

Biological Assessment of

Winter Garden Wastewater Treatment Plant

Orange County

NPDES #FL0020109

Sampled June 1995

October 1995

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Winter Garden WWTP
County: Orange
NPDES Number: FL0020109
State Permit Expiration Date: 6 March 1996

Toxics Sampling Inspection (**XSI**)

Date Sampled: 5 June 1995

Results: The pesticide atrazine (0.1 µg/L) was detected in the effluent at a concentration below chronically toxic levels. Effluent metals complied with Class III water quality standards.

Compliance Biomonitoring Inspection (**CBI**)

Date Sampled: 5 June 1995

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

Impact Bioassessment Inspection (**IBI**)

Date Sampled: 5 June 1995

Results: The macroinvertebrate data indicated that while the reference system was stressed, the test site community was even more severely degraded. Only four taxa were found at the test site, where scores for the Florida Index and the EPT Index were both zero (0), indicating extreme disturbance. These results suggest worsening conditions since 1990, when the test site taxa richness was 10, the Florida Index was 6, and the EPT Index was 1 (FDER 1990). While Shannon-Weaver diversity decreased by 57.5% at the test site (compared to the reference site) only two replicates were recovered there, so no biological integrity violations could be cited. The presence of a poor quality macroinvertebrate community at the test site is consistent with the history of low dissolved oxygen found in the discharge. The phytoplankton were slightly affected by the discharge. Moderate declines in phytoplankton taxa richness and Shannon-Weaver diversity were noted between the reference and test sites, as well as increases in the % cyanophytes at the test site.

Water Quality Inspection (**WQI**)

Date Sampled: 5 June 1995

Results: Nutrient concentrations in the Winter Garden discharge were generally low for domestic wastewater. However, because the test site stream flow was dominated by the effluent, nutrient enrichment was observed there. The total phosphorus, ammonia, and nitrate-nitrite levels at the test site were higher than the values found in approximately 70%, 75%, and 93%, respectively, of other Florida streams. Algal Growth Potential (AGP) was above the 5 mg dry wt/L "problem threshold" at the reference site (29.2 mg dry wt/L), the test site (59.2 mg dry wt/L), and in the effluent (56.3 mg dry wt/L). The effluent appeared to be responsible for the elevated test site AGP. The higher than expected AGP at the reference site may be due to nonpoint source (*e.g.*, agricultural) inputs.

Introduction

The City of Winter Garden Wastewater Treatment Plant is located in Orange County, Florida (see map in Appendix). It is a 2.0 MGD design capacity advanced wastewater treatment facility with flow equalization, nitrification, denitrification, chemical phosphorus removal, and tertiary filtration. The effluent is chlorinated, and then discharged to six percolation ponds with underdrains. Wastewater is collected from the underdrain system and discharged to Waters of the State at Outfall 001-B, where it flows into an unnamed Class III tributary of Lake Apopka. The facility's annual average discharge to the percolation ponds is 1.46 MGD. The annual average discharge from the underdrain system is 1.62 MGD, indicating additional dilution of the effluent by groundwater infiltration.

State and Federal permit limits for wastewater discharged to the percolation ponds (Outfall 001-A) are as follows: flow (2.0 MGD as an annual average), BOD (20.0 mg/L as an annual average), TSS (20.0 mg/L as an annual average), nitrate (12.0 mg/L maximum), and total residual chlorine (0.5 mg/L minimum).

State and Federal permit limits for the underdrain discharge (Outfall 001-B) are as follows: dissolved oxygen (5.0 mg/L minimum), total nitrogen (153 lbs/day as a monthly average), total phosphorus (8.34 lbs/day as a monthly average), fecal coliform (maximum of 800 coliforms/100 mL and mean of monthly values during annual period not to exceed 200 coliforms/100 mL), pH (6.0-8.5 SU), and acute whole effluent toxicity (LC_{50} of 100% or less in 96 hour test).

The Surface Water Impact Summary Report submitted by the City summarized discharge data over the past five years. Monthly data for the June, 1994 through May, 1995 period was reviewed for this report. Monthly averages for BOD over the review period ranged from 0.49 to 1.68 mg/L. TSS monthly averages ranged from 1.17 to 13.59 mg/L while pH varied between 6.3 and 6.8 SU. Monthly averages for total phosphorus in the discharge ranged from 0.13 to 0.21 mg/L and total nitrogen ranged between 1.57 and 3.23 mg/L. The maximum fecal coliform value reported during this period was 58 colonies/100 mL. Reported minimum dissolved oxygen concentrations were 2.90 mg/L.

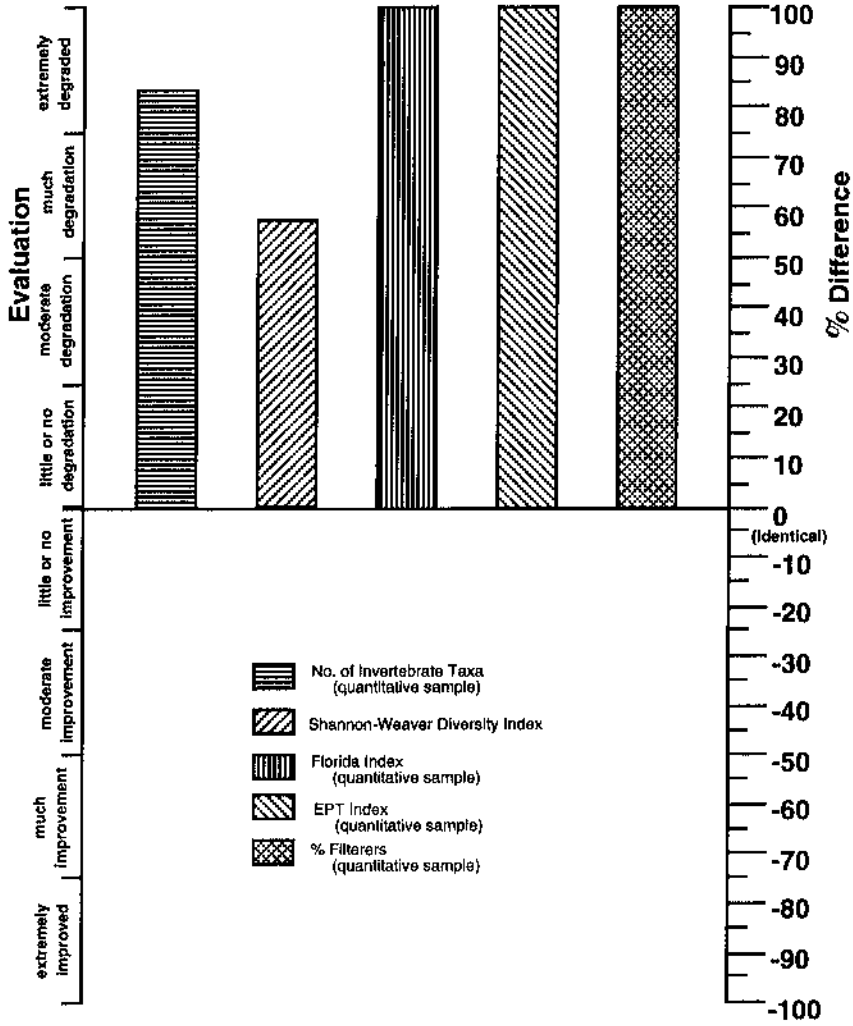
During the same time period (June 1994 to may 1995), the facility violated permit limits for pH on two occasions, total residual chlorine was less than 0.5 mg/L on four occasions, and dissolved oxygen violations occurred 28 times. In March, 1995, facility consultants began a six month study to evaluate the dissolved oxygen issue. Other plant upsets include two instanc-

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Hester-Dendy		
Number of Taxa	26	4
Florida Index	3	0
Shannon-Weaver Diversity	4.0	1.7
EPT Index	1	0
% Oligochaeta	4.0	0
% Diptera	69.5	13.3
% Gastropoda	20.3	80.0
% Trichoptera	0.6	0
% Odonata	0	0
% Coleoptera	3.4	0
%Pelecypoda	2.3	0
% Predators	9.0	6.7
% Above Surface Deposit Feeders	39.7	6.7
% Below Surface Deposit Feeders	4.0	0
% Suspension Feeders	3.3	0
% Scrapers	21.5	80.0
% Shredders	7.6	6.7
% Other	14.9	0
Phytoplankton Algae		
Number of Taxa	12	7
Shannon-Weaver Diversity	3.0	2.3
Algal Density (#/mL)	304.5	231.3
Chlorophyll a (µg/L)	0.4 U	1.2
% Blue-green	13.8	65.2
% Green	55.2	17.4
% Diatoms	17.2	13.1
% Other	10.4	4.4
Algal Growth Potential (mg dry wt/l)	29.2	58.2

es when the pond/underdrain system was bypassed, and effluent was directly discharged into Lake Apopka (once due to Tropical Storm Gordon, and once, by FDEP permission, for repairs on the collection system).

A previous bioassessment was performed on this facility (FDER 1990). Although the discharge was not acutely toxic at that time, benthic macroinvertebrate communities downstream of the discharge were stressed, with low taxa richness (10 taxa) and Florida Index (6) values. Since April, 1993, underdrain flows have increased by 0.60 MGD and dissolved oxygen violations have increased from 9 days/year to 35 days/year. During this same period, total nitrogen concentrations from the plant have decreased by 2.42 mg/L, and total nitrogen from the underdrains has decreased by 1.18 mg/L.



Effect of discharge on the benthic macroinvertebrate community.

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located in an unnamed tributary of Lake Apopka, approximately one mile southwest of the discharge, near the town of Crown Point) and a test site (located downstream of the discharge in a the unnamed receiving tributary of Lake Apopka). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Unfortunately, these dip net samples were not properly preserved, resulting in decomposed, unidentifiable, organisms. Therefore, dipnet results are not included in this report. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). While three replicate Hester-Dendys were retrieved from the reference site, only two replicates were retrieved from the test site. Phytoplankton was sampled at both reference and test sites by a grab sample (Ross 1990). Chlorophyll *a* was also de-

termined for phytoplankton communities (Ross 1990). Bacterial populations were not sampled. Algal Growth Potential (AGP) 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 to determine the effects of a discharge. These are briefly discussed here.

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. Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is a related measure which is also associated with disturbance.

Numbers of pollution sensitive taxa: Some organisms become rare or absent as the intensity or duration of disturbance increases. For example, 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. Species sensitivity data from other sources, such as Hulbert (1990), Hudson *et al.* (1990), Lenat (1993), Farrell (1992), Chang *et al.* (1992), and Whitmore (1989), are used as appropriate.

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

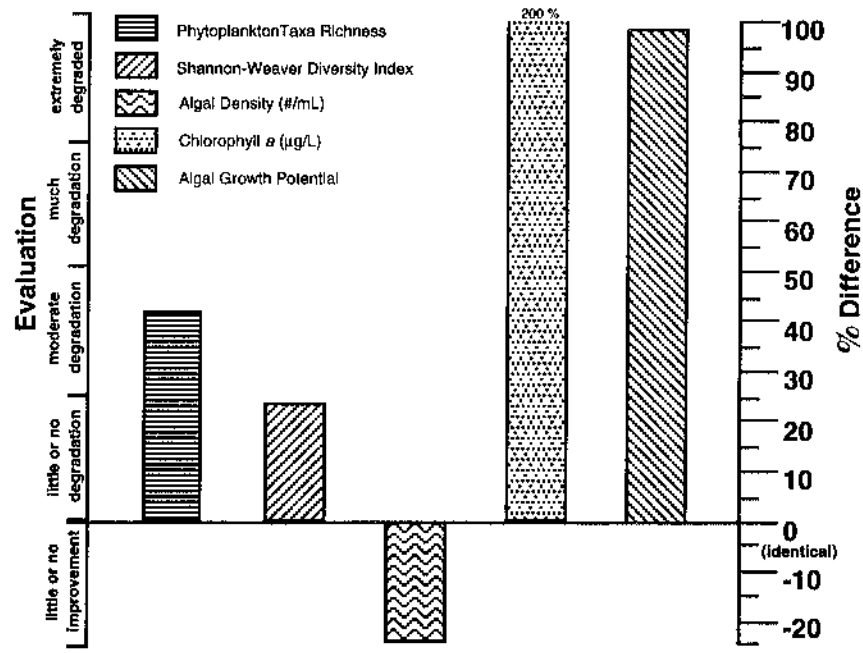
Community structure: Substantial shifts in proportions of major groups of organisms, compared to reference conditions, may indicate degradation. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance (Engel *et al.* 1994).

Algal biomass: High algal biomass (algal density or chlorophyll *a)* implies nutrient stress.

Trophic composition/feeding guilds: 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).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, the Florida Index, the EPT Index, and the % filter-feeders are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the algal density, 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: Phil Kane, Steve Kent, and Karen Gottwald (DEP Central District) and Lyn Burton, Michael Corrigan, Marshall Faircloth, Russel Frydenborg, Maosen Hua, Christy LeDuc, Kathleen Lurding, Tina Mikulski, Edward Miller, Elizabeth Miller,



Effect of discharge on the algal community.

Joe North, Urania Quintana, Tobin Rader, Bart Richard, Landon Ross, Jennifer Sparapani, Lisa Tamburello, David Whiting, Vicki Whiting, and Greg Wynn (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

The habitat assessment score at the reference site (with 71 points) was comparable to, but slightly higher than, the test site score (62 points). Both streams were small, fairly shallow (0.2 m at the reference stream, 1.0 m at the test site), with relatively low water velocity (0.1 m/sec at the reference site, 0.15 m/sec at the test site). The pH (7.6 and 7.0 SU) and temperature measurements (24.7°C and 23.7 °C) were comparable at both the reference and test sites. Conductivity at the reference site (369 µmhos/cm) was somewhat lower than the test site value (514 µmhos/cm). Dissolved oxygen was adequate for aquatic life at both stations (7.2 mg/L at the reference site and 6.5 mg/L at the test site).

The pesticide atrazine (0.1 µg/L) was tentatively identified in the effluent at a concentration below the criterion of detection. Since the Lowest Observed Effect Level for atrazine is 2 µg/L, this is not a cause for concern. No other organic priority pollutants were detected in the grab sample. Of the metals analyzed for, only aluminum (230 µg/L) and iron (294 µg/L) were detected, and these levels comply with Class III water quality standards.

The effluent was not acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the water flea, *Ceriodaphnia dubia* (Appendix).

Nutrient concentrations in the Winter Garden discharge were generally low for domestic wastewater. However, because the test site stream flow was dominated by the effluent, nutrient enrichment was observed there. For example, total phosphorus at the test site (0.22 mg/L) was almost double that of the reference site (0.13 mg/L), ammonia at the test site (0.15 mg/L) was 700% higher than that of the reference site (0.021 mg/L), and nitrate-nitrite levels at the test site (0.86 mg/L) were over 250% higher than those found at the reference site (0.34 mg/L). These total phosphorus, ammonia, and nitrate-nitrite levels at the test site were higher than the values found in approximately 70%, 75%, and 93%, respectively, of other Florida streams (see Table of Typical Water Quality Parameters in Appendix).

Algal Growth Potential (AGP) was above the 5 mg dry wt/L "problem threshold" at the reference site (29.2 mg dry wt/L) and the test site (59.2 mg dry wt/L)(Raschke and Schultz 1987). The effluent, at 56.3 mg dry wt/L, appeared to be a significant contributor to the elevated test site AGP. The higher than expected AGP at the reference site may be due to nonpoint source (*e.g.*, agricultural) inputs.

Quantitative measures of macroinvertebrate community health indicated that, while the reference site was already stressed, further adverse effects could be associated with the discharge. The Figure on p. 2 indicates the degree of difference between the invertebrate populations of the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference.

Taxa richness was fairly normal at the reference site, where 26 different kinds of organisms were found, declining precipitously at the test site, where only 4 taxa were recovered. Similarly, Shannon-Weaver diversity was good at the reference stream, at 4.0, but decreased to 1.7 at the test site. While this represents a diversity decrease of 57.5% at the test site (compared to the reference site) only two replicates were recovered there, so no biological integrity violations may be cited. The Florida Index and the EPT Index were abnormally low at the reference site, with values of 3 and 1, respectively. However, the test site scores for these two indices were both zero (0), indicating extremely disturbed conditions there. Finally, the percent filter feeders, shown to decrease with polluted conditions, dropped from 3.3% at the refer-

ence site to zero (0) at the test site. These results indicate worsening conditions since 1990, when the test site taxa richness was 10, the Florida Index was 6, and the EPT Index was 1 (FDER 1990). In summary, the macroinvertebrate data indicated that while the reference system was stressed, the test site community was even more severely degraded. The presence of a poor quality macroinvertebrate community at the test site may be related to the history of low dissolved oxygen found in the discharge.

The phytoplankton were only slightly affected by the discharge. The Figure on p. 3 represents changes in the periphyton algal community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of degradation. Moderate declines in phytoplankton taxa richness (from 12 at the reference site to 7 at the test site) and Shannon-Weaver diversity (from 3.0 at the reference site to 2.3 at the test site) were noted. Algal density was fairly low at both sites. Chlorophyll *a* increased between the reference site (0.39 µg/L) and the test site (1.2 µg/L), but the absolute value at the test site was not considered troublesome. Most notably, cyanophytes made up 65.2% of the test site community, but only accounted for 13.8% of the reference site population.

Conclusions

The pesticide atrazine (0.1 µg/L) was detected in the effluent at a concentration below chronically toxic levels. Effluent metals complied with Class III water quality standards.

The effluent was not acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the water flea, *Ceriodaphnia dubia*.

Nutrient concentrations in the Winter Garden discharge were generally low for domestic wastewater. However, because the test site stream flow was dominated by the effluent, nutrient enrichment was observed there. The total phosphorus, ammonia, and nitrate-nitrite levels at the test site were higher than the values found in approximately 70%, 75%, and 93%, respectively, of other Florida streams.

Algal Growth Potential (AGP) was above the 5 mg dry wt/L "problem threshold" at both the reference and test sites. The effluent appeared to be a significant contributor to the elevated test site AGP. The higher than expected AGP at the reference site may be due to nonpoint source (*e.g.*, agricultural) inputs.

The macroinvertebrate data indicated that while the reference system was stressed, the test site community was even more severely degraded. Only four taxa were found at the test site, where scores for the Florida Index and the EPT Index were both zero (0), indicating extreme disturbance. These results indicate worsening conditions since 1990, when the test site taxa richness was 10, the Florida Index was 6, and the EPT Index was 1 (FDER 1990). While Shannon-Weaver diversity decreased by 57.5% at the test site (compared to the reference site) only two replicates were recovered there, so no biological integrity violations could be cited. The presence of a poor quality macroinvertebrate community at the test site is consistent with the history of low dissolved oxygen found in the discharge.

The phytoplankton were slightly affected by the discharge. Moderate declines in phytoplankton taxa richness and Shannon-Weaver diversity were noted between the reference and test sites, as well as increases in the % cyanophytes at the test site.

Literature Cited

Chang, S., F. W. Steimle, R. N. Reid, S. A. Fromm, V. S. Zdanowicz, and R. A. Pikanowski. 1992. Association of benthic macrofauna with habitat types and quality in the New York Bight. Mar. Ecol. Prog. Ser. 89: 237-251.

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.

Engle, V. D., J. K. Summers, and G. R. Gaston. 1994. A benthic index of environmental condition of Gulf of Mexico estuaries. Estuaries 17(2): 372-384.

Farrell, D. H. 1992. A community based metric for marine benthos. Fla. Dept. Environ. Reg. SW Dist. Office. unpublished rept. 15 p.

FDER. 1990. Biological assessment of City of Winter Garden WWTP, Orange County, Florida. Fla. Dept. Environ. Reg. Biology Section, Tallahassee, Fla. 15 p.

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

Hudson, P. L., D. R. Lenat, B. A. Caldwell, and D. Smith. 1990. Chironomidae of the Southeastern United States: A checklist of species and notes on biology, distribution, and habitat. U. S. Fish Wildl. Serv., Fish. Wildl. Res. 7. 46 pp.

Hulbert, J. L. 1990. A proposed lake condition index for Florida. North Amer. Benth. Soc. 38th Ann. Mtg., Blacksburg, VA, 11 p.

Lenat, D. R. 1993. A biotic index for the southeastern United States: derivation and list of tolerance values, with criteria for assigning water-quality ratings. J. N. Am. Benthol. Soc. 12(3): 270-290.

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.

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 pp.

Whitmore, T. J. 1989. Florida diatom assemblages as indicators of trophic state and pH. Limnol. Oceanogr. 34(5): 882-895.

Chemistry summary table for

Winter Garden WWTP	Effluent	Reference Site	Test Site
Organic Constituents (ug/L)			
Atrazine	0.10 T		
Metals (ug/L)			
Aluminum	230 A		
Arsenic	10 U		
Cadmium	0.1 U		
Chromium	10 U		
Copper	3 U		
Iron	294 A		
Lead	10 U		
Mercury	0.10 U		
Nickel	4 U		
Selenium	30 U		
Silver	0.05 U		
Zinc	10 U		
Nutrients (mg/L)			
Ortho-phosphate	0.19 A	0.11	0.18
Total phosphorus	0.22	0.13 Q	0.22
Ammonia	0.15 A	0.021 I	0.15 A
Nitrate+Nitrite	0.87	0.34 Q	0.86
TKN	0.55	0.48 Q	0.51
General Phys-Chem Parameters			
Habitat Assessment		71	62
D.O. (mg/L)	6.4	7.2	6.5
pH (SU)	7.1	7.6	7.0
Conductivity (µmhos/cm)	512	369	514
Temperature (°C)	23.7	24.7	23.7
Total Residual Chlorine (mg/L)	< 0.03		
Hardness (mg CaCO3)	135.9		
Algal Growth Potential (mg dry wt/L)	56.3	29.2	59.2
Toxicity			
Bioassay Fish-Chlorinated	Not Toxic		
Bioassay Invertebrate-Chlorinated	Not Toxic		

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

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

Q - Sample held beyond normal holding time

T - Value reported is less than the criterion of detection

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

Typical Values for Selected Parameters in Florida Waters

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

Percentile Distribution

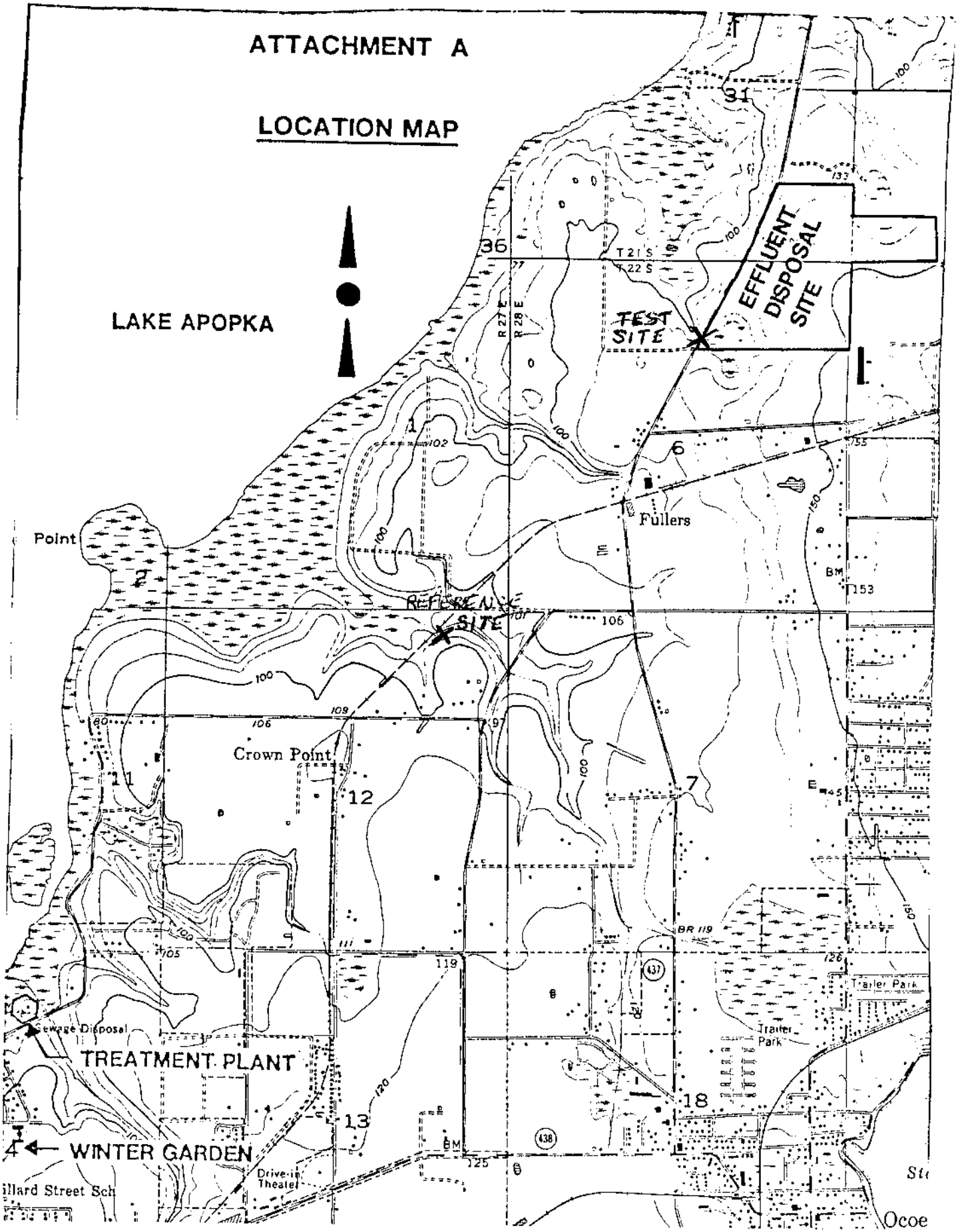
Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

Units:

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

ATTACHMENT A

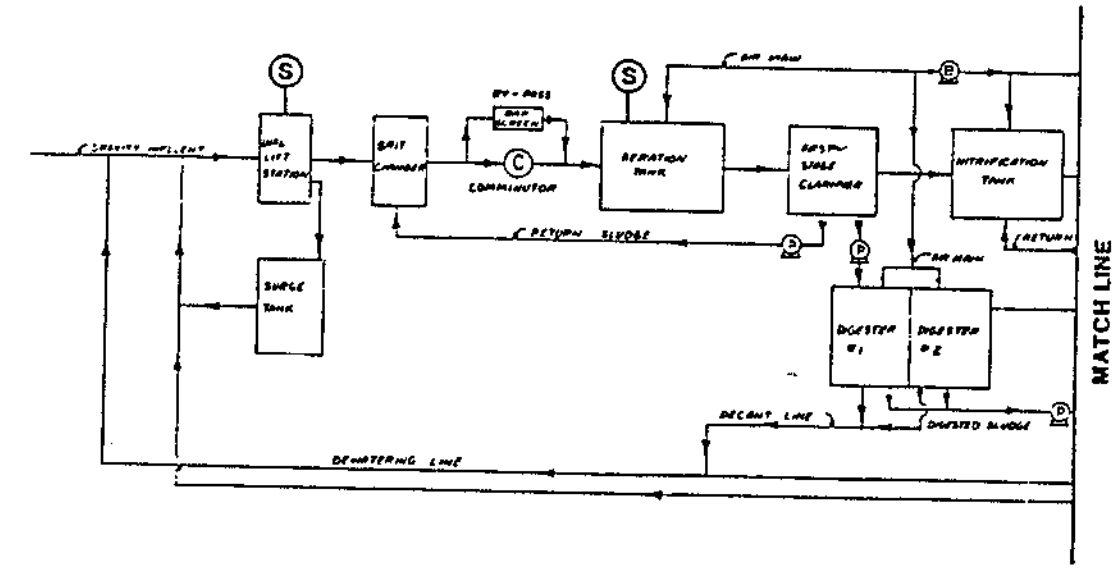
LOCATION MAP

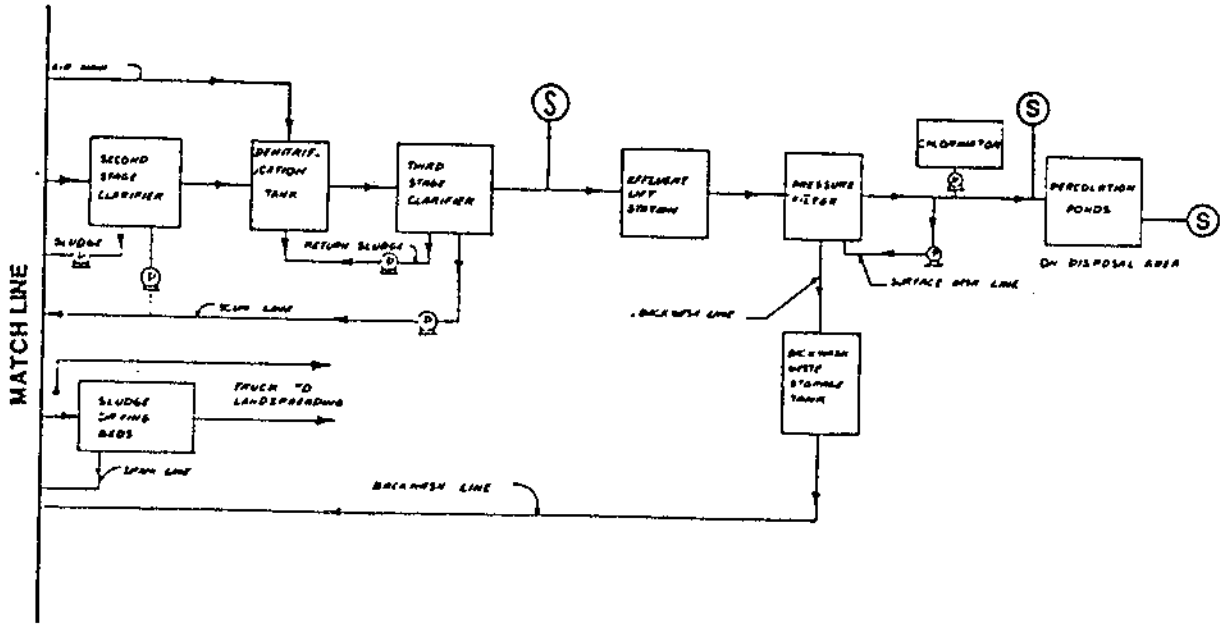


GROO & ASSOCIATES
CONSULTING ENGINEERS

ATTACHMENT D

SCHEMATIC FLOW DIAGRAM

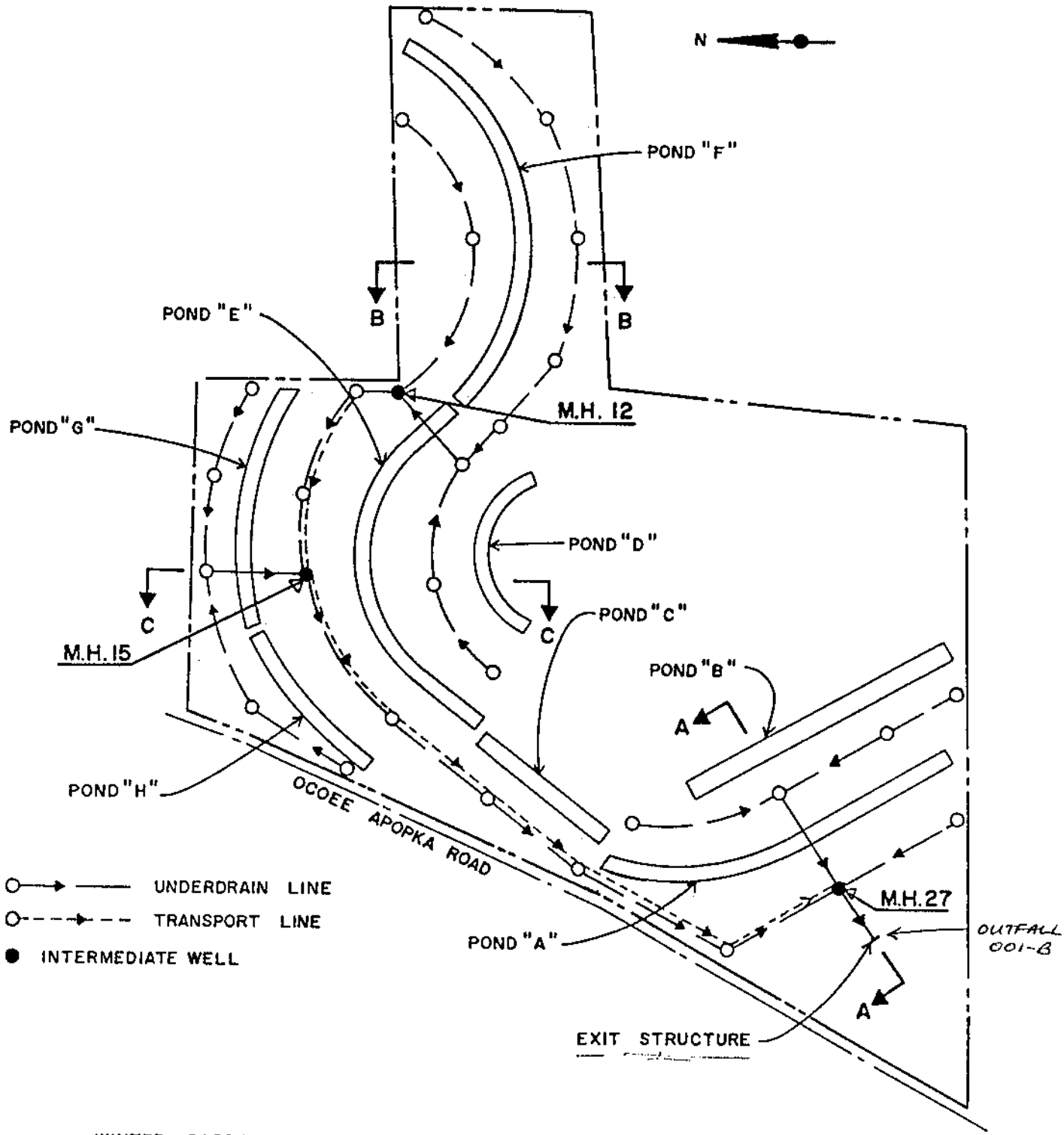




(S) SAMPLING POINT

ATTACHMENT R-1

EFFLUENT DISPOSAL AREA

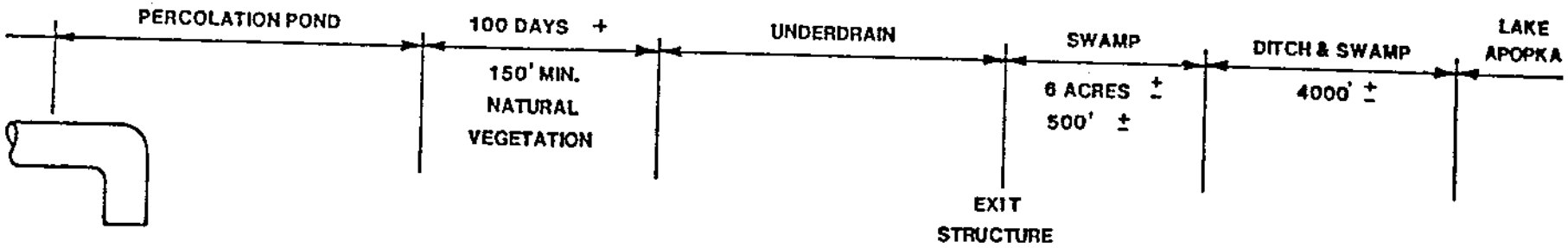


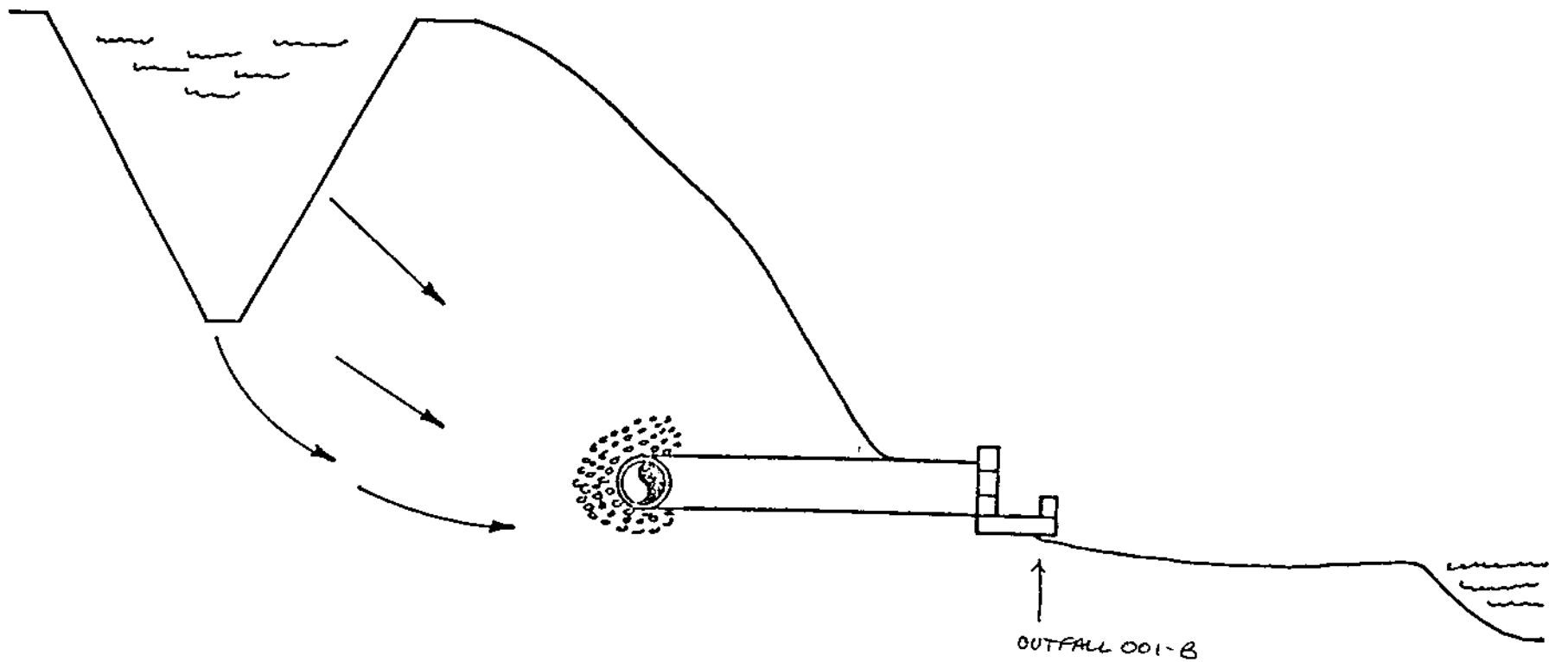
WINTER GARDEN WASTEWATER CONTROL FACILITY

GROO & ASSOCIATES
CONSULTING ENGINEERS

ATTACHMENT G

EFFLUENT FLOW SCHEMATIC





GROO & ASSOCIATES
CONSULTING ENGINEERS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: City of Winter Garden FL0020109		**Date Summary Prepared:** 5/26/95
Location (attach detailed map): See attached map	**County** Orange	**District** Central
Federal Permit # and expiration date: FL0020109 9/30/99	**State GMS # and State expiration date:** 3048M01387 DC48-192934 3/6/96	**Facility Type:** Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: Domestic Wastewater Treatment Facility

Description of treatment process: This facility is a 2.0 MGD design capacity advanced wastewater treatment facility with flow equalization, nitrification, denitrification, chemical phosphorus removal & tertiary filtration. The disinfected reclaimed water is discharged to ground/surface water via six (6) percolation ponds with underdrains, through approximately one (1) mile of wetlands and swamp to Lake Apopka.

Receiving waters: Unnamed tributary to Lake Apopka	**Classification:** I II (III)	
Design Flow: 2.0 MGD	**Mean Flow:** Plant Discharge = 1.46 AA MGD; Underdrain Discharge = 1.62 AA MGD	**Flow during survey:** To Be Determined

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.): N/A

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

State Parameter	Limit (units)
Plant Discharge	
TSS	20.0 mg/L annual aver.
BOD_5	20.0 mg/L annual aver.
pH	6.0-8.5 min/max
Cl_2	0.5 mg/L minimum
Flow	2.0 MGD AADF
Fecal coliform	800 colonies/100ml anytime max.
TN	none
NO_3	12.0 mg/L anytime max.
TP	none
Underdrain Discharge	
DO	5.0 mg/L min. anytime minimum
BOD_5	none
Flow	2.0 MGD AADF
TN	132.0 lbs/day max. 30 day average
NO_3	none

Describe special permit conditions and permit modifications:

NPDES effluent limits for outfalls 001-A & 001-B are attached.

- Existing State Permit, by specific condition, requires the city to submit a "Surface Water Impact Summary Report" (SWISR) no later than 180 days prior to expiration date of said permit.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

City of Winter Garden
(Facility)

FACILITY SUMMARY

Description of permitted outfall(s):

Outfall 001-A (chlorine contact chamber effluent)
Outfall 001-B (effluent from underdrain system) located at final exit structure from underdrains adjacent to Pond A. See attached diagram of effluent disposal area. Outfall 001-B is a 9' long Parshall flume ~200 ft from ponds.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: Effluent bypassed pond/underdrain system and discharged to Lake Apopka during Tropical Storm Gordon in 11/94, and also on 3/30/95, 1,120 GPM for 3 hrs, 15 min by-pass of ponds to lake during forced main repairs (Notified & asked for DEP 4/3/95)

(1) pH = 5.8 in 3/95 (underdrain discharge)
pH = 5.6 in 12/94 (plant discharge)
(pH range = 6.0 – 8.5) NPDES range – 6.5 – 8.5

(2) Cl_2 < 0.5 mg/L on 4 occasions in Feb 1995 + 2 occasions in April 1994 (in plant discharge to ponds) $Cl_2 \geq 0.5$ mg/L required.

(3) Dissolved Oxygen violations – numerous from 6/94 – 3/95. DO minimum = 5.0 mg/L.
1/95 – DO < 5 mg/L 6X 11/94 – DO < 5 mg/L 5X 9/94 – DO < 5 mg/L 5X 6/94 – DO < 5 mg/L 2X.
12/94 – DO < 5 mg/L 7X 10/94 – DO < 5 mg/L 5X 8/94 – DO < 5 mg/L 5X

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

- Bioassessment conducted August 27, 1990 – Except for downstream macro-invertebrate community which was very stressed, there were no other concerns with the WWTP effluent.
- There are no known previous or current enforcement actions by either FDEP or EPA.
- WQBELs – established by FDEP: Underdrain discharge limitations: (NPDES limits)
  TN = 153.0 lbs/day (9.17 mg/L) TN = 4.6 mg/L
  TP = 8.34 lbs/day (0.5 mg/L) TP = 0.25 mg/L
  DO = 5.0 mg/L minimum

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set: Comparing the MORs for the period 4/94 – 3/95 vs. 4/93 – 3/94:

Plant flows have increased from 1.19 MGD (annual average) to 1.46 MGD (annual average).
Underdrain flows have increased from 1.02 MGD (AA) to 1.62 MGD (AA).
Dissolved oxygen violations have increased from 9 days/yr to 35 days/yr. (below minimum)
Total nitrogen (TN) from plant decreased from 7.58 mg/L to 5.16 mg/L. (annual average)
TN from underdrains decreased from 3.7 mg/L to 2.52 mg/L (AA).

Additional information:

(1) A location map and schematic flow diagram of the facility are attached.

(2) Note: Six-month DO evaluation began 3/1/95 by facility consultants.

(3) Flow from underdrains exceeds flow from WWTF. No violations noted

Staff contributing to this review (signature):

Philip N Kane, Ed.D. (Biologist)
Karen Gottwald (Inspector)
Al Costin (Engineer)
Claudianne Fenaro, P.E. (WFA)
( )
( )

Page 3 of 8

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final

1. These limitations are to be achieved by the effective date of the permit, and shall remain in effect until permit expiration for outfall Serial Number 001-A (chlorine contact chamber effluent).

Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Weekly Average	Measurement Frequency	Sample Type	Sampling Point
Flow, MGD	Report	Report	Report	Continuous	Recording flow meter & totalizer	Effluent
Carbonaceous Biochemical Oxygen Demand (5 day),						
mg/l	N/A	Report	N/A	1/week	24-hr. Comp.	Influent
mg/l	20.0	25.0	40.0	1/week	24-hr. Comp.	Effluent
Total Suspended Solids,						
mg/l	N/A	Report	N/A	1/week	24-hr. Comp.	Influent
mg/l	20.0	30.0	45.0	1/week	24-hr. Comp.	Effluent

Page 4 of 8

PART I

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - Final

1. These limitations are to be achieved by the effective date of the permit, and shall remain in effect until permit expiration for outfall Serial Number 001-B after a collection of the effluent from the underdrain system.

Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETERS	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	Monthly Average	Weekly Average	Measurement Frequency	Sample Type	Sampling Point
Flow, MGD	Report	Report	Continuous	Recording flow meter & totalizer	Effluent
Total Nitrogen (as N)	4.6 mg/l (153.5 lbs/d)	6.9 mg/l	1/week	24 hr.-Comp.	Effluent
Total Phosphorus (as P)	0.25 mg/l (8.34 lbs/d)	0.375 mg/l	1/week	24 hr.-Comp.	Effluent
Fecal Coliform Bacteria (MPN/100ml)	See Item 5 on Page I-3		1/week	Grab	Effluent
pH	See Item 4 on Page I-3		Hourly	Grab	Effluent
Total Residual Chlorine	See Item 3 on Page I-3		Daily	Grab	Effluent
Dissolved Oxygen shall not be less than 5.0 mg/l			1/week	Grab	Effluent
Acute Whole Effluent Toxicity	See Item 6 on Page I-3		See Part IV	Grab	Effluent

UPSTREAM

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 06/05/95	TIME: 1050	RECEIVING BODY OF WATER: LAKE APOPKA

REMARKS:	LOCATION: CITY OF WINTER GARDEN STP, 101 E. CREST AVE, WINTER GARDEN, FL.	FIELD ID/NAME:
UPSTREAM		LWGSTP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
50		50					

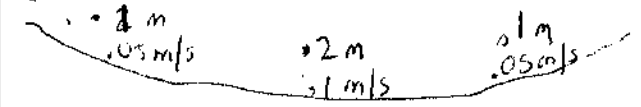
Local Watershed Erosion (check box): None [X] Slight [ ] Moderate [ ] Heavy [ ]

Local Watershed NPS Pollution (check box): No evidence [ ] Some potential sources [X] Obvious sources [ ]

Width of riparian vegetation (m) on least buffered side: 150 m

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)



Artificially Channelized [X] no [ ] [ ] [ ]
Artificially Impounded [ ] yes — recent, severe / some recovery / mostly recovered, more sinuous

High Water Mark (m above bed): 2.0 m

Canopy Cover % : Open : [ ] Lightly Shaded (11-45%): [X] Moderately Shaded (46-80%): [ ] Heavily Shaded: [ ]

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: [X] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Anaerobic: [ ] Other: [ ]

Sediment Oils: Absent: [X] 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	60%	4	4
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation	15%	8	DIP III	Other:			
Rock or Shell Rubble				Other:			
Shorezone (Roots/Veg.)	25%	8		*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								7.3 m
Mid-depth	0.15	24.7	7.6	7.2	369			
Bottom								

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

Water Odors (check box): Normal: [X] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Other: [ ]

Water Surface Oils (check box): None: [X] Sheen: [ ] Globs: [ ] Slick: [ ]

Clarity (check box): Clear: [X] Slightly turbid: [ ] Turbid: [ ] Opaque: [ ]

Color (check box): Tannic: [X] Green (algae): [ ] Clear: [ ] Other: [ ]

Weather Conditions/Notes:

3 DAYS HEAVY INTERMITTENT RAIN WARMER THAN NORMAL

Abundance:	Absent	Rare	Common	Abundant
Periphyton	[ ]	[ ]	[X]	[ ]
Fish	[ ]	[ ]	[X]	[ ]
Aquatic Macrophytes	[ ]	[ ]	[X]	[ ]
Iron/sulfur Bacteria	[X]	[ ]	[ ]	[ ]

SAMPLING TEAM:	SIGNATURE:	DATE:
KANE, KENT	Kent Kane	

UPSTREAM

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

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 06/05/95	RECEIVING BODY OF WATER: LAKE APOPKA

REMARKS:	LOCATION: CITY OF WINTER GARDEN WTP 101 E. CREST AVE. WINTER GARDEN, FL	FIELD ID/NAME: WGSTP
UPSTREAM		

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover — 27	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 — 12	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration — 12	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 — 10	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 — 10	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	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: 71

COMMENTS:

ANALYSIS DATE: 06/05/95	ANALYST: PHIL KANE	SIGNATURE: Phil Kane

DOWNSTREAM

PHIL K.

325 ~~322~~ 323

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 06/05/15	TIME 1015	RECEIVING BODY OF WATER: LAKE APOPKA

REMARKS: DOWNSTREAM	LOCATION: CITY OF WINTER GARDEN STP 101 E. CREST AVE. WINTER GARDEN, FL.	FIELD ID/NAME: WGSTP

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
50		50					

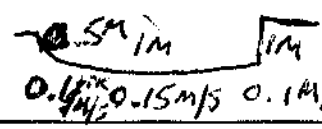
Local Watershed Erosion (check box): None ☐ Slight ☒ Moderate ☐ Heavy ☐

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

Width of riparian vegetation (m) on least buffered side: 2 m

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)



Artificially Channelized ☒ and PK ☐ ☑ ☐ (recent, severe / some recovery / mostly recovered, more sinuous)

Artificially Impounded ☒ yes

High Water Mark (m above bed): 1.5

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)	5%	5 HIT	SWEEPS	Sand	35%	5 HIT	SWEEPS
Leaf Packs or Mats				Mud/Muck/Silt			
Aquatic Vegetation	20%	5 HIT	SWEEPS	Other:			
Rock or Shell Rubble				Other:			
Shorezone (Roots/Veg.)	40%	5 HIT	SWEEPS	*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								TO BOTTOM
Mid-depth	0.7	23.7	7.0	6.5	514			
Bottom								

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

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

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:
3 DAYS HEAVY, INTERMITTENT RAIN.
WARMER THAN NORMAL

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Phil Kane	DATE: 06/05/15

DOWNSTREAM

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

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 06/05/95	RECEIVING BODY OF WATER: LAKE APOPKA

REMARKS: DOWNSTREAM	LOCATION: CITY OF WINTER GARDEN STP 101 E. CRESCENT AVE. WINTER GARDEN, FL	FIELD ID/NAME: WG STP

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover: 25	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: 20	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration: 0	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: 6	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: 6	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: 62

COMMENTS: DUCKWEED, ELDERBERRY, PANICUM SP., HYDROCOTYLE, WETLAND HARDWOODS

ANALYSIS DATE: 06/05/95	ANALYST: PHIL KANE	SIGNATURE: Phil Kane

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Winter Garden WWTP
County: ORANGE
Contact / District: Phil Kane / Central
NPDES Permit #: FL00 20109
LIMS Sample #: 107510 (Completed 6/10/95) **LIMS Job #:** 95-JUN-06-05

Sample Collection: Date 6/5/95 Time 0915
Test Beginning: Date 6/6/95 Time 1300
Test Ending: Date 6/8/95 Time 1300
Organism Batch #: 22 **Diluent Batch #:** well
Organism Age: 8 days
Test Organism: Cyprinella leedsi

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

Test Number: 2 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.3 @ 24.6 °C	106.6 @ 100.0 100.4 @ 100.1 @ 24.3 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.8 @ 24.9	8.3 @ 24.1 °C	106.0 @ 100.0 100.7 @ 100.1 @ 24.8 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.8 @ 24.9	8.3 @ 24.1 °C	49.3 @ 49.5 mmhos/cm 106.0 @ 100 µmhos/cm @ 24.8 °C 100.2 @ 100.1

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	506	5	5	5	7.7	8.2	8.4	24.7	23.7	23.9	7.8	8.0	8.5	255	255	260
Control B	3	5	5	5	7.7	8.2	8.4			23.9	7.7	7.9	8.6	255	250	250
Control C	604	5	5	5	7.7	8.2	8.4			23.9	7.8	7.9	8.7	255	250	250
Control D	775	5	5	5	7.7	8.2	8.4			23.9	7.7	7.9	8.6	255	250	250
100% A	476	5	5	5	7.0	7.8	8.2	24.0	23.7	24.0	7.4	7.8	8.5	495	495	500
100% B	302	5	5	5	7.0	7.7	8.2			23.9	7.3	7.8	8.6	495	495	500
100% C	17	5	5	5	7.0	7.7	8.2			23.9	7.3	7.9	8.6	495	495	500
100% D	287	5	5	5	7.0	7.7	8.2			24.0	7.3	7.9	8.7	495	500	500
Recorded by:		MF	MF	MF	TR	MF	JN	TR	MF	JN	TR	MF	JN	TR	MF	JN
Measured/Loaded by:		TR	MF	MF	TM	JLS	JLS	TM	JLS	JLS	TM	JLS	JLS	TM	JLS	JLS

Investigators' Signatures
Tobin C. Roden
Mandel Faircloth
Joseph Morth
Jennifer Parker
Reviewer

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):	<0.03	<0.03	DR 100	TM
Alkalinity (mg/L as $CaCO_3$):	120	115	Hach	TR
Hardness (mg/L as $CaCO_3$):	125	135	Hach	TR
Total ammonia (mg/L as N):	<0.017	0.071	Orion	JN

Ammonia Meter #98136 Ammonia Meter Slope: -58.2 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 10/05/94

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Winter Garden WWTP (effluent)
County: ORANGE
Contact / District: Phil Kane / Central
NPDES Permit #: FL0020109
LIMS Sample #: 107510 **LIMS Job #:** 95-JUN-06-05 (completed 6/15/95)

Sample Collection: Date 6/5/95 Time 0915
Test Beginning: Date 6/6/95 Time 1300
Test Ending: Date 6/8/95 Time 1300
Organism Batch #: 29 **Diluent Batch #:** 24
Organism Age: <24 hrs

Test Organism: Ceriodaphnia dubia

Test Type: Screening / Definitive
Static / Static Renewal / Flow-through

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.4 @ 24.5	8.3 @ 24.6 °C	196.6 @ 100.0 100.1 @ 100.1 @ 24.3 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.8 @ 24.9	8.3 @ 24.1 °C	100.0 @ 100.2 100.7 @ 100.1 @ 24.8 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.8 @ 24.9	8.3 @ 24.1 °C	49.3 @ 49.5 mmhos/cm 106.0 @ 100 mmhos @ 24.5 °C 100.7 100.1

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	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 48 h
Control	A	5	5	5	7.8		8.2	23.7		24.8	7.7		8.2	185		175
Control	B	5	5	5			8.2			24.8			8.2			200
Control	C	5	5	5			8.2			24.4			8.2			200
Control	D	5	5	5			8.2			24.9			8.2			195
100%	A	5	5	5	7.0		8.4	23.9		24.9	7.3		8.3	475		505
100%	B	5	5	5			8.4			25.0			8.3			495
100%	C	5	5	5			8.4			25.0			8.3			510
100%	D	5	5	5			8.4			25.0			8.2			510
Recorded by:		MF	MF	MF	TR		JN	TR		JN	TR		JN	TR		JN
Measured/Loaded by:		MF	MF	MF	TM		JLS	TM		JLS	TM		JLS	TM		JLS

Investigators' Signatures
Tobin C. Rode
Tina Mikulski
Marshall Brecheisen
Jennifer Sparagana
Reviewer

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):	<0.03	<0.03	<0.03	DR-100	TM
Alkalinity (mg/L as $CaCO_3$):	—	75	115	Hach	TR
Hardness (mg/L as $CaCO_3$):	—	80	135	Hach	TR
Total ammonia (mg/L as N):	—	<0.017	0.071	Orion	JN

Ammonia Meter #98136 Ammonia Meter Slope: -58.2 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 10/05/94

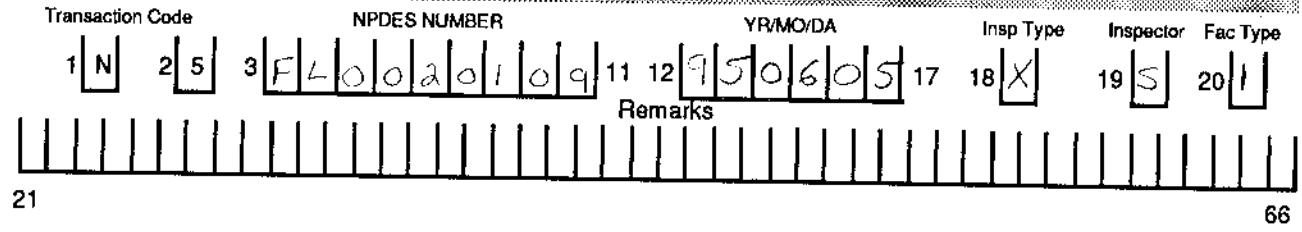
Benthic macroinvertebrate taxa list for Winter Garden WWTP, collected via Hester-Dendy artificial substrates at a reference site (an unnamed tributary of Lake Apopka located near Crown Point) and the test site (the unnamed receiving tributary), on 5 June, 1995. Densities, in number/m^2, represent the mean of three replicates at the Reference Site and the mean of two replicates at the Test Site.

	Reference Site	Test Site
Oligochaeta		
Limnodrilus hoffmeisteri	13	–
Slavina appendiculata	5	–
Gastropoda		
Hebetancylus excentricus	16	24
Micromenetus dilatatus	37	–
Physella sp.	26	20
Ancylidae	16	4
Pelecypoda		
Pisidiidae	11	–
Odonata		
Ischnura sp.	–	4
Coleoptera		
Dineutus sp.	5	–
Microcylloepus pusillus	11	–
Trichoptera		
Oecetis sp.	3	–
Diptera		
Ablabesmyia mallochi	13	–
Atrichopogon sp.	34	–
Chironomus sp.	69	8
Dicrotendipes modestus	8	–
Dicrotendipes neomodestus	5	–
Dicrotendipes simpsoni	3	–
Kiefferulus sp.	16	–
Kiefferulus dux	63	–
Larsia decolorata	3	–
Paramerina sp.	3	–
Polypedilum scalaenum grp.	21	–
Rheopelopia sp.	3	–
Tribelos jucundus	24	–
Tanytarsus sp.	3	–
Tanytarsus sp. A Epler	5	–
Tanytarsus sp. C Epler	3	–
Tanytarsus sp. L Epler	3	–
Tanytarsus sp. S Epler	11	–
Tanytarsus sp. U Epler	3	–
Chironomidae	34	–

Phytoplankton taxa list and densities (#/mL) for Winter Garden WWTP, collected via subsurface grabs at a reference site (an unnamed tributary of Lake Apopka located near Crown Point) and the test site (the unnamed receiving tributary), on 5 June, 1995.

	Reference Site	Test Site
Cyanophyta		
Dactylococcopsis sp.	11	–
Gloeothece sp.	11	–
Lyngbya sp.	11	91
Merismopedia sp.	11	–
Oscillatoria sp.	–	60
Diatoms		
Achnanthes peragalli	–	10
Gyrosigma sp.	11	–
Navicula sp.	11	–
Navicula capitata	11	10
Nitzschia sp.	11	–
Synedra sp.	–	10
Pennales	11	–
Chlorophyta		
Chlamydomonas sp.	11	–
Scenedesmus sp.	11	–
Spermatozoopsis sp.	11	–
Tetraedron sp.	–	30
Chlorophyceae	147	10
Euglenophyta		
Lepocinclis sp.	21	–
Cryptophyta		
Cryptomonas sp.	11	10

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)

