



Harbor Watch/River Watch (HW/RW) water quality monitoring program, a program of Earthplace, has engaged in an active research program on the Norwalk River and its tributaries for the last eleven years. This work was initially funded for six years by the CT DEP and then for the past five years it was supported by a mixture of grants, town allocations, and donations. During that time, HW/RW has been dedicated to improving the water quality of this urbanized river. Bacteria studies are carried out year-round with 14 established sites being maintained weekly from May 1<sup>st</sup> to September 30<sup>th</sup>. During the cold-weather months, all sites are monitored monthly. All data were collected under the guidance of an EPA approved quality assurance plan and are freely shared with CT DEP.

As part of a HW/RW school project during the winter of 2008/2009, two Wilton High School students, Angela Yi and Katie Jacobs took discharge samples from the three sewage treatment plants on the Norwalk River. *E. coli* bacteria samples were analyzed at the state certified HW/RW laboratory at Earthplace. Nutrient samples were analyzed at York Analytical Laboratories, Inc. in Stratford. The results showed significant quantities of phosphorous released to the receiving waters because phosphorous removal units are turned off during the winter months. One plant (Route 7) has no provision to remove nutrients.

In a similar fashion, sanitizing ultraviolet lamps are also turned off for during winter months, which often cause downstream testing sites to exceed the CT DEP *E. coli* bacteria criteria for a Class B River. Again, this is in compliance with existing NPDES permits.

The enclosed proposal is presented in the hope that all three NPDES permit renewals will require phosphorous removal and bacteria sanitization on a year round basis. We do realize however, that the Route 7 plant will need funding to support phosphorous removal and that funding is scarce.

This proposal is presented in the spirit of helping an impaired river regain some of its former beauty and utility.

Sincerely,

Richard B. Harris, Director, HW/RW, a Program of Earthplace

Cc: John Horkel, Ph D, Director of Earthplace

## **Nutrient and bacterial loading from sewage treatment plants on the Norwalk River**

### **The Problem:**

Phosphorous is an essential nutrient for plant growth. Superabundant levels of phosphorous in concert with elevated levels of nitrogen (always present) cause explosive growths of surface algae and aquatic weeds. Impoundments in the Norwalk River north of Rte 35, at the Stonehenge Restaurant and Factory Pond at Georgetown (to name a few) are choked with explosive plant growth during the summer months (Figure 1). This not only is a loss of aesthetics but as the aquatic weeds undergo biological decomposition at the end of the growing season dissolved oxygen (DO) deprivation occurs in the deeper parts of these impoundments (caused by eutrophication) to the point where fish can no longer seek refuge from the higher water temperatures above. This last point is often overlooked even as water temperatures rise with loss of tree lines on the river banks and global warming. All three waste water treatment plants (WTPs) on the Norwalk River are allowed to discharge phosphorous by NPDES' permit from October through April each year (Figure 2). Harbor Watch/River Watch (HW/RW) has many photos showing algae proliferation on Factory Pond at Georgetown (Appendix 1)

### **The Wastewater Treatment Plants:**

The largest waste water treatment plant (WTP) is located in Ridgefield (22 Smith Street) with an effluent discharge of 700,000 gallons-per-day (gpd) and removes phosphorous very efficiently, consistently and cost effectively (Table 1). The problem here is the WTP's NPDES permit (pending renewal) issued by CT DEP allows the plant to discontinue the phosphorous removal process from October 1<sup>st</sup> through April 30 each year (Figure 3). During the winter months the plant discharges phosphorous at the rate of 6 lbs/day (Appendix 2) or approximately 1100 lbs during the winter period. The phosphorous either goes downstream or is taken up by the sediments in the impoundments to help begin another cycle of destructive weed growth. Phosphorous is conservative and may well be accumulating in the impoundments over time as net new additional phosphorous enters from the source (Appendix 1). While the CT DEP recommends 0.2mg/L of phosphorous as a maximum discharge at the Ridgefield WTP (Appendix 2) the analysis of effluent during the summer months shows rates below a MDL of 0.050 mg/L (Table 2).

The smaller Ridgefield WTP (Route 7), which processes approximately 50,000 gpd, is older technology and has no process to remove nitrogen or phosphorous (Figure 4). It discharges 2 lbs of phosphorous per day or 720 lbs/year. Much of this discharge is available during the growing season. We do not agree with the CT DEP that this plant be capped at present levels of phosphorous in the discharge (Appendix 2). This plant comes up for NPDES permit renewal in September 2009 and a phosphorous removal unit should be installed as part of the permit renewal. Phosphorous removal should be done on a year round basis.

The third WTP at Georgetown has new technology (GE's Zenon WTP with a Zeeweed filter) and is very efficient at removing nitrogen and phosphorous (Figure 5,). It is undergoing startup and is still awaiting a NPDES permit (pending). Local management has separately elected to remove phosphorous and bacteria on a year round basis. The present effluent discharge is 50,000 gpd. A few startup problems were encountered with phosphorous removal (Figure 5) during last winter. However, it would seem prudent that the new NPDES permit should require phosphorous removal at this facility on a year-round basis.

### **Bacteria:**

Concerning bacteria, this contaminant is easily controlled with UV lights. Ridgefield and Route 7 both have UV lights on from May 1<sup>st</sup> to September 30 and bacteria counts in the effluent are zero most of the time (HW/RW records). Renewed CT DEP NPDES permits based on TMLD requirements will now allow this period to be extended a month on each end from April 1<sup>st</sup> to October 30<sup>th</sup> to accommodate fishermen. Permitting *E. coli* bacteria to be released to the river in large quantities along with probable enteric pathogens (*Salmonella*, etc.) is not a good idea particularly when efficient methodology to remove bacteria is in place. CT DEP logic is that bacteria die sooner in colder water and that nobody drinks or swims in the Norwalk River. The CT DEP issued *E. coli* criteria 12/17/02 for a Class B River for both the geometric mean and a single sample maximum. During the winter months Norwalk *E. coli* counts exceed the CT DEP Class B bacteria criteria (Table 1). Note that bacteria counts are elevated in the Ridgefield area which relates to the Ridgefield WTP winter discharge. Keeping the UV lights on at the Ridgefield and Route 7 plants year round could possibly help meet the CT DEP criteria for a Class B River during the winter months.

### **Recommendations:**

- A. Low Cost Option: Have Ridgefield WTP turn on phosphorous removal year round. Require Ridgefield and Rte 7 WTP turn on bacteria lights year round. These conditions should be reflected in the new NPDES permits.
- B. Add phosphorous removal to the Route 7 WTP. Modernize Rte 7 WTP to minimally achieve phosphorous removal year round. This NPDES permits now comes up for renewal in September 2009. A public period for comment will be held during the renewal period.

We recommend immediate implementation of option A and adoption of option B in September 2009 pending the availability of state or federal funding. The needed change in NPDES permits will improve water quality in the Norwalk River.

### **NAME**

**Richard Harris, Director HW/RW**

### **ORGANIZATION**

**Earthplace @ 10 Woodside Ln.  
Westport, CT 06880**

Figure 1 Map of HWRW WWTP discharge sites on the Norwalk River

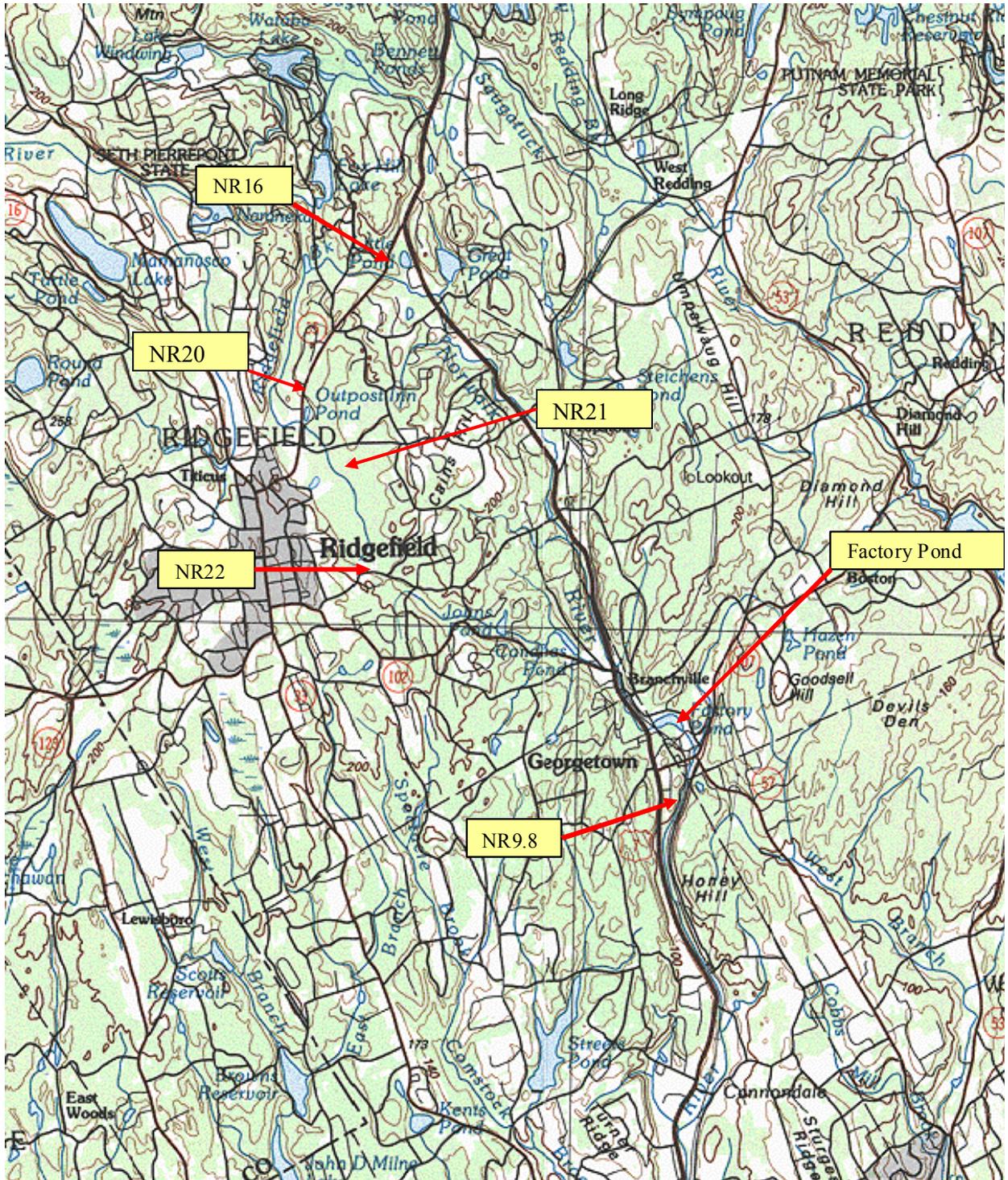


Table 1 October 2006 through March 2007 *E. coli* bacteria concentrations, geometric means and % frequency exceeding 410 colonies/100 mLs at 12 sampling sites in the Norwalk River Watershed for the period of time when the two Ridgefield and one Georgetown wastewater treatment facilities are not required by NPDES permit to begin disinfecting sewage effluent (7 sampling events)

	Dates								
Site	10/5/2006	10/12/2006	11/9/2006	12/7/2006	1/4/2007	2/1/2007	3/1/2007	<b>Geomean</b>	% Frequency Exceeding 410 colonies/100 mL
NR23	1000	4300	700	124	184	110	44	<b>318</b>	42.86%
NR22*	400	3900	4000	700	600	1800	5100	<b>1575</b>	85.71%
NR21	840	4200	2200	36	100	200	820	<b>463</b>	57.14%
NR20	900	5200	2700	52	110	200	820	<b>531</b>	57.14%
NR15	460	8200	1120	6	40	14	32	<b>124</b>	42.86%
NR13	260	4200	720	58	32	14	40	<b>135</b>	28.57%
NR9.5	84	1900	360	26	66	4	16	<b>67</b>	14.29%
NR9	220	1000	280	40	32	14	32	<b>86</b>	14.29%
NR6	900	3300	540	84	42	24	18	<b>158</b>	42.86%
NR4	920	4700	400	148	52	24	32	<b>194</b>	28.57%
SM3	3000	3200	580	32	94	88	60	<b>264</b>	42.86%
NR1	920	3900	400	160	140	500	58	<b>369</b>	42.86%

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

Table 2 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 2 A comparative view of three WTPs showing mg/L of total phosphorous observed in treated effluent from the period of 10/15/08 through 4/27/09

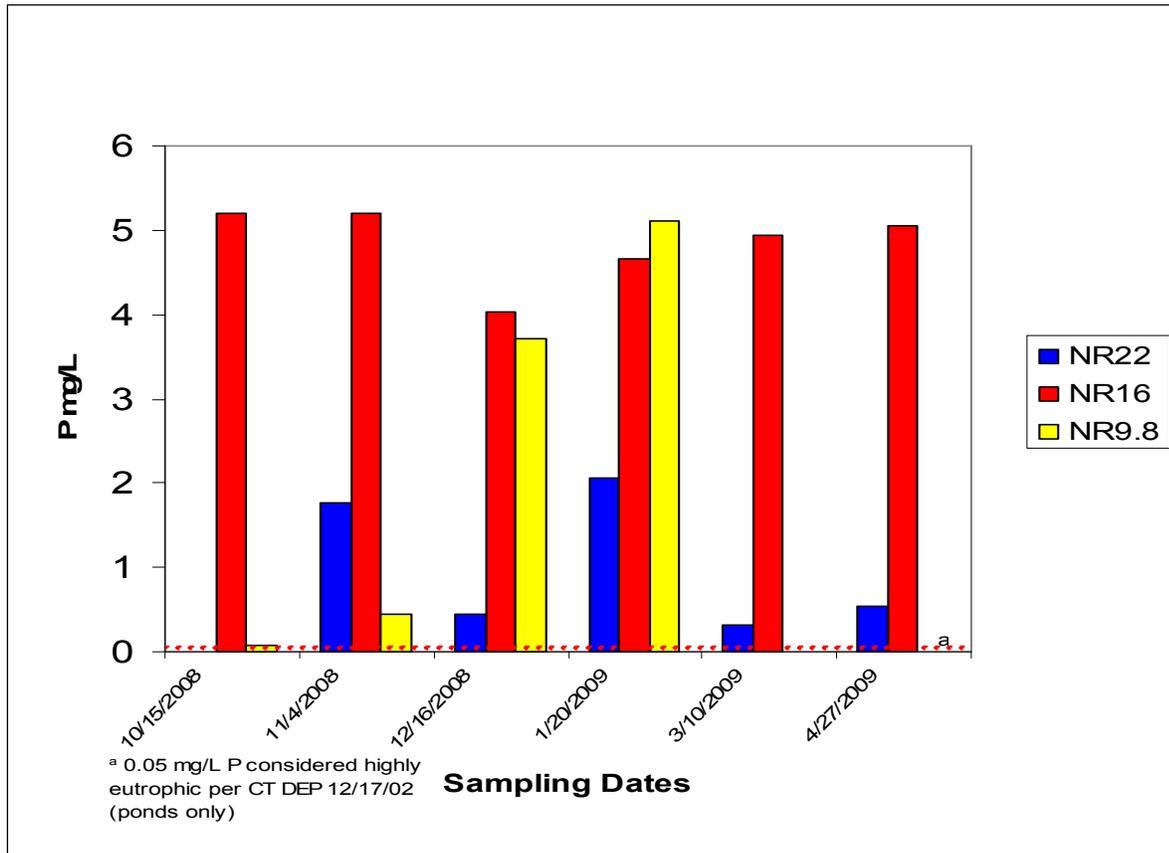


Figure 3 Observed pounds of total phosphorous released in treated effluent at the Ridgefield WTP (NR22) on six dates during the period of 10/15/08 through 4/27/09

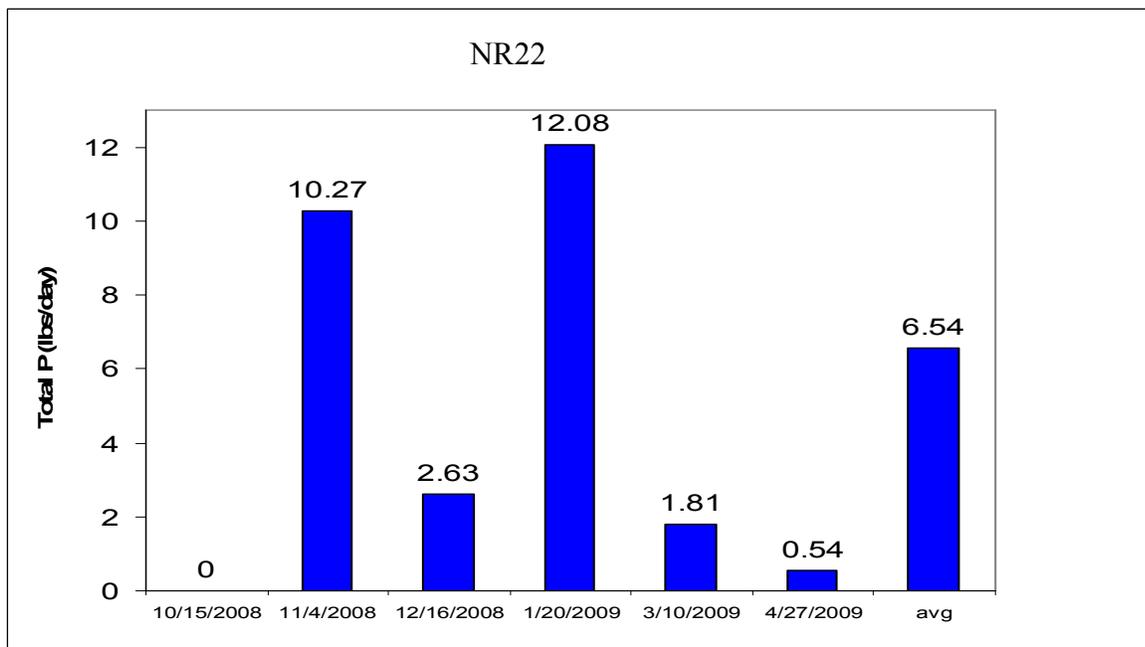


Figure 4 Observed pounds of total phosphorous released in treated effluent at the Rte 7 WTP (NR16) on six dates during the period of 10/15/08 through 4/27/09

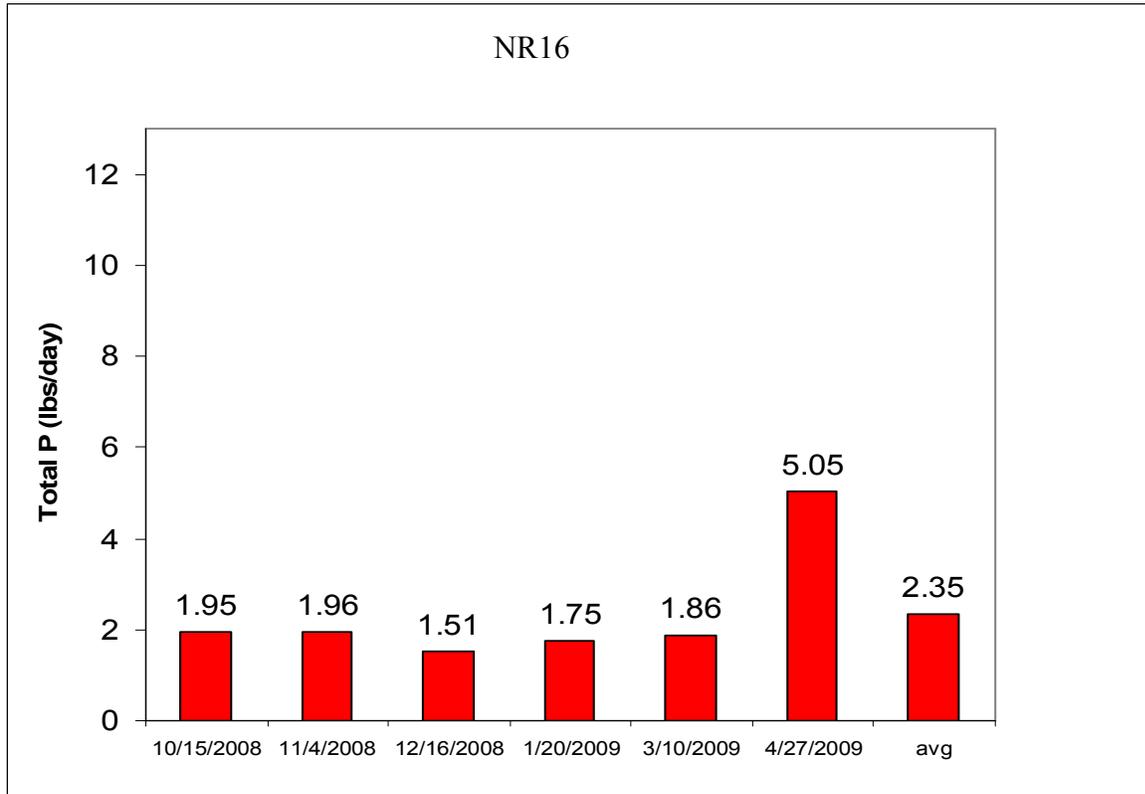
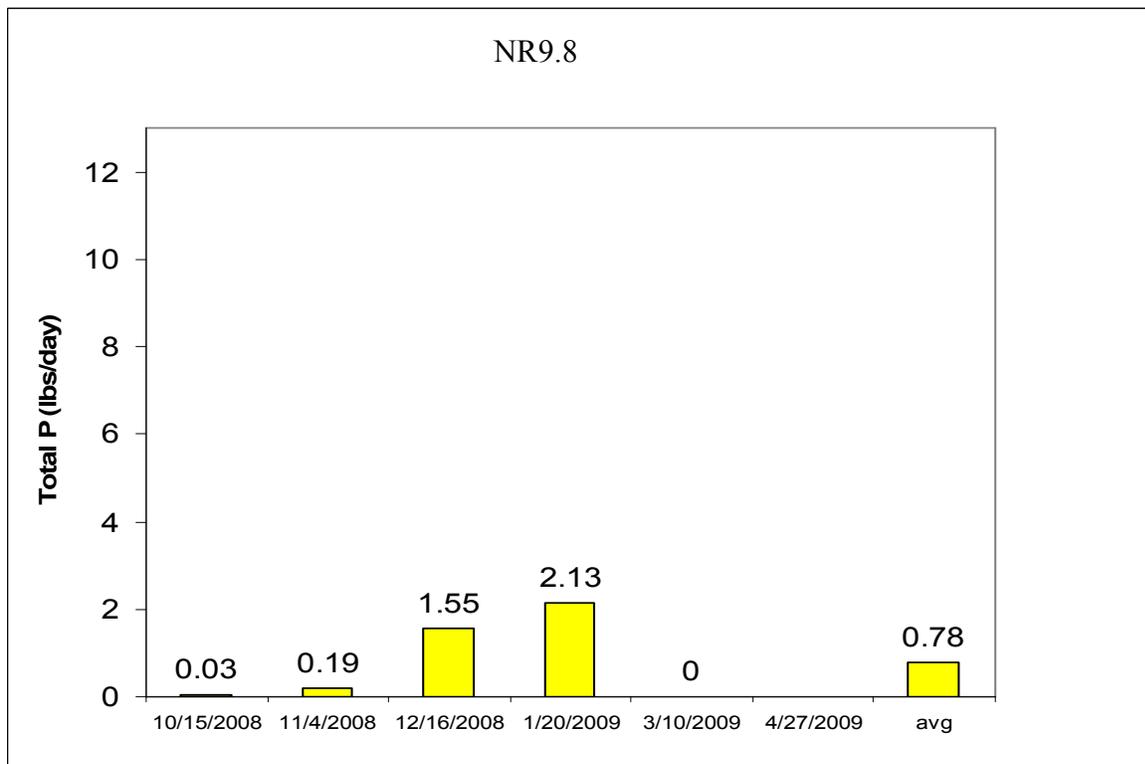


Figure 5 Observed pounds of total phosphorous released in treated effluent at the Georgetown WTP (NR9.8) on six dates during the period of 10/15/08 through 4/27/09



## Appendix 1

## Photos of Factory Pond (Norwalk River Watershed)



View of Factory Pond looking upstream from the Wire Mill Complex



Exit point of Factory Pond at the dam in the Wire Mill Complex

August 2008



Face of the Factory Pond Dam in the Wire Mill Complex



Algae growth in the Norwalk River as it flows through the Wire Mill Complex

## Appendix 2

## WWTP PHOSPHORUS FACT SHEET

### RIDGEFIELD MAIN WPCF C/O OMI

#### Facility Overview

NPDES #	CT0100854	Permit Expiration Date	9/29/2009
Town	RIDGEFIELD	Design Flow (MGD)	1.00
Receiving Waterbody	Ridgefield Brook-02	Type of Treatment*	AS, AdvTr, Nitr, DNitr, PRem, Sfilt, UV

\* AS = activated sludge, RBC = rotating biological contactor system, SBR = sequencing batch reactor system, EA = extended aeration, OD = oxidation ditch, EC/clar = clarifier, UV = ultraviolet disinfection, AdvTr = advanced treatment, Nitr = nitrification, DNitr = denitrification, PRem = phosphorus removal, FAS = powdered activated carbon system, Sft = sand filter, THH = trickling filter

#### Current and Proposed Seasonal Phosphorus

Current Average Flow (MGD) 2001 - 2007	0.62
Current Average Phosphorus Concentration (mg/L) 2001 - 2007	1.36
Current Phosphorus Treatment Performance (mg/L)	1.0 mg/l Avg Monthly, 2.0 mg/l Daily Limit
Current Average Phosphorus Load (lbs/day) 2001 - 2007	5.99
Proposed Treatment Performance (mg/L)	0.2
BMP Load Allocation (lbs/day)	1.04
Percent Reduction from Current	83
Expected WWTP Compliance Date	

#### Enrichment Factor At Point of Discharge

$\text{Enrichment Factor} = \frac{\text{Total Current Load At Discharge}}{\text{Total Forested "Natural" Condition Load}}$
Enrichment Factor: 137.89
Total Forested Condition (lbs/day): 0.04

$\text{Estimated WWTP Percent Contribution At Point of Discharge} = \frac{\text{Current WWTP Load}}{[\text{Ag}] + [\text{Urban}] + [\text{Forest}] + [\text{Total Upstream WWTP}] + [\text{Out of State}]}$
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Nutrient Export Attribute	Watershed Area (acres)	Estimated Load (lbs/day)
Agriculture	28.45	0.05
Urban	160.35	0.07
Forest	239.7	0.02
Total US WWTP	1 (No.)	5.99
Out of State	0	0.00

Total Current Load At Discharge (lbs/day)	6.14
Percent Contribution at Point of Concern	98

## WWTP PHOSPHORUS FACT SHEET

### RIDGEFIELD RTE 7 C/O OMI\*

#### Facility Overview

NPDES #	CT0101451	Permit Expiration Date	10/4/2009
Town	RIDGEFIELD	Design Flow (MGD)	0.12
Receiving Waterbody	Norwalk River-05	Type of Treatment*	RBC, UV, Nitr

\* AS = activated sludge, RBC = rotating biological contactor system, SBR = sequencing batch reactor system, EA = extended aeration, OD = oxidation ditch, DClor = disinfection, UV = ultraviolet disinfection, AdvTr = advanced treatment, Nitr = nitrification, DNitr = denitrification, PRem = phosphorus removal, PAC = powdered activated carbon system, Sfilt = sand filter, Trfilt = trickling filter

#### Current and Proposed Seasonal Phosphorus

Current Average Flow (MGD) 2001 - 2007	
Current Average Phosphorus Concentration (mg/L) 2001 - 2007	
Current Phosphorus Treatment Performance (mg/L)	No Phosphorus Treatment At This Time
Current Average Phosphorus Load (lbs/day) 2001 - 2007	
Proposed Treatment Performance (mg/L)	Cap
BMP Load Allocation (lbs/day)	0.00
Percent Reduction from Current	0
Expected WWTP Compliance Date	

#### Enrichment Factor At Point of Discharge

$\text{Enrichment Factor} = \frac{\text{Total Current Load At Discharge}}{\text{Total Forested 'Natural' Condition Load}}$
Enrichment Factor: 2.73
Total Forested Condition (lbs/day): 0.03

$\text{Estimated WWTP Percent Contribution At Point of Discharge} = \frac{\text{Current WWTP Load}}{[\text{Ag}] + [\text{Urban}] + [\text{Forest}] + [\text{Total Upstream WWTP}] + [\text{Out of State}]}$
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Nutrient Export Attribute	Watershed Area (acres)	Estimated Load (lbs/day)
Agriculture	10.69	0.02
Urban	73.06	0.03
Forest	164.2	0.02
Total US WWTP	1 (No.)	
Out of State	0	0.00

Total Current Load At Discharge (lbs/day)	
Percent Contribution at Point of Concern	

## WWTP PHOSPHORUS FACT SHEET

### REDDING WPCF

#### Facility Overview

NPDES #	CT0101770	Permit Expiration Date	1/27/2008
Town	REDDING	Design Flow (MGD)	0.25
Receiving Waterbody	Norwalk River-03a	Type of Treatment*	SBR, UV, AdvTr, Nitr, DNitr

\* AS = activated sludge, RBC = rotating biological contractor system, SBR = sequencing batch reactor system, EA = extended aeration, OD = oxidation ditch, DColor = dechlorination, UV = ultraviolet disinfection, AdvTr = advanced treatment, Nitr = nitrification, DNitr = denitrification, PRem = phosphorus removal, PAC = powdered activated carbon system, SFlt = sand filter, TRIT = trickling filter

#### Current and Proposed Seasonal Phosphorus

Current Average Flow (MGD) 2001 - 2007	0.05
Current Average Phosphorus Concentration (mg/L) 2001 - 2007	3.38
Current Phosphorus Treatment Performance (mg/L)	No Phosphorus Treatment At This Time
Current Average Phosphorus Load (lbs/day) 2001 - 2007	1.08
Proposed Treatment Performance (mg/L)	0.7
BMP Load Allocation (lbs/day)	0.29
Percent Reduction from Current	73
Expected WWTP Compliance Date	

#### Enrichment Factor At Point of Discharge

$$\text{Enrichment Factor} = \frac{\text{Total Current Load At Discharge}}{\text{Total Forested 'Natural' Condition Load}}$$

Enrichment Factor: 18.18

Total Forested Condition (lbs/day): 0.54

$$\text{Estimated WWTP Percent Contribution At Point of Discharge} = \frac{\text{Current WWTP Load}}{\text{[Ag] + [Urban] + [Forest] + [Total Upstream WWTP] + [Out of State]}}$$

[Ag] + [Urban] + [Forest] + [Total Upstream WWTP] + [Out of State]

Nutrient Export Attribute	Watershed Area (acres)	Estimated Load (lbs/day)
Agriculture	368.12	0.73
Urban	2798.77	1.21
Forest	5926.27	0.62
Total US WWTP	3 (No.)	7.07
Out of State	0	0.00

Total Current Load At Discharge (lbs/day) 9.63

Percent Contribution at Point of Concern 11