THE ONTARIO WATER RESOURCES COMMISSION

REPORT ON

INDUSTRIAL WASTE SURVEY

of the

CITY OF KITCHENER

BY

F. R. PHOENIX

INDUSTRIAL WASTE BRANCH

1961

R E P O R T

O F

A N I N D U S T R I A L W A S T E S U R V E Y

O F

T H E C I T Y O F K I T C H E N E R

1961

Industrial Waste Branch

Ontario Water Resources Commission

C O N T E N T S

	Page Number
Introduction	1
Summary	1
Conduct of the Survey	5
Tabulations by Class of Industry -	
Dairies	6
Food Processing Plants	7
Meat Packing Plants	7
Plating and Metal Working Plants	8
Rubber Manufacturers	8
Textile Plants	9
Tanneries	9
Reports on Individual Companies -	
Dare Foods Limited	10
Smiles n' Chuckles Limited	13
Weston Bakeries Limited	17
Burns and Company (Eastern) Limited	20
Kitchener Packers Limited	26
J. M. Schneider Limited	32
Phillip Hoffman and Sons Limited	38
Canada Skate Manufacturing Company	41
Globe Stamping Company Limited	45

Reports on Individual Companies (continued)

	Page Number
Kuntz Electro Platers Limited	48
Marsland Engineering Limited	52
John A.Lang and Sons Limited	55
Ontario Tanning Company	60
Dominion Rubber Company Limited	
Textile Division	62
Tire Division	65
General Products Division	67
Kaufman Rubber Company Limited	69
B. F. Goodrich Canada Limited	71
Rumpel Felt Company Limited	73
Properties of Raw Sewage and Effluent from the Doon Treatment Plant	76
Remarks and Recommendations	78

Appendix - List of Dry Industries

ONTARIO WATER RESOURCES COMMISSION

Municipality City of Kitchener Date of Inspection May-November, 1961

Re: Industrial Waste Survey of the City of Kitchener

Field Inspection by R. Phoenix, T. Metzing and M. Zaremba Report by R. Phoenix

INTRODUCTION

An industrial waste survey was conducted at the request of the Plant Operations Division, Ontario Water Resources Commission. The principal objective was to determine the current status so that data for the expansion of treatment facilities would be available and the effects of new industry could be readily evaluated.

Wastes likely to be of a nature toxic to organisms utilized in secondary treatment were examined as well as those containing high proportions of soluble organic matter and unsettleable solids. From the data collected, an estimate of the total load which could be attributed to industrial waste was made. The present overall character of the sewage received at the municipal sewage treatment plant and the effluent produced was determined for reference.

SUMMARY

Industry in Kitchener is essentially of the secondary manufacturing type. Meat packers are the only primary industries. In this report all plants are classed according to the type of operation or as "dry" industries. The dry industries have little or no significant industrial

Summary (continued)

wastes. The others produce wastes in large volumes and/or of such a character or strength that they could affect the operation of a sewage treatment plant.

All told, there are some two hundred and ten diversified industries in Kitchener. They are enumerated below according to classification.

Dairies	-	5
Food processing	-	3
Meat packing and slaughtering	-	4
Plating and metal working	-	4
Rubber manufacturing	-	3
Textile and allied manufacturing	-	2
Tanning	-	2
Dry industries	-	187

Excluding the sanitary wastes, these factories would collectively contribute the following loads:*

Biochemical Oxygen Demand (5-day)	-	19,087 pounds per day
Suspended solids	-	18,982 pounds per day
Fatty matter (ether solubles)	-	5,219 pounds per day
Hydraulic load	-	3,568,000 gallons per day

These quantities represent on the average 61 percent of the total BOD load and 41.5 percent of the average total daily flow which is treated at the sewage plant. The packers and the tanneries account for over 90 percent (both BOD and solids) of industrial sewage load.

There are some toxic wastes, that is, those which might poison organisms utilized in secondary treatment. These are described below:

* These figures represent normal weekday conditions. On Saturday and Sunday the loads will be between 40 and 60 percent of those encountered on weekdays.

Summary (continued)

Chromium	-	35.7 pounds per day
Zinc	-	5.0 pounds per day
Copper	-	3.9 pounds per day
Cyanide	-	13 pounds per day

Suggestions are made in this report that those industries which have strong wastes consider methods of reducing strengths to acceptable levels. The city, with the co-operation of industry, might establish these levels and draw up an industrial waste by-law to regulate the discharge of wastes to the sewer and disposal facilities. On the other hand, the city might elect to accept all treatable wastes and levy a surcharge, based on a formula which considers both strength and volume, for the additional treatment. In any case, some form of regulation should be instituted to protect the treatment facilities from shock loads, overloading and wastes detrimental to either primary or secondary treatment processes.

A tabulated summary of the industrial waste loading follows.

Industrial Waste Survey

City of Kitchener - 1961

Summary of Sewage Loads Attributable to Industrial Wastes

Class of Industry	Volume gpd	BOD lbs/day	Susp. Solids lbs/day	Fat lbs/day	Nitrogen (Kjeldahl) lbs/day	Chromium Total lbs/day	Zinc lbs/day	Copper lbs/day	Cyanide lbs/day
Dairies	172,900	179							
Food processing	163,000	820	248	155	15				
Meat packing	838,000	14,573	7,555	3,884	1,561				
Plating and metal working	218,150					25.7	5.0	3.9	13
Rubber Manufacturing	1,629,000	46	1,231						
Textile and allied manufacturing	120,000	237	105						
Tanning	424,000	3,278	10,874	1,180	550	10			
T O T A L	3,565,000	19,133	20,013	5,219	2,126	35.7	5.0	3.9	13

CONDUCT OF THE SURVEY

The scope of this survey was limited to a determination of characteristics, volume and variability of the industrial wastes produced by the various factories in the city. Sampling was carried out with this in mind. Those samples taken were, where possible, representative of the overall effluent from the plants and the test results were interpreted so as to give an estimate of the average daily condition. Variations in characteristics and volumes were noted. The results were also tabulated so as to reflect the contribution of each type of industry.

When secondary treatment facilites are planned it will be necessary to reassess these data and perhaps conduct more intensive investigations in some cases. More specific recommendations can then be made regarding in-plant treatment and process modification to produce effluents acceptable for secondary treatment.

The actual survey was conducted along the following lines. First, a preliminary investigation was made into the type of operation and volume of water consumed. The number of industries to be evaluated was thereby greatly reduced. Sample points were selected and sample plans developed. Then on the day selected to be as nearly representative of normal operations as possible, sampling plans were implemented and pertinent data collected. All samples taken were forwarded immediately to the Ontario Water Resources Commission Laboratory in Toronto for analysis.

All testing was done according to "Standard Methods for the Examination of Water and Wastewater" Eleventh Edition, 1960 . The test results were interpreted and the figures compiled for inclusion in this report.

SUMMARY OF SEWAGE LOADS

Dairies

Company	Volume gpd	Estimated BOD lbs/day	Days per Week	Type of Package
Kitchener Dairies Limited	47,000	35	5	paper and glass
Purity Dairy	8,900	9	5	glass
Maple Lane Dairy	19,000	50	5	paper
Silverwood Dairies Limited	63,000	40	5	paper and glass
Westside Dairy	35,000	45	5	paper and glass
T O T A L	172,900	179		

SUMMARY OF AVERAGE SEWAGE LOADS

Food Processing Plants

Characteristics	COMPANIES Dare Foods Limited	Weston Bakeries	Smiles n' Chuckles	Totals
Volume, gpd	16,000	3,000	144,000	163,000
BOD, lbs/day	55	20	750	825
Susp. Solids, lbs/day	34	11	203	248
Fat, lbs/day	7	6.5	141	154.5
Nitrogen (Kjeldahl) lbs/day			15	15
pH range	5.5-7.9	5.5 - 9.0	6.2 - 7.1	

SUMMARY OF AVERAGE SEWAGE LOADS

Meat Packing Plants

Characteristics	COMPANIES Burns & Co. (Eastern) Ltd	Kitchener Packers Ltd	Schneider Limited	Hoffman and Sons	Totals
Volume, gpd	151,500	18,500	650,000	18,000	838,000
BOD, lbs/day	3,320	548	10,330	375	14,573
Susp. Solids, lbs/day	2,670	105	4,600	180	7,555
Fat, lbs/day	690	25	2,900	269	3,884
Nitrogen (Kjeldahl) lbs/day	411	64	1,052	34	1,561
pH range	6.0 - 7.0	6.5 - 7.0	6.3 - 7.3	6.3	

SUMMARY OF AVERAGE SEWAGE LOADS

Plating and Metal Working Plants

	C O M P A N I E S				
Characteristics	Canada Skate Manfg. Co.	Globe Stamping Co., Ltd.	Kuntz Electroplaters	Marsland Engineering	Totals
Volume, gpd	16,900	100,000	84,000	17,250	218,150
Cyanide, lbs/day	1.30	0.70	9.0	2.0	13.0
Zinc, lbs/day	0.35		2.0	2.6	4.95
Total Chromium, lbs/day	1.00	0.53	18.8	5.4	25.73
Hexavalent Chromium, lbs/day	0.85	0.43	13.7	4.0	14.98
Copper, lbs/day	0.45		3.4		3.85
Nickel, lbs/day	1.30		2.4		3.7
pH	8.0		6.6	8.4	

SUMMARY OF AVERAGE SEWAGE LOADS

Rubber Manufacturers

	C O M P A N I E S				
Character-istics	Dominion Rubber Foam & Footwear	Dominion Rubber Tire plant	BF Goodrich Canada Ltd.	Kaufman Rubber Co.	Totals
Volume, gpd	150,000	975,000	364,000	140,000	1,629,000
BOD, lbs/day	46				46
Susp. solids, lbs/day	231		1,000		1,231
pH	7.5				

SUMMARY OF AVERAGE SEWAGE LOADS

Textile Plants

Characteristics	C O M P A N I E S Dominion Rubber Co.	Rumple Felt Co., Limited	Totals
Volume, gpd	100,000	20,000	120,000
BOD, lbs/day	175	62	237
Susp. Solids, lbs/day	82	23	105
pH	9.4	6.4	

SUMMARY OF AVERAGE SEWAGE LOADS

Tanneries

Characteristics	C O M P A N I E S Ontario Tanning	John A. Lang & Sons Limited	Totals
Volume, gpd	4,000	420,000	424,000
BOD, lbs/day	28	3,250	3,278
Susp.Solids, lbs/day	24	10,850	10,874
Fat, lbs/day		1,180	1,180
Nitrogen (Kjeldahl) lbs/day		550	550
Chromium, lbs/day		10	10
pH range	8.0 - 9.3	6.9 - 11.8	

DARE FOODS LIMITED

In Kitchener, Dare Foods Limited is engaged in the manufacture of biscuits only. The plant is located at 2481 King Street East. While such an operation might not have large volumes of wastes, a survey was made because the wastes were likely to be strong.

SUMMARY

As predicted, this plant contributes a comparatively small load to the sewage treatment plant. While the wastes sampled were strong, i.e. 2,100 parts per million - 3,400 parts per million biochemical oxygen demand, they would be well diluted with sanitary sewage and cooling water. A large portion of their waste is soluble organic matter such as sugar. Such waste would pass through primary treatment and would require secondary treatment for complete stabilization.

PRODUCTION DATA

Raw Materials - Flour, sugar, powdered eggs, lard, vegetable oils, colourings, flavourings, etc.

Manufacturing Operations - Mixing dough, preparation of icing and fillings, baking and packaging.

Production Volume - Average - 55,000 pounds per day

Products - Sweet biscuits - plain, filled or topped

PERSONNEL

Mr. Robert Saunders, Plant Manager

Mr. Russel Wagner, Plant Engineer

OPERATING SCHEDULE

Hours per day - 18 average

Days per week - 5 average, 5½ maximum

Number of employees - 250 average

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 23,800 average
31,500 maximum

Utilization (gallons per day)-

Cooling	-	14,000	
Steam	-	300	(boiler make-up, treated)
Product	-	500	
Sanitary	-	5,000	
Cleaning	-	2,000	
Losses to atmosphere	-	2,000	
		23,800	

WASTES

The liquid wastes resulting from the operations at this plant are primarily produced during the cleaning of equipment. They are consequently intermittent with the exception of the cooling water. The

Wastes (continued)

following tabulation shows the overall nature of the industrial waste effluent from this plant.

Flow (gallons per day)	-	16,000 average, 19,500 maximum
Biochemical Oxygen Demand (BOD) parts per million	-	343
Suspended Solids parts per million	-	213
Ether solubles (fat) parts per million	-	45
pH	-	5.5 to 7.9

An analysis report on the samples from which these figures were derived is included in this report.

REMARKS

On the whole, the wastes from this factory differ only slightly from normal sanitary sewage. Therefore, no special treatment is required. Precautionary measures, such as grease traps, prevent the discharge of excess fat, etc. to the sewers. In general, a high standard of cleanliness is maintained throughout the factory.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* c.c.

Source: Dare Foods Ltd.

Date Sampled: May 24/61 by: Zaremba

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	pH							
		Total	Susp.	Diss.									
T-527	2100.	5392	2158	3234	500	7.9							
T-528	3400	10966	1196	9770	220	5.5							

T-527	1.	Grab sample - sump at cookie machine.
T-528	2.	Grab sample - effluent at icing dept.

3M-60-170

SMILES n' CHUCKLES LIMITED

This firm produces chocolate and boiled candies. Operations are carried on at 162 Weber Street East at the corner of Cameron Street. Candy making does not usually produce wastes containing large quantities of suspended solids. There are, however, significant quantities of fatty matter and soluble organics such as sugars. Such materials, in liquid wastes, have a very high biochemical oxygen demand. A survey, including the required sampling, was made to determine the waste load and the character of the effluents.

SUMMARY

This plant produces the major part of the BOD load contributed by the food industries in the city. This was calculated at approximately 750 pounds per day. The average strength is roughly double that of normal sanitary sewage. In addition, there are periods during their dairy and cleaning operations in which much stronger wastes, such as buttermilk and sugars, are discharged.

Most of the BOD could best be satisfied in secondary treatment This was concluded on the basis of analyses of composite samples which showed a high ratio of dissolved to suspended solids. On the whole, the waste might be somewhat deficient in nitrogen which is required for proper secondary treatment. However, this would not be a serious factor as

Summary (continued)

the nitrogen available in the municipal sanitary sewage would compensate for this deficiency.

Housekeeping is good and there is little that can be done to reduce the load with the possible exception of buttermilk disposal. This might be trucked away by a hog producer if the volume is sufficient.

PRODUCTION DATA

Raw Materials - Sugars, milk, butter, glucose, cocoa flavourings, nuts.

Manufacturing Operations - Butter making, condensing milk, producing chocolate, boiling candy, enrobing chocolates, packaging, etc.

Products - Assorted chocolates, "turtles", chocolate bars, hard candy.

PERSONNEL

Mr. Gordon Hamblin, President and General Manager

Mr. George H. Miles, Plant Manager

Mr. Peter Moskalik, Chief Stationary Engineer

Mr. Lorne Hymers, Standards Supervisor

OPERATING SCHEDULE

Hours per day - 9 average, 14 maximum

Days per week - 5

Number of employees - 250 average, 500 maximum

Peak period from August to March

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 149,000 average
180,000 maximum

Utilization (gallons per day) -

sanitary	- 5,000 average 10,000 maximum
process water including steam, cooling and cleaning	- 144,000 average 170,000 maximum

WASTES

With the exception of the sanitary sewage, the total waste flow averages 144,000 gallons per day. The flow rate is fairly uniform due to continuous cooling required on the chocolate refiners and the vacuum pan.

The analyses of the samples taken showed two peak periods during a normal day. The first occurs during the receipt of the milk in the dairy. The second and most significant, takes place on the afternoon and can probably be attributed to cleaning as the analyses gave a high BOD and a high dissolved solids.

Average values for the wastes from this factory are tabulated below:

Flow (gallons per day)	- 144,000
Biochemical Oxygen Demand parts per million	- 520
Suspended Solids parts per million	- 140

Wastes (continued)

Ether Solubles (fat)
parts per million - 98

pH - 6.2 to 7.1

REMARKS

On the basis of analyses made on composite samples, it was estimated that this plant contributes in a normal day 750 pounds of BOD, and 253 pounds Suspended Solids. The presence of carbohydrates, which account for most of the oxygen requirement in this waste, suggests that biological treatment would be required to stabilize these materials.

Housekeeping is very good as it must, of necessity, be in a food plant. There appears to be no way in which the BOD can be reduced.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* ✓ c.c.

Source: Smiles & Chuckles

Date Sampled: May 24/61 by: R. Phoenix

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	pH	Total Kjeldahl as N						
		Total	Susp.	Diss.									
T-523	54.	4660	232	4428	20	7.1	10.5						
T-524	55.	572	38	534	Trace	7.0	10.5						
T-525	580.	600	120	480	290	6.8	11.5						
T-526	1220.	1240	148	1092	230	6.2	24						

T-523	1.	Composite sample, plant effluent, Cameron St., 0700 - 1000 hrs.
T-524	3.	" " " " " " 1000 - 1300 hrs.
T-525	4.	Grab sample, " " " " during receipt of milk.
T-526	5.	Composite sample " " " " 1300 - 1700 hrs.

5M 60—1311

WESTON BAKERIES LIMITED

Weston's operate a modern bakery producing bread and sweet goods at 560 Victoria Street North. Because of the nature of the raw materials used in manufacturing these products, a survey was made to evaluate the liquid wastes from this factory.

SUMMARY

Most of the waste produced here results from cleaning floors, pans and racks. Mobile machines are used to clean the floors. Washers, which recycle the cleaning solution, are used for the racks and pans. As a result, while the effluents are strong, the volumes are small.

No improvements can be suggested at this time as there are no floor drains and housekeeping is excellent due to continuous use of the floor cleaning machines.

PRODUCTION DATA

Raw Materials - Bread flour, sugar, yeast, cracked wheat, powdered eggs, mixed eggs, egg whites, etc.

Manufacturing Operations - Mixing, kneading, baking, packaging.

Production Volume - Average - 80,000 pounds per day

Products - Assorted bread, rolls and sweet goods

PERSONNEL

Mr. F. B. Osborne, Manager

Mr. J. Whittle, Office Manager

OPERATING SCHEDULE

Hours per day - 18 average, 24 maximum

Days per week - 5 average

Number of Employees - 125 average

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 5,000

Utilization (gallons per day) -

Sanitary	-	1,000
Cleaning, cooling and process	-	3,000
Steam	-	1,000 (treated)
		5,000

WASTES

Grab samples were taken representing floor washings, spent pan washer sclution, and spent rack washer solution. The analysis reports show that these wastes are quite strong, ranging from 1,800 to 6,400 parts per million BOD. However, this is not a problem as the volumes are small and discharges intermittent. It is estimated that the wastes from this

Wastes (continued)

plant have the following average properties:

Flow (gallons per day)	-	3,000
Biochemical Oxygen Demand parts per million	-	640
Suspended Solids parts per million	-	396
Ether Solubles (fat) parts per million	-	218
pH	-	5.7 to 9.0

REMARKS

From the figures obtained, the sewage load contributed by this plant appears to be quite low. None of the cleaners is particularly strong and therefore there is no need for pretreatment. While a fair amount of fat was found in the wastes, this is quite likely in emulsified form. On the whole, the operation is very clean.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix c.c.

Source: Weston Bakeries Ltd.

Date Sampled: May 16, 1961 by: R. Phoenix

Lab. No.	5-Day B.O.D.	Solids			pH	Ether solubles	Alkalinity as $CaCO_3$		Acidity as $CaCO_3$				
		Total	Susp.	Diss.									
T-445	1800	3726	526	3200	9.0	114	540		-				
T-446	2300.	3640	1680	1960	6.6	950	-		190.				

T-445 #1 Pan washer - spent solution

T-446 #2 Rack washer - spent solution

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix c.c.

Source: Weston's Ltd.

Date Sampled: May 18, 1961 by: Metzing & Zaremba

Lab. No.	5-Day B.O.D.	Solids			Ether solubles	pH							
		Total	Susp.	Diss.									
T-480	6400.	7892	3962	3930	2180	5.7							
T-480		#1 Grab sample floor washings.											

5M 60—4311

BURNS AND COMPANY (EASTERN) LIMITED

Burns operate the second largest packing plant in the city of Kitchener at 900 Guelph Street. As a mixed slaughtering and packing operation, they discharge a sizeable load to the municipal sewers. This survey was made to evaluate the flow and characteristics of the industrial waste effluents so that these may be taken into consideration in the design of secondary municipal treatment facilities.

SUMMARY

The results of the survey indicate that while the overall waste load produced by this plant is in line with similar operations elsewhere, the waste is very strong. Normal domestic sewage has a BOD (biochemical oxygen demand) of about 250 to 300 parts per million, whereas this effluent exceeds 2,000 parts per million.

There is, in addition, a possible variation of roughly 50 percent from the average in the flow, quantities of BOD and solids.

Before secondary municipal treatment is instituted, it would be advisable for the company to consider the merits of pretreatment to reduce the strength of the waste as compared with the cost of having the municipality treat the waste at the sewage plant.

PRODUCTION DATA

Raw Materials - Hogs, cattle, calves, lambs, oleo stock, pickling salts and spices, gelatin, alkaline cleaners.

Manufacturing Processes - Killing, dressing, cutting, pickling, curing, sausage making, canning, and packaging.

Products - Smoked, cooked and canned meats, sausages, fresh and frozen beef and pork, miscellaneous packinghouse products.

PERSONNEL

Mr. A. T. Beresford, General Manager

Mr. George Bonnett, Superintendent

Mr. M. Speigel, Chief Engineer

OPERATING DATA

Hours per day	- 8 average
Days per week	- 5 average
Number of employees	- 650 average

WATER SUPPLY AND DISTRIBUTION

Source	Quantity (gallons per day)
Kitchener Water Commission	58,000 to 262,000 maximum
Private well	115,000 maximum

The exact proportions of water from these sources are difficult to determine due to the intermittent use of the well.

Water Supply and Distribution (continued)

Distribution	Average quantity gallons per day
steam	8,500
cooling	68,000
process	85,500
sanitary	13,000
	175,000

WASTES

For an average day, the characteristics of the industrial wastes are calculated to be as follows:

Volume (gallons per day)	-	151,500		
BOD (parts per million)	-	2,190	-	3,320 pounds
Suspended Solids (parts per million)	-	1,760	-	2,670 pounds
Ether Solubles (fat) (parts per million)	-	456	-	690 pounds
pH range	-	6.0 - 7.0		

WASTE TREATMENT

The manure flow from the killing floor, etc. is conveyed over a pair of vibrating screens which operate alternately as required. The filtrate from the screens flows to a sump in the old screen house. All fatty waste from the processing areas flows through a pair of grease traps which are also operated in parallel. The effluent from these traps is then discharged to the old screen house sump. From there the combined effluent goes to sewer.

DETAILS OF SURVEY

The nature and variability of the industrial wastes was determined in a survey conducted May 17, 1961. Flow measurements and sampling were carried out in the old screen house where it was possible to install a "V" notch weir.

In a preliminary inspection of the plant, it was established that the screen house sump was the best sample point. A new beef killing floor had been recently put into operation and, in general, the cleanliness of the whole plant was good.

Production was fairly high and it was thought that the samples taken were representative of normal operations. A tabulation of the information obtained follows:

Period covered - 0700 hours to 1900 hours, May 17, 1961

Water Consumption -

Metered from Kitchener Water Commission	- 119,000 gallons
Estimated from well	- 115,000 gallons
	234,000 gallons

Production - confidential

Production Schedule -

beef kill	- 0700 hours to 1500 hours
hog kill	- 1240 hours to 1535 hours
clean-up	- 1700 hours to 1900 hours
Scalding tank dropped (3,000 gallons)	- 1540 hours
Casing room tanks dropped (500 gallons each)	- 1630 hours

Details of Survey (continued)

ESTIMATED WASTE FLOW AND CALCULATED LOADS

Time Period	Hours	Flow gallons	BOD pounds	Susp. Solids pounds	Ether Solubles pounds
0700 - 0900	2	24,000	756	381	52
0900 - 1200	3	46,000	1,380	1,205	418
1200 - 1600	4	85,000	1,743	1,623	365
1600 - 1900	3	38,000	304	152	34
T O T A L S	12	191,000	4,183	3,361	869
Hourly averages		15,900	348	280	73

DERIVED FIGURES

(a) Variability - During the production period the maximum percentage variations from the hourly averages are as follows:

Flow gallons	Pounds of BOD	Pounds of Susp. Solids	Pounds of Fat
80%	49%	62%	85%

Maximum possible day-to-day variation dependent upon production of all characteristics expressed as a percentage of the average

51 percent

REMARKS AND CONCLUSIONS

While the wastes appear to be quite strong, the quantity of each constituent in pounds per day is not unreasonable considering the size and condition of the plant. In fact, water is used economically resulting in an apparently concentrated waste.

Remarks and Conclusions (continued)

A very considerable daily variation, depending upon the production volume, is possible. Peak sewage loads occur between noon and 4 pm. When the hog scalding tanks is dropped, or the grease traps are cleaned, the BOD approaches 4,000 parts per million.

Although the water usage is low, the strength of the waste is such that it far exceeds that of normal sewage. It is therefore suggested that the company give serious thought to some form of pretreatment coupled with a review of housekeeping methods. The alternative to this is treatment in the municipal sewage plant for which a charge may be levied when secondary treatment is instituted.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener / Report to: R. Phoenix c.c.

Source: Burns (Eastern) Ltd.

Date Sampled: May 17, 1961 by: Zaremba & Metzing

Lab. No.	5-Day B.O.D.	Solids			pH	Ether solubles	NITROGEN AS N			Chlorides as Cl
		Total	Susp.	Diss.			NO_3	NO_2	Kjeldahl	
T-452	3150.	5918	1588	4330	6.7	220	0.16	0.01	480	696
T-453	1100.	3048	710	2338	7.0	330	0.08	0.005	148	456
T-454	3000.	11300	2620	8680	6.3	910	0.12	0.04	240	4156
T-455	3750.	7400	1120	6280	6.3	27	0.18	0.003	600	1416
T-456	2100.	11966	1956	10010	6.1	440	0.12	0.07	173	4776
T-457	800.	5300	400	4900	6.5	90	0.06	0.01	99	2006
T-458	1350.	19946	1396	18550	6.2	280	0.12	0.005	231	9686
T-459	3400	6524	2292	4232	6.0	790	0.18	Trace	264	1346

T-452		#1 Composite (30 min) 0700 - 0900 hrs. final effluent
T-453		#2 Grab - lard tank discharge
T-454		#3 Composite (30 min.) 0900 - 1200 hrs. final effluent
T-455		#4 Grab - grease trap discharge (cleanup)
T-456		#5 Composite (30 min.) 1200 - 1600 hrs. final effluent
T-457		#6 Composite (30 min.) 1600 - 1900 hrs. final effluent
T-458		#7 Grab - Hog-kill - maximum flow
T-459		#8 Grab - scalding tank discharge

5M 60—1311

KITCHENER PACKERS LIMITED

This packinghouse is of medium size and combines both slaughtering and packing operations. The plant, located at 210 Spring Valley Road, is fairly old. In order to evaluate the character and volume of wastes discharged to the municipal sewers, an industrial waste survey was conducted there in May of this year.

SUMMARY

Based on a single production unit, this packinghouse produces a much smaller quantity of waste than usual. However, the survey shows the effluent from this plant to be very strong. This can be attributed partly to the unusually low water usage. This particular effluent could be easily treated to reduce the strength since it would be easy to modify the present facilities. Such reduction might be necessary when the city installs secondary treatment facilities. Better housekeeping and blood collection might improve the situation greatly.

PRODUCTION DATA

Raw Materials - Hogs, cattle and calves, pickling salts, spices, cleaners, etc.

Manufacturing Processes - Killing, dressing, cutting, pickling, curing, sausage making, and packing

Products - sausage, cooked, cured, and smoked meats; lard, tankage, grease and tallow

Production Volume - Average - 160 hog units per day, where one hog unit equals one calf, one lamb or two and one half cattle.

PERSONNEL

Mr. Walter F. Nowak, President

Mr. Edward Novak, Plant Superintendent

OPERATING DETAILS

Hours per day - 9 average, shipping 18

Days per week - 5 average

Number of Employees - 70 average

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission
Private well - currently out of operation

Daily consumption (gallons) - 21,350 average
25,400 maximum

Utilization (average day, gallons) -

steam	-	1,750
cooling	-	nil (reused)
process	-	18,500
sanitary	-	1,100
		21,350

WASTES

For an average day the properties of the overall plant effluent will be as follows:

Volume (gallons per day) - 18,500

BOD (parts per million) - 2,959 - 548 pounds

Wastes (continued)

Suspended Solids (parts per million)	- 571	-	105 pounds
Ether Solubles (fat) (parts per million)	- 136	-	25 pounds
Nitrogen (Kjeldahl) (parts per million)	- 385	-	71 pounds
pH range	- 6.3 - 7.0		

WASTE TREATMENT

Paunch manure, etc. is not discharged to the drains, but is disposed of separately. The in-plant treatment consists of a screening chamber containing a bar screen followed by a grease trap. Grease and screenings are removed manually. These works are located in a screen house and the total plant effluent passes through them to the sewer on Spring Valley Road.

DETAILS OF SURVEY

On May 17, 1961, a survey was conducted to evaluate the wastes from this plant. Production was a little under normal but ratio of hogs to cattle was near the average.

The plant had been inspected before hand to determine the best sample points and review the processes, etc.

One whole production day was observed and the following data obtained:

Production Data

Period Covered - 0700 hours to 1900 hours, May 17, 1961

Total Water Consumption (metered) - 20,500 gallons

Production - 147 hog units

Operating Schedule -

start up	- 0700 hours
beef kill	- 0915 - 1215 hours
hog kill	- 1430 - 1630 hours
clean-ups	- 1315 - 1345 hours 1615 - 1630 hours
scalding tank dropped (1,000 gallons)	- 1641 hours
shut-down	- 1700 hours

ESTIMATED WASTE FLOW AND CALCULATED LOADS

Time Period	Hours	Flow gallons	BOD pounds	Susp. Solids pounds	Ether Solubles pounds
0700 - 1200	5	5,400	346.6	40.6	9.9
1200 - 1600	4	5,850	76.1	19.5	4.4
1600 - 1900	3	5,200	65.0	33.8	8.3
T O T A L	12	16,450	486.7	93.9	22.4

DERIVED FIGURES

(a) Variability

Minimum load is produced between the hours of 7 am and 12 noon when the average hourly biochemical oxygen demand is 69 pounds.

Maximum flow occurs between noon and 4 pm when the flow reaches an average of 1,450 gallons per hour.

Production Data (continued)

Production variation is difficult to assess, but, based on water consumption figures, the loads could exceed the averages by about 19 percent.

(b) Production relations

Water consumption per hog unit	- 139 gallons
Waste flow per hog unit	- 112 gallons
Weight of suspended solids per hog unit	- 0.64 pounds
Biochemical oxygen demand per hog unit	- 3.3 pounds

REMARKS AND CONCLUSIONS

While the average strength of the wastes produced in this operation is somewhat higher than usual, it is evident from the unit waste flow of 112 gallons that very economical usage of water is made. In addition, the very low quantities of BOD and suspended solids per hog unit points to an efficient operation and quite good grease and solids separation in the screen house. It is also possible that the practice of removing manure mechanically greatly reduces the overall load.

The analysis results which follow show unusually high BOD and solids concentrations during the beef-kill. This can be attributed to the fact that no blood is collected separately. Because blood is extremely difficult to stabilize in a secondary treatment, it is suggested that steps be taken to reduce the amount of blood discharged.

Remarks and Conclusions (continued)

Because of the low effluent flow, it would be quite feasible for the company to install some form of primary settling treatment to reduce the strength. As this might be required when the city introduces secondary treatment, it would be advisable for the company to consider this step.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix c.c.

Source: Kitchener Packers Ltd.

Date Sampled: May 17, 1961 by: Metzing and Zaremba

Lab. No.	5-Day B.O.D.	Solids			pH	Ether Solubles	NITROGEN AS N				Chlorides as Cl		
		Total	Susp.	Diss.			NO_3	NO_2	Kjeldahl				
T-447	6400.	7152	752	6400	6.7	180	0.08	Trace	930		666		
T-448	10,600	18440	1800	16640	6.3	720	0.25	"	1510		1536		
T-449	1300.	2150	334	1816	6.8	76	0.15	0.02	156		356		
T-450	1250.	2180	650	1530	6.6	160	0.07	0.02	70		506		
T-451	700.	1760	220	1540	7.0	50	0.06	0.01	140		276		

T-447		#1 Composite 0700 - 1200 hrs. (45 min) Final effluent
T-448		#2 Grab - Hog-kill - Max. Flow " "
T-449		#3 Composite 1200 - 1600 hrs. (30 min.) " "
T-450		#4 Composite 1600 - 1900 hrs. (30 min.) " "
T-451		#5 Grab - Hog-kill Max. flow " "

5M 60—1311

J. M. SCHNEIDER LIMITED

J. M. Schneider Limited operates a complete mixed slaughtering and meat packing plant at 321 Courtland Avenue East in Kitchener. While they are an old established firm, their facilities are among the most modern in the Province. As the largest packer in the city, they contribute most of the waste load produced by the meat packing industry.

SUMMARY

When this survey was made in May, 1961, it was possible to sample the total plant effluent, with the exception of the chicken plant effluent, at a manhole in the yard on a large collecting sewer. As a result, the samples taken when correlated with estimated flows gave a good picture of the sewage load and the variations in load discharged to the municipal sewers in a typical day.

The relation between the number of hog units processed and quantities of wastes produced indicates that this is an efficient operation, comparable with the best American plants. The plant is exceptionally clean and losses are kept to a minimum. As a result, there is little that can be recommended to reduce the sewage load other than in-plant pretreatment. It is suggested the company consider such treatment prior to the establishment of secondary municipal treatment.

PRODUCTION DATA

Raw Materials - Hogs, cattle, calves, sheep and lambs, poultry, pickling salts, spices, gelatin, alkaline cleaners

Manufacturing Processes - Slaughtering, dressing, cutting, pickling, curing, sausage making, canning

Production Volume - average - 1,400 hog units per day*

Products - Fresh, frozen, cooked, smoked meats and sausages, canned meat, chicken, shortening

PERSONNEL

Mr. J. D. Small, General Manager;
Mr. N. C. Schneider, Vice President;
Mr. E. H. Bull, Provision and Production Manager;
Mr. B. Steinberg, Chief Engineer

OPERATING SCHEDULE

Hours per day - 24

Days per week - 5

Number of employees - 1,050 average, 1,100 maximum

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 735,000 average
902,000 maximum

Utilization (average day, gallons) -

steam	-	9,000
cooling	-	294,000
process	-	411,000
sanitary	-	21,000
		735,000

* One hog, one sheep or lamb, or one calf equals one hog unit
One beef equals two and one half hog units

WASTES

On an average day the industrial waste effluent from Schneider's plant has the following characteristics:

Volume (gallons per day)	-	650,000	
Biochemical Oxygen Demand (parts per million)	-	1,586	- 10,330 pounds
Suspended Solids (parts per million	-	708	- 4,600 pounds
Ether Solubles (parts per million	-	447	- 2,900 pounds
pH range	-	6.3 - 7.3	

WASTE TREATMENT

All paunch manure, etc., from the killing floor is conducted over two vibrating screens. The liquid passes through the slots in the screen, while the solids are conveyed to a truck. Then the liquid passes to the collecting sewer.

The fat flow from the processing areas is collected in a large grease trap. As the fat separates and accumulates, it is removed and the supernatant liquid passes over a weir to the sewer.

In the chicken killing plant a screen is used to prevent the escape of feathers, etc., to the sewer. No attempt is made to collect the chicken blood as this would prove difficult due to the nature of their set-up.

DETAILS OF SURVEY

On May 23/24, 1961, a survey was conducted to determine the nature

Details of Survey (continued)

and variability of the industrial waste from this plant. In a preliminary examination, the general condition of the plant was noted, the layout of the drainage system was traced, and the various processes observed. As production was at a high level, the results of this survey served as a yardstick by which average waste loadings were estimated and peak loadings predicted.

The details of the investigation are tabulated below and the analytical results will be found in the Industrial Waste Analysis reports.

Period covered - 1900 hours, May 23 to 1900 hours, May 24 (twenty-four hours)

Total Water Consumption from Meters - 842,200 gallons

Production - 1,603 hog units

Operation Schedule -

chicken kill	-	0700 hours to 1600 hours
beef kill	-	0700 hours to 1700 hours
hog kill	-	1230 hours to 1700 hours
clean-up	-	1800 hours to 0200 hours

Details of Survey (continued)

ESTIMATED WASTE FLOW AND CALCULATED LOADS

Time Period	Hours	Flow Gallons	BOD pounds	Susp. Solids pounds	Ether Solubles pounds
1900 - 2200	3	94,000	470	224	224
2200 - 0100	3	78,500	785	236	283
0100 - 0400	3	77,000	1,040	695	270
0400 - 0700	3	40,000	212	111	40
0700 - 1000	3	80,000	2,720	731	192
1000 - 1300	3	82,000	2,186	924	763
1300 - 1600	3	125,000	2,843	1,400	925
1600 - 1900	3	100,000	1,050	534	220
Chicken Kill		70,000	560	442	410
T O T A L	24	746,500	11,866	5,297	3,347
Hourly Averages		31,200	495	220	140

DERIVED FIGURES

(a) Variability

Maximum percentage variation from the hourly averages in a 24 hour period

Flow in gallons	Pounds of BOD	Pounds of Susp.Solids	Pounds of Fat
45%	89%	98%	142%

Maximum percentage variation on a daily basis due to level of production All characteristics 23%

(b) Production Relations

Water consumption per hog unit - 525 gallons

Waste Flow per hog unit - 464 gallons

Weight of suspended solids per hog unit - 3.3 pounds

Biochemical oxygen requirement per hog unit - 7.4 pounds

REMARKS AND CONCLUSIONS

The strength of the industrial wastes from the J. M. Schneider plant is comparable with other similar operations. Flow figures indicate a normal output per production unit. The total load discharged is subject to a 23 percent variation from the average due to fluctuations in production. Hourly variations in strength can approach 100 percent of the average.

During a normal day maximum flow can be expected in the 6 hour period from 1 pm to 7 pm. Minimum flow occurs between 4 and 7 am. The highest concentrations are found in the period from 7 am to 7 pm.

While the strength of the waste is roughly four to five times that of normal sewage, it is outside the scope of this study to suggest ways of handling it. When secondary municipal facilities are planned, a broader investigation will undoubtedly be made to determine whether the company should build in-plant pretreatment works or pay for treatment in the municipal treatment plant. It is suggested that the company give some preliminary consideration to these alternatives.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* c.c.

Source: J.M. Schneider Ltd.

Date Sampled: May 23-24/61 by: Zaremba & Metzing

Lab. No.	5-Day B.O.D.	Solids			Ether Soluble	NITROGEN AS N			Chlorides				
		Total	Susp.	Diss.		Kjeldahl	NO_3	NO_2	*				
T-510	500	1508	238	1266	260	50.	0.	0.	396				
T-511	1000	2072	300	1772	360	116	0.06	0.	254				
T-512	1350	3786	902	2884	350	116	0.12	0.	1270				
T-513	16,500	9474	7910	1564	11,200	320	0.12	0.	181				
T-514	530.	1096	278	818	100	23.	0.06	0.	176				
T-515	3400.	6854	914	5940	240	535	0.16	0.	1780				
T-516	1350	3208	948	2260	200	Trace	0.08	0.	670				
T-517	3350	3722	1322	2400	1890	148	0.12	0.	831				

* Analysis on filtered samples

T-510	1.	Final effluent ½ hr. composite 19.00 - 22.00 p.m.
T-511	2.	Final effluent ½ hr. " 22.00 - 1.00 a.m.
T-512	3.	" " ½ hr. " 1.00 - 4.00 a.m.
T-513	4.	Grab - final effluent - 3.30 a.m.
T-514	5.	Final effluent ½ hr. composite 4.00 - 7.00 a.m.
T-515	6.	Final effluent ½ hr. composite 7.00 - 10.00 a.m.
T-516	7.	Final effluent grab - beef kill 8.00 a.m.
T-517	8.	" " " - 12:15 - Grease trap clean up.

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix c.c.

Source: T. M. Schneider Ltd.

Date Sampled: May 24, 1961 by: R. Phoenix

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	pH	NITROGEN		AS N	* Chlorides as Cl
		Total	Susp.	Diss.			Kjeldahl	NO_3	NO_2	
T-518	2650	4280	1120	3160	925	6.3	96	0.1	0.	1260
T-519	1550	5290	1356	3934	310	6.6	148	0.06	0.	1730
T-520	220	1114	140	974	30	7.3	29.6	0.0	0.	226
T-521	1050	2474	534	1940	220	6.8	82	Tr.	0.	756
T-522	1500	2274	1230	1044	740	6.5	112	0.06	0.	201

* Analysis on filtered samples.

T-518 #1 Final effluent 1/2 hr. Composite 10.00 AM -13.00 PM

T-519 #2 Final effluent Grab Hog-Kill 1:15 PM

T-520 #3 Final effluent Grab cleanup 1800

T-521 #4 Final effluent ½ hr. composite 16.00 - 19.00 PM

T-522 #5 Final effluent ½ hr. composite 13.00 - 16.00 hrs.

5M 60—1311

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* ✓ c.c.

Source: Schneiders

Date Sampled: May 26/61 by: Metzing

Lab. No.	5-Day B.O.D.	Solids			Ether Soluble	NITROGEN AS N							
		Total	Susp.	Diss.		Total ~~Kjeldahl~~							
T-544	800	1496	442	1054	410	135							
T-544	2.	Chicken Kill grab.											

5M 60—1311

PHILLIP HOFFMAN AND SONS LIMITED

This firm produces primarily pork products and does no slaughtering at all. They conduct their business in a comparatively new building located at 352 Maple Street.

SUMMARY

In general, the daily routine in this factory is the same - cutting, pickling and curing are carried on each day. Production is highest during the first half of the week. A sample showed their effluent to be normal for this type of operation, based on their production and the volume of waste. The plant is kept very clean and grease traps are located on the drains to prevent the escape of excess fat.

PRODUCTION DATA

Raw Materials - Dressed hogs and cattle, pickling salts, spices, gelatin, cleaning alkalies

Manufacturing Processes - Cutting, pickling, smoking, sausage making, rendering lard

Production Volume - 4,500,000 pounds per year

Products - Fresh, frozen, cured, smoked meats, sausages, delicatessen products, lard

PERSONNEL

Mr. Phillip Hoffman, Sr., President

Mr. Phillip Hoffman, Jr., Plant Superintendent

OPERATING SCHEDULE

Hours per day - 9 average

Days per week - 5 average

Number of employees - 37 average

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 20,000 average
33,900 maximum

Utilization (gallons per day) -

process	-	18,000
steam	-	1,000
sanitary	-	1,000
		20,000

WASTES

The waste discharged to the sewers by this plant has the following characteristics:

Flow (gallons per day average)	-	18,000
BOD (parts per million)	-	2,100
Suspended Solids (parts per million)	-	1,006
Ether Solubles (fat) (parts per million)	-	1,496

REMARKS

While the concentration of suspended solids, fat, and BOD appear to be rather high, the sewage load based on roughly 200 hog units * per day is in line with similar operations. The high values can be attributed to the economical use of water.

The plant is clean and appears to be efficiently operated.

* One lamb, calf or hog equals one hog unit
One beef equals two and one half hog units

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* c.c.

Source: Phillip Hoffman & Sons

Date Sampled: May 23/61 by: Matzing & Zaremba

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	pH	NITROGEN AS N						
		Total	Susp.	Diss.			Kjeldahl	NO_3	NO_2				
T-483	2100	5672	1006	4666	1490	6.3	189	0.12	Traces				
T-483	2.	Grab sample - external sump, during normal operations.											

5M 60—1311

CANADA SKATE MANUFACTURING COMPANY

Canada Skate Manufacturing Company, located at 248 Victoria Street North, manufactures ice skates, baseball shoes and components for roller skates. Because of the various types of finishes applied to the metal components used in the products, a survey was made to evaluate the industrial wastes from this plant.

SUMMARY

The wastes result from the processing of the various parts being electroplated, and are contained in the running rinse waters and in the various spent solutions that are periodically dumped. The concentrations of some of the materials, which might adversely affect the sewage treatment processes, exceed the limits acceptable. It is suggested the company take the necessary action to reduce these to the desired level.

PRODUCTION DATA

Raw Materials - Steel - to manufacture skate blades, cleats and roller skate components
Standard plating solutions, nickel, chrome, zinc, and standard alkali cleaners, acid pickles and strip solutions

Manufacturing Operations - Forming - machining, punching, pressing, etc.
Plating - applying the desired electrodeposited coating

Production Data (continued)

Manufacturing Operations - Assembly - attaching these finished metal components to manufactured leather boots and shoes

Products - Ice skates, baseball shoes and roller skates

PERSONNEL

Mr. R. C. Bauer, President

Mr. G. G. Bauer, Plant Manager

OPERATING SCHEDULE

Hours per day	- 9 average
Days per week	- 5 average
Number of employees	- 80, spring, summer and fall 120 in winter

WATER SUPPLY AND DISTRIBUTION

The Kitchener Water Commission has no record of the water consumption figures for the Canada Skate Company. However, Bauer Shoe Company uses an average of 85,200 gallons daily from the Water Commission and a portion of this daily supply is consumed by Canada Skate Company, a subsidiary of Bauer Shoe Company.

The majority of the water used in the electroplating operations is obtained from Canada Skate's privately owned well. An estimate of the total water used is broken down as follows:

Sanitary	- 2,500
Cooling and steam	- 2,000

Water Supply and Distribution (continued)

Plating -

Company well	- 9,900
Kitchener Water Commission (from Bauer)	- 5,000
T O T A L	- 19,400 gallons per day

WASTES

A composite sample of waste water was taken from the common sump in the plating area during the survey. The analysis of this sample indicated the presence of chromium, cyanide, zinc, copper and nickel. (see the Industrial Waste Analysis report which follows)

An estimate of the quantities of metals, etc., in pounds per day discharged to the Kitchener sanitary sewers, based on an average rinse water flow from the plating room at 14,900 gallons per day, is given below:

Constituent	Pounds per Day
Cyanide as HCN	1.30
Hexavalent chromium	.85
Total chromium	1.00
Zinc	.35
Copper	.45
Nickel	1.30

REMARKS

Modifications should be made by Canada Skate Company to reduce

Remarks (continued)

the amounts of cyanide, nickel and chromium that are presently being allowed to enter the sanitary sewer.

No spent toxic or otherwise harmful solutions should be discharged to sewer but to an acceptable land disposal area.

The concentrations of the wastes recorded on the Industrial Waste analysis report represent those concentrations that are present in the effluent from the plating area only. When this effluent is combined with the total effluent from Bauer Shoe and Canada Skate, these concentrations will become considerably smaller.

The following are the recommended limits for the various plating waste constituents which can be discharged to sanitary sewers:

Chromium (hexavalent)	- 3 parts per million maximum
Cyanide	- 2 parts per million maximum
Copper	- 1 part per million maximum
Iron	- 17 parts per million maximum
Zinc	- 15 parts per million maximum

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: H.E. Roberts * c.c.

Source: Canada Skate Co.

Date Sampled: June 7/61 by: H.E. Roberts

Lab. No.	5-Day B.O.D.	Solids			pH	Cyanide as HCN	Zinc as Zn	Chrome Hexa-valent	Copper as Cu	Nickel as Ni	Cadmium as Cd	Chrome as Cr
		Total	Susp.	Diss.								
T-630					8.0	9.0	2.7	6.0	3.1	9.0	0.	7.0

T-630 Canada Skate Co. - composite sample from plating room common sump.

3M-60-170

GLOBE STAMPING COMPANY LIMITED

Globe Stamping Company Limited, located at 232 Madison Street, manufactures door and luggage hardware and miscellaneous small steel stampings, all of which are given protective or decorative electroplated finishes. Because of the nature of these electroplated deposits, a survey was made to evaluate the liquid wastes being discharged from this plant to the Kitchener sanitary sewer system.

SUMMARY

The waste consituents resulting from the processing of the various parts being electroplated are contained in the running rinse waters and in the various spent solutions that are periodically dumped. The level is low in the rinses and no pretreatment is needed. However, spent plating solutions and cleaner should be dealt with as suggested in this report.

PRODUCTION DATA

Raw Materials - Steel - plate and strip
Standard plating solutions, nickel, chrome, brass, zinc and standard alkali cleaners, acid pickles, and strip solution

Manufacturing Operations - Steel is formed, machined, bent, etc., into hardware components; the metal surfaces are cleaned and then given a protective or decorative electro-deposited coating.

Products - Luggage and door hardware

PERSONNEL

Mr. Bruce K. Schriber, Manager

Mr. A. F. Retzler, Foreman

OPERATING SCHEDULE

Hours per day - 9 average

Days per week - 5 average

Number of employees - minimum 17
maximum 20

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption - 100,000 gallons

WASTES

A composite sample of the waste waters in the electro-finishing area was obtained at the common sump in the plating room. The analysis of this sample indicated the presence of cyanide and chromium. (see Industrial Waste Analysis report which follows, Lab. Number T-631)

Based on an estimated flow of 50,000 gallons per day from the plating room, the metals, etc., in pounds per day are as below:

Cyanide as HCN - 0.70

Hexavalent chromium - 0.43

Total chromium - 0.53

REMARKS

As the quantities of the contaminants listed above are extremely low, and generally within the allowable limits, little or no problem can be expected from that source as far as their running rinses are concerned. However, no spent plating solutions should be discharged to the sewer, but should be disposed of in a suitable dump area. Alkaline or acidic cleaning solutions should be neutralized before being released to the sewer.

The following are the recommended limits for the various plating waste constituents which can be discharged to sanitary sewers:

Chromium (hexavalent)	-	⅗ parts per million maximum
Cyanide	-	2 parts per million maximum
Copper	-	1 part per million maximum
Iron	-	17 parts per million maximum
Zinc	-	15 parts per million maximum

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: H.E. Roberts * c.c.

Source: Globe Metal Stampings Ltd.,

Date Sampled: June 7/61 by: H.E. Roberts

Lab. No.	5-Day B.O.D.	Solids			pH	Cyanide as HCN	Zinc as Zn	Chrome Hexa-valent	Copper as Cu	Nickel as Ni	Cadmium as Cd	Chrome as Cr
		Total	Susp.	Diss.								
T-631					--	1.4	0.0	0.85	--	--	0.0	1.06

T-631

Globe Metal Stampings Ltd. - composite sample taken at common plating room sump.

3M-60-170

KUNTZ ELECTRO PLATERS LIMITED

Kuntz Electro Platers is a job electro-plating shop located at 405 Nyberg Street. Because of the toxic and corrosive nature of the materials used to produce protective coatings on the work being processed, a survey was made to evaluate the liquid wastes from this plant.

SUMMARY

It is apparent that excessive amounts of material likely to be detrimental to secondary sewage treatment are escaping in the waste waters from this plant.

These concentrations can probably be reduced by better housekeeping, use of spray rinses, drip boards, etc. Spent solutions, etc. should never be discharged to sewer as these would have a shock effect on the treatment processes.

Suggested limits for the various metals, etc. are set out in this report and the company should endeavour to reduce concentrations in the effluent to these levels.

PRODUCTION DATA

Raw Materials - Standard plating solutions, nickel, chrome, cadmium, zinc, brass and copper
Standard alkali cleaners, acid pickles and dips and various bright dips

Manufacturing Operations - Cleaning - Preparing the surface of the parts to be processed
Plating - Applying the desired electro-deposited coating

Production Data (continued)

Products - Protective and decorative coatings on metallic and non-metallic parts

PERSONNEL

Mr. R. Kuntz, Sales and Purchasing
Mr. O. W. Kuntz, President

OPERATING SCHEDULE

Hours per day	-	10 average, 24 maximum
Days per week	-	5 average
Number of employees	-	40 to 45

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 85,500 average
95,500 maximum

Utilization (gallons per day)

Sanitary	-	1,200
Cooling and heating	-	8,550
Plating processes	-	75,750
T o t a l		85,500

WASTES

A composite sample of waste water was taken at the common sanitary outfall to the Kitchener sanitary sewer on Nyberg Street. Therefore, the sample represented the total plant discharge, i.e. 85,500 gallons, which

Wastes (continued)

includes sanitary waste, uncontaminated cooling water, as well as that discharge originating in the plating areas. The analysis of this sample indicated the presence of chromium, cyanide, zinc, copper, and nickel. (See the Industrial Waste Analysis report which follows)

The estimated discharge of these various toxic materials to the sanitary sewer, expressed in pounds per day, based on an average daily flow of 85,000 gallons, is tabulated below:

Constituent	Pounds per day
Cyanide as HCN	9.0
Hexavalent chromium	13.7
Total chromium	18.8
Zinc	2.0
Nickel	10.4
Copper	3.4

REMARKS

The waste analysis clearly indicates that excessive amounts of cyanide and chromium are being allowed to enter the sanitary sewer. Steps should be taken by Kuntz Electro Plating to control the discharge of both cyanide and chromium to the sanitary sewer. All spent toxic or otherwise harmful solutions should be treated fully before being discharged to the sewer or else disposed of in a suitable land disposal area.

Remarks (continued)

The following are the recommended limits for the various plating waste constituents which can be discharged to sanitary sewers:

Chromium (hexavalent)	-	3 parts per million maximum
Cyanide	-	2 parts per million maximum
Copper	-	1 part per million maximum
Iron	-	17 parts per million maximum
Zinc	-	15 parts per million maximum

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: H. E. Roberts * c.c.

Source: Kuntz Electro Platers

Date Sampled: June 7/61 by H.E. Roberts

Lab. No.	5-Day B.O.D.	Solids			pH	Cyanide as HCN	Zinc as Zn	Chrome Hexa-valent	Copper as Cu	Nickel as Ni	Cadmium as Cd	Chrome Total Cr
		Total	Susp.	Diss.								
T-632					6.6	--	--	--	--	--	--	--
T-633					---	10.6	2.3	16.0	4.0	12.2	0	22.0

T-632 Kuntz Electro Platers - composite sample taken at street manhole at entry to sanitary sewer.

T-633 " " " - " " " " " " " " " " "

* 60-170

MARSLAND ENGINEERING LIMITED

Marsland Engineering Limited located at 154 Victoria Street South, is a manufacturing concern which produces components used in the production of radio, television and electronic equipment. Due to the nature of the finishes applied to certain of these manufactured items, a survey was made to evaluate the liquid wastes. The results of this survey will not affect the overall Kitchener picture as this firm is moving to Waterloo.

SUMMARY

The industrial wastes which leave this plant originate in the metal finishing on the electroplating processes. The other manufacturing operations such as stamping, machining, and packing produce no liquid wastes.

The concentrations of metals, etc., found in the effluent were in excess of those generally acceptable for discharge to sanitary sewers. It is recommended that plans be made to remedy this situation in the new location.

PRODUCTION DATA

Raw Materials - Steel, aluminum and brass

Manufacturing Operations - Machining, stamping, shearing, electroplating, assembly and testing

Production Volume - Number of parts produced varies with size and type of items required

Products - Finished components used in electronic and radio equipment

PERSONNEL

Mr. W. Marsland, Personnel Manager
Mr. S. Marsland, President
Mr. A. Killinger, Foreman of Plating
Mr. P. Lipke, Building Maintenance

OPERATING SCHEDULE

Hours per day - 9

Days per week - 5

Number of employees - 320 average, 425 maximum

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 26,000

Utilization (gallons per day) -

sanitary	8,750
cooling and stream	1,000
process (plating)	16,250
T o t a l	26,000

WASTES

A composite sample of waste water was taken from the common floor sump in the plating area. The analysis of this sample indicated the presence of cyanide as HCN at 12.6 parts per million; chromium as hexavalent chromium 5.0 parts per million; total chromium 33.0 parts per million; and zinc 16.2 parts per million.

The quantities of these materials, in pounds, discharged daily

Wastes (continued)

to the Kitchener sanitary sewer, based on an average rinse water flow from the plating room of 16,250 gallons per day, is shown below:

Constituent	Pounds per day
Cyanide as HCN	2.0
Hexavalent chrome	4.0
Total chrome (including hexavalent chrome)	5.4
Zinc	2.6

REMARKS

Marsland Engineering are present building a new plant in Waterloo and intend to move all of their operations and equipment to this new location in October of this year. Steps should be taken in laying out their new plating room to incorporate means of reducing or eliminating these rather heavy loads of toxic wastes. It is further suggested that under no circumstances should spent plating solutions or strong alkaline cleaners, etc., be discharged to sewer. These should be transported to an acceptable land disposal site. Because the sewage volume in Waterloo is much smaller, the effect of such quantities of metals, etc., might prove to be extremely harmful to sewage plant operations.

In their new location, the company should therefore endeavour to control the levels of contaminants below the following limits.

Chromium (hexavalent)	-	3 parts per million maximum
Cyanide	-	2 parts per million maximum
Copper	-	1 part per million maximum
Iron	-	17 parts per million maximum
Zinc	-	15 parts per million maximum
pH range	-	5.5 - 9.5

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: H. E. Roberts * c.c.

Source: See Below

Date Sampled: June 7/61 by: H. E. Roberts

Lab. No.	5-Day B.O.D.	Solids			pH	Cyanide as HCN	Zinc as ZN	Chrome Hexaurlent Cr	Copper as Cu	Nickel as Ni	Cadmium as Cd	Chrome total as Cr	
		Total	Susp.	Diss.									
T-629					8.4	12.6	16.2	25.	--	--	0.	33	
T-629	2.	Kitchener - Marsland Engineering - composite sample taken at Plating sump.											

4M-59-4518

JOHN A. LANG AND SONS LIMITED

This firm operates the largest tannery in Kitchener. Although chrome tanning only is carried out here, the plant still contributes a sizeable waste load. A survey, with the necessary sampling, etc., was conducted to establish the magnitude of the load and to determine the charactistics of the effluent.

SUMMARY

For the most part, this tannery is quite clean and unobjectionable due perhaps to the fact that chrome tanning only is carried on. However, the only form of waste treatment is screening and the resultant effluent is very strong. As no settling is provided for lime sludge from the dehairing operation, an exceptionally high load of suspended solids is discharged.

The company should plan some form of pretreatment to reduce the waste load before extension of the municipal treatment plant takes place.

PRODUCTION DATA

Raw Materials - cattle and horse hides, chromic oxide, sulphuric acid, sodium bicarbonate, sodium hyposulphite, sodium tetrasulphide, lime, dyes, sulphonated castor oil and cod oil.

Manufacturing Processes - Washing hides - removal of salt, dirt, etc.

Production Data (continued)

Soaking - to soften hides
Fleshing - removal of residual flesh and fat
Dehairing - removal of hair
Bating - enzymatic process to open hides to receive tanning
Pickling - to neutralize alkali
Tanning - production of actual leather
Dyeing - to obtain desired colours
Fat liquoring - softening leather
Finishing - development of required surfaces

Production Volume - average - 1,000 sides per day

Products - Glove and garment leathers

PERSONNEL

Mr. K. Montgomery, President

Mr. Herb. Doberthein, Superintendent

OPERATING SCHEDULE

Hours per day	- 9 average
Days per week	- 5 average, 5½ maximum
Number of employees	- 160

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Treatment - 100,000 gallons per day, softened for boiler, etc., in zeolite softener

Daily consumption (gallons) - 425,000 average
450,000 maximum

Utilization (average day, gallons)

steam and process	- 422,800
sanitary	- 3,200
T o t a l	426,000

WASTES

For an average day the industrial wastes from this plant have the following characteristics:

Volume (gallons per day)	-	420,000	
Biochemical Oxygen Demand (parts per million)	-	773	- 3,250 pounds
Suspended Solids (parts per million)	-	2,580	- 10,850 pounds
Ether solubles (parts per million)	-	280	- 1,180 pounds
Nitrogen (Kjeldahl) (parts per million)	-	131	- 550 pounds
Chromium (parts per million)	-	24	- 10.1 pounds
pH range	-	6.9 to 11.8	

Small amounts of sulphides are present at times and, during the dehairing operations, the effluent has caustic alkalinity.

WASTE TREATMENT

The beam house wastes are conducted to a screen house where long hair, flesh, etc. are removed by means of a rotary slotted screen. Dye house effluent flows directly to the collecting sewer.

No further treatment is carried out on the combined stream before it enters the municipal sewer.

DETAILS OF SURVEY

May 26, 1961, was a typical production day and, on that date, a survey was made to establish the nature and volume of the wastes discharged.

Details of Survey (continued)

It was possible to obtain samples through a manhole on the large collecting sewer near the street. Composite samples were made of the effluent. No measurement of flow variation could be made, however, visual observation indicated a fairly uniform flow.

Data obtained from this investigation are compiled below. Analytical results will be found on the Industrial Waste Analysis reports which follow.

Period Covered - 0700 hours to 1700 hours (May 26, 1961)

Metered Water Consumption - 436,600 gallons

Soft Water Produced - 101,600 gallons

Production - approximately 1,000 hides

PROPERTIES OF THE EFFLUENT

Estimated flow (gallons)	- 433,400		
Biochemical Oxygen Demand (parts per million)	- 733	-	3,350 pounds
Suspended Solids (parts per million)	- 2,580	-	11,180 pounds
Ether Solubles (fatty matter) (parts per million)	- 280	-	1,210 pounds
Nitrogen (Kjeldahl) (parts per million)	- 131	-	570 pounds
Chromium (parts per million)	- 24	-	10.4 pounds
Colour	- varied depending on dyeing operations		
Odour	- occasional trace of hydrogen sulphide odour		
Production Variation	- based on water consumption the above sewage loadings might increase by 5.9%		

REMARKS

The biochemical oxygen demand of the overall effluent from this tannery is roughly two to three times that of domestic sewage. The waste is rich in Nitrogen, having a BOD to Kjeldahl Nitrogen ratio of approximately 6:1.

The quantity of suspended solids, which consists largely of lime sludge, is very high due to the lack of any form of settling equipment. As the flow is high, this causes no problems near the tannery but the solids might be deposited when the velocity decreases further downstream.

As the fatty matter is most likely in an emulsified form, no difficulty is foreseen in its disposal.

All the chromium found was in the reduced state and therefore non-toxic.

There are times when the pH or alkalinity of the effluent approaches 12. Such conditions are considered detrimental to sewers and to the sewage treatment process.

A peak load occurs in the morning between 7 am and 10 am. During this three hour interval about half the total waste load is discharged. It seems to coincide with the dumping of the dehairing vats.

In view of the foregoing, it would be advisable for the company to consider some form of settling and neutralization prior to discharge to the municipal sewer. This pretreatment would reduce the overall sewage load from the plant and perhaps result in savings should the city decide to charge for additional treatment.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* c.c.

Source: John A. Lang Ltd.

Date Sampled: May 25/61 by: Zaremba, Phoenix & Metzing

Lab. No.	5-Day B.O.D.	Solids			pH	Ether Solubles	Chlorides as Cl	Sulphides as H_2S	Nitrogen Kjeldahl as N	Chromium as Cr		Alkalinity as $CaCO_3$
		Total	Susp.	Diss.						Hexa	Total	
T-539	570	4870	1230	3640	8.6	180	1266	0	125	0.	16.	242
T-540	550	5094	1258	3836	6.9	230	1516	0	86	0.	43.	234

T-539	1.	Beam House - Dye room - final effluent ½ hr. composite 10.00 - 12.30 a.m.
T-540	2.	Beam House - Dye room - final effluent ½ hr. composite 13.00 - 17.00 p.m.

3M-60-170

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix* c.c.

Source: J.A. Lang & Sons Ltd.

Date Sampled: May 25/61 by: Zaremba, Phoenix & Metzing

Lab. No.	5-Day B.O.D.	Solids			pH	Ether Solubles	Chloride as Cl	Sulphides as H_2S	Nitrogen Kjeldahl as N	Total Chromium as Cr		Alkalinity as $CaCO_3$	
		Total	Susp.	Diss.									
T-541	1340.	9440	4440	5000	11.8	570	1316	1.0	181	12.		1260	
T-542	2.4	588	22	566		Trace	31	0	5.5	0.01		268	

T-541	1.	Beam-house & dye room effluent ½ hr. composite 7.00 - 9.30 a.m.
T-542	2.	Regeneration - softener - grab 7.15 a.m.

3M-60-170

ONTARIO TANNING COMPANY

This company has a small tannery which is devoted to tanning of sheepskins only. A brief investigation was made to determinewhether their sewage was of consequence.

SUMMARY

The load contributed by this plant proved to be small. There is no toxic waste released from their chrome tanning operations. However, an addition to the building is under construction. When this is complete, production will be increased with a resulting increase in waste load.

PRODUCTION DATA

Raw Materials - Sheep skins, soda ash, chromium sulphate, neatsfoot oil

Manufacturing Processes - Washing - fresh hides cleaned and softened
Tanning - simple chrome tanning
Dyeing - tinting wool to required shades
Finishing - shearing, oiling, etc.

Production Volume - 3,000 skins per year

Products - Rugs, wash gloves, garment linings

PERSONNEL

Mr. D. Feldstein, Partner
Mr. E. Perinik, Partner

OPERATING SCHEDULE

Hours per day - 9 average

Days per week - 5½ average

Number of employees - 2

WATER SUPPLY

Source - Kitchener Water Commission

Consumption (gallons per day) - 4,000 average

WASTES

Grab samples from the central sump showed the effluent to be mildly alkaline and having a BOD ranging from 320 - 1,100 parts per million. During rinsing, it is quite likely the BOD is very much lower. No chromium is discharged. Complete analytical results follow on the Industrial Waste Analysis reports.

REMARKS

The present load contributed by this plant is very small and contains no toxic or detrimental substances. The enlarged facilities may require reassessment at a later date.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre
= 1 lb./100,000 Imp. Gals.

Municipality: Kitchener

Report to: R. Phoenix * ✓ c.c.

Source: Ontario Tanning

Date Sampled: May 26/61 by: Metzing

Lab. No.	5-Day B.O.D.	Solids			pH	Alkalinity as $CaCO_3$	Total Chromium as Cr						
		Total	Susp.	Diss.									
T-543	1100	2842	996	1846	9.3	818	0.						
T-543	1.	Grab sample - sump.											

5M 60—1311

DOMINION RUBBER COMPANY LIMITED

Textile Division

This plant, located at 84 Margaret Avenue, produces textile components for footwear, clothing, etc. The operations are such that it was deemed necessary to conduct a survey of the industrial wastes discharged to the municipal sewers.

SUMMARY

While the volume of waste water discharged is substantial, the character of the effluent is that of a medium strength sewage. Except for the controlled discharge of alkaline wastes, no pretreatment is needed.

PRODUCTION DATA

Raw Materials - Wool, cotton, rayon fibres, and synthetic yarns, detergents, soaps, soda ash, caustic soda.

Process - Felting, weaving and knitting, scouring, dyeing

Products - Wool, cotton, rayon felts for footwear and clothing, knitted fabrics and insulating paddings.

PERSONNEL

Mr. L. F. Hiller, Factory Manager
Mr. A. Weichers, Mechanical Superintendent
Mr. R. S. Wilson, Chief Engineer

OPERATING SCHEDULE

Hours per day - 24

Days per week - $5\frac{1}{2}$

Number of employees - 170 average, 185 maximum

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 104,000

Utilization (gallons) -

process and steam - 100,000

sanitary - 4,000

104,000

WASTES

The waste waters from this plant are not as strong as normal domestic sewage. However, the volume is high and 175 pounds of oxygen are required to biologically stabilize the organic constituents. Suspended solids are insignificant, but the pH approaches the upper limit of 9.5. (See the Industrial Waste Analysis Report which follows.)

WASTE TREATMENT

Vibrating screens are used to prevent the escape of fibres to the drains.

REMARKS AND CONCLUSIONS

No pretreatment is needed here providing care is exercised

Remarks and Conclusions (continued)

in the release of highly alkaline solutions. This can be done by the slow discharge of these wastes so that no shock loading results.

DOMINION RUBBER COMPANY LIMITED

Tire Division

While the Tire Division of the Dominion Rubber Company is one of the largest water users in Kitchener, the water is used almost exclusively for steam and for cooling. A brief survey was made of this plant to determine the volume and nature of the wastes.

SUMMARY

Very little industrial waste is produced in this plant. Most of the manufacturing operations are of a mechanical nature. Treatment in the form of settling ponds is provided for the carbonate sludge produced in the hot lime water softening process. It is estimated that approximately one million gallons per day of very weak waste is discharged to the municipal sewers.

PRODUCTION DATA

Raw Materials - Rubber, rubber chemicals, textiles

Manufacturing Processes - Milling, compounding, vulcanizing

Products - Tires and tubes

PERSONNEL

Mr. A. W. Hopton, General Manager
Mr. H. Hudspeth, Sales Manager
Mr. Harold Stephens, Assistant Plant Engineer
Mr. G. Lambton, Plant Engineer

OPERATING DATA

Hours per day - 24
Days per year - 200
Days per week - 5
Number of employees - 1,100

WATER SUPPLY

Sources - Kitchener Water Commission
Private Well

Consumption - Kitchener Water Commission - 430,000 gallons per day average
Private well - 650,000 gallons per day average

Utilization (gallons) -

cooling and process - 975,000
steam - 83,000
sanitary - 22,000

Treatment - Boiler water - hot lime process
Domestic hot water - zeolite

WASTES

The only wastes of consequence are produced in the softening of water for use in the boilers. The calcium and magnesium carbonate sludge is pumped to a settling pond. The solids are removed and the clear effluent flows to the sewer.

REMARKS

Where possible, it is recommended that clean cooling water be discharged to storm drainage. This would relieve some of the hydraulic loading at the sewage treatment plant.

DOMINION RUBBER COMPANY LIMITED

General Products Division

Dominion Rubber operates two adjoining plants on Breithaupt Street. The Merchants Rubber plant produces footwear and rubber clothing, while the Foam plant produces foam rubber products of various forms. While the footwear plant can be considered "dry" as regards industrial wastes, the foam plant does discharge a quantity of organic waste to the sewer. A survey was conducted to determine the nature and strength of these wastes.

SUMMARY

Although these plants discharge a sizable volume of liquid wastes, the strength is negligible. No pretreatment other than the maintenance of the present screening facilities is recommended.

PRODUCTION DATA

Raw Materials - Rubber, latex, textiles, rubber chemicals

Manufacturing Processes - Foaming, curing, vulcanizing, fabricating, coating

Products - Footwear, rubber clothing, foam products, vinyl coated fabrics.

PERSONNEL

Mr. A. G. Walton, Superintendent of Foam Plant
Mr. D. V. Schlatzhquer, Assistant Engineer
Mr. George Bridge, Stationery Engineer

OPERATING SCHEDULE

Hours per day - 8½

Days per week - 5

Number of Employees - 50 - Foam plant
730 - Merchants Rubber plant

WATER SUPPLY

Source - Kitchener Water Commission
Private well

Consumption (gallons) - 195,600

Utilization (gallons per day) -

cooling	-	50,000
steam	-	30,000
process	-	100,000
sanitary	-	15,600

Treatment - Foam Plant -Permutit"Q" and Deacidite units -
1,000 gallons per day

Steam Plant -Permutitautomatic industrial unit
Permutit "Q" - 94,000 gallons per day

WASTES

The wastes discharged from this plant are weak. Based on the accompanying industrial waste analysis the industrial sewage load was calculated as follows:

Volume	-	150,000 gallons per day
Biochemical Oxygen Demand	-	46 pounds
Suspended solids	-	231 pounds

REMARKS

Compared with domestic sewage, the wastes from these two plants are quite weak. The hydraulic load is fairly high but the BOD and suspended solids loads are not large.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix * ✓ c.c.

Source: Dominion Rubber

Date Sampled: June 13-41/61 by: R. Phoenix

Lab. No.	5-Day B.O.D.	Solids			pH								
		Total	Susp.	Diss.									
T-679	175.	1744	82	1662	9.4								
T-680	31	1134	154	980	7.5								

T-679	1.	Textile plant sump, Composite, 24 hr. June 13/14, 1961
T-680	2.	Foam plant sump, Composite, 8 hr. June 14/61

5M 60—1311

KAUFMAN RUBBER COMPANY LIMITED

The Kaufman Rubber Company produces rubber clothing and footwear at a plant on King Street. As they use a fairly large volume of water, a brief survey was made to evaluate their liquid wastes.

SUMMARY

As most of the operations carried on in the manufacture of rubber goods are of a physical nature, very little industrial waste is produced. Clean cooling water and sanitary sewage make up the effluent from this plant.

PRODUCTION DATA

Raw Materials - Rubber, rubber chemicals, fillers, etc.

Manufacturing Processes - Milling and compounding, vulcanizing

Products - Footwear, rubber clothing

PERSONNEL

Mr. I. E. Weber, Factory Manager

Mr. Raimund Raasch, Cnief Engineer

OPERATING SCHEDULE

Hours per day - 9

Days per week - 5

Number of employees - 675

WATER SUPPLY

Source - Kitchener Water Commission

Consumption - 130,000 - 150,000 gallons per day

Treatment - Zeolite softening - 11,000 gallons per day

WASTES

The industrial waste effluent consists primarily of clean cooling water, boiler blow-down and softener backwash. In all, these form a very weak waste.

REMARKS

The total industrial waste flow amounts to about 140,000 gallons per day. It will contain only minor quantities of contaminants and adds only to the hydraulic load on the municipal treatment plant. Clean cooling water should be segregated as completely as possible for separate disposal to the storm sewer system.

B. F. GOODRICH CANADA LIMITED

As one of the major rubber manufacturing firms in Kitchener, B. F. Goodrich uses nearly one million gallons of water per day. Although large quantities of this water are used for steam and cooling, a brief survey was made to determine the volume and nature of the effluent discharged to the sanitary sewers.

SUMMARY

Very little treatable material is carried in the effluent from this plant. About half the water used is discharged to the storm sewer as clean cooling water. Some 70,000 gallons per day are lost as steam. Approximately 1,000 pounds of lime sludge is discharged from their boiler water treatment.

PRODUCTION DATA

Raw Materials - Rubber, rubber chemicals, polyvinylchloride, fillers, etc.

Manufacturing Processes - Milling, compounding, vulcanizing, moulding

Products - Tires, industrial rubber products, PVC granules

PERSONNEL

Mr. M. G. Morgan, Vice President of Manufacturing

Mr. W. M. Bobbie, Plant Engineer

OPERATING DATA

Hours per day - 24

Days per week - 5

Number of employees - 800

WATER SUPPLY

Source - Kitchener Water Commission

Consumption (gallons per day) - 900,000 average

Utilization (gallons per day) -

cooling - 450,000

steam - 70,000

process - 364,000

sanitary - 16,000

WASTES

All liquid wastes are conveyed to a central sump. The sump is divided and the clean cooling water is discharged to the storm sewer while the remainder goes to the sanitary sewer. The most significant waste is the sludge from the hot lime water treatment process. It amounts to about 1,000 pounds per day of suspended solids. Approximately 364,000 gallons of industrial wastes per day are discharged to the sanitary sewer.

REMARKS

There is little industrial waste other than the lime sludge produced here. This sludge is suspended in a large volume of water and should not present any problem.

RUMPEL FELT COMPANY LIMITED

This firm produces felts only, and carries on business at 60 Victoria Street North in Kitchener. A survey was made to determine the nature and magnitude of the sewage load contributed to the municipal system.

SUMMARY

This plant has an effluent equivalent in strength to a strong domestic sewage. As screens are provided, no fibre escapes to the sewer. No further pretreatment of the wastes is needed before discharge to the sewers.

PRODUCTION DATA

Raw Materials - Wool, cotton waste, rayon, shoddies, dyes, detergents, soda ash

Manufacturing Processes - Blending, mixing, and carding of fibres, felting, fulling, washing, dyeing, pressing and drying

Products - Wool felts

PERSONNEL

Mr. J. W. Rumpel, President and Manager

Mr. E. D. Kinzie, Secretary-Treasurer

OPERATING DETAILS

Hours per day - 9

Days per week - 5

Number of employees - 60

WATER SUPPLY AND DISTRIBUTION

Source - Kitchener Water Commission

Daily Consumption (gallons) - 24,200 average, 27,000 maximum

Utilization (gallons per day) -

steam and process	17,000
soft process water	6,000
sanitary	1,200
	24,200

WASTES

The wastes from this plant are roughly the same strength as domestic sewage when considered on the basis of biochemical oxygen demand. The industrial waste analysis report which follows gives the characteristics. Based on an estimated net flow of 20,000 gallons per day, the sewage load amounts to 62 pounds of BOD and 23 pounds of suspended solids.

WASTE TREATMENT

A vibrating screen removes all filtrate from the plant effluent which is pumped from a collecting sump. This screen seems to be quite

Waste Treatment (continued)

effective as very little fibre is found in the effluent discharged to the sewer.

REMARKS AND CONCLUSIONS

As the industrial waste water discharged from this plant differs very little from domestic sewage in the quantity of oxygen required to stabilize it, no pretreatment is necessary. The volume is low and therefore, a comparatively small load of both solids and BOD is contributed to the municipal system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Kitchener Report to: R. Phoenix * ✓ c.c.

Source: Rumpel Felt Co.

Date Sampled: May 24, 1961 by: R. Phoenix

Lab. No.	5-Day B.O.D.	Solids			pH								
		Total	Susp.	Diss.									
T-529	310.	4090	118	3972	6.4								
T-529		No. 1 Composite sample 0700 hours - 1700 hours, plant effluent at shuter screen											

5M 60-4311

Properties of Raw Sewage and Effluent from the Doon Treatment Plant

Data obtained from the Plant Operations Division of the Ontario Water Resources Commission, were analyzed statistically. These included BOD and suspended solids and covered the period from August 30, 1960 to June 21, 1961.

SUMMARY OF DATA

Property	Average, $\bar{X}$	Standard Deviation, σ	Range, R	No. Observations
BOD, influent parts per million	295	87	385	36
BOD, effluent parts per million	200	58	210	36
Suspended Solids, influent parts per million	268	57	288	36
Suspended Solids, effluent parts per million	154	52	260	36
Flow, MGD	8.52 (estimated)			

The above BOD and solids figures were derived from the results of analyses on 24 hour composite samples. These samples were taken on Wednesday of each week and should be representative of weekday conditions.

If we assume normal distribution, then 99.7 percent of the values for BOD and solids lie within the three sigma limits. That is, 99.7 percent of the results lie within the range $\bar{X} \pm 3\sigma$. The data are

Summary of Data (continued)

retabulated below on this basis.

Property	$\bar{X}$	3σ	Dispersion ($\bar{X}-3\sigma$ to $\bar{X}+3\sigma$)
BOD, influent	295	261	34 - 556
BOD, effluent	200	174	26 - 374
Suspended Solids, Influent	268	171	97 - 439
Suspended Solids, Effluent	154	156	0 - 310

Examination of the frequency histograms reveals a positive skewness in the case of the influent BOD and solids data. That is, there seems to be a tendency toward higher frequencies at the weak end of the scale. This can be attributed to the influence of some outside factor acting on the system. Quite likely this factor is dilution resulting from infiltration and storm water.

It is evident that considerable variation is possible in the character of the influent sewage. This is probably due to the variation in strength of the industrial wastes. To achieve efficient secondary treatment, these fluctuations should be reduced to a minimum.

The total quantity of water pumped both by the Water Commission and from private sources, averages 7.84 MGD. Because of the variance in flow figures, the average daily domestic sewage flow is calculated as follows:

Population - 73,000

Pounds of BOD produced per unit population - 0.17

Pounds of BOD produced by 73,000 - 12,400

Summary of Data (continued)

Assuming the strength of normal domestic sewage is about 250 parts per million and denoting the volume of domestic sewage as X million gallons, then the strength of the sewage can be expressed as follows:

$$S = \frac{12,400}{X \times 10}$$

$$\text{therefore} \quad 250 = \frac{12,400}{10X}$$

$$X = 4.95 \text{ MGD}$$

The average total weekday flow at the sewage treatment plant is estimated as follows:

Average weekday industrial waste flow	= 3.57 MGD
Average domestic sewage flow	= 4.95 MGD
T O T A L	8.52 MGD

In general, the sewage received at the treatment plant is strong and variable. This can be attributed to the industrial wastes which have an average BOD of about 530 parts per million. The strength of these wastes, in turn, is due to concentrated packinghouse and tannery wastes which contribute the majority of the BOD and solids load.

REMARKS AND RECOMMENDATIONS

The sewage received at the Doon Sewage Treatment Plant is strong. This is due to the high proportion of very strong industrial wastes. Packinghouses and tanneries contribute approximately 94 percent of the biochemical oxygen demand and 97.5 percent of the suspended solids

Remarks and Recommendations (continued)

found in these industrial wastes. On the other hand, the rubber manufacturers discharge about 45.5 percent of the industrial hydraulic load.

On a population basis, the BOD in the industrial waste load is equivalent to the domestic waste produced by between 95,000 and 115,000 persons. The ratio of BOD to organic nitrogen is 9:1; this is in the range of that for domestic sewage. While no ill effects are anticipated from the plating wastes, they cannot be overlooked. On the whole, the industrial wastes should respond to secondary treatment as well as normal domestic sewage.

The following general recommendations are made concerning the industrial waste situation in the city of Kitchener.

1. The city should consider the enactment of an Industrial Wastes By-law. This should be a realistic ordinance drawn up by the city in co-operation with the industries and the Ontario Water Resources Commission. It should be designed to prevent damage to sewers, reduce sewer maintenance, and facilitate treatment.

2. The city, in lieu of a by-law, might accept for treatment all wastes which are non-injurous to sewers or the treatment processes. An additional surcharge, based on strength and volume, might perhaps be levied to pay for the additional treatment. To arrive at a surcharge the city should survey the particular plant yearly. When the charge for the year has been established, the onus for demonstrating a reduction in the sewage load due to process changes, etc. would rest with the industry. A penalty might be provided to prevent the discharge of shock loads or an increase

Remarks and Recommendations (continued)

in loading without notification. Implementation of the foregoing proposals would probably require organization of an Industrial Wastes Section in the Works Department.

3. The packing and tanning industries particularly should evaluate the merits of pretreatment, both from the economic standpoint and from the necessity of complying with a future by-law.

4. Because of the difficulties encountered in treating fluctuating loads, the industries should endeavour to level out production and modify procedures to prevent shock loads.

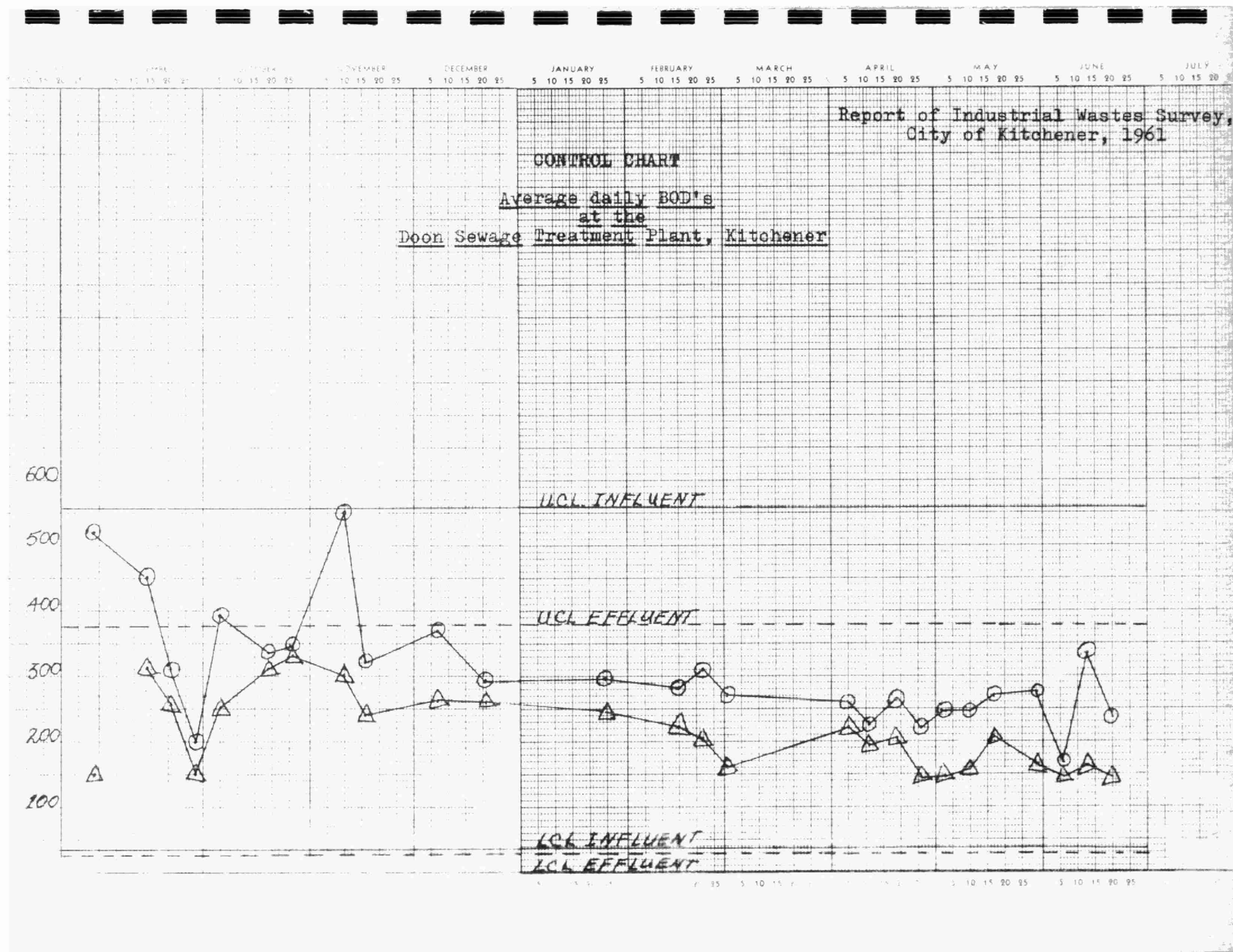
5. The metal finishing industries must endeavour to reduce toxic metals, etc. in their wastes to a minimum. Under no circumstances should spent plating or other strong solutions be discharged to the sewers without adequate pretreatment. Land disposal is generally recommended where the volume is not excessive.

6. Wherever uncontaminated cooling waters can be discharged to storm drains, this should be done to relieve some of the hydraulic load on the treatment facilities.

Report of Industrial Wastes Survey,
City of Kitchener, 1961

CONTROL CHART

Average daily BOD's at the Doon Sewage Treatment Plant, Kitchener

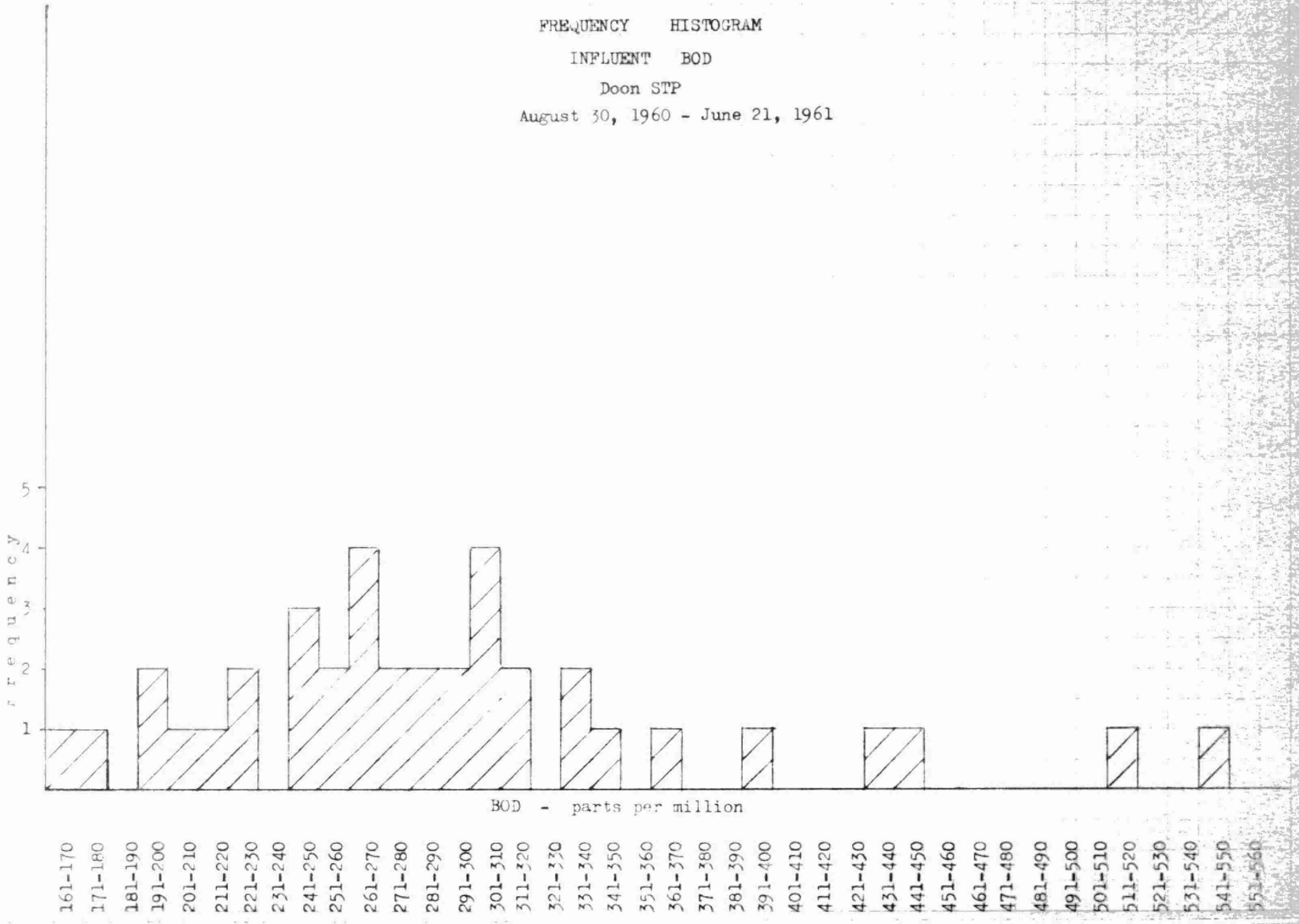


FREQUENCY HISTOGRAM

INFLUENT BOD

Doon STP

August 30, 1960 - June 21, 1961

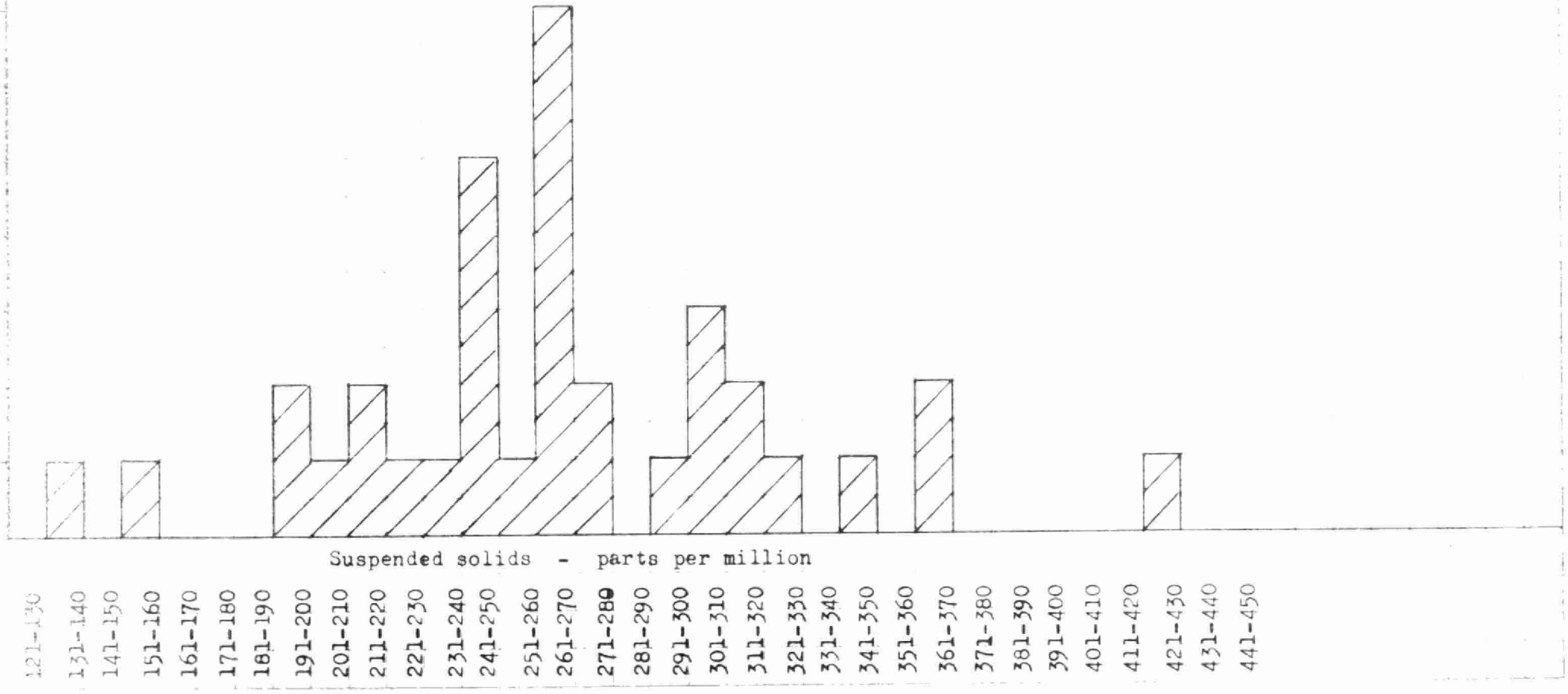


FREQUENCY HISTOGRAM

INFLUENT SUSPENDED SOLIDS

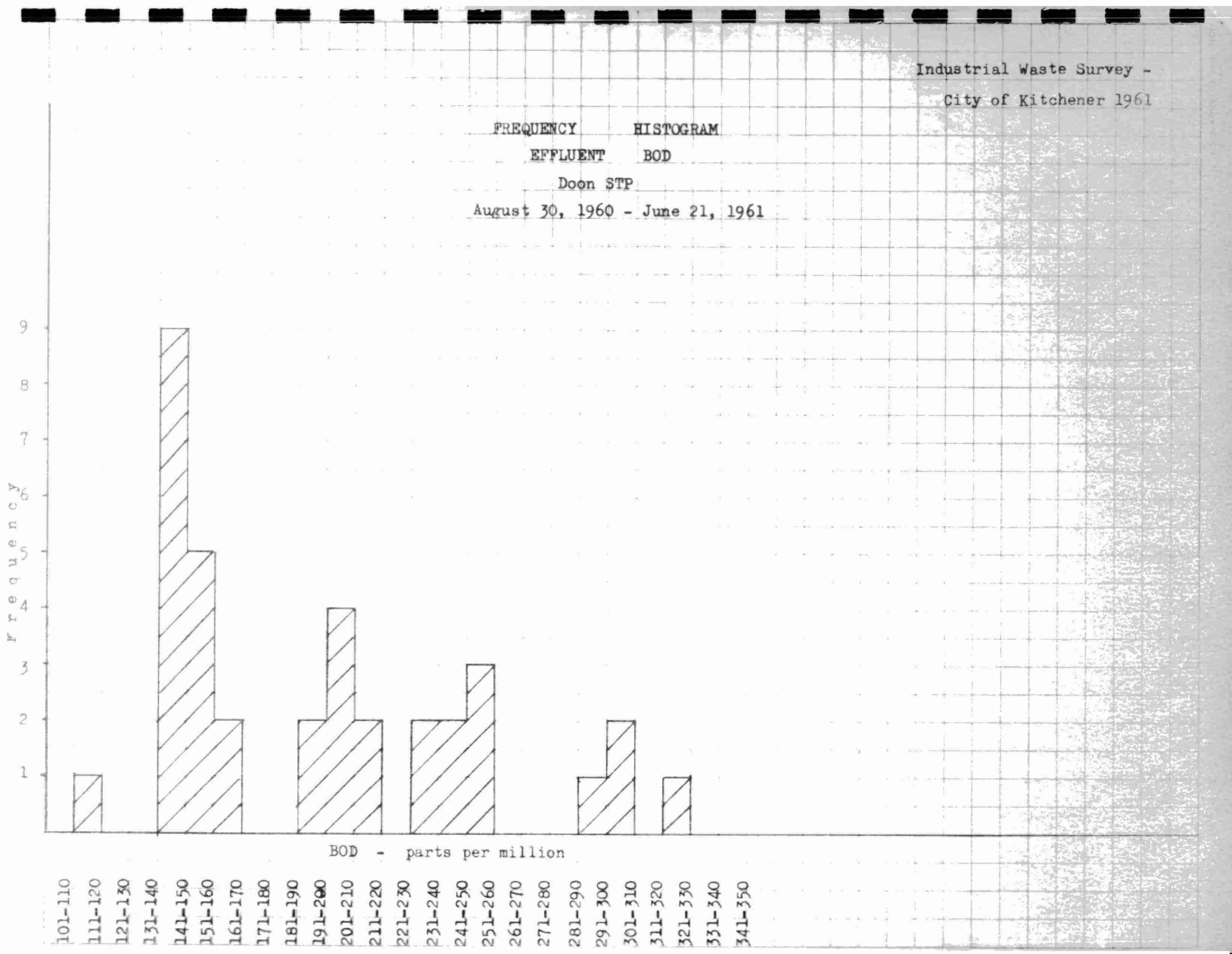
Doon STP

August 30, 1960 - June 21, 1961



Industrial Waste Survey -
City of Kitchener 1961

FREQUENCY HISTOGRAM
EFFLUENT BOD
Doon STP
August 30, 1960 - June 21, 1961



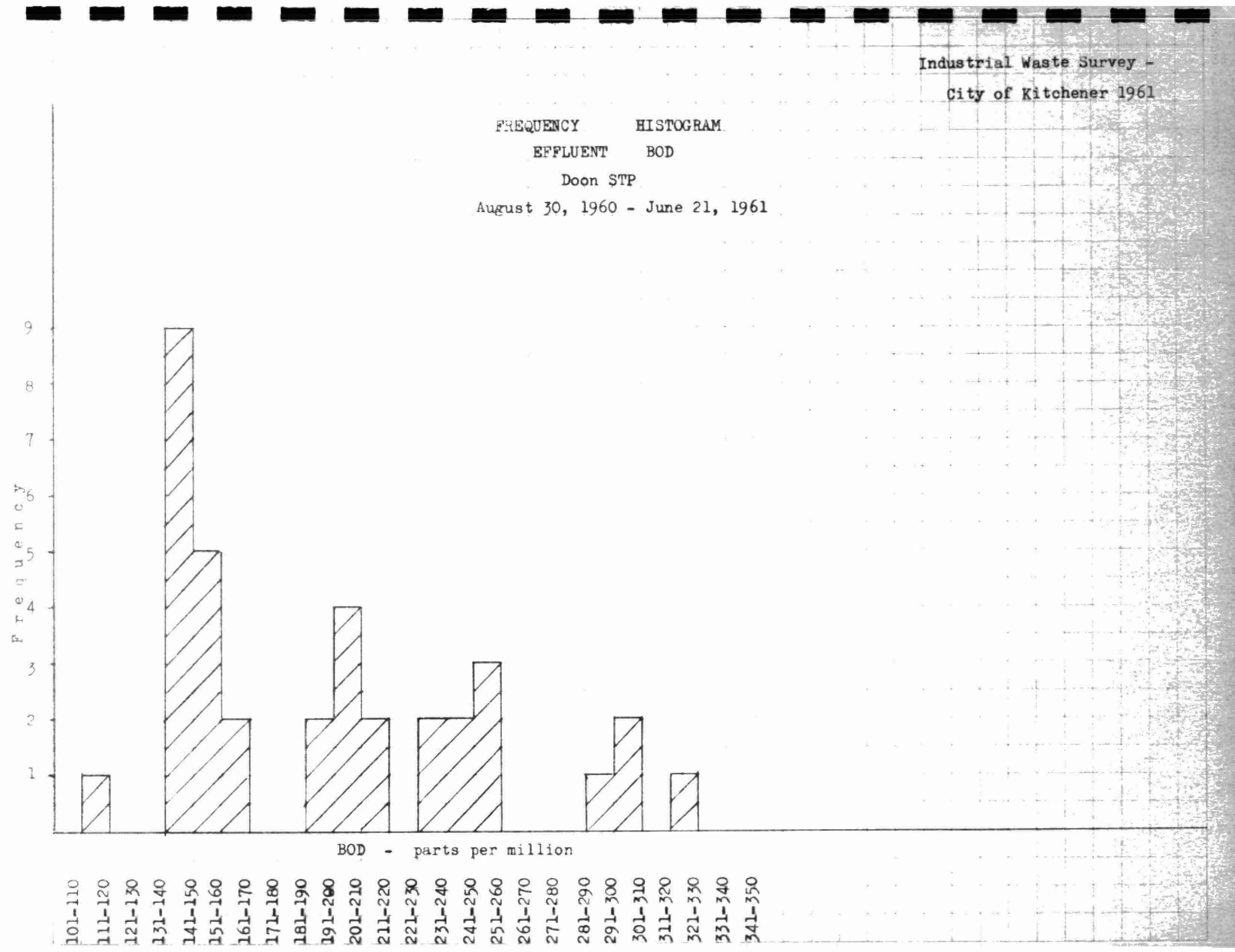
Industrial Waste Survey -
City of Kitchener 1961

FREQUENCY HISTOGRAM

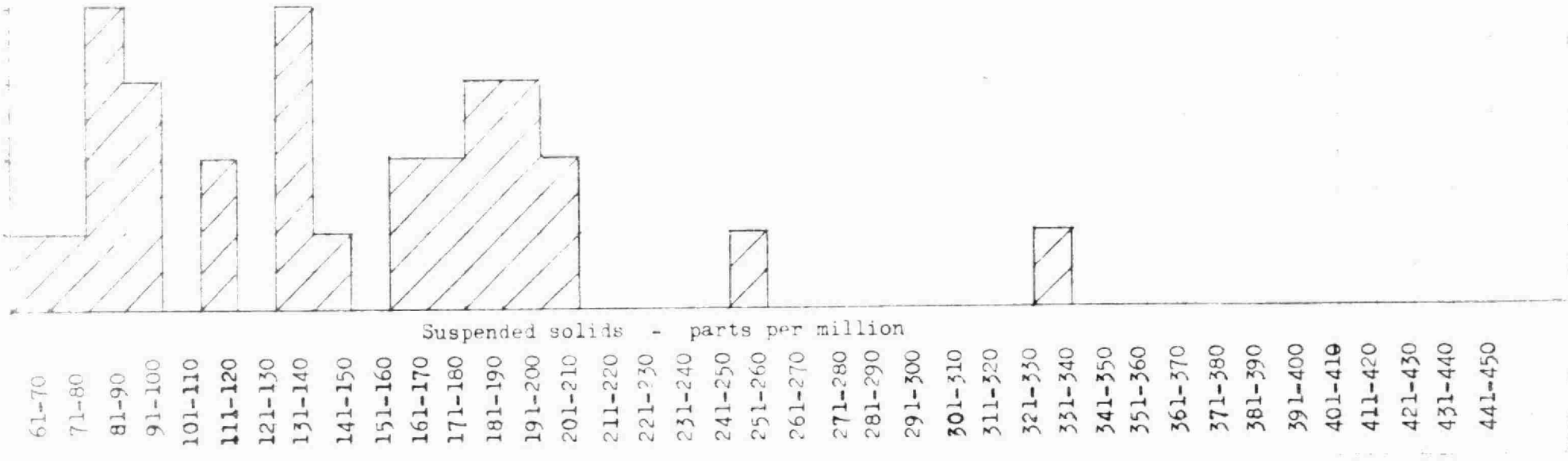
EFFLUENT BOD

Doon STP

August 30, 1960 - June 21, 1961



FREQUENCY HISTOGRAM
EFFLUENT SUSPENDED SOLIDS
Doon STP
August 30, 1960 - June 21, 1961



Prepared by:

R. P. Phoenix

Fred A. Voege
Director of Laboratories

Supervised by:

R. H. Whitsit

Approved by:

A. E. Berry
General Manager

RP:imu

APPENDIX

List of "Dry" Industries

A-K LIPPERT PLASTICS

ADVANCED FARMING SYSTEMS LTD.

ADVANCE METAL INDUSTRIES LTD.

ALJON PRINT-CRAFT LIMITED

ALLORD SUPPLY CO.

AMHERST DOORS LIMITED

ANTHES-BAETZ FURNITURE CO. LTD.

ARC ENGINEERING CO.

BAETZ BROS. FURNITURE CO. LTD.

BAETZ BROS. SPECIALTY CO. LTD.

B & W HEAT TREATING LIMITED

D. BARNETT & CO.

BARRIE GLOVE & KNITTING CO. LTD.

BEAVER FURNITURE CO. LTD.

BEISINGER INDUSTRIES LTD.

BEL-AIR ELECTRONICS CO.

BENNETT LTD. - KITCHENER DIV.

BERNARDO-HILL TILE CO. LTD.

BESTPIPE LIMITED

BIG 4-CHICK HATCHERY

BILATERAL FIRE HOSE CO.

BLOES, M. & SONS

B.M.T. ENTERPRISES

BOEHMER, A. & C. LIMITED

BONNIE STUART SHOES LIMITED

BORDEN CO. LIMITED

BRAUN, A. J. MFG. LTD.

BREITHAUPT LEATHER CO. LTD.

BRITANNIA FOOD PRODUCTS LTD.

BROWN, M. & SONS LIMITED

CAMPBELL, A. L. MACHINERY LTD.

CANADA CABINETS & FURNITURE LTD.

CANADA MACHINERY CORPORATION

CANADIAN BLOWER & FORGE CO. LTD.

CANADA PUMPS LTD.

CAYA, A. B. LIMITED

CENTREVILLE TOOL & DIE CO.

CLUETT, PEABODY & CO. OF CAN. LTD.

COCA-COLA LIMITED

CRESS LABORATORIES

CUSTOM LEATHER PRODUCTS LIMITED

DAHMER SHEET METALS LIMITED

DEPENDABLE MACHINE CO.

DOERR, GEO. C. BODY & TRAILER CO.

DOMINION BAKERY

DOMINION BUTTON MANUFACTURING LTD.

DOMINION ELECTROHOME INDUSTRIES LTD.
(HEAD OFFICE)

(DELICRAFT FURNITURE DIV.)

(GENERAL PRODUCTS DIV.)

(MOTOR & METAL PRODUCTS DIV.)

DOMINION RUBBER COMPANY LTD.
(RUBBER MACHINE SHOP)

DOON TWINES LIMITED

DUFFUS, W. CLARE LIMITED

DUNBAR ALUMINUM FOUNDRY LTD.

DUPAR CANADA LIMITED

DUROFOAM INSULATION LTD.

DYCK LEATHER & FELT SPECIALTIES LTD.

ELLIOTT, W. R. LIMITED

EMILS ORNAMENTAL IRON WORKS

FELDER TRUCK BODY AND TRAILER CO.

FERGUSON & O'REILLY

FISHERS BREAD CO. LIMITED

FOAM RUBBER PRINTING SERVICE

FOKES, H. & CO. LIMITED

FORSYTH, JOHN LIMITED

FWD CORPORATION (CANADA) LTD.

FRAME NECKWEAR CO. LIMITED

FRASER, R. A. & CO. LIMITED

GALLOWAY, JOHN LIMITED

GALT SHOE MANUFACTURING CO. LTD.

GENERAL REFRIGERATOR SALES & SERVICE

GENERAL SPRING PRODUCTS LIMITED

GIES, PHILIP FOUNDRY LIMITED

GOLDSWORTHY, R. D. & CO. LIMITED

GOOD CHEESE COMPANY

GOODRICH, B. F. CANADA LIMITED

GRAY'S BALM LABORATORIES

GREB INDUSTRIES LIMITED

HACKBORN, NORMAN

HALLMAN CARVING CO. LIMITED

HANMAR HOME EQUIPMENT LIMITED

HANMAR MANUFACTURED HOMES LTD.

HATHAWAY KRAEMER LIMITED

HAUSER, BRUCE ASSOCIATES

HAUSER, JOHN IRON WORKS LIMITED

HOLMAN BROS. (CANADA) LIMITED

HUCK GLOVE CO. LIMITED

HUDSON-HOLLIS CO.

HYDRO CITY SHOE MFRD. LIMITED

IGO PLASTICS LIMITED

IMPERIAL PLYWOODS LIMITED

INDIANA STEEL PRODUCTS CO. OF CAN.LTD.

JACKSON-COCRANE COMPANY

JONES PATTERN CO. LIMITED

KAUFMAN, JACOB LIMITED

KEICHER ENGINEERING LTD.

KITCHENER BEVERAGES LIMITED

KITCHENER BRASS & ALUMINUM FOUNDRY

KITCHENER BRICK CO. LIMITED

KITCHENER BUTTON INDUSTRIES LTD.

KITCHENER CONCRETE BLOCK CO.

KITCHENER ELECTRONIC INDUSTRIES LTD.

KITCHENER FORGINGS CO.

KITCHENER LUMBER CO. LIMITED

KITCHENER PRINTING SERVICE

KITCHENER PLASTICS LIMITED

KITCHENER SHOE CO. LIMITED

KITCHENER SILO CO. LIMITED

KITCHENER-WATERLOO CAR COVER

KITCHENER-WATERLOO RECORD

KRAEMER, LEO & CO. LIMITED

KRAUS CARPET MILLS LIMITED

KRUG, H. FURNITURE CO. LIMITED

LANCASTER WEAVING MILLS LIMITED

LATTNER, C. W. & SON

LAU PRODUCTS LIMITED

LAUMAN GOLF SUPPLY

LEDCO LIMITED

MacPHAIL ENGRAVERS LIMITED

MANSFIELD SHIRT CO. LIMITED

MASTER CRAFT WOOD PRODUCTS LTD.

McBRINE, THE L. CO. LIMITED

McKAY CONCRETE BLOCKS

McDOWELL & LINCOLN LIMITED

MERCHANTS PRINTING CO. LIMITED

MEYERS VENETIAN BLINDS

MILLER, H. W.

MITCHELL BUTTON CO. LIMITED

MOLTON MANUFACTURING CO.

MORRISON MEAT PACKERS CO.

MORVAL PRODUCTS CO. LIMITED

NATIONAL TUBULAR PRODUCTS LIMITED

NIERGARTH'S FURNITURE CREATIONS

NORTHERN VENEER & LUMBER CO. LTD.

ODD, H. CENTERLESS GRINDING LTD.

OLHEISER, M. J. & CO.

ONWARD MANUFACTURING CO. LIMITED

PANNILL VENEER CO. LIMITED

PARKWAY MANUFACTURING CO.

PEFFER SOUND SYSTEMS LIMITED

PEQUEGNAT CLOCK CO.

PERKINS GLUE CO. OF CANADA LTD.

PERMA-SHIELD REINFORCED PLASTICS

PFEIFFER, F. W. PAINT CO.

POLYCOATING & FILMS LIMITED

RAYMOND'S NUT SHOPS LIMITED

REHFELD, R. W.

RIGMIL LIMITED

RITCHIE BUTTON CO.

ROBERTS, Wm. ELECTRIC LTD.

ROYAL BUTTON CO.

ROYAL ICE DELIVERY

RUBBER LINE INDUSTRIAL PRODUCTS

RUGGED WEAR LIMITED

RUSSELL KNITTING CO.

SAVAGE SHOES LIMITED

SCHNARR BUTTON CO.

SCHULZ CONCRETE PIPE LIMITED

SEHL ENGINEERING LIMITED

SHIRLITE MANUFACTURING CO. LIMITED

SKIPPY FOOTWEAR LIMITED

SMALLWOOD, S. G. LIMITED

SPAE-NAUR PRODUCTS LIMITED

STAINES, D. R. PRINTING CO. LTD.

STANDARD TELEVISION PRODUCTS LTD.

STOERMER BELL AND BRASS FOUNDRY

STURDY TRUCK BODY MFG. CO.

SUPERIOR BOX CO. LIMITED

SUPERIOR STONE LIMITED

SWISS-KNIT LIMITED

TOLTON, HARRY A.

TOYOTA STORE FIXTURES LTD.

TWIN CITY MACHINE & REPAIR

UNIT STEP

UHRDEN INCORPORATED

VARGA, L.

WALTER, JOHN & SONS LIMITED

WARWICK MARKING PRODUCTS LTD.

WATERLOO SPRING CO. LIMITED

WEISS BAG AND BURLAP CO.

WELKER INDUSTRIES LIMITED

WESTERN SHOE CO. LIMITED

WIEGAND, J. E. & CO. LIMITED

WILSON, J. C. LIMITED

WOELFLE, W. E. SHOE CO. LIMITED

WILLIAMS, TERRY KNITTERS LIMITED

WUNDER FURNITURE MFG. CO. LIMITED

WUNDER MACHINE CO. LIMITED

ZELLNER MEDICAL CO. LIMITED

ZETTEL MANUFACTURING LIMITED

ZOLL STEEL WORKS LIMITED