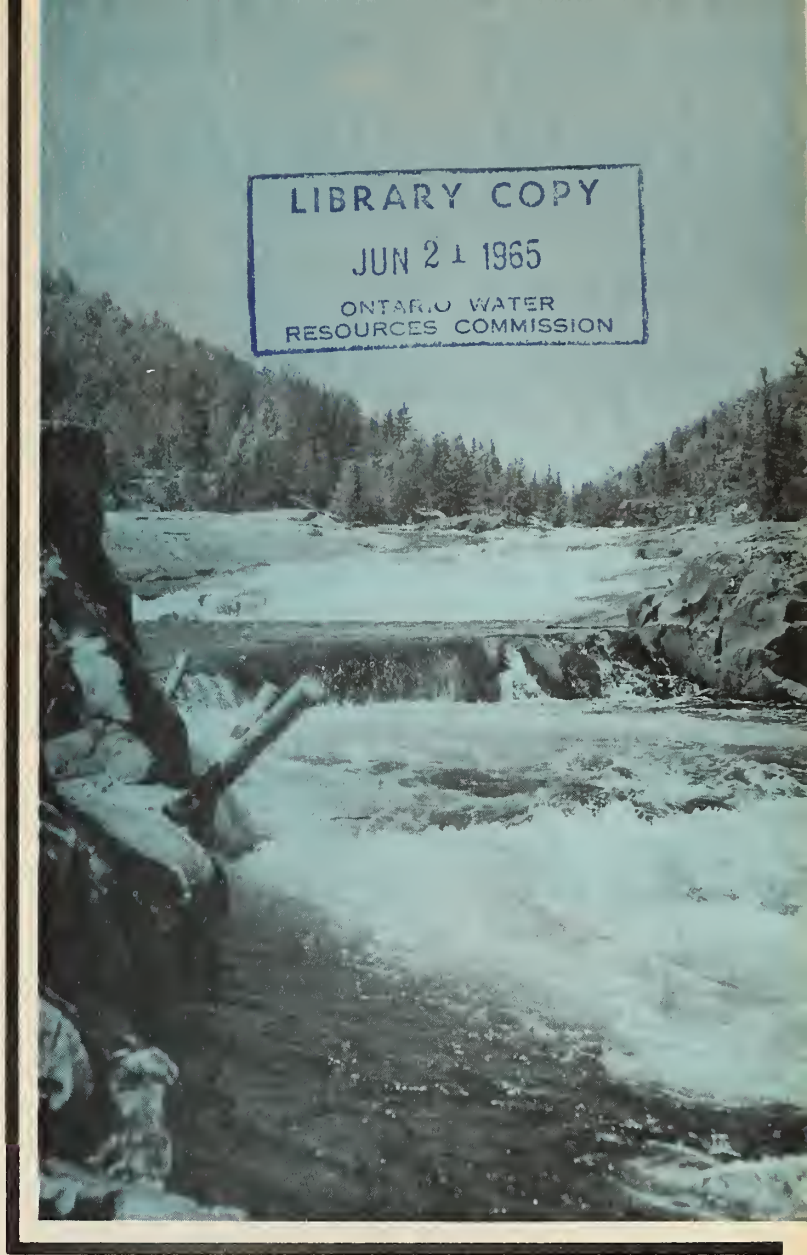


ONTARIO MINISTRY OF ENVIRONMENT
36936000023406

*Port Arthur
Water Pollution
Control Plant*



1963 Annual Report

**TD
367
.A56
P66
1963
MOE**

Ontario Water Resources Commission

**TD
367
.A56
P66
1963**

Port Arthur : water pollution
control plant.
81548



ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

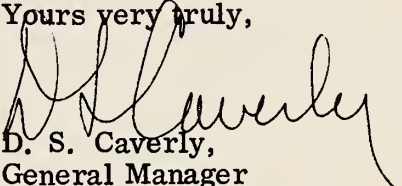
Members of the Port Arthur
Local Advisory Committee,
City of Port Arthur.


Gentlemen:

I am pleased to submit, for your information, the 1963 Annual Operating Report of the Port Arthur Water Pollution Control Plant, OWRC Project No. 58-S-13, which has been prepared by our Division of Plant Operations.

We are grateful for the kind cooperation which you and your staff have extended to our Operations staff throughout the year. We look forward to a continuing close association with you in our mutual endeavour to control pollution.

Yours very truly,


D. S. Caverly,
General Manager



Digitized by the Internet Archive
in 2015

<https://archive.org/details/portarthurwaterp23406>



General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Port Arthur Water Pollution Control Plant, OWRC Project No. 58-S-13 for 1963.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer,
Director,
Division of Plant Operations.

foreword



This report is designed to present the highlights of the operation of these works during 1963. Trends in flows and other operating data can be extremely useful in the development of necessary long range enlargement and improvement programs.

In addition to the activities reported herein, much unrecorded effort has contributed to the success of this operation. The municipality, through representatives on the Local Advisory Committee, have given valuable assistance in reviewing salary schedules, detailed operating budgets, personnel problems, flow patterns, and major maintenance problems.

The Division of Plant Operations has provided direction to the field staff in administrative procedures, quality control, maintenance schedules, equipment inspection and purchase supervision. A number of other Divisions of the Commission have been of service. The Division of Construction has offered helpful advice on equipment selection and renovation problems. The Division of Sanitary Engineering has maintained, through its District Engineering staff, a keen interest in the operation and has made a number of constructive recommendations. Its operator training courses have been very helpful. The Division of Finance has processed many payrolls, purchase orders and invoices dealing directly with this project. The Commission Personnel Director has been most helpful in counselling of personnel problems.

The excellent cooperation of all of these groups is gratefully acknowledged.



B. C. Palmer,
Director,
Division of Plant Operations



DIVISION OF PLANT OPERATIONS

contents

Foreword.....	Page 1
View of Plant.....	Page 2
History.....	Page 3
Project Staff.....	Page 4
Description of Project.....	Page 5
Design Data.....	Page 7
Plant Flow Chart.....	Page 8
Process Data.....	Page 9
Operating Costs.....	Page 17
Summary.....	Page 20
Total Costs.....	Inside back cover

C. W. Perry,
Assistant Director
D. A. McTavish,
Regional Supervisor
M. B. Fielding,
Operations Engineer

PORT ARTHUR WATER POLLUTION CONTROL PLANT



OPERATED FOR
THE CITY OF PORT ARTHUR
BY

THE ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN

A. M. Snider

COMMISSIONERS

W. D. Conklin, Q. C.

J. H. H. Root, M. P. P.

J. A. Vance, LL. D.; P. Eng.

A. A. Wishart, Q. C., M. P. P.

GENERAL MANAGER

D. S. Caverly

ASSISTANT GENERAL MANAGERS

G. M. Galimbert
L. E. Owers

COMMISSION SECRETARY

W. S. MacDonnell

1956^{to} 1963 History

INCEPTION

In 1956, the City Council of Port Arthur in conjunction with R. V. Anderson and Associates initiated plans for a new primary sewage disposal plant and extension to existing sewers.

APPROVAL

Ontario Municipal Board approval was received for the above project in April of 1958 and the final agreement between the City of Port Arthur and the OWRC was signed during the same month.

CONSTRUCTION

In May, 1958, a contract for the construction of storm relief and sanitary trunk sewers was awarded to Hacquoil's Construction. The cost of the 0.76 miles of storm relief sewers was estimated at \$152,909.20 and the cost of the 2.22 miles of sanitary trunk sewers was estimated at \$1,078,652.32 for a total of \$1,265,057.17.

The Foundation Company was awarded the contract for the construction of the primary treatment plant in June of 1958 at an estimated cost of \$699,544.00.

Construction, which was supervised by the Commission's Division of Construction, officially began in August of 1958 after the sod turning ceremonies at which Mayor Eunice M. Wishart and Mr. A. M. Snider, Commission Chairman, officiated. Construction was substantially completed and the systems put into operation early in 1960.

The sewage treatment plant was officially opened on June 15, 1961 by Mayor N. R. Wilson and the Honourable G. C. Wardrope, almost three years after the sod turning ceremony.

During the year 1962, construction work was carried out to increase the plant capacity from 2.0 MGD to 4.0 MGD and was completed during 1963. The new equipment and additions are as follows:

1. Extension to the trunk interceptor sewer.
2. Addition of two new settling tanks.
3. Construction of permanent enclosures over the primary tank collecting mechanisms.
4. Addition of a new 20,000 gpm storm pump.
5. Addition of a new 48" barminutor.
6. Addition of grit collecting mechanisms.
7. Grading and shaping of the chlorine contact chamber floor.
8. Miscellaneous equipment such as permanent ladders, fence gates, etc.

TOTAL COSTS

58 - S - 13 - \$2,871,667.94 62 - S - 101 \$714,032.22

Project Staff



S. Antonik,
Chief Operator

S. Hrymnak Operator

R. Romanick Operator

E. J. Hughes Operator

COMMENTS

The plant was under a 16 hour supervision by a staff consisting of a Chief Operator and three operators.

It was also necessary to hire part-time help in order that the staff could take their vacations and statutory holidays.

The duties of the plant staff were such as to maintain a high quality effluent. In order to do so, tests were carried out daily by the staff at the plant. Samples were also taken every two weeks and sent to the OWRC Laboratory for analysis. The operators were also responsible for maintaining all the equipment, grounds and buildings.

The operation of the project is under the supervision of engineers of the Division of Plant Operations. The project is visited periodically by the head office Operations Engineer.

Approximately 40 invoices were handled by the head office staff during the year. The head office expenses were not charged to the project.

Description of Project

GENERAL

At present, the plant is designed to give primary treatment with heated sludge digestion to 4,000,000 gallons of sewage per day. The plant is now capable of serving 40,000 persons and can be ultimately enlarged to a secondary treatment plant with a capacity of 16,000,000 gallons per day and serving 80,000 people.

The facilities presently include a combined lift station and control building, two grit channels, four primary sedimentation tanks, a heated sludge digester, four sludge drying beds, a chlorine contact chamber and one chlorine feeder.



CONTROL BUILDING

This building houses the raw sewage pumps, motors, storm pump, electrical controls, heat exchanger, sludge pumps, office, laboratory and limited storage space. There is also room for the installation of future equipment necessary for expansion.

LIFT STATION

The raw sewage enters the wet well through a 60" diameter gravity sewer at sub-basement level. It is coarse screened before passing through two barminutors which cut and shred any solid material in the sewage. Before the sewage enters the wet well, it passes through an influent manhole which houses a control gate and a by-pass line.

Due to the hydraulics of the sewer and wet well, this control gate has to be kept partially closed to avoid flooding the wet well. It is also impossible to use the by-pass without flooding basements upstream in Port Arthur. Sewage is lifted by two 5,000 gallons per minute pumps approximately 40' to the grit channels. Each pump is equipped with a 75 H. P. electric motor, and one is also equipped with a 90 H. P. diesel motor which acts as a standby power source in case of electrical power failures.



GRIT CHANNELS

Sand and grit is allowed to settle in two parallel grit channels, each 35' x 3' x 5' deep and having a detention time of 4.7 minutes at design flow. After leaving the grit channels, the sewage flows through the flow meter.



PRIMARY SEDIMENTATION

From the grit channels, the sewage flows into four rectangular primary

settling tanks. These tanks each measure 100' x 18' x 8' deep and have travelling combination scum skimmers and sludge collectors. The retention time is 2.14 hours at design flow, however, their combined maximum hydraulic capacity is 8 MGD, but at a reduced efficiency.

The sludge and scum collected in the primary tanks flows by gravity to an 11' x 11' x 10' deep raw sludge hopper, from which it is pumped by a 150 GPM, raw sludge pump to the digester.

In the event of a failure of the regular sludge and recirculation pumps, a 150 GPM standby pump powered by a 6 H. P. motor is provided.

CHLORINATION

The primary tank effluent flows into the chlorine contact chamber where its bacterial content is reduced by the addition of chlorine. The chlorine contact chamber measures 45' x 20' x 10' deep and has a retention time of 20 minutes at design flow. The gas chlorinator has a capacity of 400 pounds per day.

The chlorine tank effluent is discharged to the McIntyre River through an effluent sewer equipped with a flap gate to prevent back-flow from the river.



DIGESTION

The sludge collected in the two primary

tanks is pumped from the raw sludge hopper to the digester. The sludge is heated to an average temperature of 93° Fahrenheit and is broken down by bacterial action into:

1. A thick, black, odourless sludge.
2. A relatively clear supernatant liquor which is returned to the wet well.
3. A digester gas which is utilized to heat the digester.

Natural gas is used as a standby fuel. The digested sludge is drained out onto the sand drying beds periodically throughout the warm season. The sludge is allowed to dry on the beds into a manageable sludge cake, and is then disposed of as a soil conditioner. Facilities are also available for disposal of this digested sludge in liquid form by tank trucks.

The digester measures 50 feet in diameter by 20 feet side wall depth. It has a capacity of 50,000 cubic feet or 312,000 gallons. This capacity allows for 1.25 cubic feet per capita at design flow.

The four drying beds have a total area of 10,000 square feet which represents 0.25 square feet per capita per year at design flow.



Design-Data

GENERAL

Type of Plant - Primary treatment with digester.

Design Population - 40,000.

Design Plant Flow - 4 MGD.

Per Capita Flow - 100 GPD.

PRIMARY TREATMENT

Grit Removal

Type - two rectangular parallel grit channels.

Size - 35' x 3' x 5' deep.

Detention Time - 4.7 minutes at 2 MGD per channel.

Barminutors

Sizes - one 35" model B Barminutor.

- one 48" model A1 Barminutor.

Sewage Lift Pumps

Sizes - one 35,000 USGPM driven by a diesel engine.

- two 4,000 USGPM - each driven by a 75 HP electric motor.

- one with a 90 HP diesel engine.

Primary Sedimentation Tanks

Type - 4 rectangular parallel units.

Size - 18' x 100' x 8' deep.

Retention - 2.14 hours.

Surface Settling Rate - 560 gallons per sq. ft. per day.

Overflow Rate - 6,000 gallons per ft. of weir per day.

Chlorine Contact Chamber

Size - 45' x 20' x 10' deep.

Retention Time - 20 minutes at 4 MGD.

Chlorinator Capacity - 400 lbs. per day.

Digester

Size - 50 ft. in diameter by 20 ft. deep.

Capacity - 312,000 gallons.

Loading - 1.25 cubic ft. per capita (population 40,000).

- 2.0 lbs. of solids per cubic ft. per month.

Sludge Drying Beds

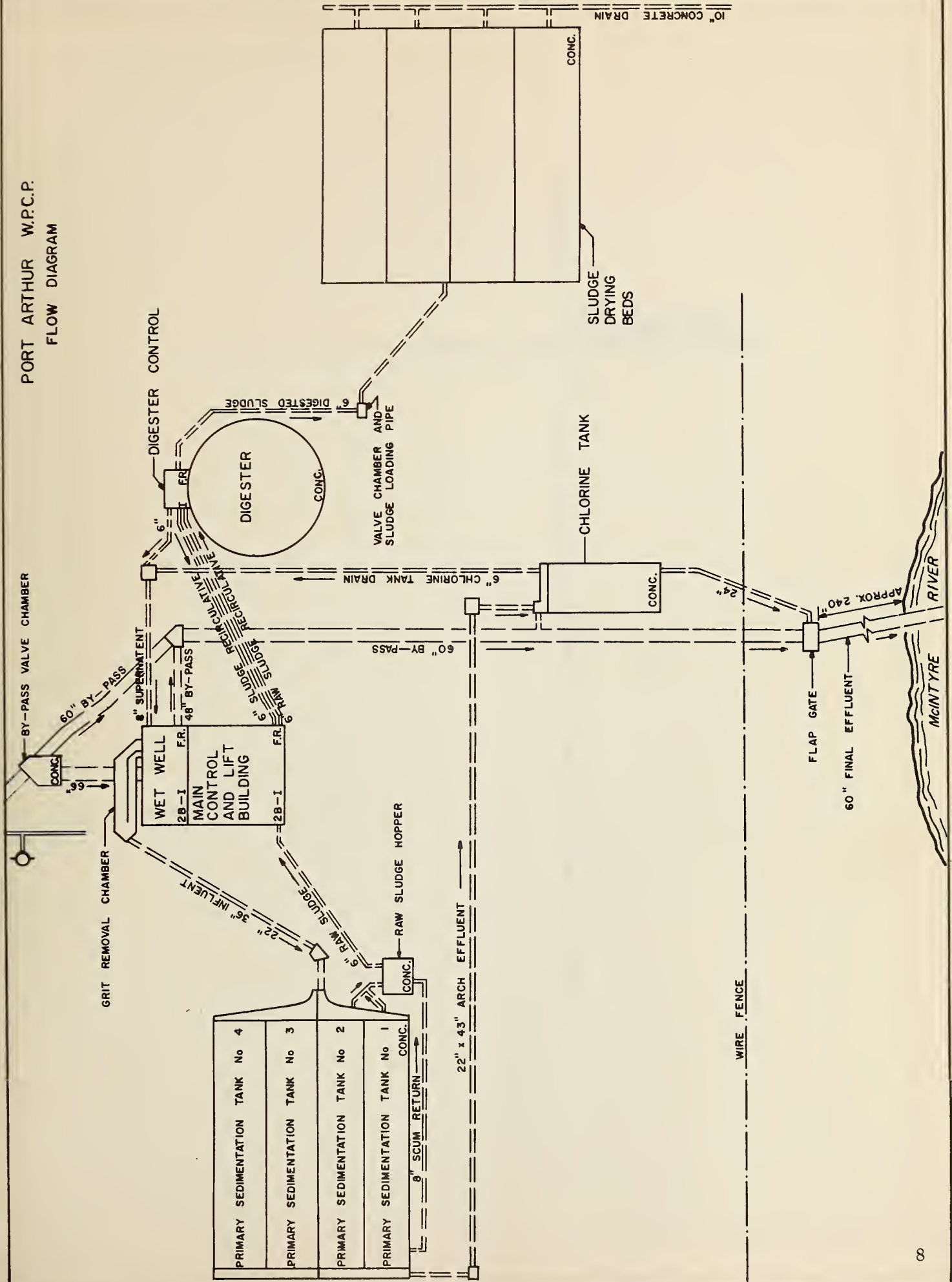
Size - 4 for a total area of 10,000 sq. ft.

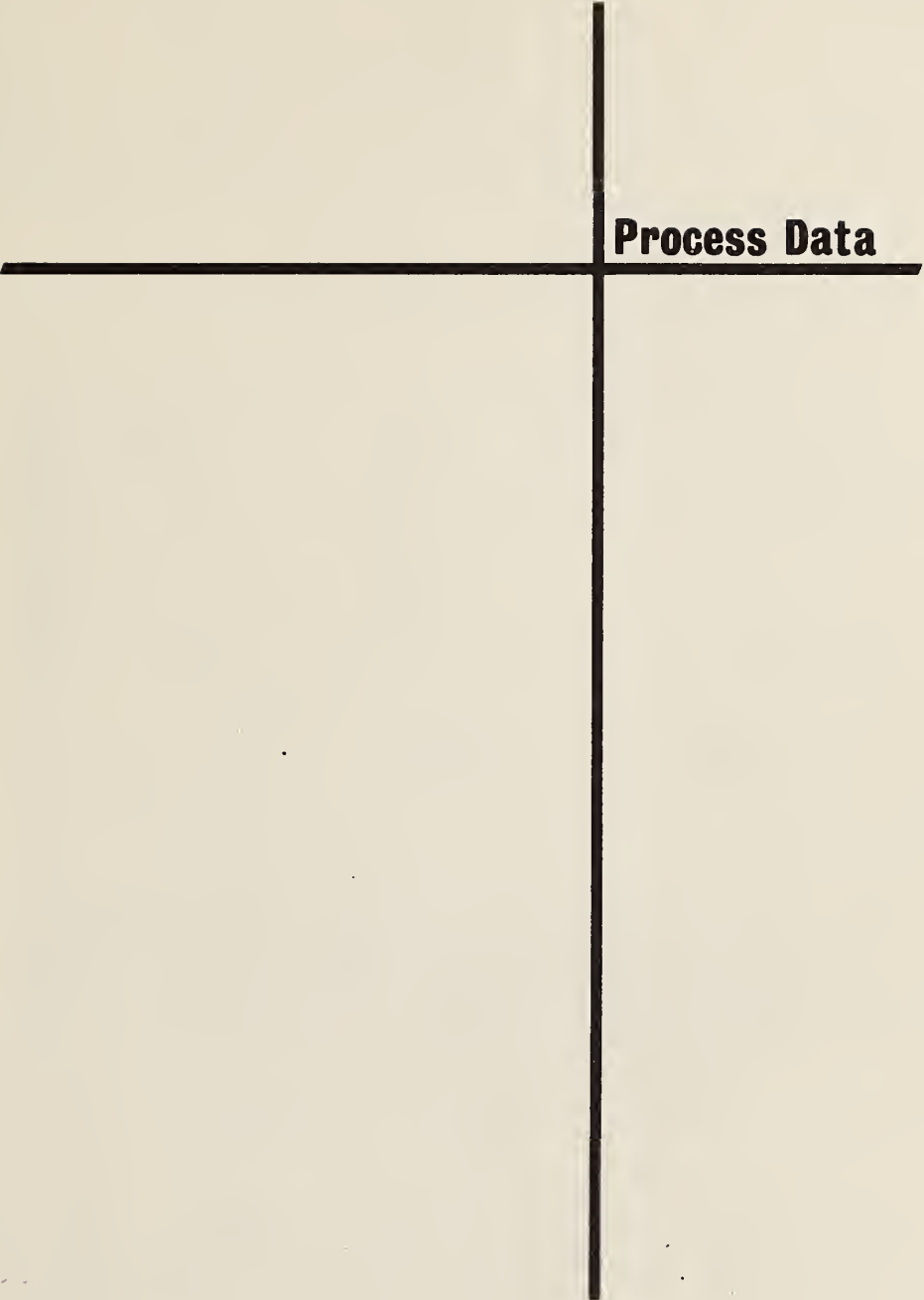
Area per capita - 225 sq. ft. @ 40,000 persons.

Outfall

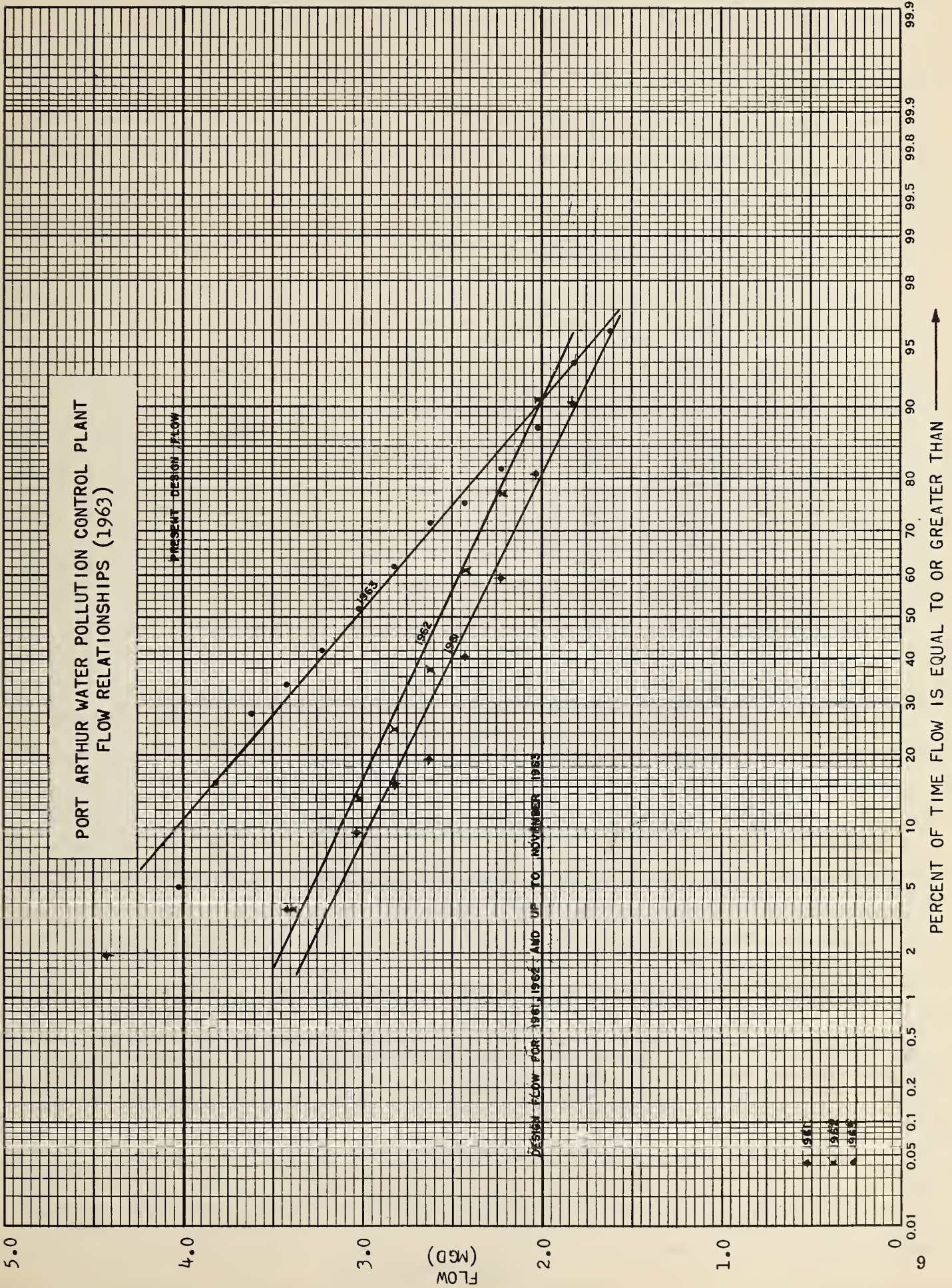
Size - 240 ft. of 60 inch diameter corrugated metal pipe discharging into the McIntyre River.

PORT ARTHUR W.P.C.P.
FLOW DIAGRAM

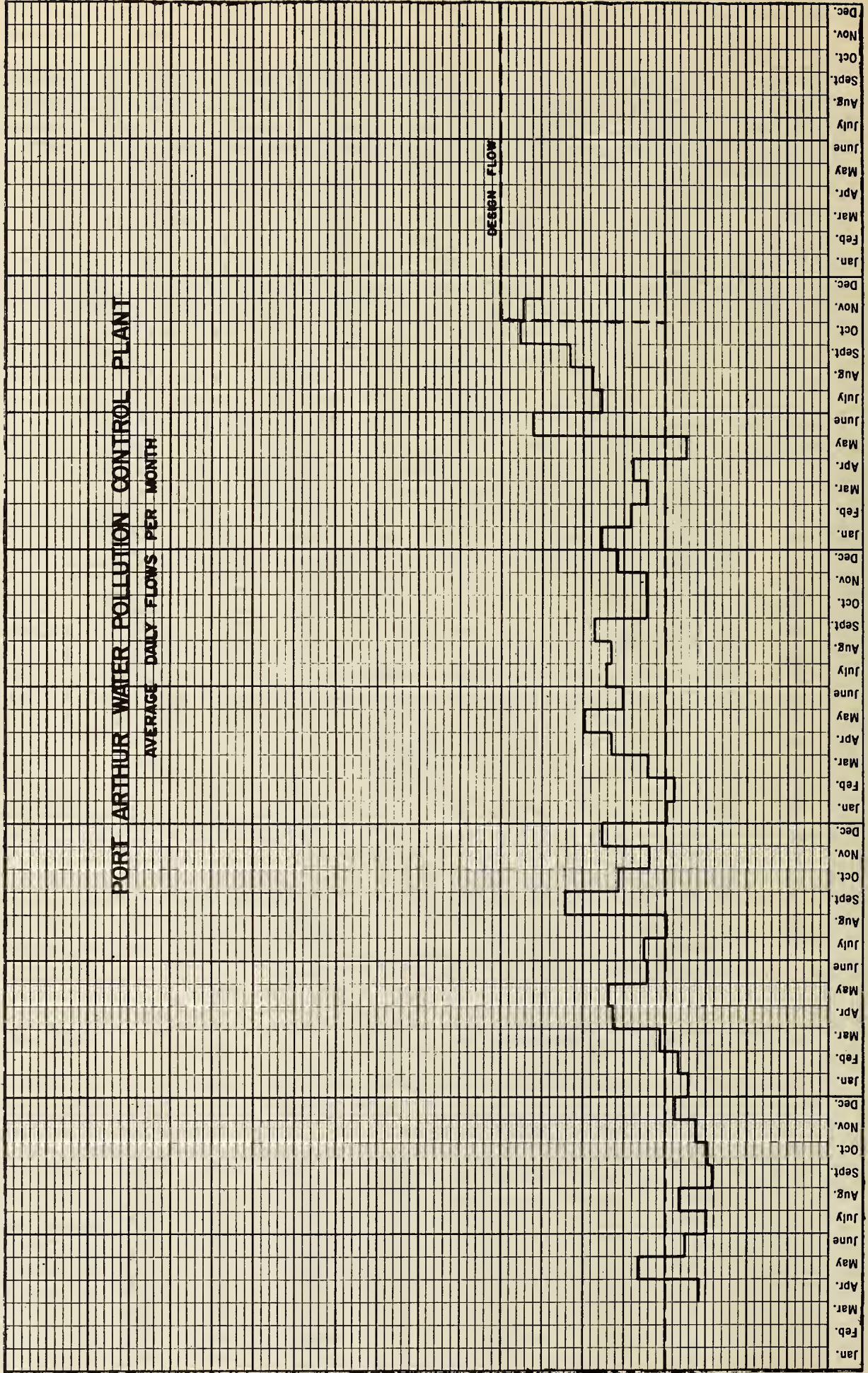




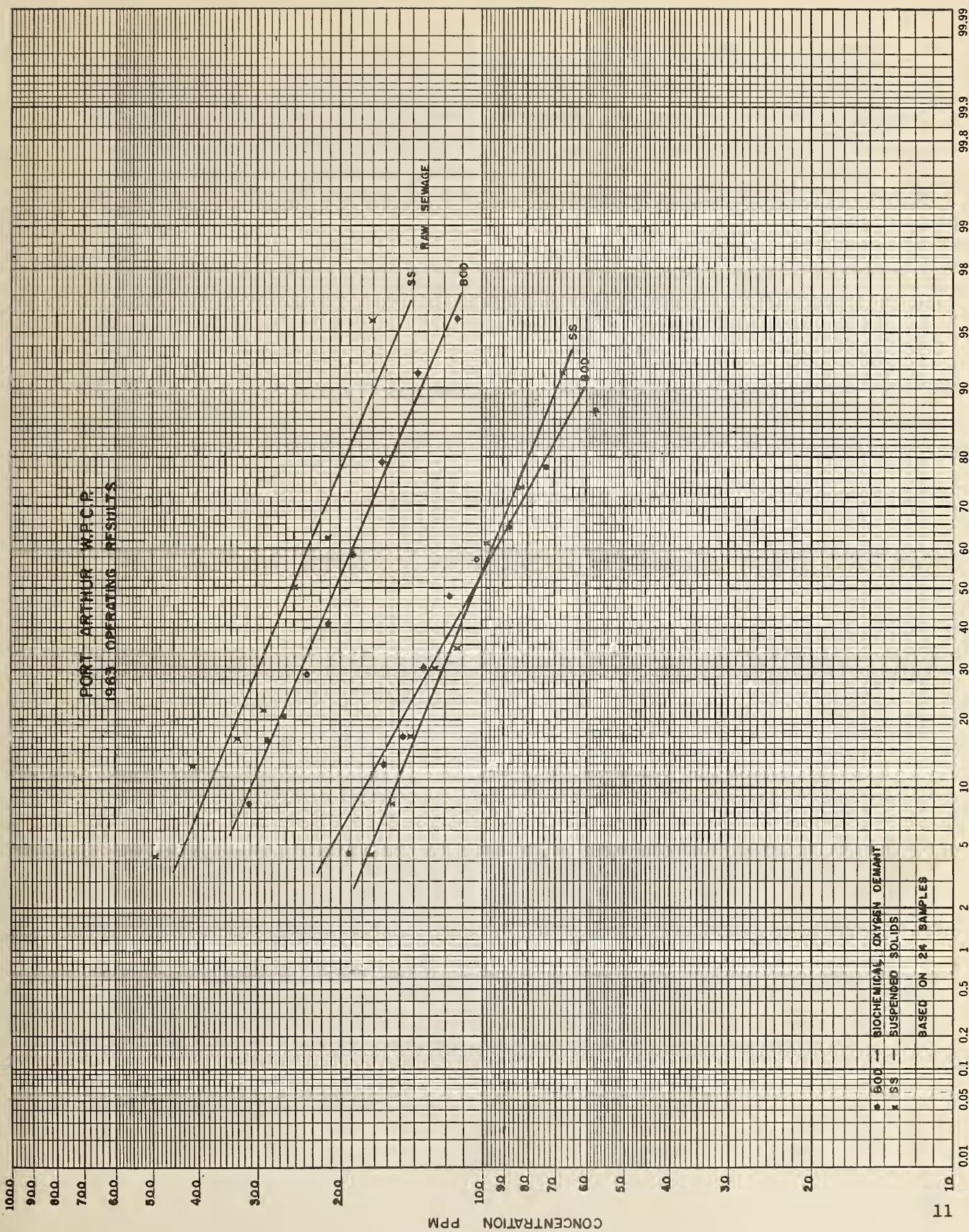
Process Data

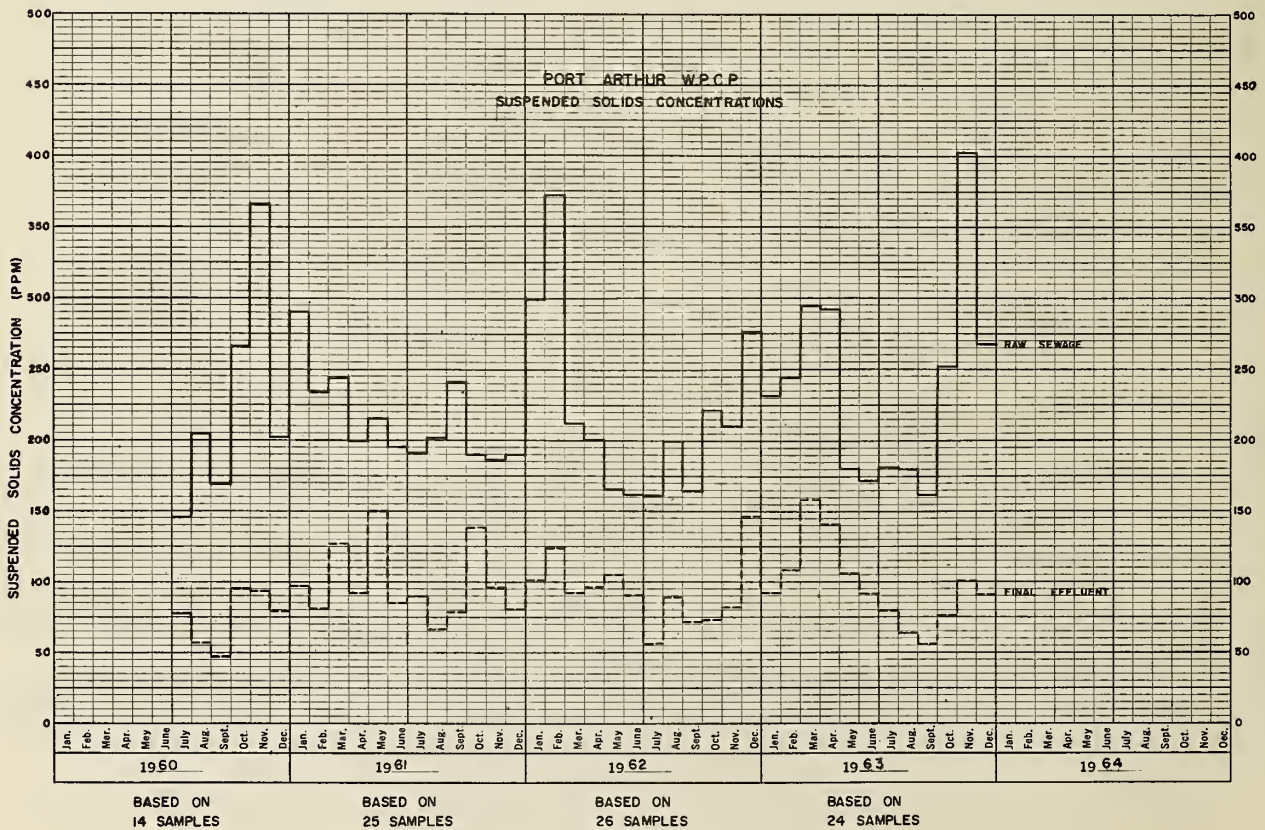
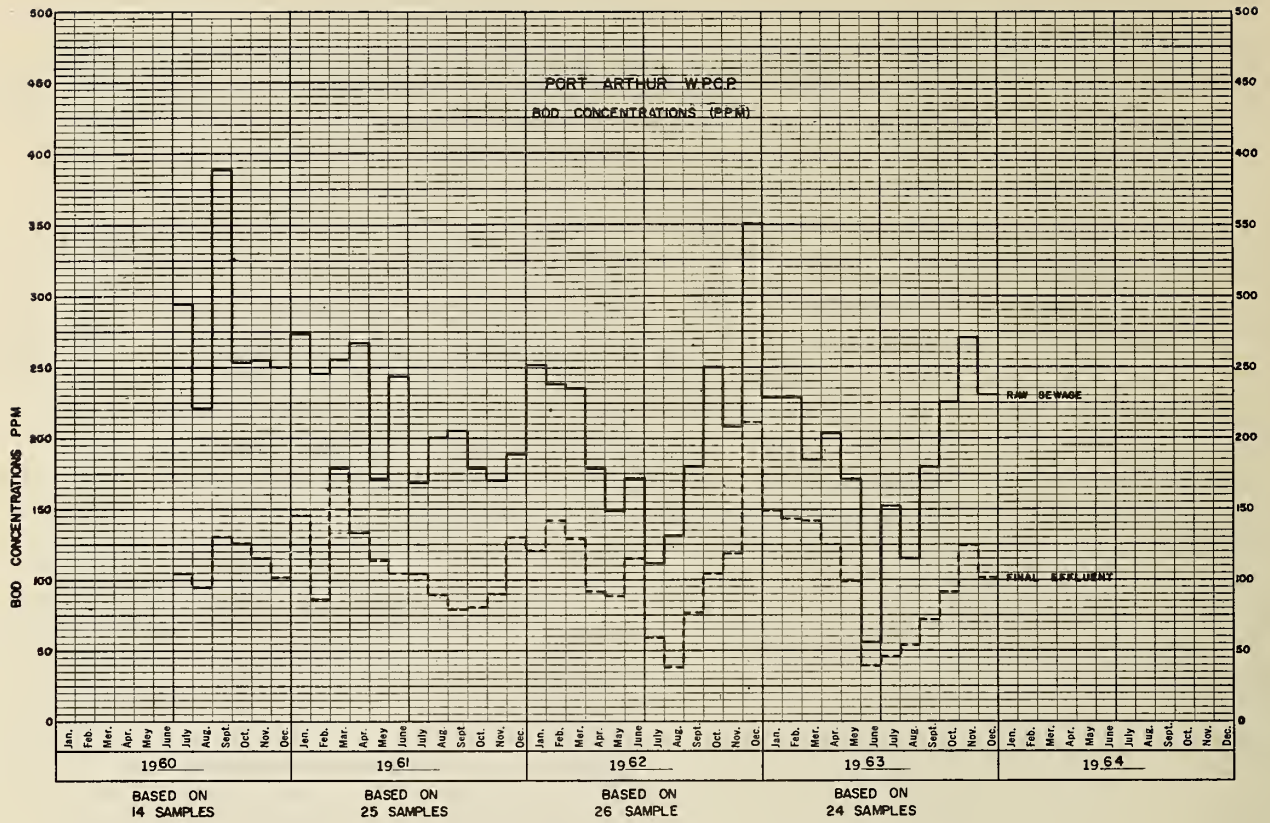


PORT ARTHUR WATER POLLUTION CONTROL PLANT
AVERAGE DAILY FLOWS PER MONTH



1960 1961 1962 1963 1964





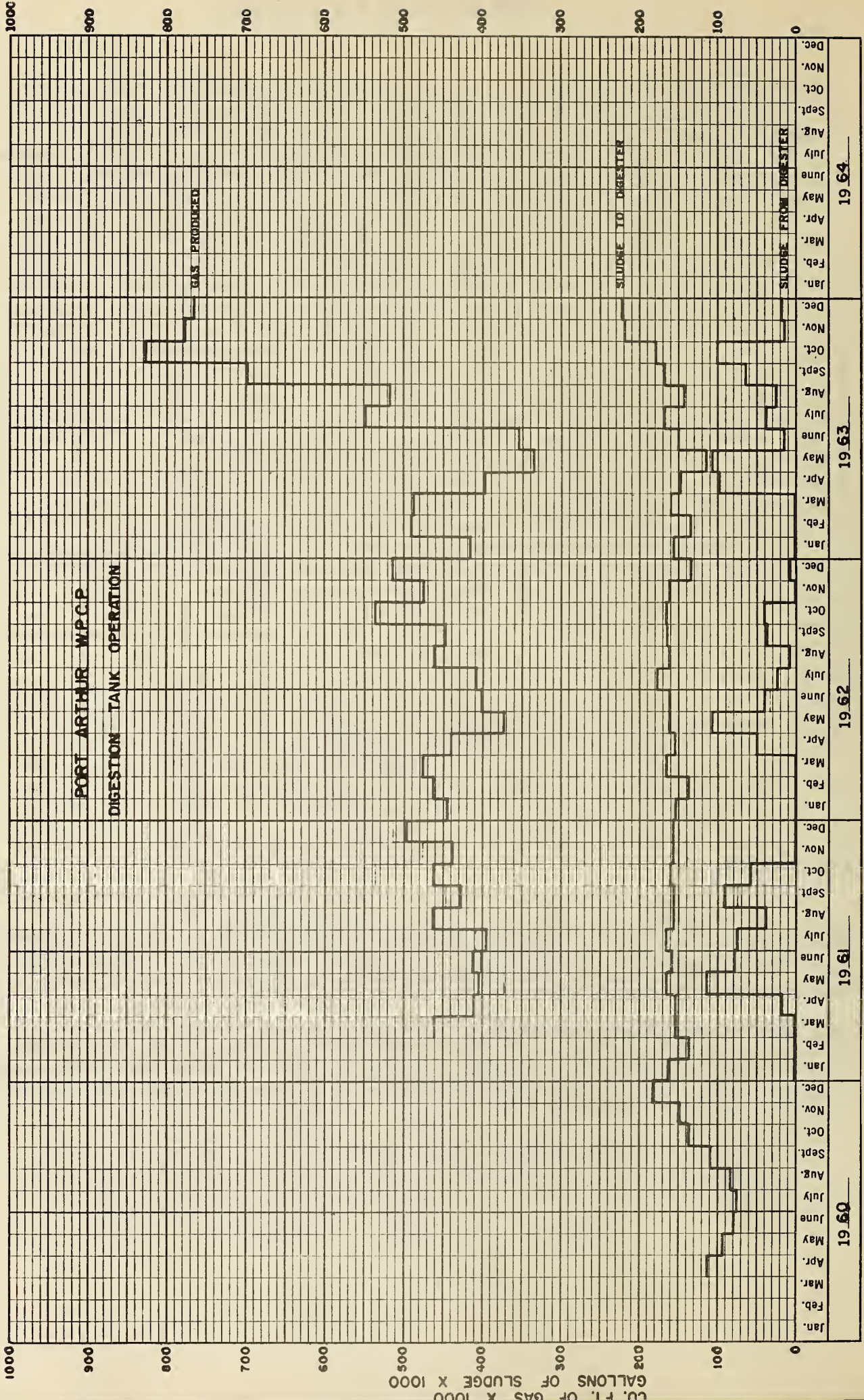
GRIT, B.O.D AND S. S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	228	148	35.0	34.4	232	92	60.5	60.1	226
FEB.	228	143	37.0	28.7	243	108	55.5	45.6	199
MAR.	185	142	23.0	14.8	294	158	46.0	46.8	255
APR.	203	125	38.5	27.9	292	141	51.5	54.1	217
MAY	172	99	42.5	19.7	180	106	41.0	19.9	245
JUNE	56	39	30.5	9.2	172	92	46.5	43.5	191
JULY	152	46	69.5	45.4	181	79	56.5	43.7	112
AUG.	115	53	54.0	27.8	180	63	65.0	52.4	118
SEPT.	180	72	60.0	51.1	162	56	65.5	50.2	149
OCT.	225	92	59.0	77.6	252	76	70.0	102.7	241
NOV.	270	124	54.0	81.5	402	100	75.0	168.7	289
DEC.	230	101	56.0	70.4	267	91	66.0	95.6	150
TOTAL	-	-	-	488.5	-	-	-	783.3	2392
AVG.	187	99	46.6	40.7	238	97	58.2	65.2	199.3

COMMENTS

During 1963, samples for sewage analysis were taken twenty-four times. The average five day BOD of the raw sewage was 187 PPM and of the final effluent was 99 PPM. The total BOD entering the plant was approximately 1,989,063 pounds and the total BOD removed was 814,000 pounds which resulted in a 46.6% reduction in BOD.

The average suspended solids of the raw sewage was 238 PPM and of the final effluent was 97 PPM. The total pounds of suspended solids entering the plant was approximately 2,531,534 pounds and the total suspended solids removed was 65.2 tons which resulted in a 58.2% reduction in suspended solids.



DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			% VOL. MAT IN DIGESTED SLUDGE	GAS PRODUCED 1000'S CU. FT.	SLUDGE FROM DIGESTER 1000'S GALS
	1000'S GALLONS	% SOLIDS	% VOL. MAT.			
JAN.	156.8	-	-	-	416,569	-
FEB.	134.4	-	-	-	490,085	-
MAR.	160.8	-	-	-	486,820	-
APR.	148.0	-	-	3.11	398,219	98,729
MAY.	114.4	2.62	78.5	3.58	334,624	107,322
JUNE	150.1	-	-	-	353,574	14,826
JULY	168.2	-	-	4.41	547,593	39,424
AUG.	141.6	3.46	79.5	-	517,152	24,598
SEPT.	167.2	3.31	82.2	-	699,977	64,022
OCT.	179.2	-	-	3.39	828,457	100,919
NOV.	219.2	4.89	74.0	-	777,667	14,826
DEC.	222.4	4.45	42.5	-	765,887	17,185
TOTAL	1962.3	-	-	-	6,616,624	481,851
AVG.	163.5	3.85	71.3	3.62	551.2	53,539

* VOL. MAT. = VOLATILE MATTER

COMMENTS

During 1963, 1,962,300 gallons of sludge at an estimated average concentration of 3.85 percent solids were pumped to the digesters. This is a slight increase over the 1,898,000 gallons pumped in 1962 and results from the increased flow.

A total of 6,616,624 cubic feet of gas was produced in the digesters in 1963 compared with 5,439,546 cubic feet in 1962.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	2.77	-	-
FEBRUARY	2.41	-	-
MARCH	2.22	-	-
APRIL	2.39	-	-
MAY	1.74	-	-
JUNE	3.62	2965	2.15
JULY	2.77	3398	3.96
AUGUST	2.39	2864	3.81
SEPTEMBER	3.16	3354	3.54
OCTOBER	3.77	1776	3.14
NOVEMBER	3.72	777	2.32
DECEMBER	3.50	-	-
TOTAL	-	15134	-
AVERAGE	2.91	-	3.15

COMMENTS

The chlorination period was from June 9 to October 15. During November, chlorination was restarted until freeze up on November 11. A residual of 0.5 PPM was maintained to reduce the bacteria count in the final effluent.

1963

PLANT

Total Operating Costs

MONTHLY

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	1732.80	1277.29	-	65.77	335.99	-	43.85	-	-	9.90	-
FEB	1882.22	1305.80	-	84.84	383.90	-	52.31	-	-	55.37	-
MARCH	3012.58	1448.09	-	55.35	346.39	-	31.85	-	236.91	893.99	-
APRIL	1884.36	1277.28	-	60.37	-	-	64.30	-	53.60	228.56	200.25
MAY	3579.75	1565.24	-	47.62	730.77	574.03	68.30	-	217.73	376.06	-
JUNE	3122.32	1353.16	107.04	51.60	373.42	1148.05	76.95	-	(2.61)	14.71	164.00
JULY	4288.47	1995.24	387.06	36.00	434.73	1143.71	101.47	-	-	26.26	-
AUG	944.07	1330.16	205.33	36.00	363.02	(1225.00)	145.85	-	-	88.71	-
SEPT	3378.59	1330.16	140.48	36.00	372.31	1148.05	112.41	10.82	139.36	89.00	-
OCT	3009.68	1330.16	280.80	-	376.70	(111.95)	348.44	172.01	13.29	104.89	495.34
NOV	2768.18	1330.16	537.04	36.00	373.42	-	45.85	-	357.00	88.71	-
DEC	3097.56	1995.24	510.87	83.62	391.19	(415.84)	205.50	-	226.01	100.97	-
TOTAL	32,700.58	17,537.98	2,168.62	593.17	4,481.84	2,261.05	1,297.08	182.83	1,241.29	2,077.13	859.59

() = CREDIT

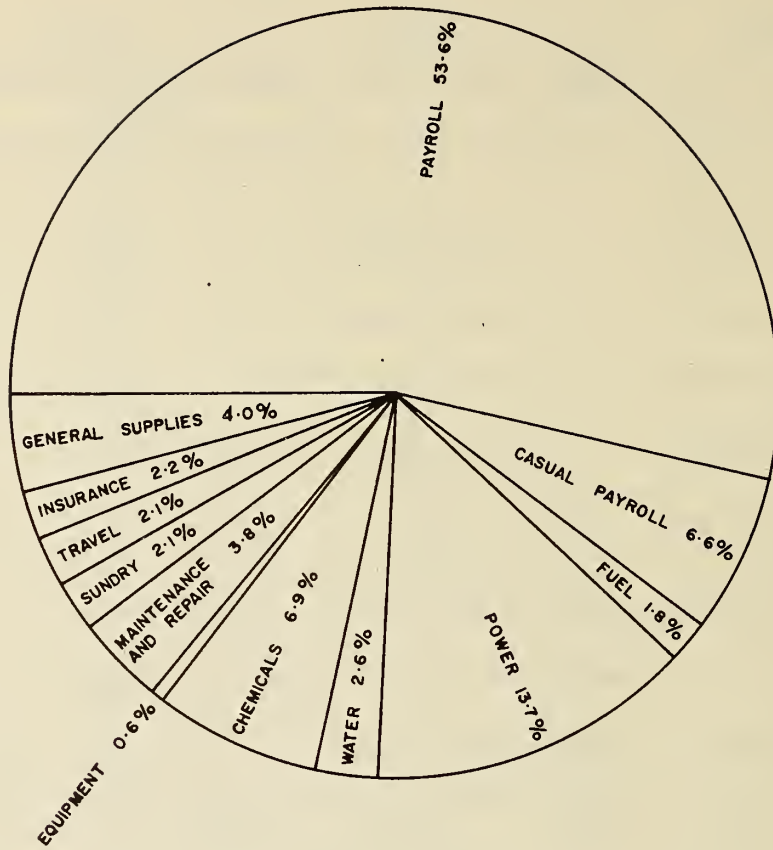
PLANT

YEARLY

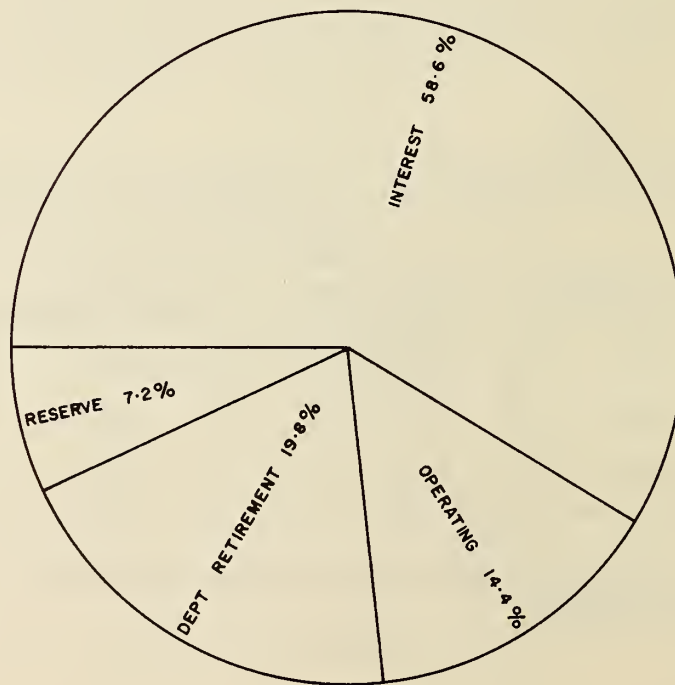
YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER CAPITA PER YEAR
1961	840.41	\$29,861.94	\$35.52	\$0.71
1962	885.49	\$31,781.54	\$35.89	\$0.73
1963	1,063.67	\$32,700.58	\$34.74	\$0.74

* These values are based on the population of the city, not on design population.

1963 OPERATING COSTS



TOTAL COSTS



SUMMARY OF OPERATING EXPENSES

ITEM	COSTS 1960	COSTS 1961	COSTS 1962	COSTS 1963	BUDGET 1963
Payroll	12,330.24	13,868.30	16,580.38	17,537.98	18,000
Casual Payroll	4,311.52	2,189.03	1,091.42	2,168.62	3,000
Superannuation	*	*	*	*	1,440
Fuel	1,524.00	677.17	914.32	593.17	750
Power	5,117.44	3,942.55	3,854.41	4,481.84	6,000
Water	-----	498.69	598.05	859.59	1,500
Chemicals	2,730.43	973.03	1,344.18	2,261.05	2,700
General Supplies	2,760.70	1,167.54	1,729.72	1,297.08	1,600
Equipment	1,930.64	5,129.24	3,888.70	182.83	200
Maint. & Repairs	114.64	205.45	519.45	1,241.29	3,600
Sludge Haulage	-----	-----	-----	-----	3,000
Sundry	2,546.60	1,210.92	1,260.91	677.45	1,200
Insurance and Taxes	-----	-----	-----	707.28	860
Travel	-----	-----	-----	692.40	-----
Contingency	-----	-----	-----	-----	1,150
TOTAL:	33,366.21	29,861.94	31,781.54	32,700.58	45,000

* Included in Payroll

Due to delay in placing the plant expansion into service, the 1963 budget, based on the expanded capacity, exceeded the actual costs by approximately \$12,000. The 1964 budget is based on the full operation of the expanded plant.

SUMMARY

The flow to the Port Arthur Water Pollution Control Plant during 1963 averaged 2.91 million gallons per day (MGD) as compared to 2.05 MGD in 1962. During 1963, the plant design capacity was increased from 2.0 MGD to 4.0 MGD. The flow during 1963 exceeded the former design capacity 91% of the time while the expanded capacity of 4.0 MGD was exceeded only 10% of the time. At no time during 1963 did the average daily flow (on a monthly basis) exceed the 4.0 MGD capacity.

The strength of the influent sewage during 1963 was consistent with that of domestic sewage, having an average BOD of 187 PPM and average suspended solids content of 238 PPM. The plant efficiency as measured by removal of BOD and suspended solids exceeded design expectations, achieving 46.6% removal of BOD and 58.2% removal of suspended solids. Higher removal efficiencies were effected when the additional treatment facilities were placed in operation.

The cost of operation during 1963 was \$32,700.58 representing a per capita cost of \$0.74 or a cost of \$34.74 per million gallons of sewage treated. This compares favourably with the costs incurred at other such plants in the province.

Total 1963 Costs

The total cost to the municipality during 1963 was as follows:

Operating.....	\$ 32,700.58
Debt Retirement.....	\$ 44,751.00
Reserve.....	\$ 16,492.00
Interest.....	<u>\$ 131,666.51</u>
TOTAL	<u>\$ 225,610.09</u>

On the basis of the population of 44,419, the total annual cost of the Port Arthur Water Pollution Control Plant was approximately \$5.08 per person.





Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION

801 BAY ST.

TORONTO 5