ANNUAL REPORT 1965

CONISTON

water pollution control plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Coniston Local Advisory Committee,
Town of Coniston.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Coniston Water Pollution Control Plant, OWRC Project No. 57-S-8.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Coniston Water Pollution Control Plant, OWRC Project No. 57-S-8.

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

Yours very truly,

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

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

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

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CONISTON

water pollution control plant

operated for

THE TOWN OF CONISTON

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

COMMISSIONERS

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D. A. Moodie
H. E. Brown
L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

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L. E. Owers
F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: R. Kauppinen

801 Bay Street Toronto 5

'65 REVIEW

A total of 72.875 million gallons was treated during the year for an average daily flow for the year of 199,000 gallons per day. This is an increase of 14% over 1964.

The plant efficiency for the year was less than that expected for the activated sludge process, being 84.0% and 75.5% in BOD and suspended solids removal respectively. This efficiency reflects a hydraulic overload experienced by the plant.

The total operating cost for the year was $12,495.59 or $171.47 per million gallons treated as compared to $11,738.97 or $178.28 per million gallons treated in 1964.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1957 - 1965

INCEPTION

In June, 1957, the Ontario Water Resources Commission entered into an agreement with the Town of Coniston for the construction of a water pollution control system. The system, designed by E. M. Powell and Associates, Consulting Engineers, Sudbury, Ontario, consisted of five sewage pumping stations, sanitary sewers and an activated sludge water pollution control plant.

APPROVAL

In February, 1958, the municipality signed an agreement with the Ontario Water Resources Commission to finance, construct and operate a water pollution control system.

CONSTRUCTION

Under the supervision of the Consulting Engineers, Carrington Construction Company Limited completed the project. On December 5, 1958, the plant was put into temporary operation, and came into full operation on April 30, 1959.

TOTAL COST

$468,190.39

K. GLIBBERY
CHIEF OPERATOR

Project Staff

COMMENTS

Mr. Glibbery was hired as an OWRC operator on December 11, 1961. His duties consist of the operation and maintenance of the Water Pollution Control Plant and of the five lift stations in the sewerage system.

The project is normally under 40 hours supervision a week which includes inspections on both Saturday and Sunday. Casual help is employed at the project to allow the operator to have weekends off, for vacations, for sickness and when additional help is required at the project.

Description of Project

COLLECTION SYSTEM

The raw sewage from the municipality is collected by a system of sanitary sewers, four ejector stations and an underground pumping station which pumps to the influent works of the plant.

These sewers are maintained by the Town's Works Department, while the lift stations and the plant are maintained and operated by the OWRC operator.

INFLUENT WORKS

The raw sewage entering the plant passes through a screening chamber where rags, paper and inorganic settleable solids are removed. The inorganic settleable solids and screenings are flushed to the sludge drying beds. The screened flow is then directed by gravity to the primary settling tank.

PRIMARY TREATMENT

The flow is retained in the primary tank for a period of 2.94 hours during which part of the suspended solids settle to the bottom of the tank. A helical scraper collects the solids or raw sludge and directs it to a sludge pocket located in the centre of the tank. The raw sludge is then pumped to the primary digester for further treatment while the primary effluent flows by gravity to the aeration tank.

AERATION PROCESS

In the aeration tank the primary effluent is mixed with the return activated sludge and aerated by means of a high intensity aerating cone. This action provides oxygen and mixing to the aerobic bacteria which treat the sewage. A retention period of 7.15 hours at design flow and 25% return sludge concentration is required to carry out this process effectively after which the flow is directed to the final settling tank.

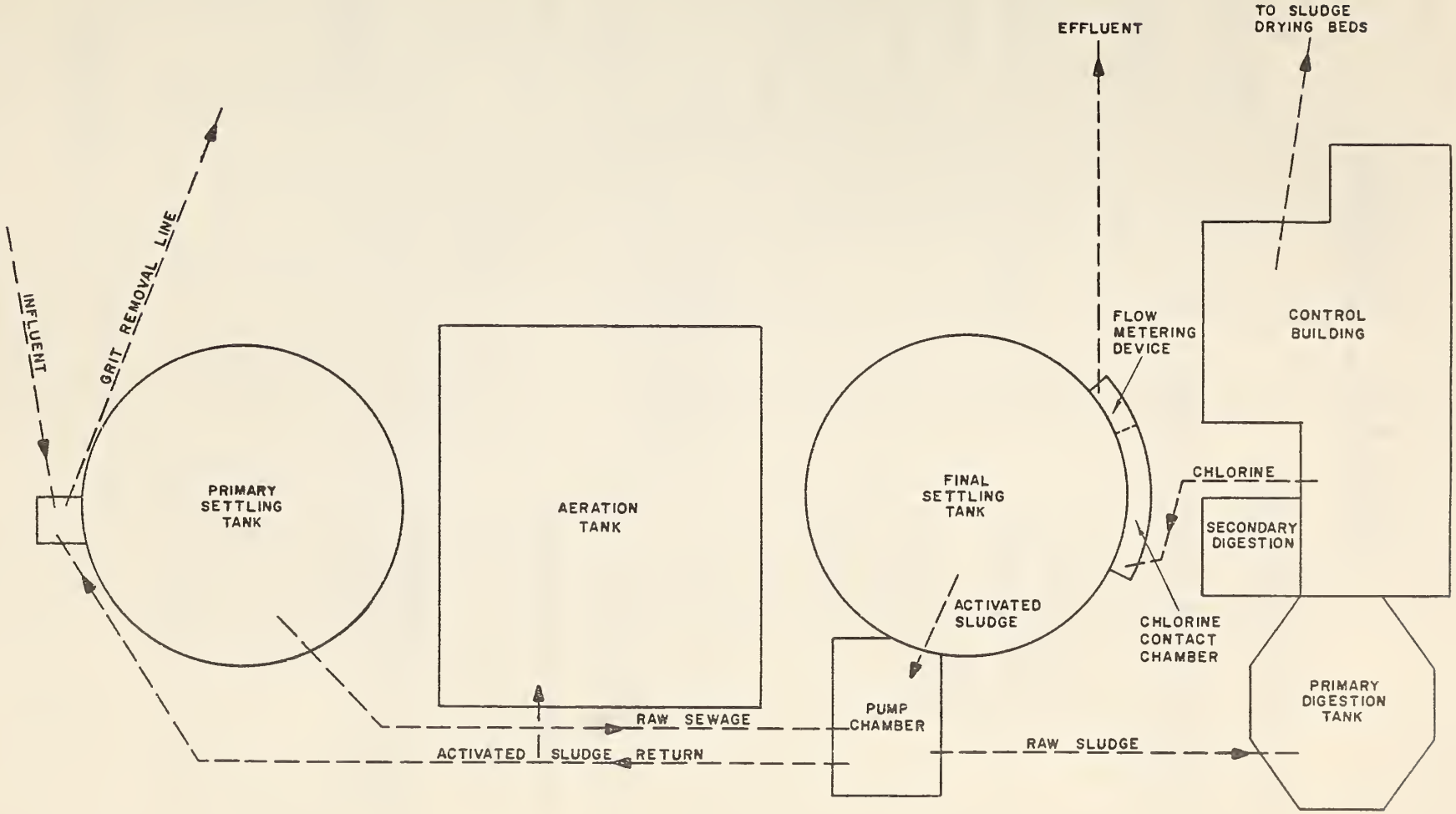
FINAL TREATMENT

From the mixture of purified effluent and activated sludge, the sludge settles out of the flow and is directed by a helical scrapper into the sludge pocket. The purified effluent flows over the collecting channel weirs and into the final effluent outlet where it is chlorinated and discharged into a stream. Part of the activated sludge is returned to the aeration tank and part is wasted to the primary tank.

SLUDGE DIGESTION

Raw and activated sludge from the primary tank mixes with the existing sludge in the primary digester. The mixture recirculates through a heat exchanger which maintains the sludge temperature between 85 and 95 degrees Fahrenheit the most efficient range for the anaerobic treatment process. Digested sludge is displaced by the incoming sludge to the secondary digester where it becomes quiescent, allowing the solid, liquid and gas phase to develop. The digester sludge and supernatant is periodically drawn off to the sludge drying bed and primary tank respectively, while the digester gas is utilized as boiler fuel.

FLOW CHART


EFFLUENT
TO SLUDGE DRYING BEDS
INFLUENT
GRIT REMOVAL LINE
FLOW METERING DEVICE
CONTROL BUILDING
PRIMARY SETTLING TANK
AERATION TANK
FINAL SETTLING TANK
CHLORINE
SECONDARY DIGESTION
ACTIVATED SLUDGE
CHLORINE CONTACT CHAMBER
PRIMARY DIGESTION TANK
PUMP CHAMBER
RAW SEWAGE
RAW SLUDGE
ACTIVATED SLUDGE RETURN

PROJECT COSTS

NET CAPITAL COST (Final) Long Term Debt to OWRC	$468,190.39
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$ 66,578.82
Net Operating	$ 12,495.59
Debt Retirement	9,448.00
Reserve	3,200.69
Interest Charged	26,268.77
TOTAL	$ 51,413.05

RESERVE ACCOUNT

Balance at January 1, 1965	$ 6,286.21
Deposited by Municipality	3,200.69
Interest Earned	413.12
Less Expenditures	-
Balance at December 31, 1965	$ 9,900.02

MONTHLY OPERATING COSTS

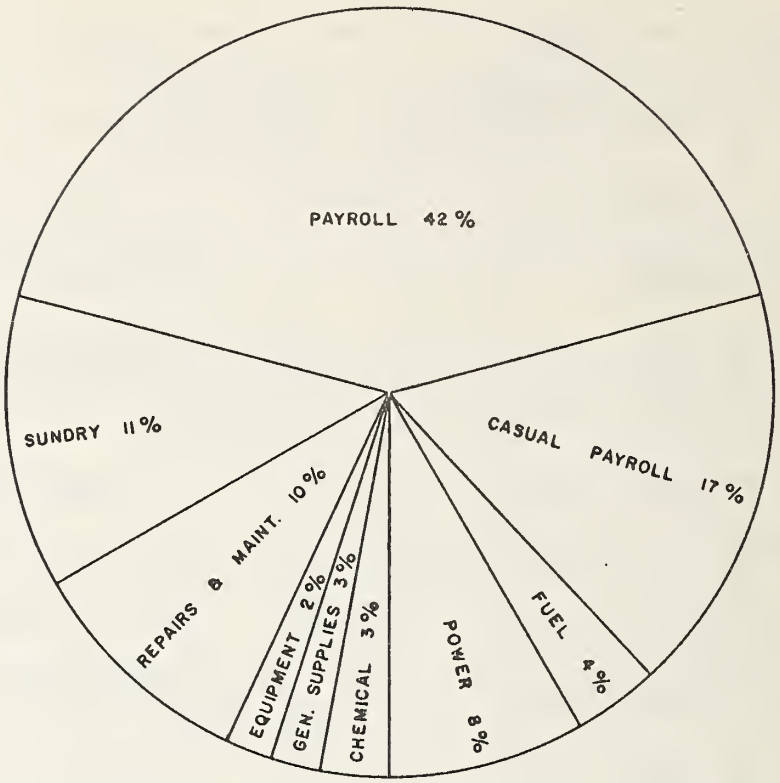
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	751.58	357.06	112.94				45.26		33.00	203.32
FEB	927.41	357.06	242.82		130.80		18.96	86.09		91.68
MARCH	1033.90	402.48	265.22	62.88	116.39		9.00		108.00	69.93
APRIL	1219.88	434.73	342.82	79.00	128.58		29.60		103.95	101.20
MAY	1577.48	617.41	85.30	72.52	113.62	224.03			320.50	144.10
JUNE	717.15	377.72	60.78		83.09		73.37	42.44		79.75
JULY	1141.86	379.90	247.96	107.27	65.13		37.96		233.57	70.07
AUG	1056.70	373.30	312.44		75.73		29.69	85.00	59.74	120.80
SEPT	949.07	426.10	200.32		73.82	115.88	15.37		44.32	73.26
OCT	865.97	583.05	101.32		71.69					109.91
NOV	1211.15	424.80	192.50	62.88	92.29		86.33		283.43	68.92
DEC	1043.44	461.42		101.76	105.44		43.31	25.03	33.48	273.00
TOTAL	12495.59	5195.03	2164.42	486.31	1056.58	339.91	388.85	238.56	1219.99	1405.94

YEARLY OPERATING COSTS

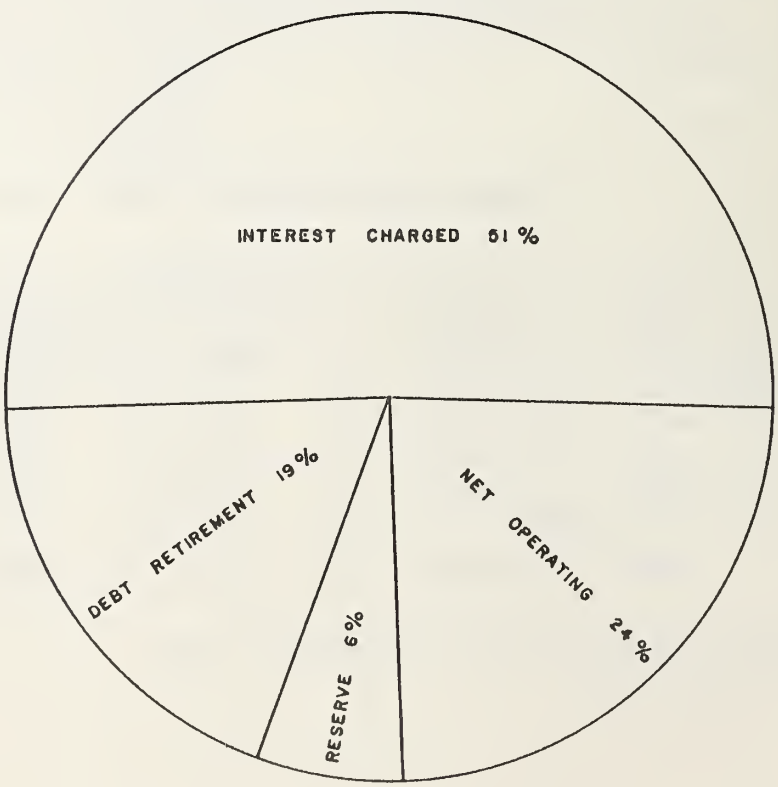
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1962	* 40.150	$10345.20	** $ 15.56	$ 257.66	12 CENTS
1963	* 54.750	8669.18	13.03	158.34	8 CENTS
1964	*** 65.844	11738.97	17.55	178.28	9 CENTS
1965	72.875	12495.59	18.68	171.47	12 CENTS

* ESTIMATED
** BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY
*** PRORATED ON AVAILABLE DATA

1965 OPERATING COSTS



TOTAL ANNUAL COST



Technical Section

Design-Data

GENERAL

Type of Plant - Activated sludge; mechanical aeration.

Design Population - 2,500 persons.

Design Plant Flow - 260,000 gpd for primary treatment 150,000 gpd for complete treatment.

Per Capita Flow - 60 gpd.

Five Day BOD -

Raw Sewage - 200 ppm

Removal - 93%

Suspended Solids -

Raw Sewage - 250 ppm

Removal - 93%

PRIMARY TREATMENT

A chamber in the influent works fitted with a screen serves as both a grit removal and screening facility.

PRIMARY SEDIMENTATION TANK

1 - 24 ft. diameter unit
Volume - 18,400 gallons
Retention Time - 2.94 hours
Surface Settling - 332 gallons per sq. ft. per day.
Weir Overflow - 1700 gallons per linear ft. per day.

SECONDARY TREATMENT

Aeration Section

1 - 29 ft. x 29 ft. tank with 6 ft. diameter Ames-Crosta-Mills cone.

Volume - 55,800 gallons

Retention Time - 7.15 hours assuming 25% return sludge.

FINAL SEDIMENTATION

1 - 28 ft. diameter type "F" tank (Ames-Crosta-Mills),

Volume - 25,000 gallons

Retention Time - 3.2 hours @ 125% of dry weather flow.

Surface Settling - 572 gallons per square foot per day.

Weir Overflow - 720 gallons per foot per day.

DIGESTION SYSTEM

Two stage having a combined capacity of 7170 cu. ft.
Loading 2.74 cu. ft. per capita.

Primary Digestion Tank

1 - concrete structure 19 ft. 3 in. across flats.
Octagonal in shape with a 12 in. diameter screw pump and 10 HP motor.

Secondary Digestion Tank

1 - concrete structure 10 ft. x 10 ft. x 8 ft. deep - 2 inch plank roof.

SLUDGE DRYING BEDS

6 beds each 20 ft. x 31 ft.

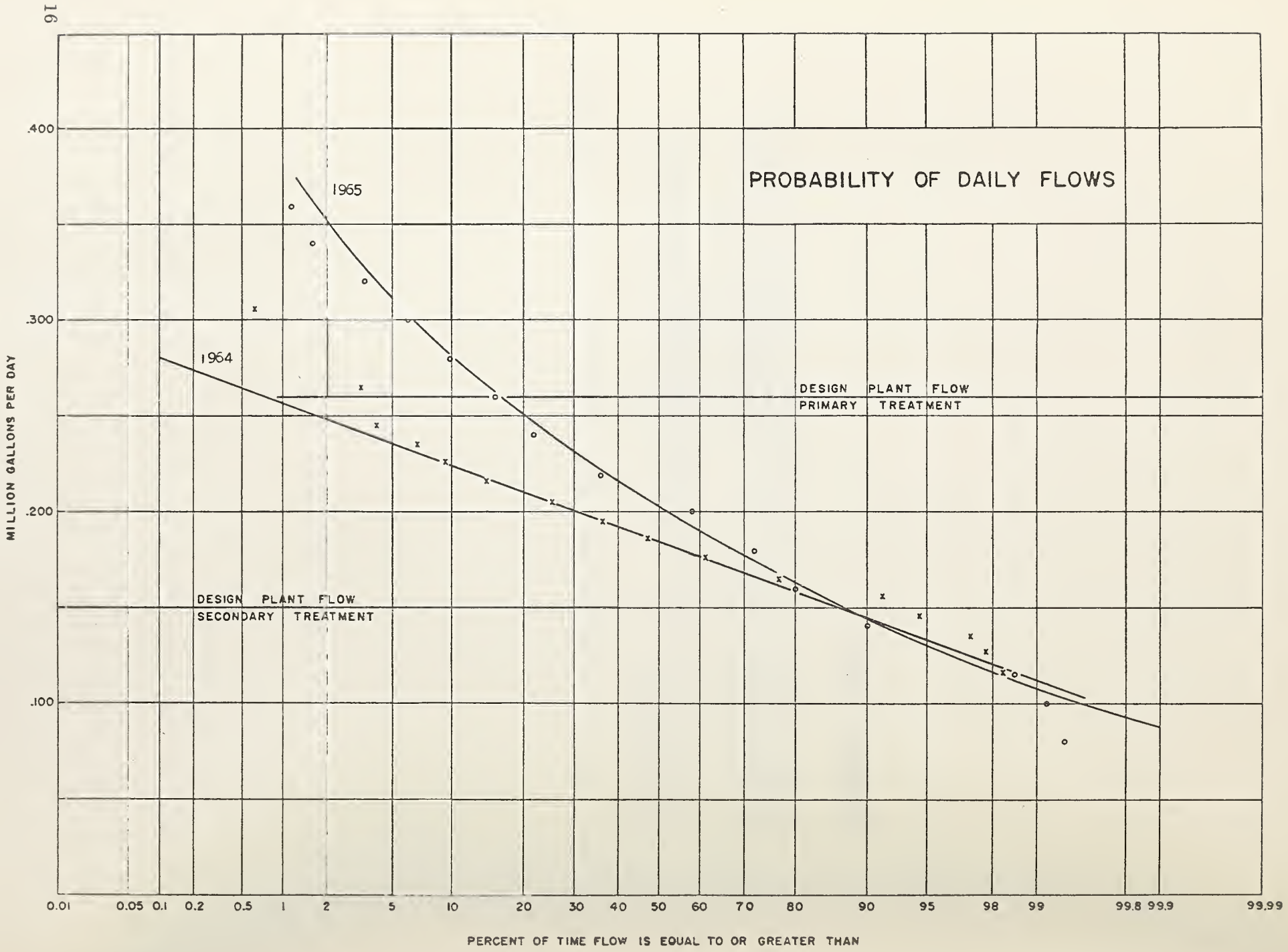
CHLORINATION

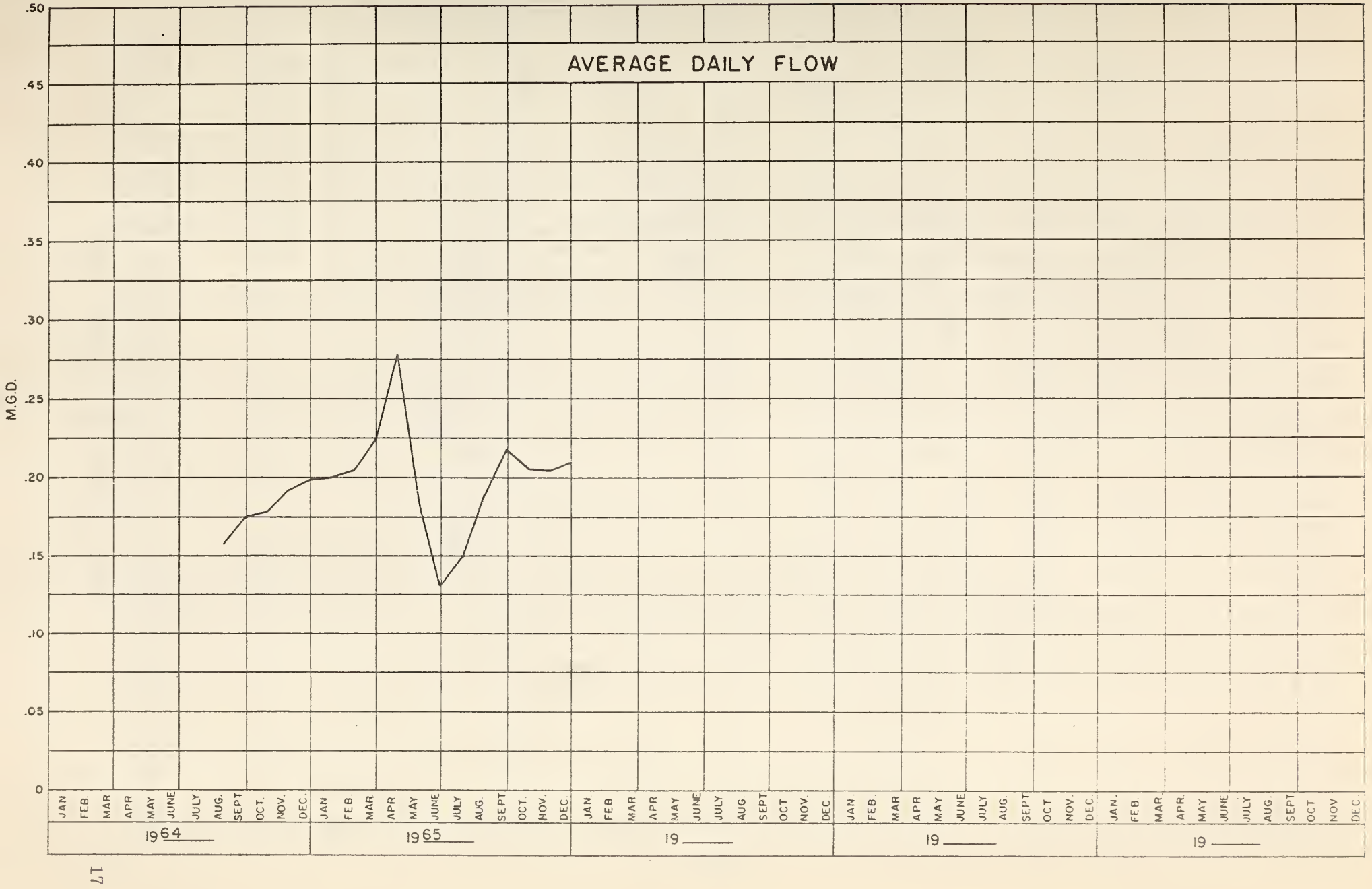
Contact chamber providing 10 minutes detention.
Chlorinator: Wallace and Tiernan - Type A 678.

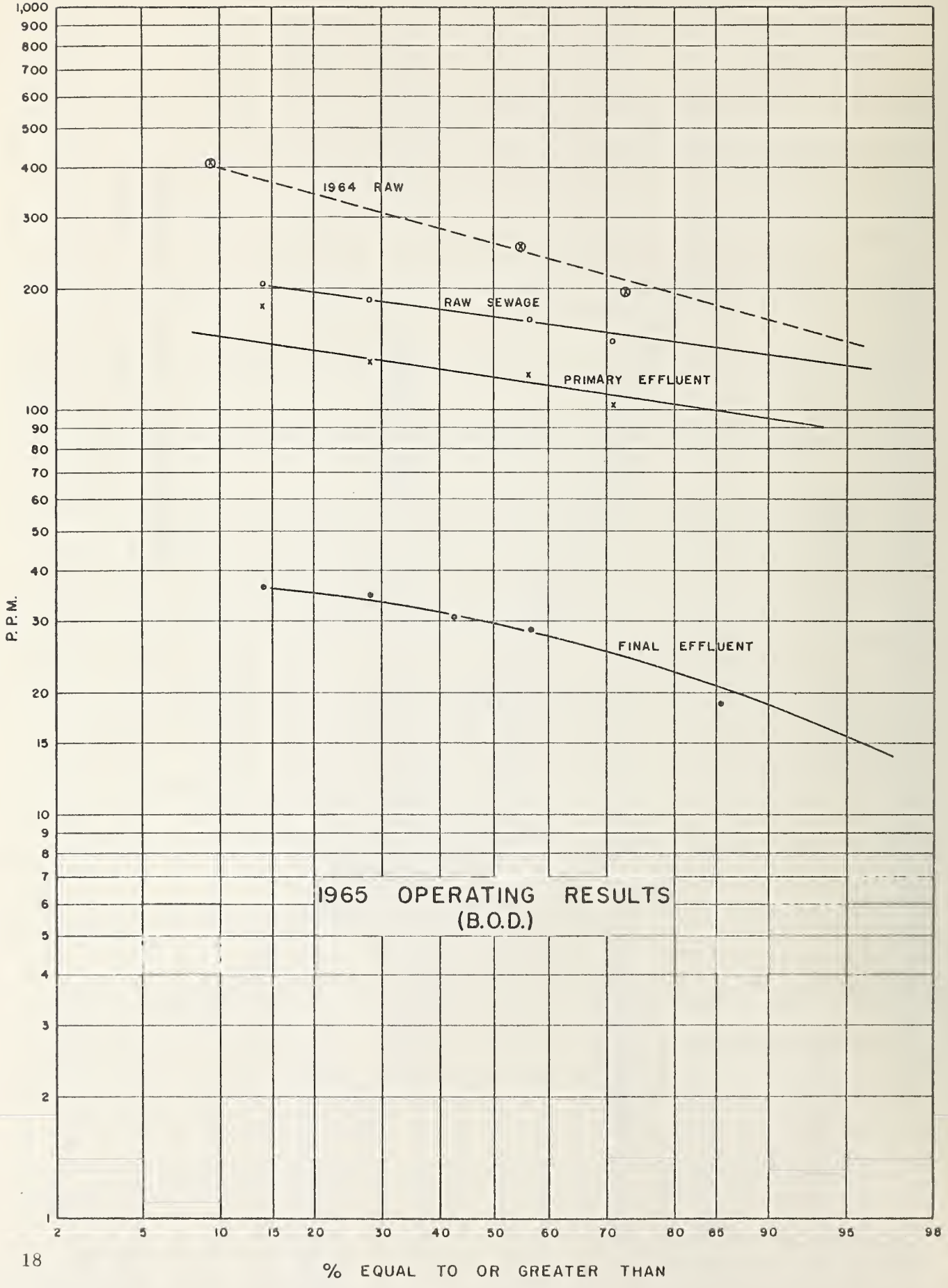
Process Data

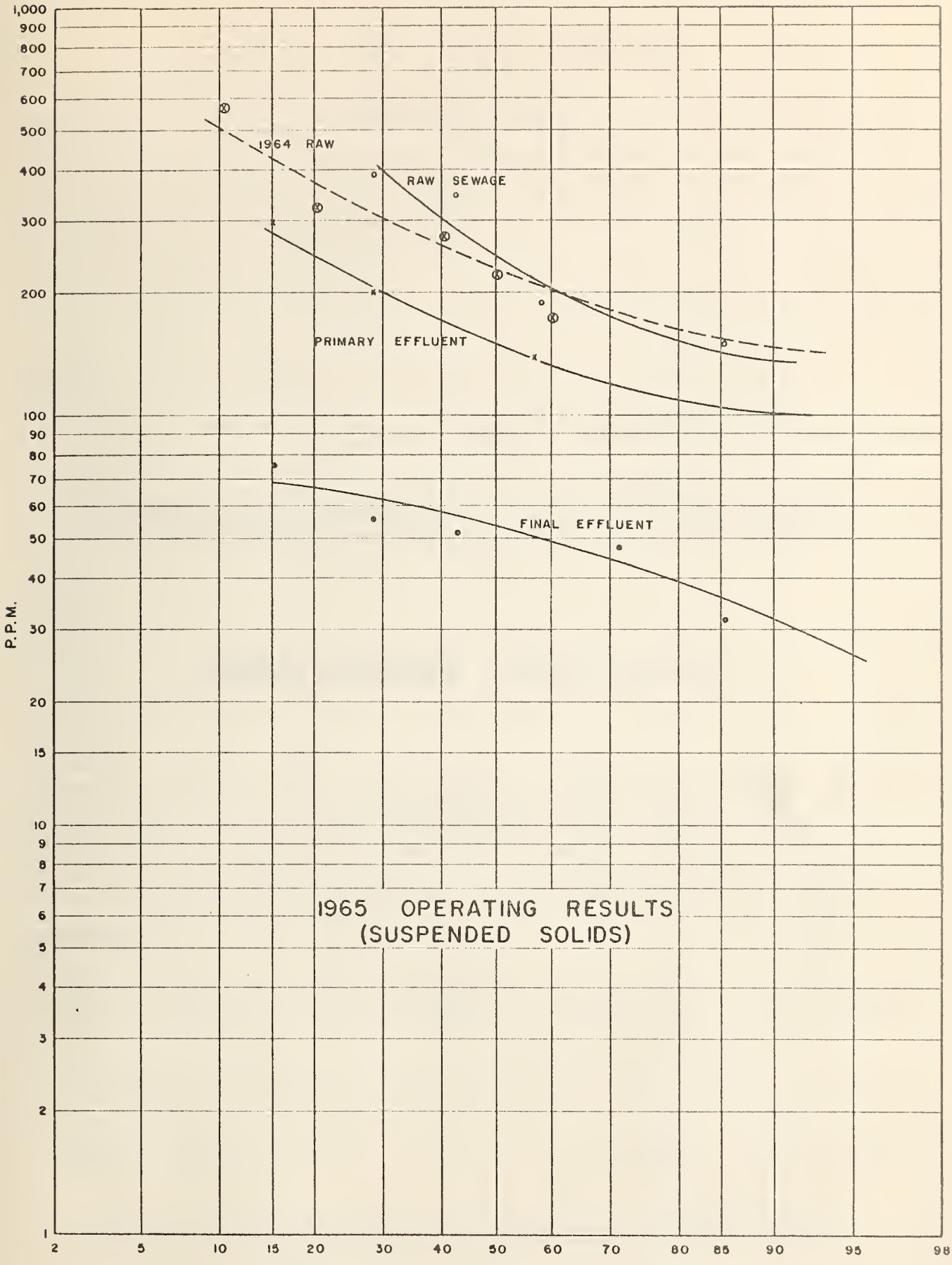
As will be noted from the following charts and graphs a total of 72.875 million gallons were treated in 1965 for an average daily flow for the year of 199,000 gallons per day. This is an increase of approximately 14% over the estimated daily flow of 175,000 gallons per day in 1964.

Also 87% of the time the flow was greater than the design flow for secondary treatment and 15% of the time greater than the design flow for primary treatment.


PROBABILITY OF DAILY FLOWS
1965
1964
DESIGN PLANT FLOW
PRIMARY TREATMENT
DESIGN PLANT FLOW
SECONDARY TREATMENT
MILLION GALLONS PER DAY
.400
.300
.200
.100
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOW
M.G.D.
.50
.45
.40
.35
.30
.25
.20
.15
.10
.05
0
JAN. FEB. MAR APR MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1964
1965
19____


1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
P. P. M.
1964 RAW
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
1965 OPERATING RESULTS
(B.O.D.)
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


1964 RAW
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
1965 OPERATING RESULTS
(SUSPENDED SOLIDS)
P.P.M.
% EQUAL TO OR GREATER THAN
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
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2
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10
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40
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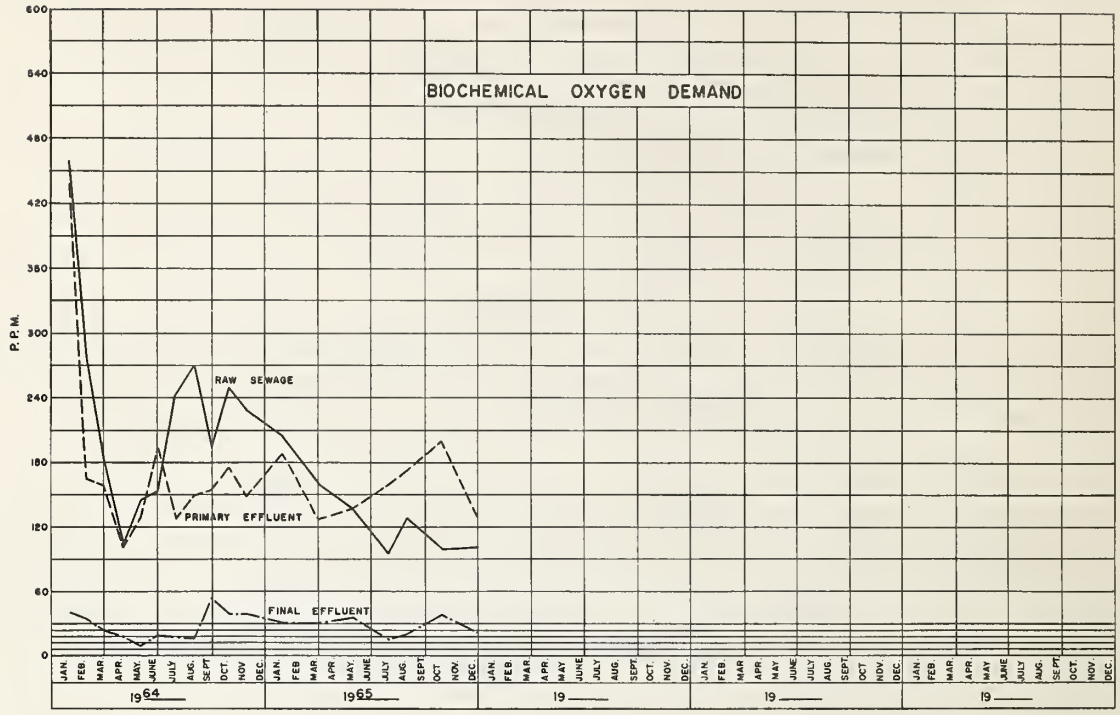
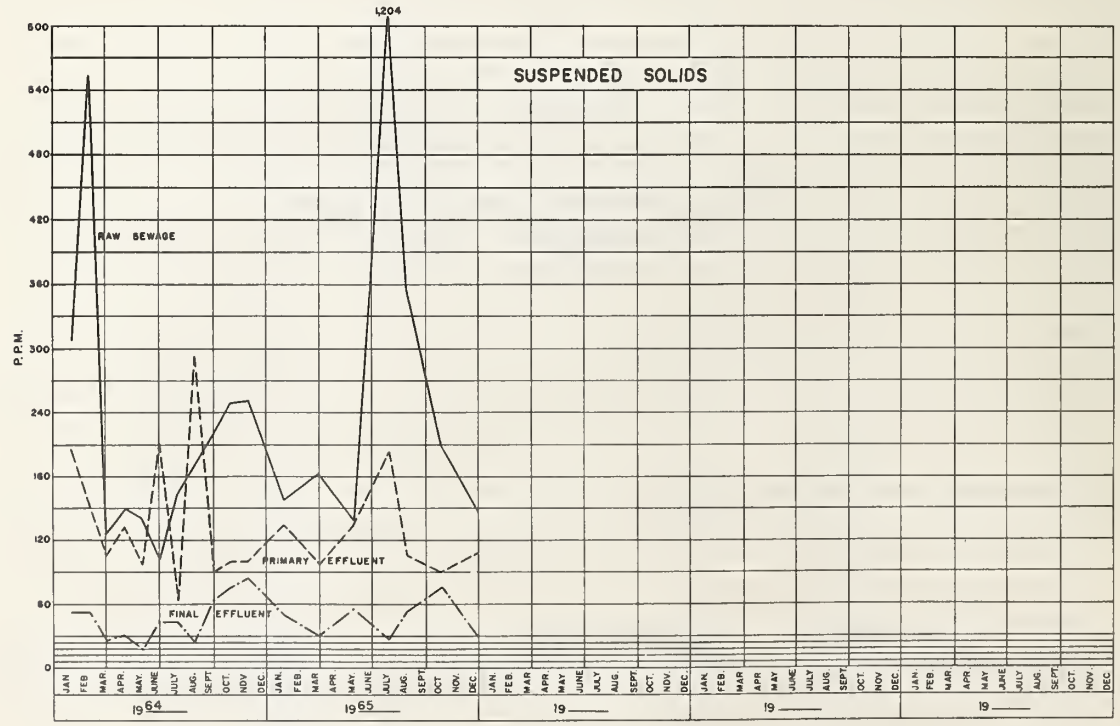
60
70
80
85
90
95
98



MONTHLY VARIATIONS



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

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	205	31	85.0	5.4	158	50	68.5	3.4	30
FEB.	*168	27	84.0	4.0	*197	48	75.5	4.8	15
MAR.	170	30	82.5	4.8	182	47	74.0	4.7	50
APR.	*168	27	84.0	5.9	*197	48	75.5	12.2	15
MAY	138	36	74.0	2.9	138	56	59.5	2.3	30
JUNE	*168	27	84.0	2.8	*197	48	75.5	3.4	30
JULY	160	14	91.0	3.4	1204	26	98.0	27.1	30
AUG.	170	20	88.0	4.4	354	52	85.5	8.8	30
SEPT.	*168	27	84.0	4.6	*197	48	75.5	5.5	45
OCT.	200	38	81.0	5.2	206	76	63.0	4.2	60
NOV.	*168	27	84.0	4.4	*197	48	75.5	5.3	30
DEC.	130	20	84.5	3.6	148	31	79.0	2.0	60
TOTAL	-	-	-	51.4	-	-	-	83.7	425
AVG.	168	27	84.0	4.3	197	48	75.5	7.0	35

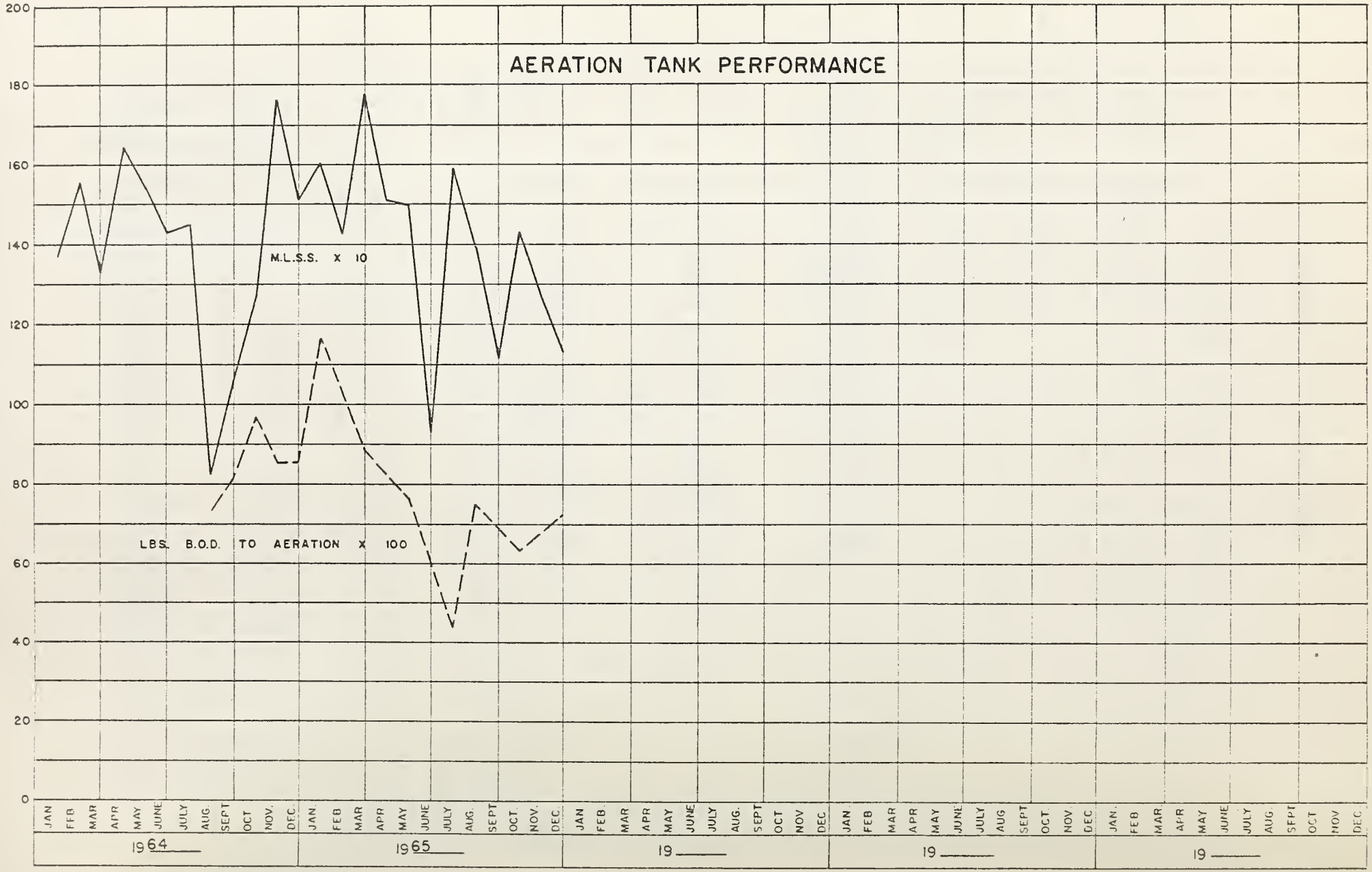
* Average values substituted
In determining the average influent SS the 1204 ppm in July was not included.

COMMENTS

The raw sewage had an average concentration of 168 ppm BOD and 197 ppm SS. The average concentration of the final effluent was 27 ppm BOD and 48 ppm SS which indicated an 85% BOD reduction and 75.5% suspended solids reduction.

The quality of the effluent was not within OWRC objectives of 15 ppm for BOD and suspended solids, for plants with secondary treatment.

A total of 425 cubic feet of grit was removed at an average of 5.8 cubic feet per million gallons treated.

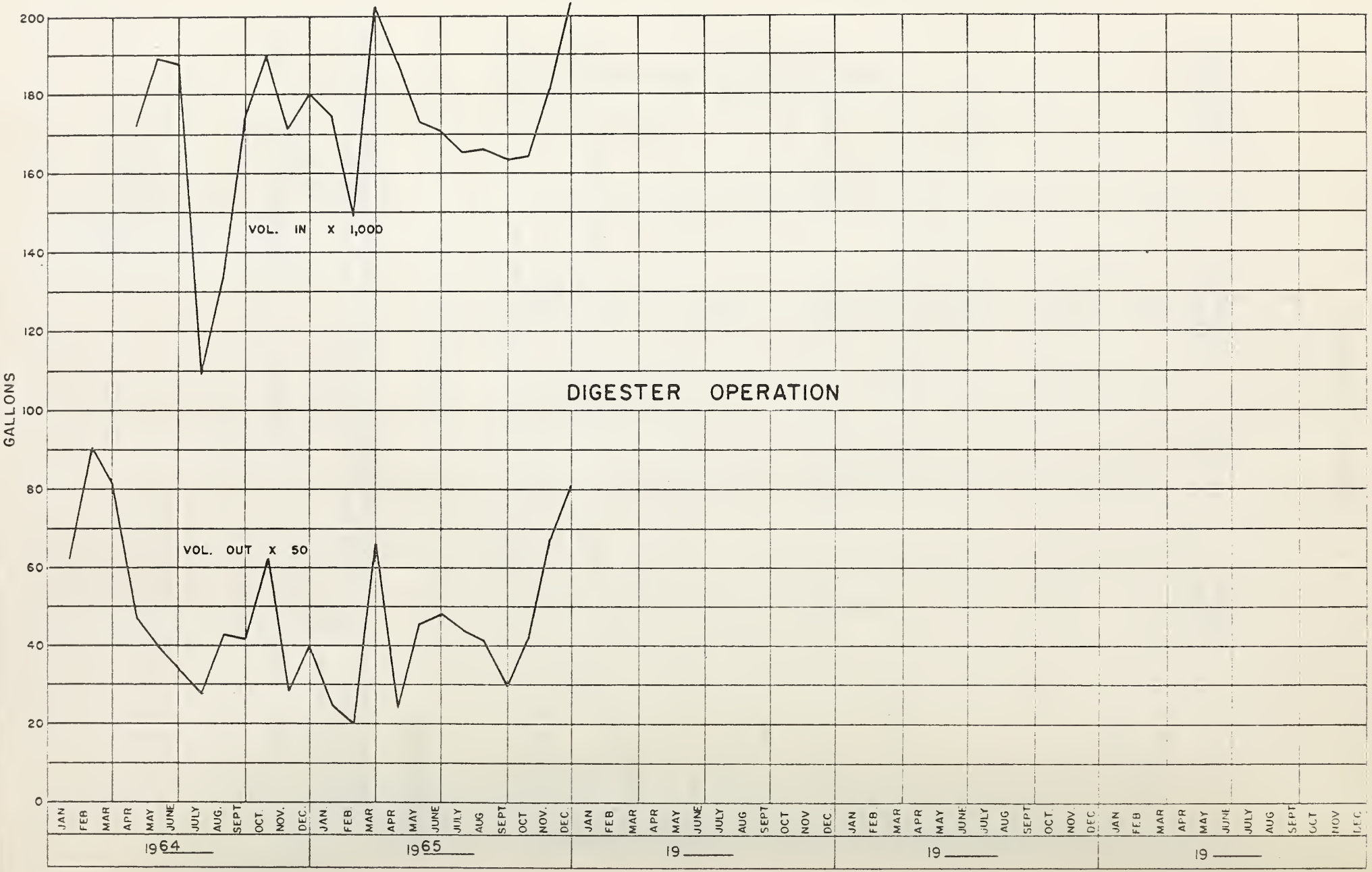

AERATION TANK PERFORMANCE
M.L.S.S. X 10
LBS. B.O.D. TO AERATION X 100
200
180
160
140
120
100
80
60
40
20
0
JAN FEB MAR APR MAY JUNE JULY AUG. SEPT OCT NOV. DEC.
1964
1965
19

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	190	1611	44	-
FEBRUARY	-	1430	-	-
MARCH	128	1779	31	-
APRIL	-	1516	-	-
MAY	138	1506	35	-
JUNE	-	923	-	-
JULY	96	1596	18	-
AUGUST	128	1386	32	-
SEPTEMBER	-	1120	-	-
OCTOBER	98	1438	24	-
NOVEMBER	-	1274	-	-
DECEMBER	110	1135	42	-
TOTAL	-	-	-	-
AVERAGE	127	1393	32	-

COMMENTS

Since mechanical aeration is used at the plant there is no direct means of measuring the air used. However, dissolved oxygen tests indicated sufficient oxygen was supplied to the process.

The primary effluent BOD of 127 ppm indicates a 24.4% reduction of BOD in the primary.


DIGESTER OPERATION
GALLONS
200
180
160
140
120
100
80
60
40
20
0
VOL. IN X 1,000
VOL. OUT X 50
JAN FEB MAR APR MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1964
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV. DEC.
1965
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
19
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT. NOV. DEC.
19
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC.
19

DIGESTER OPERATION

SLUDGE TO DIGESTERS

	1,000's cu. ft.	% solids		1,000's cu. ft.	% solids
Jan.	4.66	3.47	Aug.	4.43	9.05
Feb.	3.98	-	Sept.	4.35	-
Mar.	5.56	5.16	Oct.	4.38	0.77
Apr.	5.02	-	Nov.	4.84	-
May	4.62	6.28	Dec.	5.53	-
June	4.57	-	Total	*56.35	-
July	4.41	1.90	Avg.	4.70	4.44

SLUDGE FROM DIGESTERS

Total: *42,000 cu. ft.

Average: 3,500 cu. ft.

* Estimated total for year.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	6.179	-	-
FEBRUARY	5.708	-	-
MARCH	6.909	-	-
APRIL	8.343	-	-
MAY	5.683	330*	8.20
JUNE	3.924	450	11.48
JULY	4.595	465	10.12
AUGUST	5.821	465	7.99
SEPTEMBER	6.513	450	6.91
OCTOBER	6.400	150**	7.25
NOVEMBER	6.317	-	-
DECEMBER	6.465	-	-
TOTAL	72.875	2310	-
AVERAGE	6.073		8.46

* Chlorination for 22 days
** Chlorination for 10 days

COMMENTS

Chlorination of the final effluent was carried out from May 9 to October 10 at an average dosage of 8.46 ppm.

CONCLUSIONS

The flows in 1965 exceeded the design capacity for secondary treatment 87% of the time and the resulting quality of the effluent did not meet the standards of the OWRC for secondary treatment.

RECOMMENDATIONS

A study should be made for future plant expansion.


ONTARIO WATER RESOURCES COMMISSION