

Assessment of

Gainesville Regional Utilities
Sewage Spill

Alachua County

NPDES #FL0112895

Sampled August 2003

January 2004

Biology Section

Bureau of Laboratories

Division of Resource Assessment and Management

Quality Manual No. 870346G

NELAC Certification No. E31780

Introduction

The Gainesville Regional Utilities (GRU) Kanapaha Regional Wastewater Treatment Facility is located at 3901 S.W. 63rd Boulevard, Gainesville, Alachua County, Florida, 32601, more specifically at Latitude: 29° 36' 44" North and Longitude: 82° 24' 40" West. (Appendix 1)

The facility consists of an existing 14.900 million gallons per day (MGD) average annual daily flow (AADF) permitted capacity domestic wastewater treatment facility (WWTF). The WWTF has a Modified Ludzak-Ettinger (MLE) extended-aeration activated sludge treatment process with pre-denitrification biological nitrogen removal (BNR). Effluent is discharged to deep well injection (10.000 MDG) and the facility is developing unrestricted public access reuse 4.520 MGD reuse for a total of 14.520 MGD disposal capacity.

On July 30, 2003, at approximately 4:15 a.m., the facility experienced an abnormal event caused by a force main rupture that resulted in the release of untreated domestic wastewater into the Class III surface waters of Hogtown Creek. A sewer pipe located on 34th Street discharged approximately 2.5 million gallons of raw sewage into a nearby wetland and a storm sewer, both of which discharge into Hogtown Creek (per Consent Order, OGC File No. 03-1591 and Jessica Weatherby, Northeast District, FDEP).

Methods

The purpose of this investigation was to determine the potential effects of the spill of untreated sewage on the biota of the receiving waters. Chemical and biological comparisons were made between a control site (located in Hogtown Creek at NW 8th Ave.) and a test site (located in Hogtown Creek at Forest Park, see map in Appendix 1). The upstream Control Site was located in a residential section of Gainesville. Because the spill traveled overland and through storm sewers, it was necessary to place the Test Site on the outskirts of Gainesville in a mixed residential and forested area near a wetland (P. O'Connor, Northeast District, personal communication). Samples were collected eight days after the sewage spill.

Detailed methods and their relationship to Florida Administrative Code are given in Appendix 2. All field and laboratory biological methods followed Biology Section Standard Operating Procedures (SOPs, see http://www.floridadep.org/labs/qa/2002sops.htm for details) and met DEP quality assurance/quality control standards (see http://www.floridadep.org/labs/qa/index.htm). The following were involved in this investigation: Tom Kallemeyn and Patrick O'Connor (FDEP Northeast District), and FDEP Central Laboratory in Tallahassee.

Results and Discussion

- Specific chemical results are reported in Table 1 and a complete list of chemical analytes can be reviewed in Appendix 3. Total organic carbon loading was of the same order of magnitude at both the Test and Control Sites (9.8, 12 mg/L, respectively). Nutrient levels at the Test Site were lower for nitrogen compounds and slightly higher for phosphorus compounds compared to Control Site levels. Test Site levels of nitrogen compounds were in the 30th percentile or lower, while phosphorus compounds were in the 80th percentile or higher when compared with levels typical of Florida streams (Appendix 5). At the Control Site, ammonia and nitrate + nitrite levels were in the 60th-70th percentile of typical Florida streams, while TKN was in the 20th percentile of typical Florida streams. Phosphorus compounds were in the 80th percentile of typical Florida streams at the Control Site.
- Turbidity was 9.0 NTU at the Control Site and 3.5 NTU at the Test Site (Table 1). Total suspended solids were 11 mg/L at the Control Site and 2 mg/L at the Test Site.
- Fecal and total coliforms complied with Class III Water Quality Criteria at the Test Site, but not at the Control Site (Table 1). Fecal coliform colony counts were 60,000/100 mL and total coliform colony counts were 80,000/100 mL at the Control Site. Class III Fresh Surface Water Quality Criteria specify no more than 800 fecal coliform bacteria/100 mL in a single sample (62-302.530(6) F.A.C.) and 2,400 total coliform bacteria/100 mL in a single sample (62-302.530(7) F.A.C.); these values were greatly exceeded at the Control Site. There is another source(s) of fecal contamination in the Hogtown Creek watershed above the Control Site that should be investigated.
- Habitat assessment scores were 94 at the Control Site and 118 at the Test Site, placing both sites in the suboptimal category (Table 1, data sheets in Appendix 4). The Control Site lost points for bank stability, riparian buffer zone width and vegetation quality. Both the Test and Control Sites had low substrate availability and were moderately shaded. Water velocity was 0.07 m/sec at the Test Site and 0.5 m/sec at the Control Site. There were signs of recent flooding and a flooded channel clearly visible at the Test Site.
- Between July 31 and August 6, 2003, 3.02 inches of rainfall fell at the Gainesville Regional Airport, including a 0.86 inch rainfall on August 1, 2003 (ASOS weather data, station KFLGAINE5, Latitude 29° 41' 20", Longitude 82° 25' 1").
- Dissolved oxygen (DO as mg/L), pH (Standard Units), and conductivity (µmhos/cm) at the Control Site complied with Class III Water Quality Criteria (Table 1, 62-302.530 F.A.C.). Conductivity and pH complied with Class III Water Quality Criteria at the Test Site, but dissolved oxygen was 3.9 mg/L, below the 5.0 mg/L Class III Water Quality Standard (62-302.530(31) F.A.C.).

- Chlorophyll *a* was not detected in water samples from the Test and Control Sites (Table 1). We note that nutrients in the water column may or may not fuel algal production immediately, depending upon the sum of environmental conditions that limit algal growth at the site (e.g. pH, shading, turbidity). Thus it is not necessarily contradictory for ambient nutrient levels to be high and for no chlorophyll *a* to be detected in water samples.
- There were differences between Test and Control Sites in phytoplankton community composition (Table 2, Appendix 8). The Control Site had a somewhat higher cell density (5515 units/mL) and the community was composed of blue-green and green algae with <4% diatoms. In contrast, at the Test Site, cell density was low (99 units/mL) and the community was composed of a much higher percentage of diatoms (41.4%), as well as blue-green and green algae. A small percentage of euglenoids, which are indicative of organic enrichment (Smith, 1950), were present at the Test Site. No euglenoids were identified in the Control Site sample.
- Qualitative measures of benthic macroinvertebrate assemblages from dipnet samples are summarized in Tables 3 and 4 and in Appendix 7. The Control Site SCI score of 27 and the Test Site SCI score of 31 placed them both in the "Excellent" category.

Summary

Fecal and total coliforms did not comply with Class III Water Quality Criteria at the Control Site, an exceedance of F.A.C. 62-302.530(6) and (7). Dissolved oxygen at the Test Site was 3.9 mg/L, below the 5.0 mg/L Class III Water Quality Standard (62-302.530(31) F.A.C.). The fecal and total coliform data from the Control Site are cause for concern and suggest upstream inputs of raw sewage. The sources of fecal contamination above the Control Site should be investigated.

Benthic macroinvertebrate data from qualitative dipnet samples placed both sites in the "Excellent" category. Cell density and taxonomic composition of phytoplankton samples differed between sites, with lower cell density and higher proportion of diatoms at the Test Site. Biological data suggest that heavy rainfall in the week following the sewage spill may have diluted the effluent and spared Hogtown Creek from severe biological impacts.

Literature Cited

Barbour, M. T. and J. B. Stribling. 1994. A technique for assessing stream habitat structure. In: Proceedings of Riparian Ecosystems in the Humid United States: Functions and Values. U. S. Dept. Agriculture. 15-18 March 1993, Atlanta, Ga. 22 pp.

Beck, W. M. Jr. 1954. Studies in stream pollution biology 1. A simplified ecological classification of organisms. Quart. J. Fla. Acad. Sci. 17(4): 211-227.

EA Engineering, Science, and Technology and Tetra Tech, Inc. 1994. Bioassessment for the nonpoint source program (draft). Prepared for the Florida Department of Environmental Protection. Unpaginated.

FDEP. 1994. Lake bioassessments for the determination of nonpoint source impairment in Florida. Florida Department of Environmental Protection, Biology Section, Tallahassee, Fla. 73 p.

Magurran, A. E. 1988. Ecological diversity and its measurement. Princeton University Press, Princeton, New Jersey.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. EPA-600/9-78-018. U. S. EPA, Cincinnati, Ohio. 126 p.

Plafkin, J. L., M. T. Barbour, K. D. Porter, S. K. Gross and R. M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: Benthic macroinvertebrates and fish. U. S. EPA, Office of Water Regulations and Standards, Washington D.C., EPA 440-4-89-001

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. Florida Department of Environmental Regulation Technical Series 10(1): 1-47.

Sokal, R. R. and F. J. Rohlf. 1995. Biometry, Third edition. W. H. Freeman and Company, New York.

Stevenson, R. J. and L. L. Bahls. 1999. Periphyton protocols. Pp. 6.1-6.22 in: Rapid bioassessment protocols for use in wadeable streams and rivers. 2nd edition. By: M. T. Barbour, J. Gerritsen, B. D. Snyder and J. B. Stribling. EPA 841-B-99-002. U. S. Environmental Protection Agency, Office of Water, Washington, D. C.

Stevenson, R. J. and J. P. Smol. 2003. Use of algae in environmental assessments, pp. 775-803, in: Freshwater algae of North America, edited by J. D. Wehr and R. G. Sheath, Academic Press, San Diego. 918 pp.

Wallace, J. B., J. W. Grubaugh and M. R. Whiles. 1996. Biotic indices and stream ecosystem processes: results from an experimental study. Ecol. Appl. 6(1): 140-151.

USEPA. 2000. Nutrient Criteria Technical Guidance Manual – River and Streams. EPA-822-B-00-002.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. 4th Edition. EPA-821-R-02-013

Table 1. Class III Water Quality Criteria, microbiological and chemical data.

GRU Sewage Spill	Class III Stds	Control Site	Test Site
Nutrients (mg/L)			
Organic Carbon	-	12	9.8
Ortho-phosphate	-	0.35	0.61
Total Phosphorus	-	0.59	0.7 A
Ammonia	-	0.11	0.014 I
Unionized Ammonia	≤0.02	< 0.02 c	< 0.02 c
Nitrate+Nitrite	-	0.26	0.05
Total Kjeldahl Nitrogen	-	0.63	0.46 A
Organic Nitrogen	-	0.52 c	0.45 c
Total Nitrogen	-	0.89 c	0.51 c
General Physical and Chemical Parameters			
Habitat Assessment	-	94	118
Dissolved Oxygen (mg/L)	> 5	7.1	3.9
pH (S.U.)	6.5-8.0	7.7	7.1
Conductivity (umhos/cm)	≤1275	263	192
Temperature (C)	-	25.3	25
Turbidity (NTU)	29	9.0	3.5 A
Velocity (m/sec)	-	0.5	0.07
BOD, 5 day (mg/L)	-	2	2 K
Total Suspended Solids (mg/L)	-	11	2
Volatile Suspended Solids (mg/L)	-	3	2 K
Fixed Suspended Solids (mg/L)	-	8	2 K
Microbiological Data (number/100 mL)			
Fecal Coliforms	800	60,000	203
Total Coliforms	2400	80,000	2000

Value exceeds the Class III Water Quality Criteria

c - Value is calculated

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

I - Value reported is < the minimum quantitation limit, and ≥ the minimum detection limit

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

Table 2. Phytoplankton composition

GRU Sewage Spill	Control Site	Test Site
Number of Taxa	30	39
Shannon-Weaver Diversity	2.84	4.61
Chlorophyll a (μg/L)	0.85 U	0.85 U
Phaeophytin (μg/L)	0.85 U	0.85 U
Algal Density (number/ml)	5515	98
Percent Dominant Taxon	50.8	19.2
Dominant Taxon (name)	*Planktolyngbya*	*Jaaginema*
Number of Algal Units Identified	301	99
Percentage Composition		
Blue-green algae	58.8	34.4
Cryptomonads	0.3	0
Diatoms	3.7	41.4
Dinoflagellates	2.3	0
Euglenoids	0	6.1
Green algae	34.6	18.2
Other	0.3	0

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

Table 3. Macroinvertebrate Dipnet Samples - Qualitative

GRU Sewage Spill	Control Site	Test Site
Stream Condition Index (value)	27	31
Stream Condition Index (word)	Excellent	Excellent
Stream Condition Index Metrics		
Number of Taxa	23	29
Florida Index	14	14
Number of EPT Taxa	3	6
Number of Chironomid Taxa	8	8
Percent Dominant Taxon	25.4	14.0
Percent Diptera	30.7	26.2
Percent Suspension Feeders and Filterers	8.3	23.4
Total Number of Individuals	114	107
Community Composition: Percent of total		
Dominant Taxon (name)	*Microcylloepus pusillus*	*Cheumatopsyche*
Dominant Taxon (group)	Coleoptera	Trichoptera
Amphipoda	0.9	5.6
Coleoptera	27.2	20.6
Diptera	30.7	26.2
Ephemeroptera	17.5	11.2
Heteropoda	4.4	0.0
Odonata	4.4	2.8
Oligochaeta	7.9	1.9
Pelecypoda	0.0	7.5
Plecoptera	0.0	0.0
Trichoptera	7.0	19.6
Other	0.0	4.7
Functional Feeding Groups: Percent of total		
Burrowing Deposit Feeders	7.9	1.9
Predators	10.1	13.1
Surface Deposit Feeders	38.6	26.2
Suspension Feeders and Filterers	8.3	23.4
Scrapers	22.4	17.3
Shredders	12.7	14.5
Unknown	0	1.9

Table 4. Stream Condition Index Metrics: Peninsula, Summer Index

GRU Test Site

Metric:	Value	5	3	1	Score
Total Number of Taxa	29	≥26	25-14	<14	5
Number of EPT Taxa	6	≥4	3-2	<2	5
Number of Chironomid Taxa	8	≥7	6-4	<4	5
Percent Contribution of Dominant Taxon	14	≤29	30-64	>64	5
Percent Diptera	26.2	-	≤37	>37	3
Florida Index	14	≥7	6-4	<4	5
Percent Suspension Feeders and Filterers	23.4	-	≥7	<7	3
Total Score		**Excellent**			**31**
Interpretation of Scores		Excellent			26-31
		Good			20-25
		Poor			13-19
		Very Poor			7-12

GRU Control Site

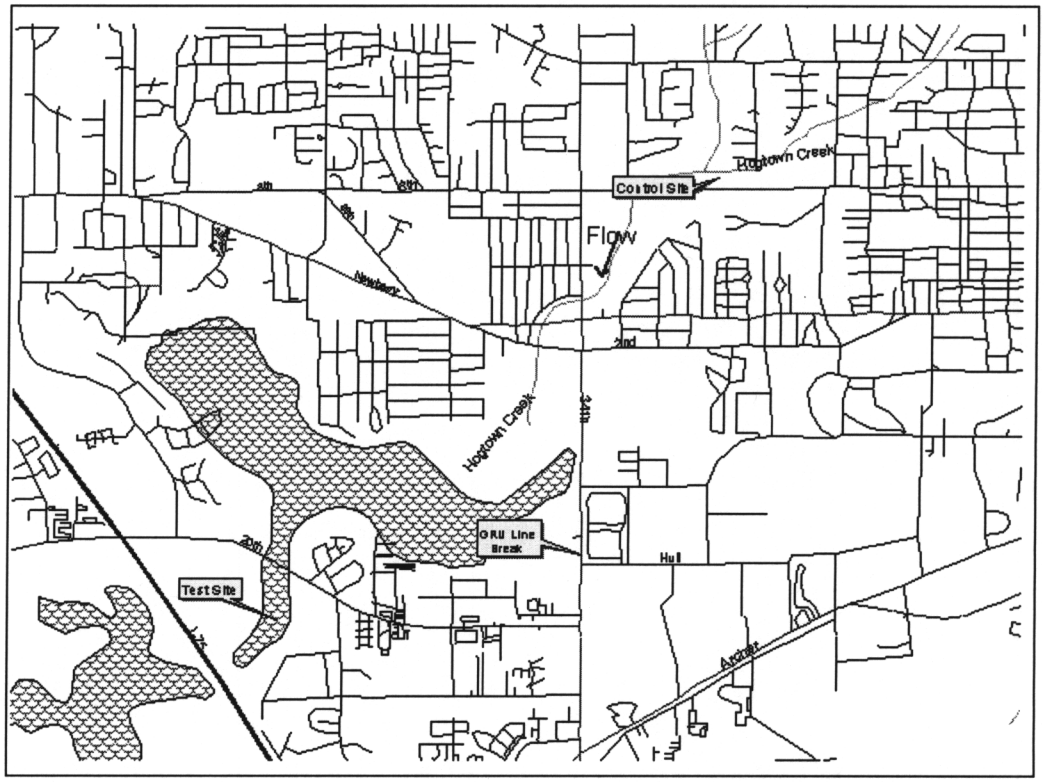
Metric:	Value	5	3	1	Score
Total Number of Taxa	23	≥26	25-14	<14	3
Number of EPT Taxa	3	≥4	3-2	<2	3
Number of Chironomid Taxa	8	≥7	6-4	<4	5
Percent Contribution of Dominant Taxon	25.4	≤29	30-64	>64	5
Percent Diptera	30.7	-	≤37	>37	3
Florida Index	14	≥7	6-4	<4	5
Percent Suspension Feeders and Filterers	8.3	-	≥7	<7	3
Total Score		**Excellent**			**27**
Interpretation of Scores		Excellent			26-31
		Good			20-25
		Poor			13-19
		Very Poor			7-12

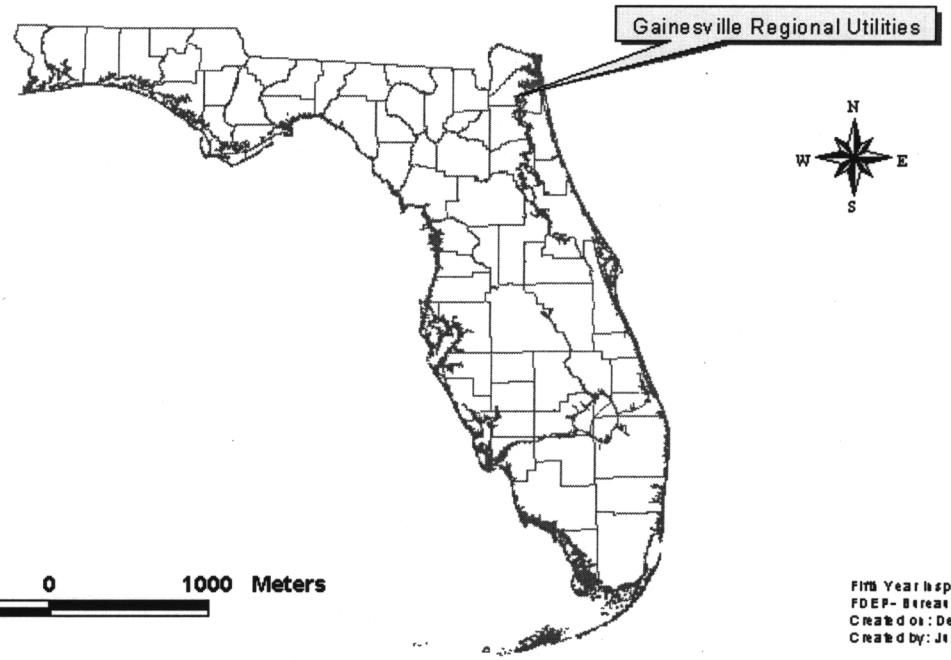
Appendices

- Appendix 1. Map of facility
- Appendix 2. Explanation of measurements
- Appendix 3. Chemical analyses of effluent and receiving water.
- Appendix 4. Typical values for selected parameters in Florida waters
- Appendix 5. Additional physical, chemical, toxicological and microbiological results
- Appendix 6. Habitat Assessment field sheets
- Appendix 7a. Dipnet samples: Taxa list and number of macroinvertebrates counted (collapsed)
- Appendix 7b. Dipnet samples: Taxa list and number of macroinvertebrates counted
- Appendix 8a. Phytoplankton: Taxa list and density (number of individuals per mL)
- Appendix 8b. Phytoplankton: Taxa list and number of individuals counted

Appendix 1

Gainesville Regional Utilities
Sewage Spill





1000 0 1000 Meters

Fifth Year Inspection Program
FDEP- Bureau of Laboratories
Created on: December 12, 2003
Created by: Julie Espy

Appendix 2

Explanation of Measurements

(1) Quality Assurance and Quality Control

FDEP's quality assurance requirements for analytical laboratories and field activities are codified in Chapter 62-160, F.A.C., Quality Assurance (QA Rule) and in internal Standard Operating Procedures (FDEP SOPs). Methods for all analyses are on file at the FDEP Central Laboratory in Tallahassee and may be viewed on the web at http://www.floridadep.org/labs/sop/index.htm and/or http://www.floridadep.org/labs/qa/index.htm .

(2) Chemical Analyses

The receiving water was analyzed for nutrients and total organic carbon following FDEP SOPs. A list of the analytes tested for, results, data qualifiers, the minimum detection limit and the practical quantitation limit are given in Appendix 3. The results from these analyses were compared with Water Quality Criteria (62-302 F.A.C., (Table 1, Appendix 2). Exceedances of Water Quality Criteria may be violations of specific provisions of Chapter 62-302 (F.A.C.).

(3) Bacteriological Testing

The effluent and water from control and test sites were analyzed for the presence and concentration of total and fecal coliform bacteria following FDEP SOPs MB1_0 and MB1_1. High levels of fecal or total coliform bacteria may constitute violation

(4) Habitat Assessment

Habitat assessment is used to evaluate the physical structure and extent of disturbance in a waterbody. Eight aspects are ranked, with 20 possible points for each aspect (QA Rule SOP FT 3100). The Habitat Assessment score includes types and amounts of benthic substrates, water velocity, amount of sand or silt accumulation, extent of artificial channelization, bank stability, and riparian zone width and vegetation type. All scores are summed to yield an overall Habitat Assessment score. Habitat Assessment score ranges from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (120-160 points), Suboptimal (80-119 points), Marginal (40-79 points), and Poor (11-39 points).

(5) Phytoplankton Assemblages

Methods: Phytoplankton were sampled using a 1 L grab sample (QA Rule SOP FS7100). Phytoplankton were subsampled and identified to the lowest practical level, usually species (FDEP SOPs AB03, AB03_1 and AB05).

Chlorophyll *a* Content: Chlorophyll *a* content is measured to estimate algal biomass (FDEP SOP BB05). High algal biomass implies nutrient stress (Stevenson and Bahls 1999) and may be a violation of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C. and/or 62-302.530(48)(b) F.A.C..

Algal Density: Algal density is estimated as number of natural units/ml for phytoplankton samples. Although algal density of a single site is highly variable and depends on a number of factors, comparison of algal density at a control site to algal density at a related test site gives a partial comparison of algal biomass at the two sites (Stevenson and Smol 2003).

Taxa richness: Taxa richness is the number of distinct algal taxa present in a sample. Extreme nutrient enrichment tends to reduce the number of different types of algae present in a sample because a few tolerant taxa tend to reproduce rapidly and constitute the majority of the cells present. However, moderate nutrient enrichment of nutrient poor waters may sometimes be correlated with increased algal taxa richness (Stevenson and Bahls 1999) as the algal community begins to respond to the increased input of nutrients.

Community Composition: Shifts in relative proportions of major groups of algae downstream of a point source, compared to upstream, control conditions, may indicate negative effects of a discharge (Stevenson and Bahls 1999) and may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Shannon-Weaver Diversity Index: This index is specified in the Florida Administrative Code 62-302 as a measure of biological integrity. Low diversity scores are undesirable. Where diversity is low, only a few taxa are abundant as compared to an area where many taxa are present with more equitable abundance among taxa (Magurran 1988). Low diversity scores related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

(6) Benthic Macroinvertebrate Assemblages

Methods: Qualitative collections are made using 20 dipnet sweeps (QA Rule SOP FS7420). Benthic macroinvertebrates were sorted and identified to the lowest practical taxonomic level, usually species (FDEP SOP IZ06).

Taxa richness: Taxa richness is the number of distinct macroinvertebrate taxa present in a sample. Stress, habitat destruction and pollution tend to reduce the number of different types of organisms present (Karr and Chu 1998). Decreases in taxa richness related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Percent Contribution of Dominant Taxon: Percent contribution of the dominant taxon is calculated by dividing the number of individuals in the most abundant taxa by the total number of individuals counted. Percent contribution of the dominant taxon tends to increase with increasing perturbation (Plafkin *et al.*, 1989). Increases in the percent contribution of the dominant taxon related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C. and/or 62-302.530(48)(b) F.A.C..

The Florida Index: Some organisms become rare or absent as the intensity or duration of disturbance increases. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their ranked sensitivity to pollution (Beck 1954). A site with a high Florida Index score is considered healthy (Ross 1990). Decreases in Florida Index points related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Ephemeroptera/Plecoptera/Trichoptera (EPT) Taxa: This value is the number of EPT taxa present. More EPT taxa are usually present in unpolluted waters (Plafkin *et al.*, 1989, Wallace *et al.*, 1996). Decreases in the number of EPT taxa related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Community Composition: Shifts in proportions of major groups of organisms downstream of a point source, compared to upstream, control conditions, may indicate negative effects of a discharge (Karr and Chu 1998). Shifts in community composition related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Functional Feeding Groups: Environmental degradation may differentially affect groups of invertebrates based on how the group feeds (e.g. predators, deposit feeders, etc.). In Florida, pollution may be responsible for reducing the numbers of filter feeders (FDEP 1994) and shredders (EA Engineering 1994). Changes in the proportions of functional feeding groups related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

The Stream Condition Index (SCI): The SCI is a composite macroinvertebrate metric developed for Florida. Using data from qualitative dipnet samples, the SCI assigns points to seven parameters, depending on how closely each parameter approaches an expected reference condition (QA Rule SOP LT 7200). Points are summed to yield a final SCI score (range 7-33, depending on region and index period). Included in the calculation of SCI are taxa richness, number of EPT taxa, number of Chironomid taxa, percent contribution of the dominant taxon, the Florida Index, percent contribution of Diptera, and the percent contribution of suspension and filter feeders. Scores are broken into four ordinal groups: Excellent, Good, Poor and Very Poor. A decrease in ordinal SCI score from the Control to the Test site may be evidence of degradation related to a facility's effluent. An SCI score of "Poor" or "Very Poor" related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

(7) Statistical Comparisons

Statistical comparisons of the proportions of taxa, major groups or feeding groups were made using 95% confidence intervals on proportions. A 95% confidence interval is the range of values above and below a given proportion that has a 95% chance of containing the true proportion (Sokal and Rohlf 1995). If the 95% confidence intervals for two proportions do not overlap, then the proportion of X in sample 1 is significantly different from the proportion of X in sample 2 at $p<0.05$. A "$p<0.05$" level of significance means that there is less than a 5% chance that the true proportions in the two samples are the same. All comparisons that are labeled as significant in the text have a probability <0.05 that the proportions are the same.

Appendix 3

Chemical analysis of receiving water

Date Sampled	Field ID	Analysis Group	Component	Result	Units	Remark	MDL	PQL
8/7/2003 11:00	CONTROL SITE	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	0.85	ug/L	U	0.85	2.6
8/7/2003 11:00	CONTROL SITE	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	0.85	ug/L	U	0.85	2.6
8/7/2003 11:00	CONTROL SITE	Bio-Peri/Phyto	Phytoplankton-Quantitative-# Wet Taxa	29	#Taxa			
8/7/2003 11:00	CONTROL SITE	Bio-Peri/Phyto	Phytoplankton-Quantitative-#Diatom Taxa	0	#Taxa			
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	Ammonia-N	0.11	mg N/L		0.01	0.02
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	NO2NO3-N	0.26	mg N/L		0.004	0.01
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	N_KJEL_TOT	0.63	mg N/L		0.06	0.2
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	O-Phosphate-P	0.35	mg P/L		0.012	0.03
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	Organic Carbon	12	mg C/L		1	5
8/7/2003 11:00	CONTROL SITE	Nutrients-Liquid	Total-P	0.59	mg P/L		0.015	0.04
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	Ammonia-N	0.01	mg N/L	U	0.01	0.02
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	NO2NO3-N	0.004	mg N/L	U	0.004	0.01
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	N_KJEL_TOT	0.06	mg N/L	U	0.06	0.2
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	O-Phosphate-P	0.004	mg P/L	U	0.004	0.01
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	Organic Carbon	1	mg C/L	U	1	5
8/7/2003 12:45	EQUIP BLK	Nutrients-Liquid	Total-P	0.015	mg P/L	U	0.015	0.04
8/7/2003 12:30	TEST SITE	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	0.85	ug/L	U	0.85	2.6
8/7/2003 12:30	TEST SITE	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	0.85	ug/L	U	0.85	2.6
8/7/2003 12:30	TEST SITE	Bio-Peri/Phyto	Phytoplankton-Quantitative-# Wet Taxa	15	#Taxa			
8/7/2003 12:30	TEST SITE	Bio-Peri/Phyto	Phytoplankton-Quantitative-#Diatom Taxa	26	#Taxa			
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	Ammonia-N	0.014	mg N/L	I	0.01	0.02
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	NO2NO3-N	0.05	mg N/L		0.004	0.01
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	N_KJEL_TOT	0.46	mg N/L	A	0.06	0.2
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	O-Phosphate-P	0.61	mg P/L		0.012	0.03
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	Organic Carbon	9.8	mg C/L		1	5
8/7/2003 12:30	TEST SITE	Nutrients-Liquid	Total-P	0.7	mg P/L	A	0.015	0.04

Appendix 4

Typical Values for Selected Parameters in Florida Waters

Percentile Distribution (1617 stations)

CONTROL SITE

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Periphyton Chlorophyll *a* (mg/m^2)	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85	**ND**
Hester-Dendy Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90	**ND**
Hester-Dendy Taxa Richness	6	6.5	9	11.5	13	15	17	21.5	26	29	32	**ND**
Dipnet Taxa Richness	9	12	17	20	**22**	24.5	26	28	31	37	53	**23**
Total Kjeldahl Nitrogen	0.30	0.39	**0.56**	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80	**0.63**
Total Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	**0.11**	0.14	0.20	0.34	0.60	**0.11**
Nitrate plus Nitrite	0.01	0.01	0.03	0.05	0.07	0.10	0.14	**0.20**	0.32	0.64	1.05	**0.26**
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	**0.39**	0.74	1.51	**0.59**
Orthophosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	**0.27**	0.59	1.37	**0.35**
Turbidity (NTU)	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30	**ND**

TEST SITE

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Periphyton Chlorophyll *a* (mg/m^2)	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85	**ND**
Hester-Dendy Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90	**ND**
Hester-Dendy Taxa Richness	6	6.5	9	11.5	13	15	17	21.5	26	29	32	**ND**
Dipnet Taxa Richness	9	12	17	20	22	24.5	26	**28**	31	37	53	**29**
Total Kjeldahl Nitrogen	0.30	**0.39**	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80	**0.46 A**
Total Ammonia	**0.02**	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60	**0.014 I**
Nitrate plus Nitrite	0.01	0.01	0.03	**0.05**	0.07	0.10	0.14	0.20	0.32	0.64	1.05	**0.05**
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	**0.39**	0.74	1.51	**0.7**
Orthophosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	**0.59**	1.37	**0.61**
Turbidity (NTU)	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30	**ND**

Taxa richness and diversity values are for benthic macroinvertebrates. Hester-Dendy sample= benthic macroinvertebrates collected from a standardized multi-plate sampler. Dipnet taxa richness = number of taxa collected in standardized dipnet sweep samples. Diversity = Shannon-Weaver H'. NTU = Nephelometric turbidity units. Adapted from Joe Hand, FDER, personal communication, 1991 (data collected 1980-1989). ND = No data. I = value is less than the minimum quantitation limit and greater than or equal to the minimum detection limit. A = value reported is the mean of two or more determinations.

Appendix 5

Additional physical, chemical, toxicological and microbiological results

STATE OF FLORIDA
DEPT. OF ENVIRONMENTAL PROTECTION
NORTHEAST DISTRICT

Division of Water Facilities
Surface Water Section

MICROBIOLOGICAL ANALYSIS REPORT

SM 9222B/9222D

NAME OF SURVEY			COLLECTOR
Hogtown Creek			O'connor
DATE: COLLECTED	**RECEIVED**	**PROCESS START**	**COMPLETED**
8/7/03	16:30 8/7/03	16:34 8/7/03	15:15 8/8/03
SURVEY TYPE	**SAMPLE TYPE**	**COUNTY**	**ANALYTICAL METHOD**
Domestic Waste Investigation	Background site Test site	Alachua	Membrane Filter
ANALYST	**COMMENTS**		
Parrish			

LAB NO.	STORET NO.	SITE LOCATION	COLL TIME	SET UP TIME	TOTAL COLIFORM #/100ML	TOTAL COLIFORM CODE	FECAL COLIFORM #/100ML	FECAL COLIFORM COD
030768		Hogtown Creek @ NW 8th	11:10	16:50	80000		60000	
030769		Hogtown Creek @ Forest Park	12:30	16:50	2000		203	

Results for NELAP accredited tests contained in this report meet the requirements for the National Environmental Accreditation Program.

RESULTS APPROVED BY:	DATE
Jeremy Parrish	8/8/03

PAGE 1

STATE OF FLORIDA
DEPT. OF ENVIRONMENTAL PROTECTION
NORTHEAST DISTRICT

MICROBIOLOGICAL ANALYSIS REPORT

REMARK CODES

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

B - Results based on colony counts outside the acceptable range.

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

J - Estimated Value.

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

L - Actual value is known to be greater than value given.

N - Presumptive evidence of presence of material.

O - Sampled, but analysis lost or not performed.

Q - Sample held beyond normal holding time.

T - Value reported is less than the criterion of detection.

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

V - Analyte was detected in both sample and method blank.

Z - Colonies were too numerous to count (TNTC).

Examples: 20 colonies from 1ml of sample would be reported as 2000 / 100ml.
2 colonies from 1ml of sample would be reported as 200B / 100ml.
30 colonies from 1ml of sample that exceeded holding time would be reported as 3000Q / 100ml.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NORTHEAST DISTRICT
7825 BAYMEADOWS WAY, SUIT B-200 **Comp.QAP # 880236**
JACKSONVILLE, FL 32256-7577

SAMPLE ID : 030768 STATION : DATE: 08/07/03 TIME: 11:00
SAMPLE SOURCE Hogtown Creek SAMPLER: O'Connor/Kallemyn/Joy Mcbane
STATION LOCATION: Hogtown Cr. @ NW 8 th
PROGRAM MOD.: DW COMPLIANCE: ☒ ENFORCEMENT: ☐
FIELD MEASUREMENTS

Tot. Depth:	0.6	Sample Depth:	0.3	W.Temp. °C:	25.29
Conductivity: µmoh/cm (EPA 120.1) :	263	Diss. Oxygen (EPA 360.1)	7.10	EPA 170.1	
Stream Velocity:	0.5	Salinity:	0.12	T.R.C.:	
pH:(EPA 150.1)	7.73	Secchi:	0.15 L	EPA 330.5	

WEATHER CONDITIONS:

LABORATORY MEASUREMENTS

Turbidity (NTU) : EPA 180.1	9.0	Color (PtCo): EPA 110.2			
pH (standard unit): EPA 150.1		Conductivity(µmohs/cm) EPA 120.1			

The following values are in mg/L

B.O.D : EPA 405.1	2	C.B.O.D : SM 5210-B		C.O.D : EPA 410.4	
Tot. S.S : EPA 160.2	11	Vol. S.S: EPA 160.4	3	Fix. S.S :	8
Tot.Solids : EPA 160.3		T.D.S EPA 160.1			
T. Alkalinity: EPA 310.1		Settleable Matter: EPA 160.5		Diss. Oxygen: EPA 360.2	

COMMENTS:

Sample Custody
Sample Released to: Bipin Adhyaru Date: 08/07/2003

Preservation: Ice Time: 16:45

Reported by: Bipin Adhyaru Date:: 08/12/2003

K = Actual value is known to be less than the value given.
A = Value is the mean of two or more determinations.
O = Sampled, but analysis lost or not performed.
Q = Sample held beyond the accepted holding time.
T = Value reported is less than the laboratory method detection limit.
U = Indicates that the compound was analyzed for but not detected.
Y = The laboratory analysis was from an unpreserved or improperly preserved sample.
REJ = Data is rejected and should not be used.
L = Off - scale high. Actual value is known to be greater than value given
J = Estimated value; value not accurate.
PQL = The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NORTHEAST DISTRICT
7825 BAYMEADOWS WAY, SUIT B-200 **Comp.QAP # 880236**
JACKSONVILLE, FL 32256-7577

SAMPLE ID : 030769 STATION : DATE: 08/07/03 TIME: 12:30
SAMPLE SOURCE Hogtown Creek SAMPLER: O'Connor/Kallemyn/Joy Mcbane
STATION LOCATION: Hogtown Cr. @ Forest park
PROGRAM MOD.: DW COMPLIANCE: ☒ ENFORCEMENT: ☐
FIELD MEASUREMENTS

Tot. Depth:	0.6	Sample Depth:	0.3	W.Temp. °C:	25.0
Conductivity: µmoh/cm (EPA 120.1) :	192	Diss. Oxygen (EPA 360.1)	3.92	EPA 170.1	
Stream Velocity:		Salinity:		T.R.C.:	
pH:(EPA 150.1)	7.09	Secchi:	0.6 L	EPA 330.5	

WEATHER CONDITIONS:

LABORATORY MEASUREMENTS

Turbidity (NTU) : EPA 180.1	3.5 A	Color (PtCo): EPA 110.2			
pH (standard unit): EPA 150.1		Conductivity(µmohs/cm) EPA 120.1			

The following values are in mg/L

B.O.D : EPA 405.1	2 K	C.B.O.D : SM 5210-B		C.O.D : EPA 410.4	
Tot. S.S : EPA 160.2	2	Vol. S.S: EPA 160.4	2 K	Fix. S.S :	2 K
Tot.Solids : EPA 160.3		T.D.S EPA 160.1			
T. Alkalinity: EPA 310.1		Settleable Matter: EPA 160.5		Diss. Oxygen: EPA 360.2	

COMMENTS:

Sample Custody
Sample Released to: Bipin Adhyaru Date: 08/07/2003

Preservation: Ice Time: 16:45

Reported by: Bipin Adhyaru Date:: 08/12/2003

K = Actual value is known to be less than the value given.
A = Value is the mean of two or more determinations.
O = Sampled, but analysis lost or not performed.
Q = Sample held beyond the accepted holding time.
T = Value reported is less than the laboratory method detection limit.
U = Indicates that the compound was analyzed for but not detected.
Y = The laboratory analysis was from an unpreserved or improperly preserved sample.
REJ = Data is rejected and should not be used.
L = Off - scale high. Actual value is known to be greater than value given
J = Estimated value; value not accurate.
PQL = The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

Appendix 6

Habitat Assessment Field Sheets

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		8/1/03	1120	Hogtown Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Alachua	Hogtown Creek @ NW 8th Ave above Possum Creek	Control Site

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)
10				85	5		

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

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

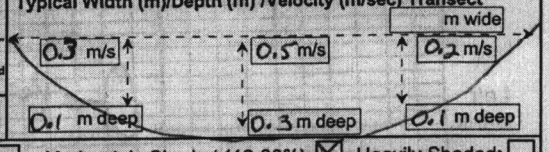
Width of riparian vegetation (m) on least buffered side: >18

List & map dominant vegetation on back

Artificially Channelized ☐ no ☐ ☒ ☐ Artificially Impounded ☐ yes
(recent, severe / some recovery / mostly recovered, more sinuous)

High Water Mark: 0.6 (m above present water level) + 0.3 (present depth in m) = 0.9 (m above bed)

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



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	<1%	5	DipNet	Sand	95	5	DipNet
Leaf Packs or Mats	<1%	5	DipNet	Mud/Muck/Silt			
Aquatic Vegetation				Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots	1%	5	DipNet	*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	0.15	25.3	7.13	7.10	263			0.3L
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: ☒ Sheen: ☐ Globs: ☐ Slick: ☐

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

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

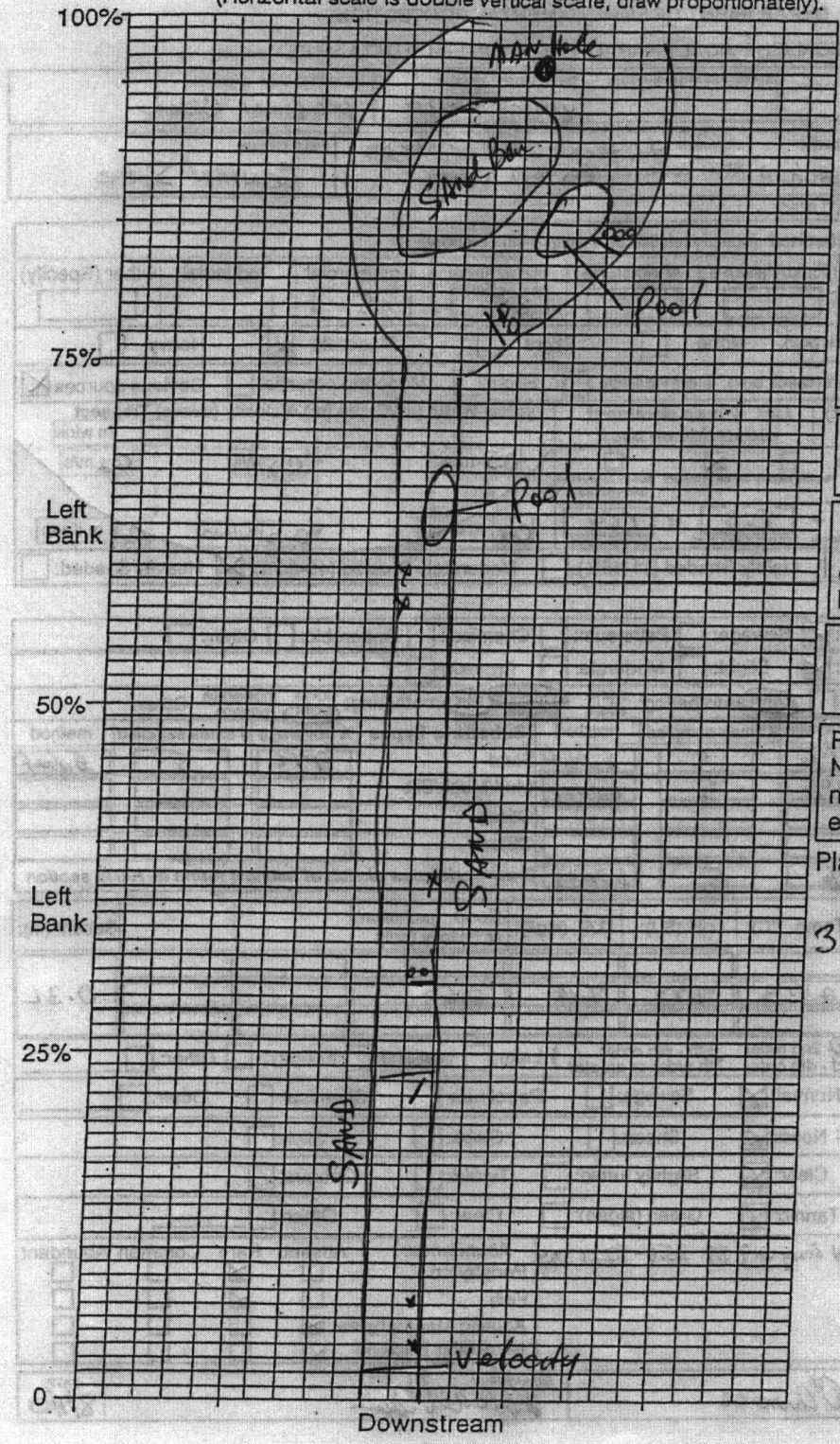
Weather Conditions/Notes: Lat Long 29 39 354 -82 21 389

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

SAMPLING TEAM: Kalleneyn McBain, O'Connor — SIGNATURE: Patrick W O'Con — DATE: 8/1/03

Site Map / Habitat Sketch

Length of grid represents 100m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).



Field ID:

Substrates: Code key, draw proportionate habitat abundanc

- / Snags
- XX Roots/undercut banks
- oo Leaf Packs (or mats)
- N/A Macrophytes
- _____
- _____

Velocity:
Note where velocity measures were taken.

Habitat Smothering:
Note areas (on map) where sanc or silt is smothering substrates, limiting habitability.

Bank Stability:
Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:
Note areas (on map) where natural vegetaton is altered or eliminated.

Plants observed/other notes:

3-4m wide

DEP-SOP-001/01: Form FD 9000-5 (December 11, 2001)

STATE OF FLORIDA, DEPARTMENT OF ENVIRONMENTAL PROTECTION
STREAM/RIVER HABITAT ASSESSMENT FIELD SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (MM/DD/YY):	RECEIVING BODY OF WATER:
		8/1/03	Hogtown Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Alachua	Hogtown Creek @ NW 8th Ave Above Possum Creek	Control Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components Substrate Diversity 12	Four or more productive habitats present [snags, tree roots/undercut banks, aquatic vegetation, leaf packs (partially decayed), rock] 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags) 15 14 13 12 11	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered 5 4 3 2 1
Substrate Availability 3	Greater than 30% productive habitat present at site 20 19 18 17 16	16% to 30% productive habitat, by aerial extent 15 14 13 12 11	6% to 15% productive habitat 10 9 8 7 6	Less than 5% productive habitat 5 4 3 2 1
Water Velocity 18	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
Habitat Smothering 9 Primary Score 42	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 the habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, as severe problem, pools absent 5 4 3 2 1
Secondary Habitat Components Artificial Channelization 10	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
Bank Stability Right Bank 5 Left Bank 5	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 8 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width Right Bank 8 Left Bank 8	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 to 18 m 8 7 6	Width of native vegetation 6 to 12 m. human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank 8 Left Bank 8 Secondary Score 52	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 10 9	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. 8 7 6	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. 5 4	Less than 25% of stream bank 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 3 2 1

94 **TOTAL SCORE**

ANALYSIS DATE:	ANALYST:	SIGNATURE:
8/1/03	O'Connor	Patrick O'Connor

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (5-10-96)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	TIME	RECEIVING BODY OF WATER:
		8/7/03	1230	Hogtown CREEK

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Alachua	Hogtown Creek @ Forest Park S of SR30	TEST Site

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
40				50	5		5

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

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

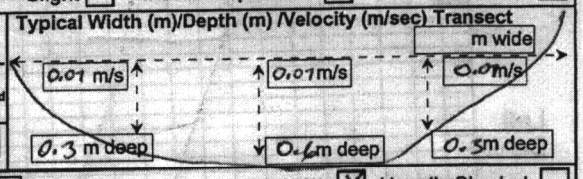
Width of riparian vegetation (m) on least buffered side: >18 — *List & map dominant vegetation on back*

Artificially Channelized ☒ no ☐ recent, severe ☐ some recovery ☐ mostly recovered

Artificially Impounded ☐ yes — more sinuous

High Water Mark: 0.3 (m above present water level) + 0.6 (present depth in m) = 0.9 (m above bed)

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



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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	3%	5	Diphet	Sand	60	5	Diphet
Leaf Packs or Mats	1%	5	Diphet	Mud/Muck/Silt	35	—	—
Aquatic Vegetation				Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots	1%	5	Diphet	*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								0.6
Mid-depth	0.3	25.0	7.09	3.92	192			
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: ☒ Sheen: ☐ Globs: ☐ Slick: ☐

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

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

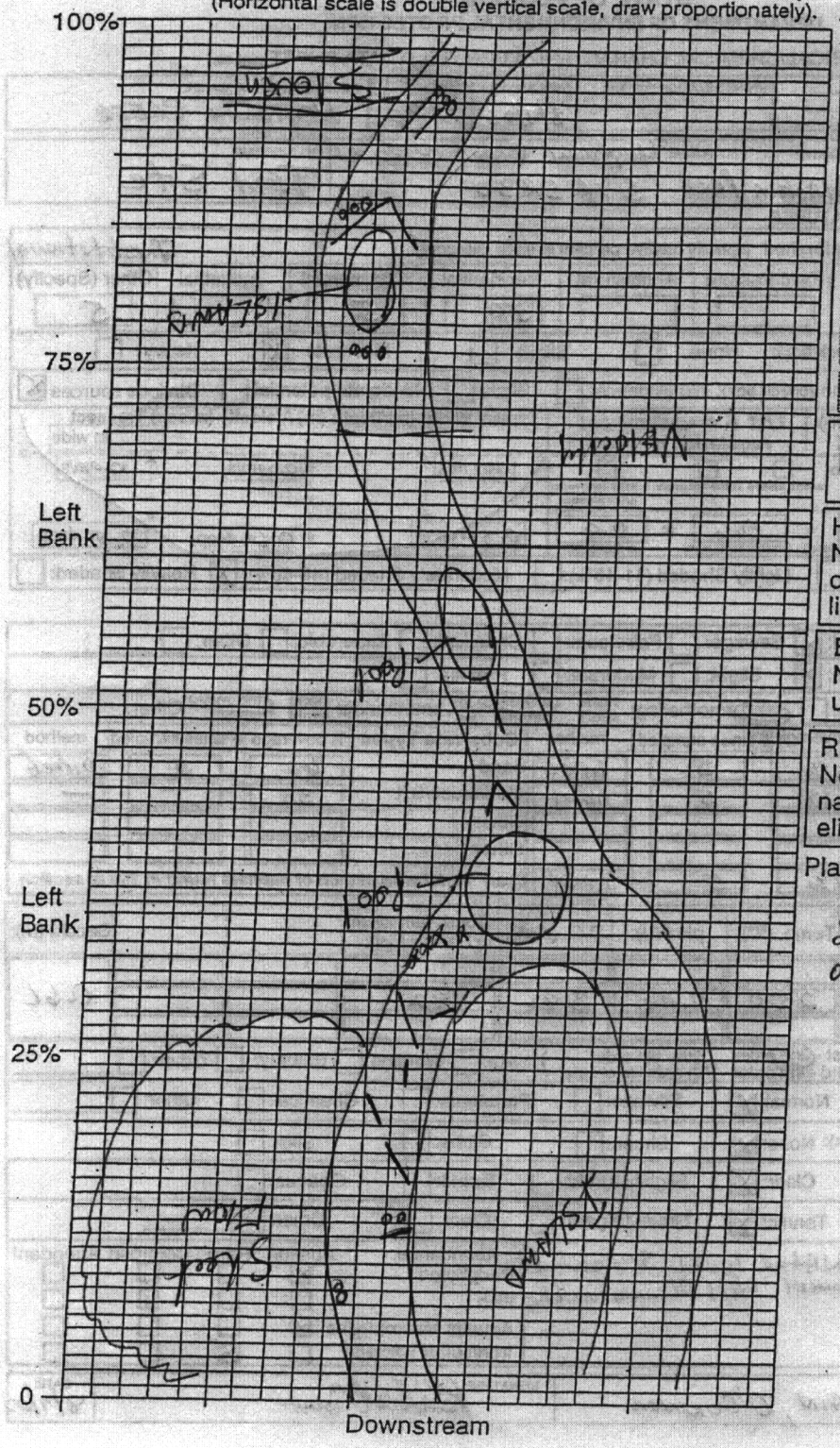
Weather Conditions/Notes: WATER level Somewhat UPAND FLOODED CHANNEL still Clearly visible

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

SAMPLING TEAM:	SIGNATURE:	DATE:
KALLEMEYN, MCBAIN, O'CONNOR		8/7/03

Site Map / Habitat Sketch

Length of grid represents 100m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).



Field ID:

Substrates: Code key, draw proportionate habitat abundanc

- Snags
- Roots/undercut banks
- Leaf Packs (or mats)
- N/A Macrophytes
- _____
- _____
- _____

Velocity:
Note where velocity measures were taken.

Habitat Smothering:
Note areas (on map) where sanc or silt is smothering substrates, limiting habitability.

Bank Stability:
Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:
Note areas (on map) where natural vegetaton is altered or eliminated.

Plants observed/other notes:

20-m wide
0.2 ft/sec = 0.07 m/sec

DEP-SOP-001/01: Form FD 9000-5 (December 11, 2001)

STATE OF FLORIDA, DEPARTMENT OF ENVIRONMENTAL PROTECTION
STREAM/RIVER HABITAT ASSESSMENT FIELD SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (MM/DD/YY):	RECEIVING BODY OF WATER:
		8/1/03	Hogtown Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Alachua	Hogtown Creek @ Forest Park South of SR 30	TEST Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components **Substrate Diversity** 13	Four or more productive habitats present [snags, tree roots/undercut banks, aquatic vegetation, leaf packs (partially decayed), rock] 20 19 18 17 16	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags) 15 14 13 12 11	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered 5 4 3 2 1
Substrate Availability 5	Greater than 30% productive habitat present at site 20 19 18 17 16	16% to 30% productive habitat, by aerial extent 15 14 13 12 11	6% to 15% productive habitat 10 9 8 7 6	Less than 5% productive habitat 5 4 3 2 1
Water Velocity 12	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
Habitat Smothering 12 Primary Score 42	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 the habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, as severe problem, pools absent 5 4 3 2 1
Secondary Habitat Components **Artificial Channelization** 19	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
Bank Stability Right Bank 9 Left Bank 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 8 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width Right Bank 10 Left Bank 10	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12 to 18 m 8 7 6	Width of native vegetation 6 to 12 m. human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank 10 Left Bank 9 Secondary Score ~~128~~ 74	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 10 9	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. 8 7 6	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. 5 4	Less than 25% of stream bank 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 3 2 1

128 **TOTAL SCORE**

ANALYSIS DATE:	ANALYST:	SIGNATURE:
8/1/03	O'Connor	Patrick O'Connor

Appendix 8a

Qualitative benthic macroinvertebrate collections (n = 20 discrete dipnet sweeps) upstream and downstream of GRU sewage spill (8/7/2003). Taxa list and number of individuals counted (collapsed). See SOP LT 7100 sect. 4.2.1 for method on collapsing taxa.

	Control	Test
Annelida		
Hirudinea		
Mooreobdella sp.	-	1
Oligochaeta		
Dero digitata complex	3	-
Dero furcata	1	-
Enchytraeidae	2	-
Limnodrilus sp.	-	2
Megascolecidae	2	-
Eclipidrilus sp.	1	-
Arthropoda		
Crustacea		
Amphipoda		
Hyalella azteca	1	6
Isopoda		
Caecidotea sp.	-	2
Insecta		
Coleoptera		
Ancyronyx variegatus	2	-
Dryopidae	-	1
Dubiraphia vittata	-	11
Macronychus glabratus	-	1
Microcylloepus pusillus	29	8
Scirtes sp.	-	1
Diptera		
Ablabesmyia mallochi	-	2
Ceratopogonidae	1	-
Hemerodromia sp.	-	2
Nanocladius sp.	3	-
Paratanytarsus sp.	1	-
Pentaneura inconspicua	1	6
Polypedilum flavum	-	6
Polypedilum illinoense grp.	4	3
Polypedilum scalaenum grp.	4	2
Rheocricotopus robacki	15	-
Rheotanytarsus exiguus grp.	-	2
Rheotanytarsus pellucidus	1	-
Stempellinella sp. A Epler	-	2
Stenochironomus sp.	5	3
Ephemeroptera		
Caenis sp.	-	3
Pseudocloeon sp.	8	3
Stenonema smithae	12	6
Heteroptera		
Rhagovelia sp.	5	-
Odonata		
Argia tibialis	3	-
Calopterygidae	-	1
Calopteryx maculata	2	-
Coenagrionidae	-	1
Gomphidae	-	1
Trichoptera		
Cheumatopsyche sp.	8	15
Oecetis sp.	-	4
Triaenodes sp.	-	2
Mollusca		
Bivalvia		
Undetermined Bivalvia	-	8
Gastropoda		
Ancylidae	-	2

Appendix 7b

Qualitative benthic macroinvertebrate collections (n = 20 discrete dipnet sweeps) upstream and downstream of GRU sewage spill (8/7/2003). Taxa list and number of individuals counted.

	Control	Test
Annelida		
Hirudinea		
Mooreobdella sp.	-	1
Oligochaeta		
Dero digitata complex	3	-
Dero furcata	1	-
Eclipidrilus sp.	1	-
Enchytraeidae	2	-
Limnodrilus sp.	-	2
Megascolecidae	2	-
Arthropoda		
Crustacea		
Amphipoda		
Hyalella azteca	1	6
Isopoda		
Caecidotea sp.	-	2
Insecta		
Coleoptera		
Ancyronyx variegatus	2	-
Dryopidae	-	1
Dubiraphia vittata	-	10
Elmidae	3	1
Macronychus glabratus	-	1
Microcylloepus pusillus	26	8
Scirtes sp.	-	1
Diptera		
Ablabesmyia mallochi	-	1
Ceratopogonidae	1	-
Chironomidae	7	9
Hemerodromia sp.	-	2
Nanocladius sp.	2	-
Paratanytarsus sp.	1	-
Pentaneura inconspicua	1	4
Polypedilum flavum	-	5
Polypedilum illinoense grp.	3	2
Polypedilum scalaenum grp.	3	1
Rheocricotopus robacki	12	-
Rheotanytarsus exiguus grp.	-	1
Rheotanytarsus pellucidus	1	-
Stempellinella sp. A Epler	-	1
Stenochironomus sp.	4	2
Ephemeroptera		
Caenis sp.	-	3
Heptageniidae	3	2
Pseudocloeon sp.	8	3
Stenonema sp.	2	-
Stenonema smithae	7	4
Heteroptera		
Rhagovelia sp.	5	-
Odonata		
Argia sp.	1	-
Argia tibialis	1	-
Calopterygidae	1	1
Calopteryx maculata	1	-
Coenagrionidae	1	1
Gomphidae	-	1
Trichoptera		
Cheumatopsyche sp.	8	11
Hydropsychidae	-	4
Oecetis sp.	-	4
Triaenodes sp.	-	2
Mollusca		
Bivalvia		
Undetermined Bivalvia	-	8
Gastropoda		
Ancylidae	-	2

Appendix 8a

Taxa list and density (number/mL) for phytoplankton collected upstream and downstream of GRU sewage spill, 8/7/2003.

	Control	Test
Bacillariophyta		
Achnanthes sp.	-	1
Achnanthes lanceolata	-	1
Achnanthes lanceolata apiculata	-	1
Achnanthes rupestoides	-	2
Cocconeis sp.	-	1
Cocconeis placentula	-	1
Nitzschia sp.	-	7
Nitzschia sigmoidea	-	1
Bacillariophyceae	110	3
Cymbellaceae	-	1
Gomphonema lingulatiforme	-	1
Eunotia sp.	-	1
Caloneis sp.	-	1
Diploneis sp.	-	1
Hippodonta capitata	-	1
Navicula sp.	-	5
Navicula rhynchocephala amphiceros	-	1
Neidium sp.	-	1
Pinnularia sp.	-	1
Surirella sp.	-	1
Amphora sp.	-	1
Aulacoseira sp.	-	2
Aulacoseira granulata	-	2
Rhizosolenia sp.	92	-
Cyclotella sp.	-	1
Fragilaria sp.	-	2
Chlorophycota		
Ankistrodesmus sp.	92	-
Ankistrodesmus falcatus	-	3
Chlorella sp.	1,026	9
Crucigenia tetrapedia	37	1
Oocystis sp.	92	-
Planktosphaeria sp.	110	-
Scenedesmus sp.	18	-
Scenedesmus bijuga	-	2
Selenastrum sp.	73	1
Tetraedron caudatum	110	-
Chlorophyceae	55	-
Elakatothrix sp.	-	1
Elakatothrix viridis	37	-
Chlamydomonas sp.	-	1
Cosmarium sp.	55	-
Mougeotia sp.	18	-
Staurastrum sp.	55	-
Staurastrum arachne gyrans	18	-
Staurastrum excavatum minimum	37	-
Staurastrum leptocladum cornutum	18	-
Xanthidium sp.	55	-
Chrysophyta		
Dinobryon sp.	18	-
Cryptophycophyta		
Cryptomonas sp.	18	-
Cyanophycota		
Aphanocapsa sp.	18	-
Chroococcus minutus	37	-
Cyanobium plancticum	92	4
Microcystis sp.	55	2
Microcystis aeruginosa	18	-
Pseudanabaena sp.	37	6
Jaaginema sp.	183	19
Planktolyngbya sp.	2,803	3
Euglenophycota		
Euglena sp.	-	4
Trachelomonas sp.	-	2
Pyrrophycophyta		
Glenodinium sp.	128	-

Appendix 8b

Taxa list and number of individuals counted for phytoplankton collected upstream and downstream of GRU swage spill, 8/7/2003.

	Control	Test
Bacillariophyta		
Achnanthes sp.	-	1
Achnanthes lanceolata	-	1
Achnanthes lanceolata apiculata	-	1
Achnanthes rupestoides	-	2
Cocconeis sp.	-	1
Cocconeis placentula	-	1
Nitzschia sp.	-	7
Nitzschia sigmoidea	-	1
Bacillariophyceae	6	3
Cymbellaceae	-	1
Gomphonema lingulatiforme	-	1
Eunotia sp.	-	1
Caloneis sp.	-	1
Diploneis sp.	-	1
Hippodonta capitata	-	1
Navicula sp.	-	5
Navicula rhynchocephala amphiceros	-	1
Neidium sp.	-	1
Pinnularia sp.	-	1
Surirella sp.	-	1
Amphora sp.	-	1
Aulacoseira sp.	-	2
Aulacoseira granulata	-	2
Rhizosolenia sp.	5	-
Cyclotella sp.	-	1
Fragilaria sp.	-	2
Chlorophycota		
Ankistrodesmus sp.	5	-
Ankistrodesmus falcatus	-	3
Chlorella sp.	56	9
Crucigenia tetrapedia	2	1
Oocystis sp.	5	-
Planktosphaeria sp.	6	-
Scenedesmus sp.	1	-
Scenedesmus bijuga	-	2
Selenastrum sp.	4	1
Tetraedron caudatum	6	-
Chlorophyceae	3	-
Elakatothrix sp.	-	1
Elakatothrix viridis	2	-
Chlamydomonas sp.	-	1
Cosmarium sp.	3	-
Mougeotia sp.	1	-
Staurastrum sp.	3	-
Staurastrum arachne gyrans	1	-
Staurastrum excavatum minimum	2	-
Staurastrum leptocladum cornutum	1	-
Xanthidium sp.	3	-
Chrysophyta		
Dinobryon sp.	1	-
Cryptophycophyta		
Cryptomonas sp.	1	-
Cyanophycota		
Aphanocapsa sp.	1	-
Chroococcus minutus	2	-
Cyanobium plancticum	5	4
Microcystis sp.	3	2
Microcystis aeruginosa	1	-
Pseudanabaena sp.	2	6
Jaaginema sp.	10	19
Planktolyngbya sp.	153	3
Euglenophycota		
Euglena sp.	-	4
Trachelomonas sp.	-	2
Pyrrophycophyta		
Glenodinium sp.	7	-