

Biological Assessment of

Callahan WWTP

Nassau County

DEP Northeast District

NPDES #FL0038407

Sampled September 2001

July 2002

Biology Section

Bureau of Laboratories

Division of Resource Assessment and Management

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger:	Callahan WWTP
County:	Nassau
NPDES Number:	FL0038407
NPDES Permit Expiration Date:	2 July 2002

Toxics Sampling Inspection **(XSI)**

Date Sampled: 14 September 2001

Results: Two organic pollutants Bromacil and *m,p*-Cresols were detected in the effluent sample below toxic levels. Copper, iron, lead, nickel, silver, and zinc were detected in the effluent at levels that complied with Class III fresh water standards.

Compliance Biomonitoring Inspection **(CBI)**

Date Sampled: 14 September 2001

Results: The effluent was not acutely toxic to the invertebrate, *Ceriodaphnia dubia*, or the vertebrate, *Cyprinella leedsi*.

Impact Bioassessment Inspection **(IBI)**

Date Sampled: 14 September 2001

Results: Periphyton results suggest some nutrient enrichment at the test site: algal density was 30% higher, diversity was 8% lower, and there was a doubling of blue-green algae in the test site sample compared to the control site sample. There were minor differences between the test and control site macroinvertebrate communities. In the Hester-Dendy samples, the Florida Index score was 27% lower at the test site (8 points) compared to the control site (11 points). Dip-net sample results were also similar between the sites (with the exception of being a greater contribution of the dominant taxa at the test site (50%) compared to the control site (35%)). The SCI scores for both the control and test sites rated in the "Good" category. Although the sites do not appear substantially different from one another in this study, nearly all measures of macroinvertebrate community health are significantly lower compared to the last Biological Assessment conducted by FDEP in 1996, suggesting worsening trends in the watershed.

Water Quality Inspection **(WQI)**

Date Sampled: 14 September 2001

Results: Effluent concentrations of ammonia (0.35 mg/L) and nitrate+nitrite (5.8 mg/L) contributed to enrichment of these nutrients at the test site. The effluent nitrate+nitrite value exceeds the facility's permit limit of 5.0 mg/L. TKN was elevated at both the control and test sites, where the concentration was higher than those found in 80-90% of other Florida freshwaters. Total phosphorus and Ortho-phosphate exceeded the values found in 60-70% of other Florida freshwaters. Corresponding to the level of nutrients at the study sites, AGP was below the fresh water "problem threshold" of 5.0 mg dry wt/L at the control site (0.89 mg dry wt/L) and above this level at the test site (8.64 mg dry wt/L). Effluent AGP was 186 mg dry wt/L.

Biological assessments are prepared by FDEP staff to provide information for review of NPDES permit renewal applications. Biological assessments, in conjunction with other information concerning the subject facility and its receiving-water body, are used to determine appropriate permit conditions.

Introduction

The Callahan Wastewater Treatment Plant is a municipal, domestic wastewater treatment plant located in Nassua County, Florida (see maps in the Appendix). Wastewater treatment includes rotating biological contactors, secondary clarification, chlorination for disinfection, and dechlorination. The effluent is discharged into the Class III fresh waters of Alligator Creek, a tributary of the Nassau River. The facility has a design flow of 1.5 MGD. The mean flow for the previous month was 1.1 MGD and the flow during this survey was 1.036 MGD. NPDES permit limits for the facility are listed in Table 1.

According to the facility's monthly operating reports, the plant has had no permit violations or enforcement actions since the last inspection (see Facility Summary in Appendix).

Methods

The purpose of this investigation was to determine the effects of the Callahan WWTP discharge on the biota of Alligator Creek. A comparison of biological community health was made between a control site located approximately 300 meters upstream of the discharge and a test site located approximately 100 meters downstream of the discharge. Habitat assessments were performed *in situ* to establish comparability between the sites.

Chemical analyses were performed on the effluent for nutrients, metals, and organic constituents (base, neutral, and acid extractables, and pesticides).

Acute screening toxicity bioassays were conducted with an effluent sample using the invertebrate test species, *Ceriodaphnia dubia*, and the fish species, *Cyprinella leedsi*. An effluent sample was also analyzed for total and fecal coliforms.

Benthic macroinivertebrates were evaluated quantitatively at the control and test sites using Hester-Dendy Multi-plate samplers that were incubated for 28 days, and qualitatively using samples collected from multiple substrates (e.g. snags, leaf packs, vegetation) using twenty discrete dip-net sweeps.

Periphyton were sampled at both the control and test sites by incubating glass microscope slides in a standard periphytometer for 28 days. Chlorophyll *a* was determined for periphyton samples using laboratory spectrophotometer analyses. Algal Growth Potential (AGP) was measured in control, test, and effluent water samples via the response of the unicellular green alga, *Selenastrum capricornutum,* in the laboratory. All methods were carried out following the Bureau of Laboratories' Standard Operating Procedures (SOP's), and may be reviewed at the FDEP website, http://www.floridadep.org/labs/sop/index.htm.

Several different measurements of macroinvertebrate and algal community health were used to determine the effects of the discharge. These measurements included abundance and community composition, taxa richness, Shannon-Weaver diversity, macroinvertebrate functional feeding groups, the number of Ephemeroptera-Plecoptera-Trichoptera (EPT) taxa, the Florida Index, and the Stream Condition Index. For a brief review of each of these measurements, see *Explanation of Measurements of Community Health* in the Appendix.

Patrick O'Connor and Thomas Kallemeyn from the FDEP Northeast District planned and collected the data for this investigation. The Central Laboratory staff in Tallahassee analyzed the samples, interpreted the results, drafted, and produced the final report. The report was reviewed by members of the Point Source Studies Review Committee (Wayne Magley, Michael Tanski, and Chuck Ziegmont), as well as representatives from the FDEP District Office.

Results and Discussion

The control site received 92 points on the habitat assessment scale and the test site received 93 points, placing each in the "suboptimal" category (see Habitat Assessment Field Sheets in Appendix). Both sites scored poorly for the primary habitat parameters of substrate availability, water velocity, and habitat smothering; as well as the secondary habitat components of artificial channelization, bank stability, and riparian buffer zone width and quality. There did not appear to be any major habitat differences between the two sites, therefore, habitat parameters should not be responsible for any differences in community health between the control and test sites.

Physical/chemical measurements were similar between the study sites (Table 1). All of the measured parameters were typical for Florida waters and complied with Class III freshwater water quality standards. The effluent dissolved oxygen level (5.3 mg/L) was less than the 6.0 mg/L permit limit which constitutes a violation of the facility's permit limits (see Facility Summary in Appendix). The control and test site levels of dissolved oxygen were above the Class III waters quality limit of 5.0 mg/L (Table 1).

Two organic compounds, Bromacil and *m,p*-Cresols were detected at low levels in the effluent sample (Table 1). Bromacil is a broad spectrum herbicide. Cresols enter the environment from natural sources, car exhaust, combustion, manufacturing, product use, and waste sites.

Copper, silver, zinc, lead, nickel, and iron were detected in the effluent sample at levels that complied with Class III freshwater water quality standards (Table 1).

No acute toxicity was indicated during the 48-hour acute screening bioassays using the invertebrate, *Ceriodaphnia dubia,* or the fish, *Cyprinella leedsi* (see Bioassay Data Sheets in Appendix).

Table 1. Effluent limits and summary of chemistry data.

Callahan WWTP	Effluent Limits	Effluent Samples	Control Site	Test Site
Organic Constituents (µg/L)				
Bromacil	-	0.27 I	-	-
m,p-Cresols	-	3.4 I	-	-
Metals (µg/L)				
Aluminum	1500 **	150 U	-	-
Arsenic	50 **	3.0 U	-	-
Cadmium	2.19 **b	0.025 U	-	-
Chromium	412 **b	0.70 U	-	-
Copper	24.3 **b	2.9 A	-	-
Iron	1000 **	222	-	-
Lead	9.27 **b	0.34 I	-	-
Nickel	321 **b	1.9 I	-	-
Selenium	5.0 **	2.5 U	-	-
Silver	0.07 **b	0.069 I	-	-
Zinc	216 **b	8.7 I	-	-
Nutrients (mg/L)				
Ortho-phosphate	-	1.3	0.19	0.22
Total phosphorus	-	1.5 A	0.21	0.26
Ammonia	10.0 *s	0.35 A	0.027	0.050
Un-ionized Ammonia	0.02	0.004	-	-
Nitrate+Nitrite	5.0 *a	5.8	0.004 U	0.12
TKN	-	2.3 A	1.5	1.7
Organic Nitrogen	-	1.9	1.2	1.65
Total Nitrogen	-	8.1	1.5	1.82
General Phys-Chem Parameters				
Habitat Assessment	-	-	92	93
DO (mg/L)	≥ 6.0 *s	5.30	5.20	5.26
pH (SU)	6.5-8.5 *s	7.12	6.05	6.12
Conductivity (µmhos/cm)	**	645	108	128
Temperature (°C)	≥ 5.0 **	26.7	23.1	24.9
TSS (mg/L)	30.0 *s	4.0	3.0	5.0
CBOD, 5 day (mg/L)	30.0 *s	5	2 K	2 K
Flow (MGD)	0.3 *	-	-	-
Hardness (mg $CaCO_3$)	-	231.73	-	-
AGP (mg dry wt/L)	-	186 J	0.885 J	8.64 J
Toxicity (48-hour static, screening bioassay)				
Bioassay - Fish	NOEC	Not Detected	-	-
Bioassay - Invertebrate	NOEC	Not Detected	-	-
Microbiology (# counts/100ml)				
Fecal Coliforms	200*	30	280	310
Total Coliforms	2400* *	810	2500	3400

A - Value is the mean of two or more determinations
I - Value is < the MQL and > the MDL
J - Estimated value
K - Actual value is known to be less than the value reported
U - Material not detected; value is the MDL
NOEC - A no observed effect concentration <100% effluent will constitute a violation

* Permit Limit
** Class III water quality standard
a - Annual average
b - Based on hardness
s - Single sample
d - monthly

Total coliforms exceeded the Class III water quality standard at the control (2,500 #/100ml) and test sites (3,400 #/100ml), a violation of Rule 62-302.530 (7) FAC. Fecal coliforms were below the Class III standard (800 #/100ml) at both study sites (Table 1). Fecal coliforms in the effluent sample complied with the facility's permit limit and Class III standards and do not appear related to the elevated levels in the receiving waters.

Effluent concentrations of total ammonia and nitrate+nitrite contributed to enrichment of these compounds at the test site compared to the control site (Table 1). The total ammonia concentration was nearly twice as high at the test site compared to the control site and nitrate+nitrite was over a magnitude higher at the test site compared to the control site. Total ammonia at the control site was below the 20th percentile compared to other typical Florida streams, while the test site concentration was greater than the 30th percentile. Nitrate+nitrite was below the 5th percentile at the control site and the test site level was greater than the 50th percentile. TKN was above the 80th percentile at the control and test sites. Ortho-phosphate and total phosphorus were greater than 60th percentile at both study sites.

Algal Growth Potential (AGP) measures the bioavailable nutrients in a water sample. Raschke and Shultz (1987) found that AGP values above 5.0 mg dry wt/L represent a "problem threshold" for freshwater systems and indicate nutrient enrichment. The effluent AGP value was 186 mg dry wt/L. The AGP value for the test site sample (8.6 mg dry wt/L) was more than approximately ten times that of the control site sample (0.9 mg dry wt/L). This increase is likely a result of the additional nutrients from the effluent and agrees with the nutrient values expected yields (Table 2). The N to P ratios were less than 11, which suggests that nitrogen was the limiting nutrient.

Table 2. Community structure of control and test sites.

Callahan WWTP	Control Site	Test Site
Periphyton Algae		
Number of Taxa	22	21
Shannon-Weaver diversity	4.05	3.72
Chlorophyll *a* (mg/m2)	0.13 U	0.057 U
Algal Density (#/cm2)	3386	4416
Diatom/Diatom + B-G Ratio	0.73	0.39
%Blue-green	25.7	55.3
% Diatoms	68.57	35.29
AGP (mg dry wt/L)	0.885 J	8.64 J

J - Estimated value

U - Material not detected; value is the MDL

There were differences in the periphyton communities that suggest some degree of nutrient enrichment at the test site compared to the control site (Table 2). Algal density was 30% higher in the test site sample (4,416 organisms/ml) compared to the control site (3,386 organisms/ml) and the percentage of blue-green algae doubled from the control site sample (25.7% contribution) to the test site (55.3% contribution). Diversity was lower (8%) at the test site compared to the control site and the number of taxa was very similar between the two sites (Table 2). Chlorophyll *a* was below the detection limit at both sites.

There were minor shifts in the macroinvertebrate community structure between the two study sites. The contribution of dominant taxon in the dip-net samples were greater in the test site sample (50% contribution) compared to the control site sample (35% contribution) (Table 3). The percentage of EPT made up only 5.7% of the test site sample compared to 25.6% of the control site sample. However, the overall number of taxa was the same between the two sites (22 taxa). Total taxa and the Florida Index were essentially unchanged at the test site compared to the control site (Table 3). The Stream Condition Index was in the "good" category at the control site with 23 points, and slightly lower at the test site with 21 points (see SCI worksheet in Appendix).

Compared to the results of a previous FDEP Bioassessment Study (1996), the biological community parameters appear substantially reduced at both study sites and suggest sources of impairment in the watershed in addition to the effluent.

Quantitative measures of macroinvertebrate health appeared to further suggest nutrient enrichment at the test site (Table 3). Collector-gatherers were the dominant functional feeding group upstream (42%) while epiphytic algal scrapers, dominated downstream (43%). The Florida Index score was 27% lower at the test site (8 points) compared to the control site (11 points). The Shannon-Weaver diversity and EPT taxa were essentially unchanged at the downstream site compared to the control (Table 3). Both sites had diversity values between the 90th and 95th percentiles compared to other typical Florida streams (Table 3).

Effluent nutrients, particularly ammonia and nitrate+nitrite, and corresponding increases in levels of these compounds at the test site may explain the differences in the macroinvertebrate and algal communities in the test site communities compared to the control site.

Table 3. Community structure of control and test sites.

Callahan WWTP	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	22	22
Number of Individuals	117	106
% Dominant Taxon	35.0	50.0
EPT	4	3
Florida Index	6	6
Stream Condition Index	23	21
Community Composition		
% Amphipoda	4.3	0.0
% Coleoptera	3.4	1.9
% Diptera	40.2	54.7
% Ephemeroptera	23.9	5.7
% Plecoptera	0.0	0.0
% Gastropoda	0.9	1.9
% Odonata	2.6	1.9
% Oligochaeta	9.4	26.4
% Pelecypoda	13.7	7.6
% Trichoptera	1.7	0.0
% Other	0.0	0.0
Functional Feeding Groups		
% Burrowing Deposit Feeders	8.6	24.5
% Predators	3.9	1.9
% Scrapers	14.1	4.7
% Shredders	18.0	24.1
% Surface Deposit Feeders	32.5	33.0
% Suspension Feeders/Filterers	20.1	9.9
% Unknown	3.0	1.9
Macroinvertebrate Hester-Dendy		
Number of Taxa	30	30
Number of Individuals	180	226
% Dominant Taxon	25.0	24.0
Florida Index	11	8
Shannon-Weaver Diversity	3.89	3.83
EPT Index	3	3
Community Composition		
% Amphipoda	0.56	0.88
% Coleoptera	13.33	0.89
% Diptera	64.44	35.40
% Ephemeroptera	8.33	7.97
% Gastropoda	11.11	42.03
% Oligochaeta	0.00	3.54
% Pelecypoda	0.00	6.19
% Trichoptera	1.11	0.88

Literature Cited

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LEGEND

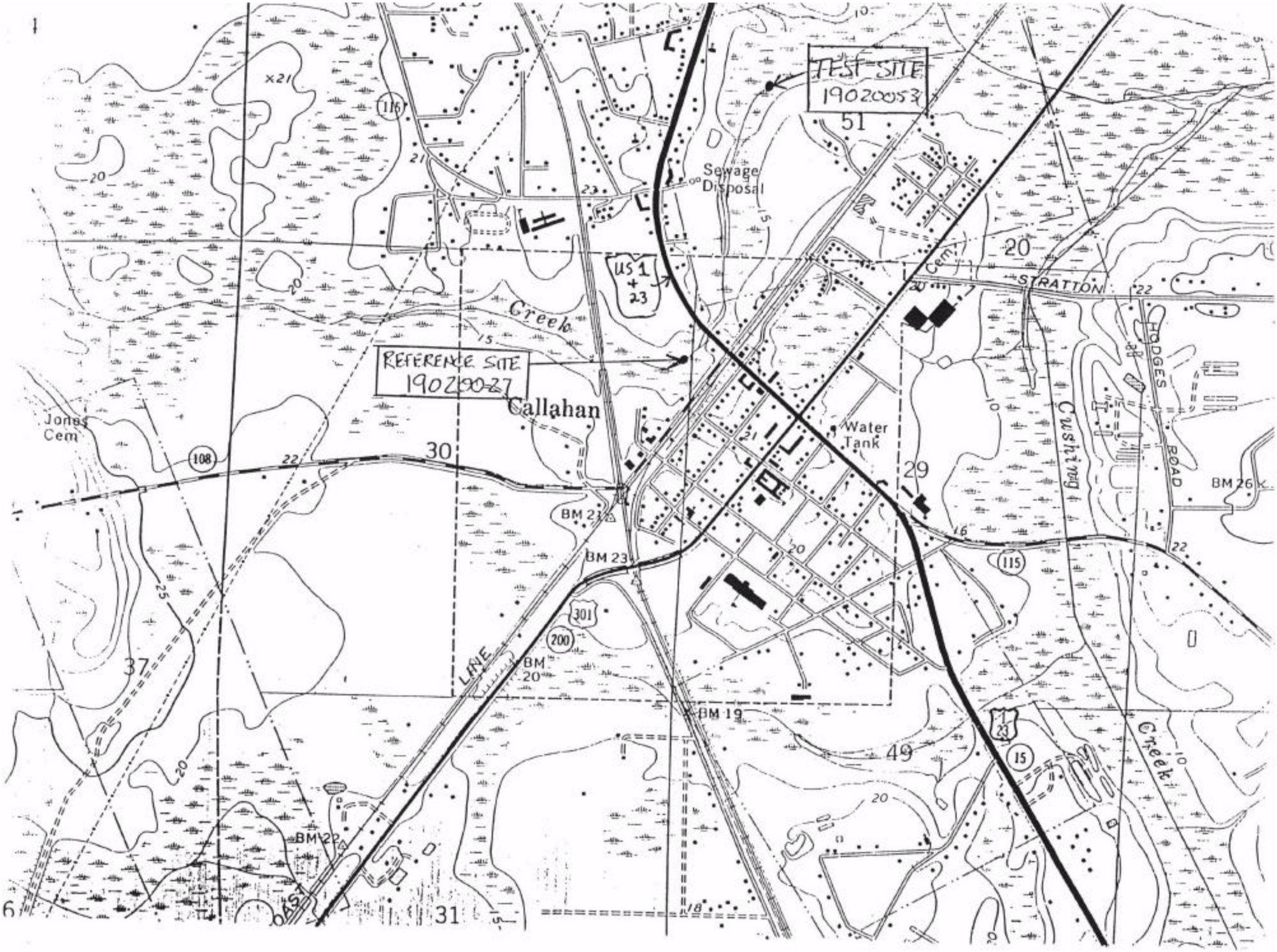
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- State Route
- Geo Feature
- Town, Small City
- US Highway
- County Boundary
- Street, Road
- Trails
- Major Street/Road
- State Route
- US Highway
- Railroad
- River
- Open Water

Scale 1:62,500 (at center)

1 Miles

2 KM

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Explanation of Biological Measures

(1) Habitat Assessment:

Eight aspects of the physical structure and extent of disturbance were ranked, with 20 possible points for each factor (SOP #IZ-21, based on Plafkin *et al.*, 1989 and Barbour and Stribling, 1994). 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. Based on the sum of the scores for each factor, Habitat Assessment score ranges from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (105-160 points), Suboptimal (102-123 points), Marginal (54-80 points), and Poor (11-33 points).

(2) Effluent and Water Samples from Control and Test Sites

Algal Growth Potential (AGP): The effluent and water from control and test sites were incubated with the diatom, *Selenastrum capricornutum,* as a measure of algal growth potential (AGP, Miller *et al.* 1978). Raschke and Shultz (1987) found that AGP above 5 mg dry weight/L creates a "problem" threshold for fresh receiving waters, implying nutrient enrichment.

(3) Algal Phytoplankton and Periphyton Assemblages

Chlorophyll *a* Content: Chlorophyll *a* content was measured in both phytoplankton and periphyton samples to estimate algal biomass (Modified from *Standard Methods* 10200H). High algal biomass implies nutrient stress.

Cell Density: Cell density was estimated as number/ml for phytoplankton samples and number/cm^2 for periphyton samples (Modified from *Standard Methods* 10200F and 10900G).

Taxa richness: Taxa richness is the number of distinct algal taxa present in a sample. Stress tends to reduce the number of different types of algae present in a sample, but moderate nutrient enrichment of nutrient poor waters may sometimes be correlated with increased algal taxa richness.

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.

Diatom to Blue-Green Algae Ratio: 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 plus Cyanophyta) is often indicative of nutrient enriched conditions in flowing streams.

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.

(4) Benthic Macroinvertebrate Assemblages

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.

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).

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 in equitable abundance among taxa.

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 sensitivity to pollution (Beck 1954). A site with a high Florida Index score is considered healthy (Ross 1990).

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).

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.

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).

The Stream Condition Index (SCI): The SCI is a composite macroinvertebrate metric (Barbour *et al.* 1996a, b) 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 (see Table 4, Barbour *et al.* 1996a, b). 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.

Typical Values for Selected Parameters in Florida Waters

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

Callahan WWTP

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Control Site												
Phytoplankton Chlorophyll *a*	**0.22**	0.52	0.94	1.6	3.02	4.63	6.72	9.87	14.68	27.35	48.7	**0.85U**
Periphyton Chlorophyll *a*	**0.31**	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17	39.51	60.85	**0.13U**
H-D Diversity	**0.84**	2.12	2.48	2.74	2.88	3.09	3.25	3.4	3.52	**3.76**	**3.9**	**3.89**
Qualitative Taxa Richness	9	12	17	20	**22**	24.5	26	28	31	37	53	**22**
H-D Taxa	6	6.5	9	11.5	13	15	17	21.5	26	**29**	**32**	**30**
TKN	0.3	0.39	0.56	0.73	0.87	1	1.11	1.26	**1.49**	**1.93**	2.8	**1.5**
Ammonia	0.02	**0.02**	**0.04**	0.05	0.06	0.08	0.11	0.14	0.2	0.34	0.6	**0.027**
NO2-NO3	**0.01**	0.01	0.03	0.05	0.07	0.1	0.14	0.2	0.32	0.64	1.05	**0.004**
Total Phosphorus	0.02	0.03	0.05	0.06	0.1	0.13	0.18	**0.25**	**0.39**	0.74	1.51	**0.21**
Ortho Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	**0.17**	**0.27**	0.59	1.37	**0.19**

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Test Site												
Phytoplankton Chlorophyll *a*	**0.22**	0.52	0.94	1.6	3.02	4.63	6.72	9.87	14.68	27.35	48.7	**0.85U**
Periphyton Chlorophyll *a*	**0.31**	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17	39.51	60.85	**0.057U**
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.4	3.52	**3.76**	**3.9**	**3.83**
Qualitative Taxa Richness	9	12	17	20	**22**	24.5	26	28	31	37	53	**22**
H-D Taxa	6	6.5	9	11.5	13	15	17	21.5	26	**29**	**32**	**30**
TKN	0.3	0.39	0.56	0.73	0.87	1	1.11	1.26	**1.49**	**1.93**	2.8	**1.7**
Ammonia	0.02	0.02	0.04	**0.05**	0.06	0.08	0.11	0.14	0.2	0.34	0.6	**0.05**
NO2-NO3	0.01	0.01	0.03	0.05	0.07	**0.1**	**0.14**	0.2	0.32	0.64	1.05	**0.12**
Total Phosphorus	0.02	0.03	0.05	0.06	0.1	0.13	0.18	**0.25**	**0.39**	0.74	1.51	**0.26**
Ortho Phosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	**0.27**	0.59	1.37	**0.22**

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

Facility Information Sheet

please provide most recent information for our writing the bioassay reports

(you need NOT complete this sheet if sampling was part of a 5th-year BIOASSESSMENT)

Facility Name: *Town of Callahan WWTF*

(as found on the permit)

NPDES permit #: *FL0038407*

Facility Location: (road) *Brandies Avenue*

(city *Callahan, Florida*

(county) *Nassau*

Receiving Water: *Alligator Creek (Class III fresh waters). The point of discharge is located approximately at latitude 30 degrees 24 minutes 27 seconds N, longitude 81 degrees 49 minutes 39 seconds W.*

Chlorination Type of Sample: ____ Chlorinated
X__ Sample collected after dechlorination
____ Non-chlorinated

Design Flow and/or Average Flow (circle one): *0.3 MGD design flow*

Type of Facility (e.g., WWTP, R/O, paper mill, etc):

WWTP

Treatment that Wastewater Receives Prior to Discharge:

This 0.3 MGD permitted capacity rotating biological contactor (RBC) Wastewater Treatment Facility consists of: comminution, influent screening, flow equalization, RBC treatment, secondary clarification, basic disinfection via chlorination, and dechlorination with discharge to Alligator Creek.

Additional Comments: *Sporadic effluent violations for CBOD5, fecal coliforms and Total Ammonia. Information submitted for the application for permit states that the outfall line is an 8 inch diameter ductile iron pipe that extends approximately 4 feet from shore has a receiving*

water body depth of approximately two feet below the water surface. This will be verified during the next inspection.

prepared by *Kathleen H. Gerard*

revised 1/14/94 KP

Department of
Environmental Protection

Lawton Chiles
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Virginia B. Wetherell
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:
Town of Callahan

RESPONSIBLE AUTHORITY:
Mr. William N. Clemons
Public Works Director
Post Office Box 5016
Callahan, FL 32011

PERMIT NUMBER: FL0038407
ISSUANCE DATE: July 3, 1997
EXPIRATION DATE: July 2, 2002
FACILITY I.D. NO: FL0038407 (Minor)
APPLICATION NO: 299174

FACILITY:

Town of Callahan WWTF
Brandies Avenue
Nassau County
Callahan, FL 32011
Latitude: 30° 24' 27" N Longitude: 81° 49' 39" W

This permit is issued under the provisions of Chapter 403, Florida Statutes, and applicable rules of the Florida Administrative Code and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TREATMENT FACILITIES:

An existing 0.3 mgd annual average daily flow (AADF) permitted capacity rotating biological contactor (RBC) WWTF consisting of comminution, influent screening, flow equalization, RBC treatment, secondary clarification, basic disinfection via chlorination, and dechlorination with:

EFFLUENT DISPOSAL:

Surface Water Discharge: An existing 0.3 mgd AADF permitted discharge to Alligator Creek (Class III fresh waters) at Discharge Location (D001). The point of discharge is located approximately at latitude 30° 24' 27" N, longitude 81° 49' 39" W.

IN ACCORDANCE WITH: The limitations, monitoring requirements and other conditions as set forth in Pages 1 through 15 of this permit.

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DEP NORTHEAST DIST Fax:904-448-4366 Mar 28 '02 12:12 P.03

DEP NORTHEAST DIST Fax:904-448-4366 Mar 28 '02 12:13 P.04

PERMITTEE: Town of Callahan
FACILITY: Town of Callahan WWTF
Brandies Avenue
Callahan, FL 32011

PERMIT NUMBER: FL0038407
ISSUE DATE: July 3, 1997
EXPIRATION DATE: July 2, 2002
APPLICATION NO.: 299174

I. RECLAIMED WATER AND EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Surface Water Discharges

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to discharge effluent from Outfall D001 to Alligator Creek. Such discharge shall be limited and monitored by the permittee as specified below:

			Effluent Limitations				Monitoring Requirements			
Parameter	Units	Max/Min	Annual Average	Monthly Average	Weekly Average	Single Sample	Monitoring Frequency	Sample Type	Monitoring Location Site Number	Notes
Flow	mgd	Maximum	0.3	-	-	-	5 Days/Week	Recording flow meters and totalizers	EFD-1	See Cond.I.A.3
Carbonaceous Biochemical Oxygen Demand (5 day)	mg/L	Maximum	15.0	15.0	22.5	30.0	Every Two Weeks	8-hour flow proportioned composite	EFD-1	
Total Suspended Solids	mg/L	Maximum	15.0	15.0	22.5	30.0	Every Two Weeks	8-hour flow proportioned composite	EFD-1	
Ammonia, Total as N	mg/L as N	Maximum	5.0	5.0	7.5	10.0	Every Two Weeks	8-hour flow proportioned composite	EFD-1	
Oxygen, Dissolved (DO)	mg/L	Minimum	-	-	-	6.0	5 Days/Week	Meter or Instrument	EFD-1	
pH	std. units	Range	-	-	-	6.5 to 8.5	5 Days/Week	Meter or Instrument	EFD-1	
Total Residual Chlorine (For Disinfection)	mg/L	Minimum	-	-	-	0.5	5 Days/Week	Meter or Instrument	EFA-1	See Cond.I.A.5
Total Residual Chlorine (For Dechlorination)	mg/L	Maximum	-	-	-	0.01	Every Two Weeks	Meter or Instrument	EFD-1	
Fecal Coliform Bacteria	See Permit Condition I.A.4.						Every Two Weeks	Grab	EFD-1	
Nutrient Monitoring	See Permit Condition I.A.6.									
Stream Monitoring	See Permit Condition I.A.7.									

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I. A. 1. and as described below:

Monitoring Location Site Number	Description of Monitoring Location
EFA-1	Post-Disinfection
EFD-1	Final effluent, prior to discharge to surface waters

3. Recording flow meters and totalizers shall be utilized to measure flow and calibrated at least annually. *[62-601.200(17) and .500(6), 5-51-93]*

4. The arithmetic mean of the monthly fecal coliform values collected during an annual period shall not exceed 200 per 100 mL of effluent sample. The geometric mean of the fecal coliform values for a minimum of 10 samples of effluent each collected on a separate day during a period of 30 consecutive days (monthly), shall not exceed 200 per 100 mL of sample. No more than 10 percent of the samples collected (the 90th percentile value) during a period of 30 consecutive days shall exceed 400 fecal coliform values per 100 mL of sample. Any one sample shall not exceed 800 fecal coliform values per 100 mL of sample. Note: To report the 90th percentile value, list the fecal coliform values obtained during the month in ascending order. Report the value of the sample that corresponds to the 90th percentile (multiply the number of samples by 0.9). For example, for 30 samples, report the corresponding fecal coliform number for the 27th value of ascending order. *[62-600.440(4)(c), 6-8-93]*

5. A minimum of 0.5 mg/L total residual chlorine must be maintained for a minimum contact time of 15 minutes based on peak hourly flow. *[62-600.440(4)(b), 6-8-93]*

6. Monitoring on a quarterly basis shall be performed on the effluent with analysis by a certified laboratory for the parameters listed below. Sampling shall be performed on the same day as routine effluent sampling and stream sampling as described in condition I.A.7. below.

PARAMETER	REPORTING UNITS	SAMPLE TYPE
Organic Nitrogen	mg/L as N	8-hour flow-proportional composite
Nitrite + Nitrate	mg/L as N	8-hour flow-proportional composite
Total Kjeldahl Nitrogen	mg/L as N	8-hour flow-proportional composite
Total Nitrogen	mg/L as N	8-hour flow-proportional composite
Orthophosphate	mg/L	8-hour flow-proportional composite
Total Phosphorous	mg/L	8-hour flow-proportional composite
Total Ammonia	mg/L as N	Grab
Temperature	degrees centigrade	Grab
Unionized Ammonia	mg/L as N	Calculated
Hardness	mg/L as $CaCO_3$	8-hour flow-proportional composite

7. The following stream monitoring and sampling shall be performed on Alligator Creek and Little Mills Creek at the upstream and downstream locations described below.

SITE NUMBER	DESCRIPTION
1	Upstream Alligator Creek at U.S. 1 (upstream from bridge)
2	Upstream Little Mills Creek at U.S. 1 (downstream from bridge)

DEP NORTHEAST DIST Fax:904-448-4366 Mar 28 '02 12:13 P.05

3	Downstream Alligator Creek at railroad crossing (100 feet upstream from bridge)

The permittee shall sample the following parameters at the three sites: Dissolved Oxygen, Ortho-Phosphorous, Fecal Coliform, $CBOD_5$, and Nitrite+Nitrate. The samples shall be collected quarterly and concurrently with the quarterly effluent samples listed in condition I.A.6. All samples shall be collected at mid-depth. The results shall be forwarded to the Northeast District Office at the address specified in Specific Condition I.B.6.

B. Other Limitations and Monitoring and Reporting Requirements

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the treatment facility shall be limited and monitored by the permittee as specified below:

			Monitoring Requirements			
Parameter	Units	Max/Min	Monitoring Frequency	Sample Type	Monitoring Location Site Number	Notes
Carbonaceous Biochemical Oxygen Demand (5 day)	mg/L	Report	Every Two Weeks	8-hour flow proportioned composite	INF-1	See Cond.I.B.3
Total Suspended Solids	mg/L	Report	Every Two Weeks	8-hour flow proportioned composite	INF-1	See Cond.I.B.3

2. Samples shall be taken at the monitoring site locations listed in Permit Condition I. B. 1 and as described below:

Monitoring Location Site Number	Description of Monitoring Location
INF-1	Influent, prior to biological treatment

3. Influent samples shall be collected so that they do not contain digester supernatant or return activated sludge, or any other plant process recycled waters. *[62-601.500(4), 5-31-93]*

4. The permittee shall provide safe access points for obtaining representative influent, reclaimed water, and effluent samples which are required by this permit. *[62-601.500(5), 5-31-93]*

5. During the period of operation authorized by this permit, the permittee shall complete and submit to the Department on a monthly basis Discharge Monitoring Report(s) (DMR), Form 62-620.910(10), as attached to this permit. The permittee shall make copies of the attached DMR form(s) and shall submit the completed DMR form(s) to the Department by the twenty-eighth (28th) of the month following the month of operation at the address specified below:

Florida Department of Environmental Protection
Wastewater Facilities Regulation Section, Mail Station 3551
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

[62-620.610(18), 11-29-94][62-601.300(1),(2), and (3), 5-31-93]

DEP NORTHEAST DIST Fax:904-448-4366 Mar 28 '02 12:14 P.06

E, H 1-14

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Wastewater Facilities Management Section, MS 3551, 2600 Blair Stone Road, Tallahassee, FL 32399-2400

PERMITTEE NAME: Town of Callahan
MAILING ADDRESS: Post Office Box 5016, Callahan, FL 32011

FACILITY: Town of Callahan WWTF
LOCATION: Braddics Avenue, Callahan, FL 32011
COUNTY: Nassau

PERMIT NUMBER: FL0038407
MONITORING PERIOD From: October 01, 2001 To: 31st 2001
LIMIT: FINAL
CLASS SIZE: Minor
FACILITY ID: FL0038407
OMS ID NO.: 3145A01840
DISCHARGE POINT NUMBER: D001
PLANT SIZE/TREATMENT TYPE: IVC
REPORT: Monthly
GROUP: Domestic
WAFR SITE NO.: 9958
OMS TEST SITE NO.: 3145X10026

001 - 1

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow	Sample Measurement	213		mgd					0	5 Days/Wk	Flow Meter
STORET No. 50050 Mon.Site No. EFD1	Permit Requirement	(Mo.Ave.)									
Flow	Sample Measurement	0.201		mgd					0	5 Days/Wk	Flowmeter
STORET No. 50050 Mon.Site No. EFD1	Permit Requirement	(Mo.Ave.)									
CBOD5	Sample Measurement				12.0			mg/L	0	Every 2wk	8hr. FPC
STORET No. 80082 Mon.Site No. EFD1	Permit Requirement				(Mo.Ave.)						
CBOD5	Sample Measurement				9.3	12.0	12.0	mg/L	0	Every 2wk	8hr. FPC
STORET No. 80082 Mon.Site No. EFD1	Permit Requirement				(Mo.Ave.)	(Wkly.Ave.)	(Max.)				
TSS	Sample Measurement				8.50			mg/L	0	Every 2wk	8hr. FPC
STORET No. 00530 Mon.Site No. EFD1	Permit Requirement				(Mo.Ave.)						
TSS	Sample Measurement				9.0	14.0	140	mg/L	0	Every 2wk	8hr. FPC
STORET No. 00530 Mon.Site No. EFD1	Permit Requirement				(Mo.Ave.)	(Wkly.Ave.)	300 (Max.)				
pH	Sample Measurement				6.5		7.1	S.U.	0	5 Days/Wk	Meter
STORET No. 00400 Mon.Site No. EFD1	Permit Requirement				(Min.)		(Max.)				

RECEIVED
NOV 16 2001
WASTEWATER COMPLIANCE EVALUATION SECTION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (YY/MM/DD)
Michael A. Williams / Agent / Operator	Michael A. Williams	(904) 879-3215	01/11/14

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

P. 02 12:11 Mar 28 '02 Fax:904-448-4366 DEP NORTHEAST DIST

Control Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	22	≥22	21-12	<12	5
EPT Index	4	-	≥2	<2	3
# Chironomid Taxa	6	≥7	6-4	<4	3
% Contribution of Dominant Taxon	35	≤31	32-66	>66	3
% Diptera	40.2	-	≤47	>47	3
Florida Index	6	≥8	7-4	<5	3
% Suspension feeders/Filterers	20.1	-	≥7	<7	3
Total Score		**Northeast**			**23**
Interpretation of Scores		**Excellent**			25-29
		Good			19-24
		Poor			13-18
		Severely Degraded			7-12

Summer Index Period: Stream Condition Index (SCI) for Florida Northeast (April 1996)

Test Site

Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	Value	5	3	1	Score
Total Number of Taxa	22	≥22	21-12	<12	5
EPT Index	3	-	≥2	<2	3
# Chironomid Taxa	6	≥7	6-4	<4	3
% Contribution of Dominant Taxon	50	≤31	32-66	>66	3
% Diptera	54.7	-	≤47	>47	1
Florida Index	6	≥8	7-4	<5	3
% Suspension feeders/Filterers	9.9	-	≥7	<7	3
Total Score		**Northeast**			**21**
Interpretation of Scores		**Excellent**			25-29
		Good			19-24
		Poor			13-18
		Severely Degraded			7-12

Summer Index Period: Stream Condition Index (SCI) for Florida Northeast (April 1996)

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Callahan WWTP
County: Nassau
Contact / District: Pat O'Connor / NE
NPDES Permit #: FL0038407
LIMS Sample #: 548629 **LIMS Job #:** TLH-2001-09-25-04
sample log 9/27/01 mf
Test Type: Screening | Definitive
(Static) | Static Renewal | Flow-through
Test Number: 1 of 2

Sample Collection: Date 9/24/01 Time 11:50
Test Beginning: Date 9/25/01 Time 14:00
Test Ending: Date ~~9/27/01~~ (B) Time 14:22
Organism Batch #: 43 **Diluent Batch #:** 25
Organism Age: <24 hours SRT toxicant batch #: NA
Test organism: Ceriodaphnia dubia

Remarks: (B) 9/27/01 (SA) wrong date.

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) 0 hr	UNCORRECTED Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (µmhos/cm) 48 h
Control A	A	5	5	5	8.1	—	8.2	24.2	—	25.0	8.4	—	7.5	165	—	240
Control B	B	5	5	5	—	—	8.5	—	—	25.3	—	—	7.6	—	—	205
Control C	C	5	5	5	—	—	8.4	—	—	25.5	—	—	7.5	—	—	190
Control D	D	5	5	5	—	—	8.4	—	—	25.5	—	—	7.5	—	—	205
100 % A	A	5	5	5	7.4	—	8.7	24.5	—	25.2	7.4	—	7.7	620	—	655
100 % B	B	5	5	5	—	—	8.7	—	—	25.2	—	—	7.8	—	—	690
100 % C	C	5	5	5	—	—	8.7	—	—	25.2	—	—	7.8	—	—	690
100 % D	D	5	5	5	—	—	8.7	—	—	25.0	—	—	7.8	—	—	700
measured by:		MF	MF	SA	SA	—	MF	SA	—	MF	SA	—	MF	SA	—	MF
recorded by:		SA	SA	SA	DPH	—	SA	DPH	—	SA	DPH	—	SA	DPH	—	SA

(B) 9/26/01 DPH looking at wrong sample Chlorine was read in the 2nd

Investigators' Signatures
Marshall Faircloth
Dan Richardson
John Ayo

Temperature Range °C
Incubator # 2 24.5-26.0°C
Room 624 24.0-25.2°C

Water Quality Parameters	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			0.05 (SA)	—	T. Kaufman	DPH
Lab Total Residual Cl2 (mg/L):		<0.03	<0.03	Hach	DPH	SA
Alkalinity (mg/L as $CaCO_3$):		76	145	Hach	SA/DPH	SA
Hardness (mg/L as $CaCO_3$):		79	233	Hach	SA/DPH	SA
Total ammonia (mg/L as N):		<0.017	<0.017	Orion	DPH	SA
Salinity:		<1	<1	YSI	SA	SA

reviewer form updated 3/3/99

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Callahan WWTP
County: Nassau
Contact / District: Pat O'Connor/Northeast
NPDES Permit #: FL0038407
LIMS Sample #: 548629 **LIMS Job #:** TLH-2001-09-25.04
sample log 9/27/01 mt
Test Type: Screening | Definitive
Static | Static Renewal | Flow-through
Test Number: 2 of 2

Sample Collection: Date 9/24/01 Time 11:50
Test Beginning: Date 9/25/01 Time 12:00
Test Ending: Date 9/27/01 Time 14:23
Organism Batch #: 12 **Diluent Batch #:** well H2O
Organism Age: 10 days SRT toxicant batch #: NA
Test organism: Cyprinella leedsi

Remarks:

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	B17	5	5	5	7.8	8.4	8.6	24.3	23.8	24.6	8.0	7.7	7.8	280	300	325
Control B	B18	5	5	5	7.8	8.4	8.6	24.2	23.8	24.6	8.0	7.7	7.7	280	285	305
Control C	B19	5	5	5	7.8	8.4	8.6	24.2	24.1	24.6	8.0	7.6	7.7	280	290	310
Control D	B20	5	5	5	7.8	8.4	8.6	24.2	23.7	24.6	8.0	7.5	7.7	280	290	305
100% A	B21	5	5	5	7.5	8.1	8.3	24.4	24.5	24.6	7.4	6.7	7.3	620	620	630
100% B	B22	5	5	5	7.5	8.3	8.4	24.5	23.6	24.8	7.4	6.7	7.3	620	665	715
100% C	B23	5	5	5	7.5	8.1	8.4	24.5	23.9	24.8	7.3	6.9	7.3	625	635	690
100% D	B24	5	5	5	7.6	8.2	8.4	24.5	24.0	24.7	7.3	6.9	7.3	625	640	670
measured by:		JA	MF	JA	JA	MF	MF	JA	MF	MF	JA	MF	MF	JA	MF	MF
recorded by:		DPH	JA	JA	DPH	JA	JA	DPH	JA	JA	DPH	JA	JA	DPH	JA	JA

Investigators' Signatures
Marshall Fairbanks
Della Parker Hanes
Joshua Ayers

Temperature Range °C
Incubator # 3 24.5–25.5°C
Room 8246 24.2–25.2°C

① Working at wrong sample chlorine was read in the field 9/24/01 DPH

Water Quality Parameters	Salt Water: Well Water	Salt Water: 20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			0.05 (A)	—	T. Kallenbach	DPH
Lab Total Residual Cl2 (mg/L):	<0.03		<0.03	Hach	DPH	JA
Alkalinity (mg/L as $CaCO_3$):	138		145	Hach	JA/DPH	JA
Hardness (mg/L as $CaCO_3$):	134		233	Hach	JA/DPH	JA
Total ammonia (mg/L as N):	<0.017		<0.017	Denver	DPH	JA
Salinity:	<1		<1	YSI	JA	JA

reviewer form updated 3/3/99

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:
	19020052	6/27/01	1000	Alligator Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Nassau	Alligator Creek 150 m Above Callahan WWTP POD	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)
4	70	—	5	10	1		

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

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

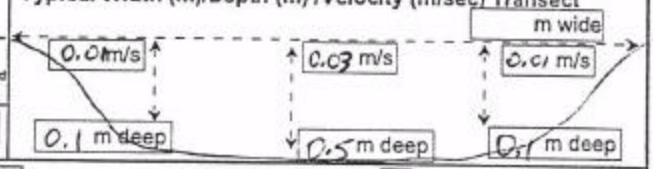
Width of riparian vegetation (m) on least buffered side: >18M

List & map dominant vegetation on back

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

High Water Mark: 1.0 (m above present water level) + 0.5 (present depth in m) = 1.5 (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	4	DIPNET	Sand			
Leaf Packs or Mats	2	4	DIPNET	Mud/Muck/Silt	94	4	DIPNET
Aquatic Vegetation	2	4	DIPNET	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots	1	4	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	0.25	23.32	6.79	3.19	269			0.5L
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:
80° P/C NO WINDS

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

SAMPLING TEAM: Kallemeyn O'Connor

SIGNATURE: Patrick W Dam

DATE: 6/27/01

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	19020052	6/27/01	Alligator Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Nassau	Alligator Creek 50m Above C'Allahan Pod	Control Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components				
Substrate Diversity [16]	Four or more productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), undercut banks, 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 [6]	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 [2]	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 [6]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Primary Score [30]				
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 [8] Left Bank [8]	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 m 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]	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 streambank surfaces are vegetated and/or poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1
Secondary Score [62]				

[92] TOTAL SCORE

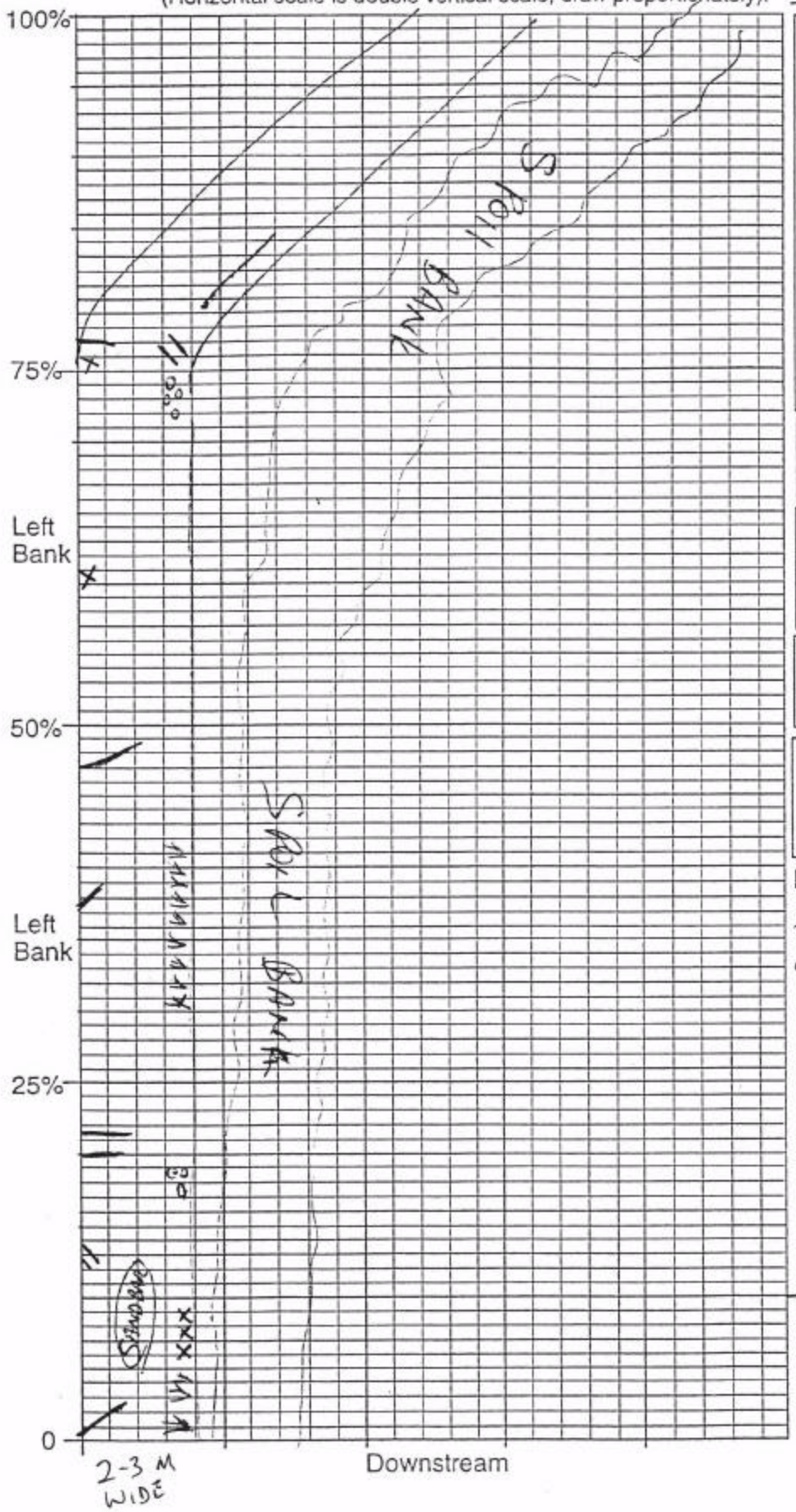
ANALYSIS DATE:	ANALYST:	SIGNATURE:
6/27/01	O'Connor	

Alligator Creek 150 m above Callahan Rd

Site Map / Habitat Sketch

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

Field ID: Control Site



Substrates: Code key, draw proportionate habitat abundance.

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

Velocity:
Note where velocity measures were taken.

Habitat Smothering:
Note areas (on map) where sand 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:

Pop Ash Cypress Red Maple grape vine

AQUATIC VEG = Alligator weed
Spoil Bank well vegetated

VELOCITY 34 SEC/M

LAT LONG
303453
814973

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:
	19020053	6/21/01	1100	Alligator Creek

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	Nassau	Alligator Creek 50 m below Callahan WWTP POD	Test 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)
4	70	–	5	10	1		

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

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

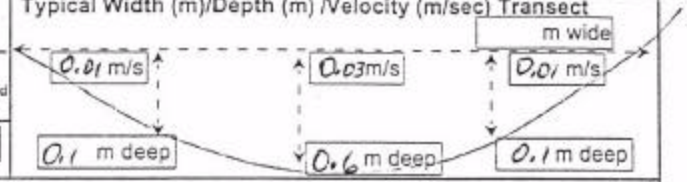
Width of riparian vegetation (m) on least buffered side: >18 m

List & map dominant vegetation on back

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

High Water Mark: 1.0 (m above present water level) + 0.6 (present depth in m) = 1.6 (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	4	D-NET	Sand			
Leaf Packs or Mats	1	4	D-NET	Mud/Muck/Silt	96	4	D-NET
Aquatic Vegetation	1	4	D-NET	Other:			
Rock or Shell Rubble				Other:			
Undercut banks/Roots	1	4	D-NET	*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								0.6L
Mid-depth	0.3	24.9	7.11	4.02	524			
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: 85°F P/C No wind

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Kalemeyn O'Connor	Rebecca Olsen	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (5-27-98)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
	19020053	6/27/01	ALLIGATOR CREEK

REMARKS:	COUNTY:	LOCATION:	FIELD ID/NAME:
	NASSAU	ALLIGATOR CREEK 50 m BELOW CALLAHAN WWTP POD	TEST SITE

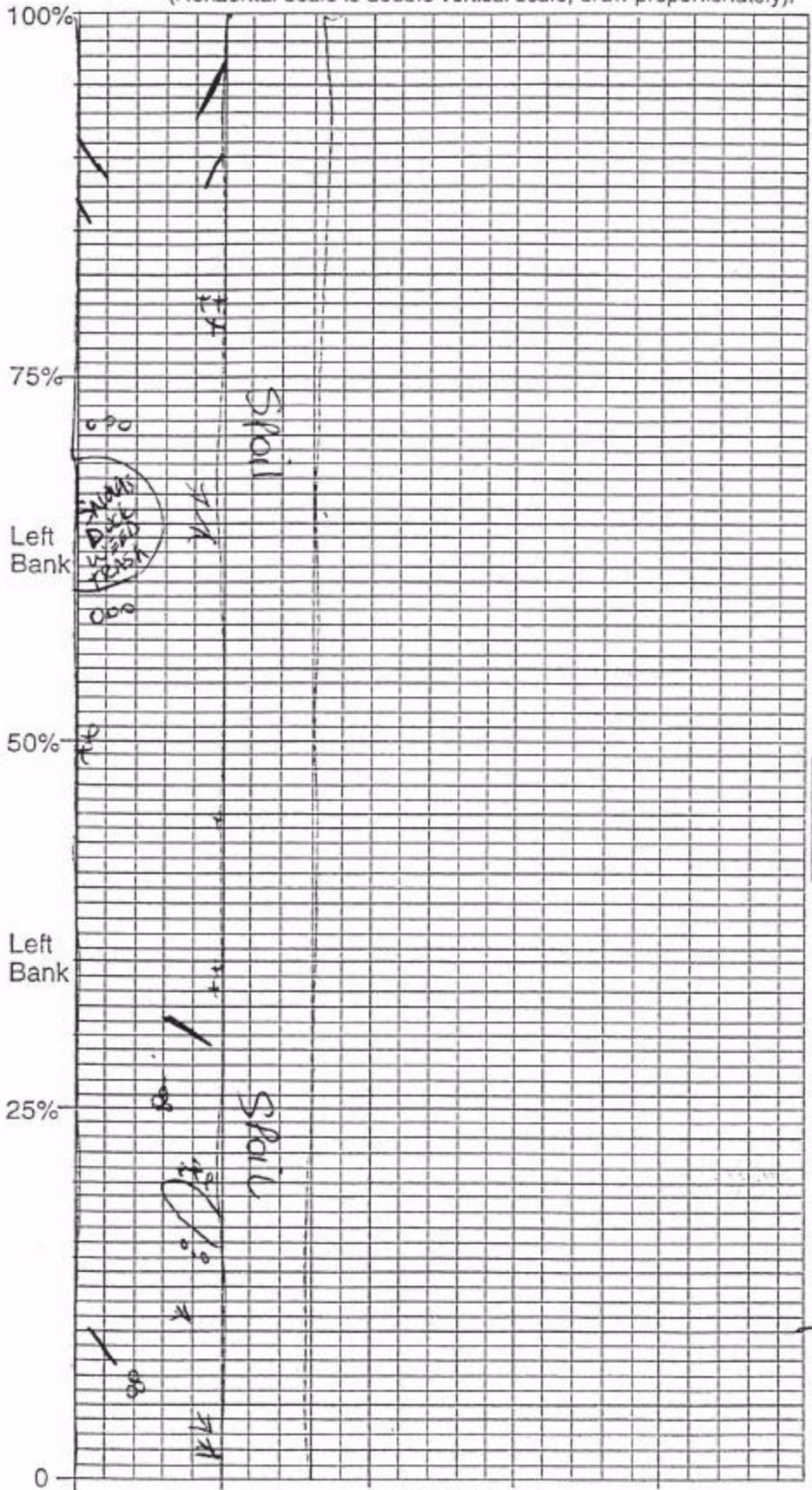
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Primary Score [29]				
Secondary Habitat Components **Artificial Channelization** [10]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, 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
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Secondary Score [64]				

[93] TOTAL SCORE

ANALYSIS DATE:	ANALYST:	SIGNATURE:
6/27/01	O'CONNOR	Robert Williams

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 abundance.

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

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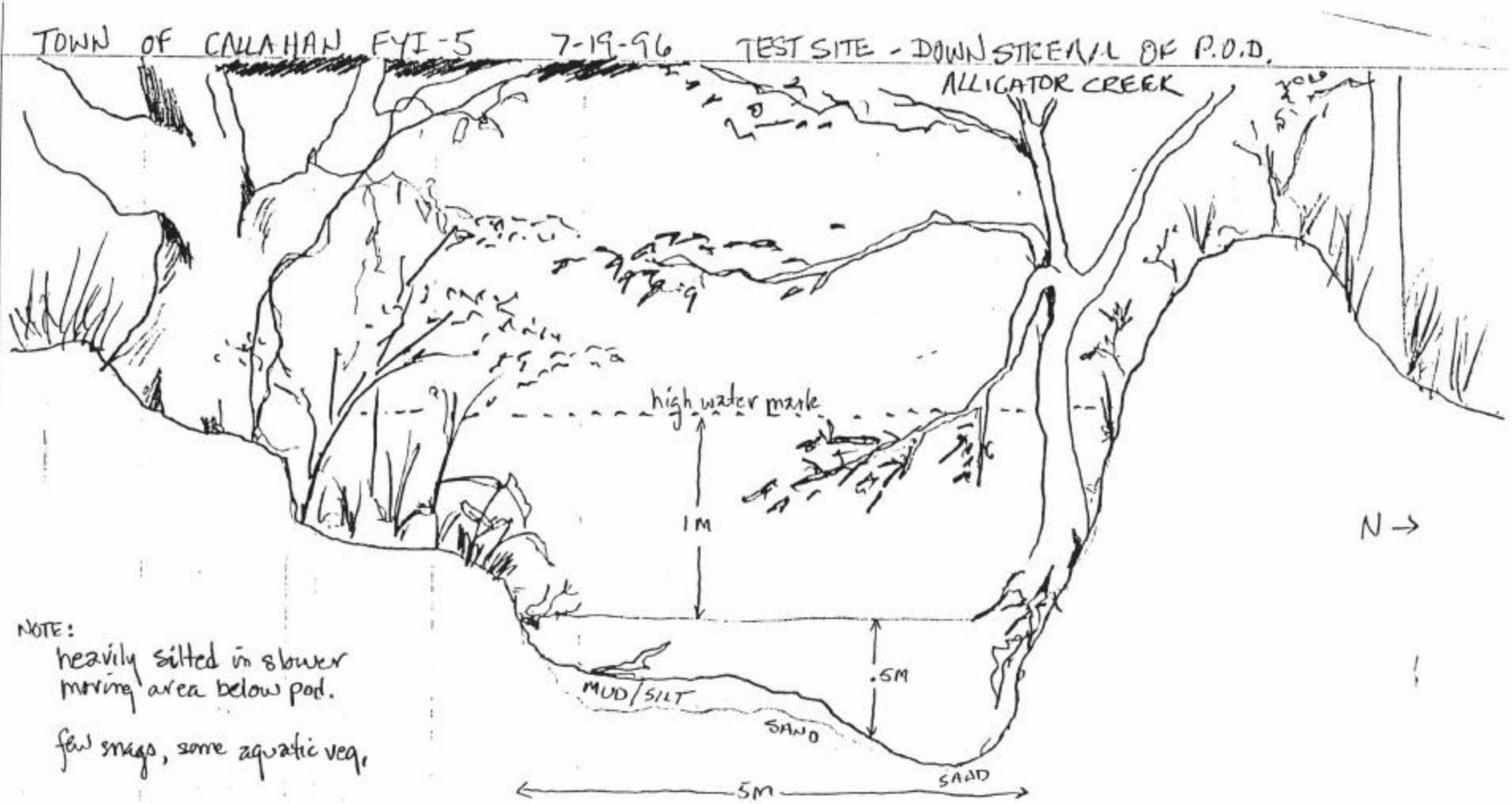
Riparian Buffer Width:
Note areas (on map) where natural vegetaton is altered or eliminated.

Plants observed/other notes:
Cypress Pop Ash Grape Vine
Red maple

Velocity 0.03 - 0.0

LAT LONG
30 34 53
81 49 61

TOWN OF CALLAHAN FYI-5 7-19-96 TEST SITE - DOWNSTREAM OF P.O.D.

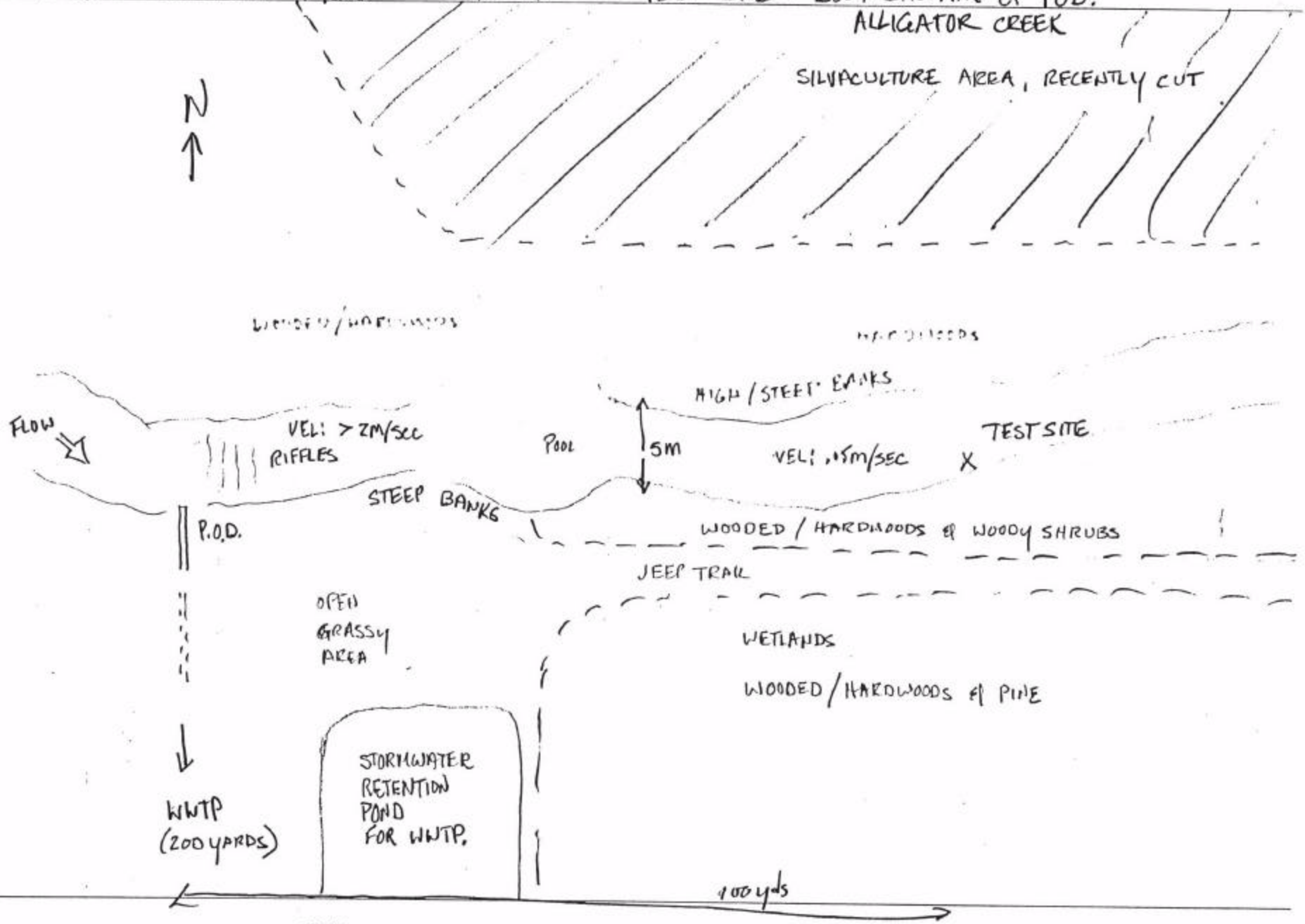


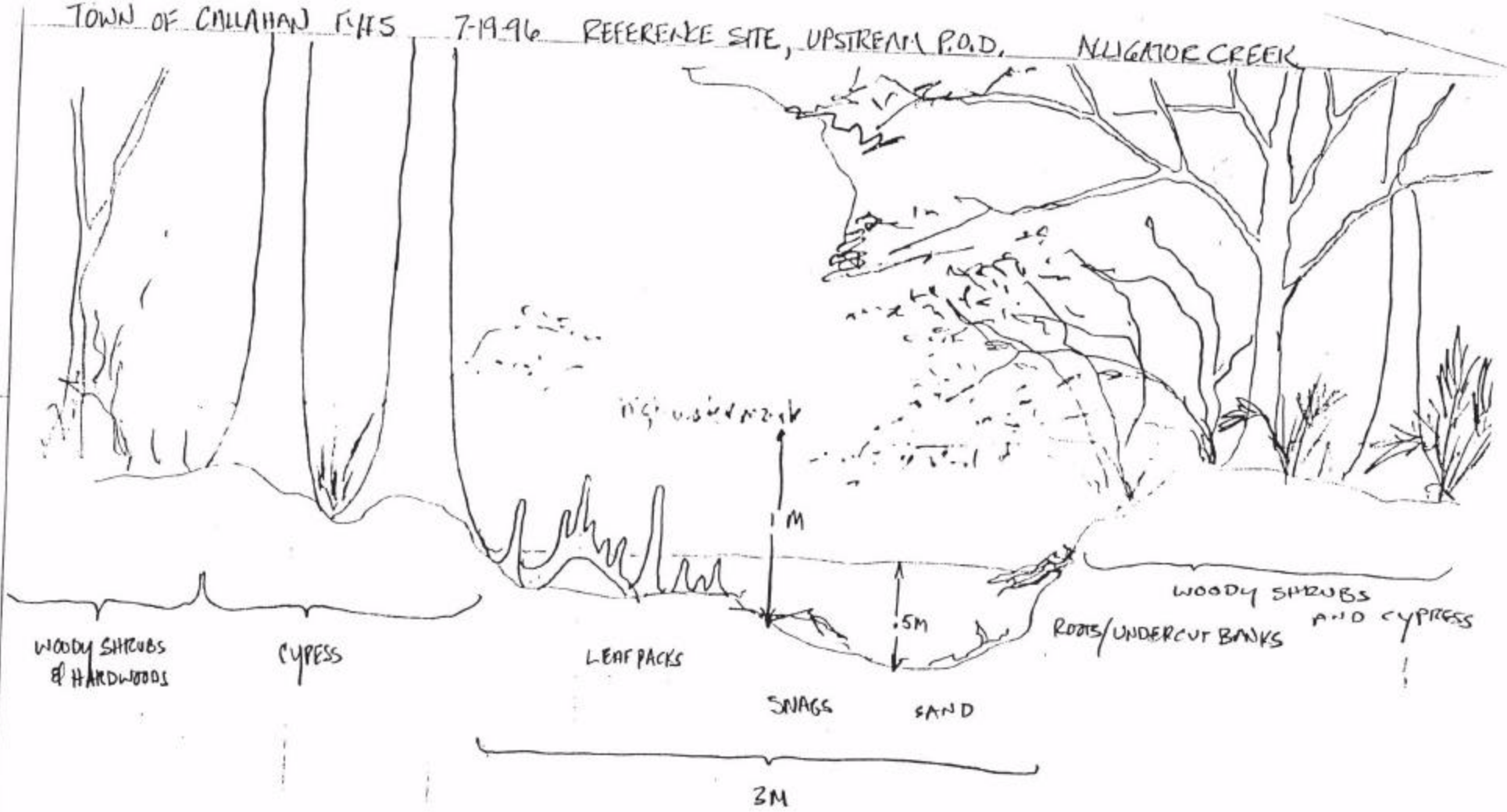
NOTE:
heavily silted in slower moving area below pod.

few snags, some aquatic veg.

TYPICAL CROSS SECTION OF ALLIGATOR CREEK AT TEST SITE

TOWN OF CALLAHAN FYIS 7-19-96 TEST SITE - DOWNSTREAM OF POD.




TOWN OF CALLAHAN FHS 7-19-96 REFERENCE SITE, UPSTREAM P.O.D. ALLIGATOR CREEK
1M
.5M
WOODY SHRUBS & HARDWOODS
CYPESS
LEAF PACKS
SNAGS
SAND
ROOTS/UNDERCUT BANKS
WOODY SHRUBS AND CYPRESS
3M

Benthic macroinvertebrate taxa list for Callahan WWTP facility, collected via Hester-Dendy samples in Alligator Creek, on 14 September 2001. Densities, in number/m^2, represent the mean of three replicates.

Scientific Name	Control Site	Test Site
Amphipoda		
Crangonyx sp.	-	5
Hyalella azteca	3	-
Annelida		
Bratislavia unidentata	-	3
Dero sp.	-	3
Enchytraeidae	-	3
Helobdella triserialis	-	11
Limnodrilus hoffmeisteri	-	3
Coleoptera		
Ancyronyx variegatus	53	3
Dubiraphia vittata	5	3
Stenelmis sp.	5	-
Diptera		
Ablabesmyia mallochi	40	21
Asheum beckae	3	-
Chironomus sp.	-	66
Cryptochironomus sp.	11	-
Dicrotendipes modestus	8	-
Dicrotendipes simpsoni	-	13
Kiefferulus sp.	5	8
Larsia sp.	-	5
Paratanytarsus sp. A Epler	3	-
Pentaneura inconspicua	32	5
Polypedilum convictum grp.	-	3
Polypedilum fallax	3	-
Polypedilum halterale grp.	3	11
Polypedilum illinoense grp.	119	29
Polypedilum scalaenum grp.	8	32
Rheotanytarsus distinctissimus grp.	3	-
Rheotanytarsus exiguus grp.	3	-
Tanytarsus sp. A Epler	3	-
Tanytarsus sp. C Epler	19	-
Tanytarsus sp. T Epler	37	-
Tribelos fuscicornis	5	-
Tribelos jucundum	-	19
Zavrelimyia sp.	5	-
Ephemeroptera		
Stenacron sp.	37	45
Caenis sp.	3	3
Gastropoda		

Hebetancylus excentricus	-	85
Hydrobiidae	13	19
Laevapex fuscus	29	143
Micromenetus dilatatus	11	-
Physella sp.	-	3
Planorbidae	-	3
Megaloptera		
Sialis sp.	3	-
Nemertea		
Prostoma sp.	-	11
Odonata		
Libellulidae	-	3
Zygoptera	3	-
Pelecypoda		
Sphaeriidae	-	37
Trichoptera		
Cheumatopsyche sp.	5	-
Oecetis nocturna	-	5

Benthic macroinvertebrate taxa list for Callahan WWTP, collected via 20 Dip Net samples in Alligator Creek, on 14 September 2001.

	Control Site	Test Site
Amphipoda		
Hyalella azteca	5	-
Annelida		
Allonais paraguayensis	-	2
Aulodrilus pigueti	-	6
Dero digitata complex	1	-
Dero sp.	-	2
Eclipidrilus palustris	-	1
Enchytraeidae	7	1
Haber speciosus	-	2
Limnodrilus hoffmeisteri	3	13
Psammoryctides convolutus	-	1
Coleoptera		
Ancyronyx variegatus	2	2
Dineutus sp.	1	-
Dubiraphia vittata	1	-
Diptera		
Chironomidae	1	-
Chironomus sp.	-	4
Cryptochironomus sp.	1	-
Paracladopelma nereis	1	-
Paratanytarsus sp. B Epler	1	-
Polypedilum halterale grp.	-	1
Polypedilum illinoense grp.	35	50
Sciaridae	1	-
Simulium sp.	5	2
Stenochironomus sp.	2	-
Tanytarsus sp.	-	1
Ephemeroptera		
Baetis propinquus	-	4
Caenis sp.	7	1
Pseudocloeon sp.	18	-
Stenacron floridense	-	1
Stenacron sp.	3	-
Gastropoda		
Ancylidae	1	1
Hydrobiidae	-	1
Odonata		
Calopteryx sp.	-	1
Coenagrionidae	3	1
Pelecypoda		
Sphaeridae	16	8
Trichoptera		
Cheumatopsyche sp.	2	-

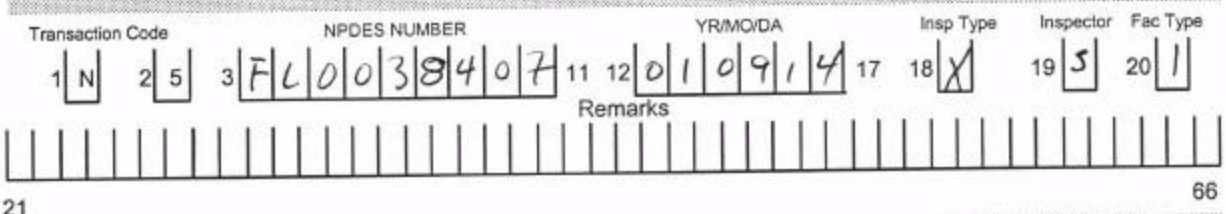
Periphyton taxa list and densities (#/cm^2) for Callahan WWTP, collected via glass microscope slides in Alligator Creek receiving water, on 14 September, 2001.

	Control Site	Test Site
Bacillariophyceae		
Achnanthes exigua	-	52
Achnanthes hungarica	145	52
Achnanthes lanceolata	145	104
Amphora sp.	145	-
Cocconeis placentula	580	208
Cyclotella sp.	-	52
Eunotia sp.	339	312
Gomphonema sp.	97	52
Gyrosigma sp.	-	52
Meridion sp.	97	-
Navicula sp.	-	52
Navicula constans	48	-
Navicula cryptocephala	97	-
Navicula peregrina	48	52
Nitzschia sp.	242	208
Nitzschia nana	97	-
Nitzschia palea	97	52
Pinnularia sp.	48	104
Synedra sp.	97	104
Synedra ulna	-	52
Trachelomonas sp.	-	52
Chlorophyceae		
Ankistrodesmus falcatus	-	52
Chlorella sp.	97	312
Chlorococcum sp.	48	-
Chroococcaceae	-	52
Chrysophyceae	-	-
Mallomonas sp.	48	-
Cyanophyceae		
Cyanobium parvum	97	779
Cyanobium plancticum	290	779
Lyngbya sp.	97	156
Merismopedia sp.	-	52
Merismopedia minima	48	-
Oscillatoria sp.	339	623
Rhopalodia gibba	-	52

Phytoplankton taxa list and densities (#/mL) for Callahan WWTP, collected via subsurface grabs in receiving water, on 14 September, 2001.

	Control	Test
Bacillariophyceae		
Achnanthes sp.	-	2
Cyclotella sp.	-	1
Eunotia sp.	-	1
Nitzschia sp.	1	-
Pennales sp.	1	4
Chlorophyceae		
Ankistrodesmus falcatus	1	1
Chlamydomonas sp.	-	2
Chlorella sp.	6	6
Lepocinclis sp.	1	2
Rhabdogloea smithii	-	1
Undetermined Chlorophyceae	1	-
Chrysophyceae		
Mallomonas sp.	1	-
Cyanophyceae		
Cyanobium parvum	2	6
Cyanobium plancticum	3	7
Lyngbya sp.	1	2
Merismopedia sp.	1	1
Microcystis sp.	1	-
Oscillatoria sp.	9	35

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



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