Biological Assessment of

Lincoln Heights Subdivision Wastewater Treatment Plant

Seminole County

NPDES #FL0025917

Sampled August 1997

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May 1998

Biology Section
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Lincoln Heights Subdivision WWTP
County: Seminole
NPDES Number: FL0025917
NPDES Permit Expiration Date: 30 April 2000

Toxics Sampling Inspection (**XSI**)

Date Sampled: 18 August 1997

Results: No organic pollutants were detected in the effluent. The concentration of copper (46.2 µg/L) exceeded the Class III water quality standard (Rule 62-302.530(24) FAC) at a hardness of 110.5 mg CaCO3.

Compliance Biomonitoring Inspection (**CBI**)

Date Sampled: 18 August 1997

Results: The effluent was acutely toxic to the fish, *Cyprinella leedsi* (with 55% mortality in the full strength sample), probably due to the elevated pH (9.9 SU). This toxicity represents a violation of Rules 62-302.530(62), 62-302.500(1)(d), and 62-4.244(3)(a) FAC). This same sample was not toxic to the invertebrate, *Ceriodaphnia dubia*. The effluent, when adjusted to a pH of 9.0 SU (the original laboratory pH value was 9.9 SU) in the laboratory, was not acutely toxic to *Cyprinella leedsi* or *Ceriodaphnia dubia*. The field pH measurement of the discharge was 9.0 SU, violating Class III water quality standards (Rule 62-302.530(52)(c) FAC) and exceeding the facility's permit limit.

Impact Bioassessment Inspection (**IBI**)

Date Sampled: 18 August 1997

Results: The macroinvertebrate community in Smith Canal was stressed primarily due to poor habitat and lack of flow. Hester-Dendy samples suggested degraded conditions at the control and test sites, with conditions somewhat worse downstream of the discharge. Hester-Dendy taxa richness, diversity, the EPT Index, and the Florida Index were low at the control site, but decreased further at the test site. The dip net results also indicated stressed conditions at the control and test sites. Most measures of phytoplankton and periphyton community health also indicated degradation associated with the discharge. The nutrient-induced imbalances in aquatic flora and dominance of nuisance species in the phytoplankton community in Smith Canal represent violations of Class III water quality standards, Rules 62-302.530(48)(b) and 62-302.530(47) FAC.

Water Quality Inspection (**WQI**)

Date Sampled: 18 August 1997

Results: Elevated concentrations of total phosphorus, nitrate+nitrite, and TKN were observed in the effluent. In addition to non-point sources of nutrients, the Lincoln Heights discharge contributed to the somewhat elevated levels of nutrients seen at the test site. Algal Growth Potential exceeded the 5 mg dry wt/L "problem threshold" at all stations.

Introduction

The Lincoln Heights subdivision is located two miles south of Lake Monroe and just west of the City of Sanford, in Seminole County, Florida (see maps in Appendix). This is a privately owned, 0.12 MGD extended-aeration wastewater treatment facility. The aerated, disinfected effluent flows through three in-line polishing ponds. Following dechlorination, wastewater is discharged to Smith Canal, which ultimately flows into the St. Johns River.

State permit limits for the Lincoln Heights WWTP effluent are listed in Table 1. Monthly operating report data from May, 1996, to June, 1997, indicate several permit violations. The TSS annual average limit was exceeded (21.0 mg/L) for that period. Dissolved-oxygen levels were below permit limits in August, 1996 (2.9 mg/L), September, 1996 (4.1 mg/L), and May, 1997 (4.4 mg/L). Silver (2.04 µg/L), copper (0.575 µg/L), and mercury (0.21 µg/L) exceeded their respective permit limits during the second quarter of 1996. The mercury limit was again violated (1.0 µg/L) in the first quarter of 1997.

The monthly operating reports (MOR's) from June, 1995, through May, 1996, compare with the MOR's from June, 1996, through May, 1997, in the following ways. The annual average flow decreased from 0.084 MGD to 0.060 MGD. The TSS monthly average limit of 30 mg/L was exceeded twice during 1995–96, and once during 1996–97. Dissolved oxygen violations occurred three times during 1996–97 compared to no dissolved-oxygen violations during 1995–96. TKN increased slightly, from an annual average of 3.13 mg/L during 1995–96, to 5.36 mg/L in 1996–97. A warning letter (No. OWL-WW-97-0023) was sent to the facility in December of 1997 from the FDEP's Central District advising the facility of possible violations of law which it may be responsible (see Appendix).

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 Smith Canal, 100 m upstream of the outfall) and a test site (in the canal 100 m below the discharge) (see maps in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Screening acute toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on an effluent sample following 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 the effluent and study sites. Methods used for all chemical analyses are on file at the DEP Central Chemistry Laboratory in Tallahassee.

Benthic macroinvertebrate communities were evaluated at the study sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip-net sweeps. Additional invertebrate collections were accomplished by using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Phytoplankton were sampled by taking subsurface grabs, and periphyton were sampled via glass microscope slides suspended near the surface. Chlorophyll *a* was determined for phytoplankton and periphyton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed 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. 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 Hudson *et al.* (1990), Lenat (1993), Chang *et al.* (1992), and Whitmore (1989), are used as appropriate.

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

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

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).

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

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.

For graphical purposes, the percent differences between the control and test sites involving the number of taxa, the diversity index, the Florida Index, the EPT Index, the diatom to blue-green algae ratio, and the % filter-feeders are measured as the control site minus test site divided by the control site. The percent differences between sites involving algal density, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site. If the value for a particular metric is zero at the control site, this metric is not used in the graphical comparison between the test and control sites as no background level is available for comparison.

The following personnel were involved in this investigation: Phil Kane, Ilia Herrera, Heriberto Colcado, and Steven Kent (DEP Central District) and Lyn Burton, Jennifer Eichelberger, Ken Espy, Marshall Faircloth, Russel Frydenborg, Joy Jackson, Scott Lashbrook, Elizabeth Miller, Johnny Richardson, Urania Quintana, Lisa Tamburello, 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, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

Habitat quality in Smith Canal, the immediate receiving water of the Lincoln Heights WWTP discharge, was rated as marginal, with scores of 48 at the control and test sites alike. Smith Canal is a stagnant ditch, with no riparian buffer zone. Aquatic macrophytes were the only in-stream habitat (see Habitat Assessment Data Sheets in Appendix). The predominant land-use in the drainage basin was residential (50%), with forest/natural (25%) and field/pasture (25%) comprising the remaining usage.

The pH was similar at both sample sites (control = 6.6 SU, test = 6.4 SU) (Table 1). Specific conductance was substantially higher below the discharge (700 µmhos/cm) compared to the control site (192 µmhos/cm). Dissolved oxygen was below the Class III water quality standard of 5.0 mg/L (Rule 62-302.530(52) FAC) at the test (1.0 mg/L) and control (3.8 mg/L) sites, likely due to the presence of oxygen demanding substances in the canal. The total suspended solids (65 mg/L) detected in the effluent violated the facilty permit limit (20 mg/L). The effluent concentration of total residual chlorine (0.02 mg/L) exceeded the 0.01 mg/L permit limit.

No organic pollutants were detected in the effluent. Aluminum, cadmium, iron, lead, and zinc were detected in the effluent at levels that comply with Class III water quality standards. At a $CaCO_3$ hardness of 110.5 mg (calculated from the calcium and magnesium values), the copper (46.2 µg/L) concentration observed in the effluent violated Class III water quality standards (Rule 62-302.530(24) FAC).

Table 1. Effluent limits and summary of chemistry data.

Lincoln Heights WWTP	Effluent Limits	Effluent Sample	Control Site	Test Site
Organic Constituents (µg/L)				
None detected	-	-	-	-
Metals (µg/L)				
Aluminum	≤ 1,500 **	294 J	-	-
Arsenic	≤ 50 **	40 U	-	-
Cadmium	≤1.2 **c	0.1 I	-	-
Chromium	≤ 224.6 **c	10 U	-	-
Copper	≤ 12.9 **c	46.2	-	-
Iron	≤ 1,000 **	177	-	-
Lead	≤ 3.6 **c	1.58 I	-	-
Mercury	≤ 0.012 **	0.10 U	-	-
Nickel	≤ 171.6 **c	6 U	-	-
Selenium	≤ 5.0 **	50 U	-	-
Silver	≤ 0.07 **	0.04 U	-	-
Zinc	≤ 171.6 **c	24 I	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	0.050 A	0.078	0.097
Total phosphorus	-	0.8	0.21	0.30
Ammonia	-	0.083	0.10	0.17
Nitrate+Nitrite	-	3.0	0.098	0.19
TKN	7.9 *a	6.8	1.5	1.9
General Phys-Chem Parameters				
Habitat Assessment	-	-	48	48
D.O. (mg/L)	≥ 6.0 *	6.6	3.8	1.0
pH (SU)	6.0-8.5 *	9.0	6.6	6.4
Conductivity (µmhos/cm)	-	432	192	700
Temperature (°C)	-	29.8	26.7	26.2
B.O.D., 5 day (mg/L)	20 *a	-	-	-
Tot. Suspended Solids (mg/L)	20 *a	65	4 A	10
Tot. Residual Chlorine (mg/L)	≤ 0.01 *	0.02	-	-
Hardness (mg CaCO3)	-	110.5	-	-
AGP (mg dry wt/L)	-	41.7	18.3	29.7
Toxicity				
Bioassay Fish	-	55% Mortality	-	-
Bioassay Invertebrate	-	No Mortality	-	-
Bioassay Fish - pH adjusted	-	No Mortality	-	-
Bioassay Invert - pH adjusted	-	No Mortality	-	-
Microbiology (# organisms/100 mL)				
Fecal Coliforms	200 a	-	-	-

* 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 less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

J - Estimated value

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

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

Lincoln Heights WWTP	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	24	30
Florida Index	2	5
SCI	15	23
EPT Index	1	1
% Dominant Taxon	15	29
Community Composition		
% Amphipoda	4	29
% Diptera	46	38
% Ephemeroptera	6	4
% Gastropoda	9	7
% Odonata	5	2
% Oligochaeta	28	16
% Other	2	4
Functional Feeding Groups		
% Predators	9	8
% Burrowing Deposit Feeders	28	15
% Surface Deposit Feeders	27	35
% Suspension Feeders	0.0	13
% Scrapers	14	11
% Shredders	21	17
Macroinvertebrate Hester-Dendy		
Number of Taxa	23	14
Florida Index	6	1
Shannon-Weaver Diversity	3.1	2.5
EPT Index	1	0
Community Composition		
% Amphipoda	1	7
% Diptera	21	4
% Gastropoda	20	43
% Oligochaeta	46	41
% Turbellaria	10	2
% Other	2	3
Functional Feeding Groups		
% Predators	10	7
% Surface Deposit Feeders	10	7
% Suspension Feeders	44	37
% Scrapers	19	43
% Shredders	10	6

The effluent was acutely toxic to the fish, *Cyprinella leedsi* (with 55% mortality in the full strength sample), probably due to the elevated pH (9.9 SU). This same sample was not toxic to the invertebrate, *Ceriodaphnia dubia*. The effluent, when adjusted to a pH of 9.0 SU in the laboratory, was not acutely toxic to *Cyprinella leedsi* or *Ceriodaphnia dubia*. The field pH measurement of the discharge was 9.0 SU (Table 1), representing a violation of Class III water quality standards (Rule 62-302.530(52)(c) FAC) and exceeded the facility permit limit (Appendix).

Elevated concentrations of total phosphorus (0.8 mg/L), nitrate+nitrite (3.0 mg/L), and TKN (6.8 mg/L) were observed in the effluent (Table 1). Higher nutrient levels at the test site were associated with the elevated nutrients in the discharge. The level of total phosphorus was 0.30 mg/L at the test site compared to 0.21 mg/L at the control site. Ammonia (test = 0.17 mg/L, control = 0.10 mg/L) and nitrate+nitrite (test = 0.19 mg/L, control = 0.098 mg/L) levels were also higher at the test site. TKN at the control site (1.5 mg/L) exceeded the values found in approximately 80% of other Florida streams, while TKN at the test site (1.9 mg/L) was greater than the values observed in 90% of other Florida streams (see *Table of Typical Water Quality Values* in Appendix).

Algal growth potential (AGP) values corresponded with the high nutrient levels. A "problem threshold" of 5 mg dry wt/L is used to predict the detrimental consequences of nutrient enrichment, such as excessive macrophyte or algal growth, dissolved-oxygen crashes, and fish kills (Raschke and Schultz 1987). The control (18.3 mg dry wt/L) and test (29.7 mg dry wt/L) site values greatly exceeded the "problem threshold" level. The effluent AGP was 41.7 mg dry wt/L (Table 2).

Measures of macroinvertebrate community health obtained using Hester-Dendy samples suggested degraded conditions at both sites, with conditions somewhat worse downstream of the discharge. Figure 1 indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the con-

trol. Hester-Dendy taxa richness decreased from 23 taxa at the control site to 14 taxa at the test site. Shannon-Weaver diversity decreased by 19% between the upstream and downstream stations (control = 3.1, test = 2.5). The EPT Index was also very low at both sites (control = 1, test = 0). The Florida Index values further demonstrate the lack of pollution sensitive taxa in Smith Canal, with scores of 6 at the control site and 1 at the test site.

The dip net results also indicated stressed conditions at the control and site sites. For example, Florida Index scores, with 2 points at the control site and 5 points at the test site, and the EPT values (1 EPT taxon at both sites) were well below the expectations for a healthy peninsular stream. The control site was ranked as "poor" by the SCI, while the test site was ranked in the low range of the "good" category.

Phytoplankton taxa richness decreased from 16 at the control site to 4 at the test site, and the percent contribution of dominant taxon rose by 49% (see Species List in Appendix). Approximately 98% of the phytoplankton community at the test site was composed of two types of pollution tolerant green algae. *Golenkinia* sp. (66% of the test site population), and *Scenedesmus* sp. (32%), commonly found in sewage ponds, are well-known indicators of eutrophic conditions, and are resistant to the herbicide copper sulfate (Palmer 1977) which may explain the elevated chlorophyll *a* and algal density at the test sites, in spite of the copper concentration in the effluent. Chlorophyll *a* corresponded with increases in algal counts. The 32.3 µg/L of chlorophyll *a* measured at the test site is greater than the 90th percentile level for typical Florida streams (see *Table of Typical Water Quality Values* in Appendix). In contrast, chlorophyll *a* was undetected at the control site. This alteration in the phytoplankton community in Smith Canal is interpreted as a violation of nutrient induced imbalances in aquatic flora (Rule 62-302.530(48)(b) FAC) and dominance of nuisance species (Rule 62-302.530(47) FAC).

Table 3. Major characteristics of algal community structure of control and test sites.

Lincoln Heights WWTP	Control Site	Test Site
Phytoplankton Algae		
Number of Taxa	16	4
Shannon-Weaver Diversity	3.6	1.1
Chlorophyll a (µg/L)	1.0 U	32.3
Algal Density (#/mL)	246	5,671
% Blue-green	3	0.0
% Green	27	99
% Diatoms	29	0.0
Periphyton Algae		
Number of Taxa	36	29
Shannon-Weaver Diversity	3.7	3.0
Algal Density (#/sq. cm)	75,247	31,657
Chlorophyll a (mg/sq. m)	8.4	2.6
Diatom/Diatom + B-G Ratio	0.8	0.9
% Blue-green	13	3
% Green	16	50
% Diatoms	70	45
AGP (mg dry wt/L)	18.3	29.7

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

The periphyton results also suggest negative effects from the discharge. Figure 2 indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the control. There was a decrease in taxa richness from 36 at the control site to 29 at the test site, as well as a decline in the Shannon-Weaver diversity values (from 3.7 to 3.0) (Table 3). Periphyton density decreased by more than 50% at the test site (31,657 organisms/cm^2) compared to the control site (75,247 organisms/cm^2). Likewise, the chlorophyll *a* decreased from 8.4 mg/m^2 at the control site to 2.6 mg/m^2 at the test site. A potential explanation for these observations involves the copper concentration of the effluent. Periphyton toxicity or growth inhibition from elevated levels of copper (46.2 µg/L) in the effluent may have been responsible for the reduction in the periphyton biomass seen at the test site.

Conclusions

No organic pollutants were detected in the effluent. The copper (46.2 µg/L) concentration was in violation of Class III water quality standards, Rule 62-302.530(24) FAC.

The effluent was acutely toxic to the fish, *Cyprinella leedsi* (with 55% mortality in the full strength sample), probably due to the elevated pH (9.9 SU). This same sample was not toxic to the invertebrate, *Ceriodaphnia dubia*. The effluent, when adjusted to a pH of 9.0 SU in the laboratory, was not acutely toxic to *Cyprinella leedsi* or *Ceriodaphnia dubia*. The field pH measurement of the discharge was 9.0 SU, violating Class III water quality standards (Rule 62-302.530(52)(c) FAC) and exceeding the facility's permit limit.

Dissolved oxygen was in violation of Class III water quality standards (Rule 62-302.530(52) FAC) at the test (1.0 mg/L) and control (3.8 mg/L) sites, probably due to low water velocity and the presence of oxygen demanding substances (*e.g.*, decaying algae).

Elevated concentrations of total phosphorus, nitrate+nitrite, and TKN were observed in the effluent and are associated with higher nutrient levels at the test site. These nutrient inputs to Smith Canal contributed to violations in biological criteria.

Algal growth potential corresponded with the high nutrient levels. The control and test site values greatly exceeded the "problem threshold" of 5 mg dry wt/L. The effluent AGP was 41.7 mg dry wt/L.

Phytoplankton populations were severely degraded below the outfall. Because there was no flow at either the test or the control site, the phytoplankton data are the most appropriate data for illustrating the effects the Lincoln Heights discharge on the algal communities in Smith Canal. Taxa richness decreased by 75% from the control site to the test site, and the percent contribution of dominant taxon rose by 49%. The test site was dominated by pollution tolerant forms (*Golenkinia* sp. and *Scenedesmus* sp.), which are very common in sewage ponds and are well-known indicators of eutrophic conditions. The chlorophyll *a* (32 µg/L) measured at the test site was greater than the values found in 93 % of other Florida streams. This alteration in the phytoplankton community in Smith Canal is interpreted as a violation of nutrient induced imbalances in aquatic flora (Rule 62-302.530(48)(b) FAC) and dominance of nuisance species (Rule 62-302.530(47) FAC).

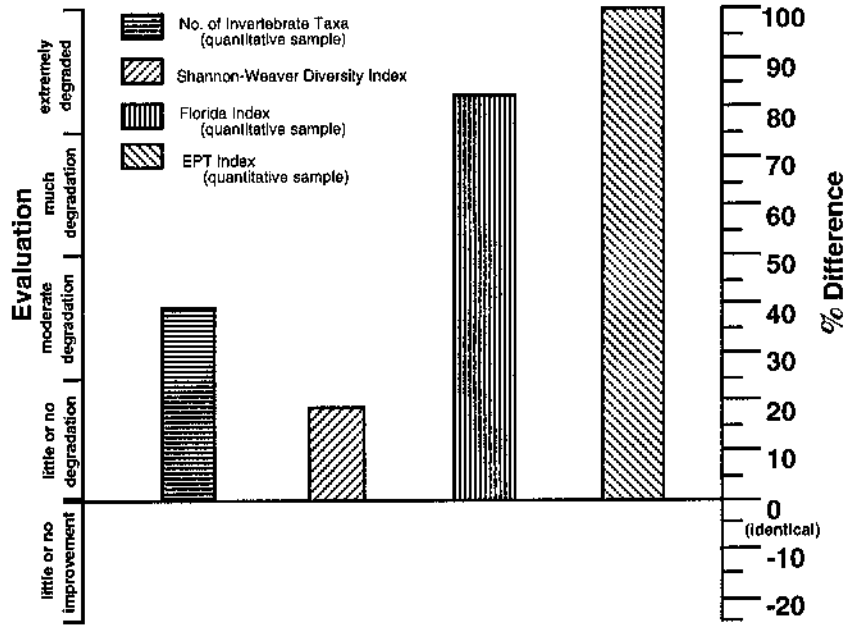


Figure 1. Effect of discharge on the benthic macroinvertebrate community.

Reductions in periphyton taxa richness, diversity, density, and chlorophyll *a*, and the greater abundance of *Cocconeis placentula*, a well known indicator of eutrophic conditions, at the test site further suggests adverse effects from the discharge.

Measures of macroinvertebrate community health obtained using Hester-Dendy samples suggested degraded conditions at both sites, with conditions somewhat worse downstream of the discharge. Hester-Dendy taxa richness, diversity, the EPT Index, and the Florida Index were low at the control site, but decreased further at the test site. The dip net results also indicated stressed conditions at the control and site sites. For example, Florida Index scores, with 2 points at the control site and 5 points at the test site, and the EPT values (1 EPT taxon at both sites) were well below the expectations for a healthy peninsular stream.

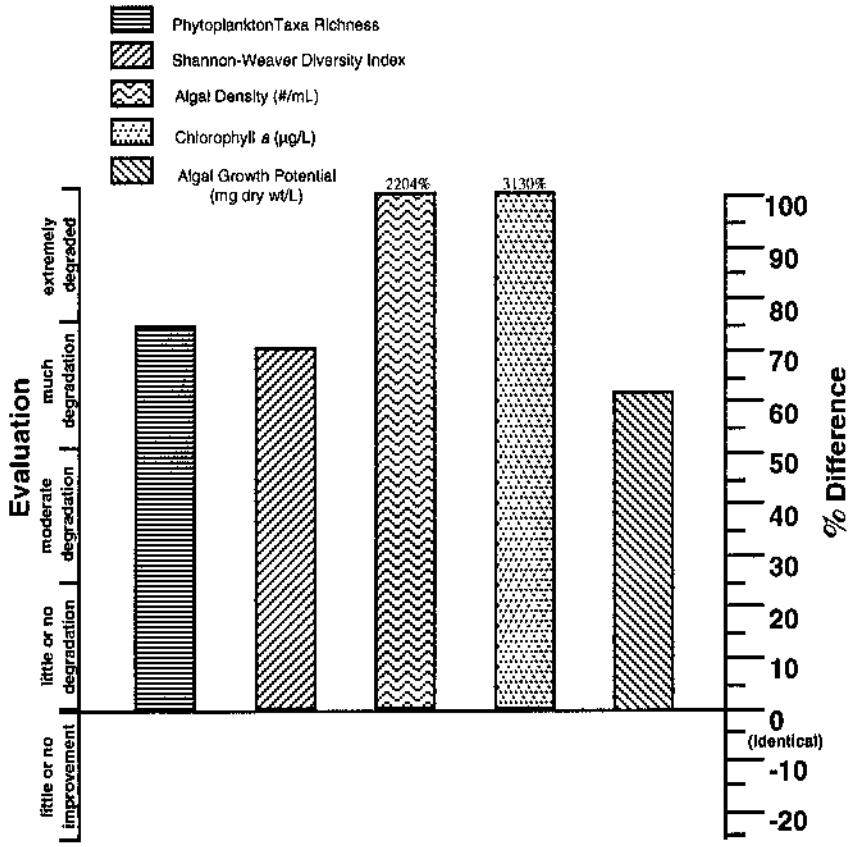


Figure 2. Effect of discharge on the periphyton community.

Literature Cited

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

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.

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.

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.

Palmer, C. M. 1977. Algae and water pollution. An illustrated manual of the identification, significance, and control of algae in water supplies and in polluted water. U. S. Environ. Prot. Agency. Office of Res. and Develop. EPA-600/9-77-036. 124p.

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.

Typical Values for Selected Parameters in Florida Waters

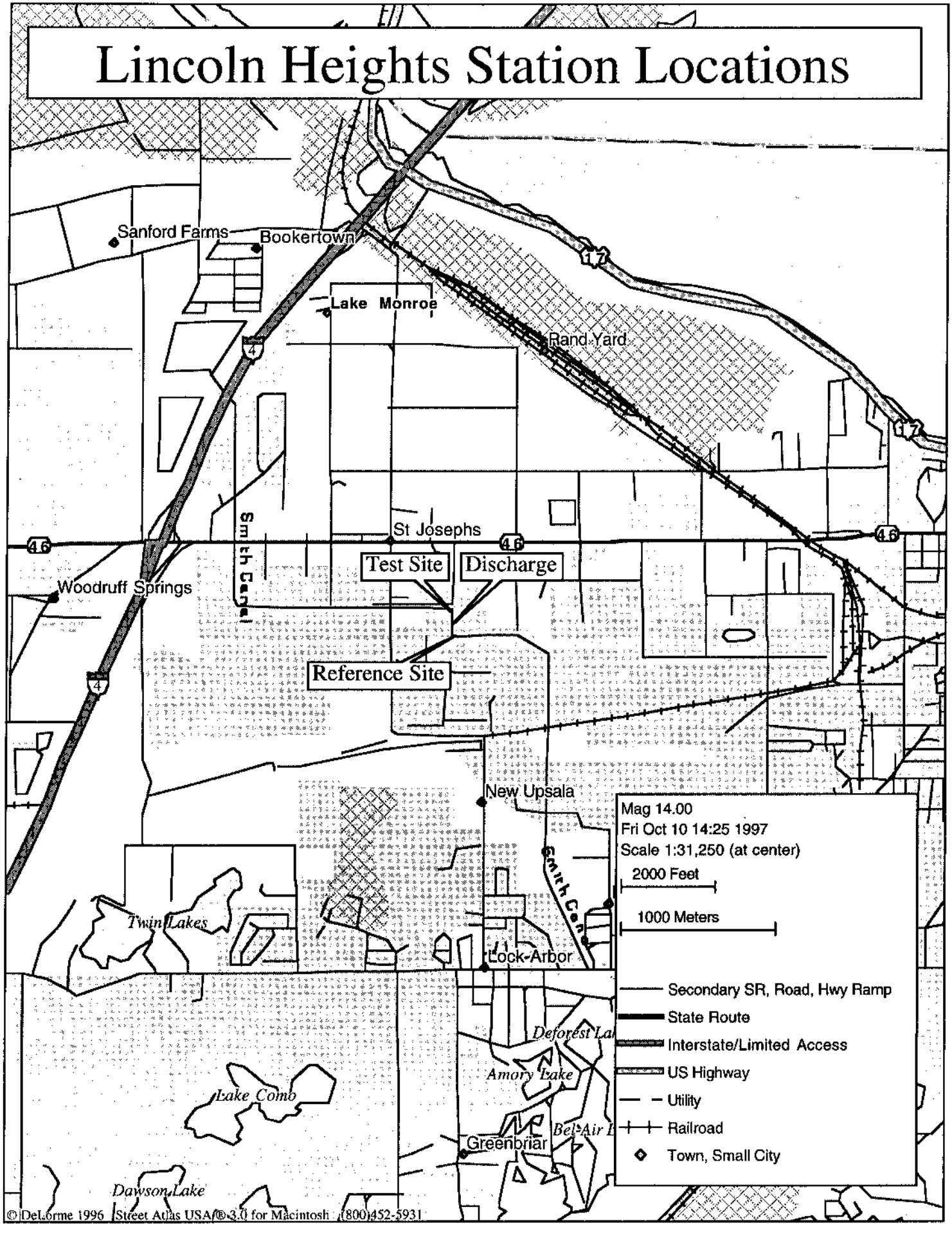
Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

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

Lincoln Heights Station Locations



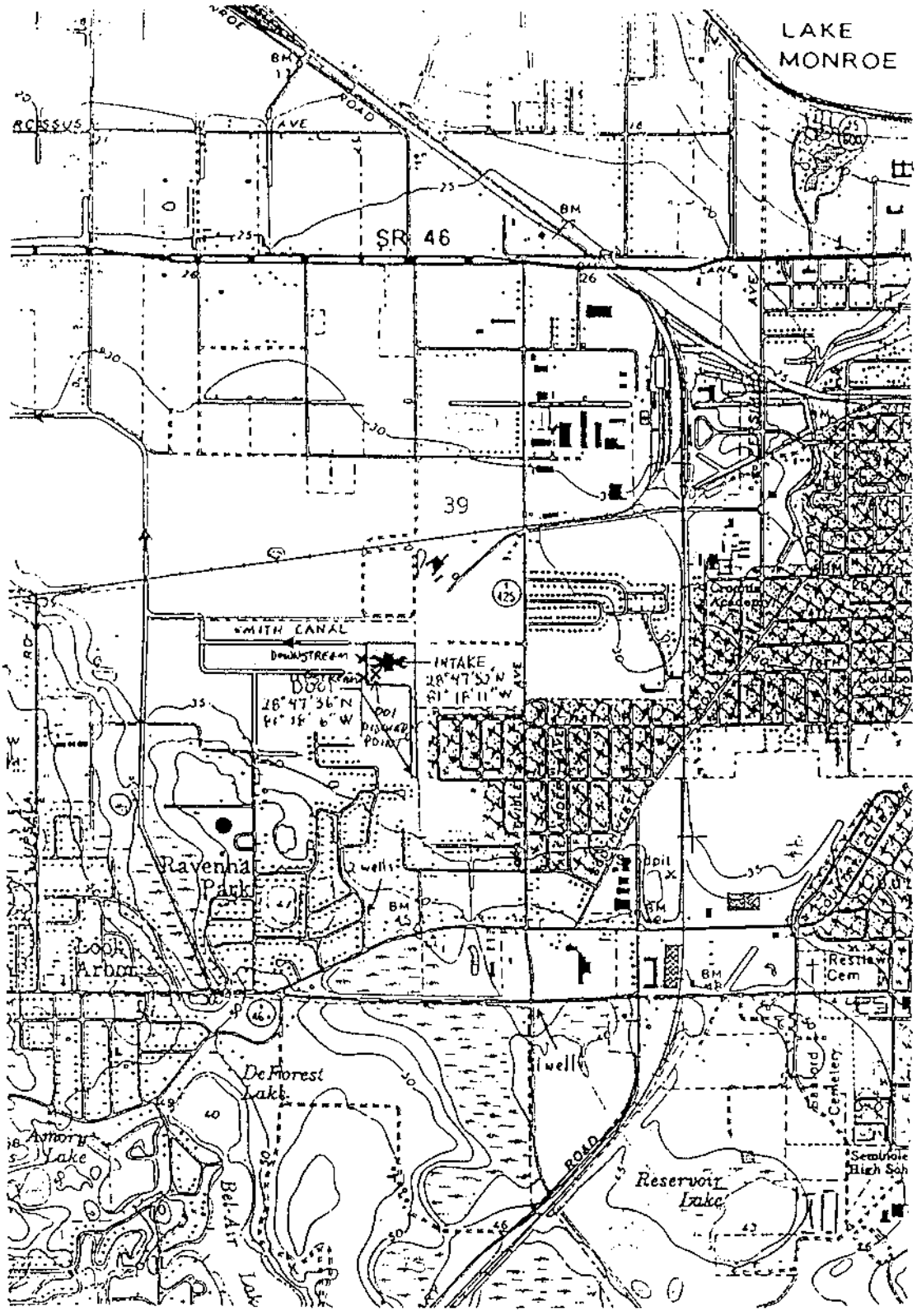


FIGURE 1
LOCATION MAP
LINCOLN HEIGHTS WWTF

LEGEND
* WWTF SITE

SOURCE: USGS QUADRANGLE MAP, SANFORD FLORIDA, PHOTOREVISED 1988

UTILITIES INC. OF FLORIDA
200 WEATHERSFIELD AVE.
ALTAMONTE SPRINGS, FLORIDA 32714
(407) 869-1919
FAX (407) 869-69

Phil: Pls forward copy to Tally, make sure yall return this to Ilia. TK all 8/12

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATI
FACILITY SUMMARY

Facility Name: Lincoln Heights Subdivision, STP		Date Summary Prep:
Location (attach detailed map): Terminus of Highy Street, Sanford, FL 32771 (See attached map)	County: Seminole	Dist: Central District
Federal Permit # and expiration date: FL0025917 4/30/2000	State GMS # and State expiration date: 3059 P01116 D059-185633 1/5/96	Facility Type: Industrial Municipal Federal Agricultural Other (list): Private Domestic

Function of facility:
Domestic Wastewater Treatment Facility

Description of treatment process:
This facility is a 0.120 MGD design capacity extended aeration wastewater treatment facility with barscreen, biological treatment (activated sludge), followed by secondary clarification and chlorination. Residuals are stored by anaerobic digestion. The disinfected effluent is discharged to surface water through three polishing ponds to Smith Canal to the St. Johns River.

Receiving waters: Smith Canal to Lake Monroe (St. Johns River) Classification: I II (III)

Design Flow:	Mean Flow:	Flow during survey:
0.120 MGD	0.060 MGD	

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

therefore, the best time to sample is:

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

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

Parameter	Limit (units)
See attached sheets for state and NPDES permit limits	

Describe special permit conditions and permit modifications:
State permit modified on 9/15/94 approving replacement of 2 mechanical aerators with a diffuser system and installation of 2 blowers.

Lincoln Heights Subdivision, STP
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):

Concrete overflow basin from polishing pond with 8 inch pipe to canal.

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

Violations from MORs - 6/96 - 5/97: DO was below the minimum of 6.0 mg/l for 8/96 (2.9 mg/l), 9/96 (4.1 mg/l) and 4.4 mg/l in 5/97. Also it wasn't reported for 7/96.

Violations from DMRs 5/96 - 4/97; TSS annual average limit of 20 mg/l exceeded (21.0 mg/l) on 5/96. Silver limit of 0.07 mg/l exceeded (2.04 mg/l), copper limit of 0.0 mg/l exceeded (.575 mg/l), mercury limit of .012 mg/l exceeded (0.21 mg/l) during quarter of 4/96 - 6/96. Same DO violations reported on MORs. During quarter of 1/97 - 3/97 mercury limit of 0.012 mg/l exceeded (1.0 mg/l) monthly TSS average limit of 30.0 mg/l exceeded (35.0 mg/l).

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

Biological Assessment was conducted on 5/4/1993. (5TH YEAR)

No enforcement actions.

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

MORs from 6/96-5/97 compare with mors from 6/95-5/96 in the following way: Flow, have decreased, going from an annual average of 0.084 mgd to 0.060 mgd. There were more months with fecal coliform counts over 1.0 #/100 mL before. The TSS monthly average limit of 30 mg/l was exceeded 2 times during 1995-96, and exceeded once during 1996-97. In general, TSS were higher during the 1995-96 year than during 1996-97. DO violations (DO below 6.0 mg/l) occurred 3 times during 1996-97, while they didn't have any DO violation during 1995-96. TKN increased a little, from an annual average of 3.13 mg/l during 1995-96 to an annual average of 5.36 mg/l during 1996-97.

Additional information:

Application for permit renewal (Wastewater Permit) was received on 8/4/95. Application presently under review.

Staff contributing to this review (signature):

Phil Kane, Ed.D (Biologist)

9/8/97 (Inspector)

(Engineer)

( )

( )

( )

PERMITTEE:
Utilities, Inc. of Florida

I. D. Number: 3059P01116
Permit Number: D059-185633
Expiration Date: 01/05/96

Attention: Donald Rasmussen,
Director of Operations

SPECIFIC CONDITIONS:

1. The required sampling at the point of discharge to Smith Canal shall be as follows:

Parameter	Recording or sampling Frequency
Flow	daily, 5 days per week
Chlorine residual*	daily, 5 days per week
pH	daily, 5 days per week
BOD_5	once every 2 weeks
TSS	once every 2 weeks
TKN	once every 2 weeks
Fecal coliform	monthly
Dissolved Oxygen (DO)	once every 2 weeks

* To be recorded before and after dechlorination.

The sampling and analysis required above shall be in accordance with Chapter 17-19, F.A.C. and approved standard methods. Properly executed reports shall be submitted monthly to this office, by the 15th day of the following month.

2. The effluent limitations for this discharge are as follows:

BOD_5 & TSS	20 ppm	Annual Average
TKN	7.9 ppm	Annual Average
Dissolved Oxygen (DO)	6.0 ppm	minimum
Total Residual Chlorine (TRC)	0.01 ppm	maximum (after August 1, 1991)

3. Within sixty (60) days from date of issuance of this permit, the permittee shall submit a application for a construction permit to install dechlorination facilities, which must be in operation by August 1, 1991.

4. Groundwater monitoring shall be performed in accordance with the previously approved groundwater monitoring plan, with the following modifications:

Reporting Frequency: The ground water monitoring data shall be reported according to the following schedule:

Sample Period	Report Due Date
1st Quarter (January-March)	April 15
2nd Quarter (April-June)	July 15
3rd Quarter (July-September)	October 15
4th Quarter (October-December)	January 15

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL

1. During the period beginning on the effective date and lasting through the term of this permit, the permittee is authorized to discharge from outfall serial number 001, sanitary wastewater.

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

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sampling Point
Flow, MGD	Report	Report	Report	5 Days/Week	Elapsed Time Measurement	Effluent
Carbonaceous Biochemical Oxygen Demand (5 Day), mg/l	20.0	30.0	60.0	1/2 Weeks	Grab	Effluent
Total Suspended Solids, mg/l	20.0	30.0	60.0	1/2 Weeks	Grab	Effluent
Fecal Coliform Bacteria, #/100 ml	200	--	800	1/Month	Grab	Effluent
pH, Standard Units	(See Item 2, Page I-3)			5 Days/Week	Grab	Effluent
Total Residual Chlorine, mg/l	(See Item 6, Page I-3)			5 Days/Week	Grab	Effluent
Total Kjeldahl Nitrogen, mg/l	7.9	--	--	1/2 Weeks	Grab	Effluent
Dissolved Oxygen, mg/l	(See Item 7, Page I-3)			1/2 Weeks	Grab	Effluent

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL

1. During the period beginning on the effective date and lasting through the term of this permit, the permittee is authorized to discharge from outfall serial number 001, sanitary wastewater.

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

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sampling Point
Total Recoverable Copper, µg/l	(See Item 8, Page I-3)			1/Quarter	Grab	Effluent
Total Recoverable Mercury, µg/l	--	--	0.012	1/Quarter	Grab	Effluent
Total Recoverable Silver, µg/l	--	--	0.07	1/Quarter	Grab	Effluent
Total Hardness, mg/l $CaCO_3$	--	--	Report	1/Quarter	Grab	Effluent

Samples shall be taken after the final treatment but prior to mixing with the receiving water.

PART I (CONTINUATION)
EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. The pH of the effluent shall not be less than 6.0 standard units nor greater than 8.5 standard units.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. The effluent shall not cause a visible sheen on the receiving water.

5. Any bypass of the treatment facility, which is not included in the effluent monitored above, is to be monitored for flow and all other parameters. For parameters other than flow, at least one grab sample per day shall be monitored. Daily flow shall be monitored or estimated, as appropriate, to obtain reportable data. All monitoring results shall be reported on a Discharge Monitoring Report (DMR) Form (3320-1).

6. The daily maximum concentration of TRC in the final effluent shall not exceed 0.01 mg/l. Testing for total residual chlorine (TRC) shall be conducted according to either the low-level amperometric titration method or the DPD colorimetric method as specified in Section 4500-Cl E. or 4500-Cl G., respectively, Standard Methods for the Examination of Water and Wastewater, 18th edition, or the most current edition.

7. The daily minimum concentration of dissolved oxygen shall not be less than 6.0 mg/l in the effluent.

8. The daily maximum of Total Recoverable Copper shall not exceed the amount resulting from the following equation:

$$\mu g/l\ Cu = e^{(0.8545(\ln H)-1.465)};$$

where lnH is the natural logarithm of the total hardness expressed as mg/l $CaCO_3$. The hardness value resulting from the monitoring requirements of Part I.A.1. shall be used. If the analysis of the effluent reveals a total hardness greater than 400 mg/l $CaCO_3$, use 400 mg/l for total hardness in the equation to calculate the total recoverable copper effluent limitation. If the analysis of the effluent reveals a total hardness less than 25 mg/l $CaCO_3$, use 25 mg/l for total hardness in the equation to calculate the total recoverable copper limitation. If the reported effluent value for the total recoverable copper exceeds the calculated value, the permittee will be considered in violation of the effluent limitation.

9. If the results for a given sample analysis are such that any parameter (other than fecal coliform) is not detected at or above the minimum level of for the test method used, a value of zero will be used for that sample in calculating an arithmetic mean value for the parameter. If the resulting calculated arithmetic mean value for that reporting period is zero, the permittee shall report "NODI=B" on the Discharge Monitoring Report (DMR) Form (EPA No. 3320-1). For fecal coliform, a value of 1.0 shall be used in calculating the geometric mean. If the resulting fecal coliform man value is 1.0, the permittee shall report "NODI=B" DMR. For each quantitative sample value that is not detectable, the test method and the minimum level for that method for that parameter shall be attached to and submitted with the DMR. The permittee shall then be considered to be in compliance with the appropriate effluent reporting requirements.

C. OVERFLOW

The permittee shall identify all wastewater discharges, at locations not authorized as permitted outfalls, that occur prior to the headworks of the wastewater treatment plant covered by this permit. The permittee shall submit, with the scheduled Discharge Monitoring Report (DMR) Form, the following information for each discharge event at each source that occurs during the reporting period covered by the DMR:

1) the cause of the discharge;
2) duration and volume (estimate if unknown);
3) description of the source, e.g., manhole cover, pump station;
4) type of collection system that overflowed, i.e., combined or separate;
5) location by street address, or any other appropriate method;

6) date of event;
7) the ultimate destination of the flow, e.g., surface waterbody, land use location, via municipal separate storm sewer system to a surface waterbody, (show location on a USGS map or copy thereof); and
8) corrective actions or plans to eliminate future discharges.

The permittee shall refer to Part II of this permit, paragraph D.4. Twenty-Four Hour Reporting, to report any unpermitted discharge events which may endanger health or the environment.

Submittal or reporting of any of this information does not provide relief from any subsequent enforcement actions for unpermitted discharges to waters of the United States.

B. SLUDGE MANAGEMENT PRACTICES

1. Annually, the permittee shall sample and analyze the sludge and report to EPA the quantitative data for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

KL 12/11
HC 12/11
C: Wayne Magley

Department of Environmental Protection

Lawton Chiles
Governor

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Virginia B. Wetherell
Secretary

CERTIFIED MAIL
Z 232 541 995

UTILITIES INC OF FLORIDA
200 WEATHERSFIELD AVENUE
ALTAMONTE SPRINGS FL 32714

ATTENTION DONALD RASMUSSEN
VICE PRESIDENT

WARNING LETTER No. OWL-WW-97-0023

RECEIVED
DEC 15 1997
WATER QUALITY
ASSESSMENT SECTION
DEPT. ENVIRONMENTAL PROT.

Seminole County - DW
Lincoln Heights
Wastewater Facility - FL0029517

Dear Mr. Rasmussen:

The purpose of this letter is to advise you of possible violations of law for which you may be responsible, and to seek your cooperation in resolving the matter. A Fifth Year Inspection (FYI) conducted on August 18, 1997, of Lincoln Heights WWTP indicates that a violation of Florida Statutes and Rules may exist at the above described facility. Department of Environmental Protection personnel noted the following regarding the above described facility:

1. Failure to meet effluent limits required by the permit:

   a. The Total Suspended Solids (TSS) annual average result (21 mg/L) as reported on the Discharge Monitoring Report (DMR) for May 1996 exceeded the maximum limit of 20 mg/L.
   b. The Total Recoverable Silver daily maximum result (2.04 ug/L) as reported on the DMR for the quarter April - June 1996 exceeded the maximum limit of 0.07 ug/L. The result for the July - September 1996 quarter was reported as <1.0 ug/L which may exceed the maximum limit.
   c. The Total Recoverable Copper daily maximum result (5.75 ug/L) as reported on the DMR for the quarter April - June 1996 exceeded the maximum limit of 0.0 ug/L. The Total Recoverable Copper result of the sample taken by Department personnel on August 18, 1997, was 46.2 ug/L.
   d. The Total Recoverable Mercury daily maximum results as reported on the DMRs for the quarters April - June (0.21 ug/L), July - September 1996 (.21 ug/L) and January - March 1997 (1.0 ug/L) exceeded the maximum limit of 0.012 ug/L.
   e. The Dissolved Oxygen (DO) results as reported on the Monthly Operating Reports (MORs) for September 1996 (4.1 mg/L and 5.1 mg/L) and May 1997 (4.4 mg/L) was below the minimum limit of 6.0 mg/L.
   f. The TSS monthly average result (35 mg/L) as reported on the DMR for April 1997 exceeded the maximum limit of 30 mg/L.

2. Failure to comply with Department quality assurance and analytical methodology requirements:

   a. The beginning and ending date and time of composite sample collection was not documented.
   b. The temperature of the composite samples was not documented.
   c. Samples were not being preserved with ice during the collection period.
   d. The pH was being measured with a bench meter, which was calibrated daily with only one buffer. The requirement is to calibrate the pH meter daily with at least two buffers.
   e. The total residual chlorine was being analyzed with a DR700 meter which was not being checked daily against known standards.

3. Failure to comply with the requirements of the ground water monitoring plan.

   a. The Department has not received the quarterly ground water monitoring reports for the following quarters: 3rd and 4th Quarters of 1995, 1st, 2nd, 3rd and 4th Quarters of 1996, and the 1st and 2nd Quarters of 1997.
   b. The ground water wells are not being analyzed for total coliform as stipulated by the permit requirement and approved ground water monitoring plan.
   c. The quarterly monitoring reports are not being submitted in the correct format (DER Form 17-1.216(2)). All required information must be included on this form.

Please be aware that Item 3a was addressed in Department letters dated April 29 and November 20, 1996 (enclosed).

Please note that the bioassessment results of this inspection are pending and are not addressed in this letter.

Section 403, Florida Statutes, provides that :

A. **Florida Statutes, Chapter 403.161 Prohibitions, violations, intent.** (1) It shall be a violation of this chapter, and it shall be prohibited for any person: (b) To fail to obtain any permit required by this chapter or by rule or regulation, or to violate or fail to comply with any rule, regulation, order, permit, or certification adopted or issued by the Department pursuant to its lawful authority.

B. **Florida Administrative Code Rule 62-601.300 General Requirements.** (3) Wastewater treatment facilities that discharge to ground waters and are not exempt from ground water monitoring by Rule 62-522.600, F.A.C., shall provide ground water monitoring in accordance with Rule 62-601.700, F.A.C. (c) The ground water monitoring report shall be completed and submitted in a timely manner so as to be received by the appropriate District Office by the date specified in the permit.

C. Florida Administrative Code Rule 62-601.400 Sampling and Testing Methods. (3) Any laboratory tests required by this rule shall be performed by a laboratory that has been certified by HRS in accordance with Rule 10D-41.100-113, F.A.C., to perform that test. On-site tests for dissolved oxygen, pH, and total chlorine residual shall be performed by a laboratory certified to test for dissolved oxygen, pH, and total chlorine residual or under the direction of an operator certified in accordance with Chapter 61E12-41, F.A.C..

D. Florida Administrative Code Rule 62-160.110 Quality Assurance - Scope (1)(a) Except as provided in paragraph (b), of this subsection, this Chapter shall apply to all programs, projects, studies, or other activities which are required by the Department, and which involve the measurement, use, or submission of environmental data or reports to the Department.

The activities observed during the Department's field inspection and any other activities at your facility that may be contributing to violations of the above described statutes or rules should be ceased. Operation of a facility in violation of state statutes or rules may result in the potential liability for damages and restoration, and the judicial imposition of civil penalties, pursuant to Sections 403.141 and 403.161, Florida Statutes.

You are requested to contact Karen Gottwald or Clarence Anderson of this office at (407)893-3313 within 15 days of receipt of this Warning Letter to arrange a meeting to discuss this matter. The Department is interested in reviewing any facts you may have that will assist in determining whether any violations have occurred. You may bring anyone with you to the meeting that you feel could help resolve this matter.

Please be advised that this Warning Letter is part of an agency investigation, preliminary to agency action in accordance with Section 120.57(4), Florida Statutes. We look forward to your cooperation in completing the investigation and resolution of this matter.

Sincerely,

Vivian F. Garfein
Director of District Management

Date: December 10, 1997

VFG/ca/ww
Enclosure

cc: DEP/Tallahassee, Attn.: Robert Glenn
DEP/Tallahassee, Attn.: Mike Tanski
Heriberto Collado

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 08/18/97	TIME: 0940	RECEIVING BODY OF WATER: SMITH CANAL TO LAKE MONROE

REMARKS: UPSTREAM	COUNTY: SEMINOLE	LOCATION: LINCOLN HEIGHTS STP	FIELD ID/NAME: LH

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)
25%		25%		50%			

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

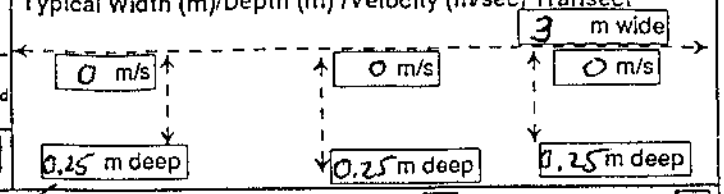
List & map dominant vegetation on back

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

Artificially Impounded ☐ yes

High Water Mark: 0.25M (m above present water level) + 0.25M (present depth in m) = 0.50M (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 (circled) 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	40	2	
Aquatic Vegetation	60	18	NET	Other:			NET
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	0.25	26.65	6.62	3.84	192			TO BOTTOM
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: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

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

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

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

Weather Conditions/Notes: PART CLOUDS / SUN

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: P.L. Ka Steven J. Kent	DATE: 08/18/97

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 05/18/97	RECEIVING BODY OF WATER: SMITH CANAL TO CARL MONROE

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
UPSTREAM	SEMINOLE	LINCOLN HEIGHTS STP	L H

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

0 Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

48 TOTAL SCORE

Comments

ANALYSIS DATE: 05/18/97	ANALYST: KANE, KENT	SIGNATURE: Phil for Steven S Kent

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 08/18/99	TIME 0945	RECEIVING BODY OF WATER: SMITH CANAL TO LAKE MONROE

REMARKS: DOWNSTREAM	COUNTY: SEMINOLE	LOCATION: LINCOLN HEIGHTS STP	FIELD ID/NAME: LH

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)
25%		25%		50%			

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: 0.25m (m above present water level) + 0.25m (present depth in m) = 0.50 (m above bed)

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

4 m wide

0 m/s	0 m/s	0 m/s
m deep	m deep	m deep

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	20	2	NET
Aquatic Vegetation	80	18	NET	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top								
Mid-depth	0.25	26.16	6.42	1.00	700			0.25
Bottom								

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

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

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:

HOT PART CLOUDY/SUN

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

SAMPLING TEAM: KANE, KENT	SIGNATURE: Phil Kane, Kent Stuart	DATE: 08/18/99

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (4-22-96)

SUBMITTING AGENCY CODE: 30 / SUBMITTING AGENCY NAME: FDEP CENTRAL DISTRICT	STORET STATION NUMBER:	DATE (M/D/Y): 08/18/97	RECEIVING BODY OF WATER: SMITH CANAL TO LAKE MONROE

REMARKS: DOWNSTREAM	COUNTY: SEMINOLE	LOCATION: LINCOLN HEIGHTS STP	FIELD ID/NAME: LH

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Substrate Types & Availability 16	Greater than 30% snags, logs, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, rock, or other stable habitat. 20 19 18 17 (16)	16% to 30% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 15% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, aquatic vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable.. or smothered. 5 4 3 2 1
Water Velocity 1	Max. observed at typical transect: >0.25 m/sec. but < 1 m/sec 20 19 18 17 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect <0.05 m/sec, or spate occurring; > 1 m/sec 5 4 3 2 (1)
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0 Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

48 TOTAL SCORE

Comments

ANALYSIS DATE: 08/18/97	ANALYST: KANE, KENT	SIGNATURE: Phil Kane Stan Ikert

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Lincoln Heights
County: Orange
Contact / District: P Kane | Tawsky | CF
NPDES Permit #: FL00 29917
LIMS Sample #: 187765 **LIMS Job #:** 97-AUG-19-18-01
sample log: 8/11/97 ov

Sample Collection: Date 8/18/97 Time 0852
Test Beginning: Date 8/19/97 Time 1430
Test Ending: Date 8/21/97 Time 1430
Organism Batch #: 62 **Diluent Batch #:** well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Temperature range: room 24.5-25.5°C
incubator 24.5-26.0°C
Test Number: 2 of 2
Remarks: D = dead, M = missing
sample filled with algae

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	24.7 @ 24.8	8.2 @ 25.4°C	1064 @ 1010 1005 @ 1005 @ 25.4°C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.1 @ 24.7	8.3 @ 25.1°C	1028 @ 1010 984 @ 1005 @ 24.8°C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.2 @ 25.6°C	1043 @ 1010 9980 @ 9917 @ 25.2°C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	H13	5	5	5	8.0	8.4	8.4	25.3	26.1	25.2	8.2	7.6	7.4	255	260	265
Control B	H14	5	5	5	8.0	8.4	8.4	25.3	26.2	24.7	8.1	7.5	7.4	255	260	260
Control C	H15	5	5	5	8.0	8.4	8.4	25.3	25.1	24.7	8.2	7.6	7.4	255	260	260
Control D	H16	5	5	5	8.0	8.4	8.5	25.3	24.6	24.7	8.2	7.5	7.4	255	255	260
pHadj A	H21	5	5	5	9.0	9.1	9.4	25.1	25.3	25.0	6.8	8.9	13.1	450	455	460
pHadj B	H22	5	5	5	9.0	9.5	9.4	25.0	24.6	24.8	6.8	11.2	13.1	450	450	460
pHadj C	H23	5	~~3~~ 5	5	9.0	9.0	9.3	24.9	25.4	24.8	7.0	9.4	12.2	450	465	460
pHadj D	H24	5	5	5	9.0	9.2	9.2	25.0	24.5	24.8	7.0	10.1	11.5	450	450	460
100% A	H17	5	3 (3D)	2	9.9	9.6	9.3	25.0	25.6	25.1	7.0	10.3	9.2	430	450	450
100% B	H18	5	1 (4D)	1	9.9	9.5	9.5	24.9	24.8	24.6	6.8	9.8	12.9	430	440	445
100% C	H19	5	3 (3D)	2	9.9	9.5	9.6	24.9	24.7	24.5	6.8	9.5	12.3	430	435	440
100% D	H20	5	4 (1D)	4	9.9	9.8	9.8	24.9	24.7	24.5	6.7	11.4	14.0	430	435	440
			A found in the algae KJ 8/20/97													
Measured/Loaded by:		DW	KJ	ND	DW	KJ	ND	DW	KJ	ND	DW	KJ	ND	DW	KJ	ND
Recorded by:		KR	KJ	ND	KR	KR	MF	KR	KR	MF	KR	KR	MF	KR	KR	MF

Investigators' Signatures
Kellie Ralston
Heidi Johnson
Mark Sisk
Marshall Faircloth
A H Wolfe
reviewer form updated 4/01/96

Water Quality Parameters (Parameter Entries Verified by MF)

	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.02	—	P. Kane
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	DR100	KR
Alkalinity (mg/L as $CaCO_3$):	130		10	Hach	ND
Hardness (mg/L as $CaCO_3$):	135		105	Hach	ND
Total ammonia (mg/L as N):	<0.017		<0.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: 59.8 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute

Sample Source: Lincoln Heights
County: Orange
Contact / District: P. Kane / Parsky / CE
NPDES Permit #: FL0025917
LIMS Sample #: 187765 LIMS Job #: 97-AUG19-18-01
sample log: 8/22/97 mw
Test Type: Screening / Definitive
Static / Static Renewal / Flow-through
Temperature range: room 24.5-25.5°C
incubator 24.5-26.0°C
Test Number: 1 of 2
Remarks: D = dead, M = missing
sample filled with algae

Sample Collection: Date 8/18/97 Time 0850
Test Beginning: Date 8/19/97 Time 1430
Test Ending: Date 8/21/97 Time 1430
Organism Batch #: 32 Diluent Batch #: 32
Organism Age: <24 hrs
Test Organism: Ceriodaphnia dubia

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	24.7 @ 24.8	8.2 @ 25.4°C	106.4 @ 101.0 1005 @ 1005 @ 25.4°C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.1 @ 24.2	8.2 @ 25.1°C	102.8 @ 101.0 984 @ 1005 @ 24.8°C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.2 @ 25.6°C	104.3 @ 101.0 9980 @ 9917 @ 25.2°C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	A	5	5	5	8.2		8.3	24.5		25.9	8.2		7.6	180		185
Control B	B	5	5	5			8.3			25.8			7.6			190
Control C	C	5	5	5			8.4			25.4			7.7			190
Control D	D	5	5	5			8.3			25.0			7.7			190
pHadj A	A	5	5	5	9.0		8.9	25.1		25.8	7.2		8.8	430		465
pHadj B	B	5	5	5			8.9			25.6			~~8.0~~ MF 9.3			465
pHadj C	C	5	5	5			~~8.0~~ MF 9.0			25.3			9.3			450
pHadj D	D	5	5	5			~~9.0~~ MF 9.0			24.8			9.2			430
100% A	A	5	5	5	9.8		9.0	25.0		25.9	7.0		8.8	420		465
100% B	B	5	5	5			9.0			25.5			9.0			445
100% C	C	5	5	5			9.0			25.0			9.1			445
100% D	D	5	5	5			9.1			24.8			9.3			430
						A 9.0							C 8.9			
						B 9.0							incorrect # written MF 8/21/97			
						incorrect # written MF 8/19/97										
Measured/Loaded by:		KR	MF	MF	DLW		ND	DLW		ND	DLW		ND	DLW		ND
Recorded by:		DW	MF	MF	KR		MF	KR		MF	KR		MF	KR		MF

Investigators' Signatures

Kelli Kalstrom

Ken Johnson

Mark Leigh

Marshall Faircloth

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):		0.02	—	P Kane
Lab Total Residual Cl2 (mg/L):	<0.03	<0.03	DR100	KR
Alkalinity (mg/L as $CaCO_3$):	75	10	Hach	ND
Hardness (mg/L as $CaCO_3$):	90	105	Hach	ND
Total ammonia (mg/L as N):	<0.017	<0.017	Orion	MF

Parameters verified by MF

Ammonia Meter #98136 Ammonia Meter Slope: 59.8 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

Lincoln Heights WWTP - Control Site

Summer Index Period: Stream Condition Index for Florida (SCI) (April 1996)													
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	**Panhandle**				**Peninsula**				**Northeast**			
		5	3	1	Score	5	3	1	Score	5	3	1	Score
Total Number of Taxa	24	≥ 31	30-16	<16		≥ 26	25-14	<14	3	≥ 22	21-12	<12	
EPT Index	1	≥ 7	6-4	<4		≥ 4	3-2	<2	1	-	≥2	<2	
# Chironomid Taxa	6	≥9	8-5	<5		≥7	6-4	<4	3	≥7	6-4	<4	
% Contribution of Dominant Taxon	15	≤22	23-61	>61		≤29	30-64	>64	5	≤31	32-66	>66	
% Diptera	46	-	≤50	>50		-	≤37	>37	1	-	≤47	> 47	
Florida Index	2	≥ 16	15-8	<8		≥7	6-4	<4	1	≥ 8	7-4	<5	
% Suspension feeders/Filterers	0	≥ 12	11-6	<6		-	≥7	<7	1	-	≥7	<7	
Total Score		**Panhandle**				**Peninsula**			(15)	**Northeast**			
Interpretation of Score		**Excellent**			27-33	**Excellent**			26-32	**Excellent**			25-29
		Good			21-26	**Good**			20-25	**Good**			19-24
		Poor			14-20	**Poor**			13-19	**Poor**			13-18
		Severely Degraded			7-13	**Severely Degraded**			7-12	**Severely Degraded**			7-12

Lincoln Heights WWTP - Test Site

Summer Index Period: Stream Condition Index for Florida (SCI) (April 1996)													
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	**Panhandle**				**Peninsula**				**Northeast**			
		5	3	1	Score	5	3	1	Score	5	3	1	Score
Total Number of Taxa	30	≥ 31	30-16	<16		≥ 26	25-14	<14	5	≥ 22	21-12	<12	
EPT Index	1	≥ 7	6-4	<4		≥ 4	3-2	<2	1	-	≥2	<2	
# Chironomid Taxa	7	≥9	8-5	<5		≥7	6-4	<4	5	≥7	6-4	<4	
% Contribution of Dominant Taxon	29	≤22	23-61	>61		≤29	30-64	>64	5	≤31	32-66	>66	
% Diptera	38	-	≤50	>50		-	≤37	>37	1	-	≤47	> 47	
Florida Index	5	≥ 16	15-8	<8		≥7	6-4	<4	3	≥ 8	7-4	<5	
% Suspension feeders/Filterers	13	≥ 12	11-6	<6		-	≥7	<7	3	-	≥7	<7	
Total Score		**Panhandle**				**Peninsula**			(23)	**Northeast**			
Interpretation of Score		**Excellent**			27-33	**Excellent**			26-32	**Excellent**			25-29
		Good			21-26	**Good**			20-25	**Good**			19-24
		Poor			14-20	**Poor**			13-19	**Poor**			13-18
		Severely Degraded			7-13	**Severely Degraded**			7-12	**Severely Degraded**			7-12

Benthic macroinvertebrate taxa list for Lincoln Heights Wastewater Treatment Plant, collected via 20 discrete dip net sweeps in Smith Canal, on 18 August, 1997.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	4	102
Undetermined Amphipoda	-	8
Coleoptera		
Undetermined Curculionidae	1	-
Undetermined Noteridae	-	2
Decapoda		
Palaemonetes paludosus	-	1
Diptera		
Chironomus sp.	14	2
Corynoneura sp.	-	1
Corynoneura sp. C Epler	-	1
Dasyhelea sp.	4	15
Goeldichironomus amazonicus	-	2
Goeldichironomus holoprasinus	1	-
Goeldichironomus sp.	-	4
Palpomyia/Bezzia grp.	1	1
Parachironomus carinatus	1	-
Pericoma sp.	-	1
Polypedilum halterale grp.	15	3
Polypedilum illinoense grp.	7	1
Tabanus sp.	1	-
Tanypus carinatus	1	9
Tanytarsus sp.	-	4
Tanytarsus sp. F Epler	-	94
Undetermined Chironomidae	-	3
Undetermined Orthocladiinae	-	1
Ephemeroptera		
Caenis sp.	6	13
Gastropoda		
Hebetancylus excentricus	-	1
Micromenetus dilatatus	1	-
Undetermined Ancylidae	6	27
Planorbella sp.	2	-
Hemiptera		
Undetermined Veliidae	-	1
Hirundinea		
Gloiobdella elongata	-	1
Helobdella stagnalis	-	3
Lepidoptera		
Acentria sp.	-	4
Nemertina		
Prostoma rubrum	-	7

Odonata		
Ischnura sp.	4	-
Undetermined Coenagrionidae	-	6
Undetermined Odonata	1	3
Oligochaeta		
Aulodrilus pigueti	1	1
Dero botrytis	1	-
Dero lodeni	1	-
Dero pectinata	-	6
Dero sp.	8	3
Dero trifida	1	*1*
Limnodrilus hoffmeisteri	13	23
Pristina aequiseta	-	8
Pristina leidyi	-	2
Pristina sp.	1	1
Pristina synclites	1	2
Stylaria lacustris	-	1
Undetermined Oligochaeta	-	8
Turbellaria		
Dugesia sp.	1	-

Benthic macroinvertebrate taxa list for Lincoln Heights Wastewater Treatment Plant, collected via Hester-Dendy artificial substrates in Smith Canal, on 18 August, 1997. Densities, in number/m^2, represent the mean of three replicates.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	19	24
Coleoptera		
Hydrobius sp.	-	3
Suphisellus sp.	-	3
Diptera		
Chironomus sp.	164	8
Goeldichironomus holoprasinus	13	-
Goeldichironomus natans	3	-
Goeldichironomus sp.	8	-
Palpomyia/Bezzia grp.	3	-
Polypedilum halterale grp.	93	3
Polypedilum illinoense grp.	3	-
Tanytarsus limneticus	-	3
Undetermined Chironomidae	16	-
Ephemeroptera		
Caenis sp.	21	-
Gastropoda		
Hebetancylus excentricus	204	127
Micromenetus dilatatus	8	-
Micromenetus dilatatus avus	16	-
Planorbella sp.	3	-
Undetermined Ancylidae	63	13
Hirundinea		
Helobdella fusca	3	-
Helobdella stagnalis	-	13
Helobdella triserialis	8	-
Lepidoptera		
Undetermined Lepidoptera	-	3
Odonata		
Argia sp.	3	-
Macromia sp.	3	-
Oligochaeta		
Dero sp.	288	13
Dero botrytis	198	13
Dero trifida	16	3
Haber sp.	11	-
Haemonais waldvogeli	-	3
Limnodrilus hoffmeisteri	132	90
Pristina synclites	5	-
Slavina appendiculata	3	-

Turbellaria		
Dugesia sp.	-	5
Undetermined Planariidae	61	3
Undetermined Turbellaria	82	-

Phytoplankton taxa list and densities (#/mL) for Lincoln Heights Wastewater Treatment Plant, collected via subsurface grabs in Smith Canal on 18 August, 1997.

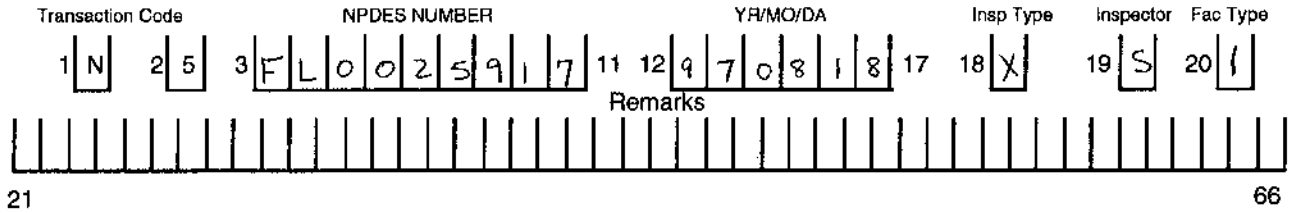
	Control Site	Test Site
Bacillariophyceae		
Cyclotella sp.	21	–
Diatomaceae	4	–
Eunotia sp.	8	–
Navicula sp.	4	–
Nitzschia sp.	29	–
Pennales	4	–
Chlorophyceae		
Chlamydomonas sp.	4	–
Chlorogonium sp.	–	64
Undetermined Chlorophyceae	50	–
Crucigenia sp.	4	–
Golenkinia sp.	4	3717
Oocystis sp.	4	–
Scenedesmus sp.	–	1826
Cryptophyceae		
Chroomonas sp.	4	–
Cryptomonas sp.	33	64
Undetermined Cryptophyceae	8	–
Cyanophyceae		
Dactylococcopsis sp.	4	–
Oscillatoria sp.	4	–
Euglenophyceae		
Euglena sp.	21	–
Lepocinclis sp.	29	–
Phacus sp.	4	–

Periphyton taxa list and densities (#/cm^2) for Lincoln Heights Wastewater Treatment Plant, collected via glass microscope slides in Smith Canal, on 18 August, 1997.

	Control Site	Test Site
Bacillariophyceae		
Achnanthes exigua	2445	101
Achnanthes hungarica	543	807
Achnanthes lanceolata	3531	403
Achnanthes sp.	–	101
Amphora sp.	–	101
Bacillaria paradoxa	–	101
Caloneis sp.	–	101
Cocconeis fluviatilis	–	101
Cocconeis placentula	1358	5646
Cyclotella sp.	272	–
Cymbella minuta	–	101
Diatomaceae	543	–
Eunotia curvata	543	101
Eunotia pectinalis minor	543	–
Eunotia sp.	3803	2823
Gomphonema angustatum	–	101
Gomphonema augur	543	–
Gomphonema grunowii	–	101
Gomphonema parvulum	543	302
Gomphonema sp.	815	101
Navicula capitata	272	–
Navicula confervacea	29067	–
Navicula cryptocephala	815	202
Navicula exigua	272	101
Navicula minima	1358	706
Navicula sp.	272	403
Nitzschia amphibia	543	202
Nitzschia gracilis	1087	–
Nitzschia palea	1358	302
Nitzschia sigma	543	–
Nitzschia sp.	1358	302
Pennales	–	907
Pinnularia biceps	272	–
Stauroneis phoenicenteron	–	101
Synedra ulna	272	–
Chlorophyceae		
Characium sp.	4346	–
Undetermined Chlorophyceae	1630	–
Cosmarium sp.	272	–
Dactylococcus sp.	272	–

Golenkinia sp.	–	12098
Mougeotia sp.	815	–
Oedogonium sp.	272	–
Oocystis sp.	543	–
Scenedesmus sp.	543	3730
Stigeoclonium sp.	2173	–
Ulothrix sp.	815	–
Chrysophyceae		
Chrysosphaerales sp.	–	101
Dinobryon sp.	272	–
Cryptophyceae		
Cryptomonas sp.	543	101
Cyanophyceae		
Anabaena sp.	1358	–
Anabaenopsis sp.	272	–
Chroococcus sp.	1087	–
Lyngbya sp.	1358	302
Oscillatoria sp.	5705	605
Spirulina sp.	–	101
Dinophyceae		
Peridinium sp.	–	101
Euglenophyceae		
Euglena sp.	–	101
Phacus sp.	–	101

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



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