THE

ONTARIO WATER RESOURCES

COMMISSION

REPORT ON

INDUSTRIAL WASTE LOADING DISCHARGED

TO

HAMILTON HARBOUR

Rdy.

BY

THE BAYFRONT INDUSTRIES

1964

SUMMARY REPORT

OF THE

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by

F. R. Phoenix and J. W. Vogt

Industrial Wastes Branch

ONTARIO WATER RESOURCES COMMISSION

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SUMMARY REPORT ON THE BAYFRONT INDUSTRIES DISCHARGING TO HAMILTON HARBOUR

April, 1964

In April, 1960, the Steel Company of Canada instituted a study of pollution control in cooperation with the OWRC. A full time air and water pollution engineer was appointed and an investigation into the reduction of suspended solids and phenols in the various wastes begun.

The OWRC had from time to time made pollution surveys on the bay and tributary creeks but this Stelco project was the beginning of a long term assessment of the industrial loadings contributed directly to the bay.

The work proceeded steadily and in March of 1962 an extensive industrial wastes survey was made by the Industrial Wastes Branch of the Commission to evaluate Stelco's waste loadings prior to the installation of the new dephenolizer facilities.

On June 21, 1962, an initial meeting of the Water Pollution Committee of the Hamilton and District Branch, Canadian Manufacturers' Association was held. This body was formed to determine "whether it would be appropriate and practicable for the Branch to finance a complete technical study of bay conditions and the effect of industrial waste".

The members' interest was heightened because it was felt attention would turn to industrial waste disposal after the municipal sewage treatment plant was completed.

Activity was stepped up in 1962 by the Industrial Wastes Branch although other committments limited the attention which could be devoted to the Hamilton area. Practical considerations indicated that the survey should be confined to an estimation of the industrial waste loadings being discharged directly to the bay through municipal and private outfalls. The Hamilton

Branch of the CMA cooperated in circulating a bulletin to the members outlining the information which would be needed for the survey.

As the survey progressed and the larger industries were covered, reports were issued to them setting out the findings. Plans for reductions in waste discharges began to emerge. Stelco installed the dephenolizer for treating coke oven wastes and Dominion Foundaries and Steel set up a multi-million dollar pollution abatement programme.

Each industry was requested, on receipt of the survey report, to develop a proposal for the reduction of the offending waste constituents in the effluents. The OWRC asked that these be presented as soon as possible, usually within six months. Because of the magnitude of some of the programmes, a staged approach was accepted in some cases.

By the end of March, 1964, all of the significant industries had been surveyed and compilation of this summary report begun.

SUMMARY

All told some fifteen plants were examined; of these, twelve were surveyed in detail. Among the plants surveyed were two steel mills, one large farm machinery producer, two chemical plants, one fertilizer producer, one soap and detergent manufacturer and various smaller enterprises. These industries used a total of 282 million gallons per day and discharged approximately 275 million gallons of waste water daily.

The importance of these industries in the economic welfare of the Province of Ontario is demonstrated by the fact that they provided employment for over 20 thousand persons.

Table I which follows is a compilation of the waste loadings contributed by the various industries.

It was concluded that the industrial loadings in terms of BOD and suspended solids were greater than that contributed by the municipal sewage facilities. Most of the phenols, nitrogen and phosphate loadings to the bay could be attributed to industrial waste discharges. These constituents are critical in that phenols are taste and odour producers in domestic water supplies and nitrogen and phosphate are nutrients essential for the growth of algae. Fortunately, to date, the optimum ratio and concentration of these two constituents does not appear to have been attained. However, it is not inconceivable that very obnoxious algal blooms could arise in the shallows of the bay at any time.

Perhaps there is a balance or equilibrium between the various waste constituents which, if upset, could result in rapid algae growth. This hypothesis, for which there is considerable evidence, suggests the need for early reduction of the nutrients in the industrial discharges.

Some of the industrial effluents contain high suspended solids loadings. These are mainly inorganic in nature and the effects on the bay are limited largely to reduction of the draft in the various slips to which they are discharged.

The foregoing are the contaminants of greatest concern. There are other materials which may be either objectionable to humans or toxic to aquatic life.

In general, the recommendations to the industries included requests that solids be removed by primary settling, that phenols be reduced by recovery or treatment to the practicable limits and that ammonia and other forms of nitrogen be eliminated from the effluents as completely as possible. Toxic constituents such as cyanides and sulphides should be treated to render them harmless and oil and grease separated.

Where possible, wastes treatable in the municipal sewage treatment plant should be handled in that way, providing the city will accept them. The city should enact an industrial wastes by-law to protect its facilities, both present and future, from detrimental waste discharges.

In conclusion, it has been indicated by this survey that there is a definite need for provision of additional treatment at the industries or their connection to the local sewerage system. Details of the degree of treatment have been included in full reports issued to the individual companies.

The City of Hamilton has already provided and is operating a 60-million gallon primary treatment plant. Consideration is now being given to the future addition of secondary treatment. It is evident that while this step is entirely desirable in reducing pollution in the bay, this alone will not achieve the complete objective. It is essential, therefore, that industry proceed with a definite scheduled programme for waste treatment. It is recognized that this will not be as easy as programming the treatment of sanitary wastes and this factor must be considered in the scheduling. As the City of Hamilton is proceeding toward complete treatment of the sanitary wastes, it is now essential that officials of the Ontario Water Resources Commission, the City and the industries meet to discuss fully the plans for the handling and disposal of industrial wastes and the timing of the various stages.

Some of the industries have already given an indication of their plans to the Commission; others are studying their problems. The continuing co-operation of all three groups will be needed if the quality of the water in the bay is to be improved and maintained.

TABLE I

Net Waste Loadings to Bay (lbs/day)

Company	5-day BOD	Susp. Solids	Iron as Fe	Phenols	Ether Solubles	Free Ammonia as NH_3	Total Kjeldahl Nitrogen as N	Phosphate as PO_4	Cyanides	Sulphates as SO_4	Fluoride as F	Sulphide as H_2S	Sulphite as SO_3
Stelco	31,000	107,000	80,000	1,050	2,770		10,600	10+	3,270				
Dofasco	10,800	165,000	54,000	560	3,660	7,800	6,500		1,000			4,600	
P and G	3,800	-330			460								
CIL	592	644	144			1,100	940	13,000		12,300	1,220		304
Cyanamid	1,600	1,000		2		6,400	7,400						
Firestone	150	550		0.6	13			30					
Stelco, Parkdale	1,020	53	7,170					10		17,300			
International Harvester	480	1,100	500		75			165					
Stanton Pipes	-33	86	15	-4				0.3					
Nat. Steel Car	5	100	4		14			2					
Can. Veg. Oil	18	160											
Domtar	28	23		3									
Total -	54,300	288,000	141,000	1,610	6,990	15,300	25,400	13,200					
City S.T.P.	39,600	43,500		17		5,340	9,900	7,700					

CONDUCT OF THE SURVEYS

The field work connected with the surveys was carried out by the staff of the Industrial Wastes Branch of the Laboratories Division of the OWRC. Preliminary visits were made to the various companies where basic data relevant to the survey were obtained. These included water consumption and utilization figures, production information, sewer plans and plant layouts. Interviews were held with production personnel to gain an understanding of the processes involved and to determine the sources of liquid wastes. On the basis of this information, sample points were selected and sampling programmes established.

Sampling was then carried out at times when production was considered to be normal. Usually, composite samples obtained over extended periods were taken. However, grab samples of unusual wastes were taken for reference. All of the samples were analysed at the Commission Laboratories according to "Standard Methods."

Flow measurements were made, calculated or estimated as accurately as possible. In many cases this was extremely difficult and the derived waste loading figures were indicative of the order of magnitude rather than the absolute value.

As each survey was completed, a report was prepared for the Commission. A copy of each report was sent to the company in question together with a covering letter from the Assistant General Manager of the OWRC asking for comments and requesting a proposal for a pollution abatement programme.

As a matter of interest and a means of indicating the discharge of industrial wastes other than those encountered at the bayfront industries, grab samples were obtained at all storm sewer outfalls along the waterfront.

CANADIAN INDUSTRIES LIMITED

INTRODUCTION

Canadian Industries Limited at Hamilton is a diversified chemical plant producing sulphuric acid, sodium sulphite, ammonium chloride, sodium thiosulphate, zinc ammonium chloride, zinc chloride, hydrogen peroxide, C. P. grade hydrochloric acid, C.P. grade sulphuric acid, vulcacel, superphosphate, and granular fertilizers.

OUTLINE OF SURVEY

Date of survey - January, 1964

The city water consumption was approximately 310,000 gpd and the bay water usage was about 1,450,000 gpd. About 31% of the city water was used in the production of steam, 24% for cooling, 14% in production, 2% for sanitary purposes and the rest for washing floors and equipment. About 60% of the bay water was used as cooling water and 40% in dust collecting and gas scrubbing equipment in the Agricultural Chemical Division.

Sanitary sewage was conveyed to the Burlington Street municipal sewer, while industrial waste water was discharged to the bay. Water from the dust collecting and gas scrubbing units, which were the main sources of contamination, was passed through a settling basin to remove suspended solids.

Total net loadings to the bay were found to be approximately as follows:

5-day BOD	-	590 lbs/day
Suspended Solids	-	640 lbs/day
Free Ammonia as NH_3	-	1,100 lbs/day
Fluoride as F	-	1,200 lbs/day
Phosphate as PO_4	-	13,000 lbs/day
Sulphate as SO_4	-	12,300 lbs/day
Chloride as Cl	-	1,000 lbs/day

The effluents from the Agricultural Chemicals Division were also found to have low pH values (1.6 and 2.6).

RECOMMENDATIONS

It was recommended that the company neutralize the discharges from the Agricultural Chemicals Division and increase the size of the settling basin to obtain more efficient suspended solids removal. Neutralization with lime and proper settling, for instance, would greatly reduce the fluoride and phosphate loadings.

REMARKS

The company was considering a change in operations which would considerably reduce the free ammonia loading and also studying means of reducing the BOD loading.

CANADIAN VEGETABLE OIL PROCESSING LIMITED

INTRODUCTION

The basic process involved here was the extraction of oil and by-products from soya beans.

OUTLINE OF SURVEY

Date surveyed - July, 1963

About 1,300,000 gpd of water was pumped from the bay and used for cooling. Water for sanitary and boiler house uses, was obtained from the city.

Sources of wastes were barometric leg condenser water, daily wash-downs and infrequent equipment clean-up operations with a caustic solution. About 22% of the cooling water was discharged to the bay, while the rest along with the caustic 'washing solution' was discharged to the Victoria Street municipal sewer.

Suspended solids were found to be excessive in the discharge to the bay.

RECOMMENDATIONS

It was recommended that the company review present waste disposal practices to prevent spilled soya meal from being washed to sewer and to neutralize the caustic cleaning solution before discharge to the sewer.

CYANAMID OF CANADA LIMITED

INTRODUCTION

Ammonia and urea were produced in this plant. Ammonia was made by reacting hydrogen, obtained from coke oven gases from Dofasco, with nitrogen, while urea was made by reacting ammonia with carbon dioxide, which is separated from blast furnace gases from Dofasco.

OUTLINE OF SURVEY

Date of Survey - January, 1964.

Approximately 20,000,000 gpd of bay water was used for cooling and city water consumption totalled about 33,000 gpd, of which 2,400 gpd was used for sanitary purposes and the rest for scrubbing solution make-up and as wash water.

Spent scrubbing solutions, used for purifying the reactant gases, was one of the main sources of wastes. Ammonia and monoethanolamine were lost to sewer elsewhere in the process. Urea was also lost through pump seal leaks, intermittent equipment washouts and washing of floors.

All industrial wastes were discharged to the bay with no treatment. Sanitary wastes were treated in septic tanks and then discharged to the bay.

Net loadings to the bay were found to be approximately as follows:

Contaminant	-	Estimated net loadings (lbs/day)
Free ammonia as N	-	5,300
Total Kjeldahl nitrogen as N	-	7,400
Hexavalent chromium as Cr	-	36
Phenol	-	2

RECOMMENDATIONS

It was recommended that studies be undertaken to reduce the total Kjeldahl nitrogen loading in the waste discharge since it represented a considerable oxygen demand on the receiving waters. Secondly, it was urged that means be sought to lower the total nitrogen content, as a means of preventing possible nuisance algal growth.

DOMINION FOUNDRIES AND STEEL LIMITED

INTRODUCTION

Dofasco operated an integrated steel mill producing many forms of plate, sheet and cast steel.

Production - 1,500,000 tons/year

OUTLINE OF SURVEY

Date of survey - March, 1963.

Water usage:

Untreated bay water	-	55.0 mgd
Treated bay water	-	10.8 mgd
City water	-	9.7 mgd
Total	-	75.5 mgd

Main Sources of Liquid Wastes and Treatment Facilities

BLAST FURNACE DIVISION

Units	Use of Water	Effluent Treatment	Point of Discharge
Blast Furnaces	Cooling hearth, bosch, stack, etc.	None	Bay
	Cooling and scrubbing gases	Dorr Thickner	Bay
Pig casting Machine	Cooling pigs	Dorr Thickner	Bay
Coke Ovens	Cooling of gases, flushing liquor make-up	Tars removed by decantation and filtration	Kenilworth Slip
	Secondary indirect cooling of gases	None	Kenilworth Slip
	Coke quenching	Sump to settle breeze	Kenilworth Slip
	Final cooling of gases	Naphthalene skimmer	Kenilworth Slip

Units	Use of Water	Effluent Treatment	Point of Discharge
Light Oil Recovery Plant	Steam to distill out aromatics from wash oil	None (decanter effluent)	Kenilworth Slip
Oxygen Steel Plant	Cooling of gases and scrubbing	None	Kenilworth Slip
Oxygen plant	Dilution of Caustic CO_2 absorbing solution	None	Kenilworth slip
	HOT MILL DIVISION		
Rolling Mills	Cooling rolls, bearings and plate	Scale pits	Ottawa Street Storm Sewer
	COLD MILL DIVISION		
Cold Reduction Mills	Preparation of rolling oil emulsions	Scale pits, oil reclaim, oil skimmers	Ottawa Street Storm Sewer, Beach Road Sewer
Annealing Furnaces	Cooling		Ottawa Street Storm Sewer
Pickle Lines	Preparation of Pickles; rinses		Ottawa Street Storm Sewer
Electrolytic Cleaning Lines	Preparation of cleaners; rinses	None	Ottawa Street Storm Sewer
	TIN MILL DIVISION		
Electrolytic Tin Lines	Preparation of electrolyte; rinses	Rinses not treated	Ottawa Street Storm Sewer
Automatic Hot Dip Tin Lines	Alkaline cleaning solution	None	Ottawa Street Storm Sewer
	GALVANIZING DIVISION		
Continuous Galvanizing Lines	Pickle rinses		Ottawa Street Storm Sewer

Total Net Loadings to Bay

Contaminant		Estimated Net Loading
5-day BOD	-	10,800 lbs/day
Suspended solids	-	165,000 lbs/day
Iron as Fe in solid form	-	54,000 lbs/day
Ether solubles	-	3,600 lbs/day
Phenols	-	560 lbs/day
Ammonia as NH_3	-	7,800 lbs/day
Cyanide as CN	-	1,000 lbs/day
Sulphides as H_2S	-	4,600 lbs/day

RECOMMENDATIONS

It was recommended that an overall engineering study be made of the waste problem and that a stepwise programme of pollution abatement be drawn up and executed.

REMARKS

Dofasco has set up and begun to carry out a 5-year pollution abatement plan which, it is hoped, will reduce by 90% the pollution load being discharged to the bay by that company. A longer range and self perpetuating programme is also being set up with the intention to eliminate all sources of pollution and to prevent new sources from arising during expansion and modernization of the plant.

DOMTAR CHEMICALS LIMITED

INTRODUCTION

At this plant, coal tar was distilled to separate its various components such as cresol, phenol, pyridine, naphthaline, phthalic anhydride, coumarone, creosote, crude naphtha, and high and low carbon pitch.

DETAILS OF SURVEY

Date of last survey - March, 1964

The approximate consumption of city water was 100,000 gpd of which about 43% was used as boiler feed water make-up and the rest as cooling water.

Contaminated process water containing oil or tar was treated by passing it through a gravity type oil separator, a fuel oil filter for removal of emulsified oil and finally through an activated sludge unit for phenol removal before discharging it to the sewer. Contaminated cooling water from a barometric leg condenser was discharged directly to sewer without treatment, and sanitary wastes were treated in a septic tank which overflowed to the sewer. All waste streams, along with storm runoff, were conveyed to the bay by way of the Strathearne Avenue storm sewer.

Total Net Loadings to Bay

Contaminant		Estimated Net Loading
5-day BOD	-	13.2 lbs/day
Suspended solids	-	26.3 lbs/day
Phenols	-	2.64 " "

RECOMMENDATIONS

It was recommended that the company investigate ways of lowering the level of contamination in the cooling water discharge.

FIRESTONE TIRE AND RUBBER COMPANY OF CANADA LIMITED

INTRODUCTION

The products manufactured by this company included a complete range of tires and tubes, floor mats for cars, splash guards, radiator hose, and radomes.

OUTLINE OF SURVEY

Date of survey - February, 1964

The city water consumption was approximately 660,000 gpd of which about 85% was used as cooling water, 11% as boiler feed water make-up, and 0.15% as soap solution make-up.

The main sources of wastes were believed to be soap solution losses, the discharge from the boilerhouse (i.e. sludge from lime softening unit and boiler blowdown), and the water from the employee showers. All of the industrial wastes plus the employee shower wastes were discharged to a ditch which drained to the bay. Other sanitary wastes were conveyed to the city sanitary sewer.

Total Net Loadings to Bay

Contaminant		Estimated Net Loading
5-day BOD	-	150 lbs/day
Suspended solids	-	550 lbs/day
Ether solubles	-	13 lbs/day
Phosphate	-	30 lbs/day

RECOMMENDATIONS

It was recommended that the strong wastes be segregated from the relatively uncontaminated cooling water and that they be directed to the city sanitary sewers.

INTERNATIONAL HARVESTER COMPANY OF CANADA, LIMITED

INTRODUCTION

Crawler tractors, farm implements (both mobile and pull types), and construction earth moving equipment were manufactured from various shapes and forms of steel. Baler and binder twines also were manufactured from sisal hemp fibres.

OUTLINE OF SURVEY

Survey completed - March, 1964

The approximate city water consumption was 540,000 gpd while the bay water usage was approximately 1,070,000 gpd.

One of the main sources of waste consisted of the loss of cleaning solutions. During the week, carry over was continually washed to sewer, while on weekends the spent solutions were dumped. Spent pickle liquor was neutralized with lime before being discharged.

Most of the industrial wastes were discharged to the bay with a small portion discharging to the city sanitary sewers. It was estimated that about 1/5 of the sanitary wastes went to the city sanitary sewers while the remainder was discharged to the bay.

Total Net Waste Loadings to the Bay on a Weekday
(not including batch discharges on weekends)

Contaminant		Estimated Net Loadings
5-day BOD	-	480 lbs/day
Suspended solids	-	1,100 lbs/day
Phosphate as PO_4	-	165 lbs/day
Ether solubles	-	75 lbs/day
Iron as Fe	-	500 lbs/day

About 25 batch discharges of varying character occurred when tanks were cleaned out on weekends. The intervals varied from once per week to twice per year. About 10 were discharged to the bay, and 4 to the city sanitary sewers, while the place of deposition of the 11 others was not certain.

RECOMMENDATIONS

It was recommended that sanitary and strong industrial wastes be segregated from the relatively uncontaminated cooling water and that these be discharged to the city sanitary sewers.

NATIONAL STEEL CAR CORPORATION LIMITED

INTRODUCTION

Railway car rolling stock and associated equipment was produced from rolled and structural steel or from aluminum sheets and extruded sections.

OUTLINE OF SURVEY

Date of survey - January, 1964

About 550,000 gpd of bay water was filtered and chlorinated, of which about 150,000 gpd was sold to Stanton Pipes (Canada) Limited and the remainder used as cooling water within the plant. City water consumption totalled about 280,000 gpd of which about 70% was used for cooling and testing for leaks, 25% for steam production, and 5% for sanitary purposes.

All industrial wastes were discharged to the Kenilworth Avenue slip, the main sources being the sludge from the hot lime treatment of boiler feed water and the zeolite ion exchanger wastes. Also sulphuric acid pickling was done infrequently and the spent acid and rinse water were dumped to the slip. Sanitary wastes were discharged to the city sanitary sewers.

Total Net Waste Loadings to the Bay

Contaminant		Estimated Net Loading
Suspended solids	-	100 lbs/day
Ether solubles	-	14 lbs/day

RECOMMENDATIONS

It was recommended that, if any pickling be done in the future, the spent solution receive satisfactory treatment before discharge to the slip. Collection and dumping of the lime sludge in the solid form was urged and it was further recommended that the two sumps, receiving wastes from the main building, be cleaned out regularly to maintain their efficiency in removing suspended solids and oil.

PROCTER AND GAMBLE COMPANY OF CANADA, LIMITED

INTRODUCTION

The Procter and Gamble Company of Canada, Limited at Hamilton produced shortening and refined fats for margarine from vegetable and marine oils, soaps and glycerine from tallows, alkyl benzene sulphonate detergents from alkyl benzene, sulfated fatty alcohol detergents from fatty alcohols, tooth pastes and shampoos. A total of approximately 25 completely different household products and about 30 different commercial brands in all were made.

OUTLINE OF SURVEY

Date of survey - November, 1963.

Bay water usage was approximately 5,600,000 gal/day all of which was used as cooling water in barometric leg condensers.

Municipal water usage was about 940,000 gallons per day, most of which was used as cooling water in special applications. Smaller amounts were used for washing equipment and floors, and for sanitary purposes.

The main sources of wastes were as follows:

1. Cooling water from barometric leg condensers.
2. Condensate from glycerine evaporators.
3. Spent bleaching earth.
4. Neutralized hydrochloric acid from fatty alcohol detergent production.
5. Equipment and floor washings.

The barometric legs discharged to hotwells where a partial separation of fatty organic matter was obtained, but in all cases the hotwells appeared to be too small to obtain a completely effective separation.

All industrial wastes from the plant are conveyed to municipal storm and sanitary sewers.

Net Waste Loadings

Waste Component	To Bay via Municipal Storm Sewers	To Municipal Sanitary Sewers
5-day BOD	3,800 lbs/day	8,000 lbs/day
Suspended solids	330 lbs/day	2,700 lbs/day
Ether solubles	460 lbs/day	2,190 lbs/day

RECOMMENDATIONS

It was recommended that the waste waters be segregated with the contaminated water being directed to the municipal sanitary sewers and the uncontaminated cooling water and storm runoff being directed to the municipal storm sewers.

STANTON PIPES (CANADA) LIMITED

INTRODUCTION

Cast grey iron pipe was made by melting scrap grey iron and centrifugally casting it in steel molds. A portion of this pipe production was cement lined. Steel pipe for pilings was also made from strip steel by welding.

OUTLINE OF SURVEY

Date of survey - February, 1964.

About 140,000 gpd of treated bay water was obtained from National Steel Car Corporation. Of this, approximately 65% was used as make-up for the circulating cooling water and slag quench systems, and 35% to pressure test the pipe. About 13,000 gpd of water was obtained from the city of which approximately 83% was used as cooling water, 14% for sanitary purposes and 3% for cement mixing and equipment washing.

The main sources of wastes were the discharge from the pressure testing operation, the slag settling tank overflow, and the wash water from the cement lining process. These all discharged to the Kenilworth Avenue slip.

The total net loadings to the bay were found to be as follows:

Suspended solids	-	86	lbs/day
Iron as Fe	-	15	lbs/day
5-day BOD	-	33	lbs/day
Phenol	-	4.5	lbs/day

RECOMMENDATIONS

It was recommended that the efficiency of the operation of blowing the scale and emery stone from the pipe with compressed air before the pipe is pressure tested, be increased.

STEEL COMPANY OF CANADA LIMITED, HAMILTON WORKS

INTRODUCTION

Stelco, Hamilton Works, operated an integrated steel mill producing steel bars, rods, reinforcing rods, plate, hot and cold rolled sheets, and strips in coiled forms. A portion of the sheet metal was galvanized or tinned. A number of by-products were also manufactured from the coking process such as coal tars, ammonia liquor, naphthalene, solvents (e.g. benzol and toluol) and coal gas.

Almost 3,000,000 tons of steel were produced annually.

OUTLINE OF SURVEY

Date of last survey - August, 1963

Approximately 173,000,000 gpd of water was used in the processes.

Main Sources of Liquid Wastes and Treatment Facilities

Units	Use of Water	Effluent Treatment
Coke Ovens	Cooling of gases	Tar decantation. Phenol recovery. Ammonia recovery.
	Final cooling of coal gas volatiles.	Naphthalene separation.
	Quenching hot coke.	Basin to settle breeze.
Benzol Plant	Steam distillations (condensates) Caustic washing solutions.	Oil skimming sump
	Sulphuric acid wash. Solvent rinses.	Burial of acid sludge
Blast Furnaces	Washing gases Scrubbing out dust.	Walker Thickener. Dorr clarifier. Filtration unit.
Pig Casting	Cooling pigs.	Settling sumps.

Units	Use of Water	Effluent Treatment
Rolling Mills	Cooling rolls. Removing scale.	Scale pits
Cold Rolling Mills	Preparation of rolling oil emulsions	
Finishing of Steel Products	Preparation of treatment solutions such as cleaning caustics, pickling acids, flux dips, and surface protection dips. Running rinses	None

All of the above waste waters were discharged to the bay. Sanitary wastes from the administrative buildings discharge to city sanitary sewer while the remainder was discharged to the bay.

Total Net Loadings to Bay

Contaminant		Estimated Average Loadings
5-day BOD	-	3,100 lbs/day
Suspended solids	-	107,000 lbs/day
Iron as Fe	-	80,000 lbs/day
Ether solubles	-	2,770 lbs/day
Phenols	-	1,050 lbs/day
Total Kjeldahl nitrogen as N	-	10,600 lbs/day
Cyanide	-	3,260 lbs/day

RECOMMENDATIONS

It was recommended that ways be sought to direct other phenolic waste streams associated with by-products to the phenol recovery unit.

Enlargement and extended use of lagoons wherever possible was recommended for study by the company. Investigations into the reduction of the cyanide content of the waste water were suggested.

STEEL COMPANY OF CANADA, PARKDALE WORKS

INTRODUCTION

At the Parkdale Works steel rod is cleaned by pickling with sulphuric acid and then coated with lime or borax. Most of the rod was drawn into wire from which in turn nails were made. A portion of the wire and nails was galvanized.

OUTLINE OF SURVEY

Date of survey - February, 1964

The city water consumption was approximately 530,000 gpd, of which about 89% was used as cooling water, 4.5% as rinse water, 2.3% as boiler feed water, 1.7% as make-up in cleaning line and 1.1% for sanitary usage. The rod cleaning line was the main source of contamination. From here, waste water was discharged to settling ponds for suspended solids removal, and then seeped to the bay. A second but smaller source of liquid waste was the rinse water used for washing the wire after hydrochloric acid pickling in the wire galvanizing operations. This was conveyed to the Strathearne slip along with the boiler blowdown and a large quantity of cooling water.

Sanitary wastes were treated in a septic tank and then discharged to the Strathearne slip.

Total new waste loadings to the bay were found to be as follows:

Immediate dissolved oxygen demand	-	1,000 lbs/day
Iron as Fe	-	7,200 lbs/day
Sulphates as SO_4	-	17,300 lbs/day

RECOMMENDATIONS

It was recommended that the rod cleaning line wastes and the rinse water from the wire cleaning operation be treated before they are discharged to the bay or disposed of in some other way.

ONTARIO WATER RESOURCES COMMISSION

All analysis except pH reported in ppm unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton Report to: J. Vogt *

Source: Storm Sewers

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids			pH at Lab.	COD	Free Ammonia as N	Total Kjeldahl Nitrogen	Phenol in ppb	Chromium as Cr	Cadmium as Cd	Phos-phates as PO_4	Sul-phide as H_2S	Cya-nide as HCN
		Total	Susp.	Diss.										
T-101	12.	402	78	324	7.4	100	2.5	3.3	15	--	--	22.	0.0	0.
T-102	150.	466	81	385	7.3	288	8.0	9.9	15	--	--	25.	0.0	0.
T-103	64.	840	129	711	7.4	248	6.5	22.	15	0.2	<0.5	17.	0.0	5.5

T-101 7 Hillyard Street

T-102 8 Wentworth Street

T-103 9 Wellington Street

ONTARIO WATER RESOURCES COMMISSION

All analysis except pH reported in ppm unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton Report to: J. Vogt *

Source: Storm Sewers

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids			pH at Lab.	COD	Free Ammonia as N	Total Kjeldahl Nitrogen	Phenol in ppb	Copper as Cu	Zinc as Zn	Cadmium as Cd	Phosphates as PO_4	Sulphide as H_2S	Cyanide as HCN	Nickel as Ni
		Total	Susp.	Diss.												
T-104	560	1,196	606	590	7.0	1,580	13	22	20	--	--	--	24.	0.0	0.	--
T-105	315	638	328	310	7.1	1,000	3.3	15	10	--	--	--	14.	0.0	0.	--
T-106	48	376	70	306	7.6	128	6.4	15	12	0.56	0.	0.	9.	0.0	0.	0.0

T-104 10. Catharine Street

T-105 11. Simcoe Street

T-106 12. Queen Street

ONTARIO WATER RESOURCES COMMISSION

All analysis except pH reported in ppm unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton Report to: J. Vogt *

Source: Storm Sewer to Bay

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids			pH at Lab.	COD	Free Ammonia as N	Total Kjeldahl Nitrogen	Phenol in ppb	Copper as Cu	Chromium as Cr	Cadmium as Cd	Phosphate as PO_4	Sulphide as H_2S	Cyanide as HCN	Nickel as Ni
		Total	Susp.	Diss.												
T-107	39.	562	56	506	7.6	122	13	18	300	0.28	0.0	0.	12.	0.0	0.	0.0
T-108	3.4	304	3	301	8.0	12	0.35	22	0	--	--	--	2.	0.0	0.	--

T-107 13. Stream to Cootes Paradise.

T-108 14. 3 ft. Concrete Pipe near Parkdale Outfall.

ONTARIO WATER RESOURCES COMMISSION

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INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton Report to: J. Vogt *

Source: Storm Sewers

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids Total	Solids Susp.	Solids Diss.	pH at Lab.	COD	Free Ammonia as N	Total Kjeldahl Nitrogen	Phenol in ppb	Copper as Cu	Chromium as Cr	Zinc as Zn	Cadmium as Cd	Phosphates as PO_4	Sulphide as H_2S	Cyanide as HCN	Ether Solubles	Nickel as Ni
T-95	72.	488	79	409	7.4	204	8.0	18	30	0.44	0.07	0.	--	14.	0.0	0.	--	0.0
T-96	134.	538	98	440	8.4	472	25	45	25	--	0.01	--	--	20.	0.0	0.	18.	--
T-97	58.	894	179	715	8.2	360	25	31	10	0.28	0.0	--	0.	15.	0.0	0.	trace	0.0

T-95 1. P.C.P. Outfall.

T-96 2. Parkdale Avenue.

T-97 3. Strathearne Avenue.

ONTARIO WATER RESOURCES COMMISSION

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INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton Report to: J. Vogt *

Source: Storm Sewers

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids			pH at Lab.	COD	Free Ammonia as N	Total Kjeldahl Nitrogen	Phenol in ppb	Chromium as Cr	Cadmium as Cd	Phosphates as PO_4	Sulphide as H_2S	Cyanide as HCN	Ether Solubles
		Total	Susp.	Diss.											
T-98	65.	920	622	298	8.5	228	11	18	350	0.03	<0.5	10.	0.0	0.5	--
T-99	39.	536	125	411	5.7	272	1.3	41	600	--	--	4.5	0.0	0.	32.
T-100	106.	426	53	373	8.4	600	6.4	6.6	50	--	--	3.5	0.0	0.	36.

T-98	4	Kenilworth Avenue.
T-99	5	Ottawa Street.
T-100	6	Plymouth Street.

ONTARIO WATER RESOURCES COMMISSION

All analysis except pH reported in ppm unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

Municipality: Hamilton

Report to: J. Vogt *
H. L. Vanesohe *

Source: Storm Sewers

Date Sampled: Feb. 4/64 by: R. Abbott, J. Vogt

Lab. No.	5-Day BOD	Solids Total	Solids Susp.	Solids Diss.	Do analysis on oil
T-109					The sample as received contained a layer of light yellow oil on the surface of the water. The oil was removed and an infrared spectrum obtained. Examination of the spectrogram showed that the oil was a medium grade petroleum lubricating oil.

T-109 15. Hillyard Street Storm Sewer.

DISCUSSION OF FINDINGS

The surveys of the bayfront industries and individual company reports constituted a large undertaking. All told, it was estimated that one hundred and twenty-five man-days were spent in the field. This was coupled with a corresponding period spent in analysing the samples, evaluating the results and preparing the reports.

It was revealed by these surveys that the major contributors of industrial waste loadings to Hamilton Harbour were the Steel Company of Canada, Dominion Foundries and Steel Limited, Procter and Gamble Company of Canada Limited, Cyanamid of Canada Limited, and Canadian Industries Limited.

In the case of the two steel producers, the wastes of the greatest consequence were mill scale, spent pickle liquor, coke oven ammonia liquor and waste lubricants.

The detergent manufacturer's wastes had a large Biochemical Oxygen Demand loading. A good deal of this could be attributed to organic materials. There were, of course, quantities of surface active substances and fatty matter present also. Cyanamid was found to be another major contributor of nitrogenous wastes and the CIL fertilizer operation the largest source of phosphates.

There seemed to be little doubt that other industrial wastes were entering the bay via the storm sewers. These sources were contributing metals, phenol and deoxygenating materials to a lesser degree but were nevertheless significant in the aggregate.

REMARKS AND CONCLUSIONS

As a result of the surveys and private investigations, both Stelco and Dofasco have already commenced staged programmes of water pollution abatement. Tentative proposals have been submitted to the OWRC for consideration.

Liaison has been established on the technical level and work is proceeding on a number of separate problems. Because of the magnitude of the task a target of five years was set for the reduction of the pollution to the lowest practicable levels.

Procter and Gamble were advised to separate strong wastes from cooling waters and direct the former to the sanitary sewers, subject of course to approval by the city.

The loss of nitrogenous substances from Cyanamid is the subject of continual cost reduction and material conservation programmes which are being carried on by the company. However, these materials cannot be reduced to acceptable levels by housekeeping etc. alone. The effluents containing them should not be discharged untreated to the bay.

It was suggested that CIL could remove the phosphate from the acidulator dust scrubber effluent by treatment with lime. If this can be accomplished, it would be most desirable, as the alternative would be treatment in the municipal sewage plant. This might not be wholly effective in the removal of the phosphates but they would be brought together with those from domestic sources so that most of the phosphate could be removed at a later date if desired.

The sampling programme on the storm sewer outfalls pointed up the fact that all of the pollution of the bay was not due entirely to discharges from the bayfront industries. Analyses are included in this report which should indicate the type of industry connected to these sewers. There also appeared to be considerable sanitary sewage in these sewers which should be eliminated.

A number of general conclusions were drawn from this work. If the quality of the water in Hamilton Harbour is to be improved and maintained to provide good industrial water and permit its use for limited recreational purposes the following suggestions should be considered.

Firstly, the City of Hamilton should draw up, enact and enforce an industrial wastes by-law governing the use of all sewers and facilities. It should be designed to protect the sewers and facilities from damage and prevent malfunction of present facilities and future secondary or tertiary treatment works.

The bayfront industries surveyed should submit proposals for pollution abatement to the OWRC and continue their efforts to reduce waste loadings. The Industrial Wastes Branch of the OWRC should follow the progress of the bayfront industries and maintain liaison with them and the city.

Wherever possible industrial wastes should be treated in the municipal facilities. This is often more feasible, because of the larger volumes treated, than carrying out the treatment at the industry. Also if tertiary treatment for the removal of phosphates and nitrates were to be added at the municipal plant, the collection of industrial wastes containing those substances into the municipal system would be very desirable.

Sources of pollution other than the bayfront industries should be located and appropriate measures taken to eliminate them.

It should be pointed out that the quality of the water in Hamilton Harbour is a matter of great concern. Rapid deterioration in quality could result from the expansion of industrial capacities, the reduction of surface area due to filling of water lots and other factors such as fluctuations or changes in the character of wastes being discharged. On the other hand, while improvement is expected from the proposed pollution programmes, it will undoubtedly be gradual. Therefore, it would be advantageous to evaluate bay water quality regularly. This would not only provide a measure of the improvement but also warning if an upset was imminent.

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FRP/JWV:kf

APPENDIX

TO

SUMMARY REPORT ON THE BAYFRONT INDUSTRIES

HAMILTON

DEFINITION OF TERMS

Many of the terms used in pollution work are unfamiliar to the layman. The following list is provided to explain the terms used in this report.

BOD - Biochemical Oxygen Demand

This is a measure of the oxygen required to stabilize a waste by means of biological processes.

COD - Chemical Oxygen Demand

This is a measure of the organic or inorganic chemicals in a waste which consume dissolved oxygen quite rapidly. The actual measurement represents the amount of oxygen required to satisfy the demand.

PHENOLS

Phenol is a hydroxy derivative of benezene. The term phenols is used here to describe not only phenol but other aromatic hydroxy compounds which react like phenol.

CONCENTRATIONS

ppm - Parts per million

This is on a weight basis and is equivalent to so many pounds per million pounds of waste water or pounds per one hundred thousand gallons.

ppb - Parts per billion

This is similiar to ppm and is equivalent to pounds per hundred million gallons.

VOLUMES

gpd - Gallons per day

MGD - Millions of gallons per day

OUTFALL The point of discharge to a receiving body of water.

STANDARD METHODS

Standard Methods for the Examination of Water and Waste Water, Eleventh Edition. Published by the American Public Health Association.

A standard reference on analytical methods.