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1981 Treatment Plant Report

METROPOLITAN WATER CONTROL COMMISSION

1981 ANNUAL WASTEWATER TREATMENT PLANT REPORT

prepared by the

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Abbreviations and Symbols

MGD or mgd	Million Gallons per Day
mg/l	Milligrams per Liter
ug/l	Micrograms per Liter
MPN/100 ml	Most Probable Number per 100 Milliliters
NTU	Nephelometric Turbidity Units
°F	Degrees Fahrenheit
BOD	Biochemical Oxygen Demand (generally means BOD_5, or Five Day Biochemical Oxygen Demand)
COD	Chemical Oxygen Demand
D.O.	Dissolved Oxygen
Kj-N	Kjeldahl Nitrogen
NH_3	Ammonia (nitrogen)
NO_2	Nitrite (nitrogen)
NO_3	Nitrate (nitrogen)
pH	Indicates Acidity/Alkalinity
Total P	Total Phosphorus
TSS	Total Suspended Solids
Turb.	Turbidity
$>$	Greater Than
$<$	Less Than
INF	Influent
EFF	Effluent
NPDES	National Pollutant Discharge Elimination System
Std.	Standard
Cd	Cadmium
Cr	Chromium
Cu	Copper
Hg	Mercury
Ni	Nickel
Pb	Lead
As	Arsenic
Zn	Zinc
Sn	Tin
Cn	Cyanide
gr/dscf	Grains/dry standard cubic foot
SCFM	Standard Cubic Feet per minute
DTPH	dry ton/hour
mg/kg	Milligram per kilogram

Definition of Parameters

Biochemical Oxygen Demand (BOD) is a measure of the dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in wastewater. A low BOD in the plant discharge is desirable because this would cause the least amount of oxygen depletion in the receiving body of water. This test normally takes five days before results are available.

Chemical Oxygen Demand (COD) is a measure of the oxygen equivalent required to chemically oxidize the organic matter present in wastewater. A low COD is desirable in plant effluent discharges. This test takes approximately three hours to complete and the results can be used to estimate BOD values. It is therefore extremely useful as a process control tool.

Total Suspended Solids (TSS) is a measure of the amount of particulate matter found suspended in a given amount of wastewater. Suspended solids adversely affect receiving waters by exerting an oxygen demand during decomposition or filtering out available sunlight needed by aquatic organisms for photosynthesis.

pH is a measure of the hydrogen ion concentration in a given sample of water. It is used as an indication of acidity or alkalinity. A pH of 7 is neutral - neither acidic or alkaline. pH values below 6 or above 9 are usually harmful to aquatic life.

Dissolved Oxygen (DO) is a measure of the concentration of oxygen dissolved in a given sample of water. A sufficient DO level in plant effluent discharges is important because dissolved oxygen is required for the life processes of aquatic organisms.

Fecal Coliform organisms are a group of bacteria present in wastewater and are used as indicators of the possible presence of pathogenic or disease producing bacteria. Monitoring of fecal coliform organisms is also done to determine the efficiency of effluent disinfection processes.

Ammonia (NH_3), Nitrate (NO_3), and Nitrite (NO_2) are nitrogenous compounds found in wastewater. Excessive discharges of these compounds can adversely affect the receiving body of water. Degradation of NH_3 to NO_3 is an oxygen demanding reaction. Monitoring of nitrogenous compounds is also useful for controlling secondary treatment processes.

Phosphorus (P) is monitored because it also can have adverse effects on the receiving body of water. When discharged in sufficient quantities it aids in stimulating excessive and undesirable algal growth.

Heavy metals covered in this report include the following: copper (Cu), chromium (Cr), zinc (Zn), lead (Pb), cadmium (Cd), mercury (Hg), nickel (Ni), arsenic (As), and tin (Sn). Close monitoring of heavy metals is necessary due to their possible toxicity to aquatic organisms present in the receiving waters.

1.0 SUMMARY

During 1981, the Commission operated fourteen wastewater treatment plants. The performance of these facilities is related to: (1) the effluent quality of each plant and the record of compliance with NPDES permit conditions; (2) the quality of air emissions from sludge incineration facilities at two regional plants; and (3) management of sludge generated at each facility as a result of wastewater treatment. The purpose of this report is to summarize the performance of Commission treatment plants during 1981 by presenting and analyzing data generated to monitor these major areas.

1.1 Effluent Quality

Table 1-1 is a summary of average annual effluent quality at each plant. Annual average effluent BOD and TSS were below permitted discharge limitations at all plants. At Bayport, Rosemount, and Stillwater, annual average effluent phosphorus was below the limit of 1 mg/L. At Empire, annual average effluent ammonia was below the limit of 1 mg/L.

One of the most important indicators of performance of individual treatment plants, and performance of the Commission in the operation of all plants, is the compliance with NPDES permit effluent limitations. Table 1-2 summarizes the trend in NPDES permit compliance for the period of NPDES administration, 1974-1981. During this period, the number of plants operated by the Commission was reduced from 21 in 1974 to 14 in 1980 and 1981. The total number of violations was reduced from 163 in 1974 to 35 in 1981. Overall percent compliance with NPDES permit effluent limitations improved from 86.4% in 1974 to 98.0% in 1980, and remained at 98.0% in 1981.

Individual NPDES compliance records of the fourteen plants currently in operation are given for the period 1977-1981 in Table 1-3. In general, performance at each plant improved significantly through the period 1977-1980, and remained approximately constant between 1980-1981. The number of violations increased from 22 to 35 between 1980-1981. However, since NPDES permit conditions changed and, therefore the number of potential violations also increased, overall percent compliance at the fourteen existing plants remained approximately the same.

Trends in plant performance can also be evaluated by examining the two major effluent parameters, BOD and TSS, in the form of a single performance indicator (BOD + TSS). Figure 1-1 shows these trends for the Metropolitan Plant alone, and for all other plants combined. Performance at the Metropolitan Plant has been somewhat erratic in the past, with particularly poor performance in 1976 and 1979. NPDES permit limitation levels were eased in 1977 and in 1978 in recognition of reduced plant performance capabilities. During 1980 and 1981, NPDES permit limitations for the Metropolitan Plant approached

TABLE 1-1

1981 ANNUAL SUMMARY OF
TREATMENT PLANT EFFLUENT QUALITY DATA

Treatment Plant	Wastewater Design Flow mgd	Flow 1981 Average mgd	1981 Avg. Percent Removal BOD	TSS	BOD, mg/l NPDES Limit	BOD, mg/l 1981 Avg.	TSS, mg/l NPDES Limit	TSS, mg/l 1981 Avg.	Fecal Coliform Geometric Mean MPN/100 ml NPDES Limit	Fecal Coliform Geometric Mean MPN/100 ml 1981 Avg.	Nutrients, mg/l Phosphorus NPDES Limit	Nutrients, mg/l Phosphorus 1981 Avg.	Nutrients, mg/l Ammonia NPDES Limit	Nutrients, mg/l Ammonia 1981 Avg.	Turbidity NTU NPDES Limit	Turbidity NTU 1981 Avg.
Anoka	2.46	2.01	92	91	25	16	30	14	200	36	---	3.4	---	14.4	25	7
Bayport	0.65	0.47	96	96	25	8	30	7	200	2	1.0	0.4	---	3.7	25	3
Blue Lake	20.00	13.7	95	98	25	12	30	6	200	20	---	3.6	---	16.6	25	6
Chaska	1.40	0.70	92	93	25	18	30	13	200	7	---	1.3	---	9.5	25	6
Cottage Grove	1.80	1.21	94	96	25	12	30	7	200	55	---	5.0	---	9.5	25	5
Empire	6.00	3.51	99	99	10	3	10	2	200	3	---	6.7	1.0	0.3	25	1
Hastings	1.83	1.50	91	91	25	20	30	22	200	11	---	5.8	---	20.6	25	11
Maple Plain	0.20	0.25	93	95	25	12	30	9	200	23	---	3.4	---	11.2	25	5
Medina	0.10	0.10	80	86	--	26	--	18	---	--	---	3.2	---	8.2	--	9
Metropolitan	290	202	91	92	30/25*	19	30	19	200	60	---	2.0	---	12.9	--	10
Rosemount	0.60	0.30	92	99	25	14	30	2	200	3	1.0	0.2	---	26.9	25	4
Savage	0.86	0.40	93	97	25	10	30	8	200	39	---	4.0	---	0.4	25	6
Seneca	24.00	13.8	91	91	25	20	30	20	200	4	---	3.7	---	20.8	25	9
Stillwater	3.02	2.31	87	94	25	18	30	10	200	2	1.0	0.5	---	10.5	25	5

*Jan-Oct/Nov-Dec

TABLE 1-2

TRENDS IN NPDES PERMIT COMPLIANCE

Year	Number of Plants In Operation (at Year-End)	Number of Violations	Percent Compliance
1974	21	163	86.4
1975	20	81	94.5
1976	20	109	92.7
1977	20	101	93.6
1978	18	94	94.5
1979	16	109	93.8
1980	14	36	98.0
1981	14	35	98.0

TABLE 1-3

NPDES PERMIT COMPLIANCE AT EXISTING PLANTS

TREATMENT PLANT	ANNUAL NUMBER OF VIOLATIONS (V) AND PERCENT COMPLIANCE (C)									
	1977		1978		1979		1980		1981	
	V	C	V	C	V	C	V	C	V	C
ANOKA	13	90	27	90	3	97	3	99	8	97
BAYPORT	2	99	0	100	0	100	0	100	0	100
BLUE LAKE	0	100	1	99	0	100	0	100	0	100
CHASKA	4	92	15	69	25	58	4	96	3	98
COTTAGE GROVE	2	96	3	94	4	95	1	99	4	96
EMPIRE	--	--	--	--	1	90	1	99	0	100
HASTINGS	7	95	2	98	2	99	5	97	8	94
MAPLE PLAIN	2	97	2	97	--	95	3	95	1	99
MEDINA	0	100	0	100	1	92	0	100	2	83
METROPOLITAN	2	96	6	88	15	69	2	96	5	89
ROSEMOUNT	4	93	1	99	1	99	1	99	0	100
SAVAGE	6	88	2	96	6	92	0	100	0	100
SENECA	5	97	5	97	8	94	0	100	2	99
STILLWATER	1	99	0	100	0	100	2	99	2	99
TOTALS	48	96	64	94	74	95	22	99	35	98

secondary treatment levels (BOD = 25 mg/L and TSS = 30 mg/L or BOD + TSS = 55 mg/L) while performance was consistently better than secondary treatment.

Other plants show a trend of improved performance throughout 1971-1981, with marked improvement in 1971-1975, and 1979-1980. NPDES permit limitations became more stringent between 1975-1980. In 1981, NPDES permit limits were at the secondary treatment level (BOD = 25 mg/L and TSS = 30 mg/L) or better at all plants. Performance at all plants was consistently better than secondary treatment.

1.2 Air Emissions

There are three major sources of air emissions at the Metro and Seneca Plants: Metro F & I No. 1 sludge incinerators, Metro F & I No. 2 sludge incinerators, and Seneca sludge incinerators. Each source is limited in the discharge of particulates, opacity, odors, and mercury. Activities involving emissions testing and the issuance of operating permits for Metro F & I No. 1 and Seneca sludge incinerators were intensified during 1981. Activities involving Metro F & I No. 2 were delayed by the shutdown at the facility in March, 1981. Activities involving odor monitoring of these sources were delayed until 1982.

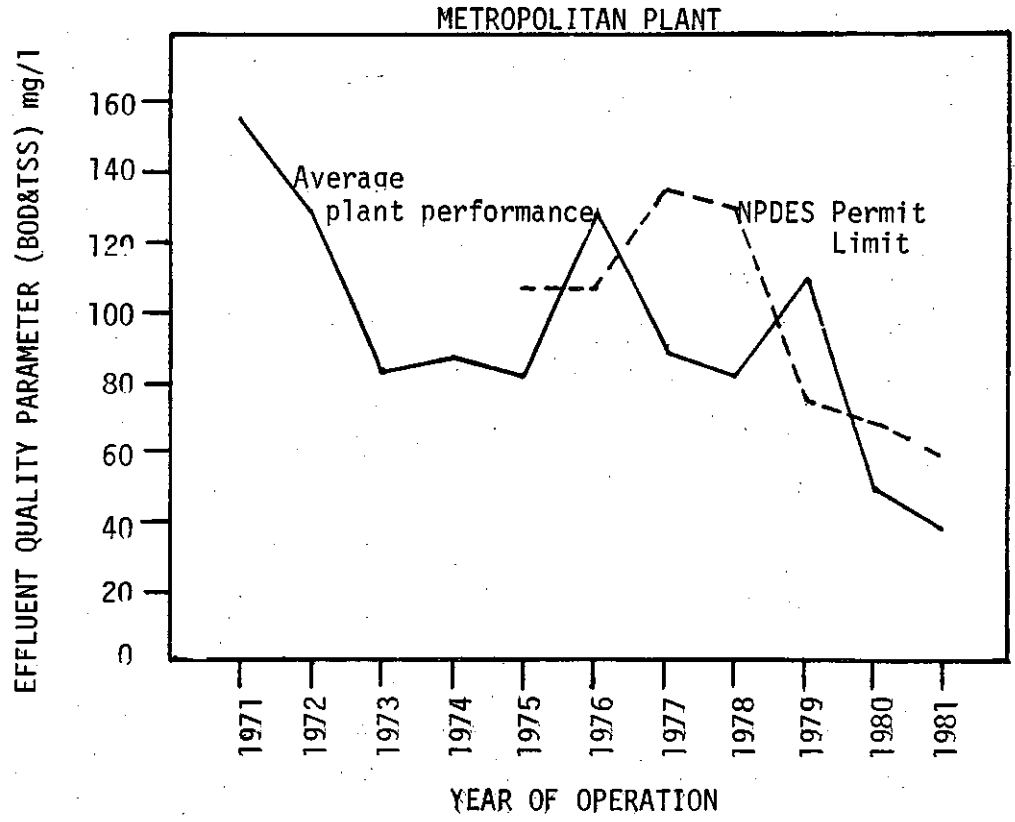
Table 1-4 is a summary of sludge incinerator emissions measured during 1981. At Metro F & I No. 1, compliance with particulate, opacity, and mercury standards were demonstrated to be acceptable. At Seneca, inconsistent compliance with particulate standards resulted in the derating of incinerator capacity for 1.4 dry tons/hour to 1.0 dry tons/hour, in order to ease the particulate standard. Compliance with opacity and mercury standards were demonstrated acceptable.

1.3 Sludge Management

Each of the fourteen plants operated by the Commission produces sludge as a result of wastewater treatment, and with the exception of Medina, each plant provides some form of sludge processing leading to ultimate disposal of the sludge. Table 1-5 is a summary of sludge generated at Commission plants.

Ultimate disposal of sludge generated at Commission plants involves either landspreading or incineration. The Metropolitan Plant and the Seneca Plant represent major points of final sludge disposal. At Metro, sludge is either landspread or incinerated; at Seneca, sludge is incinerated. The Empire Plant has on-site sludge landspreading facilities; all other plants transport sludge to Metro or Seneca, or directly to landspreading sites.

FIGURE 1
TRENDS IN PLANT PERFORMANCE
1971-1981



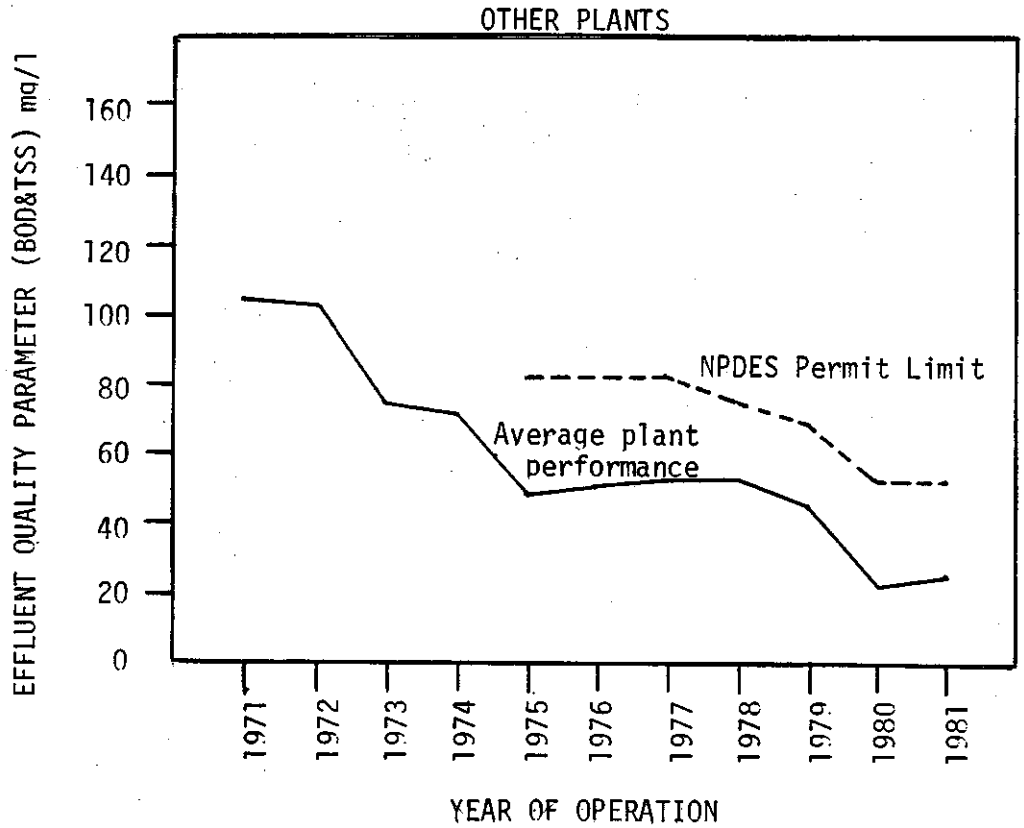


TABLE 1-4

SUMMARY OF 1981 INCINERATOR EMISSIONS QUALITY

Source/Parameter	Particulates **gr/dscf @ 12% CO_2	Opacity %	Mercury gm/24 hrs.
Metro F&I No. 1			
Standards	0.10	20	3,200
Annual Average	0.083	10	634
Number of Tests	3	91	1
Percent Meeting Standards	67	88	100
Seneca			
Standards	0.10/0.20*	20	3,200
Annual Average	0.10	15	101
Number of Tests	9	36	1
% Meeting Standards	78	78	100

*Note: Seneca incinerators were derated from 1.4 DTPH to 1.0 DTPH on November 1, 1981, resulting in an increase in the particulate emmission standard to 0.2 gr/dscf @ 12% CO_2.

** grains/dry standard cubic foot corrected to 12% CO_2.

TABLE 1-5

SUMMARY OF SLUDGE GENERATED, 1981

TREATMENT PLANT	ANNUAL FLOW		ANNUAL SLUDGE PRODUCTION			SLUDGE DISPOSAL METHOD
	MGD	MG	MG	% SOLIDS	DRY TONS	
ANOKA	2.01	734	4.81	1.57	314	(1)
BAYPORT	0.47	172	1.50	1.90	119	(1)
BLUE LAKE*	13.7	5,000	36.43	4.92	6,971	(1)(2)
CHASKA	0.70	256	3.07	1.82	200	(3)
COTTAGE GROVE	1.21	442	2.96	1.84	223	(4)
EMPIRE	3.51	1,281		12.62	680	(4)
HASTINGS	1.50	548	2.21	3.08	280	(4)
MAPLE PLAIN	0.25	92	0.16	8.10	40	(1)(3)
MEDINA	0.10	37	0	--	0	--
METROPOLITAN*	202	73,730	--	28.45	87,465	(4)(5)
ROSEMOUNT	0.30	110	1.56	9.98	648	(1)
SAVAGE	0.40	146	0.32	4.94	63	(2)(4)
SENECA*	13.8	5,037	--	21.5	12,582	(5)
STILLWATER	2.30	840	5.38	2.55	572	(1)(4)

SLUDGE DISPOSAL METHODS:

(1) Transported to Metropolitan Plant for further processing

(2) Transported to Seneca Plant for further processing

(3) Transported to Blue Lake Plant for further processing

(4) Landspreading

(5) Incineration

NOTES:

*Annual Sludge Production includes sludge transported from other plants for further processing, and chemicals added for sludge conditioning (where applicable).

2.0 INTRODUCTION

The Metropolitan Waste Control Commission was established as the areawide operational water pollution control agency by the Minnesota State Legislature, through the Metropolitan Sewer Act in 1969. This Act gives the Commission formal charge to prevent, abate, and control water pollution in lakes, rivers, and streams of the seven county Metropolitan area. The accomplishment of these responsibilities required that the Commission acquire, construct, operate, and maintain all interceptors and treatment works necessary for the collection, treatment, and disposal of wastewater in the area.

The Commission originally acquired 33 existing wastewater treatment plants in 1970. During the following ten years, the Commission reduced the number of plants in operation to 14, by constructing three new plants and closing 22. The number of plants in operation at the end of each year is shown graphically in Figure 2-1. A history of each plant is summarized in Table 2-1. Through this program of regionalization, the Commission eliminated old and outdated plants which could not comply with more stringent modern effluent limitations. New and modern plants were designed and constructed to economically meet required effluent limitations, and provide for expansion to accomodate future growth in the area.

The 14 plants currently operated by the Commission include the Metropolitan Plant. This is the largest plant in the system and serves the greater Minneapolis-St. Paul area. Three other regional plants, Blue Lake, Empire, and Seneca, each serve several suburban communities. The remaining ten smaller plants generally serve individual communities in the area.

Throughout each year, the performance of each plant is monitored, recorded, and reported to regulatory agencies, Commission administrators, and Commission program managers, in order to insure consistently good performance and indicate areas where additional effort is necessary to improve performance. At the end of each year, the record of performance of each of the Commission's Plants is summarized. This report is a summary of treatment plant performance during 1981.

The purposes of this report are as follows:

(1) To provide a summary of 1981 treatment plant performance data for future reference;

(2) To compare plant effluent quality to NPDES permit effluent limitations;

(3) To compare effluent quality to plant and administrative program performance goals;

FIGURE 2-1

NUMBER OF TREATMENT PLANTS IN OPERATION
1970-1981

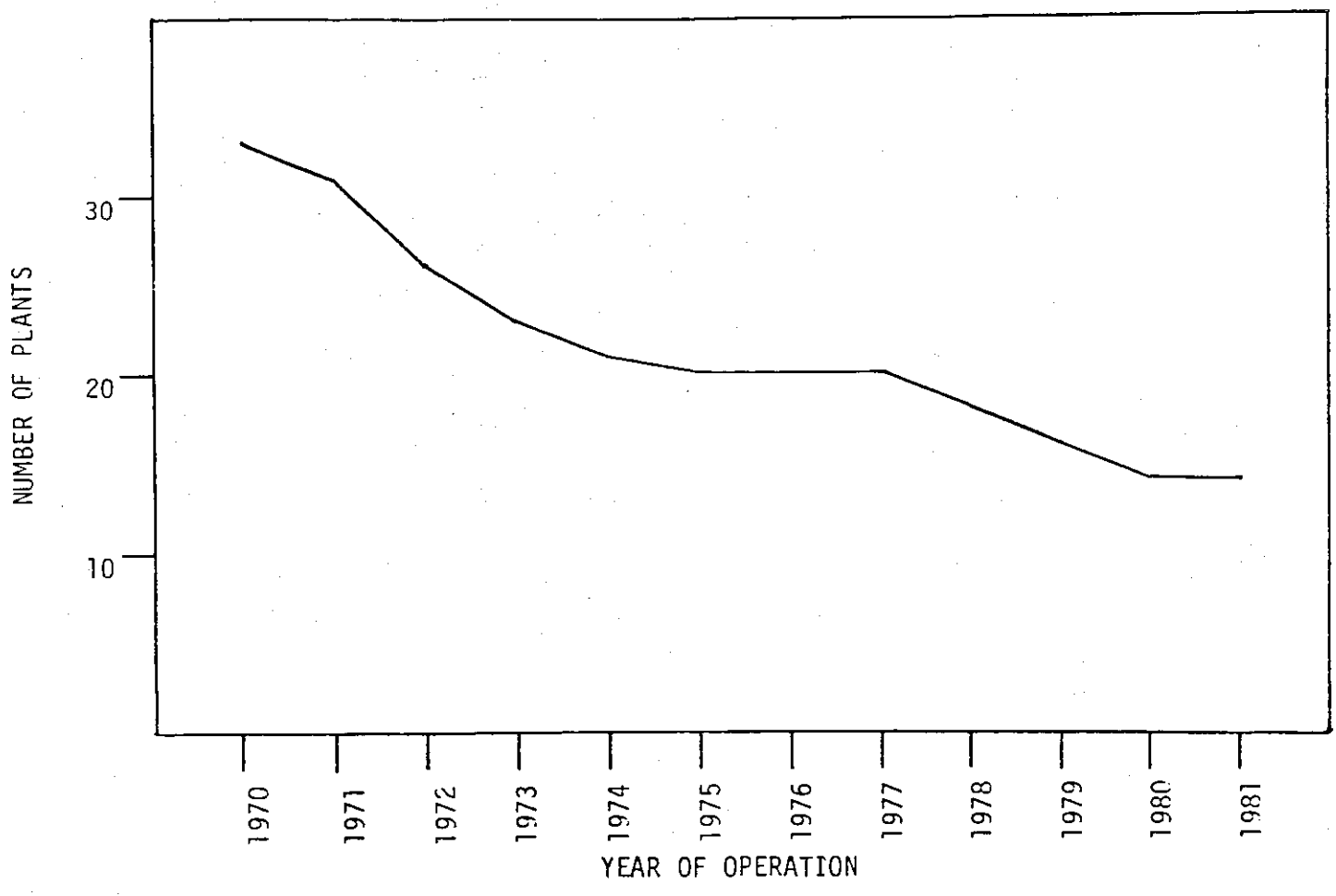


TABLE 2-1

TREATMENT PLANTS IN OPERATION DURING THE PERIOD 1971-1981

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AMOCA	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
APPLE VALLEY	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Empire Plant 9/79)		
BAYPORT	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
BLUE LAKE	(Plant Start-up 8/71) XXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
BURNSVILLE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Blue Lake Plant 9/22/72)									
CHASKA	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
CHANHASSEN	XXXXXXXXXX	XXXXXXXXXX	X (Flow diverted to Blue Lake Plant 1/10/72)									
COTTAGE GROVE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
EAGAN TOWNSHIP I	XXXXXXXXXX	XXXXXXXXXX	XXXXXX (Flow diverted to Seneca Plant, 7/21/72)									
EAGAN TOWNSHIP II	XXXXXXXXXX	XXXXXXXXXX	XXXXXX (Flow diverted to Seneca Plant, 7/21/72)									
EMPIRE									(Plant Start-Up 9/79) XXXX	XXXXXXXXXX	XXXXXXXXXX	
EXCELSIOR	XXXXXXXXXX	XXXXXXXXXX	XX (Flow diverted to Blue Lake Plant 2/22/72)									
FARMINGTON	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Empire Plant 9/79)		
FOREST LAKE TOWNSHIP	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Metropolitan Plant 9/28/72)									
FOREST LAKE VILLAGE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Metropolitan Plant 9/28/72)									
HASTINGS	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
INVER GROVE HEIGHTS	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX (Flow diverted to Metropolitan Plant 11/8/72)									
LAKEVILLE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXX (Flow diverted to Empire Plant 9/79)		
LONG LAKE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Blue Lake Plant 6/80)	
MAPLE PLAIN	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
MEDINA	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
METROPOLITAN	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
MOUND	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Blue Lake Plant 5/74)							
NEWPORT	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Metropolitan Plant 6/11/75)						
OAK PARK HEIGHTS	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXX (Flow diverted to Stillwater Plant 7/11/73)								
ORONO	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Blue Lake Plant 6/80)	
PRIOR LAKE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Blue Lake Plant 5/78)			
ROSEMOUNT I	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX (Flow diverted to Rosemount II 11/20/73)								
ROSEMOUNT II			(Plant Start-Up 11/73) XX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
ST. PAUL PARK	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Metropolitan Plant 6/18/75)						
SAVAGE	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
SENECA	(Plant Start-up 7/72)	XXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
SHAKOPEE	XXXXXXXXXX	XXXXXX (Flow diverted to Blue Lake Plant 7/71)										
SOUTH ST. PAUL	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXX (Flow diverted to Metropolitan Plant 6/24/74)							
STILLWATER	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
VICTORIA	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX (Flow diverted to Blue Lake Plant 11/7/73)								
WACONIA					(Plant acquired 11/75) XX	XXXXXXXXXX	XXXXXXXXXX	X (Flow diverted to Blue Lake Plant 1/76)				
WAYZATA	XXXXXXXXXX	XXXXXXXXX (Flow diverted to Blue Lake Plant 10/71)										

(4) To compare major air emissions to emission standards;

(5) To summarize quantity and quality of sludge production and methods of sludge treatment and disposal at each plant;

(6) To summarize activities related to plant performance at each plant; and

(7) To compare 1981 plant performance data to historical performance data.

This report is divided into seven major sections. Sections 1 and 2 are a summary and introduction, respectively. Section 3 discusses plant effluent quality relative to NPDES effluent limitations and performance goals. Section 4 discusses air emissions from the three major sources at the Metropolitan and Seneca Plants. Section 5 summarizes plant sludge production and sludge quality. Section 6 consists of individual treatment plant reports giving details of plant treatment processes, plant efficiencies, and 1981 activities at each plant. Section 7 is an appendix which presents additional data and data analyses in several forms.

3.0 EFFLUENT QUALITY

3.1 Water Pollution Control Regulations

In October, 1972, Congress passed the Water Pollution Control Act Ammendments of 1972 (Public Law 92-500). The purpose of the Act was to enhance the quality and value of water resources and to establish a national policy for the prevention, control, and abatement of water pollution. The U.S. Environmental Protection Agency (EPA) was established as the agency to administer and regulate the requirements of the Act. The national goals established for publicly owned treatment works were the attainment of a minimum of secondary treatment standards by July 1, 1983, and additional treatment standards based on receiving water quality. Congress amended Public Law 92-500 by the Clean Water Act of 1977, and the Municipal Wastewater Treatment Construction Grant Amendments of 1981. These amendments eased the compliance date for secondary treatment standards and water quality related effluent limitations to July 1, 1988.

To meet adopted receiving water quality standards stated in 6 MCAR § 4.8014 and 6 MCAR § 4.8015, the Minnesota Pollution Control Agency's Rules and Regulations also establish secondary treatment as a minimum treatment level for all publicly owned treatment plants. Secondary treatment facilities are defined, in these Rules and Regulations, as works which will provide effective sedimentation, biochemical oxidation, and disinfection, or the equivalent, including effluents conforming to the limits shown in Table 3-1.

TABLE 3-1

DEFINITION OF SECONDARY TREATMENT EFFLUENT - 6 MCAR 4.8014-4.8015

Substance or Characteristic	Limiting Concentration or Range	
	30 Day Mean	7 Consecutive Day Mean
5-Day Biochemical Oxygen Demand, mg/L(1)	25	45
Fecal Coliform Group Organisms, Number/100 mL(2)	200	400
Total Suspended Solids, mg/L(1)	30	45
Phosphorus, mg/L(3)	1	---
Turbidity, mg/L(1)	25	---
pH Range(4)	6.5-8.5	---
Unspecified Toxic or Corrosive Substances(5)	---	---

(1) Arithmetic Mean
(2) Geometric Mean; Disinfection required from March 1 through October 31.
(3) In effect where discharge is directly to lake or reservoir.
(4) Not subject to averaging.
(5) None allowed at levels acutely toxic to humans or other animals or plant life.

Where it is evident that the concentration levels specified in Table 3-1 are not effective in preventing pollution, or the specified stream flow is inadequate to protect the applicable water quality standards, effluent standards more stringent than those specified in Table 3-1 may be adopted. As such, specific water quality based effluent limitations have been adopted for the Vermillion River, and are applied to the Empire Plant. These limitations are listed in Table 3-2.

TABLE 3-2

WATER QUALITY BASED EFFLUENT STANDARDS (WPC-41)

Substance or Characteristic	Limiting Concentration or Range
5-Day Biochemical Oxygen Demand, mg/L(1)	10
Fecal Coliform Group Organisms, number/100 mL(2)	200
Total Suspended Solids, mg/L(1)	10
Phosphorus, mg/L(3)	1
Turbidity, NTU(1)	25
pH Range(4)	6.5-8.5
Ammonia as Nitrogen, mg/L(1)	1
Dissolved Oxygen, mg/L(1)	4
Unspecified Toxic or Corrosive Substances(5)	---

(1) Arithmetic Mean
(2) Geometric Mean; Disinfection required from March 1 through October 31.
(3) In effect where discharge is directly to lake or resivoir.
(4) Not subject to averaging.
(5) None allowed at levels acutely toxic to humans or other animals or plant life.

During 1974, the National Pollutant Discharge Elimination System (NPDES) was established as the major regulatory tool to be used in implementing the requirements of Public Law 92-500. Under this system, each individual wastewater discharge to state or federal waters is required to have an NPDES permit. The NPDES permit places limitations on the quantity and quality of the wastewater discharge. After establishment of initial policies and procedures, the EPA transferred the responsibility for issuing permits to individual state governments.

3.1 Effluent Limitations

In 1974, all Commission Plants were issued discharge permits by the MPCA. The permits stipulated interim effluent quality standards to be achieved for compliance with permit conditions. Effluent quality standards established for each plant were the same as, more stringent than, or less stringent than those of secondary treatment depending on the water quality standards of the receiving waters and the practicability of attaining certain levels of treatment under existing operating conditions.

These standards have been revised in the past and will be revised in the future as receiving water quality standards change, and as facilities are constructed capable of achieving higher levels of treatment. The NPDES effluent quality limitations in effect during 1981 are shown in Table 3-3.

TABLE 3-3
NPDES EFFLUENT LIMITATIONS - 1981

TREATMENT PLANT (a)	Standards Applicable	5-Day BOD mg/l 7-Day Avg.	5-Day BOD mg/l 30-Day Avg.	TSS, mg/l 7-Day Avg.	TSS, mg/l 30-Day Avg.	Fecal Coliform MPN/100 ml Geometric Mean 7-Day Mean	Fecal Coliform MPN/100 ml Geometric Mean 30-Day Mean	Turbidity NTU 7-Day Mean	Phosphorus mg/l 30-Day Mean	Ammonia mg/l 30-Day Mean	Dissolved Oxygen mg/l 30-Day Mean
ANOKA (b)	At All Times	45	25	45	30	400	200	25	---	---	---
BAYPORT	At All Times	45	25	45	30	400	200	25	1.0	---	---
BLUE LAKE	At All Times	45	25	45	30	400	200	25	---	---	---
CHASKA	At All Times	45	25	45	30	400	200	25	---	---	---
COTTAGE GROVE	At All Times	45	25	45	30	400	200	25	---	---	---
EMPIRE	At All Times	--	10	--	10	400	200	25	---	1.0	4.0
HASTINGS	At All Times	45	25	45	30	400	200	25	---	---	---
MAPLE PLAIN	At All Times	--	25	--	30	---	200	25	---	---	---
METROPOLITAN	Jan 1-Oct 31	--	30	--	30	---	200	--	---	---	---
	Nov 1-Dec 31	--	25	--	30	---	200	--	---	---	---
ROSEMOUNT	At All Times	45	25	45	30	400	200	25	1.0	---	---
SAVAGE	At All Times	45	25	45	30	400	200	25	---	---	---
SENECA	At All Times	45	25	45	30	400	200	25	---	---	---
STILLWATER	At All Times	45	25	45	30	400	200	25	1.0	---	---

(a) General Requirements for Essentially All Plants:
1) The pH shall not be less than 6.5 nor greater than 8.5. These upper and lower limitations are not subject to averaging and shall be met at all times.
2) There shall be no discharging of floating solids or visible foam in other than trace amounts.
3) The discharge shall not contain oil or other substances in amounts sufficient to create a visible color or film.

(b) Additional 30-day mean permit standards for Anoka: chromium - 0.4 mg/l, copper - 0.3 mg/l, lead - 0.5 mg/l, zinc - 0.5 mg/l, cyanide - 0.5 mg/l.

3.2 Plant Performance

During 1981, the Commission's network of treatment plants had available capacity to treat 102 billion gallons of wastewater. The actual volume of wastewater treated during 1981, was approximately 88 billion gallons. This represents a decrease of wastewater volume from the previous year of approximately 2 billion gallons. Wastewater treated during 1981, represented 85 percent of the Commission's total treatment capacity.

Of the 88 billion gallons of wastewater received during 1981, 83 percent was treated at the Commission's largest facility, the Metropolitan Wastewater Treatment Plant. Approximately 11 percent of the total flow was divided between the next two larger facilities, Blue Lake and Seneca. The remaining 6 percent was treated at other plants scattered throughout the seven county area.

At the Metropolitan Plant, effluent quality during 1981 improved from that of 1980. Average effluent BOD and TSS concentrations during 1981 were 19 mg/L and 19 mg/L, as compared to 1980 average effluent BOD and TSS values of 26 mg/L and 23 mg/L. Removal efficiencies for BOD and TSS increased from 89 percent for both BOD and TSS in 1980 to 91 percent for BOD and 92 percent for TSS in 1981. This is the second consecutive year that the Metropolitan Plant has shown significant improvement.

Effluent quality for plants other than the Metropolitan Plant also improved during 1981. Annual average effluent BOD and TSS concentrations during 1981 were 15 mg/L and 11 mg/L as compared to 1980 annual average BOD and TSS values of 17 mg/L and 16 mg/L.

The annual average BOD removal efficiency for all plants increased from 90 percent in 1980 to 91 percent in 1981, and the TSS removal efficiency increased from 90 percent in 1980 to 92 percent in 1981.

Figure 1-1, located in the first section of the report, illustrates the trend in NPDES compliance for the years 1971 thru 1981, for both the Metropolitan Plant and other plants. It can be seen from Figure 1-1, that excellent plant performance continued throughout 1981 and that effluent BOD and TSS have been significantly reduced since 1981 for the Metropolitan Plant and other plants. The annual average effluent concentration (BOD and TSS) has been below permissible NPDES discharge limits for the Metropolitan Plant during the past two years, while the annual average effluent concentration (BOD and TSS) for all other plants has been consistently below permissible NPDES discharge limits since 1975.

Annual performance and monthly variations in performance at each treatment plant are summarized in Table 3-4. Plant flow and major effluent quality parameters are included in the summary.

Nominal design flow for each plant is included in Table 3-4, as well as other places in this report. While it is normal practice to compare average annual flow to nominal design flow to relate current plant operation to plant capacity, this practice is often deceiving. Nominal design flow must be

adjusted to reflect unique flow variation factors, organic loading and organic load variation factors, and individual unit process capacities, in order to be an accurate indicator of plant capacity.

It is not within the scope of this report to analyze and define realistic current plant capacities. However, the following summary of realistic capacity versus nominal design capacity of several plants is necessary in order to understand subsequent discussions of plant performance in 1981;

Anoka:	Current plant capacity has been determined to be 2.2 mgd (instead of 2.46 mgd), due to existing activated sludge aeration and sludge processing limitations.
Bayport:	Plant capacity is somewhat less than nominal design capacity (0.65 mgd), due to alum addition for phosphorus removal, which reduces activated sludge and sludge processing capacity.
Chaska:	Plant capacity is somewhat less than nominal design capacity (1.4 mgd) due to high and highly variable organic loadings.
Hastings:	Current plant capacity has been determined to be 1.5 mgd (instead of 1.83 mgd), due to final clarification and sludge processing limitations..
Stillwater:	Plant capacity is somewhat less than nominal design capacity (3.02 mgd), due to alum addition for phosphorus removal, which reduces activated sludge and sludge processing capacity.

Table 3-4 indicates that Maple Plain and Medina are currently operating at or beyond plant capacity. Based on realistic plant capacities discussed above, Anoka, Chaska, Hastings, and Stillwater are currently operating at or near plant capacity.

Average annual effluent BOD compared favorably with monthly effluent limitations at all plants. The range of monthly average effluent BOD values exceeded NPDES effluent limitations at seven plants (Chaska, Cottage Grove, Hastings, Maple Plain, Metro, Seneca, Stillwater) resulting in one or more permit violations. Average annual effluent TSS compared favorably with monthly effluent limitations at all plants. The range of monthly average effluent TSS values exceeded NPDES effluent limitations at two plants, Hastings and Metro, resulting in one or more permit violations.

Table 3-5 is a comprehensive summary of NPDES permit violations which occurred in 1981. Violations of weekly and monthly mass limitations on BOD and TSS not shown in Table 3-3 are included on Table 3-5. Violations at the Medina Plant as a result of unauthorized discharges are also shown. A total of 35 violations occurred in 1981, ranging from eight at Anoka and Hastings to none at Bayport, Blue Lake, Empire, Rosemount, and Savage. A maximum of

TABLE 3-4

SUMMARY OF PLANT PERFORMANCE, 1981

TREATMENT PLANT	NOMINAL DESIGN FLOW OR PERMIT LIMITATION		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	AVG.
ANOKA	Flow	2.46	2.01	2.05	2.05	1.95	1.99	2.09	2.07	2.02	1.95	1.98	2.01	1.96	2.01
	BOD	25	17	22	19	19	16	17	11	10	13	16	14	20	16
	TSS	30	18	21	20	22	8	13	8	7	9	12	13	12	14
BAYPORT	Flow	0.65	0.41	0.39	0.41	0.45	0.47	0.50	0.51	0.53	0.49	0.50	0.51	0.49	0.47
	BOD	25	8	8	6	8	7	6	7	8	8	9	8	8	8
	TSS	30	6	8	7	10	7	8	6	7	6	7	8	8	7
BLUE LAKE	Flow	20.0	12.7	13.1	13.6	14.5	14.8	15.1	14.2	14.0	12.9	13.1	12.7	13.2	13.66
	BOD	25	10	12	11	12	11	15	14	11	10	8	13	14	12
	TSS	30	8	8	7	5	6	6	7	5	5	6	7	6	6
CHASKA	Flow	1.40	0.59	0.60	0.54	0.64	0.65	0.75	0.81	0.84	0.73	0.67	0.76	0.78	0.70
	BOD	25	17	14	17	26	12	17	13	24	23	26	15	17	18
	TSS	30	15	16	11	15	9	11	9	16	18	16	11	13	13
COTTAGE GROVE	Flow	1.80	1.14	1.22	1.18	1.20	1.21	1.25	1.19	1.24	1.24	1.25	1.23	1.21	1.21
	BOD	25	15	19	20	30	10	8	7	7	7	6	9	12	12
	TSS	30	9	9	11	17	9	4	6	5	2	2	5	7	7
EMPIRE	Flow	6.00	3.25	3.34	3.15	3.32	3.40	3.22	3.72	3.76	4.01	3.75	3.62	3.54	3.51
	BOD	10	2	2	3	3	2	3	3	2	3	4	3	5	3
	TSS	10	1	1	2	1	2	2	2	2	1	1	2	1	2
HASTINGS	Flow	1.83	1.45	1.61	1.57	1.63	1.46	1.49	1.45	1.49	1.46	1.46	1.42	1.48	1.50
	BOD	25	22	25	35	19	15	12	12	14	20	22	20	30	20
	TSS	30	26	32	34	24	23	10	10	14	16	20	22	28	22
MAPLE PLAIN	Flow	0.22	0.17	0.18	0.16	0.31	0.24	0.32	0.31	0.28	0.23	0.31	0.25	0.23	0.25
	BOD	25	6	7	10	13	21	11	9	11	9	9	9	27	12
	TSS	30	3	4	7	9	26	7	6	4	5	3	19	11	9
MEDINA	Flow	0.10	0.075	0.083	0.078	0.092	0.097	0.147	0.152	0.128	0.105	0.096	0.104	0.082	0.104
	Discharge	No	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-
METRO	Flow	213	155	196	182	206	214	233	230	241	224	201	172	170	202
	BOD	30/25*	15	16	17	35	25	24	37	14	14	10	9	11	19
	TSS	30	9	13	16	46	28	23	47	13	13	12	3	4	19
ROSEMOUNT	Flow	0.60	0.30	0.32	0.29	0.30	0.31	0.30	0.29	0.30	0.32	0.32	0.29	0.27	0.30
	BOD	25	13	12	16	19	13	17	13	11	11	16	11	11	14
	TSS	30	1	1	2	2	2	2	2	2	1	1	2	2	2
SAVAGE	Flow	0.36	0.35	0.36	0.38	0.40	0.43	0.43	0.40	0.43	0.41	0.41	0.38	0.41	0.40
	BOD	25	8	8	9	8	10	12	8	7	9	19	11	13	10
	TSS	30	5	14	9	9	11	15	7	6	3	7	5	7	8
SENECA	Flow	24.0	12.9	13.1	12.8	13.7	13.5	14.5	14.5	14.4	14.1	13.8	13.9	14.0	13.77
	BOD	25	18	17	19	18	23	19	17	25	18	20	23	26	20
	TSS	30	16	25	21	19	21	16	14	26	21	18	18	23	20
STILLWATER	Flow	3.02	2.17	2.20	2.18	2.28	2.33	2.37	2.42	2.43	2.32	2.38	2.32	2.26	2.31
	BOD	25	16	26	32	18	9	12	18	22	18	15	12	12	18
	TSS	30	14	12	18	14	7	7	6	9	7	8	8	7	10

*Jan.1-Oct.31/Nov.1-Dec.31, 1981

TABLE 3-5

NPDES PERMIT NON-COMPLIANCE IN 1981

TREATMENT PLANT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL BY NUMBER	TOTAL BY MONTH
ANOKA			DCN MCN		MCN	DCn				DCu,DCr, DZn	WFC		8	5
BAYPORT													0	0
BLUE LAKE													0	0
CHASKA				MB,WB						MB			3	2
COTTAGE GROVE				MB,WB MFC,WFC									4	1
EMPIRE													0	0
HASTINGS		MS	$\overline{MB}$,MB,WB MS,WS							WFC		MB	8	4
MAPLE PLAIN												MB	1	1
MEDINA										Dischg.	Dischg.		2	2
METROPOLITAN				MB,MS			MB,MS, MFC						5	2
ROSEMOUNT													0	0
SAVAGE													0	0
SENECA		WFC										MB	2	2
STILLWATER		MB	MB										2	2
TOTALS	0	3	3	3	1	1	1	0	0	4	2	3	35	21

Symbols: MB, WB=Monthly and Weekly BOD Conc; MS,WS=Monthly and Weekly TSS Conc; $\overline{MB}$,$\overline{WB}$,$\overline{MS}$,$\overline{WS}$=Mass Limits; MFC,WFC=Monthly and Weekly Fecal Coliform; pH; MP=Monthly Phosphorus Conc; $\overline{MP}$=Mass Limit; T=Turbidity; MAm=Monthly NH_3-N; MDO=Monthly Dissolved Oxygen; MCN, DCN=Monthly and Daily Cyanide; MCu,DCu=Monthly and Daily Copper; MCr,Dcr=Monthly and Daily Chromium; MPb,DPb=Monthly and Daily Lead; MZn,Dzn=Monthly and Daily Zinc.

eight violations occurred in March and April, while no violations occurred in January, August, or September.

The distributions of violations among effluent parameters and problem areas are shown in Table 3-6. A summary of non-compliance problems at plants with violations is as follows:

Anoka: Industrial waste discharges resulting in effluent limitation violations of heavy metals and cyanide occurred in March, May, June, and October, resulting in seven violations. In addition, failure to chlorinate at an adequate rate while one of two chlorine contact tanks was out of service for modifications resulted in a weekly fecal coliform violation in November.

Chaska: Monthly and weekly BOD violations in April were related to industrial waste problems. An additional monthly BOD violation occurred in October due to nitrification in the BOD test.

Cottage Grove: Nitrification in the BOD test resulted in monthly and weekly BOD violations in April. Monthly and weekly fecal coliform violations in April were due to nitrite interference in disinfection.

Hastings: BOD and TSS violations in February and March were related to process control problems, compounded by plant capacity problems and potential industrial waste problems. The weekly fecal coliform violation in October was due to nitrite interference in disinfection, while the montly BOD violation in December was related to plant capacity problems.

Maple Plain: The monthly BOD violation in December was related to equipment problems.

Medina: Two unauthorized discharges occurred in October and November due to plant capacity problems.

Metropolitan: Monthly BOD and TSS violations which occurred in April and July were related to process control problems and aggravated by temporary equipment outages for construction of plant improvements. The monthly fecal coliform violation in July was related to nitrite interference in disinfection and unrepresentative effluent sampling.

Seneca: The weekly fecal coliform violation in February was related to chlorination control problems. The monthly BOD violation in December was due to process control problems.

Stillwater: The monthly BOD violations in February and March were due to nitrification in the BOD test.

3.3 Program Goals

Initially developed in 1976, the Commission continues to utilize a criteria which rapidly assesses plant performance. The assessment is made in terms of four parameters: Compliance (C), Frequency (F), Severity (S), and Noncompliance Index (NCI).

Compliance (C) is the percentage compliance with NPDES effluent limitations as listed in each plant's NPDES Permit. The nearer the compliance number is to 100 percent, the better the plant performance.

Frequency (F) is the frequency of compliance with NPDES effluent limitations. It is calculated by dividing the total number of BOD and TSS analyses complying with effluent standards by the total number of BOD and TSS analyses performed and expressing the result as a percentage. The nearer the frequency number is to 100 percent, the better the plant performance as related to effluent quality standards.

Severity (S) is the deviation from the standard for those BOD and TSS analyses which exceed NPDES effluent limitations. It is determined by locating the median value of those values exceeding the standards and expressing the deviation as a percentage of the NPDES limit. The larger the severity number, the greater the magnitude of violation of effluent standards.

In judging the performance of plants, both frequency and severity must be considered; therefore, noncompliance index was developed to allow a rapid, single-number assessment of plant performance. The noncompliance index (NCI) is determined by multiplying the percent severity by the noncompliance (100-frequency) and dividing by 100. A low noncompliance index indicates better overall compliance with effluent quality standards.

Performance objectives in terms of compliance, frequency, and severity are defined in the operating budget of each individual treatment plant. In addition, Administration and Management (Program 001-Chief Administrator) has goals for compliance and severity at the Metropolitan Plant, and at all other plants combined. Operations Administration (Program 029-Director of Operations) has goals for compliance, frequency, and severity, related to the Metropolitan Plant, and to all other plants combined. Process Assurance (Program 030-Process Assurance Manager) has a goal based on compliance.

A summary of 1981 goals and actual performance at each plant is provided in Table 3-7. During 1981, eleven plants met their compliance goals, ten plants met their frequency goals, and nine plants met their severity goals. Individual plant goal attainment is summarized as follows:

All Goals	Two Goals	One Goal	No Goals
Anoka	Blue Lake (C,F)*	Medina (F)	(None)
Bayport**	Chaska (C,S)	Metro (S)	
Cottage Grove	Empire (C,F)		
Maple Plain	Hastings (F,S)		
	Rosemount (C,F)		
	Savage (C,F)		
	Seneca (C,S)		
	Stillwater (C,S)		

*Indicates goal(s) met
**The Bayport Plant has a perfect record of 100% compliance, 100% frequency, and no severity.

The goals not achieved and causes of non-achievement are summarized as follows:

Blue Lake (S): Nitrification in the BOD test increased severity above the goal level.

Chaska (F): The frequency goal was not obtained due to erratic performance related to industrial waste problems and nitrification in the BOD test.

Empire (S): Severity was affected by one value. Realistically, the elevated severity has no significance.

Hastings (C): Compliance was slightly less than the performance criteria due to operation near design capacity and process control problems related to this operation.

Medina (C,S): Discharge in October and November resulted in failure to comply with the compliance goal (no discharge). Severity was affected by equipment problems, algae problems, and nitrification in the BOD test.

Metro (C,F): Process control problems in April and again in July reduced compliance and frequency. Although the compliance and frequency values did not recover, performance during the last five months of 1981 was excellent, with effluent quality well within limitations.

Rosemount (S): High effluent BOD values related to industrial waste slugs increased severity above the goal level.

Savage (C,F): Severity was affected by two values. Realistically, the elevated severity has no significance.

Seneca (F): Frequency was affected by marginal performance during the fourth quarter.

Stillwater (F): Frequency was affected by nitrification in the BOD test.

A summary of 1981 goals and performance for other administrative programs is provided in Table 3-8. In general, goal attainment was marginal due to periods of reduced performance at the Metropolitan Plant.

TABLE 3-6

NPDES PERMIT VIOLATION DISTRIBUTION

Distribution of Violations Among Effluent Parameters

PARAMETER	NUMBER OF VIOLATIONS 1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	TOTAL
BOD	5	5	1	4	15
TSS	3	1	1	0	5
FECAL COLIFORM	1	2	1	2	6
METALS/CYANIDE (ANOKA)	2	2	0	3	7
DISCHARGE (MEDINA)	0	0	0	2	2
	11	10	3	11	35

Distribution of Violations Among Problem Areas

PROBLEM AREA	NUMBER OF VIOLATIONS 1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	TOTAL
PROCESS CONTROL	6	2	2	2	11
INDUSTRIAL WASTES	2	4	0	3	10
NITRIFICATION IN THE BOD TEST	2	2	0	1	4
PLANT CAPACITY	0	0	0	3	3
OTHER	1	2	1	2	7
	11	10	3	11	35

TABLE 3-7
SUMMARY OF TREATMENT PLANT GOAL PARAMETERS

Compliance, Frequency, Severity, and Noncompliance Index
Values For 1981 Compared to 1981 Goals and 1980 Values

Treatment Plant	Compliance			Frequency			Severity			NonCompliance Index		
	Actual 1980	Actual 1981	Goal 1981	Actual 1980	Actual 1981	Goal 1981	Actual 1980	Actual 1980	Goal 1981	Actual 1980	Actual 1981	Goal 1981
Anoka	99	97	96	97	94	93	10	16	33	0.3	0.1	2.3
Bayport	100	100	98	99	100	93	13	0	33	0.1	0	2.3
Blue Lake	100	100	98	99	97	93	36	40	33	0.4	1.2	2.3
Chaska	96	98	96	90	89	93	52	32	33	5.2	3.5	2.3
Cottage Grove	99	96	96	99	97	93	75	32	33	0.8	1.0	2.3
Empire	99	100	97	99	99	95	30	30	25	0.3	0.3	1.2
Hastings	97	94	95	79	80	80	24	24	33	5.0	4.8	6.6
Maple Plain	95	99	92	80	94	85	20	31	45	4.0	2.2	6.8
Medina	100	83	100	72	74	70	20	60	50	5.6	15.6	15.0
Metropolitan	96	89	92	81	81	85	40	40	40	7.6	7.6	6.0
Rosemount	99	100	97	98	97	95	56	48	25	1.1	1.4	1.2
Savage	100	100	96	99	98	93	13	36	33	0.1	0.7	2.3
Seneca	100	99	97	95	91	93	16	27	33	0.8	2.4	2.3
Stillwater	99	99	98	96	90	95	42	32	33	1.7	3.2	1.6

TABLE 3-8

SUMMARY OF ADMINISTRATIVE GOAL ATTAINMENT

Administration and Management (001) Goal Attainment

Plant(s)	NPDES Compliance, %		Severity, %	
	Goal	Actual	Goal	Actual
METROPOLITAN	94	89	35	40
ALL OTHERS	96	98	35	32

Operations Administration (029) Goal Attainment

Plant(s)	NPDES Compliance, %		Frequency, %		Severity, %	
	Goal	Actual	Goal	Actual	Goal	Actual
METROPOLITAN	94	89	93	81	33	40
ALL OTHERS	96	98	91	92	35	32

Process Assurance (030) Goal Attainment

Plant(s)	NPDES Compliance, %	
	Goal	Actual
ALL	95	98

4.0 INCINERATOR EMISSION QUALITY

Sludge generated at Commission Treatment Plants is disposed of by either digestion, landspreading, or incineration. Sludge generated at the Metropolitan and Seneca Treatment Plants is disposed of by incineration or landspreading. When incineration is used as a sludge disposal method, emissions from the incineration process are subject to limitations. The purpose of these limitations is to prevent deterioration of existing ambient air quality. Incinerator emission limitations or standards are contained in MPCA's Air Quality Rules and Regulations.

4.1 Emission Standards

APC-9 of MPCA's Air Quality Rules and Regulations deals with the control of odors by limiting odor emission rates from defined odor sources and by establishing odor standards for ambient air based upon local zoning.

Odor standards are expressed as odor concentration units. The odor concentration unit is defined as the number of standard cubic feet of odor free air needed to dilute each cubic foot of contaminated air to a point where at least 50 percent of the individuals comprising the odor test panel do not detect an odor in the diluted mixture.

An odor source as defined in APC-9 includes, but is not limited to, any stack, chimney, vent, window, opening, lagoon, basin, pond, open tank, or any organic or inorganic discharge and or application which emits odorous gas, gases, or particulates.

Odor emission rates are the product of the number of standard cubic feet per minute of air or other gases emitted from a suspected odor pollution source and the number of odor concentration units determined for that source.

The following odor limitations are contained in APC-9:

1. Odor sources emitting from well defined stacks, 50 feet or more above grade elevation, and with adequate dispersion characteristics, as determined by the Agency, shall not emit odors greater than 150 odor concentration units.

2. Odor sources of less than 50 feet elevation above grade or otherwise failing to create good dispersion conditions, as determined by the Agency, shall not emit more than 25 odor concentration units.

3. No odor source shall have an odor emission rate in excess of 1,000,000 odor concentration units per minute.

APC 28 of MPCA's Air Quality Rules and Regulations sets standards for particulate matter and opacity. These standards apply to emissions from both new and existing sewage sludge incinerators. Incinerators operating at the Metropolitan and Seneca Plants during 1981 fall into the existing sludge incinerator category. Portions of APC 28, dealing with existing sewage sludge incinerators, state that no owner or operator of an existing sewage sludge incinerator shall cause to be discharged into the atmosphere from the sewage sludge incinerator any gases which exhibit greater than 20 percent opacity and which contain particulate matter in excess of the concentrations shown in Table 4-1.

TABLE 4-1

EMISSION STANDARDS FOR EXISTING SEWAGE SLUDGE INCINERATOR, APC-28

Incinerator Burning Capacity (lb/hour)	Particulate Emission Standard grain/dscf corrected to 12% CO2	Percent Opacity Average	Percent Opacity Maximum*
200	0.3	20	40
200-2000	0.2	20	40
>2000	0.1	20	40

*A maximum of 40 percent opacity is permissible for four minutes in any 60 minute period.

Burning capacity is defined as the manufacturer's or designer's maximum rate, or such other rate that is considered good engineering practice.

APC 31 of MPCA's Air Quality Rules and Regulations sets standards for mercury emissions. This regulation states that no owner or operator of a sludge incineration and drying plant shall cause to be discharged into the atmosphere from such plant more than 3,200 grams of mercury per 24 hour period.

During the latter part of 1981, permits were issued, by MPCA to the Commission, for the operation of sludge incinerators at the Metropolitan and Seneca Plants. The emission limitations contained in these Operating Permits are listed in Table 4-2. Presently, standards listed in Table 4-2 apply to Incinerators 1-4 in Filtration and Incineration Building No. 1 at the Metropolitan Plant and Incinerators 1-2 in the Solids Processing Building at the Seneca Plant.

TABLE 4-2

SUMMARY OF INCINERATOR EMISSION STANDARDS FOR THE METROPOLITAN AND SENECA PLANTS

	Metropolitan Plant	Seneca Plant
Particulate Matter, grain/dscf at 12% CO2	0.1	0.2
Opacity, percent	20/40*	20/40*
Gas odor content, odor concentration units	25	150
Odor emission rate, odor concentration units/min.	1×10^6	1×10^6
Mercury emission rate, grams/24 hour	3200	3200

*Average opacity standard is 20 percent; except that a maximum of 40 percent opacity is permissible for four minutes in any 60 minute period.

4.2 Summary of 1981 Air Emissions

During 1981, stack gases from incinerators at the Metropolitan and Seneca Plants were sampled and analyzed for particulate matter, opacity, and mercury. Tables 4-3 and 4-4 present a summary of 1981 opacity test results for the Metropolitan Plant Filtration and Incineration Building No. 1, and the Seneca Solids Processing Building. Figure 4-1 shows that the percentage of opacity failures, for Filtration and Incineration Building No. 1 at the Metropolitan Plant, has been reduced from 100 percent in 1978 to 12 percent in 1981 and that the percentage of opacity failures, for the Solids Processing Building at the Seneca Plant, has been reduced from 61 percent in 1978 to 17 percent in 1981. Reduction in opacity failures is due to more effective control of incinerator and scrubber operation at each of the plants.

Table 4-5 summarizes results of particulate tests conducted at the Metropolitan and Seneca Plants during 1981. Annual average particulate emissions at the Metropolitan Plant were .083 g/dscf with one of three tests failing to meet emission standards. Annual average particulate emissions at the Seneca Plant were .01 g/dscf with two of nine tests failing to meet emission standards.

TABLE 4-3

SUMMARY OF OPACITY MEASUREMENTS
METROPOLITAN PLANT
1981

Month	Date	Percent Opacity Stack No. 1	2	3	4
January		*	*	*	*
February		*	*	*	*
March		*	*	*	*
April	3	---	--	--	10
	6	---	15	--	12
	7	15	--	12	--
	16	18	--	16	9
	20	13	--	17	--
	24	---	--	--	10
	27	---	--	14	9
	29	19	--	--	--
May	5	14	--	12	10
	19	---	--	16	--
	21	---	--	--	11
	26	---	--	16	9
June	4	---	--	--	17
	5	---	--	9	--
	18	---	7	7	6
	22	---	--	5	27
	24	---	7	--	--
	29	---	--	--	10
July	10	---	--	5	--
	13	---	--	19	25
	16	---	6	--	--
	24	---	--	7	12
	28	---	--	6	--
	31	---	46	--	6
August	5	---	--	5	6
	11	---	5	7	--
	17	---	--	11	6
	18	---	8	--	--
September	1	---	--	--	8
	3	---	8	7	--
	4	7	--	--	--
	8	9	--	19	--
	14	9	7	--	--
	16	---	--	7	--
	21	7	7	--	--
	24	---	--	--	11
	29	7	--	--	6
October	2	---	6	--	--
	8	7	8	--	7
	19	7	8	--	11
	26	7	8	--	5
November	3	---	6	--	6
	14	7	--	--	--
	16	11	19	--	--
	18	---	--	--	24
	24	5	6	--	--
December	1	9	6	11	--
	9	---	7	--	--
	10	9	--	15	--
	14	8	--	24	--
	15	---	9	--	--
	24	---	6	9	--
	28	---	5	--	--
	29	8	--	--	--
Total Test Measurements		20	22	24	25
Number of Tests Passing Std.		20	21	23	22
Number of Tests Failing Std.		0	1	1	3
Percent of Tests Passing Std.		100	95	96	88

*Not possible to measure opacity due to incinerator shutdown.

TABLE 4-4

SUMMARY OF OPACITY MEASUREMENTS
SENECA PLANT
1981

Month	Date	Percent Opacity
January	14	5
	21	37
	30	15
February	4	27
	19	17
March	2	41
	13	19
	16	10
April	2	20
	9	28
	16	16
May	27	20
June	17	5
	23	9
	29	6
July	6	14
	24	18
	27	7
August	3	9
	10	6
	17	6
	31	6
September	8	15
	14	16
	21	8
	29	42
October	9	11
	19	6
November	6	6
	10	15
	16	18
December	1	14
	7	11
	14	6
	21	26
	31	9
Total Test Measurements		36
Number of Tests Passing Std.		30
Number of Tests Failing Std.		6
Percent of Tests Passing Std.		83

FIGURE 4-1

SUMMARY OF OPACITY FAILURES
(% OF TOTAL READINGS)
1978 - 1981

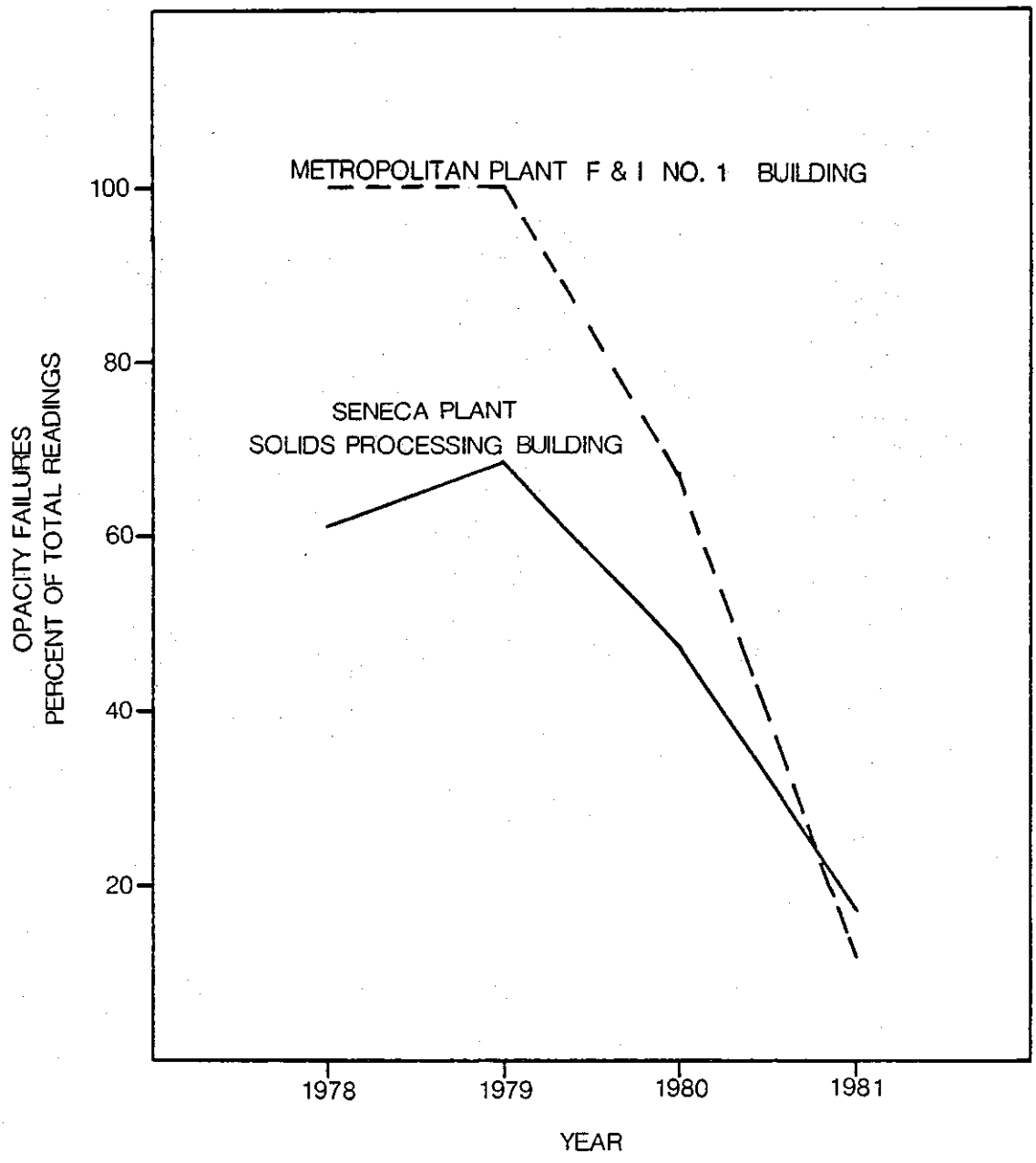


TABLE 4-5

SUMMARY OF 1981 PARTICULATE TESTING
METROPOLITAN AND SENECA PLANTS

A. Metropolitan Plant, Filtration and Incineration Building No. 1

Date	Stack ID	Burning Rate % of Design Capacity	Stack Gas Flow Rate, SCFM	Particulate grains/dscf at 12% CO2*
4/22	4-4	54	14,970	.0759
5/2	4-3	32	12,840	.0701
6/12	4-4	80	11,840	.1044

B. Seneca Plant, Solids Processing Building

Date	Stack ID	Burning Rate % of Design Capacity	Stack Gas Flow Rate, SCFM	Particulate grains/dscf at 12% CO2*
1/20	Common	89	22,350	.0668
1/27	Common	91	17,230	.0797
2/12	Common	86	16,990	.0977
3/10	Common	70	13,249	.0857
3/25	Common	85	16,610	.1627
5/1	Common	67	10,260	.1423
7/9	Common	126	13,010	.0895
7/9	Common	63	13,020	.0999
9/18	Common	89	12,964	.0939

*Particulate values corrected for fuel usage.

5.0 SLUDGE MANAGEMENT

Each of the Commission's treatment plants produces sludge as a result of wastewater treatment. At Medina, sludge settles in treatment ponds, and though periodic removal will ultimately be required, formal treatment is not provided. At all other plants, sludge treatment may include thickening, digestion, chemical conditioning, and dewatering. Final disposal of sludge is accomplished either by landspreading or incineration.

5.1 Sludge Processing

Table 5-1 is a summary of sludge processing and disposal methods utilized at Commission Plants. Most plants provide some form of sludge thickening, either in primary tanks or in independent thickener units. At the Metropolitan and Seneca Plants, gravity thickening is provided for primary sludge, while air flotation thickening is provided for secondary or waste activated sludge. At the Empire and Cottage Grove Plants, gravity thickening is provided for combined sludge.

Most of the smaller outlying plants provide sludge digestion to reduce and stabilize sludge solids. The exception is the Rosemount Plant, where chemical sludge produced by physical-chemical treatment of wastewater, is concentrated and transported to the Metropolitan Plant for disposal.

5.2 Sludge Disposal

During 1981, 110,157 dry tons of sludge were processed at Commission plants. A summary of sludge quantities processed at each of the Commission plants is shown in Table 5-2.

Sludge disposal methods, utilized by the Commission, include: (1) transporting of sludge to the Blue Lake, Seneca, or Metropolitan Plants for further processing; (2) landspreading; and (3) incineration.

Digested sludge from the Chaska and Maple Plain Plants is transported to the Blue Lake Plant. Sludge from the Blue Lake and Savage Plants is transported, by tanker truck or through the interceptors, to either the Seneca or Metropolitan Plant. Digested sludges from the Anoka, Bayport, and Stillwater Plants and undigested sludge from the Rosemount Plant are transported through the interceptors to the Metropolitan Plant for further processing. Digested sludge from the Hastings and Cottage Grove Plants is landspread. Table 5-3 lists the annual quantities of sludge transported from each of the outlying plants, the interim disposal location, and the final disposal location.

TABLE 5-1

SUMMARY OF SLUDGE PROCESSING

TREATMENT PLANT	THICKENING	DIGESTION	CONDITIONING	DEWATERING	SLUDGE DISPOSAL METHOD
Anoka	In Primaries	Anaerobic	None	None	(1)
Bayport	None	Aerobic	None	None	(1)
Blue Lake	In Primaries	None	None	None	(1)(2)
Chaska	None	Aerobic	None	None	(3)
Cottage Grove	Gravity	Anaerobic	None	None	(4)
Empire	Gravity	Anaerobic	Polymer	Centrifuging	(4)
Hastings	In Primaries	Anaerobic	None	None	(4)
Maple Plain	In Primaries	Anaerobic	None	None	(1)(3)
Medina	None	None	None	None	--
Metropolitan	Gravity (Primary)	None	Chemical	Vacuum Filters	(4)(5)
	Air Flotation(Secondary)	None	Chemical	Vacuum Filters	(4)(5)
			Thermal	Plate & Frame Presses	(4)
Rosemount	In Holding Tank	None	None	None	(1)
Savage	In Holding Tank	Anaerobic	None	None	(2)(4)
Seneca	Air Flotation(Secondary)	None	Chemical	Vacuum Filters	(5)
Stillwater	In Primaries	Anaerobic	None	None	(1)(4)

SLUDGE DISPOSAL METHODS:

(1) Transported to Metropolitan Plant for further processing
(2) Transported to Seneca Plant for further processing
(3) Transported to Blue Lake Plant for further processing
(4) Landspreading
(5) Incineration

NOTES:*Annual sludge production includes sludge transported from other plants for further processing, and chemicals added for sludge conditioning (where applicable).

At the Empire, Metropolitan, and Seneca Plants, sludge conditioning and dewatering are provided. At the Empire Plant, dewatered sludge is landspread; at the Metropolitan Plant dewatered sludge is either incinerated or landspread; at the Seneca Plant, dewatered sludge is incinerated.

5.3 Sludge Quality

During 1981, digested sludge from the outlying plants and dewatered sludge or sludge cake from the Metropolitan and Seneca Plants were analyzed routinely for solids, nutrients, and metals. Results of analyses are summarized in Table 5-4. Total solids are shown as percent; volatiles are shown as percent of total solids; nutrients (TKN, NH3-N, P) are shown as percent (dry weight basis); and metals are shown as mg/kg (dry weight basis). A more extensive summary of the quantity and quality of sludges from the various plants is listed in the Appendix of this report.

5.4 Landspreading

As shown in Tables 5-2 and 5-3, a portion of sludge generated at Commission treatment plants is landspread as a fertilizer supplement and soil conditioner. Prior to 1978, landspreading was limited to utilizing sludges, generated at the smaller treatment plants, on farm lands adjacent to these plants. All other sludges were ultimately dewatered and disposed of by incineration.

In 1978, a sludge land application program was initiated at the Metropolitan Plant. Because incinerator capacity at the plant was limiting the removal of solids from the sewage, the plant could not consistently meet NPDES discharge limitations. The land application program was developed as a means of disposing of sludge solids generated in excess of incinerator capacity.

At the Metropolitan Plant, sludges are conditioned and dewatered to produce sludge cake. Two types of sludge cake are produced: filter cake and press cake. The filter cake is produced by treating sludge with chemicals which increase the pH of the sludge and removing water with a vacuum filter. The press cake is produced by heating the sludge to 350°F and dewatering the resulting material in a bag press. Both of these processes have been shown to reduce pathogenic organisms to an acceptable level.

Since the initiation of landspreading as a sludge disposal method at the Metropolitan Plant, most of the dewatered sludge that is suitable for soil incorporation has been landspread. This is due to an increased agricultural demand for sludge to be used as a fertilizer supplement or soil conditioner, air pollution problems associated with sludge incineration, and sludge incinerator renovation. Table 5-5 illustrates the increase reliance on landspreading at the Metropolitan Plant over the last four year period.

TABLE 5-2

SUMMARY OF SLUDGE PRODUCTION AND DISPOSAL METHODS

Treatment Plant	Annual Sludge Production MG	Annual Sludge Production Dry Tons	Sludge Disposal Method
Anoka	4.81	314	(1)
Bayport	1.50	119	(1)
Blue Lake	36.43	6971	(1) (2)
Chaska	3.07	200	(3)
Cottage Grove	2.97	223	(4)
Empire	-----	680	(4)
Hastings	2.21	280	(4)
Maple Plain	0.16	40	(1) (3)
Medina	-----	---	---
Metropolitan			
a) Filtration and Incineration Bldg. 1	-----	29,736	(4) (5)
b) Filtration and Incineration Bldg. 2	-----	48,423	(4) (5)
c) Filter Presses	-----	9,306	(4)
Rosemount	1.56	648	(1)
Savage	0.32	63	(2) (4)
Seneca	-----	12,582	(5)
Stillwater	5.38	572	(1) (4)

(1) Transported to Metropolitan Plant for further processing.
(2) Transported to Seneca Plant for further processing.
(3) Transported to Blue Lake Plant for further processing.
(4) Landspreading
(5) Incineration

NOTE: Annual sludge production includes sludge transported from other plants for further processing and chemicals added for sludge conditioning where applicable.

TABLE 5-3

SUMMARY OF 1981 SLUDGE HAULING

Treatment Plant	Disposal Location	Final Processing Location	Amount Hauled During 1981 (MG)
Anoka	Coon Rapids Interceptor	Metropolitan Plant	4.81
Bayport	Oakdale Interceptor	Metropolitan Plant	1.50
Blue Lake	Seneca Plant	Seneca Plant	12.24
	3rd and Commercial Interceptor	Metropolitan Plant	24.19
Chaska	Shakopee Interceptor	Blue Lake Plant	3.07
Cottage Grove	U of M Experimental Ag. Station	Landspread	1.14
	Oakdale Interceptor	Metropolitan Plant	0.01
	Farm Land	Landspread	1.64
	Sludge Drying Beds	Landspread	0.18
Hastings	U of M Experimental Ag. Station	Landspread	1.13
	Farm Land	Landspread	1.07
Maple Plain	Sludge Drying Beds	Landspread	0.02
	Orono Interceptor	Blue Lake/Metropolitan	0.07
	Plymouth Interceptor	Blue Lake/Metropolitan	0.07
Rosemount	3rd and Commercial Interceptor	Metropolitan Plant	1.56
Savage	Farm Land	Landspread	0.08
	Sludge Drying Beds	Landspread	0.09
	Seneca Plant	Seneca Plant	0.15
Stillwater	Oakdale Interceptor	Metropolitan Plant	4.59
	Farm Land	Landspreading	0.79

TABLE 5-4

1981 SLUDGE QUALITY SUMMARY

Treatment Plant	Total Solids %	Volatile Solids %	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Cd mg/kg	Cr mg/kg	Hg mg/kg	pH	NH3-N %	KJN %	K %	P %
Anoka														
Avg.	1.57	63.6	1313	254	447	1560	7.9	1881	8.3	7.3	5.13	10.88	0.51	3.03
Range.	-----	-----	1181-1753	195-327	314-543	1354-1901	5.6-9.0	1419-2457	6.0-11.1	7.2-7.6	3.3-7.9	7.9-14.2	0.3-1.2	1.5-4.3
Bayport														
Avg.	1.90	61.7	251	21	171	706	6.5	51	5.2	6.7	0.15	4.29	0.33	3.44
Range	-----	-----	223-279	2-31	108-273	464-828	5-10	30-98	1.2-16.1	6.3-7.0	.04-0.7	1.9-6.3	0.2-0.5	0.6-4.5
Blue Lake														
Avg.	4.92	72.5	1864	43	203	709	3.8	140	3.8	5.0	0.62	4.72	0.30	1.44
Range	-----	-----	911-2381	25-57	132-268	402-1092	3.0-4.8	74-314	1.8-5.5	2.8-6.0	0.1-1.0	2.7-9.2	0.2-0.4	0.8-1.9
Chaska														
Avg.	1.82	68.8	576	40	102	727	6.2	377	3.2	6.9	0.25	6.7	1.15	3.27
Range	-----	-----	493-726	27-63	71-122	589-875	4.6-8.0	234-622	1.9-4.2	6.3-7.2	0.03-1.0	4.2-15.2	0.8-1.4	2.2-4.4
Cottage Grove														
Avg.	1.84	64.0	556	86	207	1071	8.1	69	4.9	7.5	4.09	9.43	0.50	2.79
Range	-----	-----	413-1052	33-111	174-305	903-2211	5.6-9.9	25-199	3.1-8.3	7.2-7.7	3.3-4.6	6.1-12.0	0.3-0.7	2.4-3.4
Empire														
Avg.	13.0	61.9	1162	31	233	4676	10.6	149	6.4	8.1	1.00	5.75	0.17	3.79
Range	-----	-----	987-1274	23-38	209-262	3431-6317	1.0-15.8	106-202	5.0-7.7	7.3-8.6	0.7-1.3	4.5-7.9	0.1-0.2	3.3-4.5
Hastings														
Avg.	3.08	60.5	1955	32	340	990	4.7	15,653	2.3	7.2	2.03	6.48	0.29	2.54
Range	-----	-----	1094-3971	24-40	227-694	781-1653	3.2-6.0	8,348-22,554	1.1-3.2	7.0-7.5	1.7-2.7	5.5-7.9	0.2-0.4	2.2-3.4
Maple Plain														
Avg.	8.10	61.4	1035	44	254	526	7.6	62	5.0	6.2	0.39	2.65	0.21	1.05
Range	-----	-----	444-1682	12-79	96-373	28-868	3.0-10.4	32-67	3.7-6.2	5.4-7.1	0.2-0.6	1.5-4.5	0.1-0.5	0.6-2.1
Metropolitan														
F&I No. 1 Cake	28.8	55.7	740	164	305	1479	49	676	2.4	-------	0.03	2.61	.08	1.07
F&I No. 2 Cake	26.5	49.8	848	195	347	1720	66	951	2.3	-------	0.07	2.92	.09	1.51
Press Cake	47.9	61.5	1694	281	475	3022	131	1674	2.9	-------	0.09	2.91	.09	2.76
Rosemount														
Avg.	9.98	-----	99	31	273	338	6	134	-------	--------	-------	--------	-------	-------
Savage														
Avg.	4.94	55.4	915	42	568	1027	9.0	405	64.7	6.9	0.82	3.71	0.14	1.80
Range	-----	-----	594-1207	33-47	401-1006	740-1225	6.9-12.0	197-884	52-95	6.4-7.1	0.6-1.0	1.0-6.1	0.1-0.2	0.7-2.5
Seneca														
Avg.	22.7	45.9	1016	189	245	575	8.4	478	2.0	-------	.06	3.00	.09	1.31
Stillwater														
Avg.	2.55	51.0	523	26	153	1098	6.5	108	3.2	7.1	2.29	6.08	0.26	3.61
Range	-----	-----	307-670	19-49	135-176	598-1558	4.0-8.6	30-251	0.8-5.1	6.9-7.3	1.5-2.8	4.1-11.1	0.2-0.4	2.0-4.4

TABLE 5-5

SUMMARY OF QUANTITIES AND FINAL DISPOSITION
OF METROPOLITAN PLANT DEWATERED SLUDGE NOT INCINERATED

Year	Agricultural Land (wet tons)	Other (wet tons)	Total (wet tons) Disposed by Landspreading
1978	13,700	------	13,700
1979	18,700	15,500	34,200
1980	75,600	29,600	105,200
1981	189,600	9,900	199,500

In addition to disposing of filter cake and press cake directly on land, portions of these cakes are blended together and composted prior to land application. Composting provides for additional destruction of pathogenic organisms and organic material and prevents freezing of sludge cake. This permits for sludge hauling to continue throughout the winter months.

During 1981, approximately 190,000 wet tons of sludge cake, of which 90 percent was filter cake, were hauled to farm land. Due to potential for odor problems, most of the press cake was composted. During 1981, 10,000 wet tons of compost were delivered to various sites.

In addition to the landspreading of sludge cake from the Metropolitan Plant, approximately five million gallons of liquid sludge generated at the Cottage Grove, Hastings, Maple Plain, Savage, and Stillwater Plants were applied to private farm lands.

All land application of sludge generated at Commission treatment plants is done under permits from MPCA. Each permit is granted for an individual parcel of land and specifies the maximum sludge application rate per acre. These application rates are based on maximum allowable application rates of the various chemical constituents of the sludge (NH_3, Cd, etc.). All sludge is analyzed before application to ensure meeting conditions of each individual permit.

6.0 INDIVIDUAL TREATMENT PLANT REPORTS

This section contains the individual treatment plant reports for 1981. For each plant report there is an introduction briefly describing the background of the plant, its design basis, 1981 performance and activities, and a statement regarding the future of the plant. The introduction is followed by a liquid and solids flow diagram of the treatment process together with a graphical presentation of flows for individual months of 1981 and annual average for 1971-1981. Monthly flow data are shown as a vertical bar corresponding to the range of flow for that month with the top cross bar representing the maximum flow and the bottom cross bar the minimum flow. A solid line connects the vertical bars and is drawn to the average wastewater flow for that month. Flow data are followed by 1981 monthly influent and effluent summaries. These tables contain monthly and annual average data on virtually all of the parameters for which the influent and effluent of that plant are analyzed.

Graphs of BOD and TSS for 1981 show a vertical bar which encompasses the maximum and minimum parameter range for that month. The solid line connects the monthly averages. Fecal coliform data are also presented graphically with the 1971-1981 annual averages (arithmetic average of monthly goemetric means) shown on one graph and the 1981 monthly geometric means shown on another graph. Finally, plots of effluent BOD and TSS are shown illustrating the percent of the time the effluent concentrations were less than or equal to a given value. On these graphs, data from 1974-1980 are compared to data obtained during 1981.

ANOKA WASTEWATER TREATMENT PLANT

Background

The Anoka Plant was designed by TKDA and built in two stages. The original plant was constructed in 1954-55, with a design capacity of 1.4 mgd. The plant was expanded in 1969 to a design capacity of 2.45 mgd. Actual operating capacity is somewhat less, estimated to be 2.2 mgd. Liquid treatment consists of screening, grit removal, influent pumping, primary sedimentation, primary effluent pumping, conventional activated sludge aeration, final clarification, chlorination, and discharge to the Mississippi River. Solids processing consists of combined thickening in primary tanks, anaerobic digestion, and sludge hauling to the Metro Plant Interceptor System. The plant is subject to secondary treatment limits, and additional limits on heavy metals and cyanide.

Performance

Plant flow averaged 2.01 mgd in 1981, down slightly from 2.10 in 1980. Average plant effluent quality was 16 mg/L BOD and 14 mg/L TSS. While plant performanced was good, a total of 7 cyanide and heavy metal violations occurred due to industrial wastes discharged to the plant. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	11	12	12	15	16	16	17	20	22	22	22	26
TSS	13	10	10	12	20	15	15	18	28	21	20	24

Activities

With the adoption of Waste Discharge Rules for the Metropolitan Disposal System on January 20, 1981, industrial dischargers will be issued permits and, if necessary, schedules for compliance with regulations which will eliminate significant effects on plant effluent quality.

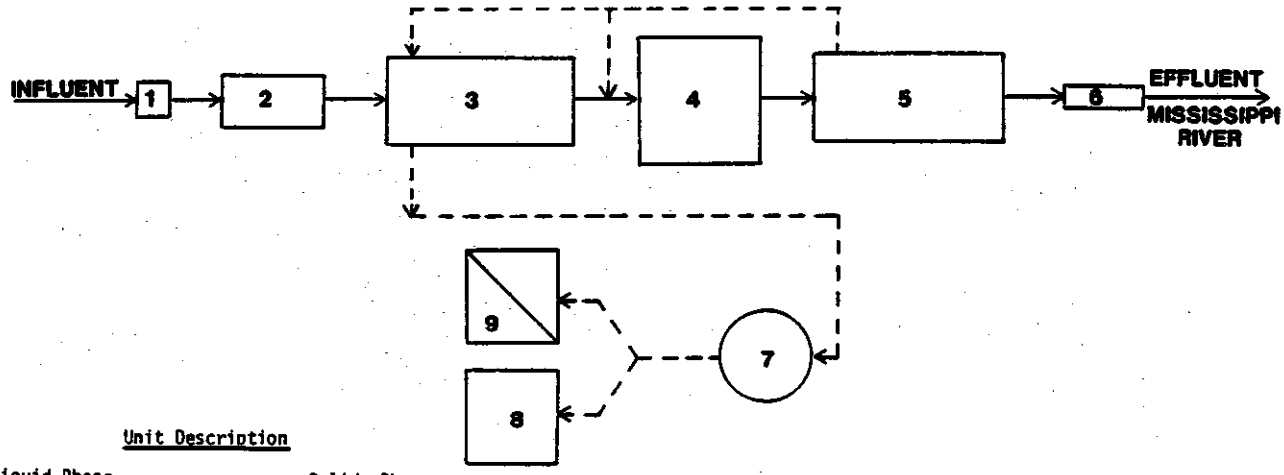
Reapplication for the plant NPDES Permit, which expires on March 31, 1982, was submitted to the MPCA on September 3, 1981.

Future

The plant will continue to serve Service Area No. 3 until the late 1980's, when it is scheduled for phaseout, with flow transported to the Metro Plant. Plant phaseout is contingent upon completion of the CAB and Minneapolis East Interceptors. Limited capital improvements are planned at the plant to ensure adequate capacity in the interim.

ANOKA WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

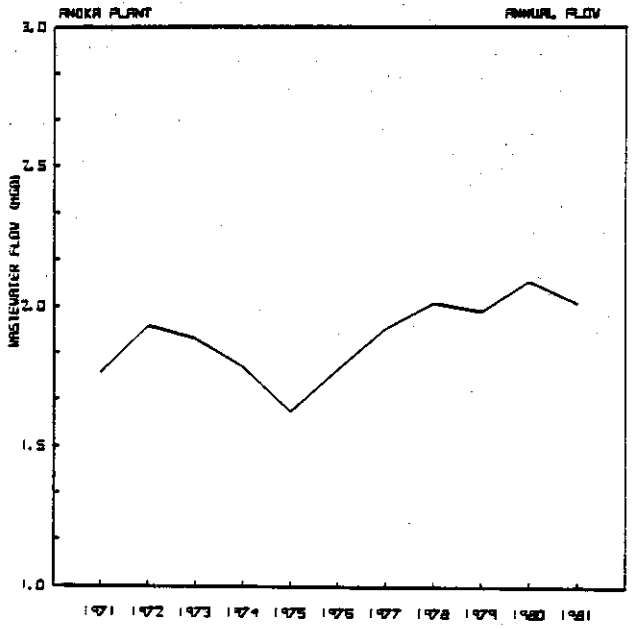
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Activated Sludge
5. Final Sedimentation
6. Chlorination

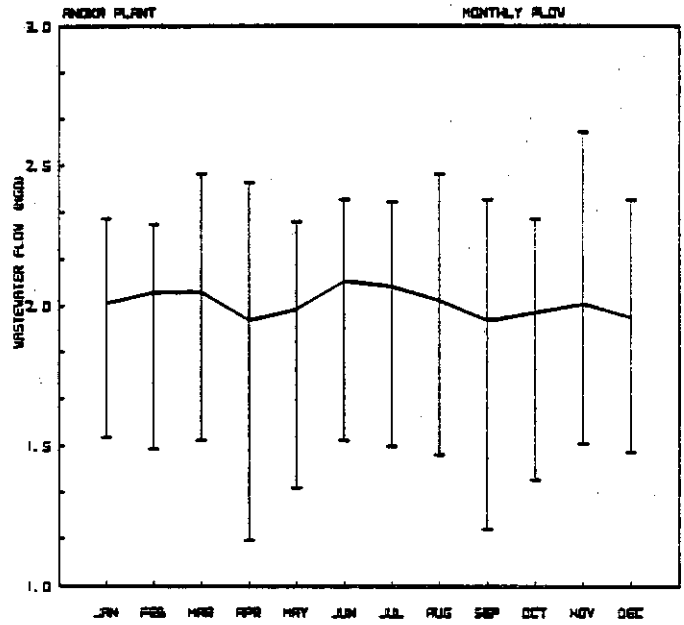
Solids Phase

7. Anaerobic Digestion
8. Landspreading
9. Disposal at Metro Plant

Legend

- Liquid Flow
- Solids Transfer
- Existing Processing Units
- Future Process Units



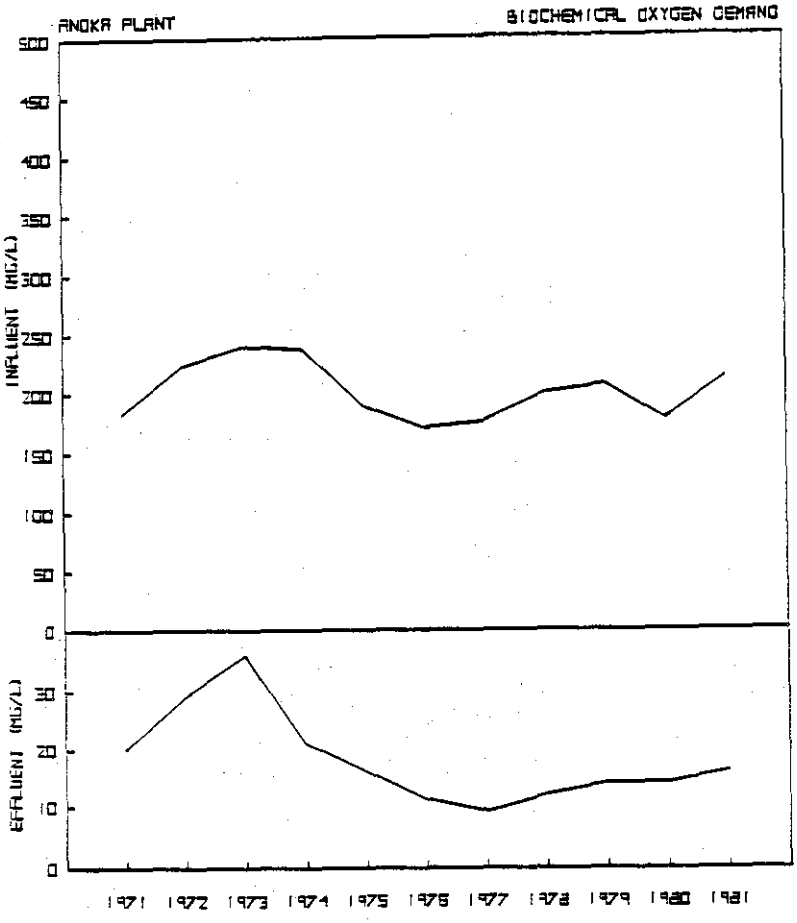


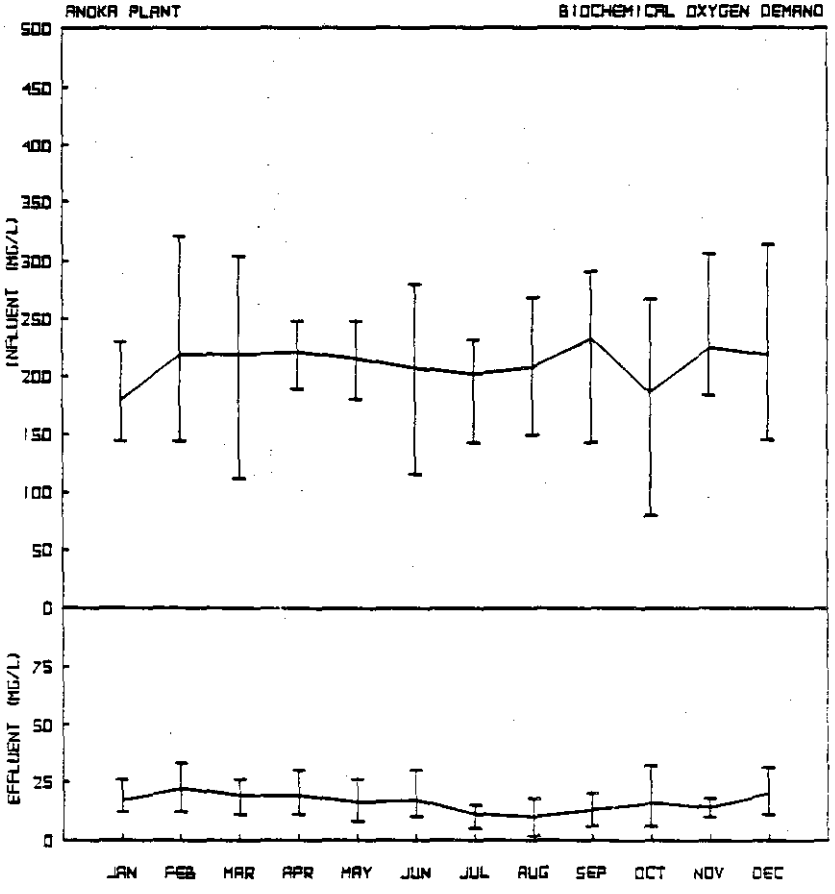
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Anoka

MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	2.01	15	179	---	105	7.6-8.3
FEBRUARY	2.05	15	219	---	147	7.7-8.1
MARCH	2.05	15	219	---	154	7.7-8.1
APRIL	1.95	16	221	---	206	7.8-8.1
MAY	1.99	16	215	362	180	7.7-8.7
JUNE	2.09	18	207	351	165	7.5-8.3
JULY	2.07	20	202	361	157	7.7-8.2
AUGUST	2.02	22	208	342	153	7.7-8.2
SEPTEMBER	1.95	21	233	397	167	7.8-8.4
OCTOBER	1.98	19	186	323	105	7.6-8.1
NOVEMBER	2.01	19	225	374	148	7.6-8.1
DECEMBER	1.96	16	218	386	140	7.6-8.1
1981 AVERAGE	2.01	18	211	362	152	7.5-8.7
1980 AVERAGE	2.09	17	176	362	141	7.5-8.2

MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: ANOKA

Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	----	----	---	---	---	---	6.5-8.5	---	---	--	--
JANUARY	17	--	18	42	9	----	17.2	---	---	---	1.5	7.3-7.6	113	6.1	90	83
FEBRUARY	22	--	21	115	11	----	17.4	---	---	---	1.8	7.4-7.6	122	4.8	90	86
MARCH	19	--	20	8	10	----	15.2	---	---	---	1.6	7.4-7.6	140	6.2	91	87
APRIL	19	--	22	18	10	----	19.6	---	---	---	1.2	7.4-7.6	132	6.6	91	89
MAY	16	68	8	49	5	20.9	16.1	.19	1.32	3.6	1.2	7.0-7.8	124	6.8	93	96
JUNE	17	82	13	7	7	22.1	12.8	.13	1.17	3.5	1.2	7.1-7.5	124	5.5	92	92
JULY	11	64	8	4	5	17.6	11.4	.07	.31	3.1	1.2	7.1-7.5	120	6.6	94	95
AUGUST	10	62	7	10	4	15.5	11.9	.05	0.80	2.6	1.2	7.1-7.5	119	5.0	95	96
SEPTEMBER	13	69	9	54	5	17.6	13.3	---	----	2.7	1.2	7.3-7.6	121	5.9	94	95
OCTOBER	16	75	12	44	7	13.2	11.5	---	----	3.1	1.1	7.3-7.6	118	5.8	91	88
NOVEMBER	14	63	13	61	7	18.6	11.3	.73	1.01	4.0	1.1	7.3-7.6	115	5.6	94	91
DECEMBER	20	77	12	26	7	23.0	15.1	1.15	1.70	4.8	1.2	7.3-7.6	127	7.1	91	92
1981 AVG.	16	70	14	36	7	18.6	14.4	.39	1.05	3.4	1.3	7.0-7.8	123	6.0	92	91
1980 AVG.	14	92	11	36	6	----	16.1	----	----	---	1.5	7.2-7.6	---	---	92	92


ANOKA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981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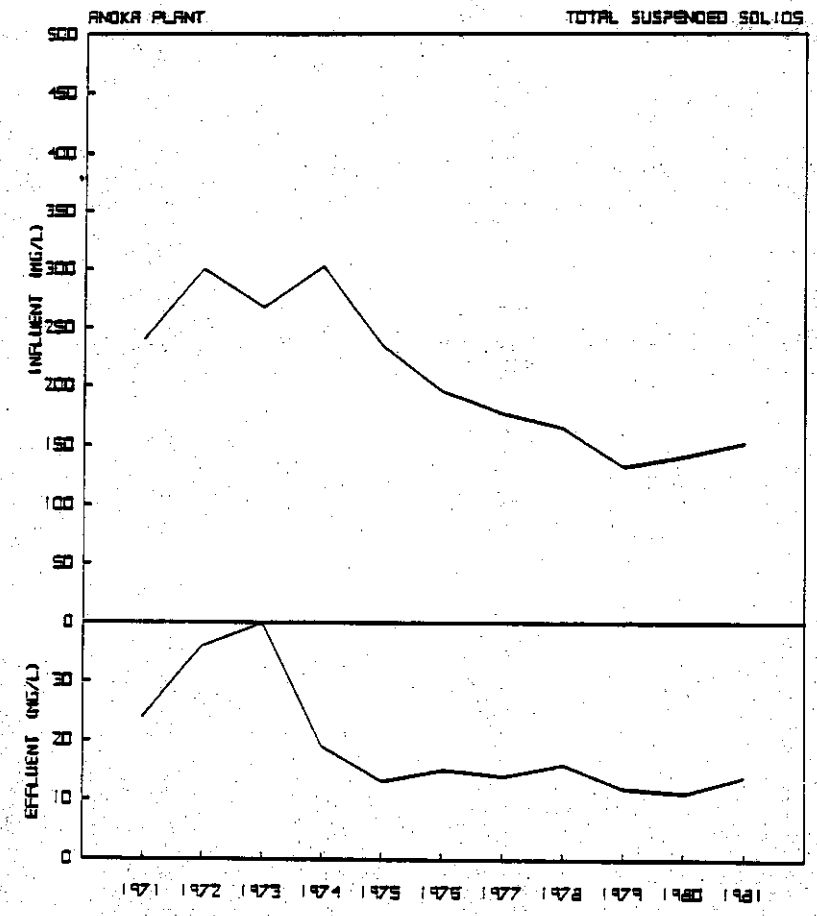
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC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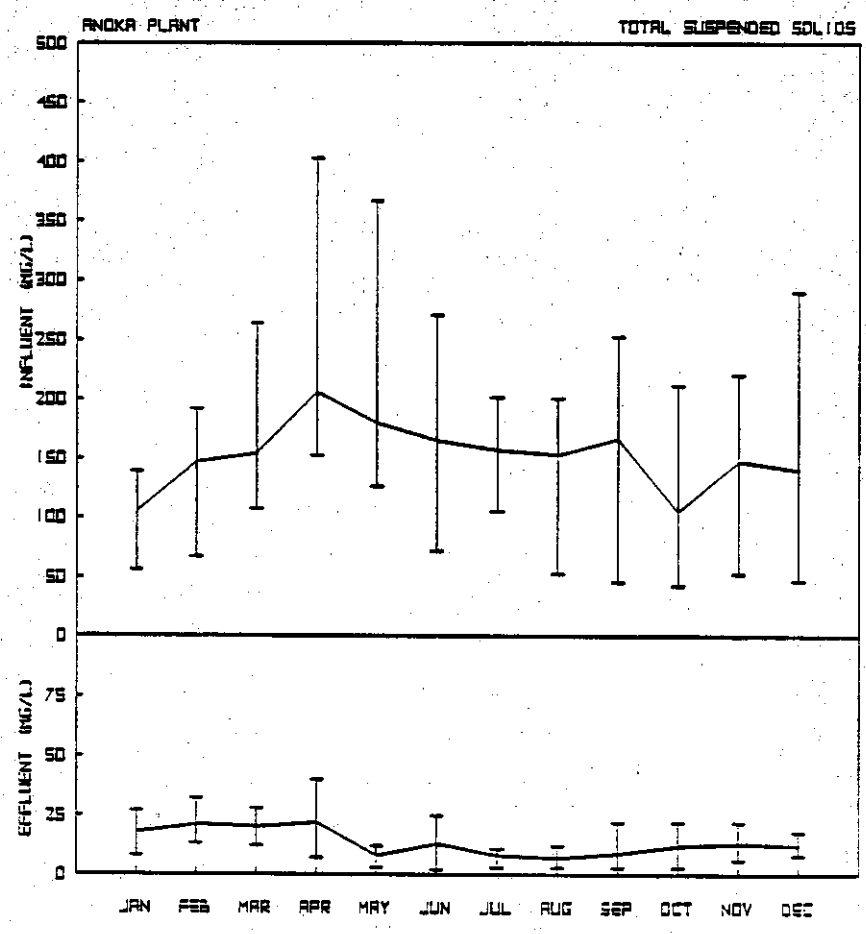
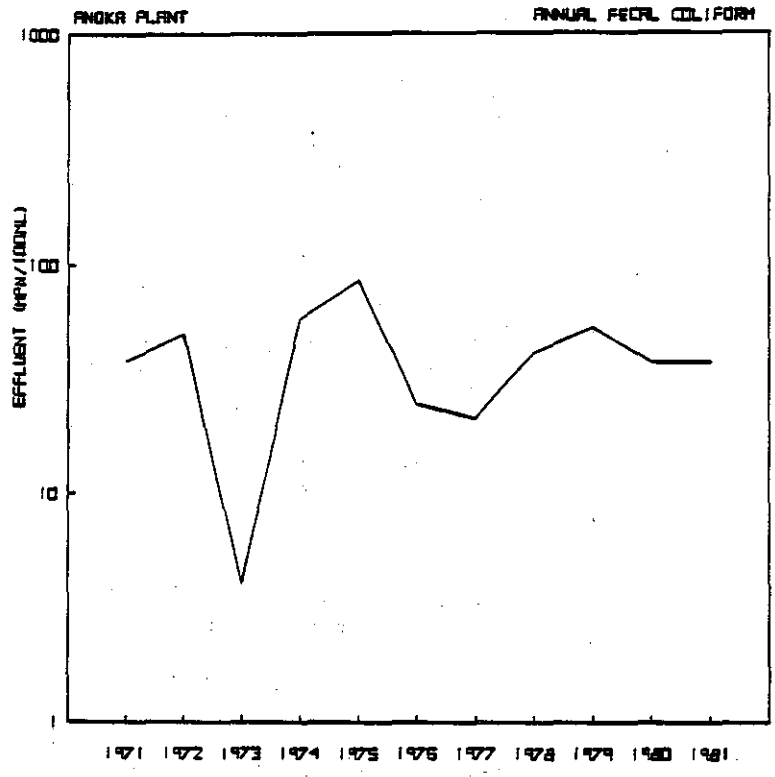
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


ANOKA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC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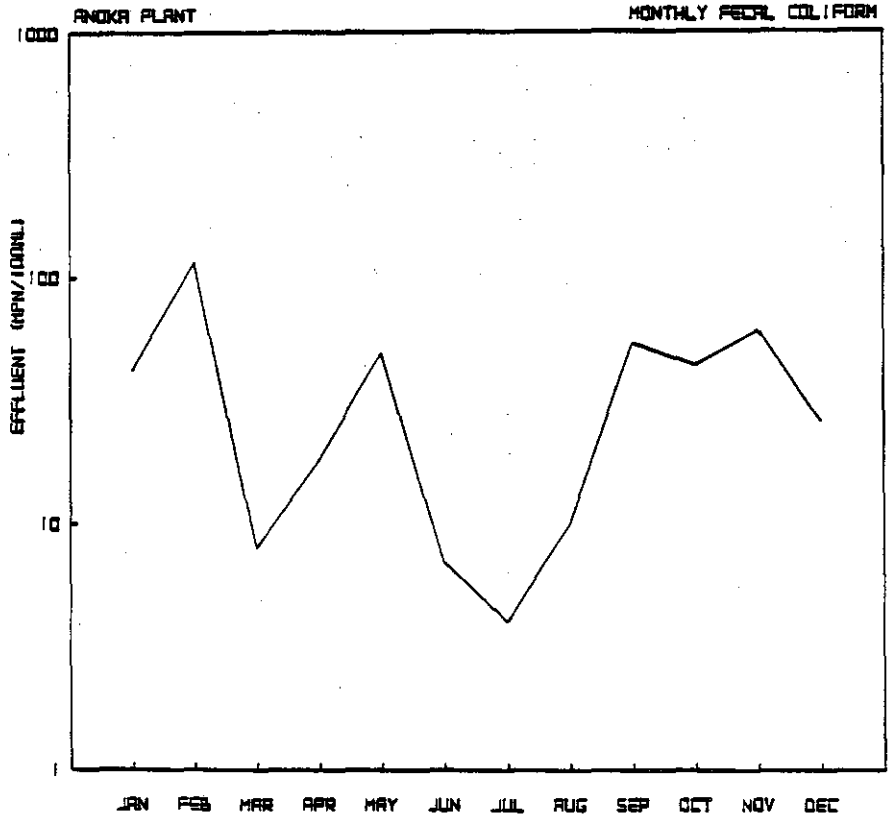
ANNUAL FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981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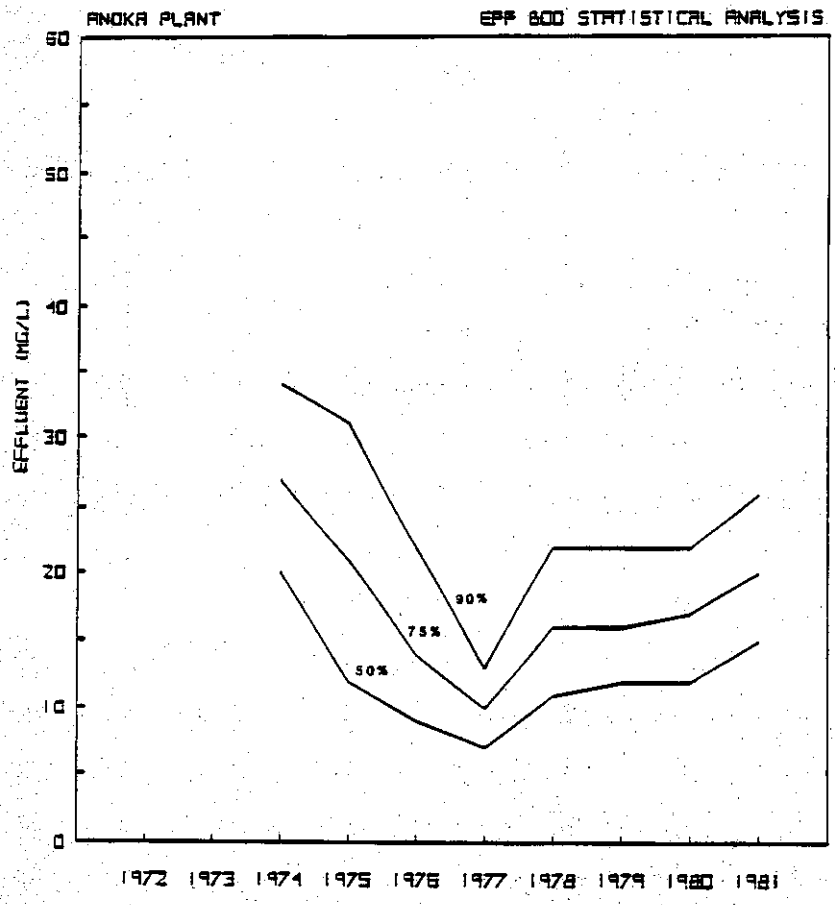
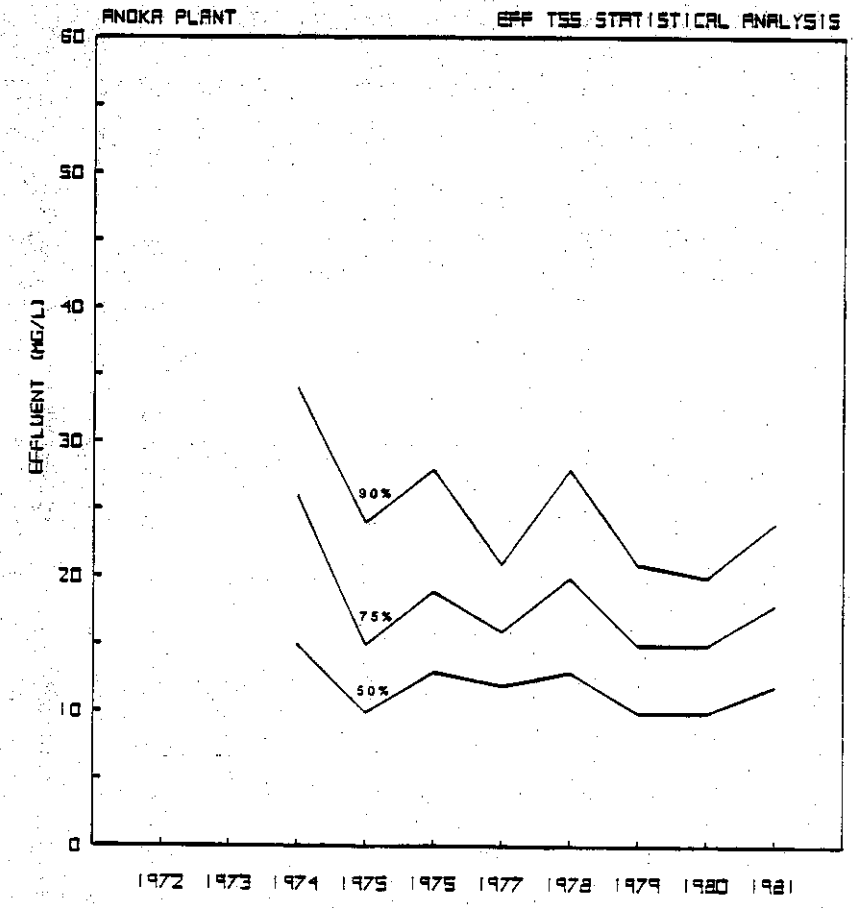
MONTHLY FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


ANOKA PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


ANOKA PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

1981 EFFLUENT DATA
ANOKA PLANT

Month	Cu mg/l	Cr mg/l	Zn mg/l	Pb mg/l	CN mg/l	Cd mg/l	Hg ug/l	Ni mg/l	As ug/l	Sn ug/l	Phenol ug/l	Fe mg/l
January	0.05	0.14	0.10	<0.06	0.140							
February	0.05	<0.05	0.09	<0.05	0.428							
March	0.06	<0.10	0.14	<0.05	0.976							
April	0.05	<0.07	0.08	<0.05	0.165							
May	0.04	<0.10	0.08	<0.05	0.563							
June	0.04	<0.06	0.08	<0.05	0.380							
July	<0.04	<0.05	0.07	<0.05	0.069							
August	<0.03	<0.05	0.08	<0.05	0.088	<0.008		0.09				
September	0.02	<0.05	0.07	<0.05	0.158							
October	0.11	<0.14	0.15	<0.05	0.253							
November	0.03	<0.05	0.06	<0.05	0.113							
December	<0.04	<0.05	0.08	<0.05	0.100							
1981 Avg.	<0.05	<0.08	0.09	<0.05	0.286	<0.008		0.09				

BAYPORT WASTEWATER TREATMENT PLANT

Background

The original Bayport Plant was built in 1939, with modifications in 1956, and 1958. Plant modifications designed by Banister, Short, Elliot, Hendrickson, and Associates were constructed in 1964. In addition, phosphorus removal facilities were added to the plant in 1973. The design capacity of the plant is 0.65 mgd. Actual operating capacity is somewhat less, due to the addition of phosphorus removal facilities. Liquid treatment consists of screening, influent pumping, contact stabilization, activated sludge aeration, alum addition for phosphorus removal, final clarification, chlorination, and discharge to Lake St. Croix (the St. Croix River). Solids processing consists of aerobic digestion and sludge hauling to the Metro Plant Interceptor System. The plant is subject to secondary treatment limits, and a phosphorus limit of 1 mg/L.

Performance

Plant flow averaged 0.47 mgd in 1981, slightly higher than 0.44 mgd in 1980. Average plant effluent quality was 8 mg/L BOD, 7 mg/L TSS, and 0.4 mg/L P. Plant performance was excellent throughout the year, with no NPDES permit violations. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	6	6	5	7	10	8	8	8	14	11	11	10
TSS	8	7	7	7	10	10	9	9	12	13	11	10

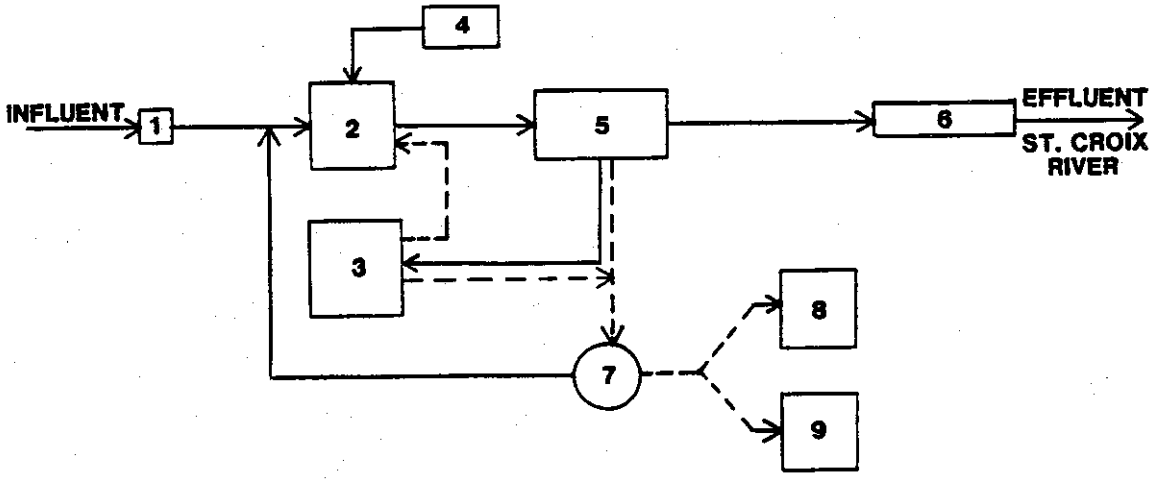
Activites

During 1980, a project to upgrade the headworks facilities at the Bayport Plant was conceived; in 1981, design of the project was completed. The project involved the installation of hydrosieves salvaged from the Apple Valley Plant to resolve mechanical problems with the existing plant barscreen, to provide some preliminary treatment in lieu of primary clarification, and to resolve nuisance problems caused by influent debris. Construction of the project began in October, 1981, and is scheduled for completion during 1982.

Future

The long-term plan for this plant is to phase it out of service and divert flows to the Stillwater Plant. This is projected to occur in the late 1980's, when the plant reaches its capacity and begins to deteriorate physically.

BAYPORT WASTEWATER TREATMENT PLANT
FLOW DIAGRAM



Unit Description

Liquid Phase

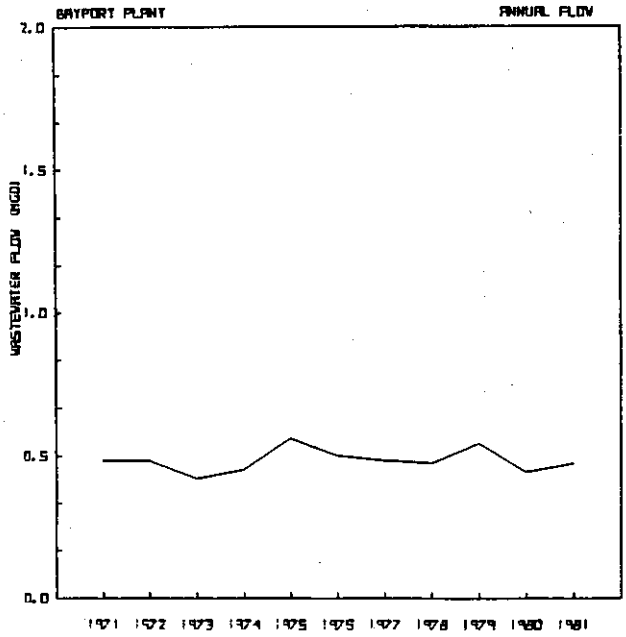
1. Screening
2. Activated Sludge
3. Sludge Reaeration
4. Chemical Addition
5. Final Sedimentation
6. Chlorination

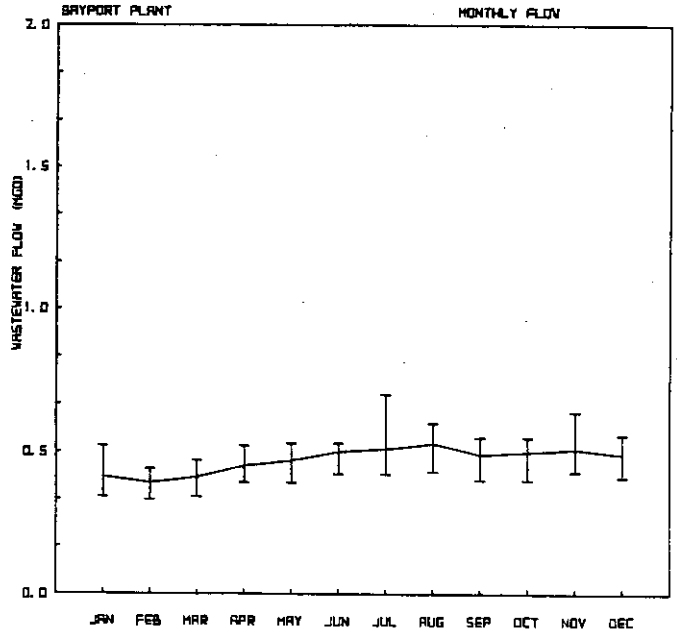
Solids Phase

7. Aerobic Digestion
8. Sand Drying Beds
9. Land Spread

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



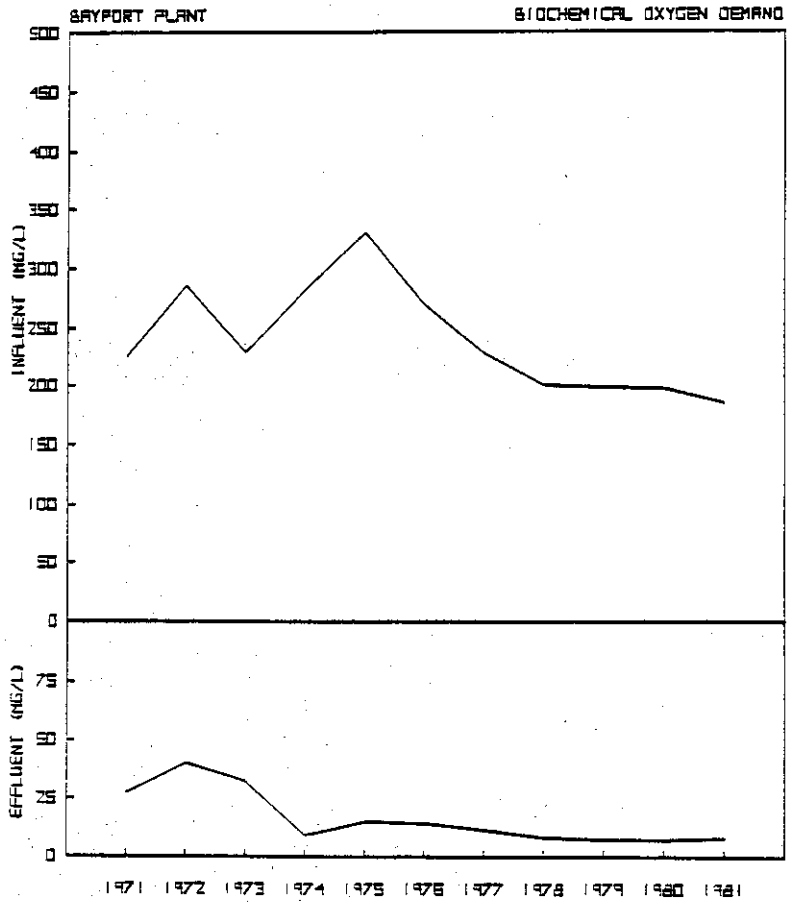


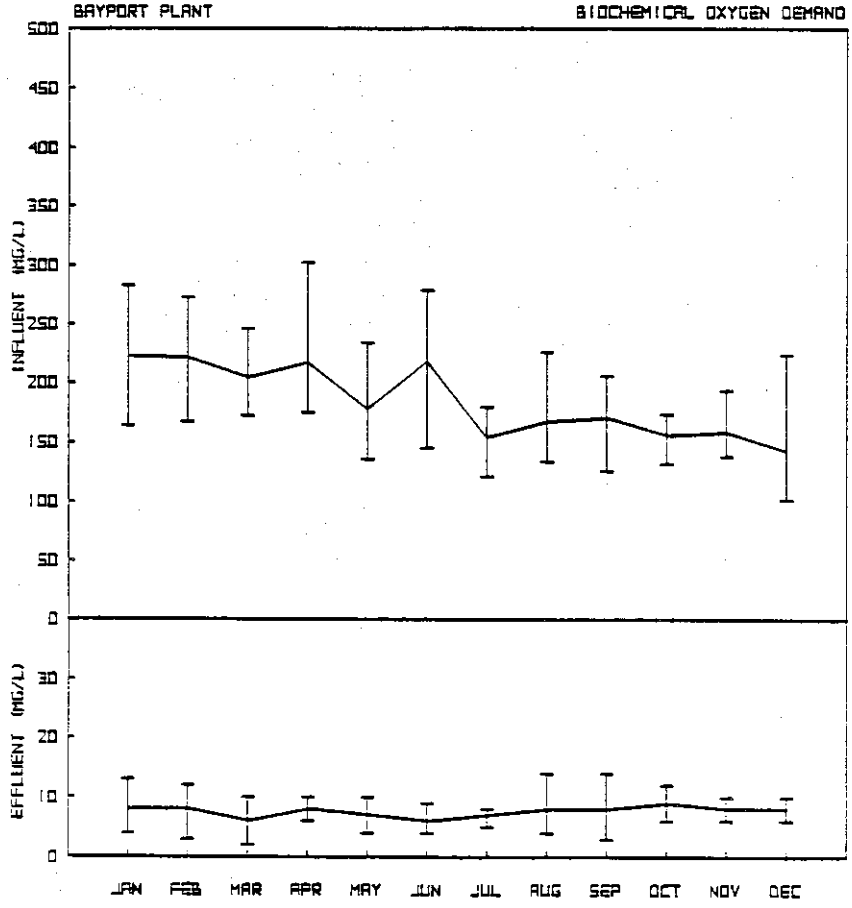
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Bayport

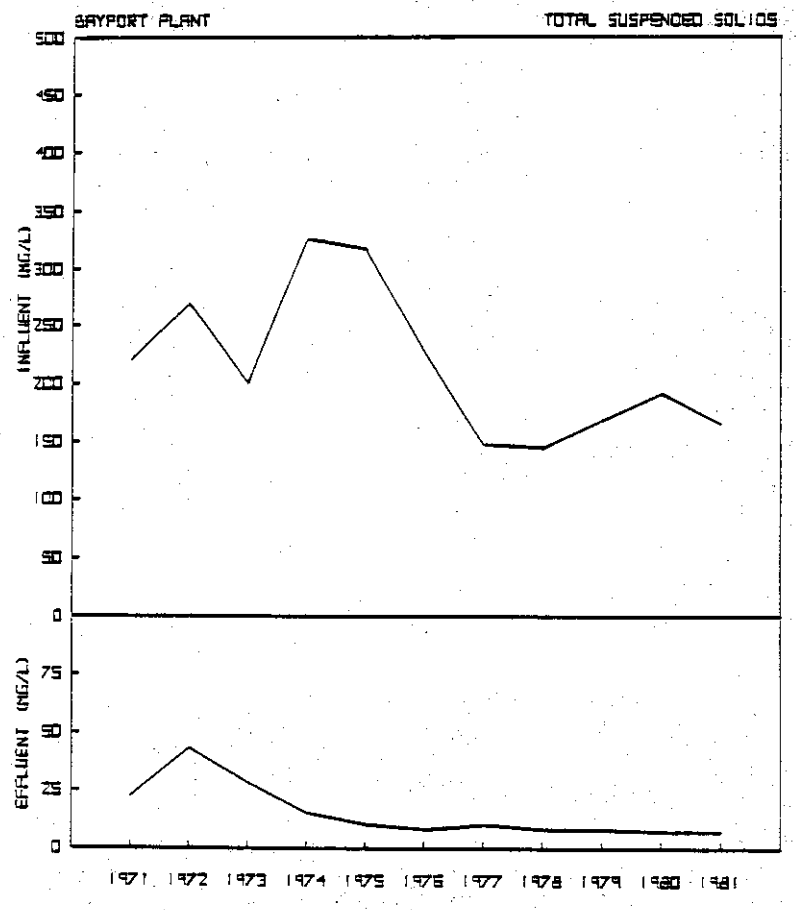
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.41	16	222	---	168	6.0-9.2
FEBRUARY	0.39	16	221	---	175	6.0-9.0
MARCH	0.41	17	204	---	182	6.0-9.1
APRIL	0.45	18	217	---	211	6.6-9.6
MAY	0.47	19	178	304	160	6.6-9.0
JUNE	0.50	21	218	406	202	6.0-8.8
JULY	0.51	22	154	294	168	6.4-8.6
AUGUST	0.53	23	168	329	176	6.4-9.0
SEPTEMBER	0.49	22	171	312	150	6.4-9.1
OCTOBER	0.50	21	156	314	164	6.2-9.2
NOVEMBER	0.51	19	159	245	146	6.8-9.4
DECEMBER	0.49	17	143	322	77	6.8-9.0
1981 AVERAGE	0.47	19	184	316	165	6.0-9.6
1980 AVERAGE	0.44	19	197	445	191	7.0-8.9

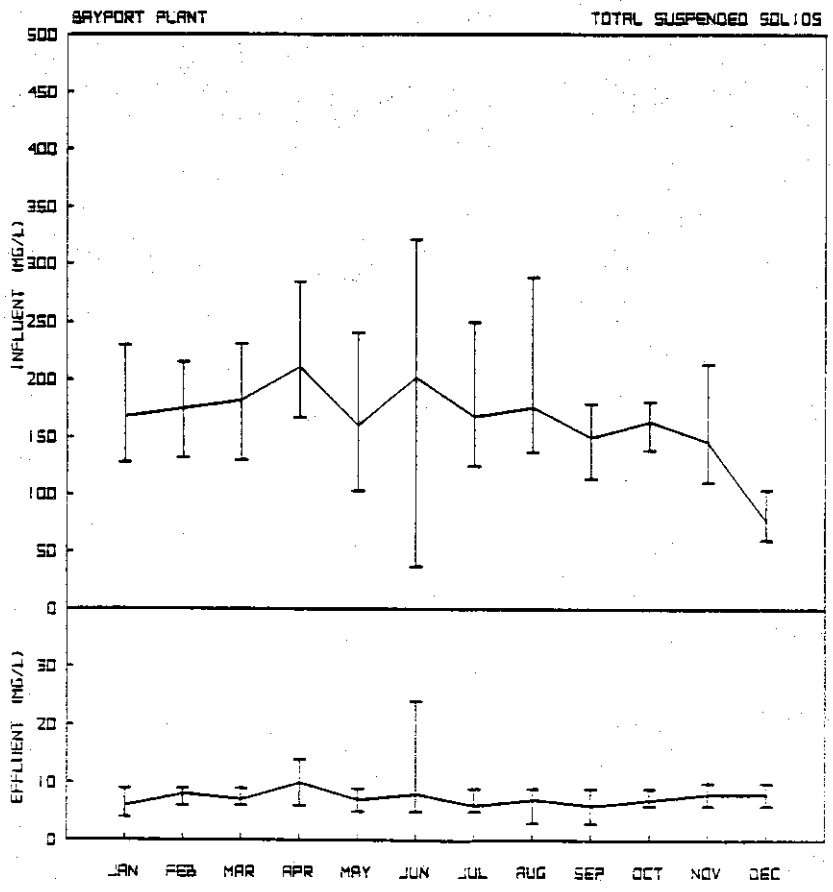
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: BAYPORT

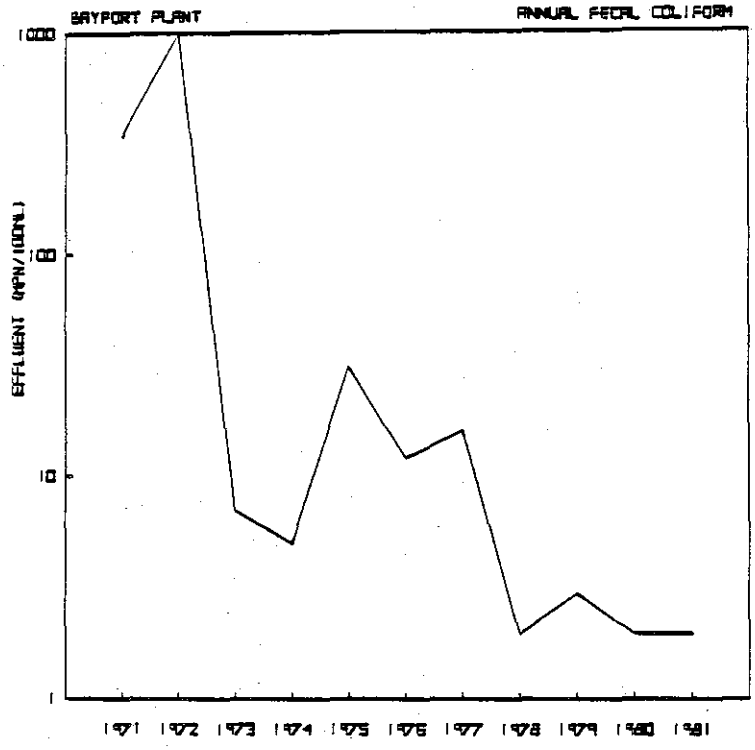
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	C12 Used lbs	C12 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	---	----	---	----	1.0	---	5.5-8.5	--	---	--	--
JANUARY	8	--	6	2	4	7.4	----	---	----	.3	4.4	6.8-7.2	35	3.7	96	96
FEBRUARY	8	--	8	1	4	7.5	----	---	----	.3	4.7	6.8-7.1	35	3.8	97	95
MARCH	6	--	7	1	4	8.7	----	---	----	.3	4.2	6.9-7.2	35	4.1	97	96
APRIL	8	--	10	1	4	6.8	----	---	----	.4	4.0	6.8-7.2	35	3.2	96	95
MAY	7	22	7	2	3	4.8	4.4	14.62	.54	.4	3.6	6.9-7.2	35	3.0	96	96
JUNE	6	31	8	2	3	6.2	3.5	11.85	.35	.4	3.2	6.9-7.2	35	2.9	97	96
JULY	7	22	6	4	3	5.2	3.2	12.03	.23	.3	3.1	6.9-7.0	35	2.5	96	96
AUGUST	8	32	7	2	3	5.5	3.8	9.51	.25	.3	3.0	6.9-7.2	31	3.0	95	96
SEPTEMBER	8	28	6	2	3	6.4	3.6	----	----	.3	3.1	7.0-7.3	34	4.8	95	96
OCTOBER	9	38	7	2	3	5.7	3.5	----	----	.3	3.1	6.9-7.1	30	3.5	94	96
NOVEMBER	8	27	8	---	3	5.4	3.9	13.28	.36	.3	3.2	7.0-7.2	--	---	95	95
DECEMBER	8	29	8	---	3	6.2	3.5	11.76	.35	.6	3.9	7.0-7.2	--	---	94	90
1981 AVG.	8	29	7	2	3	6.3	3.7	12.18	.35	.4	3.6	6.8-7.3	34	3.5	96	96
1980 AVG.	7	40	7	2	4	6.2	---	-----	----	.3	3.6	6.8-7.4	--	---	96	96

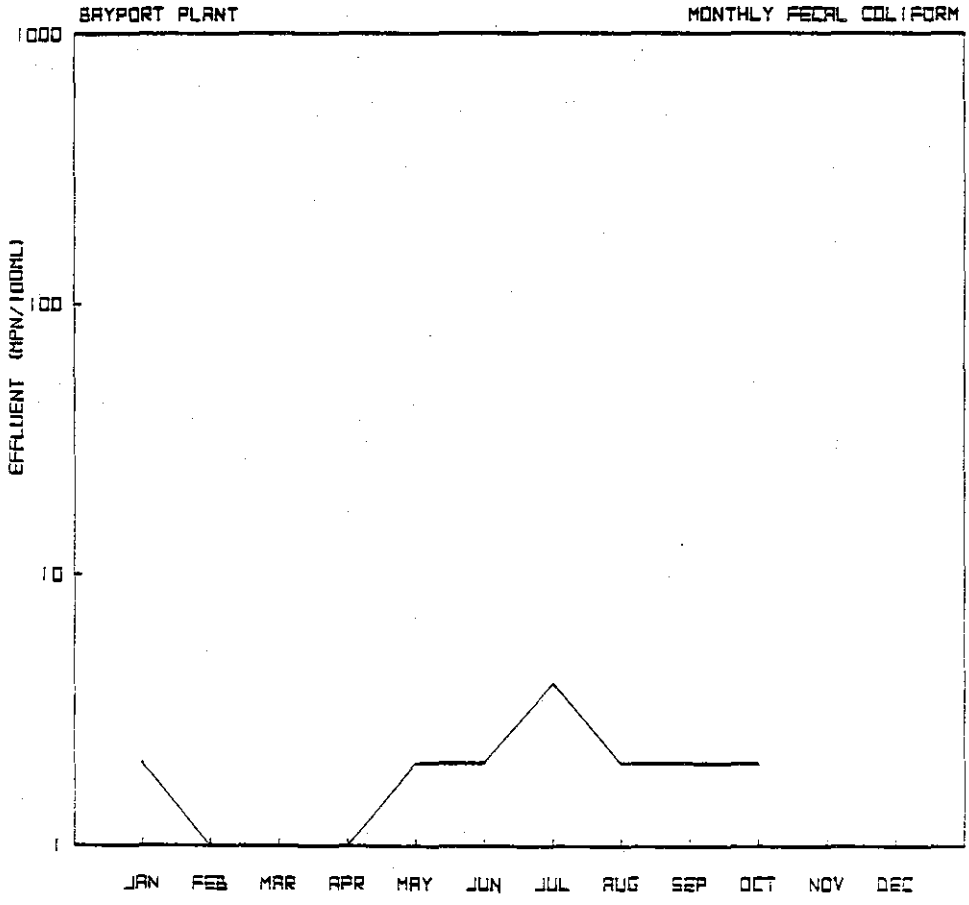

BAYPORT PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

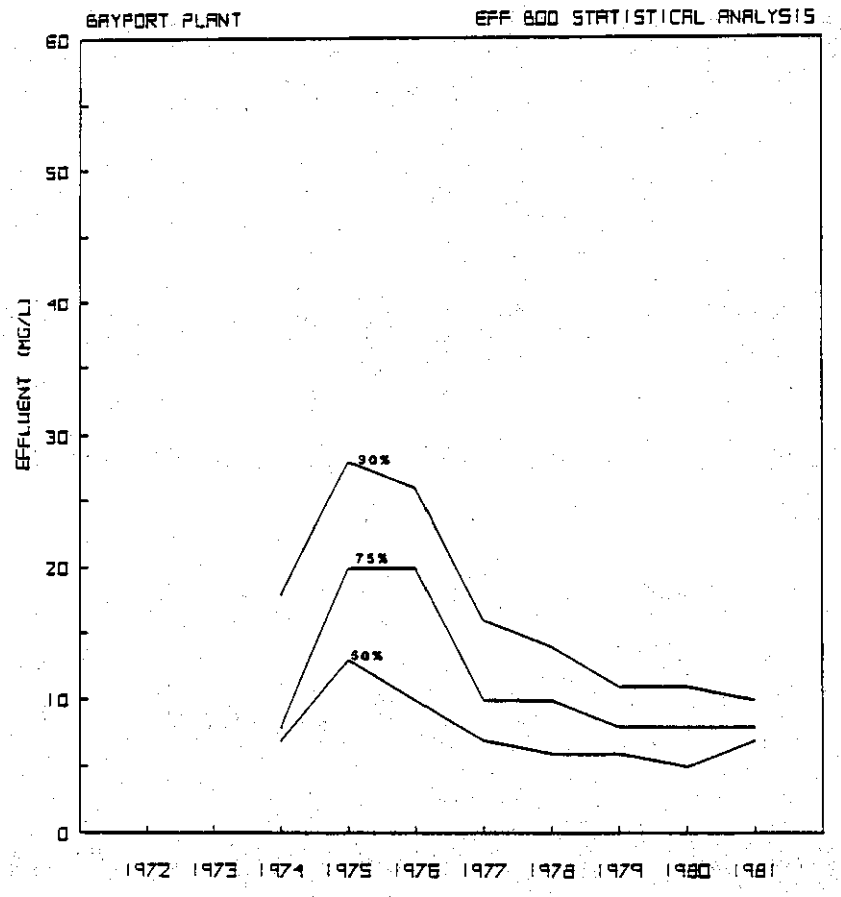

BAYPORT PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

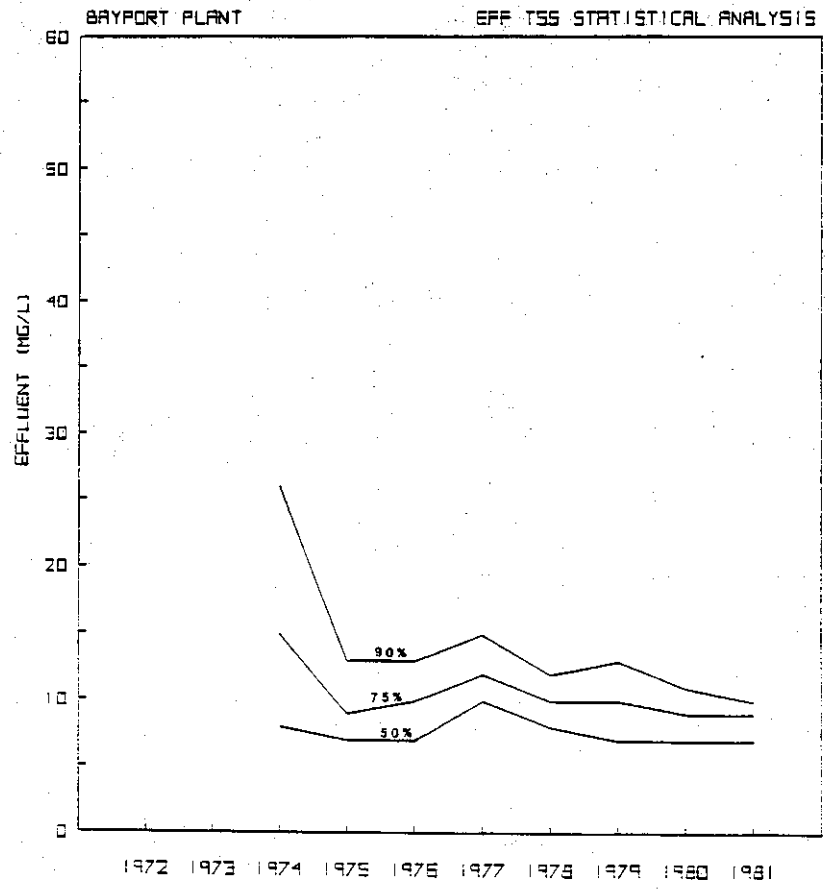

BAYPORT PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


BAYPORT PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


BAYPORT PLANT
ANNUAL FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


BAYPORT PLANT
MONTHLY FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


BAYPORT PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


BAYPORT PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

BLUE LAKE WASTEWATER TREATMENT PLANT

Background

The Blue Lake Plant was designed by Rieke-Carroll-Muller and Associates, Inc., to be built in several stages. Stage I, consisting of an aerated pond and chlorination facilities, was constructed in 1971. Stage II, consisting of the liquid treatment portion of a secondary treatment activated sludge plant, utilizing the existing aerated pond as an effluent polishing pond, was constructed in 1973. Stage III, consisting of sludge processing facilities, has not yet been constructed. The plant has a current design capacity of 20 mgd. Liquid treatment consists of screening, primary sedimentation, complete mix activated sludge aeration with integral final clarification, an effluent polishing pond, chlorination, and discharge to the Minnesota River. Solids processing consists of sludge thickening in spare primary clarifiers, and sludge hauling to either the Seneca Plant or the Metro Plant or further treatment and disposal. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 13.7 mgd in 1981, down slightly from 14.1 mgd in 1980. Average plant effluent quality was 14 mg/L BOD, and 6 mg/L TSS. Plant performance was excellent throughout the year with no NPDES Permit violations. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	11	7	8	9	14	10	10	13	22	15	14	19
TSS	13	11	8	6	28	14	11	7	22	17	15	19

Activities

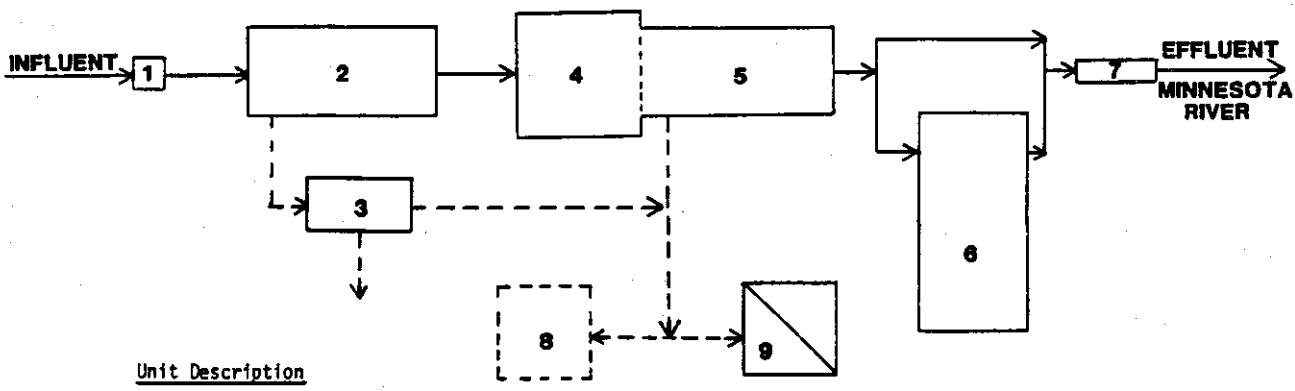
Reapplication for the plant NPDES Permit, which expires on March 31, 1982, was submitted to the MPCA on September 3, 1981.

Future

The plant is one of the Commission's permanent regional plants. Space is available for future plant expansion and provisions for advanced treatment and solids processing when needed. Interim solids processing facilities additions are planned for the near future.

BLUE LAKE WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

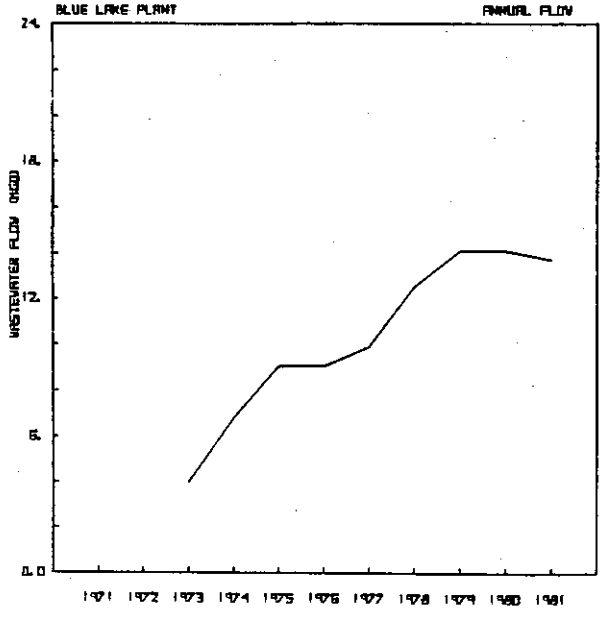
1. Screening
2. Primary Sedimentation
3. Grit Removal
4. Activated Sludge
5. Final Sedimentation
6. Aerated Effluent Pond
7. Chlorination

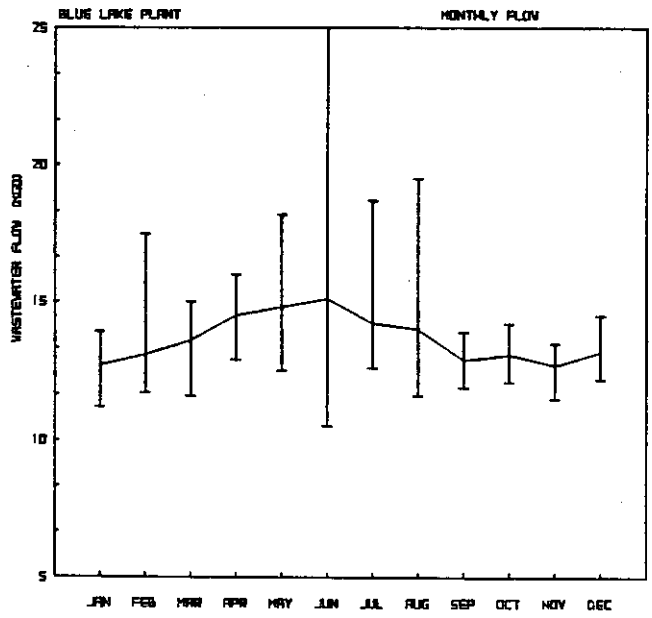
Solids Phase

8. Stage III (Future)
9. Disposal at Metro or Seneca Plant

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



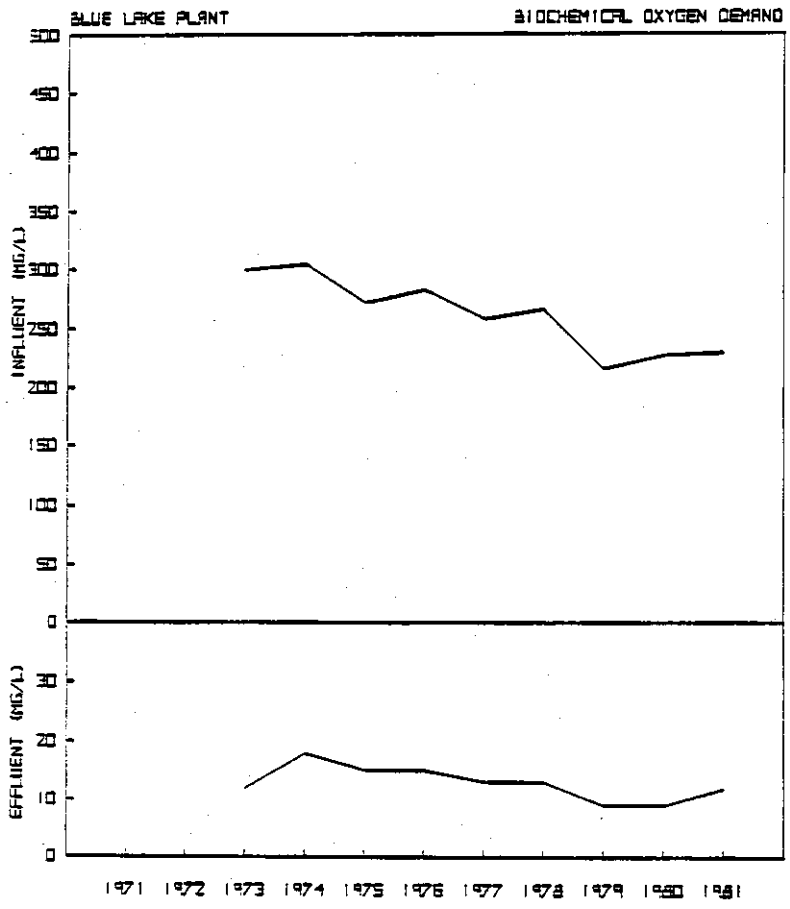


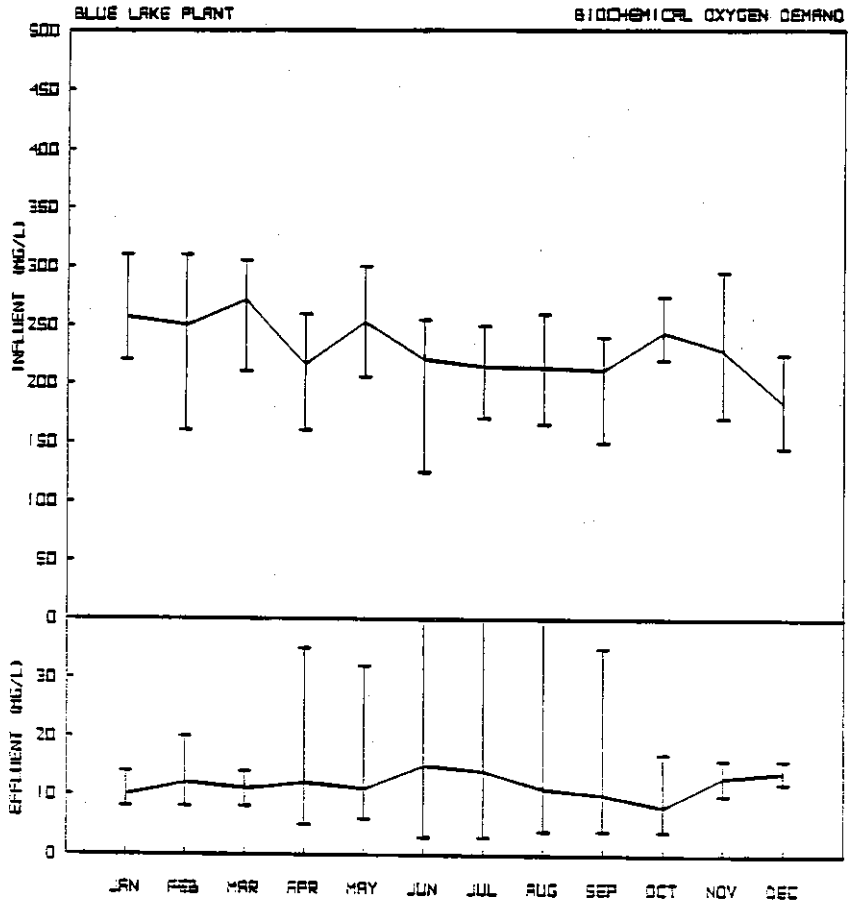
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Blue Lake

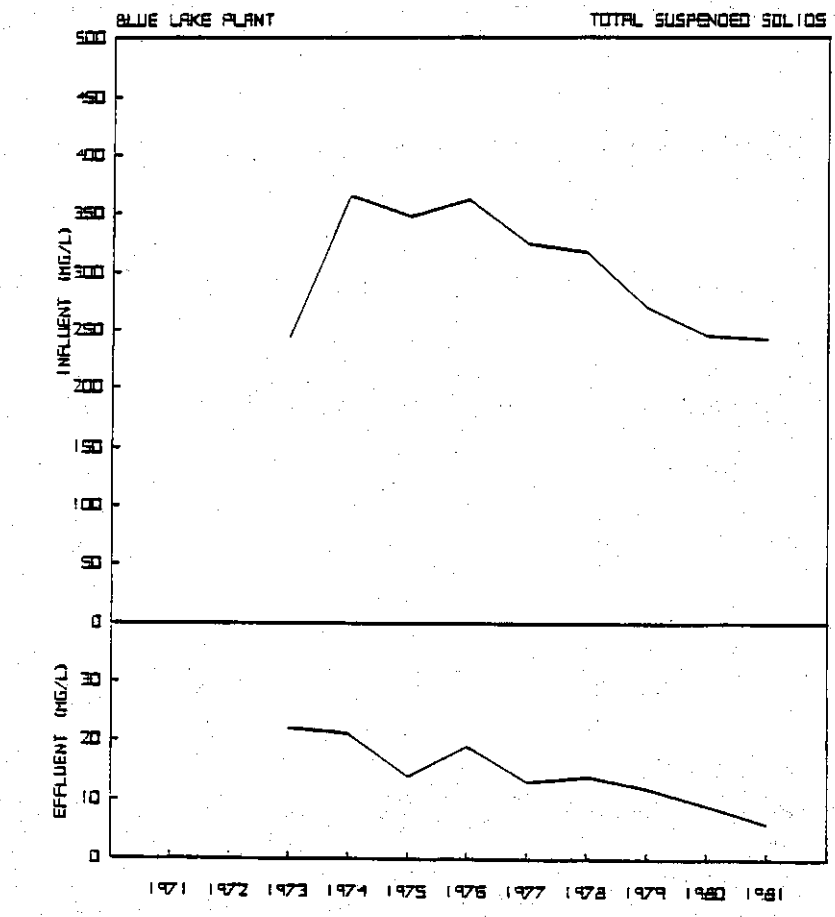
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	12.7	9	257	564	271	6.2-7.2
FEBRUARY	13.1	9	250	581	271	6.5-7.3
MARCH	13.6	12	272	593	296	6.6-7.2
APRIL	14.5	13	216	528	259	6.8-8.0
MAY	14.8	15	253	555	252	6.8-7.8
JUNE	15.1	17	220	504	257	6.8-7.8
JULY	14.2	16	214	509	229	5.6-7.4
AUGUST	14.0	17	213	486	228	6.5-7.9
SEPTEMBER	12.9	17	211	464	212	6.7-7.6
OCTOBER	13.1	16	244	490	225	6.8-9.4
NOVEMBER	12.7	16	228	430	208	6.8-7.7
DECEMBER	13.2	14	183	395	163	6.9-7.8
1981 AVERAGE	13.7	14	230	508	241	5.6-9.4
1980 AVERAGE	14.1	13	228	511	244	6.2-8.2

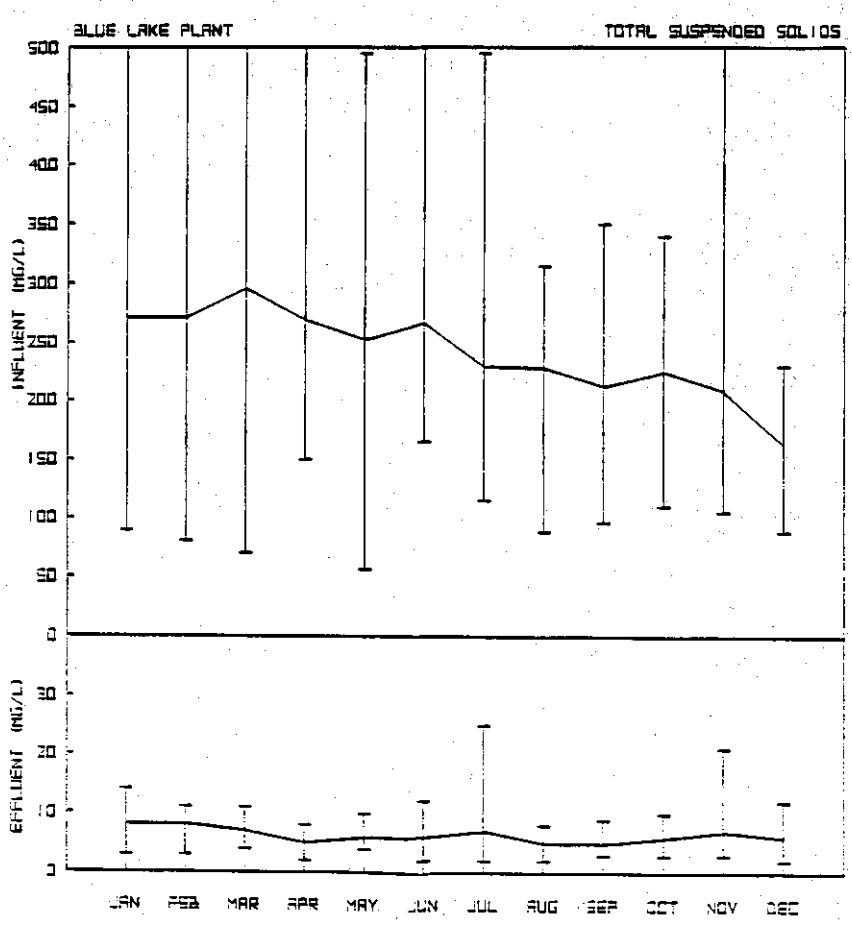
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: BLUE LAKE

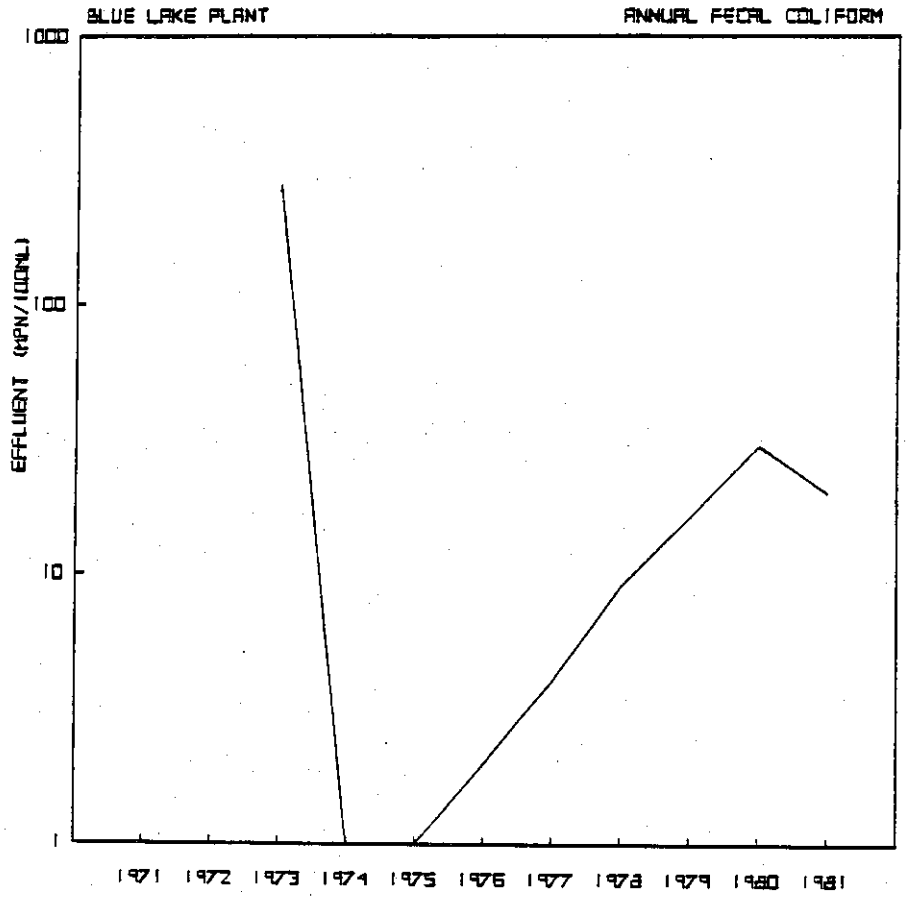
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	---	30	200	25	----	----	---	----	---	----	6.5-8.5	---	---	---	---
JANUARY	10	80	8	14	6	----	18.5	---	----	---	12.4	7.2-7.6	150	.6	96	97
FEBRUARY	12	81	8	18	6	----	16.4	---	----	---	12.4	6.9-7.6	150	.6	95	97
MARCH	11	82	7	13	5	----	16.6	---	----	---	11.5	7.3-7.6	155	.6	96	98
APRIL	12	74	5	29	5	----	16.8	---	----	---	11.5	7.4-7.9	174	.7	94	98
MAY	11	70	6	64	6	22.3	16.0	.07	.15	3.5	10.8	7.2-7.9	175	.6	96	98
JUNE	15	70	6	11	6	19.6	14.0	.07	.17	3.2	9.6	7.1-8.0	213	.6	93	98
JULY	14	69	7	2	8	19.9	14.3	.05	1.35	2.9	9.3	7.1-7.9	277	.9	93	97
AUGUST	11	76	5	2	6	20.9	16.3	.05	.20	3.2	9.9	7.0-8.1	233	0.7	95	98
SEPTEMBER	10	77	5	8	6	23.1	16.4	----	----	3.9	10.1	7.1-7.8	202	0.7	95	98
OCTOBER	8	78	6	35	6	23.9	15.5	----	----	3.6	10.4	6.8-7.3	175	0.7	97	97
NOVEMBER	13	93	7	---	6	25.0	18.3	.93	.47	3.8	11.3	6.9-7.3	---	---	94	97
DECEMBER	14	73	6	---	5	27.5	19.9	1.16	.17	4.9	12.2	7.0-7.3	---	---	93	96
1981 AVG.	12	75	6	20	6	22.3	16.6	.39	.42	3.6	11.0	6.8-8.1	190	0.7	95	98
1980 AVG.	9	78	9	30	7	----	15.1	----	----	---	10.5	6.5-7.3	---	---	95	95

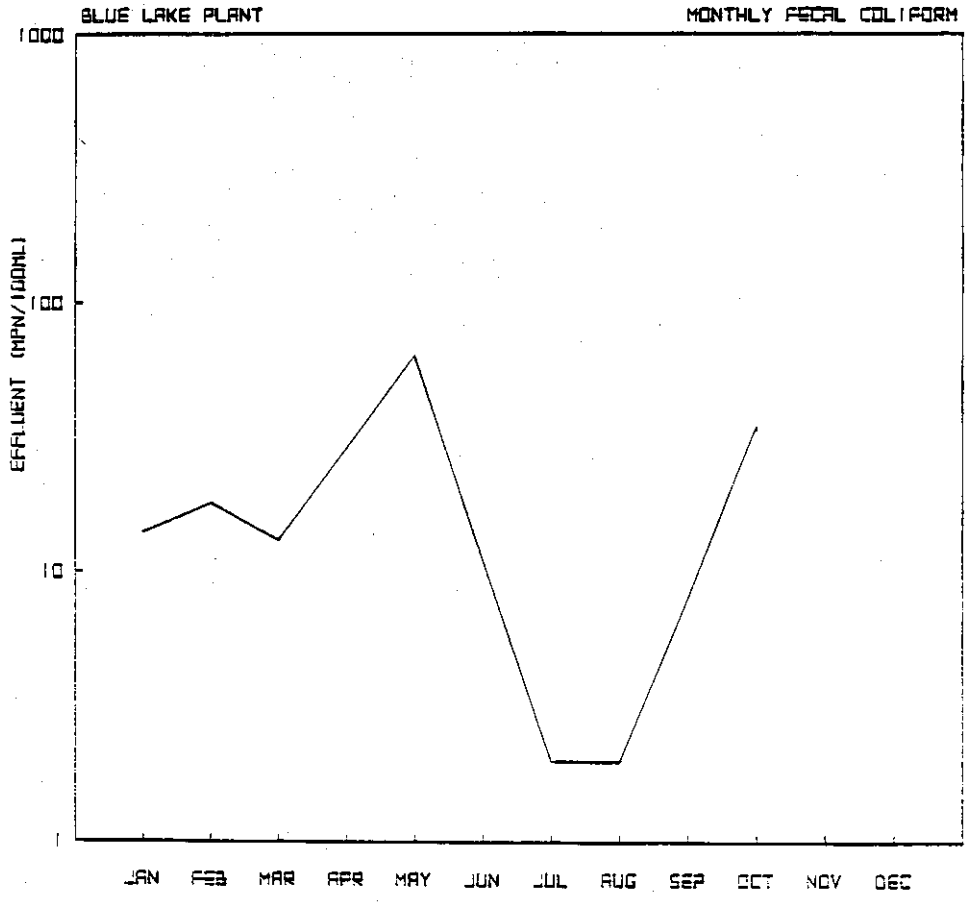

BLUE LAKE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

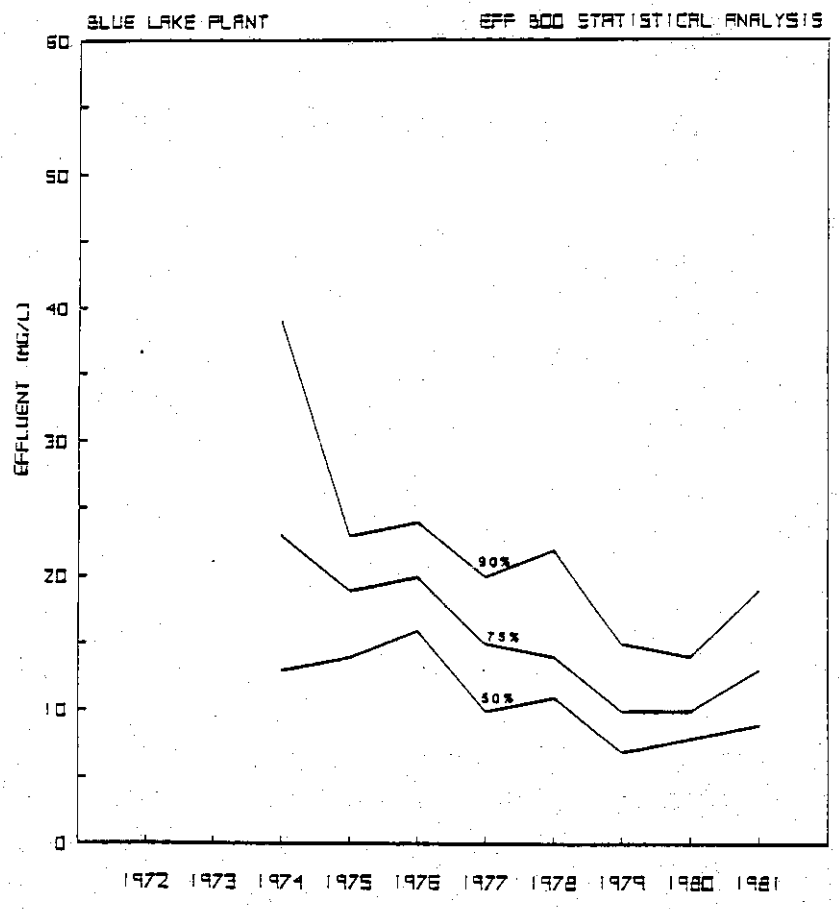

BLUE LAKE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

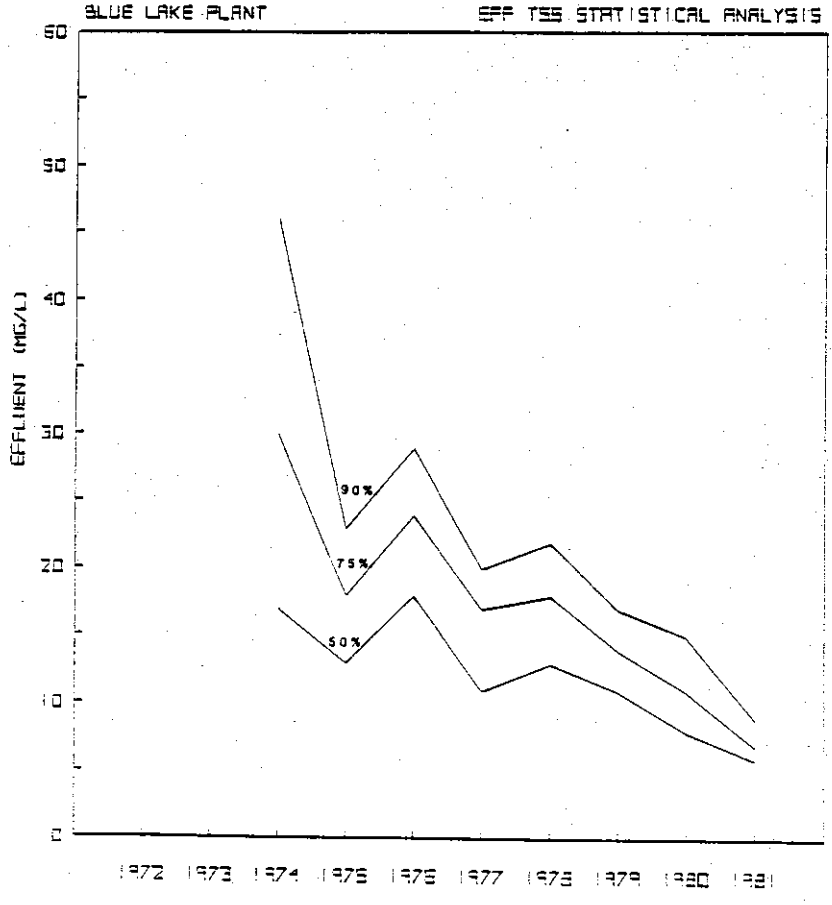

BLUE LAKE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


BLUE LAKE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


BLUE LAKE PLANT
ANNUAL FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


BLUE LAKE PLANT
MONTHLY FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


BLUE LAKE PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


BLUE LAKE PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

CHASKA WASTEWATER TREATMENT PLANT

Background

The Chaska Plant was originally constructed in 1963, with a design capacity of 0.75 mgd. The plant was converted to a pure oxygen activated sludge process in 1973, and final effluent filters were added in 1974. A plant expansion designed by McCombs-Knutson was constructed in 1980, increasing plant design capacity to 1.4 mgd. Actual operating capacity is somewhat less, due to high and highly variable organic loadings. Liquid treatment consists of screening, grit removal, influent pumping, pure oxygen activated sludge aeration, final clarification, final effluent pumping, chlorination, and discharge to the Minnesota River. Solids processing consists of aerobic digestion and sludge hauling to the Blue Lake Plant for further treatment and disposal. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 0.70 mgd in 1981, up slightly from 0.64 in 1980. Average plant effluent quality was 18 mg/L BOD, and 13 mg/L TSS. Plant performance was affected by two BOD violations in April, related to industrial waste organic loads, and a third BOD violation in October, related to nitrification in the BOD test. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	61	93	14	14	100	160	22	24	140	210	38	34
TSS	58	43	11	13	88	83	15	16	120	130	18	22

Activities

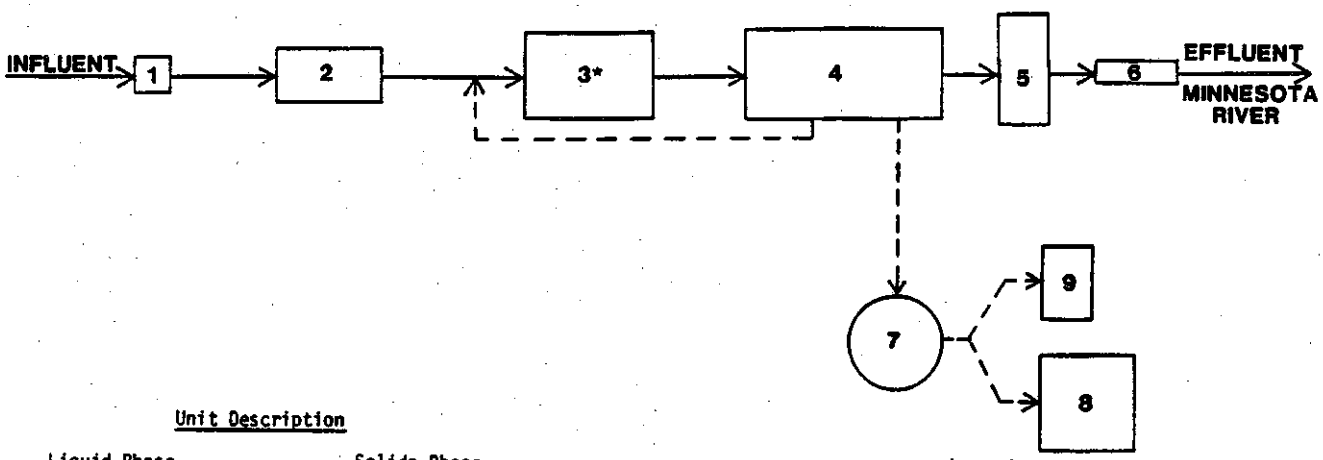
With the Adoption of Waste Discharge Rules for the Metropolitan Disposal System on January 20, 1981, industrial dischargers will be issued permits and, if necessary, schedules of compliance with regulations which reduce or eliminate significant effects on plant effluent quality .

Future

This plant is one of the Commission's permanent treatment plants. A plant expansion is planned for the mid-1980's.

CHASKA WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

1. Screening
2. Grit Removal
3. Activated Sludge
4. Final Sedimentation
5. Effluent Filtration
6. Chlorination

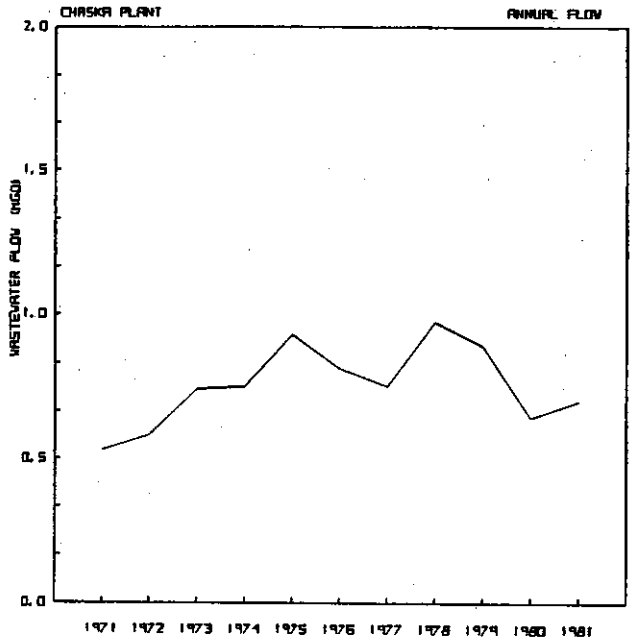
Solids Phase

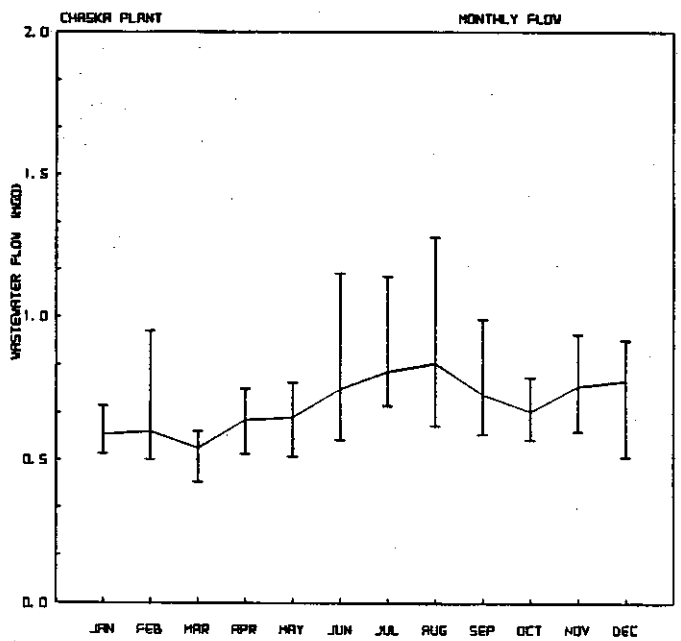
7. Two Stage Aerobic Digestion
8. Land Spready
9. Haul to Blue Lake System

* Pure Oxygen

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



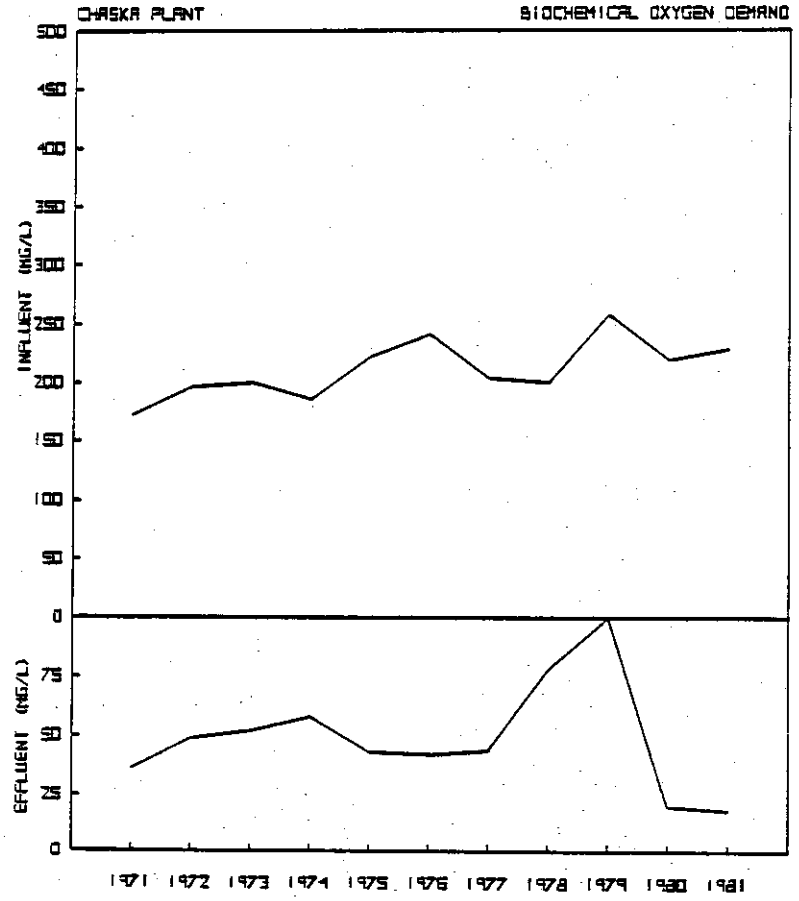


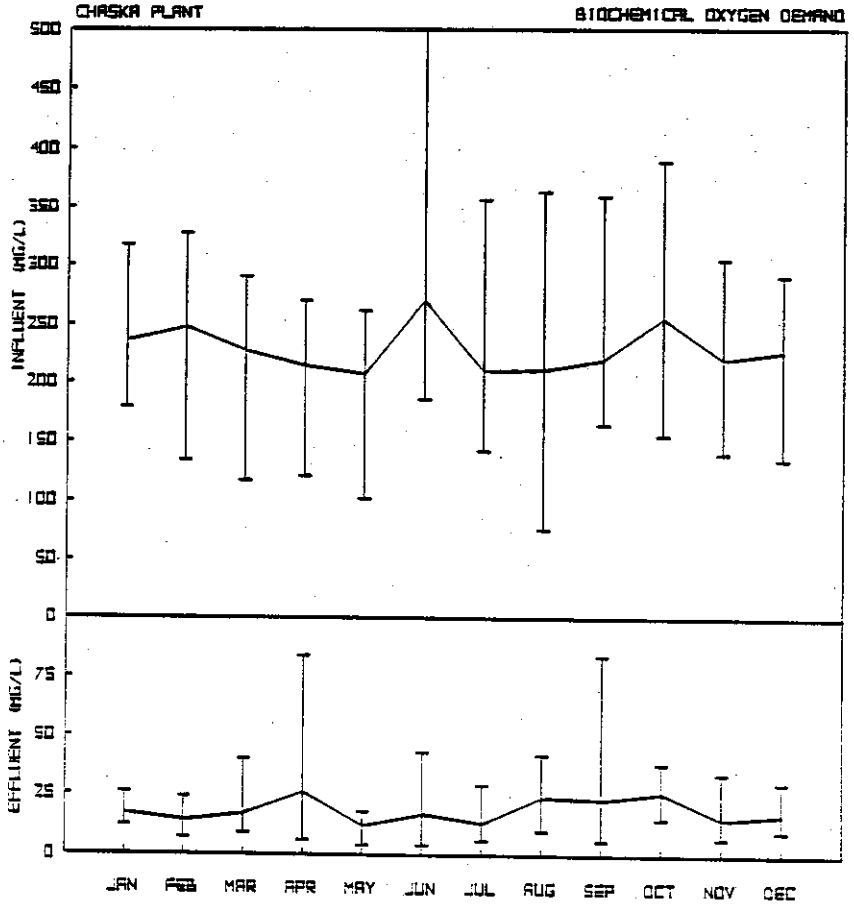
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Chaska

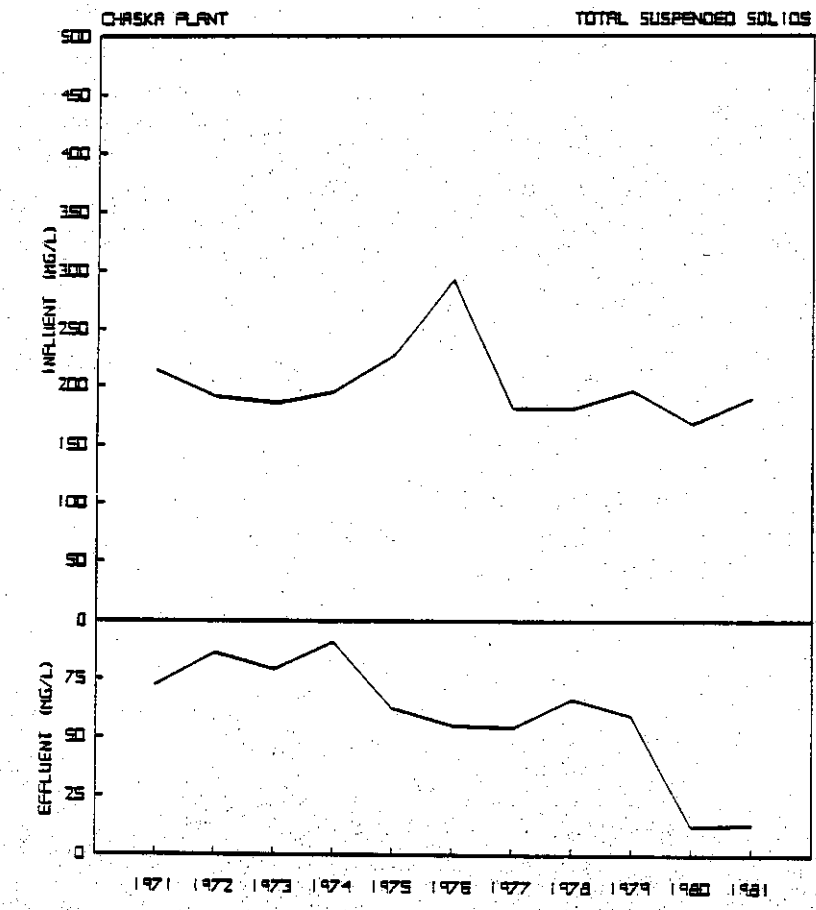
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.59	12	236	---	163	4.6-11.0
FEBRUARY	0.60	11	248	---	192	6.0-10.6
MARCH	0.54	11	227	---	210	6.9-10.9
APRIL	0.64	12	214	---	168	6.2-9.6
MAY	0.65	13	207	365	183	6.4-8.0
JUNE	0.75	15	271	460	220	5.6-12.0
JULY	0.81	17	210	428	199	6.3-10.6
AUGUST	0.84	19	211	400	155	5.6-10.2
SEPTEMBER	0.73	19	220	401	170	5.2-9.4
OCTOBER	0.67	17	256	481	190	6.2-9.6
NOVEMBER	0.76	15	220	440	208	6.4-8.8
DECEMBER	0.78	13	227	446	208	6.8-9.4
1981 AVERAGE	0.70	14	229	428	189	4.6-12.0
1980 AVERAGE	0.64	14	220	520	167	5.9-9.1

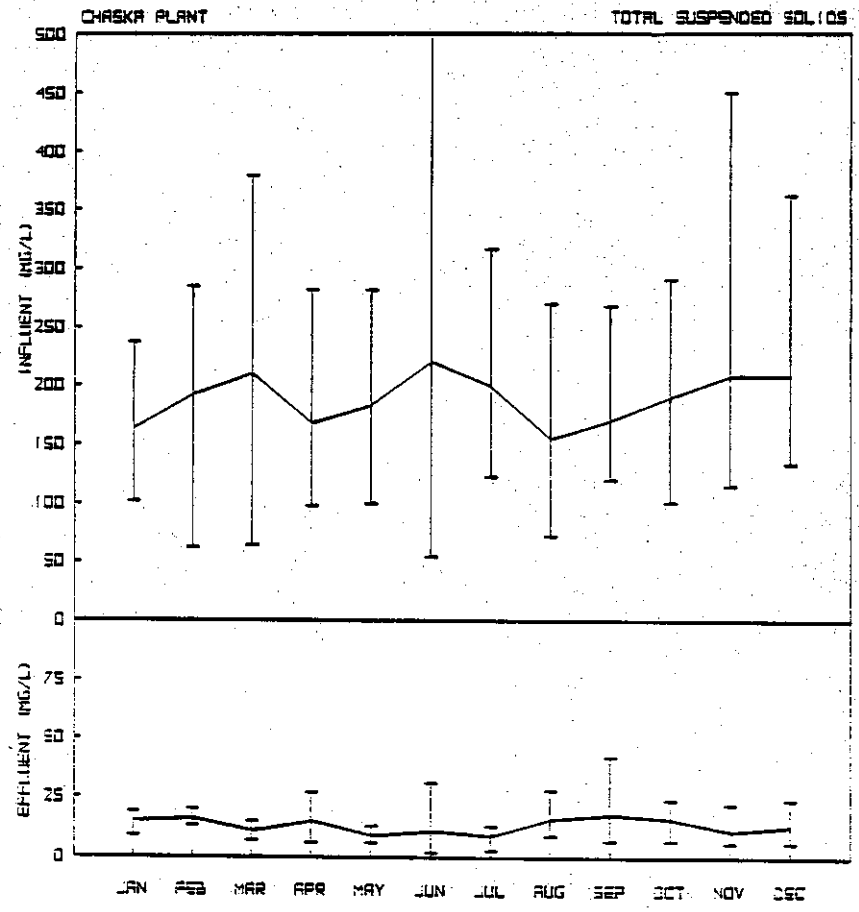
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: CHASKA

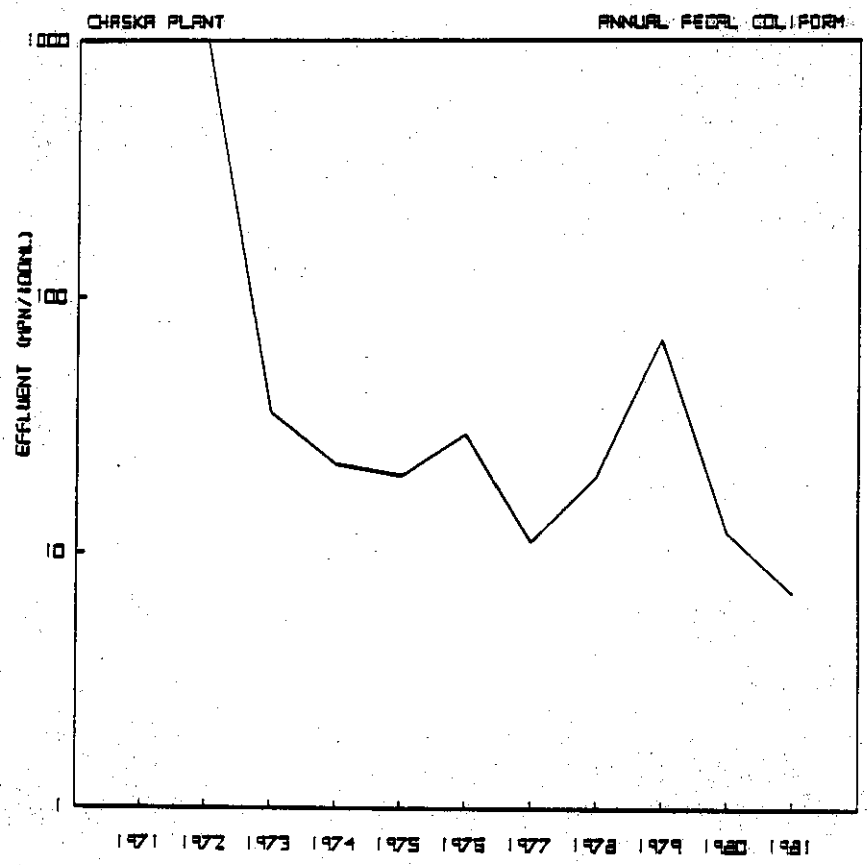
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
...DES LIMIT	25	--	30	200	25	----	----	---	---	---	---	6.5-8.5	--	---	--	--
JANUARY	17	--	15	1	7	----	----	---	---	----	8.5	6.8-7.5	35	3.7	93	91
FEBRUARY	14	--	16	1	7	----	----	---	---	----	9.3	6.9-7.4	35	3.5	94	92
MARCH	17	--	11	1	5	----	----	---	---	----	9.5	6.9-7.2	31	3.4	93	95
APRIL	26	--	15	4	8	----	----	---	---	----	9.5	6.9-8.1	30	2.7	88	91
MAY	12	63	9	3	5	20.7	15.4	.29	.35	2.0	9.5	6.7-7.2	30	2.5	94	95
JUNE	17	75	11	3	6	15.2	9.0	.09	.55	2.2	8.5	6.7-7.5	42	2.5	94	95
JULY	13	66	9	10	5	13.9	8.2	.04	.65	.8	8.9	6.5-7.2	29	2.6	94	95
AUGUST	24	100	16	20	7	10.9	5.6	.05	1.04	.6	7.6	6.5-7.2	29	1.9	89	89
SEPTEMBER	23	87	18	13	7	15.4	6.8	---	----	.5	6.8	6.7-7.1	31	2.1	89	89
OCTOBER	26	88	16	10	8	14.0	7.1	---	----	2.3	7.3	6.7-7.2	29	2.0	90	92
NOVEMBER	15	73	11	---	5	18.0	11.7	.97	1.37	0.5	8.5	6.8-7.2	--	---	93	95
DECEMBER	17	81	13	---	5	19.6	12.2	.09	3.45	1.3	9.8	6.8-7.3	--	---	93	94
1981 AVG.	18	79	13	7	6	16.0	9.5	.25	1.32	1.3	8.6	6.8-8.1	32	2.7	92	93
1980 AVG.	20	110	12	12	7	----	----	---	----	---	8.7	6.3-7.5	--	---	91	93

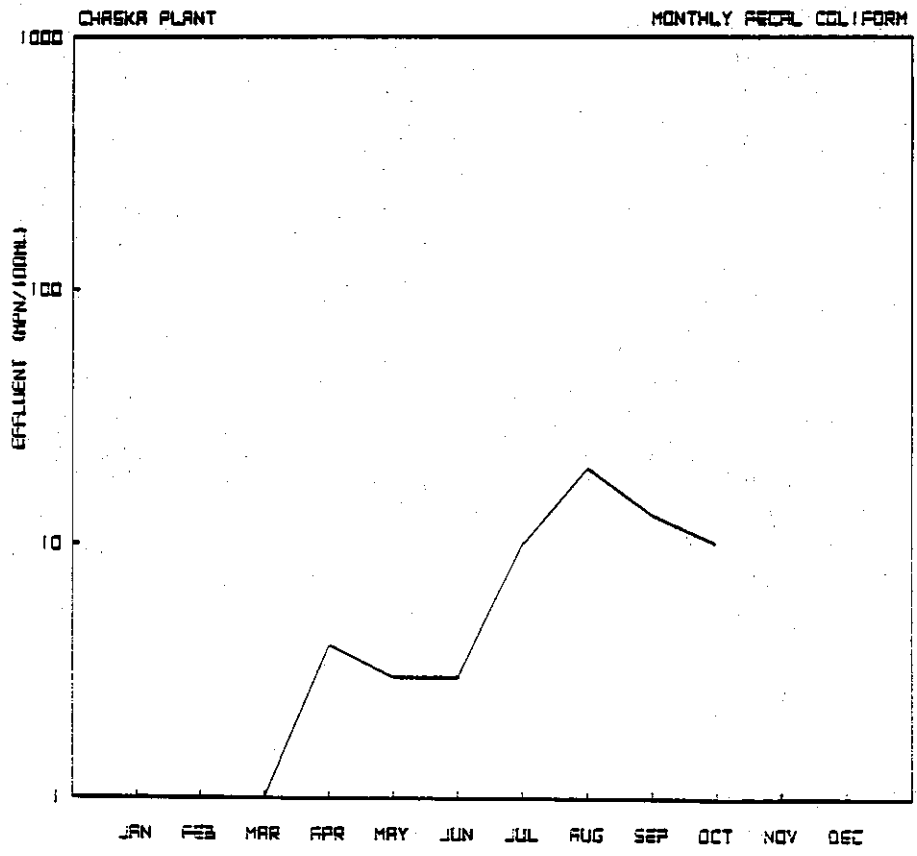

CHASKA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

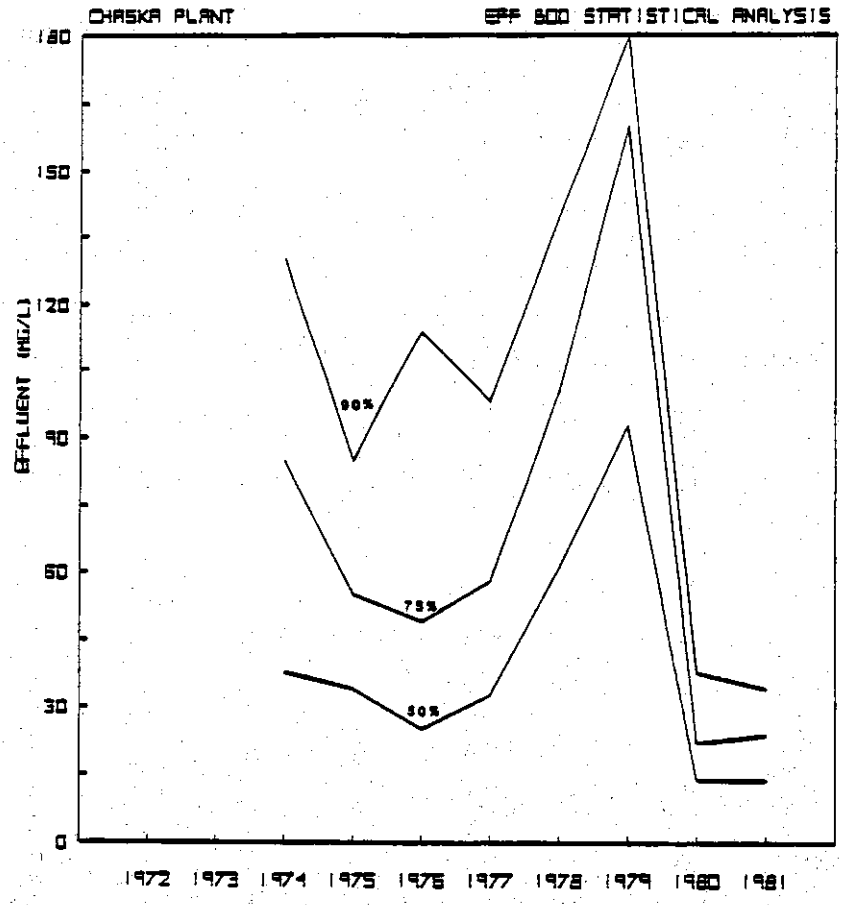

CHASKA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

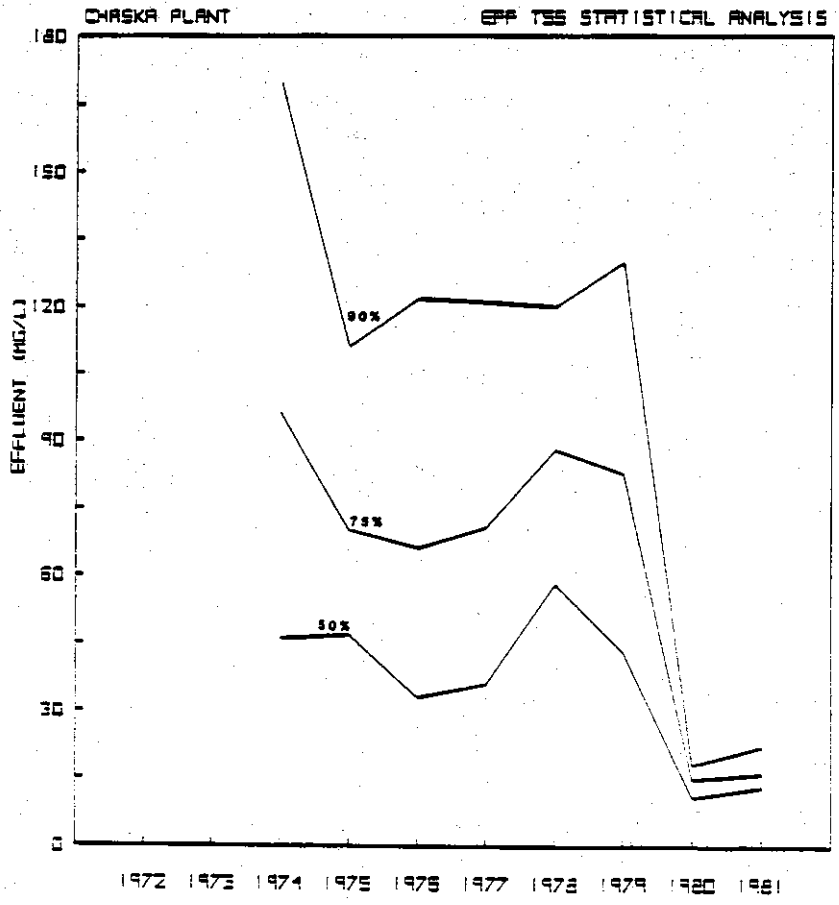

CHASKA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
500
450
400
350
300
250
200
150
100
50
0
75
50
25
0
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


CHASKA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
500
450
400
350
300
250
200
150
100
50
0
75
50
25
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


CHASKA PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (#/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


CHASKA PLANT
MONTHLY FECAL COLIFORM
EFFLUENT (#/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


CHASKA PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


CHASKA PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

COTTAGE GROVE WASTEWATER TREATMENT PLANT

Background

The Cottage Grove Plant was designed by Bonestroo, Rosene, Anderlik, and Associates, originally constructed in 1962, and expanded in 1963 and 1968. In 1975, effluent polishing filters were added to the plant. In 1976, primary anaerobic digester volume was increased and a new cover was installed. In 1979, the plant was expanded to its current design capacity of 1.8 mgd. Liquid treatment consists of screening, primary sedimentation, activated sludge aeration, final clarification, effluent polishing filters, chlorination, and discharge to the Mississippi River. Solids processing consists of combined sludge gravity thickening, anaerobic digestion, and sludge landspreading. The plant is subject to secondary treatment limits.

Performance

The plant flow averaged 1.21 mgd in 1981, down significantly from 1.58 mgd in 1980. Average plant effluent quality was 12 mg/L BOD, and 7 mg/L TSS. Plant performance was good throughout the year, although four NPDES Permit violations occurred in March, due to nitrification in the activated sludge process (chlorination interference) and in the BOD test. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	28	12	10	9	38	20	14	15	52	50	18	20
TSS	17	10	7	5	28	16	13	8	51	28	22	14

Activities

The flow reduction experienced between 1980 and 1981 is probably related to a reduction in inflow/infiltration into the city's trunk sewer leading to the plant. This reduction may be the result of the city's efforts to reduce this problem, or related to drier weather.

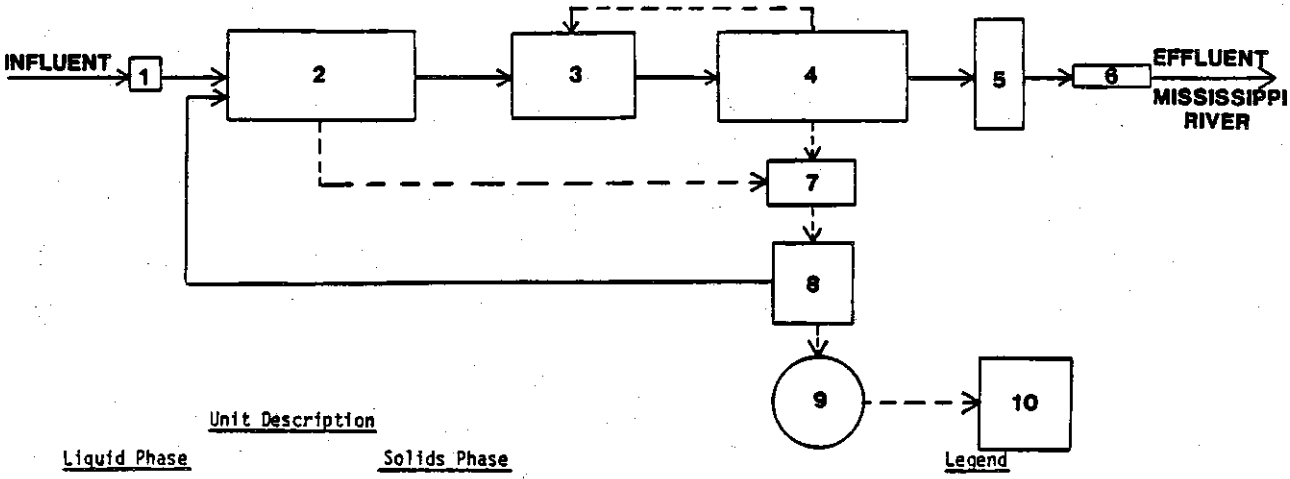
Reapplication for the plant's NPDES Permit, which expires on March 31, 1982, was submitted to the MPCA on August 24, 1981.

Future

This plant is one of the Commission's permanent treatment plants. A plant expansion is planned for the mid-1980's.

COTTAGE GROVE WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

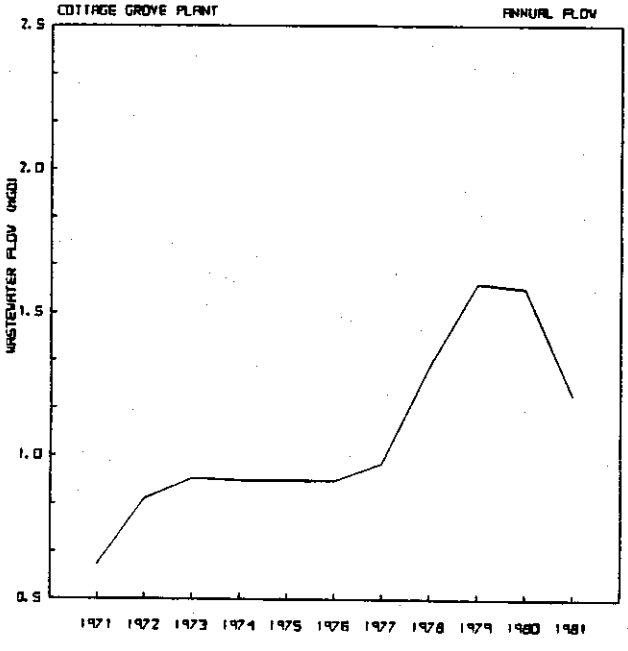
1. Screening
2. Primary Sedimentation
3. Activated Sludge
4. Final Sedimentation
5. Effluent Filtration
6. Chlorination

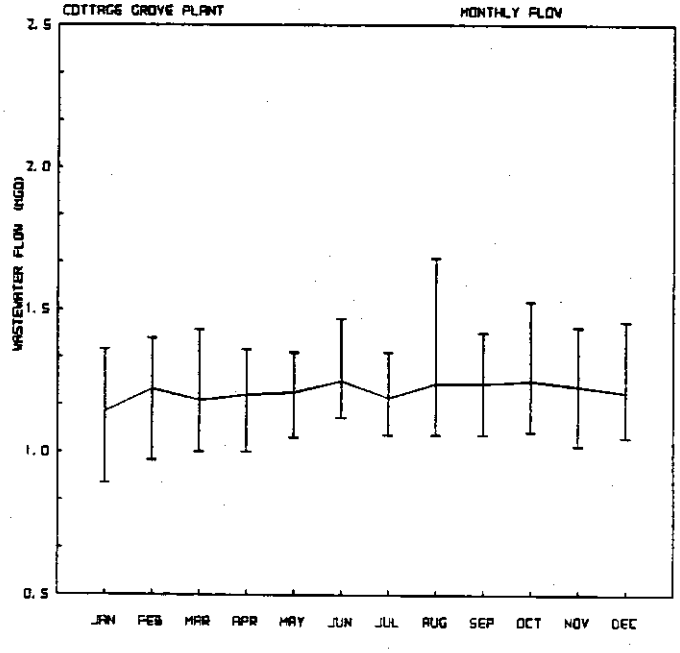
Solids Phase

7. Sludge Blend Tank
8. Sludge Thickener
9. Anaerobic Digestion
10. Haul to Land Spreading

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



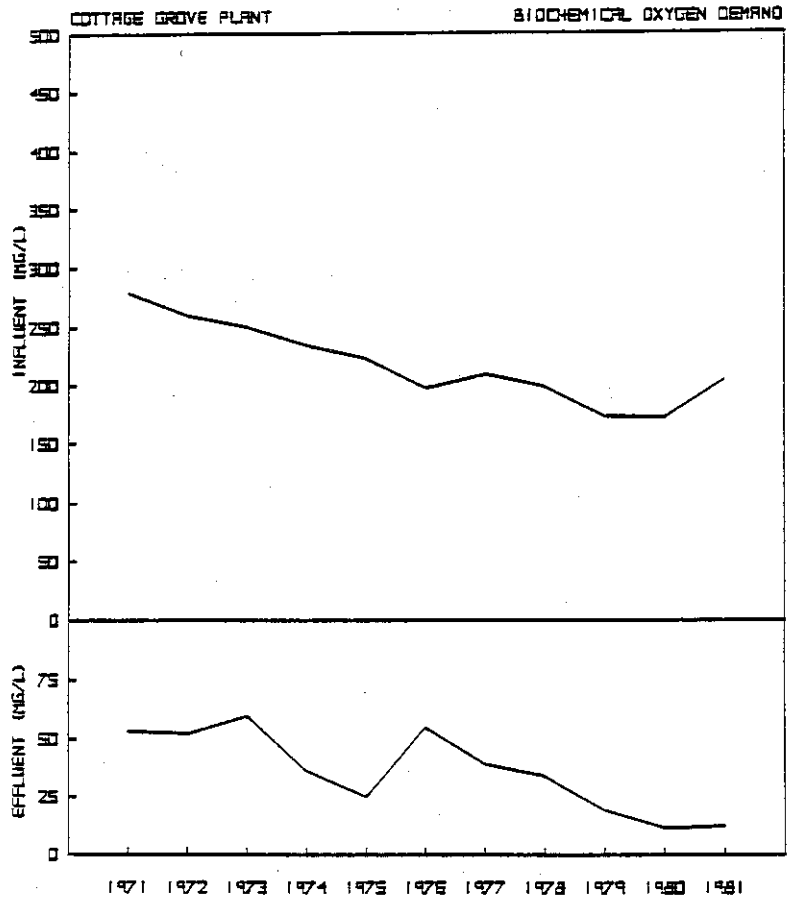


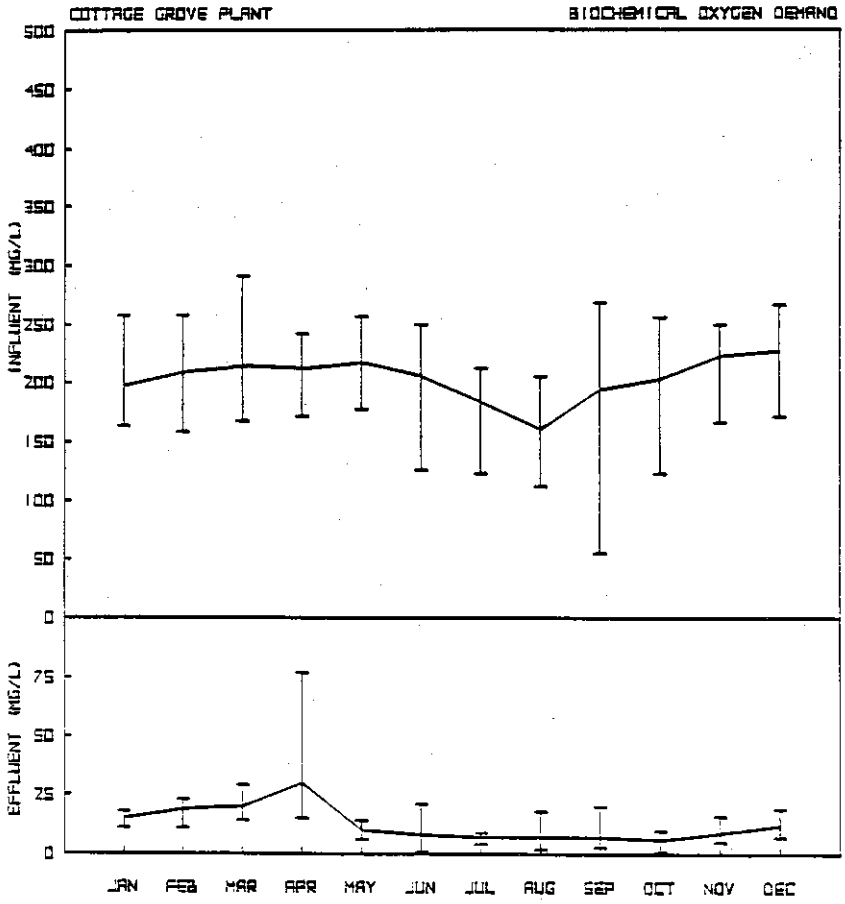
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Cottage Grove

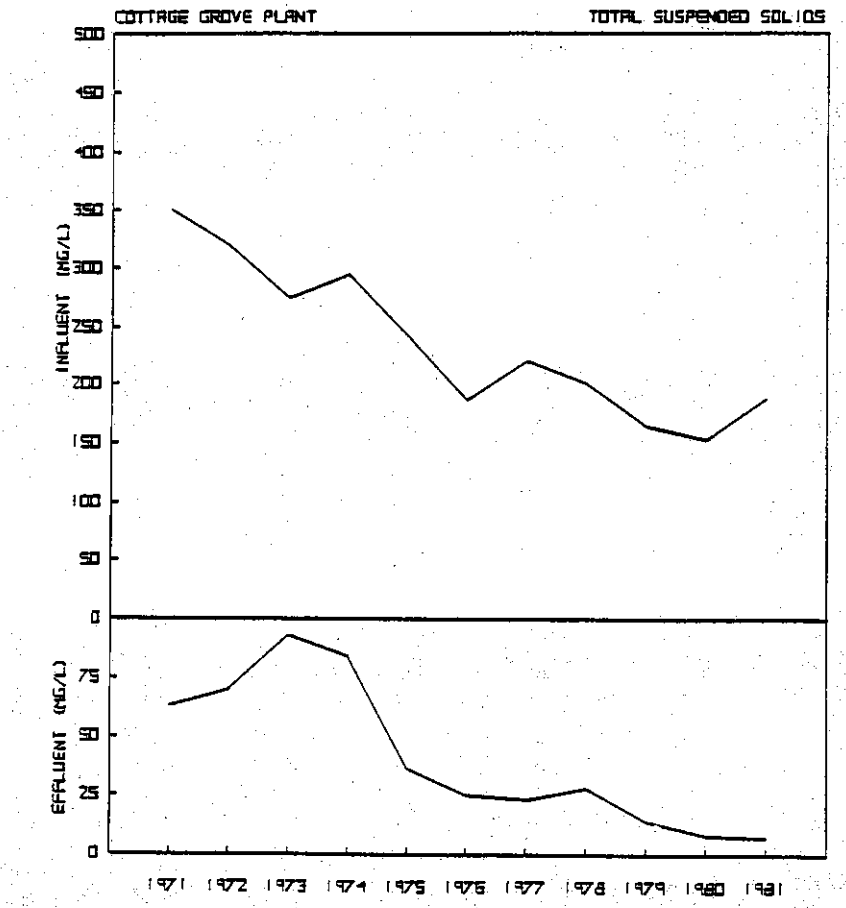
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	1.14	12	197	---	176	7.3-8.5
FEBRUARY	1.22	12	209	---	179	7.5-8.4
MARCH	1.18	11	214	---	168	7.6-8.4
APRIL	1.20	13	212	---	240	7.5-8.4
MAY	1.21	14	217	431	220	7.6-8.6
JUNE	1.25	17	205	382	177	7.5-8.0
JULY	1.19	20	183	362	168	7.4-8.1
AUGUST	1.24	21	160	381	175	7.3-8.0
SEPTEMBER	1.24	21	194	368	163	7.2-8.0
OCTOBER	1.25	18	203	422	190	7.5-8.2
NOVEMBER	1.23	17	223	403	205	7.4-8.2
DECEMBER	1.21	14	227	440	180	7.5-8.4
1981 AVERAGE	1.21	16	204	399	187	7.2-8.6
1980 AVERAGE	1.58	14	171	373	152	7.0-8.7

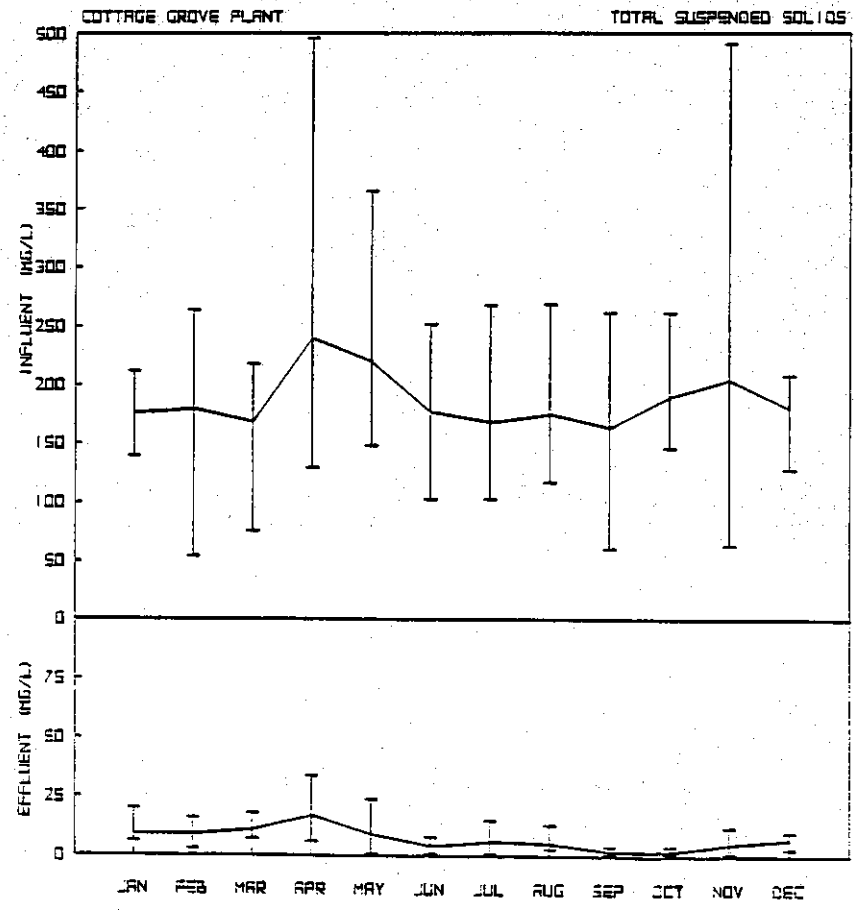
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: COTTAGE GROVE

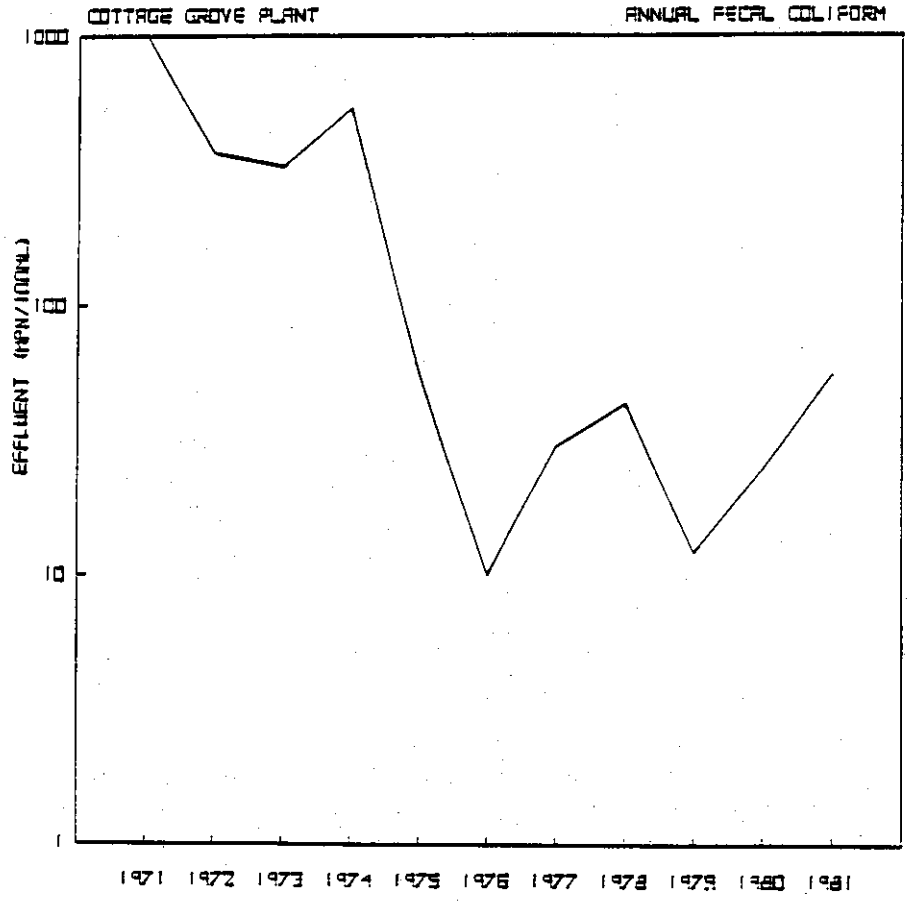
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
PROCESS LIMIT	25	--	30	200	25	---	-----	-----	-----	---	---	6.5-8.5	---	---	--	--
JANUARY	15	--	9	32	6	---	18.3	-----	-----	---	6.0	6.8-7.7	34	6.1	93	95
FEBRUARY	19	--	9	48	7	---	19.8	-----	-----	---	5.8	7.2-7.6	56	3.7	91	95
MARCH	20	--	11	116	9	---	19.8	-----	-----	---	5.6	7.3-8.3	53	4.0	91	93
APRIL	30	--	17	241	11	---	23.3	-----	-----	---	5.4	7.1-7.7	104	5.2	86	93
MAY	10	45	9	3	5	5.6	5.3	-----	-----	4.6	5.1	6.9-7.5	154	7.3	95	96
JUNE	8	48	4	24	4	4.9	1.7	18.89	.86	5.1	6.3	6.9-7.7	91	5.6	96	98
JULY	7	45	6	3	4	8.7	3.0	22.36	.89	4.9	5.8	6.7-7.3	104	6.0	96	97
AUGUST	7	39	5	5	4	5.6	1.4	20.71	.84	4.3	6.1	7.0-7.4	119	4.3	96	97
SEPTEMBER	7	42	2	24	2	6.8	0.4	-----	-----	4.5	6.0	7.0-7.3	123	4.4	96	99
OCTOBER	6	48	2	5	2	5.8	1.2	-----	-----	5.7	6.1	7.0-7.3	122	4.9	97	99
NOVEMBER	9	47	5	---	4	7.0	5.2	21.33	.81	5.0	5.7	7.1-7.7	---	---	96	98
DECEMBER	12	53	7	---	4	22.5	14.0	11.10	2.32	5.5	6.1	7.1-7.5	---	---	95	96
1981 AVG.	12	47	7	55	5	8.4	9.5	18.38	1.26	5.0	5.9	6.7-8.3	102	5.2	94	96
1980 AVG.	11	31	8	25	5	----	19.0	-----	----	---	6.0	6.8-8.1	---	---	94	95

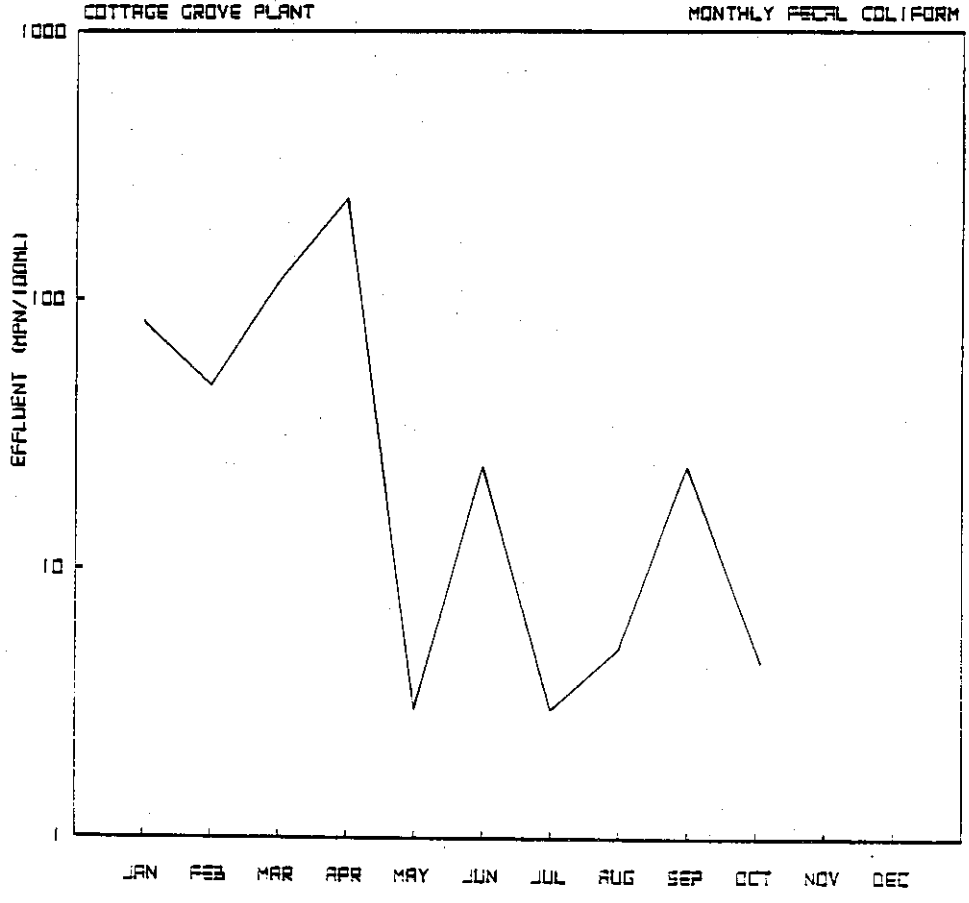

COTTAGE GROVE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


COTTAGE GROVE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


COTTAGE GROVE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


COTTAGE GROVE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


COTTAGE GROVE PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981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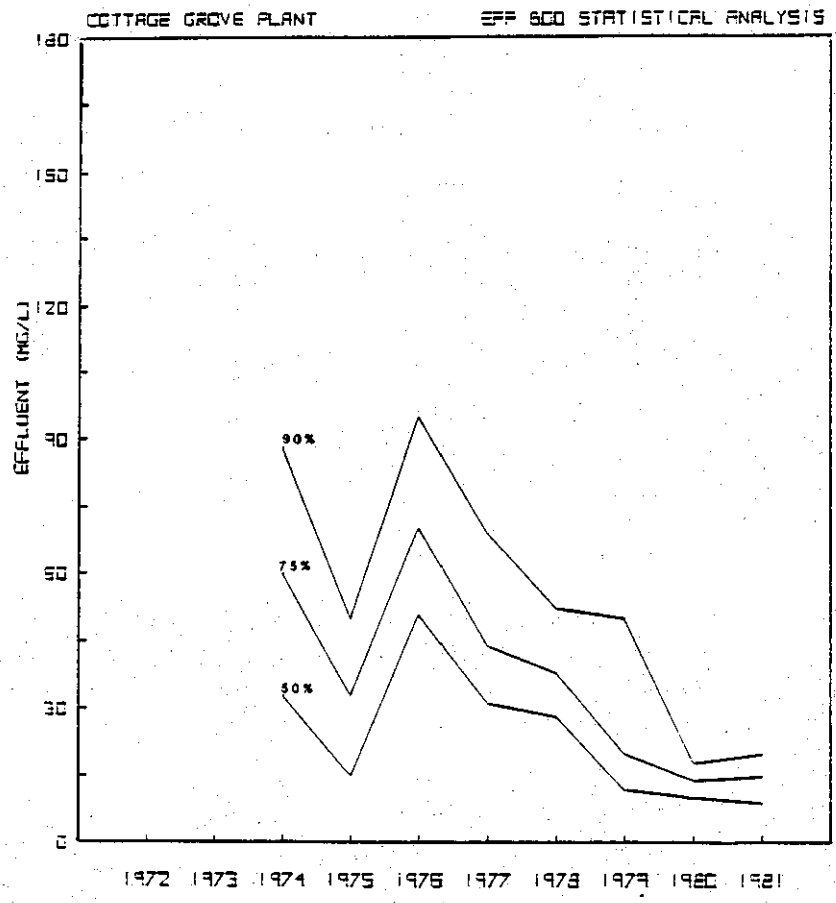
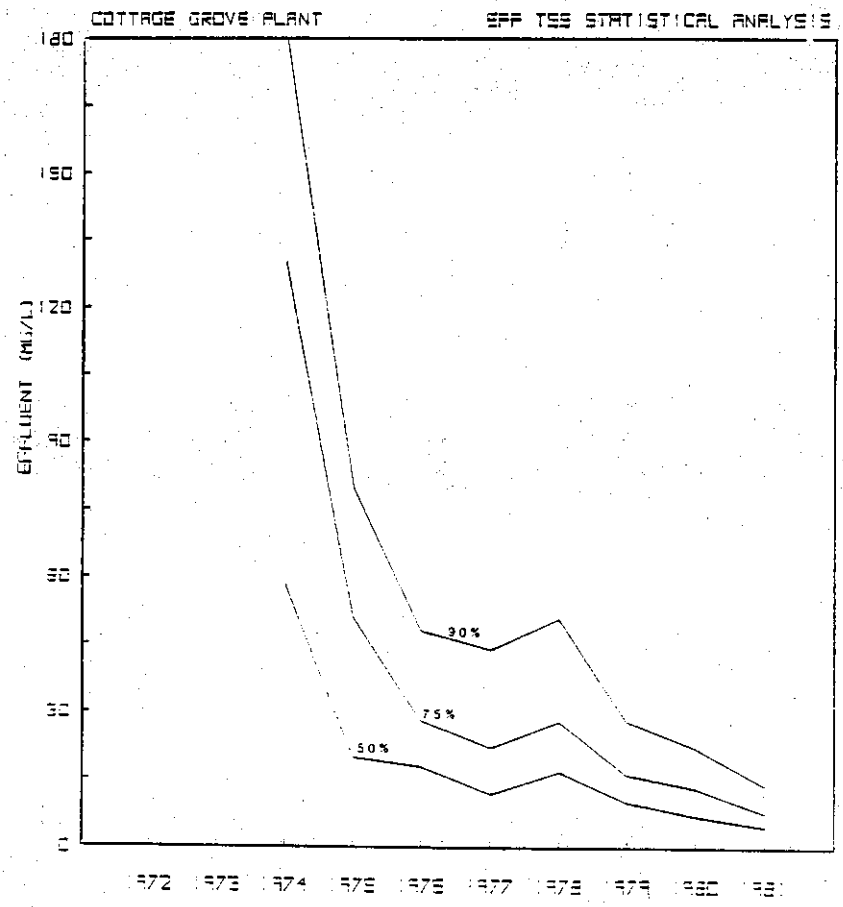
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


COTTAGE GROVE PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


COTTAGE GROVE PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

EMPIRE WASTEWATER TREATMENT PLANT

Background

The Empire Plant was designed by Short Elliot Henderson, Inc., and placed in operation in September, 1979. The plant has a design capacity of 6.0 mgd. Liquid treatment consists of screening, influent pumping, grit removal, primary sedimentation, high rate activated sludge aeration, intermediate sedimentation, nitrification activated sludge aeration, final clarification, effluent filtration, chlorination, and discharge to the Vermillion River. Solids processing consists of combined sludge gravity thickening, anaerobic digestion, centrifuge dewatering, sludge storage, and sludge landspreading. The plant is subject to effluent limits of 10 mg/L BOD and TSS, and 1 mg/L ammonia.

Performance

Plant flow averaged 3.51 mgd, up slightly from 3.48 mgd in 1980. Average plant effluent quality was 3 mg/L BOD, 2 mg/L TSS, and 0.3 mg/L ammonia. Plant performance was excellent throughout the year, with no NPDES Permit violations. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	--	4	2	3	--	10	2	4	--	28	5	4
TSS	--	3	1	1	--	5	3	1	--	11	4	2

Activities

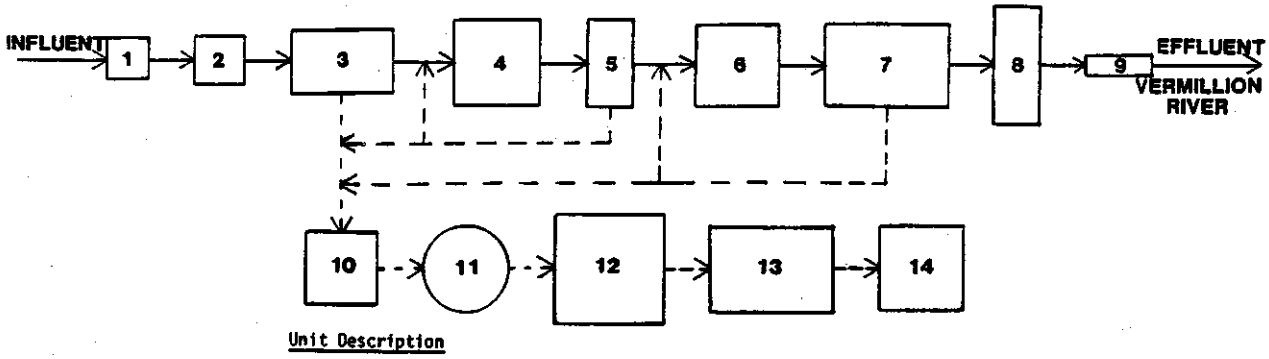
Although plant operation began in September, 1979, sludge landspreading operations were not conducted in 1979 or 1980 due to low sludge inventories. The NPDES Permit for the Empire Sludge Landspreading Area expired on September 30, 1980. The permit has not yet been reissued, due to the recent promulgation of sludge landspreading rules. In the fall of 1981, the Commission sought to begin landspreading operations at the Empire site. In a letter of September 15, 1981, the MPCA allowed the landspreading operation despite the absence of a current permit, so long as compliance with the conditions of the former permit and the Temporary Sewage Sludge Disposal Standards were maintained. The first landspreading operation at the Empire site was conducted in November and December of 1981.

Future

This plant is one of the Commission's permanent regional plants. Provisions have been made for doubling plant capacity when the area's growth requires a plant expansion.

EMPIRE WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

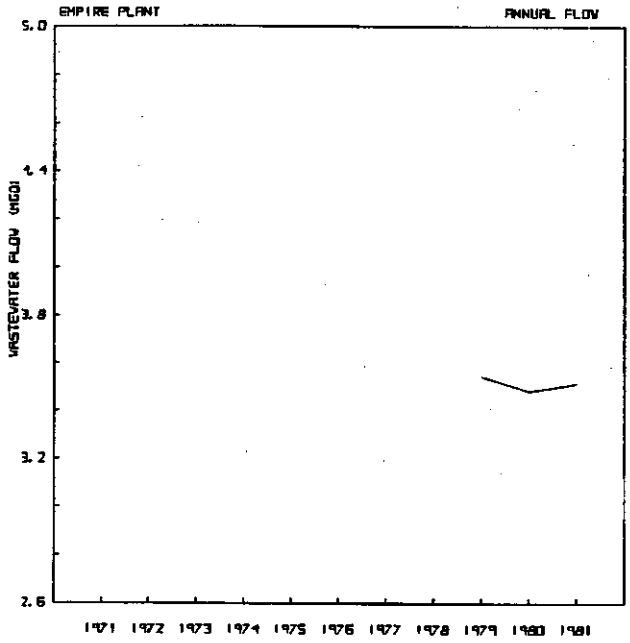
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Hi-Rate Activated Sludge Aeration
5. Intermediate Clarification
6. Nitrification Activated Sludge Aeration
7. Final Clarification
8. Effluent Filtration
9. Chlorination

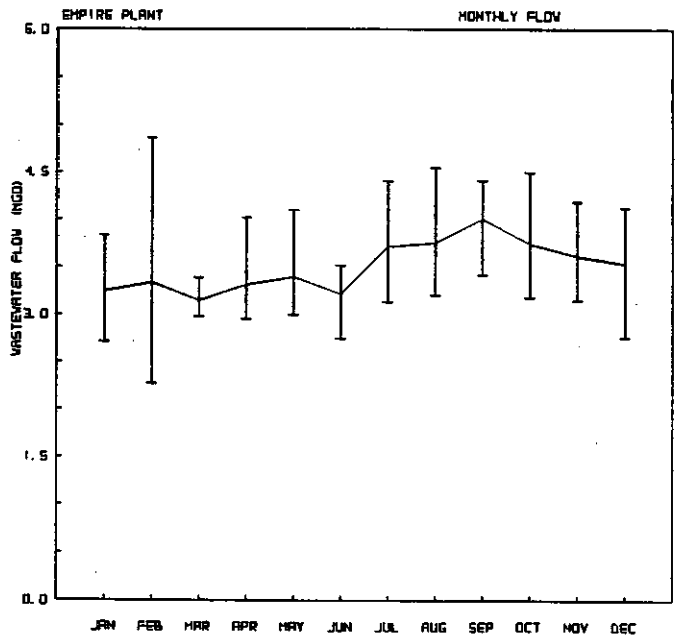
Solids Phase

10. Gravity Thickening
11. Anaerobic Digestion
12. Centrifuge Dewatering
13. Cake Storage
14. Sludge Landspreading

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



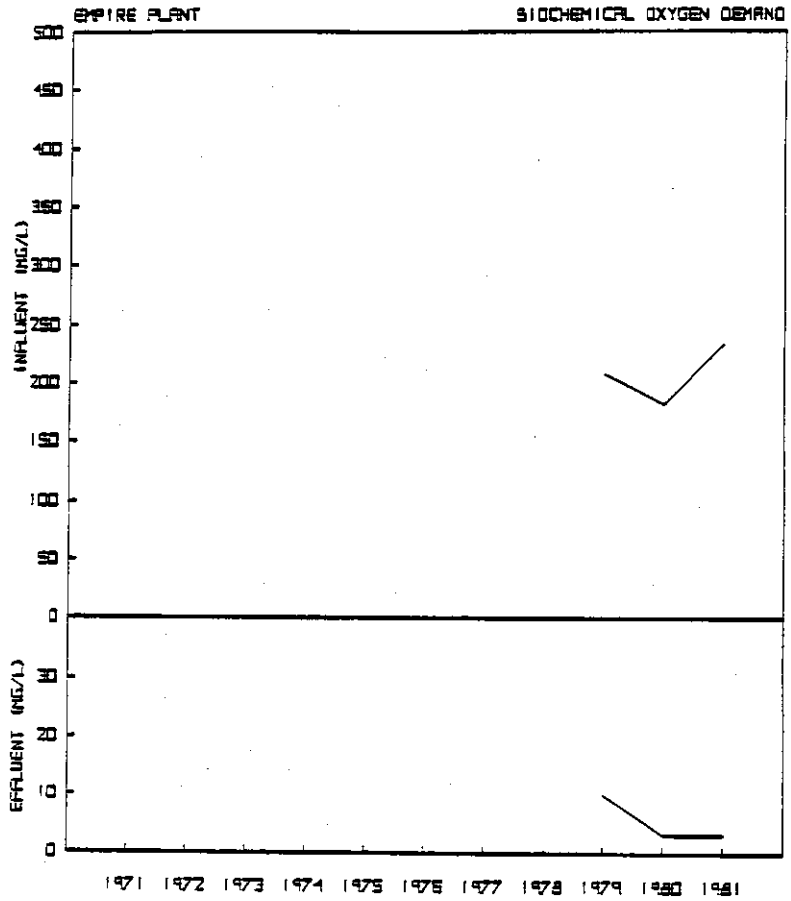


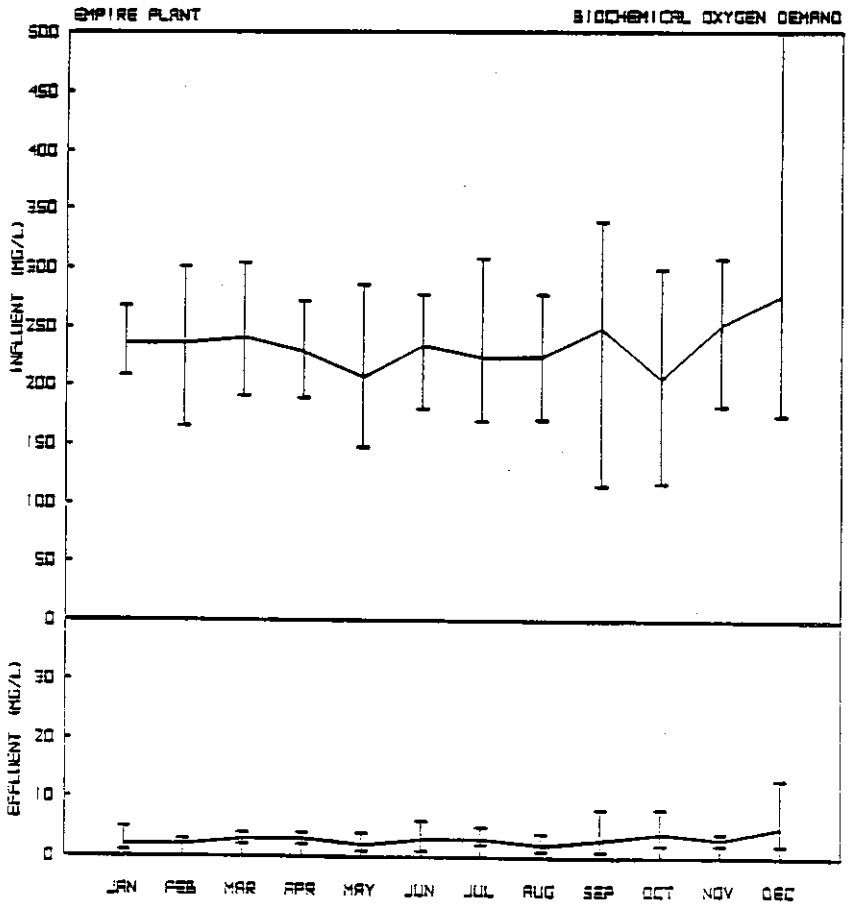
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Empire

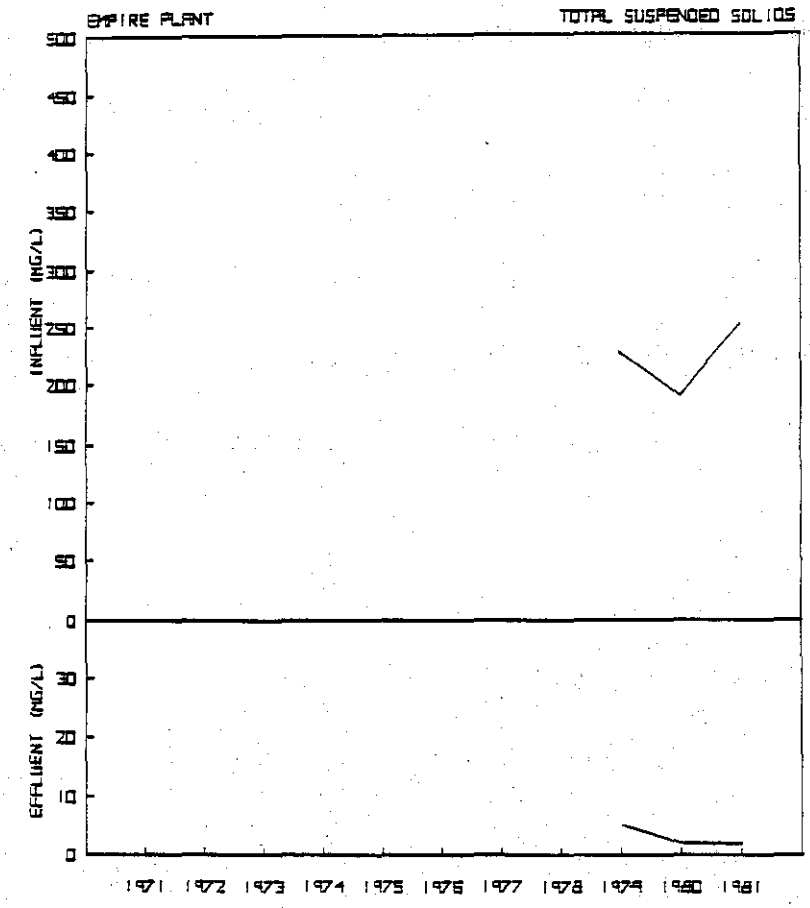
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	3.25	12	236	---	238	6.0-8.4
FEBRUARY	3.34	11	236	---	232	5.6-8.7
MARCH	3.15	11	241	475	214	6.4-8.8
APRIL	3.32	12	228	465	264	6.5-8.7
MAY	3.40	13	206	406	192	6.6-9.4
JUNE	3.22	15	234	480	270	6.6-8.4
JULY	3.72	17	223	447	235	6.1-8.2
AUGUST	3.76	18	224	597	405	6.2-8.6
SEPTEMBER	4.01	18	249	503	345	6.5-8.8
OCTOBER	3.75	17	205	393	212	6.3-8.0
NOVEMBER	3.62	16	252	380	190	6.2-8.7
DECEMBER	3.54	14	277	454	218	6.0-8.4
1981 AVERAGE	3.51	14	234	460	251	6.6-8.8
1980 AVERAGE	3.48	13	181	378	190	7.1-8.0

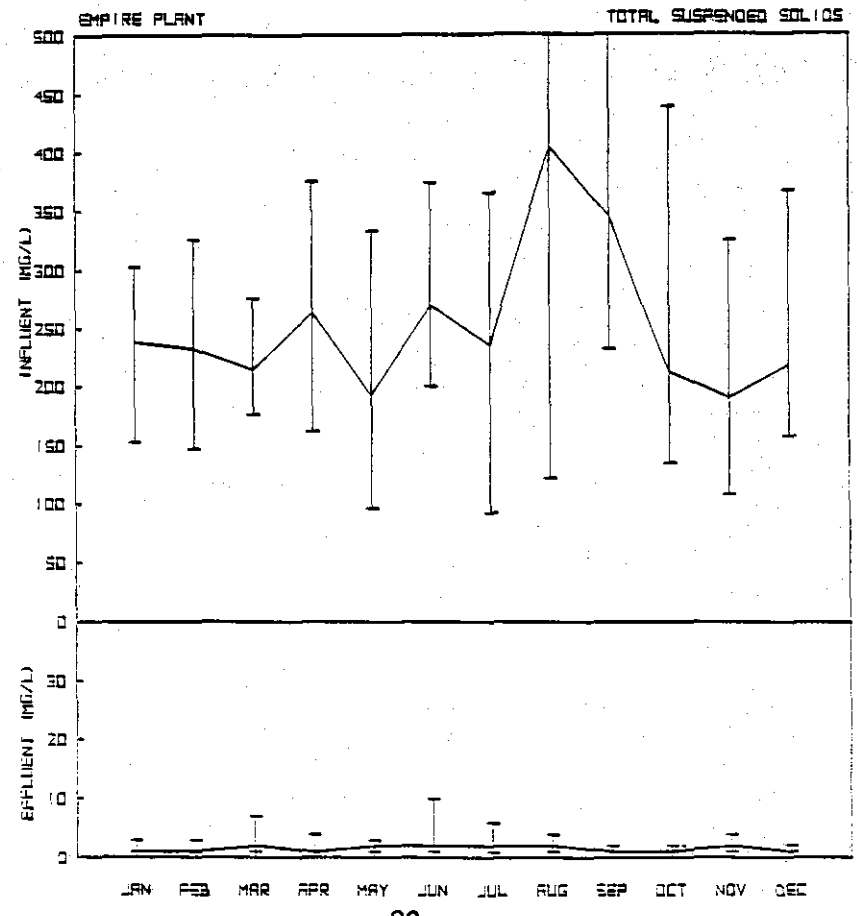
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: EMPIRE

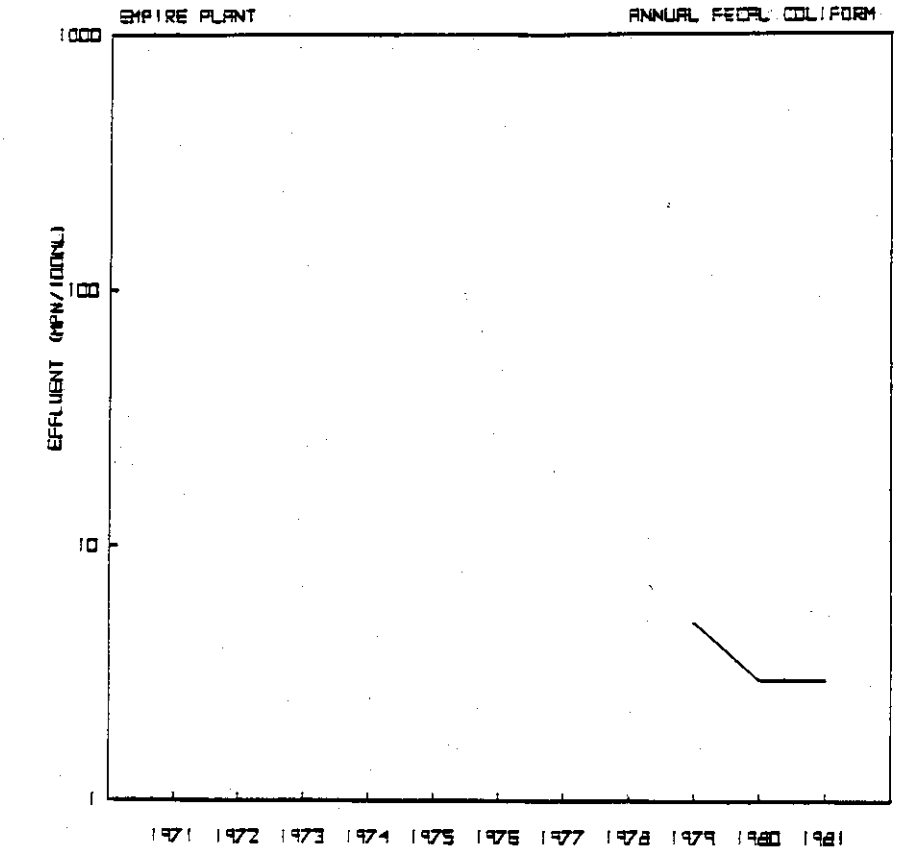
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	10	--	10	200	25	---	1.-	------	-----	---	5.0	6.5-8.5	---	---	--	--
JANUARY	2	--	1	3	1	---	.1	------	-----	---	10.7	7.2-7.7	78	.5	99	99
FEBRUARY	2	--	1	1	1	---	.1	------	-----	---	10.0	6.9-7.5	85	.7	99	99
MARCH	3	37	2	1	1	---	.1	------	-----	---	8.8	7.0-7.5	101	1.1	99	99
APRIL	3	33	1	1	0.5	---	.2	------	-----	---	8.3	7.0-7.5	100	1.1	99	99
MAY	2	24	2	1	1	1.4	.2	29.09	.02	7.5	7.7	7.1-7.5	97	1.3	99	99
JUNE	3	29	2	4	1	3.3	.9	28.05	.12	8.8	8.0	6.8-7.5	111	1.1	99	99
JULY	3	23	2	5	1	1.8	.4	20.72	.35	8.6	8.3	6.7-7.8	105	1.2	99	99
AUGUST	2	23	2	4	1	2.3	.5	26.27	.24	8.7	7.3	6.8-7.3	103	1.0	99	99
SEPTEMBER	3	25	1	2	1	1.8	.2	------	-----	7.4	7.7	6.9-7.3	99	1.1	99	99
OCTOBER	4	23	1	5	1	1.4	.2	------	-----	6.3	7.2	6.8-7.7	100	1.1	98	99
NOVEMBER	3	25	2	---	1	1.8	.3	22.73	.09	6.8	8.3	6.8-7.3	---	---	99	99
DECEMBER	5	28	1	---	1	3.0	.6	25.59	.10	6.4	9.9	7.0-7.7	---	---	98	99
1981 AVG.	3	26	2	3	1	2.2	.3	25.41	.15	6.7	8.5	6.7-7.8	98	1.0	99	99
1980 AVG.	3	31	2	3	1	---	.4	------	-----	---	8.7	7.0-8.1	---	---	98	99

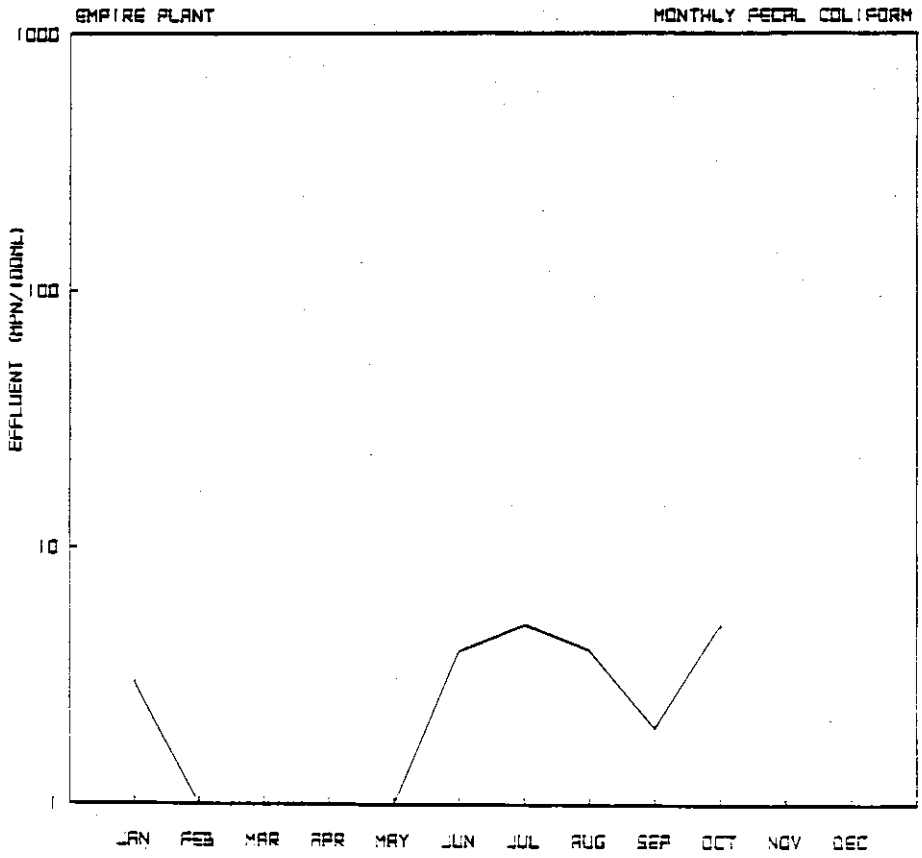

EMPIRE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


EMPIRE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


EMPIRE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


EMPIRE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


EMPIRE PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


EMPIRE PLANT
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
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JAN
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APR
MAY
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JUL
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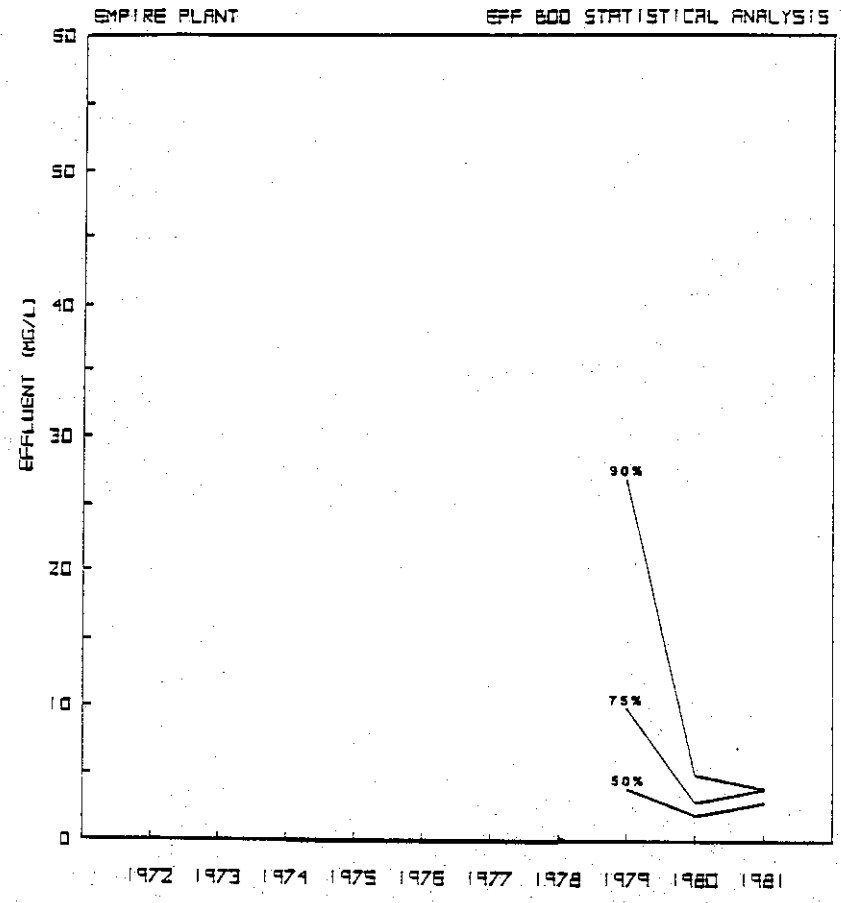
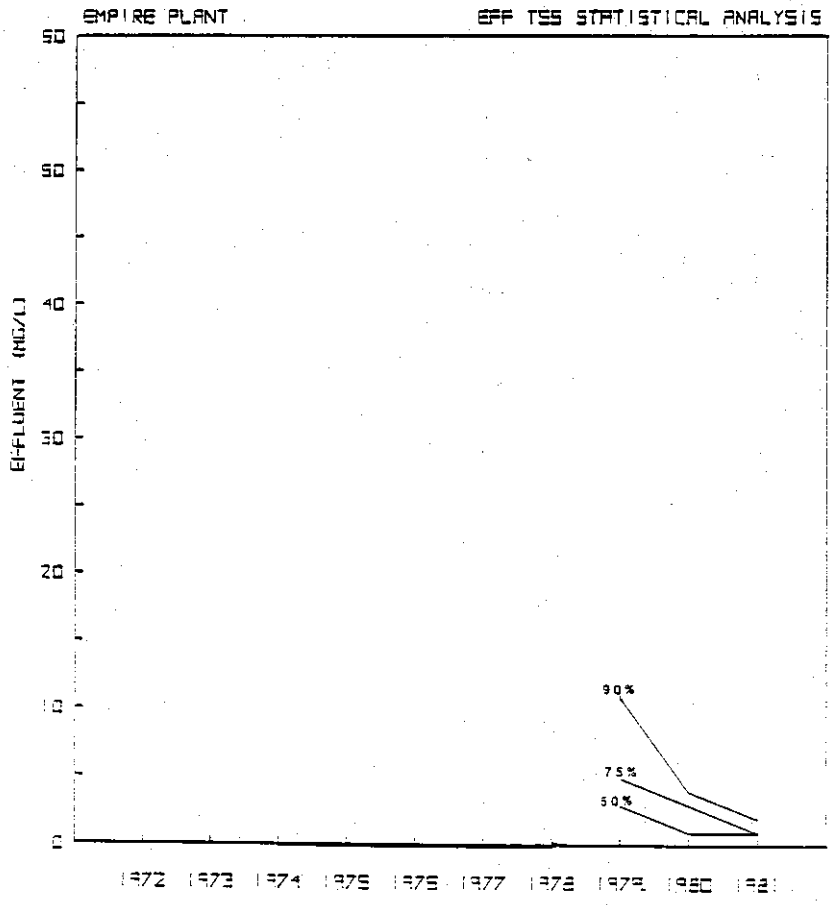

EMPIRE PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


EMPIRE PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

HASTINGS WASTEWATER TREATMENT PLANT

Background

The Hastings Plant was designed by TKDA, and built in two stages. The original plant was constructed in 1955 to provide primary treatment only. The plant was expanded in 1967 to provide secondary treatment at a design capacity of 1.83 mgd. Actual operating capacity is somewhat less, estimated to be about 1.5 mgd. Liquid treatment consists of screening, grit removal, primary sedimentation, primary effluent pumping, activated sludge aeration, final clarification, chlorination, and discharge to the Mississippi River. Solids processing consists of combined thickening in primary tanks, anaerobic digestion, and sludge landspreading. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 1.50 mgd in 1981, slightly higher than 1.44 mgd in 1980. Average plant effluent quality was 20 mg/L BOD and 22 mg/L TSS. Plant performance was marginal due to operation near plant capacity. A total of eight NPDES Permit violations occurred throughout the year. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	16	16	17	18	22	22	22	24	28	28	31	33
TSS	18	17	22	19	26	24	30	28	33	31	38	36

Activities

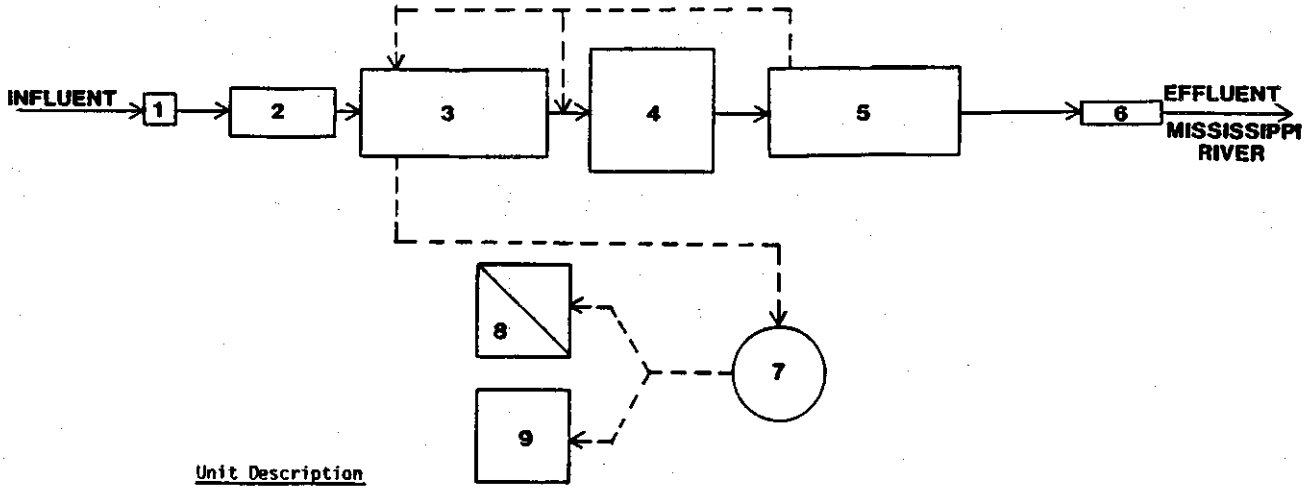
Efforts continued throughout the year to improve process control techniques at the plant to allow improved plant performance. Investigations of potential industrial waste problems affecting plant performance were initiated.

Future

This plant is one of the Commission's permanent treatment plants. A plant expansion has been designed, and construction is anticipated to begin in 1982 or 1983, if grant funds are received.

HASTINGS WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

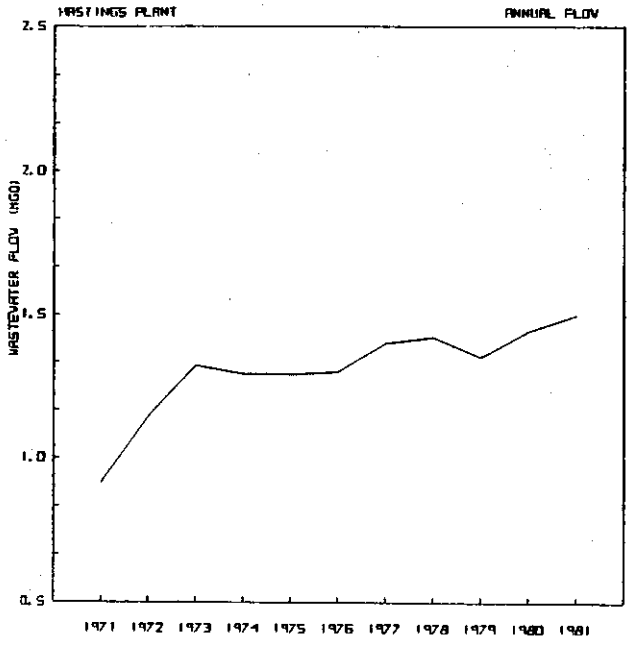
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Activated Sludge
5. Final Sedimentation
6. Chlorination

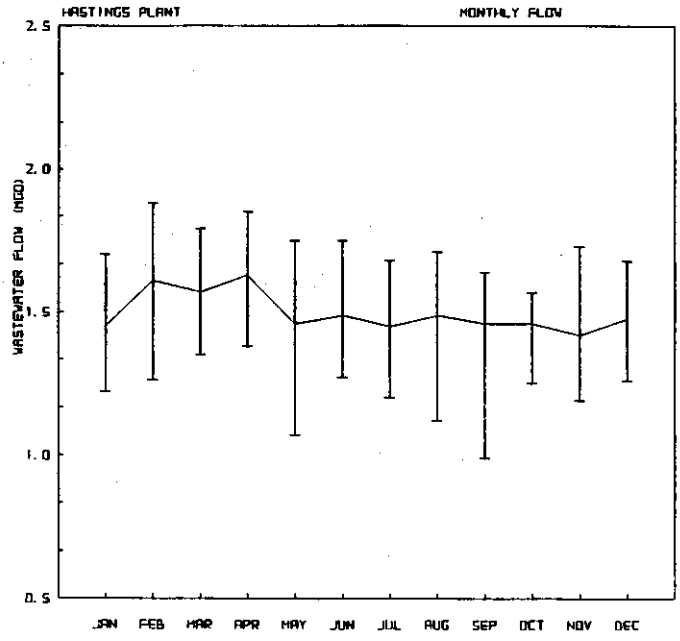
Solid Phase

7. Anaerobic Digestion
8. Solids Disposal at Metro Plant
9. Land Spreading

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



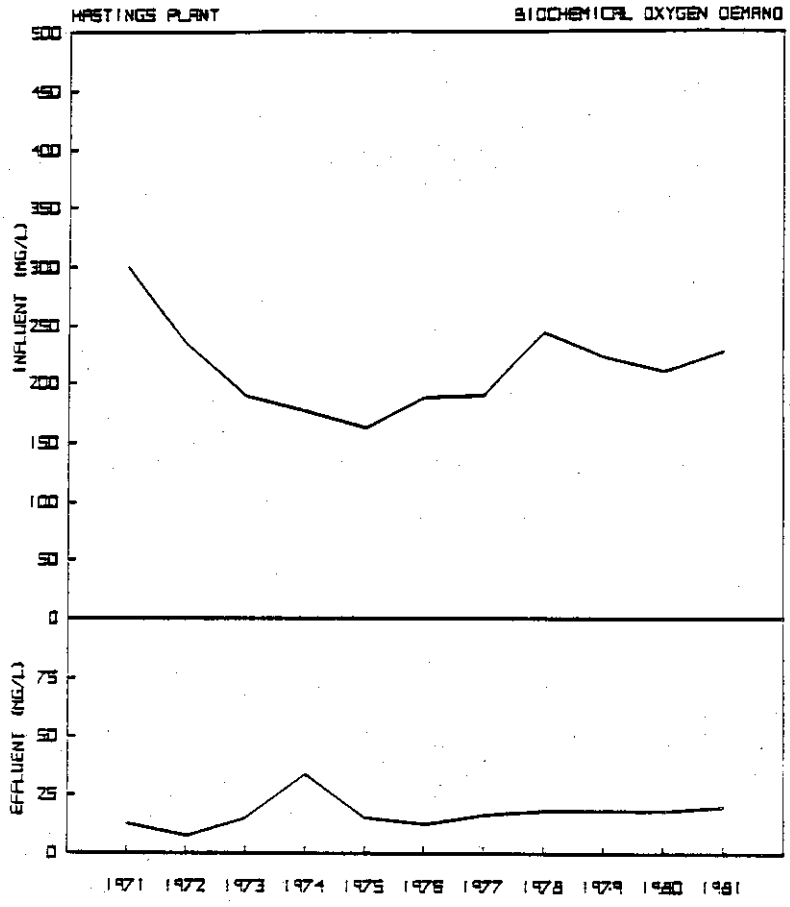


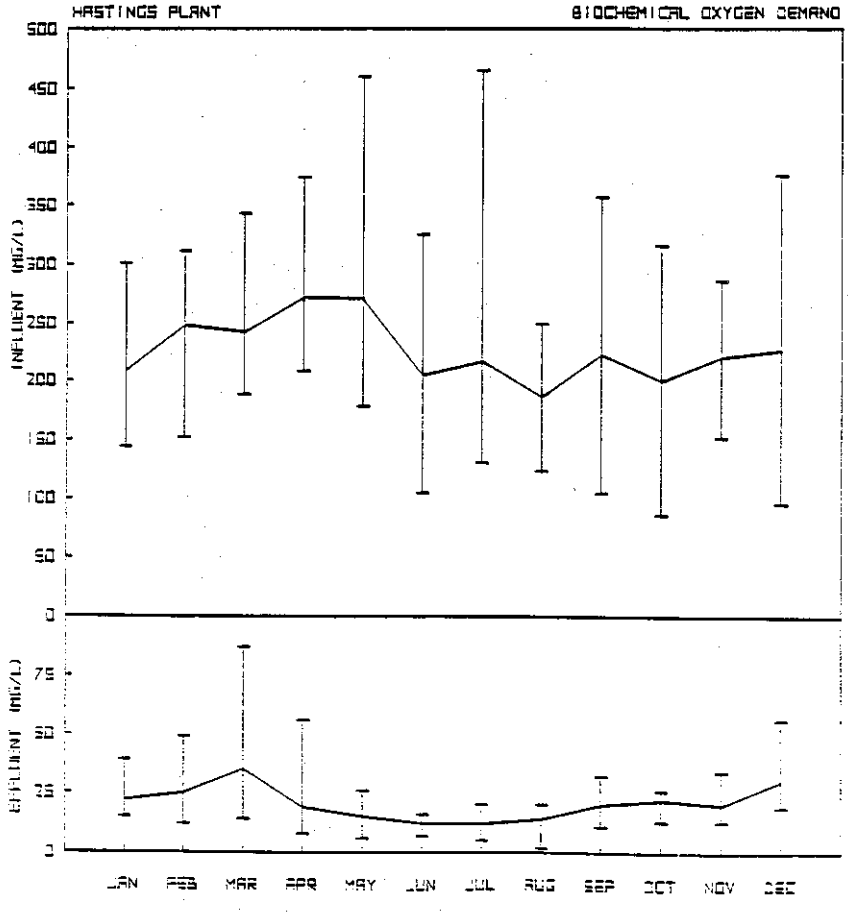
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Hastings

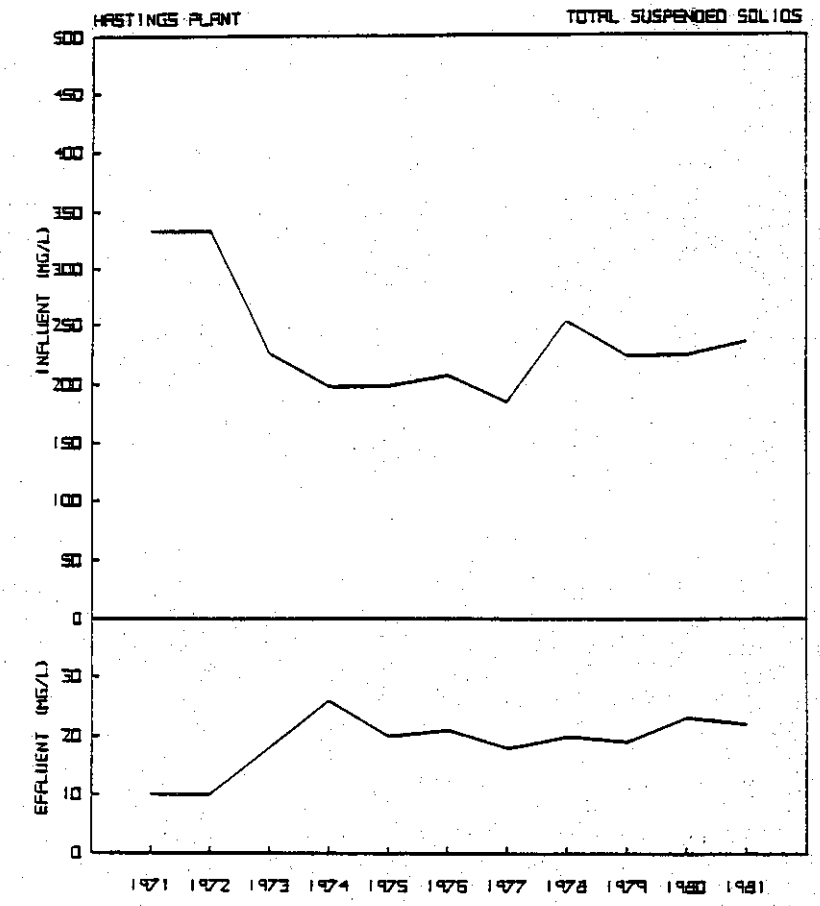
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	1.45	13	208	---	196	7.4-9.2
FEBRUARY	1.61	13	248	---	255	7.6-9.0
MARCH	1.57	13	242	---	247	7.5-9.2
APRIL	1.63	16	272	---	316	7.2-9.1
MAY	1.46	17	271	550	333	7.3-9.0
JUNE	1.49	19	205	427	227	7.3-8.7
JULY	1.45	20	217	487	228	5.9-9.9*
AUGUST	1.49	20	186	450	200	5.8-10.8*
SEPTEMBER	1.46	20	223	516	222	5.6-10.8*
OCTOBER	1.46	19	200	473	172	6.0-10.3*
NOVEMBER	1.42	17	221	486	198	6.1-9.6*
DECEMBER	1.48	16	227	514	231	5.8-10.6*
1981 AVERAGE	1.50	17	227	488	235	5.6-10.8
1980 AVERAGE	1.44	17	210	613	224	5.3-9.9

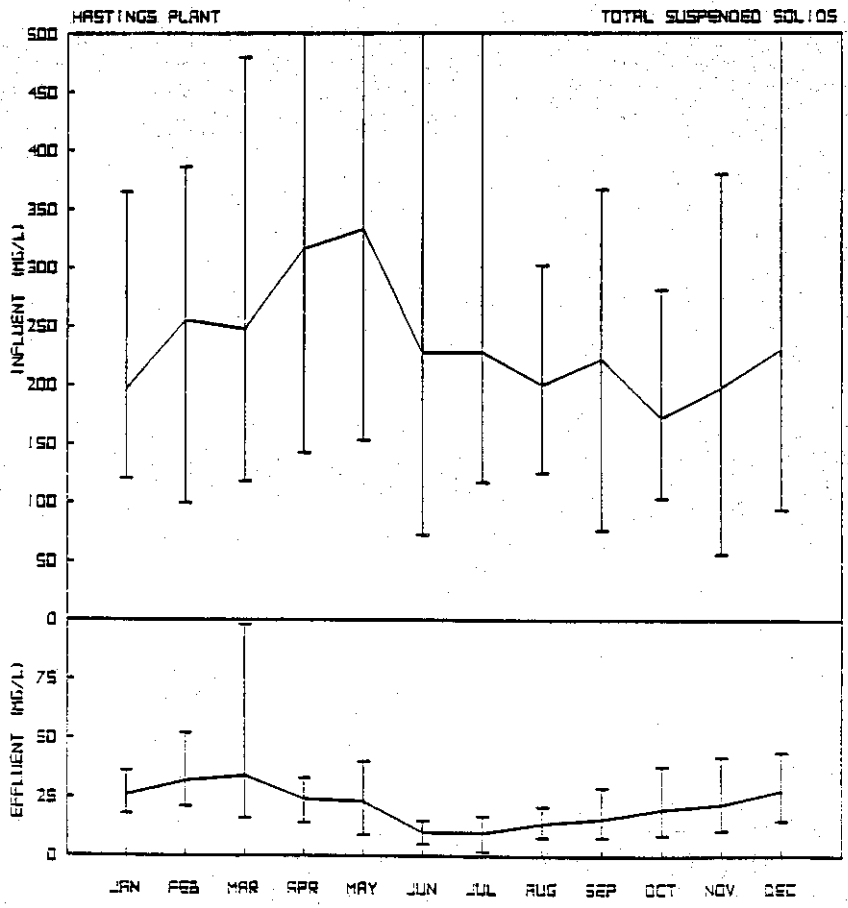
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: HASTINGS

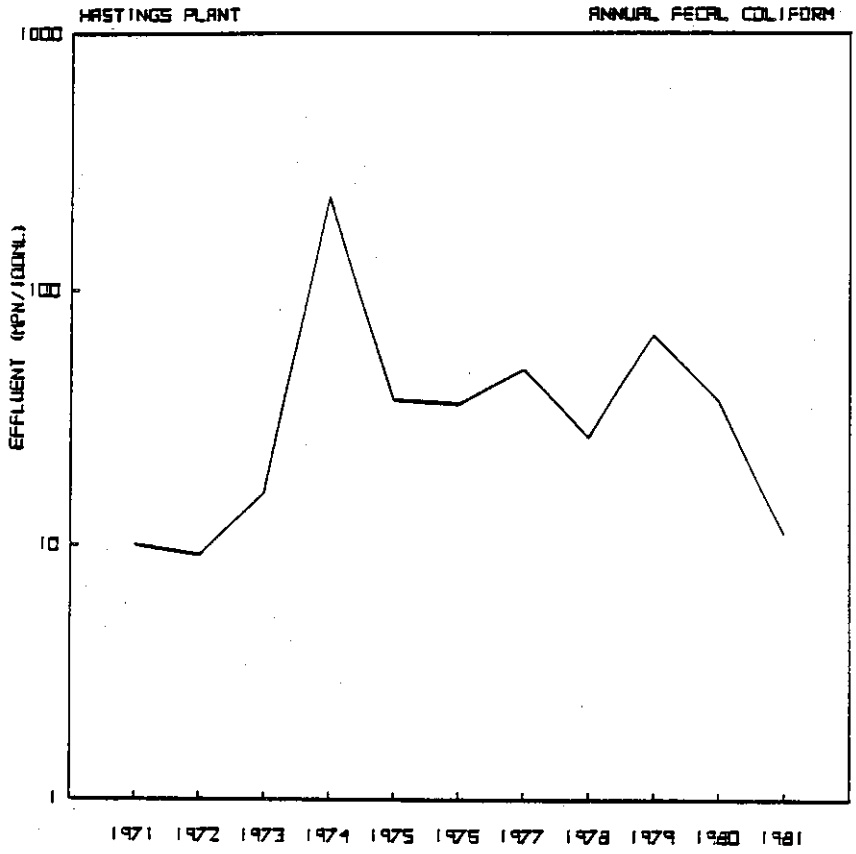
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	----	----	----	----	---	---	6.5-8.5	---	---	--	--
JANUARY	22	--	26	10	15	----	----	----	----	---	7.7	7.2-7.7	186	9.9	89	87
FEBRUARY	25	--	32	5	15	----	----	----	----	---	7.8	7.2-7.6	175	8.9	90	87
MARCH	35	--	34	12	20	----	----	----	----	---	7.2	7.1-7.8	175	7.9	86	86
APRIL	19	--	24	12	11	----	----	----	----	---	6.6	7.3-7.7	175	7.3	93	93
MAY	15	96	23	2	11	34.9	24.9	.92	.28	6.6	5.8	7.1-7.6	175	7.7	94	93
JUNE	12	78	10	6	8	30.1	19.0	1.61	1.27	5.5	5.2	7.2-7.6	165	5.5	94	96
JULY	12	68	10	3	6	22.6	14.5	4.26	1.10	4.3	5.1	7.1-7.5	150	5.4	94	96
AUGUST	14	92	14	12	8	21.8	14.1	1.41	1.08	5.0	5.1	7.2-7.6	150	4.2	93	93
SEPTEMBER	20	102	16	35	9	30.6	18.2	----	----	5.8	5.5	7.2-7.5	150	5.0	91	93
OCTOBER	22	128	20	9	11	43.8	26.3	----	----	6.5	6.0	7.1-7.5	184	5.3	89	89
NOVEMBER	20	100	22	---	8	31.3	21.4	.56	2.17	5.6	6.1	7.2-7.8	---	---	91	89
DECEMBER	30	132	29	---	13	40.5	26.4	1.30	3.58	7.2	6.2	7.1-7.5	---	---	87	88
1981 AVG.	20	100	22	11	11	32.0	20.6	1.76	1.58	5.3	6.2	7.1-7.8	168	6.7	91	91
1980 AVG.	18	143	23	36	12	----	----	----	----	---	7.6	7.3-8.1	---	---	91	90

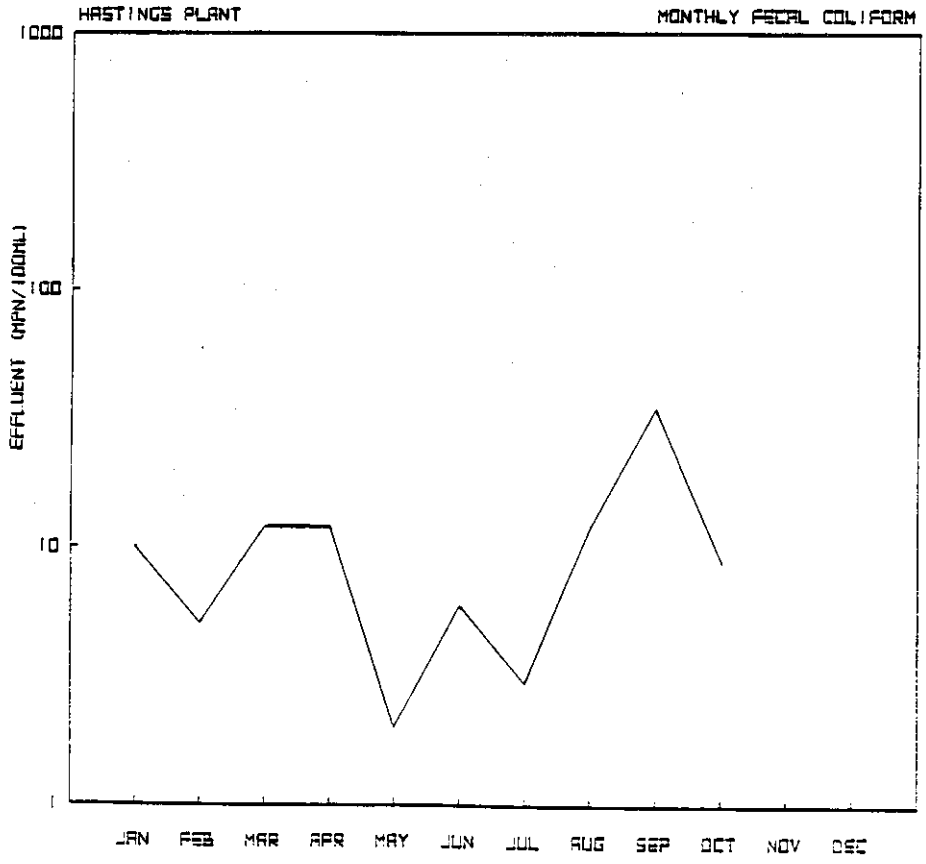

HASTINGS PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

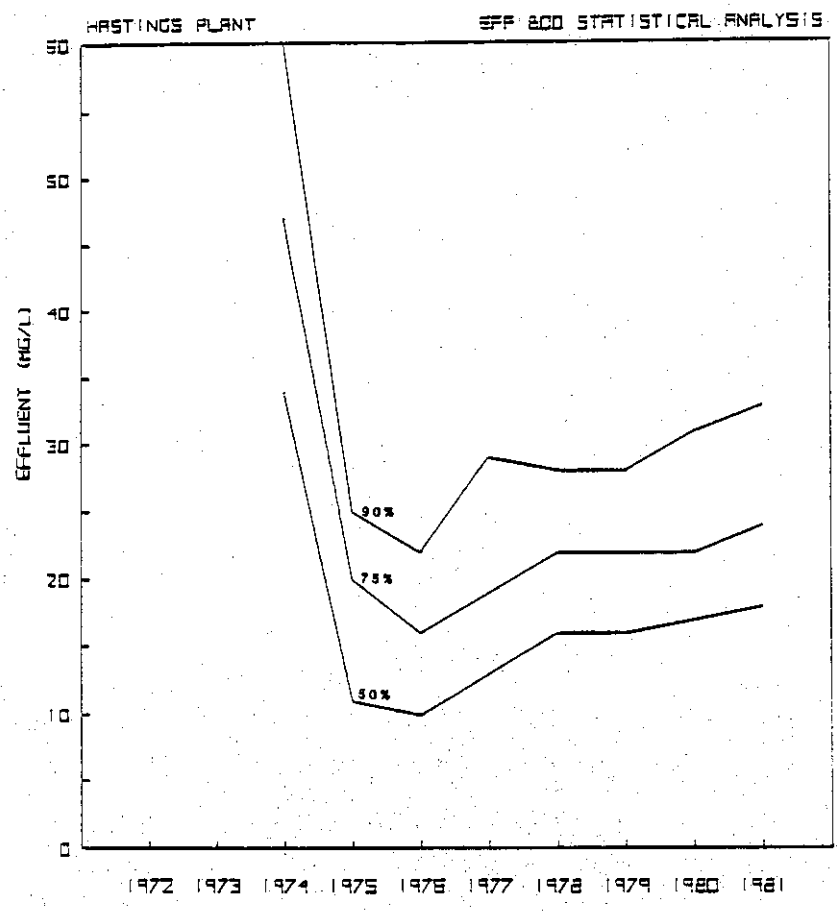

HASTINGS PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

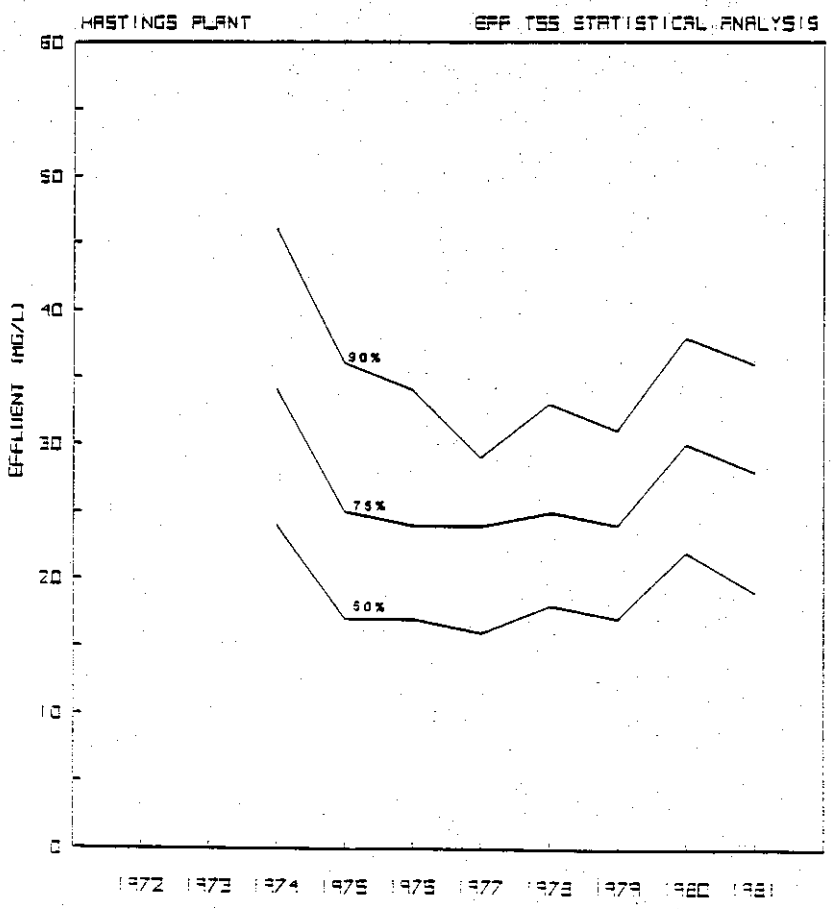

HASTINGS PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


HASTINGS PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


HASTINGS PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


HASTINGS PLANT
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


HASTINGS PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


HASTINGS PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

1981 EFFLUENT DATA
HASTINGS PLANT

Month	Cu mg/l	Cr mg/l	Zn mg/l	Pb mg/l	CN mg/l	Cd mg/l	Hg ug/l	Ni mg/l	As ug/l	Sn ug/l	Phenol ug/l	Fe mg/l
January	0.13	0.50	0.10	< 0.06	<0.020	< 0.01	0.70	< 0.04			5.8	0.32
February	0.14	0.67	0.12	< 0.05	<0.023	< 0.01	< 0.30	< 0.04			4.3	0.36
March	0.28	0.59	0.14	< 0.06	<0.020	< 0.01	< 0.24	< 0.04			5.3	0.41
April	0.61	0.40	0.10	< 0.05	<0.032	< 0.01	< 0.20	< 0.04			9.9	0.38
May	0.45	0.41	0.09	< 0.05	<0.020	< 0.01	< 0.20	< 0.04			4.0	0.29
June	0.22	0.20	0.10	< 0.05	<0.028	< 0.01	< 0.42	< 0.04			3.7	0.28
July	0.23	0.20	0.09	< 0.05	<0.043	< 0.008	< 0.38	< 0.04			4.0	0.44
August	0.18	0.33	0.09	< 0.05	<0.028	< 0.008	< 0.20	< 0.04			3.7	0.44
September	0.21	0.38	0.09	< 0.05	0.128	< 0.042	< 0.20	< 0.04			7.9	0.33
October	0.48	0.40	0.11	< 0.05	0.065	< 0.008	< 0.20	< 0.04			6.2	0.42
November	0.27	0.35	0.10	< 0.05	0.068	< 0.008	< 0.20	< 0.04			9.4	0.45
December	0.40	0.60	0.08	< 0.05	0.238	< 0.008	< 0.20	< 0.04			10.5	0.34
1981 Avg.	0.30	0.42	0.10	< 0.05	<0.059	< 0.012	< 0.29	< 0.04			6.2	0.37

MAPLE PLAIN WASTEWATER TREATMENT PLANT

Background

The original Maple Plain Plant was designed by TKDA and constructed in 1952. A plant expansion was designed by William T. Mills, consulting engineer, and constructed in 1965. Current plant design capacity is 0.22 mgd. Liquid treatment consists of grit removal, screening, influent pumping, primary sedimentation, roughing trickling filter, complete mix activated sludge aeration, final clarification, chlorination, effluent polishing pond, and discharge through a swamp to Lake Minnetonka. Solids processing consists of combined thickening in primary tanks, anaerobic digestion, and sludge hauling to other plants for processing or to landspreading sites. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 0.25 mgd in 1981, a significant increase from 0.19 in 1980. Average plant effluent quality was 12 mg/L BOD, and 9 mg/L TSS. Although flow was in excess of plant capacity, plant performance was good throughout the year. Only one NPDES Permit violation occurred. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	7	16	19	10	14	23	29	15	22	33	37	21
TSS	6	10	11	6	12	18	15	8	40	30	24	16

Activities

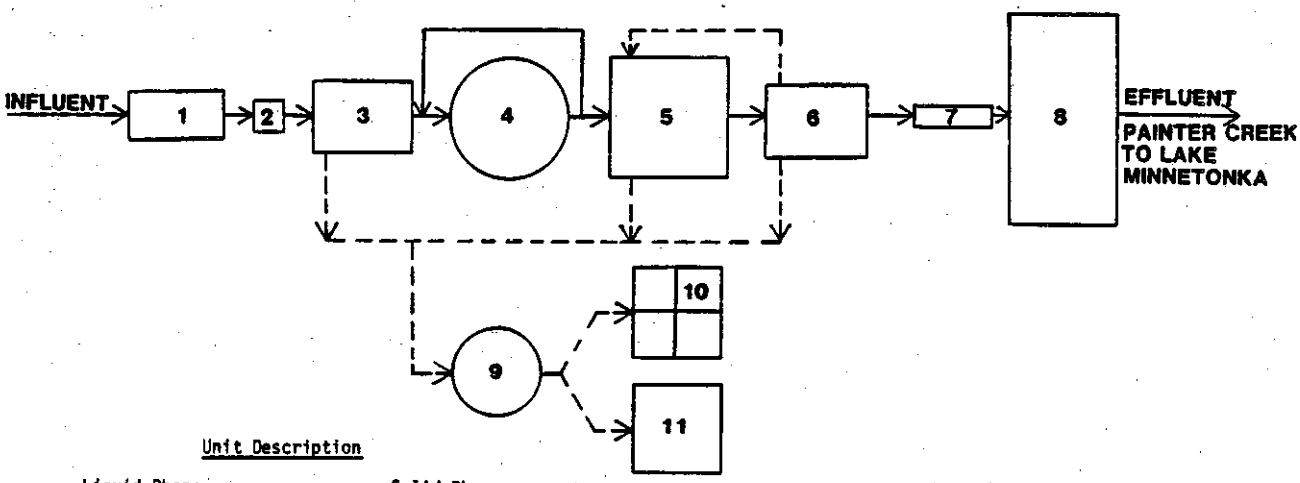
The NPDES Permit for the Maple Plain Plant expired in May, 1977, and was not reissued due to uncertainty in the future disposition of the plant. This problem still exists, as the Commission's recommended facilities plan (Interim Plant Improvements, then termination of plant operation by forcemain construction), the Metropolitan Council's Development Plan (plant upgrade and continued operation), and the Minnesota Pollution Control Agency's policy plan (elimination of all discharges to Lake Minnetonka) are in conflict.

Future

The long-term plan for this plant is to phase it out of service and divert the flow to the Blue Lake Plant. An interim plant expansion and upgrade for phosphorus removal is being studied as an alternative to immediate interceptor construction and plant phaseout.

MAPLE PLAIN WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

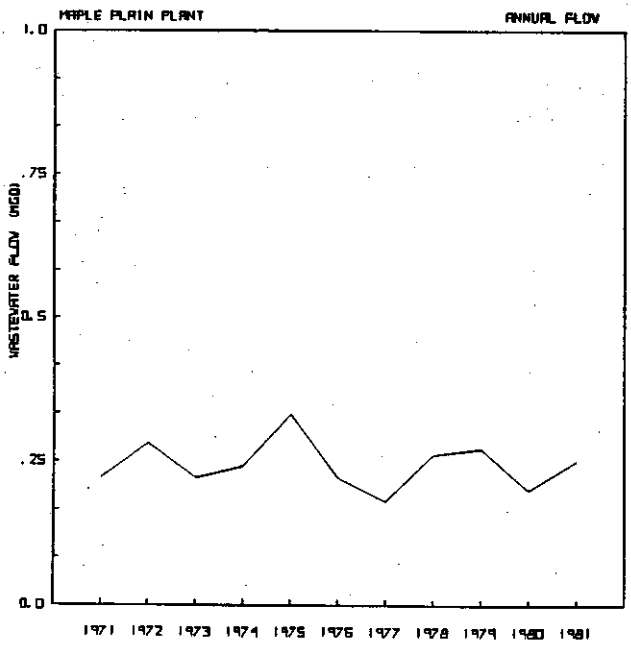
1. Grit Removal
2. Screening
3. Primary Sedimentation
4. Trickling Filter
5. Activated Sludge
6. Final Sedimentation
7. Chlorination
8. Effluent Pond

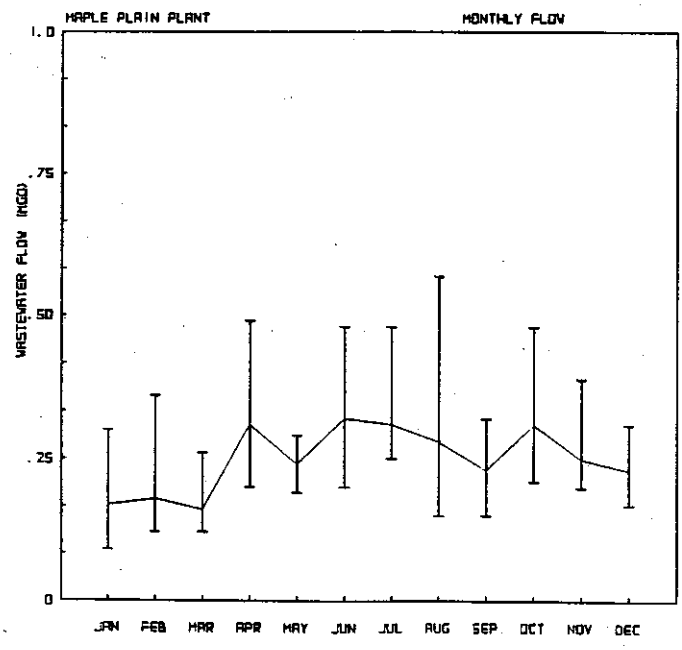
Solid Phase

9. Anaerobic Digestion
10. Sand Drying Beds
11. Land Spread

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



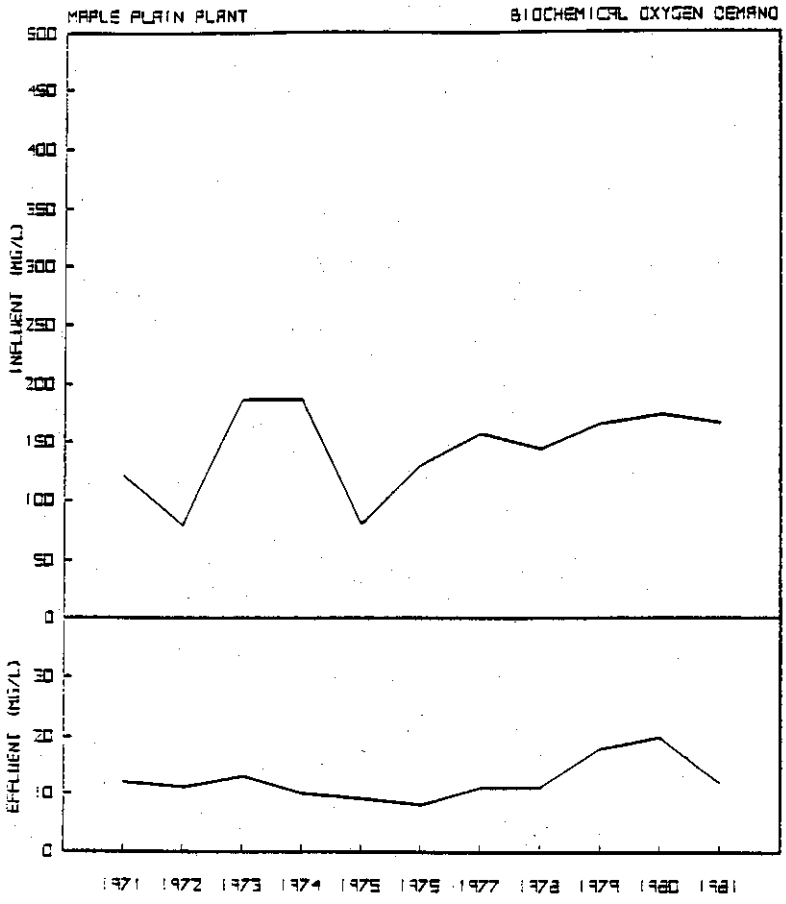


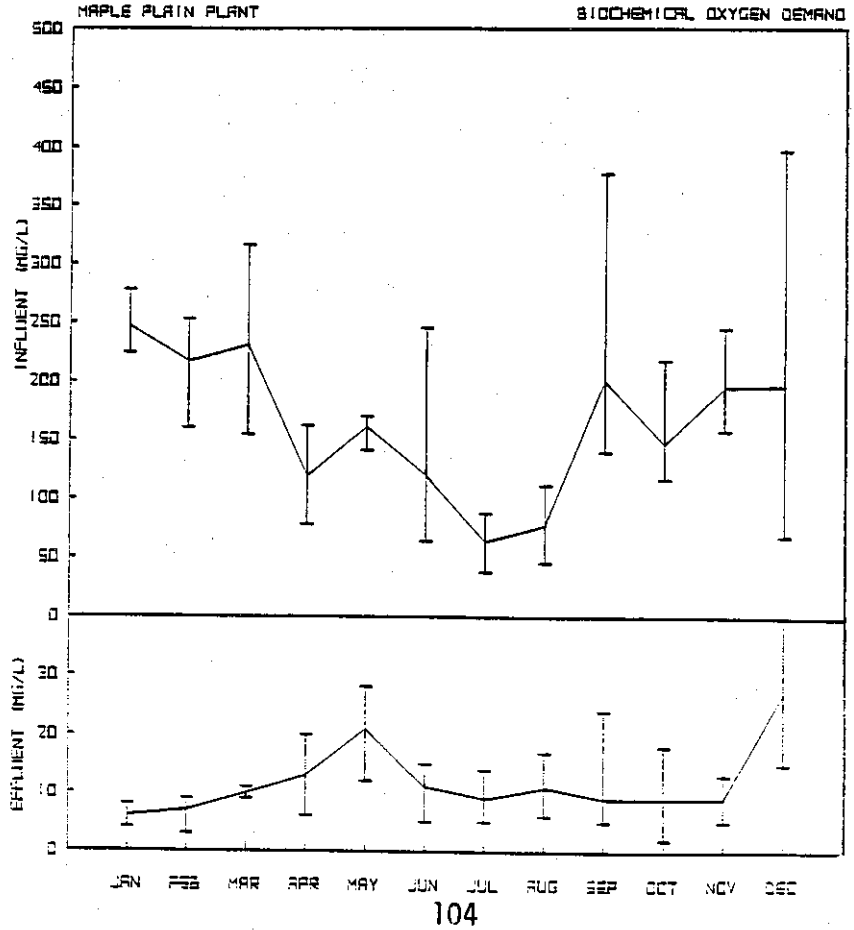
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Maple Plain

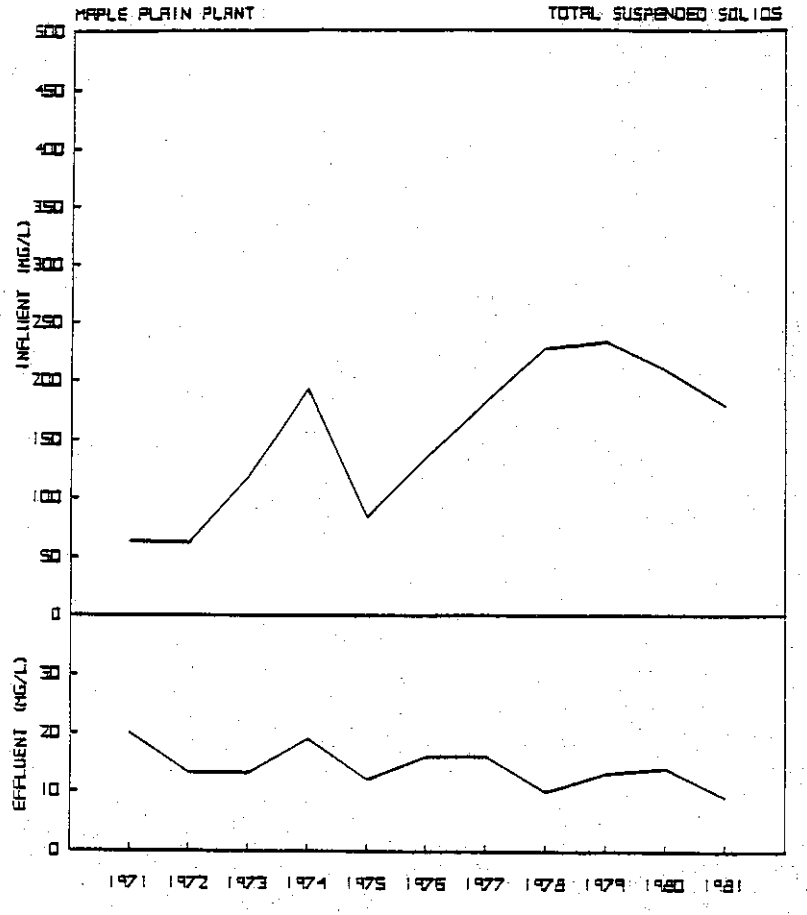
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.17	11	247	---	256	7.5-8.0
FEBRUARY	0.18	11	217	---	234	7.5-7.8
MARCH	0.16	12	231	---	245	7.6-7.8
APRIL	0.31	11	119	---	96	7.6-7.8
MAY	0.24	13	161	337	175	7.6-7.9
JUNE	0.32	14	120	212	125	7.4-8.0
JULY	0.31	15	64	141	112	7.4-7.6
AUGUST	0.28	17	78	189	208	7.3-7.6
SEPTEMBER	0.23	16	201	253	219	7.6-7.7
OCTOBER	0.31	15	147	291	126	7.6-7.8
NOVEMBER	0.25	15	196	365	174	7.7-7.8
DECEMBER	0.23	13	197	400	178	7.6-7.8
1981 AVERAGE	0.25	14	165	274	179	7.3-8.0
1980 AVERAGE	0.20	13	173	406	209	7.3-7.9

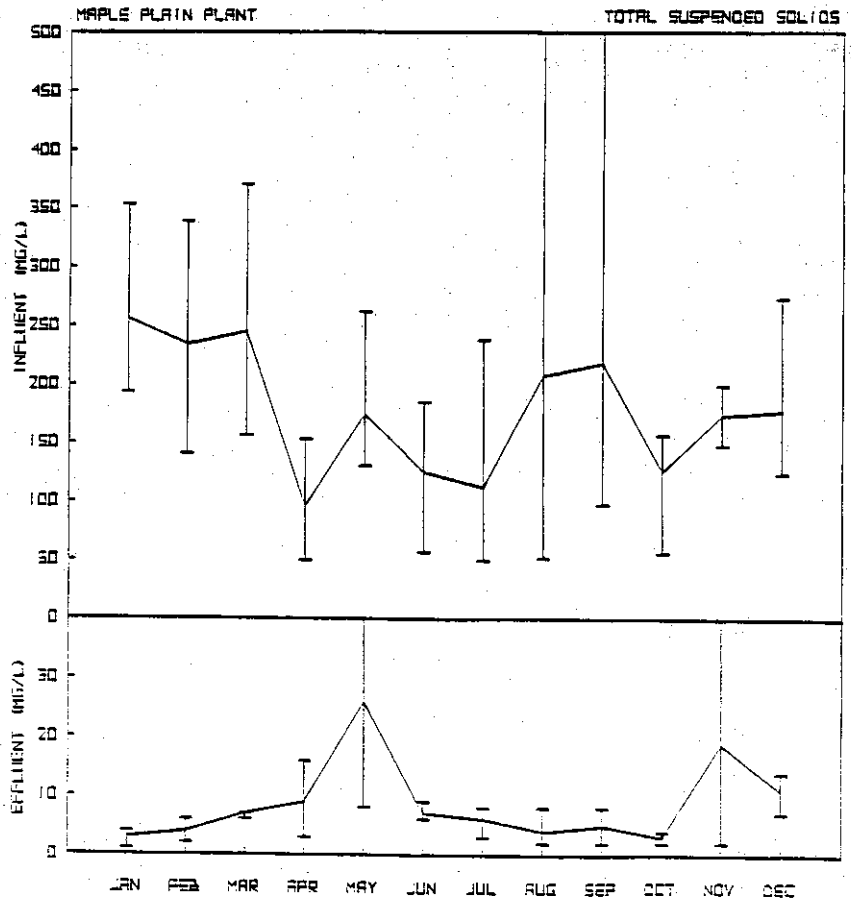
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: MAPLE PLAIN

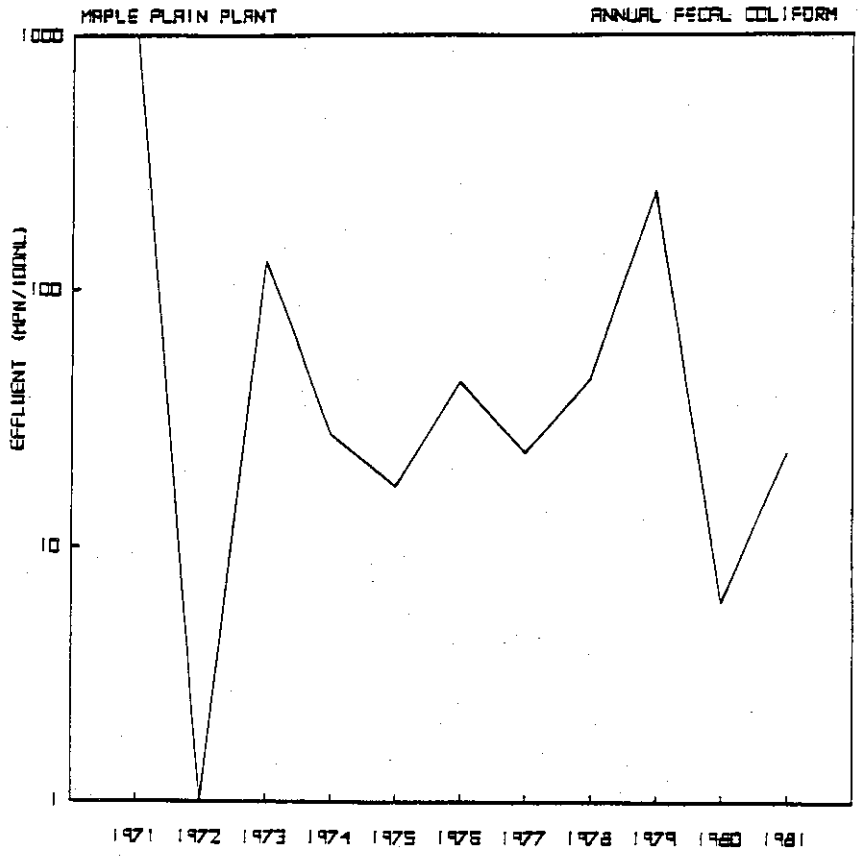
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
MPCES LIMIT	25	--	30	200	25	----	----	----	----	---	---	6.5-8.5	--	---	--	--
JANUARY	6	--	3	1	3	9.7	----	----	----	4.4	6.3	7.5-7.8	10	.7	98	99
FEBRUARY	7	--	4	1	5	17.2	----	----	----	4.1	6.3	7.5-7.8	11	.7	97	99
MARCH	10	--	7	1	4	18.5	----	----	----	3.6	6.8	7.5-7.8	10	.3	96	97
APRIL	13	--	9	8	5	9.7	----	----	----	2.5	7.9	7.5-7.8	23	.3	89	90
MAY	21	85	26	7	8	16.1	7.0	1.88	.21	3.3	7.4	7.5-7.8	26	0	87	85
JUNE	11	39	7	78	4	7.5	4.6	1.83	.46	2.8	4.0	7.5-8.1	10	0	91	94
JULY	9	40	6	16	6	17.9	13.5	5.30	.09	3.2	3.1	7.4-7.7	10	0	85	95
AUGUST	11	40	4	16	6	17.5	13.7	0.37	.10	2.7	3.4	7.3-7.7	11	0	86	98
SEPTEMBER	9	41	5	99	6	13.2	9.7	----	----	2.8	5.3	7.4-7.8	12	0	95	98
OCTOBER	3	30	3	5	3	10.5	7.1	----	----	2.6	6.3	7.6-7.8	10	0	94	97
NOVEMBER	9	44	19	---	4	18.1	13.9	2.34	.12	4.1	5.6	7.5-7.8	--	---	95	89
DECEMBER	27	83	11	---	11	29.4	19.8	0.07	.03	4.2	5.6	7.6-7.8	--	---	86	94
1981 AVG.	12	50	9	23	5	15.4	11.2	2.05	.17	3.4	5.6	7.3-8.1	13	0.3	93	95
1980 AVG.	20	104	14	5	9	8.2	----	----	----	4.0	6.0	6.7-8.0	--	---	88	93

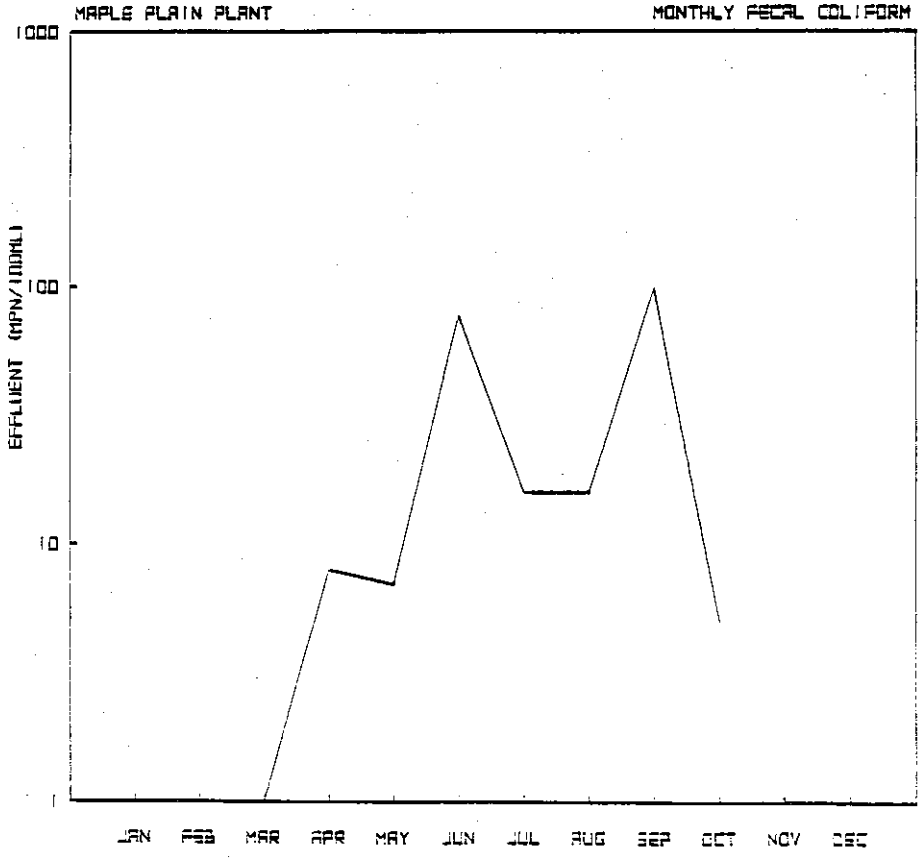

MAPLE PLAIN PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

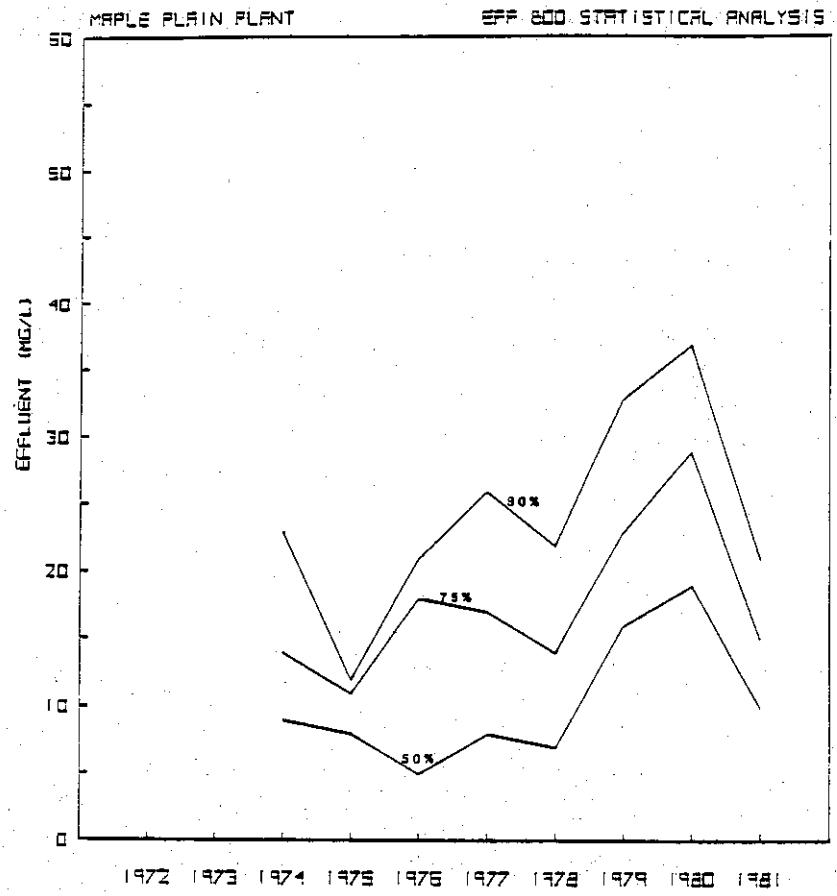

MAPLE PLAIN PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

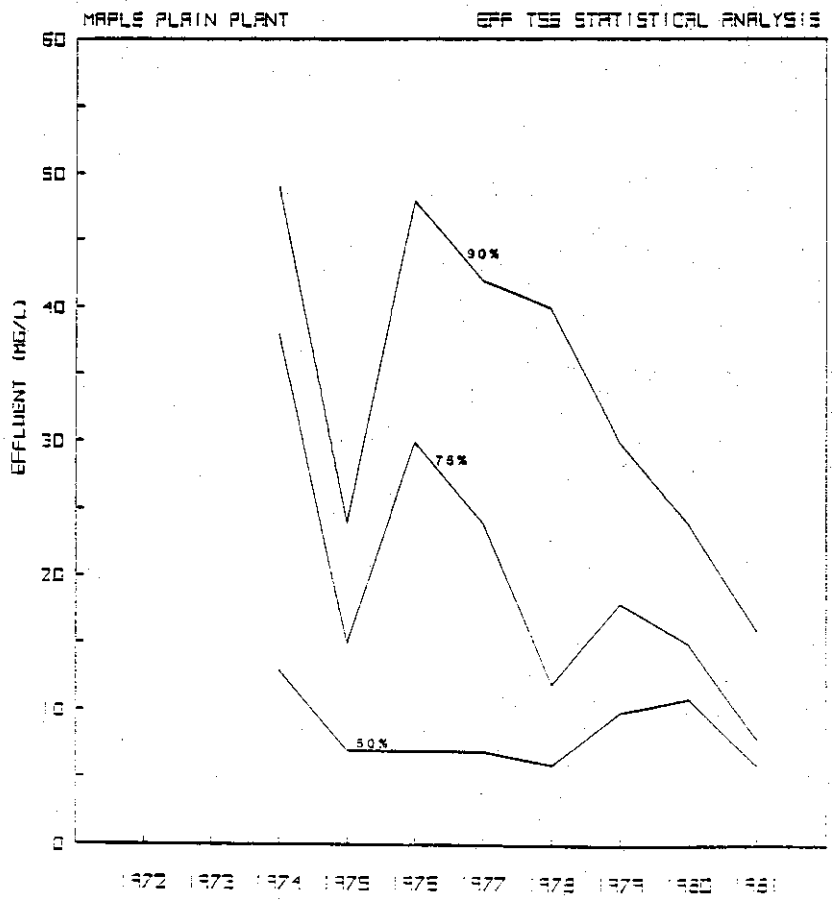

MAPLE PLAIN PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


MAPLE PLAIN PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


MAPLE PLAIN PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


MAPLE PLAIN PLANT
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


MAPLE PLAIN PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


MAPLE PLAIN PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
60
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

MEDINA WASTEWATER TREATMENT PLANT

Background

The Medina Plant was designed by William T. Mills, consulting engineer, and constructed in 1969. The plant has a design capacity of 0.10 mgd. The plant consists of a two-stage aerated lagoon followed by a two-stage seepage pond system. There is no surface discharge from the plant.

Performance

Plant flow averaged 0.104 mgd in 1981, slightly greater than 0.0098 mgd in 1980. Average aeration pond effluent quality was 26 mg/L BOD and 18 mg/L TSS, representing removal rates of 80% for BOD and 86% for TSS. Plant performance was adversely affected by discharges in October and November, which represent violations of permit conditions.

Activites

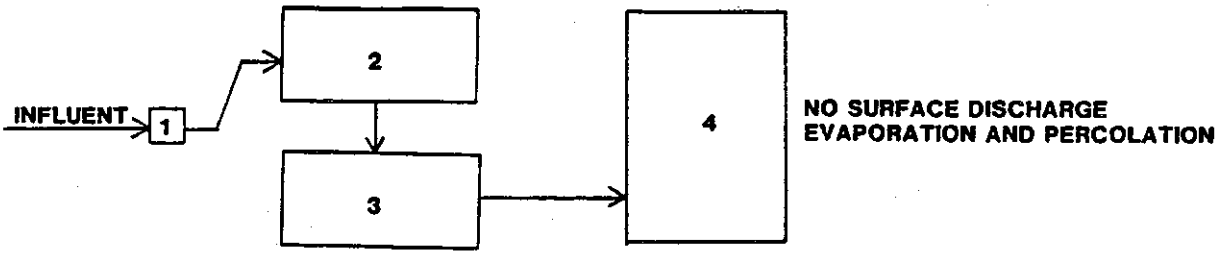
Subsequent to the issuance of a new State Disposal System Permit on November 4, 1980, the Commission undertook a project during the summer of 1981 to repair muskrat damage to seepage pond dikes to avoid unauthorized discharges through the dikes. Following this action, seepage pond capacity was significantly reduced, resulting in high seepage pond levels, and discharges in October and November of 1981. On December 7, 1981, the Commission requested permission for an emergency discharge from the Medina Plant to Elm Creek, in order to reduce the high level in the seepage ponds. The MPCA gave permission for the discharge on December 11, and the discharge began on December 21. Studies of plant capacity and alternatives to resolving plant problems were conducted in late 1981 and continued in 1982.

Future

Studies have recently been completed and have recommended plant phaseout and diversion of flow to the Metro Plant.

MEDINA WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



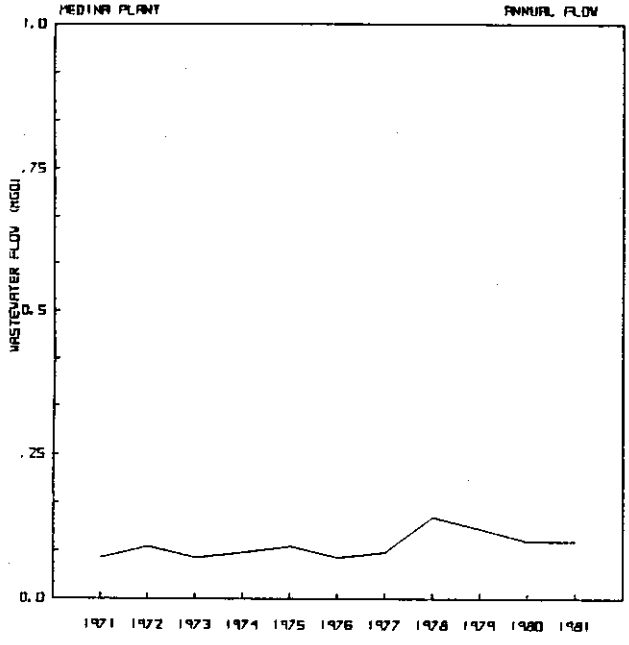
Unit Description

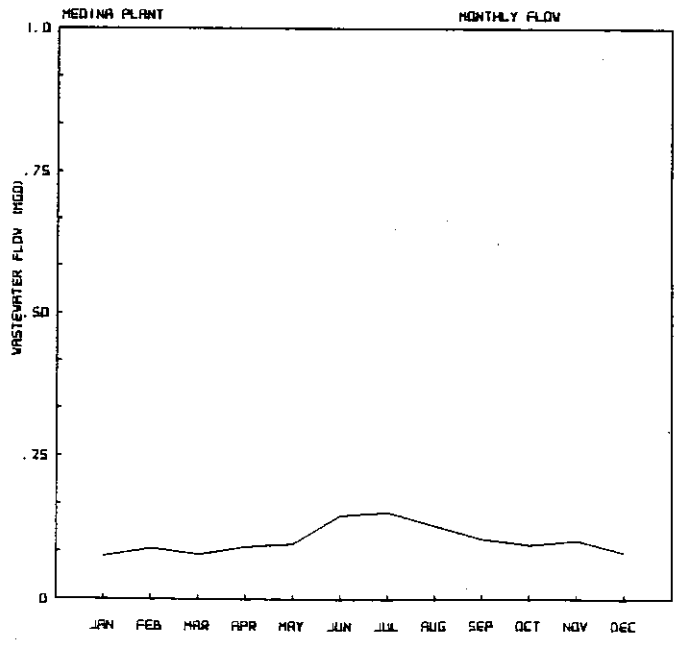
Liquid Phase

1. Screening
2. Primary Aerated Pond
3. Final Aerated Pond
4. Absorption Pond

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



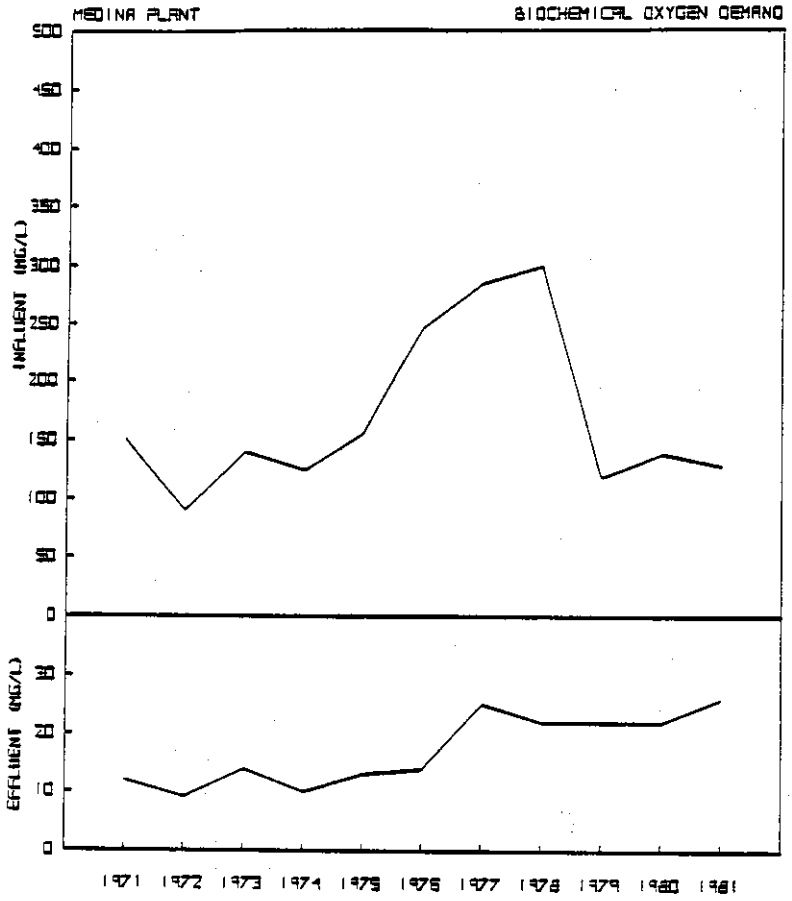


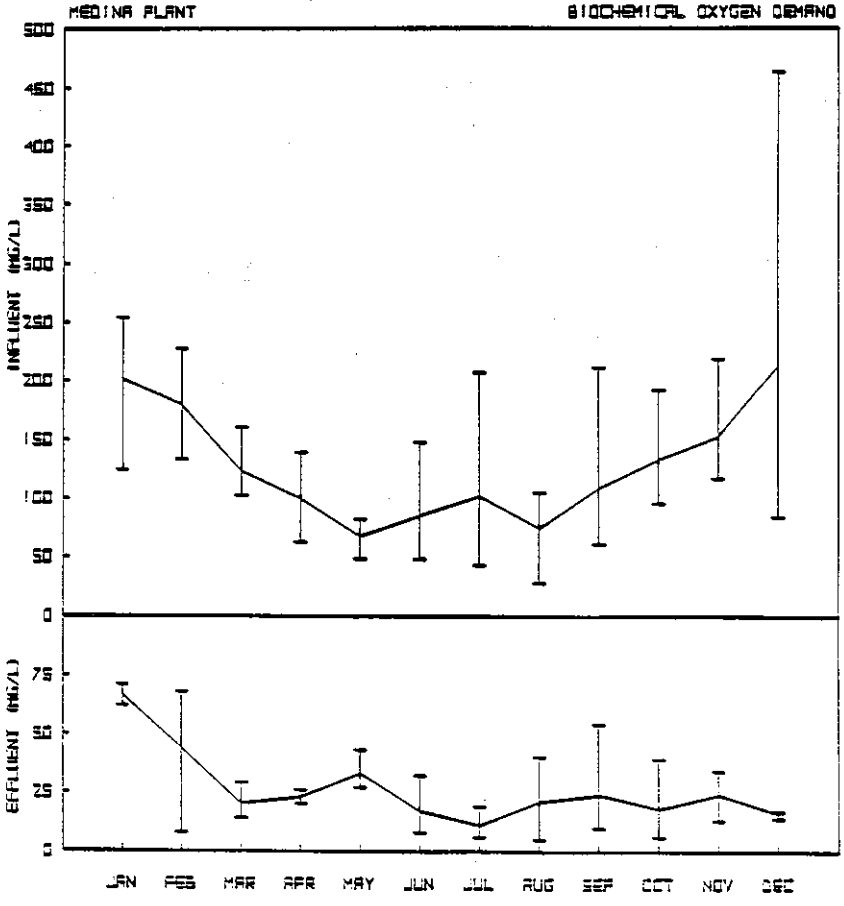
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Medina

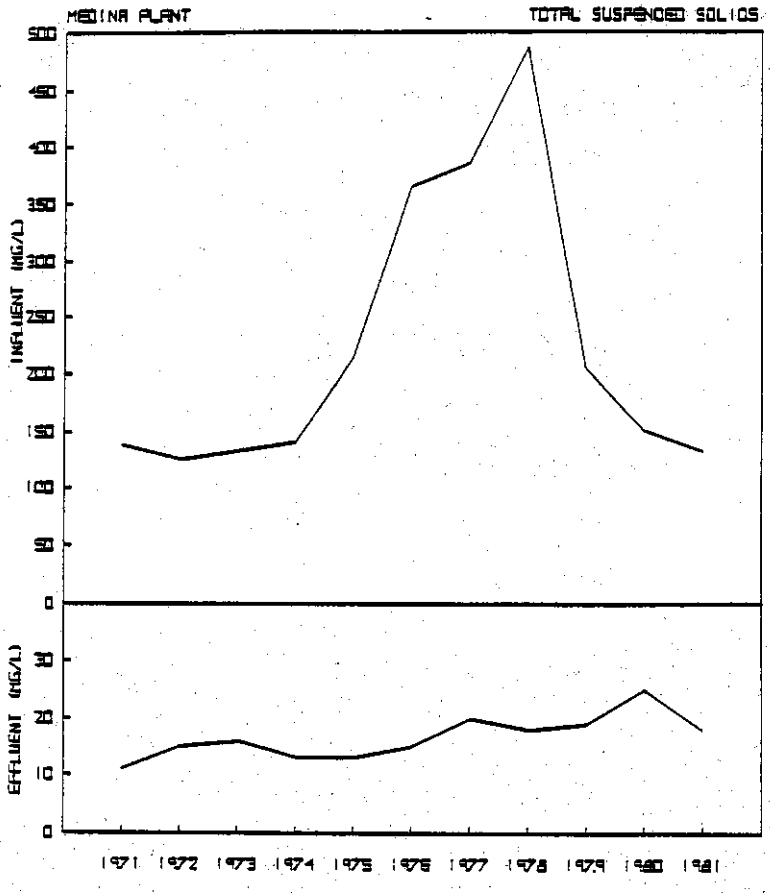
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.075	--	201	---	181	-------
FEBRUARY	0.088	--	179	---	146	-------
MARCH	0.078	--	123	---	92	-------
APRIL	0.092	--	99	---	92	-------
MAY	0.097	13	67	177	78	7.8-7.8
JUNE	0.147	14	85	133	62	7.7-7.8
JULY	0.152	--	102	203	92	7.6-7.8
AUGUST	0.128	15	74	164	161	7.7-7.8
SEPTEMBER	0.105	15	109	216	97	7.7-7.8
OCTOBER	0.096	15	133	263	149	7.5-7.9
NOVEMBER	0.104	15	153	326	252	7.5-7.8
DECEMBER	0.082	13	213	410	182	7.6-7.8
1981 AVERAGE	0.104	14	128	236	132	7.6-7.9
1980 AVERAGE	0.104	14	139	222	151	7.5-7.8

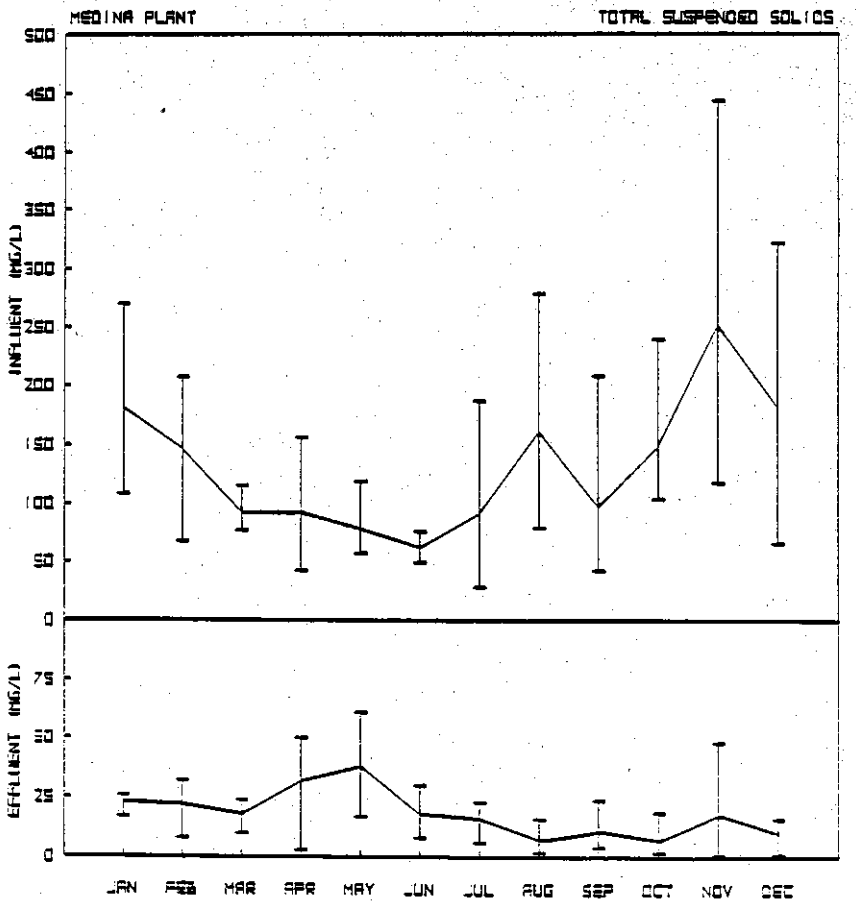
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: MEDINA

Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT																
JANUARY	57	---	23	---	15	----	----	----	----	----	3.7	6.5-7.5	---	--	67	87
FEBRUARY	44	---	22	---	16	----	----	----	----	----	1.7	6.5-6.9	---	--	76	85
MARCH	20	---	18	---	8	----	----	----	----	----	3.1	7.0-7.5	---	--	84	81
APRIL	23	---	32	---	7	----	----	----	----	----	4.4	7.4-7.8	---	--	76	65
MAY	33	108	38	---	10	9.9	2.9	.47	1.56	2.2	4.8	7.5-7.9	---	--	51	51
JUNE	17	72	18	---	12	11.5	7.0	.03	.07	3.0	4.0	7.6-7.9	---	--	81	71
JULY	11	55	16	---	7	11.9	8.9	.09	.04	3.6	3.1	7.7-7.8	---	--	89	83
AUGUST	21	53	7	---	8	13.0	8.6	.10	.03	2.9	3.3	7.7-7.8	---	--	72	95
SEPTEMBER	24	51	11	---	5	9.7	3.5	---	---	3.0	4.4	7.6-7.8	---	--	78	89
OCTOBER	18	40	7	---	8	10.9	7.1	---	---	2.8	4.2	7.5-7.8	---	--	86	95
NOVEMBER	24	74	18	---	7	17.7	10.4	2.54	.09	3.8	2.2	7.5-7.8	---	--	84	93
DECEMBER	16	56	10	---	8	23.8	17.5	.11	.05	4.3	2.4	7.5-7.7	---	--	93	95
1981 AVG.	25	65	18	---	9	13.4	8.2	.57	.31	3.2	3.4	6.5-7.9	---	--	80	86
1980 AVG.	22	98	25	---	10	----	----	----	----	---	6.5	7.4-7.8	---	--	84	83


MEDINA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


MEDINA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


MEDINA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


MEDINA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

METROPOLITAN WASTEWATER TREATMENT PLANT

Background

The Metropolitan Plant was designed by TKDA and constructed in several stages. The original plant was constructed in 1938, and provided primary treatment only. In 1966, secondary treatment portions of the plant were placed into operation, providing a high rate activated sludge process, with a design capacity of approximately 218 mgd. In 1972, four additional aeration tanks and two turbo-compressors were placed into operation allowing enough capacity to operate a step aeration activated sludge process. Subsequent to 1972, the following additions have been made to the Metropolitan Plant: (1) East pretreatment and primary treatment facilities were placed into operation in March, 1978; (2) East secondary treatment facilities were placed into operation in August 1978; (3) Dissolved air flotation thickening facilities were placed into operation in November, 1978; (4) Filtration and Incineration Building No. 1 scrubbing system was placed into operation in June, 1979; (5) In March, 1980, the sludge storage facilities and sludge thermal conditioning facilities were placed into operation; (6) Return liquor treatment facilities were placed into service in April, 1980; (7) In August, 1980, plate and frame presses were placed into operation for sludge dewatering.

Performance

Plant flow averaged 202 mgd in 1981, slightly lower than 206 mgd in 1980. Effluent quality during 1981 improved from that of 1980. Average effluent BOD and TSS concentrations during 1981 were 19 mg/L and 19 mg/L as compared to 1980 average effluent BOD and TSS values of 26 mg/L and 23 mg/L. This is the second consecutive year that the Metropolitan Plant has shown significant improvement. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

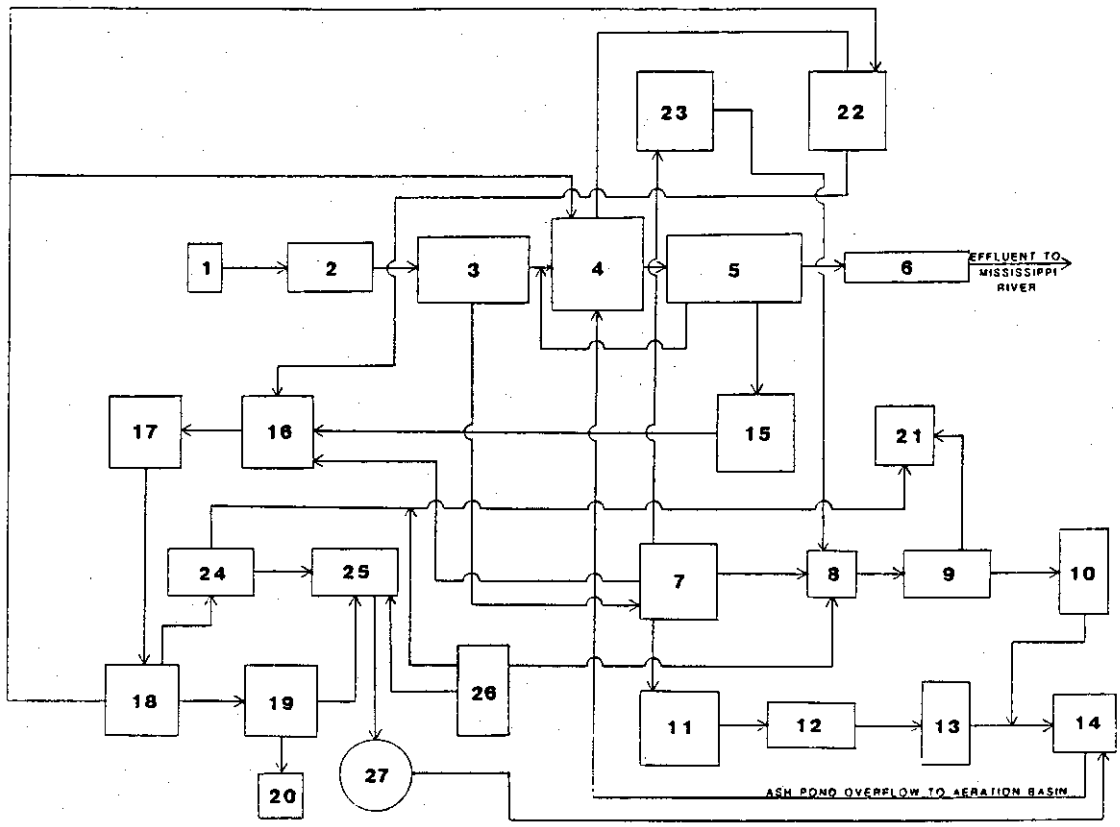
Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	40	30	20	14	53	53	29	24	64	71	44	36
TSS	37	43	15	10	55	85	33	24	78	137	60	47

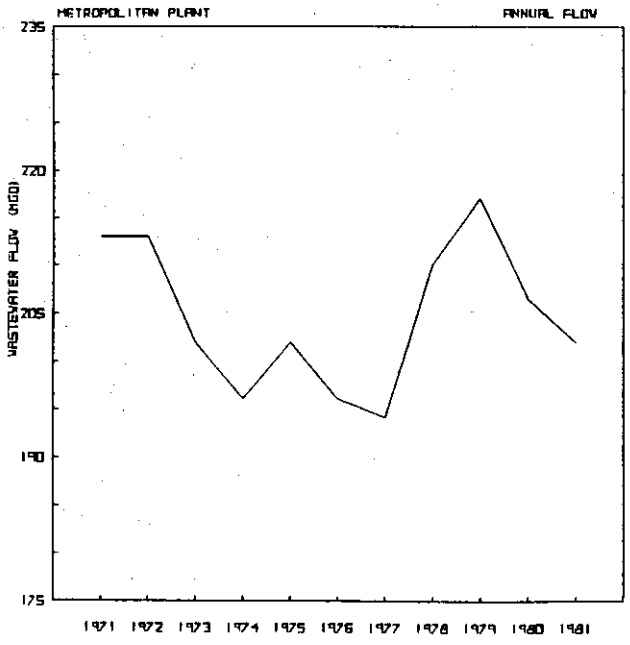
Activities

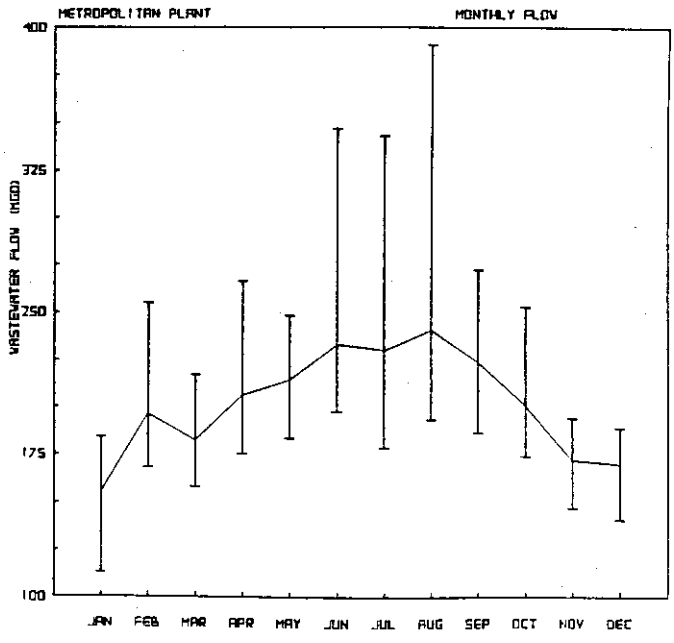
Major emphasis by Operations Personnel in 1981 was placed on optimizing operation of new processes and equipment brought on line in 1980. Additional operator training and experience allowed for continued meeting of air quality standards for F & I No. 1 incinerator emissions. Modifications to the filter press diaphragms and filter media design improved filter press performance significantly.

METROPOLITAN WASTEWATER TREATMENT PLANT
FLOW DIAGRAM



Liquid Phase		Solid Phase	
1. Screening	7. Gravity Thickening	14. Ash Pond	21. South Loadout
2. Grit Removal	8. Holding Tank	15. Flotation Thickening	22. Return Liquors Bio.
3. Primary Sedimentation	9. Vacuum Filtration	16. Sludge Storage	23. Return Liquors P-Chem.
4. Activated Sludge	10. Incineration	17. Thermal Conditioning	24. Vacuum Filter
5. Final Sedimentation	11. Concentration	18. Decant Thickening	25. Incinerator
6. Chlorination	12. Vacuum Filtration	19. Plate & Frame Press	26. Roll Press
	13. Incineration	20. North Loadout	27. Silos



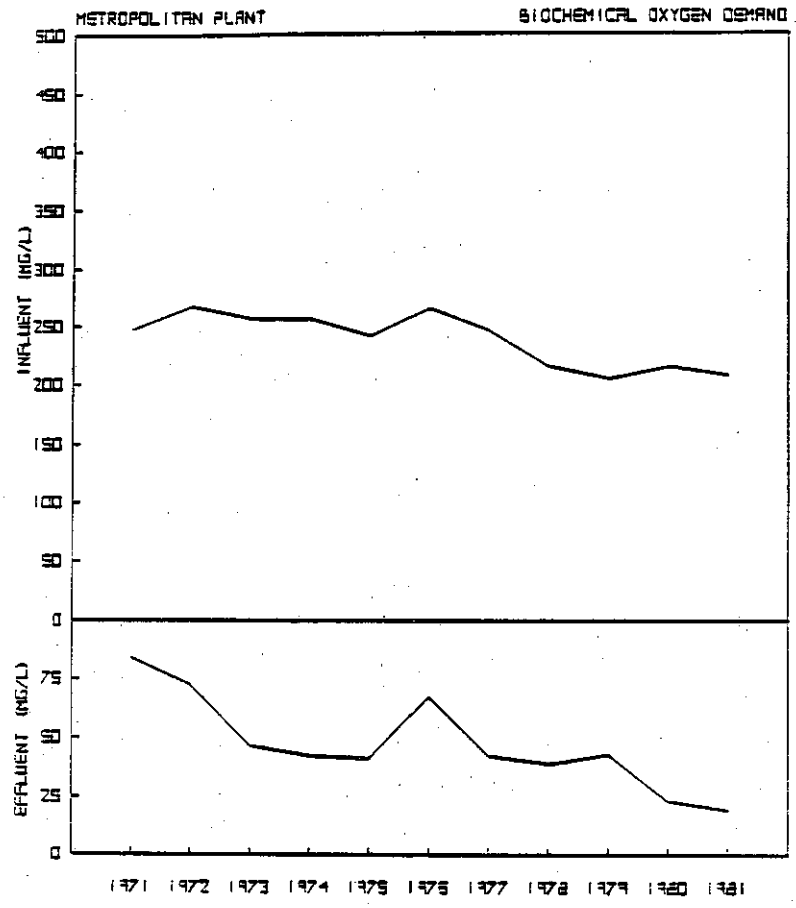


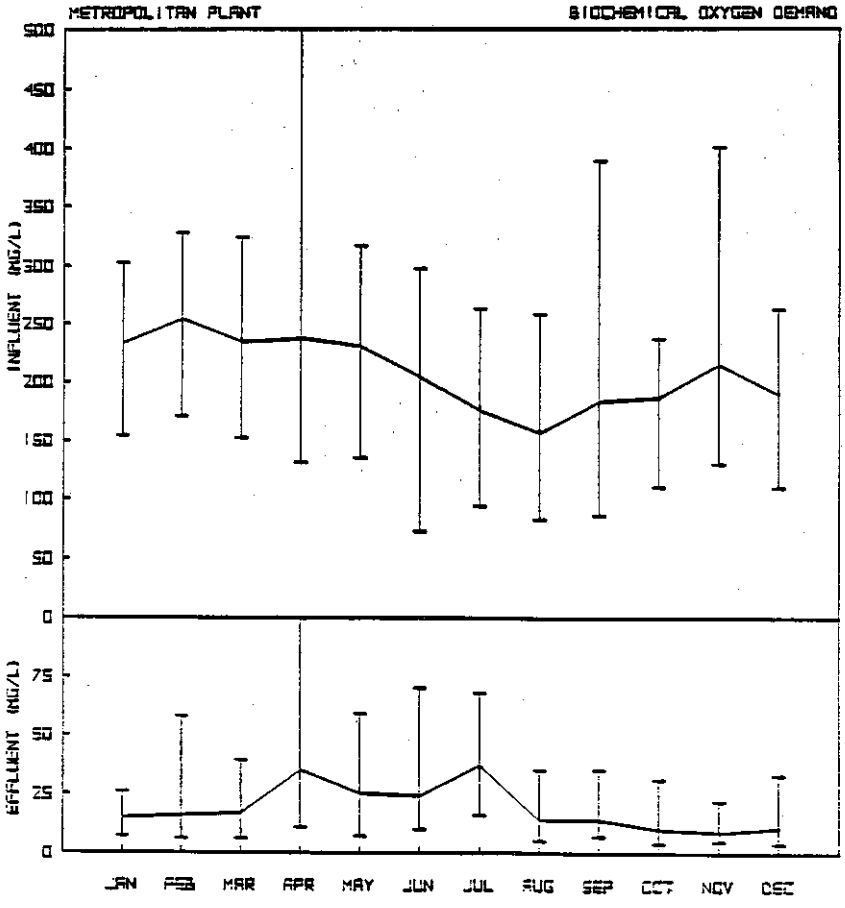
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Metropolitan

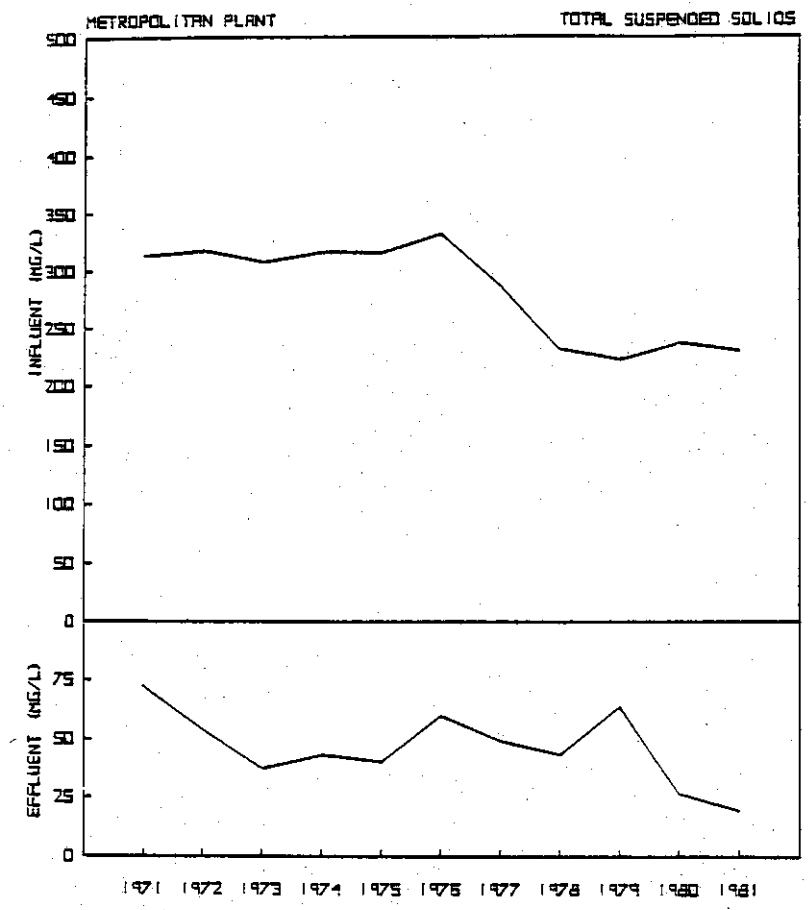
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	155	13	233	460	243	6.7-7.8
FEBRUARY	196	13	254	485	259	6.7-8.8
MARCH	182	13	234	441	215	6.7-8.5
APRIL	206	14	237	507	265	5.4-8.5
MAY	214	16	230	444	245	6.6-8.7
JUNE	233	18	204	392	239	6.4-7.5
JULY	230	20	176	358	227	6.5-8.3
AUGUST	241	20	157	317	193	6.2-7.5
SEPTEMBER	224	20	184	367	219	6.9-7.6
OCTOBER	201	19	187	391	222	7.1-7.5
NOVEMBER	172	17	215	405	225	6.7-7.7
DECEMBER	170	16	190	394	207	6.5-9.0
1981 AVERAGE	202	17	208	413	230	5.4-9.0
1980 AVERAGE	206	16	215	442	237	6.5-9.4

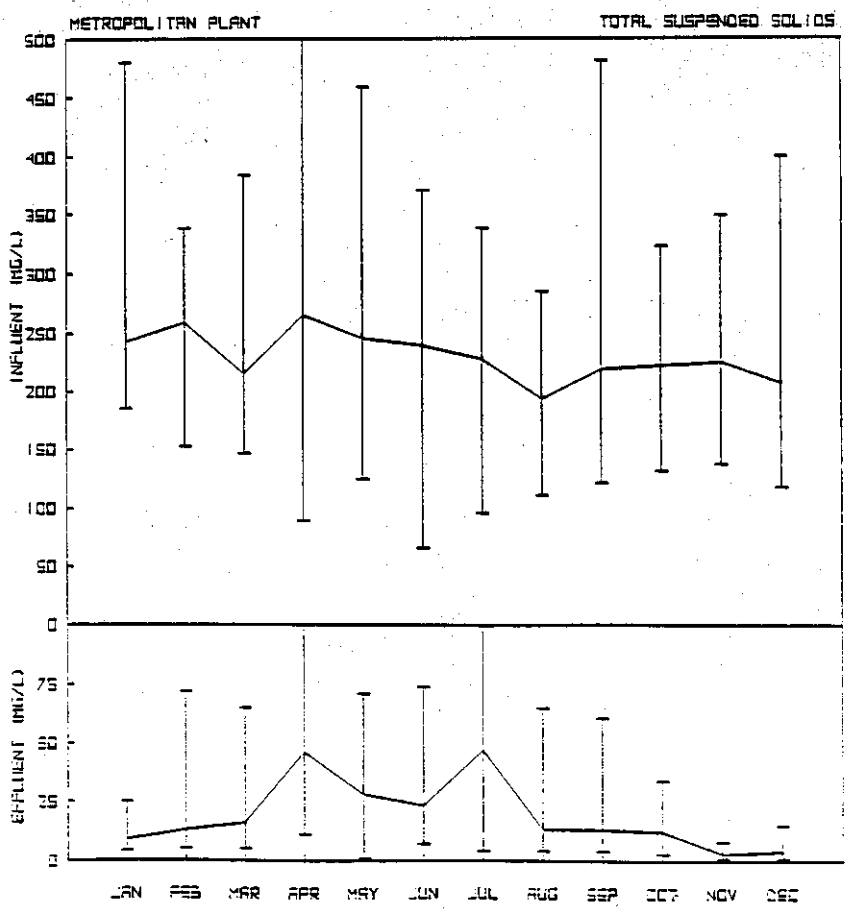
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: METROPOLITAN

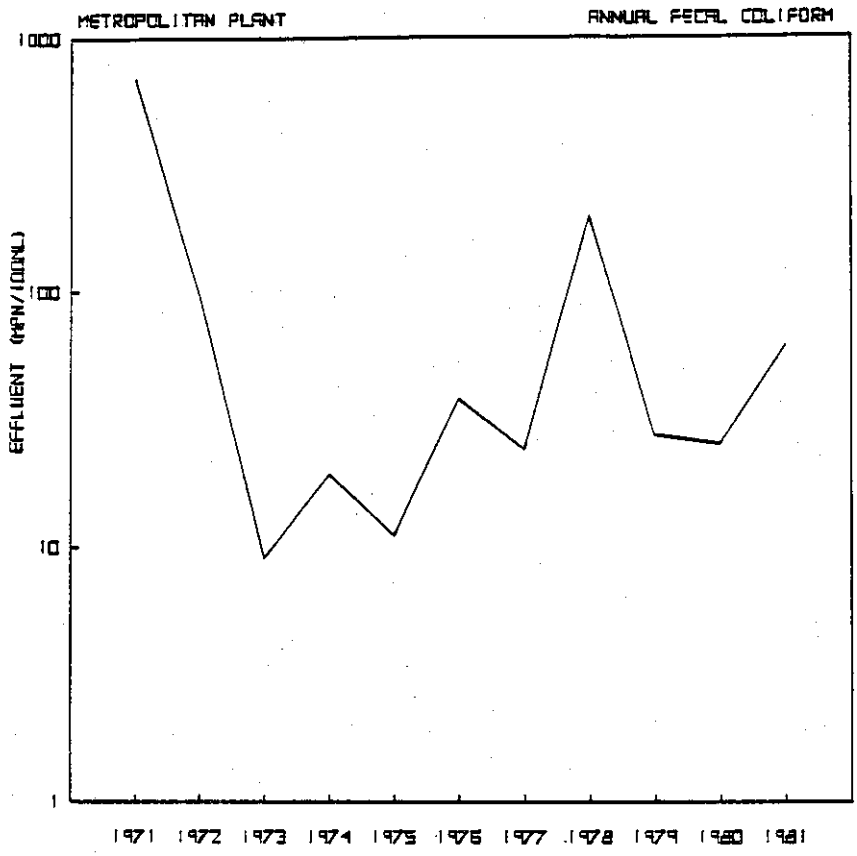
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	30/25*1	--	30	200	--	-----	-----	-----	-----	---	---	6.5-8.5	-------	---	--	--
JANUARY	15	67	9	6	6	18.7	15.3	2.33	.47	3.1	2.0	6.9-7.5	5832	1.9	94	96
FEBRUARY	16	73	13	3	8	22.4	16.4	1.39	.50	2.2	2.6	6.6-7.5	6257	1.9	94	95
MARCH	17	72	16	4	8	21.1	14.6	1.59	.42	2.0	1.3	6.8-7.5	6271	1.8	93	92
APRIL	35	110	46	19	20	17.1	10.7	3.38	.99	2.8	2.2	6.7-7.8	6993	1.7	85	83
MAY	25	91	28	37	15	20.6	11.0	3.05	.91	2.2	3.5	6.8-7.4	6613	1.8	89	88
JUNE	24	76	23	52	11	13.5	9.1	1.96	1.11	2.0	4.1	6.7-7.3	7027	1.3	88	91
JULY	37	104	47	272	22	13.9	7.6	2.34	1.63	2.2	1.8	6.8-7.9	7110	1.4	79	79
AUGUST	14	63	13	168	7	13.5	8.1	3.05	.89	1.5	3.5	6.8-7.6	8097	2.0	91	93
SEPTEMBER	14	71	13	19	7	18.2	13.1	-----	-----	1.9	3.2	7.2-8.0	12120	3.6	92	94
OCTOBER	10	74	12	20	5	22.4	14.3	-----	-----	1.8	3.4	7.0-7.6	11910	3.9	95	94
NOVEMBER	9	55	3	---	2	23.3	17.9	0.30	.95	1.6	2.1	7.2-8.3	-------	---	96	99
DECEMBER	11	63	4	---	3	25.9	17.3	2.83	.75	2.2	1.8	7.3-8.3	-------	---	94	98
1981 AVG.	19	77	19	50	10	19.2	12.9	2.27	.85	2.0	2.6	6.5-8.3	7823	2.2	91	92
1980 AVG.	23	79	25	25	13	16.7	12.7	3.29	1.24	2.4	2.3	6.5-8.0	-------	---	89	89

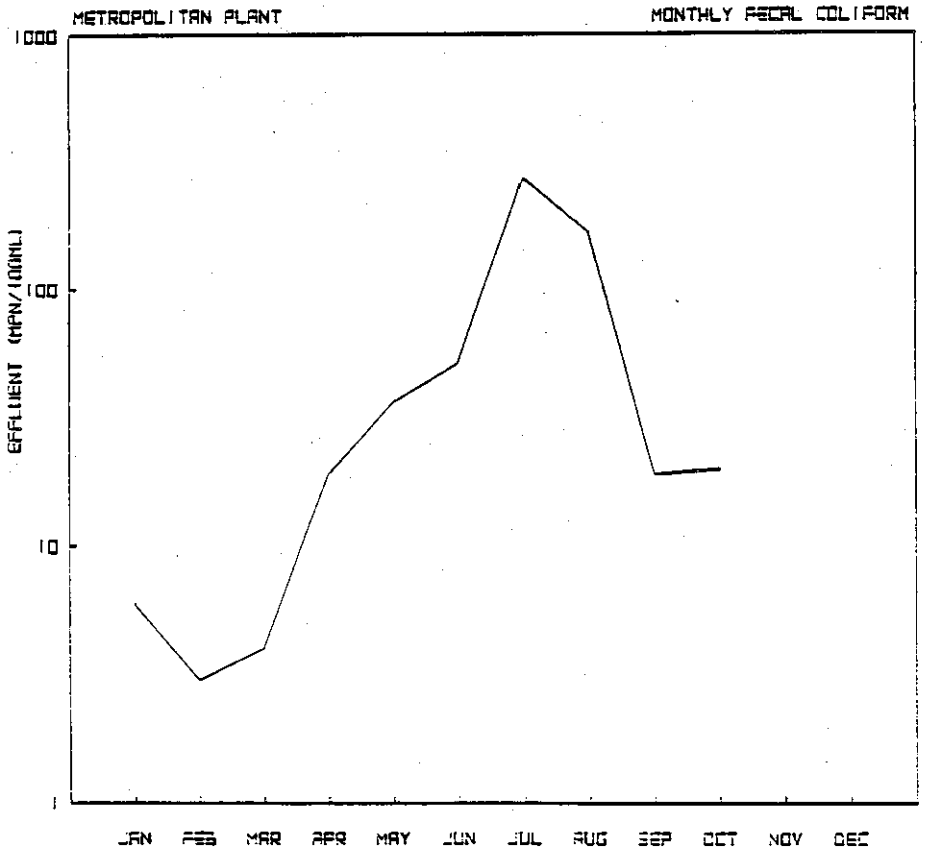

METROPOLITAN PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

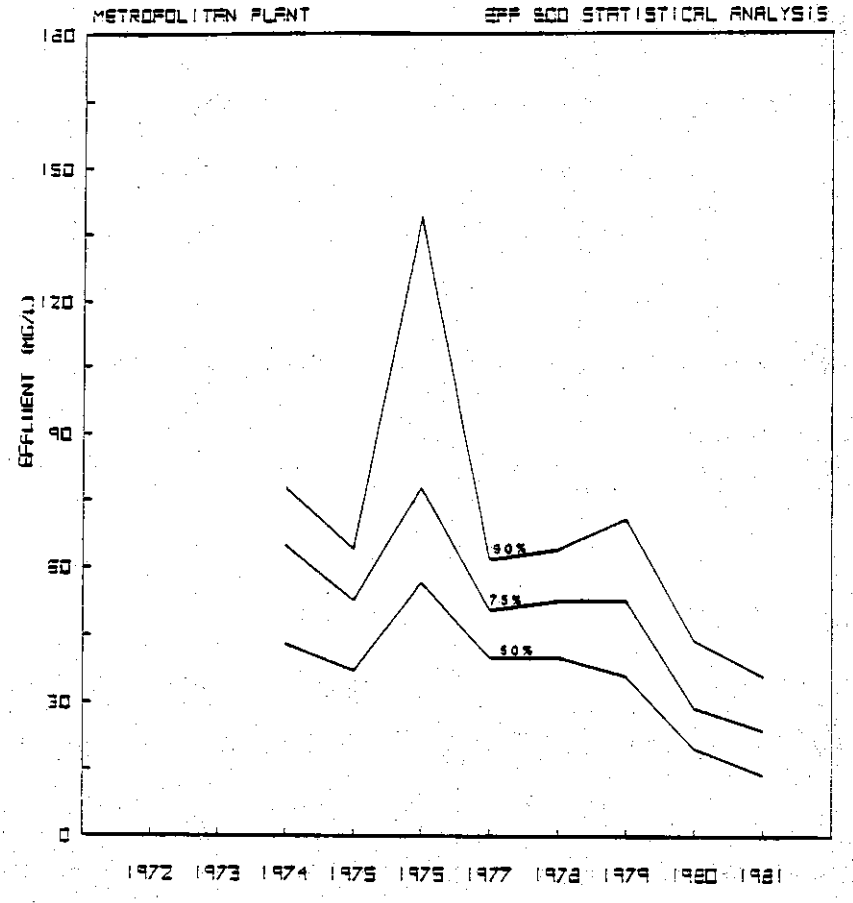

METROPOLITAN PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

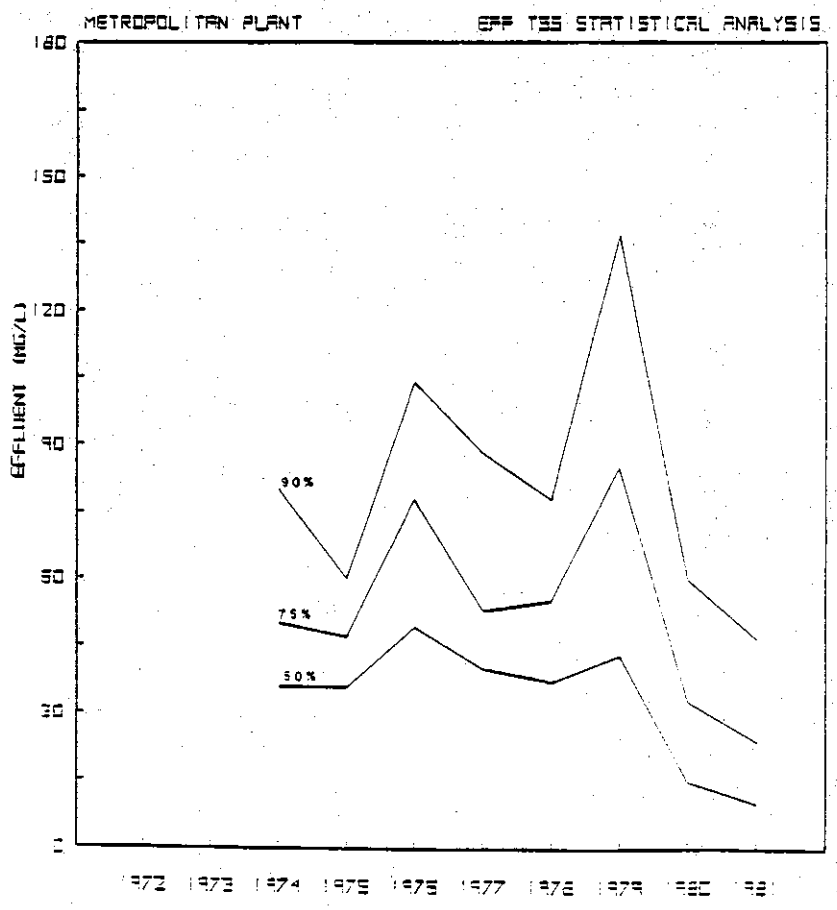

METROPOLITAN PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
500
450
400
350
300
250
200
150
100
50
0
75
50
25
0
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


METROPOLITAN PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
500
450
400
350
300
250
200
150
100
50
0
75
50
25
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


METROPOLITAN PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


METROPOLITAN PLANT
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


METROPOLITAN PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


METROPOLITAN PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
180
150
120
90
60
30
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

1981 EFFLUENT DATA
METROPOLITAN PLANT

Month	Cu mg/l	Cr mg/l	Zn mg/l	Pb mg/l	CN mg/l	Cd mg/l	Hg ug/l	Ni mg/l	As ug/l	Sn ug/l	Phenol ug/l	Fe mg/l
January	0.02	<0.08	0.12	< 0.06	0.077	<0.01	<0.53	0.12	<1.1	<0.8		
February	0.02	<0.06	0.13	< 0.05	0.061	<0.01	< 0.75	0.12	<1.2	<0.8		
March	<0.03	<0.07	0.14	<0.05	0.068	<0.01	< 0.49	0.11	<1.2	<0.5		
April	0.06	<0.11	0.17	<0.05	0.091	<0.01	<0.22	0.10	<1.0	<0.8		
May	<0.04	<0.09	0.16	<0.05	0.082	<0.01	<0.23	0.10	<1.1	<0.8		
June	<0.04	0.10	0.14	<0.05	0.074	<0.01	<0.25	0.09	<1.0	<0.8		
July	0.05	<0.11	0.17	<0.06	0.106	<0.009	<0.53	0.10	1.4	<0.8		
August	<0.03	<0.06	0.11	<0.05	0.082	<0.008	<0.22	0.10	<1.0	<0.8		
September	<0.03	<0.06	0.11	<0.05	0.128	<0.008	<0.22	0.11	<1.1	<0.8		
October	<0.02	<0.06	0.16	<0.05	0.129	<0.008	<0.61	0.12	<1.1	<0.8		
November	<0.01	<0.10	0.09	<0.05	0.086	<0.008	<0.20	0.11	<1.1	<0.8		
December	<0.01	<0.05	0.08	<0.05	0.115	<0.008	< 0.20	0.11	<1.1	<0.8		
1981 Avg.	<0.03	<0.08	0.13	<0.05	0.092	<0.009	<0.37	0.11	<1.1	<0.8		

ROSEMOUNT WASTEWATER TREATMENT PLANT

Background

The Rosemount Plant was designed by Bannister, Short, Elliot, Hendrickson and Associates and constructed in 1973. The plant has a design capacity of 0.6 mgd. Liquid treatment consists of physical-chemical treatment processes, including chemical addition and solids contact clarification, two stages of dual media filtration, activated carbon column adsorption, and chlorination. Plant effluent is discharged to the Spring Lake area of the Mississippi River. Solids processing facilities consist of sludge storage tank and sludge hauling to the Metropolitan Plant Interceptor System. The plant is subject to secondary effluent limits, and a 1 mg/L phosphorus limit.

Performance

Plant flow averaged 0.30 mgd in 1981, nearly equal to 0.29 mgd in 1980. Average plant effluent quality was 14 mg/L BOD, 2 mg/L TSS, and 0.2 mg/L P. Plant performance was excellent throughout the year, as no NPDES Permit violations were experienced. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	11	10	11	12	15	15	14	15	22	20	20	19
TSS	3	2	2	1	5	3	3	2	7	5	3	3

Activities

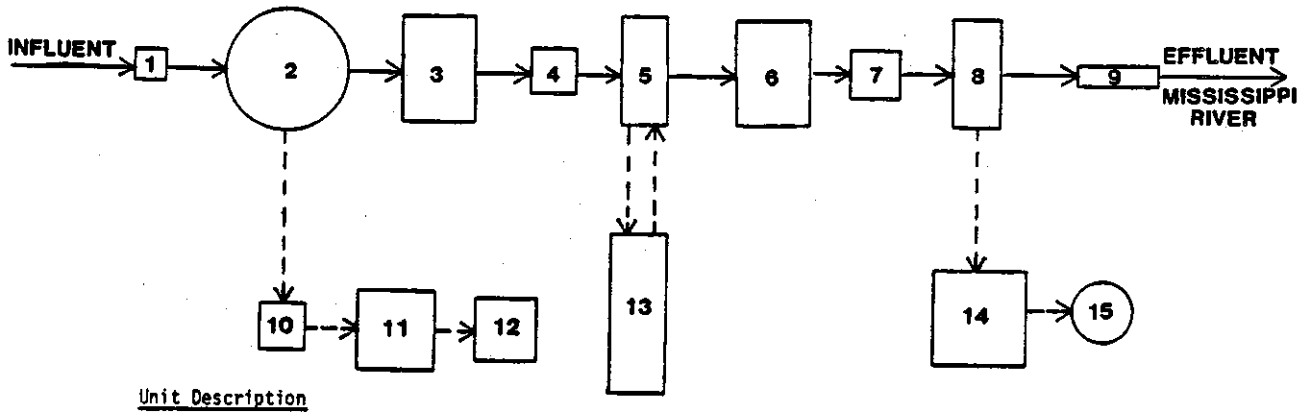
Reapplication for the plant NPDES Permit, which expires on June 30, 1982, was submitted to the MPCA on December 30, 1981.

Future

A long-term plan for the Rosemount Plant is to replace it with a lower cost, conventional, biological treatment plant at the existing site. This is expected to occur during the 1980's.

ROSEMOUNT WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

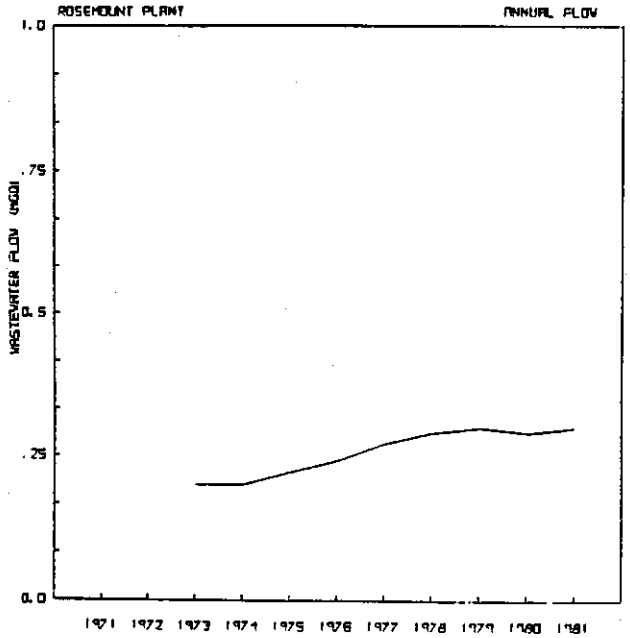
1. Screening
2. Solids Contact Clarifier
3. Dual Media Filters
4. Filtered Water Storage
5. Granular Carbon Columns
6. Dual Media Filters
7. Filtered Water Storage
8. Ion Exchange Columns
9. Chlorination

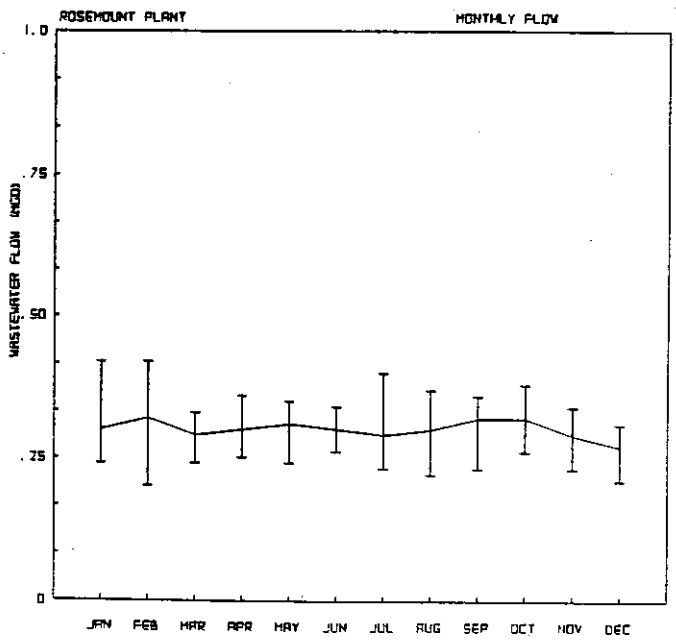
Solid Phase

10. Sludge Holding Tank
11. Sludge Dewatering
12. Land Spread
13. Carbon Regeneration System
14. Ion Exchange Regeneration System
15. Ammonia Recovery

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



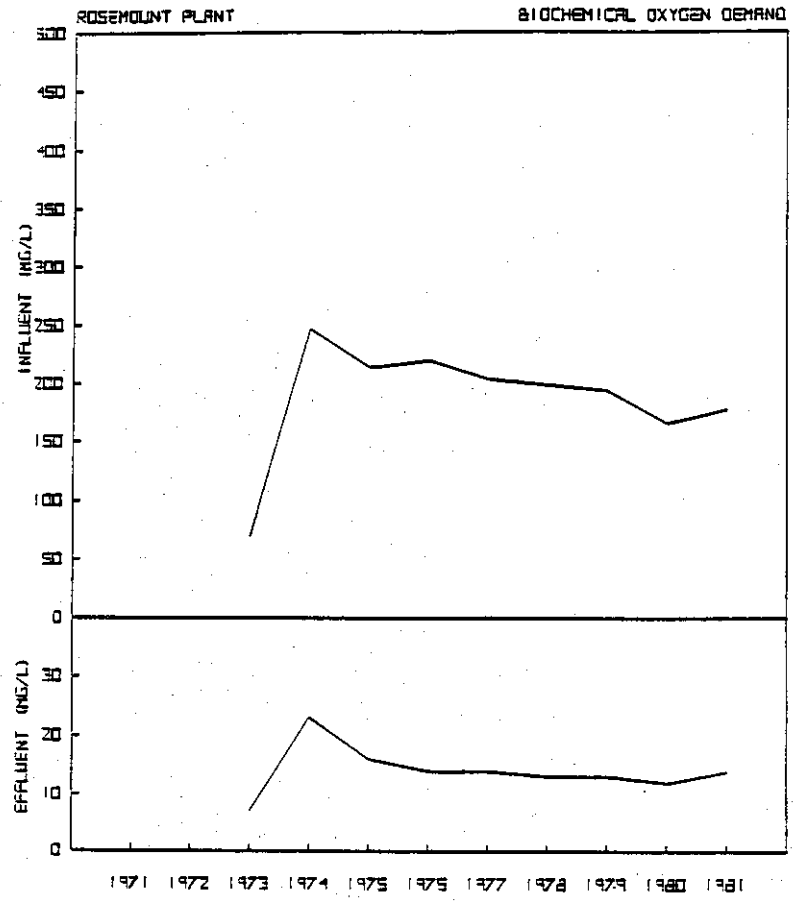


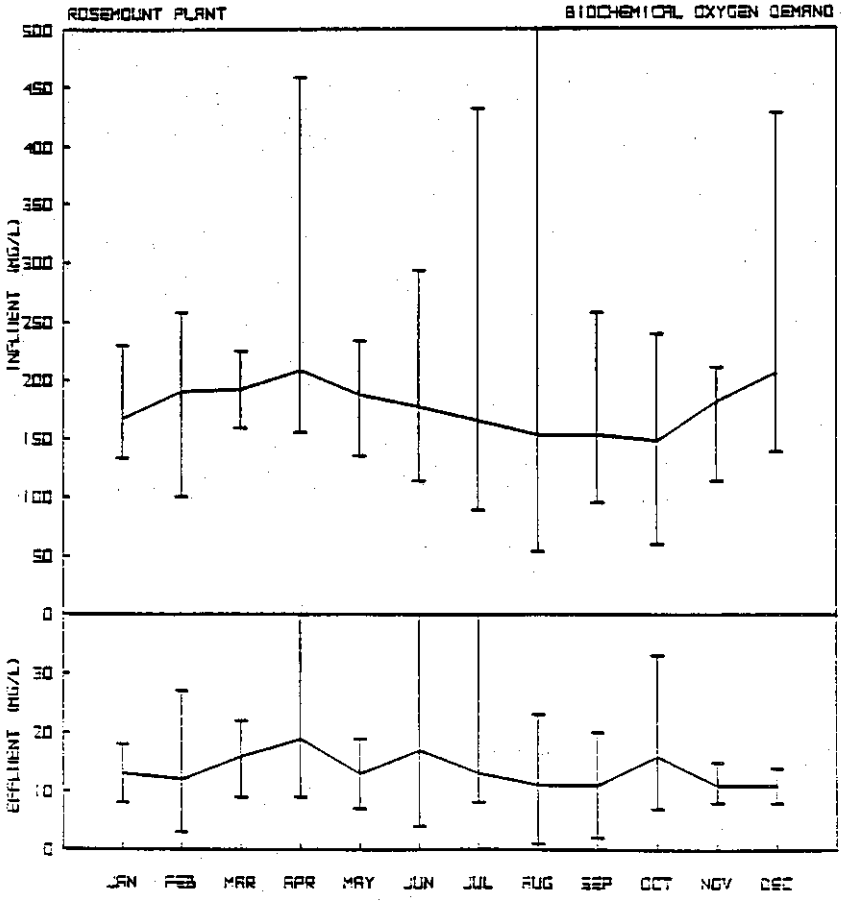
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Rosemount

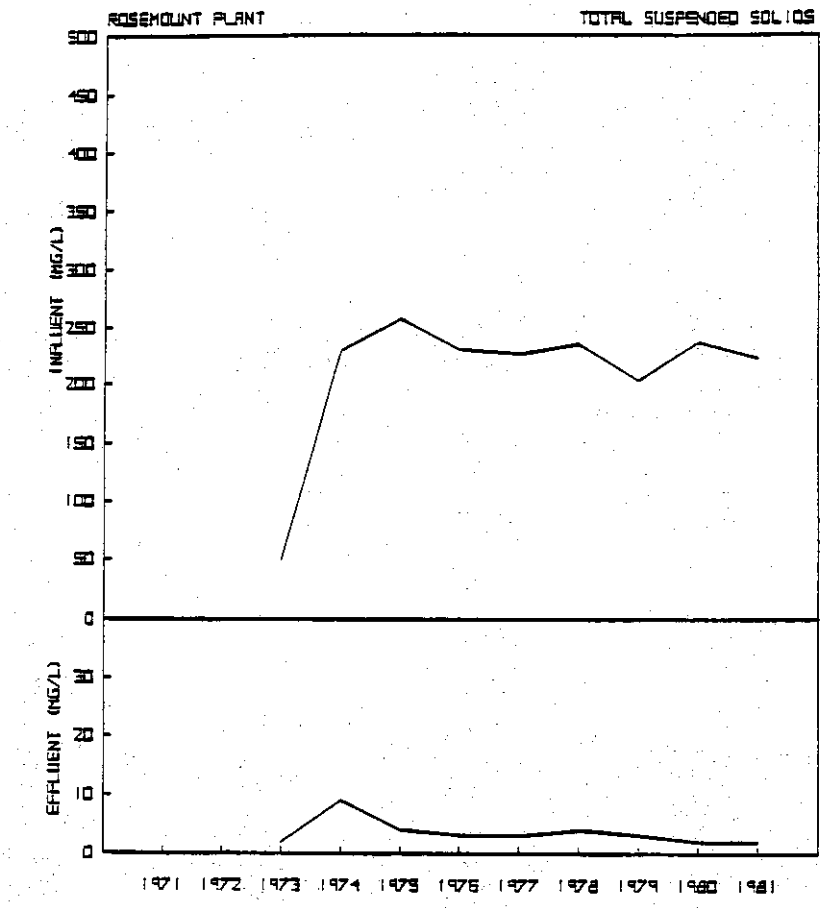
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.30	13	167	---	186	6.8-8.5
FEBRUARY	0.32	12	190	---	205	7.1-8.2
MARCH	0.29	11	192	455	206	7.2-8.1
APRIL	0.30	12	208	473	229	7.3-7.9
MAY	0.31	13	187	431	193	7.2-7.9
JUNE	0.30	14	177	436	202	7.0-7.8
JULY	0.29	16	165	370	220	6.8-7.6
AUGUST	0.30	17	153	378	278	6.9-7.7
SEPTEMBER	0.32	17	153	378	212	6.3-7.9
OCTOBER	0.32	17	148	390	220	6.8-7.9
NOVEMBER	0.29	16	182	423	228	7.2-7.8
DECEMBER	0.27	14	207	497	269	6.3-7.8
1981 AVERAGE	0.30	14	177	423	221	6.8-8.5
1980 AVERAGE	0.29	13	165	354	236	6.3-8.4

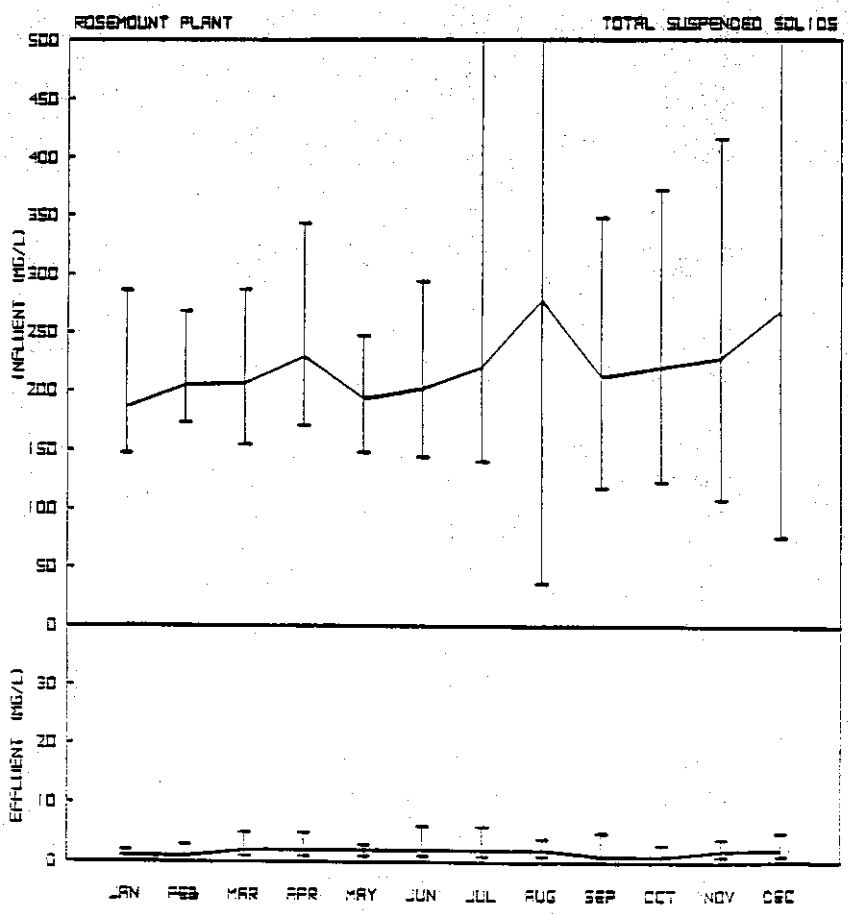
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: ROSEMOUNT

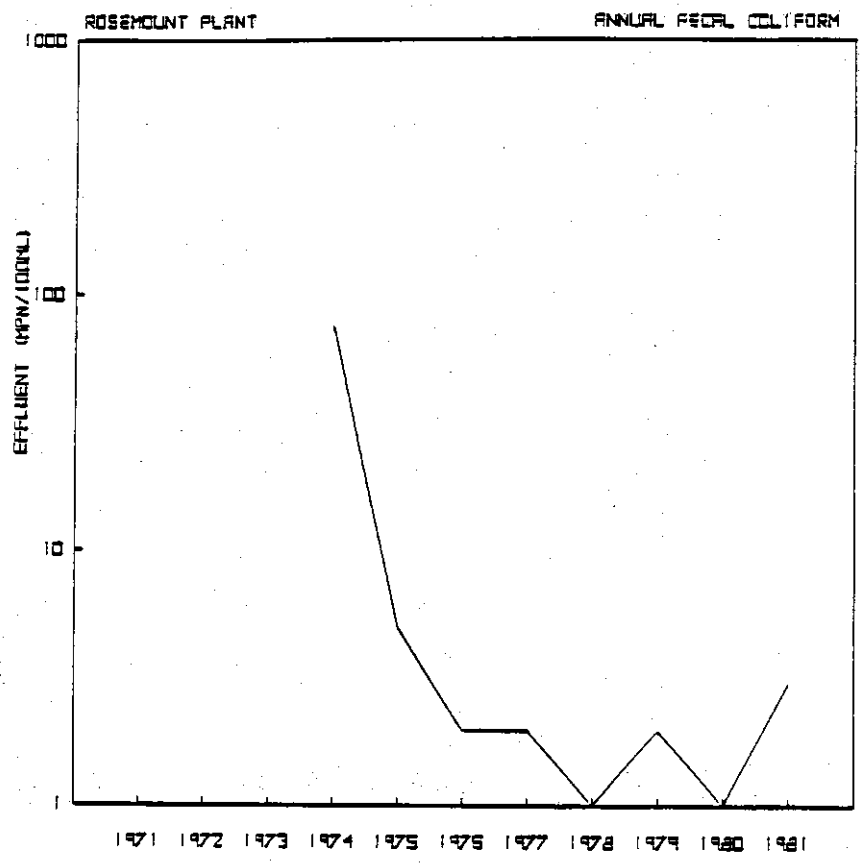
Month	300 mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO mg/l	NO mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal 300	% Removal TSS
PROCESS LIMIT	25	--	30	200	25	----	----	----	----	1.0	222	6.5-8.5	--	---	--	--
JANUARY	13	--	1	1	2	----	28.9	----	----	.1	7.7	6.5-7.7	30	2.0	92	99
FEBRUARY	12	--	1	1	3	----	26.4	----	----	.1	7.1	6.3-8.0	31	1.8	94	99
MARCH	16	52	2	1	7	----	27.5	----	----	.2	5.4	6.5-8.3	56	1.5	92	99
APRIL	19	58	2	1	5	----	28.5	----	----	.2	5.2	6.5-8.1	46	2.3	91	99
MAY	13	41	2	2	7	34.5	30.6	.15	.43	.3	5.0	6.3-7.3	36	2.2	93	99
JUNE	17	48	2	1	5	29.1	23.3	1.12	.35	.3	5.3	6.6-8.1	38	2.0	90	99
JULY	13	38	2	1	4	27.9	22.1	2.38	.42	.2	5.1	6.8-7.7	34	1.7	92	99
AUGUST	11	38	2	1	3	26.8	22.1	.40	.31	0.2	5.1	6.8-7.7	52	1.9	93	99
SEPTEMBER	11	39	1	3	4	35.7	26.3	----	----	0.2	5.1	6.7-8.2	50	1.7	93	99
OCTOBER	15	24	1	11	4	35.0	26.7	----	----	0.2	7.3	6.3-8.3	34	2.0	89	99
NOVEMBER	11	25	2	---	4	35.4	30.5	.15	.89	0.2	7.4	6.3-8.2	--	---	94	99
DECEMBER	11	32	2	---	4	38.2	30.3	.15	.67	0.2	7.9	6.7-8.4	--	---	95	99
1981 AVG.	14	40	2	3	4	32.3	26.9	.78	.50	0.2	6.1	6.5-8.4	42	1.9	92	99
1980 AVG.	12	38	2	1	3	----	27.3	----	----	0.1	7.3	6.1-8.5	--	---	93	99

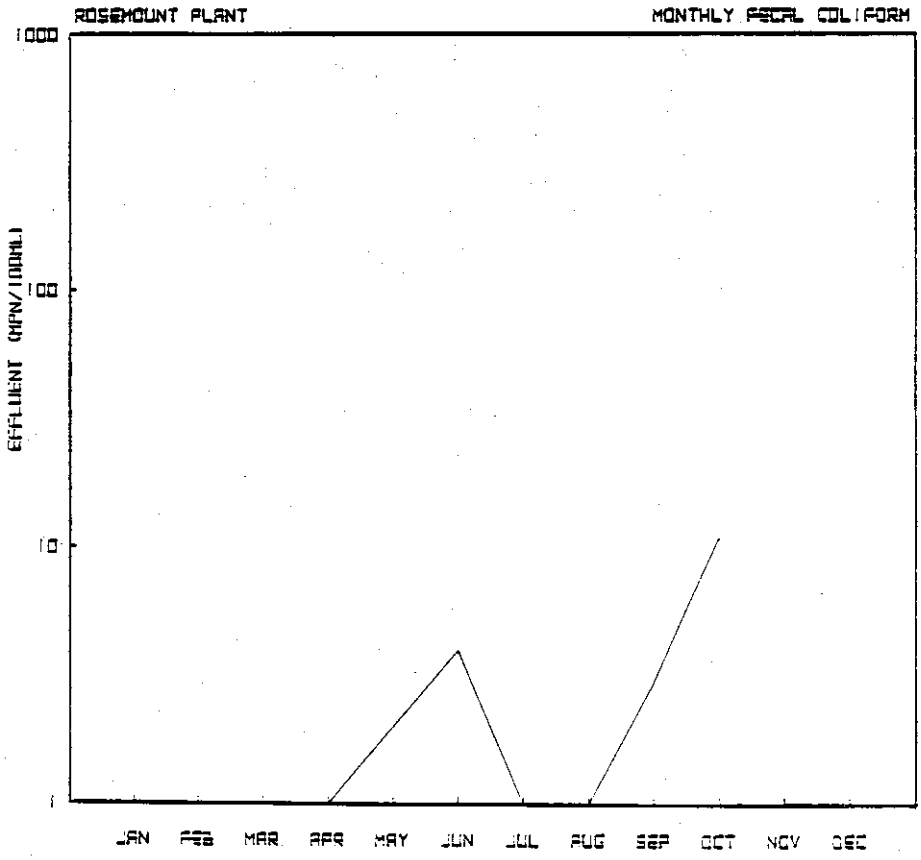

ROSEMOUNT PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

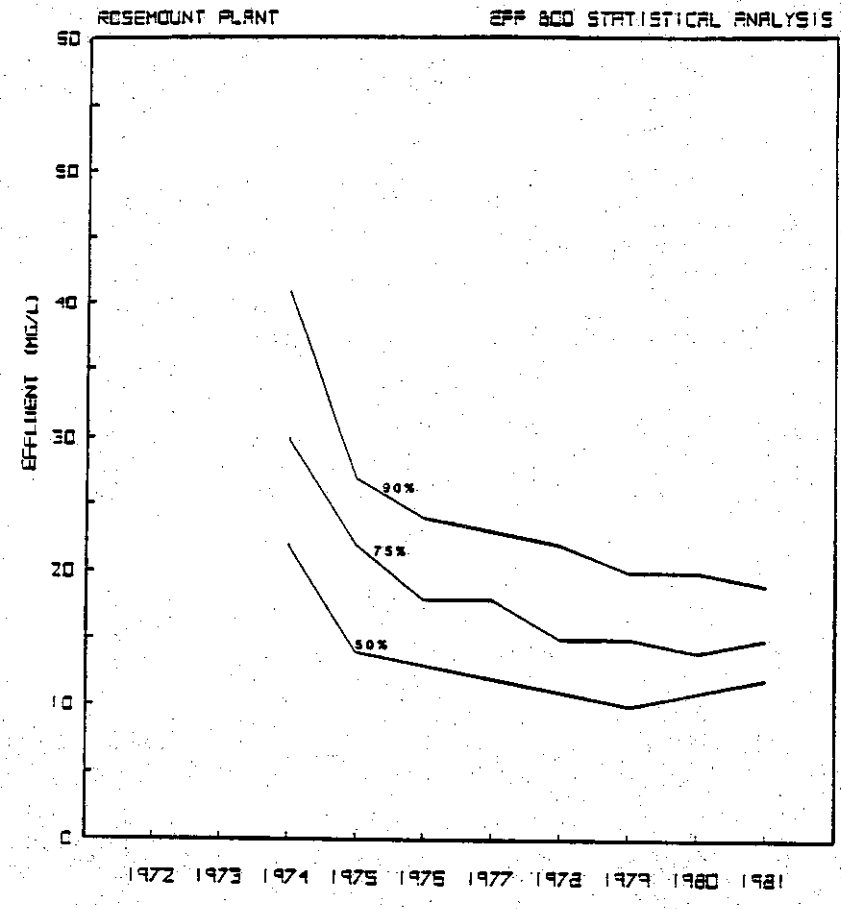

ROSEMOUNT PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

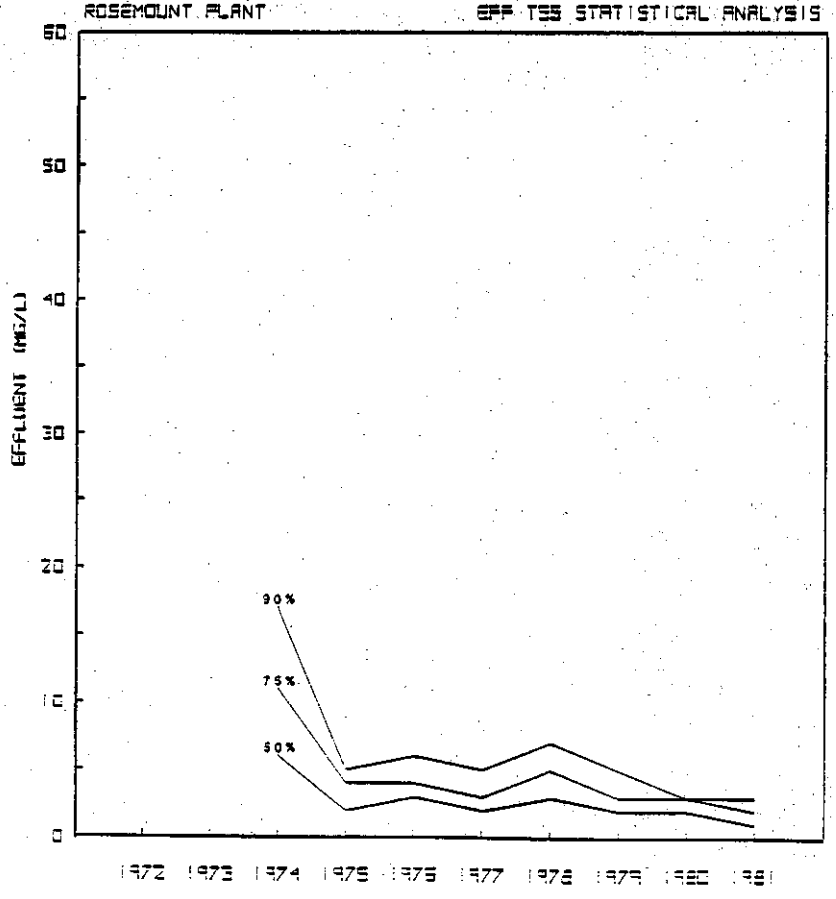

ROSEMOUNT PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


ROSEMOUNT PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


ROSEMOUNT PLANT
ANNUAL FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


ROSEMOUNT PLANT
MONTHLY FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


ROSEMOUNT PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


ROSEMOUNT PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

SAVAGE WASTEWATER TREATMENT PLANT

Background

The original Savage Plant was designed by Ellison-Philstrom, Inc., and constructed in 1963. Interim improvements to the plant were designed by RCM, and construction was completed in 1979. The plant has a current design capacity of 0.86 mgd. Liquid treatment consists of screening, influent pumping, primary clarification, a roughing trickling filter, a synthetic media high-rate trickling filter, final clarification, chlorination, and discharge to the Minnesota River. Solids processing consists of a sludge holding and decant tank, anaerobic digestion, and sludge hauling to another plant for further treatment or sludge landspreading. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 0.40 mgd in 1981, nearly equal to 0.38 mgd in 1980. Average plant effluent quality was 10 mg/L BOD, and 8 mg/L TSS. Plant performance was excellent throughout the year, as no NPDES Permit violations were experienced. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	26	26	5	9	34	41	7	12	42	59	9	15
TSS	14	10	4	5	20	18	7	12	25	28	15	17

Activities

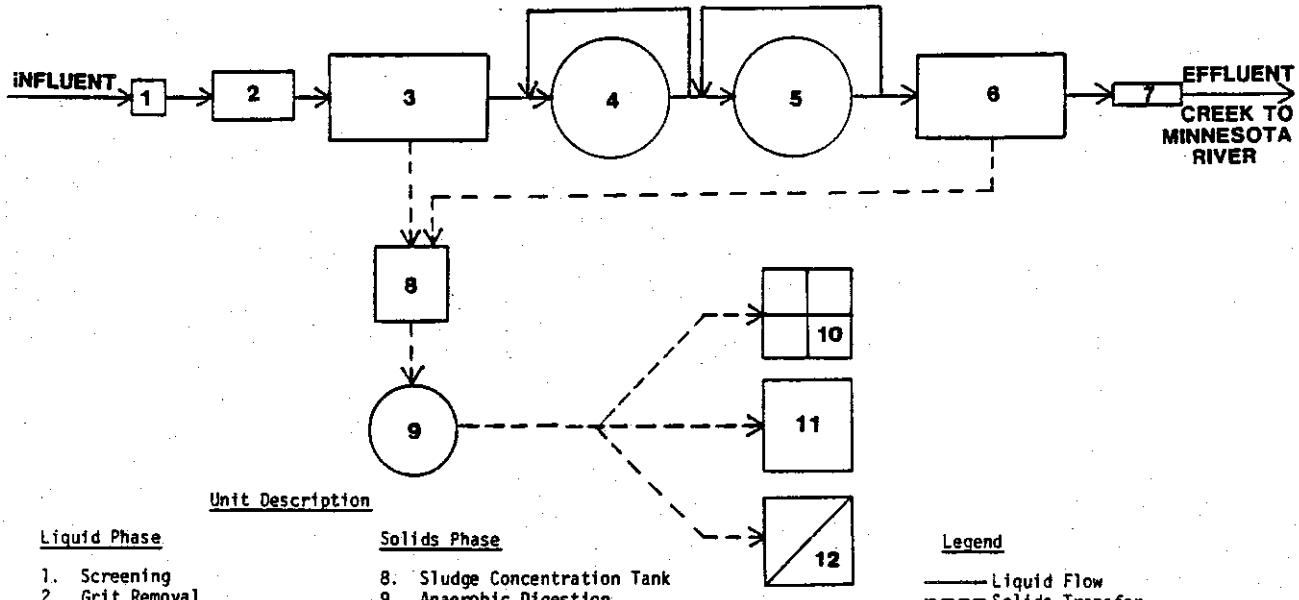
There were no major activities during 1981.

Future

A long-term plan for the Savage Plant is to phase it out of service and divert the flow to the Seneca Plant. This is projected to occur in the late 1980's as the plant reaches its capacity.

SAVAGE WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

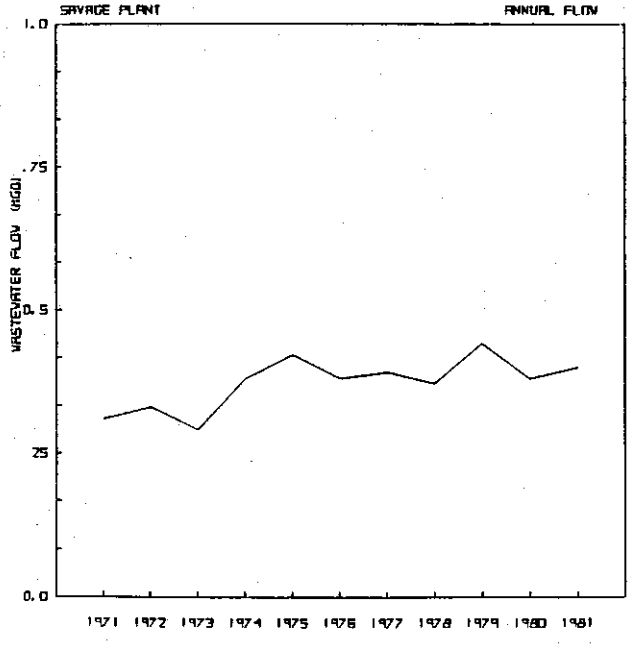
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Roughing Trickling Filter
5. Trickling Filter
6. Final Clarification
7. Chlorination

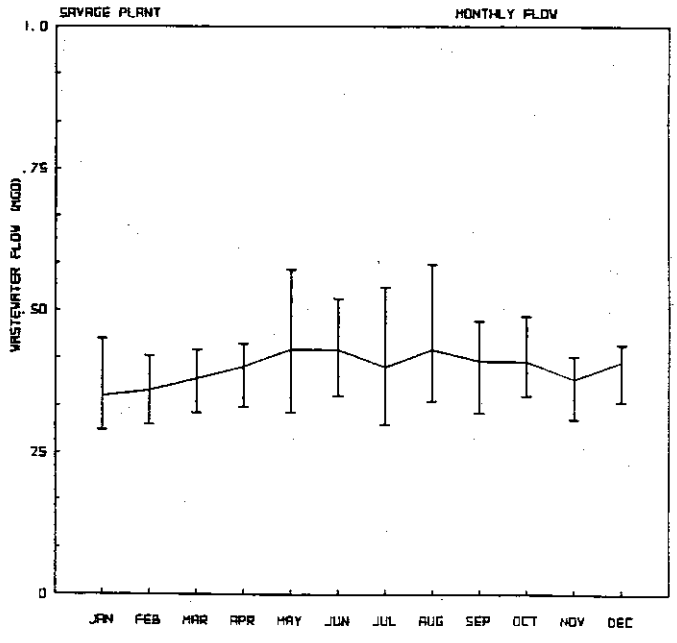
Solids Phase

8. Sludge Concentration Tank
9. Anaerobic Digestion
10. Drying Beds
11. Landspreading
12. Solids Disposal at Seneca Plant

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



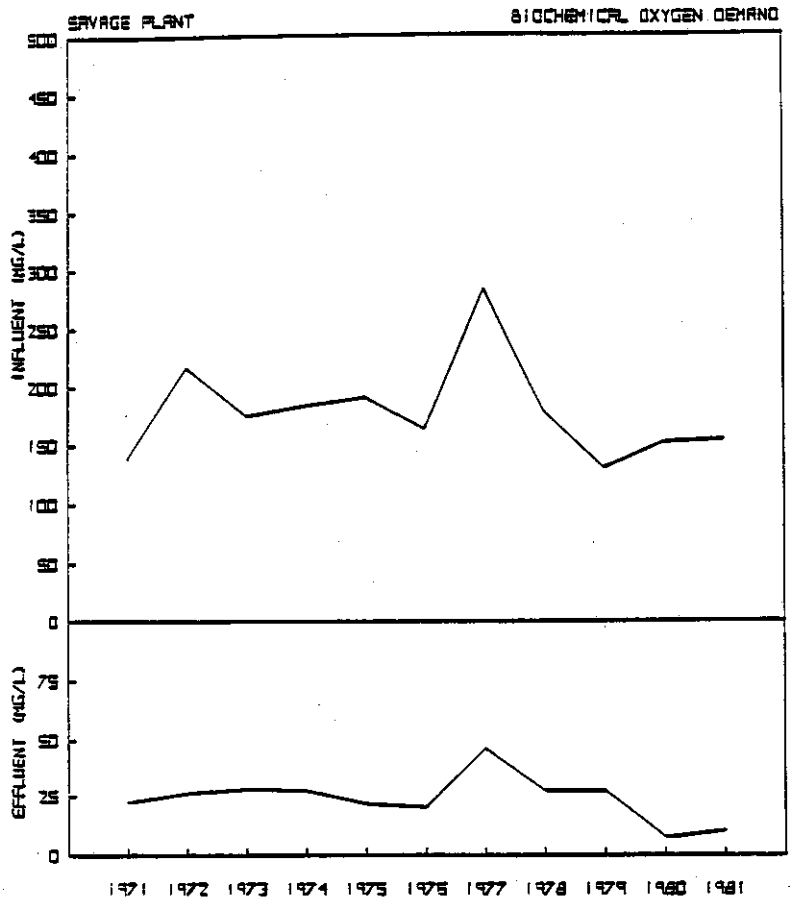


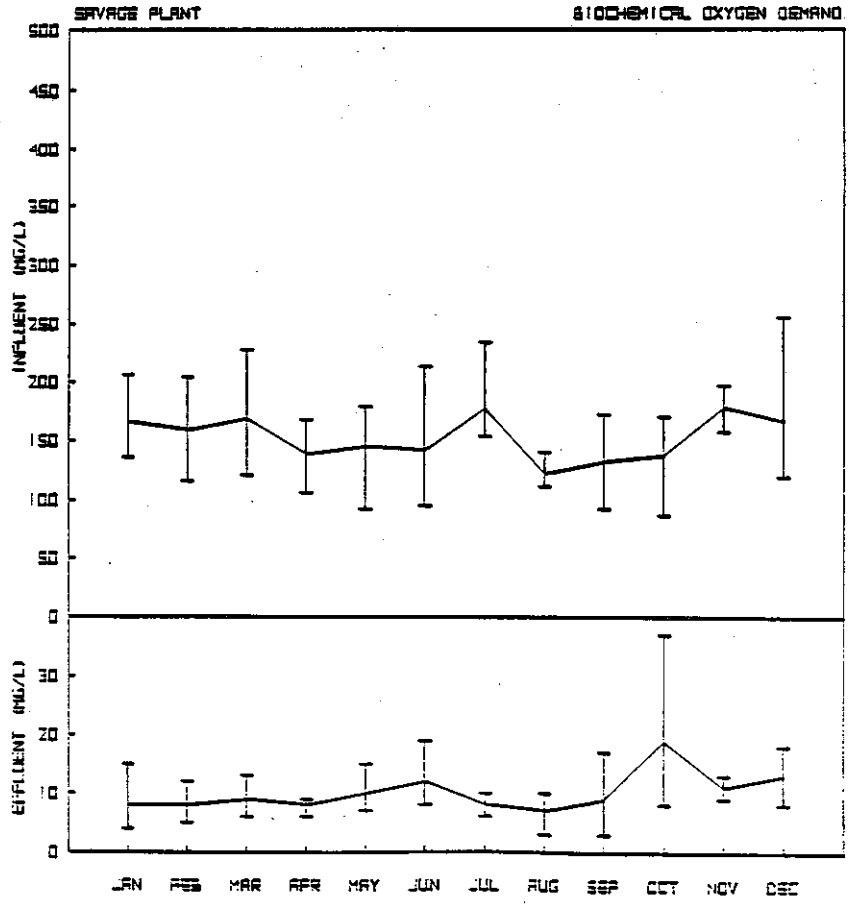
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Savage

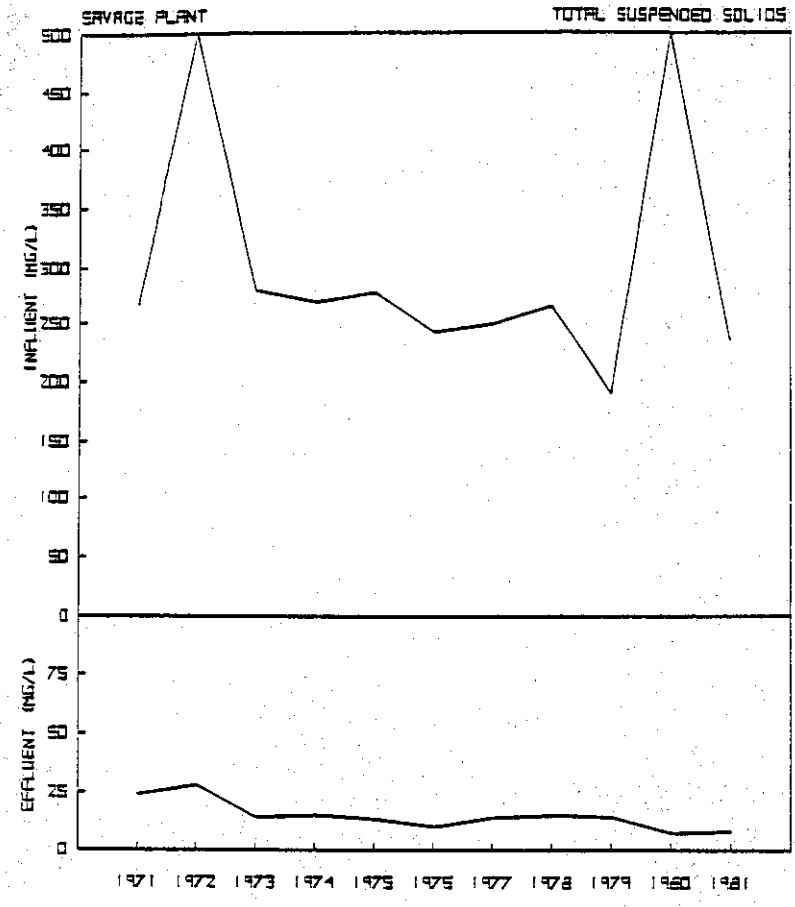
MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	0.35	14	166	---	195	6.2-12.0
FEBRUARY	0.36	13	159	---	178	5.0-11.4
MARCH	0.38	12	169	---	269	6.5-11.2
APRIL	0.40	12	139	---	211	6.0-12.0
MAY	0.43	14	145	294	257	4.0-12.2
JUNE	0.43	17	142	362	248	6.6-12.0
JULY	0.40	19	178	437	304	5.9-11.1
AUGUST	0.43	20	123	348	187	5.4-10.4
SEPTEMBER	0.41	20	133	295	182	6.0-9.8
OCTOBER	0.41	17	138	311	318	6.5-9.8
NOVEMBER	0.38	15	179	332	210	6.8-9.6
DECEMBER	0.41	11	167	308	251	6.1-9.5
1981 AVERAGE	0.40	15	153	336	234	4.0-12.2
1980 AVERAGE	0.38	17	151	396	565	2.3-13.2

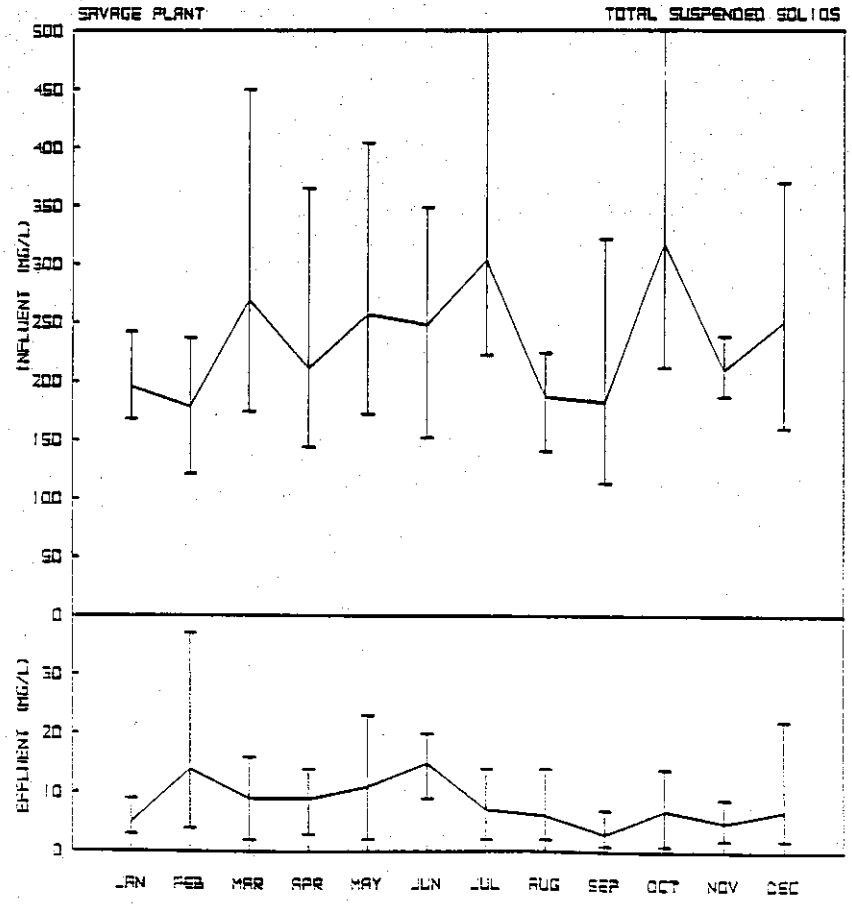
MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: SAVAGE

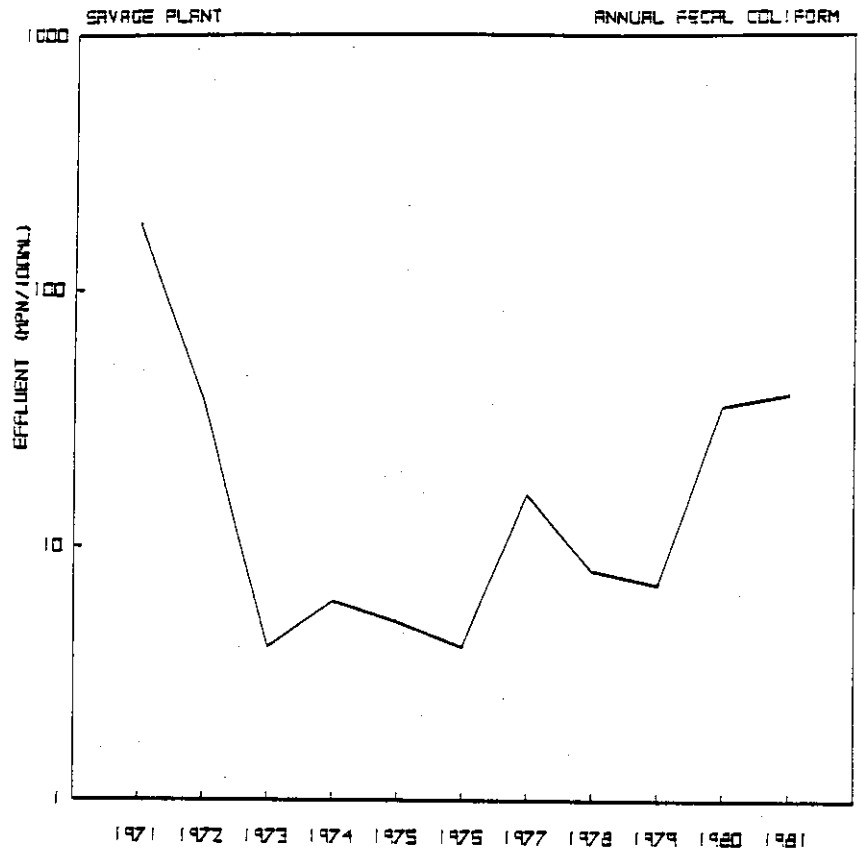
Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO mg/l	NO mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	----	---	------	----	---	---	6.5-8.5	--	---	--	--
JANUARY	8	--	5	27	4	----	---	------	----	---	9.3	7.2-7.6	15	1.8	95	97
FEBRUARY	8	--	14	6	10	----	---	------	----	---	9.3	7.4-7.6	15	1.3	95	92
MARCH	9	--	9	5	7	----	---	------	----	---	9.9	7.4-7.6	16	1.7	95	97
APRIL	8	--	9	25	6	----	---	------	----	---	9.7	7.2-7.7	20	1.7	95	96
MAY	10	67	11	53	8	10.3	.6	13.13	.04	5.4	9.1	7.3-7.6	22	1.7	93	95
JUNE	12	58	15	58	10	3.6	.3	12.911	.04	3.7	8.1	7.4-7.6	22	1.3	92	94
JULY	8	41	7	24	5	2.3	.3	11.44	.06	3.5	7.9	7.4-7.7	20	1.3	95	98
AUGUST	7	44	6	38	4	3.7	.1	11.03	.04	4.8	7.8	7.4-7.8	20	1.8	95	97
SEPTEMBER	9	51	3	30	3	2.5	.2	------	----	4.2	7.9	7.4-7.7	21	2.0	93	98
OCTOBER	19	29	7	51	5	5.3	.2	------	----	3.7	8.7	7.3-7.8	21	2.1	86	98
NOVEMBER	11	37	5	---	4	2.6	.7	12.24	.15	3.3	9.1	7.4-8.2	--	---	94	98
DECEMBER	13	49	7	---	6	2.6	.7	12.391	.20	3.4	9.5	7.3-7.9	--	---	92	97
1981 AVG.	10	48	8	39	6	4.2	.4	12.271	.09	4.0	8.8	7.2-8.2	19	1.6	93	97
1980 AVG.	7	44	7	35	5	----	---	------	----	---	8.8	7.2-7.8	--	---	95	99

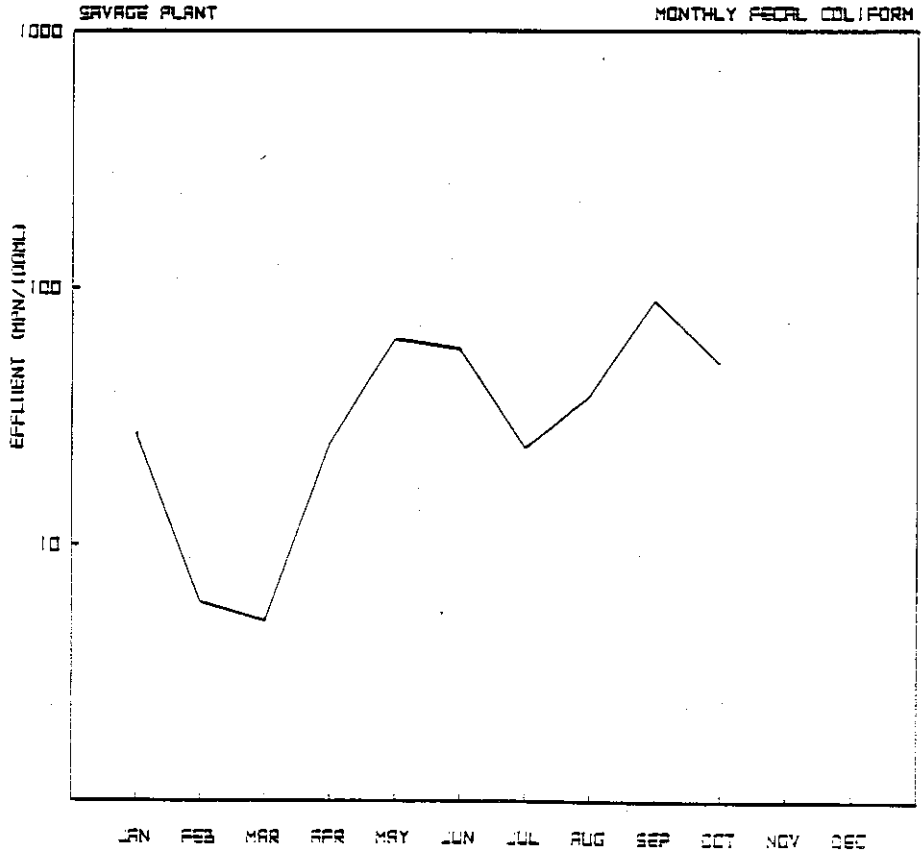

SAVAGE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

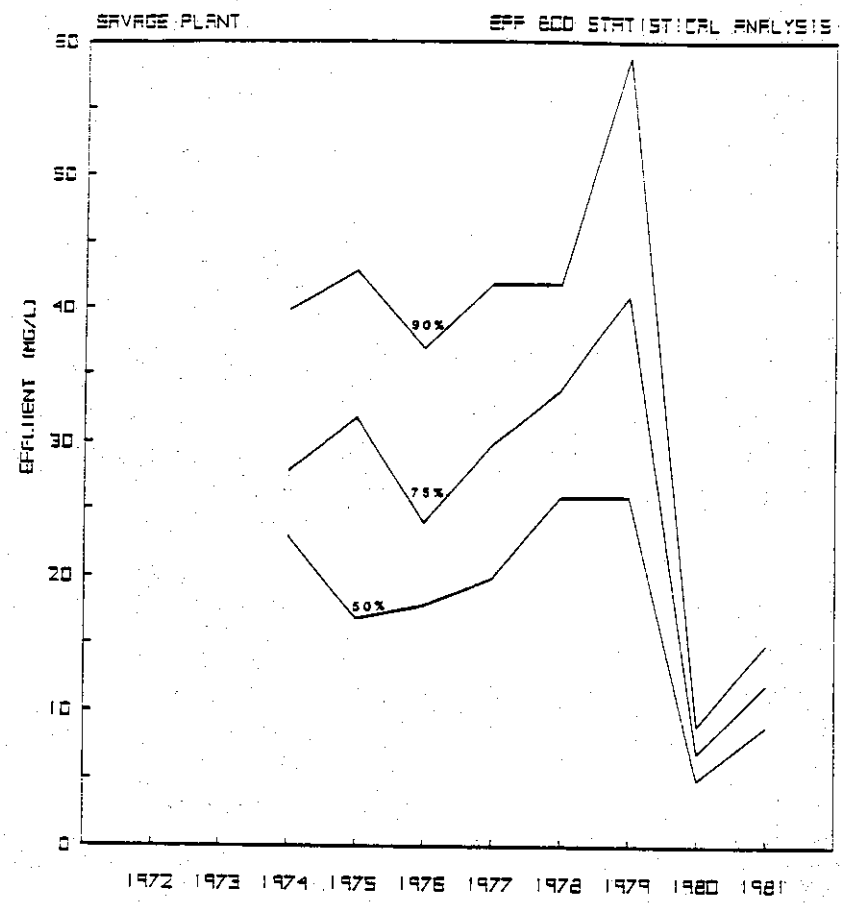

SAVAGE PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

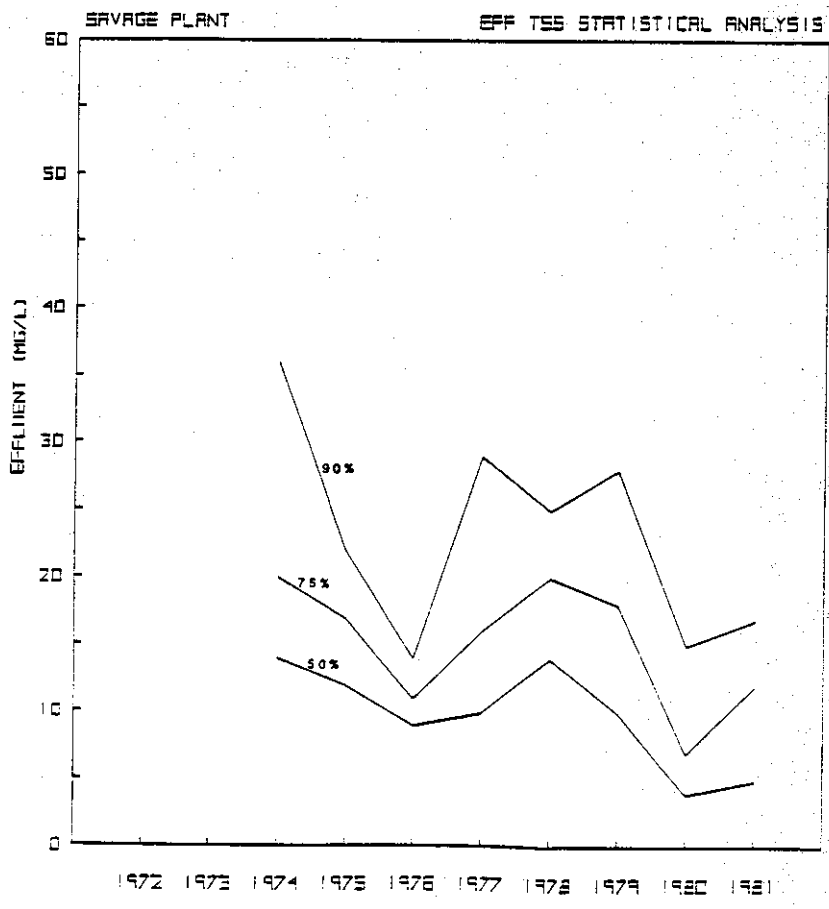

SAVAGE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


SAVAGE PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


SAVAGE PLANT
ANNUAL FECAL COLIFORM
1000
100
10
1
EFFLUENT (MPN/100ML)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


SAVAGE PLANT
MONTHLY FECAL COLIFORM
1000
100
10
EFFLUENT (MPN/100ML)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


SAVAGE PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
60
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


SAVAGE PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
60
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

SENECA WASTEWATER TREATMENT PLANT

Background

The Seneca Plant was designed by Black and Veatch, and was placed into operation in 1972, with a design capacity of 24 mgd. Liquid treatment consists of screening, grit removal, primary sedimentation, complete mix activated sludge aeration, final clarification, chlorination, and discharge to the Minnesota River. Solids processing consists of waste activated sludge air flotation thickening, combined sludge storage, chemical conditioning, vacuum filtration dewatering, and incineration. The plant is subject to secondary treatment limits.

Performance

Plant flow averaged 13.8 mgd, slightly higher than 13.0 mgd in 1980. Average effluent quality was 20 mg/L BOD, and 20 mg/L TSS. Plant performance was good throughout the year, although two NPDES Permit violations occurred. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	18	14	14	19	25	18	20	22	39	27	25	30
TSS	14	13	15	19	19	24	19	23	27	32	23	28

Activities

Progress continued on a project to supplement existing vacuum filters with a belt filter press and associated equipment. The press was purchased in April, 1980. The contract for installation of the equipment was awarded in February, 1981. The project began in March, 1981, with a completion date in January, 1983.

During 1980 and 1981, efforts were made to improve incinerator air emissions at Seneca. A part of this effort involved the installation of an innovative wet scrubber supplied by Johnson Wellscreen Division of UOP, Inc. on Incinerator No. 2 in 1980, and performance testing of both incinerators in 1980 and 1981. Testing results indicated that neither incinerator was capable of acceptable compliance with air emission limitations at full capacity.

Seneca incinerator air emission requirements were contained in the Amended Stipulation Agreement between the Commission and the MPCA, and the Consent Decree between the Commission and the EPA. As a result of these requirements, and failure to demonstrate acceptable performance at full capacity, the incinerators were derated from 1.4 to 1.0 DTPH on November 1, 1981.

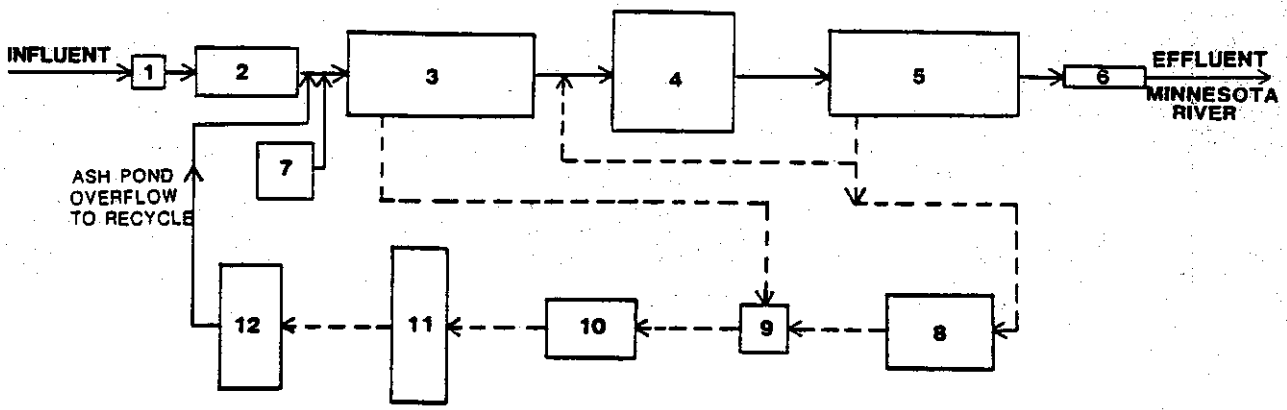
A draft Air Operating Permit for Seneca Incinerators was developed in late 1981. Discussions concerning the conditions of the permit continued into the beginning of 1982. The permit was issued in January, 1982.

Future

The Seneca Plant is one of the Commission's permanent regional plants. Space is available for future plant expansion and advanced treatment as needed. Additional sludge dewatering facilities are under construction and other sludge processing improvements are planned.

SENECA WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

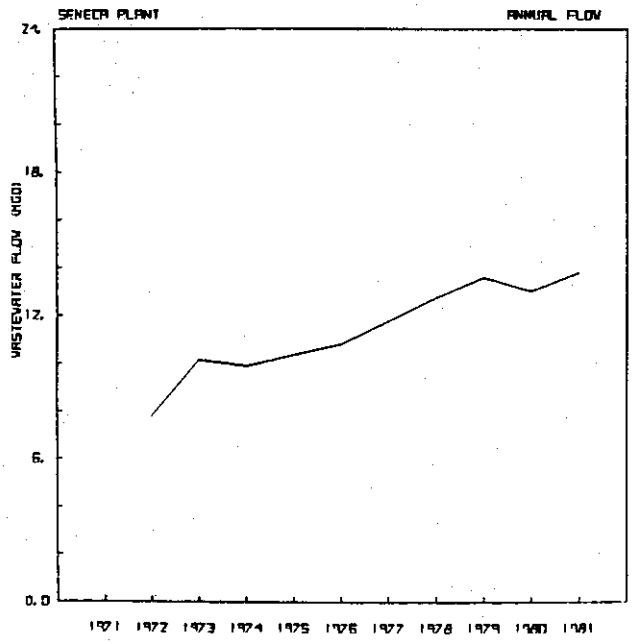
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Activated Sludge
5. Final Sedimentation
6. Chlorination
7. Chemical Addition and/or Pre-Chlorination

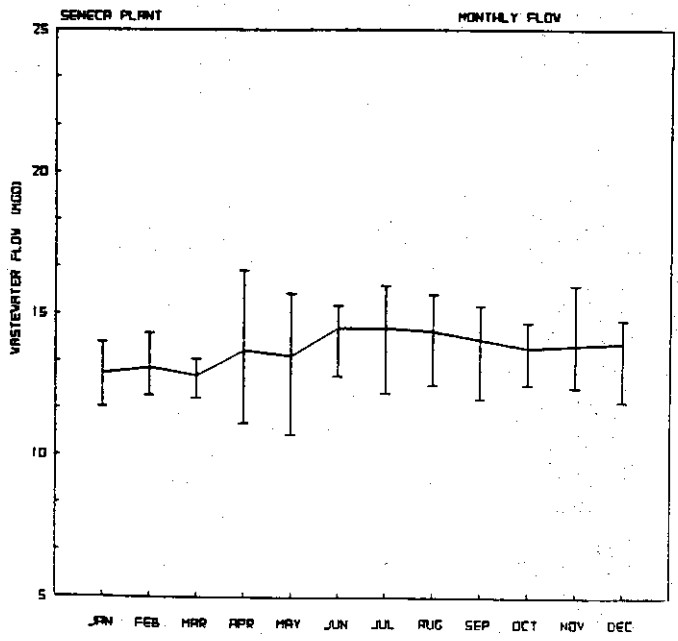
Solid Phase

8. Flotation Thickener
9. Holding Tank
10. Vacuum Filtration
11. Incineration
12. Ash Pond

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



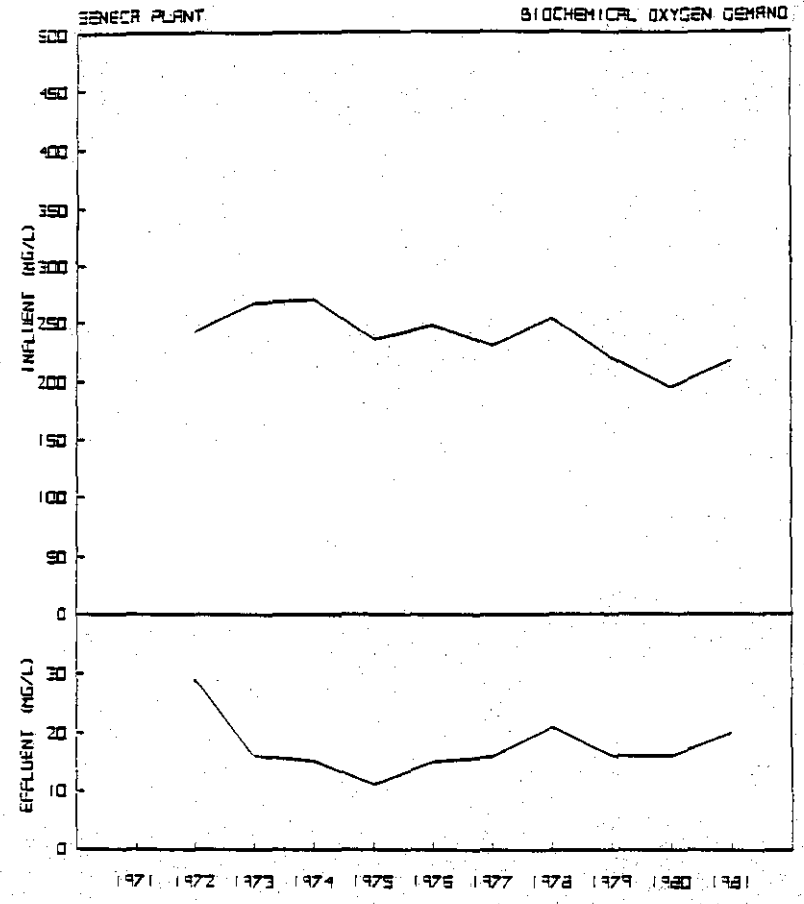


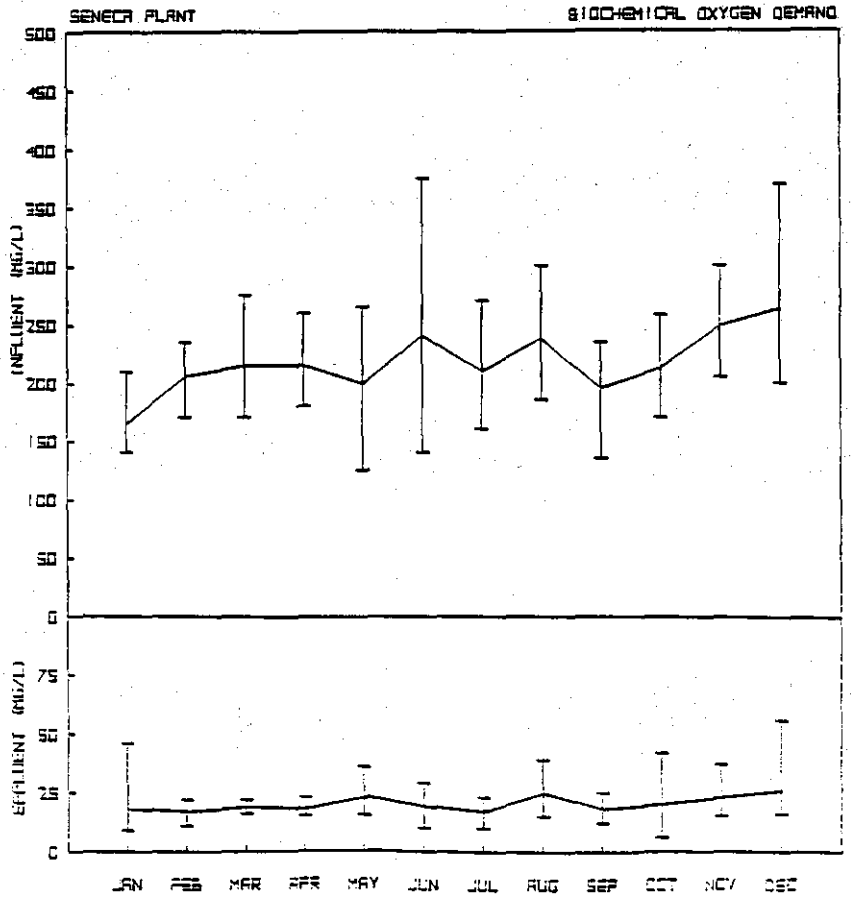
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Seneca

MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	12.9	14	164	405	159	6.7-8.5
FEBRUARY	13.1	13	206	443	175	6.8-9.1
MARCH	12.8	13	215	468	182	6.3-8.8
APRIL	13.7	14	215	461	174	7.0-9.2
MAY	13.5	16	199	512	215	7.0-9.5
JUNE	14.5	18	241	505	241	6.6-8.9
JULY	14.5	20	210	462	208	6.7-9.1
AUGUST	14.4	20	238	526	253	6.5-8.2
SEPTEMBER	14.1	20	195	487	225	6.8-7.9
OCTOBER	13.8	19	213	510	244	6.6-8.0
NOVEMBER	13.9	18	249	524	224	6.7-10.4
DECEMBER	14.0	16	264	549	237	6.6-7.9
1981 AVERAGE	13.8	17	217	488	211	6.6-10.4
1980 AVERAGE	13.0	17	194	444	186	6.4-8.8

MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: SENECA

Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	----	----	----	---	---	---	6.5-8.5	----	---	--	--
JANUARY	18	34	16	1	9	----	21.9	----	---	---	8.9	6.7-7.4	1000	4.6	89	90
FEBRUARY	17	95	25	12	12	-----	21.9	----	---	---	9.1	6.8-7.4	865	3.3	92	85
MARCH	19	88	21	1	10	----	23.4	----	---	---	8.6	6.3-7.6	874	3.3	91	88
APRIL	18	87	19	1	9	----	22.3	----	---	---	8.3	7.1-7.6	875	2.3	91	89
MAY	23	98	21	6	10	27.5	21.0	.03	.27	4.7	7.4	7.0-8.0	879	2.7	88	90
JUNE	19	87	16	4	9	23.9	19.0	.07	.18	3.7	7.9	7.0-7.6	875	2.3	92	93
JULY	17	77	14	2	8	21.7	16.7	.05	.29	2.7	7.5	6.9-7.4	870	2.2	92	93
AUGUST	25	97	25	6	13	23.3	14.5	.05	.25	3.1	7.0	6.9-7.3	898	2.3	90	90
SEPTEMBER	18	84	21	3	8	29.1	21.0	----	-----	3.7	7.0	7.0-7.6	899	3.3	91	91
OCTOBER	20	84	18	4	7	30.6	21.3	----	----	3.6	7.0	7.0-7.4	985	3.1	90	93
NOVEMBER	23	81	13	---	7	31.1	23.7	.08	.38	3.3	7.1	6.9-7.6	----	---	91	93
DECEMBER	25	88	23	---	9	30.6	22.4	.22	.33	4.6	7.5	6.8-7.4	----	---	90	90
1981 AVG.	20	88	20	4	9	27.2	20.8	.08	.34	3.7	7.8	6.7-8.0	912	3.0	91	91
1980 AVG.	16	77	16	12	9	----	21.2	----	----	---	8.5	6.8-7.9	----	---	92	91


SENECA PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981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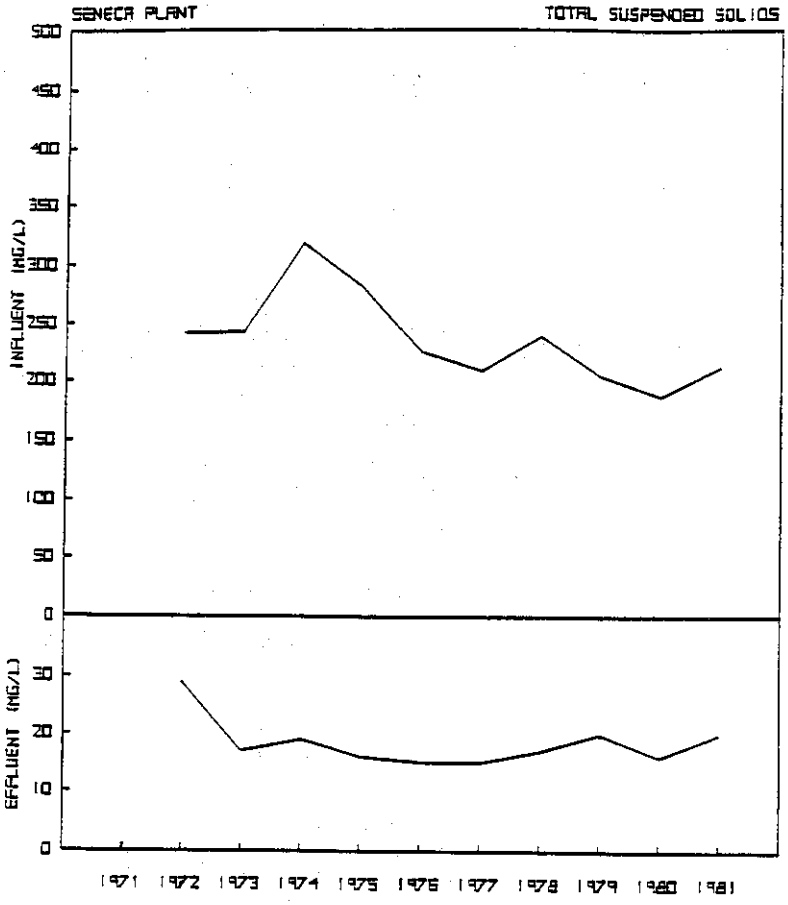
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC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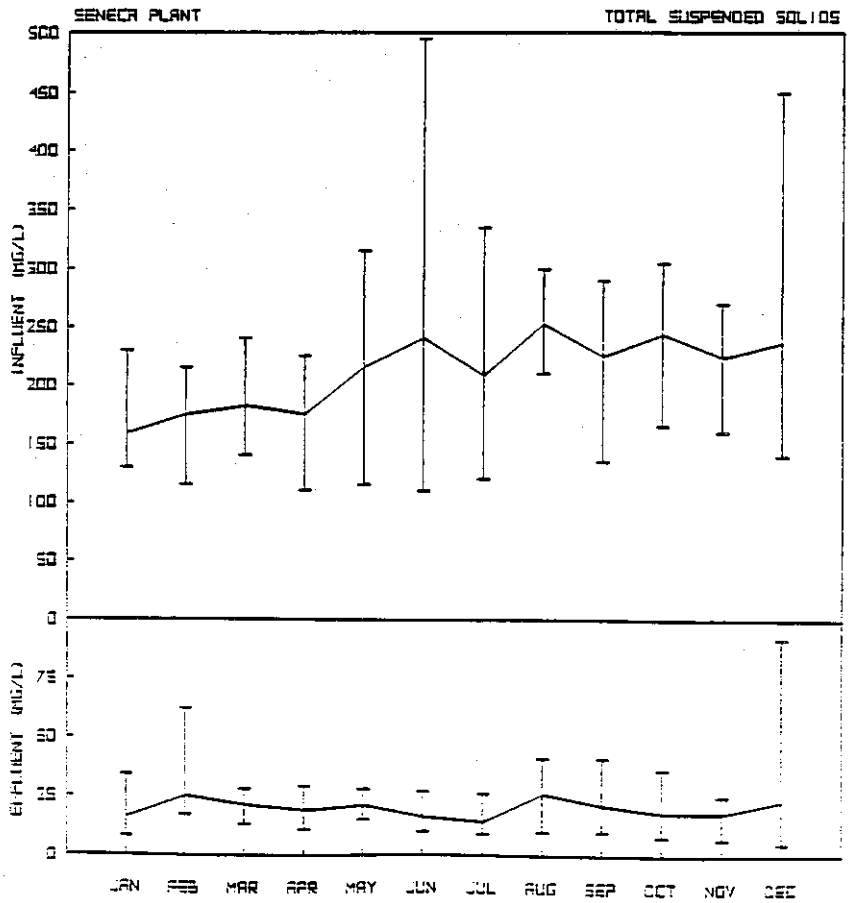
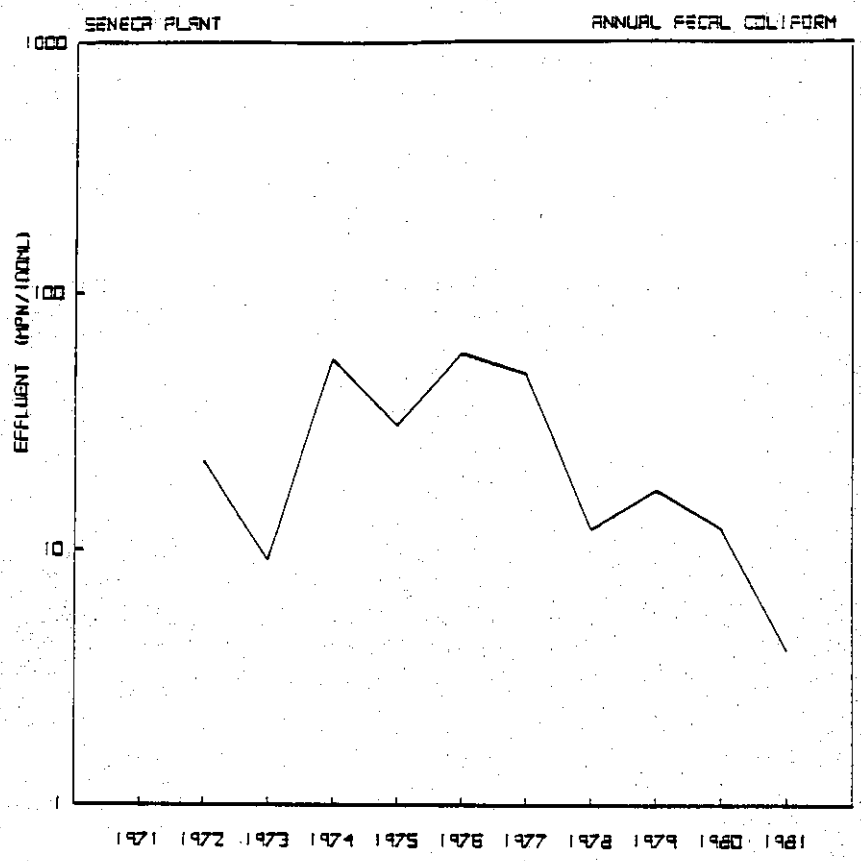
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


SENECA PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC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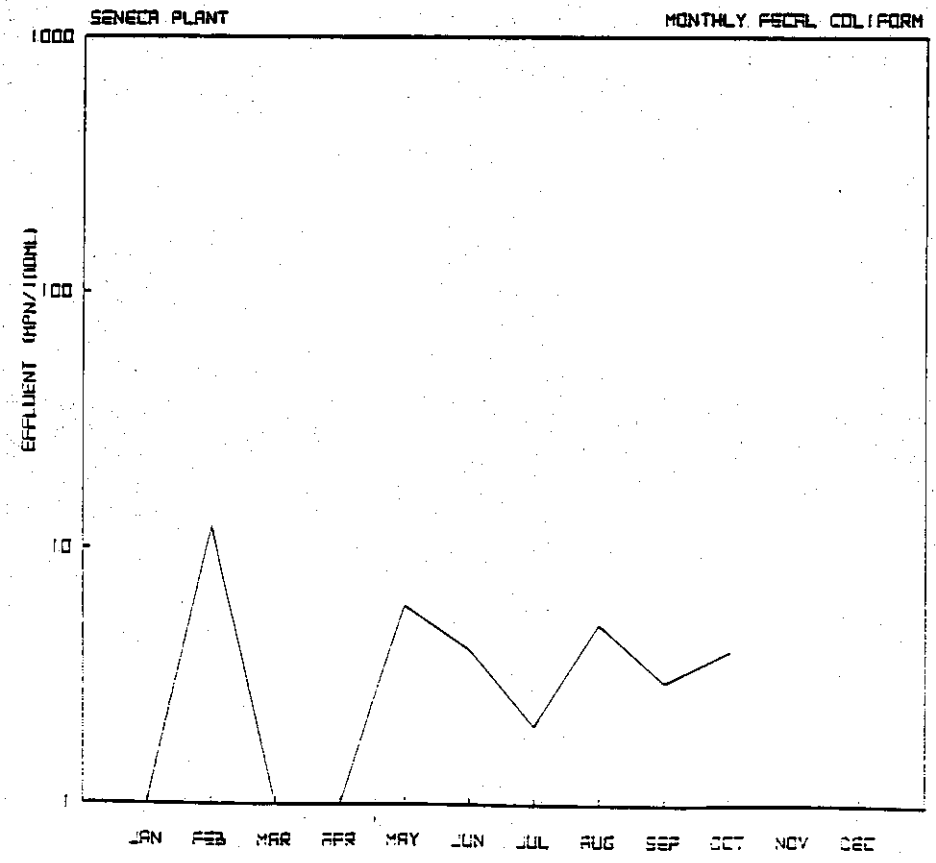
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981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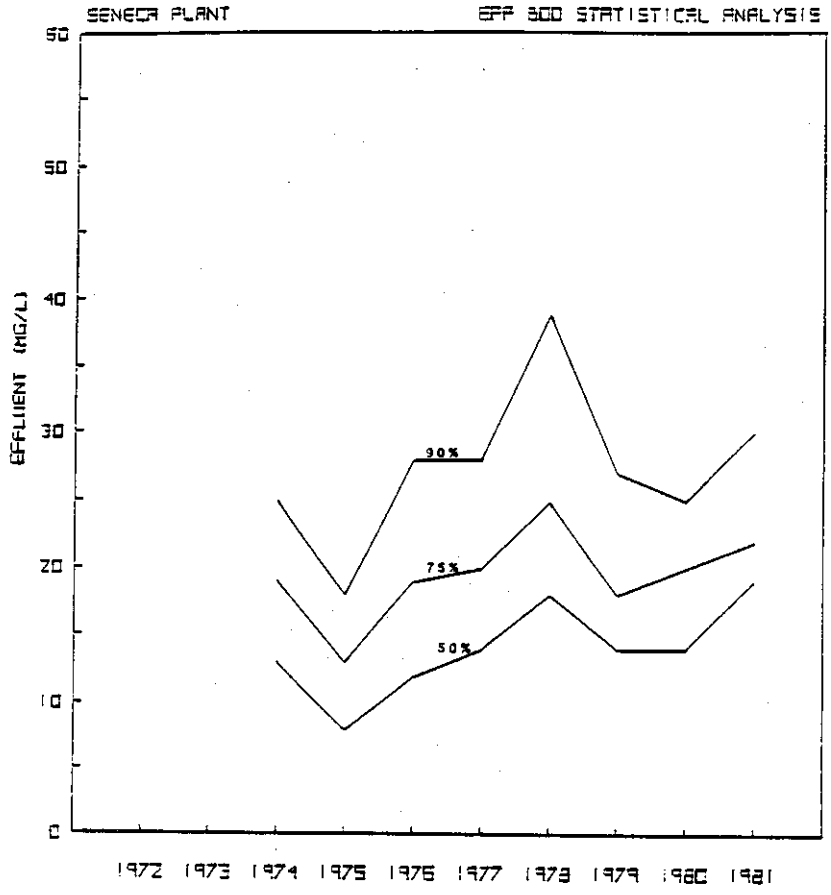
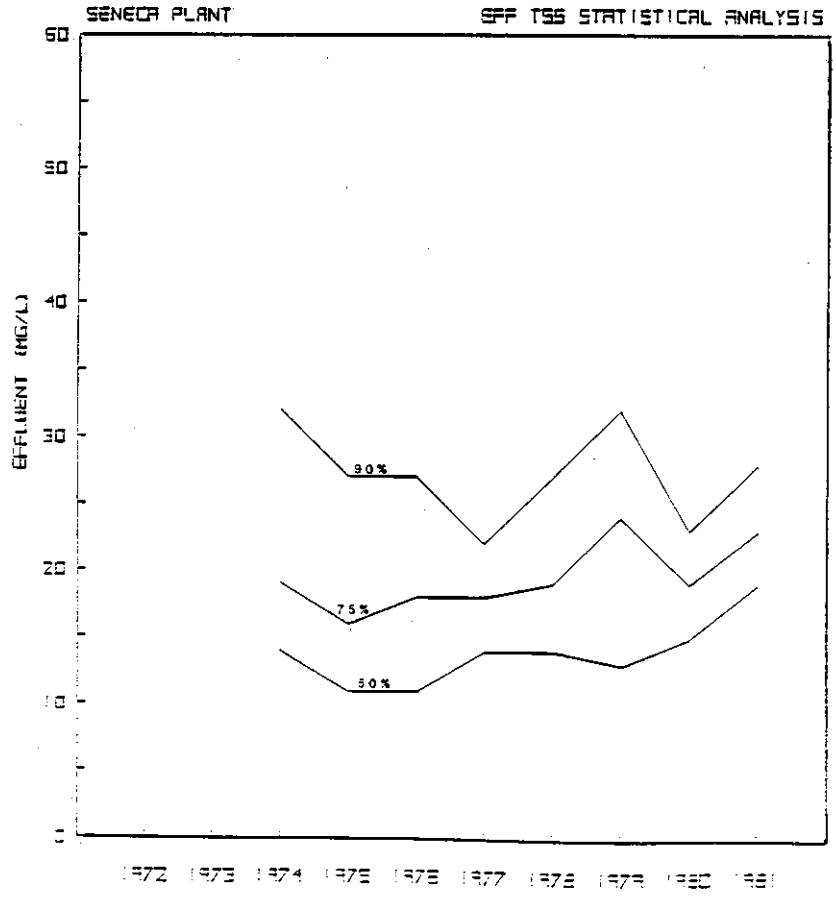
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


SENECA PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


SENECA PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
60
50
40
30
20
10
0
90%
75%
50%
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

STILLWATER WASTEWATER TREATMENT PLANT

Background

The Stillwater Plant was originally constructed in 1959 as a primary treatment plant. In 1970, the plant was upgraded to secondary treatment, and phosphorus removal facilities were added to the plant in 1973. The design capacity of the plant is 3.0 mgd. Actual operating capacity is somewhat less, due to the additional phosphorus removal facilities. Liquid treatment consists of screening, grit removal, primary sedimentation, activated sludge aeration, alum addition for phosphorus removal, final clarification, chlorination, and discharge to Lake St. Croix (the St. Croix River). Solids processing consists of combined thickening and primary tanks, anaerobic digestion, and sludge hauling to either the Metro Plant Interceptor System or sludge landspreading sites. The plant is subject to secondary treatment limits, and a phosphorus limit of 1 mg/L.

Performance

Plant flow averaged 2.30 mgd in 1981, essentially equal to 2.28 mgd in 1980. Average plant effluent quality was 18 mg/L BOD, 10 mg/L TSS, and 0.5 mg/L P. Plant performance was good throughout the year, although two NPDES Permit violations occurred in the first quarter due to nitrification in the BOD test. Statistical analyses of data show the following trend in effluent BOD and TSS from 1978 through 1981.

Effluent Concentration, mg/L

	50% of Time				75% of Time				90% of Time			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
BOD	8	8	12	14	12	12	14	24	18	21	19	33
TSS	10	10	9	8	14	12	14	12	18	16	21	15

Activities

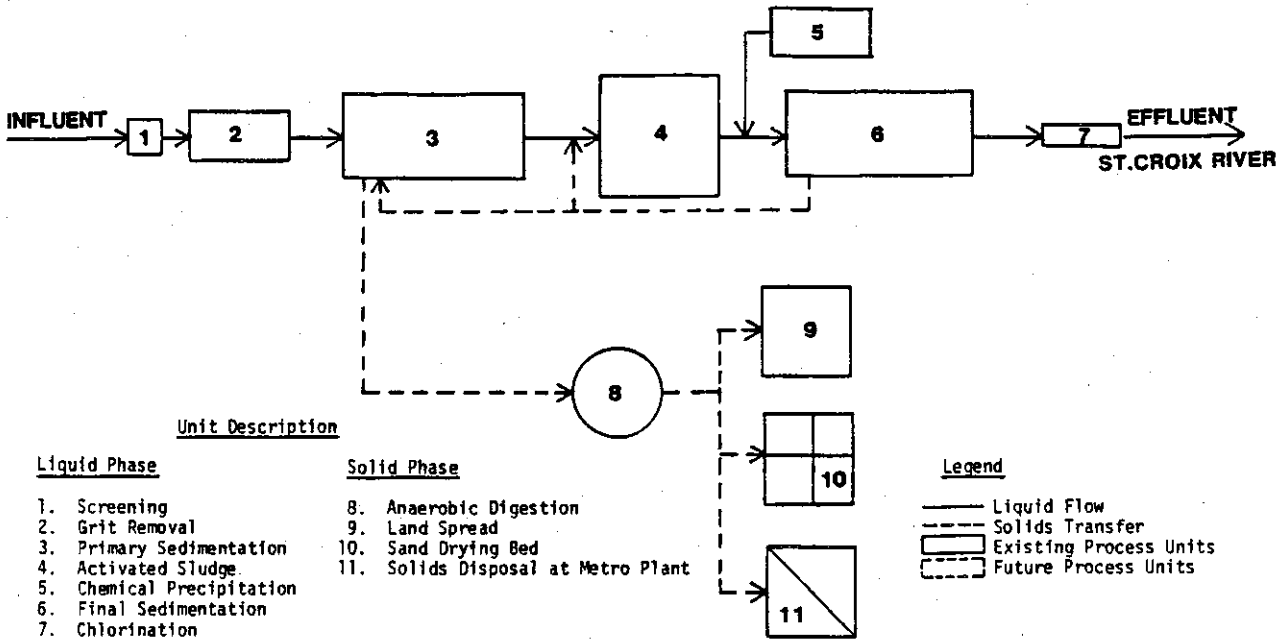
There were no major activities during 1981.

Future

This plant is one of the Commission's permanent plants. A plant expansion, with provisions to include flow from the Bayport Plant, is planned for the mid-1980's.

STILLWATER WASTEWATER TREATMENT PLANT

FLOW DIAGRAM



Unit Description

Liquid Phase

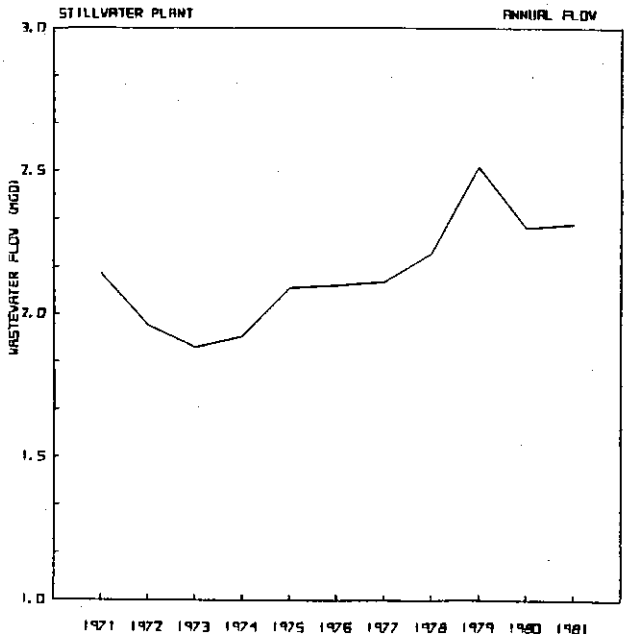
1. Screening
2. Grit Removal
3. Primary Sedimentation
4. Activated Sludge
5. Chemical Precipitation
6. Final Sedimentation
7. Chlorination

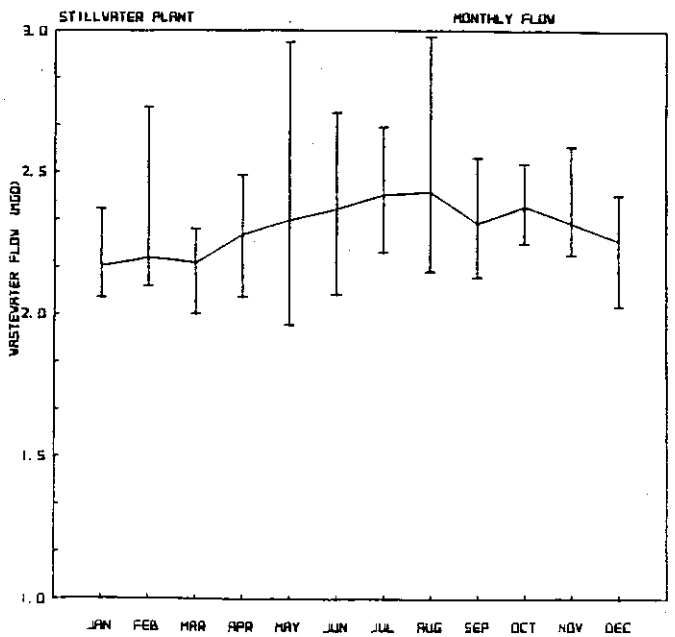
Solid Phase

8. Anaerobic Digestion
9. Land Spread
10. Sand Drying Bed
11. Solids Disposal at Metro Plant

Legend

- Liquid Flow
- Solids Transfer
- Existing Process Units
- Future Process Units



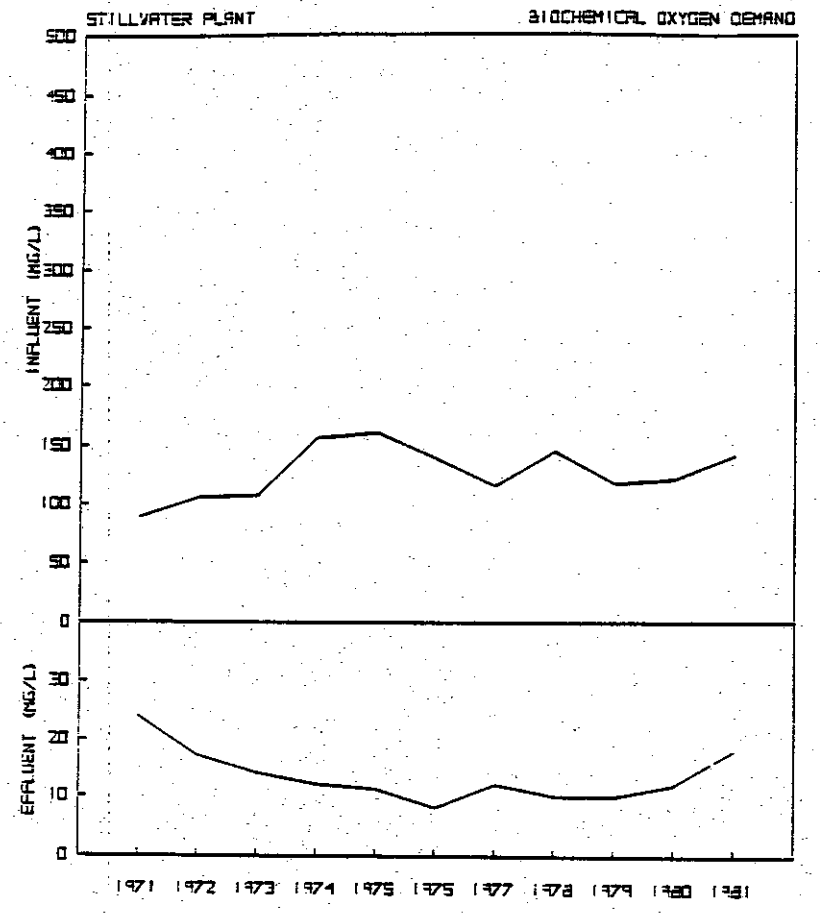


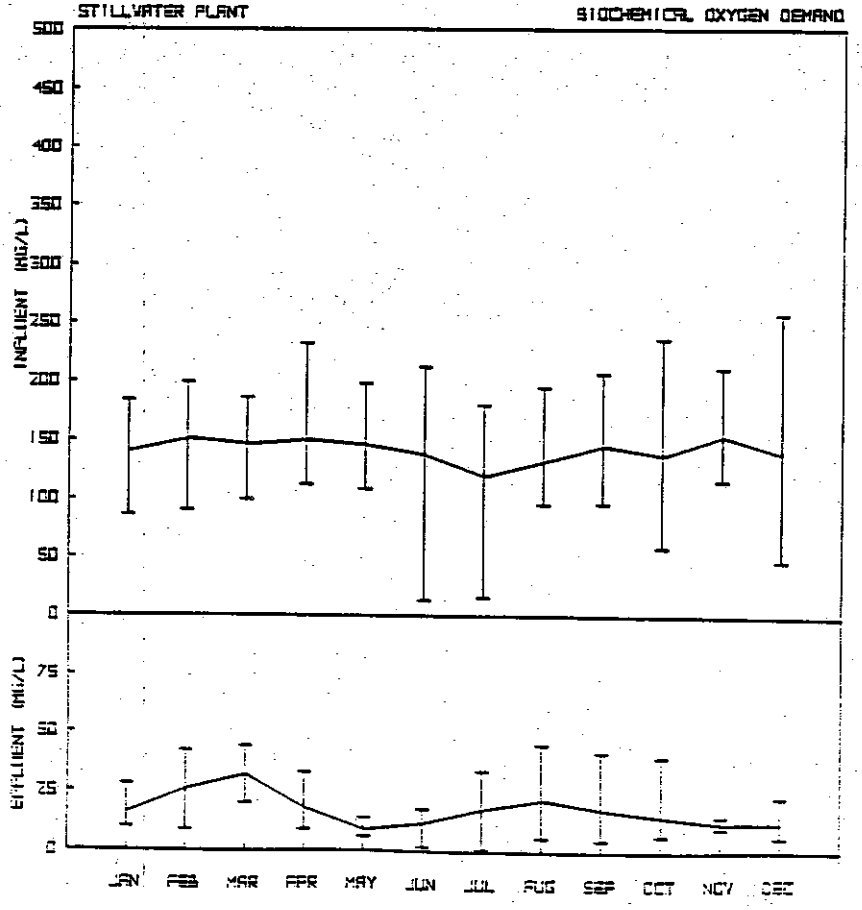
MONTHLY SUMMARY OF INFLUENT QUALITY
TREATMENT PLANT: Stillwater

MONTH	WASTEWATER FLOW MGD	TEMPERATURE DEGREES °F	BOD mg/l	COD mg/l	TSS mg/l	pH RANGE
JANUARY	2.17	13	140	---	130	7.4-7.9
FEBRUARY	2.20	11	151	---	130	7.2-7.9
MARCH	2.18	12	146	---	124	7.4-7.9
APRIL	2.28	12	150	---	141	7.4-7.8
MAY	2.33	13	145	238	142	7.2-7.8
JUNE	2.37	13	137	263	139	7.2-7.7
JULY	2.42	14	119	252	168	6.2-8.8*
AUGUST	2.43	17	132	270	193	6.5-9.0*
SEPTEMBER	2.32	17	145	284	157	6.3-8.9*
OCTOBER	2.38	16	137	292	166	6.9-9.0*
NOVEMBER	2.32	14	154	248	279	6.5-9.8*
DECEMBER	2.26	13	139	262	135	4.4-9.6*
1981 AVERAGE	2.30	14	141	264	159	4.4-9.8
1980 AVERAGE	2.30	13	121	272	127	7.2-8.0

MONTHLY SUMMARY OF EFFLUENT QUALITY
TREATMENT PLANT: STILLWATER

Month	BOD mg/l	COD mg/l	TSS mg/l	FECAL COLIFORM Geometric Mean MPN/100 ml	TURB NTU	KJN mg/l	NH mg/l	NO2 mg/l	NO3 mg/l	TOTAL P mg/l	D.O. mg/l	pH Range	Cl2 Used lbs	Cl2 Res mg/l	% Removal BOD	% Removal TSS
NPDES LIMIT	25	--	30	200	25	----	----	----	----	1.0	---	6.5-8.5	---	---	--	--
JANUARY	16	--	14	1	9	----	----	----	----	.6	5.0	7.0-7.1	97	3.1	89	89
FEBRUARY	25	--	12	1	6	----	----	----	----	.5	5.3	7.0-7.2	55	1.7	93	91
MARCH	32	--	18	1	9	----	----	----	----	.7	4.8	7.0-7.1	142	4.6	78	86
APRIL	18	--	14	1	7	----	----	----	----	.4	4.6	7.1-7.2	200	6.7	88	90
MAY	9	27	7	2	4	15.1	15.6	.22	.35	.4	4.7	7.1-7.2	114	5.0	94	95
JUNE	12	33	7	3	4	13.2	10.0	.08	.54	.4	4.5	7.0-7.2	50	2.4	91	95
JULY	18	31	6	2	4	10.3	8.7	.05	3.20	.3	4.5	7.0-7.1	113	3.8	85	96
AUGUST	22	49	9	2	4	13.7	9.3	.04	2.74	.9	4.5	7.0-7.1	97	3.2	83	96
SEPTEMBER	18	35	7	3	4	20.0	9.2	----	----	.3	4.8	7.0-7.2	104	3.4	87	96
OCTOBER	15	35	8	5	4	15.7	11.2	----	----	.4	5.1	7.0-7.2	150	4.5	89	95
NOVEMBER	12	43	8	---	4	14.7	10.3	2.20	2.50	.3	4.9	7.0-7.1	---	---	92	97
DECEMBER	12	33	7	---	4	14.5	10.8	2.75	.89	.6	5.0	7.0-7.1	---	---	91	95
1981 AVG.	18	36	10	2	5	14.6	10.5	.89	1.72	.5	4.8	7.0-7.2	112	3.7	87	94
1980 AVG.	12	45	15	2	7	----	----	----	----	.5	5.0	7.0-7.4	---	---	90	88


STILLWATER PLANT
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981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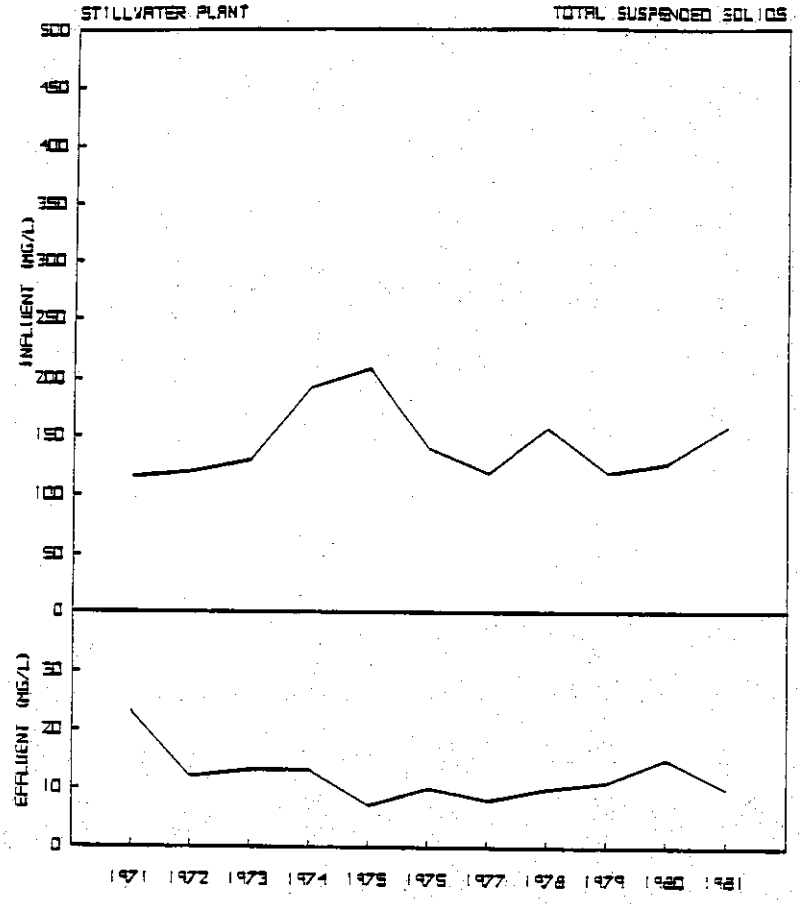
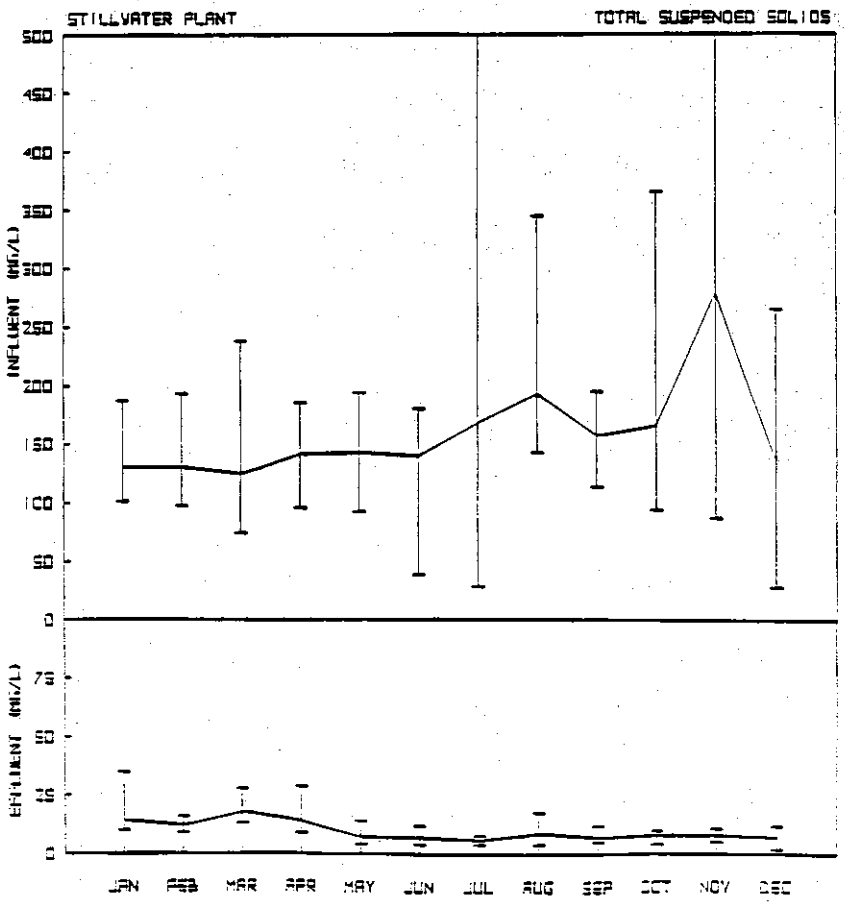
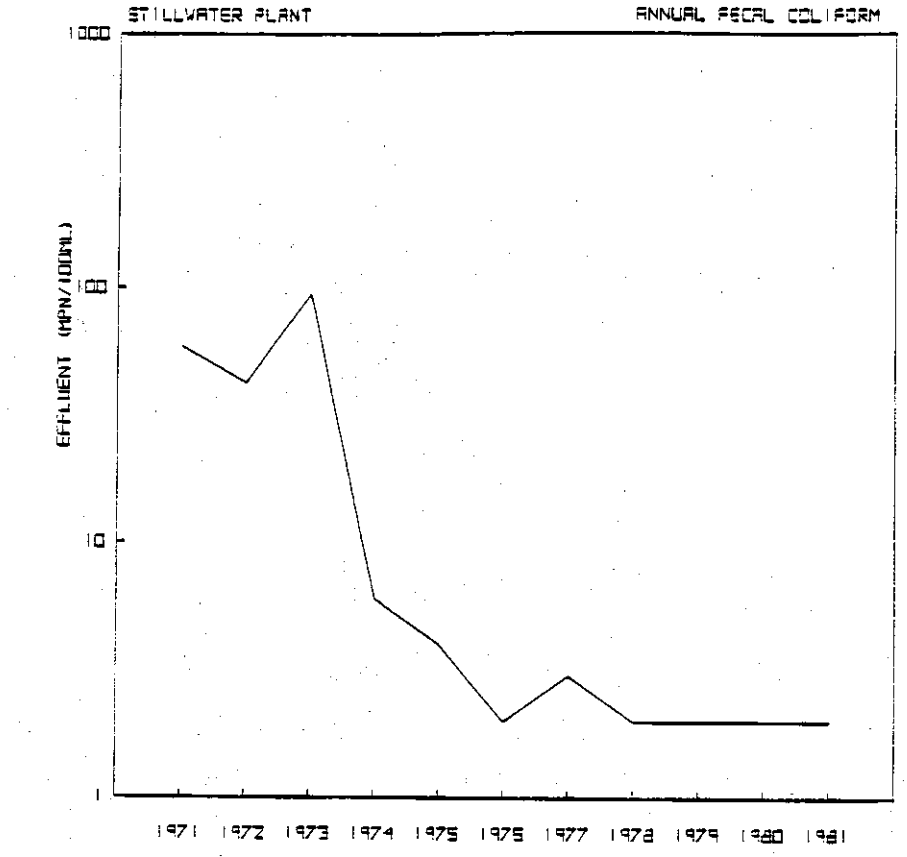
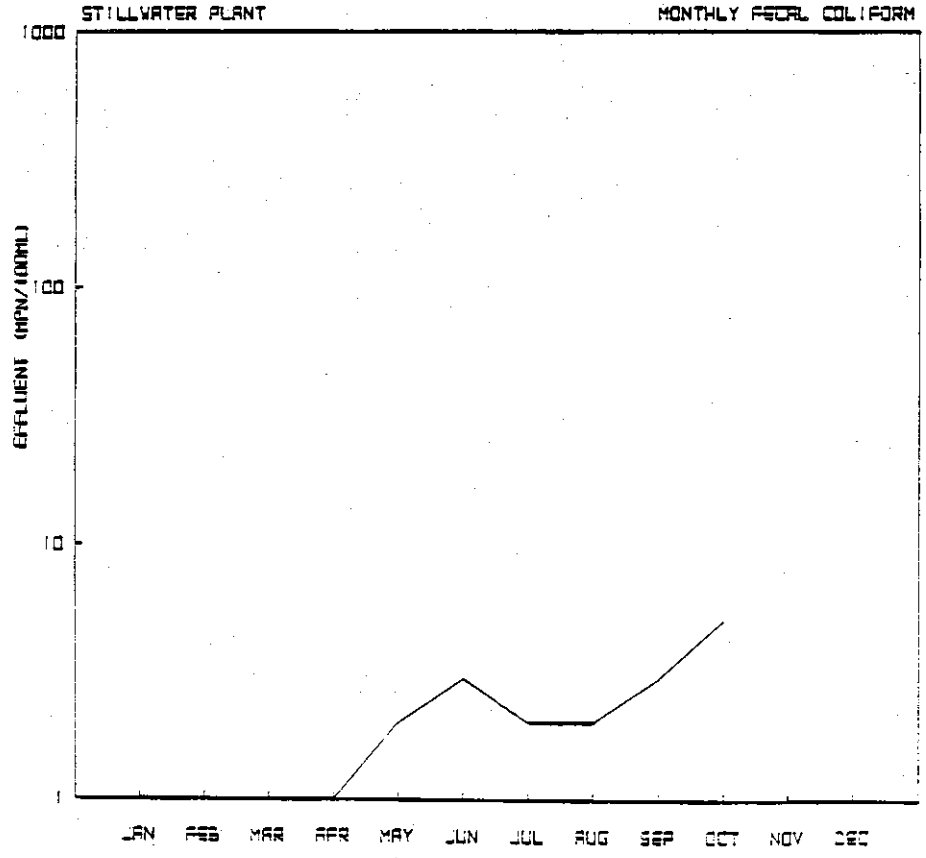
BIOCHEMICAL OXYGEN DEMAND
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


STILLWATER PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981


STILLWATER PLANT
TOTAL SUSPENDED SOLIDS
INFLUENT (MG/L)
EFFLUENT (MG/L)
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


STILLWATER PLANT
ANNUAL FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981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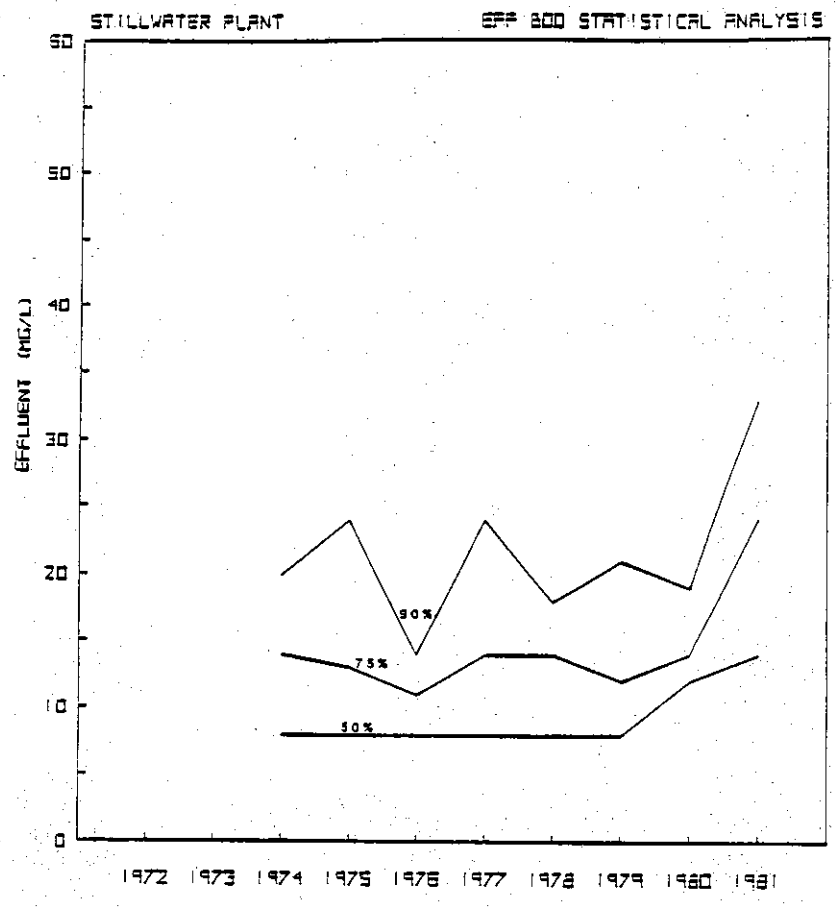
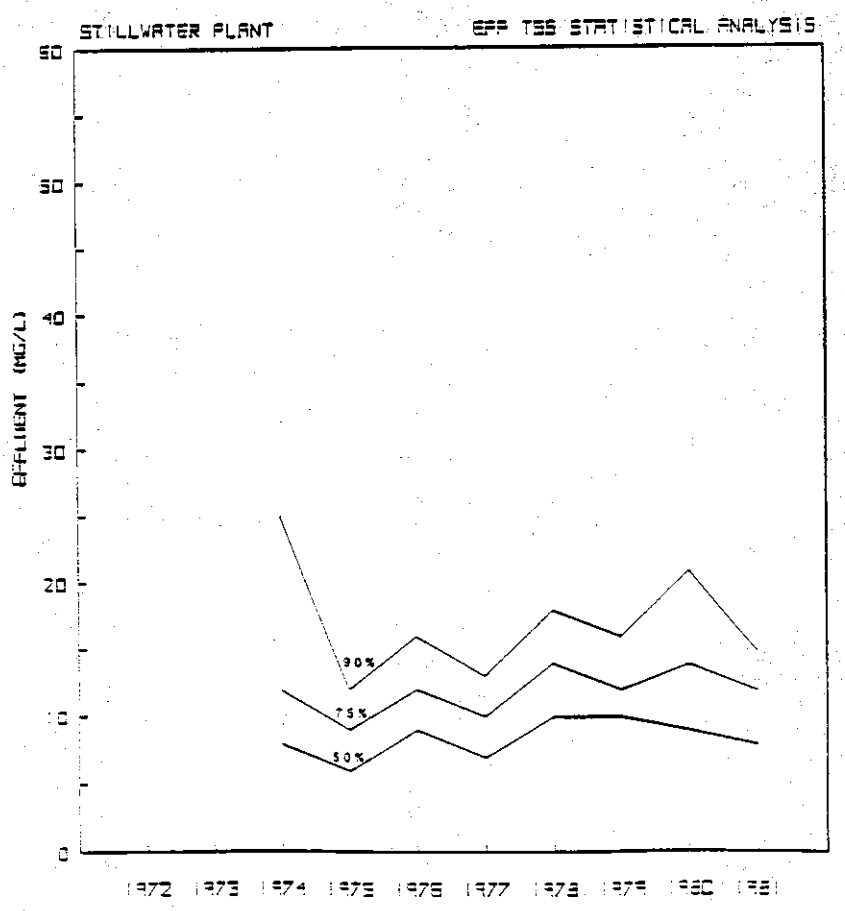
MONTHLY FECAL COLIFORM
EFFLUENT (MPN/100ML)
1000
100
10
1
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


STILLWATER PLANT
EFF BOD STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
60
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981


STILLWATER PLANT
EFF TSS STATISTICAL ANALYSIS
EFFLUENT (MG/L)
0
10
20
30
40
50
60
90%
75%
50%
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981

1981 EFFLUENT DATA
STILLWATER PLANT

Month	Cu mg/l	Cr mg/l	Zn mg/l	Pb mg/l	CN mg/l	Cd mg/l	Hg ug/l	Ni mg/l	As ug/l	Sn ug/l	Phenol ug/l	Fe mg/l
January							0.4					
February							<0.2					
March							0.2					
April							0.3					
May							<0.2					
June							<0.2					
July							0.3					
August							<0.2					
September							<0.2					
October							<0.2					
November							<0.2					
December							<0.2					
1981 Avg.							<0.2					

APPENDIX

TABLE A-1

1981 ANNUAL AVERAGE
TREATMENT PLANT INFLUENT DATA

Treatment Plant	Flow mgd	Temp °C	BOD mg/l	COD mg/l	TSS mg/l	pH Range	Settleable Solids ml/l	Nutrients Total P mg/l	Nutrients KJN mg/l	NH3 mg/l
Anoka	2.01	18	211	362	152	7.5-8.7	7.3	6.6	37.4	19.3
Bayport	0.47	19	184	316	165	6.0-9.6	11.9	5.6	28.2	15.6
Blue Lake	13.7	14	230	508	241	5.6-9.4	8.9	6.9	33.0	15.9
Chaska	0.70	14	229	428	189	4.6-12.0	6.6	7.3	33.8	16.3
Cottage Grove	1.21	16	204	399	187	7.2-8.6	10.1	8.1	45.6	26.3
Empire	3.51	14	234	460	251	5.6-8.8	11.7	14.9	49.1	24.4
Hastings	1.50	17	227	488	235	5.6-10.8	11.0	9.7	47.1	24.6
Maple Plain	0.25	14	165	274	179	7.3-8.0	9.3	4.9	39.9	20.1
Medina	0.104	14	128	236	132	7.6-7.9	----	4.7	34.2	16.9
Metropolitan	202	17	208	413	230	5.4-9.0	10.2	----	----	----
Rosemount	0.30	14	177	423	221	6.8-8.5	16.0	7.2	45.6	24.6
Savage	0.40	15	153	336	234	4.0-12.2	4.0	6.6	28.2	15.5
Seneca	13.8	17	217	488	211	6.5-10.4	7.6	8.2	38.4	23.0
Stillwater	2.31	14	141	264	159	4.4-9.8	4.6	5.3	24.2	12.2

TABLE A-2

ANNUAL AVERAGE FLOW DATA
FOR THE PERIOD 1971-1981

Treatment Plant	ANNUAL AVERAGE FLOW (MGD) 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	1.76	1.93	1.88	1.78	1.62	1.77	1.92	2.01	1.98	2.09	2.01
APPLE VALLEY	0.57	0.71	1.16	1.26	1.48	1.46	1.67	1.94	2.03	*---	----
BAYPORT	0.48	0.48	0.42	0.45	0.56	0.50	0.48	0.47	0.54	0.44	0.47
BLUE LAKE (POND)	1.43	2.96	3.74	----	-----	-----	-----	-----	----	----	----
BLUE LAKE	-----	----	3.94	6.78	9.05	9.03	9.86	12.49	14.1	14.1	13.7
BURNSVILLE	1.76	2.10	*---	----	-----	-----	-----	-----	----	----	----
CHASKA	0.53	0.58	0.74	0.75	0.91	0.81	0.75	0.97	0.89	0.64	0.70
CHANHASSEN	0.07	*---	----	----	-----	-----	-----	-----	----	----	----
COTTAGE GROVE	0.62	0.85	0.92	0.91	0.91	0.91	0.97	1.31	1.60	1.58	1.21
**EAGAN TOWNSHIP	-----	----	*---	----	-----	-----	-----	-----	----	----	----
EMPIRE	-----	----	----	----	-----	-----	-----	-----	3.54	3.48	3.51
EXCELSIOR	0.56	0.50	*---	----	-----	-----	-----	-----	----	----	----
FARMINGTON	0.35	0.30	0.40	0.35	0.59	0.37	0.35	0.52	0.78	*---	----
FOREST LAKE TOWNSHIP	0.16	0.17	*---	----	-----	-----	-----	-----	----	----	----
FOREST LAKE VILLAGE	0.23	0.25	*---	----	-----	-----	-----	-----	----	----	----
HASTINGS	0.91	1.14	1.32	1.29	1.29	1.30	1.40	1.42	1.35	1.44	1.50
INVER GROVE HEIGHTS	0.59	0.64	*---	----	-----	-----	-----	-----	----	----	----
LAKEVILLE	0.45	0.36	0.33	0.37	0.50	0.38	0.36	0.48	0.60	*---	----
LONG LAKE	0.18	0.17	0.15	0.20	0.23	0.19	0.21	0.30	0.32	0.28	*---
MAPLE PLAIN	0.22	0.28	0.22	0.24	0.33	0.22	0.18	0.26	0.27	0.20	0.25
MEDINA	0.07	0.09	0.07	0.08	0.09	0.07	0.08	0.14	0.12	0.10	0.10
METROPOLITAN	213	213	202	196	202	196	194	210	217	206	202
MOUND	1.09	1.23	1.26	1.48	*----	-----	-----	-----	----	----	----
NEWPORT	0.18	0.17	0.18	0.17	0.21	*----	-----	-----	----	----	----
OAK PARK HEIGHTS	0.07	0.10	0.12	*---	-----	-----	-----	-----	----	----	----
ORONO	0.20	0.25	0.27	0.34	0.32	0.31	0.34	0.46	0.49	0.62	*---
PRIOR LAKE	0.10	0.12	0.13	0.17	0.31	0.44	0.10	0.01	*---	----	----
ROSEMOUNT (trickling filter)	0.10	0.11	0.12	*---	-----	-----	-----	-----	----	----	----
ROSEMOUNT AWTP	-----	----	0.20	0.20	0.22	0.24	0.27	0.29	0.30	0.29	0.30
ST. PAUL PARK	0.30	0.31	0.30	0.28	0.36	*----	-----	-----	----	----	----
SAVAGE	0.31	0.33	0.29	0.38	0.42	0.38	0.39	0.37	0.44	0.38	0.40
SENECA	-----	7.76	10.12	9.89	10.34	10.81	11.72	12.71	13.6	13.0	13.8
SHAKOPEE	1.24	*---	----	----	-----	-----	-----	-----	----	----	----
SOUTH ST. PAUL	10.10	9.38	9.66	9.72	*----	-----	-----	-----	----	----	----
STILLWATER	2.14	1.96	1.88	1.92	2.09	2.10	2.11	2.21	2.51	2.30	2.31
**VICTORIA	-----	----	----	*---	-----	-----	-----	-----	----	----	----
WACONIA	-----	----	----	----	0.23	0.26	0.25	*----	----	----	----
WAYZATA	0.53	*---	----	----	-----	-----	-----	-----	----	----	----
ALL PLANTS EXCEPT METRO	26	31	36	39	32	32	33	39	45	41	40
ALL PLANTS	239	244	238	235	234	228	227	249	262	247	242

*Plant phased out during previous year.
**Flow data not available.

TABLE A-3

ANNUAL AVERAGE EFFLUENT CONCENTRATIONS
FOR THE PERIOD 1971-1981

Treatment Plant	ANNUAL AVERAGE BOD (MG/L) 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	20	29	36	21	16	11	9	12	14	14	16
APPLE VALLEY	74	113	22	24	7	7	6	12	23	*--	--
BAYPORT	27	40	32	9	15	14	11	8	7	7	8
BLUE LAKE (POND)	31	31	39	--	--	--	--	--	--	--	--
BLUE LAKE	--	--	12	18	15	15	13	13	9	9	12
BURNSVILLE	40	55	*--	--	--	--	--	--	--	--	--
CHASKA	36	49	52	58	43	42	44	78	112	20	18
CHANHASSEN	84	*--	--	--	--	--	--	--	--	--	--
COTTAGE GROVE	53	52	60	36	25	55	39	34	19	11	12
EAGAN TOWNSHIP	50	52	*--	--	--	--	--	--	--	--	--
EMPIRE	--	--	--	--	--	--	--	--	10	3	3
EXCELSIOR	13	26	*--	--	--	--	--	--	--	--	--
FARMINGTON	39	52	46	85	64	29	76	31	52	*--	--
FOREST LAKE TOWNSHIP	8	35	*--	--	--	--	--	--	--	--	--
FOREST LAKE VILLAGE	77	114	*--	--	--	--	--	--	--	--	--
HASTINGS	12	7	15	34	15	12	16	18	18	18	20
INVER GROVE HEIGHTS	76	110	*--	--	--	--	--	--	--	--	--
LAKEVILLE	36	33	34	25	28	34	51	67	65	*--	--
LONG LAKE	53	24	18	35	40	41	43	42	43	58	*--
MAPLE PLAIN	12	11	13	10	9	8	11	11	18	20	12
MEDINA	12	9	14	10	13	14	25	22	22	22	26
METROPOLITAN	84	72	46	42	41	67	42	39	43	23	19
MOUND	24	35	53	98	*--	--	--	--	--	--	--
NEWPORT	48	88	58	47	49	*--	--	--	--	--	--
OAK PARK HEIGHTS	39	32	48	*--	--	--	--	--	--	--	--
ORONO	15	10	10	6	6	8	12	24	18	31	*--
PRIOR LAKE	34	26	28	22	24	35	22	24	*--	--	--
ROSEMOUNT (trickling filter)	36	68	76	*--	--	--	--	--	--	--	--
ROSEMOUNT AWTP	--	--	7	23	16	14	14	13	13	12	14
ST. PAUL PARK	66	93	52	51	63	*--	--	--	--	--	--
SAVAGE	22	26	28	27	21	20	46	27	27	7	10
SENECA	--	29	16	15	11	15	16	21	16	16	20
SHAKOPEE	355	*--	--	--	--	--	--	--	--	--	--
SOUTH ST. PAUL	60	42	31	46	*--	--	--	--	--	--	--
STILLWATER	24	17	14	12	11	8	12	10	10	12	18
VICTORIA	73	52	70	*--	--	--	--	--	--	--	--
WACONIA	--	--	--	--	17	62	52	31	*--	--	--
WAYZATA	41	*--	--	--	--	--	--	--	--	--	--
ALL PLANTS EXCEPT METRO (weighted avg.)	52	38	27	26	16	17	17	19	17	12	15
ALL PLANTS (weighted average)	81	67	43	40	38	60	38	36	39	21	18
ALL PLANTS EXCEPT METRO- (actual average)	50	45	34	32	24	23	27	26	28	17	15
ALL PLANTS- (actual average)	51	46	34	33	25	26	28	27	28	18	15

*Plant phased out during previous year.

TABLE A-4

ANNUAL AVERAGE EFFLUENT CONCENTRATIONS
FOR THE PERIOD 1971-1981

Treatment Plant	ANNUAL AVERAGE TSS (MG/L) 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	24	36	40	19	13	15	14	16	12	11	14
APPLE VALLEY	93	148	16	14	5	5	3	6	10	*--	--
BAYPORT	22	43	28	15	10	8	10	8	8	7	7
BLUE LAKE (POND)	34	58	45	--	--	--	--	--	--	--	--
BLUE LAKE	--	--	22	21	14	19	13	14	12	9	12
BURNSVILLE	60	86	*--	--	--	--	--	--	--	--	--
CHASKA	72	86	79	91	62	55	54	66	59	12	13
CHANHASSEN	71	*--	--	--	--	--	--	--	--	--	--
COTTAGE GROVE	63	70	93	84	36	25	23	28	14	8	7
EAGAN TOWNSHIP	60	69	*--	--	--	--	--	--	--	--	--
EMPIRE	--	--	--	--	--	--	--	--	5	2	2
EXCELSIOR	13	36	*--	--	--	--	--	--	--	--	--
FARMINGTON	70	77	54	75	29	23	34	34	37	*--	--
FOREST LAKE TOWNSHIP	11	24	*--	--	--	--	--	--	--	--	--
FOREST LAKE VILLAGE	105	163	*--	--	--	--	--	--	--	--	--
HASTINGS	10	10	18	26	20	21	18	20	19	23	22
INVER GROVE HEIGHTS	139	174	*--	--	--	--	--	--	--	--	--
LAKEVILLE	47	36	36	30	33	39	53	68	71	*--	--
LONG LAKE	35	47	23	50	39	48	37	30	26	43	*--
MAPLE PLAIN	20	13	13	19	12	16	16	10	13	14	9
MEDINA	11	15	16	13	13	15	20	18	19	25	18
METROPOLITAN	72	54	37	43	40	60	49	43	64	26	19
MOUND	37	36	47	38	*--	--	--	--	--	--	--
NEWPORT	85	120	96	110	89	*--	--	--	--	--	--
OAK PARK HEIGHTS	36	47	85	*--	--	--	--	--	--	--	--
ORONO	19	15	10	10	11	17	21	32	23	43	*--
PRIOR LAKE	28	33	27	25	25	28	17	17	*--	--	--
ROSEMOUNT (trickling filter)	51	63	58	*--	--	--	--	--	--	--	--
ROSEMOUNT AWTP	--	--	2	9	4	3	3	4	3	2	2
ST. PAUL PARK	69	77	47	48	47	*--	--	--	--	--	--
SAVAGE	24	28	14	15	13	10	14	15	14	7	8
SENECA	--	29	17	19	16	15	15	17	20	16	20
SHAKOPEE	146	*--	--	--	--	--	--	--	--	--	--
SOUTH ST. PAUL	38	22	22	31	*--	--	--	--	--	--	--
STILLWATER	23	12	13	13	7	10	8	10	11	15	10
VICTORIA	59	45	52	*--	--	--	--	--	--	--	--
WACONIA	--	--	--	--	33	53	42	40	*--	--	--
WAYZATA	34	*--	--	--	--	--	--	--	--	--	--
ALL PLANTS EXCEPT METRO (weighted avg.)	44	38	27	26	17	18	15	18	16	12	14
ALL PLANTS (weighted average)	69	52	36	40	37	54	44	38	56	24	18
ALL PLANTS EXCEPT METRO-(actual average)	50	57	37	35	25	22	22	24	21	16	11
ALL PLANTS-(actual average)	51	57	37	36	26	24	23	25	23	16	12

*Plant phased out during previous year.

TABLE A-5

ANNUAL AVERAGE EFFLUENT PERCENT REMOVAL EFFICIENCY FOR THE PERIOD 1971-1981

Treatment Plant	ANNUAL AVERAGE BOD REMOVAL (%)										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	89	87	85	91	92	94	95	94	93	92	92
APPLE VALLEY	65	52	90	89	97	96	97	94	88	*--	--
BAYPORT	88	86	86	97	95	95	95	96	96	96	96
BLUE LAKE (POND)	87	92	88	--	--	--	--	--	--	--	--
BLUE LAKE	--	--	96	94	94	95	95	95	96	96	95
BURNSVILLE	74	69	*--	--	--	--	--	--	--	--	--
CHASKA	79	75	74	69	81	83	78	61	57	91	92
CHANHASSEN	70	*--	--	--	--	--	--	--	--	--	--
COTTAGE GORVE	81	80	76	85	89	72	81	83	89	94	94
EAGAN TOWNSHIP	75	69	*--	--	--	--	--	--	--	--	--
EMPIRE	--	--	--	--	--	--	--	--	95	98	99
EXCELSIOR	92	91	*--	--	--	--	--	--	--	--	--
FARMINGTON	86	87	86	91	86	94	83	91	82	*--	--
FOREST LAKE TOWNSHIP	--	--	*--	--	--	--	--	--	--	--	--
FOREST LAKE VILLAGE	51	40	*--	--	--	--	--	--	--	--	--
HASTINGS	96	97	92	81	91	94	92	93	92	91	91
INVER GROVE HEIGHTS	66	51	*--	--	--	--	--	--	--	--	--
LAKEVILLE	75	78	84	94	92	94	88	77	75	*--	--
LONG LAKE	75	86	93	86	73	78	79	74	74	61	*--
MAPLE PLAIN	90	86	93	95	89	94	93	92	89	88	93
MEDINA	92	90	90	92	92	94	86	93	82	84	80
METROPOLITAN	66	73	82	84	83	75	83	82	79	89	91
MOUND	82	79	75	52	*--	--	--	--	--	--	--
NEWPORT	79	64	72	78	71	*--	--	--	--	--	--
OAK PARK HEIGHTS	85	88	83	*--	--	--	--	--	--	--	--
ORONO	88	93	94	96	94	93	91	79	82	68	*--
PRIOR LAKE	82	78	80	80	77	68	71	78	*--	--	--
ROSEMOUNT (trickling filter)	74	72	65	*--	--	--	--	--	--	--	--
ROSEMOUNT AWTP	--	--	90	91	92	94	93	93	93	93	92
ST. PAUL PARK	88	66	79	78	72	*--	--	--	--	--	--
SAVAGE	84	88	84	85	88	88	84	85	79	95	93
SENECA	--	88	94	94	95	94	93	92	93	92	91
SHAKOPEE	11	*--	--	--	--	--	--	--	--	--	--
SOUTH ST. PAUL	88	92	90	87	*--	--	--	--	--	--	--
STILLWATER	73	84	87	92	93	94	90	93	92	90	87
VICTORIA	57	68	66	*--	--	--	--	--	--	--	--
WACONIA	--	--	--	--	90	90	85	90	*--	--	--
WAYZATA	78	*--	--	--	--	--	--	--	--	--	--
ALL PLANTS EXCEPT METRO-(weighted avg.)	83	85	89	90	93	93	93	92	92	94	93
ALL PLANTS-(weighted average)	68	75	83	85	84	77	84	84	81	90	91
ALL PLANTS EXCEPT METRO-(actual average)	77	78	84	86	88	89	88	87	86	89	92
ALL PLANTS-(actual average)	77	78	84	86	88	89	88	87	86	89	92

*Plant phased out during previous year.

TABLE A-6

ANNUAL AVERAGE EFFLUENT PERCENT REMOVAL EFFICIENCY FOR THE PERIOD 1971-1981

Treatment Plant	ANNUAL AVERAGE TSS REMOVAL (%)										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	90	88	85	94	94	92	92	90	91	92	91
APPLE VALLEY	64	55	95	96	98	98	99	98	96	*--	--
BAYPORT	90	84	86	95	97	96	93	94	95	96	96
BLUE LAKE (POND)	78	66	75	--	--	--	--	--	--	--	--
BLUE LAKE	--	--	91	94	96	95	96	96	96	96	98
BURNSVILLE	75	72	*--	--	--	--	--	--	--	--	--
CHASKA	66	54	57	53	73	81	70	63	70	93	93
CHANHASSEN	75	*--	--	--	--	--	--	--	--	--	--
COTTAGE GROVE	82	78	66	71	85	86	90	86	91	95	96
EAGAN TOWNSHIP	72	61	*--	--	--	--	--	--	--	--	--
EMPIRE	--	--	--	--	--	--	--	--	98	99	99
EXCELSIOR	93	80	*--	--	--	--	--	--	--	--	--
FARMINGTON	73	74	76	79	88	90	86	82	75	*--	--
FOREST LAKE TOWNSHIP	--	--	*--	--	--	--	--	--	--	--	--
FOREST LAKE VILLAGE	41	37	*--	--	--	--	--	--	--	--	--
HASTINGS	97	97	92	87	90	90	90	92	91	90	91
INVER GROVE HEIGHTS	42	31	*--	--	--	--	--	--	--	--	--
LAKEVILLE	73	83	89	96	97	96	93	82	81	*--	--
LONG LAKE	83	84	92	89	79	82	86	85	88	79	*--
MAPLE PLAIN	68	79	89	90	86	88	91	96	94	93	95
MEDINA	92	88	88	91	91	96	88	96	91	83	86
METROPOLITAN	77	83	88	86	87	82	83	81	71	89	92
MOUND	80	82	74	80	*--	--	--	--	--	--	--
NEWPORT	66	50	56	56	51	*--	--	--	--	--	--
OAK PARK HEIGHTS	85	81	71	*--	--	--	--	--	--	--	--
ORONO	86	91	94	96	93	88	88	81	84	72	*--
PRIOR LAKE	89	82	86	80	86	80	80	88	*--	--	--
ROSEMOUNT (trickling filter)	72	87	83	*--	--	--	--	--	--	--	--
ROSEMOUNT AWTP	--	--	96	96	98	99	99	98	99	99	99
ST. PAUL PARK	78	75	83	82	80	*--	--	--	--	--	--
SAVAGE	91	96	95	94	95	95	94	94	93	99	97
SENECA	--	88	93	94	94	93	93	93	90	91	91
SHAKOPEE	38	*--	--	--	--	--	--	--	--	--	--
SOUTH ST. PAUL	93	94	93	92	*--	--	--	--	--	--	--
STILLWATER	80	90	90	93	97	93	93	94	91	88	94
VICTORIA	62	69	72	*--	--	--	--	--	--	--	--
WACONIA	--	--	--	--	82	86	84	89	*--	--	--
WAYZATA	72	*--	--	--	--	--	--	--	--	--	--
ALL PLANTS EXCEPT METRO (weighted avg.)	82	83	88	93	94	93	94	93	93	94	94
ALL PLANTS (weighted average)	78	83	88	87	88	83	84	84	75	90	92
ALL PLANTS EXCEPT METRO-(actual average)	76	76	83	86	88	91	90	89	90	91	94
ALL PLANTS-(actual average)	76	76	84	86	88	90	89	89	89	91	94

*Plant phased out during previous year.

TABLE A-7
INFLUENT BOD DATA 1971-1981

Treatment Plant	Annual Average Values, BOD (mg/l) 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	182	223	240	237	189	170	175	199	206	176	211
APPLE VALLEY	211	235	220	228	204	189	228	216	194	*---	---
BAYPORT	225	286	229	282	330	270	228	200	198	197	184
BLUE LAKE	---	---	300	304	271	282	258	266	216	228	230
CHASKA	171	196	200	185	222	241	203	200	258	220	229
COTTAGE GROVE	279	260	250	234	222	197	209	198	172	171	204
EMPIRE	---	---	---	---	---	---	---	---	208	181	234
FARMINGTON	279	400	329	957	453	452	447	338	293	*---	---
HASTINGS	300	233	188	175	161	187	189	243	221	210	227
LAKEVILLE	144	150	213	426	373	570	432	290	257	*---	---
LONG LAKE	212	171	257	258	150	183	201	163	164	148	*---
MAPLE PLAIN	120	79	186	188	80	129	156	142	165	173	165
MEDINA	150	90	140	124	156	246	285	300	119	139	128
METROPOLITAN	247	267	256	256	241	266	246	215	205	215	208
NEWPORT	229	244	207	217	170	*---	---	---	---	---	---
ORONO	125	143	167	158	105	110	141	116	102	98	*---
PRIOR LAKE	189	118	140	111	104	110	76	103	*---	---	---
ROSEMOUNT	---	---	70	246	213	220	203	198	193	165	177
ST. PAUL PARK	550	274	248	227	224	*---	---	---	---	---	---
SAVAGE	138	217	175	184	191	163	283	179	130	151	153
SENECA	---	242	267	270	235	247	230	252	219	194	217
STILLWATER	89	106	108	157	161	140	116	146	118	121	141
WACONIA	---	---	---	---	169	676	341	*---	---	---	---
ALL PLANTS EXCEPT METRO-(weighted avg.)					234	243	229	239	207	197	217
ALL PLANTS-(weighted average)					240	263	243	219	205	212	209
ALL PLANTS EXCEPT METRO-(actual average)					209	252	232	208	191	171	192
ALL PLANTS-(actual average)					210	252	232	209	191	174	193

*Plant phased out during previous year.

TABLE A-8
INFLUENT TSS DATA 1971-1981

Treatment Plant	Annual Average Values, TSS (mg/l) 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ANOKA	240	300	267	302	234	195	176	164	132	141	152
APPLE VALLEY	258	329	320	378	300	229	271	274	240	*---	---
BAYPORT	220	269	200	326	317	227	147	144	169	191	165
BLUE LAKE	---	---	244	364	347	361	324	317	270	244	241
CHASKA	212	190	184	194	226	292	180	180	195	167	189
COTTAGE GROVE	350	318	274	294	241	185	220	200	163	152	187
EMPIRE	---	---	---	---	---	---	---	---	226	190	251
FARMINGTON	259	296	225	361	250	223	235	189	147	*---	---
HASTINGS	333	333	225	198	199	207	184	252	223	224	235
LAKEVILLE	174	212	327	849	997	876	759	388	365	*---	---
LONG LAKE	206	294	288	446	187	261	274	195	210	196	*---
MAPLE PLAIN	63	62	118	193	83	134	182	228	233	209	179
MEDINA	138	125	133	141	214	365	385	487	205	151	132
METROPOLITAN	313	318	308	317	316	332	288	231	222	237	230
NEWPORT	250	248	218	248	181	*---	---	---	---	---	---
ORONO	136	167	167	235	168	146	176	167	140	154	*---
PRIOR LAKE	255	183	193	123	180	139	83	149	*---	---	---
ROSEMOUNT	---	---	50	230	258	230	226	235	202	236	221
ST. PAUL PARK	318	308	276	270	241	*---	---	---	---	---	---
SAVAGE	267	700	280	269	278	241	249	265	190	565	234
SENECA	---	242	243	319	282	225	209	240	204	186	211
STILLWATER	115	120	130	193	210	140	118	158	119	127	159
WACONIA	---	---	---	---	187	381	270	*---	---	---	---
ALL PLANTS EXCEPT METRO-(weighted avg.)					292	264	243	255	219	204	218
ALL PLANTS-(weighted average)					313	323	281	235	221	232	228
ALL PLANTS EXCEPT METRO-(actual average)					266	266	246	235	202	209	197
ALL PLANTS-(actual average)					268	269	248	235	203	211	199

*Plant phased out during previous year.

TABLE A-9

STATISTICAL ANALYSES OF BIOCHEMICAL OXYGEN DEMAND DATA
FOR PLANTS IN OPERATION DURING 1981

TREATMENT PLANT EFFLUENT STATISTICAL DATA

BIOCHEMICAL OXYGEN DEMAND, mg/l*

Treatment Plant	50% of Time					75% of Time					90% of Time				
	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981
ANOKA	7	11	12	12	15	10	16	16	17	20	13	22	22	22	26
BAYPORT	7	6	6	5	7	10	10	8	8	8	16	14	11	11	10
BLUE LAKE	10	11	7	8	9	15	14	10	10	13	20	22	15	14	19
CHASKA	33	61	93	14	14	58	100	160	22	24	98	140	210	38	34
COTTAGE GROVE	31	28	12	10	9	44	38	20	14	15	69	52	50	18	20
EMPIRE	--	--	4	2	3	--	--	10	2	4	--	--	28	5	4
HASTINGS	13	16	16	17	18	19	22	22	22	24	29	28	28	31	33
MAPLE PLAIN	8	7	16	19	10	17	14	23	29	15	26	22	33	37	21
METROPOLITAN	40	40	36	20	14	51	53	53	29	24	62	64	71	44	36
ROSEMOUNT	12	11	10	11	12	18	15	15	14	15	23	22	20	20	19
SAVAGE	20	26	26	5	9	30	34	41	7	12	42	42	59	9	15
SENECA	14	18	14	14	19	20	25	18	20	22	28	39	27	25	30
STILLWATER	8	8	8	12	14	14	14	12	14	24	24	18	21	19	33

*The data shows that for the percent of time shown, the effluent concentration was less than or equal to the tabulated values.

TABLE A-10

STATISTICAL ANALYSES OF TOTAL SUSPENDED SOLIDS EFFLUENT DATA
FOR PLANTS IN OPERATION DURING 1981

TREATMENT PLANT EFFLUENT STATISTICAL DATA

Treatment Plant	TOTAL SUSPENDED SOLIDS, mg/l*														
	50% of Time					75% of Time					90% of Time				
	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981	1977	1978	1979	1980	1981
ANOKA	12	13	10	10	12	16	20	15	15	18	21	28	21	20	24
BAYPORT	10	8	7	7	7	12	10	10	9	9	15	12	13	11	10
BLUE LAKE	11	13	11	8	6	17	28	14	11	7	20	22	17	15	9
CHASKA	36	58	43	11	13	71	88	83	15	16	121	120	130	18	22
COTTAGE GROVE	12	17	10	7	5	22	28	16	13	8	44	51	28	22	14
EMPIRE	--	--	3	1	1	--	--	5	3	1	--	--	11	4	2
HASTINGS	16	18	17	22	19	24	26	24	30	28	29	33	31	38	36
MAPLE PLAIN	7	6	10	11	6	24	12	18	15	8	42	40	30	24	16
METROPOLITAN	40	37	43	15	10	53	55	85	33	24	88	78	137	60	47
ROSEMOUNT	2	3	2	2	1	3	5	3	3	2	5	7	5	3	3
SAVAGE	10	14	10	4	5	16	20	18	7	12	29	25	28	15	17
SENECA	14	14	13	15	19	18	19	24	19	23	22	27	32	23	28
STILLWATER	7	10	10	9	8	10	14	12	14	12	13	18	16	21	15

*The data shows that for the percent of the time shown, the effluent concentration was less than or equal to the tabulated values.

TABLE A-11

NUMBER OF PLANTS SHOWING
IMPROVEMENT OR DETERIORATION
FROM 1980 TO 1981

Total Suspended Solids

	Percent of Time		
	50%	75%	90%
Improvement	7	8	8
No Change	2	1	1
Deterioration	4	4	4

Biochemical Oxygen Demand

	Percent of Time		
	50%	75%	90%
Improvement	3	2	6
No Change	1	1	--
Deterioration	9	10	7

TABLE A-12

1981 ANNUAL AVERAGE
TREATMENT PLANT EFFLUENT DATA

Treatment Plant	BOD mg/l	COD mg/l	TSS mg/l	pH Range	Dissolved Oxygen mg/l	Fecal Coliform Geometric Mean MPN/100 ml	Turbidity NTU	Cl2 Used lbs.	Cl2 Res. mg/l	Settleable Solids mg/l	Nutrients				
											Total P mg/l	KJ-N mg/l	NH3 mg/l	NO2 mg/l	NO3 mg/l
Anoka	16	70	14	7.0-7.8	1.3	36	7	123	6.0	0.0	3.4	18.6	14.4	1.05	0.39
Bayport	8	29	7	6.8-7.3	3.6	2	3	34	3.5	0.0	0.4	6.3	3.7	0.35	12.18
Blue Lake	12	76	6	6.8-8.1	11.0	20	6	190	0.7	0.1	3.6	22.8	16.6	0.42	0.39
Chaska	18	79	13	6.5-8.1	8.6	7	6	32	2.7	0.0	1.3	16.0	9.5	1.32	0.26
Cottage Grove	12	47	7	6.7-8.3	5.9	55	5	102	5.2	0.0	5.0	8.4	9.5	1.26	18.88
Empire	3	26	2	6.7-7.8	8.5	3	1	98	1.0	0.0	6.7	2.2	0.3	0.15	25.41
Hastings	20	100	22	7.1-7.8	6.2	11	11	168	6.7	0.2	5.8	32.0	20.6	1.58	1.76
Maple Plain	12	50	9	7.3-8.1	5.6	23	5	13	0.3	0.0	3.4	15.4	11.2	0.17	2.05
Medina	26	65	18	6.5-7.9	3.4	--	9	---	---	---	3.2	13.4	8.2	0.31	0.57
Metropolitan	19	77	19	6.6-8.3	2.6	60	10	7823	2.2	0.4	2.0	19.2	12.9	0.85	2.27
Rosemount	14	40	2	6.5-8.4	6.1	3	4	42	1.9	0.0	0.2	32.8	26.9	0.50	0.78
Savage	10	48	8	7.2-8.2	8.8	39	6	19	1.8	0.1	4.0	4.2	0.4	0.09	12.27
Seneca	20	88	20	6.7-8.0	7.8	4	9	912	3.2	0.1	3.7	27.2	20.8	0.24	0.08
Stillwater	18	36	10	7.0-7.2	4.8	2	5	112	3.7	0.0	0.5	14.6	10.5	1.72	0.89

TABLE A-13

METRO AND SENECA SLUDGE QUANTITY

METRO PLANT SLUDGE PRODUCTION	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	TOTAL	AVG.
Wet Tons														
F&I No. 1	8,118	7,797	7,750	8,024	6,928	6,525	7,444	9,045	9,975	11,601	11,213	10,374	104,794	8,733
F&I No. 2	22,969	22,494	18,325	13,028	15,332	17,429	12,323	13,110	10,852	15,961	10,516	10,641	182,980	15,248
Press Cake	1,340	772	1,501	1,592	1,119	1,362	1,466	1,321	2,401	2,598	2,201	1,971	19,644	1,637
Total	32,427	31,063	27,576	22,644	23,379	25,316	21,233	23,476	23,228	30,160	23,930	22,986	307,418	25,618
Dry Tons (Total)														
F&I No. 1	2,270	2,160	2,069	2,324	1,980	2,014	2,234	2,532	2,869	3,270	3,140	2,874	29,736	2,478
F&I No. 2	5,999	5,916	4,756	3,545	4,486	4,823	3,476	3,583	2,812	4,062	2,522	2,443	48,423	4,035
Press Cake	517	280	614	752	570	685	727	665	1,144	1,295	1,034	1,023	9,306	776
Total	8,786	8,356	7,439	6,621	7,036	7,522	6,437	6,780	6,825	8,627	6,696	6,340	87,465	7,289
Dry Tons(Sludge Solids)														
F&I No. 1	1,948	1,835	1,758	1,979	1,596	1,644	1,812	2,190	2,584	2,967	2,830	2,601	25,744	2,145
F&I No. 2	4,723	1,645	3,552	2,692	3,539	3,916	2,827	2,749	1,979	3,034	1,807	1,749	37,150	3,096
Press Cake	517	280	614	752	570	685	727	665	1,144	1,295	1,034	1,023	9,308	776
Total	7,188	6,760	5,924	5,423	5,705	6,245	5,366	5,604	5,647	7,296	5,671	5,373	72,202	6,017
Sludge Disposal														
Wet Tons														
F&I No. 1 Inc	0	0	0	7,681	6,928	6,516	7,444	9,036	9,965	11,601	11,213	9,928	80,312	6,693
F&I No. 1 Loadout	8,118	7,797	7,750	343	0	9	0	9	10	0	0	446	24,481	2,040
F&I No. 2 Inc	5,889	6,296	3,953	0	0	0	0	0	0	0	0	0	16,138	1,345
F&I No. 2 Loadout	17,080	16,198	14,372	13,028	15,332	17,429	12,323	13,110	10,852	15,961	10,516	10,641	166,842	13,904
Press Cake Loadout	1,340	772	1,501	1,592	1,119	1,362	1,466	1,321	2,401	2,598	2,201	1,971	19,648	1,637
Total Inc	5,889	6,296	3,953	7,691	6,928	6,516	7,444	9,036	9,965	11,601	11,213	9,928	96,450	8,038
Total Loadout	26,538	24,767	23,623	14,963	16,451	18,800	13,789	14,440	13,263	18,559	12,717	13,058	210,968	17,581
SENECA PLANT														
Wet Tons	5,084	5,756	6,447	4,051	3,673	3,991	5,097	4,670	5,493	5,123	4,796	4,377	58,558	4,880
Dry Tons (Total)	1,093	1,249	1,399	879	808	862	994	990	1,148	1,081	1,103	976	12,582	1,048
Dry Tons (Sludge Solids)	790	919	1,043	654	571	560	653	678	820	766	795	704	8,953	746

TABLE A-14

METRO PLANT SLUDGE QUALITY

F&I No.1 VACUUM FILTER CAKE	SOLIDS %	VOLATILES %	TkN %	NH_3-N %	P %	Cd	Cu	Ni	Pb	Zn	Cr	K	Hg	PCB
Jan	28.2	64.5	2.64	0.03	0.92	43	637	141	228	1216	556	763	1.8	
Feb	26.6	61.6	2.46	0.04	0.86	46	771	194	319	1333	715	856	2.2	
March	27.3	58.3	2.60	0.04	0.91	37	646	162	268	1173	774	752	1.5	
April	29.3	51.7	2.29	0.03	0.95	64	766	178	313	1320	726	842	2.4	
May	30.3	58.4	2.19	0.03	1.00	41	688	155	264	1465	629	1053	1.4	
June	31.0	48.3	3.82	0.02	1.05	33	630	141	329	1362	663	1273	2.0	
July	30.9	49.2	2.93	0.01	0.94	40	714	173	364	1552	734	753	1.3	
Aug	28.6	51.1	2.26	0.01	1.14	53	813	171	320	1521	658	741	2.1	
Sept	29.7	55.1	2.53	0.02	1.22	69	748	158	321	1591	698	847	5.5	
Oct	29.3	59.4	2.61	0.05	1.20	55	780	167	303	1968	689	749	1.0	
Nov	27.9	59.1	2.95	0.02	1.39	54	927	185	330	1862	702	710	2.6	
Dec	26.9	61.8	3.04	0.03	1.23	51	761	141	300	1392	565	777	5.1	
Avg	28.8	55.7	2.61	0.03	1.07	49	740	164	305	1479	676	843	2.4	
F&I No.2 VF Cake														
Jan	26.4	55.5	2.87	0.07	1.29	69	832	169	297	1627	950	880	1.8	1.7
Feb	26.3	53.6	2.66	0.09	1.27	80	760	204	329	1664	1125	945	2.9	1.8
March	26.4	48.2	2.66	0.07	1.23	56	739	182	318	1292	960	920	1.54	1.3
April	27.4	51.5	2.46	0.07	1.31	75	855	173	331	1504	1001	1018	3.4	1.7
May	29.3	53.1	2.56	0.04	1.17	54	688	147	292	1412	789	970	2.0	1.5
June	27.5	50.9	3.12	0.04	1.35	43	715	157	310	1403	934	1000	1.5	1.7
July	29.1	48.0	2.69	0.03	1.31	48	837	182	405	1916	877	902	1.8	1.8
Aug	26.8	50.8	2.64	0.04	1.50	72	788	219	314	1737	928	932	2.0	1.7
Sept	26.1	42.9	2.76	0.06	1.60	80	921	217	358	1996	1060	990	5.4	3.8
Oct	25.3	44.6	3.14	0.07	1.89	85	929	224	367	2107	991	1027	1.5	-
Nov	23.9	50.9	3.49	0.10	2.21	78	1172	248	425	2303	984	983	2.1	-
Dec	23.2	47.7	4.02	0.13	2.05	61	980	214	411	1752	861	1107	2.6	-
Avg	26.5	49.8	2.92	0.07	1.51	66	848	195	347	1720	951	976	2.3	1.8
Press Cake														
Jan	40.4	69.4	2.77	0.10	2.33	125	1314	231	437	2472	1393	688	-	2.7
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	38.2	63.6	2.39	0.11	2.19	105	1568	230	479	2381	1839	827	-	-
April	47.4	62.8	2.39	0.08	2.35	138	1512	241	467	2475	1452	844	3.3	2.8
May	50.9	64.2	2.76	0.06	2.55	148	1605	313	536	3397	1845	863	2.9	3.5
June	45.9	59.6	3.55	0.06	2.82	122	3382	687	993	4800	4690	2136	4.1	3.6
July	47.3	57.6	2.94	0.07	2.65	102	1436	253	503	3007	1638	891	1.8	-
Aug	50.7	56.6	2.30	0.06	2.69	149	1601	359	480	3341	1955	722	2.5	3.2
Sept	46.5	60.0	2.68	0.08	2.50	145	1687	303	498	3553	1868	928	4.4	-
Oct	49.8	58.9	3.00	0.08	3.13	141	1406	270	417	3312	1492	894	1.8	-
Nov	46.3	63.6	3.29	0.14	3.29	127	1754	330	467	3617	1704	866	3.2	-
Dec	52.3	66.2	3.41	0.20	3.34	124	1839	297	468	3102	1622	931	3.6	-
Avg	47.9	61.5	2.91	0.09	2.76	131	1694	281	475	3022	1674	935	2.9	3.2

TABLE A-15

SENECA PLANT SLUDGE QUALITY

SENECA VACUUM FILTER CAKE	SOLIDS %	VOLATILES %	TKN %	NH_3-N %	P %	Cd	Cu	Ni	Pb	Zn	Cr	K	Hg	PCB
Jan	21.4	45.1	2.86	0.07	1.15	5.9	690	42	202	541	446	958	2.4	
Feb	22.2	52.2	2.34	0.11	0.99	5.7	910	61	211	527	426	1176	1.8	
March	22.6	55.3	2.89	0.08	1.17	5.1	912	98	221	532	457	979	2.0	
April	24.1	46.9	2.63	0.06	1.25	7.5	1291	340	215	538	641	920	2.3	
May	23.1	46.2	3.16	0.06	1.37	10.8	945	163	279	610	734	892	1.5	
June	22.5	48.9	3.90	0.06	1.73	9.3	1217	212	244	620	541	2241	2.4	
July	24.9	49.6	2.86	0.05	1.21	6.4	818	125	234	652	367	685	1.4	
Aug	21.6	33.9	2.75	0.03	1.20	7.8	1010	365	241	607	519	673	2.2	
Sept	21.6	35.6	2.91	0.05	1.33	12.6	1058	253	340	556	426	716	1.9	
Oct	21.3	39.8	2.77	0.04	1.50	12.6	1201	353	291	572	553	774	1.8	
Nov	24.8	43.8	3.36	0.08	1.31	9.9	1118	192	240	572	397	758	2.2	
Dec	22.5	53.2	3.57	0.10	1.55	7.9	1018	65	272	576	366	890	1.7	
Avg	22.7	45.9	3.00	0.06	1.31	8.4	1016	189	245	575	478	972	2.0	

TABLE A-16

OUT-PLANT SLUDGE QUANTITY

TREATMENT PLANT	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL	AVERAGE
Anoka														
Gallons	443,800	339,200	320,600	396,800	338,200	368,000	489,400	392,400	538,000	381,200	380,800	422,400	4,810,800	400,900
Dry Tons	28.5	17.8	24.5	27.0	24.4	26.2	31.4	26.0	35.9	22.7	25.6	24.3	314.3	26.25
Bayport														
Gallons	134,400	108,800	150,400	137,600	128,000	140,800	118,400	124,800	105,600	121,600	112,000	117,200	1,499,600	125,000
Dry Tons	11.5	8.6	11.3	9.8	9.1	10.6	10.8	10.8	7.7	9.5	9.4	9.6	118.7	9.9
Blue Lake														
Gallons	2,640,000	2,820,000	3,360,000	2,845,000	2,735,000	2,990,000	2,660,000	2,960,000	2,655,000	2,855,000	2,480,000	2,940,000	36,430,000	3,035,800
Dry Tons	527.3	575.0	685.1	592.0	631.8	657.1	552.4	620.9	517.0	548.8	506.7	556.6	6,970.7	580.9
Chaska														
Gallons	240,000	205,000	350,000	270,000	190,000	405,000	255,000	266,000	235,000	185,000	205,000	265,000	3,071,000	255,900
Dry Tons	14.8	14.7	22.5	17.1	13.1	24.5	15.7	16.2	15.0	11.9	13.8	20.3	199.6	16.6
Cottage Grove														
Gallons	302,200	187,400	139,500	292,500	314,600	299,200	192,000	217,000	183,800	279,200	276,800	281,600	2,965,000	247,100
Dry Tons	18.0	12.5	10.6	22.0	22.0	17.6	14.4	24.0	20.2	20.8	21.1	19.4	222.6	18.6
Empire														
Dry Tons	55.1	61.6	60.2	61.1	61.1	89.8	35.3	57.1	74.5	77.2	12.9	33.9	679.8	56.6
Hastings														
Gallons	289,400	184,400	89,600	195,200	223,800	227,200	117,800	190,400	233,600	160,400	180,000	117,000	2,208,800	184,100
Dry Tons	26.9	20.1	11.0	27.0	28.1	31.7	14.2	23.7	29.5	20.0	29.9	17.7	279.8	23.3
Maple Plain														
Gallons	-	-	83,000	1,800	8,000	4,000	8,000	8,000	24,000	-	20,000	4,000	160,800	13,400
Dry Tons			23.5	1.2	1.9	0.9	2.7	1.9	2.1		4.7	0.9	39.8	3.3
Rosemount														
Gallons	114,500	131,000	132,000	115,500	130,000	115,500	126,500	142,000	137,500	142,000	136,500	134,500	,557,500	129,800
Dry Tons	54.9	56.3	53.4	44.8	47.2	48.1	50.9	66.7	60.4	58.0	56.1	51.5	648.3	54.0
Savage														
Gallons	25,600	65,600	55,600	12,800	17,600	46,400	16,000	22,400	19,200	-	22,400	20,000	323,600	27,000
Dry Tons	5.3	10.3	11.5	3.3	2.8	6.2	3.3	4.0	4.9		6.8	4.1	62.5	5.2
Stillwater														
Gallons	368,000	390,400	438,400	425,600	444,800	464,000	527,800	489,600	480,000	464,200	387,200	503,000	5,383,000	448,600
Dry Tons	49.7	41.5	42.3	46.9	42.1	50.7	66.9	55.7	47.8	44.1	37.5	46.4	571.6	47.6

TABLE A-17

1981 SLUDGE QUALITY SUMMARY - OUT PLANTS ONLY

All Samples - Dry Weight Basis From Sludge As Hauled

TREATMENT PLANT	GALLONS HAULED	DRY TONS	%T.S.	%T.V.S.	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Cd mg/kg	Cr mg/kg	Hg mg/kg	pH	NH_3-%	KjN-%	K-%	PO_4-%	PCB mg/kg
ANOKA	4,810,800	314.3	1.57	63.6	1313 1181-1753	254 195-327	447 314-543	1560 1354-1901	7.9 5.6-9.0	1881 1419-2457	8.3 6.0-11.1	7.3 7.2-7.6	5.13 3.3-7.9	10.88 7.9-14.2	0.57 0.3-1.2	3.03 1.5-4.3	-
BAYPORT	1,499,600	118.7	1.90	61.7	251 223-279	21 2-31	171 108-273	706 464-828	6.5 5-10	51 30-98	5.2 1.2-16.1	6.7 6.3-7.0	0.15 0.04-0.7	4.29 1.9-6.3	0.33 0.2-0.5	3.44 0.6-4.5	-
BLUE LAKE	36,430,000	6,970.7	4.92	72.5	1864 911-2381	43 25-57	203 132-268	709 402-1092	3.8 3.0-4.8	140 74-314	3.8 1.8-5.5	5.0 2.8-6.0	0.62 0.1-1.0	4.72 2.7-9.2	0.30 0.2-0.4	1.44 0.8-1.9	6.2 3.0-10.8
CHASKA	3,071,000	199.6	1.82	68.8	576 493-726	40 27-63	102 71-122	727 589-875	6.2 4.6-8.0	377 234-622	3.2 1.9-4.2	6.9 6.3-7.2	0.25 0.03-1.0	6.7 4.2-15.2	1.15 0.8-1.4	3.27 2.2-4.4	-
COTTAGE GROVE	2,965,000	222.6	1.84	64.0	556 413-1052	86 33-111	207 174-305	1071 903-2211	8.1 5.6-9.9	69 25-199	4.9 3.1-8.3	7.5 7.2-7.7	4.09 3.3-4.6	9.43 6.1-12.0	0.50 0.3-0.7	2.79 2.4-3.4	-
EMPIRE	-	679.8	13.0	61.9	1162 987-1274	31 23-38	233 209-262	4676 3431-6317	10.6 1.0-15.8	149 106-202	6.4 5.0-7.7	8.1 7.3-8.6	1.00 0.7-1.3	5.75 4.5-7.9	0.17 0.1-0.2	3.79 3.3-4.5	-
HASTINGS	2,208,800	279.8	3.08	60.5	1955 1094-3971	32 24-40	340 227-694	990 781-1653	4.7 3.2-6.0	15,653 8,348-22,554	2.3 1.1-3.2	7.2 7.0-7.5	2.03 1.7-2.7	6.48 5.5-7.9	0.29 0.2-0.4	2.54 2.2-3.4	-
MAPLE PLAIN	160,800	39.8	8.10	61.4	1035 444-1602	44 12-79	254 96-373	526 28-868	7.6 3.0-10.4	62 32-67	5.0 3.7-6.2	6.2 5.4-7.1	0.39 0.2-0.6	2.65 1.5-4.5	0.21 0.1-0.5	1.05 0.6-2.1	-
ROSEMOUNT*	1,558,000	648.3	9.98	-	99	31	273	338	6	134	-	-	-	-	-	-	-
SAVAGE	323,600	62.5	4.94	55.4	915 594-1207	42 33-47	568 401-1006	1027 740-1225	9.0 6.9-12.0	405 197-884	64.7 52-95	6.9 6.4-7.1	0.82 0.6-1.0	3.71 1.0-6.1	0.14 0.1-0.2	1.80 0.7-2.5	" 2.0
STILLWATER	5,383,000	571.6	2.55	51.0	523 307-670	26 19-49	153 135-176	1098 598-1558	6.5 4.0-8.6	108 30-251	3.2 0.8-5.1	7.1 6.9-7.3	2.29 1.5-2.8	6.08 4.1-11.1	0.26 0.2-0.4	3.61 2.0-4.4	-

*Most recent metals sample data from June, 1979

TABLE A-18

SLUDGE HAULING SUMMARY

1981 SLUDGE DISPOSAL
GALLONS HAULED

	Treatment Plant/ Disposal Location	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	SUBTOTAL	TOTAL
1	Anoka-Coon Rapids Int.	443,800	339,200	320,600	396,800	338,200	368,000	489,400	392,400	538,000	381,200	380,800	422,400	-	4,810,800
	Land Spreading	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	Bayport-Oakdale Int.	134,400	108,800	150,400	137,600	128,000	140,800	118,400	124,800	105,600	121,600	112,000	117,200	-	1,499,600
	Land Spreading	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	Blue Lake-Seneca	1,280,000	2,340,000	2,355,000	655,000	170,000	810,000	510,000	640,000	795,000	585,000	1,090,000	1,010,000	12,240,000	36,430,000
	3rd and Commercial	2,000,000	2,355,000	1,055,000	2,220,000	2,575,000	2,085,000	2,150,000	2,320,000	1,860,000	2,300,000	1,390,000	1,930,000	24,190,000	-
	Metro Plant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.	Chaska-Blue Lake	240,000	205,000	350,000	270,000	190,000	405,000	255,000	266,000	235,000	185,000	205,000	265,000	-	3,071,000
	Shakopee Int.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5.	Cottage Grove-U of M	-	102,200	99,000	133,500	79,000	163,200	177,000	186,000	141,000	53,200	-	9,600	1,143,700	2,965,000
	Oakdale Int.	-	-	1,500	-	-	-	-	-	-	-	-	-	1,500	-
	Land Spreading	296,200	85,200	-	123,000	220,600	136,000	-	-	21,000	226,000	258,800	272,000	1,638,800	-
	Drying Beds	6,000	-	39,000	36,000	15,000	-	15,000	31,000	21,000	-	18,000	-	181,000	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.	Hastings-U of M	-	66,000	89,600	176,000	95,800	169,600	117,800	190,400	185,600	28,800	-	15,000	1,134,600	2,208,800
	Land Spreading	289,400	118,400	-	19,200	128,000	57,600	-	-	48,000	131,600	180,000	102,000	1,074,200	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.	Maple Plain-Beds	-	-	16,000	-	-	4,000	-	-	-	-	-	-	20,000	160,800
	Orono Int.	-	-	67,000	1,800	-	-	-	-	-	-	-	4,000	72,800	-
	Plymouth Int.	-	-	-	-	8,000	-	8,000	8,000	24,000	-	20,000	-	68,000	-
	Landspreading	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.	Rosemount-3rd and Comm	114,500	131,000	132,000	115,500	130,000	115,500	126,500	142,000	137,500	142,000	136,500	134,500	-	1,557,500
	Empire Plant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Savage-Landspreading	-	-	-	-	-	-	16,000	22,400	19,200	-	22,400	-	80,000	323,600
	Drying Beds	-	40,000	30,000	-	-	-	-	-	-	-	-	20,000	90,000	-
	Seneca Plant	25,600	25,600	25,600	12,800	17,600	46,400	-	-	-	-	-	-	153,600	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Stillwater-Oakdale Int	368,000	390,400	438,400	425,600	259,200	464,000	527,800	352,000	470,400	464,200	220,800	207,800	4,588,600	5,383,000
	Land Spreading	-	-	-	-	185,600	-	-	137,600	9,600	-	166,400	295,200	794,400	-
	Drying Beds	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTALS	5,197,900	6,306,800	5,119,100	4,722,800	4,540,000	4,965,100	4,510,900	4,812,600	4,610,900	4,618,600	4,200,700	4,804,700	-	58,410,100

DATE	ISSUED TO