

Biological Assessment of
Crystal River Sewage Treatment Plant
Citrus County
NPDES #FL0028371
Sampled October 1991

May 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger: Crystal River Sewage Treatment Plant
County: Citrus
NPDES Number: FL0028371
State Permit Expiration Date: 31 December 1991

Toxics Sampling Inspection (XSI)

Date Sampled: 21 October 1991

Results: Gamma-BHC (0.12 µg/L), aluminum (30 µg/L), iron (27 µg/L), silver (0.2 µg/L), and zinc (32 µg/L). The Gamma-BHC, silver, and zinc are in excess of Class III standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 21 October 1991

Results: The chlorinated sample was toxic to *Ceriodaphnia dubia*, killing all organisms within 24 hours. The dechlorinated sample was also toxic to *C. dubia*, with an LC_{50} of 59.63%. This is a violation of 17-302.500(1)(d), 17-302.510(5)(p), and 17-4.244(3)(a) FAC.

Impact Bioassessment Inspection (IBI)

Date Sampled: 21 October 1991

Results: Benthic macroinvertebrate communities were stressed throughout the receiving water canal, but were more degraded below the discharge. Taxa richness and Florida Index values were decreased at the test site, and Shannon-Weaver diversity was reduced by 72.7%, violating the biological integrity criterion (17-302.560(9) FAC). The overwhelming dominance of the nuisance midge, *Chironomus decorus* grp., indicated that a violation of 17-302.510(5)(q) FAC (dominance of nuisance species) occurred at the test site. Severe shifts in the phytoplankton and periphyton communities indicated that nutrient induced imbalances of aquatic flora (17-302.560(29) FAC) could be attributed to the STP discharge.

Water Quality Inspection (WQI)

Date Sampled: 21 October 1991

Results: Nutrients in the effluent were elevated, particularly total and ortho-phosphorus (3.0 mg/L for both), and nitrate (9.0 mg/L). These same compounds were equally high at the test site, but were low or undetected at the reference site. Algal growth potential was very high in the effluent and at the test site, in excess of the enrichment problem threshold.

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

Introduction

The City of Crystal River Sewage Treatment Plant, located in Citrus County, Florida, is a 0.75 MGD activated sludge facility with gravity sand filters and chlorination. Effluent is discharged into two manmade canals which flow into the Cedar Cove area of Kings Bay, and ultimately to Crystal River, an Outstanding Florida Water (see map in Appendix). Sludge is stored in piles on the banks of the discharge canals, and during periods of heavy rainfall, nutrient-rich leachate provides additional inputs to the springfed canal.

The plant has a history of permit violations. Citrus County has brought criminal charges against two plant officials suspected of records falsification. In studies of the factors contributing to excess algal growth in Kings Bay, both the Dept. of Environmental Regulation and the Southwest Florida Water Management District found that effluent from the Crystal River STP was partially responsible for the enrichment problems there (Nearhoof 1989, SWFWMD 1990). Recommendations resulting from these studies included the diversion of effluent from Kings Bay and disposal of sludge outside the watershed.

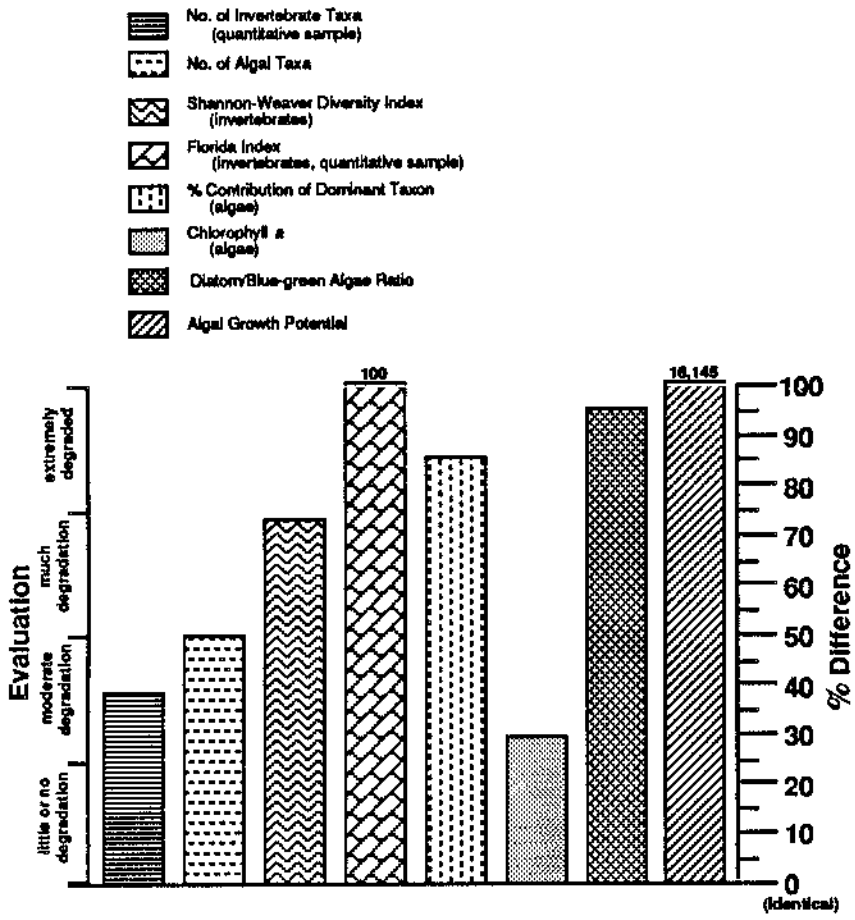
Under Consent Order by the FDER, the facility is presently building a new plant and land disposal system. Effluent flow was ceased on March 9, 1992, while this report was in the draft stage.

Methods

The focus of this investigation was to determine the discharger's

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	17	16
Florida Index	2	1
% Contribution of Dominant Taxon	60.3	66.4
% Diptera	67.5	73.7
% Malacostraca	20.6	5.3
% Gastropoda	0.8	9.3
% Hemiptera	4.8	4.0
% Ephemeroptera	0.8	2.0
% Odonata	1.6	4.5
% Other	3.9	1.2
% Collector-Gatherers	54.0	43.9
% Shredders	33.0	33.2
% Predators	11.0	8.9
% Scrapers	0.8	10.3
% Collector-Filterers	1.4	3.6
Macroinvertebrate Hester-Dendy		
Number of Taxa	13	8
Florida Index	3	0
Shannon-Weaver Diversity	2.2	0.6
% Diptera	100	99.7
% Oligochaeta	0	0.3
% Collector-Gatherers	76.8	51.0
% Shredders	19.6	47.0
% Collector-Filterers	1.9	2.0
% Predators	1.7	0
Periphyton Algae		
Number of Taxa	38	7
% Contribution of Dominant Taxon	22.5	93.6
Chlorophyll a (mg/sq. m)	8.38	10.82
Diatom/Diatom + B-G Abundance Ratio	0.84	0.04
% Blue-green	14.5	6.2
% Green	11.6	93.6
% Diatoms	73.6	0.2
% Other	0.3	0
Phytoplankton Algae		
Number of Taxa	18	9
% Contribution of Dominant Taxon	31.2	58.0
Chlorophyll a (µg/L)	0	2.99
Diatom/Diatom + B-G Abundance Ratio	0.59	0
% Blue-green	37.5	89.0
% Green	6.3	10.0
% Diatoms	53.1	0
% Euglenophytes	3.1	1.0
Algal Growth Potential (mg dry wt/l)	0.33	53.61



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

effects on the receiving waters. A comparison of biological community health was made between a reference site (located upstream of the plant in a dredged area of the unnamed canal) and a test site (the area down gradient of the discharge) (see map in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute definitive and screening toxicity bioassays, using *Ceriodaphnia dubia* as the test organism, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, as well as reference and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Periphyton was sampled at both reference and test sites by incubating glass microscope slides in a standard periphytometer for 28 days (Ross 1990). Phytoplankton was collected via sub-surface grab samples. Chlorophyll *a* was also determined for periphyton and phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal growth potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. 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 reference and test sites involving the number of taxa, the diversity index, Florida Index and the diatom to bluegreen algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Pat Fricano, Peggy Morgan, Kathy Hicks, and Dave MacColeman (DER Southwest District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

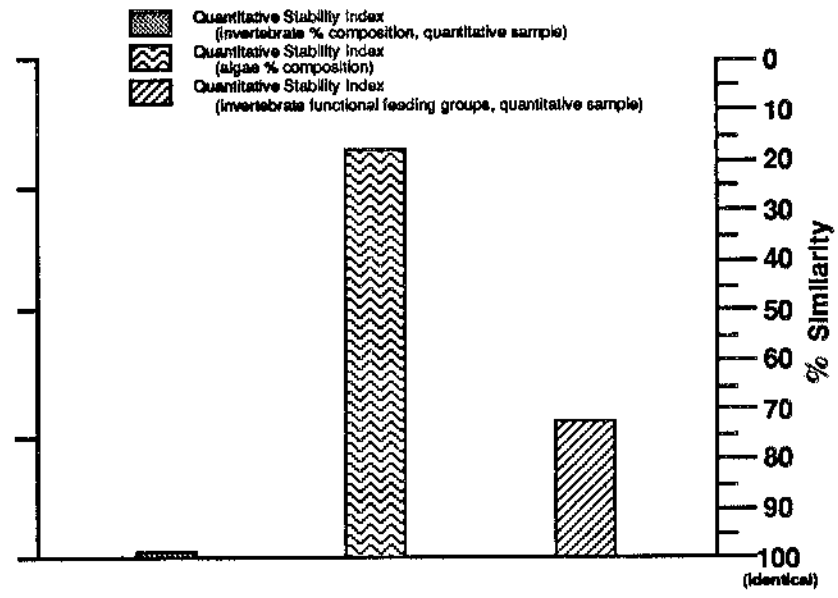
Results and Discussion

Habitat quality at the reference site was poor, with a score of 31 (Appendix). This is due to several factors, but bottom substrate characteristics were most important. This area of the canal has been recently dredged, and the streambed consisted of mostly mud and muck. Additionally, the degree of channelization and lack of bank stability detracted from the habitat potential at this site. Although the test site was situated at the point where the effluent ditch enters the canal spring head, both areas scored poorly for water velocity. At the downstream site, ample amounts of leafpacks, undercut banks, and aquatic vegetation provided a higher quality habitat (score = 65). Based on habitat quality, the test site should have supported a healthier macroinvertebrate community than the reference site. Dissolved oxygen at both sites was below ambient standards, 4.1 mg/L at the reference site and 2.4 mg/L downstream of the discharge. Because of a Site Specific Alternative Criterion for dissolved oxygen (0.1 mg/L), these low D.O. values do not represent violations. Both sites were near neutral in pH, but conductivity (307 and 244 µmhos/cm at reference and test sites, respectively) and algal turbidity were slightly higher at the reference site (Appendix).

The chlorinated sample of effluent was extremely toxic to *Ceriodaphnia dubia*, killing all organisms within 24 hours. The static definitive bioassay performed on the dechlorinated sample produced an LC_{50} of 59.63%, a violation of toxicity standards (17-302.500(1)(d), 17-302.510(5)(p), and 17-4.244(3)(a) FAC).

Analyses for organic constituents revealed the presence of Gamma-BHC (Lindane) at a concentration of 0.12 µg/L. Metals analysis of the effluent yielded the following results: aluminum (30 µg/L), iron (27 µg/L), silver (0.2 µg/L), and zinc (32 µg/L). The concentrations of Gamma-BHC, silver, and zinc were in excess of ambient standards. The presence of these compounds also could have contributed to the observed toxicity.

Nutrients were relatively high in the effluent, particularly nitrate (9.0 mg/L) and ortho-phosphorus (3.0 mg/L). The nutrient concentrations found during this investigation were similar to the average values measured at the STP during a year-long study conducted by SWFWMD (1990) and to the values measured during an FDER intensive survey (Nearhoof 1989). Ortho-phosphorus and nitrate-nitrite were also elevated at the test site, 3.0 and 9.6 mg/L, respectively, but were undetected at the reference site. Total Kjeldahl Nitrogen was higher in the effluent (0.9 mg/L)



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

and test site (0.93 mg/L), than at the reference station (0.19 mg/L).

Algal growth potential of the effluent and test sites corresponded to the high concentrations of bioavailable forms of nitrogen and phosphorus. Effluent AGP was 22.65 mg dry wt/L, while the test site waters supported 53.61 mg dry wt/L. The lower AGP in the effluent may have been due to algal inhibition caused by the metals present. However, these AGP values are well over the problem threshold of 5 mg dry wt/L, which indicates that nuisance macrophyte or algal growth, D.O. sags, and fish kills, are likely to to occur (Raschke and Shultz 1987). Past studies suggest that imbalances of aquatic flora and fauna were attributable to the nutrient enriched discharge (Nearhoof 1989, SWFWMD 1990). At the reference site, AGP was 0.33 mg dry wt/L.

Measures of benthic macroinvertebrate community health indicated stressed conditions at both sites, which were more severe below the discharge (see table and figures). Stress at the reference site was probably due to the poor habitat found there, while the greater degree of disturbance observed at the test site was related to degraded water quality. The figure on p. 2 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation.

Taxa richness declined by 38.5% at the test site, from 13 to 8 organisms (see taxa list in Appendix). Florida Index was very low at the reference site (3), but was zero at the test site. Shannon-Weaver diversity was 72.7% lower at the test site, a violation of the biological integrity criterion (17-302.560(9) FAC). The extremely low diversity at the test site was due to the overwhelming dominance of the nuisance midge, *Chironomus decorus* grp., which has consistently been associated with polluted conditions (Beck 1969, Hudson *et al.* 1990). This is a violation of 17-302.510(5)(q) FAC, dominance of nuisance species.

The figure on p. 3 summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation. In this particular case, the macroinvertebrate percent composition at the two sites was very similar, and requires some explanation. Since the macroinvertebrate assemblage, both above and below the discharge, was composed almost entirely of dipterans (causing the QSI for percent composition to be 99.7%), this is evidence, as mentioned earlier, that both sites were degraded. Although additional macroinvertebrate groups were collected from discrete sweep net samples (see taxa list in Appendix), a declining trend between reference and test sites was apparent.

Significant changes in the periphyton community below the plant discharge further demonstrated a deterioration in water quality. Thirty-eight taxa were collected at the reference site, while only seven were represented in the test site sample (see taxa list in Appendix). Diatoms were dominant upstream (73.6%), but made up only 0.2% of the downstream population. The periphyton community at the test site consisted almost entirely of *Characium* sp., a green alga which is commonly found in sewage treatment ponds (Palmer 1977). This is interpreted as a nutrient induced imbalance in aquatic flora, a violation of 17-302.560(29) FAC. The Quantitative Stability Index for algal percent composition (17.8%) also illustrates the extreme community shift.

The free-floating phytoplankton community also exhibited significant differences between reference and test sites. At the reference site, diatoms again dominated, but fair numbers of blue-green algae were also present. No diatoms were found at the test site, and blue-greens, particularly *Chroococcus* sp., comprised 89% of the algal population. Species richness declined by 50% at the test site (see taxa list). These data also indicate that nutrient induced imbalances of aquatic flora could be attributed to the STP discharge.

Conclusions

The effluent sample collected from the Crystal River Sewage Treatment Plant was toxic to the invertebrate, *Ceriodaphnia dubia*. The chlorinated effluent killed all the test organisms within 24 hours, and the dechlorinated sample produced an LC_{50} of 59.63%. This is a violation of 17-302.500(1)(d), 17-302.510(5)(p), and 17-4.244(3)(a) FAC. Organics and metals analysis of the effluent revealed the presence of several compounds which exceeded Class III standards, including Gamma-BHC (0.12 µg/L), silver (0.2 µg/L), and zinc (32 µg/L).

Nutrients were uncommonly high in the effluent and at the test site, particularly total and orthophorphorus, and nitrate-nitrite. Most nutrient constituents were either undetected or low in waters from the reference site. Algal growth potential was also extremely elevated at effluent and test sites, corresponding with the high bioavailable nutrient concentrations.

The benthic macroinvertebrate community was stressed throughout the receiving water canal, but was more degraded downstream of the discharge. This was demonstrated by decreases in taxa richness and Florida Index, as well as a 72.7% reduction in Shannon-Weaver diversity (a violation of the biological integrity criterion). The downstream community was overwhelmingly dominated by the well-known pollution tolerant chironomid, *Chironomus decorus* group, a violation of 17-302.510(5)(q) FAC, dominance of nuisance species.

Changes in the periphyton and phytoplankton populations also indicated that nutrient induced imbalances of aquatic flora (17-302.560(29) FAC) occurred below the discharge. Taxa richness was reduced, and severe community shifts occurred in both groups. Upstream, the periphyton was dominated by diatoms, while the downstream assemblage consisted almost entirely of the pollution tolerant green alga, *Characium* sp. The phytoplankton at the reference site was composed mostly of diatoms and secondarily, blue-greens. Blue-green algae, mainly *Chroococcus* sp., were in the majority at the test site.

Literature Cited

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

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

Beck, E. C. and W. M. Beck. 1969. The Chironomidae of Florida. II. The nuisance species. Fla. Entomol. 52(1):1-11.

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.

Hudson, P. L., D. R. Lenat, B. A. Caldwell, and D. Smith. 1990. Chironomidae of the Southeastern United States: A checklist of species and notes on biology, distribution, and habitat. U. S. Fish Wildl. Serv., Fish. Wildl. Res. 7. 46 pp.

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

Nearhoof, F. 1989. Crystal River Canal: Intensive survey and water quality based effluent limitations documentation (Citrus County). Fla. Dept. Environ. Reg. Water Quality Tech. Ser. 2(118): 1-119.

Palmer, C. M. 1977. Algae and water pollution. Environmental Protection Agency. EPA-600/9-77-036.

Weber, C. I. 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 p.

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

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

Southwest Florida Water Management District. 1990. An evaluation of factors contributing to the growth of *Lyngbya* sp. in Kings Bay/Crystal River, Florida. SWFWMD. 128 p.

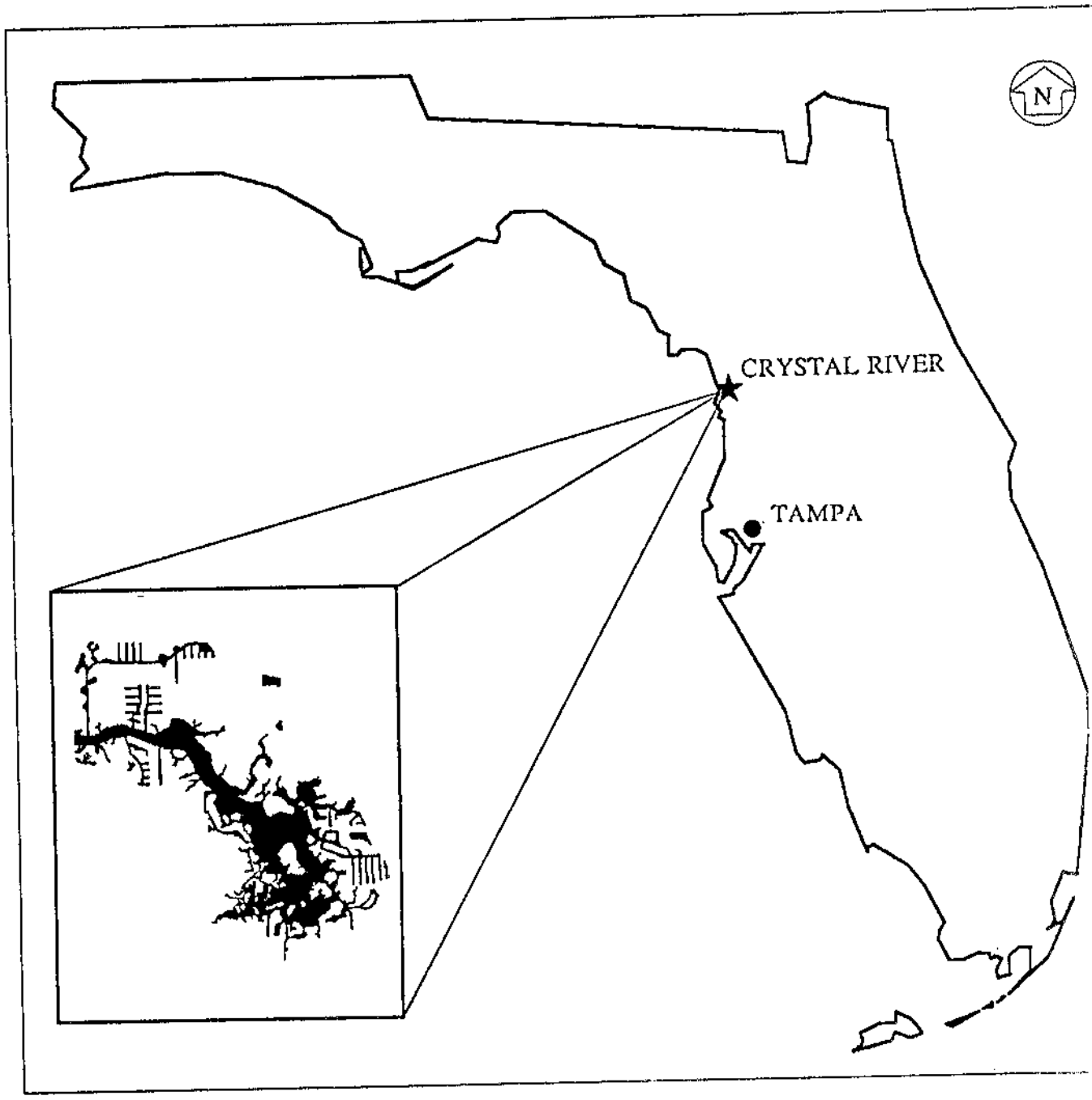
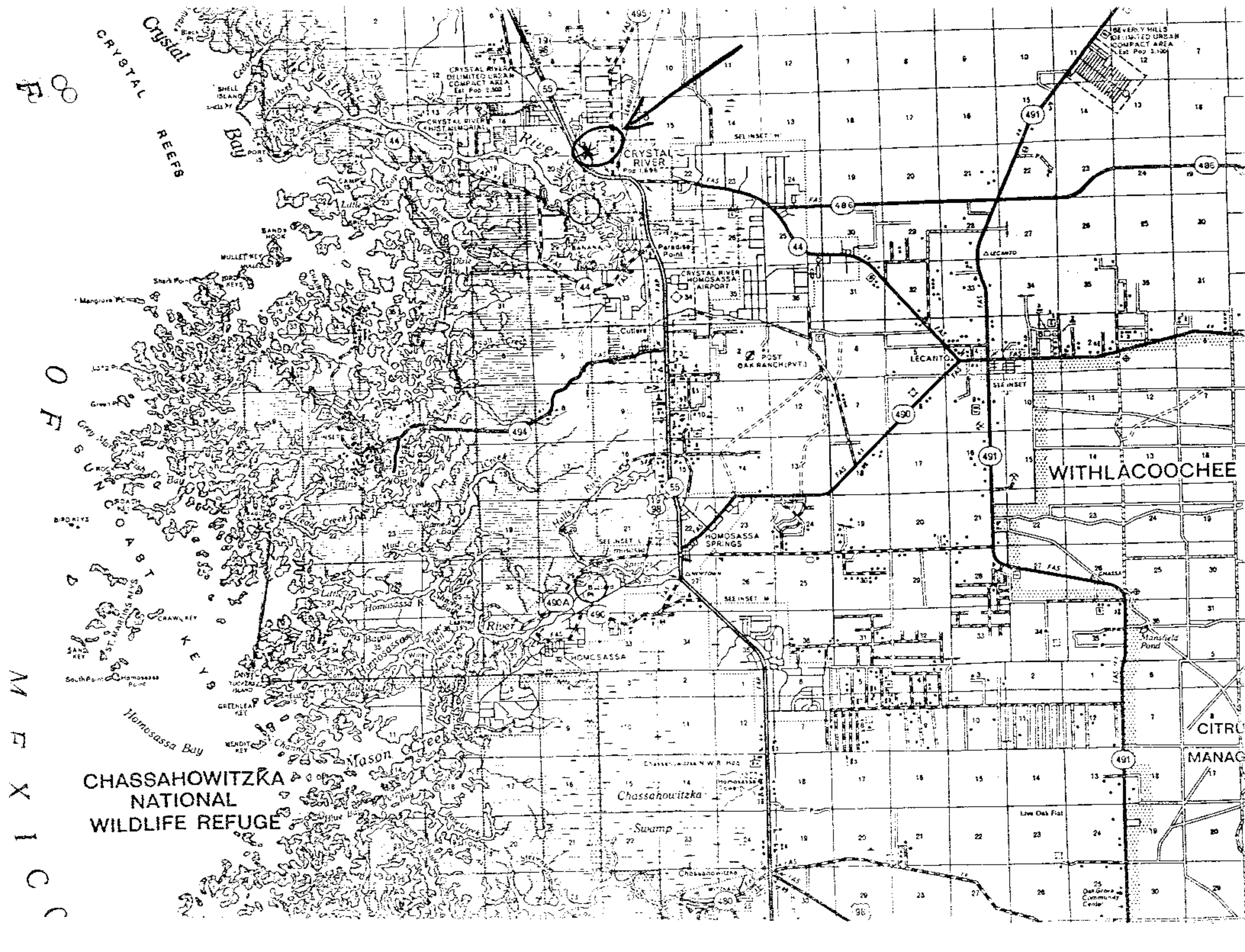
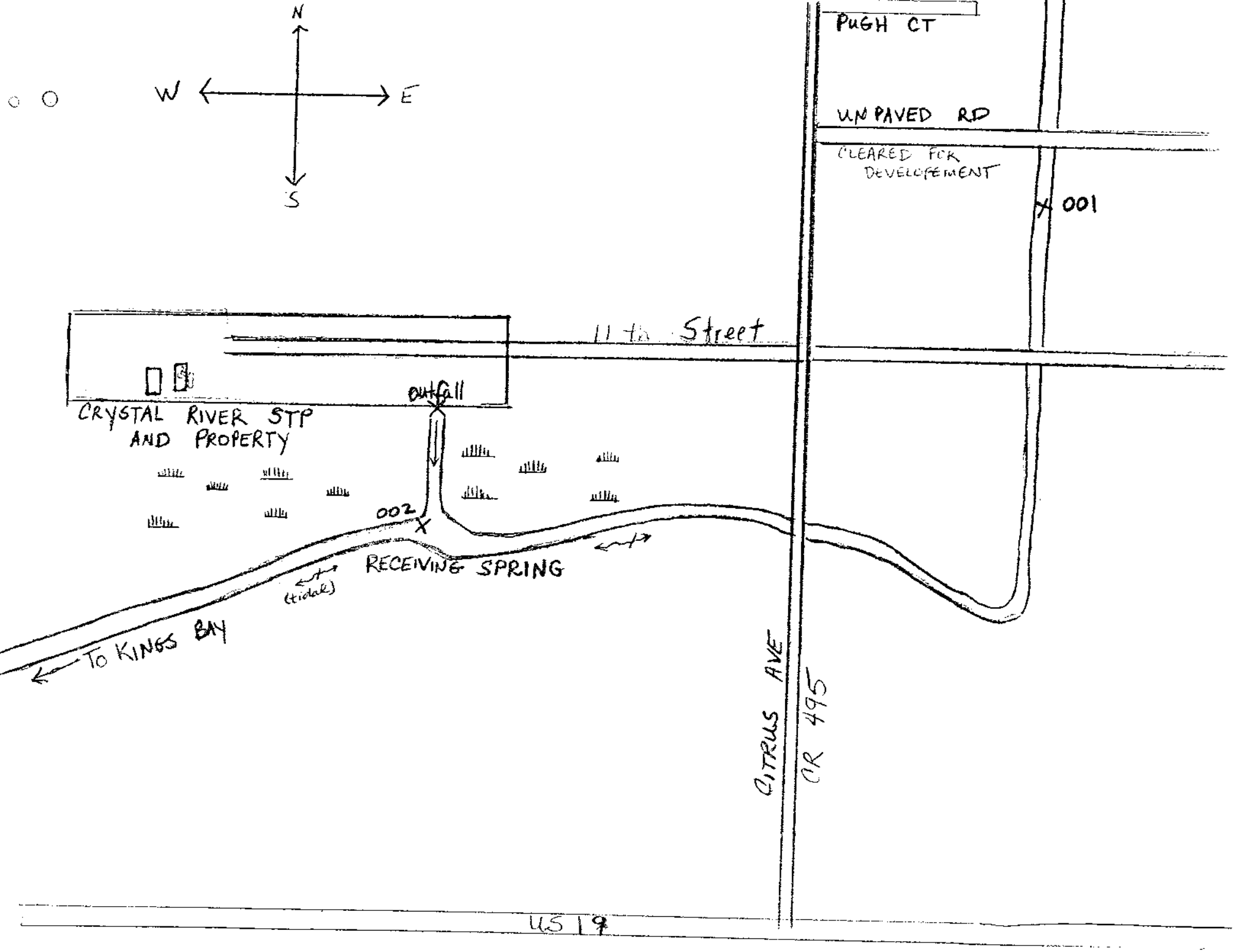


Figure 1.1 Location Map



CRYSTAL RIVER
Pop 1,696
CRYSTAL RIVER DELIMITED URBAN COMPACT AREA
Est. Pop 2,500
BEVERLY HILLS DELIMITED URBAN COMPACT AREA
CRYSTAL RIVER HOMOSASSA AIRPORT
Paradise Point
POST OAK RANCH (PVT.)
LECANTO
Cutlers
HOMOSASSA SPRINGS
HOMOSASSA
WITHLACOOCHEE
CITRU
MANAG
Mansfield Pond
Live Oak Flat
Oak Grove Community Center
Chassahowitzka
Chassahowitzka Swamp
CHASSAHOWITZKA NATIONAL WILDLIFE REFUGE
Homosassa Bay
Crystal Bay
CRYSTAL REEFS
SHELL ISLAND
SANDS HOOK
MULLET KEY
BIRD KEYS
Shark Point
Mangrove Pt.
CRAWL KEY
ST. MARTINS KEYS
SAND KEY
South Point
Homosassa Point
GREENLEAF KEY
MENDIT KEY
Mason Creek
Homosassa R.
Crystal River
O F
M E X I C
495
491
486
44
55
19
98
490
490A
494


N
W
E
S
PUGH CT
UNPAVED RD
CLEARED FOR DEVELOPEMENT
001
11th Street
outfall
CRYSTAL RIVER STP AND PROPERTY
002
RECEIVING SPRING
(tidal)
TO KINGS BAY
CITRUS AVE
CR 495
US 19

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: City of Crystal River	Prepared by: Date: 11/18/91	
Location (attach detailed map): 280 NW 11th St. Crystal River Fl.	County: Citrus	District: SWD
Federal Permit # and expiration date: FL 0028371	State GMS # and State expiration date: 4009 M1 0013	Facility Type: Industrial (Municipal) Federal Agricultural Other (list):

Function of facility:

WASTEWATER TREATMENT

Description of treatment process:

see attached permit

Receiving waters: Un-named canal to Kings Bay.	Classification: CWF (Crystal River)
Design Flow:	Actual Mean Flow:

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

therefore, the best time to sample is:

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

List effluent limits: see attached permit

Parameter	Limit (units)

Describe special permit conditions and permit modifications:

CITY OF CRYSTAL RIVER
(Facility)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Description of permitted outfall(s):

UN-NAMED CANAL DISCHARGES TO A BAYOU CONTAINING 3RD MAGNITUDE SPRING AND THEN TO KINGS BAY AND HAS BEEN THE SUBJECT AND CAUSE OF THE IMPAI

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

THE CITRUS COUNTY S.A. found that Crystal River STF facility has numerous violations of operation and records. Consent order has been proposed to eliminate discharge. Lead operator & DIR of utility where discharged after criminal charges were brought against them for record falsification.

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

See above

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

Trend is Downward - NO DISCHARGE PERMIT FOR WASTEWATER AND ALL SEPTIC SYSTEM IN OLDER AREAS TO BE SEWERED, I AND I study of current C.S. to be completed in three years

Additional information:

This facility is building a new plant and land disposal system under enforcement from the Department and the flow will cease by May 1992 per condition of Consent Order.

SOUTHWEST DISTRICT
4520 OAK FAIR BLVD.
TAMPA, FLORIDA 33610-7347
813-623-5561
Suncom—552-7612

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
DR. RICHARD D. GARRITY
DISTRICT MANAGER

PERMITTEE
City of Crystal River
123 Northwest Highway 19
Crystal River, FL 32629

Attn: Mr. Gilbert Hess
City Manager

PERMIT/CERTIFICATION
GMS ID No: 09M10013
Permit No: DO09-142177
Date of Issue: 2/29/88
Expiration Date: 12/31/91
County: Citrus
Lat/Long: 28°54'19"
82°35'43"
Sec/Town/Range: 16/18S/17E
Project: City of Crystal River

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-3, 17-4 and 17-6. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents, attached hereto or on file with department and made a part hereof and specifically described as follows:

Operation of a 0.75 MGD Type I activated sludge (carousel-aeration) sewage treatment plant with gravity sand filters and chlorination discharging to an unnamed ditch to Crystal River.

Location: 280 N.W. 11th Street, Crystal River, Florida

Replaces Permit No.: DO09-72603 Expired: 8/26/88

Protecting Florida and Your Quality of Life

PERMITTEE:
Gilbert Hess, City Manager
City of Crystal River

GMS ID NO.: 09M10013
PERMIT NO.: DO09-142177

SPECIFIC CONDITIONS:

1. Drawings, plans, documents or specifications submitted by the permittee, not attached hereto, but retained on file at the Southwest District Office, are made a part hereof.

2. The Zone of discharge boundary shall extend horizontally 100 feet from the site boundary or to the installation's property boundary, whichever is less, and vertically to the base of the shallow water table aquifer. (17-4.245(4), F.A.C.)

3. The water quality standards for class G-II groundwater shall not be exceeded at the boundary of the zone of discharge. (17-3.402, 17-3.404, F.A.C.)

4. In accordance with Chapter 17-16, F.A.C., the required certified operator on site time is: A Class C or higher operator; 6 hrs/day for 5 days/week and one visit on each weekend day.

5. The discharge from the chlorine contact chamber shall be sampled in accordance with Chapter 17-19 F.A.C. and shall meet the following limitations:

Parameter	Concentration (mg/L)	Sampling Type	Frequency
Suspended Solids	20 annual avg. 30 monthly avg. 45 weekly avg. 60 any one sample	8 hr. composite	Weekly
Fecal coliform	200 per 100 ml annual 200 per 100 ml monthly 800 per 100 ml any one sample	grab	Monthly
pH	6.0- 8.5 (Stand. Uts.)	any one sample	Daily 5/wk
Nitrate	12.0 mg/l any one sample	grab	Weekly

The results shall be reported monthly on DER Form 17-1.205(7).

5A. The discharge from the effluent outfall box shall meet the following effluent limitations:

Parameter	Concentration (mg/L)	Sampling Type	Frequency
BOD	15 monthly average	8 hr. composite	Weekly
NH_3N	5 monthly average	grab	Weekly
Dissolved Oxygen	6 mg/l (minimum)	meter	Weekly

SPECIFIC CONDITIONS: (cont'd)

6. The sludge shall be sampled after final treatment accordance with 17-7.540(2)(e) F.A.C. but prior to utilization or disposal for the parameters listed below every 3 months. A copy of the analyses shall be submitted with the monthly operation report for the following parameters:

Total Nitrogen - % dry weight
Total Phosphorus - % dry weight
Total Potassium - % dry weight
Cadmium - mg/kg dry weight
Copper - mg/kg dry weight
Lead - mg/kg dry weight
Nickel- mg/kg dry weight
Zinc - mg/kg dry weight
pH - standard units
Total Solids - %

7. The City of Crystal River shall conduct a vegetative maintenance program of the canal system. Any vegetation removed shall be disposed of at an approved upland site.

8. According to Department information, Kings Bay, the ultimate receiving water for the Crystal River WWTP, is currently experiencing an algae bloom. The causes generating or contributing to this bloom have not been determined at this time. During the course of the permit renewal period the City should be prepared to implement more stringent control technology should the results of a water quality based effluent limit study show that such improvements are needed. Under these circumstances the City would implement improvements as follows:

Item	Months Following Final Wasteload Allocation
Complete feasibility study to select treatment/disposal alternatives.	4
Complete design work on selected alternative	10
Selected alternative implemented	26

9. The permittee shall maintain an on/site log book to monitor the daily activities of the certified operator. This log book shall record sign in/out times of the certified operator, list any maintenance performed and contain the signature and certification number of the operator.

SPECIFIC CONDITIONS (con't):

10. The permittee shall maintain all audible and visual alarm systems on the lift station(s) in operating condition at all times.

11. Back flow preventers shall be installed on all potable water supplies at the treatment facility.

12. The disinfection system shall be operated to maintain a minimum chlorine residual of 0.5 mg/L at the outfall from the chlorine contact chamber. A metering device for dosing chlorine to the effluent shall be utilized and the chlorine supply tank shall be inspected regularly to ensure proper operation.

13. Prior to sixty days before the expiration of this permit, the permittee shall apply for a renewal of the permit on forms and in a manner prescribed by the Department of Environmental Regulation.

PERMITTEE:
Gilbert Hess, City Manager
City of Crystal River

GMS ID NO.: 09M10013
PERMIT NO.: DO09-142177

GENERAL CONDITIONS

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Section 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agent, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the department.

3. As provided in Subsections 403.087(6) and 403.712(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and department rules, unless specifically authorized by any order from the department.

GENERAL CONDITIONS (con't):

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized department personnel, upon presentation of credential or other documents as maybe required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purposes of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the department (17-6.130) with the following information:

(a) a description of and cause of non-compliance; and

(b) the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the department for penalties or revocation of this permit.

GENERAL CONDITIONS (con't):

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or department rules, except where such use is prescribed by Section 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or department rules.

11. This permit is transferable only upon department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:
( ) Determination of Best Available Control Technology (BACT)

( ) Determination of Prevention of Significant Deterioration (PSD)

( ) Certification of Compliance with State Water Quality Standards (Section 401. PL 92-500)

( ) Compliance with New Source Performance Standards

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

14. (con't):

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by department rule.

c. Records of monitoring information shall include:

-the date, exact place, and time of sampling or measurement;
-the person responsible for performing the sampling or measurements;
-the date(s) analyses were performed;
-the person responsible for performing the analyses;
-the analytical techniques or methods used; and
-the results of such analyses.

15. When requested by the department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly.

Issued this 29 day of Feb, 19 88

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Richard D. Garrity, Ph.D.
District Manager

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: Unnamed canal to Hog Bay

REMARKS: Dredged canal upstream of STP	LOCATION: Crystal River STP upstream	FIELD ID/NAME: 001

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 5	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 3	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 4	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability 5	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 9	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.	31

COMMENTS: Canal dredged through transitional wetland forest
Fish seen include Gambusia

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10/21/91	Fricano	[signature]

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): 10/21/91	RECEIVING BODY OF WATER: Spring feeding tributaries to KINGS BAY
REMARKS: Samples taken where effluent stream enter spring head.	LOCATION: Crystal River STP	FIELD ID/NAME: Downstream SC 2	

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 29	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 24	Max. observed; >0.3 m/sec. **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec **0-7 points**
Artificial Channel/ Flow Alteration 8	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 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality 10	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments		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.	65

COMMENTS: Fish seen included *Gambusia affinis* + *Heterandria formosa*

ANALYSIS DATE: 10/21/91	ANALYST: Fiocco	SIGNATURE:

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):	TIME	RECEIVING BODY OF WATER:
		10/21/91		

REMARKS:	LOCATION:	FIELD ID/NAME:
Dredged (canal) area w/ false bottom of sediment	Crystal River STP	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
100%						

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):
Illegal dredging

Estimated Stream Width (range, m):	6.5	Estimated Stream Depth (range, m):	1.0	yes
High Water Mark (m above bed):	0.5	Velocity (range, m/s):	0.0-0.5	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	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Rock or Shell Rubble				Woody Debris (Snags)			
Aquatic Vegetation	10	10		Leaf Packs/Roots			
Sand	25	5		Undercut Banks			
Other:				Mud/Muck	65		

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	21.5	4.1	Secchi Depth (m):	2.4
Mid-depth	20.5	3.1	pH (SU):	7.21
Bottom	20.15	2.3	Conductivity (µmho/cm):	3.02
			Other Parameters:	

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:
Cloudy 80°

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10/21/91	Friend	

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):	TIME	RECEIVING BODY OF WATER:
		10/21/91	1314	

REMARKS:	LOCATION:	FIELD ID/NAME:
Where Effluent ditch Enters Spring Head	Crystal River STP	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
100%						

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):
Crystal River STP

Estimated Stream Width (range, m):	10	Estimated Stream Depth (range, m):	1.5	yes
High Water Mark (m above bed):	1.0	Velocity (range, m/s):	0.0-.5	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	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Rock or Shell Rubble				Woody Debris (Snags)	5		
Aquatic Vegetation	50%	5		Leaf Packs/Roots	15	5	
Sand / Mud	75%	5		Undercut Banks	10	5	
Other:				Mud/Muck			

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	21.63	7.26	Secchi Depth (m):	
Mid-depth	21.70	7.37	pH (SU):	7.65
Bottom	21.93	7.14	Conductivity (µmho/cm):	2.17
			Other Parameters:	

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:
Cloudy
Low 80's F° (81-82 F°)
Humid

Abundance:	Absent	Rare	Common	Abundant
Periphyton	[ ]	[✓]	[ ]	[ ]
Fish	[ ]	[ ]	[✓]	[ ]
Aquatic Macrophytes	[ ]	[ ]	[ ]	[✓]
Iron/sulfur Bacteria	[ ]	[ ]	[ ]	[ ]

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10/21/91	Friano	Friano

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: CRYSTAL RIVER STP
Address/City:
County: CITRUS
Contact/District: PAT FRICANO / SW
NPDES Permit #: FL0028371 **Outfall #:**

Sample Collection: Date 10-21-91 Time 1200
Test Beginning: Date 10-22-91 Time 1330
Test Ending: Date 10-24-91 Time 1330
Test Organism: C. DUBIA
Life Stage/Age: < 24 HOURS

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

Remarks:
DECHLORINATED SAMPLE IN LAB W SODIUM THIOSULFATE
LIMS# 24643 91-OCT-22-21
LC 50 = 59.63

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 9@9	8.5@25.0	24.0@24.1	1388@24.3
24 hr	7@7, 9@9	8.2@26.0	26.0@26.1	1397@24.7
48 hr	7@7 9@9	8.4@25.0	24.0@24.2	1384@24.2

DECHLORINATED

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
control	A	5	5	5	7.9		8.1	24.1		24.0	7.8		8.8	163		174
control	B	5	5	5			8.1						8.9			
control	C	5	5	5			8.2						8.8			
control	D	5	5	5			8.2						8.8			
25%	A	5	5	5	7.9		8.1	24.1		24.0	7.2		8.5	230		233
25%	B	5	5	5			8.2						8.6			
25%	C	5	5	5			8.2						8.5			
25%	D	5	5	5			8.2						8.5			
50%	A	5	5	5	7.8		8.2	24.9		23.9	7.2		8.7	285		307
50%	B	5	5	4			8.2						8.8			
50%	C	5	5	5			8.2						8.8			
50%	D	5	5	5			8.3						8.8			
75%	A	5	1	0	7.7		8.2	26.0		23.9	7.2 / 7.7		8.9	348		387
75%	B	5	1	0			8.3						8.9			
75%	C	5	0	0			8.3						8.8			
75%	D	5	2	0			8.3						8.7			
100%	A	5	0	–	7.6	8.1		25.1	25.0		7.5	8.0		406	411	
100%	B	5	0	–		8.3						8.1				
100%	C	5	0	–		8.3						8.1				
100%	D	5	0	–		8.3						8.1				
Cl 100	A	5	0	–	7.7	8.3		24.9	25.0		7.6	8.1		409	402	
Cl 100	B	5	0	–		8.3						8.2				
Cl 100	C	5	0	–		8.3						8.1				
Cl 100	D	5	0	–		8.3						8.2				
Measured/Loaded by:		KP	MF		LD	LD	AZ	LD	LD	LD	LD	LD		LD	LD	LD
Recorded by:		KP	MF		MR	KP	AZ	KP	KP	AZ	MR	KP		KP	KP	AZ

Investigators' Signatures

Kim Pearce
Lisa Kam
Lee Dewey
Marbel Fandalf
Sharon M Jordan
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			1.4	Hach	PF
Lab Tot. Resid. Cl2:			0.1	Hach	KP
Alkalinity:	130	70	100	HACH	AZ
Hardness:	130	80	110	HACH	AZ
Total Ammonia:	0.0	0.0	0.0	HACH	MF

Ammonia Meter Slope: -57.5
Ammonia Blank: 0.0
Salinity Sample:

Chemistry summary table for

Crystal River STP	Effluent	Reference Site	Test Site
Organic Constituents (ug/L)			
Gamma-BHC (Lindane)	0.12		
Metals (ug/L)			
Aluminum	30 T		
Antimony	15 U		
Arsenic	20 U		
Cadmium	0.07 U		
Copper	5 U		
Chromium	10 U		
Iron	27		
Lead	15 U		
Mercury	0.1 U		
Nickel	5 U		
Selenium	30 U		
Silver	0.2		
Zinc	32		
Nutrients (mg/L)			
Ortho-phosphorus	3.0 A	0.02 U	3.0 A
Total phosphorus	3.0	0.10 K	3.0
Ammonia	0.56	0.055 A	0.06 A
Nitrate	9.0 A	0.04 U	9.6 A
Nitrate+Nitrite	9.0 A	0.04 U	9.8 A
TKN	0.90	0.19	0.93
Other Parameters			
Habitat Assessment		31	65
D.O. (mg/L)	6.4	4.1	2.4
pH (SU's)	7.0	6.9	7.0
Conductivity (µmhos/cm)	402	307	244
Temperature (°C)	24	21.5	21.7
Bioassay Invertebrate-Chlorinated	LC50 < 100%		
Bioassay Invertebrate-Dechlorinated	LC50 = 59.63		
Fecal coliform (org/100 ml)	< 10	80	< 10
Total coliform (org/100 ml)	10	200	< 10
Algal Growth Potential (mg dry wt/L)	22.65		

A - Value reported is the mean of two or more determinations
K - Actual value is known to be less than value given
N - Not analyzed for this compound
T - Value reported is less than the practical quantitation limit
U - Material analyzed for but not detected; value reported is the min. detection limit

Macroinvertebrate taxa list for Crystal River STP, Citrus County, Florida, collected via discrete dip net sweeps on 22 October 1991.

	Reference Site	Test Site
Coleoptera		
Hydroporus sp.	1	–
Peltodytes muticus	3	–
Diptera		
Chironomus decorus grp.	76	656
Dicrotendipes modestus	–	48
Glyptotendipes paripes	1	–
Goeldichironomus holoprasinus	3	–
Palpomyia grp. sp.	1	–
Tanytarsini Type 1	1	–
Tanytarsus sp.	2	24
Tipula sp.	1	–
Ephemeroptera		
Caenis sp.	–	20
Callibaetis floridanus	1	–
Gastropoda		
Cincinnatia sp.	–	24
Hebetancyclus excentricus	1	4
Micromenetes floridensis	–	4
Undetermined hydrobiid	–	60
Hemiptera		
Undetermined corixid larva	6	40
Malacostraca		
Asellus sp.	1	–
Palaemonetes paludosus	22	52
Procambarus sp.	3	–
Megaloptera		
Nigronia sp.	1	–
Sialis sp.	–	4
Odonata		
Enallagma pollutum	–	12
Epitheca princeps	–	4
Ischnura posita	–	8
Pachydiplax longipennis	2	–
Perithemis tenera seminole	–	20
Oligochaeta		
Limnodrilus hoffmeisteri	–	8

Macroinvertebrate taxa list for Crystal River STP, Citrus County, Florida, collected via Hester-Dendy samplers on 18 November 1991.

	Reference Site	Test Site
Diptera		
Asheum beckae	1	–
Chironomus decorus grp.	2	287
Dicrotendipes modestus	2	4
D. nervosus	2	–
D. simpsoni	–	7
Goeldichironomus amazonicus	9	–
G. holoprasinus	8	4
Kiefferulus dux	5	1
Labrundinia sp. B	2	–
Polypedilum fallax grp.	1	–
P. illinoense	1	–
Tanytarsus sp.	3	1
Tanytarsini Type 1	1	–
Undetermined Dipteran pupa	4	7
Oligochaeta		
Limnodrilus hoffmeisteri	–	1

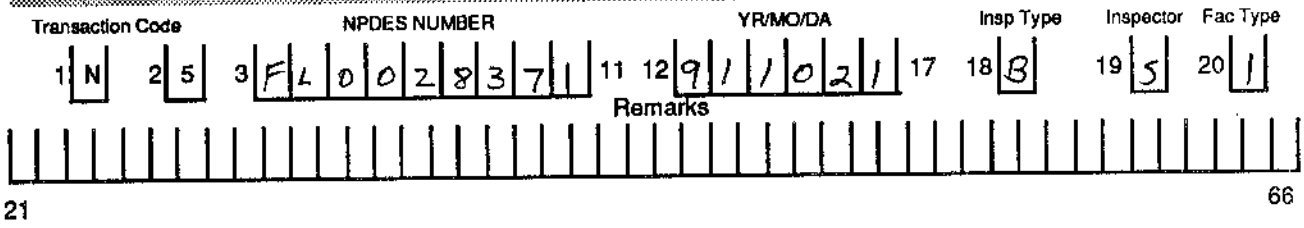
Periphyton taxa list for Crystal River STP, Citrus County, Florida, collected 18 November 1991.

	Reference Site	Test Site
Diatoms		
Achnanthes exigua	11	16
A. lanceolata	11	–
A. linearis	41	–
Cymbella minuta	11	–
Eunotia sp.	4	–
Gomphonema acuminatum	4	–
G. parvulum	101	–
G. subclavatum	4	–
G. truncatum	11	–
Navicula cf. *festiva*	15	–
N. minima	48	–
N. pupula v. *rectangularis*	4	–
N. rhynchocephala	324	–
N. viridula	34	–
Nitzschia amphibia	11	–
N. linearis	369	–
N. obtusa	4	–
N. palea	112	–
Pinnularia sp.	11	–
Synedra ulna	78	–
Chlorophyta		
Ankistrodesmus sp.	11	–
Characium sp.	52	6435
Closterium sp.	4	–
Gloeocystis sp.	22	–
Mougeotia sp.	19	–
Oedogonium sp.	26	–
Scenedesmus sp.	22	–
Stigeocolonium sp.	34	–
Chrysophyta		
Ophiocytium sp.	4	–
Cyanophyta		
Anabaena sp. 1	56	16
Anabaena sp. 2	19	16
Aphanothece sp.	–	16
Calothrix sp.	11	–
Chroococcus sp. 1	15	110
Chroococcus sp. 2	26	267
Gloeothece sp.	11	–
Lyngbya sp.	37	–
Oscillatoria sp.	41	–
Spirulina sp.	22	–

Phytoplankton taxa list for Crystal River STP, Citrus County, Florida, collected 22 October 1991

	Reference Site	Test Site
Diatoms		
Cocconeis sp.	67	–
Gomphonema sp.	135	–
Melosira sp.	672	–
Navicula sp.	67	–
Nitzschia sp.	1345	–
Chlorophyta		
Characium sp.	67	253
Cosmarium sp.	67	–
Scenedesmus sp.	135	–
Unknown chlorophyte flagellate	–	591
Cyanophyta		
Anabaena sp. 1	67	84
Anabaena sp. 2	202	–
Aphanothece sp.	336	338
Chroococcus sp.	471	4898
Lyngbya sp.	67	–
Oscillatoria sp. 1	135	84
Oscillatoria sp. 2	202	169
Spirulina sp.	135	1942
Euglenophyta		
Phacus sp.	67	–
Trachelomonas sp.	67	84

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



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

