# Water Quality Data Report
# For
# The Norwalk River Watershed
# May 2008 through September 2008

**HW/RW volunteer Dave Perman at Site NR6**


## Submitted by:

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Funded by:
The Fairfield County Community Foundation, The Wilton Conservation Department, King Industries, Norwalk River Watershed Association, Inc., NRG-Manresa, Town of Ridgefield, Norm Bloom, Leslie Bloom, and The Jeniam Foundation

**To:** The Fairfield County Community Foundation, The Wilton Conservation Department, King Industries, Norwalk River Watershed Association, Inc., NRG-Manresa, Town of Ridgefield, Norm Bloom, Leslie Bloom, and The Jeniam Foundation

**From:** Dick Harris, Principal Investigator, Earthplace, Harbor Watch/River Watch Program

**Date**: December 10, 2008

**Subject: The Norwalk River Watershed Project Water Quality Report for the period of May 1, 2008 through September 30, 2008**

## 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).

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.

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.

During 2002, the CT DEP switched to *E. coli* bacteria as the "preferred" indicator species for freshwater. *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).

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, and NRG Inc. at Manresa. The Fairfield County Community Foundation, the Town of Ridgefield, the Wilton Inland Conservation District, Leslie Bloom and Norman Bloom have provided additional funds to support 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) 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 at these locations. 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, 21$^{th}$ 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 (April 1$^{st}$ to October 30$^{th}$) monitoring is done four times per month. For the period when effluent disinfection is not required (November 1$^{st}$ to March 31$^{st}$) 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* criteria for Class AA, A, and B water are 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 Recreation** | **Class** | **Indicator** | **Criteria** |
|---|---|---|---|
| Designated Swimming | AA, A, B | *Escherichia coli* | Geometric Mean less than 126 CFUs/100mLs; Single Sample Maximum 235 CFUs/100mLs |
| Non-designated Swimming | AA, A, B | *Escherichia coli* | Geometric Mean less than 126 CFUs/100mLs; Single Sample Maximum 410 CFUs/100mLs |
| All Other Recreational Uses | AA, A, B | *Escherichia coli* | 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 swim 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:**

All monitoring sites with the exception of the Ridgefield waste water treatment plant (WTP) exceeded the CT DEP Class B river criterion for *E.coli* bacteria, including the geometric mean of <126 CFUs/100mLs and the single sample maximum (SSM) of <410 CFUs/100mLs (Table 1, Table 2, Figure 1).

All dissolved oxygen (DO) means met the CT DEP DO criterion of 5 mg/L or greater for a class B river. Observed individual DO values met the DO criteria at all monitoring sites with the exception of site NR21 and NR20 at the headwaters of the Norwalk River (Figure 2, Table 3, and Table B1).

Table 3 Monitoring sites, dates and values of DO (mg/L) not meeting the CT DEP DO criterion of 5 mg/L

| Dates | 7/27 | 8/7 | 8/27 | 9/10 | 9/18 |
|---|---|---|---|---|---|
| Site NR21 | 4.3 | 3.5 | 4.6 | 1.9 | 3.7 |
| Site NR20 | | | | 2.6 | |

The mean values of observed conductivity at the headwaters ranged from a maximum of 870 µS at Site NR23 to a minimum of 226 µS at Site SM3, which is located near the mouth of the Silvermine River (Figure 3, Appendix A2, and Table B1). Observed conductivity ranges at individual sties are more extreme at the headwaters of the Norwalk River, *i.e.* the conductivity range at SiteNR23 is 447 µS with a maximum of 1024 µS observed on 9/24 and a minimum of 577 µS observed on 9/10 (Figure 3, Table B1). Conversely, conductivity values observed on the lower end of the watershed at Site SM3 showed a very short range of 63 µS with a maximum of 250 µS observed on 9/4 and a minimum of 187 µS observed on 9/10 (Figure 3, Table B1).

Water samples from all 12 sampling sites were analyzed for total nitrogen (TN) and total phosphorous (TP) on 5/1, 6/19, 8/21 and 9/24 (Table 4, Figure 4), thanks to funding provided by NRG Inc. Two additional monitoring sites were later added for this series of tests. These sites are NR16, which is the effluent discharge from the Route 7 WTP in the Town of Ridgefield, and NR9.8, which is the effluent discharge from the Georgetown WTP (Appendix A2). Discharges of TN at two of the WTP (Site NR22 and NR16) remain relatively constant in the range of 4 ppm and 12 ppm respectively (Figure 4). The observed TN in the Georgetown WTP effluent changed over the four dates from a minimum of 0.57 ppm to a maximum of 9.10 ppm.[1] The observed TN value of 17.2 ppm on 8/21 at Site SM3 is a maximum value for the entire nutrient project and does not represent a WTP discharge (Figure 4).

Elevated TP levels were observed on May 1 in effluent discharges at Site NR16 and NR9.8 to be5.40 mg/L and 5.20 mg/L respectively (Table 4). On June 19, observed TP values at Site NR9.8 were below minimum detection limits (MDL) and concentrations remained there for the monitoring dates of 8/21 and 9/24. Site NR16 is the only WTP of the three units discharging elevated TP levels in the effluent at every sampling event during the testing period, (Table 4).

[1] The Georgetown WTP is a newly installed *Zenon* (General Electric) unit undergoing start up procedures. This is a possible cause of nutrient variation in the effluent.

Table 2 May 2008 through September 2008 *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

| | Dates | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sites | 5/1/2008 | 5/7/2008 | 5/15/2008 | 5/21/2008 | 6/4/2008 | 6/11/2008 | 6/19/2008 | 6/25/2008 | 7/2/2008 | 7/9/2008 | 7/17/2008 | 7/23/2008 |
| NR23 | 60 | 40 | 76 | 140 | 1700 | 1100 | 130 | 360 | n/a | 146 | 148 | 2300 |
| NR22 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | n/a |
| NR21 | 68 | 32 | 76 | 148 | 1800 | 780 | 130 | 52 | 480 | 180 | 252 | 9800 |
| NR20 | 88 | 28 | 108 | 168 | 3200 | 930 | 270 | 158 | 420 | 136 | 88 | 80 |
| NR15 | 56 | 36 | 88 | 108 | 470 | 400 | 190 | 124 | n/a | 760 | 164 | 500 |
| NR13 | 520 | 26 | 156 | 92 | 600 | 730 | 270 | 320 | 1100 | 232 | 144 | 460 |
| NR9.5 | 94 | 18 | 56 | 88 | 400 | 340 | 92 | 156 | 1760 | 146 | 140 | 570 |
| NR9 | 108 | 32 | 68 | 104 | 2600 | 500 | 200 | 140 | n/a | 68 | 88 | 380 |
| NR6 | 104 | 68 | 212 | 148 | 1200 | 810 | 430 | 272 | 1060 | 360 | 168 | 3800 |
| NR4 | 120 | 112 | 360 | 228 | 1300 | 330 | 170 | 380 | 800 | 440 | 380 | 6100 |
| SM3 | 84 | 96 | 124 | 112 | 3100 | 430 | 520 | 220 | 460 | 900 | 6700 | 1100 |
| NR1 | 72 | 96 | 88 | 188 | 1400 | 500 | 530 | 176 | 2800 | 200 | 270 | 6300 |

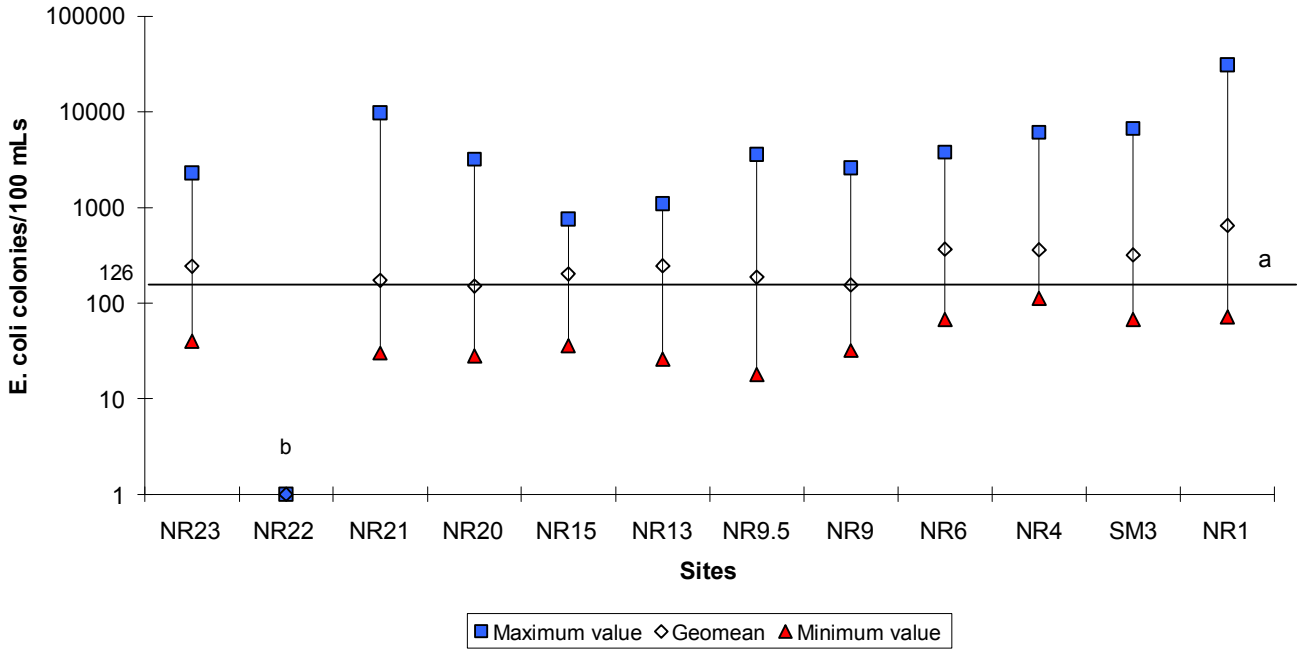
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8/7/2008 | 8/13/2008 | 8/20/2008 | 8/27/2008 | 9/4/2008 | 9/10/2008 | 9/18/2008 | 9/24/2008 | **Geomean** | %frequency over 410 colonies/100mLs |
| 260 | 460 | 144 | 320 | 640 | 400 | 100 | 152 | 244 | 21.05% |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0.00% |
| 190 | 200 | 110 | 140 | 150 | 30 | 120 | 44 | 175 | 20.00% |
| 100 | 160 | 80 | 40 | 212 | 130 | 120 | 108 | 152 | 15.00% |
| 420 | 160 | 232 | 140 | 480 | 220 | 170 | 340 | 203 | 25.00% |
| 290 | 160 | 244 | 360 | 400 | 180 | 160 | 124 | 247 | 25.00% |
| 150 | 220 | 88 | 158 | 3600 | 356 | 96 | 156 | 188 | 15.00% |
| 100 | 180 | 68 | 38 | 2200 | 260 | 112 | 72 | 155 | 15.00% |
| 470 | 470 | 220 | 180 | 1700 | 390 | 220 | 248 | 367 | 40.00% |
| 200 | 300 | 210 | 140 | 780 | 330 | 380 | 360 | 363 | 25.00% |
| 900 | 290 | 210 | 68 | 144 | 330 | 90 | 148 | 320 | 40.00% |
| 500 | 550 | 320 | 760 | 1080 | 380 | 28000 | 31000 | 648 | 55.00% |

Table 4 Observed Total phosphorous (TP) values, mg/L at three WTP effluent discharges and two sampling sites on 5/1, 6/19, 8/21, and 9/24/2008

| WTP | Site Number | TP mg/L on 5/1 | TP mg/L on 6/19 | TP mg/L on 8/21 | TP mg/L on 9/24 |
|---|---|---|---|---|---|
| Ridgefield | NR22 | ND* | ND* | ND* | ND* |
| Route 7 | NR16 | 5.40 | 5.15 | 5.07 | 4.57 |
| | NR15 | ND* | ND* | 0.13 | ND* |
| Georgetown | NR9.8 | 5.20 | ND* | ND* | ND* |
| | NR1 | ND* | ND* | ND* | 0.32 |

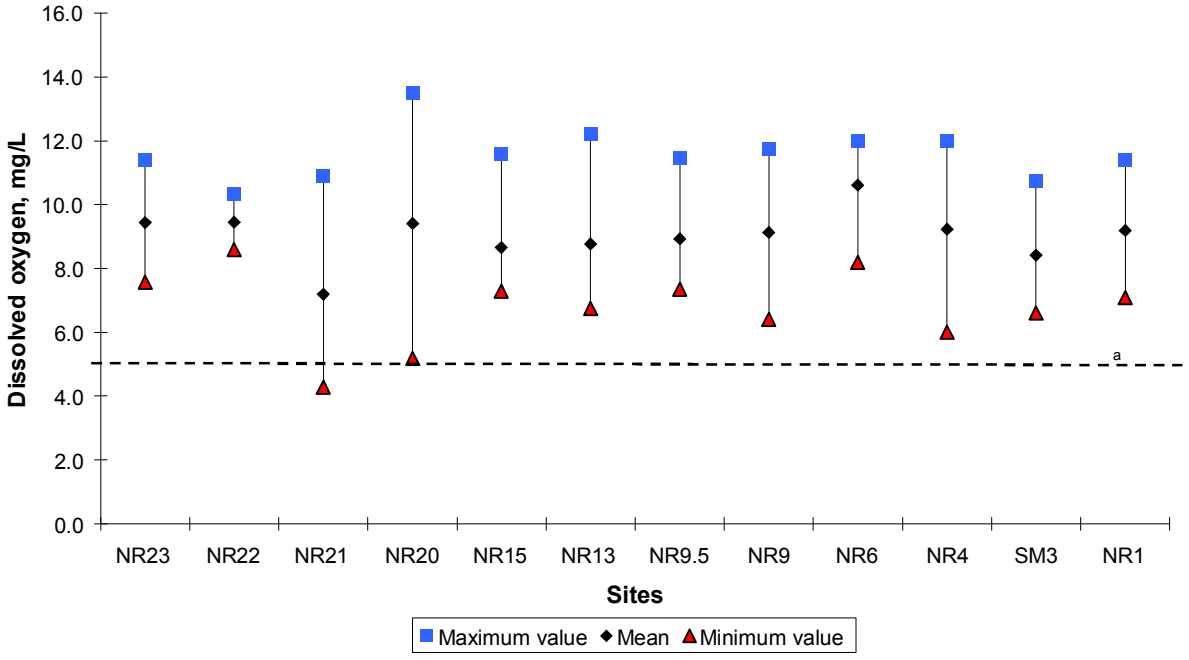
* Non-detectable, minimum detection level is .05 mg/L at York laboratories, Inc.

Figure 1 Maximum, geometric means, and minimum values of *E. coli* bacteria concentrations at 12 monitoring sites in the Norwalk River Watershed from May 2008 through September 2008 when the two Ridgefield and one Georgetown wastewater treatment facilities are required by NPDES permits to disinfect sewage effluent




[a]CT DEP geomean maximum value for a Class B river
[b.]no *E. coli* bacteria was detected in the Ridgefield Wastewater effluent Site NR22

Figure 2 Maximum, mean and minimum values for dissolved oxygen at 12 sampling sites on the Norwalk River Watershed from May 2008 through September 2008




[a]CT DEP minimum value for a Class B river

Figure 3 Maximum, geomean and minimum value for conductivity at 12 sampling sites in the Norwalk River Watershed from May 2008 through September 2008

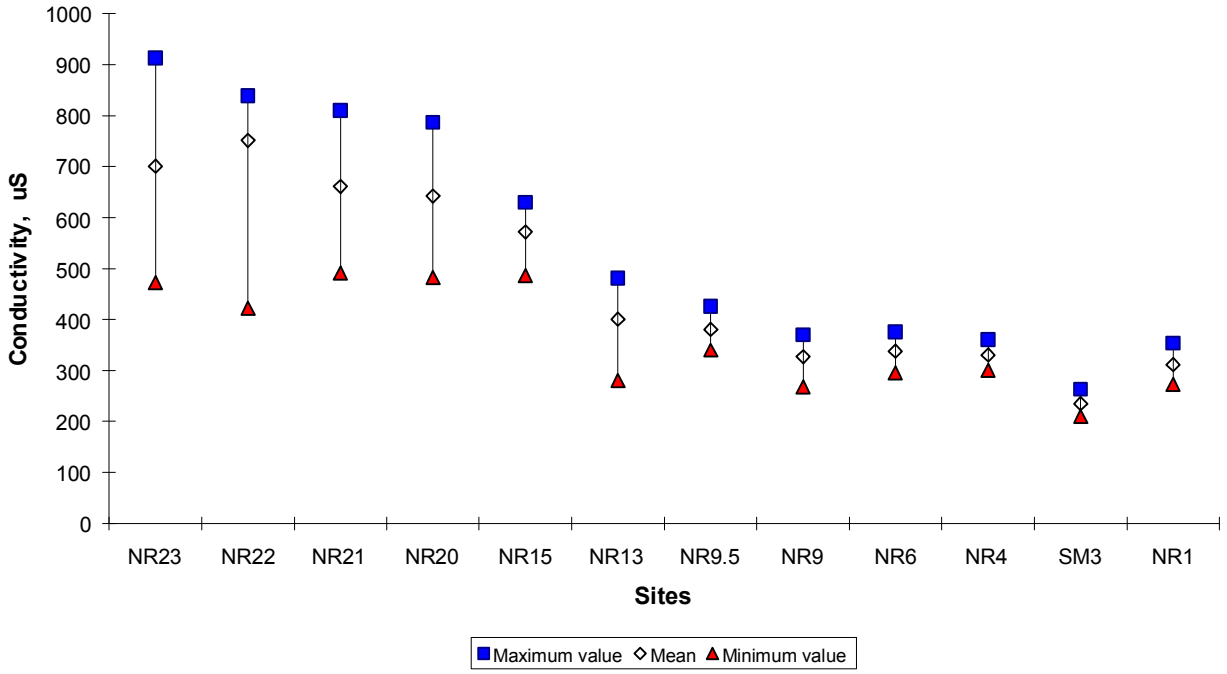
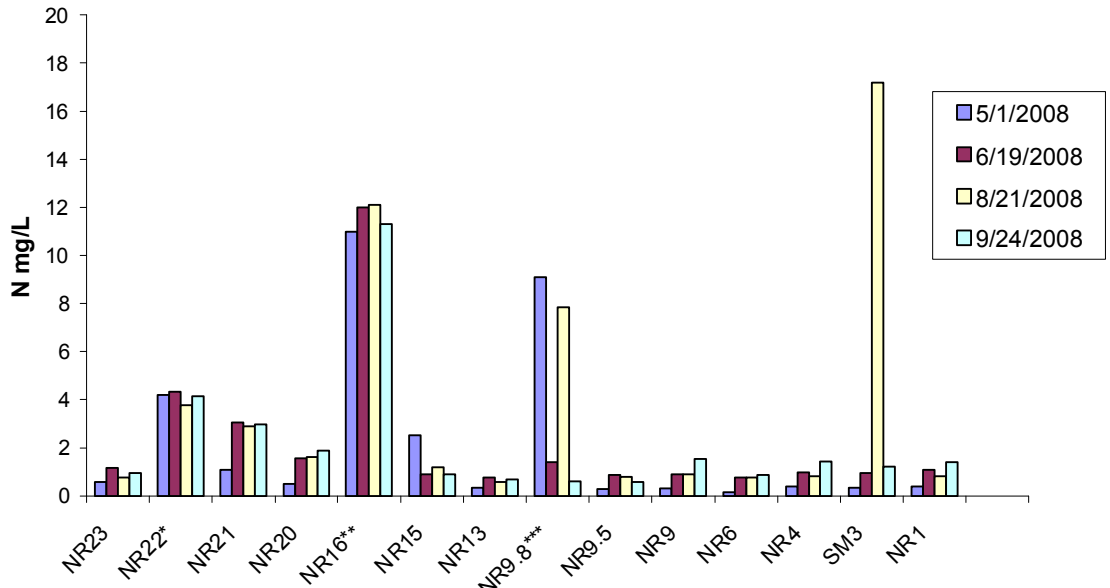
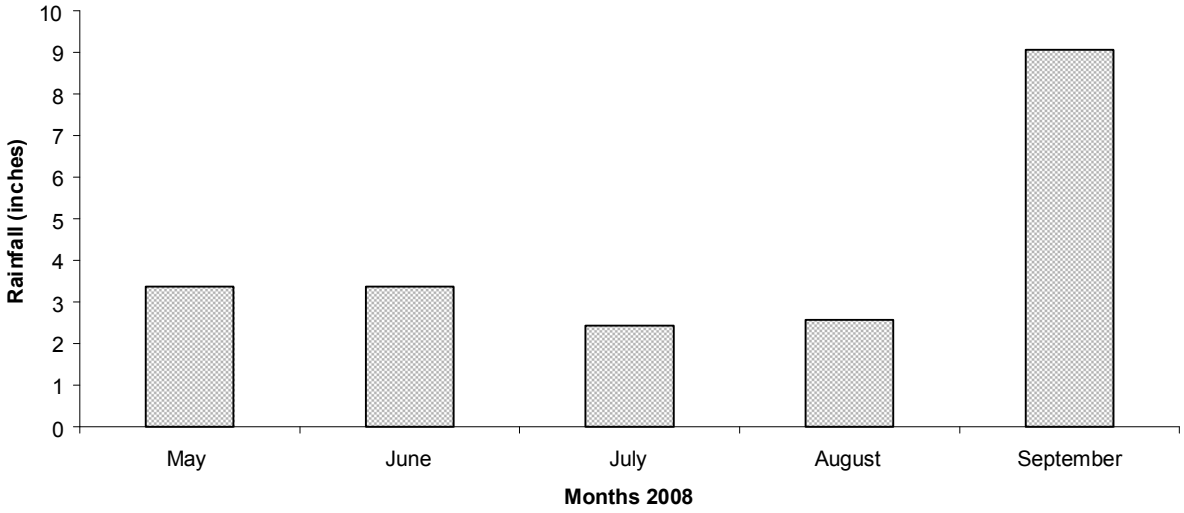



Figure 4 Total nitrogen concentrations observed at 14 monitoring sites in the Norwalk River Watershed on May 1, 2008, June 19 2008, August 21, 2008, and September 24, 2008




* sewage treatment discharge at Ridgefield (700 mgd)
** sewage treatment discharge at Ridgefield Route 7 plant (80 mgd)
*** sewage treatment discharge at Georgetown (45 mgd)

Figure 5 Monthly rainfall (inches) from May 2008 to September 2008




**IV. Discussion:**

Rainfall during May through August 2008 averaged 2.9 inches per month which is dry for the period.[2] September 2008 marked an end to the dry period with 9.1 inches of rainfall; however, 5.3 inches fell on 9/6. Much of this storm contributed to heavy runoff with relatively little soak time benefiting the Norwalk River watershed.

Observed *E.coli* bacteria levels were increased by heavy storms on 6/4, 7/2, 7/23 and 9/4[3]. In addition to the rain days, attention is drawn to elevated bacteria numbers not affected by rain. On 9/18 and 9/24 elevated *E.coli* counts of 28,000 CFUs/100 mL and 31,000 CFUs/100 mLs respectively led HW/RW to discover an ongoing sewage discharge at the School Street storm drain discharge (Table 2 and Figure1). These data were reported to the Norwalk Public Health Department who then alerted the city's Public Works Department. Fast acting by the Norwalk Public Works Department discovered a temporary sewage bypass line accidently connected to the School Street storm drain system. It was estimated that over 400,000 gallons of sewage entered the lower river/ upper harbor before HW/RW identified the polluting discharge point.[4]

The elevated *E.coli* bacteria counts observed at Site SM3 on the Silvermine River on 7/9 and 7/17 of 900 and 6700 CFU/100mLs respectively, cannot be explained (Table 2 and Table B1). Rainfall on both dates occurred at least three days prior to monitoring the site (Table 2, Table B1). In addition, an elevated TN result of 17.3 mg/L observed at the same site on 8/21 (Figure 4) also suggests that a pollution source existed upstream. These events will be investigated in future research.

Observed DO means and most of the individual samples met the CT DEP criterion of 5 mg/L or greater for a class B river (Figure 2). Values observed below 5 mg/L at Site 21 are probably due to standing water conditions in the Great Swamp (Appendix 2A) on warm days prior to its discharge at Site NR21. A low DO concentration (1.9 mg/L) observed at Site NR21 on 9/10 also impaired the water quality downstream, which resulted in a DO concentration of 2.6 mg/L observed at Site NR20 (Figure 2, Table B1).

Observed conductivity means and individual values were typical for the Norwalk River during the summer season. Higher conductivity mean values, (700 µS) observed at Site NR23 were related to

[2] Rainfall records were provided by the Norwalk Public Health Dept.
[3] The HW/RW monitoring date did not coincide with the large storm (5.3 inches) on 9/6.
[4] Details of this spill are found in Silvermine/Norwalk water quality report (6/2/08 – 7/31/08)

water moving through natural limestone beds (Figure 3) in the headwaters of the Norwalk River. As the Norwalk River flows to the south, several tributaries with lower conductivity means serve to reduce conductivity values in the main river. This condition is apparent at Site NR15 where an un-named tributary joins the main river just to the north of the site (Figure 3). Other instances are Cooper Brook where it enters the river prior to Site NR13 and the Silvermine River, where it enters the main river prior to Site NR1 (Figure 3).

Heavy rainfall events serve to reduce conductivity, as noted on 9/10 when a rainfall of 0.34 inches fell on the monitoring date (Figure 3, Table B1). The higher values were observed on 8/20 and 8/27 when there was little to no rain prior to the monitoring date (Figure 3, Table B1).

The analysis of water samples for total nitrogen (TN) and total phosphorous (TP) was conducted in the Norwalk River for all three sewage treatment plant effluent discharges (Sites NR 22, NR 16, and NR 9.8), as well as for 11 other monitoring sites. The nutrient surveys were conducted four times during the summer of 2008 (5/1, 6/19, 8/21, and 9/24) in conjunction with the ongoing *E.coli* bacteria survey occurring on the same dates. All nutrient tests were performed by York Laboratories in Stratford Connecticut using standard methods 4500N for TN and EPA 365.3 for phosphorus. All samples were collected and transported by HW/RW to York Laboratories (QAPP CT 02403, Appendix 1, page A1.1). NRG Inc. at Manresa Island (Norwalk) generously provided funding for the nutrient tests. While there is no CT DEP criteria for nutrients in moving waters, our survey had several objectives in mind.

The first objective was to determine the downstream nutrient impact, if any, of the three WTPs on the receiving waters of the river. The second objective was to quantity the amount of lbs of TN and TP were being discharged to the river. As part of this question, to observe if the phosphorous removal units at Site NR22 and Site NR 9.8 were working.

The average nitrogen releases (in lbs/day) from the three monitored WTP discharges can be estimated according to the formula (EV x C x 8.35) where EV equals the average effluent volume in millions of gallons/day, C equals the average TN concentration in mg/L, and 8.34 is the conversion factor.

Table 5 Site, average discharge volume, and average lbs/day release of nitrogen from three Wastewater Treatment Plants that discharge into the Norwalk River

| Site | Average Effluent Volume (gallons/day) | Average Effluent Volume (million gallons/day) | Average Total Nitrogen Concentration (mg/L) | Factor | Average lbs /day of Nitrogen |
|---|---|---|---|---|---|
| NR22 | 700,000 | .700 | 4.11 | 8.34 | 23.99 |
| NR16 | 80,000 | .080 | 11.6 | 8.34 | 7.74 |
| NR9.8 | 50,000 | .050 | 4.74 | 8.34 | 1.98 |

Based on volume and TN concentration, the Site NR 22 effluent discharge produces the maximum TN impact to the Norwalk River (Figure 4, Table 5). The minimum impact is observed at Site NR 9.8 where reduced volume and TN concentration limit impact. The Georgetown WTP incorporates new *Zenon* technology and may still be undergoing startup procedures. TN output at Site 9.8 does not appear to be stabilized (Figure 4, Table 5).

No "real time" flow data is published for the USGS site at Kent Street on the Norwalk River, which precludes an assessment of TN pounds entering Norwalk Harbor. HW/RW is also unable to account for the large nitrogen spike (17.3 mg/L) observed at Site SM3 (Silvermine River) on 8/21 (Figure 4).

Phosphorous removal units are operational at Site NR 22 and Site 9.8 (Table 3). Site NR 16 continues to discharge approximately 5 mg/L TP in the effluent stream (Table 3). Although levels of TP were not generally observed at the other main river sites, a concentration of 0.13 mg/L was observed at Site NR 15 on 8/21 (Table 4). Site NR 15 is one half mile downstream from Site NR 16. Elevated TP

levels of 0.32 mg/L were also observed at Site NR 1 and reflect the input from a large on-going sewage spill at the School Street storm drain outflow (Table 4).

In conclusion, the Route 7 WTP, Site NR 16 should be modified to remove phosphorous from the wastewater effluent. Downstream impoundments such as Factory Pond at Georgetown become totally overgrown with algae each summer much to the dismay of surrounding residents. Phosphorous removal is terminated by NPDES permit as of September 30 and does not resume at Sites NR 22 and NR 9.8 until April 30. HW/RW questions the wisdom of this practice as TP is a conservative pollutant and either joins the river sediments or flows to Long Island Sound during the period of limited growth.

**V. Index of Figures, Tables and Appendices**:

**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 2008 through September 2008

Monthly and Quarterly progress reports are available from June 1998 through July 2008

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"<br>Longitude: W 73° 29' 18.5" |
| NR20 | Route 35 at Fox Hill Condos | Ridgefield | Latitude: N 41° 17' 52.1"<br>Longitude: W 73° 29' 32.2" |
| NR15 | Stonehenge Road at the top of the dam | Ridgefield | Latitude N 41° 18' 32.0"<br>Longitude: W 73° 28' 8.3" |
| NR13 | Branchville at the railroad station (Route 7) | Ridgefield/Wilton | Latitude: N 41° 15' 55.8"<br>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"<br>Longitude: W 73° 26' 2.5" |
| NR9 | School Road | Wilton | Latitude: N 41° 12' 15.3"<br>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"<br>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"<br>Longitude: W 73° 25' 35.8" |
| SM3* | James Street (on the Silvermine River) | Norwalk | Latitude: N 41° 8' 10.3"<br>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"<br>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"<br>Longitude: W 73° 29' 35.6" |
| NR22 | South Street WTP outfall | Ridgefield | Latitude: N 41° 17' 26.8"<br>Longitude: W 73° 29' 29.6" |

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

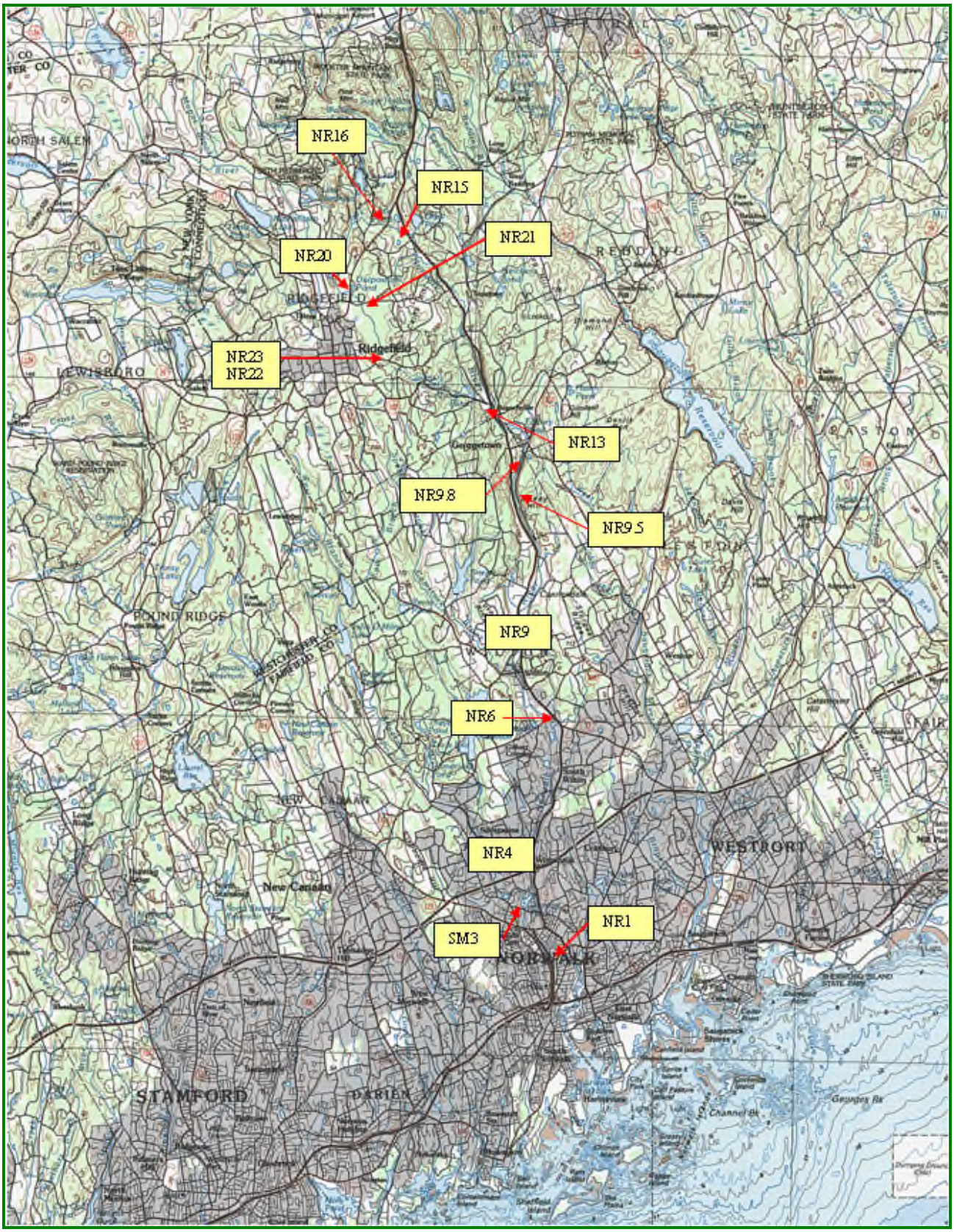


Table B1 Sampling site, date, time, air & water temperature, dissolved oxygen, conductivity, fecal coliform bacteria, *E. coli* bacteria, rainfall number of days prior to sampling, and QA/QC activity for monitoring events in the Norwalk River Watershed May 2008 through July 2008

| Site | Date | Time | Air Temp. ° C | Water Temp. ° C | D.O. mg/L | COND. umho/cm | Fecal Coliform. CFU/100 mL | E. coli CFU/100 mL | Amount of rain (in) | Days prior to sampling | QA/QC | Fecal Coliform. CFU/100 mL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR23 | 5/1/2008 | 1044 | 15.0 | 9.8 | 11.4 | 730 | 72 | 60 | 1.55 | 2 | Duplicate | 58 |
| NR22 | 5/1/2008 | 1055 | 17.0 | 12.3 | 8.6 | 765 | 0 | 0 | 1.55 | 2 | | |
| NR21 | 5/1/2008 | 1107 | 16.0 | 10.4 | 9.1 | 491 | 68 | 68 | 1.55 | 2 | Replicate | 64 |
| NR20 | 5/1/2008 | 1120 | 15.0 | 10.6 | 9.5 | 528 | 88 | 88 | 1.55 | 2 | Field Blank | 0 |
| NR15 | 5/1/2008 | 1149 | 17.0 | 11.9 | 11.6 | 486 | 60 | 56 | 1.55 | 2 | | |
| NR13 | 5/1/2008 | 1159 | 14.0 | 11.5 | 12.2 | 395 | 620 | 520 | 1.55 | 2 | | |
| NR9.5 | 5/1/2008 | 1159 | 12.0 | 11.9 | 11.5 | 345 | 102 | 94 | 1.55 | 2 | | |
| NR9 | 5/1/2008 | 1141 | 13.0 | 11.4 | 11.8 | 317 | 122 | 108 | 1.55 | 2 | | |
| NR6 | 5/1/2008 | 1124 | 15.0 | 10.7 | 12.0 | 310 | 104 | 104 | 1.55 | 2 | Field Blank | 0 |
| NR4 | 5/1/2008 | 1105 | 13.0 | 10.7 | 12.0 | 308 | 128 | 120 | 1.55 | 2 | | |
| SM3 | 5/1/2008 | 1052 | 10.0 | 11.2 | 10.7 | 222 | 96 | 84 | 1.55 | 2 | Duplicate | 100 |
| NR1 | 5/1/2008 | 1030 | 11.0 | 11.5 | 11.4 | 278 | 76 | 72 | 1.55 | 2 | Replicate | 80 |
| | | | | | | | | | | | | |
| NR23 | 5/7/2008 | 1355 | 25.0 | 15.5 | n/a | 798 | 48 | 40 | 0.23 | 5 | | |
| NR22 | 5/7/2008 | 1406 | 25.0 | 14.8 | n/a | 786 | 0 | 0 | 0.23 | 5 | Field Blank | 0 |
| NR21 | 5/7/2008 | 1425 | 25.0 | 15.5 | n/a | 608 | 36 | 32 | 0.23 | 5 | | |
| NR20 | 5/7/2008 | 1437 | 26.0 | 22.7 | n/a | 649 | 32 | 28 | 0.23 | 5 | | |
| NR15 | 5/7/2008 | 1447 | 24.0 | 19.7 | n/a | 558 | 36 | 36 | 0.23 | 5 | Duplicate | 52 |
| NR13 | 5/7/2008 | 1501 | 27.0 | 17.9 | n/a | 373 | 36 | 26 | 0.23 | 5 | Replicate | 28 |
| NR9.5 | 5/7/2008 | 1435 | 22.0 | 17.7 | 10.4 | 349 | 24 | 18 | 0.23 | 5 | Field Blank | 0 |
| NR9 | 5/7/2008 | 1413 | 22.0 | 16.8 | 10.8 | 319 | 32 | 32 | 0.23 | 5 | Duplicate | 42 |
| NR6 | 5/7/2008 | 1359 | 23.0 | 16.7 | 11.5 | 321 | 72 | 68 | 0.23 | 5 | Replicate | 52 |
| NR4 | 5/7/2008 | 1344 | 23.0 | 17.2 | 11.3 | 325 | 112 | 112 | 0.23 | 5 | | |
| SM3 | 5/7/2008 | 1332 | 22.0 | 15.8 | 10.0 | 238 | 120 | 96 | 0.23 | 5 | | |
| NR1 | 5/7/2008 | 1316 | 21.0 | 17.0 | 10.4 | 302 | 96 | 96 | 0.23 | 5 | | |
| | | | | | | | | | | | | |
| NR23 | 5/15/2008 | 1031 | 14.0 | 12.6 | 11.1 | 843 | 84 | 76 | 0.08 | 0 | Replicate | 80 |
| NR22 | 5/15/2008 | 1042 | 20.0 | 14.6 | 10.0 | 789 | 0 | 0 | 0.08 | 0 | Field Blank | 0 |
| NR21 | 5/15/2008 | 1055 | 17.0 | 14.6 | 10.9 | 638 | 80 | 76 | 0.08 | 0 | | |
| NR20 | 5/15/2008 | 1102 | 17.0 | 15.4 | 13.5 | 677 | 108 | 108 | 0.08 | 0 | | |
| NR15 | 5/15/2008 | 1119 | 16.0 | 15.0 | 9.5 | 548 | 92 | 88 | 0.08 | 0 | | |
| NR13 | 5/15/2008 | 1132 | 17.0 | 15.0 | 10.6 | 367 | 168 | 156 | 0.08 | 0 | Duplicate | 172 |
| NR9.5 | 5/15/2008 | 1120 | 19.0 | 15.3 | 10.2 | 340 | 58 | 56 | 0.08 | 0 | Duplicate | 54 |
| NR9 | 5/15/2008 | 1105 | 18.0 | 13.8 | 10.1 | 315 | 76 | 68 | 0.08 | 0 | Replicate | 80 |
| NR6 | 5/15/2008 | 1050 | 17.0 | 13.7 | 10.4 | 318 | 240 | 212 | 0.08 | 0 | Field Blank | 0 |
| NR4 | 5/15/2008 | 1035 | 19.0 | 14.6 | 10.0 | 324 | 360 | 360 | 0.08 | 0 | | |
| SM3 | 5/15/2008 | 1025 | 17.0 | 14.1 | 9.6 | 210 | 144 | 124 | 0.08 | 0 | | |
| NR1 | 5/15/2008 | 1007 | 17.0 | 14.8 | 10.0 | 295 | 88 | 88 | 0.08 | 0 | | |
| | | | | | | | | | | | | |
| NR23 | 5/21/2008 | 1016 | 18.0 | 11.4 | 10.7 | 628 | 140 | 140 | 0.24 | 1 | Duplicate | 104 |
| NR22 | 5/21/2008 | 1026 | 18.0 | 13.9 | 10.3 | 740 | 0 | 0 | 0.24 | 1 | | |
| NR21 | 5/21/2008 | 1035 | 18.0 | 12.2 | 9.5 | 575 | 148 | 148 | 0.24 | 1 | Field Blank | 0 |
| NR20 | 5/21/2008 | 1044 | 17.0 | 12.7 | 13.0 | 557 | 168 | 168 | 0.24 | 1 | | |
| NR15 | 5/21/2008 | 1056 | 17.0 | 12.4 | 10.4 | 527 | 108 | 108 | 0.24 | 1 | | |
| NR13 | 5/21/2008 | 1113 | 18.0 | 12.0 | 11.0 | 363 | 104 | 92 | 0.24 | 1 | Replicate | 88 |
| NR9.5 | 5/21/2008 | 1124 | 16.5 | 12.5 | 10.5 | 360 | 88 | 88 | 0.24 | 1 | Replicate | 70 |
| NR9 | 5/21/2008 | 1107 | 16.0 | 12.0 | 10.5 | 327 | 104 | 104 | 0.24 | 1 | Duplicate | 94 |
| NR6 | 5/21/2008 | 1050 | 17.0 | 12.0 | 10.8 | 320 | 164 | 148 | 0.24 | 1 | Field Blank | 0 |
| NR4 | 5/21/2008 | 1029 | 22.0 | 12.2 | 11.0 | 309 | 228 | 228 | 0.24 | 1 | | |
| SM3 | 5/21/2008 | 1017 | 21.0 | 11.8 | 10.4 | 218 | 112 | 112 | 0.24 | 1 | | |
| NR1 | 5/21/2008 | 955 | 20.0 | 12.1 | 10.6 | 281 | 188 | 188 | 0.24 | 1 | | |

Table B1 (continued)

| Site | Date | Time | Air Temp. ° C | Water Temp. ° C | D.O. mg/L | COND. umho/cm | Fecal Coliform. CFU/100 mL | E. coli CFU/100 mL | Amount of rain (in) | Days prior to sampling | QA/QC | Fecal Coliform. CFU/100 mL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR23 | 6/4/2008 | 1035 | 15.0 | 15.8 | 9.1 | 473 | 3300 | 1700 | 0.79 | 0 | | |
| NR22 | 6/4/2008 | 1045 | 17.0 | 17.1 | 9.8 | 835 | 1 | 1 | 0.79 | 0 | | |
| NR21 | 6/4/2008 | 1057 | 17.0 | 15.9 | 5.8 | 612 | 2500 | 1800 | 0.79 | 0 | Field Blank | 0 |
| NR20 | 6/4/2008 | 1107 | 16.0 | 16.2 | 6.2 | 483 | 3300 | 3200 | 0.79 | 0 | | |
| NR15 | 6/4/2008 | 1123 | 15.0 | 17.6 | 8.5 | 539 | 470 | 470 | 0.79 | 0 | | |
| NR13 | 6/4/2008 | 1135 | 18.0 | 17.4 | 8.4 | 372 | 680 | 600 | 0.79 | 0 | Duplicate | 670 |
| NR9.5 | 6/4/2008 | 1141 | 18.0 | 18.2 | 8.7 | 354 | 400 | 400 | 0.79 | 0 | | |
| NR9 | 6/4/2008 | 1125 | 20.0 | 16.5 | 8.9 | 307 | 2600 | 2600 | 0.79 | 0 | Replicate | n/g |
| NR6 | 6/4/2008 | 1110 | 20.0 | 16.7 | 8.4 | 301 | 1600 | 1200 | 0.79 | 0 | | |
| NR4 | 6/4/2008 | 1052 | 19.0 | 17.0 | 8.9 | 295 | 3000 | 1300 | 0.79 | 0 | Duplicate | 5000 |
| SM3 | 6/4/2008 | 1038 | 19.0 | 17.3 | 8.8 | 226 | 3100 | 3100 | 0.79 | 0 | | |
| NR1 | 6/4/2008 | 1017 | 18.5 | 18.3 | 8.6 | 305 | 1600 | 1400 | 0.79 | 0 | Field Blank | 0 |
| | | | | | | | | | | | | |
| NR23 | 6/11/2008 | 1026 | 23.0 | 20.4 | 8.5 | 577 | 1200 | 1100 | 0.11 | 1 | | |
| NR22 | 6/11/2008 | 1035 | 25.0 | 21.0 | 9.3 | 780 | 1 | 1 | 0.11 | 1 | | |
| NR21 | 6/11/2008 | 1046 | 27.0 | 21.9 | 5.6 | 631 | 880 | 780 | 0.11 | 1 | Field Blank | 0 |
| NR20 | 6/11/2008 | 1057 | 25.0 | 23.6 | 5.2 | 571 | 1210 | 930 | 0.11 | 1 | Duplicate | 1180 |
| NR15 | 6/11/2008 | 1114 | 25.0 | 23.4 | 7.5 | 618 | 500 | 400 | 0.11 | 1 | Replicate | 400 |
| NR13 | 6/11/2008 | 1129 | 25.5 | 23.6 | 6.9 | 420 | 970 | 730 | 0.11 | 1 | | |
| NR9.5 | 6/11/2008 | 1140 | 25.0 | 23.7 | 7.6 | 402 | 340 | 340 | 0.11 | 1 | Replicate | 240 |
| NR9 | 6/11/2008 | 1125 | 25.0 | 21.9 | 7.8 | 330 | 500 | 500 | 0.11 | 1 | | |
| NR6 | 6/11/2008 | 1108 | 25.0 | 22.4 | 8.0 | 338 | 810 | 810 | 0.11 | 1 | Duplicate | 780 |
| NR4 | 6/11/2008 | 1050 | 27.0 | 23.1 | 10.0 | 338 | 630 | 330 | 0.11 | 1 | Field Blank | 0 |
| SM3 | 6/11/2008 | 1037 | 24.0 | 22.5 | 7.6 | 240 | 520 | 430 | 0.11 | 1 | | |
| NR1 | 6/11/2008 | 1010 | 26.0 | 24.4 | 8.1 | 328 | 630 | 500 | 0.11 | 1 | | |
| | | | | | | | | | | | | |
| NR23 | 6/19/2008 | 1108 | 20.0 | 16.5 | 9.7 | 600 | 170 | 130 | 0.70 | 1 | Replicate | 200 |
| NR22 | 6/19/2008 | 1120 | 23.0 | 18.2 | 9.9 | 766 | 0 | 0 | 0.70 | 1 | Field Blank | 0 |
| NR21 | 6/19/2008 | 1025 | 23.0 | 16.6 | 7.3 | 633 | 130 | 130 | 0.70 | 1 | | |
| NR20 | 6/19/2008 | 1045 | 24.0 | 18.8 | 8.8 | 609 | 300 | 270 | 0.70 | 1 | | |
| NR15 | 6/19/2008 | 1057 | 22.0 | 18.5 | 8.6 | 569 | 200 | 190 | 0.70 | 1 | Duplicate | 170 |
| NR13 | 6/19/2008 | 1115 | 21.0 | 18.1 | 8.7 | 280 | 360 | 270 | 0.70 | 1 | | |
| NR9.5 | 6/19/2008 | 1149 | 20.0 | 19.1 | 8.9 | 423 | 124 | 92 | 0.70 | 1 | | |
| NR9 | 6/19/2008 | 1134 | 21.5 | 17.3 | 9.4 | 363 | 240 | 200 | 0.70 | 1 | Duplicate | 240 |
| NR6 | 6/19/2008 | 1110 | 20.0 | 17.5 | 9.7 | 355 | pink | 430 | 0.70 | 1 | | |
| NR4 | 6/19/2008 | 1055 | 22.0 | 18.2 | 10.9 | 363 | pink | 170 | 0.70 | 1 | Field Blank | 0 |
| SM3 | 6/19/2008 | 1040 | 20.0 | 17.3 | 9.2 | 221 | 1600 | 520 | 0.70 | 1 | | |
| NR1 | 6/19/2008 | 1016 | 20.0 | 18.6 | 9.3 | 273 | 2100 | 530 | 0.70 | 1 | Replicate | 1500 |
| | | | | | | | | | | | | |
| NR23 | 6/25/2008 | 1016 | 24.0 | 17.6 | 9.0 | 885 | 360 | 360 | 0.12 | 4 | | |
| NR22 | 6/25/2008 | 1029 | 25.0 | 19.5 | 9.1 | 839 | 0 | 0 | 0.12 | 4 | | |
| NR21 | 6/25/2008 | 1036 | 24.0 | 18.8 | 7.5 | 810 | 76 | 52 | 0.12 | 4 | Field Blank | 0 |
| NR20 | 6/25/2008 | 1050 | 24.0 | 21.3 | 9.6 | 770 | 172 | 158 | 0.12 | 4 | Duplicate | 172 |
| NR15 | 6/25/2008 | 1102 | 24.0 | 19.6 | 8.1 | 628 | 136 | 124 | 0.12 | 4 | Replicate | 152 |
| NR13 | 6/25/2008 | 1113 | 24.0 | 20.0 | 7.8 | 438 | 410 | 320 | 0.12 | 4 | | |
| NR9.5 | 6/25/2008 | 1123 | 23.0 | 20.3 | 8.6 | 412 | 196 | 156 | 0.12 | 4 | Duplicate | 188 |
| NR9 | 6/25/2008 | 1104 | 23.0 | 18.2 | 8.8 | 360 | 156 | 140 | 0.12 | 4 | | |
| NR6 | 6/25/2008 | 1057 | 24.0 | 19.3 | 8.6 | 361 | 320 | 272 | 0.12 | 4 | Field Blank | 0 |
| NR4 | 6/25/2008 | 1041 | 24.0 | 20.7 | 11.6 | 355 | 400 | 380 | 0.12 | 4 | | |
| SM3 | 6/25/2008 | 1014 | 24.0 | 19.7 | 7.4 | 236 | 284 | 220 | 0.12 | 4 | Replicate | 292 |
| NR1 | 6/25/2008 | 1014 | 24.0 | 21.5 | 8.7 | 329 | 212 | 176 | 0.12 | 4 | | |

Table B1 (continued)

| Site | Date | Time | Air Temp. ° C | Water Temp. ° C | D.O. mg/L | COND. umho/cm | Fecal Coliform. CFU/100 mL | E. coli CFU/100 mL | Amount of rain (in) | Days prior to sampling | QA/QC | Fecal Coliform. CFU/100 mL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR23 | 7/2/2008 | 1025 | 24.0 | 19.5 | 8.6 | 673 | n/a | n/a | 0.02 | 3 | | |
| NR22 | 7/2/2008 | 1038 | 27.0 | 20.7 | 9.1 | 708 | 0 | 0 | 0.02 | 3 | Field Blank | 0 |
| NR21 | 7/2/2008 | 1052 | 28.0 | 20.2 | 6.4 | 658 | 620 | 480 | 0.02 | 3 | Replicate | 540 |
| NR20 | 7/2/2008 | 1100 | 25.0 | 22.2 | 10.3 | 633 | 500 | 420 | 0.02 | 3 | | |
| NR15 | 7/2/2008 | 1111 | 23.0 | 20.8 | 7.6 | 630 | 500 | n/a | 0.02 | 3 | | |
| NR13 | 7/2/2008 | 1132 | 24.0 | 21.4 | 7.6 | 428 | pink | 1100 | 0.02 | 3 | | |
| NR9.5 | 7/2/2008 | 1145 | 23.0 | 21.6 | 8.1 | 398 | 1980 | 1760 | 0.02 | 3 | | |
| NR9 | 7/2/2008 | 1132 | 25.0 | 20.0 | 8.7 | 295 | n/a | n/a | 0.02 | 3 | Field Blank | 0 |
| NR6 | 7/2/2008 | 1119 | 25.0 | 20.6 | 8.7 | 327 | pink | 1060 | 0.02 | 3 | | |
| NR4 | 7/2/2008 | 1104 | 26.0 | 21.9 | 11.4 | 376 | 940 | 800 | 0.02 | 3 | Replicate | 1160 |
| SM3 | 7/2/2008 | 1052 | 23.0 | 21.7 | 7.1 | 261 | 480 | 460 | 0.02 | 3 | | |
| NR1 | 7/2/2008 | 1031 | 27.0 | 23.9 | 8.8 | 354 | 2800 | 2800 | 0.02 | 3 | Duplicate | 2600 |
| | | | | | | | | | | | | |
| NR23 | 7/9/2008 | 1059 | 28.0 | 21.5 | 8.9 | 783 | 188 | 146 | 0.41 | 4 | Replicate | 176 (E. coli) |
| NR22 | 7/9/2008 | 1111 | 31.0 | 21.9 | 9.1 | 422 | 0 | 0 | 0.41 | 4 | | |
| NR21 | 7/9/2008 | 1120 | 29.0 | 23.2 | 6.0 | 735 | 240 | 180 | 0.41 | 4 | | |
| NR20 | 7/9/2008 | 1135 | 30.0 | 26.5 | 9.5 | 697 | 192 | 136 | 0.41 | 4 | Duplicate | 156 |
| NR15 | 7/9/2008 | 1149 | 28.0 | 24.3 | 7.7 | 551 | 840 | 760 | 0.41 | 4 | | |
| NR13 | 7/9/2008 | 1203 | 270.0 | 23.9 | 8.3 | 428 | 268 | 232 | 0.41 | 4 | | |
| NR9.5 | 7/9/2008 | 1113 | 27.0 | 23.3 | 7.5 | 378 | 162 | 146 | 0.41 | 4 | | |
| NR9 | 7/9/2008 | 1056 | 28.0 | 21.6 | 8.1 | 354 | 80 | 68 | 0.41 | 4 | | |
| NR6 | 7/9/2008 | 1041 | 28.0 | 22.5 | 8.0 | 357 | 400 | 360 | 0.41 | 4 | Replicate | 228 (E. coli) |
| NR4 | 7/9/2008 | 1029 | 30.0 | 23.4 | 10.5 | 358 | 520 | 440 | 0.41 | 4 | | |
| SM3 | 7/9/2008 | 1014 | 27.0 | 22.6 | 7.1 | 245 | 1000 | 900 | 0.41 | 4 | Duplicate | 1180 |
| NR1 | 7/9/2008 | 1000 | 30.0 | 24.2 | 8.6 | 346 | 400 | 200 | 0.41 | 4 | | |
| | | | | | | | | | | | | |
| NR23 | 7/17/2008 | 1037 | 26.5 | 19.6 | 9.3 | 913 | PINK | 148 | 0.62 | 3 | | |
| NR22 | 7/17/2008 | 1048 | 29.0 | 20.9 | 9.9 | 792 | 1 | 1 | 0.62 | 3 | | |
| NR21 | 7/17/2008 | 1058 | 29.0 | 20.8 | 6.8 | 793 | 284 | 252 | 0.62 | 3 | | |
| NR20 | 7/17/2008 | 1113 | 28.5 | 24.1 | 11.5 | 750 | 104 | 88 | 0.62 | 3 | Field Blank | 0 |
| NR15 | 7/17/2008 | 1123 | 24.0 | 21.7 | 8.5 | 603 | 200 | 164 | 0.62 | 3 | Duplicate | 260 |
| NR13 | 7/17/2008 | 1152 | 25.0 | 22.3 | 8.4 | 464 | 172 | 144 | 0.62 | 3 | | |
| NR9.5 | 7/17/2008 | 1054 | 28.0 | 22.1 | 8.0 | 382 | 160 | 140 | 0.62 | 3 | | |
| NR9 | 7/17/2008 | 1111 | 28.0 | 20.5 | 8.4 | 370 | 90 | 88 | 0.62 | 3 | | |
| NR6 | 7/17/2008 | 1125 | 28.0 | 21.4 | 8.8 | 301 | 204 | 168 | 0.62 | 3 | | |
| NR4 | 7/17/2008 | 1140 | 28.0 | 23.3 | 11.6 | 365 | 440 | 380 | 0.62 | 3 | Duplicate | 440 |
| SM3 | 7/15/2008 | 1505 | 30.0 | 23.2 | 6.6 | 236 | 6800 | 6700 | 0.62 | 3 | Field Blank | 0 |
| NR1 | 7/17/2008 | 1156 | 28.0 | 25.2 | 8.8 | 339 | 400 | 270 | 0.62 | 3 | | |
| | | | | | | | | | | | | |
| NR23 | 7/23/2008 | 1053 | 24.0 | 20.9 | 7.6 | 505 | 9100 | 2300 | 0.40 | 0 | Replicate | 10000 |
| NR22 | 7/23/2008 | 1105 | 22.0 | 22.5 | 8.9 | 800 | 0 | n/a | 0.40 | 0 | | |
| NR21 | 7/23/2008 | 1118 | 23.5 | 22.2 | 4.3 | 751 | 11600 | 9800 | 0.40 | 0 | | |
| NR20 | 7/23/2008 | 1130 | 23.0 | 23.2 | 6.6 | 787 | 150 | 80 | 0.40 | 0 | | |
| NR15 | 7/23/2008 | 1142 | 24.0 | 22.9 | 7.3 | 610 | 900 | 500 | 0.40 | 0 | | |
| NR13 | 7/23/2008 | 1157 | 22.0 | 23.1 | 6.8 | 481 | 610 | 460 | 0.40 | 0 | Duplicate | 780 |
| NR9.5 | 7/23/2008 | 1224 | n/a | 23.4 | 7.4 | 426 | 630 | 570 | 0.40 | 0 | Replicate | 670 |
| NR9 | 7/23/2008 | 1210 | n/a | 21.1 | 6.4 | 267 | 430 | 380 | 0.40 | 0 | | |
| NR6 | 7/23/2008 | 1158 | n/a | 22.2 | 6.0 | 356 | 3800 | 3800 | 0.40 | 0 | | |
| NR4 | 7/23/2008 | 1140 | n/a | 22.7 | 8.2 | 342 | 6700 | 6100 | 0.40 | 0 | Duplicate | 5700 |
| SM3 | 7/23/2008 | 1125 | n/a | 23.1 | 6.6 | 263 | 1400 | 1100 | 0.40 | 0 | | |
| NR1 | 7/23/2008 | 1030 | n/a | 23.3 | 7.1 | 307 | 7200 | 6300 | 0.40 | 0 | | |

| Site | Date | Time | Air Temp. ° C | Water Temp. ° C | D.O. mg/L | COND. umho/cm | Fecal Coliform. CFU/100 mL | E. coli CFU/100 mL | Amount of rain (in) | Days prior to sampling | QA/QC | Fecal Coliform. CFU/100 mL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR23 | 8/7/2008 | 1034 | 24.0 | 20.2 | 8.6 | 784 | n/a | 260 | 0.34 | 0 | | |
| NR22 | 8/7/2008 | 1043 | 24.0 | 21.8 | 9.1 | 792 | 0 | 0 | 0.34 | 0 | Field Blank | 0 |
| NR21 | 8/7/2008 | 1054 | 23.0 | 21.1 | 3.5 | 753 | 290 | 190 | 0.34 | 0 | Replicate | 420 |
| NR20 | 8/7/2008 | 1106 | 22.5 | 23.0 | 11.1 | 682 | 180 | 100 | 0.34 | 0 | Duplicate | 190 |
| NR15 | 8/7/2008 | 1119 | 22.0 | 22.4 | 7.9 | 602 | 520 | 420 | 0.34 | 0 | | |
| NR13 | 8/7/2008 | 1133 | 23.0 | 22.3 | 8.0 | 434 | 450 | 290 | 0.34 | 0 | | |
| NR9.5 | 8/7/2008 | 1126 | | 22.6 | 8.1 | 399 | 200 | 150 | 0.34 | 0 | | |
| NR9 | 8/7/2008 | 1115 | | 20.8 | 8.3 | 341 | 130 | 100 | 0.34 | 0 | Replicate | 160 |
| NR6 | 8/7/2008 | 1051 | | 21.4 | 7.6 | 340 | 710 | 470 | 0.34 | 0 | Duplicate | n/a |
| NR4 | 8/7/2008 | 1155 | | 23.5 | 10.9 | 351 | n/a | 200 | 0.34 | 0 | | |
| SM3 | 8/7/2008 | 1007 | | 22.0 | 7.2 | 221 | 1100 | 900 | 0.34 | 0 | Field Blank | 0 |
| NR1 | 8/7/2008 | 948 | | 23.2 | 9.3 | 321 | 750 | 500 | 0.34 | 0 | | |
| | | | | | | | | | | | | |
| NR23 | 8/13/2008 | 1033 | 20.5 | 17.6 | 9.1 | 853 | 640 | 460 | 0.12 | 2 | | |
| NR22 | 8/13/2008 | 1045 | 20.5 | 20.0 | 9.4 | 816 | 1 | 0 | 0.12 | 2 | Field Blank | 0 |
| NR21 | 8/13/2008 | 1055 | 20.0 | 18.0 | 5.2 | 811 | 250 | 200 | 0.12 | 2 | | |
| NR20 | 8/13/2008 | 1106 | 21.0 | 19.7 | 11.6 | 694 | 200 | 160 | 0.12 | 2 | Replicate | 130 |
| NR15 | 8/13/2008 | 1116 | 21.7 | 19.2 | 8.7 | 470 | 190 | 160 | 0.12 | 2 | Duplicate | 200 |
| NR13 | 8/13/2008 | 1132 | 21.0 | 19.4 | 8.5 | 446 | 170 | 160 | 0.12 | 2 | | |
| NR9.5 | 8/13/2008 | 1111 | 23.0 | 20.5 | 8.7 | 400 | 240 | 220 | 0.12 | 2 | Replicate | 160 |
| NR9 | 8/13/2008 | 1056 | 24.0 | 19.3 | 8.6 | 378 | 190 | 180 | 0.12 | 2 | Duplicate | 260 |
| NR6 | 8/13/2008 | 1040 | 24.0 | 19.3 | 9.1 | 368 | 580 | 470 | 0.12 | 2 | | |
| NR4 | 8/13/2008 | 1022 | 23.0 | 20.1 | 7.8 | 365 | 420 | 300 | 0.12 | 2 | | |
| SM3 | 8/13/2008 | 1012 | 25.0 | 19.7 | 7.5 | 217 | 340 | 290 | 0.12 | 2 | Field Blank | 0 |
| NR1 | 8/13/2008 | 1000 | 23.0 | 21.0 | 8.2 | 336 | n/a | 550 | 0.12 | 2 | | |
| | | | | | | | | | | | | |
| NR23 | 8/20/2008 | 1055 | 20.0 | 16.6 | 8.9 | 956 | 192 | 144 | 0.31 | 4 | | |
| NR22 | 8/20/2008 | 1107 | 21.7 | 19.7 | 9.1 | 812 | 0 | 0 | 0.31 | 4 | | |
| NR21 | 8/20/2008 | 1115 | 22.2 | 17.6 | 5.3 | 869 | 140 | 110 | 0.31 | 4 | Field Blank | 0 |
| NR20 | 8/20/2008 | 1124 | 22.2 | 19.2 | 10.8 | 824 | 80 | 80 | 0.31 | 4 | | |
| NR15 | 8/20/2008 | 1134 | 21.1 | 16.8 | 8.5 | 647 | 268 | 232 | 0.31 | 4 | Replicate | 288 |
| NR13 | 8/20/2008 | 1156 | 22.8 | 18.2 | 8.5 | 449 | 288 | 244 | 0.31 | 4 | Duplicate | 236 |
| NR9.5 | 8/20/2008 | 1154 | 21.0 | 18.7 | 8.8 | 420 | 128 | 88 | 0.31 | 4 | Duplicate | 120 |
| NR9 | 8/20/2008 | 1130 | 21.0 | 16.9 | 9.6 | 357 | 92 | 68 | 0.31 | 4 | | |
| NR6 | 8/20/2008 | 1122 | 21.0 | 17.4 | 9.3 | 362 | 350 | 220 | 0.31 | 4 | | |
| NR4 | 8/20/2008 | 1103 | 21.0 | 19.2 | 11.9 | 364 | 280 | 210 | 0.31 | 4 | Field Blank | 0 |
| SM3 | 8/20/2008 | 1050 | 20.7 | 19.0 | 8.3 | 235 | 230 | 210 | 0.31 | 4 | | |
| NR1 | 8/20/2008 | 1033 | 20.5 | 19.9 | 9.5 | 344 | 510 | 320 | 0.31 | 4 | Replicate | 500 |
| | | | | | | | | | | | | |
| NR23 | 8/27/2008 | 1028 | 22.0 | 15.4 | 10.0 | 992 | 368 | 320 | 0.00 | 7 | Duplicate | 340 |
| NR22 | 8/27/2008 | 1041 | 24.0 | 19.6 | 9.4 | 738 | 0 | 0 | 0.00 | 7 | | |
| NR21 | 8/27/2008 | 1055 | 24.0 | 16.3 | 4.6 | 795 | 148 | 140 | 0.00 | 7 | Field Blank | 0 |
| NR20 | 8/27/2008 | 1110 | 22.0 | 17.2 | 9.3 | 759 | 48 | 40 | 0.00 | 7 | | |
| NR15 | 8/27/2008 | 1125 | 23.0 | 15.9 | 9.0 | 651 | 160 | 140 | 0.00 | 7 | | |
| NR13 | 8/27/2008 | 1139 | 23.0 | 16.9 | 8.2 | 230 | 400 | 360 | 0.00 | 7 | Replicate | 288 |
| NR9.5 | 8/27/2008 | 1141 | 22.0 | 17.2 | 9.2 | 428 | 182 | 158 | 0.00 | 7 | Replicate | 160 |
| NR9 | 8/27/2008 | 1123 | 23.0 | 16.1 | 9.6 | 354 | 42 | 38 | 0.00 | 7 | | |
| NR6 | 8/27/2008 | 1102 | 25.0 | 16.2 | 9.0 | 360 | 196 | 180 | 0.00 | 7 | Field Blank | 0 |
| NR4 | 8/27/2008 | 1046 | 26.0 | 17.7 | 10.8 | 360 | 150 | 140 | 0.00 | 7 | | |
| SM3 | 8/27/2008 | 1031 | 22.0 | 18.7 | 8.2 | 247 | 100 | 68 | 0.00 | 7 | | |
| NR1 | 8/27/2008 | 1013 | 22.0 | 18.4 | 9.4 | 369 | 1040 | 760 | 0.00 | 7 | Duplicate | 740 |

| Site | Date | Time | Air Temp. ° C | Water Temp. ° C | D.O. mg/L | COND. umho/cm | Fecal Coliform. CFU/100 mL | E. coli CFU/100 mL | Amount of rain (in) | Days prior to sampling | QA/QC | Fecal Coliform. CFU/100 mL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR23 | 9/4/2008 | 1045 | 27.5 | 19.7 | 7.8 | 907 | 640 | 640 | 0.05 | 1 | Replicate | 600 |
| NR22 | 9/4/2008 | 1100 | 28.0 | 21.4 | 9.1 | 734 | 0 | 0 | 0.05 | 1 | Field Blank | 0 |
| NR21 | 9/4/2008 | 1108 | 31.0 | 21.1 | 5.6 | 763 | 160 | 150 | 0.05 | 1 | Duplicate | 180 |
| NR20 | 9/4/2008 | 1120 | 29.0 | 22.2 | 7.9 | 752 | 216 | 212 | 0.05 | 1 | | |
| NR15 | 9/4/2008 | 1130 | 27.5 | 20.2 | 7.9 | 629 | 520 | 480 | 0.05 | 1 | | |
| NR13 | 9/4/2008 | 1145 | 28.0 | 20.7 | 7.6 | 400 | 480 | 400 | 0.05 | 1 | | |
| NR9.5 | 9/4/2008 | 1141 | 25.0 | 20.4 | 9.0 | 379 | 4000 | 3600 | 0.05 | 1 | | |
| NR9 | 9/4/2008 | 1125 | 28.0 | 19.6 | 8.9 | 274 | 2200 | 2200 | 0.05 | 1 | Replicate | 1940 |
| NR6 | 9/4/2008 | 1110 | 30.0 | 19.8 | 9.2 | 359 | 1700 | 1700 | 0.05 | 1 | Replicate | 1680 |
| NR4 | 9/4/2008 | 1052 | 29.0 | 21.3 | 9.5 | 348 | 840 | 780 | 0.05 | 1 | Duplicate | n/g |
| SM3 | 9/4/2008 | 1042 | 26.0 | 20.9 | 8.6 | 250 | 148 | 144 | 0.05 | 1 | Field Blank | 0 |
| NR1 | 9/4/2008 | 1030 | 29.0 | 21.7 | 9.6 | 371 | 1140 | 1080 | 0.05 | 1 | Replicate | 1500 |
| | | | | | | | | | | | | |
| NR23 | 9/10/2008 | 900 | 18.0 | 16.6 | 9.3 | 577 | pink | 400 | 0.57 | 1 | | |
| NR22 | 9/10/2008 | 915 | 18.0 | 19.8 | 9.5 | 664 | 0 | 0 | 0.57 | 1 | Field Blank | 0 |
| NR21 | 9/10/2008 | 927 | 18.0 | 17.2 | 1.9 | 400 | 40 | 30 | 0.57 | 1 | | |
| NR20 | 9/10/2008 | 939 | 18.5 | 17.8 | 2.6 | 283 | 160 | 130 | 0.57 | 1 | Replicate | 100 |
| NR15 | 9/10/2008 | 953 | 18.0 | 18.1 | 8.9 | 271 | 220 | 220 | 0.57 | 1 | Duplicate | 130 |
| NR13 | 9/10/2008 | 1015 | 18.0 | 18.2 | 8.6 | 241 | 210 | 180 | 0.57 | 1 | | |
| NR9.5 | 9/10/2008 | 1157 | 19.0 | 19.0 | 9.7 | 228 | 356 | 356 | 0.57 | 1 | | |
| NR9 | 9/10/2008 | 1143 | 20.0 | 18.3 | 9.2 | 226 | pink | 260 | 0.57 | 1 | | |
| NR6 | 9/10/2008 | 1127 | 18.0 | 18.2 | 9.1 | 227 | 420 | 390 | 0.57 | 1 | Duplicate | 400 |
| NR4 | 9/10/2008 | 1056 | 22.5 | 18.6 | 8.7 | 238 | 370 | 330 | 0.57 | 1 | | |
| SM3 | 9/10/2008 | 1045 | 19.0 | 18.6 | 9.8 | 187 | 330 | 330 | 0.57 | 1 | Field Blank | 0 |
| NR1 | 9/10/2008 | 1028 | 20.5 | 19.0 | 8.9 | 229 | 390 | 380 | 0.57 | 1 | | |
| | | | | | | | | | | | | |
| NR23 | 9/18/2008 | 1050 | 21.0 | 15.8 | 9.7 | 861 | 100 | 100 | 0.62 | 4 | Field Blank | 0 |
| NR22 | 9/18/2008 | 1058 | 23.0 | 18.8 | 9.6 | 767 | 0 | 0 | 0.62 | 4 | | |
| NR21 | 9/18/2008 | 1107 | 23.0 | 16.1 | 3.7 | 728 | 140 | 120 | 0.62 | 4 | | |
| NR20 | 9/18/2008 | 1114 | 23.0 | 16.7 | 9.8 | 665 | 180 | 120 | 0.62 | 4 | Replicate | 150 |
| NR15 | 9/18/2008 | 1125 | 22.0 | 16.7 | 9.0 | 518 | 180 | 170 | 0.62 | 4 | Duplicate | 180 |
| NR13 | 9/18/2008 | 1136 | 21.0 | 16.9 | 9.4 | 389 | 170 | 160 | 0.62 | 4 | | |
| NR9.5 | 9/18/2008 | 1141 | 23.0 | 17.4 | 9.3 | 350 | 124 | 96 | 0.62 | 4 | Replicate | 172 |
| NR9 | 9/18/2008 | 1128 | 22.0 | 16.6 | 9.5 | 328 | 120 | 112 | 0.62 | 4 | | |
| NR6 | 9/18/2008 | 1109 | 24.0 | 16.7 | 9.9 | 329 | 260 | 220 | 0.62 | 4 | Field Blank | 0 |
| NR4 | 9/18/2008 | 1044 | 26.0 | 17.1 | 11.3 | 328 | 440 | 380 | 0.62 | 4 | Duplicate | 370 |
| SM3 | 9/18/2008 | 1032 | 23.0 | 16.9 | 9.4 | 222 | 150 | 90 | 0.62 | 4 | | |
| NR1 | 9/18/2008 | 1017 | 23.0 | 17.8 | 10.1 | 307 | 36000 | 28000 | 0.62 | 4 | | |
| | | | | | | | | | | | | |
| NR23 | 9/24/2008 | 1131 | 25.0 | 14.0 | 10.3 | 1029 | 212 | 152 | 0.00 | 7 | | |
| NR22 | 9/24/2008 | 1142 | 22.0 | 18.1 | 10.1 | 816 | 0 | 0 | 0.00 | 7 | Field Blank | 0 |
| NR21 | 9/24/2008 | 1155 | 25.0 | 14.6 | 7.1 | 803 | 64 | 44 | 0.00 | 7 | | |
| NR20 | 9/24/2008 | 1210 | 21.0 | 15.9 | 11.4 | 797 | 108 | 108 | 0.00 | 7 | | |
| NR15 | 9/24/2008 | 1226 | 20.0 | 14.6 | 10.5 | 597 | 340 | 340 | 0.00 | 7 | Replicate | 360 |
| NR13 | 9/24/2008 | 1247 | 20.0 | 15.4 | 10.5 | 401 | 160 | 124 | 0.00 | 7 | Duplicate | 172 |
| NR9.5 | 9/24/2008 | 1248 | 18.1 | 15.7 | 10.2 | 373 | 236 | 156 | 0.00 | 7 | | |
| NR9 | 9/24/2008 | 1230 | 18.1 | 14.6 | 10.8 | 340 | 88 | 72 | 0.00 | 7 | Replicate | |
| NR6 | 9/24/2008 | 1214 | 18.1 | 15.0 | 11.2 | 339 | 276 | 248 | 0.00 | 7 | Field Blank | 0 |
| NR4 | 9/24/2008 | 1151 | 18.1 | 16.1 | 13.8 | 341 | 460 | 360 | 0.00 | 7 | | |
| SM3 | 9/24/2008 | 1137 | 17.5 | 15.2 | 10.1 | 226 | 192 | 148 | 0.00 | 7 | Duplicate | 164 |
| NR1 | 9/24/2008 | 1120 | 17.5 | 17.2 | 11.4 | 325 | 40000 | 31000 | 0.00 | 7 | | |

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 |
|---|---|---|---|
| 5/1/2008 | NR23 | 42 | 72/58 |
| 5/1/2008 | SM3 | 112 | 96/100 |
| 5/7/2008 | NR15 | 36 | 36/52 |
| 5/7/2008 | NR9 | 24 | 32/42 |
| 5/15/2008 | NR13 | 164 | 168/172 |
| 5/15/2008 | NR9.5 | 80 | 58/54 |
| 5/21/2008 | NR23 | 100 | 140/104 |
| 5/21/2008 | NR9 | 82 | 104/94 |
| 6/4/2008 | NR13 | 610 | 680/670 |
| 6/4/2008 | NR4 | 1570 | 3000/5000 |
| 6/11/2008 | NR20 | n/a | 1210/1180 |
| 6/11/20078 | NR6 | n/a | 810/780 |
| 6/19/2008 | NR15 | 260 | 200/170 |
| 6/19/2008 | NR9 | 278 | 240/240 |
| 6/25/2008 | NR20 | 232 | 172/172 |
| 6/25/2008 | NR9.5 | 180 | 196/188 |
| 7/2/2008 | NR1 | n/a | 2800/2600 |
| 7/9/2008 | NR20 | n/a | 192/156 |
| 7/9/2008 | SM3 | n/a | 1000/1180 |
| 7/17/2008 | NR15 | 224 | 200/260 |
| 7/17/2008 | NR4 | 420 | 440/440 |
| 7/23/2008 | NR13 | 650 | 610/780 |
| 7/23/2008 | NR4 | 10100 | 6700/5700 |
| 8/7/2008 | NR20 | n/a | 180/190 |
| 8/7/2008 | NR6 | n/a | 710/na |
| 8/13/2008 | NR15 | n/a | 190/200 |
| 8/13/2008 | NR9 | n/a | 190/260 |
| 8/20/2008 | NR13 | n/a | 288/236 |
| 8/20/2008 | NR9.5 | n/a | 128/120 |
| 8/27/2008 | NR23 | n/a | 368/340 |
| 8/27/2008 | NR1 | n/a | 1040/740 |
| 9/4/2008 | NR21 | n/a | 160/180 |
| 9/4/2008 | NR4 | n/a | 840/ng |
| 9/10/2008 | NR15 | 220 | 220/130 |
| 9/10/2008 | NR6 | 390 | 420/400 |
| 9/18/2008 | NR15 | 160 | 180/180 |
| 9/18/2008 | NR4 | 392 | 440/370 |
| 9/24/2008 | NR13 | 172 | 160/172 |
| 9/24/2008 | SM3 | 208 | 192/164 |

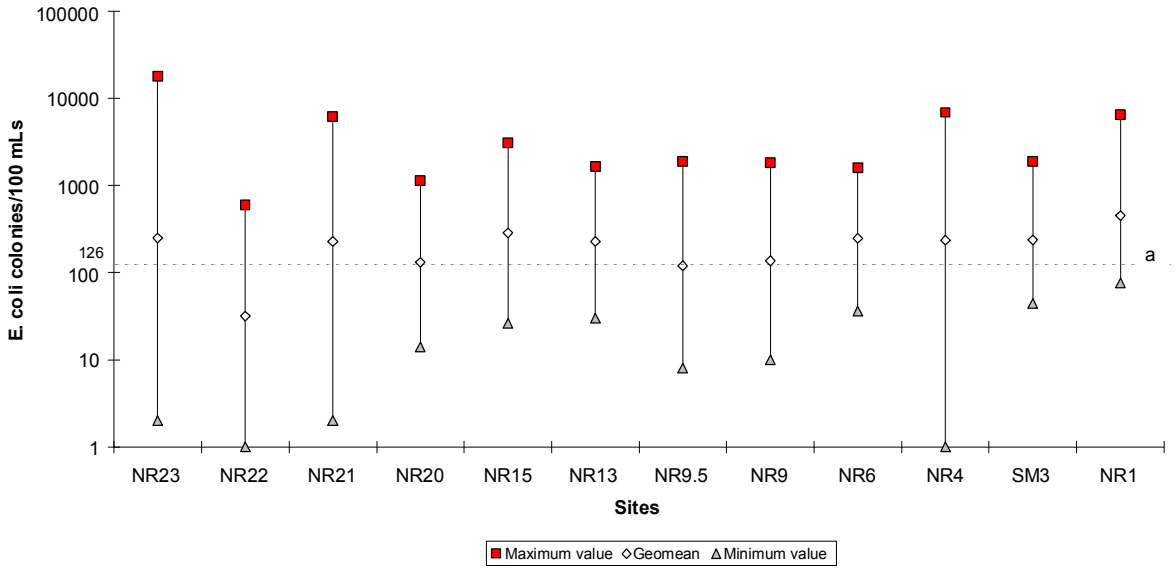
# Appendix C

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

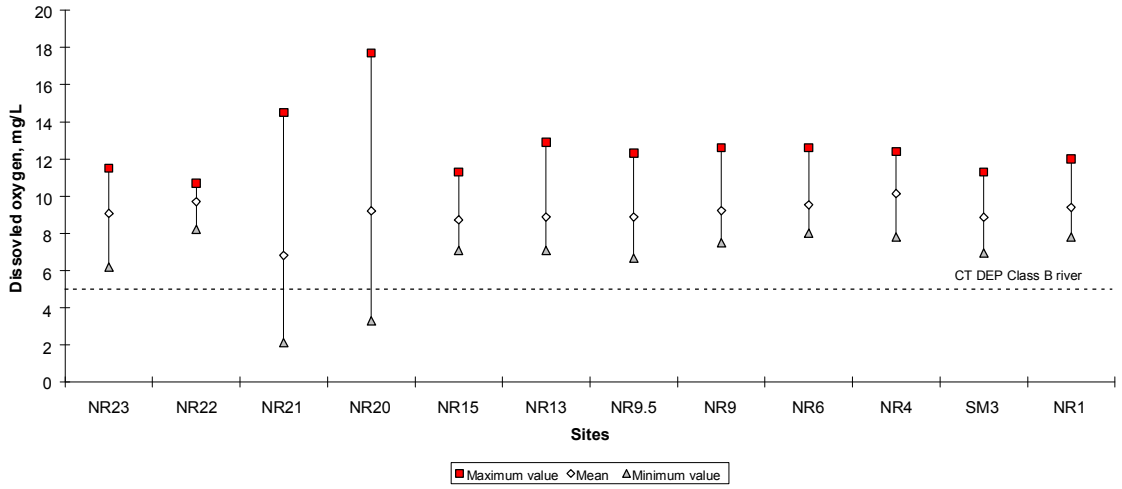
An example of a graph for maximum, geometric means, and minimum values of *E. coli* bacteria concentrations at 12 monitoring sites in the Norwalk River Watershed when the two Ridgefield and one Georgetown wastewater treatment facilities are required by NPDES permits to disinfect sewage effluent




[a]CT 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 Yaxis) 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

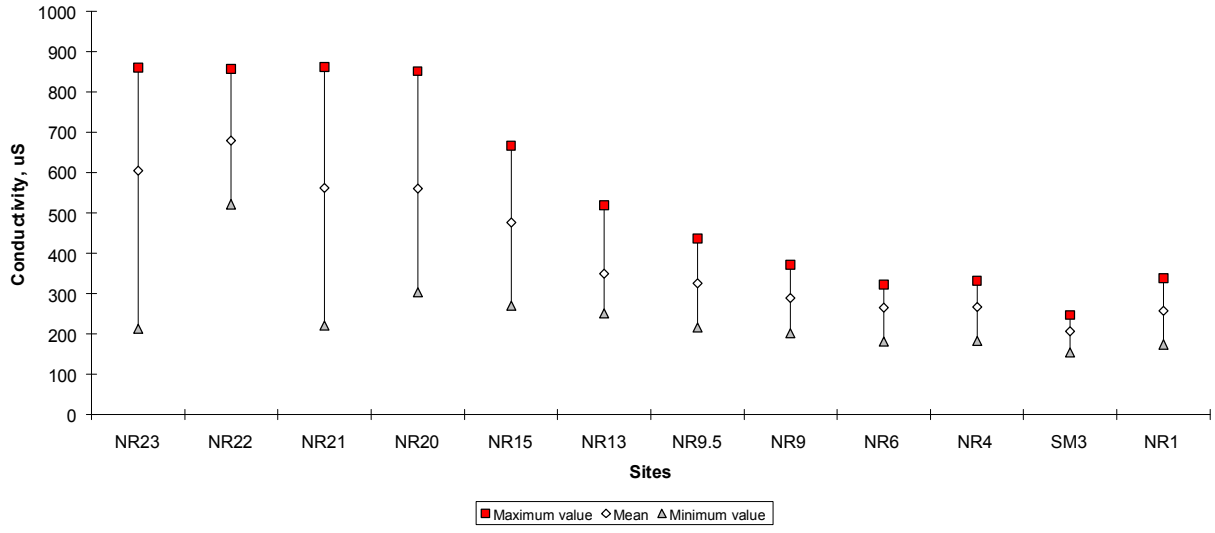
The graph below is an example of a graph showing maximum, mean and minimum values for dissolved oxygen at 12 sampling sites on the Norwalk River Watershed




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 (*u*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, (µmhos/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 µmhos/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 ($^{o}$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 $^{o}$F (29.4 $^{o}$C), or in any case raise the normal temperature of the receiving water more than 4 $^{o}$F (2.2 $^{o}$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 1$^{st}$ through September 30$^{th}$ 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.