

Biological Assessment of

Navarre Beach Sewage Treatment Plant

Santa Rosa County

NPDES #FL0023981

Sampled October 1991

March 1992

Biology Section
Division of Technical Services

Department of Environmental Regulation

Results of Fifth Year Inspections

Discharger: Navarre Beach STP
County: Santa Rosa
NPDES Number: FL0023981
State Permit Expiration Date:

Toxics Sampling Inspection (XSI)	
Date Sampled:	8 October 1991
Results:	Analysis for organic constituents revealed the presence of unidentified aliphatic compounds at 130 µg/L. The metals scan detected aluminum (32 µg/L), copper (19 mg/L), iron (17 µg/L), and zinc (15 µg/L). Copper was in violation of Class III standards for marine waters.

Results:

Compliance Biomonitoring Inspection (CBI)	
Date Sampled:	8 October 1991
Results:	The Navarre Beach STP effluent was not toxic to *Ceriodaphnia dubia*.

Impact Bioassessment Inspection (IBI)	
Date Sampled:	8 October 1991
Results:	Benthic macroinvertebrate and phytoplankton communities in Santa Rosa Sound were healthy. No biological degradation was associated with the Navarre Beach STP discharge.

Water Quality Inspection (WQI)	
Date Sampled:	8 October 1991
Results:	While certain nutrients in the effluent were somewhat elevated (*e.g.*, NO_2NO_3 at 11 mg/L and total phosphorus at 3.0 mg/L), no nutrient enrichment was observed in Santa Rosa Sound. In fact, all nutrient species measured at the reference and test sites were at or below detection limits. Algal growth potential levels corresponded to the low nutrient concentrations at the study sites. Similarly, coliform bacteria counts were very low in the effluent sample and at the Santa Rosa Sound study sites.

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 Navarre Beach Sewage Treatment Plant is located on Santa Rosa Island in Santa Rosa County, Florida (see map in Appendix). The 0.9 MGD domestic waste facility utilizes oxidation ditches, tertiary filters, a holding pond, and dechlorination equipment before discharging the treated effluent into Santa Rosa Sound. The discharge is located adjacent to waters designated as Class II (appropriate for shellfish harvesting). The plant is operating at substantially less than design capacity, as actual mean flow has been only 0.17 MGD.

Permit limits are as follows: flow (0.9 MGD), pH (6.0-8.5 S.U.), chlorine residual (0.01 mg/L maximum), BOD (5 mg/L maximum annual average), TSS (5 mg/L maximum annual average), fecal coliform (14 colonies/100 ml maximum), total phosphorus (5 mg/L maximum annual average), and total nitrogen (9 mg/L maximum annual average). Permit limits have been exceeded for chorine residual and pH on several occasions during the past year. No other problems have been reported for this facility.

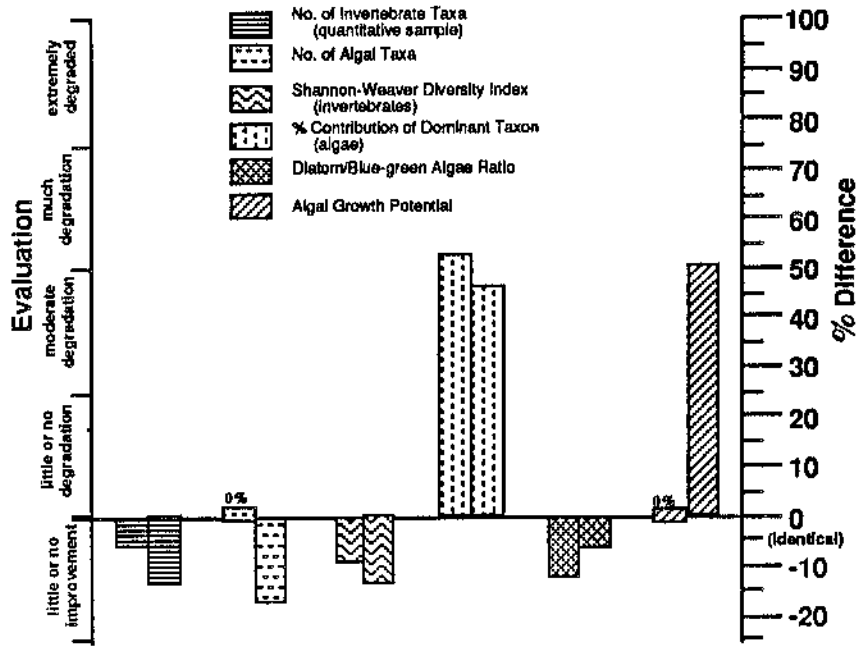
Methods

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 approximately 0.5 miles east of the outfall) and two test sites bracketing the discharge (see map in Appendix). A habitat assessment was performed in *situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. An acute screening toxicity bioassay, using *Ceriodaphnia dubia* as the test organism, was performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and for organic constituents (base neutral and acid extractables, and pesticide extractables). Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected via three Ponar grabs per site (Ross 1990). Phytoplankton was sampled at reference and test sites by subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Bacterial populations were analyzed for total and fecal coliforms following the methods of APHA (1989). Algal Growth Potential tests, using *Selenastrum capricornutum* on the freshwater effluent, and *Dunaliella tertiolecta* on saline receiving waters,

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site 1	Test Site 2
Macroinvertebrate Ponar			
Number of Taxa	29	31	33
Shannon-Weaver Diversity	3.7	4.0	4.2
% Polychaeta	48.1	28.9	40.6
% Decapoda	11.2	5.7	4.1
% Gastropoda	9.1	15.0	13.2
% Malacostraca	16.4	21.4	16.2
% Cephalochordata	3.0	16.2	11.1
% Others	12.2	12.8	14.8
% Predators	49.3	38.9	39.0
% Collector-Gatherers	34.5	42.8	44.8
% Collector-Filterers	6.5	6.5	12.2
% Scrapers	9.7	11.8	4.0
Phytoplankton Algae			
Number of Taxa	23	23	27
% Contribution of Dominant Taxon	9.2	14.3	13.9
Diatom/Blue-green Abundance Ratio	0.84	0.94	0.9
% Blue-green	13.8	5.4	8.8
% Green	7.7	8.9	3.7
% Pyrrophyta	3.1	3.6	3.8
% Others	0	0	1.5
% Diatoms	73.8	82.1	83.7
Algal Growth Potential (mg dry wt/l)	0.2	0.3	0.2



Effect of discharge on receiving water
(measured as difference between control and test sites).
(Left bar represents a comparison between control site and test site one; right bar represents a comparison between control site and test site two.)

followed Miller *et al.* (1978) and EPA (1974).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, and chlorophyll *a* are well known. Others are briefly explained here. Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (% composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (functional feeding groups).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, and the diatom to blue-green algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Glenn Butts (DER Northwest District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

The study area can best be characterized as a moderate salinity bay system formed behind a barrier island. Habitat quality was acceptable at all sites, ranging from 53 points at test site 1 to 68 points at the reference site. Land use in the area was predominantly residential and commercial. The study sites were similar with respect to many physical/chemical parameters, such as dissolved oxygen (all above 8.1 mg/L), pH (7.0 standard units), salinity (near 18 ppt), and substrate composition (clean sand and shell). A small patch of the seagrass, *Halodule* sp., which was absent at the test sites, was observed at the reference site.

The Navarre Beach STP effluent was not toxic to *Ceriodaphnia dubia*. No organisms died during the 48 hour test (Appendix). Analysis for organic constituents revealed the presence of unidentified aliphatic compounds at 130 µg/L. The metals scan detected aluminum (32 µg/L), copper (19 µg/L), iron (17 µg/L), and zinc (15 µg/L). The copper concen-

tration was in violation of Class III standards for marine waters.

Although certain nutrients in the effluent were somewhat elevated (e.g., NO_2NO_3 at 11 mg/L and total phosphorus at 3.0 mg/L), no nutrient enrichment was observed in Santa Rosa Sound. In fact, all nutrient species measured at the reference and test sites were at or below detection limits, and were considerably less than or typical of those found in Florida estuaries, based on STORET data from 690 estuary stations sampled from 1980 to 1989 (Joe Hand, personal communication, Appendix).

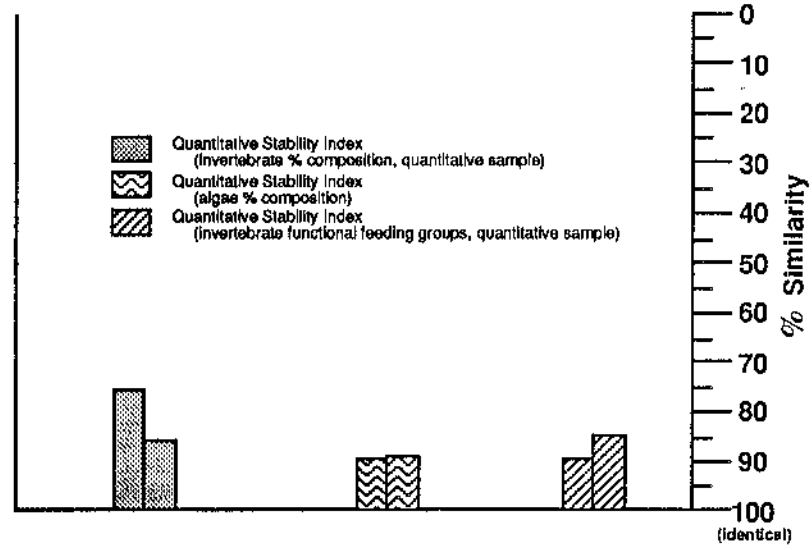
Algal growth potential levels corresponded to the low nutrient concentrations at the study sites. At the reference site, AGP was a low 0.2 mg dry wt/L, while waters from test sites 1 and 2 yielded 0.3 mg dry wt/L and 0.2 mg dry wt/L, respectively. These levels are far below the "problem threshold" of 10 mg dry wt/L, above which cultural eutrophication and its consequences are likely to occur (Ron Raschke, US EPA, personal communication).

Coliform bacteria counts were very low in the effluent sample and at the Santa Rosa Sound study sites. Total coliforms were below 10 organisms/100 ml in the effluent and at test site 1, and were measured at only 20 organisms/100 ml and 40 organisms/100 ml at test site 2 and at the reference site, respectively. Fecal coliforms were found to be less than 10 organisms/100 ml in the effluent and all study site samples.

Quantitative measures of benthic macroinvertebrate community health indicated that no degradation was associated with the discharge (see table and figures). The figure on p. 2 indicates the degree of difference between the reference and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the reference. The figure on this page summarizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation.

Taxa richness at test site 1 (with 31 taxa) and at test site 2 (with 33 taxa), was slightly higher than the number of different kinds of organisms recovered from the reference site (29). Similarly, Shannon-Weaver diversity was slightly better at the test sites (4.0 and 4.2 at test sites 1 and 2, respectively), when compared to the reference site (3.7). Community structure and trophic relationships were similar at the reference and test sites, additional indicators that the STP was having no detrimental effects. Pollution sensitive forms were well represented at all three Santa Rosa Sound stations.

The phytoplankton assemblage found in Santa Rosa Sound was taxonomically rich, dominated by diatoms. While most algal related measurements indicated that the phytoplankton communities at the test sites were as healthy as those of the reference site, an examination of the graph may confuse some readers, as two slight anomalies are evident. Although the % contribution of the dominant taxon appeared higher at the test sites (which would normally suggest degradation), the absolute differences were rather low (9.2% at the reference, 14.2% at test site 1 and 13.9% at test site 2). Further, the dominant organisms which were involved in calculating this index (*e.g.*, *Chaetoceros* sp.) are not among those associated with environmental stress. The second anomaly involved the apparent large increase in AGP at test site 2. In fact, as stated earlier, AGP was very low at all sites, and the change that is graphed involves values increasing from 0.2 mg dry wt/L to 0.3 mg dry wt/L.



Effect of discharge on receiving water
(measured as similarity between control and test sites).
(Left bar represents a comparison between control site and test site one; right bar represents a comparison between control site and test site two.)

Conclusions

The Navarre Beach STP effluent was not toxic to Ceriodaphnia dubia. Analysis for organic constituents revealed the presence of unidentified aliphatic compounds at 130 µg/L. The metals scan detected aluminum (32 µg/L), copper (19 µg/L), iron (17 µg/L), and zinc (15 µg/L). The copper concentration was in violation of Class III standards for marine waters.

While certain nutrients in the effluent were somewhat elevated (*e.g.*, NO_2NO_3 at 11 mg/L and total phosphorus at 3.0 mg/L), no nutrient enrichment was observed in Santa Rosa Sound. In fact, all nutrient species measured at the reference and test sites were at or below detection limits. Algal growth potential levels corresponded to the low nutrient concentrations at the study sites. Similarly, coliform bacteria counts were very low in the effluent sample and at the Santa Rosa Sound study sites.

Benthic macroinvertebrate and phytoplankton communities in Santa Rosa Sound were healthy. No biological degradation was associated with the Navarre Beach STP discharge.

Literature Cited

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

Environmental Protection Agency. 1974. Marine algal assay procedure: Bottle test. Nat'l Environ. Res. Center, Office of Res. and Dev., U.S. EPA, Corvallis, Oregon. 43 p.

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

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

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

Chemistry summary table for Navarre Beach STP.

	Effluent	Reference Site	Test Site 1	Test Site 2
Organic Constituents (ug/L)				
Aliphatic compounds	130			
Metals (ug/L)				
Aluminum	32T			
Arsenic	20U			
Cadmium	0.08U			
Copper	19			
Chromium	10U			
Iron	17			
Lead	1U			
Mercury	0.1U			
Nickel	5U			
Silver	0.09U			
Zinc	15			
Nutrients (mg/L)				
Ortho-phosphorus	2.8	0.02U	0.02U	0.02U
Total phosphorus	3.0	0.05U	0.05U	0.05U
Ammonia	0.02T	0.04	0.05	0.04T
Nitrate+Nitrite	11A	0.04U	0.04U	0.04U
TKN	0.8	0.04U	0.5	0.4
Other Parameters				
Habitat Assessment		68	53	61
D.O. (mg/L)		8.4	8.2	8.1
pH (SU's)		7.0	7.0	7.0
Salinity (ppt)		17.5	18.4	18.4
Temperature (°C)		18.0	18.1	18.2
Chlorophyll a (ug/L)		4U	4U	8.0
Turbidity (NTU)	2	3	3	4
Bioassay Invertebrate-Unchlorinated	Not Toxic			
Fecal coliform (org/100 ml)	10U	10U	10U	10U
Total coliform (org/100 ml)	10U	40	10U	20
BOD	1.3	0.9	1.1	1.2
TSS	5U	21	18	23

A - Value reported is the mean of two or more determinations
J - Estimated value
K - Actual value is known to be less than value given
L - Actual value is known to be greater than value given
T - Value reported is less than the practical quantitation limit
U - Material analyzed for but not detected; value reported is the minimum detection limit



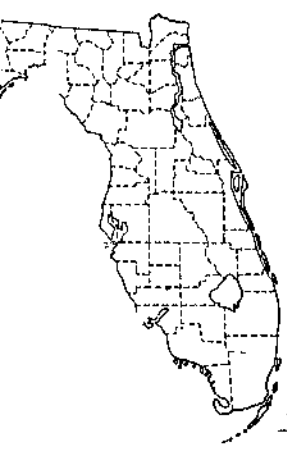
GENERAL HIGHWAY MAP

SANTA ROSA COUNTY

FLORIDA

PRICE 32¢ (Incl. State Tax)

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JUNE, 1975

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REVISIONS	
FEATURE	DATE
State Maintained Roads and City Limits	December, 1978
SR 178	JULY, 1977
REPRINTED	OCT., 1983

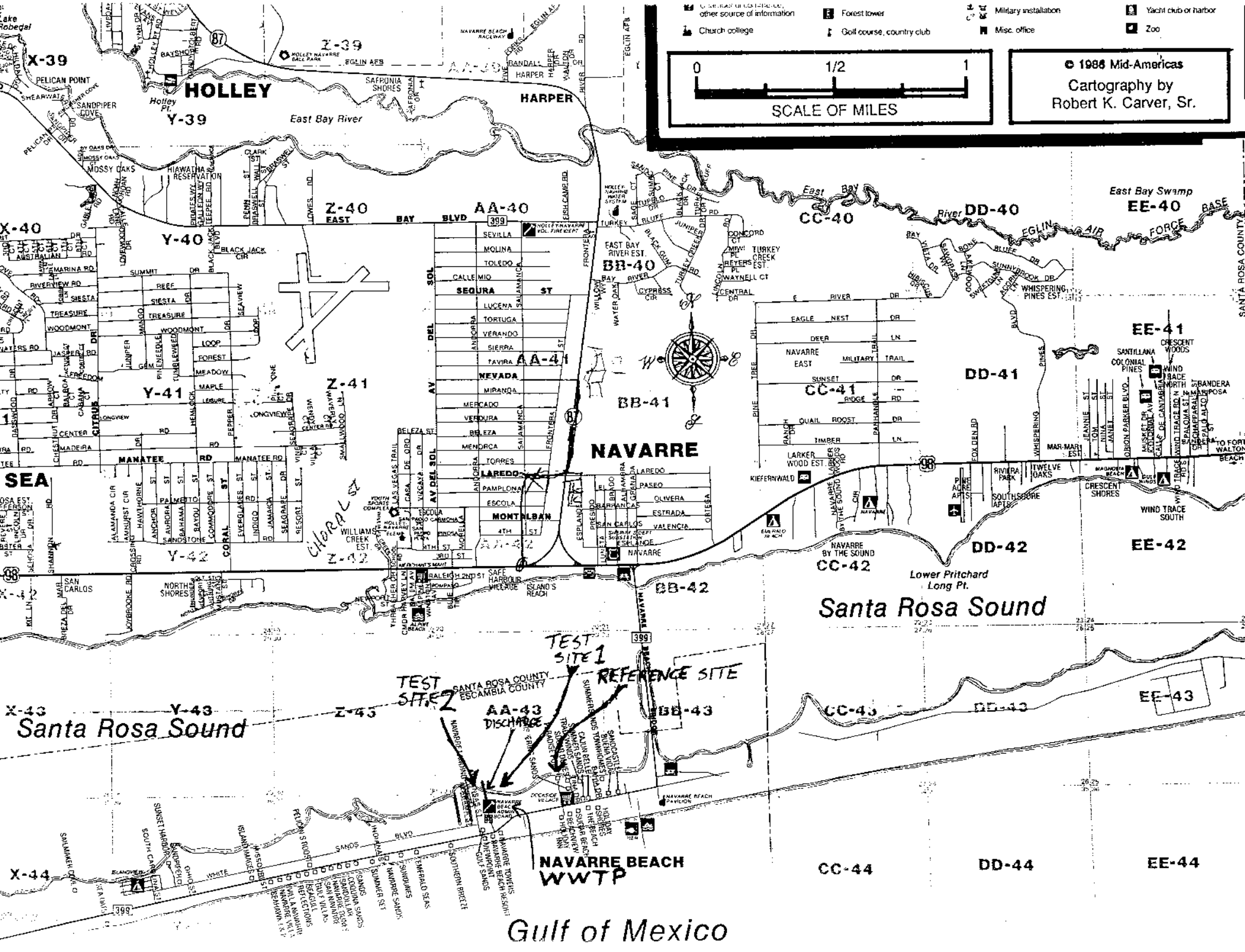
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DEPARTMENT OF TRANSPORTATION
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SCALE

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SCALE FOR INSETS

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R 27 W R 26 W


Church college
Forest tower
Golf course, country club
Military installation
Misc. office
Yacht club or harbor
Zoo
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1
SCALE OF MILES
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Cartography by
Robert K. Carver, Sr.
HOLLEY
HARPER
NAVARRE
SEA
East Bay River
East Bay Swamp
Santa Rosa Sound
Lower Pritchard
Long Pt.
Gulf of Mexico
EGLIN AIR FORCE BASE
SANTA ROSA COUNTY
NAVARRE BEACH
WWTP
TEST SITE 1
REFERENCE SITE
TEST SITE 2
SANTA ROSA COUNTY
ESCAMBIA COUNTY
AA-43
DISCHARGE
X-39
Y-39
Z-39
AA-39
BB-39
CC-39
DD-39
EE-39
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DD-42
EE-42
X-43
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PELICAN POINT
SHEARWATER
SANDPIPER COVE
MOSSY OAKS
HIAWATHA RESERVATION
SAFRONIA SHORES
EGLIN AFB
HOLLEY NAVARRE BALL PARK
NAVARRE BEACH RACEWAY
BAYSHORE
HOLLEY Pt.
BANDALL HARPER
EAST BAY BLVD
EAST BAY RIVER EST.
TURKEY CREEK EST.
WHISPERING PINES EST.
NAVARRE EAST
LARKER WOOD EST.
WILLIAMS CREEK EST.
SANTILLANA
COLONIAL PINES
CRESCENT WOODS
WIND TRACE NORTH
WIND TRACE SOUTH
MAR-MAR EST.
KIEFERNWALD
RIVIERA PARK
TWELVE OAKS
SOUTHSHORE APTS.
CRESCENT SHORES
NAVARRE BY THE SOUND
SAN CARLOS
NORTH SHORES
SAFE HARBOUR MARINA
ISLAND'S REACH
SUNSET HARBOUR
SANDPIPER COVE
ISLAND HARBOR
PELICAN'S ROOST
SANDS
NAVARRE SANDS
SUMMER SET
EMERALD SEAS
SOUTHERN BREEZE
GULF SANDS
NAVARRE TOWERS
NAVARRE BEACH RESORT
THE BEACH
SUMMER SANDS
CABANA BELLE
SANDCASTLE
BUENA VISTA
NAVARRE BEACH PAVILION
MARINA RD
SUMMIT DR
REEF
SIESTA
TREASURE
WOODMONT
FOREST
MEADOW
MAPLE
LEISURE
MADEIRA
MANATEE RD
CORAL ST
CHORAL ST
SEVILLA
MOLINA
TOLEDO
CALLE MIO
SEGURA
LUCENA
TORTUGA
VERANDO
SIERRA
TAVIRA
NEVADA
MIRANDA
MERCADO
VERDURA
BELEZA
MENORCA
TORRES
LAREDO
PAMPLONA
ESCOLA
MONTALBAN
4TH ST
BELEZA ST
DEL SOL AV
SALAMANCA
ANDORRA
FRONTERA
PASEO
OLIVERA
ESTRADA
VALENCIA
ESPLANADE
ALHAMBRA
GRANADA
PRESIDIO
SAN CARLOS
ORTEGA
EAST RIVER DR
EAGLE NEST DR
DEER LN
MILITARY TRAIL
SUNSET DR
QUAIL ROOST DR
TIMBER LN
PATHFINDER
WHISPERING PINES BLVD
GOBION PARKER BLVD
SANTA ROSA BLVD
HIGHWAY 98
HIGHWAY 399
HIGHWAY 87

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FACILITY SUMMARY

Facility Name: Navarre Beach	**Prepared by:** Tracie Rhodes **Date:** 11-4-91	
Location (attach detailed map):	**County** SANTA ROSA	**District** Northwest
Federal Permit # and **expiration date:** FL0023981 August 31, 1994	**State GMS #** and **State expiration date:** 1017C1077O February 7, 1995	**Facility Type:** Industrial Municipal Federal Agricultural Other (list):

Function of facility: Treatment of Domestic Waste

Description of treatment process:
To operate a .9 MGD oxidation ditch WWTP with tertiary filters and reclaimed water discharge to Santa Rosa Sound. Facility has a .9 MGD holding pond and declorination equipment

Receiving waters: Santa Rosa Sound	**Classification:** Class III
Design Flow: .9 MGD	**Actual Mean Flow:** .170 MGD

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

~~therefore, the best time to sample is:~~ Summer

If facility has a mixing zone, give details (size, parameters affected, etc.):
No

List effluent limits:

Parameter	Limit (units)
Flow Daily	.9 MGD (max. annual avg.)
pH - Eff Daily (Mo. Avg.)	6.0 min. - 8.5 max.
Chlorine Residual Daily (Daily)	.01 mg/l (max.)
BOD_5 Weekly	5 mg/l (max annual avg.)
TSS Weekly	5 mg/l (max. annual avg.)
Fecal Col. Form Weekly	14 /100 mL (max.)
Total Phosphorus Weekly	5 mg/l (max annual avg.)
Total Nitrogen Weekly	9 mg/l (max annual avg.)

Describe special permit conditions and permit modifications:

February 12, 1991
Specific condition # 27 added to allow 1.0 MG per month of reclaimed water for irrigation of 4.5 acres of treatment plant grounds.

September 13, 1991
Specific condition #27 further clarified to limit daily maximum flow limit to .032 MG of reclaimed water per day.

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

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

SUBMITTING AGENCY CODE: 8010 SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.03.0H31	DATE (M/D/Y): 10-07-91	RECEIVING BODY OF WATER: SANTA ROSA SOUND
REMARKS: USUALLY GOOD TREATMENT FROM WWTP	LOCATION: NAVARRE OUTFALL AREA	FIELD ID/NAME: # 21	TEST SITE #1

Habitat Parameter score	Excellent	Good	Fair	Poor
Littoral Alterations 4	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 20	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 6	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 15	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 53

COMMENTS: Clean substrate composed of sand, shell, rock rip rap, rock piles
no sea grass beds

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-07-91	G. BUTTS	Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.03.OH 31	DATE (M/D/Y): 10-07-91	RECEIVING BODY OF WATER: SANTA ROSA SOUND

REMARKS:	LOCATION: NAVARRE WWTP OUTFALL AREA	FIELD ID/NAME: # 21 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
			50	50		

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): NAVARRE WWTP DISCHARGE

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: ☐ Low organics

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	10
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell	40	Coarse Organic Debris:	10
Sand	30	Mud/Muck (organic):	10

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	18.17	8.16	Secchi Depth (m):	>1.0
Mid-depth			pH (SU):	7.0
Bottom			Conductivity (µmho/cm):	29900
			Other Parameters: SAL 18.4, ORP .302	

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

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: WINDY, COLD, STRONG NW WIND

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-07-91	G. BUTTS	Glenn Butts

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

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.03.0450	DATE (M/D/Y): 10-0891	RECEIVING BODY OF WATER: SANTA ROSA SOUND

REMARKS: IMPACT ZONE	LOCATION: WEST OF NAVARRE WWTP	FIELD ID/NAME: # 22 TEST SITE 2

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations: 6	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: 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: 6	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: 15	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 61

COMMENTS: NO SEA GRASS BEDS, CLEAN SHELL/SAND SUBSTRATE

ANALYSIS DATE: 10-08-91	ANALYST: G. BUTTS	SIGNATURE: Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.03.0H50	DATE (M/D/Y): 10-08-91	RECEIVING BODY OF WATER: SANTA ROSA SOUND

REMARKS:	LOCATION: WEST OF NAVARRE WWTP	FIELD ID/NAME: # 22 TEST SITE 2
IMPACT ZONE		

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			100			

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

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

Point-Source Pollution (list location and describe):

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: ☐ low organics

Substrate Types (estimated % surface coverage):

Limestone:		Sand/Silt/Clay Mix:	10
Consolidated Clay:		Clay/Silt (inorganic):	
Gravel/Shell	50	Coarse Organic Debris:	10
Sand	30	Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	18.2	8.11	Secchi Depth (m):	>1.0
Mid-depth			pH (SU):	7.0
Bottom			Conductivity (µmho/cm):	29900
			Other Parameters: SAL 18.4, ORP .301	

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

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:
Cold front past 24 hrs
water very choppy

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-08-91	G. BUTTS	Glenn Butts

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

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: MW DIST	STORET STATION NUMBER: 33.03.0126	DATE (M/D/Y): 10-08-91	RECEIVING BODY OF WATER: SANTA ROSA SOUND

REMARKS:	LOCATION:	FIELD ID/NAME:
BACKGROUND	EAST OF OUTFALL AND WEST OF TOLL BRIDGE	# 23 REFERENCE SITE

Habitat Parameter / score	Excellent	Good	Fair	Poor
Littoral Alterations: 4	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: 35	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: 6	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: 15	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 68

COMMENTS: SMALL HALODULE PATCH ADDING 4 DECAPOD SPECIES AND 1 ISOPOD SPECIES TO THE LIST. Clean Substrate

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-08-91	G. BUTTS	Glenn Butts

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET

SUBMITTING AGENCY CODE: 8010 / SUBMITTING AGENCY NAME: NW DIST	STORET STATION NUMBER: 33.03.0126	DATE (M/D/Y): 10-08-91	RECEIVING BODY OF WATER: SANTA ROSA SOUND

REMARKS:	LOCATION: EAST OF OUTFALL AND WEST OF TOLL BRIDGE	FIELD ID/NAME: REFERENCE # 23 SITE
BACKGROUND		

RIPARIAN ZONE/INSTREAM FEATURES

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

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other
			100			

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

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

Point-Source Pollution (list location and describe): NONE, RESIDENTIAL RUNOFF EVIDENT, FUTURE IMPACT FROM RESIDENTIAL GROWTH MAY BECOME A PROBLEM

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	50	Coarse Organic Debris:	
Sand	50	Mud/Muck (organic):	

WATER QUALITY

	Temp. (°C):	D.O. (mg/l):		
Top	18.01	8.4	Secchi Depth (m):	> 1.0
Mid-depth			pH (SU):	6.95
Bottom			Conductivity (µmho/cm):	28300
			Other Parameters:	SAL 17.5, ORP . 276

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

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: NW WIND, COLD FRONT PAST 24 hrs, Choppy AND COLD

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

ANALYSIS DATE:	ANALYST:	SIGNATURE:
10-08-91	G-BUTTS	Glenn Butts

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Navarre Beach WWTP
Address/City:
County: Escambia
Contact/District: Glenn Bahrs/NW
NPDES Permit #: FL0023981 Outfall #:

Sample Collection: Date 10/7/91 Time 1010
Test Beginning: Date 10-8-91 Time 1400
Test Ending: Date 10/10/91 Time 1400
Test Organism: C. dubia
Life Stage/Age: < 24 hrs

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

Remarks:

2480 91-OCT-08-30-01

entered 10/11/91 BWP

BIOLOGY Matrix: W-EFFLUENT
Date Collected: 7-OCT-1991 10:10:00.24
Field ID:#20
BSY-DF-ACT

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7.9 @9	9.0@21°C	20.4@23.4°C	1355@23.3°@1361
24 hr	7@7.9 @9	8.9@21.5°C	20.2@23.4	1365@23.9 @1375@24.0°
48 hr	7@7.9 @9	9.0@21°C	20.5@23.9°	1370@24.0° 1380

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control		5	5	5	6.7		8.2	20.0		20.4	9.1		8.7	177		148
Control		5	5	5			8.2						8.7			
Control		5	5	5			8.2						8.7			
Control		5	5	5			8.2						8.7			
25%		5	5	5	6.8		8.3	20.0		20.5	8.9		8.7	320		360
25%		5	5	5			8.3						8.7			
25%		5	5	5			8.3						8.7			
25%		5	5	5			8.3						8.7			
50%		5	5	5	6.9		8.4	20.0		20.2	8.7		8.8	463		541
50%		5	5	5			8.4						8.8			
50%		5	5	5			8.4						8.8			
50%		5	5	5			8.4						8.8			
75%		5	5	5	7.0		8.4	20.0		20.4	8.8		8.7	620		662
75%		5	5	5			8.4						8.7			
75%		5	5	5			8.4						8.7			
75%		5	5	5			8.4						8.7			
100%		5	5	5	7.1		8.4	20.0		20.2	8.6		8.8	770		890
100%		5	5	5			8.4						8.8			
100%		5	5	5			8.4						8.8			
100%		5	5	5			8.4						8.8			
Measured/Loaded by:		AJ	MF	MF	MF		MF	MF		MF	MF		MF	MF		MF
Recorded by:		AJ	AJ	AJ	MF		AJ	AJ		AJ	AJ		AJ	AJ		AJ

Investigators' Signatures

Marshall Faircloth

Alison Jordan

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:	Cl- blank 0				
Lab Tot. Resid. Cl2:			0	HACH	MF
Alkalinity:	120	65	120	HACH	AJ
Hardness:	130	85	64	HACH	AJ
Total Ammonia:	0.0	0.0	0.2	Hach	MF

Ammonia Meter Slope: _____ Ammonia Blank: 0.0 Salinity Sample: _____ ppt

Taxa list for Navarre Beach STP, collected in Santa Rosa Sound on 8 October 1991, via 3 Ponar grabs per site.

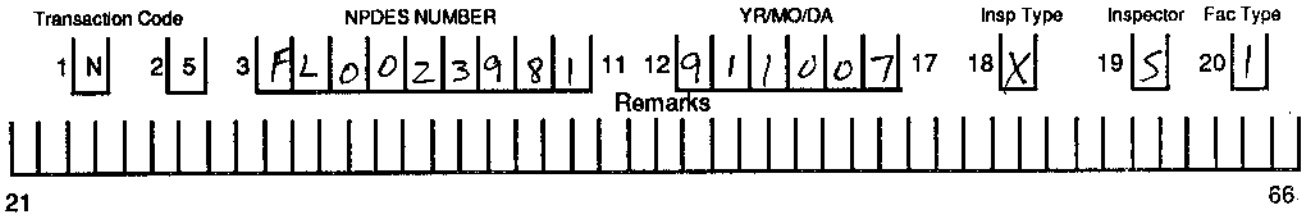
	Reference Site	Test Site 1	Test Site 2
Cephalochordata			
Branchiostoma sp.	87	349	274
Cumacea			
Oxyurostylis smithi	112	37	25
Decapoda			
Callinectes sapidus	50	12	–
Hippolyte pleuracanthus	75	–	–
Pagurus sp.	–	–	12
Palaemonetes pugio	37	37	50
Panopeus herbstii	50	50	12
Penaeus sp.	25	–	12
Pinnixa sp.	–	12	–
Processa vicina	12	12	–
Rhithropanopeus harrisii	–	–	12
Tozeuma carolinense	75	–	–
Gastropoda			
Crepidula lacteus	–	12	50
Haminoea succinea	100	75	12
Mitrella lunata	–	37	37
Nassarius vibex	15–	187	225
Odostomia sp.	12	–	–
Polinices lacteus	–	12	–
Malacostraca			
Acanthohaustorius millsi	412	62	112
Undetermined amphipod	–	–	12
Ampelisca verrilli	25	12	–
Bowmaniella floridana	–	274	100
Corophium sp.	12	–	37
Cymadusa compta	–	50	50
Erichsonella floridana	12	–	–
Lembos sp.	–	–	25
Monoculodes edwardsi	12	25	12
Mysidopsis bahia	–	87	50
Nemertea			
Carinoma tremaphoros	12	–	25
Pelecypoda			
Amygdalum papyria	–	–	12
Anomalocardia cuneimeris	187	137	175
Brachidontes exustus	–	–	100
Laevicardium mortoni	–	–	12
Platyhelminthes			
Undetermined triclad species	37	12	–

Polychaeta			
Eteone heteropoda	–	25	12
Glycera sp.	–	12	–
Laeonereis culveri	848	362	449
Magelona pettiboneae	–	–	37
Magelona sp.	–	12	–
Neanthes succinea	–	75	–
Nereis falsa	175	–	225
Nereiphylla fragilis	–	12	12
Paraonis fulgens	25	12	–
Pectinaria gouldii	12	–	12
Phyllodoce arenae	12	12	–
Potamilla cf. *reniformis*	50	–	62
Prionospio heterobranchia	37	25	25
Scolelepis squamata	212	75	162
Spiophanes bombyx	12	–	–
Tanaidae			
Leptochelia rapax	–	37	12

Phytoplankton taxa list for Navarre Beach Sewage Treatment Plant, Santa Rosa County, collected 8 October 1991.

	Test Site 1	Test Site 2	Reference Site
Diatoms			
Amphora sp.	–	473	135
Amphora sp. 1	57	284	–
Amphora sp. 2	229	378	203
Amphora sp. 3	114	–	–
Amphora sp. 4	457	378	271
Amphora sp. 5	–	–	68
Campylodiscus sp.	–	95	–
Chaetoceros sp.	114	95	406
Cocconeis sp.	57	95	–
Coscinodiscus sp.	–	95	135
Cyclotella sp.	57	473	271
Cymatosira sp.	114	95	68
Cymbella sp.	114	–	–
Diploneis sp.	114	189	68
Gyrosigma sp.	–	95	–
Mastogloia sp.	229	95	68
Navicula sp.	57	–	338
Navicula lyra	57	–	–
Navicula sp. 1	–	189	–
Navicula sp. 2	–	95	–
Nitzschia sp. 1	57	189	68
Nitzschia sp. 2	229	–	–
Nitzschia sp. 3	229	473	338
Nitzschia sp. 4	171	189	–
Nitzschia sp. 5	–	95	–
Nitzschia sp. 6	–	–	135
Operophora sp.	57	–	68
Pinnularia sp. 1	–	95	–
Rhizosolenia sp.	–	378	271
Rhizosolenia stolterforthi	114	–	68
Unidentified pennate diatom	–	1040	–
Chlorophyta			
Unknown chlorophyte flagellate	286	284	338
Cryptophyta			
Cryptomonas sp.	–	–	68
Cyanophyta			
Anabaena sp.	–	189	271
Chroococcus sp.	57	473	338
Oscillatoria sp.	114	–	–
Pyrrhophyta			
Ceratium sp.	–	95	–
Prorocentrum micans	114	189	68
Dinoflagellate cyst	–	–	68

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



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