ENVIRONMENTAL PROTECTION AGENC
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Evaluation of the

City Wastewater Treatment Pl

Port St. Joe, Florida

(FEBRUARY 8-18, 1978)

NATIONAL ENFORCEMENT INVESTIGATIONS
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EVALUATION OF THE CITY WASTEWATER TREATMENT PLANT
PORT ST. JOE, FLORIDA

[February 8 - 18, 1978]

May 1978

National Enforcement Investigations Center
Denver, Colorado

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I. INTRODUCTION

In recent years, the pulp and paper industry has shown great interest in using municipal sewage facilities for treating their industrial wastewaters. A 1977 study[1] by the Environmental Protection Agency (EPA) showed that seventeen paper mills were discharging wastewaters into publicly owned treatment systems and that several other paper companies were considering similar treatment approaches. Among these are two mills in the northwestern panhandle of Florida: the St. Joseph Paper Company in Port St. Joe, and the International Paper Company in Panama City.

Currently, the St. Joseph Paper Company discharges its industrial wastewaters into an aerated lagoon at the Port St. Joe Wastewater Treatment Plant (WWTP) for combined treatment with the city domestic sewage [Figure 1]. International Paper Company in Panama City, Florida has proposed similar treatment for its wastewaters in the Bay County, Florida WWTP. Representatives for the Bay County facility have requested a grant from the EPA, Region IV to construct additional facilities for a combined wastewater treatment system.

However, these plans have been questioned by the National Marine Fisheries Service (NMFS) and the EPA concerning the impact the proposed aerated lagoon discharge may have upon St. Andrew Bay. These agencies recommended that a study be done to predict the bacteriological effect of mixing domestic sewage with paper mill and other wastes prior to its discharge to St. Andrew Bay. The Port St. Joe WWTP offers a parallel by which the proposed treatment could be evaluated.

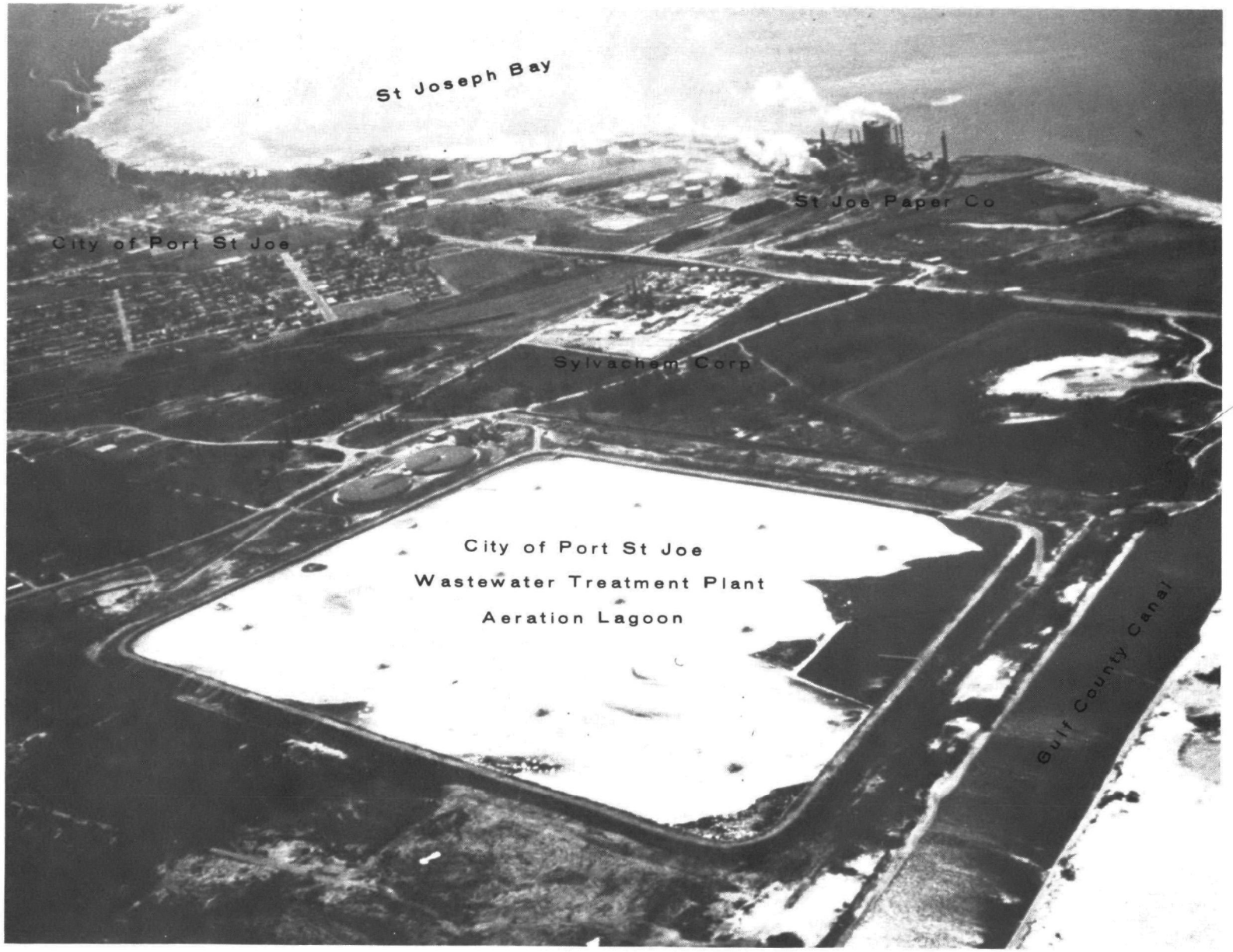

Figure 1. Port St Joe Wastewater Treatment Plant and Vicinity

The National Enforcement Investigations Center (NEIC) was requested by the EPA, Region IV Enforcement Division to evaluate the Port St. Joe WWTP to determine:

1. The efficiency of the Port St. Joe Wastewater Treatment Plant aerated lagoon in reducing solids, biochemical oxygen demand (BOD) and coliform bacteria densities when treating a mixture of domestic and paper mill wastes, and

2. Compliance of the Port St. Joe Wastewater Treatment Plant with the National Pollutant Discharge Elimination System (NPDES) Permit No. FL0020206.

Results of this study will be used by the EPA to evaluate the efficiency of the existing treatment system at Port St. Joe, Florida, and the proposed construction of treatment facilities for combining and treating International Paper Company wastewaters with municipal sewage at the Bay County WWTP in Panama City, Florida. Moreover, it is anticipated that results from this study will serve in evaluating similar facility proposals on a national basis. To accomplish these goals, it was necessary to evaluate plant efficiency and determine compliance of the Port St. Joe WWTP with the NPDES Permit limitations [Appendix A].

II. SUMMARY AND CONCLUSIONS

The Port St. Joe WWTP was evaluated from February 8 to 18, 1978 to determine the effectiveness of the plant in treating combined domestic and paper mill wastes, and to determine compliance with the NPDES permit. Wastewater samples were collected from 8 locations which included municipal and industrial inflows (Stations 1-4); primary clarifier discharges (Stations 5-6); aerated lagoon (Station 13) and final plant effluent (Station 7). The samples were analyzed for physical, chemical, and bacteriological characteristics. Measurements were performed in situ (pH, temperature, and flow) or at EPA mobile laboratories (BOD, TSS, chlorine residual, and bacteriology) located at the Port St. Joe WWTP. Additionally, the EPA evaluated the wastewater treatment practices, self-monitoring sampling procedures, laboratory analytical techniques, and other practices associated with compliance monitoring at the Port St. Joe WWTP.

The 11-day EPA survey showed that the treatment plant was in compliance with the final effluent concentrations and load limits for BOD and TSS prescribed in the NPDES permit. The pH of the plant effluent remained within the allowable range of 6.0 to 8.5 units and foam or floating solids were discharged only in trace amounts.

The treatment plant did not attain compliance with the NPDES permit limit for bacteria. During the second calendar week (February 12-17) of the study, the geometric mean for fecal coliform (FC) bacteria was 660/100 ml in the chlorinated domestic wastewater prior to mixing with the industrial wastewaters. This FC density exceeded the State of Florida requirement of the NPDES permit, which limits fecal coliforms to 400/100 ml, weekly average.

Self-monitoring data did not show any violations of the fecal coliform bacteria limit. However, a review of the self-monitoring sampling and analyses procedures practiced by the City of Port St. Joe

WWTP staff revealed inconsistencies with certain recommended procedures. The WWTP personnel did not properly dechlorinate sewage samples which were analyzed for bacteria. Furthermore, they did not use the recommended MPN method for analyzing bacterial densities in chlorinated sewage. The WWTP officials have been notified of these deficiencies and they plan to modify their procedures accordingly. However, past self-monitoring bacteriological data required by the NPDES permit that have been analyzed at the Port St. Joe WWTP laboratory must be considered invalid. Other self-monitoring data for such parameters as TSS and BOD appeared to be reliable as described in the text of this report.

One purpose for the EPA to perform a full-scale study of the Port St. Joe WWTP was to determine the fate of sewage bacteria in the treatment system. The following paragraphs summarize the on-site study findings.

Bacteria analysis of the individual industrial and municipal wastewater entering the WWTP showed the major contributor of fecal coliform (FC) bacteria was the City; this wastewater had a geometric mean of 1.8 million FC/100 ml. The city sewage is chlorinated to reduce FC bacteria before mixing with the industrial wastewaters and undergoing primary and secondary treatment. The excessively high FC density (3.5 million/100 ml) irregularly discharged with Sylvachem wastewaters into the WWTP strongly indicates the need for pretreatment disinfection of this specific industrial wastewater also. On the average, Sylvachem contributed 61,000 FC/100 ml while the St. Joe Paper Company added 140 FC/100 ml.

Chlorinated sewage from the Port St. Joe WWTP tested by using the standard most-probable-number (MPN) method contained bacteria densities averaging 57 FC/100 ml. These same samples were blended in the laboratory and found to actually contain an average of 550 FC/100 ml. Similar tests were performed with primary treated and chlorinated sewage in a bench-scale laboratory experiment.

Results indicated that substantial numbers (3,300 to 7,900 FC/100 ml) of fecal coliforms pass through the disinfection systems which had chlorine residuals ranging from 1.7 to 2.4 mg/l and a detention time of 15 minutes. When the chlorine residuals were increased to greater than 3 mg/l and contact time extended to 20 minutes or more, the fecal coliform densities were reduced to 310/100 ml or less.

Other bacteriological testing at the Port St. Joe WWTP revealed that the FC bacteria that enter the aerated lagoon may multiply by thousands. Laboratory incubation studies showed that bacterial growth was greatest at summertime lagoon temperatures of 30 to 35°C, and least during other seasonal temperatures of 15 to 25°C.

On-site studies in February when the lagoon temperature was 23°C showed that a weekly average of 500 FC/100 ml entered the aeration basin. These bacteria were comprised of equal numbers (50%) of Escherichia coli type 1 and Klebsiella. During the 12.6-day detention in the lagoon, the bacteria population underwent numerous changes: E. coli decreased to 17% while the Klebsiella increased to 74%. Although the mixture of sewage, paper mill and tall oil wastes in the lagoon favored Klebsiella, there was a substantial number of E. coli type 1 that were sustained for the 12.6-day lagoon detention. The final effluent contained 500 FC/100 ml. Thus, the 12.6-day detention in the lagoon did not decrease the number of fecal coliforms, but it did favor growth of Klebsiella over E. coli.

In summary, the WWTP effluent contained BOD and TSS concentrations of approximately 25 and 55 mg/l respectively and a FC bacteria density of 500/100 ml. This study showed that a well-operated wastewater treatment plant that provides secondary treatment by an aerated lagoon (12.6-day detention) for sewage, paper mill and tall oil wastes can be expected to reduce loadings of BOD and TSS by about 87% and the FC bacteria by approximately 97%.

III. BACKGROUND

In March 1975, the NEIC conducted a field investigation of the St. Andrew Bay estuarine system to determine if International Paper Company (IPC) was contributing to violations of water quality standards for bacteria and the associated closure of shellfish harvesting areas.[2] Results of the EPA study concluded that the Bay County aerated lagoon effluent was contributing to the bacterial degradation of the St. Andrew Bay water quality by its discharge of combined paper mill waste and sewage. The report further concluded that future plans to discharge treated sewage to the Bay County aerated lagoon should be reconsidered, since such a plan could increase pollution in the St. Andrew Bay estuarine system.

Present plans to convert, upgrade and expand the Bay County treatment facility initially call for mixing 6,800 m^3/day (1.8 mgd*) of primary treated and chlorinated sewage in the Bay County aerated lagoon prior to discharge into St. Andrew Bay. The system will eventually provide treatment for 22,680 m^3/day (6 mgd) of sewage.[3] Because of the possible impact that the effluent could have on the coliform densities and aquatic biota in the Bay system, the proposal was questioned by the National Marine Fisheries Service (NMFS) and the EPA. Meetings were held August 9, 10 and 11, 1977 with representatives from NEIC, EPA Region IV, the Florida Department of Environmental Regulations, NMFS, the U.S. Food and Drug Administration, and several consulting firms. As a result of these meetings, it was concluded that the Port St. Joe WWTP offers a parallel by which the proposed Bay County facilities could be evaluated.

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* Average daily flow; peak flow estimated to be 17,000 m^3/day or 4.5 mgd.[3]

To facilitate the comparison of these two treatment plants, a selected list of design and Company self-monitoring characteristics was obtained from WWTP officials.[4,5,6] These data are presented in Table 1 and the major similarities or differences are discussed below.

The Port St. Joe WWTP is designed to provide secondary treatment for a mixture of domestic and industrial wastewaters. At the Port St. Joe facility, domestic waste is comminuted and then chlorinated before being combined with industrial wastewaters [Figure 2]. These mixed wastewaters then undergo primary treatment prior to being discharged into approximately a 28-ha (70-acre) aerated lagoon.[5] At the Bay County facility, it is proposed that domestic waste be comminuted and then undergo primary treatment and chlorination before being combined with primary-treated wastewaters from local industry. These wastewaters would then be discharged into approximately a 28-ha (70-acre) aerated lagoon for secondary treatment.

The industrial wastewaters treated at both locations are a mixture of Kraft paper mill wastewater and tall oil processing wastewater. The industrial processes used at these industries are very similar [Appendix B]. At Port St. Joe, the papermill wastewater averages about 102,000 m^3/day (27 mgd*); at Bay County the mill wastewater average about 89,000 m^3/day (23.5 mgd). The tall oil wastewaters are approximately 1,500 m^3/day (0.4 mgd) at Port St. Joe and about 3,785 m^3/day (1.0 mgd) at Bay County. The domestic wastewater flows treated at Port St. Joe average 1,890 m^3/day (0.5 mgd). At the Bay County facility, treatment of 6,800 to 22,680 m^3/day (1.8 to 6 mgd) of domestic wastewaters is proposed.[4,5,6]

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* Flow increases to approximately 131,000 m^3/day or 34 mgd during the 10-day period per month when the bleach plant is in operation.

Table 1

WASTEWATER TREATMENT CHARACTERISTICS
PORT ST. JOE AND BAY COUNTY FACILITIES

Parameter	Port St. Joe WWTP		Bay County WWTP[a]		
			Design	Reported	
	Design	Reported[b]		Industrial	Municipal
PLANT INFLUENT					
Flow (Avg. Daily - mgd)					
Paper Mill Wastewater	33.87	34.5	26.00	23.59	
Tall Oil Wastewater	0.38	0.43	1.00	1.01	
Municipal Wastewater	0.50	0.64	6.00		6.00
Total Flow	34.75	35.57	33.00	30.60	
Peak Flow	41.50				
Wastewater Characteristics					
BOD					
mg/l	260	279	310	272	192
kg/day	34,100	37,950	37,600	26,337	4,358
lb/day	75,200	83,660	83,000	58,063	9,607
TSS					
mg/l	440	407		274	130
kg/day	58,100	55,357		27,224	2,962
lb/day	128,100	122,040		60,017	6,529
PRIMARY TREATMENT EFFLUENT CHARACTERISTICS					
BOD					
mg/l	208	240	231	230	
kg/day	27,300	32,643	27,900	26,100	
lb/day	60,200	71,965	61,600	57,600	
TSS					
mg/l	88	153		95	
kg/day	11,600	20,808		10,800	
lb/day	25,600	45,875		23,800	
SECONDARY TREATMENT EFFLUENT CHARACTERISTICS					
BOD					
mg/l	26	24	31	29	
kg/day	3,410	3,300	3,800	3,280	
lb/day	7,520	7,200	8,300	7,240	
TSS					
mg/l	44	60		64	
kg/day	5,810	8,160		7,225	
lb/day	12,810	17,990		15,929	
TREATMENT EFFICIENCIES (%)					
Primary Treatment					
BOD	20	14	10[c] (30)[d]	7.3	30
TSS	80	63	70	61.3	60
Secondary Treatment					
BOD	87.5	90	87	87.3	
TSS	50	61		33	
Overall Plant					
BOD	90	91	90	89.2	
TSS	90	85		75.6	

Table 1 (Continued)

WASTEWATER TREATMENT CHARACTERISTICS
PORT ST. JOE AND BAY COUNTY FACILITIES

Parameter	Port St. Joe WWTP		Bay County WWTP[a]	
	Design	Reported[b]	Design	Reported
				Industrial / Municipal
SECONDARY WASTEWATER TREATMENT UNIT CHARACTERISTICS				
Aeration Lagoon				
Water Surface Area (acres)	70.2	70.2	69	69
Water Depth (ft)	20	20	12	12
Free Board (ft)	5	5	3	3
Water Volume (million gal)	437	437	256	256
Detention Time in days (at avg daily flow)	12.6	12.6[e]	8.9	8.9[e]
Surface Aerators				
Number	12	12	23	33[f]
Aerator HP (ea unit)	150	150	75	75
Total HP of aerators	1,800	1,800	1,725	2,425
Oxygen in lagoon (mg/l)	0.8	0.3-3.1	3.0	0.5-3.5

a Based on information provided by George C. Cook, Superintendent Bay County Water System, Panama City, Florida, municipal waste data are assumed.
b Based on Discharge Monitoring Reports from Port St. Joe WWTP for February 8-18, 1978; bleach plant at St. Joe Paper was in operation.
c Industrial value.
d Municipal value.
e Assumed values.
f Ten additional 75 HP aerators installed July 10, 1977.

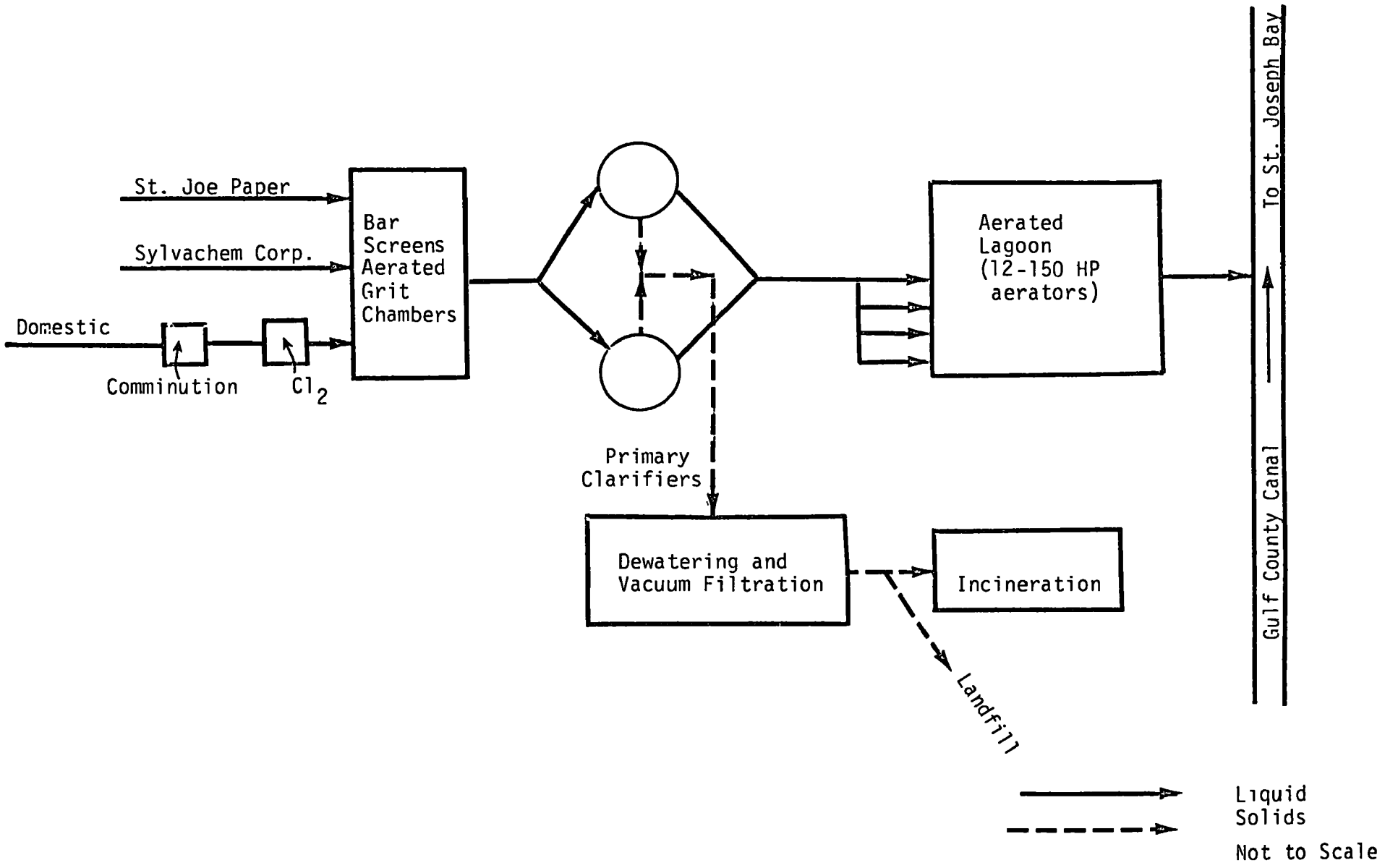

Figure 2. Flow Diagram of Port St. Joe Wastewater Treatment Plant
Port St. Joe, Florida

Primary treatment of mixed industrial and domestic wastewaters by the Port St. Joe and Bay County facilities is also similar. Both plants provide primary clarification of industrial wastewaters. The proposed or existing primary treatment facilities for domestic wastewaters consist of: bar-screen, grit chamber and a clarifier. These systems are designed to reduce 5-day BOD by 20 to 30% and TSS by 70 to 80%.[4,5,6]

Secondary treatment of mixed industrial and domestic wastewaters is similar also.[4,5,6] Both treatment plants use an aerated lagoon. Water surface area in both systems is approximately 28 ha (70 acres). The lagoon at Port St. Joe has a water depth of about 6 meters (20 feet) while the Bay County lagoon is nearly 4 meters (12 feet) deep. The larger lagoon at Port St. Joe has a calculated detention time of about 12.6 days while the Bay County lagoon has approximately 9 days of detention. Aeration in each lagoon is provided by electrically powered aerators that are mounted on floating pontoons. The Port St. Joe facility uses twelve 150 HP aerators; the Bay County facility uses thirty-three 75 HP aerators.*

Based upon information provided EPA by officials of both plants,[5,6] and by a private laboratory,[8] the following physical and chemical conditions typically occur in both of the treatment lagoons. The water temperatures range from 15 to 38°C; differences are caused by influent wastewater temperature fluctuations combined with seasonal changes of weather conditions. The pH usually is circumneutral (6.5 to 8.0 units). The dissolved oxygen in the Port St. Joe aerated lagoon is typically less than 1 mg/l. At Bay County, the oxygen level

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* Before July 1977 the Bay County lagoon had twenty-three 75 HP aerators in operation.[6]

in the lagoon is usually about 3 mg/l. The Port St. Joe lagoon usually has approximately 2 mg/l total nitrogen and 0.5 mg/l phosphorus. Nutrient levels typically are higher (total N is 10 to 20 mg/l; P is 2 mg/l) at the Bay County facility because phosphoric acid and ammonia are added to the paper mill wastewater prior to the lagoon treatment.

Each lagoon is designed to reduce the 5-day BOD by about 87% and the TSS by approximately 50%. Both plants are designed to meet the State of Florida requirement for secondary treatment systems, which is: "All discharge from municipal and privately owned domestic waste plants will comply with the Water Quality Standards of the State of Florida with 90% treatment (of BOD and TSS) or better...".[9]

IV. STUDY DESCRIPTION

STUDY SITE

The Port St. Joe Wastewater Treatment Plant (WWTP) is located adjacent to St. Joseph Bay in southwestern Gulf County, Florida. St. Joe Paper Company and Sylvachem Corporation occupy the strip of land between the treatment plant and the Bay. The Gulf County Canal bounds the treatment plant site on the north, while along the east the land is mostly swamp. To the south lies the City of Port St. Joe [Figure 1].

Eight sampling stations were established within the facility [Table 2] to obtain representative samples of municipal and industrial inflow (Station 1-4), primary clarification discharges (Station 5-6), wastewater in the lagoon (Station 13) and final effluent from the Port St. Joe Wastewater Treatment Plant (Station 7).

SAMPLING AND ANALYSES

During two presurvey visits (October 25-27, 1977 and January 17-18, 1978) wastewater samples were collected at the study site. These samples were sent to the NEIC laboratories in Denver, Colorado and used in bacteria growth studies and bacteria bioassays. Two wastewater samples were collected from the aerated lagoon on February 11 and 17, 1978. These were sent to Denver for bacterial growth studies also [Section VI and Appendix C].

During the 11-day survey (February 8 to 18, 1978) daily samples for pH, temperature, chlorine residual and coliform bacteria analyses were collected [Appendix D]. These grab samples were scheduled so as

Table 2

STATION LOCATIONS
PORT ST. JOE WWTP - FLORIDA
February 8-18, 1978

Station	Description
01	City of Port St. Joe Sanitary sewer, influent to WWTP prior to chlorination
02	City of Port St. Joe sewage after comminution and chlorination
03	St. Joe Paper Company wastewater, influent of untreated mill waste to WWTP
04	Sylvachem Company wastewater, influent of raw untreated waste to WWTP
05	Discharge from the WWTP primary Clarifier A (west tank)
06	Discharge from the WWTP primary Clarifier B (east tank)
07	Final discharge of WWTP at the parshall flume
13	Aerated lagoon, south shoreline near clarifier inflow boil

to be collected one hour later each day. This staggered schedule was designed to provide sampling of wastewaters over a 10-hr period during the survey. At the treatment plant final effluent (Station 7), grab samples for bacteria, pH and temperature measurements were collected twice daily. Bacteriological samples for Salmonella analysis were collected using the modified swab technique of Moore[10] [Appendix C]. These samples were collected on February 9, 10 and 11, 1978.

Daily, flow-weighted composite samples (24-hour) were collected from Stations 1 and 3 through 7. By prearrangement, these composite samples were collected in duplicate to provide "split" samples for the WWTP. Established chain-of-custody procedures were followed in the collection of all samples and field data [Appendix E].

After collection, the wastewater samples were transported to the NEIC mobile laboratory. The WWTP laboratory supervisor selected one each of the duplicate samples. The identification tag was marked "Company Split" and the transfer recorded by NEIC personnel. The remaining duplicate samples were relinquished to the NEIC chemistry and bacteriology mobile laboratories at the Port St. Joe WWTP. Time between sample collection and initiating of laboratory analyses by the NEIC was usually less than two hours.* Analytical methods and quality control measurements for chemistry are described in Appendix F.

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* Residual chlorine analysis was performed 5 to 30 minutes after collection.

V. NPDES COMPLIANCE MONITORING AND EVALUATION OF SELF-MONITORING AND LABORATORY PROCEDURES

A National Pollutant Discharge Elimination System (NPDES) permit was issued for the City of Port St. Joe WWTP on July 1, 1977 [Appendix A]. The permit limits the effluent BOD to a monthly average of 26 mg/l or 3,415 kg (7,529 lb)/day and a weekly average of 39 mg/l or 5,123 kg (11,294 lb)/day. Total suspended solids (TSS) are limited to a monthly average of 44 mg/l or 5,780 kg (12,810 lb)/day and a weekly average of 66 mg/l or 8,669 kg (19,000 lb)/day. The permit also specifies that the effluent pH must be in the range of 6.0 to 8.5 standard units. Additionally, the permit restricts the discharge of floating solids, foam or substances that cause a sheen on the receiving water.

The State of Florida Certification placed an additional condition in the NPDES permit related to bacteria. The fecal coliform bacteria as determined in the domestic wastewater effluent prior to mixing with the industrial flow is limited to a monthly average of 200 bacteria/100 ml and a weekly average of 400 bacteria/100 ml.

The 11-day EPA survey showed that the plant effluent met the allowable concentrations and load limits for BOD and TSS. The pH remained within the allowable range of 6.0 to 8.5 units and foam or floating solids were discharged only in trace amounts.

The weekly fecal coliform bacteria limit of 400/100 ml was exceeded the calendar week of February 12, 1978. Specific findings are discussed in Section VI of this report.

The self-monitoring data submitted by the City of Port St. Joe WWTP officials for the period of July through November 1977 showed that the plant effluent met BOD and TSS load limits, as well as the fecal coliform limit. However, in November, the monthly average TSS concentration of 52 mg/l exceeded the allowable limit of 44 mg/l. Also the average TSS concentration for the week of November 6-12, 1977 was 74 mg/l, which exceeded the allowable weekly limit of 66 mg/l.

As part of the EPA compliance monitoring evaluation, field sampling specialists from NEIC accompanied WWTP staff to sampling sites to observe sample collecting techniques being practiced. Additionally, senior specialists from NEIC visited the WWTP laboratory to interview the staff on analytical techniques. Results of these observations and interviews are presented below.

EVALUATION OF SELF-MONITORING PROCEDURES

Sampling and flow calibration procedures used by the Port St. Joe WWTP staff were evaluated by NEIC. The procedures were considered adequate except as noted in the following paragraphs.

Plant personnel collect daily flow-weighted composite samples from the three influents (i.e., chlorinated sewage, paper mill, and tall oil processor) and the final effluent using automatic samplers. Time composites are also collected daily before and after the primary clarifiers. Although the automatic samplers are designed to refrigerate the composited samples, the refrigeration units were inoperable

on the Company-installed automatic samplers located at Station 01, 03 and 04.*

The composite samples are transported to the WWTP laboratory for BOD and TSS analyses. The samples are not placed in ice during transport; EPA observers suggested that the procedure be modified to include preserving the transported samples with ice.

Daily, plant personnel collect grab samples of sewage from the City of Port St. Joe for bacteria analysis. Samples are collected after chlorination and before the sewage is mixed with industrial wastewater (Station 02). Sample bottles appeared to be properly cleaned and sealed, but did not contain a dechlorination agent; consequently, the sewage was transported to the laboratory without being dechlorinated. Additionally, the samples are not placed in ice during transport to the WWTP laboratory.

A flow calibration problem occurs periodically at the Parshall flume (Station 07). Although not observed by NEIC, it was reported that wastewater inflow from St. Joe Paper Company occasionally exceeds the maximum flow capacity of 167,000 m^3/day (44 mgd) recommended for the Parshall flume at the WWTP final effluent. When this occurs, flow measurements and related flow-proportional samples collected by Company-installed automatic samplers may be in error.

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* According to WWTP personnel, corrosive gases generated by incoming waste streams caused leakage in the compressor lines, resulting in inadequate refrigeration. The WWTP officials are considering either relocating the samplers or shielding them from the gases to correct this situation.

LABORATORY EVALUATION

The laboratory facilities were visited for inspection during the Port St. Joe WWTP evaluation. The WWTP Laboratory Supervisor and his technical assistants were interviewed concerning bacteriological and chemical laboratory procedures.

The Laboratory Supervisor holds a Bachelor of Science degree in Biology and has approximately 5 years of analytical laboratory experience. His technical assistants have a variety of background training in sewage treatment as well as 1 to 2 years experience in analytical laboratory work.

The WWTP laboratory staff routinely use the membrane filter procedure for determining bacteria densities in raw chlorinated domestic sewage. This procedure is not an approved method for monitoring chlorinated sewage. Standard Methods[11] states that the membrane filter technique should not be used for coliform analyses of raw or primary treated domestic wastes that have been chlorinated. The most-probable-number (MPN) tube-dilution procedure is the recommended method for testing these types of wastewater. Additionally, WWTP personnel do not dechlorinate samples immediately upon collection. Sample bottles should contain proper amounts of sodium thiosulfate for dechlorination of sample at the time of collection. Therefore, past self-monitoring bacteriological data required by the NPDES permit that have been analyzed at the Port St. Joe WWTP laboratory must be considered invalid.

During the NEIC evaluation, WWTP personnel were actively participating in a self training exercise in use of the MPN procedure. All indications are that the facility and personnel should have little difficulty in converting to the MPN procedure. However, it is strongly recommended that laboratory analysts participate in an EPA- or State-sponsored training course in Wastewater Microbiology.

Several additional recommendations related to bacteriological monitoring were presented to the Wastewater Treatment Plant management. These included:

1. Procurement of the 14th edition of Standard Methods for the Examination of Water and Wastewater. The laboratory is currently using the 13th edition for reference purposes.

2. The use of the 5-tube MPN procedure for NPDES self-monitoring testing.

3. Incorporation of the 5-tube MPN procedure will require procurement of a larger and more efficient autoclave that contains proper temperature controls.

4. The laboratory should obtain a water jacketed incubator that will maintain proper temperature controls.

5. The laboratory should initiate a good ongoing quality control program for bacteriology to include bound records demonstrating such items as incubator, waterbath and autoclave temperature controls. Additional items should include thermometers calibrated with a National Bureau of Standards thermometer. The balance used to weigh media and reagents should be calibrated routinely. Records should be maintained on media pH checks. Dehydrated media that has been opened should be stored in a desiccator and unused portions discarded after 6 months storage. Quality control procedures should include routine toxic trace metal analyses on distilled water used for media preparation. Records of media reagents and supply inventories should be maintained.

The Port St. Joe WWTP laboratory staff routinely performs BOD and suspended solids analyses. The WWTP uses EPA-approved analytical procedures for these tests. A laboratory technician performs the BOD and suspended solids analyses during the week and plant operators perform the analyses on weekends. The WWTP staff appear to have a good understanding of the chemical procedures which are taken from Standard Methods.

All BOD and suspended solids analyses are performed on the same day the samples are collected. The BOD procedure consisted of the multiple dilution technique with the dilutions being made in the bottles. Two bottles per dilution are prepared, one each for initial and final dissolved oxygen (DO) readings. The aerated lagoon effluent is used as bacterial "seed" for the paper and tall oil company wastewaters. The DO meter is calibrated with air saturated water at known temperature and barometric pressure. Results from all dilutions with DO depletion between 40 and 70% for each sample are averaged and the results are checked against past values.

The NEIC Laboratory Supervisor suggested that the WWTP laboratory staff prepare only one bottle per dilution to obtain both the initial and final DO values. The rationale for preparing two bottles, as stated in Standard Methods, is that in the past, DO concentrations were determined by the Winkler Method which destroyed the sample. The rationale is no longer valid when using the DO meter and, therefore, it is appropriate to use the one-bottle method.

The NPDES permit requires an instantaneous pH measurement daily on the final effluent. The practice at the Port St. Joe WWTP was to transport a composite sample to the laboratory for pH analysis. During the NEIC laboratory evaluation, the Laboratory Supervisor was advised of this error by the EPA inspection team. The WWTP staff plans to correct this procedure immediately.

No formalized quality assurance program for chemistry was in operation at the WWTP laboratory. To initiate such a program, the following suggestions were made:

1. Glucose-glutamic acid standards should be analyzed daily instead of periodically to verify the proper performance of the BOD test. In addition, 10% of the samples should be analyzed in duplicate to determine the precision of the procedure. The thermometer used to monitor the BOD incubator should be calibrated against a National Bureau of Standards thermometer or by preparing distilled water baths at 0 and 100°C.

2. The suspended solids procedure consisted of using the membrane-type filter holder with Gelman®* AE glass fiber filters. The maximum volume of water that could be passed through the filter in about five minutes was used. The thermometer used to verify the oven temperature should be calibrated as stated above. A technique to calibrate the analytical balance using a one-gram weight was demonstrated by NEIC personnel. It was recommended that this procedure be performed every day that the balance is used and the results recorded in addition to the routinely scheduled maintenance.

3. To determine the precision of the procedure, 10% of the suspended solids samples should be analyzed in duplicate. In addition, suspended solids reference samples should be analyzed frequently, preferably every day.

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* References to product® brand names in this document does not imply endorsement by the Environmental Protection Agency.

The NEIC personnel supplied the WWTP laboratory personnel with standard reference samples for both BOD and total suspended solids (TSS) analyses. They were asked to analyze the samples and submit the results to EPA within two weeks.

The WWTP performed well on the reference samples. The results they reported for BOD and TSS were 24 and 47 mg/l (true value 24 and 51 mg/l), respectively.

Furthermore, NEIC and WWTP personnel split daily wastewater composite samples from six locations in the treatment plant. Ten samples from each station were analyzed by NEIC and WWTP chemists for BOD and TSS. The NEIC and WWTP data are compared in Table 3. Except for BOD results on the Sylvachem effluent (Station 04), the NEIC and WWTP compared well. The significant difference in BOD results for the Silvachem wastewaters is believed to be related to the source of BOD bacterial seed. As previously mentioned, the WWTP used the aerated lagoon effluent as "seed" in BOD analysis of the tall oil wastes. The NEIC used raw domestic sewage as "seed" for the BOD tests [Appendix E]. It appears that the "sewage seed" selected by NEIC was composed of bacteria that were not acclimated to the tall oil wastes as were the bacteria from the lagoon effluent; consequently, the NEIC results for BOD in the Sylvachem wastewater were substantially lower than the WWTP results.

The overall effect of the difference in Sylvachem waste BOD results was minimal as demonstrated by the comparison of the WWTP and NEIC findings for the final effluent (Station 07). The mean of the ten results from BOD tests of the final discharge was 26 mg/l by NEIC analysts and 24 mg/l by the WWTP.

Generally, the Port St. Joe WWTP laboratory was clean, spacious and orderly. The laboratory bench sheets and summary results forms

Table 3

COMPARISON OF CHEMICAL DATA[a]
PORT ST. JOE WWTP - FLORIDA
February 8-18, 1978

Station No.	Description	WWTP[b]		NEIC[c]	
		BOD[d]	TSS[e]	BOD	TSS
01	City of Port St. Joe Sanitary Sewer, influent to WWTP prior to chlorination	134	191	102	206
03	St. Joe Paper Company wastewater, influent of untreated mill waste to WWTP	231	383	176	402
04	Sylvachem Company wastewater, influent of raw untreated waste to WWTP	2,680	899	1,827	870
05	Discharge from the WWTP primary Clarifier A (west tank)	243[f]	169[f]	199	167
06	Discharge from the WWTP primary Clarifier B (east tank)	237[f]	138[f]	204	119
07	Final discharge of WWTP at the Parshall flume	24	60	26	51

a Values expressed as mg/l; arithmetic mean of 10 tests unless indicated otherwise.
b Wastewater Treatment Plant
c National Enforcement Investigations Center
d Biochemical oxygen demand
e Total suspended solids
f Arithmetic mean of 9 tests

were adequate and filled out completely. Personnel were very cooperative, conscientious and capable. The staff of the WWTP laboratory were well trained in chemical procedures and used modern, well-maintained equipment.

Management expressed sincere intentions of establishing a quality assurance program, improving laboratory capabilities and adherence to established procedures, as well as procurement of additional equipment, supplies and training needs.

VI. STUDY FINDINGS

BACTERIAL GROWTH STUDIES

To determine bacterial growth patterns in the industrial and domestic wastewater mixture being treated at the Port St. Joe plant, wastewater from the primary clarifiers (Stations 05 and 06) was tested. At the NEIC laboratory, the clarifier wastewaters collected 40 hours earlier were combined and mixed thoroughly. An aliquot of the combined sample was tested for BOD and coliform bacteria densities. The sample was subsequently divided into three equal portions which were incubated: one each at 15, 22.5 and 30°C respectively. The incubated samples were mixed and aerated constantly by passing air through sterile cotton.

Initial BOD was 260 mg/l. MPN analysis showed no lactose fermentation indicating that no coliform bacteria were present in the wastewater samples. However, the bacteria culture tubes exhibited turbidity, indicating the presence of nonlactose fermenting bacteria. Aliquots from each incubated container of wastewater were tested again for BOD and coliform densities. The BOD results were erratic and the repeated MPN test showed no coliform bacteria present.

After incubating and aerating the three containers of wastewater for 5 days at 15, 22.5 and 30°C, a pure culture of Escherichia coli (2,400 per ml*) was inoculated into each.

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* Because each sample was artificially inoculated, densities are more appropriately expressed as E. coli/ml rather than E. coli/100 ml.

A BOD of 230 mg/l was measured in the inoculated sample incubated at 30°C while the BOD was 360 mg/l at 22.5°C and 390 mg/l at 15°C. Subsequent BOD measurements of each incubated sample were performed at two- or three-day intervals throughout the 17-day study. The BOD values were compared with MPN values for each of the three inoculated samples to determine the relationship between temperature, BOD and bacterial growth [Table 4].

The inoculated sample incubated at 30°C demonstrated increased growth of E. coli to a maximum of 490,000/ml on the fourth day after inoculation. Bacteria densities then declined rapidly to less than 500 E coli/ml at 9 days' incubation time. There was a concomitant decline in the BOD (from 280 to 140 mg/l) during this 9-day incubation, also.

Between the 10th and 17th day of incubation the E. coli bacteria densities fluctuated from 170 to 350/ml. The BOD showed a steady decline during this same incubation period.

The sample incubated at 22.5°C had increased growth to 240,000 E. coli/ml at three days. Bacteria densities remained relatively stable through the sixth day of incubation and then declined very slowly. Subsequent testing showed that at 17 days of incubation, bacteria density was 54,000 E. coli per ml. The BOD showed a similar pattern. It declined rapidly from 320 to 230 mg/l between the second and fifth day of incubation. Thereafter, the BOD continued to decline more slowly, reaching 120 mg/l on the sixteenth day.

The sample incubated at 15°C had an initial increase in bacterial growth to 54,000/ml on the third day of incubation. Bacteria densities gradually declined to 2,300/ml at 17 days of incubation. The BOD declined steadily from 390 to 140 mg/l during the 17 days of incubation.

Table 4

RELATIONSHIP OF ESCHERICHIA COLI[a] GROWTH AND BOD IN A MIXTURE OF INDUSTRIAL WASTEWATER AND MUNICIPAL SEWAGE
PORT ST. JOE WWTP - FLORIDA
November 1977

Day	Days of Incubation	Incubation Temperature					
		30°C		22.5°C		15°C	
		MPN/ml	BOD mg/l	MPN/ml	BOD mg/l	MPN/ml	BOD mg/l
3[b]	0	2,400	280	2,400	360	2,400	390
3	1	92,000		54,000		9,200	
4	2	130,000	250	130,000	320	7,900	290
5	3	240,000		240,000		54,000	
6	4	490,000		110,000		54,000	
7	5	35,000	220	160,000	230	35,000	270
8	6	22,000		240,000		24,000	
9	7	7,900	170	49,000	220	24,000	260
11	9	500	140	92,000	210	7,900	240
12	10	350		54,000		7,000	
14	12	170	80	24,000	190	5,400	200
15	13	350		92,000		5,400	
16	14	350	80	54,000	140	3,500	160
17	15	240		34,000		3,500	
18	16	180	60	54,000	120	3,300	140
19	17	350		54,000		2,300	

a E. coli/ml (most-probable-number, (MPN technique)
b Samples artificially inoculated on incubation day zero (11/2/77)

Interpretation of the results of this bacteria growth study require careful consideration of the several unusual observations described above. First, the samples were held 40 hours before BOD and MPN analyses were performed. Ideally, testing should be conducted within six hours of collection. Although the holding time limitation was exceeded, it was considered unusual that the wastewater sample from the primary clarifiers did not contain coliform bacteria. Possible reasons for this may include: a) components in the sample had a bactericidal effect that was selective for coliforms; b) the organisms may have experienced natural die-off during the 40-hr holding period; or c) the specific grab sample may not have contained coliform bacteria.

This phase of the bacterial growth study indicated the following: a mixture of industrial wastes (paper mill and tall oil) and sewage supported growth of E. coli; maximum bacteria growth occurred within four days; highest bacteria growth occurred at 30°C incubation with progressively less growth at 22.5 and 15°C; BOD levels exhibited a steady decline during the seventeen-day study; percent BOD removal declined as the incubation temperature was lowered.

Similar laboratory studies were conducted in February and March 1978. These studies were performed on the aerated lagoon at Station 13 rather than the clarifier discharges. This was done to eliminate possible deleterious effects that the discharges from the other clarifiers might have on the bacteria.

Two large-volume samples were collected on February 11. These were handled in a manner similar to those collected in October 1977. However, coliform bacteria showed a rapid die-off after an initial increase on the first day of incubation. The BOD results were erratic, also. This precluded use or interpretation of these data.

A third large-volume sample was collected February 17, 1978. At the NEIC laboratory the sample was quick-frozen to -80°C and stored at this low temperature until March 6, 1978. The sample was thawed rapidly in a hot water bath before BOD and bacteriological analyses. Once again, the sample was divided into equal portions and incubated each at 35, 25 and 15°C.

Initial FC bacteria densities and BOD values were low (33 FC/100 ml, 29 mg/l, respectively) [Table 5]. Subsamples incubated at 35 and 25°C demonstrated a rapid increase of FC bacteria to 11,000 and 17,000/100 ml, respectively, after only one day of incubation. Corresponding BOD values decreased slightly to 18 and 25 mg/l. The 35°C sample decreased to negligible numbers of bacteria after 4 days of incubation, and remained low during the remainder of the 18-day incubation period. The BOD values showed a decrease to 7 mg/l after 4 days and continued to decrease during the remainder of the 18-day incubation period.

The subsample incubated at 25°C decreased to the original FC densities between day 11 and day 14. The BOD values were similar to the 35°C sample.

The 15°C subsample showed a much lower bacterial growth and slower die-off rate. Maximum FC densities were observed on days 3, 5 and 13 (3,300, 3,500 and 4,900 FC/100 ml, respectively). After 13 days of incubation, FC densities rapidly decreased and were similar to initial levels on day 17. The BOD values for the 15°C sample demonstrated a slightly slower decline than the 25 and 35°C samples. The BOD values were 4 mg after 18 days of incubation.

The FC bacteria densities demonstrated a more rapid initial increase and subsequent decrease at the higher temperatures. Fecal coliform bacteria densities demonstrated less growth and slowest at

Table 5

RELATIONSHIP OF FECAL COLIFORM BACTERIA GROWTH AND BOD
IN A MIXTURE OF INDUSTRIAL WASTEWATER AND MUNICIPAL SEWAGE
PORT ST. JOE WWTP - FLORIDA
March 1978

Day	Days of Incubation	Incubation Temperature					
		30°C		22.5°C		15°C	
		MPN/ml[a]	BOD mg/l	MPN/ml	BOD mg/l	MPN/ml	BOD mg/l
6	0	33	29	33	29	33	29
7	1	11,000	18	17,000	25	46	30
8	2	3,300	12	7,000	12	330	19
9	3	230	12	7,900	10	3,330	14
10	4	5	7	3,300	7	1,300	10
11	5	<2		3,300	6	1,100	7
12	6	<2		790		790	
13	7	<2	6	330	5	3,500	7
14	8	2		790		1,100	
15	9	13	2	230	4	1,300	7
16	10	8		170		1,300	
17	11	2	3	20	4	1,300	7
18	12	5		110		790	
19	13	<2		20		4,900	
20	14	2	3	80	4	2,300	7
21	15	<2		<2		230	
22	16	<2	3	130	3	130	7
23	17	<2		<2		50	
24	18	<2	3	<2	3	<2	4

a Fecal coliforms per 100 ml natural sample as determined by most-probable-number (MPN) technique

15°C. No definitive, direct relationship between FC densities and specific BOD levels could be determined during this limited study.

However, it was obvious that the lagoon waste supports growth of coliforms, and that the temperature of the waste had a marked effect on both BOD removal and fecal coliform bacteria growth and die-off.

BACTERIA BIOASSAY

One purpose for the EPA to perform a full-scale study of the Port St. Joe WWTP was to determine the fate of sewage bacteria in the treatment system. For reasons described below, the EPA conducted a bacteria bioassay to determine if a mixture of sewage, paper mill and tall oil wastewaters was toxic.

As part of a cooperative agreement between the EPA and the University of Colorado, the NEIC collected an effluent sample from the Port St. Joe treatment lagoon during the presurvey visit on October 26, 1978. Subsequent analysis by scientists at the University of Colorado* revealed that the lagoon wastewater sample contained: chloroform ($\leq$1 µg/l); dimethyl disulfide (10 to 20 µg/l); toluene (<0.01 µg/l); tetrachloroethylene ($\leq$1 µg/l); camphor (10 to 20 µg/l); fenchone ($\leq$1 µg/l); 3-caryophilline (1 µg/l), and dimethyl trisulfide ($\leq$1 µg/l). None of these wastewater components appeared to be present in amounts toxic to bacteria.

On January 17 and 18, 1978, the NEIC visited the Port St. Joe facility, collected wastewater from industrial and municipal inflows as well as from several locations in the treatment system. Additionally, wastewater samples were collected from the two industries that

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* The Environmental Trace Substances Research Program, University of Colorado, Boulder, Colorado.

discharge into the Bay County Wastewater Treatment Plant in Panama City, Florida. These nine samples were tested for bacterial toxicity at the Denver NEIC laboratories. Stations 01 through 07 were at Port St. Joe WWTP. The two samples collected from the Bay County Treatment system in Panama City were identified as Station 09, International Paper Company primary clarifier effluent and Station 12, Arizona Chemical Company (tall oil processor) untreated wastewater.

At the NEIC laboratory, three strains of bacteria commonly associated with sewage and paper mill wastes were used for the bacteria toxicity testing. These were Escherchia coli, Klebsiella pneumonia and Salmonella enteriditis ser typihimurium. The techniques used for toxicity testing involved agar diffusion and broth culturing which are described in Appendix C. No inhibition zones were observed with any of the nine wastewater samples when subjected to the agar diffusion test. Furthermore, none of the nine samples showed any bacterial growth reduction in the broth culture test. It was concluded that none of the nine wastewater samples were toxic to E. coli, K. pneumonia and S. enteriditis ser typhimurium.

PLANT EVALUATION

Industrial wastewater accounts for approximately 98% of the wastewater treated by the Port St. Joe Wastewater Treatment Plant (WWTP). The largest inflow to the WWTP is from the Port St. Joe Paper Company. Based upon the 11-day study by NEIC, the WWTP received an average wastewater flow of 131,000 m^3/day (34.5 mgd) and a peak flow at 140,000 m^3/day (36.9 mgd) from the paper mill. The mill process wastewaters were highly colored and had a strong odor. Measured parameters [Table 6 and Appendix G] revealed the wastewater had a pH range of 5.8 to 11.4; temperature of 28 to 35°C; an average BOD of 179 mg/l and an average TSS of 402 mg/l. Waste loading was calculated to

Table 6

SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS
PORT ST. JOE WWTP - FLORIDA
February 8-18, 1978

	Flow		pH	Temp	Cl_2	BOD			TSS		
	$m^3 \times 10^3$	mgd		°C	mg/l	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Station 01 - Sewage before Cl_2											
Range	1.77-3.07	0.467-0.810	6.0-8.3	13-18		70-200	152-608	355-1,340	79-1,000	188-3,030	413-6,680
Avg.	2.43	0.643		15		102	250	550	196	523	1,150
Station 02 - Sewage after Cl_2											
Range	1.77-3.07	0.467-0.810	6.0-7.4	14-17	3.2-26						
Avg.	2.43	0.643		15.3	9.93						
Station 03 - St. Joe Paper											
Range	106-140	27.9-36.9	5.8-11.4	28-35		120-220	30,700-15,300	33,600-67,700	250-560	33,300-69,500	73,400-153,000
Avg.	131	34.5		31.4		179	23,400	51,500	402	52,200	115,000
Station 04 - Silvachem											
Range	1.32-1.98	0.348-0.524	3.6-12.1	29-40		630-3,600	831-7,130	1,830-15,700	300-1,700	395-3,370	870-7,430
Avg.	1.64	0.433	32.6			1,827	3,120	6,860	870	1,480	3,260
Station 05 - Clarifier "A"											
Range	58.3-73.4	15.4-19.4	7.0-10.4	26-34		140-250	8,940-17,600	19,700-38,800	120-210	6,990-14,900	15,000-32,900
Avg.	67.4	17.8		30.4		199	13,300	29,400	167	11,400	25,000
Station 06 - Clarifier "B"											
Range	58.3-73.4	15.4-19.4	6.9-10.8	22-34		150-280	9,580-18,300	21,000-40,000	88-140	5,900-9,990	13,000-22,000
Avg.	67.4	17.8	30.1			204	13,700	30,200	119	8,040	17,700
Station 07 - WWTP Final Discharge											
Range	177-147	30.8-38.9	6.5-7.6	15-24		24-33	2,800-4,680	6,160-10,300	32-78	3,720-11,100	8,200-24,500
Avg.	135	35.6		21.4		26	3,580	7,890	51	6,930	15,260
Station 13 - Lagoon											
Range			6.3-7.9	20-25							
Avg.				22.9							

average 23,400 kg (51,500 lb)/day of BOD and 52,200 kg (115,000 lb)/day of TSS.

Both total and fecal coliform bacteria densities in the St. Joe Paper Company wastewater and at all other sampling stations used in this study were measured daily [Appendix G]. The primary concern is with fecal coliforms because the Port St. Joe WWTP permit and the receiving water quality criteria specifically limit these organisms.

The paper mill wastewaters contained an average (geometric mean) of 140 fecal coliforms per 100 ml [Table 7]. Randomly, fecal coliform colonies were picked and subjected to coliform typing as described in Appendix C. All of the colonies selected were E. coli type 1. Relatively few (16) colonies were identified. However, the IMViC* testing showed that a substantial portion of coliforms contributed by St. Joe Paper Company were of definite fecal origin.

The Sylvachem Company processes tall oil to produce rosin and other fatty acids. During the study, the average wastewater flow from this chemical industry measured 1,640 m^3/day (0.43 mgd) while the peak flow was 1,980 m^3/day (0.52 mgd). The wastewater was characterized by a pH range of 3.6 to 12.1; temperature of 29 to 40°C; an average BOD of 1,827 mg/l and an average TSS of 870 mg/l [Table 6]. Average daily loads for BOD and TSS were calculated to be 3,120 kg (6,860 lb) and 1,480 kg (3,260 lb), respectively. Although oil and

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* IMViC is used with plus and minus signs to express the difference between the organisms in a "formula." "I" is the indole reaction, "M" the red reaction, "V" the acetyl-methyl-carbinol test (originated by Voges-Proskauer), "i" is euphony, and "C", growth in mineral solution containing citrate as a sole source of carbon. Example "IMViC ++ -- " would be E. coli type 1, since this gives positive indole and methyl red reactions, but negative Voges-Proskover and citrate reactions.

Table 7

SUMMARY OF BACTERIOLOGICAL CHARACTERISTICS
PORT ST. JOE WWTP - FLORIDA
February 8-18, 1978

Station	Description	Coliforms/100 ml				Total Colonies	E. Coli Type 1[a]	Intermediate Coliform types[b]	Klebsiella[c]
		Total	10-day GM[a]	Fecal	10-day GM			(%)	
01	Sewage before chlorination	790,000 - 1,600,000	13,000,000	330,000 - 22,000,000	1,800,000	--	--	--	--
02	Sewage after chlorination	<2 - ≤240,000	300	<2 - 54,000	57	--	--	--	--
02	Sewage after chlorination blended sample	<2 - ≤240,000	6,100	<2 - 54,0000	550	63	95	5	0
03	St. Joe Paper Company effluent	23- 160,000	1,5000	2 - 1,400	140	16	100	0	0
04	Sylvachem Co. effluent	<2 - 9,200,000	260,000	<2 - 3,500,000	61,000	63	57	19	24
05 and 06	Discharge from WWTP primary clarifiers	5 - ≥240,000	5,400	<2 - 17,000	500	36	50	0	50
13	Aeration Lagoon	490 - 54,000	6,600	79 - 7,000	1,000	73	33	8	59
07	Final effluent from WWTP	170 - 24,000	2,900	46 - 4,900	500	139	17	9	74

a Of definite fecal origin.
b May or may not be of definite fecal origin.
c Comprises 30 to 40% of coliforms found in human and animal feces.
d Geometric mean

grease measurements were not made by the EPA, daily observations of the process wastewater indicated that an oily slick was common in the Sylvachem wastewater.

High numbers of fecal coliform bacteria were introduced with the Sylvachem Company wastewater influent [Station 04] to the City of Port St. Joe WWTP. Fecal coliforms numbered as high as 3.5 million/ 100 ml and had a geometric mean of 61,000 FC/100 ml.

Biochemical testing revealed these fecal coliform bacteria were composed of 57% E. coli type 1, 24% Klebsiella and 19% intermediate coliform types. These large numbers of fecal coliforms and the high percentage of E. coli type 1 indicate that Sylvachem wastewaters are contaminated with fecal material. Pretreatment disinfection of the tall oil processing wastewater would preclude these high numbers.

The inflow (February 8 to 18, 1978) of domestic wastewater averaged 2,430 m^3/day (0.64 mgd). The peak flow of 3,140 m^3/day (0.81 mgd) was measured on February 17, 1978; this flow occurred following local precipitation of 3.5 cm (1.5 inches) during the week. City sewage was characterized by a pH range of 6.0 to 8.3; temperature of 13 to 18°C, and average BOD of 102 mg/l and an average TSS of 196 mg/l. Daily average load for BOD was 250 kg (550 lb) and for TSS was 523 kg (1,150 lb) [Table 6].

To determine the disinfection efficiency the domestic wastewater was analyzed for coliform bacteria both before and after chlorination. Fecal coliform bacteria in the raw sewage (Station 01) averaged 1.8 million/100 ml. Chlorinated sewage samples (Station 02) contained an average of 57 fecal coliforms/100 ml. Further study indicated that these numbers and the apparent disinfection efficiency were somewhat deceptive. Subsamples of the post-chlorinated sewage were blended at approximately 15,000 rpm in a sterile Waring blender for 30 seconds.

The results from the blended samples revealed that high numbers of coliform bacteria resided in sewage particles and were escaping disinfection. Blended samples of chlorinated sewage had ranges of bacteria that were similar to unblended sewage [Table 7] but the geometric mean density was increased to 550 fecal coliforms/100 ml.

Biochemical testing of selected isolates by the IMViC procedure showed 95% E. coli type 1 and 5% intermediate coliform types. None of the colonies picked were identified as Klebsiella.

To determine if disinfection was more effective after primary treatment, another series of bench-scale tests were performed in the manner described previously. Raw sewage* used in the test contained the same average density of fecal coliforms as found in the Port St. Joe sewage---1.8 million/100 ml. After chlorination (15 minutes detention with an average chlorine residual of 4.3 mg/l), the sewage sample contained an average of 71 FC/100 ml. Analysis after blending the sewage sample showed the average density of fecal coliforms increased from 71 to 160/100 ml. Thus, tests revealed that coliform bacteria resided in sewage even after primary treatment and chlorination. Furthermore, analysis of the blended sample of chlorinated sewage showed that, on the average, less than one-half of the fecal coliforms were measured by conventional MPN analysis. Other laboratory tests with extended chlorine contact showed no appreciable change from the trend described [Table 8].

Effluent from each clarifier was characterized to determine the primary treatment efficiency. The pH ranged 6.9 to 10.8; temperature ranged 22 to 34°C; BOD averaged 201 mg/l and TSS averaged 143 mg/l. The primary treatment effluent had a daily average load for

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* Primary-treated sewage samples were collected from the Arvada, Colorado WWTP randomly over a 15-day period.

Table 8

COMPARISON OF BLENDED VS UNBLENDED
PRIMARY TREATED SEWAGE AT VARIOUS DISINFECTION RATES
PORT ST. JOE WWTP - FLORIDA
March 1978

Day	Chlorine Residual mg/l	Contact Time minutes	Fecal Coliforms MPN[a]/100 ml	Fecal Coliforms MPN/100 ml Blended
8	0	0	92,000	
9	0	0	2,200,000	
10	0	0	3,300,000	
13	0	0	3,300,000	
14	0	0	7,900,000	
15	0	0	2,300,000	
	Geometric Mean		1,800,000	
1	2.4	15	3,300	4,600
2	1.7	15	7,900	3,300
2	4.6	15	5	17
3	4.6	15	23	140
7	4.5	15	130	1,300
8	5.4	15	330	460
9	5.2	15	23	31
10	4.0	15	7	110
13	4.2	15	170	220
14	5.6	15	2	<2
15	4.5	15	33	110
	Geometric Mean		71	160
8	5.4	20	23	170
9	5.2	20	2	2
10	3.6	20	2	46
13	3.6	20	11	13
14	5.4	20	2	2
15	4.2	20	13	2
	Geometric Mean		5	9
8	5.4	30	23	310
9	4.8	30	17	11
10	3.4	30	23	230
13	3.0	30	6	<2
14	5.1	30	2	2
15	4.0	30	13	8
	Geometric Mean		11	14

a Most probable number

BOD of 27,100 kg (59,600 lb) and TSS of 19,400 kg (42,700 lb). This represented about 3% reduction in BOD and 65% reduction in TSS.

Examination of samples collected from both clarifiers revealed that fecal coliform bacteria were being introduced to the treatment lagoon. The discharge from Clarifier A (Station 05) contained fecal coliform densities ranging as high as 17,000/100 ml with a geometric mean of 690/100 ml. The discharge from Clarifier B (Station 06) contained fecal coliform bacteria densities as high as 13,000/100 ml with a geometric mean of 380/100 ml. The proportional geometric mean coliform densities of both clarifiers yielded a value of 500 FC/100 ml. Further biochemical tests revealed the presence of the following species of Enterobacteriacea: 50% E. coli type 1 and 50% Klebsiella.

Primary treated wastes were pumped from the clarifiers through a distribution header into the 28-ha (70-acre) lagoon. Observation of the inflow boils along the south edge of the lagoon indicated a non-uniform inflow pattern. The engineering drawings and discussions with plant-operating personnel revealed that the unequal discharge was apparently a design problem and not a malfunction.

The lagoon has twelve 75 HP aerators that serve to mix and aerate wastewaters. During the 11-day EPA study, ten aerators were operated the first 2 days and eleven aerators were operated thereafter. The aeration system was designed to provide a surplus of oxygen to wastewaters in the lagoon; reportedly, dissolved oxygen levels ranged from 0.3 to 3.1 mg/l.[13] The wastewater temperature and pH were measured daily by the EPA. The temperature of the lagoon water ranged from 20 to 25°C and the pH ranged 6.3 to 7.9. Typically, a heavy layer of foam (approximately 100 cm thick) covered much of the lagoon surface.

Daily water samples were collected from the lagoon and analyzed for bacteria. Results were compared with bacterial densities measured

in the primary treatment inflow to determine if coliform bacteria are either sustained or multiply in the lagoon during the 12.6-day* detention period. Analyses of samples collected from the south shoreline of the aerated lagoon (Station 13) revealed coliform bacteria densities were higher than the combined average of the clarifier discharges. Geometric mean densities were 6,600 total coliforms/ 100 ml and 1,000 fecal coliforms/100 ml, respectively. IMViC typing revealed that percentages of E. coli had decreased (33%), while Klebsiella bacteria were increasing (59%). Intermediate coliform types were 8%.

The lagoon discharge caused discoloration in the receiving water, Gulf County Canal. The discolored water generally hugged the near shoreline (south bank) of the canal. Trace amounts of foam, similar to that which covered the lagoon, were often observed in the Gulf County Canal. The WWTP has attempted to alleviate the foam in the final discharge by adding a defoaming agent, Houghton De-Ariex,® at a maximum rate of 20 gpd.[5] Additionally, the WWTP uses a "rainbird" type sprinkling system in the lagoon and a series of baffles to suppress foaming as well as prevent surface foam from being directly discharged into the Gulf County Canal.

Other observations of the lagoon and at the final discharge point revealed numerous areas of apparent seepage. The northeast dike of the lagoon appeared to have the worst seepage problem, but seepage was observed along the northern dike which is adjacent to the Gulf County Canal and along the west dike area also. Reportedly, the lagoon was constructed on native sand and not sealed.[5] Daily records from the WWTP analytical laboratory show the flow differential between the effluent and the influent was as high as 16,100 m^3/day (4.25 mgd). This flow loss was attributed to a combination of seepage and evaporation.[3]

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* Based upon engineering design.[12]

The final effluent from the lagoon was monitored daily by the EPA. During the study, the treated waste flow averaged 135,000 m^3/day (35.6 mgd). Water temperatures averaged 21°C, and the pH ranged from 6.5 to 7.6. Dissolved oxygen in the final effluent reportedly ranged from 8.0 to 8.7 mg/l.[15] Suspended solids averaged 51 mg/l and the BOD averaged 26 mg/l; average TSS and BOD loads were 6,930 kg (15,260 lb/day) and 3,580 kg (7,890 lb)/day, respectively. This represented an average overall reduction in solids and BOD of 87%.

The final discharge was monitored twice daily to determine densities of coliform bacteria. Additionally, the effluent was monitored for the percentages of Klebsiella and E. coli, as well as for the presence of Salmonella. The final discharge contained 500 fecal coliforms/100 ml; this is the same density of fecal coliforms found entering the lagoon from the combined clarifier discharges (Stations 05 and 06). Although the number of fecal coliform bacteria entering and discharged from the lagoon was the same, the bacteria types had changed. Percentages of E. coli decreased to 17% with an accompanying increase in Klebsiella to 74%. Intermediate coliform varieties made up the remaining 9%. Apparently, the lagoon wastewater favored the growth and survival of Klebsiella over E. coli [Figure 3].

Attempts to isolate pathogenic Salmonella from the final discharge were unsuccessful. The failure to recover Salmonella from the wastewaters does not necessarily mean that the organisms are absent, but that the recovery technique used was unsuccessful [Appendix B].

The fecal coliform bacteria including E. coli type 1 are sustained in the aerated lagoon and discharged at an average of 500 bacteria/100 ml. Receiving waters have been designated by the State of Florida for non-body-contact recreation (e.g., fishing, boating, etc.) which limits fecal coliform bacteria to 500/100 ml. Although

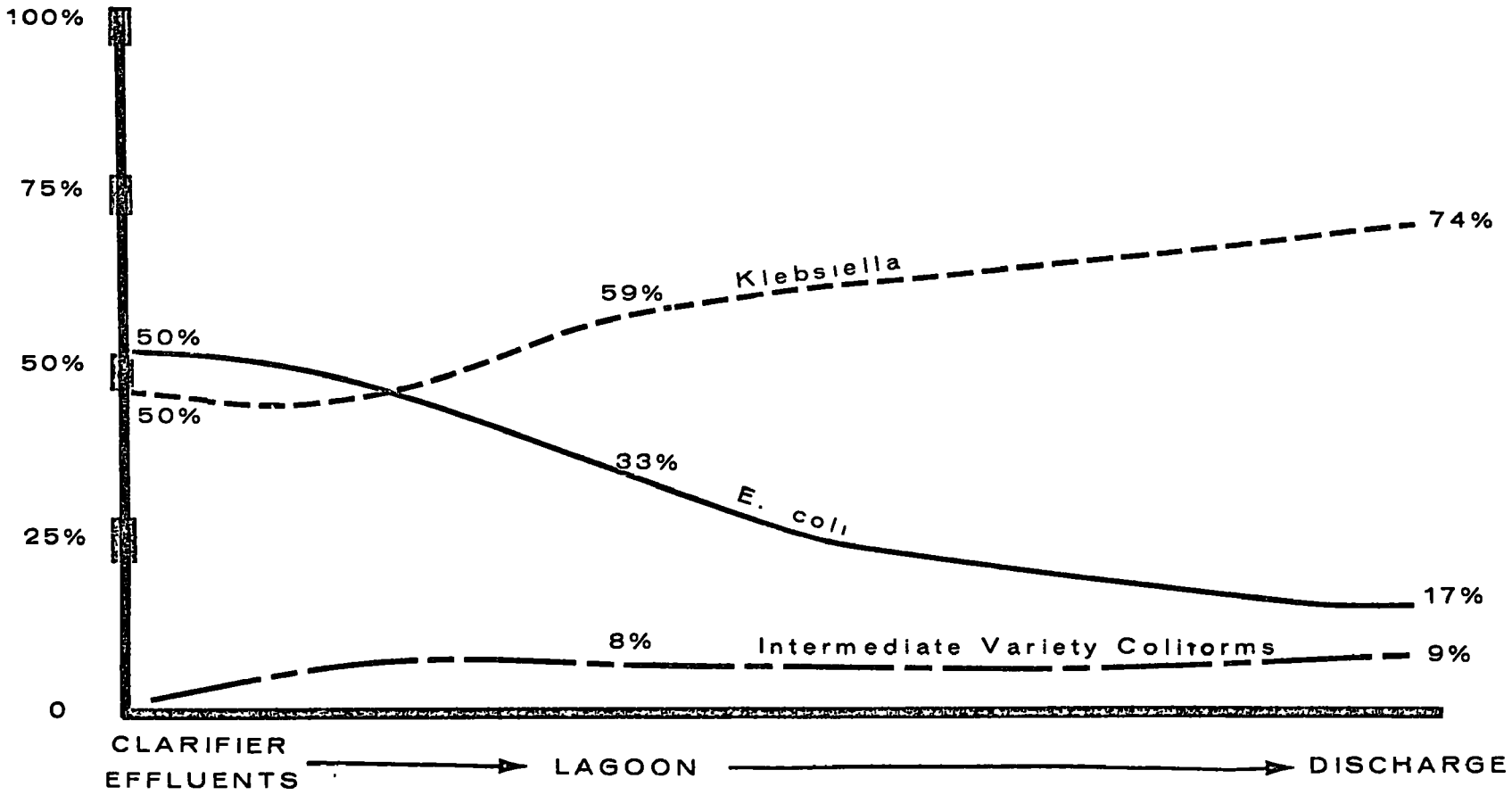

Figure 3. Coliform Growth in the Aeration Lagoon

the fecal coliform limit in the receiving water is not exceeded, further treatment at the WWTP would be necessary in order to upgrade or protect the adjacent water quality for such uses as swimming or shellfish harvesting.

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APPENDIX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE SEP 23 1977

SUBJECT: Effect of Proposed Bay Co. Treatment Scheme

FROM. Paul J. Traina, Director
Enforcement Division

TO. Thomas P. Gallagher, Director
National Enforcement Investigation Center

SUMMARY

In order to predict the bacteriological effect of mixing domestic sewage with papermill waste in the Bay Co. aerated lagoon prior to discharge to St. Andrews Bay, it has been recommended that a pilot study be made of a similarly treated effluent. The Port St. Joe aerated lagoon offers such a parallel. This system mixes papermill waste with chlorinated raw domestic sewage in a 70 acre aerated lagoon prior to discharge to St. Joseph Bay.

ACTION

Request your staff perform a pilot study of the Port St. Joe effluent sufficient to predict the coliform level to be expected from the Bay County aerated lagoon. The study will need to be made as soon as possible so as not to adversely affect funding of the Bay Co. system.

BACKGROUND

The selected alternative in the Bay Co. 201 plan is to mix 6 MGD of chlorinated primary treated domestic sewage in the existing Bay Co. aerated lagoon prior to discharge to St. Andrews Bay. Several questions were raised by National Marine Fisheries Service (NMFS) personnel as to the effect this treatment scheme would have on the coliform levels in the Bay system. Meetings were held on August 9, 10, and 11, 1977, with various agency personnel participating, including: NEIC Denver, EPA Region IV, the Florida Department of Environmental Regulation, NMFS, Panama City, and several consulting firms. It was concluded that a pilot study should be performed on a similar system as soon as possible in order to predict the level of coliform to be expected in the combined Bay Co. system. Based on the results of this study, EPA would recommend either to continue with the selected 201 proposal or select another alternative.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

4AEL:SST

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JUN 28 1977

City of Port St. Joe
Post Office Drawer A ,
Port St. Joe, Florida 32456

Re: NPDES Permit No. FL0020206

Dear Sir:

Enclosed is the National Pollutant Discharge Elimination System permit for the facility referenced above. This NPDES permit constitutes my determination under Title 40, Code of Federal Regulations, Section 125.35, as amended (39 FR 27080, July 24, 1974).

In accordance with 40 CFR 125.35, this permit will become issued and effective on the effective date specified in the permit, provided that no request for an adjudicatory hearing and/or legal decision is subsequently filed with the Agency. In the event that such a request is filed, the contested provisions of the permit will be stayed and will not become effective until the administrative review process is completed. All uncontested provisions of the permit will be considered issued and effective on the effective date set out in the permit and must be complied with by the facility

If you wish to request an adjudicatory hearing and/or legal decision, you must submit such request (an original and two copies) to the Regional Hearing Clerk within ten (10) days from the receipt of this letter. The request will be timely if mailed by Certified Mail within the ten (10) day time period. For the request to be valid, it must conform to the requirements of 40 CFR 125.36(b). Such requirements are specified in the attachment hereto.

If you have any questions about the permit, please contact the coordinator for your state at 404/881-3971. Information on the request procedures and legal matters may be obtained by contacting Ms. Sara S. Turnipseed at 404/881-3506.

Sincerely yours,

Jack E. Ravan
Regional Administrator

Enclosures

cc: Mr. John Jackson
Florida Department of Environmental
Regulation

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

City of Port St. Joe
Post Office Drawer A
Port St. Joe, Florida 32456

is authorized to discharge from a facility located at

Kenny Mill Road - St. Road 382

to receiving waters named

St. Joseph Bay via Gulf County Canal

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on JUL 1 1977

This permit and the authorization to discharge shall expire at midnight, JUN 30 1982

Signed JUN 28 1977

Jack E. Ravan
Regional Administrator

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL (SUBJECT TO REVISION AS REQUIRED BY FUTURE FACILITIES PLAN APPROVED UNDER TITLE II, P.L. 92-500)

1. These effluent limitations are to be achieved by July 1, 1977, and shall remain in effect until permit expiration for outfall Serial Number 001.

Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETER	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS		
	kg/day(lbs/day)		Other Units (Specify)		Measurement	Sample	Sampling
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Frequency	Type	Point
Flow, M^3/day (MGD)					Daily	Instantaneous	Influent or Effluent
*Biochemical Oxygen Demand (5 day)	3415(7529)	5123(11294)	26 mg/l	39 mg/l	Daily	Composite	Effluent
Suspended Solids	5780(12810)	8669(19000)	44 mg/l	66 mg/l	Daily	Composite	Effluent
Fecal Coliform Bacteria, Geometric Mean					Daily	Grab	Domestic Effluent be Mixing with Industrial

*Ultimate Oxygen Demand 10,733 lbs/day.

2. COD shall not exceed 10,733 lbs/day based on: 10,733 lbs/day = 34.75 MGD X 8.34 /1.43 X BOD_5(mg/l) + 4.57 X TKN (mg/l/ TKN assumed to equal zero.

3. The pH of the effluent shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored daily by grab sample.

4. There shall be no discharge of floating solids or visible foam in other than trace amounts.

5. The effluent shall not cause a visible sheen on the receiving water.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

   Permittee shall comply with Final Effluent Limitations on effective date of permit.

2. Permittee shall at all times provide the operation and maintenance necessary to operate the existing facilities at optimum efficiency.

3. Permittee shall verify effluent limitations. Effluent limitations are established in the Choctawhatchee River Basin Water Quality Management Plan. See Table 32.3BA-7. The wasteload allocation for the City of Port St. Joe is 10,733 lbs/day UOD. The BOD_5 limitation is 22.5 mg/l and is based on the formula.

   UOD(lbs/day) = Design Capacity

   (MGD) X 8.34 X [1.43 X BOD_5 (mg/l) +

   4.57 X TKN (mg/l]

   The factor 1.43 is that used for domestic waste and may not be applicable to the combined waste from Port St. Joe. The permittee shall submit a plan of study for determining the proper factor to be applied to the Port St. Joe effluent. The plan shall be submitted not later than 12 weeks following the effective date of the permit and shall include a schedule calling for completion of the study not later than 18 months from the effective date of the permit. Permittee shall submit the results of the study within 14 days of completion. A bacteriological study shall be done to determine whether disinfection of the final effluent is necessary prior to discharge. Effluent limits shall be determined for a possible Bay discharge.

4. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1 or T-40) postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on SEP 30 1977 Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Water Enforcement Branch
Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30308

Florida Department of Environmental Regulation
2562 Executive Center Circle East
Tallahassee, Florida 32301

3. Definitions

a. The monthly average, other than for fecal coliform bacteria, is the arithmetic mean of all the composite samples collected in a one-month period. The monthly average for fecal coliform bacteria is the geometric mean of samples collected in a one-month period.

b. The weekly average, other than for fecal coliform bacteria, is the arithmetic mean of all the composit samples collected during a one-week period. The weekly average for fecal colifrom bacteria is the geometric mean of samples collected in a one-week period.

c. Flow, M^3/day (MGD): The flow limit expressed in this permit is the 24 hour average flow, averaged monthly. It is determined as the arithmetic mean of the total daily flows recorded during the calendar month.

d. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

e. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

f. Composite Sample: A "composite sample" is any of the following:

(1) Not less than four influent or effluent portions collected at regular intervals over a period of 8 hours and composited in proportion to flow.

(2) Not less than four equal volume influent or effluent portions collected over a period of 8 hours at intervals proportional to the flow.

(3) An influent or effluent portion collected continuously over a period of 24 hours at a rate proportional to the flow.

g. Grab Sample: A "grab sample" is a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the total discharge.

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Federal Water Pollution Control Act, As Amended. (Federal Register, October 16, 1973; Title 40, Chapter I, Sub-chapter D, Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants".)

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses.

d. The analytical techniques or methods used; and

e. The results of all required analyses

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1 or T-40). Such increased frequency shall also be indicated.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

MANAGEMENT REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Non compliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. Bypassing

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where

unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. All permittees who have such sewer bypasses or overflows of this discharge shall submit, not later than six months from the date of issue of this permit, detailed data or engineering estimates which identify:

a. The location of each sewer system bypass or overflow;

b. The frequency, duration and quantity of flow from each sewer system bypass or overflow.

This requirement is waived where infiltration/inflow analyses are scheduled to be performed as part of an Environmental Protection Agency facilities planning project.

6. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. Power Failures

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures either by means of alternate power sources, standby generators or retention of inadequately treated effluent. Should the treatment works not include the above capabilities at time of permit issuance, the permittee must furnish within six months to the permitting authority, for approval, an implementation schedule for their installing, or documentation demonstrating that such measures are not necessary to prevent discharge of untreated or inadequately treated wastes. Such documentation shall include frequency and duration of power failures and an estimate of retention capacity of untreated effluent.

8. Onshore or Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentations of credentials:

a. The enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. Transfer of Ownership or Control

In the event of any change in control or ownership or facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. Toxic Pollutants

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permt does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

11. Expiration of Permit

Permittee is not authorized to discharge after the expiration date. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit such information, forms, and fees as are required by the agency authorized to issue permits no later than 180 days prior to the expiration date.

12. Industrial Pretreatment Standards

Permittee shall require any industrial dischargers into the permitted system to meet Federal Pretreatment Standards (40 CFR, Part 128) promulgated in response to Section 307(b) of the Act. The permittee shall provide yearly reports to the permitting agency regarding the pretreatment requirements which have been imposed on each major contributing industry and the results achieved therefrom. Other information may be needed regarding new industrial discharges and this will be requested from the permittee after the permitting agency has received notice of the new industrial discharge.

A major contributing industry is one that: (1) has a flow of 50,000 gallons or more per average work day; (b) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (c) has in its waste a toxic pollutant in toxic amounts as defined in standards issued under Section 307(a) of the Act; (d) has significant impact either singly or in combination with other contributing industries, on the treatment works or the quality of its effluent.

Any change in the definition of a major contributing industry as a result of promulgations in response to Section 307 of the Act shall become a part of this permit.

3. Control of User Discharges to the System:

(a) Under no circumstances shall the permittee allow introduction of the following wastes into the waste treatment system:

Wastes which create a fire or explosion hazard in the treatment works.

Wastes which will cause corrosive structural damage to treatment works.

Solids or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment works.

Wastewaters at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so as to cause a loss of treatment efficiency.

(b) The permittee shall notify the permitting agency of any of the following changes in user discharge to the system no later than 180 days prior to change of discharge:

(1) New introductions into such works of pollutants from any source which would be a new source as defined in Section 306 of the Act if such source were discharging pollutants.

(2) New introductions of pollutants into such works from a source which would be subject to Section 301 of the Act if it were discharging such pollutants.

(3) A substantial change in volume or character of pollutants being introduced into such works by a source already discharging pollutants into such works at the time the permit is issued.

This notice will include information on the quantity and quality of the wastewater introduced by the new source into the publicly owned treatment works, and on any anticipated impact on the effluent discharged from such works.

PART III - OTHER REQUIREMENTS

Requirements for Effluent Limitations on Pollutants Attributable to Industrial Users

1. Effluent limitations from this discharger are listed in Part I of this permit. It is apparent that other pollutants attributable to inputs from major contributing industries using the municipal system are also present in the permittee's discharge. At such time as sufficient information becomes available to establish limitations for such pollutants, this permit may be revised to specify effluent limitations for any or all of such other pollutants in accordance with best practicable technology or water quality standards.

2. With regard to the effluent requirements listed in Part I of this permit, it may be necessary for the permittee to supplement the requirements of the Federal Pretreatment Standards (40 CFR, Part 128) to ensure compliance by the permittee with all applicable effluent limitations. Such actions by the permittee may be necessary regarding some or all of the major contributing industries discharging to the municipal system.

   The permittee shall require each major contributing industry subject to pretreatment standards or any other applicable requirements promulgated pursuant to Section 307 of the Act to submit to the permittee periodic notices regarding specific actions taken to achieve full compliance with the requirements of Section 307. Starting on DEC 31 1977 the permittee shall submit annually to the permit issuing authority a report summarizing the progress of all known major contributing industries subject to the requirements of Section 307 until full compliance is achieved. Submission would be required again only if a major contributing industry reverts to violation of Section 307. Such report shall include at least the following information:

   (a) A narrative summary of actions taken by the permittee to ensure that all major contributing industries comply with the requirements of Section 307.

   (b) The number of major contributing industries using the treatment works, divided into SIC group categories.

   (c) The number of major contributing industries in full compliance with the requirements of Section 307, or not subject to these requirements (e.g., discharge only compatible pollutants).

   (d) A list identifying by name those major contributing industries presently in violation of the requirements of Section 307.

3. Not later than 180 days following the effective date of this permit, the permittee shall have promulgated an enforceable industrial waste ordinance subject to the review of the permitting agency. This ordinance should allow the permittee to enforce all pretreatment requirements necessary to ensure compliance with the terms and conditions of this permit, as well as to ensure compliance by all major contributing industries with the pretreatment standards and any other applicable requirements promulgated pursuant to Section 307 of the Act. The following provisions shall be included, as a minimum:

Disposal Requirements

(a) The ordinance should indicate that disposal into the sewer system of any pollutant by any person is unlawful except in compliance with Federal standards promulgated pursuant to the Federal Water Pollution Control Act Amendments of 1972 (FWPCAA), and any more stringent State and local standards.

(b) Require authorization for disposal of industrial wastes in the system.

(c) Require, as a condition for this authorization, that industries provide information describing wastewater constituents and characteristics, and type of activity involved.

(d) Describe other requirements and procedures for obtaining the authorization, the duration of the authorization, and the method of renewal.

Prohibited Discharges

Prohibit wastes as defined in 40 CFR 128.131 of the Federal Register and include any additional prohibitions necessitated by local conditions.

Pretreatment Standards

(a) Provide authority to ensure compliance of major contributing industries (as defined in 40 CFR 128.124 of the Federal Register) with Federal pretreatment standards and any other applicable requirements promulgated by EPA in accordance with Section 307 of FWPCAA.

(b) Require compliance with any more stringent pretreatment standards necessitated by local conditions.

Inspection and Entry

(a) State that agents of the treatment works and/or EPA will be permitted to enter all properties of the contributing industry for the purpose of inspection, observation, measurement, sampling and testing.

(b) Require that wastewaters be accessible, through such means as a control manhole, for purposes of inspection, observation, measurement, sampling and testing.

Reporting and Self-monitoring

(a) Require major contributing industries, and other industries as deemed necessary, to file a periodic report on the constituents and characteristics of their wastewaters.

(b) State requirements for maintaining records, using and maintaining monitoring equipment, and sampling. (The analytical methods described in 40 CFR 136.3 may be referenced).

Enforcement

(a) State that civil and criminal penalties and fines for violations will be levied in accordance with judicial procedures.

(b) Indicate that violation of the ordinance may result in termination of the disposal authorization.

Charges (optional unless facility has received a Federal Construction Grant)

(a) Provide a classification system for determining charges to defray the cost of construction and operation and maintenance of the treatment facility. Classifications can be based on wastewater constituents and characteristics, and other parameters that would ensure an equitable distribution of costs.

(b) Provide for additional charges such as monitoring fees and disposal authorization fees as deemed appropriate.

4. Immediately upon issuance of this permit, the permittee shall establish and implement a procedure to obtain from all major contributing industries specific information on the quality and quantity of effluents introduced by such industrial users. The following information shall be reported to the permitting agency on a yearly basis beginning DEC 31 1977; reports reflecting no change from the previous year may simply relate this fact, without submitting repetitive data.

(a) Section IV, Standard Form A shall be completed and submitted for each major contributing industry.

(b) Information on the municipal facility as a whole is to be reported on the monthly NPDES Discharge Monitoring Report Form (Form 3320-1).

Once the specific nature of industrial contributions has been identified, data collection and reporting requirements may be levied for other parameters in addition to those included Form 3320-1.

CONDITIONS OF STATE CERTIFICATION

The State of Florida Department of Environmental Regulation has certified the discharge(s) covered by this permit with conditions (Attached). Section 401 of the Act requires that conditions of certification shall become a condition of the permit. The monitoring and sampling shall be as indicated for those parameters included in the certification. In the event of any conflict between the conditions of this permit and in the certification attached, the more restrictive shall rule.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
2562 EXECUTIVE CENTER CIRCLE, EAST
MONTGOMERY BUILDING
TALLAHASSEE, FLORIDA 32301

REUBIN O'D ASKEW
GOVERNOR

JOSEPH W. LANDERS, JR
SECRETARY

June 20, 1977

Paul J. Traina
Director, Enforcement Division
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Mr. Traina:

Pursuant to Section 401 of the Federal Water Pollution Control Act (33 USC 1251, 1341), the State of Florida hereby issues certification for:

City of Port St. Joe FL0020206

an applicant for a National Pollutant Discharge Elimination System (NPDES) permit.

The applicant must meet all applicable sections in Chapter 403 Florida Statutes and Chapter 17-3 Florida Administrative Code.

The fecal coliform as determined on domestic waste effluent prior to mixing with industrial flow shall be limited to 200/400 per 100 ml. on monthly and weekly averages.

The State of Florida certifies that if the applicant meets the conditions developed for the NPDES permit, in addition to the specific requirements stated herein, its discharge will comply with the provisions of Sections 301 and 302 of the Act.

Insofar as we can determine, there are no further limitations under Sections 306 and 307 applicable to this case.

Sincerely,

Joseph W. Landers, Jr.
Secretary

JWL:btp

40 CFR 125.36(b)(2)

Requests for an adjudicatory hearing shall:

(i) State the name and address of the person making such request;

(ii) Identify the interest of the requestor which is affected by the proposed issuance, denial or modification of the permit contained in the determination of the Regional Administrator pursuant to §125.35(a);

(iii) Identify any persons whom the request represents;

(iv) Include an agreement by the requestor to be subject to examination and cross-examination and to make any employee or consultant of such requestor or other person represented by the requestor available for examination and cross-examination at the expense of such requestor or such other person upon the request of the Presiding Officer, on his own motion, or on the motion of any party.

(v) State with particularity the reasons for the request;

(vi) State with particularity the issues proposed to be considered at the hearing; and

(vii) Include proposed terms and conditions which, in the judgment of the requestor, would be required to carry out the intendment of the Act.

APPENDIX B

INDUSTRIAL PROCESS EVALUATION

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO : Assistant Director for Technical Programs DATE February 13, 1978

FROM : F. Early, Process Control Branch

SUBJECT. Project 202, Comparability of the Industrial Sources Discharging to the Port St. Joe WTF vis-a-vis those Discharging to the Bay County Treatment Lagoon.

The two pulp mills and the two by-product refineries are of approximately the same size and produce in general similar products by essentially the same methods. Any differences which have been identified are felt to be of comparatively little significance in terms of their effect on the waste waters being discharged from the respective facilities.

At the end of the discussion part of this memo is a tabulation of the major process operations which might have an impact on the nature and amounts of pollutants found in effluents from the four plants inspected for this study.

The decision that there is no difference, with respect to the planned biologic study between the effluents from the Port St. Joe Paper Company (PSJ) with Sylvachem Corporation (SC) and those from the International Paper Company (IPC) and Arizona Chemical Company (AZC) at Panama City, Florida is based on my judgement that the process differences found during the inspections would not have a significant effect on the nature of the pollutants in the effluents. Inspection of the four facilities found eleven differences which needed evaluation to determine whether they might have an effect on the effluents from the plants as they entered the respective treatment facilities.

Seven differences were found between the pulp mills which might affect their effluent; a discussion of these follows.

Hardwood pulp is made practically all the time at IPC, but, from the data made available, the rate seems to be limited to the range of 20 to 35% of the total pulp production. Since all the wood is dry debarked there is no chance of significant amounts of hardwood bark extractives entering the effluent stream. Any differences between the lignaceous components of the hardwoods versus the softwood would be totally masked by the agressive action of the chemicals used in the kraft pulping process; the lignin degradation products which escape from the recovery process would not be very much different from each other. The fact that softwoods are always being processed at IPC means that the residual resinous material from the alkaline pulping of pine will always be present in both the waste streams at about the same concentration. Therefore the hardwood pulping at IPC would not significantly alter the nature of the effluents vis-a-vis PSJ.

The two differences in the pulping process, i.e., sulfidity and continuous digestion each appear superficially to be important differences between the two mills. The forty percent difference in the sulfidity of the pulping white liquor results in a smaller difference in the proportions of the components in the mill effluent and in no effect on the nature of these components. The effect of continuous digestion is practically nil because it is simply a different mechanical method of carrying out the same chemical process. Thus one pulping process difference, sulphidity, has only a slight effect on component balance, the other pulping difference has virtually no effect.

The bleaching processes on examination turns out to be different methods of achieving a very similar result and have much more effect on the qualities of the finished pulp than on the nature and concentration of pollutants in the respective process effluents. The differences in the pulp are very sophisticated, effecting strength, viscosity and brightness over a very narrow span; the differences in the materials removed and the reaction products of the processes used is quite insignificant.

On the other hand the fact that the bleach plant at PSJ is run only 10 days per month is of such magnitude that it can only be overcome by carrying out the study during the period when bleaching is being done in the mill.

The fact that the pulp washing at the IPC is being done on both two and three stage washing lines is a difference which results in a small increase in the concentration of ligin degradation products in the effluent but no difference in the nature of these materials. I decided that the overall effect in this case was also of no significance when compared to the PSJ effluent.

The difference between making bleached market pulp and bleached linerboard is, as with the bleaching, one in which the differences in the finished products are important and technically sophisticated; but when examined with respect to the effect on the effluent flowing from the pipe the differences are very minor. Removal of another 1% of lignin from the pulp has a drastic effect on its chemical and physical properties but adds less than 2% to the pollutants entering the pulp washing system and the same percentage to those entering the effluent stream.

The four remaining process differences were found at the byproducts processing plants of AZC and SC. These differences impact flows which are in either case less than 3% of the total flow to the treatment systems. This fact has the effect of reducing any effects on the effluents.

First, the vegetable oil fatty acids (VOFA) being processed at SC is very similar in nature to the fatty acids (TOFA) resulting from the processing of tall oil from the papermill. The processing of both crude VOFA and TOFA is essentially the same. The fractions which find their way into the waste waters are also similar since they result from the same process applied to materials of very similar chemical and physical properties.

I concluded that there was no significant difference to be found here.

The processing of turpentine at AZC appears superficially to be a significant difference until one considers that the source in each case is the pulp mill (both mills discard turpentine decanter underflow to the treatment system. Moreover no water is used in the processing of the liquid turpentine at AZC. The only water which contacts any fraction of the turpentine is the barometric condensor water which is used to maintain vacuum. This water which may include a light fraction of turpentine is later treated in the skimming basin.

The ploymerization process in use at AZC produces a material unlike any made at SC but the reaction is carried out in the absence of water and the treatment vessel is cleaned when necessary with solvent, which is reclaimed. The reaction product is washed with dilute acid (.05% HCl) which is sewered. This wash water has a very low organic content. The only other water from this process is from the barometric condensor which is used to control processing vacuum. I judged that the contribution of possibly significant new pollutants to the effluent stream from this source is nil.

At AZC the esterification of rosin and fatty acids to make special products is carried out in closed vessels without the use of any water. Thus no new pollutants are added to the effluent stream from this source.

In the final analysis I concluded that none of the differences that I had been able to find between these two very similar operations would have any significant effect on the nature of the effluents flowing into the two treatment systems.

Table 1

Process Differences Between the Two Industrial Complexes

Pulping of Hardwood at IP
Sulfidity: 28% vs 20%
Batch vs continuous digestion
Bleach 6-vs 4-stages
cont. vs 10 day/1 mo operation
Washing 2- & 3-vs 3-stage
Bleached market pulp vs bleached linerboard

Turpentine distilled at AZCml
Resin forming polymerization at AZCml
Esterification of rosin and soap at AZCml
Crude vegetable oil fatty acids processed at Sylvachem

Table 2

Comparable Process Elements of the Two Industrial Complexes

International Paper Co.	Port St. Joe Paper Co.
Raw Materials Woods Pines Longleaf Loblolly Slash Hardwoods Sweet Gum Hickory Elm Beech Pecan (v. little) Oaks Water Red White Live Purchase chips, some	Raw Materials Woods Pines Slash Longleaf Loblolly Hardwoods Trace Purchased chips, some 80% from chip and saw operations balance includes some whole tree chips
Fuels Oil # 6 Bark Tall oil waste from AZCml and Silvachem Black liquor	Fuels Oil # 6 Bark Black liquor
Dry debark wood without log washing	Dry debark wet logs from flume flume dredged, water recycled
Conventional kraft process Sulfidity maintained at 28% Strong Black Liquor oxidation 20 Batch digesters Hot stock refining 3 2- & 3 3- stage washing lines Screening Bleaching: 6-stages C_DEHDED Sometimes bleach all HW Solvay ClO_2 - process	Conventional kraft process Sulfidity maintained at 20% No Black Liquor oxidation 10 Batch digesters 2 down for rebuild 1 Kamyr continuous digester 1 stage of high-heat washing Hot stock refining 4 3-stage washing lines Screening Bleaching: 4-stage CEDH Operate 10 days/month Flash dried bleached pulp made for sale - warehouse full

Table 2 (cont.)

Recovery
1 Evaporator, 6-body, 6-effect
Surface Condenser, normally operating
1 Evaporator, 6-body, 5-effect
barometric condensers
recirculate from cooling tower
1 Evaporator, 9-body, 6-effect
Barometric condensor to cooling tower for recycle
5% Blowdown
Normally operate as alternate to above
Sour condensate to BSW

Two new low-odor recovery boilers
Cascade evaporators

Cascade evaporator
ESP two chamber, four field
Wet bottom
One Lime Kiln
Venturi scrubber
mud washing recycled, excess to settling pond, decantant to waste treatment

Papermill
One PM used as a pulp drier
One Linerboard PM

Chemicals:
Alum
Modified rosin size
Capacity: 700 T/D Linerboard
800 T/D Pulp
Byproducts to Arizona Chemical Co:
Tall oil soap
Sulphate crude turpentine

Pulps Produced for:
Primary K No.34
Secondary K No.26-27
Bleaching
K No.11-13 HW
K No.21-22 Sw

Recovery
3 Evaporators, 6-body, 6-effect
old evaporators used as surface condensers, sour condensate to liquor dilution

New low-odor recovery boiler
Two old recovery boilers, cold standby

Cascade evaporators
ESP two chamber, four field
Wet bottom
Lime kilns, three
Venturi scrubbers
mud washing recycled

Papermill
100 T/day recycled corrugating cuttings processed into primary sheet
Two Linerboard PM
Chemicals:
Alum
Modified rosin size
Capacity: 1400 T/D Linerboard

Byproduct to Sylvachem Co:
Tall oil soap
Byproducts to other locations:
Crude sulphate turpentine
Pulps Produced for:
Primary sheet
Secondary sheet
Bleaching

Table 2 (cont.)

Pulpmill capacity:
1100-1400 T/D

Bleach plant capacity:
500 T/D
Effluent:
Primary treated
25-26 MGD
was 32 (exceeds design cap of Bay City WTF)

Process water treatment
Flocculate-clarify-filter
sludge to settling basin
supernatant to sewer
Deionize (salt split) for boilers
waste to equalization
and then to sewer

Arizona Chemical Company

Raw Material:
Crude tall oil soap
Crude tall oil
Crude sulphate turpentine
ClO_2 waste acid
Sulphuric acid
Sodium Hydroxide

Processes:
Desaponification
decanting, waste to pulpmill
wash
decant
Flash dry
Strip volatile fatty acid from rosin and nonvolatile residue
Rosin - modified and/or sold
Modification-may be disproportionation or esterification

Pulpmill capacity:
1200 T/D optimum

Bleach plant capacity:
500 T/D
Effluent:
Untreated
32 MGD
Range 28-40,(40 too high, exceeds capacity of Gulf Cty WTF and of the companys flow measuring nozzles

Process Water treatment
Flocculate-clarify-sludge to land treatment along treatment canal

Deionize (salt split) for boilers
waste to process scrubbers and to waste treatment

Sylvachem Corporation

Crude tall oil soap
Crude tall oil
ClO_2 waste acid
Sulphuric acid
Sodium Hydroxide
Crude Vegetable oil fatty acid (mixed soya-cotton-peanut-palm, desaponified waste from food processing plants)

Desaponification
decanting, waste to pulp mill
wash
decant
Flash dry
Strip volatile fatty acid from rosin and nonvolatile residue
Rosin - sold as is or modified
Disproportionation may be done on rosin

Table 2 (cont.)

Volatile fatty acid bleach (dry) distill Turpentine processing consist of distillation with acid-oxidation steps for cleanup	Volatile fatty acid bleach (dry) distill Vegetable oil received as crude, processing similar to that of fatty acids from tall oil distillation.
Capacity: Crude tall oil soap 150 tons/day Crude tall oil 300 tons/day Crude sulphate turpentine 30 tons/day	Crude tall oil soap 150 tons/day Crude tall oil 300 tons/day Crude vegetable oil fatty acids 150 tons/day
Process heat: Dowtherm A	Process heat: Dowtherm A

APPENDIX C

BACTERIOLOGICAL METHODS

BACTERIOLOGICAL METHODS

Bacteriological analyses of total and fecal coliform bacteria were performed according to standard procedures using the Most Probable Number technique.[1] Using aseptic techniques, all samples were collected in sterile bottles prepared by the accepted procedure. Replicate sampling was performed for quality control purposes; these data are available in the NEIC laboratory files.

Toxicity testing methodology involved agar diffusion and broth culture techniques.

The agar diffusion test consisted of seeding nutrient agar plates with 0.1 ml of an overnight nutrient broth culture of the test organism. The bacteria were added to 2 ml of molten agar (45°C) and overlayed on the nutrient agar plates. The wastewater samples, which were filter sterilized through a 0.22 micron (average pore size) membrane filter, were spotted on sterile, dry, filter paper discs. The impregnated discs were then placed on the seeded nutrient agar plates and incubated for 24 to 48 hours at 35°C. The plates were observed for a clear zone of growth inhibition around the sample disc. A disinfectant was used as a positive control. Negative,

sterile distilled water controls and seeded plates containing no discs showed good lawns of bacterial growth without inhibition. Broth culture techniques involved innoculating sterile 0.5 ml volumes of nutrient broth of each of the test organisms and adding a soaked sample disc to each tube. Positive and negative controls similar to the agar diffusion test were used.

Salmonella sampling involved placement of sterile pads at the sampling site for 1 to 3 day periods. The pads were retrieved aseptically, placed in sterile containers, chilled, and transported to the laboratory within one hour for analyses. There is no standard procedure for detection of Salmonella in wastewaters. The method employed by NEIC is the elevated temperature technique of Spino[2], with modifications. Selective enrichment media consisted of dulcitol-selenite broth. Incubation temperature was 41.5°C (107°F). On each of four successive days, growth in each of the enrichment media was streaked onto selective plating media that consisted of xylose-lysine-deoxycholate agar. After 24 hours incubation at 35°C±0.2°C, colonies with characteristics typical of Salmonella were picked from the plates and subjected to biochemical and serological testing. Biochemical testing was performed using a commercial multitest system.

Differentiation of the coliform group of organisms was performed according to standard procedures[1] with modifications. Single, well isolated colonies were randomly picked from membrane filter plates containing M-FC medium incubated ar $44.5^{o}C \pm 0.2^{o}C$. The cultures were streaked for purification to an eosin-methylene-blue agar plate. A single well isolated colony was picked to an agar slant and incubated at $35^{o}C \pm 0.5^{o}C$ for 24 hours. The cultures were subjected to a commercial differential test system containing biochemical tests for hydrogen sulfide, ornithine decarboxylase, motility, citrate (HOMoC series), indole, lysine decarboxylase, glucose, lactose, and rhamnose. Bacteria not identified as Klebsiella were subjected to IMViC testing for identification of E. coli. The IMViC tests were performed according to standard procedures[1].

REFERENCES

1. Rand, M. et al., 1975. Standard Methods for Examination of Water and Wastewater, 14th Ed., Amer. Public Health Assn., New York, N.Y.

2. Spino, D.F., July, 1966. Elevated Temperature Technique for the Isolation of Salmonella from Streams. Applied Microbiology, 14, 4; American Society for Microbiology.

APPENDIX D

SURVEY METHODS

SURVEY METHODS

Sampling and In-Situ Measurements

All influent and wastewater discharges were monitored February 8-18, 1978. Established chain-of-custody procedures were followed in the collection of all samples (Appendix F). The sampling locations and the NEIC monitoring procedures used during the survey are discussed below.

Station 01

Domestic waste samples from the City of Port St. Joe, prior to chlorination, were collected by means of a Tru-Test Automatic Sampler manufactured by the Chicago Pump Division of the FMC Corporation. This type of sampler collects a sample proportional to flow and is equipped with a refrigerator to reduce the sample temperature to below $4^{o}C$. The flow is measured by means of a 30.5 cm (12 in.) Kennison nozzle and continuously recorded and totalized. This device was calibrated, prior to installation, against a standard traceable to the National Bureau of Standards (NBS) by Alden Research Laboratories and certified to an accuracy of $\pm$0.25%. Prior to the monitoring period, this device was calibrated by WWTP personnel in the presence of NEIC personnel. An additional calibration was performed on the last monitoring day (February 18, 1978) to assure that the device provided accurate measurements during the monitoring period.

The automatic sampler was cleaned just prior to the start of sampling and sealed to insure detection of access by other than NEIC personnel. Because the refrigeration system was inoperative during the EPA survey, the sample container was packed in ice for temperature reduction of the sample to 4.0°C. Composite samples for BOD and TSS were removed from the sampler at approximately 0700 each day and transported for analysis to an NEIC mobile laboratory located at the Port St. Joe WWTP. The sampler was cleaned, a pre-cleaned sample container installed, and re-sealed after each 24-hour composite period.

Field *(in situ)* measurements for pH and temperature were made by the NEIC field team periodically during the monitoring period. Daily, the team also collected samples for coliform analysis; the bacteriological analyses were performed in another NEIC mobile laboratory temporarily located at the Port St. Joe WWTP. Flows were determined from daily readings of the flow totalizer.

Station 02

Wastes from the City of Port St. Joe, after chlorination, were sampled at the discharge from the chlorine contact tank and analyzed for chlorine residual and coliform densities.* The pH and temperature were determined on site. The chlorine and coliform samples were transported within a few minutes to the nearby NEIC mobile laboratories for analysis.

*As this waste stream had essentially the same characteristics as Station 01, with the exception of chlorine addition, composite samples for BOD and TSS analysis were not collected.

Station 03

The wastes from the St. Joe Paper Company (SJPC) were discharged into the Port St. Joe WWTP system and monitored by means of a Tru-Test automatic sampler, as described previously, and two 91.4 cm (36 in.) Kennison flow nozzles. The sampler is flow proportional and the nozzles were calibrated in the same manner as described for Station 01.

The sampler was sealed and samples handled in an identical manner as Station 01. The refrigeration system was not working on the sampler, and the samples were iced to provide the necessary temperature reduction.

Flows were determined by daily totalizer readings from the WWTP flow meter. The Kennison nozzles have a total rated capacity of 151 m^3/day X 10^3 (40 mgd). The bleach plant was in operation during the NEIC survey and the maximum daily flow recorded was 146 m^3/day X 10^3 (38.7 mgd); the WWTP has, in the past, reported flow in excess of this rated capacity when the paper company is operating the bleach plant.

Measurements for pH and temperature were analyzed on site *(in situ)* periodically. Samples for coliform densities were collected daily and analyzed at the NEIC mobile laboratory located at the WWTP.

Station 04

Wastewater from the Silvachem tall oil process enters the WWTP through sampling location 04 and is continuously monitored by means of a 90^{o} V notch-weir and Tru-Test flow proportional automatic sampler as described previously. Prior to and near the conclusion of the EPA survey, these devices were inspected by NEIC personnel and found to be monitoring properly. The weir was constructed and installed according to specifications found in the Water Measurement Manual[1]. Prior to the survey, the refrigeration unit on the sampler was found to be inadequate and the sample container was packed in ice to provide the required temperature reduction.

Before the start of the monitoring period, the sample unit was cleaned and the sample container replaced with a pre-cleaned container. The sampler was sealed during the monitoring to detect any access to the sampler by other than NEIC personnel and the sampler and sample container cleaned daily when each composite sample for BOD and TSS analysis was removed.

Field *(in situ)* measurements for pH and temperature were determined periodically. Samples for coliform densities were collected

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[1] Water measurement Manual, U.S. Department of Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1974.

Stations 05 and 06

The effluents from clarifier A (west side) and clarifier B (east side) Stations 05 and 06, respectively, were sampled for BOD and TSS with SERCO automatic samplers and flow proportioned, on the basis of the effluent flow metering system, at the end of each 24-hour collection interval (0800-0800). Temperature and pH were determined on site *(in situ)* and grab samples for coliform densities were collected each day.

Station 07

The City measured flow from the discharge of the aerated lagoon by means of a 1.2 m (4 ft.) Parshall flume and continuous flow recorder and totalizer. A Tru-Test automatic sampler is located approximately 1.8 m (6 ft.) upstream of the converging section of the flume. Prior to the survey, the flume and sampler were inspected by NEIC personnel; the flume was found to have considerable turbulence in the measuring section. At the suggestion of NEIC personnel, WWTP staff installed a stainless steel baffle in the flow channel upstream of the flume to reduce this turbulence. Subsequent measurement by the NEIC sampling team showed the device to be measuring and recording properly. All other dimensions met the recommendations of the Water Measurement Manual.

Daily composite samples were collected from the City sampler (0700-0700). The sampler and sampling container were cleaned just prior to the survey and each day when the composite sample was removed. The sampler was sealed to insure no undetected access to the sample.

Temperature and pH measurements were made on-site periodically each day and grab samples for coliform densities were collected twice daily. Cotton swabs were suspended in the lagoon overflow structure and were removed at the end of one, two and three day exposures for isolation of Salmonella.

Station 13

Daily grab samples for fecal coliform analysis and pH and temperature measurements were taken from the south side of the lagoon adjacent to the influent-flow boil. In addition, twice during the study, 38.7 liters (10 gallon) samples were collected and shipped to the NEIC laboratory, Denver, Colorado, for bacteriological bioassay studies.

APPENDIX E

CHEMICAL METHODS

Analytical Methodology and Quality Control for the Port St. Joe Study

The following methods were used to analyze the samples from the Port St. Joe Study.

Parameter	Method	Reference
BOD	Full bottle dilution technique with settled raw sewage used as seed	Standard Methods, 14th Ed., p. 543
TSS	Gravimetric, millipore filter-Whatman GFC	Standard Methods, 14th Ed., p. 94
Chlorine (Residual)	Iodometric II	Standard Methods, 14th Ed., p. 318

Analytical quality control practices used during the survey included the analysis of distilled water blanks, duplicates, and QC check samples. At least one duplicate was analyzed every ten samples. The quality control results for the reference samples are summarized below.

Parameter	NEIC Value	True Value	Sample Source	Acceptable Range
BOD	16 (mean of 6 results)	19	EPA	15 - 24
COD	40 (mean of 4 results)	58	EPA	46 - 70
TSS	48 (mean of 4 results)	51	EPA	48 - 54
Chlorine Residual	1.25(mean of 4 results)	1.4	EPA	1.2 - 1.6

The BOD results on the reference samples are slightly low, with one result being just within the acceptable range and the other just outside. A possible explanation for these results is that the volume of raw sewage used as a seed did not provide an adequate population of acclimated microbes to effectively digest the samples. The NEIC BOD results were slightly but consistently lower than the WWTP results. The plant used the pond effluent as the source of seed which was acclimated to the wastes coming into the plant. This probably is the reason why the NEIC results were generally slightly lower than the WWTP results.

However, the NEIC and WWTP BOD results on the tall oil waste were substantially different. The NEIC BOD method includes the use of cleaned air to mix the samples. The air mixing step could have sparged volatile organic compounds from the samples. This along with the different seed could have caused the NEIC results to be low.

The NEIC results on the suspended solids reference samples were within the acceptable range. In addition, the NEIC and WWTP TSS results also agreed very well. The NEIC results on the residual chlorine reference sample were within the acceptable range.

The precision of analysis results are summarized below. The range of deviation corresponds to the percent difference in duplicate analysis of a sample.

Parameter	Concentration Range, mg/l	Range of % Deviation	Average % Deviation
BOD	12 - 1660	0 - 20.8	5.2
TSS	50 - 408	1.0 - 29.8	10.2
Chlorine (Residual)	3 - 26	0 - 28.6	4.4

APPENDIX F

CHAIN-OF-CUSTODY PROCEDURES

ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

CHAIN OF CUSTODY PROCEDURES
February 9, 1978

GENERAL

Evidence gathering surveys should be characterized by the minimum number of samples required to give a fair representation of the media from which taken. To the extent possible, the quantity of samples and sample locations will be determined prior to the survey.

Chain of Custody procedures must be followed to maintain the documentation necessary to trace sample possession from the time taken until the evidence is introduced in an appropriate proceeding. A sample is under custody if:

1. It is in your actual physical possession, or

2. It is in your view, after being in your physical possession, or

3. It was in your physical possession and then you locked it up in a manner so that no one could tamper with it, or

4. It is in a designated "secure" area.

All survey participants will receive a copy of the survey study plan and will be knowledgeable of its contents prior to the survey. A pre-survey briefing will be held to re-appraise all participants of the survey objectives, sample locations and appropriate procedures. After all samples are collected, a de-briefing will be held in the field to determine adherence to procedures and whether additional evidence type samples are required.

SAMPLE COLLECTION

1. To the maximum extent achievable, as few people as possible should handle samples.

2. All samples shall be obtained, using recognized standard field sampling techniques. The field sampler is responsible for the care and custody of the samples collected until properly dispatched to the receiving laboratory or transferred to another custodian.

3. Sample identification cards or sample tags as appropriate, shall be completed for each sample. (See sample Fig. I). In-situ measurements, i.e. samples collected, analyzed and documented by the same person onsite may be recorded directly in field data record sheets and books. Examples of in-situ measurements are pH, temperature, conductivity flow measurements, etc. In-situ measurement recordings and sample identification must be legibly filled out in ballpoint (waterproof ink).

4. Bound Field Data Record logbooks shall be maintained to record in-situ measurements and other pertinent information necessary to refresh the sampler's memory in the event he later takes the stand to testify regarding his actions during the evidence gathering activity. A separate set of field notebooks shall be maintained for each survey and stored where they can be protected and accounted for at all times. Logbook entries shall be signed and dated by the author.

5. Colored slides or photographs taken which visually show the effluent or emission source and/or any monitoring locations should contain written documentation on the back of the photo which includes the signature of the photographer, time, date and site location. Photographs of this nature, which may be used as evidence, shall be handled recognizing Chain of Custody procedures to prevent alteration.

TRANSFER OF CUSTODY AND SHIPMENT

1. Samples will be accompanied by a Chain of Custody Record (Fig. II). When turning over the possession of samples, the transferor and transferee will sign, date and time the sheet. This record sheet allows transfer of custody of a group of samples in the field, to the mobile laboratory or to the NEIC-Denver laboratory.

2. The field custodian or field sampler, if a custodian has not been assigned, will have the responsibility of properly packaging and dispatching samples to the proper laboratory for analysis. Shipping containers will be padlocked for shipment to the receiving laboratory. The "Dispatch" portion of the "Chain of Custody Record" shall be properly filled out, dated, and signed.

3. All packages will be accompanied by the Chain of Custody Record showing identification of the contents. The original will accompany the shipment, and a copy will be retained by the survey coordinator.

4. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government Bill of Lading should be obtained. Receipts from post offices, and bills of lading will be retained as part of the permanent documentation.

LABORATORY CUSTODY PROCEDURES

1. The laboratory shall designate a "sample custodian" with an alternate designated in his absence. The laboratory shall set aside a "sample storage area". Samples should be handled by the minimum possible number of persons.

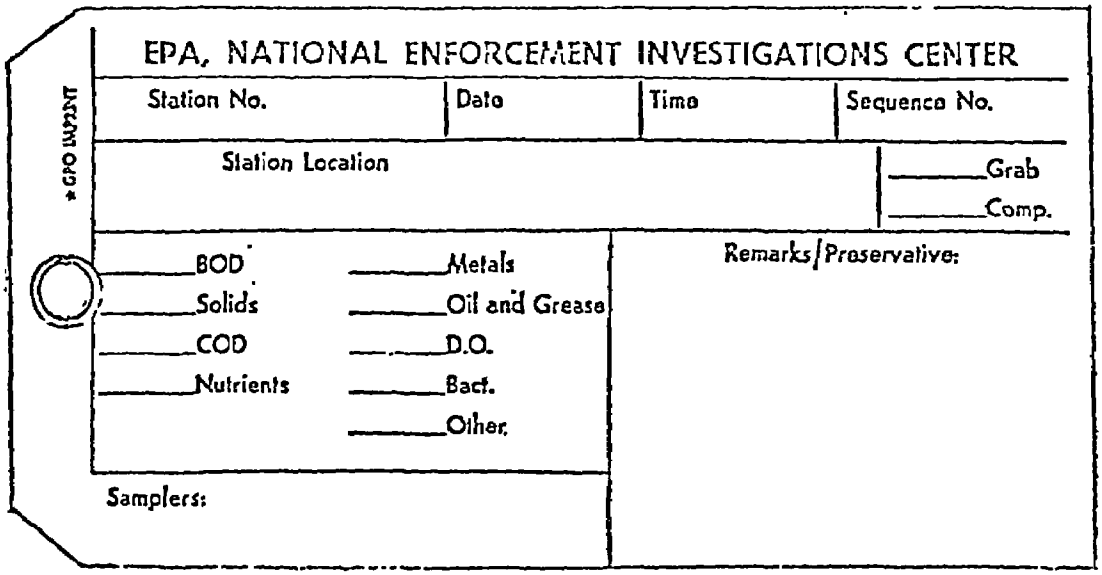
2. All incoming samples shall be received only by the custodian, who will indicate receipt by signing the Chain of Custody Sheet accompanying the samples and retaining the sheet as permanent records. Couriers picking up samples at the airport, post office, etc. shall sign jointly with the laboratory custodian. Samples will be stored in the sample storage area and will be distributed by the custodian to individual analysts. Laboratory personnel are responsible for the care and custody of the sample once it is handed over to them until it is returned to the custodian.

3. The analyst will record in his laboratory notebook or analytical worksheet, identifying information describing the sample, the procedures performed and the results of the testing. The notes shall be dated and signed. The notes shall be retained as a permanent record in the laboratory and should note any abnormalities which occurred during the testing procedure. In the event that the person who performed the tests is not available as a witness at time of trial, notes may be used as evidence.

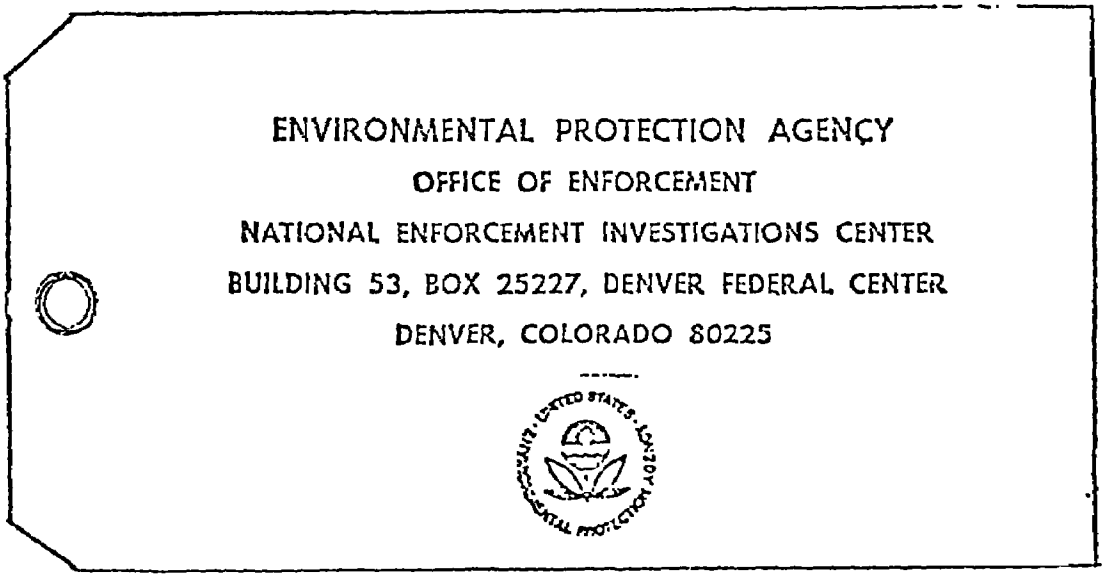
4. Standard methods of laboratory analyses shall be used as described in the "Guidelines Establishing Test Procedures for Analysis of Pollutants," 38 F.R. 28758, October 16, 1973, as amended. If laboratory personnel deviate from standard procedures, justification and rationale should be documented.

5. Once the sample testing is completed, the unused portion of the sample, together with all identifying tags and laboratory records, should be returned to the custodian. Returned samples may be disposed only upon the order of the Enforcement Specialist and Ass't. Director, Technical Programs.

EXHIBIT I



Front



Back

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: *(Signature)*

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE			SEQ NO	NO OF CONTAINERS	ANALYSIS REQUIRED
				Water		Air			
				Comp	Grab				

Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by Mobile Laboratory for field analysis: *(Signature)*	Date/Time
Dispatched by: *(Signature)* — Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment:		

Distribution: Orig.– Accompany Shipment
1 Copy– Survey Coordinator Field Files

202120

GPO 831-464

APPENDIX G

PHYSICAL, CHEMICAL, AND BACTERIOLOGICAL RESULTS

DAILY PHYSICAL AND CHEMICAL CHARACTERISTICS
CITY OF PORT ST. JOE
WASTEWATER TREATMENT PLANT EVALUATION
February 8-18, 1978

Station	Station Description	Date* (Feb)	Flow $m^3 \times 10^3$	Flow mgd	pH Range	Temperature C° max	Temperature C° min	Cl_2 mg/l	BOD mg/l	BOD kg/day	BOD lb/day	TSS mg/l	TSS kg/day	TSS lb/day
01	City of Port St. Joe Sanitary Sewer Influent to WWTP to Chlorination	9	3.05	0.805	8.3 6.2	14			70	213	470	79	241	530
		10	2.77	0.733	7.2 6.1	14-13			88	244	538	86	239	526
		11	3.07	0.810	7.2 6.3	15-14			82	252	554	81	248	547
		12	1.99	0.526	7.1 6.9	15-14			100	199	439	130	259	570
		13	1.77	0.467	6.4 6.3	17-15			86	152	335	120	212	467
		14	1.83	0.484	7.1 6.6	18-15			120	220	484	140	257	565
		15	1.87	0.495	6.9 6.6	15			100	188	413	100	188	413
		16	2.03	0.537	6.8 6.5	15-14			92	187	412	100	203	448
		17	2.92	0.771	7.3 6.3	15-14			80	233	514	120	350	772
		18	3.03	0.801	6.0	14			200	608	1,340	1,000	3,030	6,680
02	City of Port St. Joe Sewage After Communution and Chlorination	8						9.8						
		9	3.09	0.805	7.4 6.3	15-14		12						
		10	2.77	0.733	7.1 6.2	15-14		8.8						
		11	3.07	0.810	7.1 6.3	15		16						
		12	1.99	0.526	7.0 6.9	16-15		13						
		13	1.77	0.467	6.4 6.2	17-16		6.0						
		14	1.83	0.484	6.8 6.3	17-15		4.0						
		15	1.87	0.495	6.6 6.4	15		6.4						
		16	2.03	0.537	6.6 6.1	15		3.2						
		17	2.92	0.771	6.8 6.6	16-15		5.0						
		18	3.03	0.801	6.0	15								
03	St. Joe Paper Company Wastewater Influent of Raw Untreated	9	133	35.2	11.4 9.8	32-30			220	29,300	64,600	250	33,300	73,400
		10	131	34.7	10.0 6.9	32-29			160	21,000	46,300	380	49,900	110,000
		11	127	33.6	9.2 6.8	31-28			120	15,300	33,600	340	43,300	95,300
		12	140	36.9	10.5 6.6	31-28			220	30,700	67,700	340	47,700	105,000
		13	139	36.7	9.8 6.4	33			170	23,700	52,200	500	69,500	153,000
		14	136	35.8	10.6 5.8	34-32			170	23,100	50,800	430	58,100	128,000
		15	137	36.2	10.8 6.7	32-30			160	21,900	48,300	410	56,300	124,000
		16	137	36.3	10.0 8.9	35-32			190	26,100	57,500	450	61,700	136,000
		17	119	31.5	10.5 9.6	33-30			190	22,700	49,900	360	42,900	94,600
		18	106	27.9	10.7	33			190	20,100	44,200	560	59,000	130,000

DAILY PHYSICAL AND CHEMICAL CHARACTERISTICS (Continued)
CITY OF PORT ST. JOE
WASTEWATER TREATMENT PLANT EVALUATION
February 8-18, 1978

Station	Station Description	Date* (Feb)	Flow $m^3 \times 10^3$	Flow mgd	pH Range	Temperature C° max	Temperature C° min	Cl_2 mg/l	BOD mg/l	BOD kg/day	BOD lb/day	TSS mg/l	TSS kg/day	TSS lb/day
04	Sylva Chemical Company Wastewater Influent of Raw Untreated Waste to WWTP	9	1.44	0.380	6.6 3.6	34-30			1,000	1,440	3,170	370	531	1,170
		10	1.70	0.450	7.9 5.5	40-30			750	1,280	2,810	700	1,190	2,630
		11	1.78	0.469	8.2 6.5	33-29			690	1,230	2,700	650	1,150	2,540
		12	1.52	0.401	9.2 7.1	35-32			1,600	2,430	5,350	960	1,460	3,210
		13	1.32	0.348	8.4 7.9	35-34			630	831	1,830	300	395	810
		14	1.48	0.392	6.9 6.2	32-29			2,000	2,970	6,540	880	1,310	2,880
		15	1.66	0.438	12.1 6.5	35-34			1,400	2,320	5,110	1,100	1,830	4,020
		16	1.74	0.460	9.6 6.7	32-29			3,400	5,920	13,040	1,200	2,090	4,600
		17	1.76	0.465	9.1 6.4	36-30			3,200	5,630	12,410	840	1,480	3,260
		18	1.98	0.524	6.0	31			3,600	7,130	15,700	1,700	3,370	7,430
05	Discharge from the WWTP Primary Clarifier "A" (West Tank) (Flow = 1/2 Daily Eff. Flow)	9	60.9	16.1	10.2 8.6	31-26			230	14,000	30,900	160	9,760	21,500
		10	65.9	17.4	9.2 8.1	29			200	13,200	29,000	150	9,900	21,800
		11	64.0	16.9	9.2 8.4	28-27			140	8,940	19,700	150	9,580	21,100
		12	68.5	18.1	9.7 7.4	31-29			180	12,300	27,200	180	12,300	27,200
		13	71.2	18.8	8.8 7.6	30-29			170	12,100	26,700	210	14,900	32,900
		14	70.4	18.6	8.7 7.0	31			180	12,700	27,900	210	14,800	32,600
		15	70.8	18.7	9.5 8.4	34-32			160	11,400	25,000	180	12,800	28,100
		16	73.4	19.4	9.9 7.7	32-30			240	17,600	38,800	170	12,500	27,500
		17	69.3	18.3	9.8 9.7	32-30			240	16,600	36,600	140	9,720	21,400
		18	58.3	15.4	10.4 10.0	35-32			250	14,600	32,100	120	6,990	15,400
06	Discharge from the WWTP Primary Clarifier "B" (East Tank) (Flow = 1/2 Daily Eff Flow)	9	60.9	16.1	10.4 8.8	32-27			220	13,400	29,500	120	7,310	16,100
		10	65.9	17.4	9.5 8.2	29-28			180	12,100	26,700	98	6,450	14,200
		11	64.0	16.9	9.5 9.2	28			150	9,580	21,100	92	5,900	13,000
		12	68.5	18.1	10.0 7.3	31-22			220	15,100	33,200	130	8,900	19,600
		13	71.2	18.8	8.8 7.7	30-29			160	11,400	25,100	140	10,000	22,000
		14	70.4	18.6	8.5 6.9	32-30			170	12,000	26,400	130	9,170	20,200
		15	70.8	18.7	9.8 8.4	32-31			170	12,000	26,500	88	6,220	13,700
		16	73.4	19.4	10.2 7.8	32-30			250	18,300	40,400	130	9,530	21,000
		17	69.3	18.3	10.0 9.7	32-31			240	16,600	36,600	140	9,720	21,400
		18	58.3	15.4	10.8 10.2	34-32			280	16,600	36,600	120	7,000	15,400

DAILY PHYSICAL AND CHEMICAL CHARACTERISTICS (Continued)
CITY OF PORT ST. JOE
WASTEWATER TREATMENT PLANT EVALUATION
February 8-18, 1978

Station	Station Description	Date* (Feb)	Flow $m^3 \times 10^3$	Flow mgd	pH Range	Temperature C° max	Temperature C° min	Cl_2 mg/l	BOD mg/l	BOD kg/day	BOD lb/day	TSS mg/l	TSS kg/day	TSS lb/day
13	Lagoon	9			7.9 7.2	22	21							
		10			7.6 6.9	21	20							
		11			7.9 7.6	21	20							
		12			7.6 7.1	24	20							
		13			7.2 6.3	24								
		14			6.7	25	24							
		15			7.4 7.1	25	24							
		16			7.4 7.1	24								
		17			7.7 7.5	25	24							
		18			7.6 7.5	25								
07	Final Discharge of WWTP at the Parshall Flume	9	121	32.1	7.6 6.5	21	15		24	2,920	6,430	52	6,310	13,900
		10	132	34.8	7.4	20	19		24	3,160	6,970	60	7,900	17,400
		11	128	33.8	7.6 7.4	20	19		26	3,330	7,330	40	5,130	11,300
		12	137	36.3	7.5 7.1	22	18		28	3,850	8,480	52	7,130	15,700
		13	142	37.6	7.4 6.6	24	22		33	4,680	10,300	78	11,100	24,500
		14	141	37.3	7.3 6.6	24	21		31	4,380	9,640	52	7,350	16,200
		15	142	37.4	7.5 7.2	23	22		25	3,540	7,800	36	5,080	11,200
		16	147	38.9	7.4 7.2	24	22		24	3,540	7,800	64	9,440	20,800
		17	139	36.6	7.3 7.1	23	22		26	3,600	7,940	94	6,080	13,400
		18	117	30.8	7.5 7.2	24	22		24	2,800	6,160	32	3,720	8,200

* Data represents date composite sample period ends, i.e. approximately 0700-0700 each day

SUMMARY OF BACTERIOLOGICAL DENSITIES
CITY OF PORT ST. JOE, FLORIDA
WASTEWATER TREATMENT PLANT EVALUATION
FEBRUARY 8-18, 1978

Station Number	Description	Number of Samples	Total Coliforms MPN/100 ml Maximum	Minimum	Log Mean	Median	Fecal Coliforms MPN/100 ml Maximum	Minimum	Log Mean	Median
01	City of Port St. Joe sanitary sewer, influent to WWTP prior to chlorination	10	160,000,000	790,000	13,000,000	13,000,000	22,000,000	330,000	1,800,000	1,700,000
02	City of Port St. Joe sewage after communution and chlorination	10	>240,000	<2	300	190	54,000	<2	57	11
02 Blended		10	>240,000	<2	6,100	55,000	54,000	<2	550	1,400
03	St. Joe Paper Company Wastewater, influent of untreated mill waste to WWTP	10	160,000	23	1,500	2,000	1,400	2	140	200
04	Sylvachem Company Wastewater, influent of raw untreated waste to WWTP	10	9,200,000	<2	260,000	1,000,000	3,500,000	<2	61,000	100,000
05	Discharge from the WWTP Primary Clarifier A (west tank)	10	160,000	5	5,100	12,000	17,000	<2	690	1,500
06	Discharge from the WWTP Primary Clarifier B (east tank)	10	>240,000	5	5,400	14,000	13,000	<2	380	700
13	Aerated lagoon, south shoreline near clarifier inflow boil	10	54,000	490	6,600	6,300	7,000	79	1,000	1,200
07	Final discharge of WWTP at the Parshall flume	20	24,000	170	2,900	2,800	4,900	46	500	490

DAILY BACTERIOLOGICAL DATA (MPN)
CITY OF PORT ST. JOE WWTP EVALUATION
February 8-18, 1978

Station No.	Description	Data Collected	Coliforms/100ml Total	Fecal
01	City of Port St. Joe sanitary sewer influent to WWTP prior to chlorination	2/8/78	13,000,000	4,900,000
		2/9/78	13,000,000	1,100,000
		2/10/78	4,600,000	330,000
		2/11/78	7,900,000	1,700,000
		2/12/78	13,000,000	490,000
		2/13/78	790,000	330,000
		2/14/78	35,000,000	1,700,000
		2/15/78	160,000,000	22,000,000
		2/16/78	35,000,000	13,000,000
		2/17/78	11,000,000	1,700,000
02	City of Port St. Joe sewage after communution and chlorination	2/8/78	<2	<2
		2/9/78	7	4
		2/10/78	49	2
		2/11/78	<2	<2
		2/12/78	5	<2
		2/13/78	330	17
		2/14/78	≥ 240,000	54,000
		2/15/78	17,000	790
		2/16/78	92,000	35,000
		2/17/78	240,000	3,300

DAILY BACTERIOLOGICAL DATA (MPN)
CITY OF PORT ST. JOE WWTP EVALUATION
February 8-18, 1978
(CONT'D.)

Station No.	Description	Data Collected	Coliforms/100ml Total	Fecal
02 (Blended)	City of Port St. Joe sewage after communution and chlorination (blended sample)	2/8/78	220	4
		2/9/78	17,000	1,500
		2/10/78	330	23
		2/11/78	<2	<2
		2/12/78	790	12
		2/13/78	92,000	1,300
		2/14/78	≥240,000	54,000
		2/15/78	130,000	7,900
		2/16/78	160,000	54,000
		2/17/78	160,000	54,000
03	St. Joe Paper Company wastewater influent of untreated mill waste to WWTP	2/8/78	310	170
		2/9/78	3,300	79
		2/10/78	2,200	1,300
		2/11/78	1,700	130
		2/12/78	160,000	1,400
		2/13/78	23	8
		2/14/78	1,300	280
		2/15/78	31	2
		2/16/78	7,000	230
		2/17/78	17,000	630

DAILY BACTERIOLOGICAL DATA (MPN)
CITY OF PORT ST. JOE WWTP EVALUATION
February 8-18, 1978
(CONT'D.)

Station No.	Description	Data Collected	Coliforms/100ml Total	Fecal
04	Sylvachem Company wastewater influent of raw untreated waste to WWTP	2/8/78	<2	<2
		2/9/78	230,000	130,000
		2/10/78	660,000	22,000
		2/11/78	1,200,000	330,000
		2/12/78	790,000	70,000
		2/13/78	1,400,000	79,000
		2/14/78	≥2,400,000	≥2,400,000
		2/15/78	130,000	79,000
		2/16/78	2,400,000	220,000
		2/17/78	9,200,000	3,500,000
05	Discharge from the WWTP Primary Clarifier A (west tank)	2/8/78	1,100	79
		2/9/78	92,000	140
		2/10/78	17,000	7,000
		2/11/78	1,700	700
		2/12/78	35,000	2,300
		2/13/78	160,000	4,900
		2/14/78	7,900	4,900
		2/15/78	35,000	17,000
		2/16/78	490	490
		2/17/78	5	<2

DAILY BACTERIOLOGICAL DATA (MPN)
CITY OF PORT ST. JOE WWTP EVALUATION
February 8-18, 1978
(CONT'D.)

Station No.	Description	Data Collected	Coliforms/100ml Total	Fecal
06	Discharge from the WWTP Primary Clarifier B (east tank)	2/8/78	350	110
		2/9/78	92,000	1,200
		2/10/78	24,000	1,400
		2/11/78	790	330
		2/12/78	54,000	1,700
		2/13/78	≥ 240,000	13,000
		2/14/78	4,900	700
		2/15/78	33,000	85
		2/16/78	3,300	700
		2/17/78	5	<2
13	Aerated lagoon, south shoreline near clarifier inflow boil	2/8/78	490	79
		2/9/78	7,900	140
		2/10/78	2,200	1,100
		2/11/78	1,300	1,300
		2/12/78	4,600	490
		2/13/78	54,000	1,700
		2/14/78	24,000	3,500
		2/15/78	54,000	7,000
		2/16/78	24,000	4,300
		2/17/78	1,700	1,100

DAILY BACTERIOLOGICAL DATA (MPN)
CITY OF PORT ST. JOE WWTP EVALUATION
February 8-18, 1978
(CONT'D.)

Station No.	Description	Data Collected	Coliforms/100ml Total	Fecal
07	Final discharge of WWTP at the Parshall Flume	2/8/78	170	46
			330	330
		2/9/78	1,300	330
			790	130
		2/10/78	1,300	140
			1,100	130
		2/11/78	3,300	1,700
			1,700	490
		2/12/78	1,400	230
			7,000	110
		2/13/78	24,000	490
			13,000	490
		2/14/78	17,000	3,300
			13,000	4,900
		2/15/78	14,000	630
			7,900	1,700
		2/16/78	4,900	1,400
			4,900	4,900
		2/17/78	1,100	110
			2,300	1,300