

Biological Assessment of

Gulf Power's Crist Electric Generating Plant

Escambia County

NPDES #FL0000227

Sampled 8 October, 1990

April 1991

Biology Section
Division of Administrative and Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger:	**Gulf Power Crist Electric Plant**
County:	**Escambia**
NPDES Number:	**FL0000227**
State Permit Expiration Date:	?

Toxics Sampling Inspection (XSI)

Date Sampled:	9 October 1990
Results:	No organic priority pollutants detected. Metals invalidated due to blank contamination.

Compliance Biomonitoring Inspection (CBI)

Date Sampled:	9 October 1990
Results:	Not toxic.

Impact Bioassessment Inspection (IBI)

Date Sampled:	9 October 1990
Results:	Benthic communities relatively unaffected, although diversity was reduced (high numbers of pollution sensitve *Hyalella azteca* present downstream). Factors other than discharger (conductivity changes due to estuarine influence) were probably responsible.

Water Quality Inspection (WQI)

Date Sampled:	9 October 1990
Results:	Total coliform violations above and below discharge, probably due to nonpoint sources. No other problems.

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

Introduction

The Gulf Power Company Crist Electric Generating Plant consists of a seven-unit steam turbine electric generating station which discharges wastewater into the Escambia River. Wastewater from cooling tower and boiler blowdown, air pre-heater wash, bottom ash sluice, and other minor process streams are discharged into the river after pre-treatment in an ash pond. Condenser cooling water and coal pile sump overflows are discharged directly into the river. Discharge is through a canal that is approximately 5,000 feet long with an underflow under Thompson Bayou. The facility is located along Ten Mile Road in Pensacola.

The Crist Plant usually receives satisfactory CSI ratings from the Department. Oil and grease excursions occurred in September and November, 1990, at the ash pond discharge. An occasional pH excursion has been documented. Excess manganese was found in monitoring wells in August, 1990. A fuel spill occurred on December 22, 1989, releasing 55,000 gallons of bunker C oil into containment area number 2. No oil entered waters of the State.

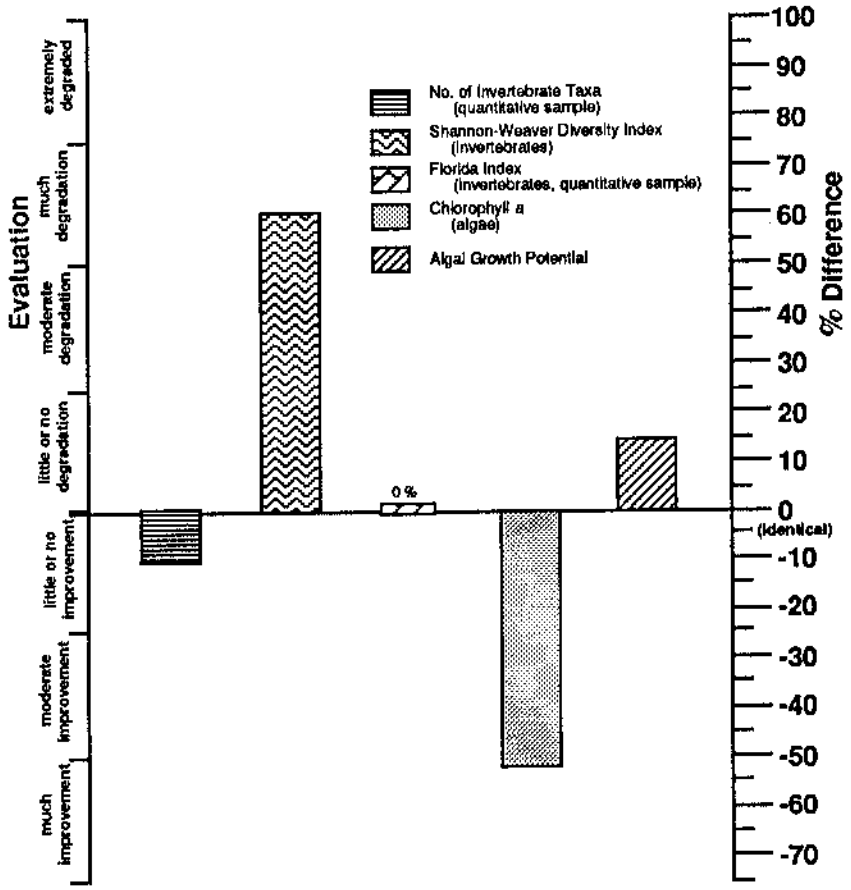
The 7Q10 for the Escambia River is 777 cfs (Hughes 1981). The drainage area for the Escambia River near its mouth is 4,233 square miles (Foose 1983).

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a control site (located on the Escambia River, upstream of the discharge) and a test site (the area down gradient of the discharge). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. An acute screening toxicity bioassay, using *Notropis leedsi* as the test organism, was performed on an effluent sample (Peltier and Weber 1985, FDER 1985). The effluent was analyzed for organic constituents (base neutrals, acid extractables, and pesticide extractables) and metals. Additionally, nutrient analyses were performed on reference and test sites. Methods used for all chem-

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	7	13
Florida Index	0	1.0
% Contribution of Dominant Taxon	39.4	47.9
% Malacostraca	0	47.9
% Polychaeta	86.4	25
% Nemertea	9.1	9.4
%Decopoda	1.5	4.2
% Pelecypoda	1.5	4.2
%Gastropoda	0	5.2
% Other	1.5	4.2
% Predators	42.4	23.8
% Collector-Gatherers	56.1	66.0
% Collector-Filterers	1.5	4.5
% Scrapers	0	5.5
% Shredders	0	0.3
% Parasites		
Macroinvertebrate Hester-Dendy		
Number of Taxa	19	21
Florida Index	5.0	5.0
Shannon-Weaver Diversity	2.5	.98
% Malacostraca	51.2	84.0
% Thoracica	12.4	6.7
% Diptera	26.0	2.6
% Polychaeta	6.4	2.1
% Decopoda	2.8	2.5
%Platyhelminthes	0	2.0
% Other	1.2	.08
% Predators	3.2	.31
% Collector-Gatherers	73.2	91.9
% Collector-Filterers	22.8	7.3
% Scrapers	0	.05
% Shredders	.81	.47
Chlorophyll *a* (mg/mm^2)	35.9	17.0
Algal Growth Potential (mg dry wt/l)	2.8	3.1



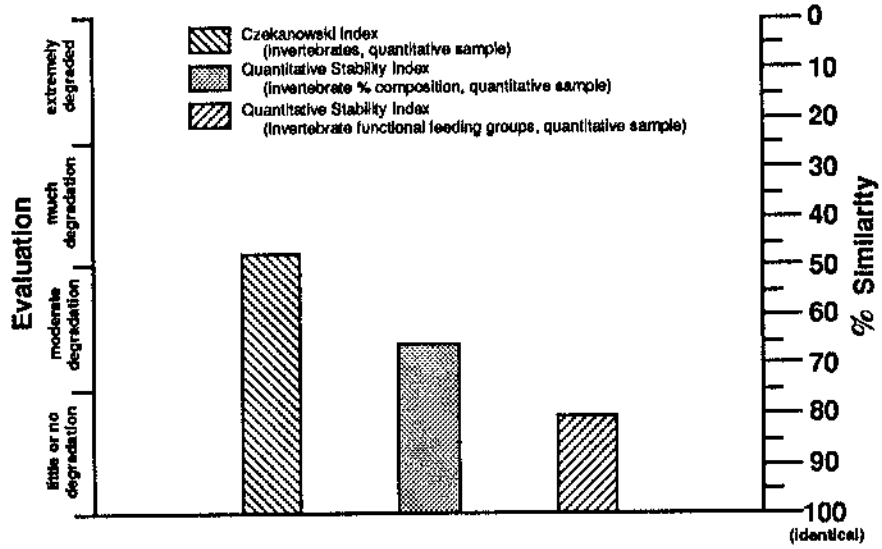
Effect of discharge on receiving stream
(measured as difference between control and test sites).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, and chlorophyll *a* are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. Czekanowski's Similarity Index is a multivariate ordination procedure which compares organism abundance and taxonomic structure between sites. The determination of the Quantitative Similarity Index (for taxonomic % composition) is a two step process. First, the relative pro-

ical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at control and test sites. Collection methods consisted of a timed (one hour per site) multi-substrate (*e.g.*, snags, vegetation, sediment) semi-quantitative effort. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Chlorophyll *a* was also determined for periphyton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Duneliella tertiolecta* as the test organism, followed EPA (1974).



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

portions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

For graphical purposes, the percent differences between the control and test sites involving the number of taxa, the diversity index, and the Florida Index are measured as the control site minus test site divided by the control site. The percent differences between sites involving the percent contribution of dominant taxon, chlorophyll *a*, and algal growth potential are measured as the test site minus control site divided by the control site.

The following personnel were involved in this investigation: Glenn Butts (DER Northwest district) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandra McClure (Tallahassee Biology Laboratory).

Results and Discussion

The Escambia River is a large, alluvial system. The sample sites were located near the mouth of the river, where it discharges into the saline Escambia Bay. Habitat quality at the control site (Habitat Score = 55) closely corresponded to that of the test site (with 52 points) (Appendix). The pH was similar at both sampling areas (6.8 at the control, 6.9 at the test site), as was dissolved oxygen (4.8 mg/l at the control, 5.5 mg/l at the test site). Conductivity values were elevated at both areas (control site = 4900 μmhos/cm^2, test site =7000 μmhos/cm^2), reflecting the saline influence of the Escambia Bay.

Effluent organic constituents were found to be below detection limits (see Appendix). Results from metals analyses were invalidated due to moderate levels of contamination detected in the blanks.

Nutrients were not found to be a significant problem at either site. The total phosphorus and bioreactive nitrogen concentrations (0.13mg/l and 0.9 mg/l, respectively) were slightly higher at the upstream sampling location. The standing crop of test algae produced during algal growth potential experiments was below the "problem threshold" of five mg algal dry weight/l at both stations.

Fecal coliforms were within Class III standards at both the control (with 630 organisms/100 ml) and test site (with 500 organisms/100 ml). However, total coliform levels exceeded limits at both sampling locations. The Crist Plant did not contribute to the increased total coliform levels, as was demonstrated by the lower values found at the test site (6500 organisms/100ml) than at the control (7600 organisms/100ml). These high total coliforms were probably associated with non-point source inputs.

The effluent did not cause mortality to the fish, *Notropis leedsi,* in a 48 hour static acute toxicity test (Appendix). The salinity of the discharge was sufficiently high to prevent the use of *Ceriodaphnia dubia* as a test organism.

Most measures of macroinvertebrate health indicated the discharge was not adversely affecting the community. The upper left figure (page 2) indicates the degree of difference between control and test sites. Larger differences (that is higher percentages) correspond with greater degrees of degradation. Negative values mean the test site is better than the control.

The Florida Index was identical at both locations (with five points each), while taxa richness was somewhat better (by 10%) at the test site. Diversity was much lower downstream of the discharge. This was predominately due to the high numbers of *Hyalella azteca* recovered at the test site. This amphipod is a Class II Florida Index indicator organism, considered moderately sensitive to pollution. Its abundant presence in this estuarine transitional zone may be due to factors other than the discharge (*e.g.*, tolerance to rapidly changing conductivity). In view of the situation, this lowered diversity probably does not represent a problem. Algal biomass (represented by periphyton chorophyll *a*), was reduced at the test site, indicating no nutrient enrichment from the effluent.

The lower right figure (page 2) summarizes the similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. The Quantitative Stability Indices for both community composition and functional feeding groups indicated that the two communities were moderately similar, as did Czekanowski's Index. Observed differences were probably due to the greater abundance of *Hyalella azteca* at the test site.

Conclusions

The discharge from the Gulf Power Crist Electric Generating

Plant was not found to have deleterious effects on receiving waters. Biological communities were relatively healthy in the vicinity of the outfall, although diversity was reduced. It is thought that factors other than the discharge were responsible for this effect. The effluent was not toxic to *Notropis leedsi*, and no priority pollutants were detected. Metals samples were invalidated due to moderate contamination in the blanks. Algal growth potential and nutrients were below problem levels. Total coliform violations were observed both upstream and downstream of the discharge, probably caused by non-point sources.

Literature Cited

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

Environmental Protection Agency. 1974. Marine algal assay procedure: Bottle test. Nat'l Environ. Res. Center, Office of Res. and Dev., U.S. EPA, Corvallis, Oregon. 43 p.

Florida Department of Environmental Regulation. 1985. Quality assurance manual for performing acute toxicity tests. 2nd edition. Fla. Dept. Environmental Regulation, Biology Section, Tallahassee. 53 pp.

Peltier, W. H. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 3rd edition. EPA/600/4-85/013. U. S. EPA, Cincinnati, Ohio. 216 pp.

Raschke, R. L. and D. A. Schultz. 1987. The use of the algal growth potential test for data assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227.

Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

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

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.02.0016	DATE (M/D/Y): 10-8-90	RECEIVING BODY OF WATER: ESCAMBIA RIVER

REMARKS:	LOCATION: ABOVE GULF POWER CRIST PLANT	FIELD ID/NAME: #1 CRIST PLANT SURVEY

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 15	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 16	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 5	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 6	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 8	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments		TOTAL SCORE
5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	50 ~~55~~

COMMENTS: TIDAL AREA, DREDGED CHANNEL UP TO MONSANTO, USUALLY POOR HABITAT QUALITY FOR SNAGS + LEAF PACKS

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-8-90	G.L. BUTTS	Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW Dist	STORET STATION NUMBER: 33.02.0016	DATE (M/D/Y): 10-8-90	RECEIVING BODY OF WATER: ESCAMBIA RIVER

REMARKS: HD set out 10-8-90 retrieved 11-5-90	LOCATION: ABOVE GULF POWER CRIST PLANT	FIELD ID/NAME: # 1 CRIST PLANT SURVEY

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
75	5	15		5		

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

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

Point-Source Pollution (list location and describe): CENTURY WWTP (.6 MGD), MONSANTO, PAPER MILL IN BREWTON, AL.

Estimated Stream Width (range, m): 35	Estimated Stream Depth (range, m): 4.5	yes
High Water Mark (m above bed): 1.2	Velocity (range, m/s): 0.33	Impounded ☐ Channelized ☐

Canopy Cover % (check box): Open: ☐ Lightly Shaded: ☒ Moderately Shaded: ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: ☒ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Anaerobic: ☐ Other: ☐ H_2S odor

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/~~Shell~~	5%	Coarse Organic Debris:	
Sand:	90%	Mud/Muck (organic):	5%

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	26.2	4.84	Secchi Depth (m):	1.2
Mid-depth			pH (SU):	6.8
Bottom			Conductivity (µmho/cm):	4900
			Other Parameters:	ORP .215, Sal 2.3

Stream Type (check box): Blackwater: ☐ Deep Aquifer Fed: ☐ Surficial Aquifer Fed: ☐ Alluvial: ☒ Other: ☐

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

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

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

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

Weather Conditions:

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

ANALYSIS DATE: 10-8-90	ANALYST: G.L. Butts	SIGNATURE: Glenn Butts

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

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: FDER	STORET STATION NUMBER: 33.02.0018	DATE (M/D/Y): 10-08-90	RECEIVING BODY OF WATER: ESCAMBIA RIVER

REMARKS:	LOCATION: BELOW GULF POWER CRIST PLANT	FIELD ID/NAME: 4

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 15	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 10	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 6	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 8	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 8	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments 5	Add **5 points** if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	**TOTAL SCORE** 52

COMMENTS: BELOW DISCHARGE CANAL, CHANNEL DREDGING		
ANALYSIS DATE: 10-08-90	ANALYST: G. LUTTS	SIGNATURE: Glenn Lutts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: 2016 / SUBMITTING AGENCY NAME: FDER NW	STORET STATION NUMBER: 33.02.0018	DATE (M/D/Y): 10-08-90	RECEIVING BODY OF WATER: ESCAMBIA RIVER
REMARKS: NAT SUB 1/3 D-81 SET OUT A.S.	LOCATION: GULF POWER CRIST PLANT SURVEY	FIELD ID/NAME: 4	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
80	5	5			10	

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

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

Point-Source Pollution (list location and describe): RUN OFF INTO GULF POWER DISCHARGE CANAL

Estimated Stream Width (range, m): 50	Estimated Stream Depth (range, m): 4.0		yes
High Water Mark (m above bed): 1.5	Velocity (range, m/s): 0.25	Impounded ☐	Channelized ☐

Canopy Cover % (check box): Open: ☐ Lightly Shaded: ☒ Moderately Shaded: ☐ Heavily Shaded: ☐

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:	5	Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	5
Sand:	85	Mud/Muck (organic):	5

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	28.1	5.33	Secchi Depth (m):	1.5
Mid-depth	27.99	4.0	pH (SU):	6.72
Bottom	28.38	2.35	Conductivity (µmho/cm):	7000
			Other Parameters: ORP .198, Sal 3.6	

Stream Type (check box): Blackwater: ☐ Deep Aquifer Fed: ☐ Surficial Aquifer Fed: ☐ Alluvial: ☒ Other: ☐

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

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

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

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

Weather Conditions: Clear

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

ANALYSIS DATE: 10-08-90	ANALYST: G. BUTTS	SIGNATURE: Glenn Butts

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Crist Generating Plant
Address/City: aka Gulf Power
County: Escambia
Contact/District: Glenn Bates
NPDES Permit #: FL0002127 **Outfall #:** 002

Collection: Date 10-9-20 Time 1100
Test Beginning: Date 10-10-20 Time 1330
Test Ending: Date 10-12-20 Time
Test Organism: Mysids (Americamysis bahia)
Life Stage/Age: 2-2 days

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

Remarks: art 100% = 5.0

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	50	5	5	5	8.3	8.4	8.9	7.7	8.1	8.2	22.0	22.0	22.0	238		240
control	94	5	5	5	8.3	8.1	9.0	7.7	8.1	8.2						
100%	63	5	5	5	8.7	8.4	8.6	8.2	7.7	7.6	22.1	22.0	22.0	7950		7850
100%	14	5	5	5	8.7	8.0	8.6	8.2	7.6	7.6						
Measured/Loaded by:		LB	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC		SMC
Recorded by:		LB	SMC	SMC	MF	LB	SMC	MF	LB	SMC	MF	LB	SMC	MF		SMC

Investigators' Signatures

Sean Symmes-Cline
MFarnell
Lynn Burton

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:	125	120	54	HACH	LB
Hardness:	125	130	426	HACH	LB
Total Ammonia:	2	0	.080	Orion	LB

Ammonia meter slope: -56.5

Sample Number: 90-OCT-11-06-01 Sample Status: Authorized by Liang T. Lin
Sample Location: Gulf Power Crist Plant discharge ash pond discharge Matrix: Effluent
Field ID: #5 Storet Station Number:
Date/Time Collected: 9-OCT-1990 11:00:01.91
Comments:

Sample Number: 90-OCT-11-06-01 Test status: Authorized by Laura Harrison
Analysis Id: W-BNA Analysis Description: base-neutral-acid water analysis

Storet Number	Analyte	Result	Units
34205	Acenaphthene	10 U	ug/L
34200	Acenaphthylene	10 U	ug/L
39330	Aldrin	10 U	ug/L
34220	Anthracene	10 U	ug/L
34526	Benzo(a)anthracene	10 U	ug/L
34230	Benzo(b)fluoranthene	10 U	ug/L
34242	Benzo(k)fluoranthene	10 U	ug/L
34247	Benzo(a)pyrene	10 U	ug/L
34521	Benzo(g,h,i)perylene	15 U	ug/L
34292	Benzyl butyl phthalate	10 U	ug/L
	a-BHC	10 U	ug/L
39337	b-BHC	10 U	ug/L
39340	d-BHC	10 U	ug/L
	g-BHC	10 U	ug/L
39120	Benzidine	10 U	ug/L
34273	Bis(2-chloroethyl)ether	10 U	ug/L
34278	Bis(2-chloroethoxy)methane	15 U	ug/L
34283	Bis(2-chloroisopropyl)ether	15 U	ug/L
39100	Bis(2-ethylhexyl)phthalate	10 U	ug/L
34636	4-Bromophenyl phenyl ether	10 U	ug/L
34581	2-Chloronaphthalene	10 U	ug/L
34641	4-Chlorophenyl phenyl ether	10 U	ug/L
34320	Chrysene	10 U	ug/L
39310	4,4'-DDD	10 U	ug/L
39320	4,4'-DDE	10 U	ug/L
39300	4,4'-DDT	10 U	ug/L
34556	Dibenzo(a,h)anthracene	15 U	ug/L
39110	Di-n-butyl phthalate	10 U	ug/L
34536	1,2-Dichlorobenzene	10 U	ug/L
34566	1,3-Dichlorobenzene	10 U	ug/L
34571	1,4-Dichlorobenzene	10 U	ug/L
34631	3,3'-Dichlorobenzidine	10 U	ug/L
39380	Dieldrin	10 U	ug/L
34336	Diethylphthalate	10 U	ug/L
34341	Dimethylphthalate	10 U	ug/L
34611	2,4-Dinitrotoluene	10 U	ug/L
34626	2,6-Dinitrotoluene	10 U	ug/L
34596	Di-n-octyl phthalate	10 U	ug/L
34361	Endosulfan-I	10 U	ug/L

Continued

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the minimum detection limit
N/A - Not applicable NR - Not requested

Cont. from previous page for Sample Number: 90-OCT-11-06-01 Analysis_id: W-BNA

34356	Endosulfan-II	10 U	ug/L
34351	Endosulfan-sulfate	10 U	ug/L
39390	Endrin	10 U	ug/L
34366	Endrin-aldehyde	10 U	ug/L
34376	Fluoranthene	10 U	ug/L
34381	Fluorene	10 U	ug/L
39410	Heptachlor	10 U	ug/L
39420	Heptachlor-epoxide	10 U	ug/L
39700	Hexachlorobenzene	15 U	ug/L
34391	Hexachlorobutadiene	10 U	ug/L
34396	Hexachloroethane	60 U	ug/L
34386	Hexachlorocyclypentadiene	10 U	ug/L
34403	Indeno(1,2,3-cd)pyrene	10 U	ug/L
34408	Isophorone	10 U	ug/L
34696	Naphthalene	10 U	ug/L
34447	Nitrobenzene	10 U	ug/L
34438	N-Nitrosodimethylamine	50 U	ug/L
34428	N-Nitrosodi-n-propylamine	10 U	ug/L
34433	N-Nitrosodiphenylamine	15 U	ug/L
34671	PCB-1016	10 U	ug/L
39488	PCB-1221	10 U	ug/L
39492	PCB-1232	10 U	ug/L
39496	PCB-1242	10 U	ug/L
39500	PCB-1248	10 U	ug/L
39504	PCB-1254	10 U	ug/L
39508	PCB-1260	10 U	ug/L
	PCB-1262	10 U	ug/L
34461	Phenanthrene	10 U	ug/L
34469	Pyrene	10 U	ug/L
39400	Toxaphene	10 U	ug/L
34551	1,2,4-Trichlorobenzene	10 U	ug/L
34462	4-Chloro-3-methyl phenol	15 U	ug/L
34586	2-Chlorophenol	15 U	ug/L
34601	2,4-Dichlorophenol	15 U	ug/L
34606	2,4-Dimethylphenol	15 U	ug/L
34616	2,4-Dinitrophenol	30 U	ug/L
34657	2-Methyl-4,6-dinitrophenol	30 U	ug/L
34591	2-Nitrophenol	15 U	ug/L
34646	4-Nitrophenol	50 U	ug/L
39032	Pentachlorophenol	15 U	ug/L
34694	Phenol	15 U	ug/L
34621	2,4,6-Trichlorophenol	15 U	ug/L

Comments (1): Tentative identification of an aromatic compound at 150 ug/L.
(2):
(3):
(4):
(5):
(6):

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-11-04-01 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Escambia River above Gulf Power Canal Matrix: Fresh Surf Water
Field ID: #1 Storet Station Number: 33020016
Date/Time Collected: 8-OCT-1990 09:40:50.98
Comments:

Sample Number: 90-OCT-11-04-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NH3 Analysis Description: Analysis for ammonia in water

Storet Number	Analyte	Result	Units
00610	Ammonia-N	0.084 A	mg N/L

Sample Number: 90-OCT-11-04-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NO2NO3 Analysis Description: Analysis for nitrite+nitrate in water

Storet Number	Analyte	Result	Units
00630	NO2NO3-N	0.18 A	mg N/L

Sample Number: 90-OCT-11-04-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TKN Analysis Description: TKN for water sample

Storet Number	Analyte	Result	Units
00625	N_KJEL_TOT	0.76 A	mg N/L

Sample Number: 90-OCT-11-04-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TOC Analysis Description: Total organic carbon

Storet Number	Analyte	Result	Units
00680	TOC	2	mg C/L

Sample Number: 90-OCT-11-04-01 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TP Analysis Description: Analysis for total phosphorus in water

Storet Number	Analyte	Result	Units
00665	Total-Phosphorus	0.079 A	mg P/L

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-11-04-02 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Gulf Power discharge canal 100 yds above mouth of riv Matrix: Fresh Surf Water
Field ID: #2 Storet Station Number: 33020036
Date/Time Collected: 8-OCT-1990 11:44:50.98
Comments:

Sample Number: 90-OCT-11-04-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NH3 Analysis Description: Analysis for ammonia in water

Storet Number	Analyte	Result	Units
00610	Ammonia-N	0.093 A	mg N/L

Sample Number: 90-OCT-11-04-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NO2NO3 Analysis Description: Analysis for nitrite+nitrate in water

Storet Number	Analyte	Result	Units
00630	NO2NO3-N	0,14 A	mg N/L

Sample Number: 90-OCT-11-04-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TKN Analysis Description: TKN for water sample

Storet Number	Analyte	Result	Units
00625	N_KJEL_TOT	0.22 A	mg N/L

Sample Number: 90-OCT-11-04-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TOC Analysis Description: Total organic carbon

Storet Number	Analyte	Result	Units
00680	TOC	3	mg C/L

Sample Number: 90-OCT-11-04-02 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TP Analysis Description: Analysis for total phosphorus in water

Storet Number	Analyte	Result	Units
00665	Total-Phosphorus	0.089 A	mg P/L

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the minimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-11-04-03 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Gulf Power discharge canal below Thompsons Bayou Matrix: Fresh Surf Water
Field ID: #3 Storet Station Number: 33020035
Date/Time Collected: 8-OCT-1990 11:00:50.98
Comments:

Sample Number: 90-OCT-11-04-03 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NH3 Analysis Description: Analysis for ammonia in water

Storet Number	Analyte	Result	Units
00610	Ammonia-N	0.10 A	mg N/L

Sample Number: 90-OCT-11-04-03 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NO2NO3 Analysis Description: Analysis for nitrite+nitrate in water

Storet Number	Analyte	Result	Units
00630	NO2NO3-N	0.16 A	mg N/L

Sample Number: 90-OCT-11-04-03 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TKN Analysis Description: TKN for water sample

Storet Number	Analyte	Result	Units
00625	N_KJEL_TOT	0.16 A	mg N/L

Sample Number: 90-OCT-11-04-03 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TOC Analysis Description: Total organic carbon

Storet Number	Analyte	Result	Units
00680	TOC	3	mg C/L

Sample Number: 90-OCT-11-04-03 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TP Analysis Description: Analysis for total phosphorus in water

Storet Number	Analyte	Result	Units
00665	Total-Phosphorus	0.086 A	mg P/L

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the minimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-11-04-04 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Escambia River below Gulf Power discharge canal Matrix: Fresh Surf Water
Field ID: #4 Storet Station Number: 33020018
Date/Time Collected: 8-OCT-1990 12:15:50.98
Comments:

#4 downstream

Sample Number: 90-OCT-11-04-04 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NH3 Analysis Description: Analysis for ammonia in water

Storet Number	Analyte	Result	Units
00610	Ammonia-N	0.059 A	mg N/L

Sample Number: 90-OCT-11-04-04 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NO2NO3 Analysis Description: Analysis for nitrite+nitrate in water

Storet Number	Analyte	Result	Units
00630	NO2NO3-N	0.26 A	mg N/L

Sample Number: 90-OCT-11-04-04 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TKN Analysis Description: TKN for water sample

Storet Number	Analyte	Result	Units
00625	N_KJEL_TOT	0.57 A	mg N/L

Sample Number: 90-OCT-11-04-04 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TOC Analysis Description: Total organic carbon

Storet Number	Analyte	Result	Units
00680	TOC	3	mg C/L

Sample Number: 90-OCT-11-04-04 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TP Analysis Description: Analysis for total phosphorus in water

Storet Number	Analyte	Result	Units
00665	Total-Phosphorus	0.14 A	mg P/L

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Sample Number: 90-OCT-11-04-05 Sample Status: Authorized by Yuh-Hsu Pan
Sample Location: Gulf Power Crist Plant discharge ash pond discharge Matrix: Effluent
Field ID: #5 Storet Station Number:
Date/Time Collected: 9-OCT-1990 11:00:50.98
Comments:

#5 effluent

Sample Number: 90-OCT-11-04-05 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NH3 Analysis Description: Analysis for ammonia in water

Storet Number	Analyte	Result	Units
00610	Ammonia-N	0.18 A	mg N/L

Sample Number: 90-OCT-11-04-05 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-NO2NO3 Analysis Description: Analysis for nitrite+nitrate in water

Storet Number	Analyte	Result	Units
00630	NO2NO3-N	0.25 A	mg N/L

Sample Number: 90-OCT-11-04-05 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TKN Analysis Description: TKN for water sample

Storet Number	Analyte	Result	Units
00625	N_KJEL_TOT	1.0 A	mg N/L

Sample Number: 90-OCT-11-04-05 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TOC Analysis Description: Total organic carbon

Storet Number	Analyte	Result	Units
00680	TOC	4	mg C/L

Sample Number: 90-OCT-11-04-05 Test status: Authorized by Yuh-Hsu Pan
Analysis Id: W-TP Analysis Description: Analysis for total phosphorus in water

Storet Number	Analyte	Result	Units
00665	Total-P	0.13 A	mg P/L

End of Report

A - Value reported is the mean of two or more determinations
E - Scientific notation
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 - Not analyzed for this compound
T - Value reported is less than the practice quantiation limit
U - Material was analyzed for but not detected; The value reported is the mimimum detection limit
N/A - Not applicable NR - Not requested

Macroinvertebrate taxa list for Crist Electric Generating Plant, Escambia County, Florida, collected from Hester-Dendy samplers above and below the discharge on November 5, 1990.

	Control Site	Test Site
Decopoda		
Callinectes sapidus	–	+
Rhithropanopeus harrisii	+	+
Undetermined Decapoda sp.	+	+
Diptera		
Ablabesmyia parajanta grp.	+	–
Cricotopus bicinctus	–	+
Cricotopus/Orthocladius grp.	+	+
Dicrotendipes lucifer	+	+
Dicrotendipes modestus	+	+
Dicrotendipes neomodestus	–	+
Nanocladius alternantherae	–	+
Nanocladius distinctus	+	–
Polypedilum illinoense	+	+
Pseudochironomus fulviventris	–	+
Undetermined Diptera pupae	+	+
Rheotanytarsus exiguus grp.	+	–
Tanytarsus sp.	–	+
Tribelos fuscicorne	+	–
Malacostraca		
Cassidinidea ovalis	+	+
Corophium lacustre	+	+
Corophium sp.	+	–
Hyalella azteca	+	+
Munna reynoldsi	–	+
Palaemonetes paludosus	–	+
Oligochaeta		
Nais elinguis	–	+
Pelecypoda		
Undetermined Mytillidae sp.	+	–
Platyhelminthes		
Undetermined Platyhelminthes sp.	–	+
Polychaeta		
Laeonereis culveri	+	–
Neanthes succinea	–	+
Polydora ligni	+	+
Thoracica		
Balanus eburneus	+	+
Total	**19**	**23**

Macroinvertebrate taxa list for Crist Electric Generating Plant, Escambia County, Florida, collected via timed qualitative methods (dip net, etc.) above and below the discharge on October 8, 1990.

	Control site	Test site
Decapoda		
Rhithropanopeus harrisii	+	+
Diptera		
Palpomyia grp. sp.	–	+
Polypedilum illinoense	–	+
Tanytarsus sp.	–	+
Gastropoda		
Undetermined Hydrobiidae	–	+
Neretina reclivata	–	+
Malacostraca		
Grandidierella bonnieroides	–	+
Nemertea		
Undetermined Nemertea sp.	+	+
Oligochaeta		
Undetermined marine Oligochaeta	+	+
Pelecypoda		
Rangia cuneata	+	–
Undetermined Pelecypoda sp.	–	+
Polychaeta		
Hobsonia florida	+	+
Neanthes succinea	+	+
Parandalia americana	+	+
Polydora socialis	+	+
Total	**8**	**14**