


Biological Assessment of

# Imperial Harbor Utilities Company
# Reverse Osmosis Facility

Lee County

NPDES #FL0038792

Sampled March 1995

July 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: Imperial Harbor Utilities Company
County: Lee
NPDES Number: FL0038792
State Permit Expiration Date: 19 December 1995

### Toxics Sampling Inspection (XSI)

Date Sampled: 6 March 1995

Results: No organic pollutants were detected in the effluent sample. No metals were found in the effluent above Class III standards.

### Compliance Biomonitoring Inspection (CBI)

Date Sampled: 6 March 1995

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

### Impact Bioassessment Inspection (IBI)

Date Sampled: 6 March 1995

Results: Qualitative measures of benthic macroinvertebrate community health indicated that while both the reference and test sites were stressed, no degradation could be positively associated with the discharge. The two stations were both depressed in terms of the Florida Index, the EPT Index, and the SIIF score. Both sites were dominated by pollution tolerant taxa. However, conditions were certainly no worse at the test site than they were at the degraded background site. Similarly, phytoplankton communities did not appear to be negatively affected by the discharge. Chlorophyll *a* was fairly average for a Florida stream at both stations.

### Water Quality Inspection (WQI)

Date Sampled: 6 March 1995

Results: Specific conductance violations were found in effluent (1618 µmhos/cm) and test site samples (1562 µmhos/cm) (Rule 62-302.530(23) FAC). The dissolved oxygen at the reference site was below Class III standards. Bioreactive nutrients were low or undetected at both the test and reference sites. Effluent phosphorus compounds were undetected. Effluent ammonia and nitrate-nitrite levels were only slightly above average for a typical Florida stream. Algal Growth Potential (AGP) levels were not above the "problem threshold" of 5.0 mg dry wt/L in either the effluent (2.3 mg dry wt/L), the test site (0.2 mg dry wt/L), or reference site samples (0.6 mg dry wt/L).

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 Imperial Harbor Utilities Company is a reverse osmosis water treatment plant located in Lee County, north of Bonita Springs. The reject water is aerated to reduce hydrogen sulfide and increase dissolved oxygen levels prior to discharge. The effluent is released to a drainage ditch, which flows into Spring Creek, and then into Estero Bay. Design flow from this facility, which discharges intermittently, is 0.016 MGD. Flow during this survey was 0.014 MGD.

Permit limits for the effluent are as follows: flow (0.016 MGD), pH (6.5-8.5 SU's), hydrogen sulfide (maximum of 0.01 mg/L), dissolved oxygen (minimum of 5.0 mg/L), fluoride (maximum of 10 mg/L), combined radium$^{226}$ and radium$^{228}$ (maximum of 5 pCi/L), and gross alpha radiation (15 pCi/L).

A consent order required the installation of an aeration system to reduce effluent hydrogen sulfide and increase dissolved oxygen. No violations of permit limits have been noted since the aeration unit began operation. The facility was previously abandoned by Harbor Utilities, and was transferred to Bonita Springs Utilities. The current plan is to shut down this facility when a water line has been established to connect this system to the Bonita Springs Utilities water system.

## Methods

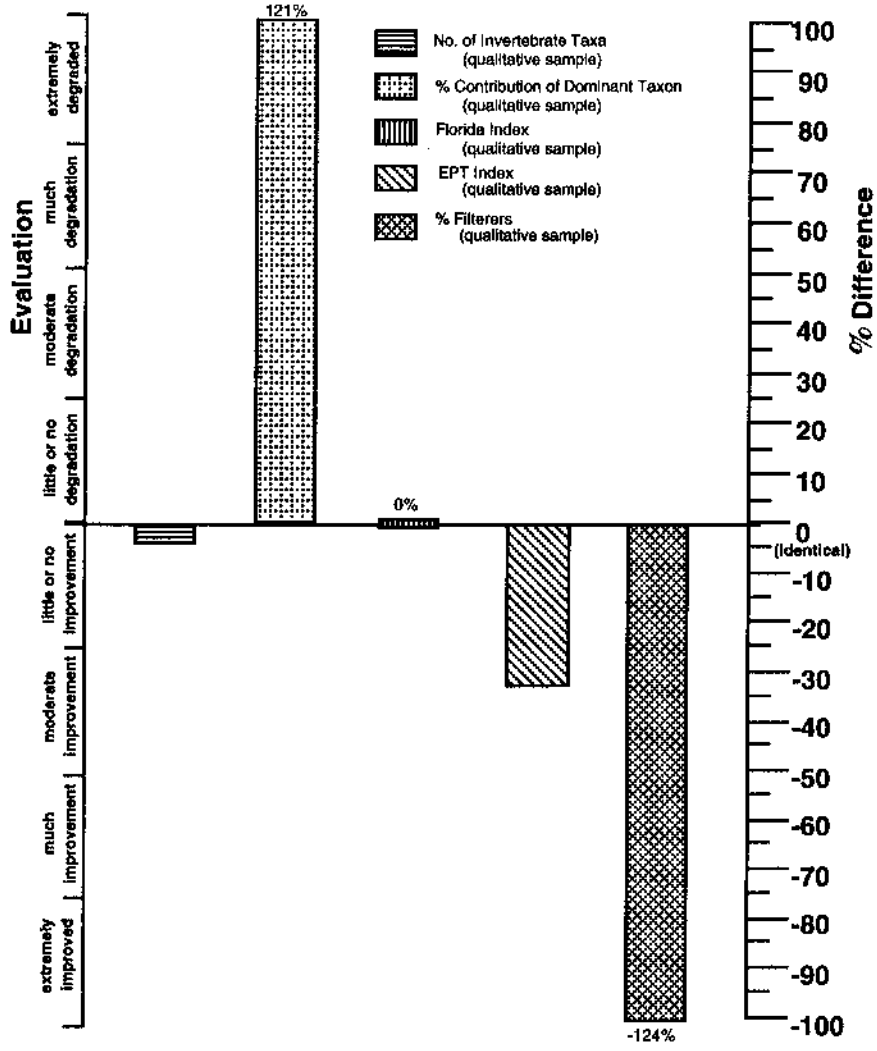
The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community health was made between a reference site (located in a drainage ditch upstream of the discharge) and a test site (located in the ditch downstream of the discharge) (see maps 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 screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, 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

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

| | Reference Site | Test Site |
|---|---|---|
| **Macroinvertebrate Qualitative** | | |
| Number of Taxa | 22 | 23 |
| Florida Index | 1 | 1 |
| Lake Condition Index | 4 | 5 |
| SIIF | 13 | 17 |
| EPT Index | 2 | 3 |
| % Contribution of Dominant Taxon | 13.8 | 31.4 |
| % Diptera | 41.3 | 73.5 |
| % Oligochaeta | 42.5 | 0.8 |
| % Odonata | 2.5 | 0 |
| % Ephemeroptera | 6.3 | 8.3 |
| % Gastropoda | 2.5 | 9.9 |
| % Trichoptera | 0 | 0.8 |
| % Decapoda | 2.5 | 0 |
| % Amphipoda | 0 | 1.7 |
| % Other | 2.4 | 5.0 |
| % Predators | 8.1 | 11.6 |
| % Above Surface Deposit Feeders | 25.6 | 35.5 |
| % Below Surface Deposit Feeders | 41.3 | 0.8 |
| % Suspension Feeders | 3.1 | 7.0 |
| % Scrapers | 5.6 | 14.1 |
| % Shredders | 1.3 | 17.8 |
| % Other | 15 | 12.4 |
| **Phytoplankton Algae** | | |
| Number of Taxa | 8 | 15 |
| Shannon-Weaver Diversity | 2.6 | 3.7 |
| Algal Density (#/L) | 280.5 | 392.7 |
| Chlorophyll a (µg/L) | 6.4 | 8.5 |
| % Blue-green | 18.5 | 37.8 |
| % Green | 0 | 8.1 |
| % Diatoms | 74.1 | 43.2 |
| % Other | 7.4 | 10.8 |
| **Algal Growth Potential (mg dry wt/l)** | 0.6 | 0.2 |

analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP 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. Phytoplankton was sampled via subsurface grabs. Chlorophyll *a* was also determined for periphyton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).




***Effect of discharge on the benthic macroinvertebrate community.***

## 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: Stress tends reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

Shannon-Weaver diversity: This index is specified in the Florida Administrative Code as a measure of biological integrity. Low diversity scores are undesirable. They represent conditions where only a few organisms are abundant, to the exclusion of other taxa. Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is a related measure which is also associated with disturbance.

Numbers of pollution sensitive taxa: Some organisms become rare or absent as the intensity or duration of 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. 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: This index is the sum of the number of EPT taxa present. Higher EPT values are associated with healthier systems.

Community structure: Substantial shifts in proportions of major groups of organisms, compared to reference conditions, may indicate degradation. 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 (Engel *et al.* 1994).

Algal biomass: High algal biomass (algal density or chlorophyll *a* implies nutrient stress. 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: Disturbance can shift the feeding strategies of invertebrates. In Florida for example, pollution may be responsible for reducing the numbers of filter-feeders (FDEP 1994) and shredders (EA Engineering 1994).

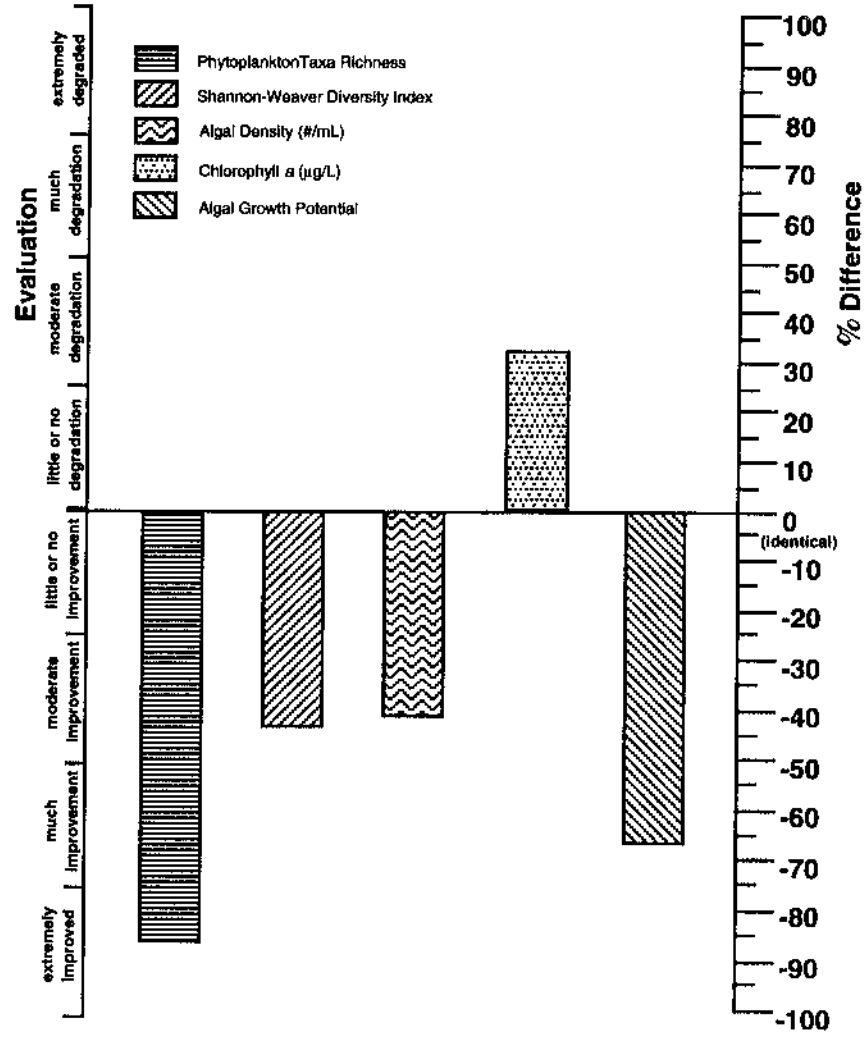
The Stream Invertebrate Index for Florida (SIIF) is a composite macroinvertebrate metric (EA Engineering 1994). The SIIF assigns points to a variety of parameters, depending on how closely each parameter approaches an expected reference condition (see SIIF calculation table in Appendix).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, the Florida Index, the EPT Index, and the % filter-feeders 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: Ford Walton (DEP South District) and Lyn Burton, Michael Corrigan, Marshall Faircloth, Russel Frydenborg, Christy LeDuc, Kathleen Lurding, Tina Mikulski, Elizabeth Miller, Urania Quintana, Barton Richard, Lisa Tamburello, David Whiting, Vicki Whiting, and Greg Wynn (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

## Results and Discussion

The study sites were highly disturbed drainage ditches, with essentially no water velocity. These shallow (0.1 m to 0.2 m deep), artificially channelized systems received very low habitat assessment scores, with 37 points at the reference site and 35 points at the test site. Stream habitat was limited, consisting mainly of benthic leaf mats and aquatic vegetation. Dis-




***Effect of discharge on the algal community.***

solved oxygen was very low at the reference site (2.2 mg/L, which is less than the Class III standard of 5.0 mg/L), but improved at the test site (7.9 mg/L). Temperature (24.0 °C to 24.9 °C) and pH (7.2 to 7.5 SU's) were similar between the sites. However, conductivity at the test site (1562 µmhos/cm) was substantially higher than at the reference site (590 µmhos/cm), and in violation of Rule 62-302.530(23) FAC. The specific conductance of the effluent (1618 µmhos/cm) was also in violation of this standard.

No organic pollutants were detected in the effluent sample. No metals were found in the effluent above Class III standards.

The effluent was not toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*.

Bioreactive nutrients were low or undetected at both the test and reference sites. Effluent phosphorus compounds were undetected. Effluent ammonia and nitrate-nitrite levels were only slightly above average for a typical Florida stream.

Algal Growth Potential (AGP) levels were not above the "problem threshold" of 5.0 mg dry wt/L (Raschke and Schultz 1987) in either the effluent (2.3 mg dry wt/L), the test site (0.2 mg dry wt/L), or reference site samples (0.6 mg dry wt/L).

Qualitative measures of benthic macroinvertebrate community health indicated that while both the reference and test sites were stressed, no degradation could be positively associated with the discharge. The figure on p. 2 indicates the degree of difference between the invertebrate populations of 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.

Taxa richness was very similar at both receiving water stations, with 23 taxa found at the test site, and 22 taxa at the reference site. The Florida Index was very low at both sites (1 point apiece), indicating that both systems were equally disturbed. A minimum of 7 Florida Index points is expected from a normal Peninsular stream. Because these ditches had no perceptible water velocity, the macroinvertebrate component of the Lake Condition Index (used for lentic systems) was also calculated. The LCI results (5 points at the test site and 4 points at the reference site) also indicated altered conditions at both stations. The EPT Index (2 at the reference site and 3 at the test site) also suggested that neither site achieved biological expectations. The test site, with a SIIF score of 17, was at the low range of the "moderately impaired" category. The reference site, with 13 SIIF points, was in the "severely degraded" range. These results suggest that the test site was no worse than the reference site, which was already impaired from human activities.

Pollution tolerant organisms dominated both sites, with 13.8% of the reference site population being composed of the oligochaete, *Dero digitata*, and 31.4% of the test site community consisting of the dipteran, *Chironomus* sp. Given the degree of degradation in the background system, it would be difficult to attribute this increase in the % contribution of the dominant taxon solely to the effluent, which was low in nutrients and fairly well oxygenated. It was somewhat noteworthy that the increased conductivity at the test site did not appear to have more effect on the invertebrate community there. However, given the extremely stressed conditions at the reference site (dissolved oxygen of 2.2 mg/L), it is not surprising that, by comparison, the test site was not too dissimilar.

The figure on p. 3 represents changes in the phytoplankton algal community. As was noted with the macroinvertebrates, larger differences (that is, higher percentages) correspond with greater degrees of degradation. Phytoplankton communities did not appear to be negatively affected by the discharge. Phytoplankton taxa richness and diversity were actually higher at the test site than the reference site. Chlorophyll *a*, with 6.4 µg/L at the reference site and 8.5 µg/L at the test site, was fairly average for a Florida stream at both stations. Algal density was analogous, with slightly more cells/L found at the test site than the reference, but both values being fairly typical.

## Conclusions

Specific conductance violations were found in effluent (1618 µmhos/cm) and test site samples (1562 µmhos/cm) (Rule 62-302.530(23) FAC). The dissolved oxygen at the reference site was below Class III standards.

No organic pollutants were detected in the effluent sample. No metals were found in the effluent above Class III standards.

The effluent was not toxic to the bannerfin shiner, *Cyprinella leedsi*, or to the invertebrate, *Ceriodaphnia dubia*.

Bioreactive nutrients were low or undetected at both the test and reference sites. Effluent phosphorus compounds were undetected. Effluent ammonia and nitrate-nitrite levels were only slightly above average for a typical Florida stream.

Algal Growth Potential (AGP) levels were not above the "problem threshold" of 5.0 mg dry wt/L in either the effluent (2.3 mg dry wt/L), the test site (0.2 mg dry wt/L), or reference site samples (0.6 mg dry wt/L).

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Similarly, phytoplankton communities did not appear to be negatively affected by the discharge. Chlorophyll *a* was fairly average for a Florida stream at both stations.

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## Chemistry summary table for

| Imperial Harbor Utilities | Effluent | Reference Site | Test Site |
|---|---|---|---|
| **Organic Constituents (ug/L)** | | | |
| none detected | | | |
| **Metals (ug/L)** | | | |
| Aluminum | 100 U | | |
| Antimony | 0 | | |
| Arsenic | 10 U | | |
| Cadmium | 0.1 U | | |
| Copper | 4 I | | |
| Chromium | 10 U | | |
| Iron | 10 U | | |
| Lead | 10 U | | |
| Mercury | 0.10 U | | |
| Nickel | 4 U | | |
| Selenium | 30 U | | |
| Silver | 0 | | |
| Zinc | 4 U | | |
| **Nutrients (mg/L)** | | | |
| Ortho-phosphate | 0.004 U | 0.004 I | 0.005 I |
| Total phosphorus | 0.015 U | 0.047 | 0.024 I |
| Ammonia | 0.11 | 0.020 U | 0.020 U |
| Nitrate+Nitrite | 0.18 A | 0.020 U | 0.020 U |
| TKN | 0.48 A | 1.1 | 0.64 |
| **General Phys-Chem Parameters** | | | |
| Habitat Assessment | | 37 | 35 |
| D.O. (mg/L) | 6.5 | 2.2 | 7.9 |
| pH (SU's) | 7.7 | 7.2 | 7.5 |
| Conductivity (µmhos/cm) | 1618 | 590 | 1562 |
| Temperature (°C) | 26.7 | 24.9 | 24.0 |
| Sulfide (mg/L) | 2.4 | | |
| Algal Growth Potential (mg dry wt/L) | 2.3 | 0.6 | 0.2 |
| **Toxicity** | | | |
| Bioassay Fish | not toxic | | |
| Bioassay Invertebrate | not toxic | | |

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

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

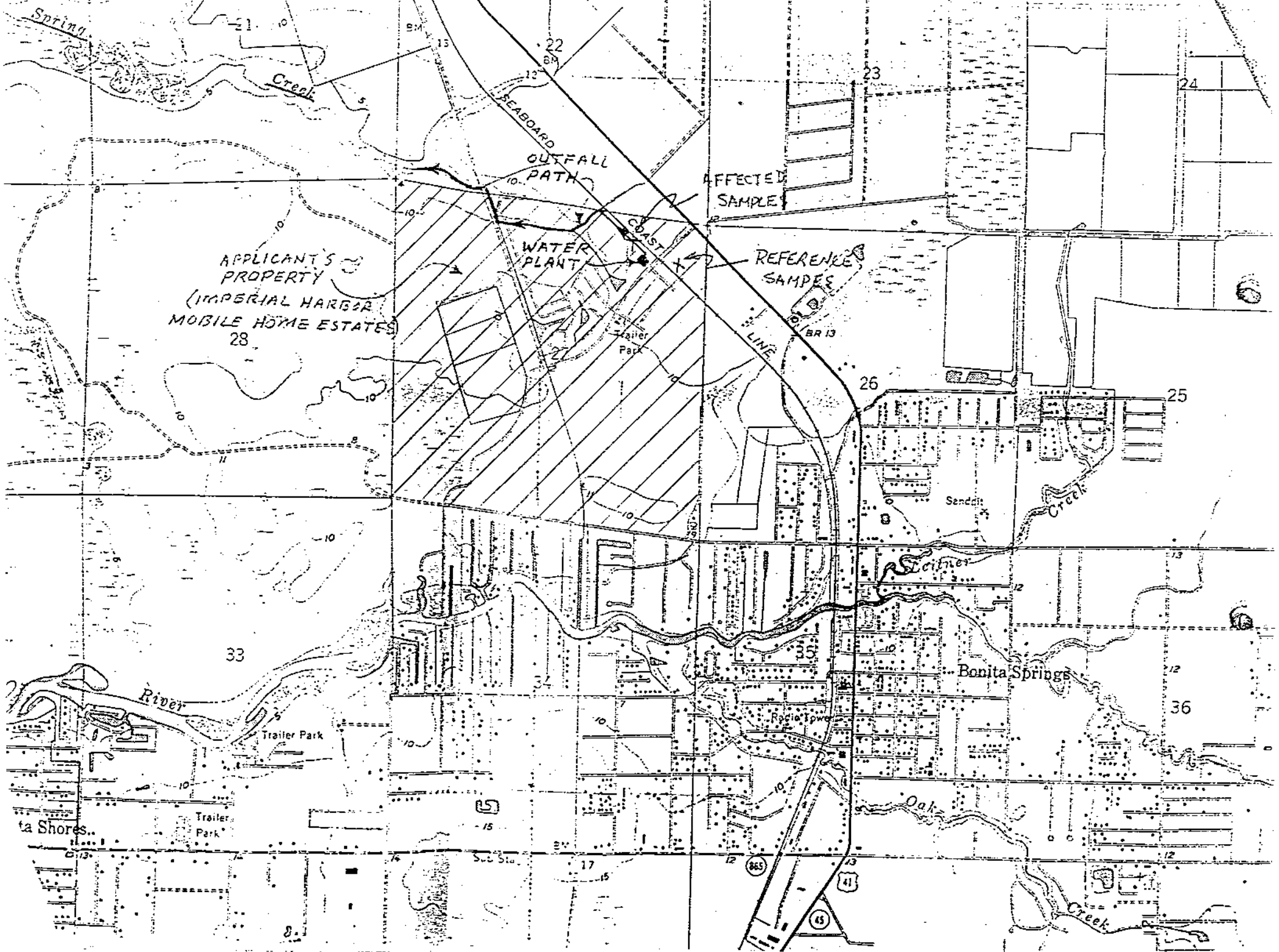
U - Material analyzed for but not detected; value reported is the minimum detection limit

# Typical Values for Selected Parameters in Florida Waters

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

| Parameter | Percentile Distribution | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 Phosphate | 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-Phosphate | 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-Phosphate | 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


Spring
Creek
SEABOARD
OUTFALL
PATH
AFFECTED
SAMPLES
COAST
WATER
PLANT
REFERENCE
SAMPLES
APPLICANT'S
PROPERTY
(IMPERIAL HARBOR
MOBILE HOME ESTATES)
28
Trailer
Park
LINE
BR 13
26
25
Sendit
Creek
Estuary
33
34
35
Bonita Springs
36
River
Trailer Park
Trailer
Park
Oak
Creek
865
41
45

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

# FACILITY SUMMARY

| Facility Name: Imperial Harbor RO<br>Harbor Utilities Company, Inc. | | Date Summary Prepared:<br>6 March 95 |
|---|---|---|
| Location (attach detailed map):<br>Off Imperial Boulevard, North of Bonita Springs<br>Map attached. | County<br><br>Lee | District<br><br>South |
| Federal Permit # FL0038792<br>and expiration date: 10/31/98 | State GMS # and 5236P02042<br>State expiration date: 12/19/95 | Facility Type: **Industrial**<br>Municipal Federal Agricultural<br>Other (list): |

Function of facility:
Reverse Osmosis Water Plant

Description of treatment process:

Degassifier is used to reduce hydrogen sulfide levels and increase dissolved oxygen.

| Receiving waters:<br>Spring Creek | Classification: I II (III) |
|---|---|

| Design Flow:<br>0.016 MGD | Mean Flow: | Flow during survey:<br>0.014 MGD |
|---|---|---|

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

therefore, the best time to sample is: While plant is operating and discharging reject water.

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

No mixing zone.

List effluent limits (if necessary, attach relevant paperwork):

| Parameter | Limit (units) |
|---|---|
| Flow | 0.016 MGD |
| pH | 6.5 - 8.5 SU |
| DO | MIN 5.0 mg/L |
| H2S | 0.01 mg/L |
| FLUORIDES | 10 mg/L |
| COMBINED RADIUM 226 & 228 | 5 pCi/L |
| GROSS ALPHA | 15 pCi/L |

Describe special permit conditions and permit modifications:

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Imperial Harbor RO
(Facility)

# FACILITY SUMMARY

Description of permitted outfalls(s):

RO reject water discharges to drainage ditch then to Spring Creek.

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

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

Consent Order 92-1382 _ Required aeration unit to educe hydrogen sulfide levels and increase dissolved oxygen levels.

EPA C.O.& A. - untimely permit renewal.

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

DO increased to above 5.0 after installation of aeration unit. Hydrogen sulfide levels decreased after installation of the aeration unit.

Additional Information:
The facility was abandoned by Harbor Utilites and Bonita Springs Utilities was appointed receiver.

The current plan is to take this system off line as soon as a line can be run to connect to the Bonita Springs Utilities Water System.

Staff contributing to this review (signature):

(Biologist)

(Inspector)

(Engineer)

# STATE OF FLORIDA
## DEPARTMENT OF ENVIRONMENTAL REGULATION

## PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

| SUBMITTING AGENCY CODE: 52 / SUBMITTING AGENCY NAME: SOUTH DIST | STORET STATION NUMBER: | DATE (M/D/Y): 3-6-95 | TIME: 1346 | RECEIVING BODY OF WATER: SPRING CREEK |
|---|---|---|---|---|

| REMARKS: FL0038794 | LOCATION: IMPERIAL HARB UTIL AFFECTED | FIELD ID/NAME: IW-030695-3 |
|---|---|---|

### RIPARIAN ZONE/INSTREAM FEATURES

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

| Forest | Field/Pasture | Agricultural | Residential | Commercial | Industrial | Other (Specify) |
|---|---|---|---|---|---|---|
| | 40 | | 40 | | 20 | |

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

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

Point-Source Pollution (list location and describe): IMPERIAL HARBOR UTIL. R.O. DISCHARGE

| Estimated System Width (range, m): 5 | Estimated System Depth (range, m): 0.2 | yes |
|---|---|---|
| High Water Mark (m above bed): 0.5 | Velocity (range, m/s): 0.0 | Impounded [ ] Channelized [✓] |

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 Deposits: Sludge: [ ] Paper Fiber: [ ] Mud: [X] Sand: [ ] Shell: [ ] Other: [ ]

| Substrate Types | % coverage | # times sampled | method | Substrate Types | % coverage | # times sampled | method |
|---|---|---|---|---|---|---|---|
| Woody Debris (Snags) | | | | Riffles | | | |
| Leaf Packs | ~~5~~ | | | Sand | 10 S | 1 | |
| Aquatic Vegetation | 20 | 2 | | Mud/Muck/Silt | 10 S | 1 | |
| Rock or Shell Rubble | | | | Benthic leaf mats | 60 A | 2 | |
| Undercut Banks/Roots | | | | Other: | | | |

### WATER QUALITY

| | Depth (m): | Temp. (°C): | pH (SU): | D.O. (mg/l): | Cond. (µmho/cm): | | | Secchi (m): |
|---|---|---|---|---|---|---|---|---|
| Top | | | | | | | | |
| Mid-depth | 0.1 | 24.0 | 7.5 | 7.9 | 1500 | | | VOB |
| Bottom | | | | | | | | |

System Type : Stream: [X] (Sand Bottomed Swamp & Bog Alluvial / Sand Bot w/ Spring Calcareous Misc.) Lake: [ ] Wetland: [ ] Estuary: [ ] Other: [✓] DITCH

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: [X] Green (algae): [ ] Clear: [✓] Other: [ ]

Weather Conditions:

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

| SAMPLING TEAM: WALTON / PARKER | SIGNATURE: Albert S Walton Jr | DATE: 3-6-95 |
|---|---|---|

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

| SUBMITTING AGENCY CODE: 52<br>SUBMITTING AGENCY NAME: SOUTH DIST | STORET STATION NUMBER: | DATE (M/D/Y): 3-6-95 | RECEIVING BODY OF WATER: SPRING CREEK |
|---|---|---|---|

| REMARKS: | LOCATION: IMPERIAL HARBOR UTIL. AFFECTED | FIELD ID/NAME: IW-030695-3 |
|---|---|---|

| Habitat Parameter<br>score | Excellent | Good | Fair | Poor |
|---|---|---|---|---|
| Bottom Substrate/ Available Cover<br>12 | Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat.<br>23-30 points | 20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat.<br>16-22 points | 5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat.<br>8-15 points | Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious.<br>0-7 points |
| Water Velocity<br>4 | Max. observed: >0.3 m/sec. but < 1 m/sec<br>23-30 points | Max. observed; 0.1 to 0.3 m/sec<br>16-22 points | Max. observed; 0.05 to 0.1 m/sec<br>8-15 points | Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec<br>0-7 points |
| Artificial Channel/ Flow Alteration<br>3 | No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates.<br>12-15 points | — | — | Artificially channelized, or scouring present during spates because of excess impervious surface in watershed.<br>0-3 points |
| Bank Stability<br>10 | Stable. No evidence of erosion or bank failure. Little potential for future problems.<br>9-10 points | Moderately stable. Infrequent or small areas of erosion, mostly healed over.<br>6-8 points | Moderately unstable. Moderate areas of erosion, high erosion potential during floods.<br>3-5 points | Unstable. Many raw, eroded areas. Obvious bank sloughing.<br>0-2 points |
| Riparian Zone Vegetation Quality<br>6 | Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes.<br>9-10 points | 50% to 80% of riparian zone is vegetated, but one class of plants is not represented.<br>6-8 points | 25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented.<br>3-5 points | Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present.<br>0-2 points |

| Adjustments<br>— | Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow. | TOTAL SCORE<br>35 |
|---|---|---|

| COMMENTS: |
|---|

| ANALYSIS DATE: 3-6-95 | ANALYST: WALTON | SIGNATURE: Albert S. Walton, Jr. |
|---|---|---|

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

# PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

| SUBMITTING AGENCY CODE: 52 / SUBMITTING AGENCY NAME: SOUTH DIST | STORET STATION NUMBER: | DATE (M/DY): 3-6-95 | TIME: 1424 | RECEIVING BODY OF WATER: SPRING CREEK |
|---|---|---|---|---|

| REMARKS: | LOCATION: IMPERIAL HARBOR UTILITIES - REFERENCE | FIELD ID/NAME: |
|---|---|---|
| FL0038 D94 | | IW-030695-4 |

## RIPARIAN ZONE/INSTREAM FEATURES

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

| Forest | Field/Pasture | Agricultural | Residential | Commercial | Industrial | Other (Specify) |
|---|---|---|---|---|---|---|
| 40 | | | 40 | | 20 | |

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

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

Point-Source Pollution (list location and describe):

| Estimated System Width (range, m): 2 | Estimated System Depth (range, m): 0.1 | yes |
|---|---|---|
| High Water Mark (m above bed): 1.0 | Velocity (range, m/s): 0.0 | Impounded [ ] Channelized [ ] |

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

## SEDIMENT/SUBSTRATE

Sediment Odors: Normal: [ ] Sewage: [ ] Petroleum: [ ] Chemical: [ ] Anaerobic: [✓] slightly 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 |
|---|---|---|---|---|---|---|---|
| Woody Debris (Snags) | 1 | 2 | | Riffles | | | |
| Leaf Packs | | | | Sand | | | |
| Aquatic Vegetation | 50 | 2 | | Mud/Muck/Silt | 29 | 1 | |
| Rock or Shell Rubble | | | | Benthic leaf mats | 20 | 2 | |
| Undercut Banks/Roots | | | | Other: | | | |

## WATER QUALITY

| | Depth (m): | Temp. (°C): | pH (SU): | D.O. (mg/l): | Cond. (µmho/cm): | | | Secchi (m): |
|---|---|---|---|---|---|---|---|---|
| Top | | | | | | | | |
| Mid-depth | 0.1 | 24.9 | 7.19 | 2.2 | 590 | | | VOB |
| Bottom | | | | | | | | |

System Type: Stream: [ ] (Sand Bottomed / Swamp & Bog / Alluvial / Sand Bot w/ Spring / Calcareous / Misc.) Lake: [ ] Wetland: [ ] Estuary: [ ] Other: [✓] DITCH

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:

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

| SAMPLING TEAM: | SIGNATURE: | DATE: |
|---|---|---|
| WALTON / PARKER | Albert S. Walton, Jr. | 3-6-95 |

# 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/DY): | RECEIVING BODY OF WATER: |
|---|---|---|---|
| | | 3-6-95 | SPRING CREEK |

| REMARKS: | LOCATION: | FIELD ID/NAME: |
|---|---|---|
| FL0038794 | IMPERIAL HARBOR UTILITY - REFERENCE | IW-030695-41 |

| Habitat Parameter / Score | Excellent | Good | Fair | Poor |
|---|---|---|---|---|
| Bottom Substrate/ Available Cover — 18 | 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 — 0 | Max. observed: >0.3 m/sec. but < 1 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, or spate occurring; > 2 m/sec 0-7 points |
| Artificial Channel/ Flow Alteration — 3 | 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 — 10 | 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 — 6 | Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. 9-10 points | 50% to 80% of riparian zone is vegetated, but one class of plants is not represented. 6-8 points | 25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. 3-5 points | Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. 0-2 points |

| Adjustments | | TOTAL SCORE |
|---|---|---|
| — | Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow. | 37 |

COMMENTS: WET PART OF DITCH - ISOLATED POOL

| ANALYSIS DATE: | ANALYST: | SIGNATURE: |
|---|---|---|
| 3-6-95 | WALTON | aSWalton |

# FDEP Biology Section — Acute Bioassay Bench Sheet

**Sample Source:** Imperial Harbor Utilities
**County:**
**Contact / District:** Walton / South
**NPDES Permit #:** FL0038794
**LIMS Sample #:** 100735 (Sample log 3/10/95) **LIMS Job #:** 95-MAR-07-20

**Sample Collection:** Date 3/6/95 Time 1255
**Test Beginning:** Date 3/7/95 Time 1500
**Test Ending:** Date 3/9/95 Time 1500
**Organism Batch #:** 13 **Diluent Batch #:** 10
**Organism Age:** < 24 hours
***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<br>9.0 @ 9.0 | 24.1 @ 24.1 | 8.2 @ 23.8 °C | 101.9 @ 104.1<br>970 @ 1000 @ 23.8 °C |
| 24 hr | 7.0 @ 7.0<br>9.0 @ 9.0 | 23.4 @ 23.3 | 8.4 @ 23.5 °C | ~~970~~ 1000 @ 104.1 *calibration written in wrong place<br>932/960 @ 1010/1004 @ 23.7 °C mf |
| 48 hr | 7.0 @ 7.0<br>9.0 @ 9.0 | 21.3 @ 21.2 | 8.7 @ 22.3 °C | 97.8 @ 104.1<br>9150/9270 @ 9836/10013 @ 22.2 °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 | UNCORRECTED 24 h | UNCORRECTED 48 h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 5 | 5 | 4 | 8.2 | ~~8~~ | 8.2 | 23.3 | | 22.3 | 8.0 | | 8.1 | 190 | ~~169~~ | 169 |
| Control | B | 5 | 5 | 5 | | | 8.3 | | | 22.3 | | | 8.1 | *~~270~~ | | 175 |
| Control | C | 5 | 5 | 5 | | | 8.3 | | | 22.1 | | | 8.1 | | | 176 |
| Control | D | 5 | 5 | 5 | | | 8.3 | | | 22.0 | | | 8.1 | | | 176 |
| 6.25% | A | 5 | 5 | 5 | 8.2 | | 8.4 | 23.4 | | 22.0 | 8.1 | | 8.3 | 270 | | 262 |
| 6.25% | B | 5 | 5 | 5 | | | 8.4 | | | 22.0 | | | 8.3 | | | 284 |
| 6.25% | C | 5 | 5 | 5 | | | 8.4 | | | 22.0 | | | 8.3 | | | 305 |
| 6.25% | D | 5 | 5 | 5 | | | 8.4 | | | 21.8 | | | 8.3 | | | 325 |
| 12.5% | A | 5 | 5 | 5 | 8.3 | | 8.5 | 23.4 | | 21.9 | 8.1 | | 8.4 | 355 | | 422 |
| 12.5% | B | 5 | 5 | 5 | | | 8.5 | | | 21.9 | | | 8.4 | | | 428 |
| 12.5% | C | 5 | 5 | 5 | | | 8.5 | | | 21.8 | | | 8.4 | | | 457 |
| 12.5% | D | 5 | 5 | 5 | | | 8.5 | | | 21.7 | | | 8.4 | | | 480 |
| 25% | A | 5 | 5 | 5 | 8.3 | | 8.5 | 23.5 | | 21.8 | 8.1 | | 8.5 | 525 | | 631 |
| 25% | B | 5 | 5 | 4 | | | 8.6 | | | 21.9 | | | 8.4 | | | 625 |
| 25% | C | 5 | 5 | 5 | | | 8.6 | | | 21.8 | | | 8.4 | | | 657 |
| 25% | D | 5 | 5 | 5 | | | 8.6 | | | 21.7 | | | 8.4 | | | 681 |
| 50% | A | 5 | 5 | 5 | 8.3 | | 8.5 | 23.5 | | 21.7 | 8.2 | | 8.4 | 945 | | 1011 |
| 50% | B | 5 | 5 | 5 | | | 8.5 | | | 21.8 | | | 8.4 | | | 998 |
| 50% | C | 5 | 5 | 5 | | | 8.5 | | | 21.8 | | | 8.4 | | | 994 |
| 50% | D | 5 | 5 | 5 | | | 8.5 | | | 21.6 | | | 8.4 | | | 984 |
| 100% | A | 5 | 5 | 4 | 8.2 | | 8.4 | 23.5 | | 21.7 | 8.2 | | 8.4 | 1670 | | 1487 |
| 100% | B | 5 | 5 | 5 | | | 8.4 | | | 21.8 | | | 8.4 | | | 1498 |
| 100% | C | 5 | 5 | 5 | | | 8.4 | | | 21.8 | | | 8.4 | | | 1486 |
| 100% | D | 5 | 5 | 5 | | | 8.4 | | | 21.7 | | | 8.3 | | | 1588 |
| Recorded by: | | MF | MF | MF | DW | | JN | DW | | JN | DW | | JN | DW | | JN |
| Measured/Loaded by: | | MF | MF | MF | TM | | LW | TM | | LW | TM | | LW | TM | | LW |

* Wrong data

**Investigators' Signatures**
Jennifer Spagnoli
Tina M. Kubala
Marshall Faircloth
Robin G. Rader
Reviewer
Form updated 10/05/94

| Water Quality Parameters | Salt Water (Well Water) | 20% Min Water | Sample | Method | Measured by |
|---|---|---|---|---|---|
| Field Total Residual Cl2 (mg/L): | | | — | — | — |
| Lab Total Residual Cl2 (mg/L): | <0.03 | <0.03 | | DR-100 | JN |
| Alkalinity (mg/L as $CaCO_3$): | ~~320~~ 125 | 75 | 320 | Hach | TR |
| Hardness (mg/L as $CaCO_3$): | ~~525~~ 120 | 80 | 525 | Hach | TR |
| Total ammonia (mg/L as N): | <0.017 | <0.017 | 0.047 | Orion | mf |

Ammonia Meter #98136 Meter Slope: -57.3
Ammonia Blank: <0.017
Control Salinity: 0 ppt
Sample Salinity: 0.8 ppt

* Wrong data TR

# FDEP Biology Section — Acute Bioassay Bench Sheet

**Sample Source:** Imperial Harbor
**County:**
**Contact / District:** AS Walton / South
**NPDES Permit #:** FL00 38794
**LIMS Sample #:** 100735 (sample log 3/10/95) **LIMS Job #:** 95-MAR-07-20

**Sample Collection:** Date 3/6/95 Time 1255
**Test Beginning:** Date 3/7/95 Time 1500
**Test Ending:** Date 3/9/95 Time 1500
**Organism Batch #:** 9 **Diluent Batch #:** well water
**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<br>9.0 @ 9.0 | 24.1 @ 24.1 | 8.2 @ 23.8 °C | 101.9 @ 104.1<br>970 @ 1000 @ 23 (lacks 6 & 10 IS) |
| 24 hr | 7.0 @ 7.0<br>9.0 @ 9.0 | 23.4 @ 23.3 | 8.4 @ 23.5 °C | 101.8 @ 104.1<br>932/9740 @ 1010/10019 @ 23.7 |
| 48 hr | 7.0 @ 7.0<br>9.0 @ 9.0 | 21.3 @ 21.2 | 8.7 @ 22.3 °C | 97.8 @ 104.1<br>9150/9770 @ 9836/10219 @ 22.2 |

| 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 | 114 | 5 | 5 | 5 | 7.8 | 8.3 | 8.4 | 25.1 | 22.3 | 21.5 | 8.4 | 8.2 | 8.5 | 255 | 240 | 237 |
| Control B | 44 | 5 | 5 | 5 | 7.8 | 8.3 | 8.4 | 25.2 | 22.4 | 21.3 | 8.4 | 8.2 | 8.4 | 255 | 240 | 235 |
| Control C | 1065 | 5 | 4 | 4 | 7.8 | 8.3 | 8.4 | 25.2 | 22.4 | 21.3 | 8.4 | 8.2 | 8.4 | 255 | 240 | 235 |
| Control D | 351 | 5 | 5 | 5 | 7.8 | 8.3 | 8.4 | 25.1 | 22.5 | 21.2 | 8.4 | 8.2 | 8.5 | 255 | 240 | 235 |
| 100% A | 222 | 5 | 5 | 5 | 8.2 | 8.3 | 8.3 | 24.1 | 23.4 | 21.3 | 8.9 | 8.2 | 8.5 | 1740 | 1660 | 1600 |
| 100% B | 75 | 5 | 5 | 5 | 8.2 | 8.3 | 8.3 | 23.9 | 22.4 | 21.2 | 9.0 | 8.3 | 8.5 | 1740 | 1660 | 1600 |
| 100% C | 41 | 5 | 5 | 5 | 8.2 | 8.3 | 8.3 | 23.8 | 22.4 | 21.1 | 9.0 | 8.3 | 8.5 | 1740 | 1640 | 1570 |
| 100% D | 503 | 5 | 5 | 5 | 8.2 | 8.3 | 8.3 | 23.9 | 22.5 | 21.1 | 9.0 | 8.3 | 8.6 | 1740 | 1650 | 1580 |
| Recorded by: | | MF | MF | MF | DW | ME | JN | DW | JRS | JN | DW | JRS | JN | DW | JRS | JN |
| Measured/Loaded by: | | MC | MF | MA | TM | JRS | LW | TM | ME | LW | TM | MC | LW | TM | MF | LW |

**Investigators' Signatures**
Marshall Faircloth, Jenna Mikulsky, Jennifer Sparapani, Robin C. Radcliffe, Jon Thomas Smith, Lori Wenzel

Reviewer

Form updated 10/05/94

**Salt Water** | **Water Quality Parameters**

| | Well Water | 20% Min Water | Sample | Method | Measured by |
|---|---|---|---|---|---|
| Field Total Residual Cl2 (mg/L): | | | — | — | — |
| Lab Total Residual Cl2 (mg/L): | <0.03 | — | 0.06 | DR-100 | JN |
| Alkalinity (mg/L as $CaCO_3$): | 120 | — | 320 | Hach | TR |
| Hardness (mg/L as $CaCO_3$): | 125 | — | 525 | Hach | TR |
| Total ammonia (mg/L as N): | <0.017 | — | 0.047 | Orion | MF |

Ammonia Meter #98136 Meter Slope: -57.3 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0.8 ppt

Benthic macroinvertebrate taxa list for Imperial Harbor Utilities, collected via 20 dip net sweeps, on 6 March 1995.

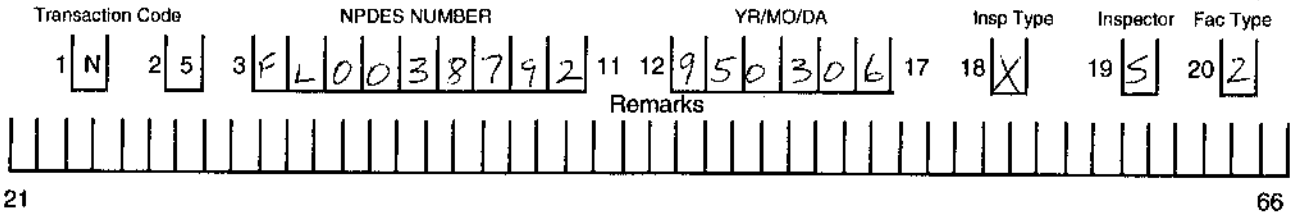
| | Reference Site | Test Site |
|---|---|---|
| **Oligochaeta** | | |
| *Dero trifida* | 8 | – |
| *Dero digitata* | 11 | – |
| *Dero vaga* | 1 | – |
| *Haemonais waldvogeli* | 6 | – |
| *Limnodrilus hoffmeisteri* | 7 | 1 |
| Undetermined Branchiobdellida | 1 | – |
| **Gastropoda** | | |
| *Ferrissia hendersoni* | – | 4 |
| *Physella* sp. | – | 8 |
| Undetermined Hydrobiidae | 2 | – |
| **Acarina** | | |
| *Arrenurus* sp. | – | 1 |
| **Amphipoda** | | |
| *Hyalella azteca* | – | 2 |
| **Decapoda** | | |
| *Palaemonetes paludosus* | 2 | – |
| **Ephemeroptera** | | |
| *Caenis* sp. | 1 | 9 |
| Undetermined Baetidae | 4 | 1 |
| **Odonata** | | |
| *Ischnura* sp. | 1 | – |
| *Ischnura ramburii* | 1 | – |
| *Libellula incesta* | 1 | – |
| *Pachydiplax longipennis* | 1 | – |
| **Hemiptera** | | |
| *Hydrometra* sp. | – | 1 |
| *Pelocoris femoratus* | – | 1 |
| **Coleoptera** | | |
| *Celina* sp. | – | 2 |
| **Trichoptera** | | |
| *Oecetis* sp. | – | 1 |
| **Lepidoptera** | | |
| Undetermined Noctuidae | – | 1 |
| **Diptera** | | |
| *Chironomus* sp. | 2 | 38 |
| *Einfeldia natchitocheae* | 1 | – |
| *Goeldichironomus* sp. | 1 | – |
| *Goeldichironomus carus* | 1 | – |
| *Goeldichironomus fluctuans* | – | 1 |
| *Kiefferulus* sp. | 7 | – |
| *Larsia decolorata* | – | 6 |
| *Palpomyia/Bezzia* grp. | – | 1 |
| *Polypedilum* | 1 | – |
| *Polypedilum tritum* | 5 | 4 |

| | | |
|---|---|---|
| *Polypedilum illinoense* grp. | – | 10 |
| *Pseudochironomus* | – | 9 |
| *Tanypus* sp. | 6 | 1 |
| *Tanypus carinatus* | 2 | – |
| *Tanytarsus* sp. | 1 | 12 |
| *Tanytarsus* sp. L Epler | 3 | – |
| *Tanytarsus* sp. U Epler | – | 1 |
| *Tanytarsus* sp. T Epler | – | 2 |
| *Tanytarsus* sp. G Epler | 1 | 2 |
| *Zavreliella marmorata* | 1 | – |
| Undetermined Chironomidae | 1 | 2 |

Phytoplankton taxa list and densities (#/mL) for Imperial Harbor Utilities, collected via subsurface grabs on 6 March 1995.

| | Reference Site | Test Site |
|---|---|---|
| **Cyanophyceae** | | |
| *Anabaena* | 1 | – |
| *Chroococcus* | 3 | 5 |
| *Gloeocapsa* | – | 2 |
| *Lyngbya* | 1 | 1 |
| *Merismopedia* | – | 3 |
| *Oscillatoria* | – | 3 |
| **Bacillariophyceae** | | |
| *Cocconeis* | – | 2 |
| *Eunotia* | – | 4 |
| *Gomphonema* | – | 2 |
| *Gyrosigma* | 2 | – |
| *Navicula* | 10 | 2 |
| *Nitzschia* | 4 | 2 |
| *Pinnularia* | 3 | 1 |
| *Synedra* | – | 1 |
| Undetermined pennate diatom | 1 | 2 |
| **Chlorophyceae** | | |
| *Gonatozygon* | – | 2 |
| *Oocystis* | – | 1 |
| **Cryptophyceae** | | |
| *Cryptomonas* | 2 | 4 |

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




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