanical				$70,000
			Sub-Total:	**$232,000**
			Construction Total:	**$772,650**
Engineering and Contingency				$240,000
			Total Cost (2001 $)	**$1,012,650**
			Total Cost (2003 $)	**$1,070,000**

REF: Unit costs from Means (2001) Construction Cost Data and equipment vendor quotes

WWTP Expansion to 36 mgd
New Chlorine Contact Tank

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

One Year Storm

Item	Quantity	Unit	Unit Price	Amount
Weir Gates	2	each	$10,000.00	$20,000.00
Sluice Gate	2	each	$15,000.00	$30,000.00
Walls	700	CY	$450.00	$315,000.00
Slab	450	CY	$350.00	$157,500.00
Piping	1	LS	$15,000.00	$15,000.00
Mixer	2	LS	$20,000.00	$40,000.00
By-pass Pu	1	LS	$20,000.00	$20,000.00
Existing Tai	1	LS	$48,000.00	$48,000.00
			Sub-Total:	**$645,500.00**
Site:				
Excavation	1660	cu.yd.	$10.00	$16,600.00
Demo	253	cu.yd.	$80.00	$20,240.00
Ledge	800	cu.yd.	$50.00	$40,000.00
Structural F	504	cu.yd.	$20.00	$10,080.00
			Sub-Total:	**$86,920.00**
Other:				
Contractor (	7%		$732,420.00	$51,269.40
Overhead 8	10%		$732,420.00	$73,242.00
Electrical	5%		$732,420.00	$36,621.00
Mechanical	5%		$732,420.00	$36,621.00
			Sub-Total:	**$197,753.40**
Construction Total (2001 $):				**$930,173.40**
Constuction Total (2003 $):				**$990,000.00**

Two Year Storm

Item	Quantity	Unit	Unit Price	Amount
Weir Gates	2	each	$10,000.00	$20,000.00
Sluice Gate	2	each	$15,000.00	$30,000.00
Walls	800	CY	$450.00	$360,000.00
Slab	550	CY	$350.00	$192,500.00
Piping	1	LS	$20,000.00	$20,000.00
Mixer	2	LS	$25,000.00	$50,000.00
By-pass Pu	1	LS	$20,000.00	$20,000.00
Existing Tai	1	LS	$0.00	$0.00
			Sub-Total:	**$692,500.00**
Site:				
Excavation	2000	cu.yd.	$10.00	$20,000.00
Demo	253	cu.yd.	$80.00	$20,240.00
Ledge	800	cu.yd.	$50.00	$40,000.00
Structural F	504	cu.yd.	$20.00	$10,080.00
			Sub-Total:	**$90,320.00**
Other:				
Contractor (	7%		$782,820.00	$54,797.40
Overhead 8	10%		$782,820.00	$78,282.00
Electrical	5%		$782,820.00	$39,141.00
Mechanical	5%		$782,820.00	$39,141.00
			Sub-Total:	**$211,361.40**
Construction Total (2001 $):				**$994,181.40**
Constuction Total (2003 $):				**$1,050,000.00**

Three Year Storm

Item	Quantity	Unit	Unit Price	Amount
Weir Gates	4	each	$10,000.00	$40,000.00
Sluice Gate	4	each	$15,000.00	$60,000.00
Walls	1050	CY	$450.00	$472,500.00
Slab	900	CY	$350.00	$315,000.00
Piping	1	LS	$15,000.00	$15,000.00
Mixer	2	LS	$30,000.00	$60,000.00
By-pass Pu	1	LS	$20,000.00	$20,000.00
Existing Tai	1	LS	$0.00	$0.00
			Sub-Total:	**$982,500.00**
Site:				
Excavation	3500	cu.yd.	$10.00	$35,000.00
Demo	253	cu.yd.	$80.00	$20,240.00
Ledge	800	cu.yd.	$50.00	$40,000.00
Structural F	504	cu.yd.	$20.00	$10,080.00
			Sub-Total:	**$105,320.00**
Other:				
Contractor (	7%		$1,087,820.00	$76,147.40
Overhead 8	10%		$1,087,820.00	$108,782.00
Electrical	5%		$1,087,820.00	$54,391.00
Mechanical	5%		$1,087,820.00	$54,391.00
			Sub-Total:	**$293,711.40**
Construction Total (2001 $):				**$1,381,531.40**
Constuction Total (2003 $):				**$1,460,000.00**

REF: Unit Costs from Means(2001) Construction and equipment

WWTP Expansion to 36 mgd
New Outfall

Project: LTCP, Portsmouth NH
Updated: Dec. 2003 (ENR 6782)

One Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Yard Piping	1	LS	$15,000.00	$15,000.00
Sluice gates	2	lf	$15,000.00	$30,000.00
			Sub-Total:	**$45,000.00**
Site:				
Microtunneling	550	lf	$900.00	$495,000.00
Piping	550	lf	$500.00	$275,000.00
Moblization	1	LS	$150,000.00	$150,000.00
Subcontractor Moblization	1	LS	$100,000.00	$100,000.00
Equipment	1	LS	$80,000.00	$80,000.00
Excavation	500	cu.yd.	$8.50	$4,250.00
Structural Fill	100	cu.yd.	$15.00	$1,500.00
Tide Flex Valves	8	Each	$20,000.00	$160,000.00
diffuser structure	1	LS	$100,000.00	$100,000.00
			Sub-Total:	**$1,365,750.00**
Other:				
Contractor Costs	7%		$1,410,750.00	$98,752.50
Overhead & Profit	10%		$1,410,750.00	$141,075.00
Electrical	0%		$1,410,750.00	$0.00
Mechanical	0%		$1,410,750.00	$0.00
			Sub-Total:	**$239,827.50**
Construction Total (2001 $):				$1,650,577.50
Construction Total (2003 $):				$1,750,000.00

Two Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Yard Piping	1	LS	$25,000.00	$25,000.00
Sluice gates	3	lf	$15,000.00	$45,000.00
			Sub-Total:	**$70,000.00**
Site:				
Microtunneling	550	lf	$950.00	$522,500.00
Piping	550	lf	$550.00	$302,500.00
Moblization	1	LS	$150,000.00	$150,000.00
Subcontractor Mol	1	LS	$100,000.00	$100,000.00
Equipment	1	LS	$80,000.00	$80,000.00
Excavation	500	cu.yd.	$8.50	$4,250.00
Structural Fill	100	cu.yd.	$15.00	$1,500.00
Tide Flex Valves	10	Each	$20,000.00	$200,000.00
diffuser structure	1	LS	$120,000.00	$120,000.00
			Sub-Total:	**$1,480,750.00**
Other:				
Contractor Costs	7%		$1,550,750.00	$108,552.50
Overhead & Profit	10%		$1,550,750.00	$155,075.00
Electrical	0%		$1,550,750.00	$0.00
Mechanical	0%		$1,550,750.00	$0.00
			Sub-Total:	**$263,627.50**
Construction Total (2001 $):				$1,814,377.50
Construction Total (2003 $):				$1,920,000.00

Three Year Storm

Item	Quantity	Unit	Unit Price	Amount
Storage Tanks /Piping:				
Yard Piping	1	LS	$50,000.00	$50,000.00
Sluice gates	4	lf	$15,000.00	$60,000.00
			Sub-Total:	**$110,000.00**
Site:				
Microtunneli	550	lf	$1,000.00	$550,000.00
Piping	550	lf	$600.00	$330,000.00
Moblization	1	LS	$150,000.00	$150,000.00
Subcontracto	1	LS	$100,000.00	$100,000.00
Equipment	1	LS	$80,000.00	$80,000.00
Excavation	500	cu.yd.	$8.50	$4,250.00
Structural Fil	100	cu.yd.	$15.00	$1,500.00
Tide Flex Va	12	Each	$20,000.00	$240,000.00
diffuser struc	1	LS	$100,000.00	$150,000.00
			Sub-Total:	**$1,605,750.00**
Other:				
Contractor C	7%		$1,715,750.00	$120,102.50
Overhead &	10%		$1,715,750.00	$171,575.00
Electrical	0%		$1,715,750.00	$0.00
Mechanical	0%		$1,715,750.00	$0.00
			Sub-Total:	**$291,677.50**
Construction Total (2001 $):				$2,007,427.50
Construction Total (2003 $):				$2,130,000.00

REF: Unit Costs from Means(2001) Construction and equipment

Appendix 5-2

OPINION OF COSTS FOR ABATEMENT ALTERNATIVES

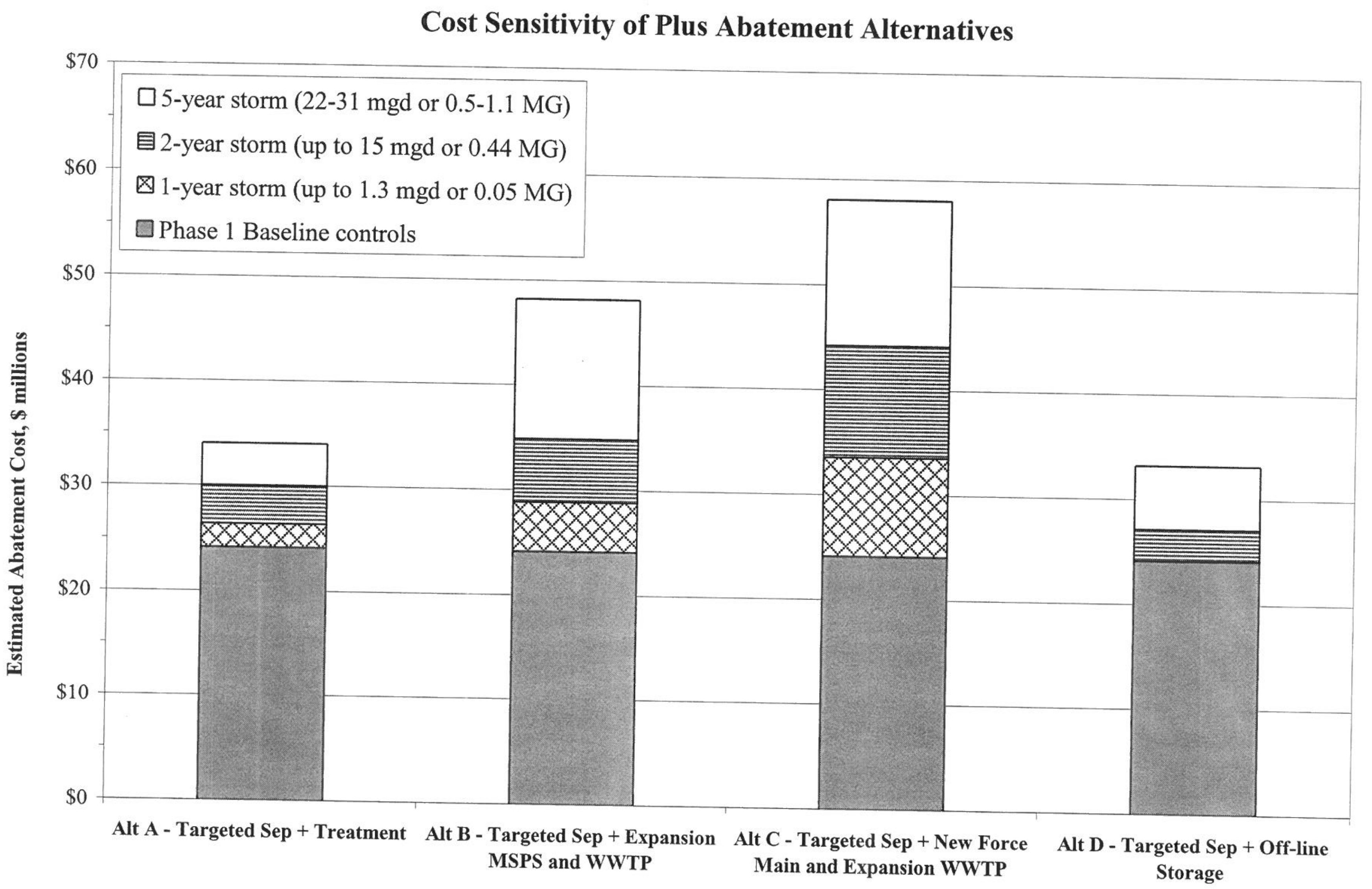
Abatement Alternatives Summary of Costs

Project: LTCP, Portsmouth, NH

Updated: Dec 2003 (ENR 6782)

Abatement Alternative	Phase 1 - Baseline Controls*	Phase 2 - Plus Abatement Projects: 1-year storm up to 1.3 mgd or 0.05 MG	Phase 2 - Plus Abatement Projects: 2-year storm up to 15 mgd or 0.44 MG	Phase 2 - Plus Abatement Projects: 5-year storm 22 - 31 mgd or 0.5 -1.1 MG	TOTAL (maximum)
	Estimated Construction cost, Millions of Dollars				
Alternative A - Targeted Separation plus Treatment	$ 24.17	$ 2.2	$ 3.6	$ 4.0	**$ 28.17**
Alternative B - Targeted Separation plus Expansion of Mechanic Street Pumping Station and WWTP to 36 mgd	$ 24.17	$ 4.6	$ 6.0	$ 13.4	**$ 37.53**
Alternative C - Targeted Separation plus new Force Main from Deer Street Pumping Station to WWTP	$ 24.17	$ 9.3	$ 10.7	$ 13.9	**$ 38.03**
Alternative D - Targeted Separation plus Off-line Storage at South Mill Pond	$ 24.17	$ -	$ 3.0	$ 6.0	**$ 30.17**

Notes: * Phase 1 Baseline controls include Lincoln Area targeted separation, restoration of Deer Street and Mechanic Street pumping stations, and treatment of separated stormwater.
- See Appendix 5-1 costs for individual abatement technologies.
- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.



Note: Phase 1 baseline controls of $24.17 M for all alternatives include: Lincoln area targeted separation, storm water treatment and upgrades to pumping stations.

1110\08B_comp\Alternatives Cost.xls,cost chart

Alternative A - Targeted Separation plus Rapid Treatment / Disinfection
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

	1-year storm event flows	2-year storm event flows	5-year storm event flows
	1.3 mgd	15 mgd	31 mgd
ITEM	Estimated Construction cost, Millions of Dollars		
Targeted Separation	$		21.37
Restoration of Pumping Station Capacity			
Deer Street PS upgrades	$		2.0
Mechanic Street PS upgrades	$		0.3
Storm water treatment	$		0.5
SUBTOTAL BASELINE CONTROLS			$ 24.17
Rapid Treatment of Remaining CSO flows	$ 2.2	$ 3.6	$ 4.0
See attached			
SUBTOTAL PLUS ABATEMENT PROJECTS	$ 2.2	$ 3.6	$ 4.0
Estimated Total Project Cost, Dec 2003 $	$ 26.40	$ 27.77	$ 28.17
Say,	*$28 million*		

Notes:

- See Appendix 5-1 costs for individual abatement technologies.
- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Alternative A - Plus Project
Rapid Treatment for remaining CSOs
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

ITEM		1-year storm event volume	2-year storm event volume	5-year storm event volume
		1.3 mgd	19 mgd	31 mgd
		Estimated Construction cost, Millions of Dollars		
General admin and mobilization		$ 100,000	$ 230,000	$ 250,000
Sitework		$ 320,000	$ 500,000	$ 550,000
Concrete		$ 240,000	$ 400,000	$ 450,000
Masonry Building		$ 180,000	$ 200,000	$ 200,000
Metals (grating, hatches, stairs)		$ 40,000	$ 60,000	$ 60,000
Finishes		$ 10,000	$ 20,000	$ 20,000
Equipment		$ 350,000	$ 600,000	$ 750,000
Screening, Vortex separator, sludge pumps				
chlor / dechlor feed equipment, odor control				
Instrumentation		$ 50,000	$ 100,000	$ 100,000
Mechanical piping and valves		$ 40,000	$ 60,000	$ 60,000
Electrical		$ 100,000	$ 160,000	$ 160,000
Subtotal		$ 1,430,000	$ 2,330,000	$ 2,600,000
Contractor Overhead & Profit	10%	$ 143,000	$ 233,000	$ 260,000
Subtotal		$ 1,573,000	$ 2,563,000	$ 2,860,000
Contingency	20%	$ 314,600	$ 512,600	$ 572,000
Engineering	20%	$ 314,600	$ 512,600	$ 572,000
Total Project Cost, Dec 2003 $		$ 2,202,000	$ 3,588,000	$ 4,004,000
Say,		***$4 million maximum***		

Notes:

- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Alternative B - Targeted Separation plus Expansion of Mechanic Street Pumping Station and WWTP
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

ITEM	1-year storm event flows	2-year storm event flows	5-year storm event flows
	No events	0.6 mgd	27 mgd
	Estimated Construction cost, Millions of Dollars		
Targeted Separation	$		21.37
Restoration of Pumping Station Capacity			
Deer Street PS upgrades	$		2.0
Mechanic Street PS upgrades	$		0.3
Storm water treatment	$		0.5
SUBTOTAL BASELINE CONTROLS			**$ 24.17**
Expansion of Peirce Island WWTP to 36 mgd	$ 4.6	$ 6.0	$ 9.2
Expansion of Mechanic Street Pump Station Capacity up to 36 mgd (Additional beyond above restoration cost)	$ -	$ -	$ 4.2
SUBTOTAL PLUS ABATEMENT PROJECTS	$ 4.6	$ 6.0	$ 13.4
Estimated Total Project Cost, Dec 2003 $	**$ 28.81**	**$ 30.20**	**$ 37.53**
Say,	***$38 million***		

Notes:
- See Appendix 5-1 costs for individual abatement technologies.
- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Alternative C - Targeted Separation plus new Force Main from Deer Street Pumping Station and Expansion of WWTP
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

ITEM	1-year storm event flows	2-year storm event flows	5-year storm event flows
	No events	No events	29 mgd
	Estimated Construction cost, Millions of Dollars		
Targeted Separation	$ 21.37		
Restoration of Pumping Station Capacity			
Deer Street PS upgrades	$ 2.0		
Mechanic Street PS upgrades	$ 0.3		
Storm water treatment	$ 0.5		
SUBTOTAL BASELINE CONTROLS			$ 24.17
Expansion of Peirce Island WWTP to 36 mgd	$ 4.6	$ 6.0	$ 9.2
New Force Main Deer Street to WWTP (Additional beyond above restoration cost)	$ 4.7	$ 4.7	$ 4.7
SUBTOTAL PLUS ABATEMENT PROJECTS	$ 9.3	$ 10.7	$ 13.9
Estimated Total Project Cost, Dec 2003 $	**$ 33.51**	**$ 34.90**	**$ 38.03**
Say,	*$38 million*		

Notes:

- See Appendix 5-1 for detailed costs for individual abatement technologies.
- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Alternative D - Targeted Separation plus Storage at South Mill Pond

Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

ITEM	1-year storm event volume	2-year storm event volume	5-year storm event volume
	No events	0.03 MG	0.64 MG
	Estimated Construction cost, Millions of Dollars		
Targeted Separation	$		21.37
Restoration of Pumping Station Capacity			
Deer Street PS upgrades	$		2.0
Mechanic Street PS upgrades	$		0.3
Storm water treatment	$		0.5
SUBTOTAL BASELINE CONTROLS			$ 24.17
Off-line Storage of Remaining CSO volume	$ -	$ 3.0	$ 6.0
See attached			
SUBTOTAL PLUS ABATEMENT PROJECTS	$ -	$ 3.0	$ 6.0
Estimated Total Project Cost, Dec 2003 $	$ 24.17	$ 27.17	$ 30.17
Say,	*$30 million*		

Notes:

- See Appendix 5-1 for detailed costs for individual abatement technologies.
- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Alternative D - Plus Project
Offline Storage for remaining CSOs
Opinion of Cost

Project: LTCP, Portsmouth, NH
Updated: Dec 2003 (ENR 6782)

		1-year storm event volume	2-year storm event volume	5-year storm event volume
		No events	0.03 MG	0.64 MG
ITEM		*Estimated Construction cost, Millions of Dollars*		
General admin and mobilization			$ 200,000	$ 400,000
Sitework			$ 350,000	$ 600,000
Concrete			$ 600,000	$ 1,300,000
Masonry Building			$ 130,000	$ 200,000
Metals (grating, hatches, stairs)			$ 55,000	$ 85,000
Finishes			$ 10,000	$ 20,000
Equipment (screening, odor control, pumping)			$ 500,000	$ 1,000,000
Instrumentation			$ 80,000	$ 130,000
Mechanical piping and valves			$ 80,000	$ 250,000
Electrical			$ 130,000	$ 280,000
Subtotal			$ 2,135,000	$ 4,265,000
Contractor Overhead & Profit	10%		$ 8,000	$ 25,000
Subtotal			$ 2,143,000	$ 4,290,000
Contingency	20%		$ 428,600	$ 858,000
Engineering	20%		$ 428,600	$ 858,000
Total Project Cost, Dec 2003 $		$ -	$ 3,000,200	$ 6,006,000
Say,		***$6 million maximum***		

Notes:

- Unit costs based from Means (2001) Construction Cost Index Data and vendor equipment quotes.

Appendix 7-1

STATE REVOLVING FUND & STATE AID GRANT ELIGIBILITY CRITERIA

ELIGIBILITY CRITERIA
FOR
FUNDING UNDER THE STATE REVOLVING FUND (SRF)
and STATE AID GRANT (SAG) PROGRAMS

As a result of a review of federal regulations (02/17/84 Federal Register/Vol. 49, No. 34), state SRF rules (Env-C 500), Chapter 277 of the laws of New Hampshire, and past practices, it is the policy of the Water Supply & Pollution Control Division of the New Hampshire Department of Environmental Services, that the **following are deemed eligible/ineligible costs under both the SRF and SAG programs** (see Note, p. 4):

ELIGIBLE	**INELIGIBLE**
• Land acquisition integral to treatment process, including spray irrigation (with buffer area), other forms of effluent disposal, and for land disposal of sludge and septage	• Land acquisition not integral to treatment process (including land under WWTF sites)
• Land lease for land disposal of sludge and septage if for 10 years and if funds are placed in escrow for lease only	
• Conventional wastewater treatment facility with 20-year life	• Easements and ROW's
• Innovative/alternative wastewater treatment facility with 20-year life	
• Community subsurface disposal system or STEP system from septic tank to collector or disposal system where community retains easement to tank	• Individual septic system unless related to community-wide solution
• Interceptor[1] with 50-year life	
• Collector[2] only if remediating documented public health threat, groundwater contamination, or nuisance condition	• Collector which does not remediate documented problems
• Service connection from eligible collector or interceptor to property or easement line	• Service connection from property or easement line to building
• Pump station associated with eligible collection system	• Legal costs
• I/I correction, including stormwater diversion/separation	• Fiscal costs

[1] Per Env-C 502.12 "interceptor sewer" means a sewer designed to collect wastewater from collector sewers and transport it to a wastewater treatment facility.

[2] Per Env-C 502.04 "collector sewer" means lateral sewers primarily installed to collect wastewater directly from individual building sewers or private property.

ELIGIBLE	INELIGIBLE
• CSO treatment or abatement	• Fines/penalties due to violations of or failure to comply with state or federal laws and regulations
• Rehabilitation or replacement of eligible collectors or interceptors	
• Septage receiving, treatment, and land application facilities	
• Sludge composting, land application, sludge incineration and ash disposal, sludge monofill, and sludge processing equipment and facility	
• Vehicles directly related to treatment process (sludge hauling, septage hauling if STEP process) or for maintenance and equipment transport	• Vehicles for personnel transportation
• Computers and software directly related to process control, analysis, and data management and reporting functions	• Computers and software (i.e. not directly related to process control used for billing, general office use, etc.)
• Cost of restoring streets and ROW's to original condition; cost of repaving limited to 2 X width of trench; alternative paving (full width), if cost is less than trench paving	• Paving or street restoration outside project area
• Facility planning	• Curb-to-curb paving unless more cost effective than trench paving
• Infiltration/inflow documentation study, sewer system evaluation study	
• Interest on advances	• Drainage outside project area
• Construction engineering[3]	
• Consulting engineer design fees	
• Value engineering[4] fees	
• Environmental/archaeological consulting fees	
• Costs for establishing or using DBE/WBE services	
• Costs of preparation of applications and permits required by federal, state, or local regulations or procedures	
• Costs of complying with procurement requirements	

3 Ratio is applied where ineligible portions are involved.

4 See Env-C 500 for discussion of projects requiring V.E.

ELIGIBLE	INELIGIBLE
• Costs of meeting specific federal statutory procedures	
• O&M manual and plan of operation development costs	
• Start-up services, including staff training, laboratory and QA/QC procedures, maintenance, and records management	
• Subsurface investigations, soil borings, groundwater monitoring	
• Costs to mitigate direct adverse physical impacts due to WWTF or pump station per NEPA requirements, including site screening landscaping (trees, shrubs)	• Costs of solutions to aesthetic problems
• Costs of laboratory equipment and benches and 1-year supply of chemicals to conduct tests for plant operation	
• Office furnishings not to exceed allowance of $1,000	
• Costs of shop equipment installed at WWTF necessary for plant operation or shown cost effective over contract services	
• Hand tools not to exceed allowance of $2,000	• Site maintenance equipment (lawn mowers, snow blowers)
• Special tools required for specific equipment maintenance	
• Portion of collection system maintenance and safety equipment used for eligible collector maintenance	• Portion of collection system maintenance equipment used for ineligible collector maintenance
• Cost of mobile equipment necessary for WWTF operation or equipment maintenance, including portable stand-by generators, emergency pumps, and critical replacement parts	
• Municipal utility relocation to avoid interferences	
• Safety equipment (boat for lagoons, emergency showers, gas air packs, etc.)	• Office equipment not safety related
• Textbooks and other printed materials used for proper O&M of facility (Sacramento Course, NY and Texas Manuals, Metcalf & Eddy, etc.)	
• Other items deemed reasonable, necessary, and allocable to the project	• Costs outside the scope of the approved project

The following are deemed eligible/ineligible costs under the SRF or the SAG programs:

ELIGIBLE (SRF)

- Cadastral and engineering survey costs
- Administrative costs directly related to SRF loan requiring additional time over standard work hours or additional personnel (time records required to support eligibility)

ELIGIBLE (SAG)

- Engineering survey costs

INELIGIBLE (SAG)

- Cadastral survey costs
- Administrative costs

SOLID WASTE MANAGEMENT PROJECTS:

ADDITIONAL ELIGIBLE COSTS (SRF)

- Phase 1,2, and 3 Hydrogeological Studies
- Engineering Planning, Design and construction Services
- Transfer/Material Handling/Recycling Station construction
- Closure Construction

ADDITIONAL INELIGIBLE COSTS (SRF)

- Costs not specifically attributable to a Landfill Closure Project
- Maintenance and upkeep after construction is complete

NOTE: In order for wastewater facilities and solid waste management facilities to be deemed eligible for SRF or SAG funds, they must be proven the most cost-effective alternative based on present worth analysis, NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Residential Sewer User Charges
Provided by the Wastewater Engineering Bureau
Department of Environmental Services

MUNICIPALITY	2000	1999	1998	1997	1996	1995	1994	1993	1992
ALLENSTOWN	$229.90	$229.90	$229.90	$229.90	$229.90	$216.40	$184.00	$184.00	$171.00
ANTRIM	**$513.48**	**$513.48**	**$513.48**	**$513.48**	**$458.74**	**$417.50**	**$417.52**	**$417.52**	**$379.44**
ASHLAND	**$595.20**	**$789.60**	$293.88	$293.88	$293.88	$220.00	$220.08	$215.28	$214.32
BEDFORD	$213.24	$213.24	$193.80	$193.80	$193.80	$193.80	$193.20	$193.80	$190.00
BELMONT	*$92.00*	$290.66	$290.66	$290.66	$290.66	$290.66	$300.00	$118.16	$290.66
BENNINGTON	$345.12	$345.12	$345.12	$345.12	$345.12	$313.68	$285.40	$285.40	$285.40
BERLIN	**$508.80**	$369.36	$361.00	$353.52	**$353.52**	**$353.52**	**$424.32**	$280.82	$209.00
BETHLEHEM	$285.00	$301.70	$295.80	$290.00	$290.00	$290.00	$289.10	$280.68	$199.44
BOSCAWEN	$300.00	**$480.00**	**$480.00**	**$480.00**	**$480.00**	**$570.00**	**$570.00**	**$550.00**	**$540.00**
BOW	$296.00	$296.00	$296.00	$296.00	$296.00	$296.00	$296.00	$296.00	$296.00
BRISTOL	**$517.32**	**$517.32**	**$492.48**	**$492.48**	**$492.48**	**$492.48**	**$492.48**	**$563.64**	**$578.26**
CANAAN	$391.50	$391.50	**$391.50**	**$403.52**	**$444.00**	**$423.00**	**$391.50**	**$391.50**	**$391.50**
CENTER HARBOR	$250.00	$250.00	$250.00	$250.00	$250.00	$250.00	$250.00	$246.75	$235.00
CHARLESTOWN	$240.00	$240.00	$240.00	$250.00	$255.00	$255.00	$240.00	$190.18	$160.00
CLAREMONT	**$520.00**	**$520.00**	**$398.00**	**$398.00**	**$398.00**	**$398.00**	**$398.00**	**$398.96**	**$363.28**
COLEBROOK	$270.00	$240.00	$240.00	$240.00	$240.00	$240.00	$240.00	$188.00	$240.64
CONCORD	$322.80	$303.60	$295.20	$280.00	$280.00	$280.00	$280.80	$280.80	$280.80
CONWAY VILLAGE	$162.00	$168.00	$114.00	$108.00	$94.00	$90.00	$104.00	$144.00	$91.00
DALTON	$340.00	$340.00	$340.00	$340.00	$340.00	$340.00	$340.00	$320.00	**$320.00**
DERRY	$324.40	$324.40	$324.40	$324.40	$324.40	**$358.40**	**$358.40**	**$359.20**	$248.00
DOVER	$384.00	$384.00	$367.20	$367.20	$367.20	$367.20	$360.00	$360.00	$360.00
DURHAM	$395.00	$357.60	$357.60	$298.80	$298.80	$290.40	$264.00	$264.71	$207.00
ENFIELD	**$431.64**	**$431.64**	**$399.36**	**$431.64**	**$431.64**	**$436.64**	$431.30	**$431.64**	**$432.64**
EPPING	$221.30	$221.30	$221.30	$221.30	$221.30	$136.70	$136.70	$136.70	$136.70
ERROL	$306.00	$340.00	$340.00	$304.00	$340.00	$340.00	**$340.00**		
EXETER	$281.64	$281.64	$281.64	$281.64	$281.64	$299.64	$239.16	$284.64	$281.65
FARMINGTON	$359.10	$359.10	$359.10	$359.10	**$359.10**	**$359.10**	**$359.10**	**$359.10**	**$359.10**
FRANKLIN	$335.20	$335.20	$335.20	$335.20	$321.60	$321.60	$321.60	$320.20	**$322.26**
GILFORD	**$511.43**	**$511.43**	$287.29	$287.29	**$374.86**	**$374.86**	**$374.86**	**$374.86**	**$374.86**
GOFFSTOWN	$200.00	$200.00	$200.00	$200.00	$200.00	$200.00	$200.00	$200.00	$220.00
GORHAM	$383.00	$395.00	$383.00	**$401.96**	**$402.00**	**$364.25**	**$349.00**	**$419.56**	$300.00
GREENVILLE	**$540.00**	$389.00	**$389.00**	**$389.00**	$339.00	$339.00	$339.00	$389.38	$381.00
GREENVILLE EST VD	**$564.50**	**$564.50**	**$564.50**	**$564.50**	**$526.00**				
GROVETON	$200.00	$200.00	$200.00	$120.00	$90.00	$90.00	$90.00	$86.00	$82.00
HAMPTON	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01
HANOVER	$228.64	$228.64	$363.00	$363.00	**$363.00**	**$363.00**	$330.00	$331.00	**$331.00**
HENNIKER	$315.90	$293.18	$291.66	$286.78	$283.56	$280.86	$265.48	$221.62	$210.36
HIGHLANDS VILLAGE	**$850.00**	**$936.00**							
HILLSBOROUGH	$132.00	*$110.00*	*$100.00*	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00
HINSDALE	**$455.00**	**$605.00**	**$473.75**	**$430.00**	**$430.00**	$240.00	$240.00	$240.00	$240.00
HOLDERNESS	$343.80	$349.00	$490.00	$249.30	$249.30	$251.70	$217.00	$217.00	
HOOKSETT	$266.00	$266.00	$266.00	$266.00	$266.00	$266.00	$266.00	$266.00	$228.00
HOPKINTON	**$456.10**	**$456.10**	**$427.20**	**$427.20**	**$427.20**	**$427.20**	**$406.20**	**$406.34**	**$340.50**
HUDSON	$242.88		$242.80	$242.80	$227.25	$233.86	$250.00	$249.95	$223.00
JAFFREY	**$547.20**	**$547.20**	**$457.86**	**$459.00**	**$459.00**	**$459.00**	**$431.00**	**$431.00**	**$431.00**
KEENE	$310.60	$310.60	$311.43	$310.60	$310.60	$310.60	$310.60	$311.58	$252.68
LACONIA	$281.60	$281.60	$281.60	$281.60	$281.60	$281.60	$281.60	$281.60	$281.60
LANCASTER	$286.50	$286.50	$286.50	$286.50	$254.00	$110.00	$110.00	$110.00	$90.00
LANDAFF	$400.00	$400.00	$310.00	$310.00	$281.00	$281.00	$255.50	$255.50	$204.98
LEBANON	$293.64	$255.36	$255.46	$215.40	$215.40	$215.40	$215.40	$193.07	$215.96
LINCOLN	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01
LISBON	$400.00	$400.00	$310.00	$310.00	$281.00	$281.00	$255.50	$255.50	$204.98

Towns with the $0.01 charge are Ad Valorem, cost of the WWTF is on the tax base

MUNICIPALITY									
LITTLETON	$314.60	$254.08	$246.30	$235.24	$212.81	$199.20	$172.95	$172.95	$127.00
LONDONDERRY	$320.00	$320.00	$320.00	$320.00	$320.00	$320.00	$320.00	$312.00	$312.00
MANCHESTER	$230.00	$230.00	$230.00	$230.00	$230.00	$230.00	$208.40	$208.83	$174.00
MARLBOROUGH	$247.50	$247.50	$247.50	$270.00	$337.50	$450.00	$450.00	$450.00	$450.00
MEREDITH	$351.00	$336.00	$336.00	$336.00	$336.00	$336.00	$336.00	$288.45	$288.44
MERIDEN	$280.00	$280.00	$280.00	$284.00	$264.00	$297.00	$240.00	$215.97	$240.00
MERRIMACK	$134.00	$134.00	$134.00	$134.00	$134.00	$134.00	$134.00	$134.00	$134.00
MILFORD	$344.08	$334.08	$333.12	$333.12	$333.12	$334.43	$316.80	$318.00	$302.40
MILTON	$150.00	$150.00	$150.00	$150.00	$150.00	$150.00	$150.00	$175.00	$175.00
NASHUA	$296.00	$284.94	$284.40	$149.28	$149.28	$170.40	$166.67	$161.82	$154.00
NEW HAMPTON	$168.53	$157.50	$157.50	$133.00	$133.00	$126.00	$126.00	$126.00	$126.00
NEW LONDON	$760.00	$760.00	$760.00	$760.00	$796.00	$815.00	$788.00	$814.10	$547.20
NEWBURY	$394.00	$376.00	$367.00	$336.00	$304.00	$304.00	$300.00	$304.00	$304.00
NEWCASTLE	$252.60	$252.60	$252.60	$252.60	$252.60	$252.60	$252.60	$230.00	$230.21
NEWFIELDS	$440.00	$440.00	$270.00	$542.00	$270.00	$366.00	$366.00	$275.00	$200.00
NEWINGTON	*$1,398.06*	*$1,440.00*	*$1,680.00*	$400.00	$400.00	$400.00	$100.00	$100.00	$100.00
NEWMARKET	$384.00	$372.00	$348.00	$240.00	$240.00	$240.00	$240.00	$240.00	$240.00
NEWPORT	$415.80	$415.80	$415.80	$415.80	$415.80	$415.80	$415.80	$415.80	$415.80
NORTH CONWAY	$837.00	$837.00	$556.80	$570.00					
NORTHFIELD	$187.40	$197.00	$397.72	$170.49	$159.94	$159.94	$160.45	$214.13	$190.00
NORTHUNBERLAND	$200.00	$200.00	$200.00	$120.00	$90.00	$90.00	$90.00	$86.00	$81.00
OSSIPEE	$876.00	$486.00	$556.00	$546.00	$190.00	$190.00	$190.00	$190.00	$190.00
PEMBROKE	$262.00	$262.00	$246.00	$238.00	$175.50	$175.50	$185.50	$215.50	$215.50
PETERBOROUGH	$301.90	$301.90	$277.44	$249.48	$252.67	$252.00	$252.00	$252.67	$252.00
PIERMONT	$587.00	$587.00	$240.00	$240.00	$240.00	$240.00	$240.00	$240.00	$240.00
PITTSBURG	$125.00	$125.00	$125.00	$125.00	$125.00	$125.00	$125.00	$125.00	$125.00
PITTSFIELD	$560.00	$440.68	$440.68	$285.20	$285.20	$285.00	$285.20	$210.00	$230.00
PLYMOUTH	$343.80	$343.80	$343.80	$289.80	$249.30	$249.30	$249.30	$249.30	$250.00
PORTSMOUTH	$534.00	$525.00	$516.00	$480.00	$423.60	$424.73	$282.00	$283.00	$283.00
ROCHESTER	$388.80	$375.60	$355.20	$351.60	$351.60	$331.20	$331.20	$315.00	$315.00
ROLLINSFORD	$480.00	$480.00	$480.00	$480.00	$440.00	$440.00	$440.00	$440.00	$440.00
RYE	$288.00	$613.80	$587.68	$524.28	$660.00	$605.00	$408.00	$745.36	$845.00
SALEM	$263.60	$257.60	$257.60	$257.60	$257.60	$329.60	$329.60	$330.45	$355.00
SANBORNTON	$146.50	$121.00	$121.00	$120.00	$84.00	$91.82	$126.00	$91.82	$91.82
SANDWICH	$405.00	$396.00	$356.04	$315.00	$408.00	$336.00	$423.00	$453.00	$444.00
SEABROOK	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01
SOMERSWORTH	$217.20	$217.20	$217.20	$221.20	$221.20	$204.40	$204.40	$204.80	$204.40
STEWARTSTOWN	$166.50	$166.50	$186.50	$186.50	$186.50	$186.50	$186.50	$180.50	$302.68
STRATFORD VILLAGE	$230.00	$230.00	$198.00	$173.00	$139.00	$139.00	$120.00	$120.00	$120.00
SUNAPEE	$290.00	$285.00	$263.00	$263.00	$190.00	$180.00	$180.00	$165.00	$165.00
SWANZEY	$224.00	$220.00	$218.19	$154.00	$124.00	$104.00	$116.00	$119.64	$120.73
TILTON	$240.00	$240.00	$240.00	$240.00	$240.00	$240.00	$240.64	$240.00	$240.64
TROY	$240.00	$180.00	$168.00	$180.00	$135.00	$135.00	$175.50	$224.10	$246.00
WAKEFIELD	$702.08	$540.50	$465.37	$471.87	$463.00	$510.00	$497.00	$522.00	$394.00
WALPOLE	$312.00	$360.00	$360.00	$312.00	$312.00	$312.00	$394.00	$264.71	$342.91
WARNER	$580.00	$580.00	$580.00	$580.00	$595.00	$580.00	$580.00	$737.00	$506.70
WATERVILLE VALLEY	$214.20	$204.00	$204.00	$163.80	$163.80	$163.80	$163.80	$163.80	$202.04
WEARE	$216.93	$220.70	$378.88	$338.29	$234.15	$402.99	$444.37	$276.17	$228.00
WHITEFIELD	$206.40	$206.40	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00	$110.00
WILTON	$240.00	$240.00	$210.00	$250.00	$265.00	$250.00	$230.00	$230.00	$230.00
WINCHESTER	$368.00	$368.40	$315.00	$315.00	$315.00	$315.00	$315.00	$240.00	$240.00
WOLFEBORO	$857.00	$857.00	$857.00	$857.00	$803.00	$785.00	$740.00	$597.00	$485.00
WOODSTOCK	$155.00	$145.00	$145.00	$135.00	$135.00	$135.00	$135.00	$135.00	$135.00
WOODSVILLE	$325.50	$325.50	$325.50	$325.50	$325.50	$325.50	$235.50	$235.50	$202.25
STATE AVERAGE	$350.52	$350.82	$324.69	$310.12	$294.18	$292.52	$282.82	$278.28	$262.91
BENCH MARK	$420.00	$420.00	$389.00	$372.00	$353.00	$351.00	$338.00	$334.00	$318.00

The STATE AVERAGE represents the average with the high and low values for the year deleted, values in italics.
The BENCH MARK is the value 20% above the state average where towns are eligable for an additional 10% grant.
The BENCH MARK value is rounded down.

New Hampshire Department of Environmental Services

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Water Division
Wastewater Engineering Bureau

State Aid Grant Program *Requirements*

RSA 486:1,III., which became effective on July 1, 1993, provides for financial assistance in the form of a 20 percent or, if the community's sewer user fee is 20 percent higher than the state average user fee, a 30 percent grant for the planning, design and construction of certain sewage disposal facilities by municipalities. This statute sets minimum requirements that must be met for a project to be eligible for funding. They are:

- A pre-application must be submitted to place the project on the approved priority list.
- The project must meet the Eligibility Criteria for Funding.
- Procurement of all professional engineering services must be accomplished using the State Standard Contract form for Reports, Design, or Construction Services.
- Engineering reports or facilities plans, if applicable, must be reviewed and approved by NHDES.
- Construction plans and specifications, revisions, and formal addenda must be reviewed and approved by NHDES. Authorization to advertise for bidding must be received from NHDES. Bid documentation establishing the low responsive and responsible bidder must be submitted to NHDES for review. Authorization to award the construction contract must be received from NHDES.
- Periodic site inspections and a final inspection by NHDES personnel must be conducted to insure compliance with approved plans and specifications.
- Change orders must be reviewed and approved by NHDES.
- Invoices for engineering services and contractors pay estimates must be submitted monthly to NHDES for review.
- Operation and maintenance manuals, if applicable, must be reviewed and approved by NHDES.
- Record drawings must be submitted to NHDES.
- Final project cost documentation must be submitted to NHDES for a determination of final eligible project costs.

If you have any questions or require additional information about the State Aid Grant Program for wastewater projects, please contact Stephen Snell at 271-2977, or at ssnell@des.state.nh.us

Updated: December 4, 2000

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Appendix 7-2

COSTS PER HOUSEHOLD ESTIMATES

COST PER HOUSEHOLD
Worksheet 1

		Line Number
Current WWT Costs		
• Annual Operations and Maintenance Expenses (Excluding Depreciation)	4,031,106 (FY2002)	100
• Annual Debt Service (Principal and Interest)	2,758,590	101
Subtotal (Line 100 + Line 101)	6,789,696	102
Projected WWT and CSO Costs (Current Dollars)		
• Estimated Annual Operations and Maintenance Expenses (Excluding Depreciation) $22.5m	500,000 *1	103
• Annual Debt Service (Principal and Interest)	2,025,000 *2	104
Subtotal (Line 103 ÷ Line 104)	2,525,000	105
Total Current and Projected WWT and CSO Costs (Line 102 + Line 105)	9,314,696	106
Residential Share of Total WWT and CSO Costs (54%)	5,029,936	107
Total number of Households in Service Area	4,825	108
Cost Per Household (Line 107 ÷ Line 108)	1,042 ($1356)*3	109

*1 - Does not include $1m for O&M of new WWTP

*2 - Does not include $20m for new WWTP

*3 - Includes new WWTP costs

RESIDENTIAL INDICATOR
Worksheet 2

		Line Number
Median Household Income (MHI)		
• Census Year MHI	2001	201
• MHI Adjustment Factor	1	202
• Adjusted MHI (Line 201 x Line 202)	56,100 (2001)	203
Annual WWT and CSO Control Cost Per Household (CPH) (Line 109)	1042	204
Residential Indicator:		
Annual Wastewater and CSO Control Costs per Household as a percent of Adjusted Median Household Income (CPH as % MHI) (Line 204 ÷ Line 203 x 100)	1.86%	205

BOND RATING
Worksheet 3

		Line Number
• Most Recent General Obligation Bond Rating	A-1	
Date:	June 30, 2001	
Rating Agency:	Moody's	
Rating:	A-1	301
• Most Recent Revenue (Water/Sewer or Sewer) Bond		
Date:	N/A	
Rating Agency:		
Bond Insurance (Yes/No)		
Rating:		302
Summary Bond Rating:		303

OVERALL NET DEBT AS A PERCENT OF FULL MARKET PROPERTY VALUE

Worksheet 4

		Line Number
• Direct Net Debt (G.O. Bonds Excluding Double-Barreled Bonds)	30,932,557	401
• Debt of Overlapping Entities (Proportionate Share of Multijurisdictional Debt)	N/A	402
• Overall Net Debt (Lines 401+402)	30,932,557	403
• Market Value of Property	2,490,644,613	404
• Overall Net Debt as a Percent of Full Market Property Value (Line 403 divided by Line 404 x 100)	1.24%	405

UNEMPLOYMENT RATE
Worksheet 5

			Line Number
•	Unemployment Rate - Permittee	2.3%	501
	Source:	CAFRA Report June 2001	
•	Unemployment Rate - County (use if permittee's rate is unavailable)		502
•	Source:		

Benchmark:

•	Average National Unemployment Rate:	4.4% June 2001 (Aug)	503
•	Source:	Bureau of Labor Statistics (Web site)	

MEDIAN HOUSEHOLD INCOME
Worksheet 6

		Line Number
• Median Household Income - Permittee (Line 203)	56,100	601
• Source:		
Benchmark:		
• Census Year National MHI	38,885 (1998)	602
• MHI Adjustment Factor (line 202)	1.147	603
• Adjusted National MHI: (line 602 x line 603)	44,591	604
• Source:	U.S. Census Bureau	

PROPERTY TAX REVENUES AS A PERCENT OF FULL MARKET PROPERTY VALUE
Worksheet 7

		Line Number
• Full Market Value of Real Property (Line 404)	2,490,644,613	701
• Property Tax Revenues	41,122,197	702
• Property Tax Revenue as a Percent of Full Market Property Value (702 ÷ 701 x 100)	1.68%	703

PROPERTY TAX REVENUE COLLECTION RATE
Worksheet 8

		Line Number
• Property Tax Revenue Collected (Line 702)	39,878,435	801
• Property Taxes Levied	41,122,197	802
• Property Tax Revenue Collection Rate (line 801 ÷ line 802 x 100)	97%	803

SUMMARY OF PERMITTEE FINANCIAL CAPABILITY INDICATORS
Worksheet 9

Indicator	Column A: Actual Value	Column B: Score	Line Number
Bond Rating (Line 303)	A-1	3	901
Overall Net Debt as a Percent of Full Market Property Value (line 405)	1.24%	3	902
Unemployment Rate (Line 501)	2.3%	3	903
Median Household Income (Line 601)	56100	2	904
Property Tax Revenues as a Percent of Full Market Property Value (Line 703)	1.68%	3	905
Property Tax Revenue Collection Rate (Line 803)	97%	2	906
Permittee Indicators Score (Sum of Column B ÷ Number of Entries)		2.67	907

FINANCIAL CAPABILITY MATRIX SCORE
Worksheet 10

		Line Number
• Residential Indicator Score (Line 205)	1.86	1001
• Permittee Financial Capability Indicators Score (Line 907)	2.67	1002
• Financial Capability Matrix Category (see matrix next page)	Low Burden	1003

Note - If new WWTP $20m Capital + $1m O&M then RIS = 2.42 Medium Burden