

Biological Assessment of

City of Jacksonville Mandarin STP

Duval County

NPDES #FL0023493

Sampled 25 June 1991

October 1991

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: City of Jacksonville Mandarin STP
County: Duval
NPDES Number: FL0023493
State Permit Expiration Date:

Toxics Sampling Inspection (XSI)

Date Sampled: 25 June 1991

Results: 770 µg/L of aliphatic hydrocarbons (C6-18) present in the sample which could have contributed to toxicity observed in bioassays. Bis (2-ethylhexyl) phthalate (86 µg/L) was also found and is highly bioaccumulative and chronically toxic at 358 µg/L. Copper measured in the effluent violated Class III standards.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 25 June 1991

Results: Acutely toxic to *Ceriodaphnia dubia* within 24 hours. No mortality in *Notropis leedsi* tests.

Impact Bioassessment Inspection (IBI)

Date Sampled: 25 June 1991

Results: Algal population community structure was typical of mesotrophic systems. Chlorophyll *a* values were elevated and indicative of nutrient enriched conditions. Macroinvertebrate communities throughout the reach were depressed, suggesting stress. Without a much more intensive biological study, it would be impossible to differentiate between the many potential causes (multiple point source discharges, stormwater runoff, dredging) for the observed biological disturbances. The data, however, indicate that the Mandarin STP is a contributor to the environmental stress in this reach of the St. Johns River.

Water Quality Inspection (WQI)

Date Sampled: 25 June 1991

Results: Nutrients in the effluent were elevated, and contributed to the high levels of nutrients found at the three river stations. Effluent unionized ammonia (0.16 mg/L) was in the acutely toxic range. This reach of the St. Johns river had higher nitrate+nitrite and TKN concentrations than 90% and 95% of all statewide estuaries, respectively. AGP values were much lower than expected based on nutrient results, suggesting algal inhibition. Copper (found in the effluent at 35 µg/L) can depress algal growth at 5 µg/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 City of Jacksonville Mandarin Sewage Treatment Plant (#5), located in Duval County, is a 5.0 MGD activated sludge domestic wastewater treatment facility. The effluent is disinfected (via chlorine), dechlorinated, and then flows to a holding pond before final discharge through a 8000 foot force main to the St. Johns River (see map in Appendix). The plant has been operating at below design capacity (average 3.1 MGD discharge).

Permit limits are as follows: BOD (20 mg/L annual average), TSS (20 mg/L annual average), nitrate (12 mg/L annual average), fecal coliforms (200 org./100 mL), pH (6 – 8.5), and chlorine (minimum of 0.5 mg/L for disinfection, maximum in effluent after dechlorination of 0.01 mg/L).

This facility has sporadically violated permit limits for BOD, TSS, and the minimum and maximum chlorine residuals. Bioassay tests indicate that the effluent has been toxic.

Planned modifications to the plant include the construction of DynaSand filtration as well as other pumping and piping improvements. The City of Jacksonville also intends to expand to 7.5 MGD and upgrade the facility (to meet a BOD of 5 mg/L and a TSS of 5 mg/L) in the near future.

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 at the mouth of Julington Creek where it enters the St. Johns River and two test sites located about 0.5 miles north of and 0.5 miles south of the discharge). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Peltier and Weber 1985, FDER 1985). The effluent was analyzed for metals and for organic constituents (base neutrals, acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on reference and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Collection methods consisted of three Ponar dredges per station. Phytoplankton was collected via sub-surface grab samples. Chlorophyll a was also determined

Major characteristics of community structure of control and test sites.

	Control Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	3	14	5
Shannon-Weaver Diversity	.59	3.0	2.1
% Gastropoda	89.4	7.9	40.3
% Pelecypoda	3.4	31.9	9.7
% Polychaeta	0	22.3	20.2
% Diptera	7.2	25.3	29.8
% Malacostraca	0	4.7	0
% Rhynchocoela	0	3.2	0
% Other	0	4.6	0
% Predators	7.2	21.4	23.4
% Collector-Gatherers	0	34.9	23.4
% Collector-Filterers	3.4	33.5	9.7
% Scrapers	89.4	8.7	40.3
% Shredders	0	1.6	3.2
Phytoplankton Algae			
Number of Taxa	24	25	25
% Contribution of Dominant Taxon	16.8	15.0	16.9
Chlorophyll a (ug/L)	14.12	8.98	12.83
Diatom/B-G Abundance Ratio	0.36	0.45	0.43
% Cyanophyta	32.8	21.8	26.9
% Chlorophyta	46.6	34.7	39.2
% Bacillariophyta	18.3	17.6	20.0
% Cryptophyta	1.5	21.8	10.8
% Other	0.8	4.2	3.0
Algal Growth Potential (mg dry wt/l)	4.117	3.712	4.263

for phytoplankton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

The following personnel were involved in this investigation: Wayne Magley and Doug Gilbert (DER Point Souce Evaluation Section), Jim Wright (DER Northwest District), and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results

The St. Johns river in the vicinity of the Mandarin STP is a heavily urbanized, tidally influenced area. Anthropogenic discharges in this reach include extensive amounts of urban runoff and industrial and domestic wastes. The river has been highly altered by channelization and seawall construction. The biota in this area are stressed by wide fluctuations of salinity. Finally, due to the tides, water current patterns are complex, and it is difficult to determine the spatial extent and influence of the high numbers of potential pollution sources. Lee Banks, a DER biologist who has worked on the St. Johns river for over 15 years, indicated that a relatively unimpaired reference site is not available within 20 miles of the Mandarin STP (personal communication). For example, in 1987, Mote Marine Laboratory sampled the St. Johns River at the mouth of Julington Creek, which was the reference site in the present study. They found sediment enrichment of heavy metals, coprostinol, and chlorinated pesticides. It is important to keep these facts in mind throughout this discussion, as the reference site in this study was subject to anthropogenic inputs.

Habitat assessment scores at the test sites (with 45 points) were comparable to that of the reference site (55 points). Physical/chemical measurements were fairly similar at three sites. During the sampling, the water at the stations was warm (over 29.0 °C), adequately oxygenated near the bottom (5.4 mg/L at the reference, 5.8 mg/L at the test sites), brackish (1580 µmhos/cm2 at the reference, 1880 µmhos/cm^2 at the test sites), with a near neutral pH (6.8 to 6.9).

The Mandarin STP effluent was acutely toxic to the water flea, *Ceriodaphnia dubia*, killing all organisms in the full strength sample within 24 hours. No mortality was noted in tests using *Notropis leedsi*.

Several organic constituents were detected in the effluent, including Bis (2-ethylhexyl) phthalate (86 µg/L (estimated)), aliphatic chains with 6 to 18 carbons (770 µg/L), alkyl sub benzene (30 µg/L), and a pyridine derivative (60 µg/L). Other organics found near quantitation limits included Diethylphthalate (3.4 µg/L), Naphthalene (5.6 µg/L), and 2,4-Dimethylphenol (2.7 µg/L).

A few of these contaminants are of concern. Bis (2-ethylhexyl) phthalate has been found to be chronically toxic to *Daphnia magna* at 358 µg/L, and highly bioaccumulative (3,600 times) in the amphipod, *Gammarus psuedolimnaeus* (EPA Ambient Water Quality Criteria Document). Short chain aliphatics (e.g. Number 2 fuel oil) may be acutely toxic at concentrations as low as 100 µg/L to 400 µg/L (Dye and Frydenborg 1980). The presence of 770 µg/L of C6-18 aliphatics in the effluent suggests that they may have contributed to the toxicity observed in the *Ceriodaphnia dubia* bioassay.

Five different metals were detected in the discharge: aluminum (199 µg/L), cadmium (0.3 µg/L), copper (35 µg/L), iron (282 µg/L), and zinc (36 µg/L). The concentration of copper exceeded Class III standards.

Nutrients in the effluent were elevated, including total phosphorus (4.8 mg/L), ammonia (11 mg/L), nitrate-nitrite (0.47 mg/L), and TKN (19 mg/L). Based on field parameters taken at the outfall, the unionized ammonia was calculated to be 0.16 mg/L. This is a violation of the unionized ammonia standard. This unionized ammonia value is also in the toxic range.

Nutrient concentrations at all the ambient St. Johns River stations (including the Reference and 2 test sites) were much higher than those found in typical Florida estuaries (see appendix). STORET data from 1700 estuary stations, for the period of 1980 to 1989, have been compiled into a percentile distribution, also found in the Appendix (Joe Hand, personal communication). Data from this

present investigation were evaluated against these.

The three stations were very similar with regard to the degree of nutrient enrichment exhibited. Total phosphorus found in this reach of the St. Johns was greater than 75% of all other Florida estuaries. Similarly, the ammonia, nitrate+nitrite, and TKN values detected there were higher than 70%, 90%, and 95% of other estuaries statewide, respectively.

Despite these elevated nutrient concentrations, algal growth potential at the three sites was approximately 1 mg below the established 5 mg algal dry wt/L eutrophication threshold (Raschke and Schultz 1987). When nutrient levels are considered, the AGP results suggest algal inhibition. As previously noted, 35 µg/L of copper was detected in the effluent. Copper is known to depress algal growth at 5 µg/L (EPA Ambient Water Quality Criteria Document).

Macroinvertebrate communities exhibited a patchy distribution and were relatively depressed throughout area. The reference site (near Julington Creek) and Test Site #2 (south of the discharge) possessed only 3 and 5 taxa, respectively (see Table). Although the test site 0.5 miles north of the discharge had more different types of organisms (14), all of these taxa richness values are considered low compared to similar, yet fairly undisturbed ecosystems. For example, a station in the St. Marys River (north of the present study area) with an analogous salinity regime yielded an average of 21.5 taxa with a Shannon-Weaver diversity of 3.7 (Lee Banks, personal communication). Diversities in the Mandarin area ranged from 0.6 to 3.0. The types of organisms collected from all sites are typically resistant to pollution.

Without a much more intensive biological study, it would be impossible to differentiate between the many potential causes of the observed biological stress. These include multiple point source discharges, stormwater runoff, and dredge and fill activities (channelization and seawall construction).

The algal communities at the three sites were very similar with respect to composition and structure, and typical of mesotrophic waters. Chlorophyll *a* values were higher than about 75% of the rest of Florida's estuaries (Joe Hand personal communication). This elevated phytoplankton biomass (as measured by chlorophyll *a* content) was probably a consequence of the nutrient loading in the area.

Conclusions

The Mandarin STP discharge was acutely toxic to the invertebrate, *Ceriodaphnia dubia*, killing all organisms in the full strength sample within 24 hours. No mortality was noted in tests using the fish, *Notropis leedsi*.

The observed toxicity may have been caused by the 770 µg/L of aliphatic hydrocarbons (C6-18) present in the sample. Bis (2-ethylhexyl) phthalate (86 µg/L), which is highly bioaccumulative and chronically toxic at 358 µg/L, is also a cause for concern.

Copper measured in the effluent violated Class III standards. Nutrients in the effluent were elevated, and contributed to the high levels of nutrients found at the three river stations. A violation of the unionized ammonia standard was detected in the effluent. Unionized ammonia was also present at concentrations (0.16 mg/L) which are acutely toxic.

This reach of the St. Johns river had higher nitrate+nitrite and TKN concentrations than 90% and 95% of all Statewide estuaries, respectively.

AGP values were much lower than expected based on nutrient results, suggesting algal inhibition. Copper (found in the effluent at 35 µg/L) can depress algal growth at 5 µg/L.

Algal population community structure was typical of mesotrophic systems. Chlorophyll *a* values were elevated and indicative of nutrient enriched conditions. Macroinvertebrate communities throughout the reach were depressed, suggesting stressed conditions.

Without a much more intensive biological study, it would be impossible to differentiate between the many potential causes (multiple point source discharges, stormwater runoff, dredging) for the observed biological disturbances. The data presented here certainly indicate that the Mandarin STP is a contributor to the environmental stress in this reach of the St. Johns River.

Literature Cited

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

Dye, C. W. and R B. Frydenborg. 1980. Oil dispersants and the environmental consequaences of their usage: A literature review. Fla. Dept. Environmental Regulation Technical Series 5(1): 1-51.

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

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

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

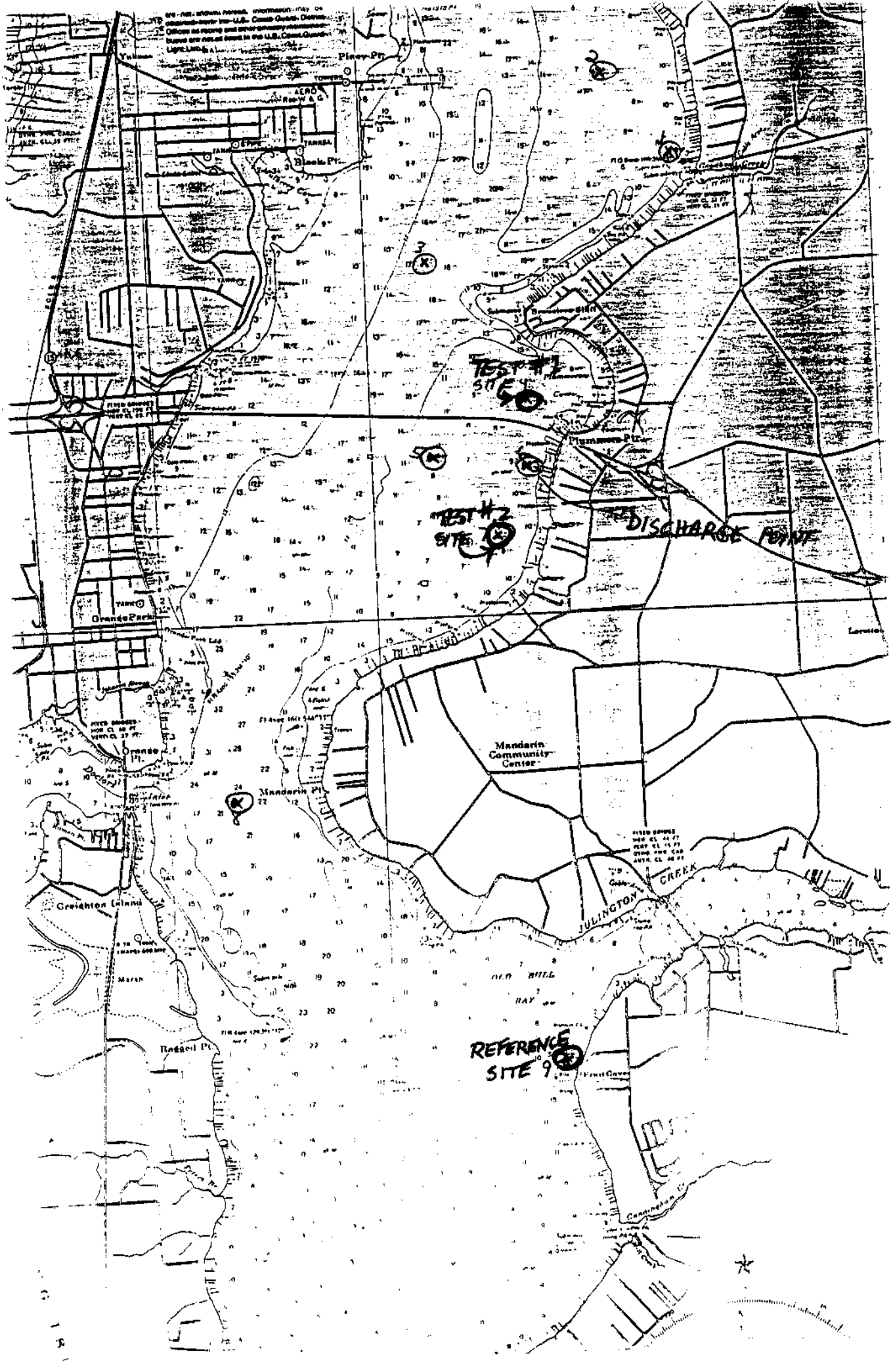
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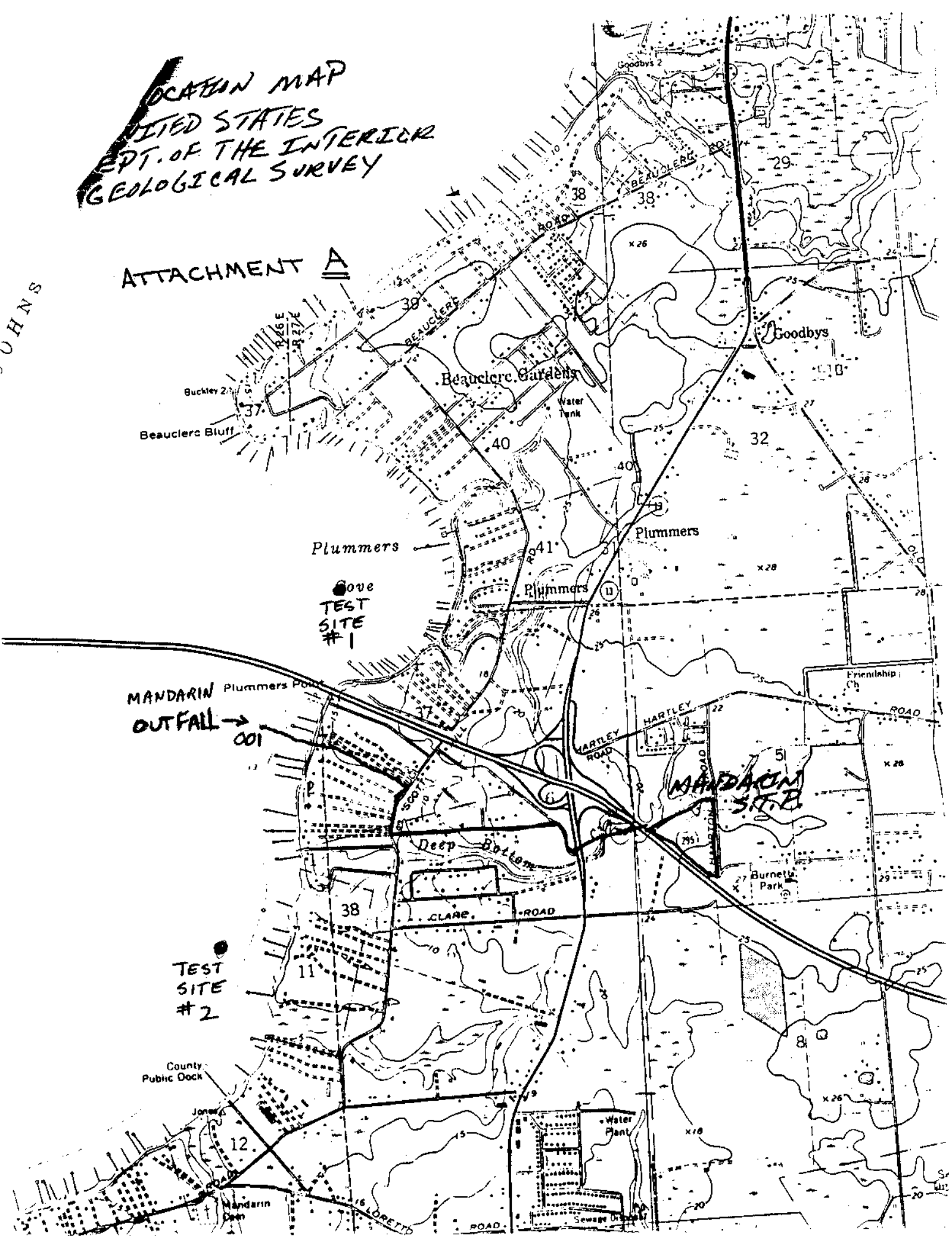
Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

Typical Estuarine STORET Values Based on 1980 – 1989 Period
(Produced by Joe Hand DER Standards & Monitoring)

Parameter	Percentile Distribution				
	10	**30**	**50**	**70**	**95**
BOD5 (mg/L)	0.70	1.10	1.50	1.90	4.00
Chl *a* - corrected (µg/L)	3.28	5.13	6.93	9.60	22.20
DO (mg/L)	5.00	6.10	6.60	7.10	9.00
TKN (mg/L)	0.34	0.50	0.69	0.82	1.49
NH3 +NH4 (mg/L	0.02	0.04	0.06	0.09	0.28
NO2+NO3 (mg/L)	0.00	0.01	0.02	0.05	0.23
TP (mg/L)	0.02	0.07	0.11	0.17	0.59
FC (MFM/100 mL)	4.0	10.0	15.0	40.0	396.0
TC (MFI/100 mL)	7.0	24.0	65.0	100.0	1300.0
Total Residual (NFLT mg/L)	7.0	11.5	19.0	25.6	76.0
Secchi (m)	0.60	0.80	1.0	1.2	2.6
Water Temp (°C)	20.27	24.00	25.00	26.20	29.10

Mandarin revised




LOCATION MAP
UNITED STATES
DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
ATTACHMENT A
Goodbys 2
BEAUCLERC ROAD
Beauclerc Gardens
Water Tank
Buckley 2
Beauclerc Bluff
Goodbys
Plummers
Plummers Cove
TEST SITE #1
MANDARIN
OUTFALL → 001
Plummers Point
HARTLEY ROAD
Friendship Ch
MANDARIN S.T.P.
Deep Bottom
CLARE ROAD
Burnett Park
TEST SITE #2
County Public Dock
Jones
Mandarin Oaks
LORETTO ROAD
Water Plant
Sewage Outfall

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: City of Jacksonville Mandarin STP #5		**Prepared by:** Kathleen H. Gerard **Date:**
Location (attach detailed map): 10828 Hampton Road Jacksonville, Florida	**County** Duval	**District** Northeast
Federal Permit # and expiration date: FL0023493 permit pending - hearing requested	**State GMS # and State expiration date:** 3116P03343 DC16-165373 12/31/92	**Facility Type:** Industrial Municipal Federal Agricultural Other (list):

Function of facility:

Wastewater Treatment -Domestic

Description of treatment process:

This is a 5.0 MGD activated sludge wastewater facility with chlorination, dechlorination with discharge to an effluent holding pond and then to the St. Johns River.

The plant will soon be modified to include the construction of DynaSand filtration and other piping and pumping modifications.

Receiving waters: St. Johns River	**Classification:** III
Design Flow: 5.0 MGD	**Actual Mean Flow:** 3.12841

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

therefore, the best time to sample is:

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

List effluent limits:

Parameter	Limit (units)
BOD_5	20 mg/l Annual Avg.
TSS	20 "
NO_3-N	12 "
Fecal Coliforms	200 No. per 100 ml.
pH	6 - 8.5
Chlorine Residual	Min. 0.5 mg/l Max. 0.01

Describe special permit conditions and permit modifications:

See attachments for numerous Specific conditions.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):

8000' force main to the St. Johns River. It is located approximately 2000' south of the Buckman Bridge on the east shore of the river.

See attachment.

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

Sporadic violations of BOD_5, TSS, minimum chlorine residual, maximum chlorine residual
Toxic bioassays

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

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

Additional information:

The City of Jacksonville is currently planning to expand and upgrade this facility.

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		6/25/91	St. Johns

REMARKS:	LOCATION:	FIELD ID/NAME:
	STATION 4	MANDARIN TEST SITES

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations — 5	None—Unaltered shoreline. **9-10 points**	Mostly natural shoreline, but with occasional riprap. **6-8 points**	Shoreline consisting mostly of riprap and vertical seawalls. **3-5 points**	Shoreline consisting almost entirely of vertical seawalls. **0-2 points**
Community Types Observed — 45	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. **38-50 points**	Two or three communities observed from those listed. **26-37 points**	One community observed from those listed. **13-25 points**	No communities observed from those listed. **0-12 points**
Tidal Fluctuation — 3	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations — 5	Only natural runoff.. **9-10 points**	Mostly natural runoff, but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action — 5	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type — 3	Combination of sand, gravel, and shell. **12-15 points**	Primarily sand, with small areas of mud. **8-11 points**	Mixture of sand and mud, or well-aerated mud only. **4-7 points**	Anaerobic mud. **0-3 points**

TOTAL SCORE 45

COMMENTS: THIS SCORE USED FOR TEST SITES 1 and 2.

ANALYSIS DATE:	ANALYST:	SIGNATURE:
6/25	G. Hebert	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
		6/25/91	St. Johns

REMARKS:	LOCATION:	FIELD ID/NAME:
	4 TEST SITE #1	

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			75	15	10	

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

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

Point Source Pollution (list location and describe):

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

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

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

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):			
Top	29.5	7.1	Secchi Depth (m):	2.2	
Mid-depth	29.4	6.2	pH (SU):	6.9	BOT
Bottom	29.0	5.8	Conductivity (umho/cm):	1880	BOT
			Other Parameters:		

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

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

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

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

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

Weather Conditions:

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:

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

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			St. Johns River

REMARKS:	LOCATION:	FIELD ID/NAME:
From memory Original Lost	STATION 9	MANDARIN REFERENCE SITE

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations 7	None—Unaltered shoreline. **9-10 points**	Mostly natural shoreline, but with occasional riprap. **6-8 points**	Shoreline consisting mostly of riprap and vertical seawalls. **3-5 points**	Shoreline consisting almost entirely of vertical seawalls. **0-2 points**
Community Types Observed 26	At least four communities observed from the following list: mangrove swamp, marsh, oyster bar, grass bed, reef, saltern, natural beach, or tidal creek. **38-50 points**	Two or three communities observed from those listed. **26-37 points**	One community observed from those listed. **13-25 points**	No communities observed from those listed. **0-12 points**
Tidal Fluctuation 4	>0.75 m. **4-5 points**	0.5 - 0.75 m. **3 points**	0.25 - 0.5 m. **2 points**	<0.25 m. **0-1 point**
Freshwater Discharges/ Alterations 5	Only natural runoff.. **9-10 points**	Mostly natural runoff; but with a few, small stormwater sources. **6-8 points**	Considerable stormwater discharge from local roads, parking lots, etc. **3-5 points**	Extensive manmade discharges, especially from canals draining large tracts of land. **0-2 points**
Flow and Wave Action 9	Light to moderate wave action present except under the harshest weather conditions. Flow unrestricted by manmade structures. **9-10 points**	—	—	Heavy wave action sometimes present even during average weather conditions, or flow restricted by manmade structures so that velocities are very high. **0-2 points**
Sediment Type 4	Combination of sand, gravel, and shell. **12-15 points**	Primarily sand, with small areas of mud. **8-11 points**	Mixture of sand and mud, or well-aerated mud only. **4-7 points**	Anaerobic mud. **0-3 points**

TOTAL SCORE 55

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
	DGilbert	Dana R. Gilbert

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y):	RECEIVING BODY OF WATER:
			St. Johns River

REMARKS:	LOCATION:	FIELD ID/NAME:
From memory original sheets lost	STATION 9	MANDARIN REFERENCE SITE

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			75	20	5	

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 Stream Width (range, m): 4000	Estimated Stream Depth (range, m): 0-7.6		yes
High Water Mark (m above bed): 1?	Velocity (range, m/s): ± .9	Impounded ☐	
		Channelized ☑	

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

SEDIMENT/SUBSTRATE

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

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

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

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	50
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell		Coarse Organic Debris:	25
Sand:		Mud/Muck (organic):	25

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top			Secchi Depth (m):	
Mid-depth			pH (SU):	
Bottom			Conductivity (µmho/cm):	
			Other Parameters:	

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

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

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

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

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

Weather Conditions: Raining (thunderstorm)

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
	DKGilbert	Dwight K. Gilbert

Chemistry summary table for Mandarin STP.

	Effluent	Reference Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
Bis (2-ethylhexyl) phthalate	86 J			
Diethylphthalate	3.4 T			
Naphthalene	5.6 T			
2, 4-Dimethylphenol	2.7 T			
C 6-18 Aliphatics	770			
Alkyl sub Benzene	30			
Pyridine derivative	60			
Metals (ug/L)				
Aluminum	199			
Arsenic				
Cadmium	0.3			
Copper	35			
Chromium				
Iron	282			
Lead				
Mercury				
Nickel				
Silver				
Zinc	36			
Nutrients (mg/L)				
Ortho-phosphorus		0.06	0.1	0.1
Total phosphorus	4.8	0.24	0.17	0.22
Ammonia	11	0.06	0.09	0.1
Nitrate+Nitrite	0.47	0.16	0.21	0.19
TKN	19	1.7	1.1	1.6
Other Parameters				
Habitat Assessment		55	45	45
D.O.		5.4	5.8	5.8
pH		6.8	6.9	6.9
Conductivity/Salinity		1580	1880	1880
Temperature		29.4	29.0	29.1

Sample Source: Mandarin WWTP
Address/City: Hampton
County: Duval
Contact/District: Wayne Magley / NE
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 6/25/91 Time 11:30
Test Beginning: Date 6/26/91 Time 11:30
Test Ending: Date 6/27/91 Time 1030
Test Organism: C. dubia
Life Stage/Age: < 24 hours

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

Remarks:
Terminated @ 24 hours

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7@7.909	8.9@21°	1356@23.3 @1364	20.7@23.2
24 hr	7@7.909	8.8@22°	1358@23.3 @1367	23.3 20.6@23.3
48 hr	@7.909	8.9@21°	1358@23.3 @1362	20.3@22.9

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control		5	5		9.2	8.9		8.3	8.3		20.2	20.0		171	180	
Control		5	5													
Control		5	5													
Control		5	5													
100%		5	0		9.1	9.0		7.4	8.4		19.5	21.0		807	846	
100%		5	0													
100%		5	0													
100%		5	0													
Measured/Loaded by:		MF	MF	MF	MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		MF	MF	MF	AZ	AZ		AZ	AZ		AZ	AZ		AZ	AZ	

Investigators' Signatures
Alison Jordan
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:	[redacted]			Hach	MF
Lab Tot. Resid. Cl2:	[redacted]		0	HACH	MF
Alkalinity:	122	70	150	Hach	AZ
Hardness:	125	100	245	Hach	AZ
Total Ammonia:	0.0	0.0	1.2	Hach	MF

Ammonia meter slope: _____

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Mandarin WWTP
Address/City: Hampton
County: Duval
Contact/District: Wayne Magley / NE
NPDES Permit #: _____ **Outfall #:** _____

Sample Collection: Date 6/25/91 Time 11:30
Test Beginning: Date 6/26/91 Time 11:30
Test Ending: Date 7/2/91 Time 12:30
Test Organism: N. Tecase
Life Stage/Age: 24 hour

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

Remarks:

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7@7.9@9	8.4@21	1356@23.3 @1364	20.7@23.2
24 hr	7@7.9@9	8.8@22	1352@23.5 @1367	20.8@23.3
48 hr	10@7.7@9	5.9@21	1332@23.5 @1373	20.3@22.9

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	62	5	5	5	9.2	8.0	8.1	7.8	8.0	8.1	20.8	20.5	19.8			
Control	92	5	5	5	9.2	8.0	8.1	7.8	8.0	8.1				240	241	241
100%	77	5	5	5	9.2	7.3	7.7	7.4	7.8	8.0	19.1	20.3	19.9			
100%	68	5	5	5	9.2	7.3	7.7	7.4	7.8	7.9				861	877	850
Measured/Loaded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF
Recorded by:		MF	MF	MF	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ

Investigators' Signatures

Alison Jordan
Marshall Faircloth

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:	[illegible]			Hach	MF
Lab Tot. Resid. Cl2:			0	HACH	MF
Alkalinity:	122	70	150	HACH	AJ
Hardness:	125	100	245	HACH	AJ
Total Ammonia:	0.10	0.0	1.2	Hach	MF

Macroinvertebrate taxa list collected via ponar dredge for Mandarin WWTP, Duval County, Florida on 25 June, 1991.

	Reference Site	Test Site #1	Test Site #2
Rhithropanopeus harrisii	0	12	0
Coelotanypus scapularis	25	125	25
Cryptochironomus sp.	0	12	0
Polypedilum scalaenum	0	37	12
Procladius sp.	0	12	0
Rheotanytarsus exiguus grp.	0	12	0
Caenis sp.	0	12	0
Littoridinops ? sp.	312	62	50
Hyalella azteca	0	37	0
Undetermined oligochaete sp.	0	12	0
Undetermined mytillid sp.	0	25	0
Rangia cuneata	12	225	12
Streblospio benedicti	0	175	25
Prostoma rubra	0	25	0

Phytoplankton taxa list for Mandarin Sewage Treatment Plant, collected 25 June, 1991.

	Test Site #1	Sta 005	Sta 006	Test Site #2	Reference Site
Bacillariophyta					
Achnanthes sp.	–	176	129	220	–
Bacillaria sp.	516	–	–	–	43
Cocconeis sp.	–	–	–	–	43
Coscinodiscus sp.	43	44	43	–	129
Cyclotella sp.	387	–	86	88	129
Melosira sp.	129	264	387	396	215
Navicula sp.	43	–	43	264	215
Nitzschia sp.	344	264	215	132	215
Pinnularia sp.	–	–	43	–	–
Rhizosolenia sp.	–	–	–	–	43
Synedra sp.	–	44	–	44	–
Chlorophyta					
Ankistrodesmus sp.	129	–	43	44	215
Chlamydomonas sp.	129	88	86	176	43
Chlorogonium sp.	43	–	43	44	43
Closterium sp.	86	44	43	44	–
Coelastrum sp.	–	–	43	–	–
Unknown chlorophyte flagellate	387	132	86	440	430
Gloeocystis sp.	86	–	–	44	129
Golenkinia sp.	129	44	–	–	–
Gonium sp.	–	–	–	44	–
Pandorina sp.	–	44	–	–	–
Scenedesmus sp.	430	44	430	220	559
Spermatozoopsis sp.	301	352	387	308	301
Staurastrum sp.	–	–	86	–	–
Tetraedron sp.	–	–	–	–	43
Treubaria sp.	–	–	43	–	–
Ulothrix sp.	1160	615	1418	879	859
Chrysophyta					
Mallomonas sp.	215	88	172	–	43
Cryptophyta					
Cryptomonas sp. 1	559	88	172	176	–
Cryptomonas sp. 2	1246	572	730	440	86
Cyanophyta					
Anabaena sp.	–	–	43	–	–
Aphanocapsa sp.	86	–	43	–	43
Chroococcus sp.	1160	703	730	967	945
Lyngbya sp.	–	–	86	–	–
Merismopedium sp.	215	132	301	220	43
Microcystis sp.	–	264	86	176	215
Oscillatoria sp.	215	220	86	176	601
Rhabdoderma sp.	129	–	–	–	–

Euglenophyta					
Euglena sp.	–	–	43	44	–
Phacus sp.	–	–	–	44	–
Pyrrhophyta					
Glenodinium sp.	129	132	172	88	–

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0023493 11	12 910625 17	18 X	19 S	20 1

Remarks

21 66

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

Transaction Code	NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N 2 5	3 FL0023493 11	12 910625 17	18 B	19 S	20 1

Remarks

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