

Biological Assessment of

United Technologies, Pratt-Whitney Co.

Palm Beach County

NPDES #FL0026042

Sampled 27 February 1991

July 1991

Biology Section
Division of Administrative and Technical Services

Introduction

United Technologies, a subsidiary of Pratt and Whitney Company, is located in northern Palm Beach County on State Road 710 (see map in Appendix). This facility and its parent company develop and manufacture aircraft engines and have engaged in optic research and helicopter preparation. During these activities, various wastewaters are produced, including non-contact cooling water, boiler blowdown, stormwater runoff (potentially contaminated with fuel and lubrication fluids used in rocket testing), and miscellaneous contributions. These wastes are either discharged to or collected in an extensive internal canal system on the plant site. At least two designated NPDES outfalls may discharge to this internal canal, consisting of combined industrial and sanitary wastes (#001), and cooling pond water (#002). Other contributions to this canal may be intermittent industrial discharges and groundwater leakage. Additional wastes from this facility are chemically treated prior to discharge to percolation ponds. The internal canal eventually exits the facility's property (outfall #003) and becomes a feeder canal which flows approximately three miles to the C-18 canal, which flows to the Loxahatchee River. In the past, significant concentrations of PCB's have been detected in the canal and in various effluents, due to transformer leakage. Additionally, many violations of Class III water quality standards have been noted at all three outfalls.

The discharge has been acutely toxic to *Ceriodaphnia dubia* (in bioassays conducted for PW/UT by Springborn Bionomics, Inc., report #BW-86-42029 in April, 1986). At that time, no toxictiy was observed in uncontaminated surface waters.

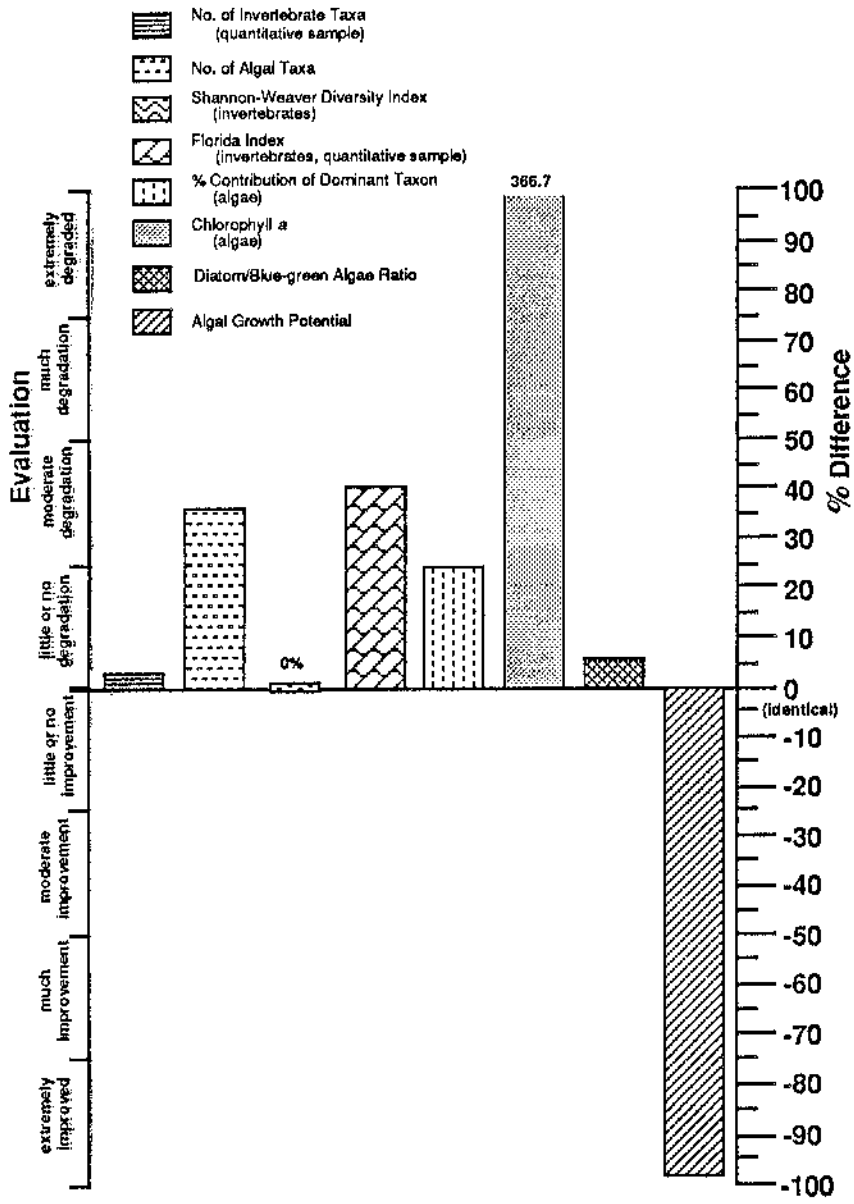
Recent DER sampling at the discharge site (June, 1990) showed significant quantities of organic chemicals and metals in sediments. At least one burnpit area (Test Area D) is a subject of remediation efforts being performed under a consent order of DER (OGC case #84-0076). The contaminated groundwater from this site was treated and discharged during 1990 (according to a letter from PW/UT manager W. J. Dail dated 9/4/1990 to the US EPA).

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a control site (located in a canal upstream of the Pratt-Whitney discharge) and a test site (in the same canal, down gradient of the discharge). A habitat assessment was performed *in situ* to establish comparability between

Major characteristics of community structure of control and test sites.

	Control Site	Test Site
Macroinvertebrate Hester-Dendy		
Number of Taxa	36	35
Florida Index	5	3
Shannon-Weaver Diversity	3.0	3.0
% Diptera	71.2	53.3
% Oligochaeta	21.6	37.7
% Ephemeroptera	.33	5.7
% Platyhelminthes	0	1.7
%Gastropoda	5.1	1.3
%Odonata	.82	.25
% Other	.97	.08
%Collector-Gatherers	81.8	80.2
% Collector-Filterers	2.9	6.9
% Predators	3.2	1.2
% Scrapers	7.5	9.4
% Shredders	4.1	1.7
% Parasites	.36	.06
Periphyton Algae		
Number of Taxa	45	29
% Contribution of Dominant Taxon	17.9	22.2
Chlorophyll a (mg/sq. m)	3.3	15.4
Diatom/Diatom + B-G Abundance Ratio	0.70	0.66
% Blue-green	17.7	32.0
% Green	39.6	4.3
% Diatoms	41.1	63.4
% Other	0.6	0.3
Algal Growth Potential (mg dry wt/l)	1.08	0.02



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

sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (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 control and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at control and test sites. Invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Periphyton was sampled at both the control and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Chlorophyll *a* was also determined for periphyton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. 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. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% 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, Florida Index and the diatom to blue-green algae ratio 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: Doug Strom (DER, Southeast District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

Habitat quality at the test site (Habitat Score = 33) was comparable to that of the upstream control site (Habitat Score = 39, Appendix). Water at both sites was characteristic of South Florida canals, with low velocity flow and low pH. Dissolved oxygen measured near the surface was low upstream (5.2 mg/l at the surface), and below Class III standards downstream (3.2 mg/l). Bottom dissolved oxygen values approached 1.0 mg/l at both sites. Conductivity was only slightly higher at the test site (control site = 306 µmhos/cm2, test site = 359 µmhos/cm2).

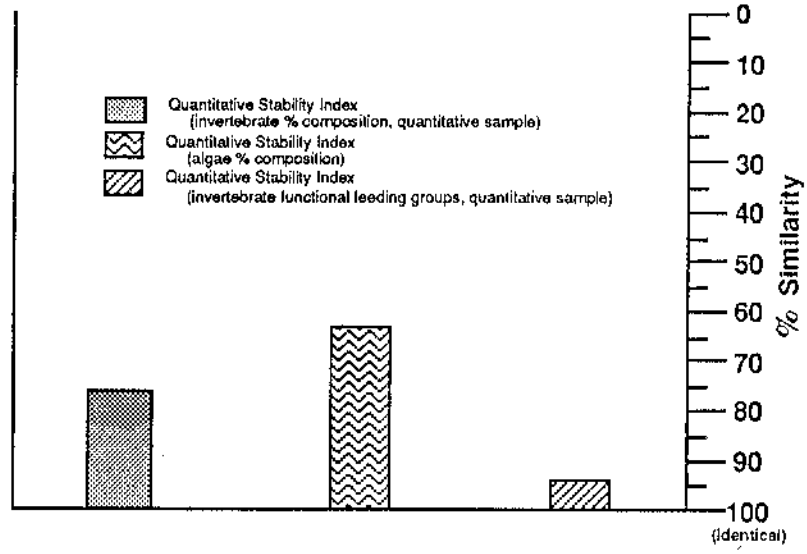
All effluent organic constituents determined from a single grab sample were below detection limits (Appendix). The only metal detected in the discharge above quantitation limits was iron (799 µg/l). This concentration was within ambient standards. Bioreactive nitrogen was low at both sites, while orthophosphate was only slightly above background levels at both areas (control site = 0.050 mg/l, test site = 0.048 mg/l).

Algal growth potential (AGP) was low at both stations, but more so at the test site (see table on p. 1). Because the pH of the samples tested was at or below the range for optimum growth of *Selenastrum* (lower limit = 6.0 su), pH related growth inhibition is likely. Inhibition due to effluent constituents was not apparent from results of chemical analyses. Note that the "improvement" in AGP shown on the graph is probably an artifact of growth inhibition caused by low pH.

The periphyton community appeared moderately affected by the discharge, but not necessarily degraded. The figure on p. 2 indicates the degree of difference between the control and test sites. The figure on this page summarizes similarities between the sites.

Periphyton taxa richness was reduced by 36% at the test site, and chlorophyll *a* was 367% higher. While an increase in chlorophyll of this proportion would usually be a symptom of an enrichment problem, the absolute value of 15.4 mg/m2 measured at the downstream site is not unusually high. Taxonomic composition also differed between the two sites. The control site had a higher proportion of green algae, composed mostly of *Characium* sp. Downstream, a higher proportion of diatoms were found, dominated by *Cymbella naviculiformis*. As the presence of diatoms generally indicates healthy conditions, this suggests that the test site, while somewhat different from the control, was not degraded.

Measures of macroinvertebrate health also indicated that no significant negative effects were caused by the discharge (see Table and Figures). Low D.O. and low water velocity at both sites were probably responsible for the reduced Florida Index scores (control = 5, test = 3). Taxa richness (36 taxa at the control, 35 at the test site) and diversity measurements (3.0 at both sites) were fairly good for canals, which are considered, by definition, disturbed systems.



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

Conclusion

The discharge from the Pratt-Whitney plant did not exert negative effects on the receiving water biota, which were fairly typical of south Florida canal systems. The effluent was not acutely toxic, nor were deleterious levels of priority pollutants or metals found. Algal growth potential and nutrient concentrations were low at at both sites, although low ambient pH may have reduced the AGP results.

Literature Cited

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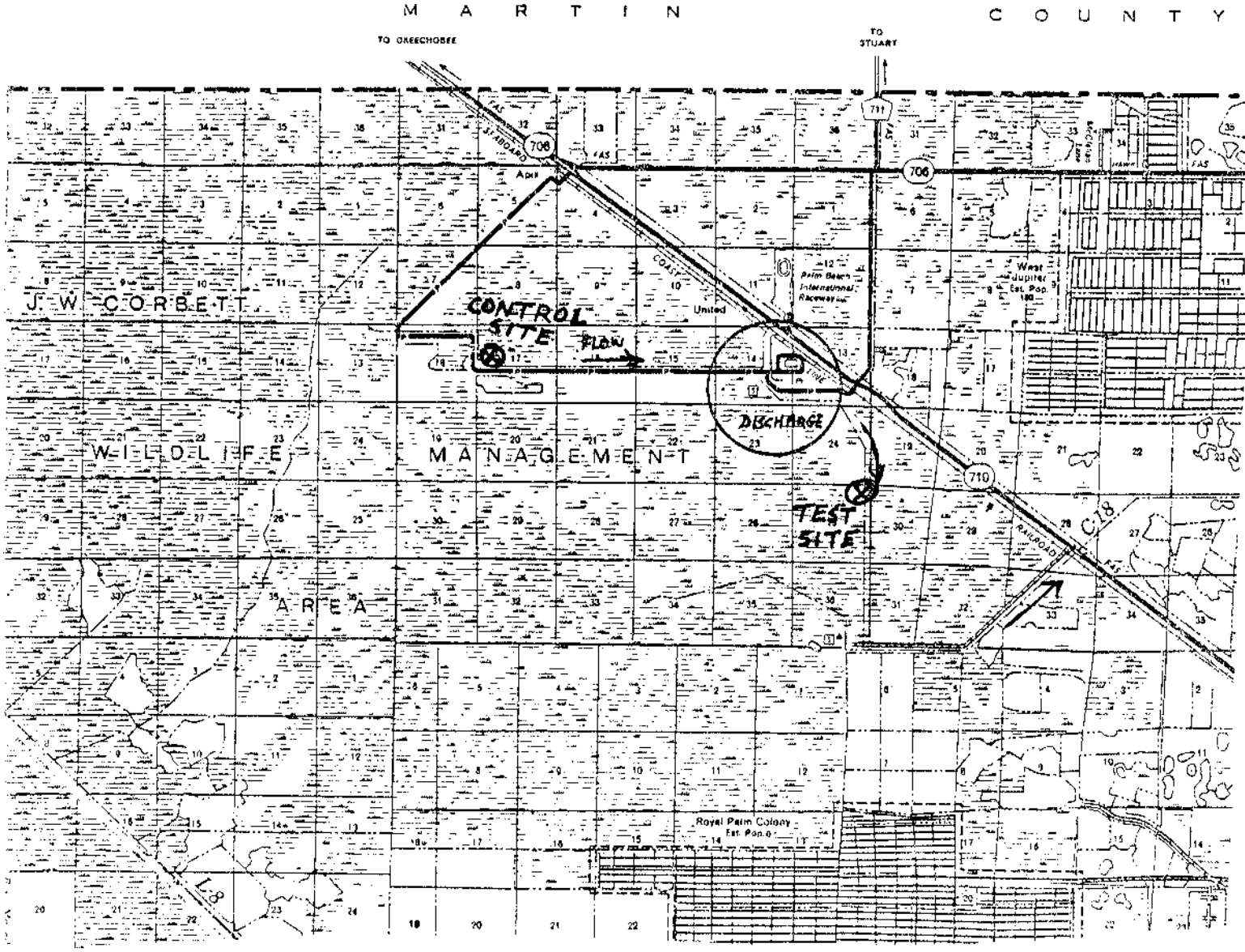
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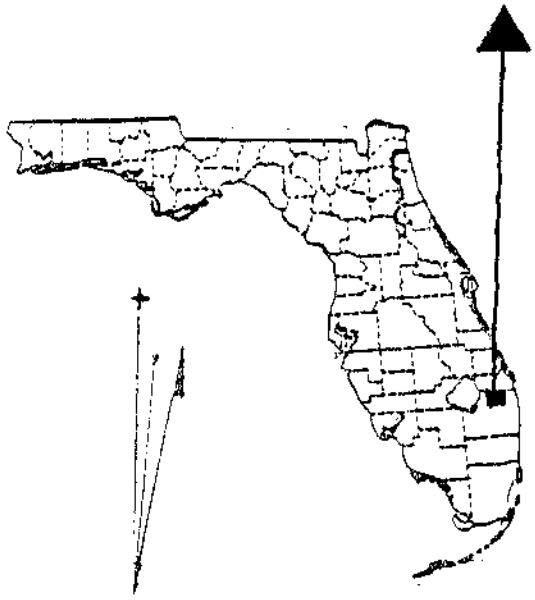


Figure 1. Portions of Northern Palm Beach County, Florida, including location of United Technologies.

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			N. of FPL Substation

REMARKS:	LOCATION:	FIELD ID/NAME:
Form inadequate for canal evaluation	P+W. Site Ind. Canal	PW-2

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 20 sand/rock	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 5 no flow	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 2 canal	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 7	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 5	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
	Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	37

COMMENTS: Larger (wider) canal than PW-1; water is clearer, more plants

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-30-91	Doug Straw	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

COI - P

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			Site Industrial Canal

REMARKS:	LOCATION:	FIELD ID/NAME:
	N. of FPL substation	PW-2

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
30	30			30	40	

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): none evident

Estimated Stream Width (range, m): 15-20	Estimated Stream Depth (range, m): 5-10	Impounded (yes)	☐
High Water Mark (m above bed): 0.1	Velocity (range, m/s): 0	Channelized	☒

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	2-5%
Sand:		Mud/Muck (organic):	10-15%

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top 2"	26.4	5.3	Secchi Depth (m):	1
Mid-depth 2'	22.5	1.3	pH (SU):	5.4
Bottom 5'	22.1	1.0	Conductivity (µmho/cm):	300
			Other Parameters:	

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

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: partly cloudy, 75 80°F

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-30-91	Doug Strom	Douglas A. Strom

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		1-30-91	Corbett Wm A Corp to Industrial Canal

REMARKS:	LOCATION:	FIELD ID/NAME:
not a very good form for assessing rivers	S of at NPDES point	PW-1

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover — 18 — emergent vegetation	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 — wind driven — 3 — no current	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 — 1 — Canal	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 — deer crossing present	**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 — 5 — upland veg	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
	Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	35

COMMENTS: Small canal, water is greenish brown w/abundant periphyton

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-30-91	Doug Straw	Douglas M Straw

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		1-30-91	Corbett WMA Canal

REMARKS:	LOCATION:	FIELD ID/NAME:
	10' S of NPDES point	DW-1

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
80	20					

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

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

Point-Source Pollution (list location and describe):
NPDES site for P&W Runoff - Pratt & Whitney sources

Estimated Stream Width (range, m):	6-10	Estimated Stream Depth (range, m):	1.0	yes
High Water Mark (m above bed):	0.1	Velocity (range, m/s):	0	Impounded ☐ Channelized ☒

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	
Sand:	~50	Mud/Muck (organic):	50

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top 4"	21.9	3.2	Secchi Depth (m):	1.2
Mid-depth 2'	21.8	2.1	pH (SU):	6.1
Bottom 8'	21.2	1.2	Conductivity (µmho/cm):	359
			Other Parameters:	

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

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

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

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

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

Weather Conditions:
clear,
75-80°F

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
1-30-91	Doug Strom	Douglas G. Strom

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: United Technologies
Address/City: (Pratt-Whitney)
County:
Contact/District:
NPDES Permit #: Outfall #:

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

Remarks: Cl2 Used = 0.0 Hach MF

Sample Collection: Date 2/27/91 Time
Test Beginning: Date 2/28/91 Time 0950
Test Ending: Date 3/2/91 Time 1100
Test Organism: C. dubia 2nd Brood
Life Stage/Age: Neonate < 24 hrs

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7@7 9@9		1451@23.1	22.6
24 hr	7@7 9@9	8.8@22°	1414@23.7	21.3 @ 23.2
48 hr	7@7 9@9	8.8@22°	1374@23.6	22.0 @ 23.7

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		5	5	5	8.6			8.1			29.5C			334		
Control		5	5	5												
Control		5	5	5												
Control		5	5	5												
100%		5	5	5	9.0			7.3			23.0°			375		
100%		5	5	5												
100%		5	5	5												
100%		5	5	5												
Control					8.6	8.5	8.0	8.1	8.3	8.1	20.5	21.2	21°C	334	368	365
100%					9.0	8.6	8.1	7.3	8.3	8.1	23.5	21.2	21°C	375	392	388
Control	97	5	5	5	8.3	7.8	8.8	7.6	8.0	8.0	19°C	21°C	21°C			
Control	29	5	5	5	8.3	7.9	8.8	7.6	8.0	8.1				327	258	259
100%	72	5	5	5	9.5	7.7	8.6	7.2	7.8	8.1	26°C	21°C	21°C			
100%	7	5	5	5	9.3	7.7	8.5	7.2	7.8	8.1				423	411	415
Measured/Loaded by:		MF	MF	SMC	AJ	MF	SMC	AJ	MF	SMC	AJ	MF	SMC	EDB	MF	SMC
Recorded by:		MF	MF	SMC	EDB	SMC	SMC	EDB	SMC	SMC	EDB	SMC	SMC	AJ	SMC	SMC

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:			0.0	Hach	MF
Alkalinity:	125	120	125	HACH	AJ
Hardness:	125	140	155	HACH	AJ
Total Ammonia:					

Ammonia meter slope:

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
CENTRAL LABORATORY
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

CHEMICAL ANALYSIS REPORT

Job ID: 91-FEB-28-05
Date Received: 28-FEB-1991
Authorized: 22-APR-1991
Submitted By: Russ Frydenborg DER Biology Lab

Project: BIOASSAY
Customer ID: BIOLOGY
By: Bill Coppenger

all undetected

For Additional Information, Please Contact
G. William Coppenger, Ph.D.
Yuh-Hsu Pan, Ph.D.
Suncom 277-2571
(904) 487-2571

Certified By: _____ Date: 4-22-91

Abbreviations & Storet Codes:

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 practical quantitation limit
U - Material was analyzed for but not detected;
The value reported is the minimum detection limit
NA - Not applicable
NR - Not requested

14275/91-FEB-28-05-01/W-BNA Continued from Page 2

Storet#	Analyte	Value	Units
34596	Di-n-octyl phthalate	2 U	ug/L
34361	Endosulfan-I	8 U	ug/L
34356	Endosulfan-II	8 U	ug/L
34351	Endosulfan-sulfate	8 U	ug/L
39390	Endrin	8 U	ug/L
34366	Endrin-aldehyde	8 U	ug/L
34376	Fluoranthene	2 U	ug/L
34381	Fluorene	2 U	ug/L
39410	Heptachlor	8 U	ug/L
39420	Heptachlor-epoxide	8 U	ug/L
39700	Hexachlorobenzene	2 U	ug/L
34391	Hexachlorobutadiene	2 U	ug/L
34396	Hexachloroethane	2 U	ug/L
34386	Hexachlorocyclypentadiene	5 U	ug/L
34403	Indeno(1,2,3-cd)pyrene	5 U	ug/L
34408	Isophorone	2 U	ug/L
34696	Naphthalene	2 U	ug/L
34447	Nitrobenzene	2 U	ug/L
34438	N-Nitrosodimethylamine	2 U	ug/L
34428	N-Nitrosodi-n-propylamine	2 U	ug/L
34433	N-Nitrosodiphenylamine	2 U	ug/L
34671	PCB-1016	1.0E+03 U	ug/L
39488	PCB-1221	1.0E+03 U	ug/L
39492	PCB-1232	1.0E+03 U	ug/L
39496	PCB-1242	1.0E+03 U	ug/L
39500	PCB-1248	1.0E+03 U	ug/L
39504	PCB-1254	1.0E+03 U	ug/L
39508	PCB-1260	1.0E+03 U	ug/L
	PCB-1262	1.0E+03 U	ug/L
34461	Phenanthrene	2 U	ug/L
34469	Pyrene	2 U	ug/L
39400	Toxaphene	1.0E+03 U	ug/L
34551	1,2,4-Trichlorobenzene	2 U	ug/L
34462	4-Chloro-3-methyl phenol	2 U	ug/L
34586	2-Chlorophenol	2 U	ug/L
34601	2,4-Dichlorophenol	2 U	ug/L
34606	2,4-Dimethylphenol	2 U	ug/L
34616	2,4-Dinitrophenol	15 U	ug/L
34657	2-Methyl-4,6-dinitrophenol	15 U	ug/L
34591	2-Nitrophenol	2 U	ug/L
34646	4-Nitrophenol	15 U	ug/L
39032	Pentachlorophenol	5 U	ug/L
34694	Phenol	2 U	ug/L
34621	2,4,6-Trichlorophenol	2 U	ug/L

Comments (1)
(2)
(3)
(4)
(5)
(6)

Ross Fruchtborg

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
CENTRAL LABORATORY
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

CHEMICAL ANALYSIS REPORT

Job ID: 91-FEB-28-06
Date Received: 28-FEB-1991
Authorized: 2-MAY-1991

Project: BIOASSAY
Customer ID: BIOLOGY
By: Tim Fitzpatrick

Submitted By: DER Biology Lab

For Additional Information, Please Contact
G. William Coppenger, Ph.D.
Yuh-Hsu Pan, Ph.D.
Suncom 277-2571
(904) 487-2571

Certified By: GWC Date: 5-3-91

Abbreviations & Storet Codes:

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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 practical quantitation limit
U - Material was analyzed for but not detected;
The value reported is the minimum detection limit
Q - Evidence that analyte was present in sample is equivocal
NA - Not applicable
NR - Not requested

14278/91-FEB-28-06-02 Continued from Page 3

Analysis ID: AG-G-W
Silver in water by furnace AA
Analyzed: 18-APR-1991 By: Jack Merritt
Authorized: 2-MAY-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01077	Silver	0.1 U	ug/L

Analysis ID: CD-G-W
Cadmium by graphite furnace for water samples
Analyzed: 11-APR-1991 By: Jack Merritt
Authorized: 18-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01027	Cadmium	0.3	ug/L

Analysis ID: HG-H-W
Mercury by cold vapor using hydride sys.-water
Analyzed: 21-MAR-1991 By: Laurie Roughton
Authorized: 2-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
71900	Mercury	0.1	ug/L

Analysis ID: SE-G-W
Selenium in water by furnace AA
Analyzed: 17-APR-1991 By: Jack Merritt
Authorized: 26-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01147	Selenium	3 U	ug/L

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SL *SAVANNAH LABORATORIES*
& ENVIRONMENTAL SERVICES, INC.

Russ Prudenborg

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahasse, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-00535

UNITED TECHNOLOGIES
PRATT - WHITNEY

Received: 01 MAR 91

Dr. Yuh-Hsu Pan
DER-Chemistry Section
2600 Blairstone Road
Tallahassee, Florida 32399-2400

Project: T151/District/Special

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION	SAMPLED BY
00535-1	C-272	Client
00535-2	C-273	
00535-3	C-284	
00535-4	C-285	
00535-5	C-286	

P-W UP P-W DOWN

LIQUID SAMPLES

PARAMETER	00535-1	00535-2	00535-3	00535-4	00535-5
Ammonia-N, mg/l	0.043	0.071	<0.030	<0.030	<0.030
Total Kjeldahl Nitrogen-N, mg/l	1.6	1.1	0.79	0.58	0.61
Total Phosphorus, mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate + Nitrite-N, mg/l	<0.10*	<0.10*	<0.10*	<0.10*	<0.10*

Sample ID: 14279/91-FEB-28-07-01 Matrix: W-SURF-FRH
Location: Pratt-Whitney/United Tech
Field ID: upstream
Collected: 27-FEB-1991 00:00 By: Doug Strom
Authorized: 11-APR-1991 By: Tim Fitzpatrick
Type: Grab Sample
Lab Comments:
Field Comments:

Analysis ID: W-PO4
Orthophosphate analysis for water samples
Analyzed: 1-MAR-1991 By: Lei Wei
Authorized: 11-APR-1991 By: Tim Fitzpatrick
Sample exceeded holding time prior to analysis.

Storet#	Analyte	Value	Units
70507	O-Phosphate-P	0.050 A	mg P/L

Sample ID: 14280/91-FEB-28-07-02 Matrix: W-SURF-FRH
Location: Pratt-Whitney/United Tech
Field ID: downstream
Collected: 27-FEB-1991 12:00 By: Doug Strom
Authorized: 11-APR-1991 By: Tim Fitzpatrick
Type: Grab Sample
Lab Comments:
Field Comments:

Analysis ID: W-PO4
Orthophosphate analysis for water samples
Analyzed: 1-MAR-1991 By: Lei Wei
Authorized: 11-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
70507	O-Phosphate-P	0.048 A	mg P/L

********** END OF REPORT **********

Macroinvertebrate taxa list for United Technologies/Pratt and Whitney testing facility, Palm Beach County, Florida, collected from Hester-Dendy samplers above and below the discharge on 27 February 1991.

	Control Site	Test Site
Acarina		
Sperchon sp.	1	–
Diptera		
Asheum beckae	–	48
Chironomus decorus grp.	38	8
Cladotanytarsus sp.	–	6
Cladopelma sp.	1	–
Cricotopus/Orthocladius grp. sp.	1	–
Dicrotendipes modestus	6	133
Dicrotendipes nervosus	–	6
Einfeldia austini	1	–
Einfeldia natchitocheae	9	6
Einfeldia sp.	–	4
Glyptotendipes lobiferus	12	32
Goeldichironomus carus	–	2
Goeldichironomus holoprasinus	8	18
Guttipelopia guttipennis	7	8
Kiefferulus dux	297	271
Larsia sp.	2	–
Meropolopia sp.	–	2
Microtendipes sp.	–	2
Nimbocera pinderi	–	2
Palpomyia grp. sp.	2	1
Parachironomus hirtalatus	5	2
Polypedilum fallax grp.	2	22
Polypedilum illinoense	1	–
Pseudochironomus richardsoni	2	2
Undetermined dipteran pupae	7	15
Undetermined dipteran species	2	–
Stratiomys sp.	–	1
Tanytarsus sp.	34	40
Tanytarsini type 1	–	4
Ephemeroptera		
Caenis diminuta	2	68
Gastropoda		
Hebetancyclus excentricus	6	–
Laevapex peninsulae	5	1
Micromenetus dilatus	10	1
Physella heterostropha pomila	4	9
Physella sp.	3	–
Planorbella duryi	1	1
Planorbella scalaris	–	3
Pseudosuccinia columella	2	–

Hemiptera		
Metrobates hesperius	1	–
Hirudinea		
Batracobdella phalera	1	–
Lepidoptera		
Undetermined lepidopteran	1	–
Malacostraca		
Hyalella azteca	2	–
Palaemonetes paludosus	–	1
Odonata		
Ischnura ramburii	1	–
Pachydiplax longipennis	4	3
Oligochaeta		
Chaetogaster limnaei	2	–
Dero digitata	–	2
Dero obtusa	72	448
Dero pectinata	31	1
Pristina aequiseta	27	–
Platyhelminthes		
Dugesia sp.	–	20

Periphyton taxa list for the United Technologies/Pratt and Whitney facility, Palm Beach County, Florida, collected 27 February 1991.

	Control Site	Test Site
Diatoms		
Achnanthes linearis	119	250
Achnanthes microcephala	1	1334
Amphora ovalis	9	–
Anomoeoneis vitrea	4	1501
Cymbella aspera	1	–
Cymbella minuta	7	167
Cymbella naviculiformis	29	6005
Cymbella pusilla	3	–
Eunotia curvata	9	–
Eunotia flexuosa	–	417
Eunotia naegelii	6	–
Eunotia pectinalis	1	–
Eunotia suecica	–	83
Fragilaria construens	–	250
Fragilaria crotonensis	14	1751
Gomphonema augur	1	–
Gomphonema gracile	6	–
Gomphonema parvulum	3	–
Melosira granulata	1	167
Navicula cf *festiva*	3	–
Navicula cf *lacustris*	1	–
Navicula radiosa	28	–
Navicula cf *secura*	–	83
Nitzschia amphibia	78	3086
Nitzschia obtusa	–	83
Nitzschia palea	49	417
Stauroneis anceps	1	–
Synedra ulna	26	1585
Chlorophyta		
Ankistrodesmus sp.	–	500
Bulbochaete sp.	33	–
Characium sp.	148	–
Chlorella sp.	10	–
Closterium sp.	1	–
Cosmarium sp.	3	250
Gloeocystis sp.	42	–
Mougeotia sp.	7	83
Oedogonium sp.	39	–
Oocystis sp.	3	–
Scenedesmus sp.	1	250
Selenastrum sp.	1	–
Tetraedron sp.	–	83
Zygnema sp.	1	–

Chrysophyta		
Stipitococcus sp.	1	–
Cyanophyta		
Aphanocapsa sp.	–	500
Aphanothece sp.	7	584
Chroococcus sp.	23	2002
Coelosphaerium sp.	1	–
Gomphosphaerium sp.	–	167
Lyngbya sp.	16	334
Merismopedium sp.	–	1835
Microcystis Aeruginosa	3	–
Oscillatoria sp. 1	39	–
Oscillatoria sp. 2	23	1168
Oscillatoria sp. 3	17	2085
Euglenophyta		
Phacus sp.	1	–
Trachelomonas sp.	–	83
Unidentified algal taxon	9	–
Total	829	27103

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Pratt-Whitney/United Technologies
County: Palm Beach
NPDES Number: FL0026042
State Permit Expiration Date:

Toxics Sampling Inspection (**XSI**)	
Date Sampled:	February 27, 1991
Results:	No deleterious levels of organic priority pollutants or metals found.

Compliance Biomonitoring Inspection (**CBI**)	
Date Sampled:	February 27, 1991
Results:	Effluent was not toxic in 48 hour acute tests to *Ceriodaphnia dubia* nor *Notropis leedsi.*

Impact Bioassessment Inspection (**IBI**)	
Date Sampled:	February 27, 1991
Results:	No significant effects on benthic macroinvertebrate or periphyton communities found. Algal Growth Potential was reduced at the test site, probably due to low ambient pH.

Water Quality Inspection (**WQI**)	
Date Sampled:	February 27, 1991
Results:	Bioreactive nitrogen was low (< 0.1 mg/l) at both sites. Orthophosphorus was 0.5 mg/l at the control site and 0.48 mg/l at the test site.

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

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0026427 11	12 910227 17	18 X	19 S	20

Remarks

21 66

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0026427 11	12 910227 17	18 F	19 S	20

Remarks

21 66