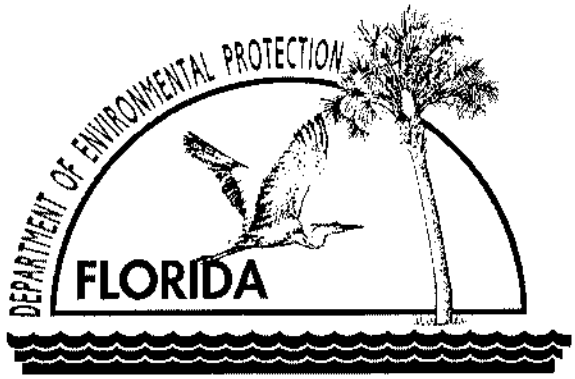
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Biological Assessment of

City of Bunnell WWTP

Flagler County

NPDES #FL0020907

Sampled September 1998

April 1999

Biology Section
Division of Administrative and Technical Services
Bureau of Laboratories

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger: City of Bunnell WWTP
County: Flagler
NPDES Number: #FL0020907
Permit Expiration Date: 4/11/99

Toxics Sampling Inspection (XSI)

Date Sampled: 08 September 1998

Results: Silver was detected in the effluent (0.21 µg/L) at a level that exceeded the Class III water quality standard of 0.07 µg/L (Rule 62-302.530(60) FAC). No organic pollutants were detected in the effluent.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 08 September 1998

Results: The effluent sample was not toxic to the fish, *Cyprinella leedsi,* or to the invertebrate, *Ceriodaphnia dubia,* during the 48-hour bioassay.

Impact Bioassessment Inspection (IBI)

Date Sampled: 08 September 1998

Results: The discharge appeared to cause declines in taxa richness and diversity in the test site phytoplankton community. The effluent did not appear to have any adverse affects on the macroinvertebrate communities. Macroinvertebrate taxa richness, Florida Index and SCI scores were slightly higher at the test site compared to the control site.

Water Quality Inspection (WQI)

Date Sampled: 08 September 1998

Results: The dissolved oxygen levels at the control (2.6 mg/L) and test (3.4 mg/L) sites failed to meet Class III water quality standards (Rule 62-302.530(31) FAC). Effluent nutrients appeared to cause increases in total phosphorus, ortho-phosphate, and nitrate+nitrite at the test site. AGP corresponded to the increased nutrients at the test site (113.1 mg dry wt/L) and greatly exceeded the 5 mg dry wt/L "problem threshold". Total coliforms in the effluent and at the study sites exceeded Class III water quality standards (Rule 62-302.530(7) FAC) and the facility's permit limit. However, the effluent sample was held beyond the normal holding time. Fecal coliforms at the test site exceeded Class III water quality standards (Rule 62-302.530(6) FAC).

This Biological Assessment was prepared by DEP staff to provide information to be used in reviewing an NPDES permit renewal application for the subject facility. This assessment will be used in conjunction with other information concerning the facility and its receiving water body to determine appropriate final permit conditions.

Introduction

The City of Bunnell Wastewater Treatment Plant (WWTP) is a municipal treatment plant located in Flagler County, Florida (see maps in the Appendix). Activities at this plant include Class I reliability conventional aeration, with optional step aeration (activated sludge), chlorination, and dechlorination. The treated effluent is discharged into an unnamed drainage canal which leads to the Black Branch Canal and ultimately to the Class III Haw Creek. The design flow of the wastewater system is 0.60 MGD; the actual flow during this survey was 0.28 MGD. State permit limits for the City of Bunnell WWTP are listed in Table 1. According to the facility's summary report, the plant has no current enforcement activities with FDEP (see Facility Summary in the Appendix).

Methods

The focus of this investigation on September 10, 1998, was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a control site (located in an unnamed drainage canal approximately 125 meters upstream of the discharge) and a test site (located in the same unnamed drainage canal approximately 125 meters downstream of the discharge). A habitat assessment was performed *in situ* to establish comparability between sites and supplemental physical/chemical data were also collected on the effluent and study sites. The effluent was analyzed for nutrients, metals, and for organic constituents (base neutral and acid extractables, and pesticide extractables). Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Acute screening toxicity bioassays, using the invertebrate, *Ceriodaphnia dubia,* and the fish, *Cyprinella leedsi*, as test organisms, were performed on an effluent sample.

Benthic macroinvertebrate communities were evaluated at control and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip-net sweeps. No Hester-Dendy samplers were deployed due to ditch dredging near the point of discharge. Several different measurements of macroinvertebrate and algal community health have been employed to determine the effects of the discharge. These measurements include: habitat assessment, taxa richness, Shannon-Weaver Diversity Index, the Florida Index, Ephemeroptera/Plecoptera/Trichoptera (EPT) Index, community composition, functional feeding groups, algal biomass, and the Stream Condition Index (SCI). For a discussion of each of these measures see *Explanation of Measurements of Community Health* in the Appendix.

Phytoplankton were sampled at both control and test sites via subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities. No periphyton racks were deployed due to ditch dredging near the point of discharge. *Selenastrum capricornutum* was used as the test organism for the algal growth potential tests. All field and laboratory biological methods were carried out following Biology Section Standard Operating Procedures (SOP's). The latest version of the SOP's can be viewed on our web site at 'www.dep.state.fl.us/labs/sops.htm'.

For graphical purposes, the percent differences between the control and test sites involving the number of taxa, the diversity index, the Florida Index, the EPT Index, and the % filter-feeders are measured as the control site minus test site divided by the control site. The percent differences between sites involving % contribution, algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site.

The following personnel were involved in this investigation: Pat O'Connor and Jeff Martin (DEP Northeast District), and Julie Baughman, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Scott Lashbrook, Elizabeth Miller, Urania Quintana, Johnny Richardson, Lisa Tamburello, Steve Wolfe, David Whiting, and Vicki Whiting (DEP Central Biology Laboratory in Tallahassee). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Chuck Ziegmont, and Michael Tanski, as well as District representatives.

Results

The habitat quality at each of the study sites was rated as "marginal" (see Habitat Assessment Data Sheets in Appendix). Both sites lacked productive substrates and adequate water velocity. In addition, there was severe habitat smothering at the study sites re-

Table 1. Effluent limits and summary of chemistry data.

City of Bunnell WWTP	Effluent Limits	Effluent Samples	Control Site	Test Site
Organic Constituents (µg/L)				
	-	None Detected	-	-
Metals (µg/L)				
Aluminum	1500 **	100 U	-	-
Arsenic	-	20 U	-	-
Cadmium	1.51 **a	0.06 U	-	-
Chromium	278 **a	10 U	-	-
Copper	16 **a	4.9	-	-
Iron	1000 **	56 I	-	-
Lead	5.0 **a	0.22 I	-	-
Mercury	0.012 **	0.1 U	-	-
Nickel	214 **a	6.0 U	-	-
Selenium	5.0 **	30 U	-	-
Silver	0.07 **	0.21	-	-
Zinc	144 **a	37 I	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	2.0	0.022 A	0.53
Total phosphorus	-	2.2 A	0.073	0.59
Ammonia	-	0.042	0.35 A	0.26
Nitrate+Nitrite	-	30 J	0.051 I	7.1 J
TKN	5.0 *	1.6 A	1.6	1.9
Organic Nitrogen	-	1.56	1.25	1.64
Total Nitrogen	-	31.6	1.65	9.0
General Phys-Chem Parameters				
Habitat Assessment	-	-	60	67
D.O. (mg/L)	≥ 6.0 *	7.5	2.6	3.4
pH (SU)	6.0-8.5 *	7.1	6.4	6.5
Conductivity (µmhos/cm)	**	737	288	446
Temperature (°C)	**	28.4	25.5	26.8
C.B.O.D., 5 day (mg/L)	16 *	2.0 K	2.0 K	2.0 K
TSS (mg/L)	60 *	1.0 K	3.0	4.0
Flow (MGD)	-	0.28	-	-
Hardness (mg $CaCO_3$)	-	144	-	-
Toxicity (48-hour static, screeening bioassay)				
C. leedsi - fish	-	Not Toxic	-	-
C. dubia - invertebrate	-	Not Toxic	-	-
Microbiology (# counts/100mL)				
Fecal Coliforms	≤ 800 **	10 QB	540	1500 B
Total Coliforms	≤ 2400 **	3600 Q	4600	6900

* Permit limit
** Class III water quality standard
a - Value is based on hardness
A - Value is the mean of two or more determinations
B - Colony counts outside acceptable range
I - Valueis < the minimum practical limit, and ≥ the minimum detection limit
J - Estimated value
K - Actual value is known to be less than value given
Q - Sample held beyond normal holding time
U - Material analyzed for but not detected; value is the minimum detection limit

sulting from an inadequate riparian buffer zone. The results for the City of Bunnell WWTP effluent and receiving water sites are presented in Tables 1 and 2.

Discussion

Silver (0.21 µg/L) was detected in the effluent at a level that exceeded the Class III water quality standard of 0.07µg/L (Rule 62-302.530(60) FAC).

The dissolved oxygen levels at the control and test sites failed to meet Class III water quality standards (Rule 62-302.530(31) FAC) (Table 1).

The effluent total nitrogen concentration apparently contributed to the 82% increase of this nutrient at the test site (Table 1). Effluent levels of total phosphorus, ortho-phosphate, and nitrate+ nitrite seem to be responsible for increases in these nutrients at the test site (Table 1). The dramatic increase in the AGP at the test site, compared to the control site, seems to be a direct result of the increased nutrients from the effluent (Table 2). The test site AGP (113.1 mg dry wt/L) greatly exceeded the 5 mg dry wt/L "problem threshold" (Raschke and Schultz 1987) and was over 5,000% higher than the control site (1.9 mg dry wt/L).

There appear to be sources of total coliforms at the receiving water sites in addition to the effluent (Table 1). The level of total coliforms at the control site were greater than those in the effluent. The test site total coliforms were higher than the control site due to the addition of the discharge. Total coliforms at the control and test sites and fecal coliforms at the test

Table 2. Biological community structure of study sites.

City of Bunnell WWTP	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	21	32
Florida Index	1	4
SCI	19	23
EPT Index	0	1
% Dominant Taxon	22	21
Community Composition		
% Coleoptera	2	1
% Diptera	22	29
% Ephemeroptera	0	2
% Gastropoda	22	22
% Odonata	4	4
% Oligochaeta	42	16
% Pelecypoda	5	21
% Other	3	5
Functional Feeding Groups		
% Predators	5	14
% Burrowing Deposit Feeders	38	13
% Surface Deposit Feeders	17	17
% Suspension Feeders/Filterers	6	22
% Scrapers	22	28
% Shredders	2	4
Phytoplankton Algae		
Number of Taxa	12	5
Shannon-Weaver Diversity	3	2.2
Chlorophyll *a* (µg/L)	1.00 U	1.00 U
Algal Density (#/mL)	200	314
% Blue-green	67	29
% Green	11	43
% Diatoms	4	0
AGP (mg dry wt/L)	1.9	113.1

U - Material analyzed for but not detected; value reported is the minimum detection limit

site exceeded Class III water quality standards (Rules 62-302.530 (7) and (6) FAC, respectively).

The effluent appears to have had an effect on the receiving phytoplankton community (Figure 1). The number of taxa decreased by 58% and diversity decreased by 27% from the control site to the test site. In spite of the elevated nutrients, the algal densities were fairly low at the study sites. Nevertheless, there was a 57% increase in algal density and the AGP was two orders of magnitude higher at the test site compared to the control site (Table 2).

Qualitative measures of macroinvertebrate community health showed some improvement at the test site compared to the control site (Table 2). Taxa richness, the number of chironomid taxa, the Florida Index, and the SCI scores all increased at the test site compared to the control (Figure 2 and Table 2). The suspension feeders, which are typically "good water quality indicators" increased from 6% at the control site to 22% at the test site. The SCI scores placed both sites in the "good" category. Both sites, however, lacked pollution-sensitive taxa, as seen from the very low EPT and Florida Index scores at the control and test sites (Table 2). The effluent did not appear to adversely effect the macroinvertebrate communities.

Literature Cited

Barbour, M. T., J. Gerritsen, and J. S. White. 1996. Development of the Stream Condition Index for Florida. Prepared for the Fla. Dept. Environ. Protection. 105 p.

EA Engineering, Science, and Technology and Tetra Tech, Inc. 1994. Bioassessment for the nonpoint source program (draft). Prepared for the Fla. Dept. Environ. Protection. Unpaginated.

FDEP. 1994. Lake bioassessments for the determination of nonpoint source impairment in Florida. Fla. Dept. Environ. Prot. Biology Section, Tallahassee, Fla. 73 p.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. U. S. Environ. Prot. Agency, EPA-600/9-78-018. 126 p.

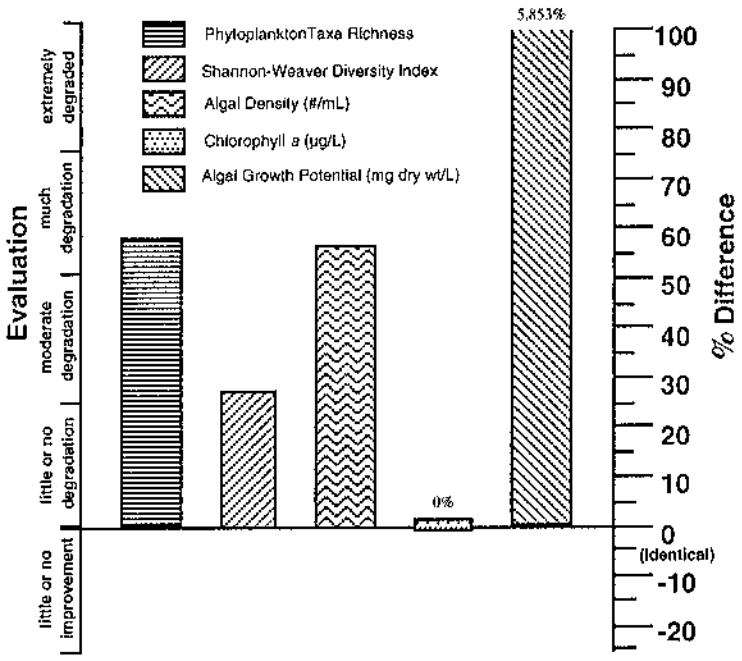


Figure 1. Effect of discharge on the algae community.

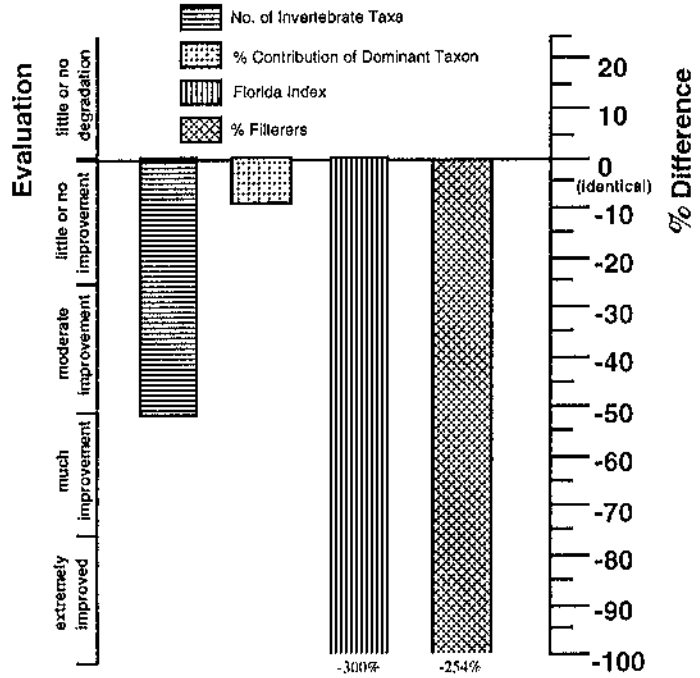


Figure 2. Effect of discharge on the benthic community.

Raschke, R. L. and D. A. Schultz. 1987. The use of the algal growth potential test for data assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227.

Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

Weber, C. I. 1993. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 pp.

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health may have been employed to determine the effects of a discharge. These are briefly discussed here.

Habitat Assessment: Seven attributes known to have potential effects on the stream biota were evaluated and scored, with 20 possible points for each factor. Based on the sum of these individual scores, overall habitat quality is assigned to one of four categories: Optimal (105-140 points); Suboptimal (70-104 points); Marginal (35-69 points); and Poor (0-34 points).

Taxa richness: Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa.

The Florida Index: Some organisms become rare or absent as the intensity or duration of disturbance increases. The Florida Index, assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy.

Ephemeroptera/Plecoptera/Trichoptera (EPT) Index: This index is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to control conditions, may indicate degradation.

Algal biomass: High algal biomass (algal density or chlorophyll *a*) implies nutrient stress. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions in flowing streams.

Functional Feeding Groups: Disturbance can shift the feeding strategies of invertebrates. In Florida, for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA Engineering 1994).

The Stream Condition Index (SCI): The SCI is a composite macroinvertebrate metric (Barbour *et al.* 1996) developed for Florida. The SCI assigns points to a variety of parameters, depending on how closely each parameter approaches an expected control condition (see SCI calculation table in Appendix).

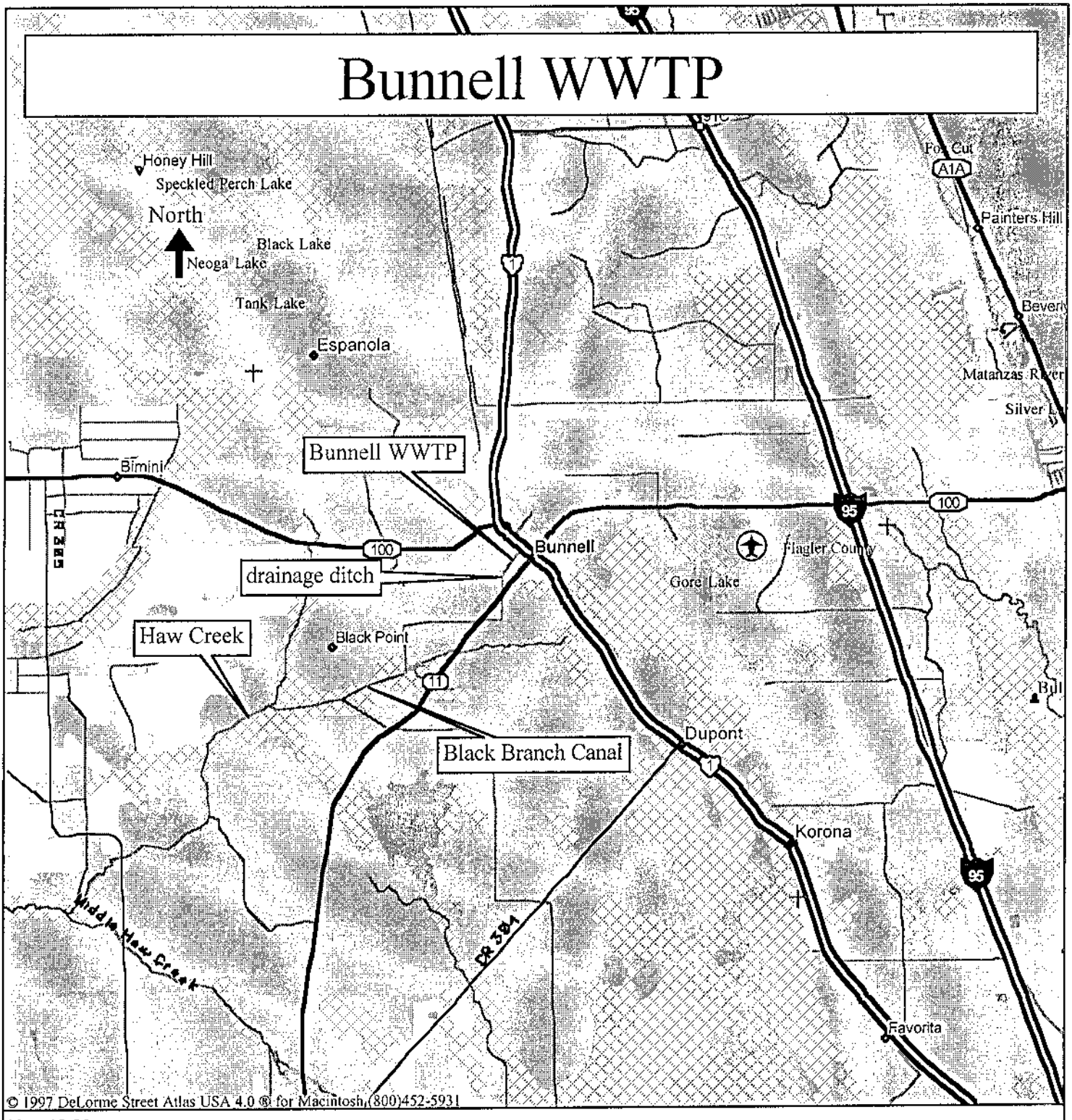
Typical Values for Selected Parameters in Florida Waters

Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

Parameter	Percentile Distribution										
	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30

Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates

Bunnell WWTP

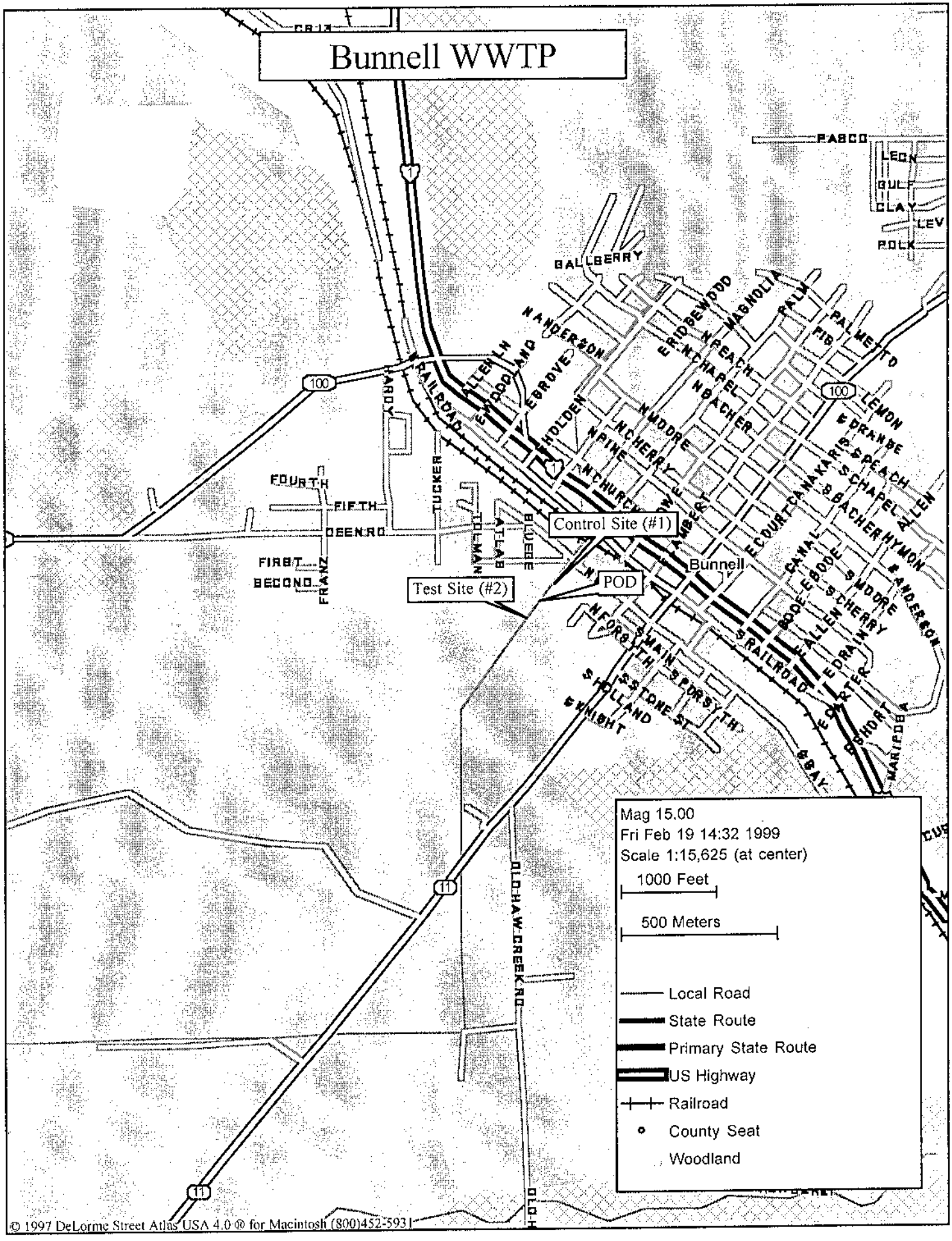


Mag 12.00
Thu Dec 31 08:54 1998
Scale 1:125,000 (at center)

2 Miles

2 KM

- Major Connector
- State Route
- Primary State Route
- Interstate/Limited Access
- US Highway
- County Seat
- Small Town
- Geographic Feature
- Park/Reservation
- Locale
- Public Airport
- Exit
- Cemetery
- Land


Bunnell WWTP
Control Site (#1)
Test Site (#2)
POD
Bunnell
Mag 15.00
Fri Feb 19 14:32 1999
Scale 1:15,625 (at center)
1000 Feet
500 Meters
Local Road
State Route
Primary State Route
US Highway
Railroad
County Seat
Woodland
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STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: City of Bunnell		Date Summary Prepared: 9/8/98 AND 12/23/98
Location (attach detailed map): Tollman Street Bunnell	County: Flagler	District: Northeast
Federal Permit # FL 0020907 and expiration date: 4/11/99	State GMS # and 3118 mo 7027 State expiration date: 4/4/99	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:
Wastewater Treatment Facility

Description of treatment process: .6 mGD Class I rehability Conventional Aeration w/ optional Step aeration WWTF w/ chlorinated effluent dechlorinated + discharged to an unnamed drainage canal to Black Branch to Haw Creek.

Receiving waters: unnamed ditch → Canal to Black Branch → Haw Creek | Classification: (I) II III

Design Flow: .60 mGD | Mean Flow: .25 | Flow during survey: .28

Discharge is: (Continuous) Intermittent Seasonal Rainfall dependent
Other (describe)

therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):

List effluent limits (if necessary, attach relevant paperwork):

Parameter	Limit (units)			Describe special permit conditions and permit modifications:
	Annual	monthly	WKly	Single
CBOD 5	8	8	12	16 mg/L
TSS	20	30	45	60 mg/L
Fecal Coliforms	200	200	Single Sa	mple = 800 no/100 mL
TKN	2.5	2.5	3.75	5.0 mg/L
pH = 6.0 min. 8.5 max	6.0 min pH 8.5 max pH			
Chlorine = .50 min .01 max	.50 min for disinfection .01 max after dechlor.			

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):

to unnamed ditch.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: N/A

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:

Had EPA Consent order, not sure why. No longer in effect? Initially was not a delegated facility.

No current enforcement activities w/ FDEP.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

Data submitted on BMRs is consistent w/ DEP sampling results.

Additional information:

Inspection revealed ortho-phosphate was not being sample @ time of collection. This has now been corrected.

Staff contributing to this review (signature):

Pat O'Connor (Biologist)

Belinda Bishop (Inspector)

B. Bishop & Jeff Martin (Engineer)

( )

( )

( )

I.D. Number: 3118M07027
Permit Number: DO18-238243
Date of Issue: April 11, 1994
Expiration Date: April 11, 1999

Mayor Benjamin F. Cauley
City of Bunnell WWTP

16. Pursuant to Rule 17-640.500(1)(f) FAC, the Agricultural Use Plan shall be updated and submitted to the Department annually beginning one year from the date of operation permit issuance. The pH of the residuals soil mixture and a summary of the total domestic wastewater residuals, nitrogen, and heavy metals applied on an annual basis shall be submitted with the annual update to the Agricultural Use Plan.

17. In accordance with Chapter 17-601 FAC, the monitoring requirements and effluent limitations for this plant are as follows:

PARAMETER	EFFLUENT LIMIT	MINIMUM FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION
Flow (mgd)	0.300 Annual Average	Continuous	A	Influent or Effluent
CBODs (mg/L)	(a)	Every two weeks	(b)	Influent (c) & Effluent (d)
TSS (mg/L)	(a)	Every two weeks	(b)	Influent (c) & Effluent (d)
TKN (mg/L)	(a)	Every two weeks	(b)	Effluent (d)
DO (mg/L)	6.0 Minimum	Daily, 5/week	Instrument	Effluent (d)
pH Units	Minimum 6.0 Maximum 8.5	Daily, 5/week	Instrument	Effluent (d)
Chlorine Residual(mg/L)	0.5 Minimum (e) 0.01 Maximum	Daily, 5/week Daily, 5/week	Meter or Instrument	ccc Dechlor. Effluent
Fecal Coliform no./100 (mL)	200 (i)	Every two weeks	Grab	Effluent (d)
Toxicity	See Specific Condition Number 18			
Nutrient Monitoring	See Specific Condition Number 19			
Stream Monitoring	See Specific Condition Number 20			
Testing Methods	See Specific Condition Number 21			

(a)

	ANNUAL	MONTHLY	WEEKLY	ONE TIME MAXIMUM
CBODs	8.0	8.0	12.0	16.0
TSS	20	30*	45*	60*
TKN	2.5	2.5	3.75	5.0

* Rule 17-600.740, FAC
A. Recording flowmeter and totalizer required.

(b) 8-hour minimum flow-proportioned composite sample.

Florida Department of
Environmental Protection

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7577

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

PERMITTEE:

Honorable Benjamin F. Cauley, Mayor
City of Bunnell
Post Office Box 756
Bunnell, Florida 32110

I.D. Number: 3118M07027
Permit/Cert Number: DO18-238243
Date of Issue: April 11, 1994
Expiration Date: April 11, 1999
County: Flagler
Lat/Long: 29°27'50"N/81°15'46"W
Section/Township/Range: 15/12S/30E
Project: City of Bunnell WWTP

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-301, 17-302, 17-4, 17-600, 17-601, 17-602, 17-610, 17-640, and 17-7. The above named Permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

To operate a 0.600 MGD Class I reliability conventional aeration, optional step aeration (activated sludge) WWTP with the chlorinated treated effluent dechlorinated (post aerated and discharged to an unnamed drainage canal to Black Branch to Haw Creek. The permitted capacity of the facility is limited to 0.300 MGD until new WQBELs have been completed and the antidegradation requirements have been satisfied.

Located off Tolman Street, City of Bunnell, Flagler County, Florida.

In accordance with application received September 23, 1993 and additional information received through March 14, 1994.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
			1100	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
		Burwell Steam Water Ditch upstream of Pond 100-150 yds	Site #1

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Land-Use in Watershed (specify relative percent in each category):

Forest/Natural	Silviculture	Field/Pasture	Agricultural	(Residential)	Commercial	Industrial	Other (Specify)
20				70	10		

Local Watershed Erosion (check box): None ☐ Slight ☐ Moderate ☒ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☒

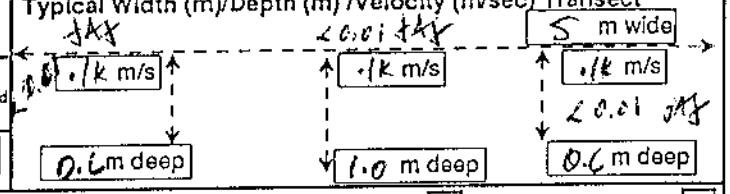
Width of riparian vegetation (m) on least buffered side: 21 — *List & map dominant vegetation on back*

Artificially Channelized ☐ no ☒ recent/severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark: 0.3 (m above present water level) + 1.0 (present depth in m) = 1.3 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



Canopy Cover %: Open ☐ Lightly Shaded (11-45%) ☒ Moderately Shaded (46-80%) ☐ Heavily Shaded ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☒ Other ☐

Sediment Oils: Absent ☐ Slight ☒ Moderate ☒ Profuse ☐

Sediment Deposition: Sludge ☐ Sand smothering: none slight (moderate) severe Silt smothering: none slight moderate severe Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags) ✓	2	5	Direct	Sand			
Leaf Packs or Mats ✓	5	5	Direct	Mud/Muck/Silt ✓	83	5	Direct
Aquatic Vegetation ✓	10	5	Direct	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	TURB		Secchi (m):
Top								0.2
Mid-depth	0.5	23.46	6.55	2.60	285	38		
Bottom								

System Type: Stream ☐ (1st - 2nd order, 3rd - 4th order, 5th - 6th order, 7th order or greater) Lake ☐ Wetland ☐ Estuary ☐ Other ☒ Ditch

Water Odors (check box): Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Other ☒ H_2S

Water Surface Oils (check box): None ☐ Sheen ☒ Globs ☐ Slick ☐

Clarity (check box): Clear ☐ Slightly turbid ☐ Turbid ☒ Opaque ☐

Color (check box): Tannic ☐ Green (algae) ☐ Clear ☐ Other ☒ muddy

Weather Conditions/Notes: Cloudy warm 2+ in des Rain Previous week

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Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☒	☒	☐
Fish	☐	☒	☐	☐
Aquatic Macrophytes	☐	☐	☒	☐
Iron/sulfur Bacteria	☐	☐	☒	☐

SAMPLING TEAM:		SIGNATURE:	DATE:
Maria Olivares	DEPT. OF ENV. PROTECTION NORTHEAST DISTRICT - JAX		

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		9/8/98	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
		Beeline II Stormwater Ditch Upstream of POD 100-150 YDS	Site #1

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components				
Substrate Diversity [11]	Four or more productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock). 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 (11)	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered. 5 4 (3) 2 1
Substrate Availability [8]	Greater than 30% productive habitat present at site. 20 19 18 17 16	16% to 30% productive habitat, by aerial extent. 15 14 13 12 11	6% to 15 % productive habitat 10 9 (8) 7 6	Less than 5% productive habitat. 5 4 3 2 1
Water Velocity [3]	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 (3) 2 1
Habitat Smothering [5]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%> 80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent (5) 4 3 2 1
Primary Score (77) [28] 36				
Secondary Habitat Components				
Artificial Channelization [3]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 (3) 2 1
Bank Stability				
Right Bank [8]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. (8) 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Left Bank [8]				
Riparian Buffer Zone Width				
Right Bank [2]	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 m to 18 m 8 7 6	Width of native vegetation 6 to 12 m, human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 (2) 1
Left Bank [2]				
Riparian Zone Vegetation Quality				
Right Bank [5]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 10 9	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 8 7 (6)	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 5 4	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1
Left Bank [5]				
Secondary Score [33]				

(60) **TOTAL SCORE**

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DEPT. OF ENV. PROTECTION

ANALYSIS DATE:	ANALYST:	SIGNATURE:

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		9/8/98	1200	

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Flagler	Bunnell Storm Water Ditch Below POD 100-0940 S	@ Site #2

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Land-Use in Watershed (specify relative percent in each category):

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
20				70	10		

Local Watershed Erosion (check box): None ☐ Slight ☐ Moderate ☒ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☒

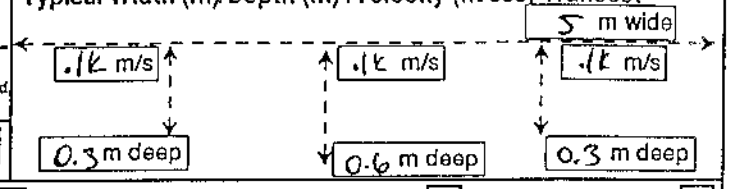
Width of riparian vegetation (m) on least buffered side: | *List & map dominant vegetation on back*

Artificially Channelized ☐ no ☒ recent, severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark: 0.3 (m above present water level) + 0.6 (present depth in m) = 0.9 (m above bed)

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect



Canopy Cover % : Open : ☐ Lightly Shaded (11-45%): ☒ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☐ Sewage: ☐ Petroleum: ☐ Chemical: ☒ Anaerobic: ☐ Other: ☐

Sediment Oils: Absent: ☐ Slight: ☐ Moderate: ☒ Profuse: ☐

Sediment Deposition: Sludge: ☐ Sand smothering: none slight moderate severe Silt smothering: none slight moderate severe Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	1	5	DIPNET	Sand			
Leaf Packs or Mats	5	5	DIPNET	Mud/Muck/Silt	84	5	DIPNET
Aquatic Vegetation	10	5	DIPNET	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	0.6	26.8	6.5	3.36	446			0.3
Bottom								

System Type : Stream: ☐ (1st - 2nd order, 3rd - 4th order, 5th - 6th order, 7th order or greater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☒ Ditch

Water Odors (check box): Normal: ☐ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☒ H_2S

Water Surface Oils (check box): None: ☐ Sheen: ☒ Globs: ☐ Slick: ☐

Clarity (check box): Clear: ☐ Slightly turbid: ☐ Turbid: ☒ Opaque: ☐

Color (check box): Tannic: ☐ Green (algae): ☐ Clear: ☐ Other: ☒ MUDDY

Weather Conditions/Notes: PET cloudy Hot 2+ inches Rain previous week

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Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☒	☐	☐
Fish	☐	☒	☐	☐
Aquatic Macrophytes	☐	☐	☒	☐
Iron/sulfur Bacteria	☐	☐	☒	☐

SAMPLING TEAM:	SIGNATURE:	DATE:
DEPT. OF ENV. PROTECTION NORTHEAST DISTRICT - JAX		

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/DD): 6/8/98	RECEIVING BODY OF WATER:

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Flagler	Bunnell Stormwater Ditch Below Pond 100-150 yds 1200	Site #2

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components Substrate Diversity [11]	Four or more productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock). 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 (11)	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Substrate Availability [8]	Greater than 30% productive habitat present at site. 20 19 18 17 16	16% to 30% productive habitat, by aerial extent. 15 14 13 12 11	6% to 15 % productive habitat 10 9 (8) 7 6	Less than 5% productive habitat. 5 4 3 2 1
Water Velocity [4]	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 (4) 3 2 1
Habitat Smothering [5]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent (5) 4 3 2 1
Primary Score [28]				
Secondary Habitat Components Artificial Channelization [3]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 (3) 2 1
Bank Stability Right Bank [8] Left Bank [8]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. (8) 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width Right Bank [2] Left Bank [8]	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 m to 18 m (8) 7 6	Width of native vegetation 6 to 12 m, human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank [5] Left Bank [5]	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody macrophytes. Normal, expected plant community for given sunlight & habitat conditions. 10 9	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 8 7 6	25% to 50% of riparian zone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 5 4	Less than 25% of streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1
Secondary Score [39]				

[61] TOTAL SCORE

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DEPT. OF ENV. PROTECTION
NORTHEAST DISTRICT - JAX

ANALYSIS DATE:	ANALYST:	SIGNATURE:

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: City of Bunnell
County: Flagler
Contact / District: Jeff Martin & Pat O'Connor / Northeast
NPDES Permit #: FL0020907
LIMS Sample #: 343825 LIMS Job #: TLH-1998-09-09-12
sample log 9/11/98 @ 1100

Sample Collection: Date 9/8/98 Time 9:40
Test Beginning: Date 9/9/98 Time 1450
Test Ending: Date 9/11/98 Time 1400
Organism Batch #: 68 Diluent Batch #: well H2O
Organism Age: 12 days SRT toxicant batch #: NA
Test organism: Cyprinella leedsi

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Remarks:

Test Number: 2 of 2
Temperature range of culture room = 24.0-25.0°C
Incubator #3 Temperature range = 24.0-25.0°C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED ~~Cond. (mmhos/cm)~~ Cond. (umhos/cm) 0 hr	Cond. 24 h	Cond. 48 h
Control A	E1	5	5	5	7.8	8.2	8.3	25.2	24.2	24.4	7.6	7.6	7.6	245	240	260
Control B	E2	5	5	5	7.8	8.2	8.2	25.0	24.8	24.3	7.6	7.7	7.7	250	250	260
Control C	E3	5	5	5	7.8	8.2	8.4	25.0	24.4	25.1	7.6	7.6	7.5	250	255	270
Control D	E4	5	5	5	7.8	8.2	8.4	25.0	24.0	24.4	7.6	7.6	7.6	250	255	265
100% A	E5	5	5	5	7.2	7.8	8.1	25.2	24.0	25.3	7.7	7.6	7.4	(A) 820	800	835
100% B	E6	5	5	5	7.2	7.8	8.1	25.3	24.7	24.7	7.7	7.5	7.5	835	835	860
100% C	E7	5	5	5	7.2	7.8	8.1	25.3	24.3	24.5	7.8	7.4	7.5	840	830	855
100% D	E8	5	5	5	7.2	7.8	8.1	25.3	24.1	24.0	7.8	7.4	7.6	840	830	850
														(A) 820	DW 11/9/98	
measured by:		MF	FW	CH	MF	FW	CH	MF	FW	CH	MF	FW	CH	MF	FW	CH
recorded by:		FW	FW	CH	CH	FW	CH	CH	FW	CH	CH	FW	CH	CH	FW	CH

Investigators' Signatures
Marshall Faircloth
Courtney Head
Jason Mumford

reviewer

form updated 5/22/98

	Salt Water (Well Water)	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			0.1	—	Jeff Martin	MF
Lab Total Residual Cl2 (mg/L):	<0.03	—	<0.03	DR-100	MF	MF
Alkalinity (mg/L as $CaCO_3$):	121	—	86	Hach	MF	MF
Hardness (mg/L as $CaCO_3$):	115	—	134	Hach	MF	MF
Total ammonia (mg/L as N):	<0.017	—	<0.017	ORION	FW	MF
Salinity:	0	—	0	YCT	MF	MF

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: City of Bunnell
County: Flagler
Contact / District: Jeff Martin - Pat O'Connor / Northeast
NPDES Permit #: FL0020907
LIMS Sample #: 343825 LIMS Job #: TLH-1998-09-09-12
sample log 9/14/98 DW

Sample Collection: Date 9/8/98 Time 9:40
Test Beginning: Date 9/9/98 Time 1430
Test Ending: Date 9/11/98 Time 1420
Organism Batch #: 39 Diluent Batch #: 41
Organism Age: <24 hour SRT toxicant batch #: NA
Test organism: Ceriodaphnia dubia

Test Type: (Screening) | Definitive
Static | (Static Renewal) | Flow-through
Test Number: 1 of 2
Remarks:

Culture Room Temperature range = 24.0-25.0°C
Incubator #1 Temperature range = 23.6-24.7°C

Conc.	Chamber #	Number Live 0 hr	24 h	48 h	pH 0 hr	24 h	48 h	Temperature (°C) 0 hr	24 h	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED (Cond. (mmhos/cm)) Cond. (umhos/cm) 0 hr	24 h	48 h
Control A	A	5	5	5	8.1		8.1	25.1		24.3	7.7		7.6	170		170
Control B	B	5	5	5			8.1			24.3			7.6			180
Control C	C	5	5	5			8.1			24.3			7.9			180
Control D	D	5	5	5			8.2			24.4			7.7			190
100% A	A	5	5	5	7.1		8.2	25.2		24.4	7.7		7.7	810		800
100% B	B	5	5	5			8.2			24.4			7.8			835
100% C	C	5	5	5			8.2			24.4			7.6			855
100% D	D	5	5	5			8.2			24.5			7.8			840
measured by:		MF	FW	CH	MF		CH	MF		CH	MF		CH	MF		CH
recorded by:		FW	FW	CH	CH		CH	CH		CH	CH		CH	CH		CH

Investigators' Signatures

Marshall Faircloth
Century Hgs
Tom Burkett

Water Quality Parameters	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			0.1	—	Jeff Martin	MK
Lab Total Residual Cl2 (mg/L):	—	<0.03	<0.03	DR-100	MF	MF
Alkalinity (mg/L as $CaCO_3$):	—	72	86	Hach	MF	MF
Hardness (mg/L as $CaCO_3$):	—	82	134	Hach	MF	MF
Total ammonia (mg/L as N):	—	<0.017	<0.017	ORION	FW	MF
Salinity:	—	0	0	YCT	MF	MF

reviewer form updated 5/22/98

City of Bunnell WWTP Control Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	21	≥22	21-12	<12	3
EPT Index	0	-	≥2	<2	1
# Chironomid Taxa	5	≥7	6-4	<4	3
% Contribution of Dominant Taxon	23	≤31	32-66	>66	5
% Diptera	23	-	≤47	>47	3
Florida Index	1	≥8	7-4	<5	1
% Suspension feeders/Filterers	9	-	≥7	<7	3
Total Score		Northeast			19
Interpretation of Scores		Excellent			25-29
		Good			19-24
		Poor			13-18
		Severely Degraded			7-12

Summer Index Period: Stream Condition Index (SCI) for Florida Northeast (April 1996)

City of Bunnell WWTP Test Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	32	≥22	21-12	<12	5
EPT Index	1	-	≥2	<2	1
# Chironomid Taxa	10	≥7	6-4	<4	5
% Contribution of Dominant Taxon	21	≤31	32-66	>66	5
% Diptera	29	-	≤47	>47	3
Florida Index	4	≥8	7-4	<5	3
% Suspension feeders/Filterers	3	-	≥7	<7	1
Total Score		Northeast			23
Interpretation of Scores		Excellent			25-29
		Good			19-24
		Poor			13-18
		Severely Degraded			7-12

Summer Index Period: Stream Condition Index (SCI) for Florida Northeast (April 1996)

Phytoplankton taxa list and densities (#/mL) for Bunnell WWTP, collected via subsurface grabs in unnamed stormwater ditch, on 08 September, 1998.

	Control Site	Test Site
Bacillariophyceae		
Nitzschia sp.	7	–
Chlorophyceae		
Chlamydomonas sp.	7	90
Closterium sp.	–	45
Phacotus sp.	15	–
Cyanophyceae		
Anabaena sp.	15	–
Chroococcus sp.	7	45
Johannesbaptistia sp.	7	–
Lyngbya sp.	15	–
Microcystis sp.	7	–
Oscillatoria sp.	74	45
Spirulina sp.	7	–
Euglenophyceae		
Euglenophyceae	15	45
Euglena sp.	7	–
Lepocinclis sp.	15	–
Trachelomonas sp.	–	45

Benthic macroinvertebrate taxa list for Bunnell WWTP, collected via 20 discrete dip net sweeps in unnamed stormwater ditch, on 08 September, 1998.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	–	2
Coleoptera		
Curculionidae	–	1
Diptera		
Ablabesmyia mallochi	–	2
Ceratopogonidae	–	2
Chironomidae	3	2
Cladopelma sp.	3	6
Dasyhelea sp.	–	15
Dicrotendipes modestus	3	2
Dicrotendipes sp.	–	1
Goeldichironomus holoprasinus	13	–
Goeldichironomus sp.	–	7
Labrundinia becki	–	1
Palpomyia/Bezzia grp.	–	1
Parachironomus directus	–	1
Parachironomus supparilis	–	2
Polypedilum illinoense grp.	5	4
Procladius sp.	–	7
Tanytarsus sp. T Epler	–	1
Ephemeroptera		
Caenis sp.	–	4
Gastropoda		
Ancylidae	2	27
Micromenetus dilatatus	11	6
Physella sp.	11	6
Planorbella sp.	1	2
Pomacea paludosa	1	–
Hemiptera		
Belostoma sp.	–	1
Hydrocanthus sp.	2	–
Microvelia sp.	–	1
Hirudinea		
Gloiobdella elongata	1	–
Helobdella triserialis	2	–
Lepidoptera		
Pyralidae	–	3
Nemertea		
Prostoma rubrum	–	2
Odonata		
Coenagrionidae	1	–
Corduliidae	–	2

Libellulidae	2	–
Pachydiplax longipennis	2	–
Zygoptera	–	5
Oligochaeta		
Aulodrilus pigueti	–	1
Dero digitata complex	5	6
Dero vaga	5	6
Haber speciosus	13	11
Limnodrilus hoffmeisteri	27	4
Stylaria lacustris	–	2
Pelecypoda		
Sphaeriidae	6	38
Turbellaria		
Dugesia sp.	–	1

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0020907		980908		X	S	1

Remarks

21 66

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
N	5	FL0020907		980908		B	S	1

Remarks

21 66