#237



Biological Assessment of

Charlotte Harbor Water Association

Charlotte County

NPDES #FL0035378

February 1998

February 1999

Biology Section
Division of Administrative and Technical Services
Bureau of Laboratories

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger: Charlotte Harbor Water Association
County: Charlotte
NPDES Number: FL0035378
Permit Expiration Date: 29 Febuary 2000

Toxics Sampling Inspection (XSI)

Date Sampled: 9 February 1998

Results: The concentration of copper (3.9 µg/L) in the effluent sample exceeded the Class III water quality standard (Rule 62-302.530(24) FAC). All other metals complied with Class III water quality standards. Concentrations of hydrogen sulfide (0.05 mg/L) and Total Residual Chlorine (TRC) (0.05 mg/L) exceeded the facility's permit limits. The TRC also violated Class III water quality standards (Rule 62-302.530(19) FAC). Radium 226 (40.8 pCi/L) and gross alpha activity (3,025 pCi/L) levels exceeded Class III water quality standards (Rule 62-302.530(58)(a) and (b) FAC) and their respective permit limits.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 9 February 1998

Results: The effluent sample was not acutely toxic to the fish, *Menedia beryllina,* but resulted in 100% mortality to the invertebrate, *Americamysis bahia*. Part of Charlotte Harbor's reverse osmosis treatment process involves the addition of salts to the effluent. These salts may not provide a complete proportional match of all the ions found in natural seawater (FDEP 1995). This imbalance of the major seawater ions probably caused the effluent to be toxic to the invertebrate.

Impact Bioassessment Inspection (IBI)

Date Sampled: 9 February 1998

Results: The macroinvertebrate communities at both the control and test sites were depauperate, due to poor habitat quality and in particular the anaerobic sediments. The phytoplankton communities appeared worse at the test site than at the control, with lower taxa richness, diversity, and increases in algal density and chlorophyll *a*.

Water Quality Inspection (WQI)

Date Sampled: 9 February 1998

Results: Ortho-phosphate and total phosphorus levels at both the control and test sites exceeded levels found in over 95% of Florida's estuaries. Nitrate+nitrite at the control and test sites exceeded 95% and 85% of Florida's estuaries, respectively. The specific conductivity was high in the effluent (7,533 µmhos/cm) and may have contributed to elevated levels at the test site. Algal growth potential at both study sites exceeded the 10 mg dry wt/L "problem threshold" for marine systems.

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 Charlotte Harbor Water Association, is located in Charlotte County, Florida (see maps in the Appendix). This industrial facility is a reverse osmosis, drinking-water treatment plant that provides potable water to the Harbor Heights area in southwest Florida.

The treatment facility produces a reverse osmosis concentrated by-product that is sent through a degassing tower that strips the hydrogen sulfide gas and increases the dissolved oxygen. Wastewater is discharged to San Marino canal which eventually flows into the Class III Peace River. A mixing zone of 25 feet from the point of discharge has been established for gross alpha particle activity and combined radium 226 and 228, which are monitored quarterly.

State permit limits for the Charlotte Harbor Water Association Plant are listed in Table 1. According to the facility's monthly operating reports the plant exceeded its permit limits twice in the past year. In July, 1997, the facility reported a fluoride level of 5.1 mg/L, which exceeded the permit limit of 5.0 mg/L. In January, 1998, the facility reported a discharge flow of 0.153 MGD, which exceeded the permitted flow of 0.15 MGD. There are currently no enforcement actions against Charlotte Harbor Water Association.

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 control site (located in Santa Barbara Canal) and a test site (located in San Marino Canal, downstream of the discharge). A habitat assessment was performed *in situ* to establish comparability between sites on February 9, 1998. Supplemental physical/chemical data were also collected on the effluent and study sites. The effluent was analyzed for nutrients, metals, and for organic constituents (base neutral and acid extractable, and pesticide extractable). Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Acute screening bioassays, using the invertebrate, *Americamysis bahia,* and the fish, *Menidia beryllina*, as test organisms, were performed on an effluent sample. Benthic macroinvertebrate communities were evaluated at the control and test site. Invertebrates were collected via a petite Ponar dredge. Phytoplankton were sampled at both control and test sites via subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities. Algal Growth Potential (AGP) tests used *Selenastrum capricornutum* as the test organism for the freshwater receiving-water sites and *Dunaliella tertiolecta* for the marine effluent. All field and laboratory biological methods were carried out following Biology Section Standard Operating Procedures (SOP's). The latest version of the SOP's can be viewed on our web site at 'www.dep.state.fl.us/labs/sops.htm'.

Several different measurements of macroinvertebrate and algal community health have been employed to determine the effects of the discharge. These measurements include: habitat assessment, taxa richness, Shannon-Weaver Diversity Index, community composition, functional feeding groups, and algal biomass. For a discussion of each of these measures see *Explanation of Measurements of Community Health* in the Appendix.

For graphical purposes, the percent differences between the control and test site involving the number of taxa, the diversity index, the diatom to blue-green algae ratio, the % filter-feeders, the number of polychaete taxa, and the % pelecypods are measured as the control site minus test site divided by the control site. The percent differences between sites involving the % tubificids, algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site.

The following personnel were involved in this investigation: Mike DelGais and Ford Walton (DEP South District, Ft. Myers), and Julie Baughman, Rob Buda, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Scott Lashbrook, Elizabeth Miller, Urania Quintana, Johnny Richardson, Roy Stanley, Lisa Tamburello, Steve Wolfe, David Whiting, and Vicki Whiting (DEP Central Biology Laboratory in Tallahassee). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Chuck Ziegmont, and Michael Tanski, as well as District representative

Results and Discussion

San Marino and Santa Barbara are both man-made canals that are somewhat tidally influenced and eventually flow into the Class III

Peace River. Habitat quality was in the lower range of the "fair" category at both the Santa Barbara control site (29 points) and the San Marino test site (28 points) (see Habitat Assessment Field Data Sheets in the Appendix). The substrate at both sites consisted of anaerobic mud/muck.

Physical/chemical measurements complied with Class III waters at both the control and test sites (Table 1). Dissolved oxygen levels were 6.6 mg/L at the control site and 8.1 mg/L at the test site. The pH (6.5 SU at the control site and 6.8 SU at the test site) and temperature (16.7 °C at the control site and 16.5 °C at the test site) were comparable. The conductivity (226 µmhos/cm) at the control site was considerably lower than at the test site (1,322 µmhos/cm). This 485% increase in specific conductance is a violation of Class III water quality standards (Rule 62-302.530(23) FAC). The effluent conductivity was 7,533 µmhos/cm.

The effluent concentrations of hydrogen sulfide (0.05 mg/L) and total residual chlorine (0.05 mg/L) exceeded the facility's permit limit of 0.01 mg/L. The total residual chlorine level is also a violation of Class III water quality standards (Rule 62-302.530 (19) FAC). Total fluoride was measured at the permit limit of 5.0 mg/L. Effluent levels of radium 226 (40.8 pCi/L) and gross alpha activity (3,025 pCi/L) exceeded their respective permit limits (5.0 pCi/L and 15.0 pCi/L) and Class III water quality standards (Rules 62-302.530 (58)(a) and (b) FAC).

Aluminum, iron, lead, and silver were detected in the effluent at levels that complied with Class III water quality standards (Table 1). The concentration of copper in the effluent (3.9 µg/L) exceeded Class III water quality standards (2.9 µg/L), a violation of Rule 62-302.530(24) FAC. No organic compounds were detected in the plant's effluent. The effluent sample was not toxic to the fish, *Menidia beryllina*. There was, however, 100% mortality of the invertebrate, *Americamysis bahia* (Appendix).

Nutrients were elevated throughout the study area (Table 1). Nutrients at the control site were similar or higher than test site levels. For example, total nitrogen was the same in the effluent and at both study sites (1.8 mg/L). Control site levels of ortho-phosphate (0.6 mg/L), and nitrate+nitrite (0.6 mg/L) were higher than those found in over 95% of other Florida estuaries. Ammonia (0.1 mg/L) was also higher at the control site compared to the test site (0.03 mg/L). Test site levels of nitrate+nitrite (0.1 mg/L), ortho-phosphate (0.4 mg/L), and total phosphorus (0.9 mg/L) exceeded values found in 80% to 95% of other Florida estuaries. AGP at both the control (35.1 mg dry wt/L) and test sites (12.1 mg dry wt/L) exceeded the 10 mg dry wt/L "problem threshold" (Ron Raschke, USEPA, pers. comm.) for marine systems. AGP in the effluent was 36.9 mg dry wt/L.

Figure 1 represents changes in the phytoplankton algal community. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Phytoplankton taxa richness at the

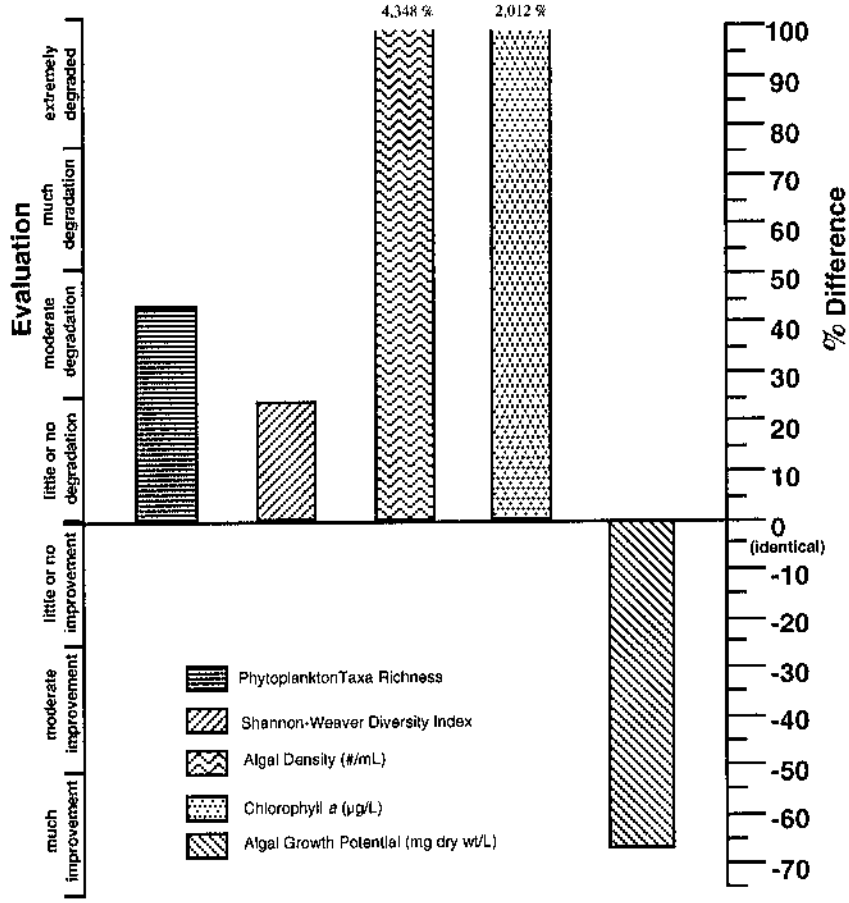


Figure 1. Effect of discharge on the phytoplankton community.

Table 1. Effluent permit limits and summary of chemistry data.

Charlotte Harbor Water Association	Effluent Limits	Effluent Sample	Control Site	Test Site
Organic Constituents (µg/L)				
	-	None Detected	-	-
Metals (µg/L)				
Aluminum	≤ 1,500 **	39 I	-	-
Arsenic	≤ 50 **	40 U	-	-
Cadmium	≤ 9.3 **	0.02 U	-	-
Chromium	≤ 50 **	10 U	-	-
Copper	≤ 2.9 **	3.9 A	-	-
Iron	≤ 300 **	10 I	-	-
Lead	≤ 5.6 **	0.4 I	-	-
Mercury	≤ 0.025 **	0.1 U	-	-
Nickel	≤ 8.3 **	7 U	-	-
Selenium	≤ 71 **	50 U	-	-
Silver	≤ 2.3 **	0.09 I	-	-
Zinc	≤ 86 **	10 U	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	1.9 Q	0.6	0.4
Total phosphorus	≤ 15 *	2.3	0.8	0.9
Ammonia	-	1.1 A	0.1	0.03
Nitrate+nitrite	-	0.2	0.6	0.1
TKN	-	1.6	1.2	1.7
Total Nitrogen	-	1.8	1.8	1.8
General Phys-Chem Parameters				
Habitat Assessment	-	-	29	28
Flow (MGD)	0.15 *	-	-	-
D.O. (mg/L)	≥ 4.0 *	7.5	6.6	8.1
pH (SU)	6.1 - 8.1 *	7.3	6.5	6.8
Conductivity (µmhos/cm)	-	7,533	226	1,322
Temperature (°C)	-	24.3	16.7	16.5
Hydrogen sulfide (mg/L)	≤ 0.01 *	0.05	-	-
Total Residual Chlorine (mg/L)	≤ 0.01 *	0.05	-	-
Total Fluoride (mg/L)	≤ 5.0 *	5	-	-
Total Suspended Solids (mg/L)	≤ 50.0 *	-	-	-
Radium 226 (pCi/L)	≤ 5.0 *	40.8	-	-
Gross Alpha Activity (pCi/L)	≤ 15.0 *	3,025	-	-
AGP (mg dry wt/L)	-	36.9	35.1	12.1
Toxicity				
Bioassay Fish	-	Not Toxic	-	-
Bioassay Invertebrate	-	Toxic	-	-

* Permit limit
** Class III water quality standard
a - Annual average
c - Value is calculated based on hardness
A - Value reported is the mean of two or more determinations
I - Value reported is < the minimum quantitation limit, and ≥ the minimum detection limit
Q - Sample held beyond normal holding time
U - Material analyzed for but not detected; value reported is the minimum detection limit

control site (34 taxa) was considerably higher than at the test site (19 taxa). Shannon-Weaver diversity was also greater at the control site (3.8) compared to the test site (2.9), a reduction of 24%. In addition, algal density increased dramatically from 1,544 cells/mL at the control site to 32,617 cells/mL at the test site. Similarly, chlorophyll *a* increased from 1.12 mg/L at the control site to 49.82 mg/L at the test site. Green algae made up over 60% of the test site phytoplankton community, while the control site's algal community was more diverse in its composition.

Figure 2 indicates the degree of difference between the invertebrate communities at 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. Both the control (8 taxa) and test sites (11 taxa) had low taxa richness. Shannon-Weaver diversity was 2.8 at the control site and 2.2 the test site, a decrease of 21%. Pollution-tolerant freshwater chironomids made up 93% of the community at the control site and 51% of the test site. Freshwater oligochaetes made up another 41% of the test site. Only one polychaete, the pollution-tolerant, *Streblospi benedicti,* was present at the test site.

Conclusions

Habitat quality was at the lower end of the "fair" category at both the control and test sites. The shoreline consisted mostly of vertical seawalls, producing moderate wave action and providing very little habitat for invertebrate communities.

The concentration of copper in the effluent (3.9 µg/L) exceeded the Class III marine water quality standard of 2.9 µg/L, a violation of Rule 62-302.530(24) FAC. No organic pollutants were detected in the effluent.

The effluent concentrations of hydrogen sulfide (0.05 mg/L) and total residual chlorine (0.05 mg/L) exceeded the facility's permit limits of 0.01 mg/L. The total residual chlorine level is also a violation of Class III water quality standards (Rule 62-302.530 (19) FAC). Total fluoride was measured at the permit limit of 5.0 mg/L. Effluent levels of radium 226 (40.8 pCi/L) and gross alpha activity (3,205 pCi/L) exceeded their respective permit limits (5.0 pCi/L and 15.0 pCi/L) and Class III water quality standards (Rules 62-302.530 (58)(a) and (b) FAC).

The effluent sample was not toxic to the fish, *Menidia beryllina,* but was toxic to the invertebrate, *Americamysis bahia,* during the 48-hour acute screening bioassay.

The Charlotte Harbor Water Association facility produces a reverse osmosis concentrated byproduct. During the reverse-osmosis process, the source-water was stripped of its ions. Surface water from San Marino Canal and chemical salts were added to the concentrate to adjust the major seawater ions to the proportions present in natural seawater. The addition of salts to the effluent may not provide a complete proportional match of all the ions found in natural seawater. A substantial imbalance of the major seawater ions probably caused the effluent to be toxic to the mysid shrimp, *Americamysis bahia.* The saltwater fish, *Menidia beryl-*

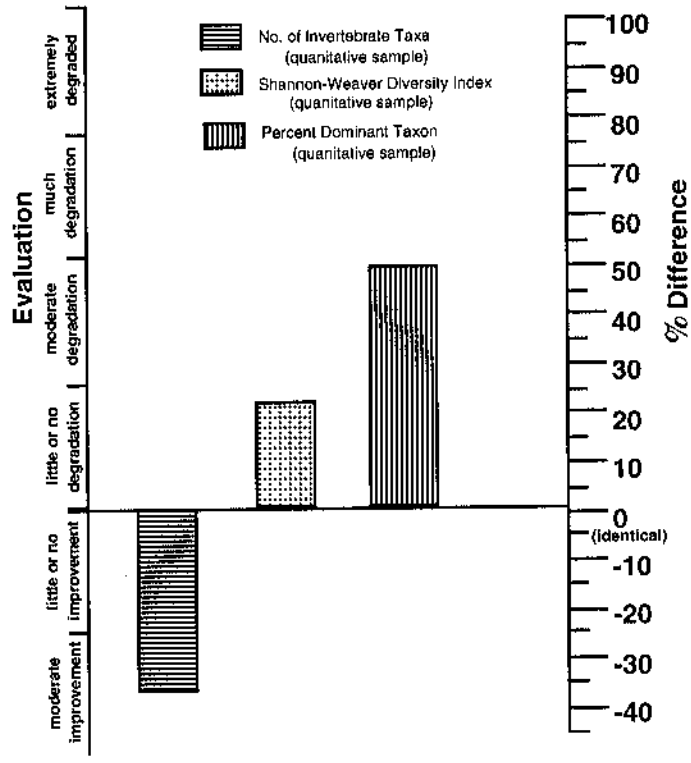


Figure 2. Effect of discharge on the macroinvertebrate community.

Table 2. Major characteristics of macroinvertebrate community structure of control and test site.

Charlotte Harbor Water Association	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	8	11
Shannon-Weaver Diversity	2.8	2.2
Percent Dominant Taxon	27	39
No. Polychaeta Taxa	0	1
Community Composition		
% Amphipoda	0.0	3
% Diptera	93	51
% Gastropoda	7	2
% Odonata	0.0	2
% Oligochaeta	0.0	41
% Polychaeta	0.0	2
Functional Feeding Groups		
% Predators	47	50
% Burrowing Deposit Feeders	0	41
% Surface Deposit Feeders	23	5
% Suspension Feeders	3	1
% Scrapers	7	2
% Unknown	20	2
Phytoplankton Algae		
Number of Taxa	34	19
Shannon-Weaver Diversity	3.8	2.9
Chlorophyll a (µg/L)	1.12 U	49.82
Algal Density (#/mL)	1,544	32,617
% Blue-green	16	5
% Green	38	63
% Cryptophytes	22	15
% Dinoflagellates	1	0
% Diatoms	17	9
AGP (mg dry wt/L)	35.1	12.1

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

lina, apparently are not as sensitive to an imbalance of seawater ions (FDEP 1995). It does not appear that the elevated levels of copper caused the effluent to be toxic to the invertebrate, *Americamysis bahia.*

Nutrients at the Santa Barbara Canal control site were equal to or greater than levels found at the test site in San Marino Canal, an indication of non-point source nutrient enrichment in these canal systems. Ortho-phosphate and total phosphorus at both the control and test sites exceeded 95% of levels found in other Florida estuaries. AGP at the control (35.1mg dry wt/L) and test sites (12.1mg dry wt/L) exceeded the 10 mg dry wt/L "problem threshold" for a marine system.

The test site algae community showed signs of perturbation compared to the control site. Phytoplankton taxa richness and diversity was considerably lower at the test site. Algal density at the test site increased more than 2,000% compared to the control site. Similarly, chlorophyll *a* increased over 4,000% at the test site. Green algae made up over 60% of the test site phytoplankton community while the control site's algal community was more diverse in its composition.

Some quantitative measures of macroinvertebrate community health indicated that factors in addition to the discharge were affecting the receiving water communities. Both sites had low taxa richness and diversity. Stress-tolerant freshwater chironomids dominated both study sites. Overall, there was little difference between the macroinvertebrate communities at the control and test sites.

Literature Cited

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

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.

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.

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

Explanation of Measurements of Community Health

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

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

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

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

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

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

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

Typical Values for Selected Parameters in Florida Waters

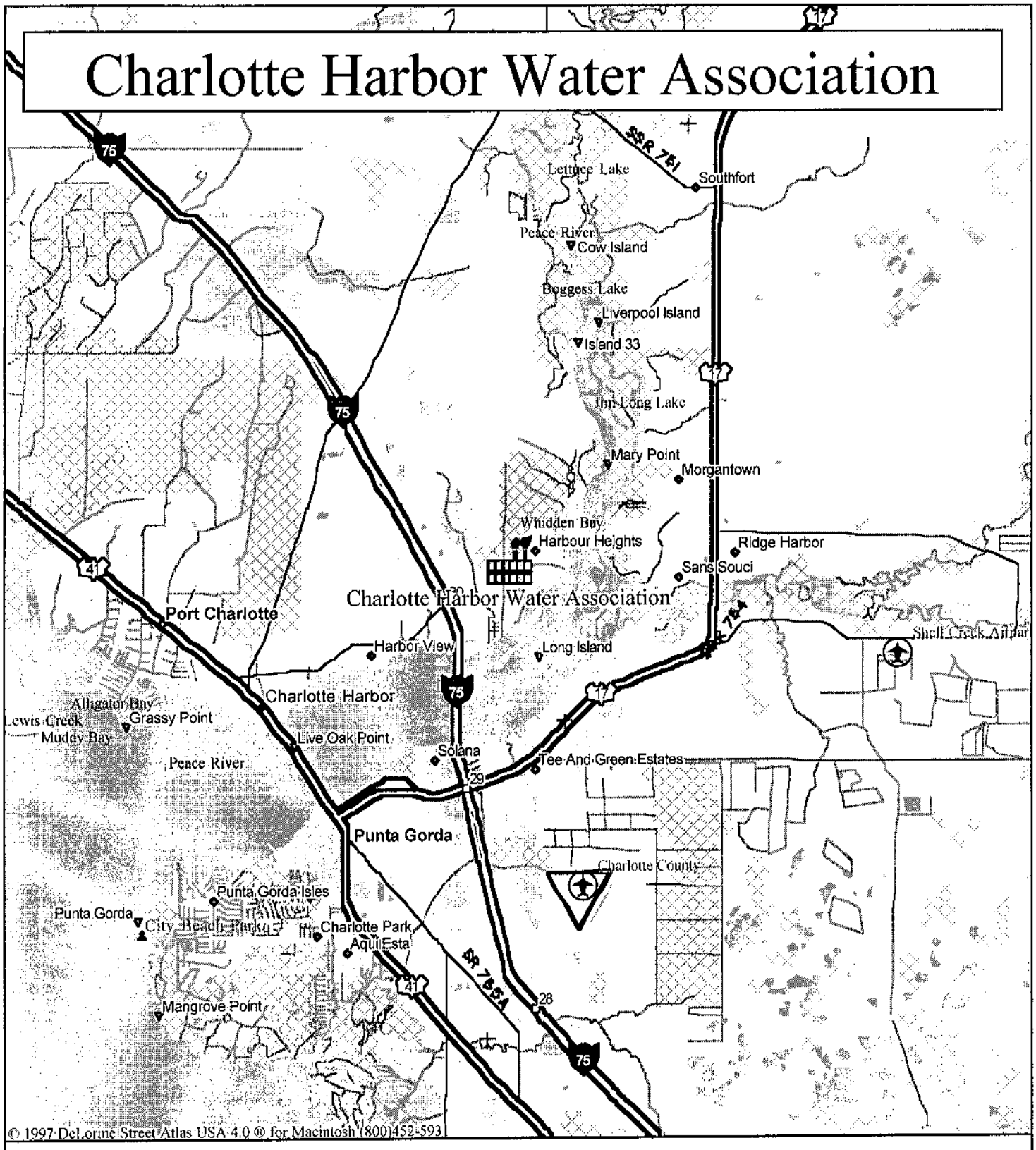
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

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 Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
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-Phosphate	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-Phosphate	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

Charlotte Harbor Water Association

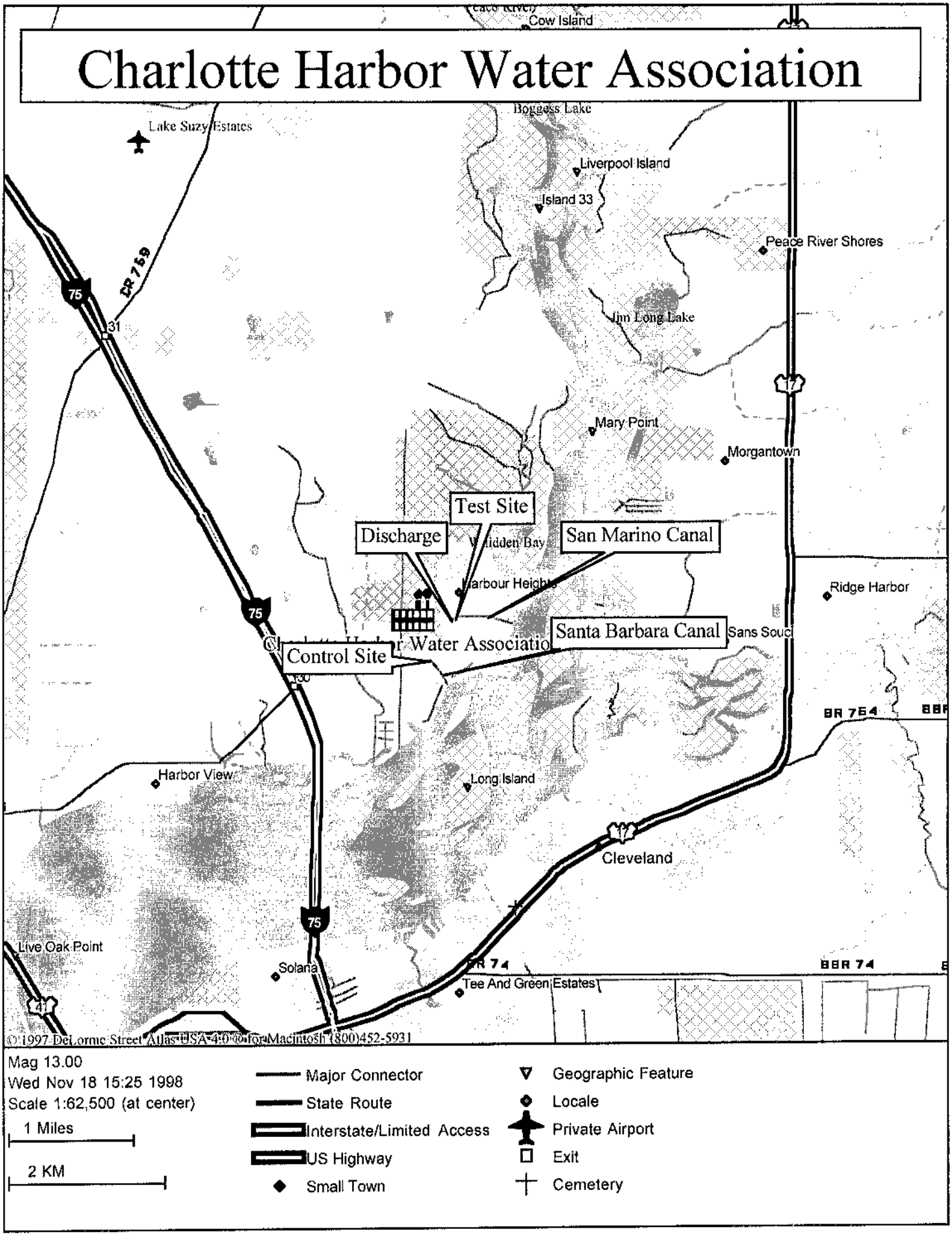


Mag 12.00
Wed Nov 18 15:00 1998
Scale 1:125,000 (at center)

2 Miles

2 KM

- Major Connector
- State Route
- Interstate/Limited Access
- US Highway
- County Seat
- Small Town
- Airfield
- Geographic Feature
- Park/Reservation
- Locale


Charlotte Harbor Water Association
Cow Island
Lake Suzy Estates
Boggess Lake
Liverpool Island
Island 33
Peace River Shores
Jim Long Lake
Mary Point
Morgantown
Test Site
Discharge
San Marino Canal
Hidden Bay
Harbour Heights
Ridge Harbor
Santa Barbara Canal
Sans Souci
Control Site
Water Associatio
Harbor View
Long Island
Cleveland
Live Oak Point
Solana
Tee And Green Estates
CR 759
BR 764
BBR 74
75
17
41
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Mag 13.00
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Scale 1:62,500 (at center)
1 Miles
2 KM
Major Connector
State Route
Interstate/Limited Access
US Highway
Small Town
Geographic Feature
Locale
Private Airport
Exit
Cemetery

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: CHARLOTTE HARBOR WATER ASSOCIATION		Date Summary Prepared: 5/20/98
Location (attach detailed map): BROADPOINT DRIVE HARBOR HEIGHTS, FL 33983	County: CHARLOTTE	District: SOUTH - FT. MYERS
Federal Permit # FL0035378 and expiration date: 02/28/00	State GMS # and 5208P02027 State expiration date: 10/25/98	Facility Type: (Industrial) Municipal Federal Agricultural Other (list):

Function of facility: THIS FACILITY IS A REVERSE OSMOSIS (RO) DRINKING WATER TREATMENT PLANT THAT PROVIDES POTABLE WATER TO THE HARBOR HEIGHTS AREA. THE TREATMENT PROCESS GENERATES A BY-PRODUCT, RO CONCENTRATE.

Description of treatment process:

THE REVERSE OSMOSIS (RO) CONCENTRATE PASSES THROUGH A DEGASSIFICATION TOWER WHICH STRIPS HYDROGEN SULFIDE AND INCREASES DISSOLVED OXYGEN.

Receiving waters: SAN MARINO CANAL	Classification: I II (III)	
Design Flow: 0.15 MGD	Mean Flow:	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.):

A MIXING ZONE HAS BEEN ESTABLISHED FOR GROSS ALPHA PARTICLE ACTIVITY AND COMBINED RADIUM 226 & 228. A MIXING ZONE OF 25 FEET FROM THE POINT OF DISCHARGE WAS ESTABLISHED. MONITORING OF GROSS ALPHA PARTICLE ACTIVITY AND COMBINED RADIUM 226 & 228 IS CONDUCTED ON A QUARTERLY BASIS.

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

Parameter	Limit (units)
FLOW	REPORT (MGD)
pH	6.1 min - 8.1 max. (S.U.)
TOTAL PHOSPHORUS	10 monthly avg. & 15 daily max. (mg/L)
HYDROGEN SULFIDE	0.01 daily max. (mg/L)
TEMPERATURE	REPORT DAILY MAX. - (°C)
DISSOLVED OXYGEN	4.0 daily min. & 5.0 daily avg. (mg/L)
TOTAL RESIDUAL CHLORINE	0.01 daily max. (mg/L)
TOTAL FLUORIDE	5.0 daily max. (mg/L)
TOTAL SUSPENDED SOLIDS	30.0 monthly avg. & 50.0 daily max. (mg/L)
RADIUM 226 & 228	5.0 max. (pCi/L)
GROSS ALPHA ACTIVITY	15.0 max. (pCi/L)

Describe special permit conditions and permit modifications:

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):

THE PERMITTED OUTFALL IS A DISCHARGE PIPE ESTIMATED AT THE END OF THE SAN MARINO CANAL. THIS CANAL IS TIDAL INFLUENCED. AT HIGH TIDE, THE OUTFALL IS UNDER WATER. AT LOW TIDE, THE OUTFALL IS EXPOSED.

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

THE JANUARY 1998 MONTHLY OPERATING REPORT (MOR) SUBMITTED FOR STATE PERMIT # I008-236002 INDICATES AN EXCEEDANCE FOR DAILY MAXIMUM FLOW. THE FACILITY REPORTED A MAXIMUM FLOW OF .1531 MGD. THE PERMIT IMPOSED LIMIT FOR MAXIMUM FLOW IS .15 MGD. THE JULY 1997 MOR FOR THE STATE PERMIT INDICATES AN EXCEEDANCE FOR FLUORIDE. THE FACILITY REPORTED A FLUORIDE RESULT OF 5.09 mg/L. THE PERMIT IMPOSED EFFLUENT LIMITATION FOR FLUORIDE IS 5.0 mg/L.

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

THERE ARE NO CURRENT ENFORCEMENT ACTIONS AGAINST CHARLOTTE HARBOR WATER ASSOCIATION.

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

THERE APPEARS TO BE AN IMPROVING TREND. STATE PERMIT (I008-236002) IMPOSED EFFLUENT LIMITATIONS FOR FLOW WERE EXCEEDED 11 MONTHS FROM 1994-1996. FLUORIDE LIMITS WERE EXCEEDED 14 MONTHS FROM 1994-1996. FROM JANUARY 1997 - MARCH 1998, FLUORIDE AND FLOW HAVE BEEN EXCEEDED ONCE.

Additional Information:

Staff contributing to this review (signature):

(Biologist)

(Inspector)

(Engineer)

( )

( )

( )

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
	NONE	2-9-98	1425	PEACE R

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	CHARLOTTE	SANTA BARBARA CANAL - "REFERENCE" SITE	TW-020998-3

RIPARIAN ZONE/INSTREAM FEATURES

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

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

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

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

Width of riparian vegetation (m) on least buffered side: 0

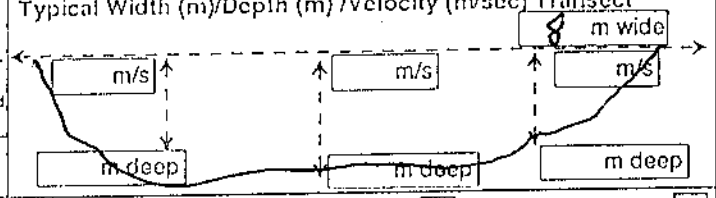
List & map dominant vegetation on back

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

Artificially Impounded ☐ yes

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

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



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

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☐ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☑ Other: ☐ _____

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)				Sand			
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation				Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots							

Draw aerial view sketch of habitats found in 100 m section

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	1.0 ft	16.7	6.46	6.6	226			
Bottom								

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

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/Notes:

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

SAMPLING TEAM:	SIGNATURE:	DATE:
WALTON / DOLGAS	asw alton	2-9-98, REDONE 4-21-98

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

SUBM'TTING AGENCY CODE: / SUBM'TTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		2-9-98	PEACE R.

REMARKS:	LOCATION: CHARLOTTE HARBOR WATER ASSN. — REF E REACH SITE	FIELD ID/NAME: HW-020998-3

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations: 1	None—Unaltered shoreline. 9-10 points	Mostly natural shoreline, but with occasional riprap. 6-8 points	Shoreline consisting mostly of riprap and vertical seawalls. 3-5 points	Shoreline consisting almost entirely of vertical seawalls. 0-2 points
Community Types Observed: 6	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. 38-50 points	Two or three communities observed from those listed. 26-37 points	One community observed from those listed. 13-25 points	No communities observed from those listed. 0-12 points
Tidal Fluctuation: 3	>0.75 m. 4-5 points	0.5 - 0.75 m. 3 points	0.25 - 0.5 m. 2 points	<0.25 m. 0-1 point
Freshwater Discharges/ Alterations: 4	Only natural runoff.. 9-10 points	Mostly natural runoff, but with a few, small stormwater sources. 6-8 points	Considerable stormwater discharge from local roads, parking lots, etc. 3-5 points	Extensive manmade discharges, especially from canals draining large tracts of land. 0-2 points
Flow and Wave Action: 10	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. 9-10 points	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. 0-2 points
Sediment Type: 5	Combination of sand, gravel, and shell. 12-15 points	Primarily sand, with small areas of mud. 8-11 points	Mixture of sand and mud, or well-aerated mud only. 4-7 points	Anaerobic mud. 0-3 points

TOTAL SCORE: 29

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
2-9-98	A.S. WALTON	A.S. Walton

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
	SEE LAST REPORT	2-9-98	1322	PEACE R.

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	CHARLOTTE	SAN MARINO CANAL - TEST SITE	1W_020998-2

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
				90	10		

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

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

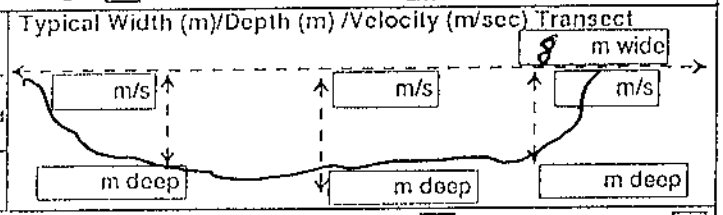
Width of riparian vegetation (m) on least buffered side: 0 | *List & map dominant vegetation on back*

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

Artificially Impounded ☐ yes

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

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



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

SEDIMENT/SUBSTRATE

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

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

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

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

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	1.0 ft	16.5	6.80	8.1	1322			
Bottom								

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

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/Notes:

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

SAMPLING TEAM:	SIGNATURE:	DATE:
WALTON / DELGAIS	asWalton	2-9-98, REDONE 4-21-98

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/DAY):	RECEIVING BODY OF WATER:
		2-9-98	PEACE R.

REMARKS:	LOCATION: CHAR. HARBOR WATERSHED — TEST SITE	FIELD ID/NAME:
		IW-020998-2

Habitat Parameter	Excellent	Good	Fair	Poor
Littoral Alterations score: 1	None—Unaltered shoreline. 9-10 points	Mostly natural shoreline, but with occasional riprap. 6-8 points	Shoreline consisting mostly of riprap and vertical seawalls. 3-5 points	Shoreline consisting almost entirely of vertical seawalls. 0-2 points
Community Types Observed score: 6	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. 38-50 points	Two or three communities observed from those listed. 26-37 points	One community observed from those listed. 13-25 points	No communities observed from those listed. 0-12 points
Tidal Fluctuation score: 3	>0.75 m. 4-5 points	0.5 - 0.75 m. 3 points	0.25 - 0.5 m. 2 points	<0.25 m. 0-1 point
Freshwater Discharges/ Alterations score: 4	Only natural runoff.. 9-10 points	Mostly natural runoff, but with a few, small stormwater sources. 6-8 points	Considerable stormwater discharge from local roads, parking lots, etc. 3-5 points	Extensive manmade discharges, especially from canals draining large tracts of land. 0-2 points
Flow and Wave Action score: 10	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. 9-10 points	———	———	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. 0-2 points
Sediment Type score: 4	Combination of sand, gravel, and shell. 12-15 points	Primarily sand, with small areas of mud. 8-11 points	Mixture of sand and mud, or well-aerated mud only. 4-7 points	Anaerobic mud. 0-3 points

TOTAL SCORE: 28

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
2-9-98	A.S. WALTON	Albert S Walton

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Charlotte Harbor Water Association
County: Charlotte
Contact / District: A.S. Walton / SD
NPDES Permit #: FL0035378
LIMS Sample #: 306679 LIMS Job #: 1998-02-12-02
sample log: 2/23/98 DW

Sample Collection: Date 2/9/98 Time 11:41
Test Beginning: Date 2/10/98 Time 1615
Test Ending: Date 2/12/98 Time 14:45
Organism Batch #: 36 Diluent Batch #: 4
Organism Age: 5 days
Test Organism: Americamysis bahia

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Temperature range: room 23.0-24.8°C
incubator 26.0-26.5°C
Test Number: 1 of 2
Remarks: D = dead, M = missing

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	21.5 @ 21.5	8.2 @ 25.3 °C	99.8 @ 96.3 989 @ 1005 @ 25.7 °C
24 hr	7.2 @ 7.0 9.0 @ 9.0	22.3 @ 22.4	8.1 @ 25.5 °C	101.5 @ 96.3 978 @ 1005 @ 25.4 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.5 @ 23.5	8.2 @ 24.9 °C	98.6 @ 96.3 990 @ 1005 @ 24.5 °C 9930 @ 10089

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 hr	pH 0 hr	pH 24 h	pH 48 hr	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 hr	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 hr	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 hr
40F ASW Diluted to Test salinity	Control A	F13	5	5	5	8.5	8.0	7.7	23.6	25.3	25.6	7.7	7.4	6.9	10.21	10.72	10.90
	Control B	F2 14	5	5	5	8.5	8.0	7.8	23.5	24.8	26.2	7.8	7.4	7.0	10.26	10.57	11.35
	Control C	F3 15	5	5	5	8.6	8.0	7.8	23.5	24.8	25.7	7.7	7.5	6.8	10.27	10.72	10.98
	Control D	F4 16	5	5	5	8.5	8.0	7.8	23.6	24.2	25.5	7.7	7.4	6.8	10.28	11.06	11.06
40F salt Mix made up to Test salinity	Control A	F8 17	5	5	5	8.2	8.2	8.2	24.2	24.8	25.4	7.8	7.4	6.8	10.31	10.51	10.70
	Control B	F6 18	5	5	5	8.2	8.2	8.2	24.3	25.0	25.2	7.8	7.5	6.7	10.37	10.62	10.71
	Control C	F7 19	5	4 10	4	8.2	8.1	8.2	24.3	25.2	25.0	7.9	7.3	6.6	10.37	10.72	10.60
	Control D 40F MF	F8 20	5	5	5	8.2	8.2	8.2	24.4	25.1	25.1	7.9	7.1	6.7	10.37	10.71	11.01
	100% A	F9 21	5	0 SD	—	8.1	8.3	—	24.1	25.0	—	7.9	7.4	—	10.34	10.65	—
	100% B	F10 22	5	0 SD	—	8.1	8.3	—	24.1	25.3	—	8.0	7.5	—	10.37	10.72	—
	100% C	F11 23	5	1 40	0 10	8.1	8.3	8.5	24.1	25.3	25.3	8.0	7.5	6.5	10.37	10.78	11.10
	100% D	F12 23	5	2 30	0 20	8.1	8.3	8.4	24.1	24.8	25.5	8.0	7.4	6.5	10.38	10.55	10.96
		B incorrect sample code recorded 2/13/98 MF													A 10.37 pen slipped MF 2/14/98		
Measured/Loaded by:		DW	FW	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF
Recorded by:		MF	FW	MF	MF	FW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW

Investigators' Signatures

Marshall Fairbanks

Tanya Lowery

Salt Water

Water Quality Parameters

	Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):					
Lab Total Residual Cl2 (mg/L):	<0.03		0.05	DR/100	TL/DW
Alkalinity (mg/L as $CaCO_3$):	54		400	Hach	FW
Hardness (mg/L as $CaCO_3$):					
Total ammonia (mg/L as N):	<0.017		0.713	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: ~58.6 Ammonia Blank <0.017 Control Salinity 6.0 ppt Sample Salinity adjusted to 6.0 ppt

reviewed

form updated 4/01/96

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Charlotte Harbor Water Association
County: Charlotte
Contact / District: A.S. Walton / SD
NPDES Permit #: FL0035378
LIMS Sample #: 306679 **LIMS Job #:** 1998 02-12-02
sample log: 2/23/98 DW
Test Type: Screening / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room 23.0 - 24.8 °C
incubator 26.0 - 26.5 °C
Test Number: 2 of 2
Remarks: D = dead, M = missing

Sample Collection: Date 2/9/98 Time 11:41
Test Beginning: Date 2/10/98 Time 1530
Test Ending: Date 2/12/98 Time 14:50
Organism Batch #: 4 **Diluent Batch #:** 4
Organism Age: 12 days
Test Organism: Menidia beryllina

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	21.5 @ 21.5	8.2 @ 25.3 °C	99.8 @ 96.3 989 @ 1005 @ 25.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	22.3 @ 22.4	8.1 @ 25.5 °C	101.5 @ 96.3 978 @ 1005 @ 25.9 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.5 @ 23.5	8.2 @ 24.9 °C	98.6 @ 96.3 990 @ 1005 @ 24.5 °C 993 @ 1089

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	D13	5	5	5	8.6	7.9	7.9	23.7	25.2	25.2	7.4	7.5	6.9	8.36	8.67	8.74
Control	D14	5	5	5	8.6	7.9	7.9	23.7	25.7	25.2	7.3	7.6	7.0	8.39	8.65	8.52
Control	D15	5	5	5	8.6	8.0	7.9	23.7	25.3	25.3	7.4	7.5	7.0	8.39	8.69	8.93
Control	D16	5	5	5	8.6	8.0	7.9	23.7	25.0	25.1	7.4	7.6	6.9	8.41	8.66	8.72
100 %	D17	5	5	5	8.1	8.3	8.4	25.2	25.4	25.1	7.7	7.8	6.6	8.92	9.01	9.09
100 %	D18	5	5	5	8.1	8.3	8.4	25.3	25.3	24.8	7.8	7.8	5.8	8.92	8.96	8.94
100 %	D19	5	5	4 ID	8.1	8.3	8.4	25.3	25.0	24.7	7.8	7.8	5.5	8.92	8.88	8.91
100 %	D20	5	5	5	8.1	8.3	8.4	25.3	25.0	24.7	7.8	7.9	5.5	8.91	8.92	8.93
Measured/Loaded by:		DW	DW	FW	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF
Recorded by:		MF	DW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW	MF	FW	FW

@ 5.7 D.O. (FW)

Investigators' Signatures

Marshall Faircloth

Tayson Lowery

reviewer

form updated 4/01/96

Water Quality Parameters

	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):					
Lab Total Residual Cl2 (mg/L):	20.03		0.05	DR-100	TL/DW
Alkalinity (mg/L as $CaCO_3$):	54		400	Hach	FW
Hardness (mg/L as $CaCO_3$):					
Total ammonia (mg/L as N):	20.017		0.713	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -58.6 Ammonia Blank: 20.017 Control Salinity: 4.9 ppt Sample Salinity: 4.9 ppt

Phytoplankton taxa list and densities (#/mL) for Charlotte Harbor Water Association, collected via subsurface grabs in Santa Barbara (Control) and San Marino (Test) Canals, on 9 Feburary, 1998.

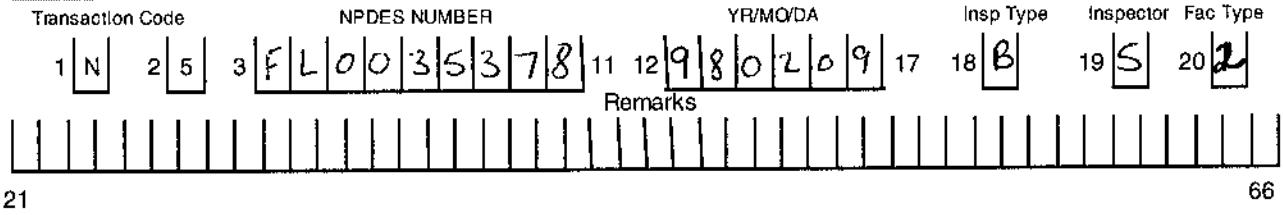
	Control Site	Test Site
Bacillariophyceae		
Achnanthes sp.	4	–
Bacillaria sp.	4	–
Capartogramma crucicula	9	–
Cocconeis sp.	9	–
Cyclotella sp.	18	526
Fragilaria sp.	22	–
Melosira sp.	110	2236
Navicula sp.	13	–
Nitzschia sp.	57	–
Pennales sp.	4	132
Skeletonema sp.	13	–
Chlorophyceae		
Chlamydomonas sp.	110	2367
Chlorogonium sp.	–	395
Undetermined Dictyosphaeriaceae	–	13415
Dunaliella sp.	26	2499
Pandorina sp.	4	–
Pediastrum sp.	4	–
Pteromonas sp.	4	–
Pyramimonas sp.	4	263
Undetermined Scenedesmaceae	9	–
Scenedesmus sp.	340	526
Selenastrum sp.	4	132
Spermatozoopsis sp.	18	1578
Tetraedron sp.	22	–
Tetraselmis sp.	–	526
Undetermined Chlorophyceae	57	1184
Chrysophyceae		
Mallomonas sp.	4	–
Cryptophyceae		
Chroomonas sp.	26	2894
Cryptomonas sp.	309	2104
Cyanophyceae		
Aphanocapsa sp.	9	–
Chroococcus sp.	18	–
Dactylococcopsis sp.	49	1315
Gloeocapsa sp.	–	132
Lyngbya sp.	40	–
Merismopedia sp.	40	–
Microcystis sp.	62	–
Oscillatoria sp.	–	132
Synechococcus sp.	26	–

Dinophyceae		
Peridinium sp.	9	–
Euglenophyceae		
Euglena sp.	13	132
Lepocinclis sp.	9	132
Trachelomonas sp.	62	–

Benthic macroinvertebrate taxa list for Charlotte Harbor Water Association, collected via Ponar grab samples in Santa Barbara (Control) and San Marino (Test) Canals, on 9 Feburary, 1998. Densities, in number/m^2, represent the mean of three replicates.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	–	16
Undetermined Amphipoda	–	16
Diptera		
Ceratopogon sp.	47	–
Chironomidae	–	16
Chironomus sp.	16	16
Coelotanypus sp.	16	342
Cryptochironomus sp.	–	16
Palpomyia/Bezzia grp.	31	–
Procladius sp.	62	78
Tanypus sp.	16	–
Tanypus stellatus	16	16
Tanytarsus sp.	16	–
Gastropoda		
Undetermined Gastropoda	16	–
Pyrogophorus platyrachis	–	16
Odonata		
Aphylla williamsoni	–	16
Oligochaeta		
Dero sp.	–	16
Limnodrilus hoffmeisteri	–	373
Polychaeta		
Streblospio benedicti	–	16

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)

