

Biological Assessment of

Panama City Beach Wastewater Treatment Plant

Bay County

NPDES #FL0021512

Sampled September and October 1992

February 1993

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: Panama City Beach Wastewater Treatment Plant
County: Bay
NPDES Number: FL0021512
State Permit Expiration Date: 27 July 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 28 September 1992

Results: No organic priority pollutants were detected in the effluent, although aliphatic compounds were tentatively identified at an estimated concentration of 42 µg/L. No metals found in the sample were above Class III standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 28 September 1992

Results: The effluent was not acutely toxic to either test organism, *Ceriodaphnia dubia* or *Notropis leedsi*. No mortality occurred during the 48 hour static acute bioassay.

Impact Bioassessment Inspection (IBI)

Date Sampled: 28 September 1992 and 27 October 1992

Results: No degradation in benthic macroinvertebrate communities that could be attributed to the effluent was apparent. Samples collected with Hester-Dendy artificial substrates were very similar in species richness and diversity, and slightly higher in Florida Index at the test site. Phytoplankton communities were sparse at the study areas, and seemed to be strongly influenced by flow regime. Periphyton algae below the discharge showed symptoms of degradation, demonstrated by a 39% reduction in taxa richness, a 75% rise in the percent composition of dominant taxon, and a 234% increase in chlorophyll *a*. These and other changes in algal community structure suggest that the facility is violating the standard which prohibits a discharge from causing imbalances in aquatic flora (Rule 17-302.560(29) FAC).

Water Quality Inspection (WQI)

Date Sampled: 28 September 1992

Results: Elevated nutrients at the test site caused enrichment problems, exhibited by an excessive algal growth potential of 42.6 mg dry wt/L. Concentrations of total phosphorus, ortho-phosphate, and nitrate-nitrite were high in the effluent, and greater than 95% of typical Florida streams in the receiving ditch. Ammonia was also relatively high at the test site, possibly due to decomposition of effluent-born nitrogenous compounds. Most nutrient forms were undetected or very low at the reference site, as was algal growth potential (0.5 mg dry wt/L). Standards for total and fecal coliform bacteria were exceeded at the reference site (as were the holding times). Bacterial levels were within standards at the test site and in the effluent.

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 Panama City Wastewater Treatment Plant is located at 110 South Arnold Road in Panama City, Bay County, Florida (see map in Appendix). This 7.0 MGD design flow facility provides secondary treatment of domestic wastes for a population that fluctuates seasonally due to tourism (leading to a mean flow of 3.3 MGD). Treatment consists of extended aeration, filtration, post-aeration, and dechlorination prior to effluent disposal. Sludge is de-watered by belt presses and transported to the Bay County Landfill. Final effluent is discharged to an unnamed ditch (referred to as Panama City Beach Ditch in this report) which flows to West Bay. The receiving ditch is listed as Class III, while West Bay is a Class II waterbody.

State permit limits for the effluent are as follows: flow (annual average of 7.0 MGD), BOD (annual average of 10 mg/L), TSS (annual average of 20 mg/L), organic nitrogen (annual average of 3.0 mg/L), ammonia (maximum of 2.0 mg/L), pH (6 to 7.3), chlorine residual (maximum of 0.01 mg/L at discharge), fecal coliforms (maximum of 200 organisms/100ml), and dissolved oxygen (minimum of 6.0 mg/L) (see facility summary in Appendix).

The FDER Biology Section has performed several bioassays on this facility over the last seven years. In 1985, dechlorinated effluent was toxic to *Mysidopsis bahia*, which was attributed to high ammonia levels. The 1987 tests resulted in toxicity to *Ceriodaphnia dubia*, with no determined cause. The samples were not toxic to *Daphnia pulex* or *Notropis*

Major characteristics of community structure of control and test sites.

	Reference Site (#6)	Test Site (#2)
Macroinvertebrate Qualitative		
Number of Taxa	26	14
Florida Index	9	13
% Contribution of Dominant Taxon	42.9	64.0
% Diptera	80.2	73.2
% Odonata	7.9	7.9
% Trichoptera	1.6	11.6
% Malacostraca	4.0	0.6
% Ephemeroptera	1.6	0
% Other	4.8	6.7
% Predators	18.2	8.6
% Collector-Gatherers	32.8	5.2
% Collector-Filterers	19.6	80.4
% Scrapers	18.6	3.7
% Shredders	10.3	2.1
% Piercers	0.5	0
Macroinvertebrate Hester-Dendy		
Number of Taxa	25	24
Florida Index	10	13
Shannon-Weaver Diversity	2.62	2.44
% Diptera	81.4	73.0
% Trichoptera	2.9	13.3
% Gastropoda	1.0	6.9
% Oligochaeta	6.4	1.2
% Ephemeroptera	2.5	0
% Other	5.6	5.6
% Predators	6.7	4.7
% Collector-Gatherers	37.5	4.5
% Collector-Filterers	29.5	80.3
% Scrapers	23.6	7.9
% Shredders	2.7	0.8
% Parasites	0	1.8
Phytoplankton Algae		
Number of Taxa	12	10
% Contribution of Dominant Taxon	21.6	37.9
Chlorophyll a (µg/L)	3.7	0
Diatom/Diatom + B-G Abundance Ratio	0.43	0.54
% Blue-green	10.8	41.4
% Diatoms	8.1	48.3
% Green	29.7	3.4
% Chrysophytes	27.0	6.9
% Cryptophytes	21.6	0
% Euglenophytes	2.7	0

Major characteristics of community structure of control and test sites. (continued)

Periphyton Algae		
Number of Taxa	51	31
% Contribution of Dominant Taxon	18.7	32.8
Chlorophyll a (mg/sq. m)	3.2	10.7
Diatom/Diatom + B-G Abundance Ratio	0.90	0.94
% Blue-green	7.0	6.1
% Green	27.6	1.9
% Diatoms	62.6	91.9
% Other	2.7	0
Algal Growth Potential (mg dry wt/l)	0.5	42.6

leedsi in either of the above cases. No mortality was observed in any of the test organisms during a May, 1989, bioassay.

No permit violations have occurred within the past year, according to MOR data. A Compliance Sampling Inspection performed in March, 1992, reported the plant to be operating satisfactorily.

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 (#6, located in Botheration Bayou, which flows into West Bay) and a test site (#2, in the Panama City Beach Ditch, downstream of the discharge) (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 *Notropis 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 DER 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. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers that were incubated for 28 days (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Phytoplankton was sampled via subsurface grabs. Chlorophyll *a* was also determined for periphyton and 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).

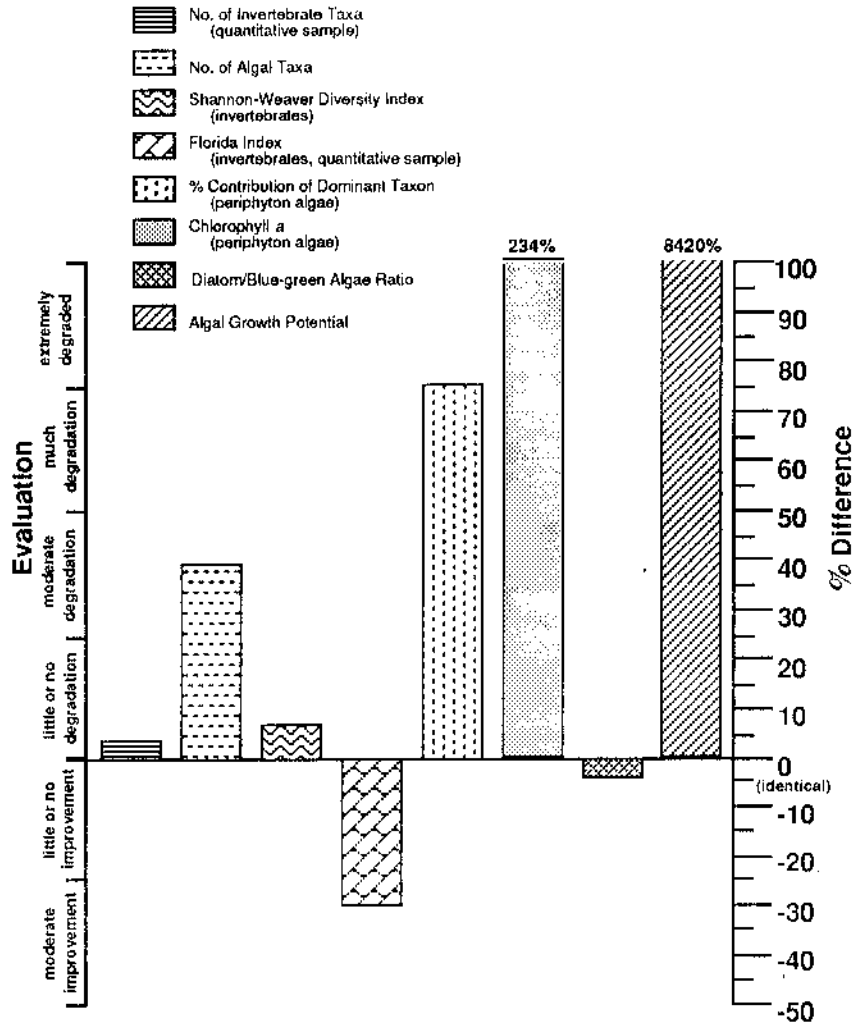
For graphical purposes, the percent differences between the refer-

ence 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, chlorophyll *a*, 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 (DER Northwest District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Kim Pearce, Landon Ross, Urania Quintana, and Greg Wynn (Tallahassee Biology Laboratory).

Results and Discussion

Habitat quality was similar at the two study areas, with scores of 52 and 56 at reference and test sites, respectively (Appendix). Although the site at Botheration Bayou had fewer hardwood leaf packs, it scored slightly higher than the test site for total available habitat types due to the amount of submerged roots and snags present. Panama City Beach Ditch, however, had a more constant and higher flow, due to the influence of the 3 MGD discharge. Both stations were adequately oxygenated (6.1 and 5.1 mg/L at reference and test sites, respectively), and relatively similar in pH (6.6 at reference, 7.6 at test site). A notable difference in specific conductance was observed, with 162 µmho/cm in Botheration Bayou, and 1110 µmho/cm below the WWTP outfall. Effluent specific conductance was 1223 µmho/cm.



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

The sample of effluent was not toxic to either test organism, *Ceriodaphnia dubia* or *Notropis leedsi*. No mortality occurred during the 48 hour static acute bioassay (Appendix).

No organic priority pollutants were detected in the discharge, except for the tentative identification of aliphatic compounds at an estimated concentration of 42 µg/L. Metals that were found above quantitation limits included aluminum (51 µg/L), iron (28 µg/L), and zinc (31 µg/L). None of these values represents a violation of ambient standards.

Three nutrient species were elevated in the effluent, which appeared responsible for excessive enrichment of the receiving waters. Test site concentrations of total phosphorus (2.5 mg/L), ortho-phosphate (2.3 mg/L), and nitrate-nitrite (5.4 mg/L) were greater than 95% of all representative Florida streams (see Table of Typical Water Quality Values in Appendix). These same nutrients were undetected or below quantitation limits at the reference station. Ammonia in the Panama City Beach Ditch was greater than 90% of typical streams in the state. This ammonia

level may be due to decomposition of the elevated nitrogen-bearing compounds in the discharge, or may result from an ammonia discharge from an upstream landfill site (R. Wieckowicz, DER, personal comm.).

Results of algal growth potential (AGP) tests indicated severe enrichment at the test site. Algal dry weight was 42.6 mg/L there, substantially higher than the 5 mg dry wt/L "eutrophication threshold". According to Raschke and Schultz (1987), when AGP rises above this level, undesirable consequences of enrichment are likely to occur, such as nuisance algal or macrophyte growth, D.O. sags, and fish kills. Effluent AGP (9.3 mg dry wt/L) was also above the problem level, but was a low 0.5 mg dry wt/L at the reference site.

Total and fecal coliform bacteria were undetected in the effluent. At the reference site, bacterial analysis resulted in 3500 total coliforms/100 mL and 1000 fecal coliform organisms/100 mL, respectively, which is above ambient standards. Coliform bacterial levels were within standards at the test site. It should be noted that all bacteriological samples were not analyzed within the normal holding time.

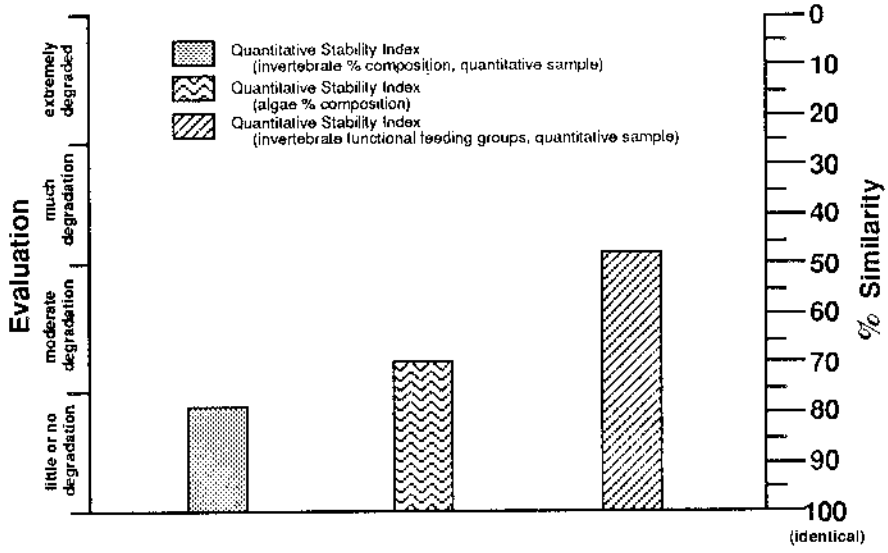
Benthic macroinvertebrate communities collected from Hester-Dendy samples did not appear to be adversely affected by the plant discharge. The figure on p. 3 indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the control.

Taxa richness and Shannon-Weaver diversity was very similar at the two stations, while the Florida Index increased by three points at the test site. The relative abundance of each individual taxa appears in the Appendix. The reference site macroinvertebrate population was dominated by *Tanytarsus* sp. S Epler, while *Rheotanytarsus distinctissimus* grp. was most numerous at the test site. Both of these chironomid midges are very common inhabitants of stream systems and are not usually associated with organic enrichment. As the name implies, *R. distinctissimus* is rheophilic, and is a frequent "bloom-organism" in medium-sized to large rivers (*e.g.*, Econfina Creek, Suwannee River), and may have been favored by the more constant and swiftly moving flow at the test site. The same two taxa were also dominant in dip net sweeps. Although a greater number of taxa was collected at the reference site using the dip net method (where more diverse habitat was found), trends in community composition and Florida Index were analogous.

The figure on this page summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. In this particular case, the lack of similarity between sites with respect to the functional feeding group index is a reflection of the differences in feeding strategies of the dominant organism at each station. While *Rheotanytarsus distinctissimus* is exclusively a collector-filterer, *Tanytarsus* spp. are scrapers and collector-gatherers, as well as filterers.

Phytoplankton community structure corresponded with flow regime at the two study sites. Typical water column dwellers characterized the reference site, including coccoid green algae, and flagellated members of the Chrysophyta, Cryptophyta, and Euglenophyta. The test site was dominated by filamentous blue-greens and diatoms, an assemblage more representative of lotic systems.

The attached algal community was degraded below the plant discharge, as indicated by the reductions in species richness and increases in percent contribution of dominant taxon and chlorophyll *a*. The diatom, *Eunotia flexuosa*, which was dominant at the reference site, develops



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

best in waters of low mineral content where the current is slow (Patrick and Reimer 1966). *Navicula viridula*, which made up the majority of the test site population (33%), has a more cosmopolitan distribution, and can be found in nutrient-enriched conditions. This shift in community structure and increased algal biomass observed downstream of the discharge is interpreted as a violation of Rule 17-302.560(29) FAC, "nutrient induced imbalances in aquatic flora or fauna". The changes in periphyton communities are consistent with the elevated nutrients and algal growth potential seen below the discharge.

Conclusions

The full strength effluent sample was not acutely toxic to either test organism, Cerio*daphnia dubia* or *Notropis leedsi*. No mortality occurred during the 48 hour static acute bioassay.

No organic constituents were detected in the effluent, although aliphatic compounds were tentatively identified at an estimated concentration of 42 µg/L. No metals were found in the sample above Class III standards.

Elevated nutrients at the test site caused enrichment problems, suggested by an excessive algal growth potential of 42.6 mg dry wt/L. Concentrations of total phosphorus, ortho-phosphate, and nitrate-nitrite were high in the effluent, and greater than 95% of typical Florida streams in the receiving ditch. Ammonia was also relatively high at the test site, possibly due to decomposition of effluent-born nitrogenous compounds. Most nutrient forms were undetected or very low at the reference site, as was algal growth potential.

Total and fecal coliform bacteria exceeded ambient standards in Botheration Bayou, but not at the test site. Neither type of bacteria was detected in the effluent.

Measurements of benthic macroinvertebrate community health indicated that the receiving water biota were not degraded by the discharge. Differences in taxa richness and diversity of Hester-Dendy samples were minimal, and a slight increase in Florida Index was observed below the outfall in both qualitative and quantitative samples.

The phytoplankton community appeared to be strongly influenced by flow regime. The slower moving waters of the reference site favored typical water column dwellers which were not present at the test site, where flow was constant due to the WWTP discharge. However, phytoplankton was generally sparse at both locations, as would be expected in stream systems.

Periphyton algae showed signs of degradation downstream of the facility's outfall. Taxa richness was decreased by 39%, and the percent contribution of dominant taxon rose by 75%. The dominant diatom at the reference site, which thrives in water of low mineral content, was replaced with one tolerant of nutrient enrichment at the test site. A substantial increase in chlorophyll *a* at the test site was noted, also related to the nutrients present. These changes suggest that the facility is violating the standard which prohibits a discharge from causing imbalances in aquatic flora (Rule 17-302.560(29) FAC).

Literature Cited

American Public Health Assoc., American Water Works Assoc., and Water Pollution Control Federation. 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed. New York, N.Y. 1268 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.

Patrick, R., and C. W. Reimer. 1966. The Diatoms of the United States, Vol. 1. Monog. Acad. Nat. Sci. Philadelphia. 688 p.

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. 1991. 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 p.

Chemistry summary table for

Panama City Beach WWTP	Effluent	Reference Site (#6)	Test Site (#2)
Organic Constituents (ug/L)			
Tentative identification of:			
aliphatics	est. 42.0		
Metals (ug/L)			
Aluminum	51		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.08 U		
Copper	10 T		
Chromium	10 U		
Iron	28		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	0.10 U		
Zinc	31		
Nutrients (mg/L)			
Ortho-phosphate	2.9	0.02 U	2.3
Total phosphorus	2.9	0.04 U	2.5
Ammonia	0.059	0.19	0.35
Nitrate+Nitrite	6.4	0.046 T	5.4
TKN	0.62	0.72	1.1
Other Parameters			
Habitat Assessment		52	56
D.O. (mg/L)	7.4	6.1	5.1
pH (SU's)	6.9	6.6	7.6
Conductivity (µmhos/cm)	1223	162	1110
Temperature (°C)	26.4	25.7	25.8
Hardness (mg CaCO3)	207		
BOD5 (mg/L)	1.3	1.3	1.4
Total Coliform Bacteria (org/100 mL)	10 UQ	3500 Q	2100 Q
Fecal Coliform Bacteria (org/100 mL)	10 UQ	1000 Q	580 Q
Algal Growth Potential (mg dry wt/L)	9.3	0.5	42.6
Bioassay Invertebrate-Dechlorinated	Not Toxic		
Bioassay Fish-Dechlorinated	Not Toxic		

Q - Sample held beyond normal holding time

T - Value reported is less than the practical quantitation 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)

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 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: PANAMA CITY BEACH WWTP	**Prepared by:** **Date:**	
Location (attach detailed map):	**County** BAY	**District** Northwest
Federal Permit # FL0021512 **and expiration date:**	**State GMS # and** 1003M02216 **State expiration date:** 7-27-93	**Facility Type:** Industrial (Municipal) Federal Agricultural **Other (list):**

Function of facility: WASTEWATER TREATMENT

Description of treatment process:
Extended Aeration units, filtration, reaeration basin, dechlorination, and effluent disposal to West Bay. Aerated sludge holding tanks with dewatering on belt presses.

Receiving waters: West Bay	**Classification:** III
Design Flow: 7.0 MGD	**Actual Mean Flow:** 3.265 MGD

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

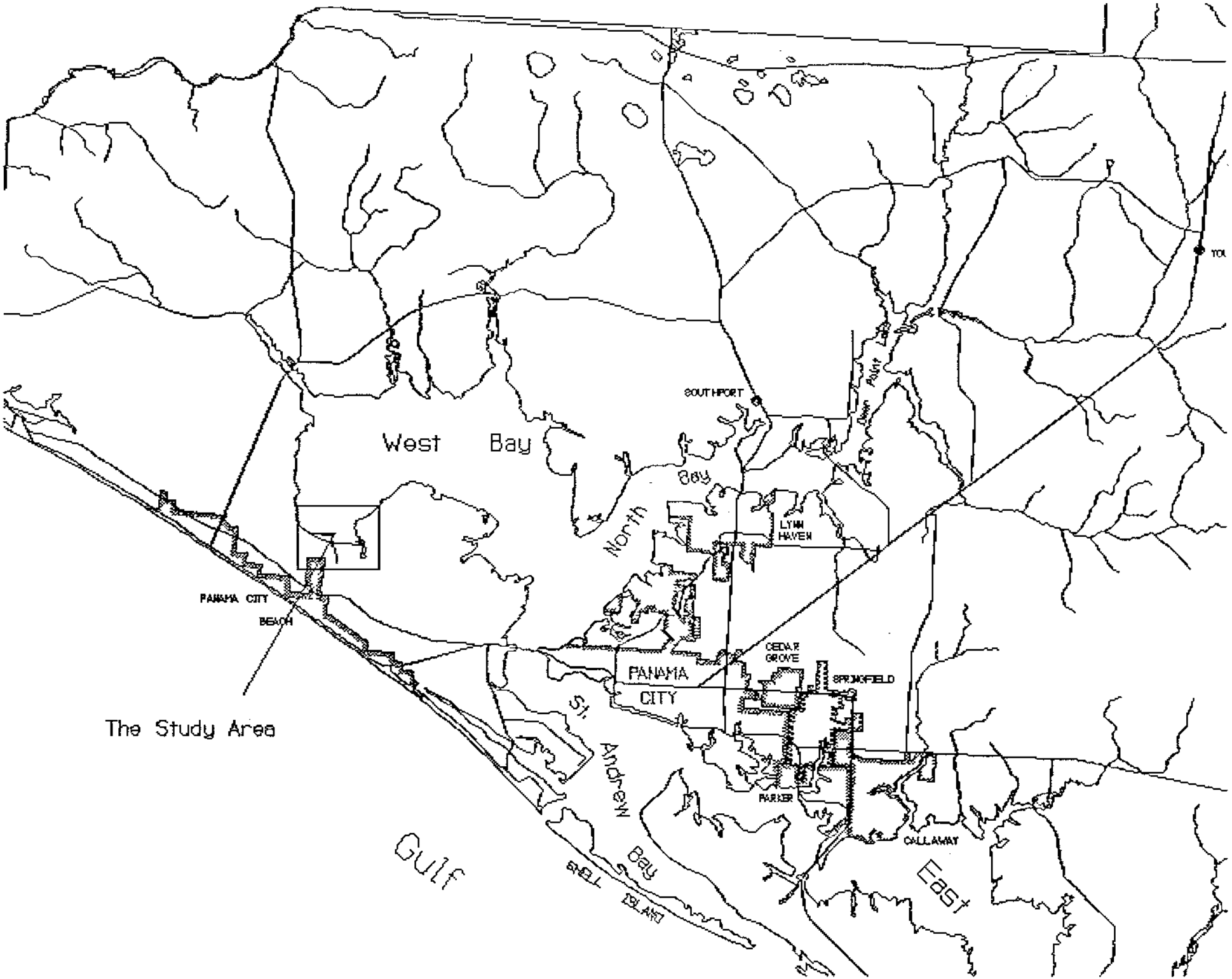
therefore, the best time to sample is:

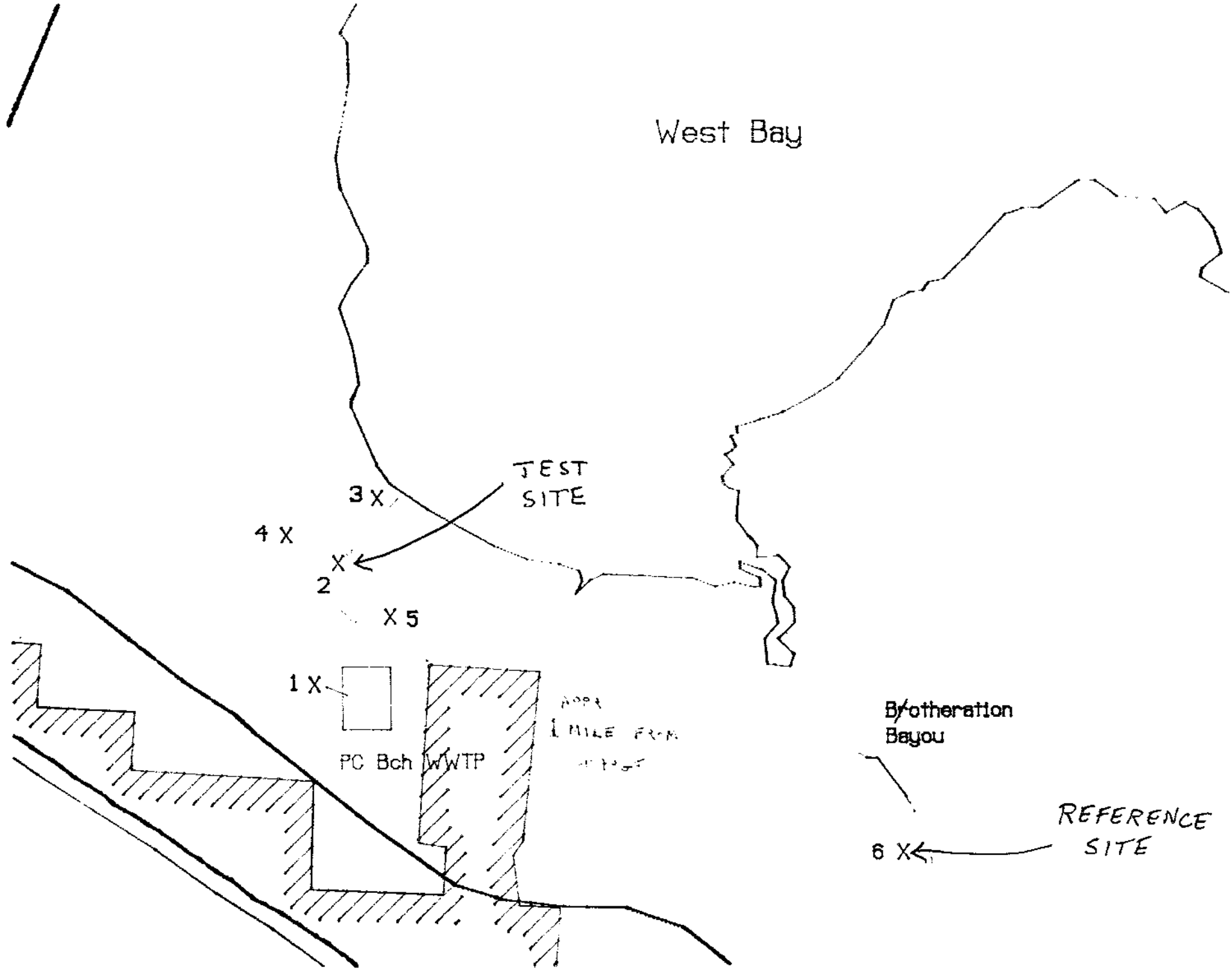
If facility has a mixing zone, give details (size, parameters affected, etc.):
No mixing zone

List effluent limits:

Parameter	Limit (units)
Flow	7.0 MGD MAX. ANNUAL Avg.
pH eff.	6.0 min / 7.3 MAX
Cl_2 Residual	0.01 mg/L MAX.
BODs	10 mg/L MAX. MN. AVG.
TSS	30 mg/L MAX. MN. AVG.
ORG-N	3.0 mg/L MAX
NH_3	2.0 mg/L MAX
Nitrate/Nitrite	N/A
Total Phosphorous	N/A
DO	6.0 min
Fecal Coliform	200 /100 ml (MAX)

Describe special permit conditions and permit modifications:


West Bay
North Bay
SOUTHPORT
LYNN HAVEN
PANAMA CITY BEACH
PANAMA CITY
CEDAR GROVE
SPRINGFIELD
PARKER
CALLAWAY
The Study Area
St. Andrew Bay
Gulf
East


West Bay
TEST SITE
3 X
4 X
X
2
X 5
1 X
PC Bch WWTP
1 MILE FROM
Brotheration Bayou
REFERENCE SITE
6 X

DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8070	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
SUBMITTING AGENCY NAME: NW DIST	N/A	9-23-92	[illegible]

REMARKS:	LOCATION:	FIELD ID/NAME:
PAPER MILL LAND WITH PLANTED PINES	CONTROL SITE AT DIRT ROAD CROSSING	# 5

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 22	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 14	Max. observed; >0.3 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 **0-7 points**
Artificial Channel/ Flow Alteration 5	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 8	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 3	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		TOTAL SCORE
2	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	52

COMMENTS: Water Quality appears good however [illegible] Silviculture practices, clear cutting. Low [illegible]

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09-28-92	G.L. Butts	G. L. Butts

FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 SUBMITTING AGENCY NAME: EDSR NW DIST	STORET STATION NUMBER: 1003A11255	DATE (M/D/Y): 09-27-92	RECEIVING BODY OF WATER:

REMARKS: Riparian Zone Pine trees & introduced exotics	LOCATION: DOWNSTREAM AT POWER LINES / DIRT RD	FIELD ID/NAME: # 2

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 18	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 16	Max. observed; >0.3 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 **0-7 points**
Artificial Channel/ Flow Alteration 6	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 8	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 3	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 56

COMMENTS: This stream has sufficient vegetation for habitat [illegible] flow due to constant 3.0 MGD discharge

ANALYSIS DATE: 09-28-92	ANALYST: G.L. Butts	SIGNATURE: Glenn L. Butts

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 8070 / SUBMITTING AGENCY NAME: NC DOT	STORET STATION NUMBER: NA	DATE (M/D/Y): 09-27-92	TIME	RECEIVING BODY OF WATER:
REMARKS: ALL PAPER MILL LAND + PLANTED PINES	LOCATION: CONTROL SITE AT ROAD CROSSING			FIELD ID/NAME:

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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): PROBABLY NONE, [illegible] EVIDENCE, CLEAR CUTTING TO STREAM EDGE

Estimated System Width (range, m):	Estimated System Depth (range, m):	yes
High Water Mark (m above bed):	Velocity (range, m/s):	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: ☐

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	35	5		Rock or Shell Rubble	0		
Leaf Packs	1			Sand	33	5	
Aquatic Vegetation	1			Mud/Muck	10	3	
Submerged Roots	15	5		Other:			
Undercut Banks	10	5		Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m
Top	25.7	6.1	6.6	18				
Mid-depth								
Bottom								

System Type : Stream: ☒ (Surficial Aquifer Fed ☐ Alluvial ☐ / Deep Aquifer Fed ☐ Blackwater ☐) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions: LOW FLOW, No Hard-wood leaf packs

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09-28-92	G.L. BUTTS	

DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: 3010 / SUBMITTING AGENCY NAME: FDER NW DIST	STORET STATION NUMBER: 1003A11255	DATE (M/D/Y): 9-23-92	TIME	RECEIVING BODY OF WATER:

REMARKS: PLANTED PINES FOR PAPER MILL	LOCATION: DOWNSTREAM LOCATION AT POWERLINE/DIRT RD	FIELD ID/NAME: # 2

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
						100

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): PANAMA CITY BEACH WWTP, URBAN RUNOFF UPSTREAM, SILVICULTURE DOWNSTREAM

Estimated System Width (range, m):	Estimated System Depth (range, m):	yes
High Water Mark (m above bed):	Velocity (range, m/s):	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: ☐

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	10	3		Rock or Shell Rubble	0		
Leaf Packs	10	2		Sand	25	5	
Aquatic Vegetation	30	5		Mud/Muck	15	2	
Submerged Roots	5	1		Other:			
Undercut Banks	5	3		Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m
Top	25.9	5.1	7.2	110				
Mid-depth								
Bottom								

System Type : Stream: ☒ (Surficial Aquifer Fed ☐ Deep Aquifer Fed ☐ Alluvial ☐ Blackwater ☐) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions: LOW RAINFALL FOR 28 day Period

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

ANALYSIS DATE: 09-28-92	ANALYST: G.L. BUTTS	SIGNATURE:

Sample Source: PANAMA CITY BEACH WWTP
Address/City: _____
County: BAY
Contact/District: GLEN BUTTS NW
NPDES Permit #: FL0021512 Outfall #: _____

Sample Collection: Date 9-28-92 Time 1040
Test Beginning: Date 9-29-92 Time 1400
Test Ending: Date 10-1-92 Time 1400
Test Organism: C. DUBIA
Life Stage/Age: < 24 HRS

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

42272 92-SEP-29-14
entered 10/1

Remarks:
DECHLORINATED AT PLANT

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 10@10	8.5@24.0	23.2@ 23.2	971 9590 @23.4
24 hr	7@7, 9@9	8.7@23.0°C	22.8@22.8	956 9391 @23.0°C
48 hr	7@7, 9@9	8.8@22.0	22.0@22.3	943 9290 @22.5

		Number Live			pH			Temp. (°C)			DO (mg/L)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
control	A	5	5	5	8.5		8.1	23.5		23.0	8.5		8.8	157		165
control	B	5	5	5			8.2						8.8			
control	C	5	5	5			8.2						8.8			
control	D	5	5	5			8.2						8.8			
100%	A	5	5	5	7.3		8.3	23.0		23.0	8.3		8.8	1164		1205
100%	B	5	5	5			8.3						8.8			
100%	C	5	5	5			8.3						8.8			
100%	D	5	5	5			8.3						8.8			
Measured/Loaded by:		KP	MF	KP	KP		MF	KP		MF	KP		MF	KP		MF
Recorded by:		MF	KP	KP	MF		KP	MF		KP	MF		KP	MF		KP

Investigators' Signatures
Kim Pearce
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	0.0		<0.03	DR-100	KP
Alkalinity:	124	70	110	Hach	KP
Hardness:	125	77	207	Hach	KP
Total Ammonia:	0	0	0	orion	MF

Ammonia Meter Slope: -58.0
Ammonia Blank: 0.0
Salinity Sample: 0 ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: PANAMA CITY BEACH WWTP
Address/City: _____
County: BAY
Contact/District: GLEN BUTTS NW
NPDES Permit #: FL00 21512 Outfall #: _____

Sample Collection: Date 9-28-92 Time 1040
Test Beginning: Date 9-29-92 Time 1400
Test Ending: Date 10-1-92 Time 1400
Test Organism: N. LEEDSI
Life Stage/Age: 9 days

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

42272 92-SEP-29-14
entered 10/1

Remarks:
DECHLORINATED AT PLANT

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 10@10	8.5@24.0	23.2@ 23.2	971 9590@23.4
24 hr	7@7, 9@9	8.7@23°C	22.8@22.8	956 @23.0°C
48 hr	7@7, 9@9	8.8@22.0	22.0@22.3	943 9290 @22.5

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	57	5	5	5	7.8	8.2	8.4	23.5	22.5	22.3	8.2	8.3	9.1	~~244~~		
control	261	5	5	5	7.8	8.2	8.4				8.3	8.3	9.1	244	240	242
100%	67	5	5	5	7.3	7.9	8.2	22.5	22.5	22.0	8.4	8.3	9.0	~~1237~~		
100%	50	5	5	5	7.3	7.9	8.2				8.4	8.3	9.0	1237	1244	1247
														trends in wrong plate MF 9/29/92		

Measured/Loaded by:	MF	KP	KP	KP	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF
Recorded by:	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF	MF	KP

Investigators' Signatures
Kim Pearce
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			not measured		
Lab Tot. Resid. Cl2:	0.0		<0.03	DR-100	KP
Alkalinity:	124	70	110	Hach	KP
Hardness:	125	77	207	Hach	KP
Total Ammonia:	0	0	0	orion	MF

Ammonia Meter Slope: -58.0
Ammonia Blank: 0.0
Salinity 0

Macroinvertebrate taxa list for Panama City Beach WWTP, collected via Hester-Dendy artificial substrates in Botheration Bayou (reference site) and Panama City Beach Ditch (test site) on 27 October, 1992.

	Reference Site	Test Site
Coleoptera		
Hygrotus sp.	4	–
Stenelmis sp.	1	–
Diptera		
Cricotopus bicinctus	1	2
Cryptochironomus sp.	2	–
Dicrotendipes modestus	2	–
Nanocladius sp.	–	1
Pentaneura inconspicua	1	3
Polypedilum illinoense	2	–
P. scalaenum	9	1
P. tritum	4	1
Paratanytarsus sp.	5	1
Rheotanytarsus distinctissimus grp.	8	147
R. exiguus grp.	2	6
Simulium sp.	–	11
Tanytarsus sp. L Epler	4	1
T. sp. M Epler	–	1
T. sp. S Epler	124	7
Tribelos jucundum	2	–
Undetermined dipteran pupa	1	–
Ephemeroptera		
Caenis sp.	5	–
Gastropoda		
Hebetancyclus excentricus	2	15
Pseudosuccinea columella	–	2
Hirudinea		
Helobdella fusca	–	2
H. triserialis	–	7
Malacostraca		
Hyalella azteca	3	–
Lirceus sp.	2	–
Procambarus sp.	1	–
Odonata		
Boyeria vinosa	–	1
Enallagma cardenium	–	3
Epitheca princeps	–	1
Progomphus obscurus	1	–
Oligochaeta		
Dero trifida	12	1
Eclipidrilus sp.	–	1

Nais communis	1	–
Slavina appendiculata	–	1
Trichoptera		
Cheumatopsyche sp.	6	3
Hydropsyche decalda	–	30

Macroinvertebrate taxa list for Panama City Beach WWTP, collected via discrete dip net sweeps in Botheration Bayou (reference site) and Panama City Beach Ditch (test site) on 27 October, 1992.

	Reference Site	Test Site
Coleoptera		
Dineutus serrulatus serrulatus	8	–
Paracymus sp.	4	–
Diptera		
Chironomus sp.	52	–
Cricotopus bicinctus	–	28
Cryptochironomus sp.	8	–
Dicrotendipes neomodestus	8	–
Paratanytarsus sp.	4	–
Polypedilum halterale grp.	12	–
P. scalaenum grp.	52	–
Psectrocladius elatus	4	–
Rheotanytarsus distinctissimus grp.	–	420
R. exiguus grp.	–	8
Simulium sp.	–	20
Stenochironomus sp.	4	–
Tanytarsus sp. A Epler	4	–
T. sp. S Epler	216	–
T. sp. G Epler	4	–
T. sp. L Epler	24	–
T. sp. U Epler	8	–
Tribelos jucundum	4	–
Undetermined dipteran pupa	–	4
Ephemeroptera		
Caenis sp.	8	–
Gastropoda		
Hebetancyclus excentricus	–	20
Pseudosuccinea columella	–	4
Hemiptera		
Immature corixid	8	–
Malacostraca		
Hyalella azteca	4	–
Lirceus sp.	8	–
Procambarus sp.	8	4
Odonata		
Boyeria vinosa	–	4
Enallagma cardenium	–	32
Epitheca princeps	–	12
Gomphus minutus	8	–
Ischnura sp.	4	–
Macromia taeniolata	–	4
Progomphus obscurus	28	–

Oligochaeta		
Aulodrilus pigueti	4	–
Eclipidrilus sp.	–	20
Trichoptera		
Cheumatopsyche sp.	8	4
Hydropsyche decalda	–	72

Periphyton taxa list for Panama City Beach WWTP, collected in Botheration Bayou (reference site) and Panama City Beach Ditch (test site) on 27 October, 1992.

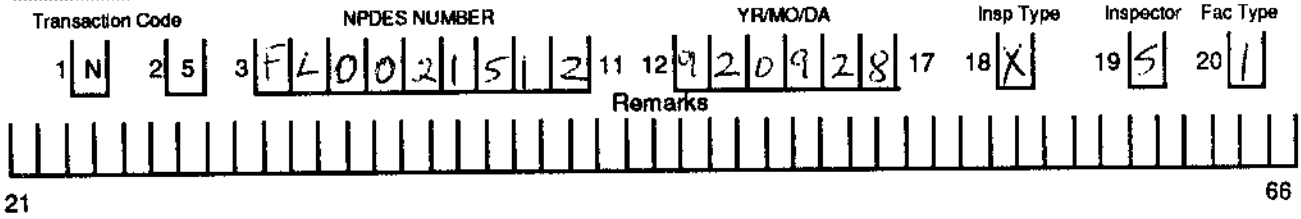
	Reference Site	Test Site
Diatoms		
Achnanthes exigua	4	102
A. linearis	8	–
A. microcephala	82	–
A. minutissima	4	–
Anomoeoneis serians	66	–
A. vitrea	62	–
Capartogramma crucicula	–	17
Cocconeis placentula	4	–
Cyclotella sp.	–	30
Cymbella minuta	4	–
Eunotia flexuosa	198	–
E. monodon	–	17
E. pectinalis	29	123
E. tenella	4	–
Frustulia rhomboides	4	13
Gomphonema gracile	17	–
G. parvulum	17	34
Navicula accomoda	4	21
N. confervacea	4	115
N. constans	–	13
N. elginensis	–	9
N. festiva	4	123
N. minima	–	72
N. pupula v. *rectangularis*	4	–
N. simula	4	–
N. viridula	4	502
Nitzschia amphibia	4	34
N. ignorata	4	9
N. microcephala	45	–
N. obtusa	4	–
N. palea	29	77
N. romana	4	–
Pinnularia abaujensis	4	34
P. subcapitata	–	9
Stauroneis sp.	4	–
S. smithii	–	9
Surirella delicatissima	33	–
Synedra miniscula	–	9
S. ulna	–	38
Tabellaria fenestrata	4	–
Chlorophyta		
Characium sp.	29	4

Chlorococcum sp.	–	4
Closterium sp.	17	–
Cosmarium sp.	37	–
Gloeocystis sp.	8	–
Micrasterias sp.	12	–
Mougeotia sp.	70	–
Oedogonium sp.	66	–
Pleurotaenium sp.	4	–
Scenedesmus sp.	21	–
Spondylosium sp.	21	–
Staurastrum sp.	4	–
Stigeocolonium sp.	–	21
Tetraedron sp.	4	–
Chrysophyta		
Dinobryon sp.	4	–
Mallomonas sp.	4	–
Cyanophyta		
Anabaena sp.	8	–
Aphanocapsa sp.	8	4
Chroococcus sp.	21	4
Gloeocapsa sp.	25	–
Lyngbya sp.	–	21
L. contorta	–	4
Merismopedia sp.	8	–
Oscillatoria sp.	4	–
Phormidium sp.	–	55
Stigonema sp.	–	4
Euglenophyta		
Trachelomonas sp.	21	–

Phytoplankton taxa list for Panama City Beach WWTP, collected in Botheration Bayou (reference site) and Panama City Beach Ditch (test site) on 28 September, 1992

	Reference Site	Test Site
Diatoms		
Cocconeis sp.	–	26
Navicula sp.	51	26
Nitzschia sp.	25	52
Pinnularia sp.	–	26
Stauroneis sp.	–	26
Unidentified pennate diatom	–	208
Chlorophyta		
Cosmarium sp.	25	–
Elakatothrix sp.	25	–
Kirchneriella sp.	101	–
Scenedesmus sp.	76	–
Unknown chlorophyte flagellate	51	26
Chrysophyta		
Dinobryon sp.	76	–
Mallomonas sp.	177	52
Cryptophyta		
Cryptomonas sp.	202	–
Cyanophyta		
Oscillatoria sp.	101	26
Phormidium sp.	–	286
Euglenophyta		
Trachelomonas sp.	25	–

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



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

