

Biological Assessment of

Occidental Chemical Corporation

Hamilton County

NPDES #FL0000655

Sampled August 1994

January 1995

Biology Section

Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No. 870346G

Department of Environmental Protection
Results of Fifth Year Inspections

Discharger: Occidental Chemical Corporation
County: Hamilton
NPDES Number: FL0000655
State Permit Expiration Date: 29 May 1995

Toxics Sampling Inspection (XSI)

Date Sampled: 15 August 1994

Results: No organic priority pollutants or pesticides were found in either the 001-4 (Swift Creek) or the 002-2 (Hunter Creek) discharge. No metals were detected at levels exceeding Class III standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 15 August 1994

Results: Neither effluent was acutely toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*.

Impact Bioassessment Inspection (IBI)

Date Sampled: 15 August 1994

Results: The benthic macroinvertebrate community was moderately degraded in Swift Creek and severely degraded in Hunter Creek. Decreases in taxa richness, the EPT index, and the proportion of filter feeders, as well as a substantial increase in the percent contribution of dominant taxon, all demonstrated the harmful effects of the Occidental discharges. The Stream Invertebrate Index for Florida placed Swift Creek in the "moderate impairment" category and Hunter Creek in the "severe degradation" category, while the reference site was ranked "unimpaired". Pollution sensitive groups such as ephemeropterans and trichopterans were reduced or eliminated at both test sites. The adverse changes in the macroinvertebrate populations of the test sites indicate violations of the standard prohibiting imbalances of aquatic fauna (Rule 62-302.560(29) FAC). Algal communities were degraded downstream of both outfalls, as demonstrated by tremendous increases in both periphyton and phytoplankton density and chlorophyll *a*. These increases in biomass were more striking in Swift Creek, corresponding to the extremely high nutrient concentrations. The periphyton community in Hunter Creek also suffered reduced taxa richness, reduced diversity, and high dominance of an organism which is a known indicator of eutrophic conditions. These adverse changes in the algal community are interpreted as a violation of imbalances of aquatic flora (Rule (62-302.560(29) FAC).

Water Quality Inspection (WQI)

Date Sampled: 15 August 1994

Results: Extreme nutrient enrichment was observed in Swift Creek, with most nutrient species being found at concentrations higher than those found in 95% of other Florida streams. Phosphorus concentrations at Hunter Creek were higher than those found in approximately 75% of other Florida streams. Unionized ammonia in the Swift Creek combined mine outfall (0.0213 mg/L) violated permit limits and Class III water quality standards (Rule 62-03.530(3) FAC). Total coliforms exceeded Class III standards at both test sites, but since sample holding times for these analyses were exceeded, water quality violations could not be cited. Dissolved oxygen violated permit limits in the effluent, and was below standards at Robinson Branch and Swift Creek.

Introduction

Occidental Chemical Corporation operates two large phosphate mining and fertilizer manufacturing complexes in Hamilton County, Florida, near the town of White Springs. The company mines phosphate rock and produces liquid and granular fertilizers, and animal feeds.

The Swift Creek Chemical Complex includes a process water treatment area, gypsum stack, cooling pond, process water recirculation system, and a contaminated non-process water retention system. Non-process water consists of vacuum seal water, filter vacuum, scrubber water, evaporator condensate, filter skirt sprays, and stormwater run-off from the chemical complex. Discharge of treated (double limed) process water and contaminated non-process water is permitted through Swift Creek canal, through Eagle Lake (outfall spillway 001-18 to Swift Creek, in-stream sampling point 001). To date, only non-process water has been discharged to Swift Creek.

The Swift Creek Mine includes mining and beneficiation operations which includes a phosphatic clay settling system within the mine's recirculation system. Excess waters, accumulated primarily from extreme rainfall events, are discharged through Eagle Lake, and then to Swift Creek. A new mining discharge has been permitted to Camp Branch (outfall spillway 004-1). The discharge will consist of stormwater run-off and dewatering operations during mining. The excess water is routed to previously mined pits or reclaimed areas for settling prior to discharge.

The Suwannee River Chemical Complex consists of a process water treatment area, the CTC and Dorr-Oliver gypsum stacks, cooling ponds, process water recirculation systems, and a contaminated non-process water retention system. Discharge of treated (double-limed)

Major characteristics of invertebrate community structure of control and test sites.

	Reference Site	Test Site 1	Test Site 2
Macroinvertebrate Qualitative			
Number of Taxa	37	27	20
Florida Index	15	12	14
SIIF	23	15	13
EPT Index	5	1	1
% Contribution of Dominant Taxon	11.6	34.6	25.9
% Oligochaeta	0	12.1	0
% Diptera	52.1	56.6	14.1
% Ephemeroptera	9.9	0	0
% Trichoptera	10.7	0.6	0.7
% Odonata	8.3	3.3	3.7
% Coleoptera	14.1	9.9	28.9
% Amphipoda	0.8	13.7	25.9
% Isopoda	3.3	0.6	14.1
% Other	0.8	3.3	12.5
% Predators	20.4	25.7	17.5
% Above Surface Deposit Feeders	40.3	25.4	34.6
% Below Surface Deposit Feeders	0	12.2	0
% Suspension/Filter Feeders	14.8	7.6	6.7
% Scrapers	11.9	4.1	22.3
% Shredders	12.4	18.2	9.3
% Other	0.3	6.9	9.6
Macroinvertebrate Hester-Dendy			
Number of Taxa	13	24	No Data
Florida Index	16	16	
Shannon-Weaver Diversity	1.13	2.95	
EPT Index	4	1	
% Diptera	2.1	68.7	
% Ephemeroptera	89.7	0	
% Trichoptera	2.5	19.1	
% Odonata	3.6	0.8	
% Coleoptera	1.4	1.0	
% Other	0.8	10.5	
% Predators	4.6	28.4	
% Above Surface Deposit Feeders	46.4	26.7	
% Below Surface Deposit Feeders	0	0	
% Suspension/Filter Feeders	3.2	21.3	
% Scrapers	45.6	2.7	
% Shredders	0.2	18.0	
% Scavengers	0	2.9	

process water and contaminated non-process water is through outfalls 001-17, 001-8, and 001-4 to Swift Creek (in-stream sampling point 001). Discharge of treated process water occurs infrequently, from extreme rainfall events.

The Suwannee River Mine consists of mining and beneficiation operations which include a phosphatic clays settling system with recirculation to the mine's hydraulic system. Excess mining waters are accumulated primarily from rainfall events and discharged through various outfalls to Swift Creek and Hunters Creek (in-stream sampling point 002). This mine has been inactive since May, 1992, to present.

Chronic toxicity has been detected at the 001 outfall in December, 1992, January, 1993, and December, 1993.

Permit limits for outfall 001-4 (combined discharge from outfalls 001-2, 001-7, 001-8, 001-9, and 001-17) to Swift Creek and outfall 002-2 to Hunter Creek are listed in the Appendix. Limits for the individual outfalls that combine to form outfall 001-4 are also included. Summaries of the previous year's (June 1993 to June 1994) monitoring data indicate that phosphorus limits (5 mg/L monthly maximum and the 3 mg/L monthly average) were exceeded at outfall 001-7 (part of combined outfall 001-4) on eight and nine occasions, respectively. A sulfuric acid spill (unknown quantity) occurred at the chemical plant on July 24, 1994. The spill was contained, treated with caustic agents and released to the fresh water ditch, then to a storm water pond and discharged through 001-2.

Occidental has been conducting quarterly macroinvertebrate sampling since the end of 1992. We were provided with the data from the April, 1994 sampling. Upon examination, we found that the EPT Index at Swift and Hunter Creeks was 50% of that found at Camp Branch (a reference site). On this date, the proportion of ephemeropterans (mayflies) was decreased by 97% at Swift Creek and by 55% at Hunter Creek, when compared to Camp Branch. In a previous bioassessment (FDER 1992), mayflies were also found to be unusually rare in Swift Creek.

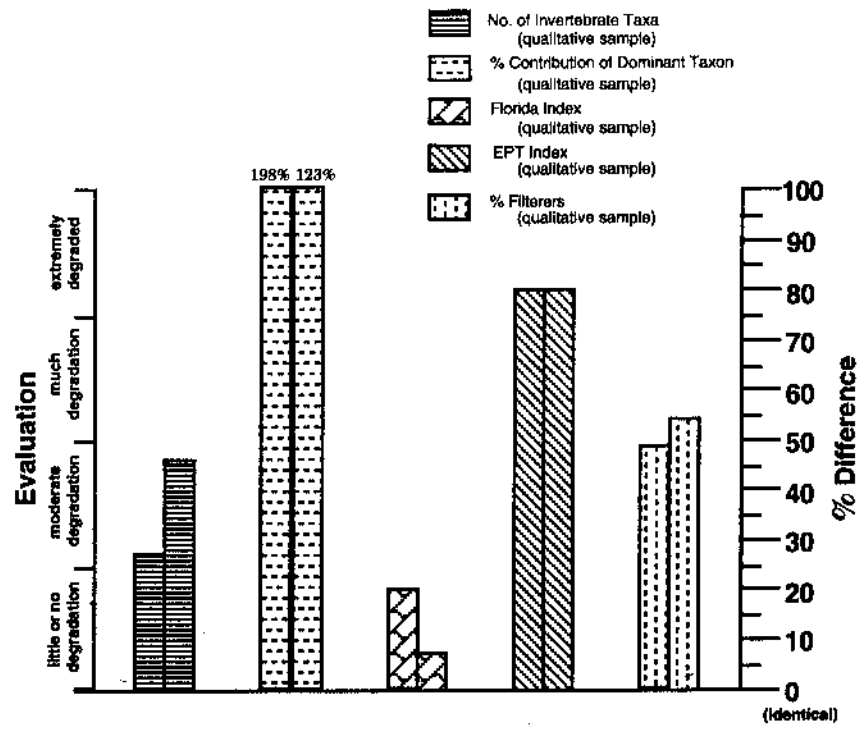
Major characteristics of algal community structure of control and test sites.

	Reference Site	Test Site 1	Test Site 2
Periphyton Algae			
Number of Taxa	15	24	9
Shannon-Weaver Diversity	3.42	3.62	0.61
Algal Density (#/sq. mm)	68	589	298
Chlorophyll a (mg/sq. m)	0.45	21.6	2.17
Diatom/Diatom + B-G Abundance Ratio	0.73	0.94	0.98
% Blue-green	26.7	5.4	1.7
% Green	2.2	3.1	0.6
% Diatoms	71.1	91.5	97.8
Phytoplankton Algae			
Number of Taxa	7	27	22
Shannon-Weaver Diversity	2.02	3.29	4.06
Algal Density (#/mL)	2794	73,522	9863
Chlorophyll a (µg/L)	0.39 U	13.6	0.39 U
% Blue-green	70.6	60.6	18.3
% Green	5.9	20.3	41.7
% Diatoms	17.6	18.7	31.7
% Euglenophytes	0	0.4	8.3
% Chrysophytes	5.9	0	0
Algal Growth Potential (mg dry wt/l)	8.9	34.8	16.1

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 reference site (located in Robinson Branch in Columbia County) and two test sites (one located in Swift Creek at the facility's 001 instream sampling point and the other in Hunter Creek downstream of the Land and Lakes Reclamation Areas) (see maps in Appendix). The Robinson Branch location is also an eco-regional reference site. Flow at the test site in Swift Creek (Test Site 1) is composed primarily of effluent. Conditions at test site 1 represent the combined influences of the Swift Creek Mine and Chemical Complex and the Suwannee River Mine and Chemical Complex.

Conditions at the test site in Hunter Creek (Test Site 2) represent influences from runoff from the Land & Lakes Reclamation Areas. 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 screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on effluent samples from outfalls 001-4 and 002-2 (Weber 1991). The effluents were analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluents and study sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.



Effect of discharge on the benthic macroinvertebrate community. *The left bar for each parameter shows differences between the reference site and test site 1. The right bar shows differences between the reference site and test site 2.*

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates at all three sites were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were attempted using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Due to the extreme water level fluctuation observed at the reference site, it was suspected that the artificial substrate samplers may have been exposed during the incubation period. The Hester-Dendy samplers at test site 2 were lost due to sand smothering. Therefore, the dip net data will be emphasized in this report. Periphyton was sampled at both reference 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). 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 to determine the effects of a discharge. These are briefly discussed here.

Taxa richness: It is generally accepted that taxa richness is among the most robust measures of benthic community health. Anthropogenic stress has a tendency to reduce the number of different types of invertebrates present in a system. Algal taxa richness may increase with moderate nutrient enrichment, compared to an oligotrophic natural background, but become reduced with extreme nutrient enrichment or toxicity.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable, in that they represent conditions where only a few organisms are abundant, to the exclusion of other taxa. Such scores may be associated with organic/nutrient enrichment and decreased dissolved oxygen. Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is also associated with disturbance.

Numbers of pollution sensitive taxa: Unpolluted sites have characteristic numbers and types of taxa which are sensitive to anthropogenic stress. These organisms

become rare or absent as the intensity or duration of the disturbance increases. For example, 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 (*e.g.*, around 20 or more in the Panhandle, around 15 or more in the Peninsula). Species sensitivity data from other sources, such as Hulbert (1990), Hudson *et al.* (1990), Lenat (1993), Farrell (1992), Chang *et al.* (1992), and Whitmore (1989), are used as appropriate.

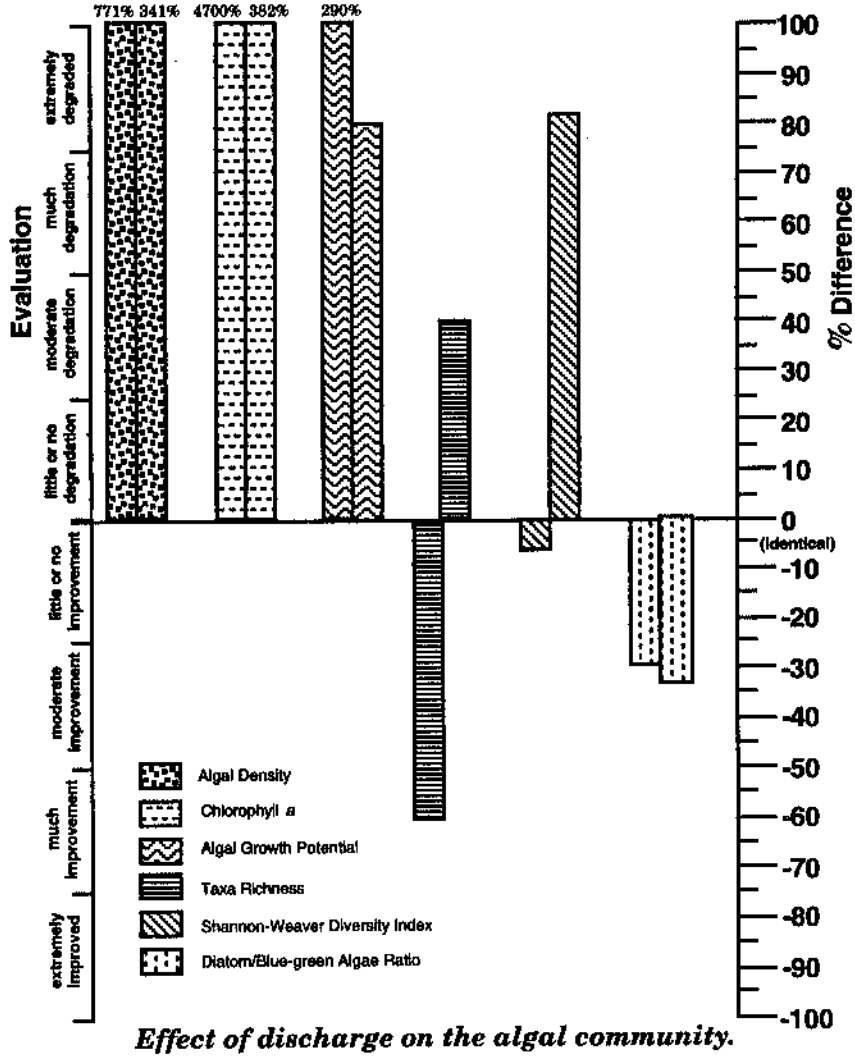
Ephemeroptera/Plecoptera/Trichoptera Index: To calculate the index, one simply sums the number of EPT taxa present at a station. Higher EPT scores (*e.g.*, 7 or more in the Panhandle, 4 or more in the Peninsula) are associated with healthier systems, while lower scores indicate stressed conditions.

Community structure: A system is generally considered degraded if a substantial shift in the proportions of the major taxonomic groups (*e.g.*, mayflies, riffle beetles, etc.) is observed when compared to a reference site. In marine systems, an increase in the % tubificid oligochaetes, a decrease in the % pelecypods, and a decrease in the number of polychaete taxa are all considered indicators of disturbance.

Algal biomass: The density of algal cells and the chlorophyll *a* concentration are used as estimators of biomass. A system has traditionally been considered nutrient stressed when biomass exceeds problem threshold levels, often resulting in visible algal blooms, nuisance scums, and low dissolved oxygen from the decomposition of the decaying algal tissue. 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 in flowing streams.

Trophic composition/feeding guilds: Undisturbed aquatic systems possess characteristic proportions of organisms using various functional feeding strategies, and human disturbance shifts these established feeding strategies. In Florida for example, pollution is known to reduce the numbers of filter-feeders and shredders.

The Stream Invertebrate Index for Florida (SIIF) is a composite metric which is based upon the macroinvertebrate communities found at Florida Eco-regional reference sites sampled with dip net sweeps (EA Engineering 1994). The SIIF assigns 5, 3, or 1 point(s) to a variety of invertebrate parameters, depending on how closely that parameter approaches the expected Eco-regional reference condition. Five points is the best score for metrics which are particularly strong at discriminating between healthy and impaired sites (see SIIF calculation table in Appendix).



Effect of discharge on the algal community.

The left bar for each parameter shows differences between the reference site and test site 1. The right bar shows differences between the reference site and test site 2.

The following parameters are used in calculating the SIIF for the Panhandle: taxa richness, EPT Index, % contribution of the dominant taxa, % Diptera, Florida Index, % suspension feeders/filterers, and % shredders (EA Engineering 1994). In the Panhandle, 23-29 SIIF points indicates no impairment, 15-22 points indicates moderate impairment, and 7-14 points is clear evidence of severe degradation. In the Florida Peninsula, these same parameters, along with the number of crustacean and mollusk taxa and the % of crustacean and mollusk taxa, are used to calculate the SIIF. In the Peninsula, 27-33 SIIF points indicates no impairment, 17-26 points indicates moderate impairment, and 9-16 points is clear evidence of severe degradation. Although the SIIF is based on samples collected during the summer, similar relationships should apply in other seasons.

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the Florida Index, the EPT Index, the diatom to bluegreen algae ratio, and the % filterfeeders are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving algal density, 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: Tim McKelvey, Mike Hollingsworth, and Richard Bowman (DEP Northeast District) and Lyn Burton, Marshall Faircloth, Russel Frydenborg, Christy LeDuc, Kathleen Lurding, Elizabeth Miller, Urania Quintana, Landon Ross, Vicki Whiting, Greg Wynn, and David Young (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Bioassessment Review Committee, consisting of Jan Mandrup-Poulsen, Wayne Magley, and Mike Tanski, as well as District representatives.

Results and Discussion

Habitat quality scores at the reference site (Robinson Branch = 139 points) and at both test sites (Swift Creek = 122 points, Hunter Creek = 118), were comparable, and indicated that each site had adequate in-stream substrate and water velocity for macroinvertebrate success (Appendix). The reference site and Hunter Creek were similar in width (2 to 4 m), while Swift Creek was slightly wider (6 m). All three sites had substantial water velocity (0.5 m/sec or more). Dissolved oxygen was below the standard at Robinson Branch and in Swift Creek (4.2 and 4.7 mg/L, respectively) (violating Rule 62-302.560(31) FAC), but was higher at Hunter Creek (6.7 mg/L). A dissolved oxygen level of 4.1 mg/L in the combined mine outfall at Swift Creek represented a violation of permit limits. Water at the reference site was slightly acidic (pH = 6.1) while both test sites were essentially neutral (test site 1 = 7.3 and test site 2 = 7.4). Conductivity varied considerably among the three sites, and was measured at 69 µmhos/cm at Robinson Branch (reference), 472 µmhos/cm at Swift Creek (test site 1), and 185 µmhos/cm at Hunter Creek (test site 2).

Neither effluent sample was toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*. No mortality occurred during any of the four 48-hour acute toxicity bioassays (Appendix).

No organic pollutants were detected in either effluent. At the combined mine outfall at Swift Creek, aluminum (269 µg/L) and iron (115 µg/L) were detected at concentrations above practical quantitation limits. In the Hunter Creek outfall, aluminum (549 µg/L), iron (396 µg/L), and zinc (11 µg/L) were detected at concentrations above practical quantitation limits. None of these concentrations was in violation of Class III standards or permit limits.

Total coliform bacteria were within standards at the reference site (1,300 organisms/100 mL). Total coliforms exceeded Class III standards at both test sites, with 9,000 organisms/100 mL at test site 1 (Swift Creek) and 5,000 organisms/100 mL at test site 2 (Hunter Creek). Because sample holding times for these analyses were exceeded, water quality violations could not be cited. Fecal coliforms were within standards at all sites.

Extreme nutrient enrichment was observed in Swift Creek. Concentrations of ortho-phosphate (6.6 mg/L), total phosphorus (6.9 mg/L), and ammonia (0.73 mg/L), were higher than those found in 95% of other Florida streams (see Table of Typical Water Quality Values in Appendix). The nitrate-nitrite (0.90 mg/L) concentration in Swift Creek was also elevated. In contrast, levels of nitrogenous compounds were average at Hunter Creek, but phosphorus concentrations measured there (*e.g.*, ortho-phosphate = 0.22 mg/L) were higher than those found in approximately 75% of other

Florida streams. Nutrient concentrations at the reference site were about average for a typical Florida stream. Unionized ammonia in the combined mine outfall (measured at 0.0213 mg/L) violated permit limits and Class III water quality standards (Rule 62-03.530(3) FAC).

Algal growth potential (AGP) of the two effluents corresponded to the nutrient levels, 39.0 at outfall 001-4 (to Swift Creek) and 8.9 at outfall 002-2 (to Hunter Creek). Test site 1 (Swift Creek) AGP (34.8 mg dry wt/L) was almost three times higher than that measured at the reference site (8.9 mg dry wt/L). Algal growth potential at Hunter Creek (16.1 mg dry wt/L) was almost double the reference site value. Although AGP at all sites exceeded the 5 mg dry wt/L "problem threshold" (Raschke and Schultz 1987), the substantial increase in AGP at both test sites further suggests nutrient enrichment caused by the discharges.

Most measures of macroinvertebrate health indicated that the two receiving waters were degraded when compared to the reference. The **upper left figure** indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference.

In the 20 dip net sweep samples, changes in all measurements, except the Florida Index, indicated moderate to severe degradation. Decreases in taxa richness, the EPT index, and the proportion of filter feeders, as well as a substantial increase in the percent contribution of dominant taxon, all demonstrated the harmful effects of both Occidental discharges. The Stream Invertebrate Index for Florida (SIIF) placed Robinson Branch in the "no impairment category" and Swift Creek in the "moderate impairment" range, while Hunter Creek scored in the "severe degradation" range (Appendix).

The Swift Creek community was overwhelmingly dominated by members of the *Polypedilum scalaenum* group, which is common in areas of poor water quality (Epler 1992). Additionally, ephemeropteran populations were completely absent at both test sites, and the proportions of caddisflies (trichopterans) were greatly decreased at both study areas when compared to the reference site. Past studies have shown that Occidental's mining discharge has had detrimental effects on mayflies in Hunter Creek (*e.g.*, "Four Point Agreement"). A bioassessment performed by FDEP also documented a paucity of ephemeropterans in Swift Creek (FDER 1992). Mayflies are susceptible to ammonia toxicity, and potentially deleterious ammonia concentrations are characteristic of Occidental's discharge. In summary, the adverse changes in the macroinvertebrate populations of the test sites indicate violations of the standard prohibiting imbalances of aquatic fauna (Rule 62-302.560(29) FAC).

Hester-Dendy artificial substrates were recovered from Robinson Branch and Swift Creek, but were buried in Hunter Creek. However, the hydrologic fluctuations observed during sampler incubation suggest that caution be used in interpreting the results from Robinson Branch. Both Robinson Branch and Swift Creek were at flood stage when the samplers were deployed. Upon sampler recovery, the water level was substantially lower at the reference site, and the samplers nearly exposed. This potentially confounding effect (dry samplers during incubation) makes further interpretation of these data difficult. Although many community health measurements indicated ambiguous results, the community shifts observed were essentially the same. The population of ephemeropterans plunged from approximately 90% at the reference site to zero at Swift Creek, with an accompanying increase in the proportion of dipterans (chiefly *Polypedilum scalaenum* group).

The **lower right figure** represents changes in the periphyton algal community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of degradation.

Enrichment effects in Swift Creek from Occidental's discharge were obvious. Algal density and chlorophyll *a* were 771% and 4,700% higher, respectively, than in Robinson Branch, corresponding to the elevated nutrients and algal growth potential. The fact that more taxa were recovered below the discharge is not necessarily a sign of improvement. It is not uncommon to find a greater number of algal taxa in enriched situations, although periodically, one or a few organisms outcompete the others to

form a bloom. Although a similar increase in biomass was observed in Hunter Creek, the absolute values of the density and chlorophyll *a* measurements were not particularly troublesome. Taxa richness and diversity, however, were substantially lower when compared to the reference site, and 92% of the population was made up of the diatom, *Cocconeis placentula*. This organism was considered by Whitmore (1989) to be characteristic of nutrient polluted waters, indicating that "imbalances in aquatic flora" are occurring in Hunter Creek (Rule 62-302.560(29) FAC).

Although the phytoplankton community is generally not the target population for evaluating water quality in flowing systems, data from the analysis of water column algae are included in this study. The population was sparse at the reference site, consisting mostly of filamentous cyanophytes. Shannon-Weaver diversity and taxa richness were a bit higher below the two discharges. As was noted in the periphyton, algal biomass in Swift Creek was extremely high compared to the reference site, both as phytoplankton density (a 2,531% increase) and as chlorophyll *a* (3,387% higher in Swift Creek).

Conclusions

Neither effluent sample was toxic to the water flea, *Ceriodaphnia dubia*, or to the fish, *Cyprinella leedsi*. No organic pollutants were detected in either effluent. The metals detected in the effluents did not violate Class III standards or permit limits.

Total coliforms exceeded Class III standards at both test sites, with 9,000 organisms/100 mL at test site 1 (Swift Creek) and 5,000 organisms/100 mL at test site 2 (Hunter Creek). Because sample holding times for these analyses were exceeded, water quality violations could not be cited. Fecal coliforms were within standards at all sites.

Extreme nutrient enrichment was observed in Swift Creek. Concentrations of ortho-phosphate (6.6 mg/L), total phosphorus (6.9 mg/L), and ammonia (0.73 mg/L), were higher than those found in 95% of other Florida streams. Phosphorus concentrations at Hunter Creek (*e.g.*, ortho-phosphate = 0.22 mg/L) were higher than those found in approximately 75% of other Florida streams. Unionized ammonia in the Swift Creek combined mine outfall (measured at 0.0213 mg/L) violated permit limits and Class III water quality standards (Rule 62-03.530(3) FAC).

Algal growth potential (AGP) at Swift Creek (34.8 mg dry wt/L) was almost three times higher than that measured at the reference site (8.9 mg dry wt/L). AGP at Hunter Creek (16.1 mg dry wt/L) was almost double the reference site value.

The benthic macroinvertebrate community was moderately degraded in Swift Creek and severely degraded in Hunter Creek. Decreases in taxa richness (27% lower in Swift Creek, 46% in Hunter), the EPT index (89% lower at both test sites), and the proportion of filter feeders (49% lower in Swift Creek, 55% in Hunter), as well as a substantial increase in the percent contribution of dominant taxon (198% higher in Swift Creek, 123% in Hunter), all demonstrated the harmful effects of the Occidental discharges. The Stream Invertebrate Index for Florida placed Swift Creek in the "moderate impairment" category and Hunter Creek in the "severe degradation" category, while the reference site was ranked "unimpaired". Pollution sensitive groups such as ephemeropterans and trichopterans were reduced or eliminated at both test sites, which were dominated by a dipteran known to inhabit areas of poor water quality. In summary, the adverse changes in the macroinvertebrate populations of the test sites indicated violations of the standard prohibiting imbalances of aquatic fauna (Rule 62-302.560(29) FAC).

Algal communities were degraded downstream of both outfalls, demonstrated by tremendous increases in both periphyton and phytoplankton density and chlorophyll *a*. These increases in biomass were more striking in Swift Creek, corresponding to the extremely high nutrient concentrations. The periphyton community in Hunter Creek also suffered reduced taxa richness, reduced diversity, and high dominance of an organism which is a known indicator of eutrophic conditions. These adverse changes in the algal community are interpreted as a violation of imbalances of aquatic flora (Rule 62-302.560(29) FAC).

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Chemistry summary table for

Occidental Chemical Corporation	Combined Mine Outfall (001-4)	Hunter Creek Outfall (002-2)	Reference Site	Test Site 1 (Swift Ck)	Test Site 2 (Hunter Ck)
Organic Constituents (ug/L)					
None Detected					
Metals (ug/L)					
Aluminum	269 A	549			
Arsenic	10 U	10 U			
Cadmium	0.08 U	0.08 U			
Copper	5 U	5 U			
Chromium	10 U	10 U			
Iron	115 A	396			
Lead	10 U	10 U			
Mercury	0.10 U	0.10 U			
Nickel	5 U	5 U			
Selenium	30 U	30 U			
Silver	0.05 U	0.05 U			
Zinc	4 U	11			
Nutrients (mg/L)					
Ortho-phosphate	8.0	0.14	0.080	6.6	0.22 A
Total phosphorus	7.8	0.21	0.14	6.9	0.30
Total Ammonia	1.6	0.024	0.050	0.73	0.031
Unionized Ammonia	0.0213	0.0001			
Nitrate+Nitrite	0.78	0.020 U	0.064	0.90	0.13
TKN	2.5	0.56	1.3	1.6	0.64
Other Parameters					
Habitat Assessment			139	122	118
D. O. (mg/L)	4.1	6.5	4.2	4.7	6.7
pH (SU's)	7.2	6.9	6.1	7.3	7.4
Specific Conductance (µmhos/cm)	367	198	69	472	185
Temperature (°C)	28.0	25.5	24.2	28.1	25.1
Algal Growth Potential (mg dry wt/L)	39.0	8.9	8.9	34.8	16.1
BOD5 (mg/L)	2	< 2	< 2	3	< 2
TSS (mg/L)	11	6	1	19	5
VOL SS (mg/L)	5	1	< 1	5	2
FIX SS (mg/L)	6	5	< 1	14	3
Bioassay Fish	No Mortality	No Mortality			
Bioassay Invertebrate	No Mortality	No Mortality			
Fecal Coliform (org/100 mL)	90	270	< 20	80	500
Total Coliform (org/100 mL)	24,000	3,000	1,300	9,000	5,000

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

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

FACILITY SUMMARY

Facility Name: Occidental Chemical Corporation

County: Hamilton (24)

Site Name: Suwannee River Chemical Complex and Mines

State GMS # 3124P00081
State Permit No. IC24-197228 Issued 11/21/91 Expires 05/29/95
State Permit No. IO24-165413 Issued 05/29/90 Expires 05/05/95

Federal Permit No. FL0000655 Expires 06/30/97

Description of Treatment Process:

Occidental Chemical Corporation operates two phosphate mining and fertilizer manufacturing complexes (Suwannee River and Swift Creek complexes) near the town of White Springs, Hamilton County, Florida. The company strip mines phosphate rock with draglines and produces liquid fertilizers (di-ammonium phosphate, mono-ammonium phosphate, and triple super phosphate) and animal feeds (pollyphos and dical phosphate).

The Suwannee River Chemical Complex consists of a process water treatment area, the CTC and Dorr-Oliver gypsum stacks, cooling ponds and associated process water recirculation systems with 4.32 MGD (design) emergency wastewater treatment facility providing two-stage pH adjustment and settling, and a contaminated non-process water retention system. Discharge of treated (double limed) process water and contaminated non-process water and contaminated process water is through outfalls 001-17, 001-8, and to 001-4 Swift Creek (in-stream sample point 001). Discharge of treated process water occurs infrequently from extreme rainfall events.

The Suwannee River Mine consists of mining and benefication operations which include a phosphatic clays settling system with recirculation to the mine's hydraulic system. Excess mining waters are accumulated primarily from rainfall events and discharged through 001-7 to Swift Creek and through outfall 002-2 to Hunter Creek (in-stream sample point 002).

Receiving Waters; Swift Creek and Hunter Creek to the Suwannee River (OFW)

Classification: Class III, fresh water

Design Flow: Rainfall dependent
Actual Mean Flow: 6/93 to 6/94 : Outfall 001: 45.17 MGD; Outfall 002: 9.01; Outfall 001-7: 14.4
Discharge is: Continuous Intermittent Seasonal
Rainfall dependent Other (describe)

List effluent limits:

Description of permitted outfalls(s):

001-2, 001-17	Contaminated Nonprocess Water, clean water ditch at chem plant, cooling tower blowdown, pump seal water, and condensate.
001-7	(Altman Bay Canal including west diversion ditch when used) Beneficiation Process, Mine De-watering and STP Effluent.
001-9	Rerouted flow from 001-7 during high flow periods.
001-8	Treated Process Water
001-4	Combined discharge from 001-2, 001-7, 001-8, 001-9 and 001-17
002-2	(Spillway 33) Mining effluent to Hunter Creek
001	Instream sampling point Swift Creek
002	Instream sampling point Hunter Creek at C.R. 135 bridge

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

<u>Toxicity</u>

Chronic toxicity testing performed on Pimephales Promelas (F.H. minnow) has detected toxicity during a routine test performed in December 1992 and the two subsequent follow-up tests conducted December and January 1993.

Bioassy Test Results at Swift Creek 001

7-day chronic, Pimephales Promelas (F.H. minnow)

Date	NOEC
3/2/93	<100%
6/22/93	>100%
8/24/93	>100%

10/12/93	Problem with control
1/18/94	<100%
2/8/94	<100%
2/22/94	<100%
3/29/94	<100%
4/19/94	<100%
5/17/94	>100%

A toxicity identification evaluation (TIE) is being performed by Thorton Laboratories, Dr. John Davis, ESP and Don Mount, ASCI Corp. The initial results isolated the toxic substances by filtration through a one micron filter. The laboratory suspects the toxicity is due to something ingested by the F.H. minnows and then takes four or more hours to show effects. The toxicity has been detected primarily in the winter months. The cause is suspected to be a form of bacteria. The results of the TIE are to be presented by Occidental within the next month.

MOR Data

A summary of the previous years monitoring data can be obtained from the NE District Office. The results from the sampling conducted on August 15, 1994 are summarized in the chemistry table of the report.

The data set for the outfall 001-7 shows levels of phosphorous which exceed the 5 mg/l monthly maximum and 3 mg/l monthly average for eight and nine months, repectively. Rule 62-671.300(1) provides that if total phosphorous levels exceed the 3 mg/l monthly average for more than one 30 day period per calendar year the permittee shall prepare a study within 120 days upon written notification by the Department. The study shall consist of the following:

a. A chronology of at least one year's discharge data.
b. An assessment of the cause and origin of the phosphorous constituent of the discharge.
c. Description of the discharger's current maintenance, operation and management practices directly related to the control of phosphorous.
d. An evaluation of the environmental significance of the phosphorous levels.
e. An identity of reasonable methods to abate to the extent practicable, the influx of phosphorous into the discharge.

Plant Upsets

July 24, 1994 - Sulfuric acid spill occurred at the chemical plant of unknown quantity. The spill was contained, treated with caustic and released to fresh water ditch, then to a storm water pond and discharged through 001-2.

No record of any other spills or upsets.

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

A biological assessment was conducted by the Department on February 3, 1992 on the Swift Creek Mine Site, which included the outfall 001.

Oxy has been conducting quarterly biological integrity sampling since the end of 1992. Their Shannon-Weaver index data shows the sites have consistently achieved results above the minimum standard (75% of background).

/RNB

PERMITTEE:

Suwannee River Mine & Chemical Plant
Industrial Wastewater Treatment
and Disposal System

I.D. Number: 3124P00081
Permit/Cert Number: I024-165413
Date of Issue: May 29, 1990
Expiration Date: May 29, 1995
MODIFICATION DATE: October 30, 1992

001-4 Combined Discharge from 001-2, 001-7, 001-8, 001-9 and 001-17	pH (S.U.)	5.0-9.5	5.0-9.5	2/week	Grab

002-2 (Spillway 33)	Flow (MGD)	- - -	- - -	Continuous	Recorder
	pH (S.U.)	6.0-9.0	6.0-9.0	2/week	Grab
Mining Effluent to	Turbidity	- - -	- - -	" "	"
Hunter Creek	Total Non-Volatile Non-Filterable Residue (mg/l)	25	12	" "	24-Hour Composite
	Total Non-Filterable Residue (mg/l)	60	30	" "	" " "
	Total Phosphorous as P* (mg/l)	5	3	" "	" " "

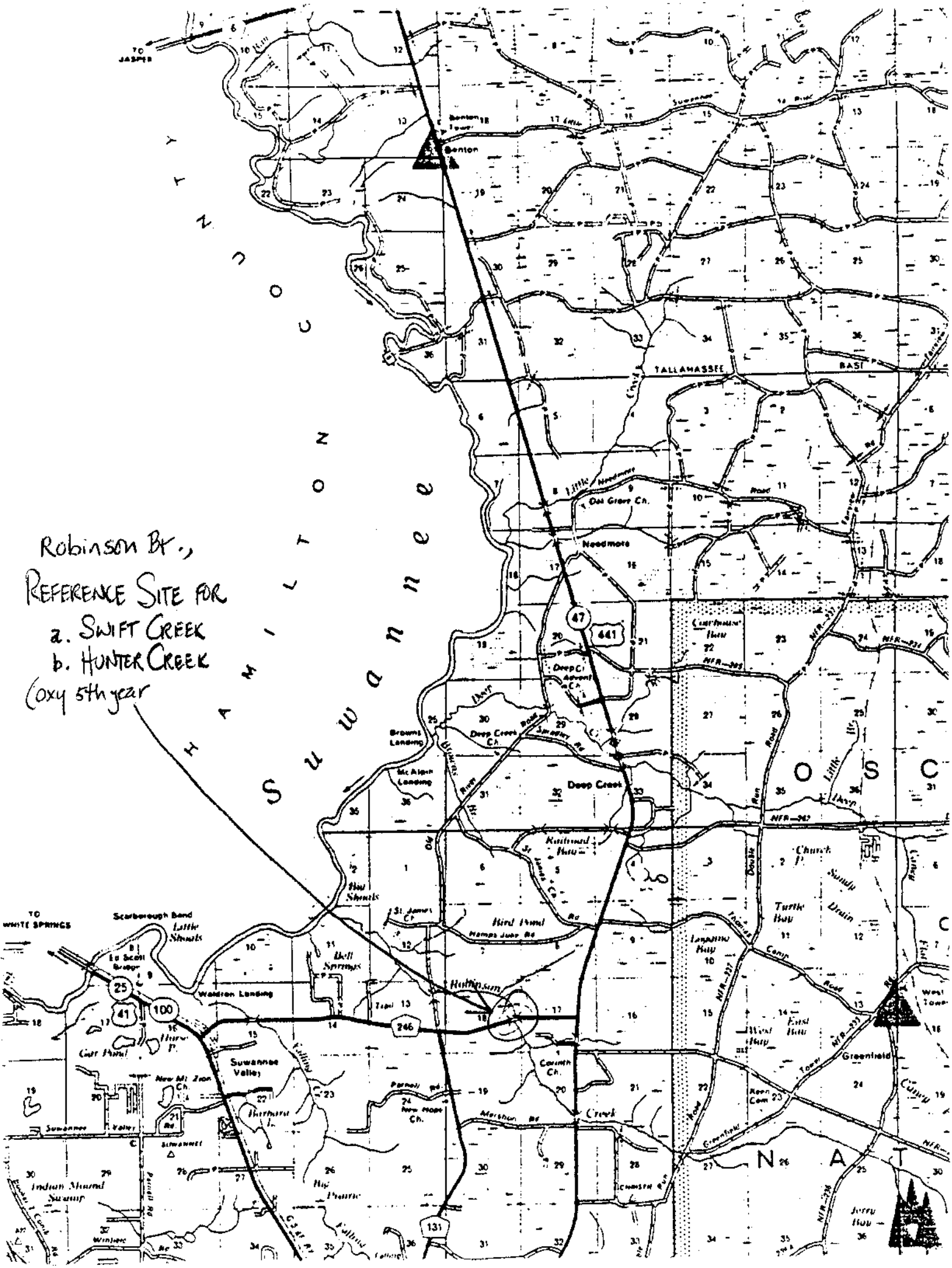
* Total Phosphorous is for monitoring and reporting only, except as provided for in Section 17-671.300(1), FAC.

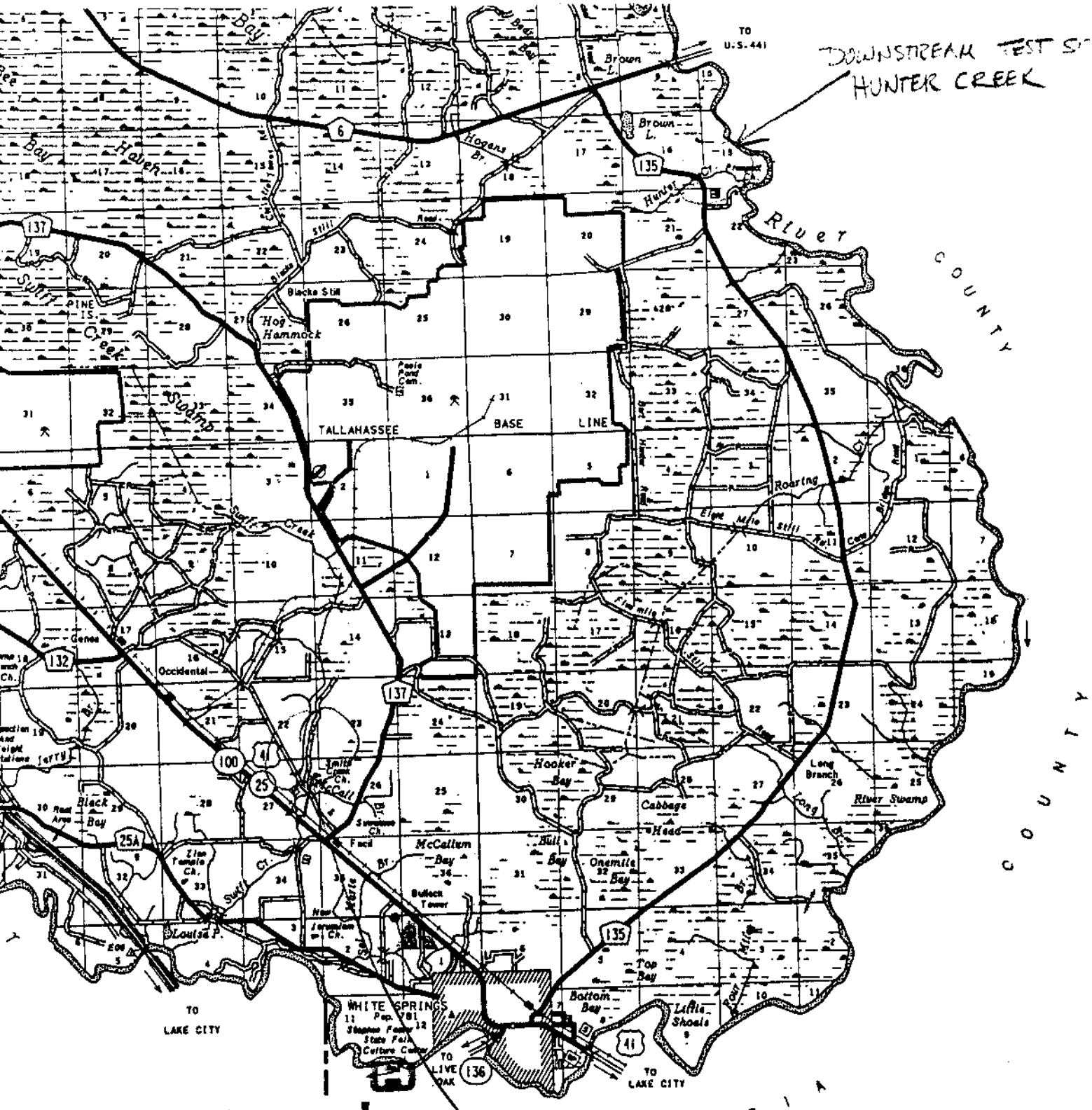
Monitoring Point	Parameters	Effluent Limitations 1-Day Max	30-Day Avg	Measurement Frequency	Sample Type
001-2, 001-17 Contaminated Nonprocess Water	Flow (MGD)	- - -	- - -	Continuous (001-2) Daily (001-17)	Recorder(001-2) Instant.(001-17)
	Total Phosphorus as P (mg/l)	105	35	2/week	24-Hour Composite
	Total Fluoride (mg/l)	75	25	" "	" " "
	pH (S.U.)			" "	Grab
001-7 (Altman Bay Canal including west diversion ditch when used) Beneficiation Process, Mine De-watering and STP Effluent and 001-9 process and mine dewatering	Flow (MGD)	- - -	- - -	Continuous	Recorder
	Total Non-Volatile Non-Filterable Residue (mg/l)	25	12	2/week	24-Hour Composite
	Total Non-Filterable Residue (mg/l)	60	30	" "	" " "
	Total Phosphorous as P* (mg/l)	5	3	" "	" " "
	pH (S.U.)	6.0-9.0	6.0-9.0	" "	Grab
	Turbidity (NTU)	See 17-3.061(3)(r)		" "	"

* Total Phosphorous is for monitoring and reporting only, except as provided for in Rule 17-671.300(1), FAC.

Monitoring Point	Parameters	Effluent Limitations 1-Day Max	30-Day Avg	Measurement Frequency	Sample Type
001-8 Treated Process Water	Flow (MGD)	- - -	- - -	Continuous	Recorder
	Total Phosphorous as P (mg/l)	105	35	2/week	24-Hour Composite
	Total Fluoride (mg/l)	75	25	" "	" " "
	Total Suspended Solids, TSS*(mg/l)	- - -	- - -	- - -	- - -
	Radium 226**	9 pCi/l	- - -	- - -	" " "
	Turbidity	See 17-3.061(3)(r)		2/week	" " "

** The Permittee shall first analyze for gross alpha particle activity when discharging treated process water. If the gross alpha particle activity exceeds five picocuries per liter, the Permittee will be required to analyze an aliquot of the same sample for radium 226 and 228 and results to be submitted as part of the subsequent monthly report.


Robinson Br.,
REFERENCE SITE FOR
a. SWIFT CREEK
b. HUNTER CREEK
(oxy 5th year
Suwannee
HAMILTON
LAFAYETTE
TALLAHASSEE
Benton
Deep Creek
Hutchinson
Suwannee Valley
Indian Mound Swamp
Big Prairie
Greenfield
Turtle Bay
Bird Pond
Bell Springs
Waldron Landing
Scarborough Bend
Little Shoals
Bay Shoals
Browns Landing
McAlpin Landing
Needmore
Deep Creek Ch.
Old Union Ch.
Corinth Ch.
New Hope Ch.
New Mt. Zion Ch.
Marshall Rd
Parnell Rd
Camp Road
Church Rd
Double Run
Sandy Drain
Little Run
Swamp Road
Greenfield Road
Old Railroad Grade
Railroad Grade
Suwannee Valley Rd
Deep Creek Rd
Old Union Rd
Bird Pond Rd
Hamps Jones Rd
St. James Ch. Rd
Courthouse Bay
Railroad Bay
Langston Bay
West Bay
East Bay
Jerry Bay
Room Corn
Corinth
Church
Sandy
Turtle
Langston
West
East
Jerry
Room
Corn
Deep Ck Advent Ch.
NFR-931
NFR-932
NFR-933
NFR-934
NFR-935
NFR-936
NFR-937
NFR-938
TO JASPER
TO WHITE SPRINGS
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ion every year. Adverse weather is the cause of low production. Natural n reduces the number of chicks each pair bring to maturity, but the rate at which es are made up from one season to the phenomenal. When population levels are production rockets upward; when the bir- crowding a given range, production s. Biologists call it the principle of in- This is why it does not take four or five s to rebuild a low quail population. With le climatic conditions two pairs from a can replace all their winter losses.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21010017	DATE (M/D/Y): 8/15/94	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: REFERENCE SITE FOR OCCIDENTAL 5th YEAR INSPEC.	LOCATION: ROBINSON BRANCH at C.R. 246	FIELD ID/NAME: Reference Site

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover 20	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. (20) 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity 17	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 18 (17) 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 1
Artificial Channelization 20	No artificial channelization or dredging. Stream with normal, sinuous pattern (20) 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Deposition 20	Less than 20% of habitats affected by sand or silt accumulation (20) 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 14 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability 17	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 (17) 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width 20	Width of native vegetation (least buffered side) greater than 18 m (20) 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality 20	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated. Poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

5 Add **5 points** if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

139 **TOTAL SCORE**

Comments

ANALYSIS DATE: 8/15/94	ANALYST: HOLLINGSWORTH	SIGNATURE: Mike Hollingsworth

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21020040	DATE (M/D/Y): 8/15/94	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: TEST SITE FOR OCCIDENTAL, SUWANEE RIVER MINE RUNOFF AND CHEMICAL PLANT NONCONTACT DISCHARGE	LOCATION: SWIFT CREEK TEST SITE	FIELD ID/NAME: SP-001

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover [15]	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. 20 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). (15) 14 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity [18]	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 (18) 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 1
Artificial Channelization [19]	No artificial channelization or dredging. Stream with normal, sinuous pattern 20 (19) 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Deposition [12]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	(20)%-50% of habitats affected by sand or silt accumulation 15 14 13 (12) 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [13]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 (13) 12 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [20]	Width of native vegetation (least buffered side) greater than 18 m (20) 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [20]	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. (20) 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. 15 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated. Poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

[5] Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

Comments

[122] **TOTAL SCORE**

ANALYSIS DATE: 8/15/94	ANALYST: MIKE HOLLINGSWORTH	SIGNATURE: Mike Hollingsworth

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET (v2)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21020063	DATE (M/D/Y): 8/15/94	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: TEST SITE FOR OCCIDENTAL, SUWANEE RIVER MINE RUNOFF FROM LAND O LAKES RECLAMATION AREAS.	LOCATION: HUNTER CREEK at C.R. 135	FIELD ID/NAME: SP-002

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Bottom Substrate/ Available Cover [14]	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs (partially decayed), undercut banks, rubble, or other stable habitat. 20 19 18 17 16	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 (14) 13 12 11	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious, substrates unstable. 5 4 3 2 1
Water Velocity [18]	Max. observed: >0.25 m/sec. but < 2 m/sec 20 19 (18) 17 16	Max. observed; 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed; 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 5 4 3 2 1
Artificial Channelization [20]	No artificial channelization or dredging. Stream with normal, sinuous pattern (20) 19 18 17 16	May have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Deposition [14]	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 (14) 13 12 11	Smothering of 50%-80% of habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, a severe problem, pools absent 5 4 3 2 1
Bank Stability [12]	Stable. No evidence of erosion or bank failure. Little potential for future problems. 20 19 18 17 16	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 15 14 13 (12) 11	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 10 9 8 7 6	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 5 4 3 2 1
Riparian Buffer Zone Width [20]	Width of native vegetation (least buffered side) greater than 18 m (20) 19 18 17 16	Width of native vegetation (least buffered side) 12 m to 18 m 15 14 13 12 11	Width of native vegetation 6 to 12 m, human activities still close to system 10 9 8 7 6	Less than 6 m of native buffer zone due to intensive human activities 5 4 3 2 1
Riparian Zone Vegetation Quality [15]	Over 80% of streambank surfaces consist of native plants, including trees understory shrubs, or non-woody macrophytes. Plants growing naturally. 20 19 18 17 16	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. Some disruption in community evident. (15) 14 13 12 11	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 10 9 8 7 6	Less than 25% of streambank surfaces are vegetated. Poor plant community (*e.g.* grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 5 4 3 2 1

[5] Add 5 points if cross-sectional area of flow is estimated to be > one square meter during periods of normal flow.

[118] **TOTAL SCORE**

Comments

ANALYSIS DATE: 8/15/94	ANALYST: TIM McKELVEY	SIGNATURE: Tim McKelvey

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21010017	DATE (M/D/Y): 8/15/94	TIME: 0835	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: REFERENCE SITE FOR OCCIDENTAL 5th YEAR INSPEC.	LOCATION: ROBINSON BRANCH at C.R. 246	FIELD ID/NAME: Reference Site

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
100							

Local Watershed Erosion (check box): None [✓] Slight [ ] Moderate [ ] Heavy [ ]

Local Watershed NPS Pollution (check box): No evidence [✓] Some potential sources [ ] Obvious sources [ ]

Width of riparian vegetation (m) on least buffered side: 7 18

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

Flow: 0.5 m/s

see attached

Artificially Channelized [✓] no [ ] recent, severe [ ] some recovery [ ] mostly recovered, more sinuous

Artificially Impounded [ ] yes

High Water Mark (m above bed): 1.3 m

Canopy Cover %: Open: [ ] Lightly Shaded (11-45%): [ ] Moderately Shaded (46-80%): [ ] Heavily Shaded: [✓]

SEDIMENT/SUBSTRATE

Sediment Odors: Normal: [✓] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Anaerobic: [ ] Other: [ ]

Sediment Oils: Absent: [✓] Slight: [ ] Moderate: [ ] Profuse: [ ]

Sediment Deposition: Sludge: [ ] Sand smothering: none (slight) moderate severe Silt smothering: none (slight) moderate severe Other:

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	15	5	dipnet	Riffles			
Leaf Packs or Mats	5	5	dipnet	Sand	50	5	dipnet
Aquatic Vegetation				Mud/Muck/Silt			
Rock or Shell Rubble				Other:			
Undercut Banks/Roots	30	5	dipnet	*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):			Secchi (m):
Top	0.3	24.2	6.05	4.22	69			0.25
Mid-depth								
Bottom								

System Type: Stream: [✓] (1st (2nd) order, 3rd - 4th order, 5th - 6th order, 7th order or greater) Lake: [ ] Wetland: [ ] Estuary: [ ] Other: [ ]

Water Odors (check box): Normal: [✓] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Other: [ ]

Water Surface Oils (check box): None: [✓] Sheen: [ ] Globs: [ ] Slick: [ ]

Clarity (check box): Clear: [✓] Slightly turbid: [ ] Turbid: [ ] Opaque: [ ]

Color (check box): Very Tannic: [✓] Green (algae): [ ] Clear: [ ] Other: [ ]

Weather Conditions/Notes:

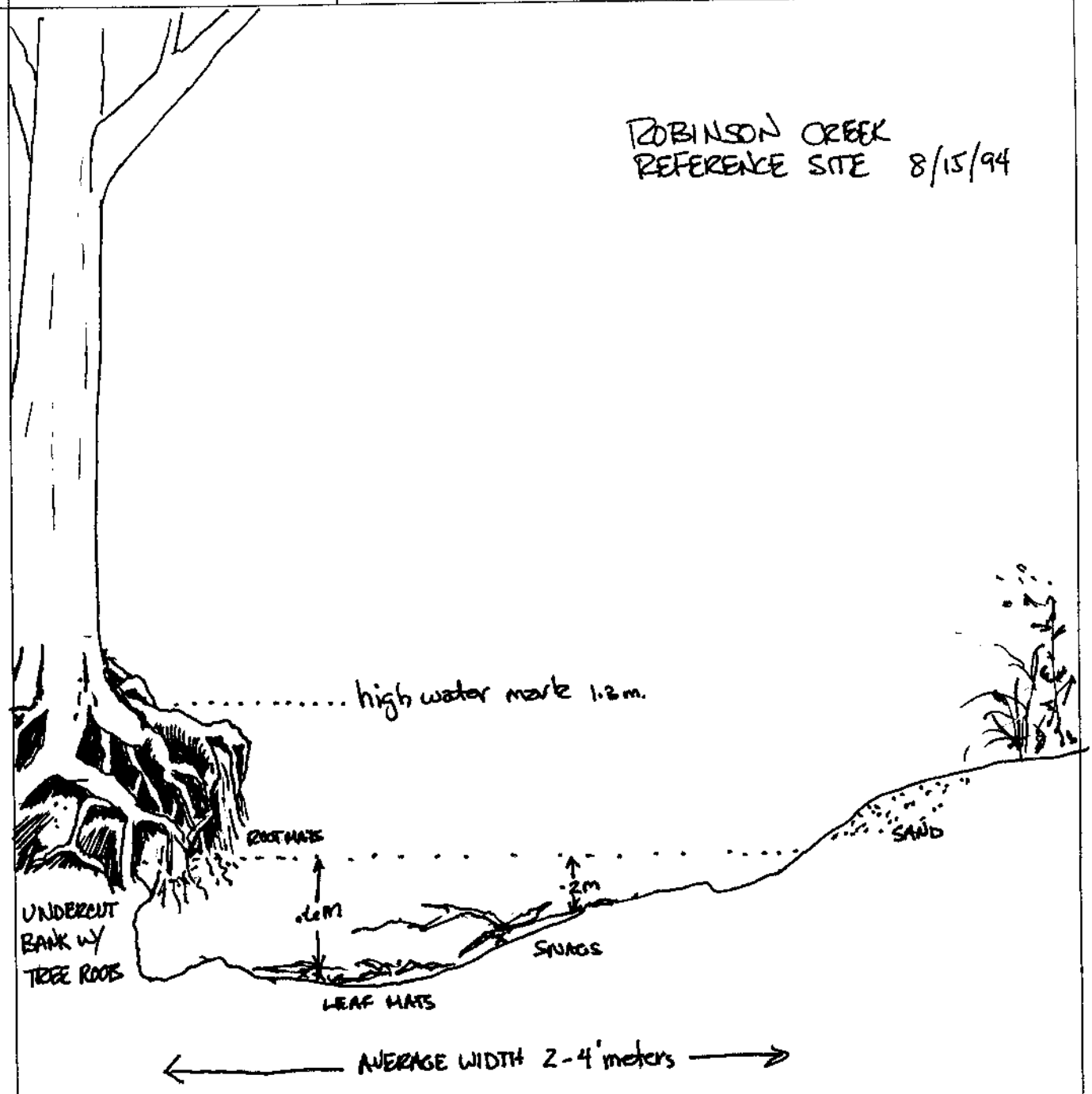
Partly Cloudy & Hot

* water level down from time of recon, woody debris out of water.

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

SAMPLING TEAM:	SIGNATURE:	DATE:
Hollingsworth, McKelvey, Bowman	Tami McKelvey KAS	8/15/94

ROBINSON CREEK
REFERENCE SITE 8/15/94



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 8031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21020040	DATE (M/D/Y): 8/15/94	TIME: 1055	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: TEST SITE FOR OCCIDENTAL, SUWANEE RIVER MINE RUNOFF AND CHEMICAL PLANT NONCONTACT DISCHARGE	LOCATION: SWIFT CREEK TEST SITE	FIELD ID/NAME: SP-001

RIPARIAN ZONE/INSTREAM FEATURES * STREAM IS MOSTLY EFFLUENT

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
100%							

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

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

Width of riparian vegetation (m) on least buffered side: 718

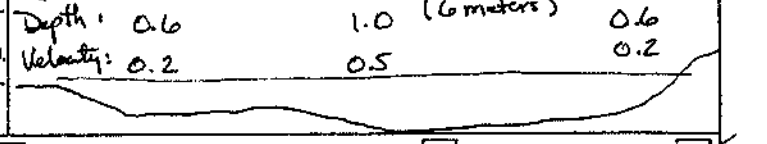
List & map dominant vegetation on back (see attached)

Artificially Channelized ☑ no ☐ recent, severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark (m above bed): 1-2 m

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)



Canopy Cover % : Open : ☐ Lightly Shaded (11-45%): ☐ Moderately Shaded (46-80%): ☐ Heavily Shaded: ☑ (some open areas not tested) at test site

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	20	4	dipnet	Riffles			
Leaf Packs or Mats	6	4	dipnet	Sand	50	3	dipnet
Aquatic Vegetation	2	4	dipnet	Mud/Muck/Silt	9	3	dipnet
Rock or Shell Rubble	1	2	dipnet	Other:			
Undercut Banks/Roots				*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	* all measurements taken with hydrolab/surveyor 3		Secchi (m):
Top	1.0							1.0
Mid-depth		28.1	7.30	4.69	472			
Bottom								

System Type : Stream: ☑ (1st / 2nd order / 3rd - 4th order / 5th - 6th order / 7th order or greater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☐

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

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

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

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

Weather Conditions/Notes:

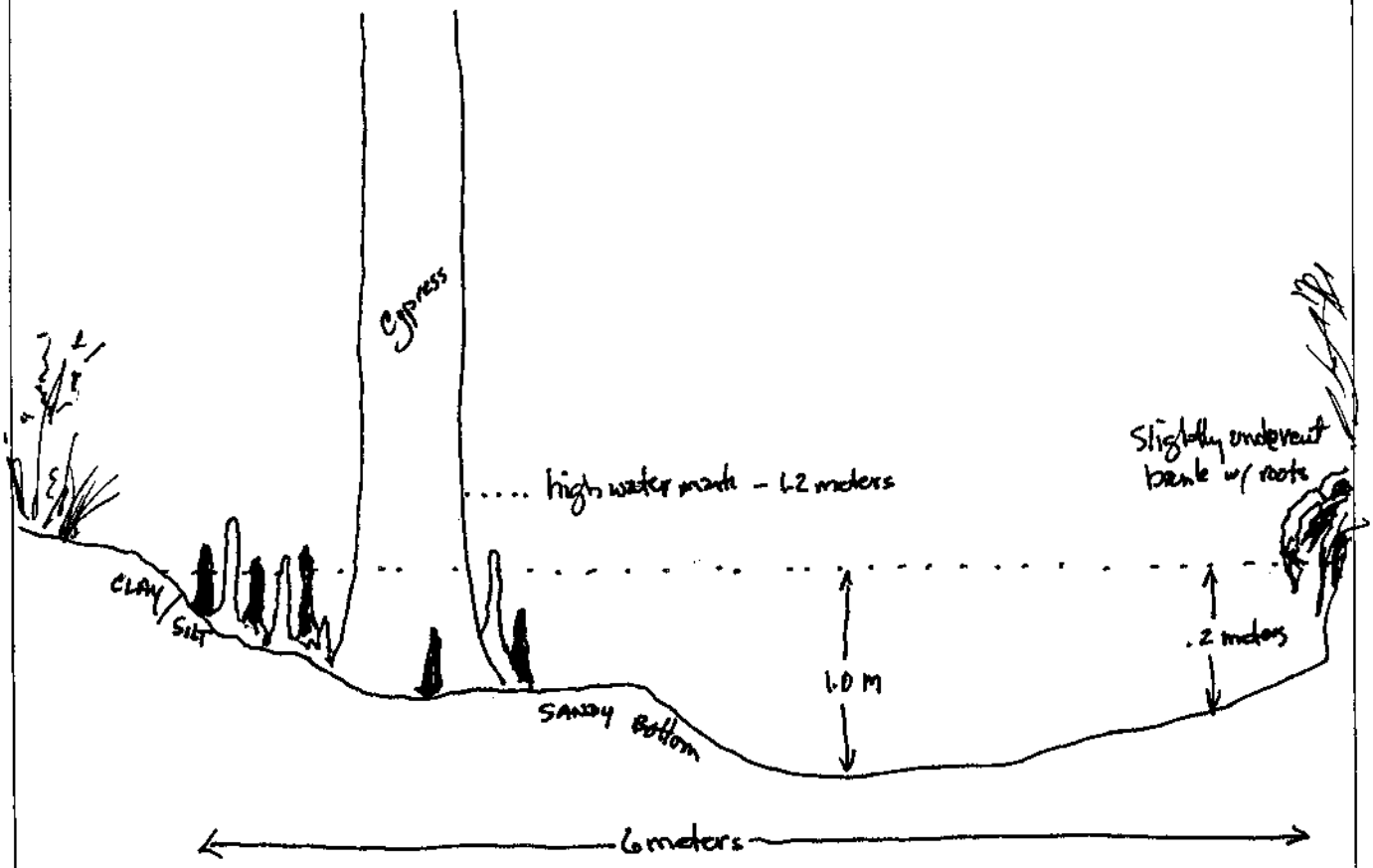
Cloudy, rain, warm

water level approximately the same as when reconned

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

SAMPLING TEAM:	SIGNATURE:	DATE:
HOLLINGSWORTH, MCKELVEY, BOWMAN	Terri McKelvey KA	8/15/94

SWIFT CREEK
TEST SITE 8/15/94
OCCIDENTAL CHEMICAL CORP.



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 5)

SUBMITTING AGENCY CODE: 6031 / SUBMITTING AGENCY NAME: DEP JAX/NED	STORET STATION NUMBER: 21020063	DATE (M/D/Y): 8/15/94	TIME: 1440	RECEIVING BODY OF WATER: SUWANEE RIVER

REMARKS: TEST SITE FOR OCCIDENTAL, SUWANEE RIVER MINE RUNOFF FROM LAND & LAKES RECLAMATION AREAS	LOCATION: HUNTER CREEK at C.R. 135	FIELD ID/NAME: SP-002

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest/Natural	Silviculture	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
95						5	

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

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

Width of riparian vegetation (m) on least buffered side: 7/8m

List & map dominant vegetation on back

Typical Width (m)/Depth (m) /Velocity (m/sec) Transect (draw cross-section & provide at least 3 velocity & depth values)

flow 1.3 m/s

see attached

Artificially Channelized ☑ no ☐ recent, severe ☐ some recovery ☐ mostly recovered, more sinuous

Artificially Impounded ☐ yes

High Water Mark (m above bed): 1.0m

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

SEDIMENT/SUBSTRATE

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

Sediment Oils: Absent ☑ Slight ☐ Moderate ☐ Profuse ☐

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

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	10	4	dipnet	Riffles			
Leaf Packs or Mats	5	4	dipnet	Sand	50	2	dipnet
Aquatic Vegetation				Mud/Muck/Silt			
Rock or Shell Rubble	5	4	dipnet	Other: hard clay	20	2	dipnet
Undercut Banks/Roots	10	4	dipnet	*Draw aerial view sketch of habitats found in 100 m section*			

WATER QUALITY	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm) or Salinity (ppt):	all measurements taken with hydrolab / surveyor3		Secchi (m):
Top	0.6 m							.6L
Mid-depth		25.1	7.4	6.7	185			
Bottom								

System Type: Stream ☑ (1st - 2nd order / 3rd - 4th order / 5th - 6th order / 7th order or greater) Lake ☐ Wetland ☐ Estuary ☐ Other ☐ _____

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

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

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

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

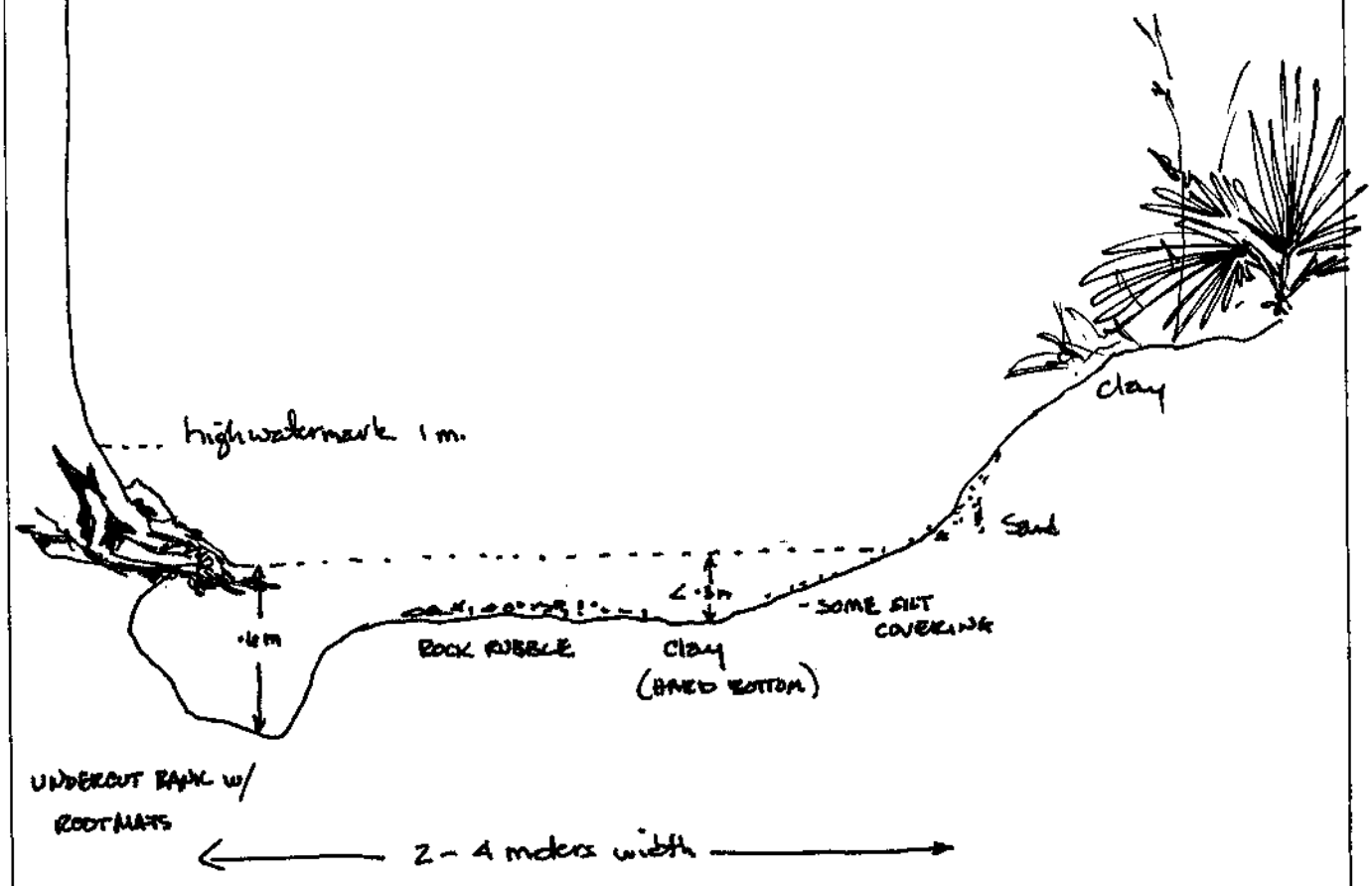
Weather Conditions/Notes: Cloudy, hot, some rain.

* Hester dendy completely covered by sand, unable to retrieve sample.
* Water level down from time of recon.

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

SAMPLING TEAM:	SIGNATURE:	DATE:
HOLLINGSWORTH, McKELVEY, BOWMAN	Tami McKelvey x-15	8/15/94

HUNTER CREEK
TEST SITE 8/15/94
OCCIDENTAL CHEMICAL CORP.



FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Occidental Chemical SR Mine
County:
Contact / District: Tim McKelvy / NE
NPDES Permit #: FL00
LIMS Sample #: 86078 **LIMS Job #:** 94-Aug-16-05

Sample Collection: Date 8-15-94 Time 1230
Test Beginning: Date 8-16-94 Time 1430
Test Ending: Date 8-18-94 Time 1430
Organism Batch #: 30 **Diluent Batch #:** 32
Organism Age: ≤ 24 hrs
Test Organism: Ceriodaphnia dubia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0	24.0 @ 24.0	8.4 @ 23.6 °C	1030 @ 1047
	9.0 @ 9.0			9850 @ 10000 @ 24.7 °C
24 hr	7.0 @ 7.0	24.9 @ 24.9	8.2 @ 25.0 °C	1046 @ 101.1
	9.0 @ 9.0			1040 @ 1047 @ 25.1 °C
48 hr	7.0 @ 7.0	24.9 @ 24.9	8.3 @ 24.9 °C	105.2 @ 101.1
	9.0 @ 9.0			1047 @ 1047 @ 24.6 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control	A	5	5	5	8.2		8.2	23.6		24.0	7.9		8.1	165		165
Control	B	5	5	5			8.2			24.0			8.1			165
Control	C	5	5	5			8.2			24.0			8.2			170
Control	D	5	5	5			8.2			23.9			8.2			175
100%	A	5	5	5	7.5		8.4	23.4		24.1	7.1		8.4	345		330
100%	B	5	5	5			8.4			24.1			8.4			335
100%	C	5	5	5			8.4			24.1			8.4			335
100%	D	5	5	5			8.4			24.1			8.4			360
Measured/Loaded by:		TM	TM	TM	TM		TM	TM		TM	TM		TM	TM		TM
Recorded by:		TM	TM	TR	TR		TR	TR		TR	TR		TR	TR		TR

Investigators' Signatures

Tom C. Rader

Tina McKelvy

Reviewer

form updated 4/27/94

	Salt Water / Well Water	Water Quality Parameters: 20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			—	—	—
Lab Total Residual Cl2:		<0.03	.04	DR-180	TM
Alkalinity:		75	85	Hach	TR
Hardness:		80	90	Hach	TR
Total Ammonia:		<0.07	1.19	Orion	TM

Ammonia Meter #98136 Ammonia Meter Slope: 56.1 Ammonia Blank: <0.07 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Occidental Chemical SR Mine
County:
Contact / District:
NPDES Permit #: FL00
LIMS Sample #: 86078 **LIMS Job #:** 94-Aug-16-05

Sample Collection: Date 8-15-94 Time 1220
Test Beginning: Date 8-16-94 Time 1450
Test Ending: Date 8-18-94 Time 1430
Organism Batch #: 33 **Diluent Batch #:** well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 2 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.0	8.4 @ 23.6 °C	1030 @ 1047 9880 @ 10000 @ 24.7 °C
24 hr	7.2 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.2 @ 25.0 °C	104.6 @ 101.1 1040 @ 1047 @ 25.1 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.3 @ 24.9 °C	105.2 @ 101.1 1047 @ 1047 @ 24.6 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	86	5	5	5	7.9	8.1	8.2	23.8	23.7	23.9	8.1	8.0	8.1	245	250	250
Control B	29	5	5	5	7.9	8.1	8.2			23.8	8.1	8.0	8.1	245	250	255
100% A	41	5	5	5	7.3	7.7	7.9	23.3	23.7	23.8	6.1	7.9	8.1	355	365	365
100% B	149	5	5	5	7.3	7.7	7.9			23.7	6.1	7.8	8.1	355	365	365
Measured/Loaded by:		TM	TM	TR	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TM	TM	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR

Investigators' Signatures

Robin C Kaden
Tina Mikulsky

Reviewer

Water Quality Parameters	Salt Water / (Well Water)	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			—	—	—
Lab Total Residual Cl2:	<0.03		.04	DR-100	TM
Alkalinity:	125		85	Hach	TR
Hardness:	120		90	Hach	TR
Total Ammonia:	<0.017		1.19	Orion	TM

Ammonia Ammonia Ammonia Control Sample

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Occidental Chemical Hunter Creek
County:
Contact / District: Tim McKelvey / NE
NPDES Permit #: FL00
LIMS Sample #: 86079 **LIMS Job #:** 94-

Sample Collection: Date 5-15-94 Time 1330
Test Beginning: Date 5-16-94 Time 1430
Test Ending: Date 5-18-94 Time 1420
Organism Batch #: 30 **Diluent Batch #:** 32
Organism Age: <24 hrs
Test Organism: Ceriodaphnia dubia

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.0	8.1 @ 23.6 °C	1030 @ 1047 9880 @ 10000 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.2 @ 25.0 °C	104.6 @ 101.1 1040 @ 1047 @ 25.1 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.3 @ 24.9 °C	105.2 @ 101.1 1047 @ 1042 @ 24.6 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control	A	5	5	5	8.3		8.0	23.5		24.3	8.1		8.2	165		170
Control	B	5	5	5			8.1			24.4			8.2	-		200
Control	C	5	5	5			8.2			24.4			8.1			170
Control	D	5	5	5			8.2			24.4			8.1			170
100%	A	5	5	5	7.6		8.4	23.3		24.4	7.6		8.1	195		195
100%	B	5	5	5			8.4			24.4			8.1			190
100%	C	5	5	5			8.4			24.5			8.1			205
100%	D	5	5	5			8.4			24.5			8.1			205
Measured/Loaded by:		TM	TM	TM	TM		TM	TM		TM	TM		TM	TM		TM
Recorded by:		TM	TM	TR	TR		TR	TR		TR	TR		TR	TR		TR

Investigators' Signatures

Robin C. Rader
Tina Mikulski
Marshall Faircloth

Reviewer

form updated 4/27/94

Water Quality Parameters	Salt Water / Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			—	—	—
Lab Total Residual Cl2:		<0.03	.04	DR-100	TM
Alkalinity:		75	95	Hach	TR
Hardness:		80	135	Hach	TR
Total Ammonia:		<0.017	<0.017	Orion	TM

Ammonia Meter #98136 Ammonia Meter Slope: -61.1 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Occidental Chemical Hunter Creek
County:
Contact / District:
NPDES Permit #: FL00
LIMS Sample #: 86079 **LIMS Job #:** 94-

Sample Collection: Date 8-15-94 Time 1330
Test Beginning: Date 8-16-94 Time 1430
Test Ending: Date 8-18-94 Time 1430
Organism Batch #: 33 **Diluent Batch #:** well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 2 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.0	8.4 @ 23.6 °C	1030 @ 1047 9880 @ 10000 @ 24.7 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.2 @ 25.0 °C	104.6 @ 101.1 1040 @ 1047 @ 25.1 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.9 @ 24.9	8.3 @ 24.9 °C	105.2 @ 101.1 1047 @ 1047 @ 24.6 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	883	5	5	5	7.9	8.1	8.2	23.8	23.9	23.6	8.2	8.0	8.2	245	250	250
Control B	18	5	5	5	7.9	8.1	8.2			23.6	8.2	8.0	8.2	245	255	255
100% A	630	5	5	5	7.2	7.7	7.9	23.1	23.9	23.6	7.5	8.0	8.2	200	205	205
100% B	1	5	5	5	7.2	7.7	7.9			23.6	7.5	8.0	8.2	200	210	210
Measured/Loaded by:		TM	TM	TR	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TM	TM	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR

Investigators' Signatures

Robin C. Kada
Tina McKendree
Marshall Faircloth

Reviewer

Water Quality Parameters	Salt Water: Well Water / 20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:		—	—	—
Lab Total Residual Cl2:	<0.03	.04	DR-100	TM
Alkalinity:	125	95	Hach	TR
Hardness:	120	135	Hach	TR
Total Ammonia:	<0.017	<0.017	Orion	TM

Ammonia Ammonia Ammonia Control Sample ppt ppt

Typical Values for Selected Parameters in Florida Waters

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

Percentile Distribution

Parameter	5 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates

Calculation and Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft Version 1994)								
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**				**Peninsula (75b, c, d)**			
	5	3	1	**Score**	5	3	1	**Score**
Number of Taxa	≥ 31	16–30	0–15	5	≥ 27	14–26	0–13	
EPT Index	≥ 7	4–6	0–3	3		≥ 4	0–3	
% Contribution of Dominant Taxon		≤ 20	> 20	3		≤ 37	> 37	
Florida Index	≥ 18	9–17	0–8	3	≥ 7	4–6	0–3	
% Diptera		≤ 38	> 38	1		≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	≥ 12	7–11	0–6	5	≥ 8	4–7	0–3	
% Shredders		≥ 10	0–9	3		≥ 13	0–12	
% Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 16	0–15	
# Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 4	0–3	
Total Score	**Panhandle**			23	**Peninsula**			
Interpretation of Score	**No Impairment**			**29-23**	**No Impairment**			**33-27**
	Moderate Impairment			**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation			**14-7**	**Severe Degradation**			**16-9**

Stat 1 - Stock

Calculation and Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft Version 1994)								
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**				**Peninsula (75b, c, d)**			
	5	3	1	**Score**	5	3	1	**Score**
Number of Taxa	≥ 31	16–30	0–15	3	≥ 27	14–26	0–13	
EPT Index	≥ 7	4–6	0–3	1		≥ 4	0–3	
% Contribution of Dominant Taxon		≤ 20	> 20	1		≤ 37	> 37	
Florida Index	≥ 18	9–17	0–8	3	≥ 7	4–6	0–3	
% Diptera		≤ 38	> 38	1		≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	≥ 12	7–11	0–6	3	≥ 8	4–7	0–3	
% Shredders		≥ 10	0–9	3		≥ 13	0–12	
% Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 16	0–15	
# Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 4	0–3	
Total Score	**Panhandle**			15	**Peninsula**			
Interpretation of Score	**No Impairment**			**29-23**	**No Impairment**			**33-27**
	Moderate Impairment			**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation			**14-7**	**Severe Degradation**			**16-9**

Calculation and Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft Version 1994)								
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**				**Peninsula (75b, c, d)**			
	5	3	1	Score	5	3	1	Score
Number of Taxa	≥ 31	16–30	0–15	3	≥ 27	14–26	0–13	
EPT Index	≥ 7	4–6	0–3	1		≥ 4	0–3	
% Contribution of Dominant Taxon		≤ 20	> 20	1		≤ 37	> 37	
Florida Index	≥ 18	9–17	0–8	3	≥ 7	4–6	0–3	
% Diptera		≤ 38	> 38	3		≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	≥ 12	7–11	0–6	1	≥ 8	4–7	0–3	
% Shredders		≥ 10	0–9	1		≥ 13	0–12	
% Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 16	0–15	
# Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 4	0–3	
Total Score	**Panhandle**			13	**Peninsula**			
Interpretation of Score	**No Impairment**			**29-23**	**No Impairment**			**33-27**
	Moderate Impairment			**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation			**14-7**	**Severe Degradation**			**16-9**

Calculation and Interpretation of the Stream Invertebrate Index for Florida (SIIF) (Draft Version 1994)								
Macroinvertebrate Dip Net (20 sweeps of most productive substrates)	**Panhandle (65, 75a)**				**Peninsula (75b, c, d)**			
	5	3	1	Score	5	3	1	Score
Number of Taxa	≥ 31	16–30	0–15		≥ 27	14–26	0–13	
EPT Index	≥ 7	4–6	0–3			≥ 4	0–3	
% Contribution of Dominant Taxon		≤ 20	> 20			≤ 37	> 37	
Florida Index	≥ 18	9–17	0–8		≥ 7	4–6	0–3	
% Diptera		≤ 38	> 38			≤ 32	> 32	
% Suspension feeders/ Collector-Filterers	≥ 12	7–11	0–6		≥ 8	4–7	0–3	
% Shredders		≥ 10	0–9			≥ 13	0–12	
% Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 16	0–15	
# Crustacean/Mollusks (Peninsula only)	–	–	–			≥ 4	0–3	
Total Score	**Panhandle**				**Peninsula**			
Interpretation of Score	**No Impairment**			**29-23**	**No Impairment**			**33-27**
	Moderate Impairment			**22-15**	**Moderate Impairment**			**26-17**
	Severe Degradation			**14-7**	**Severe Degradation**			**16-9**

Benthic macroinvertebrate taxa list for Occidental Chemical Corporation, collected via 20 discrete dip net sweeps in Robinson Branch, Swift Creek, and Hunter Creek, on 15 August, 1994.

	Reference Site	Test Site 1	Test Site 2
Acarina			
Hydrodroma sp.	24	–	–
Amphipoda			
Hyalella azteca	24	900	840
Coleoptera			
Ancyronyx variagata	72	–	–
Derallus sp.	–	36	–
Dineutus sp.	–	36	24
Dubiraphia sp.	120	–	120
Dubiraphia vittata	48	–	–
Macronychus glabratus	48	–	–
Microcylloepus pusillus	120	–	792
Scirtes sp.	–	36	–
Stenelmis sp.	–	540	–
Decapoda			
Procambarus sp.	–	–	24
Diptera			
Ablabesmyia mallochi	–	–	24
Ablabesmyia rhamphe grp.	–	36	–
Conchapelopia sp.	96	–	–
Cryptochironomus sp.	24	144	–
Glyptotendipes sp.	–	72	–
Helopelopia sp.	24	–	–
Hemerodromia sp.	–	–	48
Labrundinia pilosella	–	108	–
Meropelopia sp.	24	–	–
Nanocladius sp.	–	36	–
Natarsia sp.	–	–	24
Palpomyia grp. sp.	24	36	–
Parachironomus directus	–	324	–
Pentaneura inconspicua	–	180	120
Polypedilum aviceps	24	–	–
Polypedilum convictum grp.	24	180	24
Polypedilum illinoense	24	–	–
Polypedilum scalaenum grp.	96	2268	–
Potthastia longimana	24	–	–
Rheotanytarsus distinctissimus grp.	24	180	–
Rheotanytarsus exiguus grp.	48	36	48

Simulium sp.	168	–	–
Stenochironomus sp.	264	36	24
Stempellinella sp.	48	–	–
Tanytarsus sp. D (Epler)	24	–	–
Tanytarsus sp. M (Epler)	48	–	48
Tanytarsus sp. O (Epler)	24	–	–
Tipula sp.	–	36	–
Tribelos fuscicorne	144	–	–
Tribelos jucundum	336	–	72
Undetermined Dipteran pupae	–	36	24
Ephemeroptera			
Hexagenia limbata	24	–	–
Stenonema smithae	264	–	–
Gastropoda			
Ferrissia sp.	–	–	264
Isopoda			
Asellus sp.	96	–	456
Lirceus sp.	–	36	–
Odonata			
Argia sp.	144	–	96
Gomphus lividus	24	–	–
Gomphus pallidus	24	–	–
Ischnura posita	24	–	–
Ischnura sp.	–	144	–
Macromia taeniolata	–	36	–
Perithemis tenera seminole	24	–	–
Progomphus obscurus	–	–	24
Undetermined Odonata sp.	–	36	–
Oligochaeta			
Aulodrilus pigueti	–	72	–
Limnodrilus hoffmeisteri	–	720	–
Pelecypoda			
Corbicula manilensis	–	36	–
Pisidium dubium	–	180	–
Sphaerium/Musculium grp. sp.	–	–	120
Trichoptera			
Cernotina sp.	24	–	–
Cheumatopsyche sp.	96	36	24
Triaenodes sp.	168	–	–
Undetermined Hydropsychidae	24	–	–
Total	2904	6552	3240

Benthic macroinvertebrate taxa list for Occidental Chemical Corporation, collected via Hester-Dendy artificial substrates in Robinson Branch and Swift Creek, on 15 August, 1994. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site 1
Amphipoda		
Hyalella azteca	–	41
Coleoptera		
Ancyronyx variagata	4	–
Microcylloepus pusillus	–	3
Stenelmis sp.	–	2
Diptera		
Ablabesmyia rhamphe grp.	–	49
Asheum beckae	–	3
Cladotanytarsus sp.	–	3
Conchapelopia sp.	1	–
Labrundinia pilosella	–	5
Pentaneura inconspicua	–	27
Polypedilum illinoense	–	1
Polypedilum scalaenum grp.	2	208
Polypedilum sp.	–	1
Rheotanytarsus exiguus grp.	2	–
Stenochironomus sp.	–	1
Stelechomyia perpulchra	–	1
Tanytarsus sp. A (Epler)	–	2
Thienemanniella sp.	1	–
Tribelos fuscicorne	–	7
Undetermined Dipteran pupae	–	40
Ephemeroptera		
Stenonema exiguum	16	–
Stenonema smithae	237	–
Stenonema sp.	2	–
Gastropoda		
Ferrissia sp.	–	2
Hebetancyclus excentricus	–	8
Isopoda		
Asellus sp.	1	–
Megaloptera		
Corydalus cornutus	1	2

Odonata		
Argia bipunctulata	–	2
Argia moesta	–	1
Argia sp.	–	1
Boyeria vinosa	10	–
Trichoptera		
Chimarra sp.	1	–
Cyrnellus fraternus	6	60
Cyrnellus sp.	–	37
Total	284	507

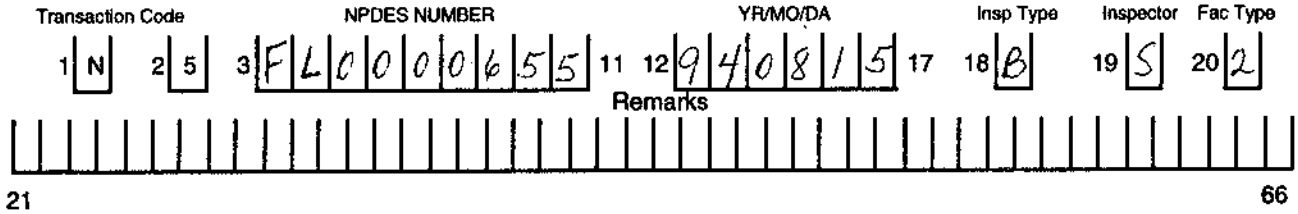
Periphyton taxa list and densities (#/mm^2) for Occidental Chemical Corporation, collected via glass microscope slides in Robinson Branch, Swift Creek, and Hunter Creek, on 15 August, 1994.

	Reference Site (Robinson Br)	Test Site 1 (Swift Ck)	Test Site 2 (Hunter Ck)
Diatoms			
Achnanthes exigua	2	16	2
Achnanthes hungarica	–	5	–
Achnanthes lanceolata	3	3	–
Achnanthes lanceolata v. *dubia*	–	32	7
Cocconeis placentula	3	100	274
Cyclotella meneghiniana	–	26	–
Eunotia curvata	2	–	–
Eunotia pectinalis	11	–	–
Eunotia praerupta	–	34	–
Eunotia sp.	15	–	–
Eunotia pectinalis v. *undulata*	2	–	–
Gomphonema parvulum	–	3	–
Melosira varians	6	3	–
Navicula decussis	–	–	3
Navicula minima	5	42	5
Navicula rhynchocephala	–	5	–
Navicula viridula	–	21	–
Nitzschia amphibia	–	18	–
Nitzschia palea	–	5	–
Nitzschia romana	2	18	–
Surirella sp.	–	3	–
Synedra ulna	–	110	–
Terpsinoe musica	–	95	–
Chlorophyta			
Ankistrodesmus sp.	–	3	–
Chlamydomonas sp.	–	3	–
Elakatothrix sp.	–	3	–
Scenedesmus sp.	–	11	–
Selenastrum sp.	2	–	2
Cyanophyta			
Chroococcus sp.	3	26	–
Dactylococcopsis sp.	–	3	–
Gloeocapsa sp.	2	–	–
Lyngbya sp.	11	3	2
Microcystis sp.	3	–	2
Phormidium sp.	–	–	2

Phytoplankton taxa list and densities (#/mL) for Occidental Chemical Corporation, collected via subsurface grabs in Robinson Branch, Swift Creek, and Hunter Creek, on 15 August, 1994.

	Reference Site (Robinson Br)	Test Site 1 (Swift Ck)	Test Site 2 (Hunter Ck)
Diatoms			
Achnanthes sp.	–	1195	493
Amphora sp.	–	299	164
Cocconeis sp.	–	299	164
Cyclotella sp.	–	2092	329
Desmogonium sp.	164	–	–
Gomphonema sp.	–	598	–
Melosira sp.	164	897	–
Navicula sp.	–	1195	658
Nitzschia sp.	164	3586	1151
Pinnularia sp.	–	299	–
Surirella sp.	–	–	164
Synedra sp.	–	3288	–
Chlorophyta			
Actinastrum sp.	–	299	–
Chlamydomonas sp.	164	1494	329
Chlorella sp.	–	2989	–
Closterium sp.	–	–	329
Crucigenia sp.	–	1793	1973
Kirchneriella sp.	–	299	–
Scenedesmus sp.	–	6575	329
Schroederia sp.	–	–	329
Selenastrum sp.	–	–	329
Tetraedron sp.	–	598	329
Tetraspora sp.	–	598	–
Treubaria sp.	–	299	–
Synura sp.	164	–	–
Unknown chlorophyte flagellate	–	–	164
Cyanophyta			
Anabaena sp.	–	598	–
Aphanocapsa sp.	–	1494	164
Chroococcus sp.	–	32,278	329
Dactylococcopsis sp.	–	4483	493
Merismopedia sp.	–	598	–
Microcystis sp.	–	3586	–
Oscillatoria sp.	1644	1494	658
Phormidium sp.	329	–	164
Euglenophyta			
Euglena sp.	–	–	329
Trachelomonas sp.	–	299	493

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)

