Florida

Department of Environmental Protection

Biological Assessment of

Cantonment Wastewater Treatment Plant

Escambia County

NPDES #FL0038504

Sampled October 1993

March 1994

Biology Section
Division of Technical Services

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Cantonment Wastewater Treatment Plant
County: Escambia
NPDES Number: FL0038504
State Permit Expiration Date: 8 May 1994

Toxics Sampling Inspection (XSI)

Date Sampled: 12 October 1993

Results: No metals were detected in the effluent at levels exceeding Class III standards. No organic priority pollutants or pesticides were found.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 12 October 1993

Results: The sample of effluent was not acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 12 October 1993

Results: Benthic macroinvertebrate communities were moderately degraded at the test site, as indicated by reductions in taxa richness and the Florida Index. The macroinvertebrate community at the reference site was represented by at least some pollution sensitive taxonomic groups, but the test site was dominated by pollution tolerant, nuisance dipterans. This is interpreted to be a violation of Rule 17-302.530(47) FAC, which prohibits the discharge of substances which result in the dominance of nuisance species. Substantial community shifts in the phytoplankton assemblage were apparent at the test site, probably in response to increased nutrient content. The population changed from one made up largely of chrysophytes and cryptophytes to a community composed almost entirely of cyanophytes. The diatom/blue-green ratio decreased by 85%, corresponding to the change in species composition.

Water Quality Inspection (WQI)

Date Sampled: 12 October 1993

Results: Dissolved oxygen at the test site was below the Class III water quality standard (Rule 17-302.530(31) FAC). Nitrate-nitrite levels in the effluent and at the test site were extremely elevated. Test site orthophosphate, NH_3, and TKN concentrations were much higher than typical Florida streams. Nutrient concentrations at the reference site were either very low or undetected. Algal growth potential (AGP) corresponded with nutrient concentrations, well exceeding the 5 mg dry wt/L "problem threshold" in the effluent (129.6 mg dry weight) and at the test site (225.2 mg dry weight/L). Reference site AGP was very low (0.3 mg dry wt/L). Total and fecal coliforms were undetected in the effluent and were within Class III standards at the study sites.

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide the basis for specific condition recommendations for permit renewal.

Introduction

The Cantonment WWTP, which treats domestic wastewater, is located on SR 297A in Escambia County, Florida (see maps in Appendix). The plant has four rotating biological contactors with two clarifiers, and a design flow of 0.7 MGD. De-chlorinated effluent is discharged through a two mile pipe, which flows into a concrete cascade located on the northwest side of SR186, and then to Eleven Mile Creek. Average discharge flow has been 0.35 to 0.5 MGD.

Permit limits for the plant are as follows: flow (0.70 MGD), pH (6-8.5 S.U.), dissolved oxygen (5.0 mg/L minimum), BOD_5 (17 mg/L annual average), TSS (20 mg/L annual average), TKN (10 mg/L), chlorine residual (0.5 mg/L minimum for disinfection, 0.01 mg/L maximum at discharge), and fecal coliform bacteria (200 organisms/100 mL) (see Facility Summary in Appendix).

Data from the monthly operating reports from July, 1992, to July, 1993, indicate several violations. Chlorine residuals were above the maximum twice during the year (in December, 1992, and June, 1993) and below the minimum in January, 1993. The Total Kjeldahl Nitrogen limit was exceeded twice. During this same period of time, DEP inspectors noted several problems which included: improper execution of chain-of-custody, solids in the stilling well, and algae in the influent composite sampler tubing.

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	32	23
Florida Index	7	4
% Contribution of Dominant Taxon	21.0	32.5
% Diptera	2.0	60.3
% Oligochaeta	54.3	31.8
% Pelecypoda	21.0	0
% Playthelminthes	7.5	0
% Gastropoda	6.3	2.8
% Odonata	5.2	3.6
% Other	3.7	1.5
% Below surface deposit feeders	54.6	35.3
% Above surface deposit feeders	1.9	24.5
% Suspension feeders	21.5	0
% Predator/Carnivores	14.0	18.4
% Shredders	0.4	18.0
% Scrapers	6.6	3.6
% Other	1.1	0.2
Macroinvertebrate Ponar		
Number of Taxa	50	26
Florida Index	3	3
Shannon-Weaver Diversity	3.4	3.2
% Diptera	6.1	52.2
% Oligochaeta	43.0	18.9
% Pelecypoda	34.2	0
% Odonata	4.8	21.3
% Coleoptera	6.1	1.2
% Gastropoda	0.9	4.8
% Other	4.9	1.6
% Below surface deposit feeders	43.4	20.1
% Predator/Carnivores	10.0	37.3
% Suspension feeders	35.4	0
% Above surface deposit feeders	6.0	24.8
% Shredders	0.6	12.1
% Scrapers	3.3	5.8
% Other	1.3	0
Phytoplankton Algae		
Number of Taxa	4	9
% Contribution of Dominant Taxon	45.5	31.7
Diatom/Diatom + B-G Abundance Ratio	0.33	0.05
% Blue-green	18.2	95.1
% Diatoms	9.1	4.9
% Chrysophyta	45.5	0
% Cryptophyta	27.3	0
Algal Growth Potential (mg dry wt/L)	0.3	225.2

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located above the outfall in a lowland tributary to Eleven Mile Creek) and a test site (the area down gradient of the discharge in Eleven Mile Creek) (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Due to low flow conditions, additional invertebrate collections were accomplished using petite Ponar dredges rather than Hester-Dendy samplers. Phytoplankton was sampled via subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this report. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, and chlorophyll *a* are well known. Others are briefly explained here. 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 (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. 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. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (for % composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (for functional feeding groups).

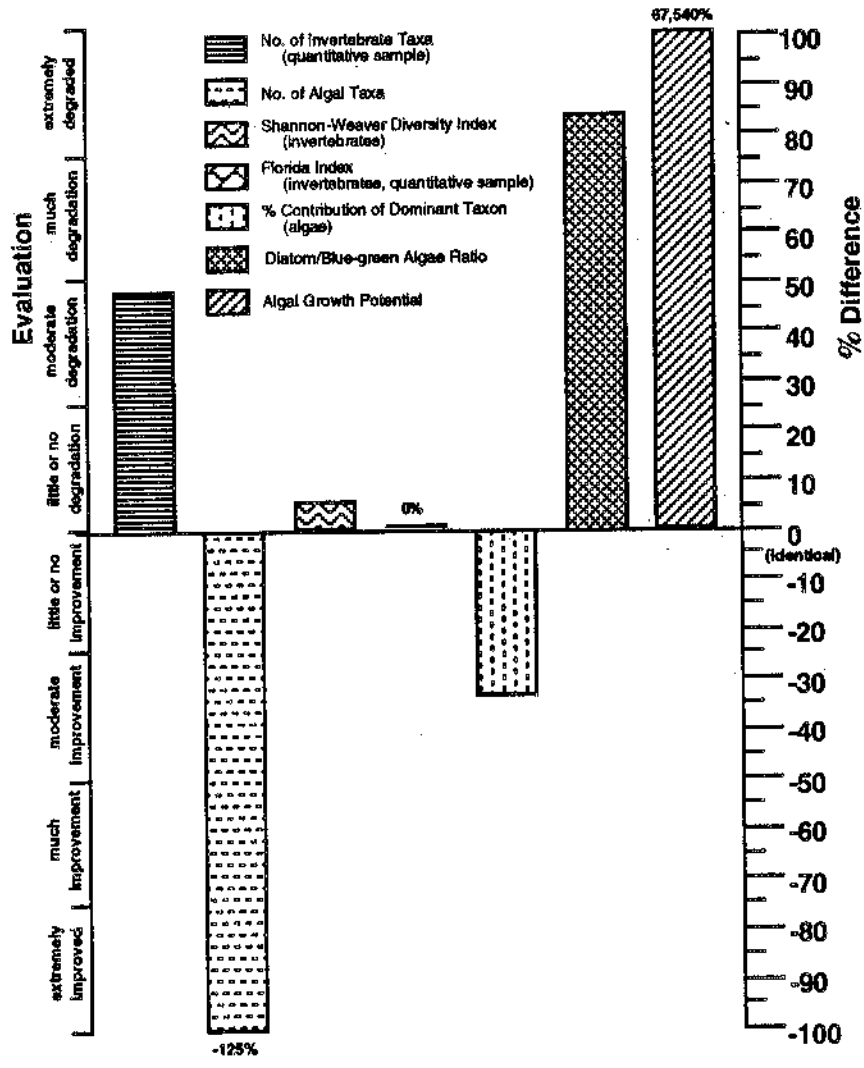
For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, Florida Index and the diatom to blue-green algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Glenn Butts, Sally Cooey, Dawn Gorres, and Karen McDonald (DEP Northwest District) and Chris Barge, Lyn Burton, Marshall Faircloth, Russel Frydenborg, Christy LeDuc, Kathleen Lurding, Elizabeth Miller, Kim Pearce, Urania Quintana, Greg Wynn and David Young (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

The reference site, located in an unnamed tributary of Eleven Mile Creek, and the test site, situated in the channelized upper portion of Eleven Mile Creek, received similarly low habitat assessment scores (39 and 35 points, respectively).

Water movement was sluggish to stagnant at both stations, which were subject to the effects of artificial impoundments and non-point source pollution. The reference site was characterized by mostly residential land use, although a stormwater pond from a road prison drains into the upper reaches. This site was characterized as tannic and lightly shaded, with a slight hydrogen sulfide odor in the sediments. Between the reference and test sites, this stream is impounded twice, once to form a private pond (Bryan's Pond), and again (especially during periods of low flow) at the SR 297A bridge. The test site was characterized by mostly industrial land use, with the potential for non-point source runoff from the Champion Paper Mill and an old landfill. Water at the moderately shaded test site was grayish-green with a sewage odor. Growth of the bacterum, *Sphaerotilus* sp., was noted on the rocks near the outfall, and a whitish foam was observed on the surface of the water. The reference site had slightly acidic water (pH 6.3) while the test site had a pH of 7.2. Conductivity increased from 67 µmho/cm at the reference site to 570 µmho/cm at the test site. Dissolved oxygen decreased from 8.1 mg/L at the reference site to 3.5 mg/L at the test site. The low dissolved oxugen at the test site is a violation of Class III water quality standards (Rule 17-302.530(31) FAC) (Appendix).

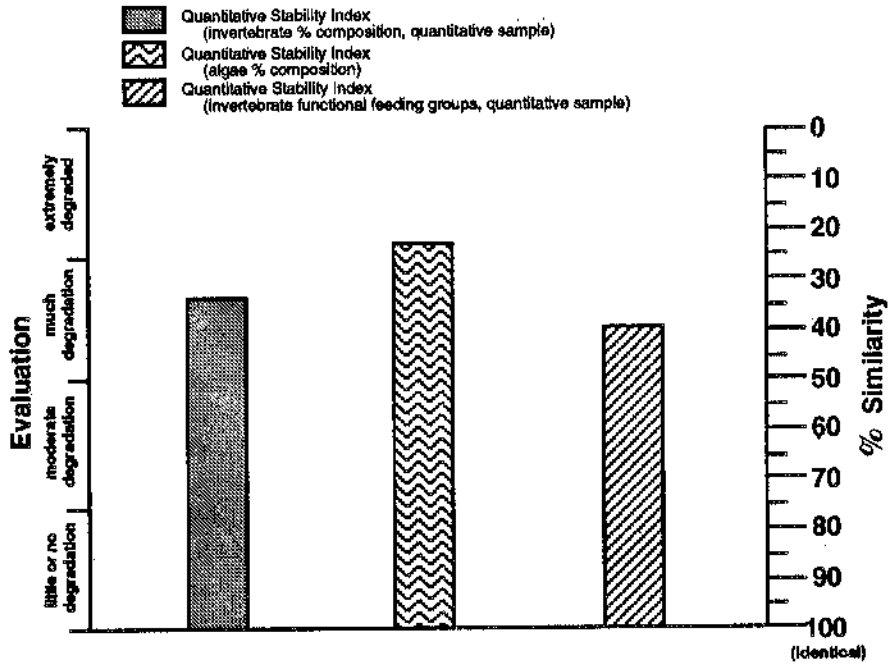


Effect of discharge on receiving stream
(measured as difference between control and test sites).

The sample of effluent was not acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*. No mortality occurred during either 48 hour bioassay (Appendix).

No organic priority pollutants or pesticides were found in the effluent. The following metals were detected at concentrations above the practical quantitation limit (PQL): aluminum (1130 µg/L), iron (129 µg/L), and zinc (53 µg/L). Copper was found below the PQL, at 5 µg/L. At the calculated hardness of 137.2 mg/L $CaCO_3$, none of these concentrations exceeded Class III standards.

Nutrient enrichment at the test site was clearly evident, with most compounds found at concentrations well above average for a freshwater stream system (see Table of Typical Water Quality Values in Appendix). Test site ammonia (0.73 mg/L) and nitrate-nitrite (15 mg/L) levels were much greater than 95% of typical Florida streams. In fact, the nitrate-nitrite concentration was 15 times the 95th percentile level. Total phosphorus and TKN were also elevated, higher than 86% and 89% of typical streams, respectively. The test site nitrate-nitrite concentration can be directly linked to the excessive effluent nitrate-nitrite level of 17 mg/L. Orthophosphate enrichment at the test site (0.34 mg/L) also appeared to be related to the elevated orthophosphate of the effluent (0.42 mg/L).



Effect of discharge on receiving stream
(measured as similarity between control and test sites).

The test site ammonia concentration was somewhat higher than that found in the effluent. The additional water column ammonia downstream of the outfall may be related to sediment interactions. The sediments below the outfall (reported to have a strong sewage odor) are probably highly enriched with nitrogenous compounds from previous effluent additions. This sediment may provide a microbially mediated source of ammonia to the water column. In contrast, nutrient concentrations at the reference site were either very low or undetected, suggesting that the enrichment in Eleven Mile Creek was caused primarily by the Cantonment WWTP.

Algal growth potential (AGP) increased from 0.3 mg dry weight/L at the reference site to 225.2 mg dry weight/L at the test site. Effluent AGP was 129.6 mg dry weight/L. The extreme increases in nutrient levels downstream of the discharge corresponded to the dramatic increase in AGP. An AGP "problem threshold" of 5 mg dry weight/L has been established, since this level has been correlated with the detrimental consequences of nutrient enrichment, such as algae blooms, low dissolved oxygen, and fish kills (Raschke and Schultz 1987).

Total and fecal coliforms were undetected in the effluent and within Class III standards at the reference and test sites (see Chemistry Summary Table).

Some measures of benthic macroinvertebrate community health indicated moderate degradation below the discharge. The figure on p. 3 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference. The figure on this page summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

Taxa richness was reduced at the test site, both in the dip net and petite Ponar samples, by 28% and 48%, respectively, compared to the reference site. Although the Florida Index declined by 43% in the dip net samples, it remained the same (3 points apiece) in the petite Ponar samples. The Ponar dredge is not the most effective sampler in streams, however, the water level was too low for deployment of Hester-Dendys. Florida Index values at both the reference and test sites were much lower than expected of a healthy stream in Florida (considered to be 20 points). Shannon-Weaver diversity in the petite Ponar samples was comparable at both sites (3.4 and 3.2 at the reference and test sites, respectively).

Quantitative stability indices for community structure and functional feeding groups demonstrated large differences between the reference and test sites. The reference site was dominated by oligochaetes (*Haemonais waldvogeli, Aulodrilus piqueti,* and *Limnodrilus hoffmeisteri)* and pelecypods (Sphaeridae), which are generally characteristic of low dissolved oxygen or otherwise disturbed conditions. However, other more sensitive taxonomic groups were present at the reference site (*e.g.*, ephemeropterans, trichopterans, and decapods) suggesting at least a moderately healthy community. In contrast, these sensitive organisms were severely reduced or eliminated at the test site, in both dip net and Ponar samples. Below the discharge, the macroinvertebrate population was dominated by pollution tolerant dipterans, particu-

larly *Polypedilum illinoense, Chironomus* sp., and *Goeldichironomus holoprasinus* (Hudson *et al.* 1990). Two of these species are listed as nuisance organisms (Beck and Beck 1969). This community shift between the two study areas suggests that conditions were worse downstream of the discharge, probably due to nutrient enrichment or dissolved oxygen violations associated with the Cantonment discharge. This is interpreted to be a violation of Rule 17-302.530(47) FAC, which prohibits the discharge of substances which result in the dominance of nuisance species.

While phytoplankton is generally not the target population for determining pollution effects in flowing waters, low flow conditions prevented the incubation of artificial substrates for attached algae collection. Therefore, the phytoplankton community was used for this assessment. Measures of phytoplankton community health indicated gross community shifts at the test site, probably in response to increased nutrient content. The phytoplankton assemblage consisted almost entirely of cyanophytes (95%), while that of the upstream station was more diverse, dominated by the chrysophyte, *Dinobryon* sp., and *Cryptomonas* sp., a flagellate common to lentic systems. The diatom/diatom + blue-green ratio decreased by 85% at the test site. The combination of sluggish water movement, ample nutrients, and impoundments along Eleven Mile Creek contributed to the establishment of a free-water algal population. The chlorophyll *a* sample at the test site was invalidated during the analysis, therefore, no comparison could be made with the reference site.

Conclusions

.Dissolved oxygen decreased from 8.1 mg/L at the reference site to 3.5 mg/L at the test site. Dissolved oxygen at the test site violated Class III water quality standards (Rule 17-302.530(31) FAC).

The sample of effluent collected from Cantonment WWTP was not acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*. No metals were detected at levels which exceeded Class III standards, and no organic priority pollutants were detected.

Extreme nutrient enrichment at the test site was clearly due to the discharge. Ammonia (0.73 mg/L) and nitrate-nitrite (15 mg/L) levels were greater than 95% of representative Florida streams. Total phosphorus and TKN were also elevated, higher than 86% and 89% of typical streams, respectively. Nutrient concentrations at the reference site were either very low or undetected.

Algal growth potential (AGP) far exceeded the 5 mg dry wt/L "problem threshold" in the effluent (129.6 mg dry weight) and at the test site (225.2 mg dry weight/L). Reference site AGP was a very low 0.3 mg dry wt/L.

Total and fecal coliforms were undetected in the effluent and within standards at the reference and test sites.

Benthic macroinvertebrate communities were moderately degraded at the test site. Taxa richness was reduced at the test site (compared to the reference site), both in the dip net and petite Ponar samples, by 28% and 48%, respectively. The Florida Index declined by 43% at the test site in the dip net samples. Shannon-Weaver diversity in the dredge samples was comparable at both sites. The macroinvertebrate community at the reference site was represented by at least some pollution sensitive taxonomic groups, but the test site was dominated by pollution tolerant, nuisance dipterans. This is interpreted to be a violation of Rule 17-302.530(47) FAC, which prohibits the discharge of substances which result in the dominance of nuisance species.

Measures of phytoplankton community health indicated gross community shifts at the test site, probably in response to increased nutrient content. The test site phytoplankton assemblage consisted almost entirely of cyanophytes, while the upstream station was more diverse, with chrysophytes, cryptophytes, diatoms, and cyanophytes. The diatom/diatom + blue-green ratio decreased by 85% at the test site, indicating disturbed conditions. The combination of sluggish water movement, ample nutrients, and impoundments along Eleven Mile Creek contributed to the establishment of a free-water algal population at the test site.

Literature Cited

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Chemistry summary table for

Cantonment WWTP	Effluent	Control Site	Test Site
Organic Constituents (ug/L)			
None detected			
Metals (ug/L)			
Aluminum	1130		
Arsenic	20 U		
Cadmium	0.08 U		
Copper	5 I		
Chromium	10 U		
Iron	129		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Silver	0.08 U		
Zinc	53		
Nutrients (mg/L)			
Ortho-phosphate	0.42	0.015 U	0.34 A
Total phosphorus	0.51	0.034 I	0.62
Ammonia	0.15	0.028 I	0.73
Nitrate+Nitrite	17	0.020 U	15
TKN	1.3	0.56 A	1.9
Other Parameters			
Habitat Assessment		39	35
D.O. (mg/L)	8.5	8.1	3.5
pH (SU's)	6.7	6.3	7.2
Conductivity (µmhos/cm)	520	67	570
Hardness (mg/L as CaCO3)	137.2		
TSS (mg/L)	11	5 U	21
Turbidity (NTU)	9	7	18
Color (PCU)	10	100	20
BOD (mg/L)	3.0	0.8	2.3
Temperature (°C)	24.2	23.6	21.3
AGP (mg dry wt/L)	129.6	0.3	225.2
Bioassay Fish	Not toxic		
Bioassay Invertebrate	Not toxic		
Fecal coliform (org/100 ml)	10 U	20	100
Total coliform (org/100 ml)	10 U	10	1300

A - Value reported is the mean of two or more determinations

I - Value reported is less than the practical quantitation limit, and greater than or equal to the minimum detection limit

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

Typical Values for Selected Parameters in Florida Waters

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

Percentile Distribution

Parameter	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 Phosphorus	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
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

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

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: CANTONMENT WWTP		Date Summary Prepared: 10-05-93
Location (attach detailed map):	County: ESCAMBIA	District: NORTH WEST
Federal Permit # FL0038504 and expiration date:	State GMS # and 1017C72366 State expiration date: MAY 8, 1994	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: DOMESTIC WASTEWATER TREATMENT PROVIDING SECONDARY TREATMENT. USUALLY OPERATES 45% OF CAPACITY

Description of treatment process: A 0.7 MGD DOMESTIC PLANT WITH 4 ROTATING BIOLOGICAL CONTACTORS WITH TWO CLARIFIERS. CHLORINATION AND DE-CHLORINATION IS PROVIDED WITH FINAL DISCHARGE THROUGH A CONCRETE CASCADE INTO ELEVEN MILE CREEK AT SR 186.

Receiving waters: ELEVEN MILE CREEK	Classification: I II (III)	
Design Flow: 0.7 MGD	Mean Flow: 0.4 MGD	Flow during survey:

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.):

NO MIXING ZONE

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

Parameter	Limit (units)
FLOW	0.70 MGD MAX
PH	6 MIN - 8.5 MAX
BOD	17 mg/L annual ave
TSS	20 mg/L annual ave
Dissolved oxygen	5.0 mg/L min.
Fecal Coliform	200/100 max.

Describe special permit conditions and permit modifications:

CANTONMENT
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s): 001 OUTFALL THROUGH APPROXIMATELY 2 MILE PIPE INTO A CONCRETE CASCADE ON THE NW SIDE OF SR 186 BRIDGE. FINAL DISCHARGE IS INTO ELEVEN MILE CREEK.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: Last monthly operating report was submitted July 1993
MOR data from 7/92 to 7/93 shows the following violations:
① chlorine residuals were above the maximum in 12/92 & 6/93
chlorine residuals were below the ~~maximum~~ minimum in 1/93
② nitrogen-Kjeldahl was above maximum in 4/93 & 5/93

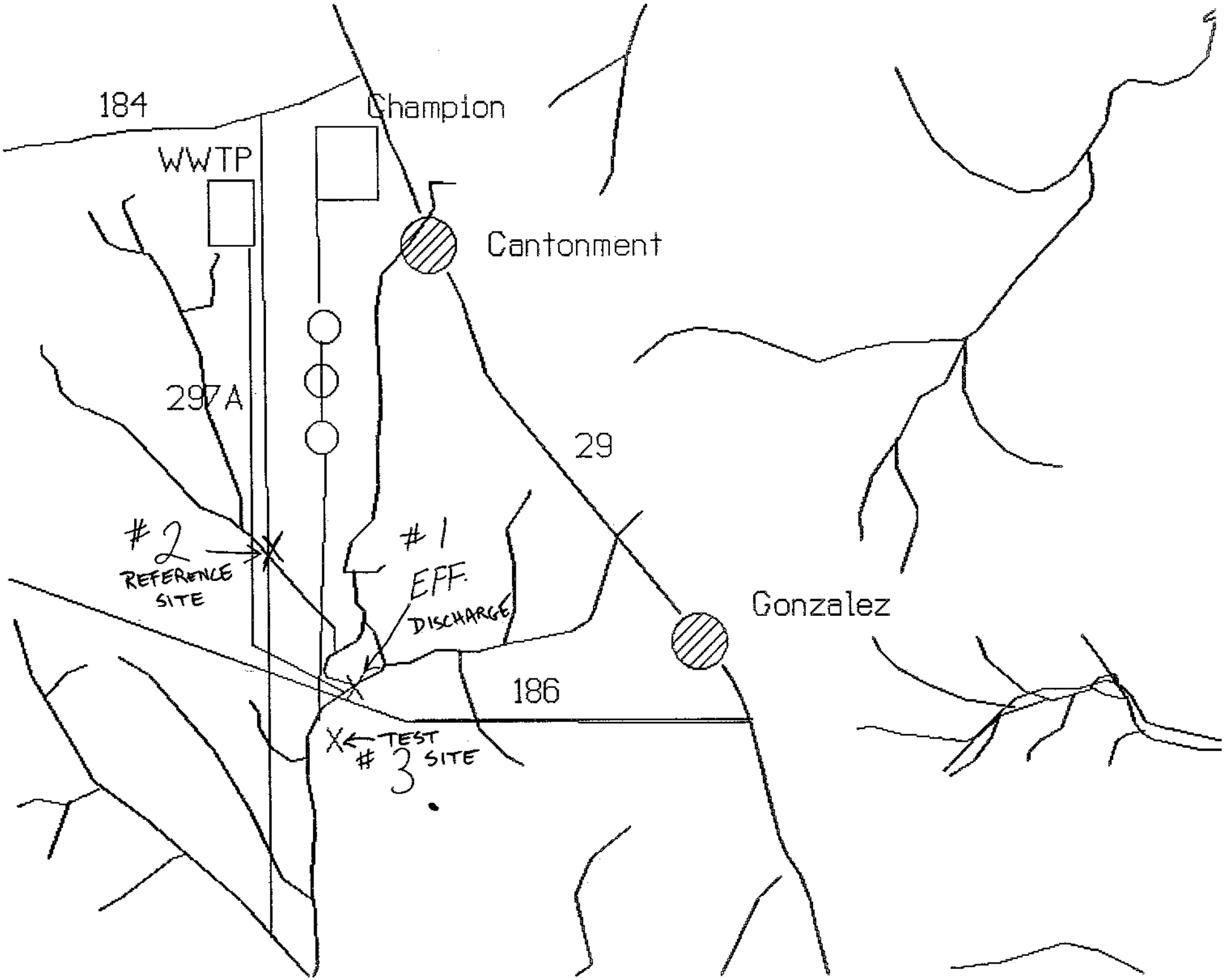
Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
NO PREVIOUS BIOASSESSMENTS.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:
DEP inspectors noted the following observations during 7/92 to 7/93: proper chain-of custody not executed correctly, solids noted in stilling well, algae noted in influent composit sampler tubing, & indicated to WWTP that raw data must be maintained at facility for 5 years.
Overall, MOR results are comparable to DER results.

Additional information:

Staff contributing to this review (signature):
Glenn Butts (Biologist)
Dawn M. Gosses (Inspector)
(Engineer)
Howard L. McDonald (CPS)
( )
( )


TION
HISTORIC SITE
GS
TERY
TRIAL PLANT
E TANKS
L PUMPING STATION
RM
RANSPORTATION CAMP
L PLANT
ON
TOWER
ENCE
OW
TATION WITH NAME
BOL
CANTONMENT
CANTONMENT DELIMITED URBAN COMPACT AREA
Est. Pop. 5,000
OLF KING
OLF SITE 6-A
OLF SITE 6
OLF SITE 4A
COASTAL AIRFIELD
PENSACOLA DELIMITED URBAN COMPACT AREA
Est. Pop. 113,300
NAAS SAUFLEY FIELD
FERGUSON AIRPORT
OLF BRONSON (NAVY)
U.S. NAVAL RES.
PENSACOLA NAVAL AIR STATION
FORREST SHERMAN FIELD
WARRINGTON
BROWNSVILLE
W. Pensacola
Avondale
Cerny Hgts.
Myrtle Grove
Millview
Halcyon Shores
Haven Park
Perdido Hgts.
Paradise Beach
Cummings Pt.
Ramsey Beach
Chambers Pt.
Wicker Lakes
Redfish Pt.
Beulah
Beulah School
Philpot Tower
Pine Forest
Edge
Olive
Ensley
Tristan Village
Crescent Lake
Lake Fan
Galleview
Goulding
Beach Haven
Pleasant Grove
Sherman Grove
Du Pont Point
Turkle Pt.
Turkle Bay
Sherman Inlet
San Carlos Beach
Muslin Beach
Fort Barrancas
Magazine Pt.
Dauenport Bayou
Bayou Grande
Bayou Marcus
Bayou Chico
Big Eagle
Riverview
Ipsco
TALLAHASSEE BASE LINE
REFERENCE SITE
DISCHARGE TEST SITE
TO MOBILE
TO GATESWOOD
TO FOLEY
Bay
Pensac


184
Champion
WWTP
Cantonment
297A
29
#2
REFERENCE
SITE
#1
EFF.
DISCHARGE
Gonzalez
186
TEST
SITE
#3

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: FDEP NW DIST	STORET STATION NUMBER:	DATE (M/D/Y): 10-12-93	RECEIVING BODY OF WATER: ELEVEN MILE CREEK

REMARKS:	LOCATION: ABOVE CANTONMENT WWTP AT SR 297 A	FIELD ID/NAME:
CONTROL SITE		# 2

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover — 16	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity — 2	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration — 2	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability — 7	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality — 7	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments — 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE — 39

COMMENTS: BELOW ROAD PRISON, SOME POTENTIAL RUNOFF SOURCES, IMPOUNDMENT UPSTREAM AT PRISON, OLD WWTP DISCHARGE LOCATION

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-12-93	G. BUTTS	Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 SUBMITTING AGENCY NAME: FDEP NW DIST	STORET STATION NUMBER:	DATE (M/D/Y): 10-12-93	RECEIVING BODY OF WATER: ELEVEN MILE CREEK

REMARKS:	LOCATION: BELOW CANTONMENT WWTP (above Champion)	FIELD ID/NAME:
TEST SITE		# 3

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 10	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 5	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 3	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 7	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 5	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE 35

COMMENTS: PAPER MILL OUTFALL BELOW CANTONMENT OUTFALL. UPSTREAM AFFECTED BY STORMWATER RUNOFF FROM MILL + OLD LAND FILL

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-12-93	G. BUTTS	Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: FDEP NW DIST	STORET STATION NUMBER:	DATE (M/D/Y): 10-12-93	TIME	RECEIVING BODY OF WATER: ELEVEN MILE CREEK

REMARKS:	LOCATION: BELOW CANTONMENT WWTP (above Champion)	FIELD ID/NAME:
TEST SITE		# 3

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
15	10		5		70	

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

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

Point-Source Pollution (list location and describe): 22 MGD PAPER MILL OUTFALL

Estimated System Width (range, m): 9.2	Estimated System Depth (range, m): 0.4	yes
High Water Mark (m above bed): 1.0	Velocity (range, m/s): <.025	Impounded ☒ Channelized ☒

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 Deposits: Sludge: ☐ Paper Fiber: ☐ Mud: ☐ Sand: ☒ Shell: ☐ Other: ☒ Clay/rocks

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Riffles	5	1	
Leaf Packs				Sand	10	1	
Aquatic Vegetation	5	1		Mud/Muck/Silt			
Rock or Shell Rubble	10	2		Benthic leaf mats	20	5	
Undercut Banks/Roots	20	5		Other: CLAY	30	5	

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):	COLOR		Secchi (m):
Top	0.5	21.3	7.2	3.5	570	20		
Mid-depth								
Bottom								

System Type : Stream: ☒ (Sand Bottomed / Sand Bot w/ Spring / Swamp & Bog / Calcareous / Alluvial / Misc.) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

Water Surface Oils (check box): None: ☒ Sheen: ☐ Globs: ☐ Slick: ☐ whitish foam from outfall

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

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

Weather Conditions: Clear, sunny

SAW THREE WATER MOCCASIN'S BELOW OUTFALL

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

SAMPLING TEAM:	SIGNATURE:	DATE:
G. BUTTS, D. GORRES	Glenn Butts	10-12-93

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: FDEP NW DIST	STORET STATION NUMBER:	DATE (M/D/Y): 10-12-93	TIME	RECEIVING BODY OF WATER: ELEVEN MILE CREEK

REMARKS:	LOCATION: ABOVE CANTONMENT WWTP AT SR 297 A	FIELD ID/NAME:
CONTROL SITE		# 2

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
15	10	5	70			

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

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

Point-Source Pollution (list location and describe): ROAD PRISON UPSTREAM MAY POSE RUNOFF PROBLEM; STREAM FLOW IMPEDED BY SR 297 A BRIDGE

Estimated System Width (range, m): 16.0	Estimated System Depth (range, m): 0.2-1.2	yes
High Water Mark (m above bed): 0.5	Velocity (range, m/s): <.025	Impounded ☒ Channelized ☐

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

SEDIMENT/SUBSTRATE

Sediment Odors: Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ Other ☒ Slight H_2S

Sediment Oils: Absent ☒ Slight ☐ Moderate ☐ Profuse ☐

Sediment Deposits: Sludge ☐ Paper Fiber ☐ Mud ☒ Sand ☐ Shell ☐ Other ☒ leaf debris

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Riffles			
Leaf Packs	[illegible]			Sand	10	2	
Aquatic Vegetation	10	4		Mud/Muck/Silt	45	7	
Rock or Shell Rubble	5	1		Benthic leaf mats	25	5	
Undercut Banks/Roots	5	1		Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):	COLOR		Secchi (m):
Top	0.5	23.6	6.3	8.1	67	100		
Mid-depth								
Bottom								

System Type: Stream ☒ (Sand Bottomed, Sand Bot w/ Spring, Swamp & Bog, Calcareous, Alluvial, Misc.) Lake ☐ Wetland ☐ Estuary ☐ Other ☐ _____

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

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 ☐ _____

Weather Conditions: Clear, Sunny

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

SAMPLING TEAM:	SIGNATURE:	DATE:
G. BUTTS, D. GORRES	Glenn Butts	10-12-93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Contaminant
Location:
County: ESCAMBIA
Contact/District: GLENN BUTTS NW
NPDES Permit #: FL0038504 **Outfall #:**

Sample Collection: Date 10/11/93 Time 0930
Test Beginning: Date 10/12/93 Time 1200
Test Ending: Date 10/14/93 Time 1200
Organism Batch #: 113 **Diluent Batch #:** 26
Organism Age: < 24 hrs
Test Organism: Ceriodaphnia dubia

63560 93-OCT-12-13 Used 10/4/93

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

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	22.9 @ 23.0	8.4 @ 23.3	1005 @ 1,000 9650 @ 10,000 @ 24.3 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.1	8.5 @ 23.3	990 @ 1,000 9460 @ 10,000 @ 23.7 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.0	995 @ 1,000 9550 @ 10,000 @ 23.9 °C

		Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
Conc.	Chamber #	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Control	A	5	5	5	8.3	8.7	8.3	23.2		23.7	8.8		8.2	160		165
Control	B	5	5	5			8.3			23.8			8.2			155
Control	C	5	5	5			8.3			24.0			8.2			165
Control	D	5	5	5			8.3			24.1			8.2			175
100%	A	5	5	5	7.3		8.2	24.1		23.7	8.2		8.1	480		530
100%	B	5	5	5			8.2			23.8			8.2			545
100%	C	5	5	5			8.2			23.9			8.2			510
100%	D	5	5	5			8.2			23.9			8.3			575
Measured/Loaded by:		TM	TM	TM	TM		TM	TM		TM	TM		TM	TM		TM
Recorded by:		TM	TM	TM	TR		TR	TR		TR	TR		TR	TR		TR

Investigators' Signatures

Tina M. Kendall
Robin C. Rader
Marshall Faircloth

Reviewer

	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			0.01	—	GB
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	TM
Alkalinity:	125	70	55	Hach	TR
Hardness:	120	80	145	Hach	TR
Total Ammonia:	← not measured →				

Ammonia Meter #98136 Ammonia Meter Slope: n/m Ammonia Blank: n/m Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 7/8/93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Containment WWTP
Location:
County: ESCAMBIA
Contact/District: GLENN BUTTS NW
NPDES Permit #: FL0038504 **Outfall #:**

Sample Collection: Date 10/11/93 Time 0930
Test Beginning: Date 10/12/93 Time 1200
Test Ending: Date 10/19/93 Time 1200
Organism Batch #: 42 **Diluent Batch #:** 1 sea M
Organism Age: 4 days old
Test Organism: Cyprinella leedsi

63560 93-OCT-12-13

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

Test Number: 2 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	22.9 @ 23.0	5.4 @ 23.3	1005 @ 1,000 9650 @ 10,000 @ 24.3 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.0 @ 23.1	8.5 @ 23.3	990 @ 1,000 9460 @ 10,000 @ 23.7 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.0	995 @ 1,000 9550 @ 10,000 @ 23.9 °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. (µmhos/cm) 0 hr	24 h	48 h
Control A	390	5	5	5	7.8	8.3	8.3	23.0	22.9	23.5	9.0	8.7	8.7	240	245	250
Control B	333	5	5	5	7.8	8.3	8.3			23.4	8.9	8.8	8.5	240	240	245
100% A	4	5	5	5	7.3	7.7	7.8	24.4	22.8	23.3	9.2	8.3	8.6	540	520	530
100% B	3	5	5	5	7.3	7.7	7.8			23.2	9.0	8.5	8.4	540	530	535
Measured/Loaded by:		TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TR	TM	TM	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR

Investigators' Signatures

Tina Mikulski
Tobin G. Roden
Marshall Faircloth

Reviewer

form updated 7/8/93

Water Quality Parameters	Salt Water/ Well Water	20‰ Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			<0.01	—	GB
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	TM
Alkalinity:	125	70	55	Hach	TR
Hardness:	120	80	145	Hach	TR
Total Ammonia:	← not measured →				

Ammonia Meter #98136 Ammonia Meter Slope: n/m Ammonia Blank: n/m Control Salinity: 0 ppt Sample Salinity: 0 ppt

Benthic macroinvertebrate taxa list for Cantonment WWTP, collected via 20 discrete dip net sweeps in Eleven Mile Creek, on 12 October, 1993.

	Reference Site	Test Site
Acarina		
Arrenurus sp.	8	–
Mideopsis sp.	4	–
Neumania sp.	4	–
Coleoptera		
Berosus sp.	4	–
Dubiraphia sp.	4	–
Macronychus glabratus	–	12
Stenelmis sp.	–	4
Undetermined Curculionidae	–	4
Undetermined Dytiscidae	–	4
Decapoda		
Palaemonetes paludosus	12	–
Diptera		
Ablabesmyia mallochi	–	9
Ablabesmyia rhamphe grp.	12	44
Dasyhelia sp.	4	–
Chironomus sp.	–	194
Goeldichironomus holoprasinus	–	70
Palpomyia grp. sp.	4	18
Polypedilum illinoense	8	607
Stenochironomus sp.	4	–
Zavreliella marmorata	4	–
Undetermined dipteran pupae	–	185
Ephemeroptera		
Caenis diminuta	4	–
Callibaetis pretiosus	4	–
Gastropoda		
Hebetancyclus excentricus	16	–
Micromenetus dilatatus	40	40
Physella sp.	52	12
Hirudinea		
Helobdella triserialis	8	4
Odonata		
Enallagma divagans	32	–
Erythemis simplicicollis	–	4

Ischnura hastata	8	–
Ischnura ramburii	–	60
Pachydiplax longipennis	48	4
Oligochaeta		
Allonais inaequalis	–	320
Aulodrilus pigueti	208	–
Branchiura sowerbyi	–	26
Dero digitata	–	6
Dero lodeni	42	–
Dero obtusa	10	–
Dero sp.	21	–
Dero trifida	31	–
Haemonais waldvogeli	364	–
Limnodrilus hoffmeisteri	198	154
Pristina aequiseta	–	6
Pristina synclites	–	6
Tubifex tubifex	52	–
Undetermined Enchytraeidae	–	77
Pelecypoda		
Sphaerium or *Musculium* sp.	360	–
Platyhelminthes		
Dugesia tigrina	128	–
Trichoptera		
Hydropsyche sp.	4	–
Oecetis sp.	4	–
Total	1706	1870

Benthic macroinvertebrate taxa list for Cantonment WWTP, collected via Ponar grab samples in Eleven Mile Creek, on 12 October, 1993. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site
Coleoptera		
Berosus sp.	75	–
Dubiraphia sp.	437	25
Haliplus sp.	25	–
Macronychus glabratus	–	12
Peltodytes sp.	50	–
Decapoda		
Procambarus sp.	12	–
Diptera		
Ablabesmyia rhamphe grp.	62	12
Chironomus sp.	25	37
Cladotanytarsus sp.	87	–
Cryptochironomus sp.	50	50
Dicrotendipes modestus	37	–
Goeldichironomus carus	–	12
Goeldichironomus holoprasinus	12	324
Meropelopia sp.	–	12
Palpomyia grp. sp.	75	–
Parachironomus carinatus	12	–
Polypedilum halterale grp.	12	–
Polypedilum illinoense	12	998
Polypedilum trigonus	12	–
Pseudochironomus sp.	87	–
Paratanytarsus sp. B Epler	25	–
Tanytarsus sp. G Epler	12	–
Undetermined dipteran pupae	50	175
Undetermined Sciomyzidae	12	–
Ephemeroptera		
Caenis sp.	12	–
Tricorythodes albilineatus	–	12
Gastropoda		
Micromenetus dilatatus	–	62
Physella sp.	62	25
Planorbella duryi	25	50
Undetermined Ancylidae sp.	–	12
Hemiptera		
Neoplea sp.	12	–

Hirudinea		
Helobdella triserialis	37	–
Mooreobdella microstoma	–	12
Odonata		
Arigomphus pallidus	25	–
Celithemis fasciata	37	–
Enallagma divagans	62	–
Enallagma sp.	12	–
Epitheca cynosura	12	–
Epitheca sepia	25	–
Ischnura ramburii	25	599
Ischnura sp.	12	25
Libellula incesta	37	–
Libellula vibrans	25	–
Pachydiplax longipennis	187	25
Undetermined Libellulid sp.	–	12
Oligochaeta		
Allonais inaequalis	–	37
Aulodrilus pigueti	1248	–
Branchiura sowerbyi	–	187
Dero pectinata	212	–
Dero sp.	12	–
Dero trifida	50	50
Haemonais waldvogeli	2058	–
Ilyodrilus templetoni	37	–
Limnodrilus hoffmeisteri	399	312
Slavina appendiculata	25	–
Tubifex tubifex	100	–
Pelecypoda		
Elliptio buckleyi	12	–
Sphaerium or *Musculium* sp.	3281	–
Platyhelminthes		
Dugesia sp.	187	12
Polychaeta		
Undetermined Spionidae	–	12
Trichoptera		
Ceraclea sp.	112	–
Oxyethira sp.	75	–
Undetermined Trichoptera pupa	25	–
Total	9621	3101

Phytoplankton taxa list and densities (#/mL) for Cantonment WWTP, collected via subsurface grabs in Eleven Mile Creek, on 11 October, 1993.

	Reference Site	Test Site
Diatoms		
Navicula sp.	–	70
Nitzschia sp.	–	70
Rhizosolenia sp.	70	–
Chrysophyta		
Dinobryon sp.	349	–
Cryptophyta		
Cryptomonas sp.	209	–
Cyanophyta		
Anabaena sp.	–	908
Arthrospira sp.	–	279
Chroococcus sp.	140	–
Lyngbya sp. 1	–	279
Lyngbya sp. 2	–	140
Merismopedia sp.	–	70
Microcystis sp.	–	559
Oscillatoria sp.	–	489
Total	768	2864

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0038504 11	12 93/01/12 17	18 B	19 S	20 1

Remarks

21 66

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0038504 11	12 93/01/12 17	18 X	19 S	20 1

Remarks

21 66