

Biological Assessment of

City of Lake Butler Wastewater Treatment Plant

Union County

NPDES #FL0028428

Sampled September 1992

January 1993

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: City of Lake Butler Wastewater Treatment Plant
County: Union
NPDES Number: FL0028428
State Permit Expiration Date: 20 July 1993

Toxics Sampling Inspection (XSI)

Date Sampled: 14 September 1992

Results: Organic constituents detected in the sample were bis (2-ethylhexyl) phthalate at < 5 µg/L, and the tentative identification of aliphatic compounds at an estimated 120 µg/L. This level of phthalate esther may be cause for concern, as the ambient standard for Class III freshwaters is 3 µg/L. An unusually elevated concentration of silver (1.2 µg/L) was found in the effluent, considerably in excess of Class III standards. Silver has been found to be acutely toxic to invertebrates at 0.9 µg/L, and may be partly or entirely responsible for the *C. dubia* mortality.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 14 September 1992

Results: Acutely toxic to *Ceriodaphnia dubia*, killing all test organisms within 24 hours. This is a violation of 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. Not toxic to *Notropis leedsi*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 14 September 1992

Results: Benthic macroinvertebrate communities were severely degraded at the test site. Decreases in taxa richness, Florida Index, and the displacement of pollution sensitive species by organisms tolerant of organic and toxic wastes were evident downstream of the discharge. This is interpreted as a violation of 17-302.560 (29) FAC, imbalances in aquatic fauna. Phytoplankton populations exhibited evidence of nutrient enrichment, with community shifts favoring the strong dominance of blue-green algae. Biomass as chlorophyll *a* doubled at the test site, probably in response to higher bioavailable nutrients present.

Water Quality Inspection (WQI)

Date Sampled: 14 September 1992

Results: Nutrients were elevated at the test site, in direct response to high concentrations in the effluent. At the reference station, nitrogen and phosphorus containing compounds were mostly undetected or below quantitation limit. Algal growth potential values corresponded to the trend in nutrient levels at the study sites, increasing from 0.8 to 21.4 mg dry wt/L. The AGP measured at the test site was more than four times the enrichment "problem threshold". Total and fecal coliform bacteria exceeded Class III standards at both the reference and test sites, but not due to the wastewater facility.

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

Introduction

The Lake Butler Wastewater Treatment Plant serves the city of Lake Butler in Union County, Florida (see maps in Appendix). Processing of wastewater at this 0.5 MGD design flow facility consists of primary settling, biological treatment in six rotating contactors, followed by secondary settling, chlorination, and post-aeration (see diagram and facility summary in Appendix). Effluent travels from the dechlorination chamber, over a weir, to a discharge pipe that runs underground to Silver Run Creek. Silver Run Creek flows into Richard Creek, and ultimately to the New River, which is a tributary of the Santa Fe River (Outstanding Florida Water).

Numerous permit violations have been documented since January, 1990 (see list in Appendix). These violations included exceeding the allowed concentrations for several permit parameters, as well as negligence in reporting the required data. A list of enforcement actions by DER and EPA associated with these permit violations is also included in the Appendix. Additionally, the facility was to have initiated a monitoring plan for Silver Run and Richard Creeks in the vicinity of the discharge, with a program beginning no later than July, 1992. To date, no such plan has been submitted and no stream monitoring data have been reported.

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	30	13
Florida Index	23	1
% Contribution of Dominant Taxon	14.6	34.0
% Diptera	24.0	56.4
% Oligochaeta	6.3	19.2
% Gastropoda	1.0	20.5
% Coleoptera	16.7	1.9
% Trichoptera	12.5	0
% Odonata	9.4	0.6
% Ephemeroptera	8.3	0
% Other	21.8	1.4
% Predators	25.4	13.7
% Collector-Gatherers	29.2	43.9
% Collector-Filterers	24.2	0
% Scrapers	13.0	23.3
% Shredders	8.3	19.2
Phytoplankton Algae		
Number of Taxa	11	8
% Contribution of Dominant Taxon	45.2	41.2
Chlorophyll a (µg/L)	1.19	3.74
Diatom/Diatom + B-G Abundance Ratio	0.46	0.06
% Blue-green	48.4	85.3
% Green	9.7	8.8
% Diatoms	41.9	5.9
Algal Growth Potential (mg dry wt/l)	0.76	21.38

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 Silver Run Creek, approximately 150 ft upstream of the outfall) and a test site (the area down gradient of the discharge). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were in-

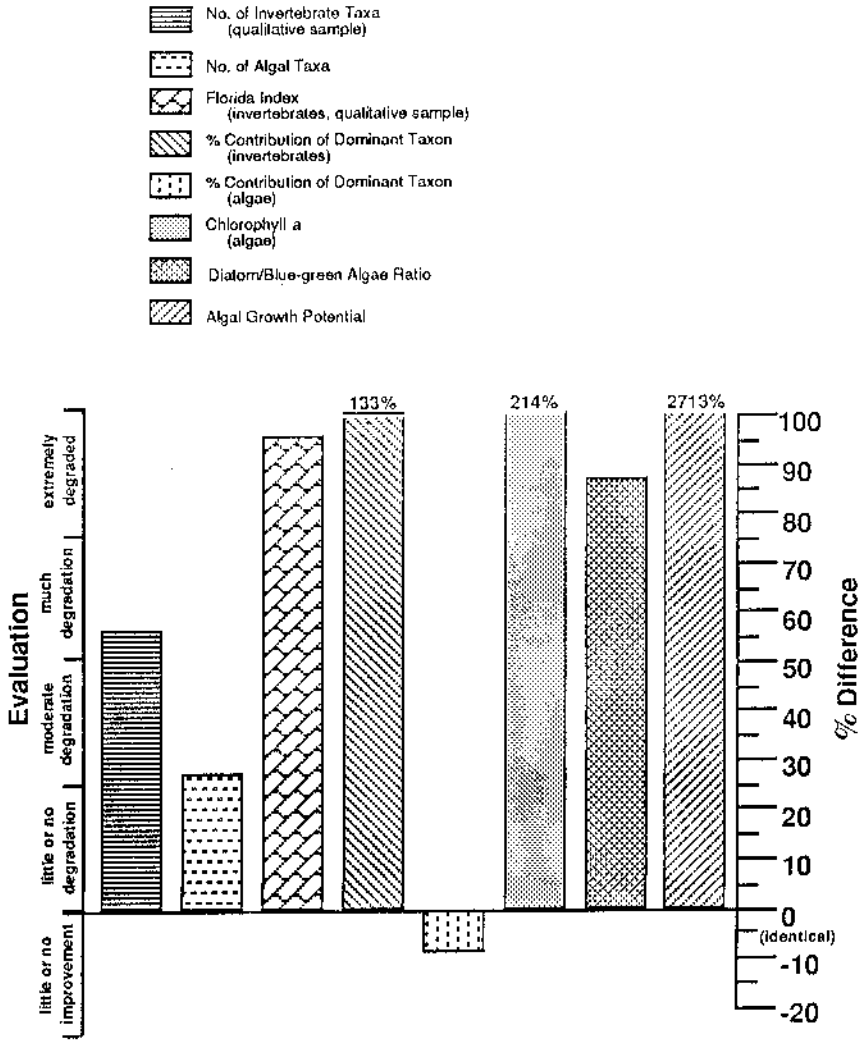
cubated for 28 days (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Phytoplankton populations were analyzed from samples taken via subsurface grabs. Chlorophyll *a* was also determined for periphyton and phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this report. Many of these, such as the number of taxa and chlorophyll *a* are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (for % composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (for functional feeding groups).

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

The following personnel were involved in this investigation: Scott Bulgrin (DER Northeast District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Kimberly Pearce, and Landon Ross (Tallahassee Biology Laboratory).



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

Results and Discussion

Habitat quality at the two study sites was nearly identical, with scores of 79 and 81 for reference and test sites, respectively (Appendix). Both areas had adequate substrate for macroinvertebrate colonization and establishment, and received maximum scores for bank stability and stream bank vegetation quality. Water velocity was higher than anticipated in the creek, probably due to frequent heavy rainfall during the preceding weeks. Neither stretch of Silver Run Creek was artificially channelized, and due to the stream's morphometry, limited scouring would be expected. There were, however, large amounts of debris present in the creek, presumably imported with the stormwater runoff. Some of these debris disturbed the artificial substrate samplers, a phenomenon which will be discussed later.

Many physical/chemical measurements at the study areas were quite similar (Appendix). Both sites were circum-neutral in pH, adequately oxygenated (6.8 mg/L and 6.7 mg/L at reference and test sites, respectively), and low in conductivity (58 µmho/cm at reference, 92 µmho/cm at test site). Surrounding land at each station was used for forestry, pasture, residential, commercial, and urban purposes. The test site, however, was further characterized by the presence of a sewage odor in the water and sediments, as well as an oily sheen in the water. These conditions were not observed at the reference site, and are probably related to the Lake Butler WWTP discharge.

Analysis of organic constituents in the effluent revealed the presence of bis (2-ethylhexyl) phthalate at < 5 µg/L. Although this is not an unequivocal measurement, the actual concentration could possibly exceed the Class III standard for phthalate esthers of 3 µg/L, which would be cause for concern. Aliphatic compounds were tentatively identified in the effluent at an estimated concentration of 120 µg/L. However, aliphatic and aromatic compounds were also tentatively identified in the blank, but at substantially lower estimated levels (2 and 1 µg/L, respectively). The following metals were detected in the effluent at concentrations above practical quantitation limits: aluminum (182 µg/L), calcium (42.3 mg/L), copper (13 µg/L), iron (295 µg/L), magnesium (10.2 mg/L), silver (1.2 µg/L), and zinc (18 µg/L). This level of silver is in violation of the Class III standard of 0.07 µg/L. Silver is known to be acutely toxic to *Daphnia magna* at 0.9 µg/L (EPA Ambient Criteria).

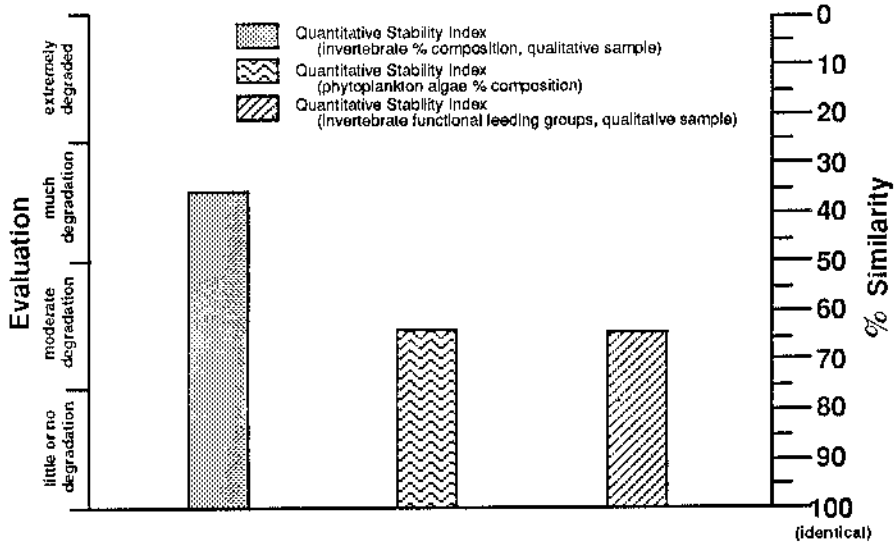
The sample of effluent was acutely toxic to the invertebrate, *Ceriodaphnia dubia* (Appendix). All test organisms were dead within 24 hours. This is a violation of 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. No mortality occurred during the 48 hour bioassay of the fish, *Notropis leedsi*.

A substantial increase in nutrient concentrations was observed downstream of the outfall compared to the reference site. STORET data from 1617 Florida stream stations, for the period of 1980 to 1989, have been compiled into a percent distribution, found in the Appendix (Joe Hand, personal communication). Data from this present investigation were evaluated against these values. Test site concentrations of total phosphorus, ortho phosphate, TKN, and NO_2NO_3 were higher than 81%, 68%, 87%, and 80%, respectively, of all representative streams in the state. While the level of NH_3 was elevated at the station downstream of the discharge, it was higher than that of the effluent; this may have been related to the decomposition of other effluent nitrogen compounds. At the reference site, all nutrient values except for TKN were undetected or below the practical quantitation limit.

Algal growth potential (AGP) corresponded to the nutrient levels, and increased from the reference site to the test site by 2713%. The 21.4 mg dry wt/L measured at the test site was more than four times the "problem threshold" of 5 mg dry wt/L. According to Raschke and Schultz (1987) detrimental enrichment effects such as nuisance algal growth, D.O. sags, and fish kills, are likely to occur when AGP rises above this level. Algal growth potential of the discharge was 30 mg dry wt/L.

Populations of total and fecal coliform bacteria were above ambient standards at both of the study sites (see chemistry summary table). Fecal coliforms at the test site were ten times higher than that of the reference station. Total and fecal coliform bacteria were low in the effluent, 700 and 80 organisms/100 mL, respectively.

All measures of macroinvertebrate community health collected by dip net sweeps indicated severe degradation at the downstream station. Dip net data were used in this assessment due to disturbance of the Hester-Dendy samplers. Several individual multiplate samplers were missing at both study sites, probably damaged and washed away by moving branches and other debris. The figure on p. 2 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the control.



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

Species richness was reduced by 57%, accompanied by substantially greater percent contribution of dominant taxon. Perhaps the most important symptom of stressed conditions was the huge decline in the Florida Index score, from 23 at the reference site to 1 below the outfall. Several macroinvertebrate groups which are considered pollution sensitive were eliminated at the test site, including ephemeropterans, trichopterans, and four genera of odonates (see taxa list in Appendix). The test site was dominated by *Polypedilum illinoense*, which is known to be tolerant of sewage and toxic wastes (Hudson *et al.* 1990). Two other organisms that are commonly found in organically enriched conditions were sub-dominant at the downstream site, *Chironomus* sp. and the oligochaete, *Limnodrilus hoffmeisteri.*

The figure on this page summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. The QSI (for percent composition) further emphasizes the observed differences in macroinvertebrate community structure. Furthermore, an entire trophic group (collector-filterers) was completely eliminated from the test site, as reflected in the QSI (for functional feeding groups). These negative effects on macroinvertebrate communities are interpreted as being a violation of 17-302.560 (29) FAC, imbalances in aquatic fauna.

In addition to the Hester-Dendys, periphytometers were also adversely affected by the heavy rains during the 28 day incubation period. Almost no algae were recovered, which is highly unusual. Instead, the material scraped from the microscope slides consisted almost exclusively of filamentous bacteria. For this reason, the phytoplankton assemblage will be used for this assessment, though it is usually not the target algal population in flowing systems.

Taxa richness was generally low at both study sites, although it was slightly reduced below the discharge. Phytoplankton populations were very strongly dominated by blue-green algae at the test site. Although cyanophytes were also most numerous at the reference station, diatoms constituted 42% of the algal assemblage. The reduced diatom to blue-green ratio at the test site further emphasized these differences in community structure. While algal biomass was relatively low at both stations, chlorophyll *a* was 214% higher at the test site. This trend, like the algal growth potential test results, may be associated with higher nutrient levels below the outfall.

Conclusions

The sample of effluent collected from the City of Lake Butler Wastewater Treatment Plant was acutely toxic to *Ceriodaphnia dubia*, killing all test organisms in 24 hours. This is a violation of 17-302.510(5)(p) FAC, 17-302.500(1)(d) FAC, and 17-4.244(3)(a) FAC. No mortality occurred in a 48 hour bioassay using the bannerfin shiner, *Notropis leedsi.*

Some organic constituents were detected in the sample: bis (2-ethylhexyl) phthalate at < 5 µg/L, and the tentative identification of aliphatic compounds at 120 µg/L (estimated). This level of phthalate esther may be cause for concern, as the ambient standard for Class III freshwaters is 3 µg/L.

An unusually elevated concentration of silver (1.2 µg/L) was found in the effluent, considerably in excess of Class III standards. Silver has been found to be acutely toxic to invertebrates at 0.9 µg/L, and may be partly or entirely responsible for the C. dubia mortality.

The facility was responsible for the great increase of nutrients found

at the test site, since nutrients were mostly undetected or below quantitation limits at the reference station. Concentrations of total phosphate, TKN, NO_2NO_3, and ammonia were all greater than 80% of typical Florida streams at the test site, while the ortho phosphorus level there exceeded 68%. Algal growth potential values corresponded to the trend in nutrient levels, increasing from 0.8 mg dry wt/L at the reference site to 21.4 mg dry wt/L at the test site. The AGP measured at the test site was more than four times the enrichment "problem threshold".

Populations of total and fecal coliform bacteria were well above ambient standards at both of the study sites, with fecal coliforms at the test site ten times higher. Total and fecal coliform bacteria were low in the effluent, 700 and 80 organisms/100 mL, respectively.

Benthic macroinvertebrate communities collected via dip net sweeps were severely stressed downstream of the discharge. Taxa richness was reduced by 57%, and Florida Index score plunged from 23 to 1. Pollution sensitive individuals and groups were virtually eliminated at the test site, which was dominated by organisms known to be tolerant to organic wastes, such as *Polypedilum illinoense*, *Chironomus* sp., and *Limnodrilus hoffmeisteri*. This is interpreted as a violation of 17-302.560 (29) FAC, imbalances in aquatic fauna.

Phytoplankton populations exhibited symptoms of enrichment, with the test site strongly dominated by blue-green algae, displacing the diatom fraction. Although chlorophyll *a* was relatively low at both study areas (as would be expected in a flowing system), the increase below the outfall may be associated with elevated nutrient concentrations.

Literature Cited

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

Aquatic Toxicity Information Retrieval Data Base (AQUIRE). 1991. U.S. EPA Environmental Research Laboratory, Duluth, Mn.

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.

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.

Chemistry summary table for

Lake Butler STP	Effluent	Reference Site	Test Site
Organic Constituents (ug/L)			
Bis (2-ethylhexyl) phthalate	5.0 K		
Tentative ID and estimated conc.:			
aliphatics*	120		
Chlorpyrifos	0.04 T		
Metals (ug/L)			
Aluminum	182		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.08 U		
Calcium (mg/L)	42.3		
Copper	13		
Chromium	10 U		
Iron	295		
Lead	15 U		
Magnesium (mg/L)	10.2		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	1.2 A		
Zinc	18		
Nutrients (mg/L)			
Ortho-phosphate	2.0	0.025 T	0.25
Total phosphorus	2.0	0.030 T	0.43
Ammonia	0.11 A	0.034 T	0.63
Nitrate+Nitrite	5.8	0.02 U	0.32
TKN	1.8	0.79	1.8
Other Parameters			
Habitat Assessment		79	81
D.O. (mg/L)	8.8	6.8	6.7
pH (SU's)	7.3	6.7	7.0
Conductivity (µmhos/cm)	390	58	92
Temperature (°C)		26.0	25.0
Hardness (mg CaCO3)	144		
TSS (mg/L)	12 A	15 A	16 A
BOD5 (mg/L)	5 A	1.8 A	6.2 A
Bioassay Fish-Dechlorinated	Not toxic		
Bioassay Invertebrate-Dechlorinated	24 hr LC50<100%		
Fecal coliform (org/100 ml)	80	5,000	≥160,000
Total coliform (org/100 ml)	700	50,000	≥160,000

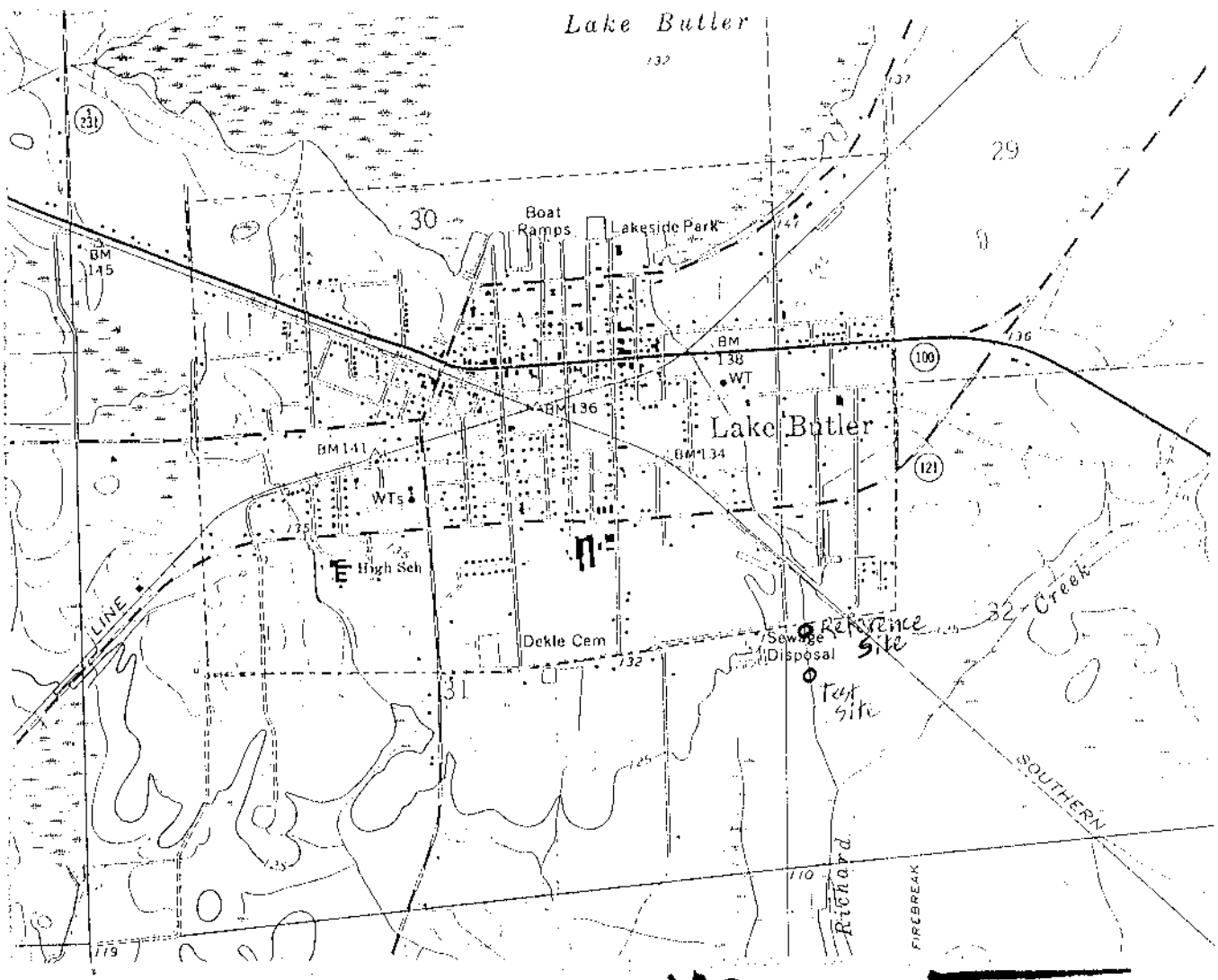
A - Value reported is the mean of two or more determinations

K - Actual value is known to be less than value given

T - Value reported is less than the practical quantitation limit

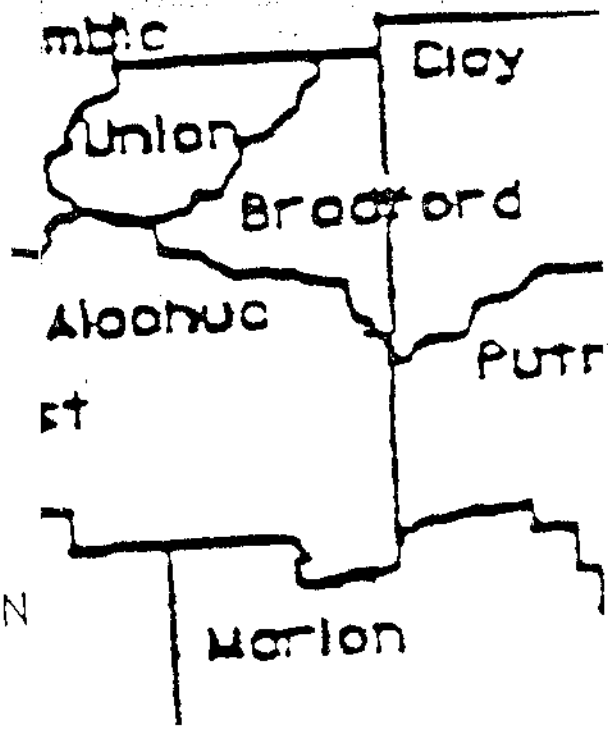
U - Material analyzed for but not detected; value reported is the minimum detection limit

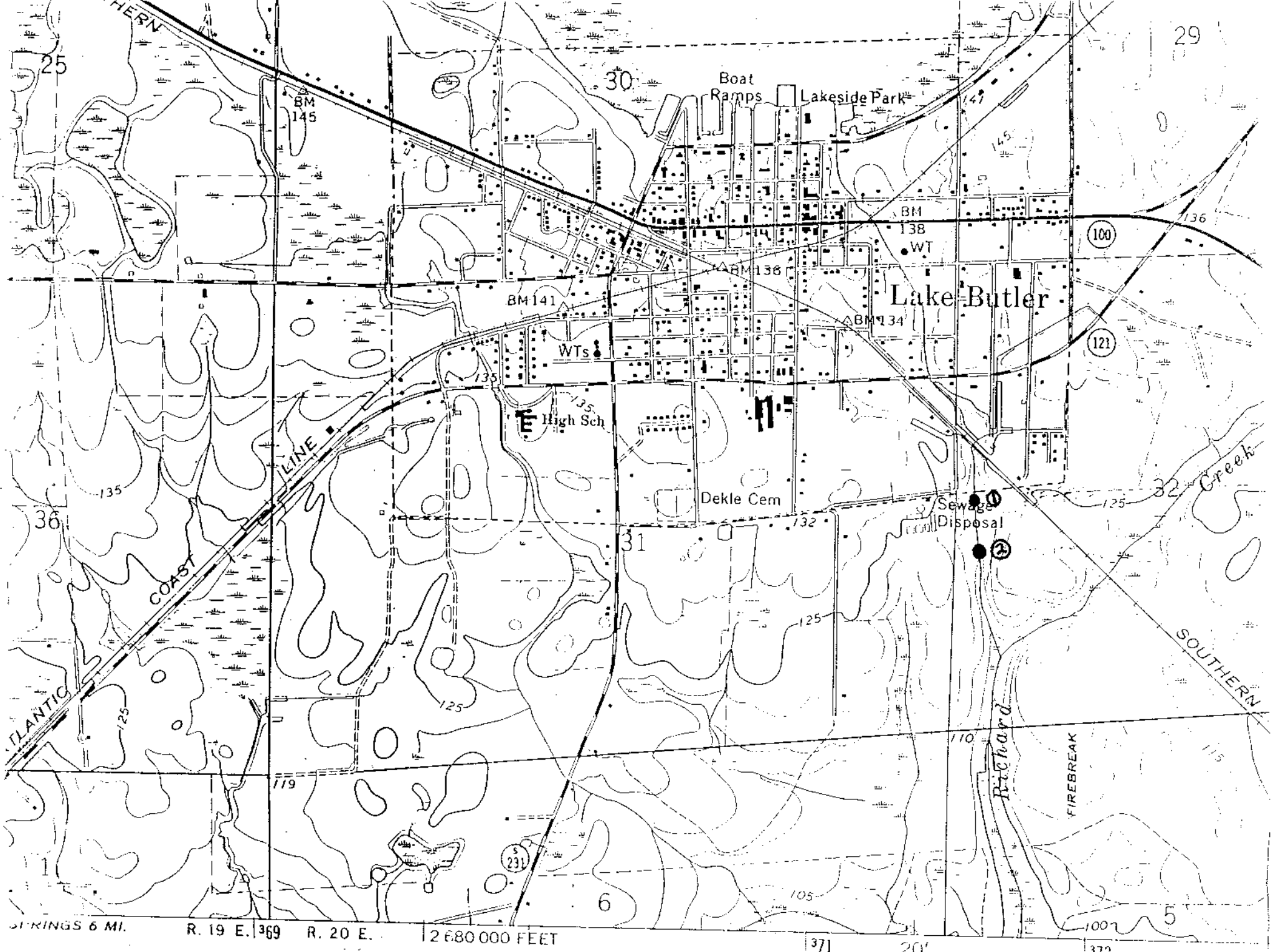
*Blank contained tentative ID of aliphatics and aromatics at estimated concentrations of 2 and 1 µg/L, respectively.



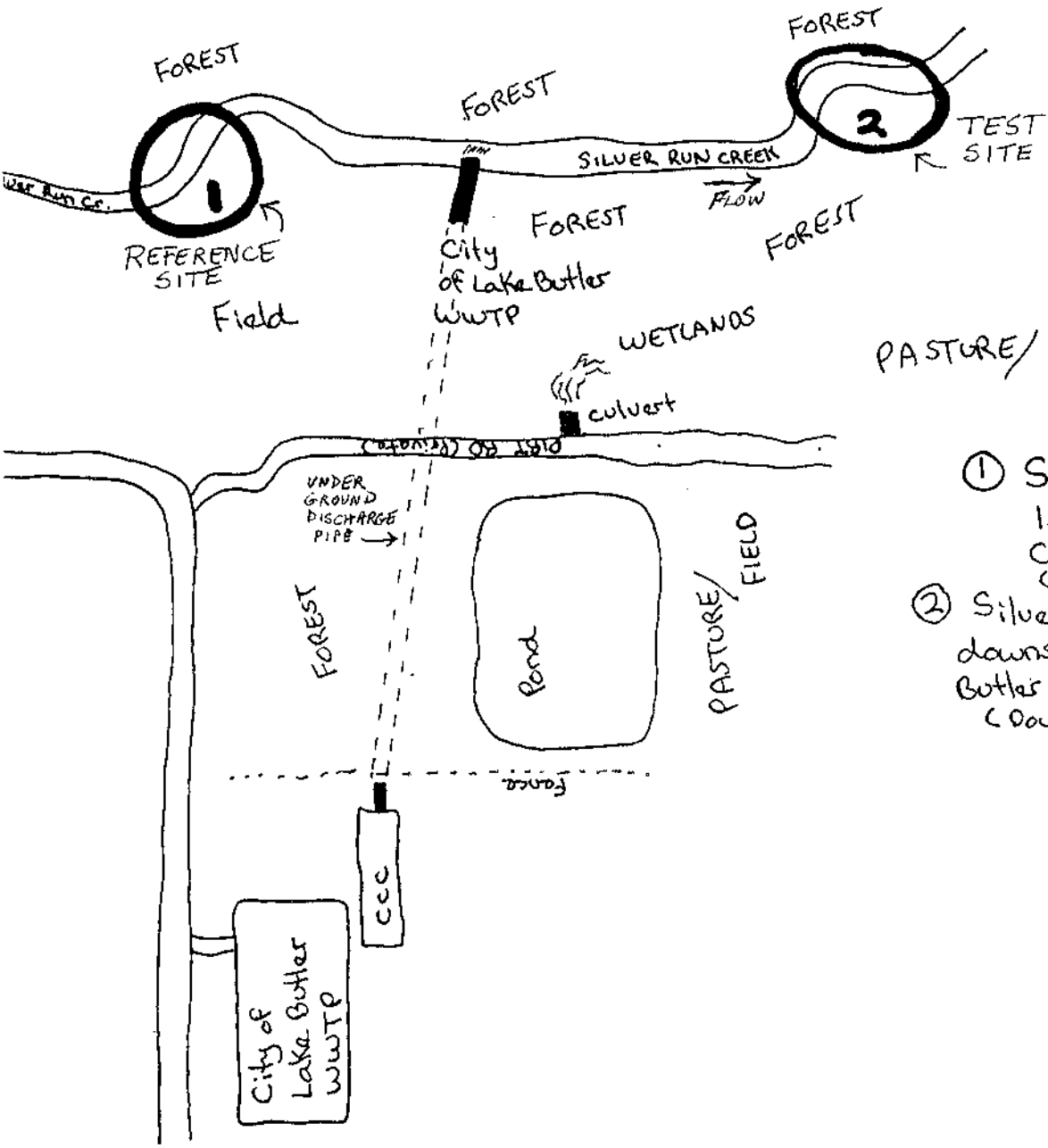


QUADRANGLE LOCATION





published by the Geological Survey



① Silver Run Creek, 150 Ft upstream of City of Lake Butler WWTF (upstream site)

② Silver Run Creek, 200 ft downstream of City of Lake Butler WWTP (Downstream site)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: Lake Butler, City of		Date Summary Prepared: 10/16/92
Location (attach detailed map): SE 11th Street Lake Butler, FL 32054	County: Union	District: FL DER Northeast District
Federal Permit # FL0025429 and expiration date: expires 30 Jun 1996	State GMS # and 3163M01817 State expiration date: expires DO63-148674 20 Jul 1993	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility: Facility is a 0.5 mgd (design flow) rotating biological contact (RBC) wastewater treatment plant serving the City of Lake Butler, FL.

Description of treatment process: Treatment consists of primary settling, biological treatment in six(6) rotating biological contactors (RBCs) followed by secondary settling, chlorination and post aeration.
See Figure 1.

Receiving waters: Silver Run Creek to Richard Creek to New River	Classification: I II (III)	
Design Flow: 0.500 MGD	Mean Flow: .404 MGD	Flow during survey: 580,000 GPD

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

therefore, the best time to sample is: Anytime

If facility has a mixing zone, give details (size, parameters affected, etc.):

Facility has no mixing zone.

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

Parameter	Limit (units)
See attached sheets	
A. State Permit	
B. NPDES	

Describe special permit conditions and permit modifications:

NPDES Chronic Whole Water Toxicity.
A 96-hour acute static toxicity tests using Ceriodaphnia dubia and Notropis leadsi has been put in the permit.

Lake Butler, City of
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s): Effluent from the City of Lake Butler WWTP exits the dechlorination chamber over a weir to the discharge pipe which runs underground east to Silver Run Creek.

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

- See attached list of permit violations obtained from MOR data sheets and occurring from 1/90 to 5/92. (Attachment C).
- No accurate measure of flow recorded several times in 1991 due to mechanical difficulties with flow meter.
- No record of Total Residual Chlorine (TRC) content of effluent being measured after dechlorination as required by FAC Rule 17-3.121(10) effective 07/20/90.

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

No previous impact bioassessments or WQBEL's available.

Previous and/or current enforcement actions are listed on attached (Attachment D).

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set: Reviewing the MOR data with DER results, one can find that the data set is improving slightly but the City of Lake Butler WWTP still has some problems with MOR sheets and what is required. The facility has also had some problems with toxicity, chronic and acute.

Additional information: The permit states "The Permittee shall initiate regular monitoring of the segment of the Silver Run Creek and Richard Creek near the outfall for maintaining data on the impact of the discharge on the water quality of the river." A monitoring plan was supposed to be in place by May 16, 1992 and the Program was to begin by July 16, 1992. Reviewing the files the City of Lake Butler WWTP has not submitted any stream monitering data.

Staff contributing to this review (signature):

SCOTT Bulgin Scott Bulgin (Biologist)

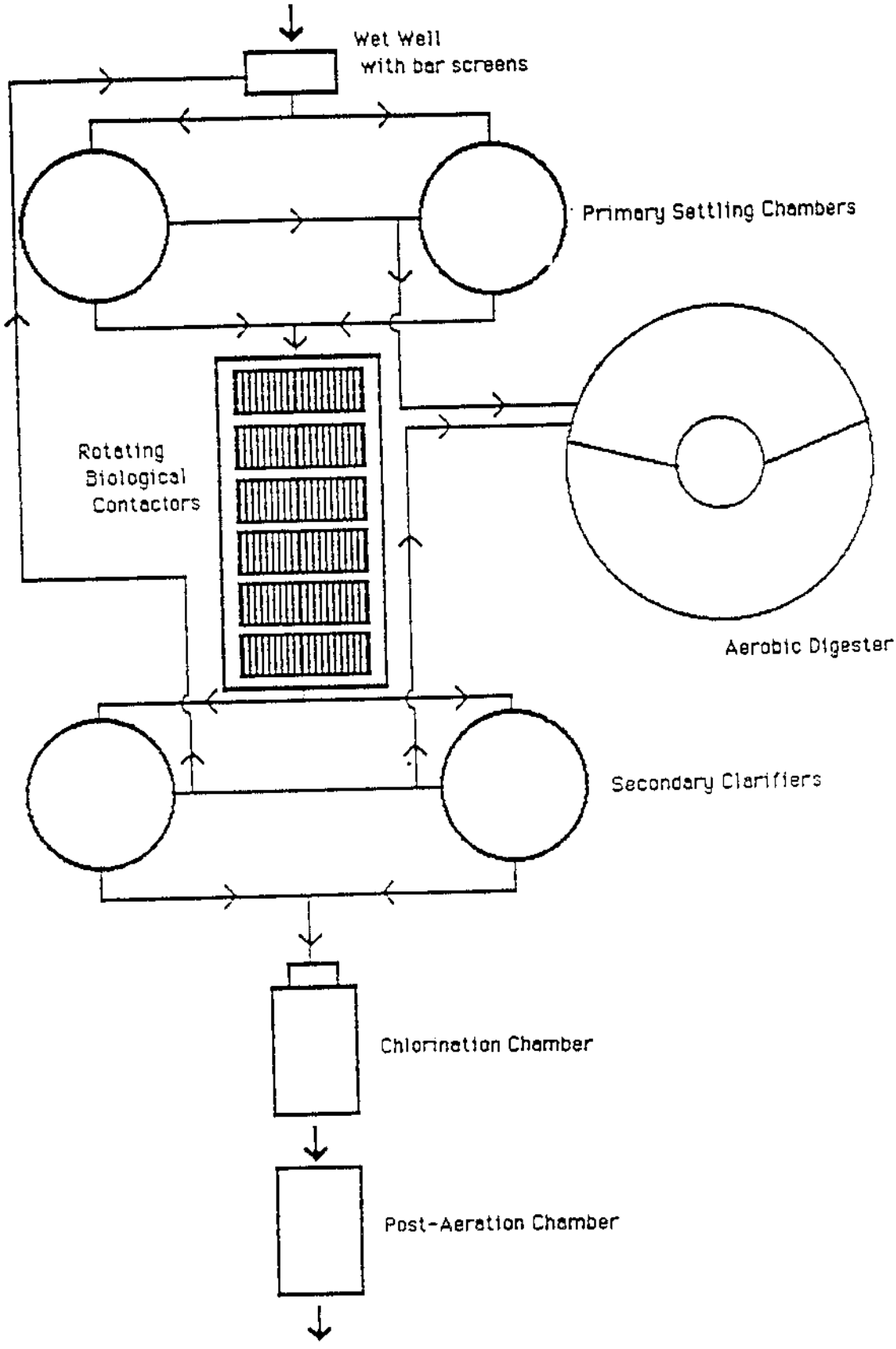
Lindy Payne Lindy Payne ESI [redacted] (Engineer)

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FIGURE 1: FLOW DIAGRAM, LAKE BUTLER WWTP



PERMITTEE:

City of Lake Butler WWTP

I.D. Number: 3163M01817
Permit Number: DO63-148674
Date of Issue: July 20, 1988
Expiration Date: July 20, 1993

12. The monitoring requirements and effluent limitations for this plant are as follows:

PARAMETER	ANNUAL AVERAGE	MINIMUM FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION
Flow (mgd)	0.500	Daily, 5/week	Flow Meter & Totalizer	Influent
*BOD_5 (mg/l)	10	Weekly	** 8-hour Composite	Influent and Effluent
*TSS (mg/l)	10	Weekly	8-hour Composite	Influent and Effluent
Org. N_2 ON (mg/l)	3	Every Two Weeks	8-hour Composite	Effluent
Ammonia N_2 NH_3-N (mg/l)	2	Every Two Weeks	8-hour Composite	Effluent
pH Units	6.0 - 8.5	Daily, 5/week	Grab	Effluent
Chlorine Residual(mg/l)	0.5 Minimum	Daily, 5/week	Grab	Effluent
Fecal Coliform no./100 (ml)	200	Monthly	Grab	Effluent
Dissolved Oxygen (mg/l)	6.0 Minimum	Daily, 5/week	Grab	Effluent

* or 90% removal, whichever is more stringent.

** Flow proportioned

	ANNUAL	MONTHLY	WEEKLY	ONE TIME MAXIMUM
BOD_5	10	12.5**	15**	20**
TSS	10	12.5**	15**	20**

** Rule 17-6.180

13. By July 20, 1990, the permittee shall complete and have in operation dechlorination facilities which reduce the total residual chlorine (TRC) content of the effluent to 0.01 mg/l or less, as required by FAC Rule 17-3.121(10). This limit which is necessary to prevent toxic effects from chlorine in the receiving waters does not provide for a zone of mixing for TRC in the receiving waters. The permittee may apply for a mixing zone for TRC if the permittee determines such to be a benefit. If a mixing zone is granted by the Department, the permittee may request a modification of the above effluent limit for TRC. The Department's mixing zone regulations are contained in FAC Rule 17-4.244.

The permittee shall also comply with all TRC effluent limits and dechlorination requirements contained in any EPA National Pollutant Discharge Elimination (NPDES) permit for the facility.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL

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

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

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS		
	Annual Average	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type	Sampling Point
Flow, MGD	Report	Report	Report	---	5/Week	Representative	Effluent
Biochemical Oxygen Demand (5-Day), mg/l	10.0	10.0	12.0	20.0	1/Week	8-hr. Comp.	Effluent
Total Suspended Solids, mg/l	10.0	12.5	15.0	20.0	1/Week	8-hr. Comp.	Effluent
Total Kjeldahl Nitrogen (as N), mg/l	---	5.0	6.0	---	1/Week	8-hr. Comp.	Effluent
Organic Nitrogen (as N), mg/l	3.0	---	---	---	1/Week	8-hr. Comp.	Effluent
Ammonia Nitrogen (as N), mg/l	2.0	2.0	2.4	---	1/Week	8-hr. Comp.	Effluent
Total Residual Chlorine, mg/l*	---	---	---	0.01	1/Week	Grab	Effluent
Fecal Coliform Bacteria, N/100 ml	See Item 3 on Pg. I-2.				1/Week	Grab	Effluent
Dissolved Oxygen, mg/l	See Item 4 on Pg. I-2.				5/Week	Grab	Effluent
pH shall not be less than 6.0 nor greater than 8.5 std. units.					5/Week	Grab	Effluent
Chronic Whole Effluent Toxicity	See Item 10 on Pg. I-3.				See Part IV	24-hr. Comp.	Effluent

*See Pg. I-2, Item 2. for additional requirements.

PREVIOUS AND CURRENT; Enforcement Actions

FL DER Enforcement Actions

23 April 1991 Warning Notice issued concerning numerous effluent limitation violations.

12 Dec 1991 OGC Consent Order No. 91-1918 issued.

2 April 1992 Modified Consent Order No. 91-1918 reissued.

15 April 1992 Consent Order 91-1918 settled. City of Lake Butler WWTP payed fine of $11,337.

USEPA Enforcement Actions

12 June 1990 USEPA Notice of Violation issued documenting numerous NPDES violations occurring from October, 1988 to March, 1990.

31 May 1990 NPDES Permit expired. Discharged without an effective permit from June 1990 to 31 July 1991.

24 Sept 1991 Administrative Complaint filed, Docket # CWA-IV 91-558, for operating without a permit and violating final effluent limits as specified in permit.

13 Nov 1991 USEPA issued Administrative Order # 92-028 for violation of Section 301 of the US Clean Water Act.

12 March 1992 USEPA issued a Consent agreement and Order Assessing Administrative Penalties for violations listed in Administrative Complaint #CWA-IV 91-558.

List of Permit Violations for Lake Butler STP, 1/90 to 5/92.

Parameter	MOR Data	Permit Limit	Date of Violation
BOD_5 (mg/L)	16 mg/L	15 mg/L weekly	3-21-90
	15 mg/L	12.5 mg/L monthly	4-90
	16 mg/L	15 mg/L weekly	5-2-90
	16 mg/L	15 mg/L weekly	4-2-91
	not reported	to be reported weekly	5-28-91
	18 mg/L	15 mg/L weekly	6-5-91
	not reported	to be reported weekly	7-29-91
	not reported	to be reported weekly	10-28-91
	13.5 mg/L	12.5 mg/L monthly	2-92
	21 mg/L	15 mg/L weekly	3-27-92
TSS (mg/L)	11.9 mg/L	10 mg/L annual avg.	1-90 to 12-90
	13.7 mg/L	10 mg/L annual avg.	1-91 to 12-91
	not reported	to be reported bi-weekly	7-29-91
	15.6 mg/L	12.5 mg/L monthly	2-92
	14 mg/L	12.5 mg/L monthly	3-92
NH_3 (mg/L)	3.7 mg/L	2 mg/L annual avg.	1-90 to 12-90
	2.4 mg/L	2 mg/L annual avg.	1-91 to 12-91
Organic N (mg/L)	3.5 mg/L	3 mg/L annual avg.	1-90 to 12-90
	3.3 mg/L	3 mg/L annual avg.	1-91 to 12-91
Fecal Coliform (#/100 mL)	> 800	200/100 mL monthly	8-90
	450 avg.	200/100 mL monthly	11-90
	533 avg.	200/100 mL monthly	6-91
Chlorine Residual (mg/L)	.4 mg/L	.5 mg/L daily min.	28 occasions from 1-7-90 to 7-3-90

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

SUBMITTING AGENCY CODE: 8C31	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
SUBMITTING AGENCY NAME: [illegible]		09/15/12	

REMARKS: [illegible]	LOCATION: Silver Run Creek [illegible] upstream of City of Lake [illegible] WWTP	FIELD ID/NAME: (UPSTREAM)

Habitat Parameter score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 23	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 21	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 15	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 5	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 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** 79

COMMENTS: water high due to [illegible] runoff [illegible] water color / high for [illegible]

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/15/12	SCOTT BUGGRIN	Scott Buggrin

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 09/15/92	RECEIVING BODY OF WATER:

REMARKS: Silver Run Creek used for Recreation. Pasture Area nearby. Cows in area.	LOCATION: Silver Run Creek, 200 ft downstream of City of Live Oak WWTP	FIELD ID/NAME:

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 22	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 24	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 15	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 5	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 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** 81

COMMENTS: WATER High due to heavy rain. Lots of trash in creek with flow [illegible] due to runoff and flow under velocity high for event.

ANALYSIS DATE: 09/15/92	ANALYST: SCOTT BURGIN	SIGNATURE: Scott Burgin

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: EC 31 / SUBMITTING AGENCY NAME: FL Dept of Environmental Protection	STORET STATION NUMBER:	DATE (M/D/Y): 9/14/92	TIME: 13:15	RECEIVING BODY OF WATER: Silver Run Creek

REMARKS: High water and high flow due to heavy rainfall. Trash and debris in creek.	LOCATION: Silver Run Creek 150 ft upstream of City of Lake Butler WWTP	FIELD ID/NAME: Cypress Plantation

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category): City of Lake Butler

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
30	30		10	10		20

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

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

Point-Source Pollution (list location and describe): Field/Pasture Runoff

Estimated System Width (range, m): 2-3	Estimated System Depth (range, m): 0.6-1	yes
High Water Mark (m above bed): 1-3	Velocity (range, m/s): 0.25-0.3	Impounded ☐ Channelized ☐

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	25	5	DRNET	Rock or Shell Rubble			
Leaf Packs	15	5	DRNET	Sand	25	2	
Aquatic Vegetation				Mud/Muck	5	1	
Submerged Roots				Other: Root Mat	10	2	
Undercut Banks	20	5	DRNET	Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m)
Top	26.0	6.8	6.68	58				
Mid-depth	26.0	6.8	6.68	58				0.5
Bottom	26.0	6.8	6.68	58				

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

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

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

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

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

Weather Conditions: Sunny, 82°

Cows from pasture in creek, Runoff from Rain heavy

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/14/92	SCOTT BERGRIN	Scott Bergrin

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 3)

SUBMITTING AGENCY CODE: EC31	STORET STATION NUMBER:	DATE (M/D/Y): 09/14/92	TIME: 11	RECEIVING BODY OF WATER:
SUBMITTING AGENCY NAME: FL DEP				

REMARKS: High water over high flow due to heavy rainfall. Lots of debris in creek	LOCATION: Silver Run Creek downstream of City of Cocoa Butler WWTP	FIELD ID/NAME:

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
30	30		10	10		20

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

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

Point-Source Pollution (list location and describe): City of Cocoa Butler WWTP

Estimated System Width (range, m): 2-3	Estimated System Depth (range, m): 0.6-1	yes
High Water Mark (m above bed): 1-3	Velocity (range, m/s): 0.33-0.4	Impounded ☐ Channelized ☐

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	25	7	D-NET	Rock or Shell Rubble			
Leaf Packs	5	1	D-NET	Sand	25	2	
Aquatic Vegetation				Mud/Muck	5	1	
Submerged Roots				Other: Root Mass	10	2	
Undercut Banks	30	7	D-NET	Other:			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):	pH (SU):	Cond. (µmho/cm):				Secchi (m)
Top	25	6.7	6.95	92				
Mid-depth	25	6.7	6.95	92				0.6
Bottom	25	6.7	6.95	92				

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

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

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

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

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

Weather Conditions: Sunny, 82°

Cows From Pasture in Area Runoff From Rain, Heavy

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
09/14/92	SCOTT BURGRIN	Scott Burgrin

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: LAKE BUTLER WWTP
Address/City: _____
County: UNION
Contact/District: SCOTT BULGRIN NE
NPDES Permit #: FL00 28428 Outfall #: _____

Sample Collection: Date 9-14-92 Time 1040
Test Beginning: Date 9-15-92 Time 1250
Test Ending: Date 9/16/92 Time 1330
Test Organism: C. DUBIA
Life Stage/Age: < 24 HRS

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

41055 92-SEP-15-28
entered 9/18

Remarks:
test terminated at 24 HOURS

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.0; 10.10	8.6 @ 23.5°C	23.5 @ 23.7°C	961 @ 1650 @ 23.1
24 hr	7.0; 10.10	8.5 @ 24°C	24.0 @ 24.1°C	979 @ 1685 @ 24.0
48 hr				

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	A	5	5		8.3	8.3		23.2	24.0		8.7	9.0		166	172	
control	B	5	5			8.3						9.0				
control	C	5	5			8.3						9.0				
control	D	5	5			8.3						9.0				
100%	A	5	0	–	7.3	8.3		22.7	24.0		8.8	9.1		390	405	
100%	B	5	0	–		8.4						9.1				
100%	C	5	0	–		8.3						9.1				
100%	D	5	0	–		8.4						9.1				
Measured/Loaded by:		KP	MF		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		MF	MF		KP	KP		KP	KP		KP	KP		KP	KP	

Investigators' Signatures
Kim Pearce
Marshall Faircloth
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			< 0.05 not measured		SB KP
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	Hach	MF
Alkalinity:	121	73	109	Hach	LM
Hardness:	123	82	144	Hach	LM
Total Ammonia:	0.0	0.0	0.7	Hach	MF

Ammonia Meter Slope: _____ Ammonia Blank: _____ Salinity Sample: _____ ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: LAKE BUTLER WWTP
Address/City:
County: UNION
Contact/District: SCOTT BULGRIN NE
NPDES Permit #: FL00 28428 Outfall #:

Sample Collection: Date 9-14-92 Time 1040
Test Beginning: Date 9-15-92 Time 1250
Test Ending: Date 9-17-92 Time 1330
Test Organism: N. LEEDSI
Life Stage/Age: 11 days

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

41055 92-SEP-15-28
entered 9/18

Remarks:

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7.0, 7.1, 10.0, 10.1	8.6 @ 23.5°C	23.5 @ 23.7°C	961 @ 23.1
24 hr	7.0, 7.1, 10.0, 10.1	8.5 @ 24°C	24.0 @ 24.1°C	979 @ 24.0
48 hr	7.0, 7.1, 10.0, 10.1	8.5 @ 24.0°C	23.6 @ 23.1°C	985 @ 23.7

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	46	5	5	5	7.9	8.3	8.4	23.3	23.4	23.0	8.5	9.0	8.3			
control	73	5	5	5	7.9	8.3	8.4				8.5	9.0	8.3	245	243	244
100%	19	5	5	5	7.2	7.8	7.9	22.1	23.3	23.0	8.8	8.4	8.0			
100%	190	5	5	5	7.2	7.8	7.9				8.8	8.4	8.0	400	411	415
Measured/Loaded by:		MF	KP	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF	KP	KP	MF

Investigators' Signatures

Kim Pearce
Marshall Faircloth
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample (LO.05)	Method	Measured by (SB)
Field Tot. Resid. Cl2:			not measured		KP mis-read field sheet
Lab Tot. Resid. Cl2:	0.0	0.0	0.0	Hach	MF
Alkalinity:	121	73	109	Hach	CM
Hardness:	123	82	144	Hach	LM
Total Ammonia:	0.0	0.0	0.7	Hach	MF

Ammonia Meter Slope: _____
Ammonia Blank: _____
Salinity Sample: _____ ppt

Typical Values for Selected Parameters in Florida Waters

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

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

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

Macroinvertebrate taxa list for Lake Butler STP, collected on 15 September, 1992 via discrete dip net sweeps in Silver Run Creek, Union County.

	Reference Site	Test Site
Coleoptera		
Macronychus glabratus	–	24
Microcylloepus pusillus	16	–
Stenelmis sp.	112	48
Diptera		
Chironomus sp.	–	480
Conchapelopia sp.	8	–
Cryptochironomus sp.	–	24
Endochironomus nigricans	8	–
Hemerodromia sp.	16	–
Polypedilum convictum grp.	56	–
P. illinoense	40	1272
P. scalaenum	16	–
Parametriocnemus sp.	8	–
Paratanytarsus sp.	–	24
Pseudorthocladius sp.	–	24
Rheocricotopus robacki	8	–
Stenochironomus sp.	24	–
Undetermined dipteran pupa	–	288
Ephemeroptera		
Acerpenna pygmaeus	16	–
Stenonema exiguum	32	–
Undetermined leptophlebiid	16	–
Gastropoda		
Physella sp.	–	768
Undetermined hydrobiid	8	–
Hemiptera		
Rhagovelia sp.	16	–
Malacostraca		
Lirceus sp.	8	48
Procambarus sp.	16	–
Megaloptera		
Corydalus cornutus	32	–
Odonata		
Argia sp.	32	–
Boyeria vinosa	8	–
Calopteryx sp.	16	–
Ischnura sp.	8	24
Macromia taeniolata	8	–
Oligochaeta		
Eclipidrilus sp.	8	–
Limnodrilus hoffmeisteri	–	552
Undetermined enchytraeid	40	168

Pelecypoda		
Corbicula manilensis	96	–
Trichoptera		
Cheumatopsyche sp.	40	–
Chimarra sp.	48	–
Hydropsyche decalda	8	–

Periphyton taxa list for Lake Butler STP, collected 10 October, 1992 on glass microscope slides in Silver Run Creek, Union County.

	Reference Site	Test Site
Diatoms		
Achnanthes sp.	1.4	–
Cocconeis sp.	4.1	–
Eunotia sp.	1.4	–
Gomphonema sp.	–	1.5
Nitzschia sp.	2.7	1.5
Pinnularia sp.	–	1.5
Chlorophyta		
Unknown chlorophyte flagellate	–	1.5
Cyanophyta		
Lyngbya sp.	2.7	–
Microcystis sp.	–	1.5
Oscillatoria sp.	–	1.5

Phytoplankton taxa list for Lake Butler STP, collected 14 September, 1992 via subsurface grabs in Silver Run Creek, Union County.

	Reference Site	Test Site
Diatoms		
Cocconeis sp.	24	–
Frustulia sp.	24	–
Melosira sp.	194	49
Navicula sp.	24	–
Nitzschia sp.	24	–
Pinnularia sp.	24	–
Chlorophyta		
Closterium sp.	24	–
Gloeocystis sp.	–	25
Scenedesmus sp.	24	–
Schroederia sp.	24	25
Selenastrum sp.	–	25
Cyanophyta		
Chroococcus sp.	339	147
Oscillatoria sp.	–	147
Phormidium sp.	24	–
Schizothrix sp.	–	74
Spirulina sp.	–	344