

**Water Quality Data Report
For
The Norwalk River Watershed
May 2007 through September 2007**



Submitted by:

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Funded by:

The Wilton Conservation Department, Trout Unlimited, King Industries,
Norwalk River Watershed Association, Inc., The Scallon Foundation
The Jeniam Foundation and The Fairfield County Community Foundation

To: Wilton Inland Conservation Department; Trout Unlimited; Norwalk River Watershed Association; The Scallon Foundation; The Fairfield County Community Foundation; and The Jeniam Foundation

From: Dick Harris, Principal Investigator, Earthplace, Harbor Watch/River Watch Program
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Date: October 26, 2007

Subject: The Norwalk River Watershed Project Water Quality Report for the period of May 2007 through September 2007

I. Introduction:

Purpose of Study: The Earthplace Harbor Watch/River Watch (HW/RW) Program was funded by the Connecticut Department of Environmental Protection (CT DEP) to conduct water quality monitoring on the Norwalk River for six years, June 1998 through June 2005. HW/RW collected and analyzed water samples for both fecal coliform bacteria and *Escherichia coli* (*E. coli*) bacteria at a total of ten sites, nine of them along the main stem of the Norwalk River and one on the Silvermine River (Figure A2, Figure A3).

Background: From June 1998 through May 1999, HW/RW conducted a first-year water quality monitoring study in the Norwalk River Watershed. This study was funded by the CT DEP and was intended to provide water quality information in support of the Norwalk River Watershed Initiative. The purpose of the study was to obtain data on the levels of fecal coliform bacteria, dissolved oxygen, and conductivity at selected locations in the Norwalk River and in its major tributaries (Silvermine River, Comstock Brook and Cooper Brook). The study indicated that fecal coliform bacteria levels frequently exceeded the state's water quality criterion for Class B water at a number of sites along the Norwalk River. Most sites met the dissolved oxygen level CT DEP criterion for Class B waters. The first year study also showed that conductivity levels were consistently higher in the upper reaches of the watershed than in the lower watershed. Based upon the water quality data collected, HW/RW determined that the water quality in the Norwalk River Watershed was moderately impaired.

During 2002, the CT DEP switched to *E. coli* bacteria as the indicator species. *E. coli* is one of the two bacteria components of the fecal coliform bacteria group, and it is a more specific indicator of fecal material arising from humans and other warm-blooded animals. For recreational waters the US EPA recommends the use of *E. coli* because it is a better indicator of a human health risk from water contact than fecal coliform bacteria (Table 1).

The CT DEP and HW/RW executed a contract for the second year funding in September 1999; the second year monitoring period was from September 1, 1999 through November 30, 2000. HW/RW was authorized to begin testing for *E. coli* bacteria in November 1999. Sampling took place at 12 sites along the Norwalk River. Monthly reports were prepared and submitted to the CT DEP and disseminated to the seven towns comprising the Norwalk River Watershed as well as the Norwalk River Watershed Initiative Advisory Committee.

Funding was then made available by the CT DEP to continue testing on the Norwalk River for a third summer (April 1 to September 30, 2001) based on a continuing interest by Norwalk River Watershed Advisory Committees and the CT DEP. The same testing protocols used in 2000 by HW/RW were again used under the original QAPP which was extended on April 25, 2001 to September 30, 2001 by the EPA's Office of Environmental Measurement and Evaluation.

Additional 319 funding was allocated to continue the HW/RW testing regime on the Norwalk River for twenty-three months beginning July 2002 and ending June 30, 2004. The last contract with the CT DEP expired on 6/30/05. Renewed testing of the Norwalk River and its tributaries began on May 1, 2005 based on the interest and generosity of the Town of Wilton, The Norwalk River Watershed Association, King Industries, Trout Unlimited and the Scallon Foundation. The Fairfield County Community Foundation and Norwalk's Daphne Culpepper Fund have provided additional funds for the 2007/2008 monitoring season.

Although these monthly reports are submitted to the CT DEP for review and comment, Harbor Watch/River Watch is solely responsible for the collection, analysis and interpretation of the water quality data.

II Methods and Procedures:

Water monitoring is carried out under protocols of an EPA approved and revised EPA Quality Assurance Project Plan (QAPP). Monitoring teams leave the Earthplace in Westport between 9:30AM and 10:00AM, and return in early afternoon. Each team is comprised of an experienced leader and one or two trained volunteers. Water samples are collected at 12 (Figure A2) of the original 23 monitoring sites within the watershed (QAPP Appendix A1.1). These sites, which represent the more impacted areas, were selected in concert with the CT DEP, because results from the first year's study consistently demonstrated elevated fecal coliform bacteria counts. In addition to focusing monitoring efforts at these sites, it was determined to analyze for both fecal coliform and *E. coli* bacteria.

The following tests are run *in situ*: dissolved oxygen (QAPP Appendix A3.1) and conductivity (QAPP Appendix A3.5). Water and air temperatures, as well as general observations and storm events are also recorded at each site visit. Observations are recorded (QAPP Appendix 5) on the HW/RW Data Sheet.

Upon return to the lab, fecal coliform and *E. coli* bacteria membrane filtration tests (QAPP Appendix A3.10) are performed and analyzed according to Standard Methods, 20th edition (9222D & 9222G) and recorded (QAPP Appendix 5) on the HW/RW bacteria log. The frequency of which water quality monitoring for bacteria concentrations occurs is separated into two seasonal testing periods. For the period when the three wastewater treatment plants (WTP) are required to disinfect their wastewater effluent (May 1st to September 30th) monitoring is done four times per month. For the period when effluent disinfection is not required (October 1st to April 30th) monitoring is done monthly.

E. coli bacteria will be evaluated using the criteria published in the CT DEP Surface Water Quality Standards, 12/17/02. The CT DEP *E. coli* criterion for Class AA, A, and B water is established at three levels (Table 1).

Table 1 CT DEP criterion for *E. coli* bacteria levels as applied to recreational use, effective 12/17/02

Designated Use	Class	Indicator	Criteria
Recreation			
Designated Swimming	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126 CFUs/100mLs; Single Sample Maximum 235 CFUs/100mLs
Non-designated Swimming	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126 CFUs/100mLs; Single Sample Maximum 410 CFUs/100mLs
All Other Recreational Uses	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126 CFUs/100mLs; Single Sample Maximum 576 CFUs/100mLs

The Norwalk River is classified by the CT DEP for “Non-designated swimming” because people still bathe in the river. The report will focus on *E. coli* bacteria levels, because it is the indicator bacteria of choice by the CT DEP. Fecal coliform bacteria levels are reported on Table B1 only as additional data for those who may be interested.

III. Results:

From 5/1/07 through 9/30/07 (the period when UV lights are turned on to disinfect effluent at the three waste water treatment plants [WTP] on the Norwalk River) all twelve monitoring sites exceeded CT DEP criteria for *E. coli* bacteria. Ten sites exceeded geometric means of <126 CFU/100 mLs (Table 1, Table 2, Figure 1). The two exceptions were the Ridgefield WTP’s (Site NR22) geomean of 2 CFU/100 mLs and Site NR9.5 at 102 CFU/100 mLs (Table 2, Figure 1). Only Site NR22 met the secondary CT DEP single sample maximum (SSM) of <10% of all samples taken over 410/100 mLs (Table 2, Figure 1).

Observed dissolved oxygen (DO) means all met the CT DEP DO criterion of 5 mg/L or greater (Figure 2, Table B1). Individual DO readings exceeded the DO criterion at Site NR21 with values of 3.3 mg/L observed on 7/11 and 3.6 mg/L observed on 7/25 (Figure 2, Table B1). Additionally, a DO value of 3.6 mg/L was observed at Site NR20 on 7/25 (Figure 2, Table B1).

Observed conductivity means were at a maximum value of 767 μ S at Site NR22 and a minimum value of 209 μ S at Site SM3 (Figure 3, Table B1). Conductivity ranges at individual sites were extended in the upper river ranging from 242 μ S to 908 μ S at Site NR23 (Figure 3, Table B1) and from 297 μ S to 842 μ S at Site NR20 (Figure 3, Table B1). Conductivity ranges in the lower river (Site NR13 downstream to Site NR1) were reduced. Observed values ranged from 215 μ S to 512 μ S at Site NR13 and from 165 μ S to 240 μ S at the Silvermine River Site SM3 (Figure 3, Table B1).

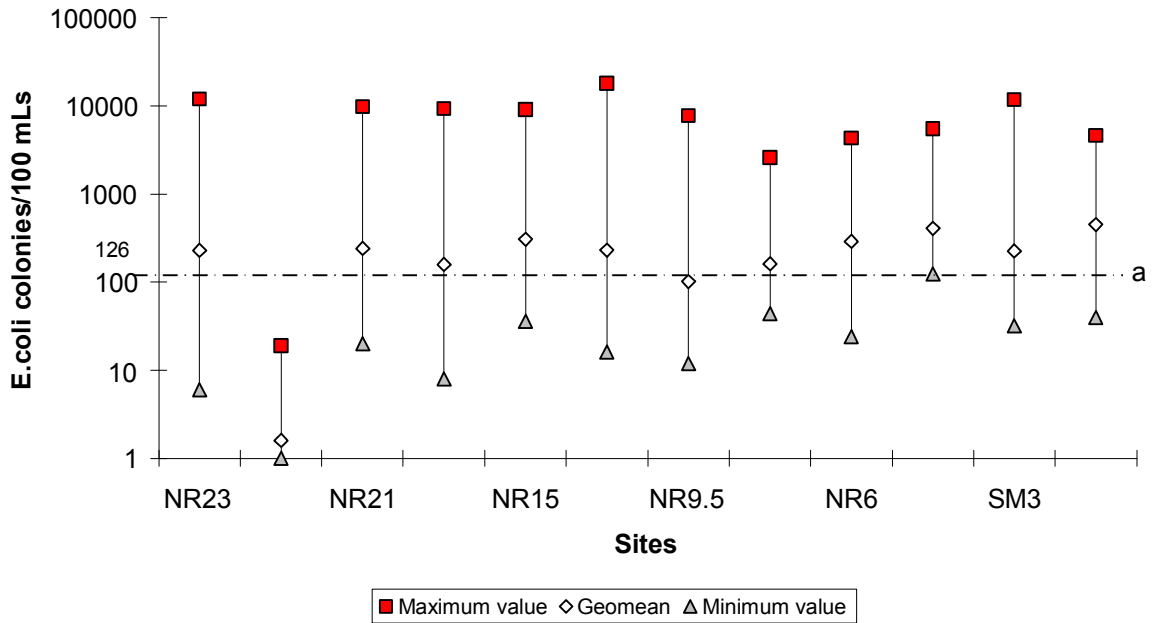
Table 2 May 2007 through September 2007 *E. coli* bacteria concentrations, geometric means and % frequency exceeding 410 colonies/100 mLs at 12 sampling sites in the Norwalk River Watershed for the period of time when the two Ridgefield and one Georgetown wastewater treatment facilities are not required by NPDES permit to begin disinfecting sewage effluent (one sampling event in April), and are required to disinfect sewage effluent (20 sampling events-May to September)

	Dates											
Sites	5/3/07	5/9/07	5/17/07	5/24/07	6/7/07	6/13/07	6/21/07	6/27/07	7/5/07	7/11/07	7/19/07	7/25/07
NR23	8	6	3240	70	52	144	148	120	1800	580	440	124
NR22	1	1	19	1	1	1	1	1	1	1	1	1
NR21	48	20	380	36	106	156	360	256	760	204	380	420
NR20	28	8	660	48	206	220	128	84	1000	60	360	84
NR15	36	42	780	118	86	420	420	580	800	188	240	368
NR13	16	26	440	64	96	180	380	340	480	136	420	272
NR9.5	12	32	440	38	70	320	92	38	140	28	64	180
NR9	44	92	580	132	128	288	100	68	190	88	268	102
NR6	48	24	480	80	440	420	232	156	1180	420	332	172
NR4	124	176	980	180	480	1160	180	132	900	460	600	280
SM3	104	48	280	104	130	360	168	128	4400	144	790	156
NR1	80	40	1040	92	200	700	760	220	1420	300	580	180

Sites	8/1/07	8/8/07	8/16/07	8/22/07	9/5/07	9/12/07	9/20/07	9/26/07	Geomean	%frequency over 410 colonies/100mLs
NR23	40	12000	900	840	100	1800	200	160	230	40.00%
NR22	0	0	0	0	1	0	0	1	2	0.00%
NR21	580	9800	420	440	248	400	132	60	240	30.00%
NR20	156	9300	80	440	120	420	84	80	159	25.00%
NR15	520	9100	380	400	340	480	136	232	308	40.00%
NR13	520	18000	184	740	96	620	80	160	231	35.00%
NR9.5	82	7720	72	148	96	660	36	42	102	15.00%
NR9	240	2600	120	240	50	580	60	136	162	15.00%
NR6	180	4300	360	740	180	2000	208	124	289	40.00%
NR4	480	5500	220	600	300	1100	160	260	409	50.00%
SM3	60	11780	56	660	80	1600	92	32	225	25.00%
NR1	500	4600	300	1500	720	1800	740	360	450	55.00%

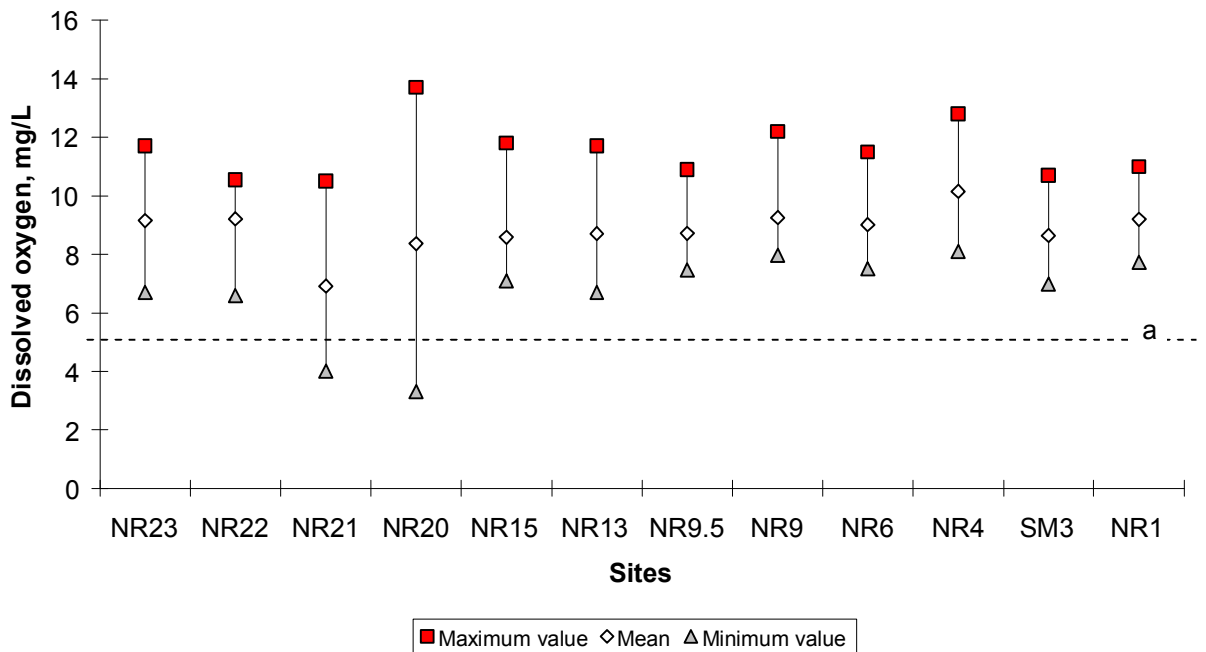
*Bacteria count at the Ridgefield WTP effluent discharge are fecal coliform counts

Figure 1 Maximum, geometric means, and minimum values of *E. coli* bacteria concentrations at 12 monitoring sites in the Norwalk River Watershed from May 2007 through September 2007



^aCT DEP geomean maximum value for a Class B river

Figure 2 Maximum, mean and minimum values for dissolved oxygen at 12 sampling sites on the Norwalk River Watershed from May 2007 through September 2007



^aCT DEP minimum value for Class B river

Figure 3 Maximum, geomean and minimum value for conductivity at 12 sampling sites in the Norwalk River Watershed from May 2007 through September 2007

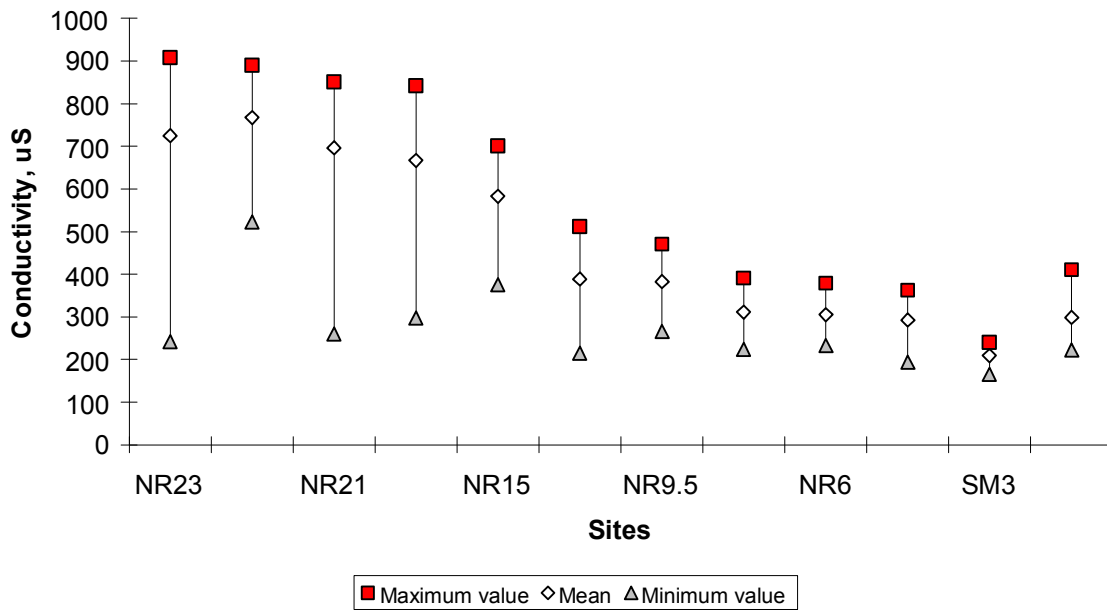


Figure 4 Comparison of monthly rainfall (inches) from May to September for years 2006 and 2007

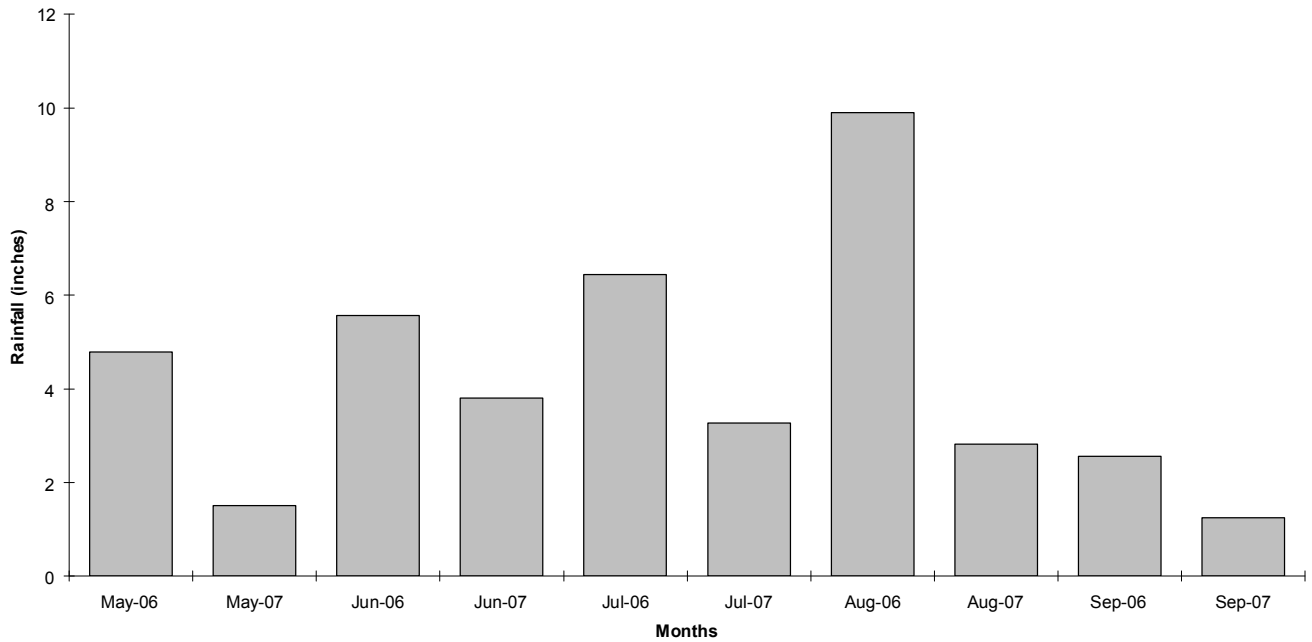
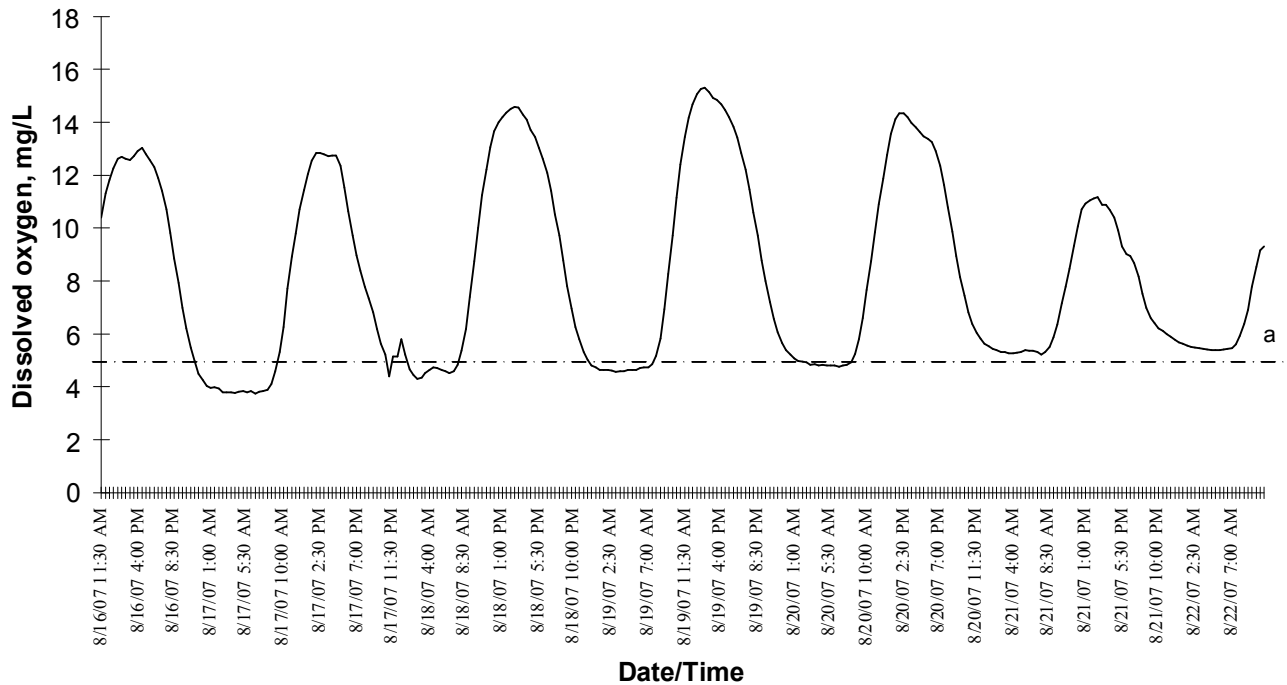


Figure 5 Dissolved oxygen levels at Site NR20 from August 16, 2007 11:30AM to August 22, 2007 11:00AM



^aCT DEP Class B river criterion

IV. Discussion:

Lack of rainfall continues to be a problem for the Norwalk River watershed. From 5/1 through 9/30 a total of 10.18 inches fell in decreasing amounts as the autumn months approached (Figure 4) compared to 29.24 inches during the same period in 2006. Water levels dropped as the summer wore on with progressively drier months and many of the smaller tributaries began to dry up. Nevertheless, HW/RW was able to capture the effect of three storms, 8/8, 8/22 and 9/12 within a day of the event (Table 2, Table B1).

The storm effects of 1.56 inches on 8/8 were observed just as the rain ceased (Table 2, Table B1). *E. coli* bacteria counts were very elevated, especially at Sites NR23, NR13 and SM3 (Table 2, Table B2). The 18,000 CFU/100 mLs *E. coli* count observed at Site NR13 suggests that septic infiltration or a broken sewer main may be nearby (Table 2, Table B1). *E. coli* input from this source may only occur with heavy rain. For several years HW/RW has attempted to locate this random pollution source at Site NR13 with investigation leading up nearby Cooper Brook to the Ancona Market¹ on Route 102.

¹ Some polluted samples were taken from the small tributary flowing behind the Ancona Market, but efforts have been frustrated every time the tributary dries up. The small creek is presently dry. HW/RW has not observed gray water at Site NR13 or anywhere else in the immediate area providing a clue as to the location of a bacteria source.

The 12,000 CFU/100 mLs count at Site NR23 comes from Steep Brook, which flows through the center of Ridgefield parallel to Main Street. HW/RW has continuously monitored five sites on this brook for over six years. The observed E. coli bacteria counts in this brook appear to come from many sources. These include storm-water input from storm drain laterals that discharge to the brook, septic infiltration and in one case, a telephone pole carelessly driven through a sewer main.

The 11,780 CFU/100 mLs bacteria count observed at Site SM3 on 8/8 is a record maximum for this site (Table 2). Possible sources are many and may include septic infiltration as well as input from storm water runoff. Heavy rains bring a strong smell of sewage to this site (personal observation) but no evidence of gray water.

Reduced DO levels observed at Sites NR21 and NR20 on 7/19 and 7/25 (Figure 2, Table B1) are partially the result of water standing in the Great Swamp (Figure 2A) prior to its discharge to the river at Site NR21. Hot weather and reduced flow help create the conditions for low DO values (Table B1). In an effort to better understand what happens over time with DO values at one of the more stressed sites HW/RW deployed a YSI Sonde 600 XLM probe at Site NR20 (Figure A2) for a period of six days (8/16 through 8/22). The probe was programmed to record DO levels every half hour (Figure 5). Results indicate that DO levels can vary as much as 6 mg/L in a single day with the lowest levels frequently dropping to <5mg/L at night (Figure 5).

Conductivity means for the Norwalk River are elevated at Site NR23 through Site NR13 (Figure 3). Cooper Brook, Comstock Brook and the Silvermine River all have lower conductivity values and reduce Norwalk River conductivity as the river flows south to Long Island Sound (Figure 3). All conductivity means are 80 to 100 μ S higher than what was observed from 5/1 through 7/30 due to lower flow and less water, which tends to raise conductivity values in the Norwalk River (Figure 3). Only the Silvermine River Site SM3 conductivity mean has remained constant around 200 μ S (Figure 3).

V. Index of Figures, Tables and Appendices:

Figure 1 Maximum, geometric means, and minimum values of E. coli bacteria concentrations at 12 monitoring sites in the Norwalk River Watershed from May 2007 through September 30 2007

Figure 2 Maximum, mean and minimum values for dissolved oxygen at 12 sampling sites in the Norwalk River Watershed from May 2007 through September 30 2007

Figure 3 Maximum, mean and minimum value for conductivity at 12 sampling sites in the Norwalk River Watershed from May 2007 through September 30 2007

Figure 4 Comparison of monthly rainfall (inches) from May through September for years 2006 and 2007

Figure 5 Dissolved oxygen levels at Site NR20 from August 16, 2007 11:30AM to August 22, 2007 11:00AM

Table 1 CT DEP criterion for E. coli bacteria levels as applied to recreational use, effective 12/17/2002

Table 2 May 2007 through September 2007 E. coli bacteria concentrations, geometric means and % frequency exceeding 410 colonies/100 mLs at 12 sampling sites in the Norwalk River Watershed for the period of time when the two Ridgefield and the Georgetown wastewater treatment facilities are required by NPDES permits to disinfect effluent discharges

Appendix A

Table A1 Site identification, site location, GPS coordinates and town for sampling and testing (headwaters to the mouth)

Figure A2 Norwalk River testing sites

Appendix B

Table B1 Date, time, air & water temperature, dissolved oxygen, conductivity, fecal coliform bacteria, *E. coli* bacteria, rainfall number of days prior to sampling, and QA/QC activity for monitoring events in the Norwalk River Watershed, May 2007 through September 2007

Table B2 Results of fecal coliform bacteria counts (colonies/100 mLs H₂O) inter-laboratory services with the Norwalk Public Health Laboratory (NPHL)

Appendix C

Interpretation of graphs

Appendix D

Glossary

VI. References

Harris, R. B. and P. J. Fraboni: Quality Assurance/Quality Control Plan for the Norwalk River Watershed Monitoring Project (QA No. CT00162) (re-approved October 2001 and extending to September 2002).

US Environmental Protection Agency. 1986. Ambient Water Quality Criteria for Bacteria, US EPA 440/5-84-002, Washington, DC.

Harris, R. B. and P. J. Fraboni. 1999. Water Quality Data Final Report for the Norwalk River Watershed (June 1998 –May 1999).

Harris, R. B. and P. J. Fraboni. 2000. Water Quality Data Final Report for the Norwalk River Watershed (July 1999–September 2000).

Harris, R. B. and P. J. Fraboni. 2001. Water Quality Data Final Report for the Norwalk River Watershed (July 2001 –September 2001).

CT DEP, Water Quality Standard 12/17/02

VII. Reporting Period

Summary report for a five month monitoring period, May through September 2007

Monthly progress reports are available from June 1998 through June 2007

cc: Norwalk River Watershed Initiative Committee Co-Chairs
Norwalk River Watershed Association
Norwalk River Watershed Towns- Conservation Commissions- Norwalk, Wilton, Ridgefield, and Redding

Appendix A

Table A1 Site number identification, site location and town for sampling and testing
(headwaters to mouth), *=tributary to the Norwalk River

Site No.	Site Area	Town	GPS Coordinates
NR21	Farmingville Road at the Great Swamp outlet	Ridgefield	Latitude: N 41° 17' 40.2" Longitude: W 73° 29' 18.5"
NR20	Route 35 at Fox Hill Condos	Ridgefield	Latitude: N 41° 17' 52.1" Longitude: W 73° 29' 32.2"
NR15	Stonehenge Road at the top of the dam	Ridgefield	Latitude N 41° 18' 32.0" Longitude: W 73° 28' 8.3"
NR13	Branchville at the railroad station (Route 7)	Ridgefield/Wilton	Latitude: N 41° 15' 55.8" Longitude: W 73° 26' 27.2"
NR 9.5	Downstream of the Georgetown Wastewater Treatment Plant -- Old Mill Road	Wilton	Latitude: N 41° 14' 46.0" Longitude: W 73° 26' 2.5"
NR9	School Road	Wilton	Latitude: N 41° 12' 15.3" Longitude: W 73° 25' 51.6"
NR6	Near Wolfpit Road in back of the Wilton Corporate Office Complex	Wilton	Latitude: N 41° 11' 0.1" Longitude: W 73° 25' 18.4"
NR4	Upstream of Route 15 (Glover Avenue) and downstream of the Merritt 7 Office Complex	Norwalk	Latitude: N 41° 8' 3.5" Longitude: W 73° 25' 35.8"
SM3*	James Street (on the Silvermine River)	Norwalk	Latitude: N 41° 8' 10.3" Longitude: W 73° 26' 4.0"
NR1	Post Road (US Route 1) adjacent to the Ash Creek Grille Restaurant	Norwalk	Latitude: N 41° 7' 10.8" Longitude: W 73° 25' 1.3"

Site No.	Site Area	Town	GPS Coordinates
NR23	Steep Brook next to South Street WTP	Ridgefield	Latitude: N 41° 17' 24.3" Longitude: W 73° 29' 35.6"
NR22	South Street WTP outfall	Ridgefield	Latitude: N 41° 17' 26.8" Longitude: W 73° 29' 29.6"

Appendix A2 Location of sampling sites located in the Norwalk River Watershed

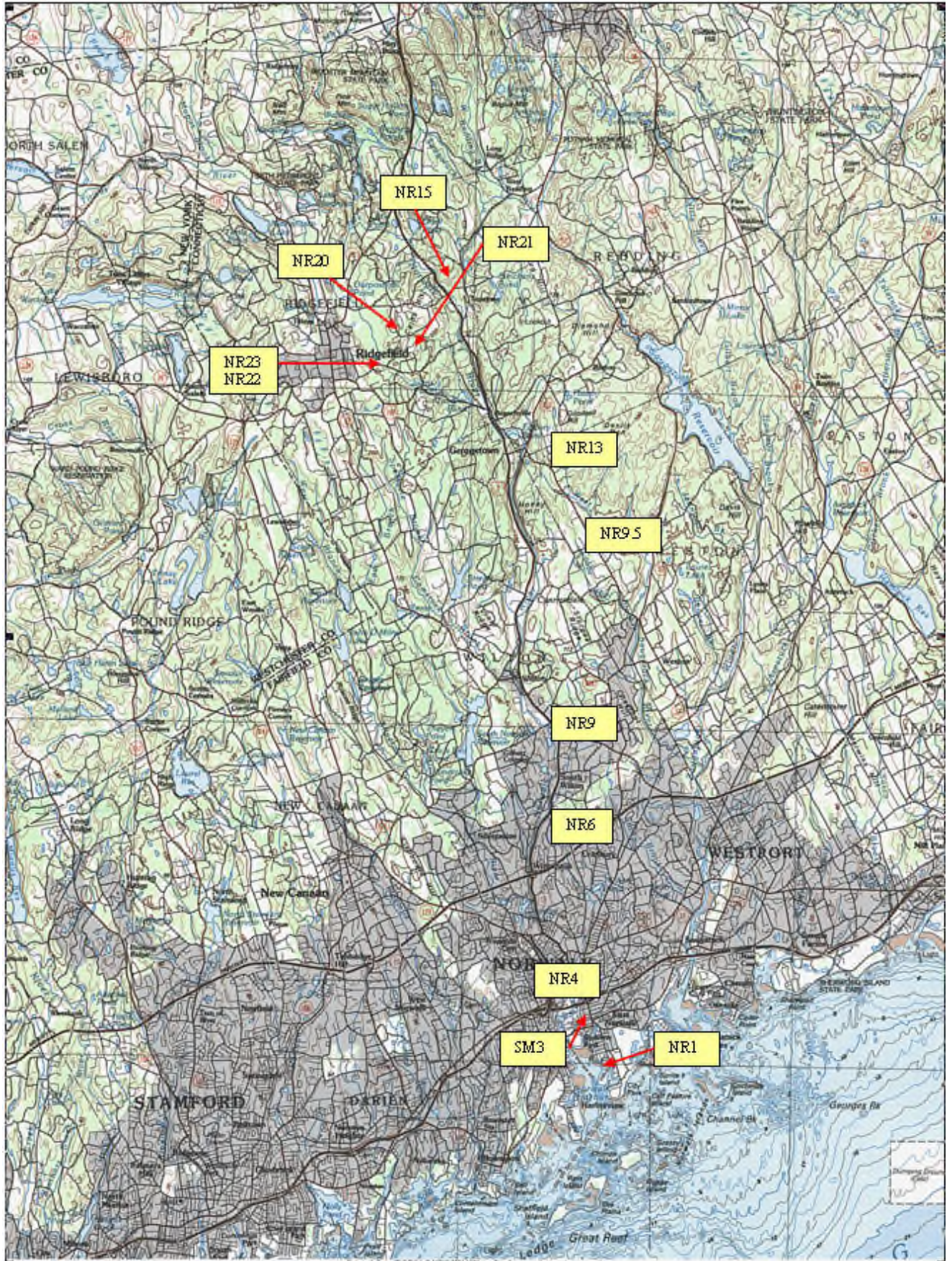


Table B1 Sampling site, date, time, air & water temperature, dissolved oxygen, conductivity, fecal coliform bacteria, *E. coli* bacteria, rainfall number of days prior to sampling, and QA/QC activity for monitoring events in the Norwalk River Watershed May 2007 through September 2007

Site	Date	Time	Air Temp ° C	Water Temp ° C	DO mg/L	Cond uS	Fecal Coliform CFU/100mL	E. coli CFU/100mL	Amount of rain(in)	Days prior to sampling	QA/QC	Fecal Coliform CFU/100 mL
NR23	5/3/07	1030	18.0	11.0	11.7	515	36	8	0.08	1		
NR22	5/3/07	1040	19.0	12.2	9.6	523	0	0	0.08	1		
NR21	5/3/07	1050	19.0	13.2	10.3	393	52	48	0.08	1	Field Blank	0
NR20	5/3/07	1100	17.0	13.2	12.0	421	36	28	0.08	1	Duplicate	36
NR15	5/3/07	1115	19.0	14.1	11.8	376	44	36	0.08	1	Replicate	28
NR13	5/3/07	1130	19.0	13.6	11.7	252	20	16	0.08	1		
NR9.5	5/3/07	1140	19.0	14.0	10.9	288	16	12	0.08	1		
NR9	5/3/07	1123	19.5	13.2	11.0	260	44	44	0.08	1		
NR6	5/3/07	1107	19.0	12.7	11.3	233	48	48	0.08	1	Field Blank	0
NR4	5/3/07	1049	19.0	12.6	11.0	237	136	124	0.08	1	Replicate	112
SM3	5/3/07	1035	17.0	12.7	10.7	182	104	104	0.08	1	Duplicate	80
NR1	5/3/07	1016	17.0	13.1	11.0	231	80	80	0.08	1		
NR23	5/9/07	1040	26.0	14.2	11.5	797	38	6	0.08	7		
NR22	5/9/07	1100	26.0	13.7	8.8	780	0	0	0.08	7		
NR21	5/9/07	1110	27.0	18.1	10.5	630	24	20	0.08	7	Field Blank	0
NR20	5/9/07	1125	24.0	18.3	13.7	623	12	8	0.08	7		
NR15	5/9/07	1135	24.5	17.8	10.3	532	48	42	0.08	7	Duplicate	52
NR13	5/9/07	1150	25.0	17.0	10.8	349	32	26	0.08	7	Replicate	22
NR9.5	5/9/07	1205	23.0	16.6	10.7	314	32	32	0.08	7		
NR9	5/9/07	1149	24.0	15.6	12.2	269	104	92	0.08	7	Field Blank	0
NR6	5/9/07	1128	22.0	15.0	11.5	249	32	24	0.08	7	Replicate	30
NR4	5/9/07	1110	24.0	14.9	11.6	256	198	176	0.08	7	Duplicate	206
SM3	5/9/07	1051	20.0	14.3	9.9	202	70	48	0.08	7		
NR1	5/9/07	1025	24.0	15.4	10.1	253	50	40	0.08	7		
NR23	5/17/07	1050	16.0	14.8	9.6	525	4060	3240	0.80	1		
NR22	5/17/07	1105	17.0	16.2	9.3	795	23	19	0.80	1	Field Blank	0
NR21	5/17/07	1115	16.0	16.8	5.3	630	460	380	0.80	1	Replicate	400
NR20	5/17/07	1126	18.0	17.6	6.4	584	700	660	0.80	1	Duplicate	600
NR15	5/17/07	1140	16.0	17.8	9.1	530	880	780	0.80	1		
NR13	5/17/07	1151	17.0	17.5	9.3	338	480	440	0.80	1		
NR9.5	5/17/07	1145	17.0	17.6	9.7	291	440	440	0.80	1		
NR9	5/17/07	1030	18.0	17.2	9.6	277	580	580	0.80	1	Field Blank	0
NR6	5/17/07	1115	18.0	17.0	9.7	258	500	480	0.80	1	Duplicate	440
NR4	5/17/07	1100	20.0	17.2	9.8	250	1040	980	0.80	1	Replicate	1060
SM3	5/17/07	1045	18.0	17.0	9.5	203	280	280	0.80	1		
NR1	5/17/07	1025	17.0	17.4	9.5	239	1040	1040	0.80	1		
NR23	5/24/07	1030	21.0	14.1	9.2	822	70	70	0.10	6	Duplicate	n/g
NR22	5/24/07	1045	22.0	15.8	9.8	811	1	1	0.10	6		
NR21	5/24/07	1055	24.0	17.1	8.1	700	38	36	0.10	6	Replicate	38
NR20	5/24/07	1105	23.0	18.1	12.6	700	48	48	0.10	6	Field Blank	0
NR15	5/24/07	1115	24.0	17.4	8.6	589	138	118	0.10	6		
NR13	5/24/07	1125	24.0	17.0	9.1	365	68	64	0.10	6		
NR9.5	5/24/07	1147	24.0	17.5	8.7	361	50	38	0.10	6		
NR9	5/24/07	1132	24.0	15.4	9.3	322	134	132	0.10	6	Duplicate	144
NR6	5/24/07	1107	23.0	15.6	9.7	290	720	80	0.10	6	Replicate	660
NR4	5/24/07	1050	27.0	16.3	10.8	297	200	180	0.10	6	Field Blank	0

SM3	5/24/07	1037	22.5	15.1	9.4	215	108	104	0.10	6		
NR1	5/24/07	1017	21.0	16.7	10.1	289	110	92	0.10	6		

			Air Temp ° C	Water Temp ° C	DO mg/L	Cond µS	Fecal Coliform CFU/100 mL	<i>E. coli</i> CFU/100mL	Amount of rain(in)	Days prior to sampling	QA/QC	Fecal Coliform. CFU/100 mL
Site	Date	Time										
NR23	6/7/07	1025	17.0	13.4	10.0	735	64	52	1.51	3	Duplicate	70
NR22	6/7/07	1036	18.0	16.4	10.6	740	1	1	1.51	3	Field Blank	0
NR21	6/7/07	1045	21.0	15.2	8.1	620	124	106	1.51	3	Replicate	112
NR20	6/7/07	1052	19.0	16.5	8.5	586	210	206	1.51	3		
NR15	6/7/07	1103	20.0	16.8	9.6	445	112	86	1.51	3		
NR13	6/7/07	1112	20.0	16.6	9.8	365	110	96	1.51	3		
NR9.5	6/7/07	1140	20.0	17.7	9.3	327	118	70	1.51	3	Field Blank	0
NR9	6/7/07	1120	19.0	16.4	9.4	304	128	128	1.51	3	Duplicate	92
NR6	6/7/07	1105	19.0	16.2	9.7	300	440	440	1.51	3		
NR4	6/7/07	1050	20.0	16.7	10.1	290	580	480	1.51	3	Replicate	600
SM3	6/7/07	1035	19.0	16.6	10.4	189	168	130	1.51	3		
NR1	6/7/07	1014	18.0	17.4	9.5	268	280	200	1.51	3		
NR23	6/13/07	1100	20.0	16.4	9.2	793	220	144	0.38	2		
NR22	6/13/07	1128	18.0	17.9	6.6	800	1	1	0.38	2	Field Blank	0
NR21	6/13/07	1121	18.0	18.8	9.3	837	220	156	0.38	2	Replicate	168
NR20	6/13/07	1137	18.0	18.0	6.5	754	276	220	0.38	2		
NR15	6/13/07	1150	18.0	19.5	8.3	593	480	420	0.38	2	Duplicate	520
NR13	6/13/07	1220	19.0	18.9	8.0	395	204	180	0.38	2		
NR9.5	6/13/07	1210	17.0	19.6	8.4	351	pink	320	0.38	2		
NR9	6/13/07	1154	17.0	17.9	8.6	293	288	288	0.38	2	Duplicate	n/g
NR6	6/13/07	1135	17.0	18.3	8.6	261	500	420	0.38	2	Field Blank	0
NR4	6/13/07	1110	18.0	18.3	8.9	257	1580	1160	0.38	2	Replicate	1500
SM3	6/13/07	1059	17.0	18.8	8.2	222	440	360	0.38	2		
NR1	6/13/07	1039	17.0	19.1	8.7	261	pink	700	0.38	2		
NR23	6/21/07	1040	20.0	16.9	9.4	896	152	148	0.04	1		
NR22	6/21/07	1049	22.0	19.3	9.6	890	1	1	0.04	1		
NR21	6/21/07	1100	23.0	18.8	7.8	851	380	360	0.04	1	Field Blank	0
NR20	6/21/07	1109	23.0	20.7	10.4	842	156	128	0.04	1		
NR15	6/21/07	1121	23.0	18.0	8.6	666	480	420	0.04	1	Replicate	428
NR13	6/21/07	1132	23.0	19.3	9.0	440	380	380	0.04	1	Duplicate	340
NR9.5	6/21/07	1040	22.0	20.1	8.6	348	108	92	0.04	1	Duplicate	82
NR9	6/21/07	1125	22.0	17.0	9.4	249	100	100	0.04	1	Field Blank	0
NR6	6/21/07	1115	22.0	18.0	8.7	258	232	232	0.04	1	Replicate	172
NR4	6/21/07	1053	22.0	19.3	8.6	269	180	180	0.04	1		
SM3	6/21/07	1039	22.0	19.0	8.3	183	184	168	0.04	1		
NR1	6/21/07	1020	22.0	20.4	9.4	257	920	760	0.04	1		
NR23	6/27/07	1020	29.0	20.8	8.9	908	136	120	0.04	6	Duplicate	148
NR22	6/27/07	1041	31.0	21.3	9.4	820	1	1	0.04	6		
NR21	6/27/07	1054	32.0	22.8	6.9	849	264	256	0.04	6	Field Blank	0
NR20	6/27/07	1102	30.0	24.9	8.1	816	84	84	0.04	6		
NR15	6/27/07	1115	30.0	22.7	8.0	686	760	580	0.04	6		
NR13	6/27/07	1130	29.0	22.9	8.5	395	340	340	0.04	6	Replicate	288
NR9.5	6/26/07	1231	32.0	21.9	8.7	373	42	38	0.04	6		
NR9	6/26/07	1155	32.0	19.1	9.1	272	84	68	0.04	6	Replicate	72
NR6	6/26/07	1140	30.0	20.3	8.6	285	228	156	0.04	6		

NR4	6/26/07	1123	31.0	22.0	8.8	293	220	132	0.04	6	Field Blank	0
SM3	6/26/07	1103	30.0	20.0	8.1	200	160	128	0.04	6		
NR1	6/26/07	1047	31.0	22.3	8.9	301	500	220	0.04	6	Duplicate	460

			Air Temp	Water Temp	DO	Cond	Fecal Coliform	E. coli	Amount of	Days prior to		Fecal Coliform
Site	Date	Time	° C	° C	mg/L	uS	CFU/100 mL	CFU/100 mL	rain(in)	sampling	QA/QC	CFU/100 mL
NR23	7/5/07	1048	25.0	19.0	6.7	544	1800	1800	0.62	1		
NR22	7/5/07	1059	26.0	19.3	9.5	792	1	1	0.62	1		
NR21	7/5/07	1106	26.0	20.2	5.6	645	840	760	0.62	1	Field Blank	0
NR20	7/5/07	1119	27.0	20.7	7.4	620	1000	1000	0.62	1	Duplicate	940
NR15	7/5/07	1131	25.0	20.1	8.1	654	1940	800	0.62	1	Replicate	1600
NR13	7/5/07	1145	27.0	19.7	8.2	410	480	480	0.62	1		
NR9.5	7/5/07	1132	24.0	20.3	8.1	382	250	140	0.62	1	Duplicate	200
NR9	7/5/07	1115	26.0	17.6	8.9	305	190	190	0.62	1		
NR6	7/5/07	1058	27.0	18.0	8.0	290	1200	1180	0.62	1	Replicate	880
NR4	7/5/07	1045	26.0	19.3	8.4	287	900	900	0.62	1	Field Blank	0
SM3	7/5/07	1031	26.0	18.6	8.2	215	4400	4400	0.62	1		
NR1	7/5/07	1002	24.0	20.0	7.7	301	1800	1420	0.62	1		
NR23	7/11/07	1047	27.0	21.2	7.6	882	580	580	0.23	0		
NR22	7/11/07	1053	28.0	22.6	9.3	800	1	1	0.23	0	Field Blank	0
NR21	7/11/07	1100	27.5	22.8	5.4	851	216	204	0.23	0		
NR20	7/11/07	1109	28.0	24.0	3.3	827	76	60	0.23	0	Replicate	60
NR15	7/11/07	1120	27.0	23.6	7.1	669	244	188	0.23	0		
NR13	7/11/07	1133	27.0	23.9	6.7	330	192	136	0.23	0	Duplicate	246
NR9.5	7/11/07	1205	27.0	24.2	7.5	460	30	28	0.23	0		
NR9	7/11/07	1228	28.0	21.6	8.0	358	104	88	0.23	0		
NR6	7/11/07	1240	27.0	23.1	7.5	352	500	420	0.23	0	Field Blank	0
NR4	7/11/07	1256	29.0	24.6	9.5	341	620	460	0.23	0	Replicate	500
SM3	7/10/07	1301	31.0	25.1	8.2	224	144	144	0.23	0		
NR1	7/11/07	1313	29.0	26.0	8.9	326	800	300	0.23	0	Duplicate	800
NR23	7/19/07	1040	22.7	18.5	8.8	706	440	440	0.85	1		
NR22	7/19/07	1057	22.6	21.6	8.6	776	1	1	0.85	1	Field Blank	0
NR21	7/19/07	1106	22.6	21.5	6.1	645	480	380	0.85	1		
NR20	7/19/07	1115	22.6	22.5	8.8	574	380	360	0.85	1	Duplicate	240
NR15	7/19/07	1127	22.6	22.7	8.1	649	260	240	0.85	1	Replicate	340
NR13	7/19/07	1139	22.6	22.3	8.4	493	580	420	0.85	1		
NR9.5	7/19/07	1139	27.0	23.1	8.0	429	76	64	0.85	1		
NR9	7/19/07	1118	27.0	20.3	8.6	332	296	268	0.85	1	Duplicate	204
NR6	7/19/07	1057	26.0	20.7	7.8	323	332	332	0.85	1		
NR4	7/19/07	1043	27.0	21.7	10.0	292	1140	600	0.85	1	Replicate	1200
SM3	7/19/07	1028	25.0	21.3	7.8	221	960	790	0.85	1	Field Blank	0
NR1	7/19/07	1013	26.0	22.5	8.2	277	840	580	0.85	1		
NR23	7/25/07	715	18.2	18.0	8.3	725	180	124	0.80	2	Replicate	236
NR22	7/25/07	725	18.4	20.6	8.6	776	1	1	0.80	2		
NR21	7/25/07	736	18.3	18.0	4.0	734	540	420	0.80	2	Field Blank	0
NR20	7/25/07	743	18.4	18.7	3.6	624	112	84	0.80	2		
NR15	7/25/07	756	18.5	20.3	8.0	564	376	368	0.80	2		
NR13	7/25/07	1146	26.0	21.3	9.1	477	304	272	0.80	2	Duplicate	300
NR9.5	7/25/07	1135	26.0	22.0	8.1	428	190	180	0.80	2		
NR9	7/25/07	1119	26.0	19.6	8.7	385	112	102	0.80	2		
NR6	7/25/07	1102	28.0	20.0	9.0	378	180	172	0.80	2	Duplicate	204
NR4	7/25/07	1045	28.0	20.9	11.2	310	440	280	0.80	2	Field Blank	0
SM3	7/25/07	1033	25.0	20.3	8.5	217	184	156	0.80	2		
NR1	7/25/07	1012	25.0	21.8	9.6	292	460	180	0.80	2	Replicate	500

			Air Temp	Water Temp	DO	Cond	Fecal Coliform	E. coli	Amount of	Days prior to		Fecal Coliform
Site	Date	Time	° C	° C	mg/L	uS	CFU/100 mL	CFU/100 mL	rain(in)	sampling	QA/QC	CFU/100 mL
NR23	8/1/07	1126	31.5	21.9	7.7	866	60	40	0.14	3		
NR22	8/1/07	1040	32.0	22.4	9.1	664	1	0	0.14	3		
NR21	8/1/07	1049	34.0	21.8	5.2	837	720	580	0.14	3	Replicate	n/g
NR20	8/1/07	1055	30.0	23.4	6.8	830	208	156	0.14	3	Duplicate	140
NR15	8/1/07	1108	29.0	22.3	7.7	545	540	520	0.14	3	Field Blank	0
NR13	8/1/07	1119	30.0	23.3	7.0	215	640	520	0.14	3		
NR9.5	8/1/07	1154	29.0	23.6	7.8	452	82	82	0.14	3		
NR9	8/1/07	1138	30.0	21.1	9.1	368	240	240	0.14	3	Duplicate	240
NR6	8/1/07	1115	30.0	21.8	8.5	379	228	180	0.14	3		
NR4	8/1/07	1100	30.0	23.4	126.6	362	620	480	0.14	3	Field Blank	0
SM3	8/1/07	1045	26.5	22.6	7.9	232	60	60	0.14	3	Replicate	60
NR1	8/1/07	1025	27.0	23.8	9.3	362	1180	500	0.14	3		
NR23	8/8/07	1110	28.0	23.0	8.4	242	16800	12000	1.56	0		
NR22	8/8/07	1120	30.0	23.0	8.7	768	0	0	1.56	0		
NR21	8/8/07	1130	31.0	23.6	5.1	260	11500	9800	1.56	0		
NR20	8/8/07	1145	30.0	24.5	6.9	297	10600	9300	1.56	0	Field Blank	0
NR15	8/8/07	1154	28.0	25.2	7.3	476	10200	9100	1.56	0	Replicate	10000
NR13	8/8/07	1209	30.0	23.9	7.8	271	20400	18000	1.56	0	Duplicate	TNTC
NR9.5	8/8/07	1147	28.0	23.7	8.2	267	9200	7720	1.56	0	Duplicate	TNTC
NR9	8/8/07	1131	28.0	23.6	8.0	244	3100	2600	1.56	0		
NR6	8/8/07	1114	27.5	22.6	8.6	262	pink	4300	1.56	0	Field Blank	0
NR4	8/8/07	1100	30.0	23.9	8.5	195	6300	5500	1.56	0	Replicate	TNTC
SM3	8/8/07	1049	27.0	23.0	8.4	165	12400	11780	1.56	0		
NR1	8/8/07	1027	27.5	24.5	8.4	277	7100	4600	1.56	0		
NR23	8/16/07	1128	26.0	19.8	8.7	817	900	900	0.07	3		
NR22	8/16/07	1048	22.0	21.4	9.0	749	0	0	0.07	3		
NR21	8/16/07	1103	25.0	21.1	6.7	746	420	420	0.07	3	Field Blank	0
NR20	8/16/07	1113	25.0	22.3	7.7	739	80	80	0.07	3	Replicate	72
NR15	8/16/07	1142	25.0	21.2	8.0	558	380	380	0.07	3	Duplicate	300
NR13	8/16/07	1156	25.0	21.8	8.5	423	184	184	0.07	3		
NR9.5	8/16/07	1134	26.0	22.8	7.7	422	120	72	0.07	3	Duplicate	120
NR9	8/16/07	1105	26.0	20.6	8.2	391	200	120	0.07	3		
NR6	8/16/07	1040	25.0	20.7	8.3	369	380	360	0.07	3	Field Blank	0
NR4	8/16/07	1024	27.0	21.3	9.0	356	480	220	0.07	3	Replicate	460
SM3	8/16/07	1011	25.0	20.9	7.0	210	60	56	0.07	3		
NR1	8/16/07	956	27.0	22.3	8.6	356	300	300	0.07	3		
NR23	8/22/07	1032	16.0	15.5	9.8	592	1260	840	0.62	1		
NR22	8/22/07	1042	17.0	19.1	9.5	739	0	0	0.62	1		
NR21	8/22/07	1000	18.0	16.0	6.1	640	500	440	0.62	1	Field Blank	0
NR20	8/22/07	1105	17.0	16.0	8.3	516	540	440	0.62	1		
NR15	8/22/07	1126	17.0	17.1	9.4	611	400	400	0.62	1	Replicate	320
NR13	8/22/07	1140	16.0	16.7	9.7	480	1000	740	0.62	1	Duplicate	920
NR9.5	8/22/07	1121	19.0	17.5	8.3	328	184	148	0.62	1	Replicate	n/g
NR9	8/22/07	1101	19.0	15.8	9.1	224	280	240	0.62	1		
NR6	8/22/07	10.45	19.0	16.0	9.3	252	740	740	0.62	1	Field Blank	0
NR4	8/22/07	1028	19.0	16.4	8.1	253	680	600	0.62	1		
SM3	8/22/07	1016	19.0	16.7	8.2	174	760	660	0.62	1		
NR1	8/22/07	957	19.0	17.3	8.6	223	1800	1500	0.62	1	Duplicate	1500

			Air Temp	Water Temp	DO	Cond	Fecal Coliform	E. coli	Amount of	Days prior to		Fecal Coliform
Site	Date	Time	° C	° C	mg/L	uS	CFU/100 mL	CFU/100 mL	rain(in)	sampling	QA/QC	CFU/100 mL
NR23	9/5/07	1031	20.0	16.9	9.6	806	144	100	0.00	7	Duplicate	140
NR22	9/5/07	1046	22.0	20.4	10.5	709	1	1	0.00	7		
NR21	9/5/07	1058	22.0	18.2	7.6	694	280	248	0.00	7	Replicate	264
NR20	9/5/07	1110	21.5	18.4	7.8	704	124	120	0.00	7	Field Blank	0
NR15	9/5/07	1120	21.0	17.6	8.2	582	340	340	0.00	7		
NR13	9/5/07	1144	21.0	18.2	7.3	353	132	96	0.00	7		
NR9.5	9/5/07	1128	21.0	18.2	9.0	468	96	96	0.00	7		
NR9	9/5/07	1111	20.0	17.2	9.9	365	56	50	0.00	7		
NR6	9/5/07	1052	20.0	17.7	8.7	372	400	180	0.00	7		
NR4	9/5/07	1035	20.0	19.1	11.3	359	460	300	0.00	7	Field Blank	0
SM3	9/5/07	1020	19.0	18.8	8.5	238	92	80	0.00	7	Duplicate	72
NR1	9/5/07	1000	19.0	18.4	9.6	407	760	720	0.00	7	Replicate	696
NR23	9/12/07	1050	23.0	17.5	8.6	656	2700	1800	1.00	1		
NR22	9/12/07	1112	23.0	21.4	8.4	860	0	0	1.00	1		
NR21	9/12/07	1140	25.0	19.4	5.2	784	580	400	1.00	1	Duplicate	500
NR20	9/12/07	1153	22.0	20.5	8.7	738	480	420	1.00	1	Replicate	420
NR15	9/12/07	1205	20.0	18.5	8.2	701	620	480	1.00	1		
NR13	9/12/07	1220	21.0	19.3	7.5	461	880	620	1.00	1		
NR9.5	9/12/07	1150	19.5	18.9	8.6	440	820	660	1.00	1		
NR9	9/12/07	1135	20.0	17.7	8.5	299	720	580	1.00	1		
NR6	9/12/07	1120	20.0	18.2	8.6	280	3000	2000	1.00	1		
NR4	9/12/07	1100	23.5	19.7	10.1	256	2000	1100	1.00	1	Duplicate	2000
SM3	9/12/07	1048	19.5	19.6	8.3	220	2600	1600	1.00	1	Replicate	2260
NR1	9/12/07	1028	20.0	19.7	8.6	260	3000	1800	1.00	1		
NR23	9/20/07	1120	24.0	15.3	10.1	832	224	200	0.17	5	Field Blank	0
NR22	9/20/07	1130	25.0	18.4	10.2	751	0	0	0.17	5		
NR21	9/20/07	1140	26.0	16.7	7.6	762	152	132	0.17	5		
NR20	9/20/07	1147	26.0	16.8	10.2	735	92	84	0.17	5		
NR15	9/20/07	1205	24.0	14.6	9.4	588	136	136	0.17	5	Duplicate	180
NR13	9/20/07	1212	25.0	14.8	9.3	443	84	80	0.17	5		
NR9.5	9/20/07	1214	22.0	15.2	9.3	457	40	36	0.17	5		
NR9	9/20/07	1153	21.0	15.0	9.7	354	64	60	0.17	5	Field Blank	0
NR6	9/20/07	1125	22.0	14.8	9.5	354	216	208	0.17	5	Duplicate	256
NR4	9/20/07	1109	24.0	16.2	12.2	345	164	160	0.17	5	Replicate	156
SM3	9/20/07	1053	21.0	15.0	9.0	233	92	92	0.17	5		
NR1	9/20/07	1037	19.0	16.0	9.9	378	800	740	0.17	5		
NR23	9/26/07	1140	28.0	18.7	9.4	842	420	160	0.00	7	Replicate	344
NR22	9/26/07	1148	29.0	20.4	9.2	800	1	1	0.00	7	Field Blank	0
NR21	9/26/07	1202	29.0	20.7	7.4	818	84	60	0.00	7	Duplicate	80
NR20	9/26/07	1217	28.0	21.8	9.7	816	92	80	0.00	7		
NR15	9/26/07	1230	29.0	19.0	8.2	651	248	232	0.00	7		
NR13	9/26/07	1245	29.0	19.3	8.6	512	260	160	0.00	7		
NR9.5	9/26/07	1228	25.0	18.5	8.9	470	60	42	0.00	7		
NR9	9/26/07	1208	26.0	17.6	9.9	354	154	136	0.00	7		
NR6	9/26/07	1144	26.0	18.0	8.7	358	160	124	0.00	7	Field Blank	0
NR4	9/26/07	1125	26.0	19.4	12.8	344	480	260	0.00	7		
SM3	9/26/07	1106	23.0	17.7	8.5	240	60	32	0.00	7	Duplicate	48
NR1	9/26/07	1045	24.0	18.8	9.7	410	420	360	0.00	7	Replicate	420

Table B2 Results of fecal coliform bacteria counts (colonies/100 mLs) inter-laboratory services with the Norwalk Public Health Laboratory (NPHL)

Date	Site	Fecal coliform bacteria counts (NPHL)	Fecal coliform bacteria counts HW/RW Lab
5/3/2007	NR20	n/a	36/30
5/3/2007	SM3	n/a	104/80
5/9/2007	NR15	n/a	48/52
5/9/2007	NR4	n/a	198/2006
5/17/2007	NR20	n/a	700/600
5/17/2007	NR6	n/a	500/440
5/24/2007	NR23	0	70/ng
5/24/2007	NR9	164	134/144
6/7/2007	NR23	120	64/70
6/7/2007	NR9	190	128/92
6/13/2007	NR15	420	480/520
6/13/2007	NR9	400	288/ng
6/21/2007	NR13	n/a	390/340
6/21/2007	NR9.5	n/a	108/82
6/27/2007	NR23	140	136/148
6/27/2007	NR1	n/a	500/460
7/5/2007	NR20	960	1000/940
7/5/2007	NR9.5	520	250/200
7/11/2007	NR13	224	192/246
7/11/2007	NR1	620/960	800/800
7/19/2007	NR20	244	380/240
7/19/2007	NR9	284	296/204
7/25/2007	NR13	380	304/300
7/25/2007	NR6	216	180/204
8/1/2007	NR20	144	208/140
8/1/2007	NR9	300	240/240
8/8/2007	NR13	19,600	20,400
8/8/2007	NR9.5	14,500	9,200
8/16/2007	NR15	396	380
8/16/2007	NR9.5	108	120/120
8/22/2007	NR13	620	1000/920
8/22/2007	NR1	1300	1800/1500
9/5/2007	NR23	n/a	144/140
9/5/2007	SM3	n/a	92/72
9/12/2007	NR21	640	580/500
9/12/2007	NR4	2100	2000/2000
9/20/2007	NR15	n/a	136/180

9/20/2007	NR6	n/a	216/256
9/26/2007	NR21	n/a	84/80
9/26/2007	SM3	n/a	60/48

Appendix C

How to read the graphs in this report

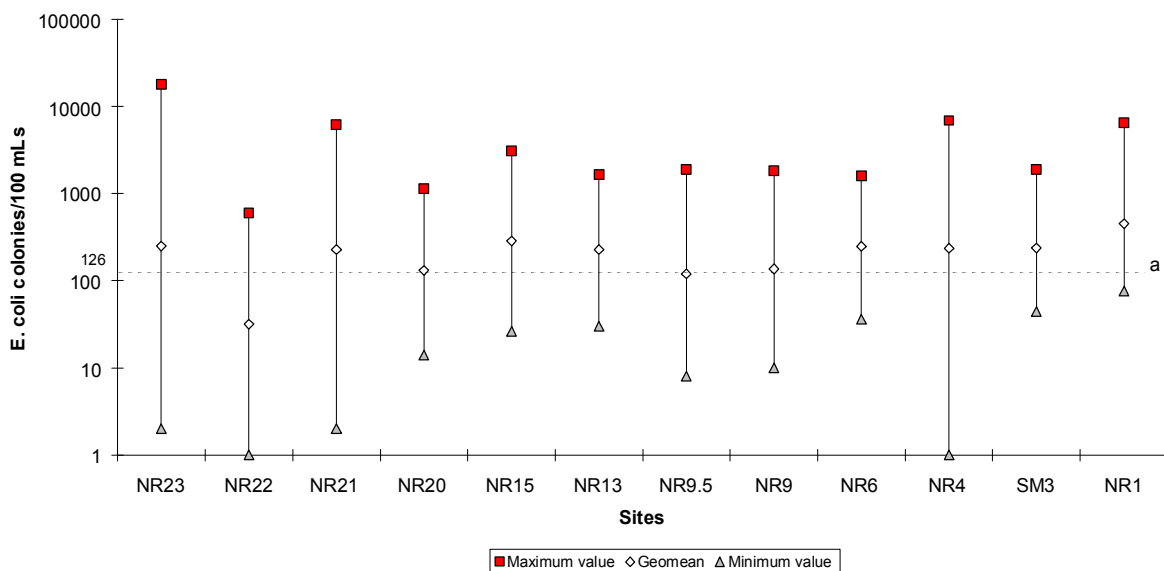
Monitoring data are presented in this report with graphs and tables. Selected Figures and Tables are used to highlight critical parameters of the Norwalk River's water quality on either a monthly or total project basis. The following are some examples of the types of graphs and how to read them.

Graphs of Physical and Bacteria Data

Physical and bacteria data are graphed in the following way:

During a sampling period (usually a three month period) the *E. coli* colony concentration, the dissolved oxygen level and the conductivity are graphed by displaying the maximum value, the minimum value, and the mean or geomean value for each sampling site. The graph below is an example of a graph displaying *E. coli* counts

An example of a graph for maximum, geometric means, and minimum values of *E. coli* bacteria concentrations at 12 monitoring sites in the Norwalk River Watershed when the two Ridgefield and one Georgetown wastewater treatment facilities are required by NPDES permits to disinfect sewage effluent

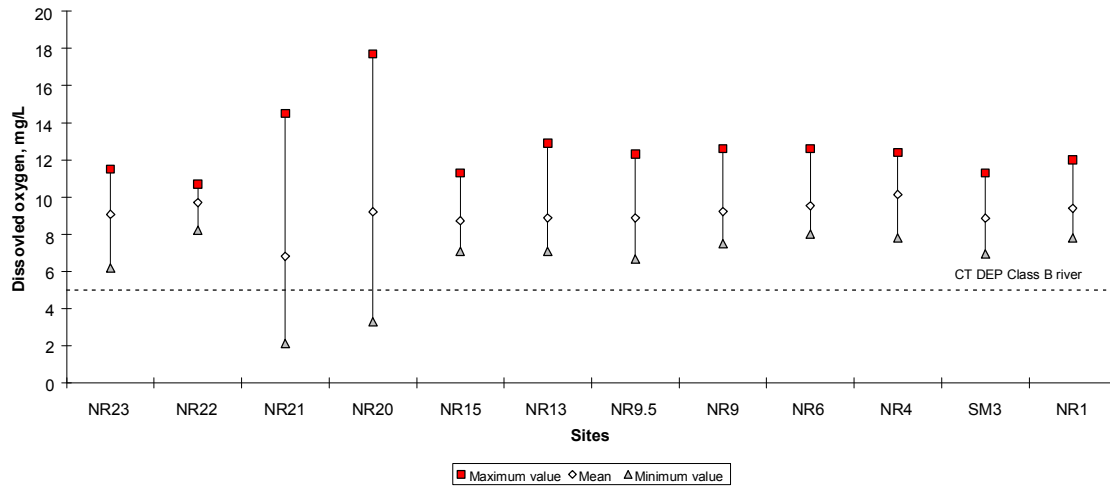


Upstream to Downstream

^aCT DEP water quality geometric mean limit for *E. coli* bacteria level for Class B rivers

The previous graph shows the results for *E. coli* bacteria for the Norwalk River watershed. The sample sites are arranged along the bottom (X-axis), upstream to downstream, left to right. The concentration of *E. coli* bacteria forming units (CFUs) per 100 mL is arranged on the logarithmic scale along the left (Y-axis). The dashed horizontal line at 126 colonies/100 mL (left Y-axis) indicates the geomean *E. coli* criterion in the Connecticut Department of Environmental Protection (CT DEP) Water Quality Standards (WQS) that are set for Class B surface waters. The geometric mean presents results of all sample runs in a way that minimizes the impact on the entire data set by very high or very low individual results. An *E. coli* geometric mean marker extending above this line exceeds the criterion. For example, every site except NR22 exceeded the geomean criterion

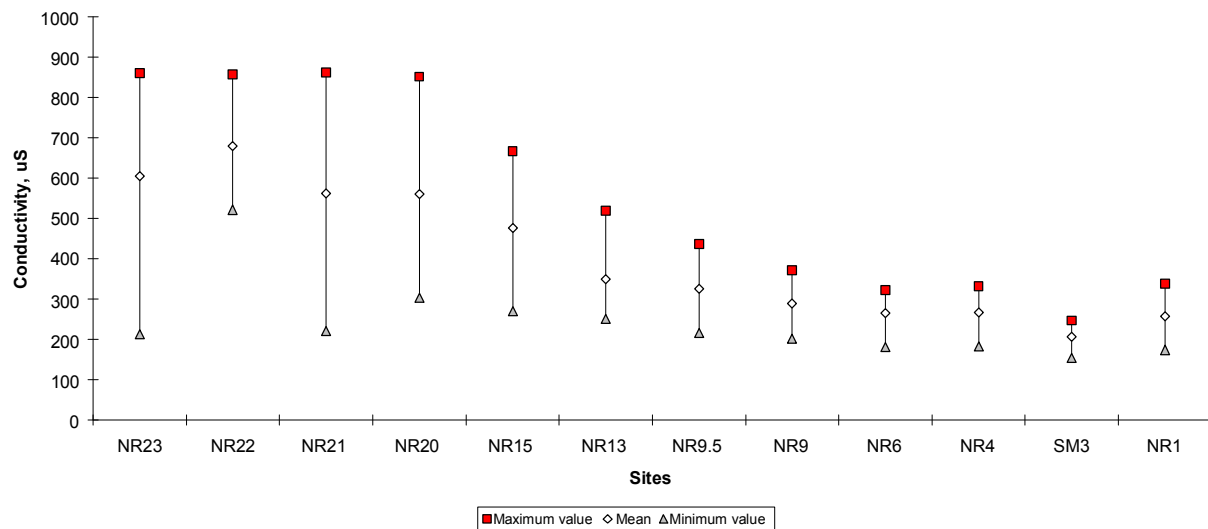
The graph below is an example of a graph showing maximum, mean and minimum values for dissolved oxygen at 12 sampling sites on the Norwalk River Watershed



5 mg/L dissolved oxygen = The CT DEP water quality standard for a Class B rivers

The graph above is read in the same way as the previous one. However, it displays the maximum, minimum values and the mean for dissolved oxygen levels for each sampling site during the sampling period. The dashed horizontal line shows the CT DEP water quality standard for dissolved oxygen for a Class B river. In the example above all mean values for dissolved oxygen meet the CT DEP Class B criterion for dissolved oxygen. However, Sites NR21 and NR20 had minimum readings below the CT DEP criterion.

An example of a Conductivity graph is below.



The line graph above again displays the conductivity range (maximum value to minimum value) with the mean for that range. The conductivity is recorded in micro-Siemens (μ S)

Appendix D

Glossary

Dissolved oxygen: The oxygen dissolved in water and readily available to aquatic organisms expressed in milligrams per liter (mg/L) or parts per million (ppm). Connecticut's Water Quality Standards requires that the dissolved oxygen of a Class B stream shall not be less than 5 mg/L at any time.

Conductivity: Conductivity is a measure of the ability of water to pass an electrical current. Conductivity of water is positively affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate (ions that carry a negative charge) as well as sodium, magnesium, calcium, iron and aluminum (ions that carry a positive charge). Conductivity is useful as a general measure of stream water quality. Each stream tends to have a relatively constant range of conductivity measurements. Significant changes in conductivity can be used as an indicator of pollution entering a stream. For example, the presence of metal trash in water and/or the use of iron pipes can increase conductivity. An elevated conductivity level can also occur from natural sources such as the presence of limestone in streambeds. Conductivity is measured in micromhos per cm, ($\mu\text{mhos/cm}$) a measure of conductance equal to one millionth of a mho/cm. While there is no CT DEP criterion for conductivity, the rivers in the United States generally range from 50 to 1500 $\mu\text{mhos/cm}$. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 μmhos . Conductivity values outside this range could indicate that the water is not suitable for certain species of fish or macro invertebrates.

Fecal coliform bacteria: Fecal coliform bacteria are that portion of the coliform group that originates in the intestinal tract of man and other warm-blooded animals. Fecal bacteria are used as indicator organisms, which are not usually harmful to man. Their presence indicates that pathogens (such as cholera, salmonella, etc.) may be present in surface waters. The higher the count in colonies per 100 milliliters indicates a higher probability that pathogens are being discharged to surface waters. Fecal bacteria are used because they are more universal and survive for longer periods than pathogens in water. The Connecticut Water Quality Standards for a Class B stream are as follows: As an indicator of general sanitary quality Fecal coliform bacteria shall not exceed a geometric mean of 200 organisms/100 mL in any group of samples nor shall 10% of the samples exceed 400 organisms/100 mL.

***E. coli* bacteria:** *Escherichia coli* (*E. coli*) bacteria are one of two organisms that comprise fecal coliform bacteria. Studies have indicated that *E. coli* alone may be a more specific indicator organism of gut level contaminants to fresh surface waters from either man or animal. The other organism comprising coliform bacteria is *Klebsiella*, which sometimes occurs in soil or leaves. The EPA recommends *E. coli* as the best indicator of health risk from water contact in recreational waters.

Quality Assurance/Quality Control (QA/QC): Analytical measures taken to assure that field and laboratory work meets the highest standards of precision and accuracy. QA is an integrated management system designed to ensure that a product or service meets defined standards of quality with a stated level of confidence. QA activities involve planning quality control, quality assessment, data management and quality improvement. QC is the overall system of technical activities designed to measure quality and limit error in a product or service. A QC program

manages quality so that data meets the needs of the user as expressed in a quality assurance project plan. All scientific analysis of the Norwalk River is accomplished in accord with an EPA approved QA/QC which was re-approved on April 25, 2001 and covers the monitoring period from April 2001 through September 2001.

Water temperature: Water temperature is measured in degrees centigrade (°C). Connecticut's Water Quality Standards state that no temperature increase is allowable except when the increase will not exceed the recommended limit on the most sensitive receiving water use. In no case shall the temperature exceed 85 °F (29.4 °C), or in any case raise the normal temperature of the receiving water more than 4 °F (2.2 °C).

Rainfall: Rainfall measurements used in this report follows criteria used by the CT State Health Services. The day of sampling is referred to as day zero. Days are numbered backwards from the testing date to the first rainfall in inches prior to the testing date. For example, if a test was conducted on Monday 5/25 and the previous rain of 0.2 inches occurred on 5/18, the records would indicate 0.2 inches for the amount of rain occurring seven days before the sampling date. If the rain were continuous over the time period, for example, if 0.3 inches fell on 5/17 and 0.2 more inches fell on 5/18, rainfall would be shown as 0.5 inches occurring seven days before the sampling. Rainfall is recorded at rainfall monitoring station located at the Town Hall in Norwalk.

Storm events: Storm events are classified as rainfall exceeding one inch in 24 hours. This much rain will increase surface runoff (input) and flow through the storm drain networks. Stormwater runoff carries many pollutants to the river, especially during the first hour.

Observations: Observations are noteworthy occurrences in the river ecology such as the appearance of stranding blue-green algae, a flock of geese or fish kills. These observations can be incorporated into the data record sheets. These help provide a seasonal definition for water related problems which are not recorded elsewhere.

Seasonal Disinfection: Seasonal disinfection is action taken by a wastewater treatment plant to eliminate bacteria from the effluent discharge. Connecticut's Water Quality Standards require disinfection for the period of May 1st through September 30th at all Wastewater Treatment Plants discharging effluent into streams north of Route I-95. The process is carried out by chlorination or exposing the effluent to ultra violet light just prior to discharge. The period of this disinfection presently takes place when the public is deemed more likely to be fishing or bathing in the water.