THE

ONTARIO WATER RESOURCES

COMMISSION

INDUSTRIAL WASTES SURVEY

of the

DOMINION FOUNDRIES AND STEEL LIMITED

Hamilton, Ontario

1968

A

Report On

An Industrial Wastes Survey

of

DOMINION FOUNDRIES AND STEEL LIMITED
HAMILTON, ONTARIO.

October 15 - 22, 1968

Division of Industrial Wastes
ONTARIO WATER RESOURCES COMMISSION

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REPORT

Ontario Water Resources Commission

Municipality HAMILTON Date of Inspection October 15 - 22, 1968.

Re: DOMINION FOUNDRIES AND STEEL LIMITED
Mr. P. Kresin

Field Inspection by Mr. J. D. Luyt, Mr. K. H. Eggers Report by K. H. Eggers and J. D. Luyt.

An industrial wastes survey was conducted at Dominion Foundries and Steel Limited, Hamilton, during the period October 15 - 22, 1968. The purposes of the survey were to determine the efficiency of the Company's existing waste treatment facilities, to collect information on contaminant loadings still being discharged to Burlington Bay, and to point out those areas or waste discharges where the waste treatment and disposal procedures were not satisfactory.

SUMMARY

For purposes of discussion, the Dominion Foundries and Steel Limited plant in Hamilton can conveniently be divided into two areas.

(1) Bay Front Area

Coking of coal was carried out in two batteries of coke ovens. Ammonia, cyanides and sulphides were removed from the gas from the south battery and the gas used as fuel. Wastewater generated during the scrubbing processes was directed to the biological phenol oxidation plant. Gas from the newer north battery did not undergo direct water scrubbing but after tar removal was sent to the flare for disposal by burning. Wastewater containing phenol from this battery was also directed to the phenol oxidation plant.

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Cooling water from the by-product coke plant area containing relatively high loadings of phenols, cyanide and ammonia was directed to the Kenilworth slip of Burlington Bay.

Iron ore, coke and limestone were charged into three blast furnaces to produce iron. Exhaust gases were scrubbed and the wash water containing high concentrations of suspended solids was directed through a Dorr Thickener and a lagoon system to Burlington Bay.

Molten iron, scrap iron and flux were used for the production of steel in 'basic oxygen furnaces'. Flue gases from this operation were scrubbed with water. The resulting slurry containing iron and other suspended solids was collected in a sump. A portion of the slurry was pumped to a Link Belt Thickener and the lagoon system with the remainder overflowing directly to the Kenilworth slip of Burlington Bay.

(2) Main Plant and Homer Street Plant

Steel ingots were flattened in hot mills and rolled into the final shapes in cold rolling mills. Cleaning, pickling, annealing and plating lines were used for the preparation and finishing of the steel. Wastes discharged to the Bay from these areas included lubricating oils, cooling emulsions and spent pickle liquor.

The treatment facilities which were installed in the Bay Front Plant since the previous survey conducted in April 1966, have

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resulted in a reduction of the suspended solids, iron, phenol, ammonia and sulphide loadings discharged to the Bay. However, excessive loadings of suspended solids from the melt shop, and phenol, cyanide and ammonia originating in the by-product coke plant area were still being discharged to Burlington Bay. Large amounts of lubricating oils, cooling emulsions and spent pickle liquor originating in the Main and Homer Street plants were also discharged to the Bay.

It is recommended that measures be taken to improve the existing waste treatment facilities and to prevent excessive amounts of contaminants, particularly suspended solid material, oil and pickle liquor, from gaining access to Burlington Bay.

Personnel Participating in the Survey

Mr. J. D. Luyt - P. Eng.,
Mr. K. H. Eggers - Technician
Mr. P. Kresin - Student Engineer,

all of the Division of Industrial Wastes.

Personnel Interviewed

Mr. M. Greenfield, P. Eng. - Metallurgical Department
Mr. D. Nicks - Blast Furnace Technologist

DESCRIPTION OF PLANT OPERATIONS

1. Coking and By-Product Processes

Coal was coked in the south coke plant (105 ovens) and the new north coke plant (53 ovens). The coke ovens were heated

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by combustion of fuel gas in flues built into the refractory brick walls. After completion of carbonization the coke was pushed out and quenched with water to prevent combustion.

The gas generated in the coking process was collected in ducts and passed through primary coolers where ammonia flushing liquor was used as the coolant. This liquor was itself cooled in a heat exchanger (closed system) and then recirculated. Part of the liquor was bled off and discharged to the biological oxidation plant. After leaving the primary coolers the gas passed through exhausters and electrostatic tar precipitators. Following this the gas from the north coke plant was bled-off and sent to the flare for burning. The gas from the south coke plant, after leaving the tar precipitator was passed through an HCN-tower where hydrogen cyanide (HCN) was removed as ammonium thiocyanate (NH_4CNS). This material was discharged to sewer as a 10 - 20% solution. The original proposal involved using the waste solution as part of the quenching liquid at the coke quench stations. In the ammonia scrubbers the ammonia in the gas was converted to ammonium sulphate crystals using the "Standard Wilputte Ammonium Sulphate Controlled Crystal Process". The ammonium sulphate was stored to be sold as fertilizer. In the final coolers the gas was cooled by a water spray. This water was kept in a closed circuit by passing it through basins for naphthalene removal and through water-cooled spiral heat exchangers for indirect cooling. In order to maintain dissolved solids in the closed system at a

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low level, a bleed-off was withdrawn and discharged to the biological oxidation plant. After passing through benzol washers the gas was directed to the H_2S-absorbers where sulphur was recovered by the "Stretford H_2S Liquid Purification Process".

The purified gas was stored for use as coke oven fuel.

2. Blast Furnaces

Iron ore, coke and limestone were charged into three blast furnaces. Heated air was blown in from the bottom to promote combustion of the coke, which provided the heat necessary for the metallurgical reducing reactions. Incandescent carbon from the coke and carbon monoxide formed between the coke and the oxygen of the blast, reduced the iron ore to molten iron. The layer of slag formed on top of the molten iron was dumped into a slag pit and hauled from the site to be used for construction purposes (e.g. roads). The molten iron was tapped periodically and either cast into "pigs" or transferred to the steel making plant.

Blast furnace flue gas was cleaned in dry dust catchers, primary wet cleaners and electrostatic precipitators before being used to preheat the air blast to the furnaces.

3. Steel Making

Molten iron, scrap iron, and a flux were charged into the "basic oxygen furnaces". A supersonic stream of high purity

oxygen was introduced into the charge, causing a violent reaction and turbulence to bring the molten metal and hot gases into intimate contact and burn off the impurities. Alloy additions were made here. The molten steel was poured into ingot molds, and transferred to the hot mill for further processing.

Flue gases from the basic oxygen furnaces were drawn through "spark arrester boxes" where dust and furnace "slop" was precipitated by high pressure water sprays. Subsequently the gas was scrubbed with water in venturi scrubbers prior to entering the stack.

4. Hot Mill

Ingots were reheated in gas fired soaking pits to a uniform temperature. The reheated ingots were flattened in a reversing 2 Hi-Hot Mill and the resulting slabs passed through a synchronized 7-stand tandem Universal Plate Mill.

High pressure water sprays removed scale formed during hot rolling. In the pickling lines, iron oxide was removed from the plate using sulphuric or hydrochloric acid solutions.

5. Steel Finishing

Further reduction was accomplished by cold rolling (3 single-stand reversing mills in the Main Plant, a 5-stand 56" cold mill and a single-stand 66" cold mill in the Homer Street Plant). Heat generated during cold rolling was dissipated by flood lubrication using

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an oil-water emulsion. The used emulsion was filtered, recirculated and discharged in batches after being used for periods of about one week. Cold-rolled coils were passed through an alkaline cleaning solution to remove lubricating oils and then batch annealed.

Electrolytic and hot dip tin lines and continuous galvanizing lines were available for plating and metal-coating.

Production and Operating Data

The plant operated continuously producing approximately 2,000,000 ingot tons of steel per year. Construction of a new blast furnace was planned to start in January 1969, and to be completed by late 1970. This would increase blast furnace capacity by 60 per cent.

Water Consumption and Distribution

(1) Untreated Bay Water (from Bay Front Pump House)

Blast Furnaces	-	23.0 MGD
Coke Plant	-	10.0 MGD
Oxygen Steel Plant	-	14.0 MGD
Miscellaneous	-	3.0 MGD
Approximate Total	-	50.0 MGD

(2) Treated Bay Water (from Bay Water Pump House)

Main and Homer Street Plant	-	13.0 MGD
Miscellaneous	-	0.7 MGD
Approximate Total		13.7 MGD

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(3) City Water

Bay Front Plant:

Boiler House	-	1.0 MGD
Cooling Tower	-	0.6 MGD
Miscellaneous	-	0.1 MGD
Approximate Total	-	1.7 MGD

Main Plant:

Hot Mill	-	2.9 MGD
Cold Mill	-	1.95 MGD
Boiler House	-	0.30 MGD
Miscellaneous	-	0.15 MGD
Approximate Total	-	5.3 MGD

Homer Street Plant:

Cold Mill	-	1.4 MGD
Cleaning, Batch Annealing	-	1.1 MGD
Pickle Lines	-	0.5 MGD
Approximate Total	-	3.0 MGD

Total Water Usage: Approximately 73.7 MGD

MAJOR SOURCES OF LIQUID WASTES AND DISPOSAL

(1) Bay Front Plant

Blast Furnaces

Water used for scrubbing of blast furnace gases (9.6 MGD) containing high concentrations of suspended solids including iron was discharged to the "Dorr Thickener". The thickener overflow was directed to a large lagoon system which emptied into Burlington Bay.

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Cooling water from the blast furnaces was also discharged to the lagoon.

By-Product Coke Plant

Bleed-off from the flushing liquor in the primary coolers and from the recirculated water in the final coolers amounted to 0.144 MGD and was discharged to the biological oxidation plant. The treated effluent also passed through the large lagoon to Burlington Bay.

Five hundred gallons per day of 'Stretford solution' containing up to 30% sodium thiocyanate as well as 4,500 gallons per day of a 10 - 20% solution of ammonium thiocyanate was discharged to the Kenilworth slip. An estimated volume of 6.2 MGD of cooling water having a high phenol content was also discharged to the Kenilworth Slip.

Melt Shop

The wastewater (slurry) originating from the washing of the melt shop gases was discharged to a sump for pumping to the "Link-belt" thickener. Due to operating problems, up to one-half of the total flow of 14 MGD overflowed to a sewer discharging directly into the Kenilworth Slip.

The suspended solids content of the slurry was 1,300 - 2,000 ppm. No treatment was provided for that portion of the slurry not reporting to the thickener.

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(2) Main Plant and Homer Street Plant

Water was used to remove scale during hot rolling and was passed through scale pits before being discharged to the Ottawa Street sewer. There were two scale pits, one serving the 2-Hi Hot Mill, the other for the 7-stand Universal Plate Mill. Oil was skimmed off the pit serving the Universal Plate Mill by a belt-type oil skimmer.

Oil-water emulsions used as a coolant in the cold rolling operations were filtered and recirculated. Portions of these emulsions leaked to waste and were passed through separators. Batches of spent coolant solutions were also discharged to the separators (55,000 - 95,000 gallons per week) but only relatively small portions of the oil was retained. The discharge from the separators was routed to the Ottawa Street sewer.

Wash water used in the cleaning lines and batches of alkaline cleaning solutions (34,500 gallons per week) were also discharged to the Ottawa Street Sewer.

Wash and rinse water used in the pickling and plating operations and a bleed-off from the chromate solution tanks were continuously discharged to the Ottawa Street sewer. Batches of chromic acid or sodium dichromate solutions were discharged to the same sewer (6,500 gallons per two weeks).

Spent pickle liquor (56,000 gallons per day of H_2SO_4 and HCl solutions) was collected in a tank and dumped on a slag-filled area on company property. The acid had eaten its way through the

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fill and was being discharged directly to Burlington Bay.

SAMPLING PROGRAMME AND ANALYTICAL RESULTS

Samples of plant effluents were obtained at several locations (see attached plot plan) between October 15 and 22, 1968. Samples of all major effluents were composited by taking aliquots every half hour over a 6 to 6-1/2 hour period on two separate days. All samples were submitted to the OWRC laboratory for analysis, for the most part in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater", twelfth edition.

WASTE LOADINGS

Waste loading figures were calculated from the average concentrations of the composite samples collected at each sample point. The average concentrations were corrected for service water loadings using the contaminant concentrations of the raw water. In this way net loadings were calculated. Wastewater flow rates were obtained from plant personnel.

Discrepancies occurred in the suspended solids and phenol loadings when comparing the separate flows from the melt shop and the coke plant with the combined effluent to the Kenilworth slip. The loadings calculated from each of the separate sewers were considered to be more representative of the existing conditions and were therefore used in this report.

A discrepancy also occurred in the ether solubles loading in the effluent from the cold rolling area and the oil reclaim unit (sample points #23 and #40). The loading found on October 18, 1968, in the effluent from the cold rolling area was considered to be fairly representative, and was used for the calculation of the total ether solubles loading.

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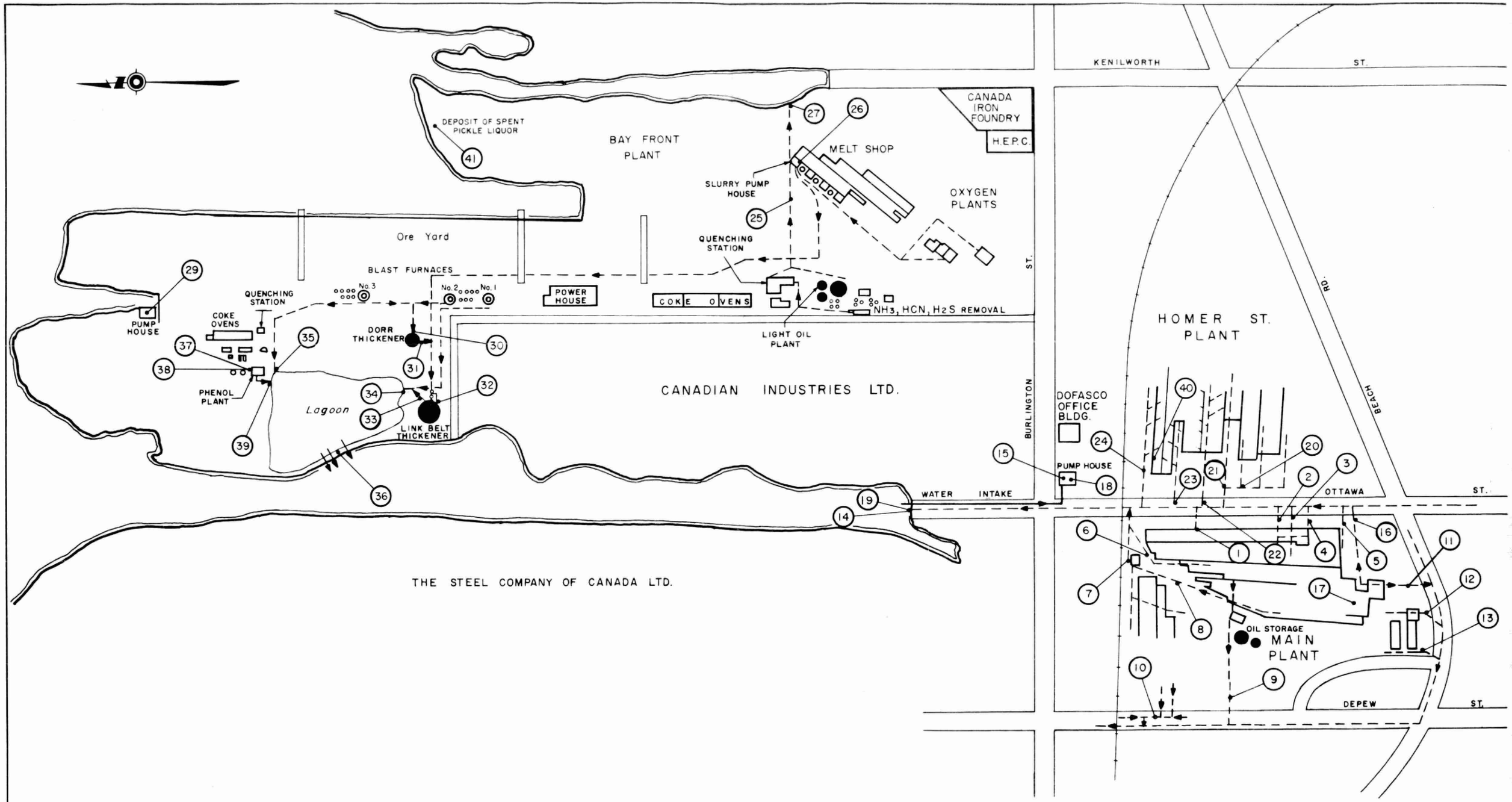

THE STEEL COMPANY OF CANADA LTD.

LEGEND

(36) — SAMPLING POINT

ONTARIO WATER RESOURCES COMMISSION	
DOFASCO (HAMILTON)	
SCALE: NOT TO SCALE	
DRAWN BY: L.L BROOME	DATE: JANUARY, 1969
CHECKED BY: K E.	DRAWING No: 69-11-IW

Sample Points, Sources and Disposal of Wastes

Sample Point	Flow MGD	Areas Represented	Disposal
Main Plant			
1	8.64	Scale Pit, Universal Plate Mill	Ottawa St. sewer
2	4.75	Cold Rolling Area, Universal Plate Mill.	Ottawa St. sewer
3	negl.	Tin Plate Inspection	Ottawa St. sewer
4	1.5	Yard; North Soaking; 2 Hi Hot Mill	Ottawa St. sewer
5	negl.	South Soaking Pit	Ottawa St. sewer
6	0.47	Pickle Bldg., Cold Rolling, N.E. Plate Finishing.	Ottawa St. sewer
7	1.70	Furnace, Foundry, Tin Plate and Cleaning Lines.	Ottawa St. sewer
8	1.65	Electro-Tinning Lines	Ottawa St. sewer
9	1.00	Foundry Service Bldg., Electric Repair Shop.	M.H.#69 Depew St. sewer
10	negl.	Furnace Foundry, Core Aisles; Central Boiler House.	Depew St. sewer.
11	negl.	Annealing, South Cold Rolling	Beach Rd. sewer
12	negl.	Guard House	Beach Rd. sewer
13	negl.	Truck Repair, Melt Shop	Beach Rd. sewer
14	-	Ottawa St. sewer to Bay	Ottawa St. Slip
15	13.7	Raw water - untreated	-
16	0.1	Annealing, South Cold Rolling, Oil Reclaim.	Ottawa St. sewer
17	-	Oil Reclaim Unit	Ottawa St. sewer

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Sample Points, Sources and Disposal of Wastes - (continued)

Sample Point	Flow MGD	Areas Represented	Disposal
Main Plant			
18	13.7	Raw water - treated	-
19	-	Ottawa St. sewer to bay	Ottawa St. Slip
Homer Street Plant			
20	0.36	No. 3 Pickle Line	Ottawa St. sewer
21	1.96	Batch Annealing, Temper Mill and No.3 Pickle Line	Ottawa St. sewer
22	1.50	Batch Annealing and Temper Mill No.2 Cleaning Line.	Ottawa St. sewer
23	0.50	Cold Rolling and General Drainage	Ottawa St. sewer
24	0.36	No.2 Pickle Line	Ottawa St. sewer
40	0.058	Oil Reclaim Unit	Ottawa St. sewer
Bay Front Plant			
25	6.2	By-Product Area and South Coke Ovens	Kenilworth Slip
26	6.8	Melt Shop Slurry	Kenilworth Slip and Link Belt Thickener
27	13.0	By-Product Area, South Coke Ovens and Melt Shop	Kenilworth Slip
29	50.0	Bay Front Pump House	-
30	9.6	Influent to Dorr Thickener	-
31	9.6	Effluent from Dorr Thickener	Lagoon
32	7.2	Influent to Link Belt Thickener	-
33	7.2	Effluent from Link Belt Thickener	Lagoon
34	28.3	South Influent to Lagoon	Lagoon

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Sample Points, Sources and Disposal of Wastes - (continued)

Sample Point	Flow MGD	Areas Represented	Disposal
Main Plant			
35	8.7	No.3 Blast Furnace Cooling Water and Coke Ovens Cooling Wastes.	Lagoon
36	37.0	Lagoon Effluent	Hamilton Harbour
37	.060	Phenol Plant Influent	-
38		Phenol Plant Influent with Dilution	-
39	0.144	Phenol Plant Effluent	Lagoon
41		Spent Pickle Liquor	Hamilton Harbour

AVERAGE WASTE COMPONENT CONCENTRATION FOR MAIN WASTE FLOWS AND SERVICE WATER

(All analyses in parts per million unless otherwise indicated)

SAMPLE POINT#	AREAS SERVED	FLOW MGD	BOD 5	SUSP. SOLIDS	TOTAL IRON	TOTAL CHROMIUM	ETHER SOLUBLES	PHENOLS (PPB)	CYANIDE AS HCN	AMMONIA AS N	COD	PHOSPHATES AS PO_4
	MAIN PLANT											
1	SCALE PIT UNIVERSAL PLATE MILL	8.64	16.5	65	15.2	-	3	3.5	-	-	37	-
2	COLD ROLLING AREA; UNIVERSAL PLATE MILL; NORTH SOAKING PITS.	4.3	53	159	19.6	-	44	10	-	-	131	-
4	YARD, NORTH SOAKING PITS 2-HI HOT MILL.	1.5	30.5	110	25	-	33[1] 1465[2]	3.5	-	-	173	-
6	PICKLE BUILDING, COLD ROLLING AISLE N.E. PLATE FINISHING.	0.47	44	78.5	705	-	4.5	30	-	-	148	1.5
7	FURNACE, FOUNDRY, CENTRAL BOILER HOUSE, TIN PLATE AND CLEANING LINES.	1.7	45.5	80	13.5	8.5	21	15[1] 1000[2]	-	-	104	11.0
9[4]	FOUNDRY SERVICE BUILDING ELECTRIC REPAIR SHOP.	1.0	>110	0	1.7	-	74	6	-	-	142	-
16	ANNEALING, SOUTH COLD ROLLING AREA, OIL RECLAIM.	0.1	430	175	2.9	-	154	3.5	-	-	780	-
	HOMER ST. PLANT											
21[4]	BATCH ANNEAL, TEMPER MILL, #3 PICKLE LINE.	1.96	26	21	25.4	-	134	6	-	-	155	-
22	BATCH ANNEAL, TEMPER MILL.	1.5	76	70.5	13.2	-	68	10	-	-	335	-
23	COLD ROLLING, OIL RECLAIM GENERAL DRAINAGE.	0.5	780	225	21	7.2	1370[3]	13.5	-	-	1470	-

[1] SAMPLE OF OCT. 15, 1968.

[2] SAMPLE OF OCT. 16, 1968.

[3] SAMPLE OF OCT. 18, 1968.

[4] GRAB SAMPLE

AVERAGE WASTE COMPONENT CONCENTRATION FOR MAIN WASTE FLOWS AND SERVICE WATER - continued

(All analyses in parts per million unless otherwise indicated)

SAMPLE POINT#	AREAS SERVED	FLOW MGD	BOD 5	SUSP. SOLIDS	TOTAL IRON	TOTAL CHROMIUM	ETHER SOLUBLES	PHENOLS (PPB)	CYANIDE AS HCN	AMMONIA AS N	COD	PHOSPHATES AS PO_4
	HOMER ST. PLANT - CONTINUED											
24	#2 PICKLE LINE, GENERAL DRAINAGE.	0.36	50.1	62	110.6	-	47	6.5	-	-	169	-
	BAY FRONT PLANT											
25	BY-PRODUCT COKE PLANT	6.2	121	15	2.0	-	3	6250	16.2	40	350	-
26	MELT SHOP SLURRY	6.8	21	1666	126.8	-	1	12	-	-	52	-
27	BY-PRODUCT COKE PLANT AND MELT SHOP SLURRY (KENILWORTH SEWER)	13.0	13	87	42	-	4.5	1250	4.2	13	99	0.4
36	LAGOON (EFFLUENT)	37.0	5	13	5	-	1.5	4	0.065	13.75	11	0.22
41	PICKLE LIQUOR DEPOSIT	0.056	-	-	54500	-	-	-	-	-	-	-
	SERVICE WATER											
15	BAY WATER (PUMP HOUSE)	13.7	36	112	19.7	-	3	2	-	1.7	111	3.7
18	TREATED BAY WATER (PUMP HOUSE)	13.7	12	30	12.6	0.08	3	-	-	-	38	4.2
29	BAY WATER (BAY FRONT PUMP HOUSE)	50.0	2.2	9	2.87	-	0	6	0	3.4	70	0.42

MAJOR SOURCES OF BOD_5

Origin	Waste Flow MGD	Concentration ppm	Loading tons/day
Cold Rolling Area (Main Plant)	4.3	53	0.36
Foundry, Service Building	1.0	110	0.37
Annealing, Cold Rolling, Oil Reclaim (Main Plant)	0.1	430	0.20
Batch Anneal, Temper Mill	1.5	76	0.30
Cold Rolling, Oil Reclaim (Homer Street Plant)	0.5	780	1.86
By-Product Coke Plant	6.2	121	3.69
Melt Shop	6.8	21	0.65
Lagoon	37.0	5	0.56
		Approximate Total	8.0

MAJOR SOURCES OF SUSPENDED SOLIDS

Origin	Waste Flow MGD	Concentration ppm	Loading tons/day
Cold Rolling Area (Main Plant)	4.3	159	1.01
Cold Rolling (Homer Street Plant)	0.5	225	0.28
Melt Shop	6.8*(1)	1660	55.00
Lagoon	37.0	13	0.74
		Approximate Total	57.00

*1) That portion of the flow which enters the Kenilworth slip reported here.

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MAJOR SOURCES OF IRON

Origin	Waste Flow MGD	Concentration ppm	Loading tons/day
Pickling, Cold Rolling, N. E. Plate Finishing	0.47	705	1.38
#2 Pickle Line	0.36	110.6	0.16
Melt Shop	6.8	157	5.20
Lagoon	37.0	5	0.37
Spent Pickle Liquor	0.056	54,500	15.25
	Approximate Total		22.5

MAJOR SOURCES OF PHENOLS

Origin	Waste Flow MGD	Concentration ppb	Loading tons/day
By-Product Coke Plant	6.2	6250	.19

MAJOR SOURCES OF ETHER SOLUBLES

Origin	Waste Flow MGD	Concentration ppm	Loading tons/day
Cold Rolling, Universal Plate Mill	4.3	44	0.90
North Soaking 2-Hi Hot Mill	1.5	33 1465	0.23*1 11.00*2
Furnace, Foundry, Tin Plate and Cleaning Lines	1.7	21	0.16
Foundry, Service Building, Electric Repair Shop	1.0	74	0.36
Annealing, South Cold Rolling, Oil Reclaim	0.1	154	0.08
Batch Anneal, Temper Mill	3.46	110	1.80
Cold Rolling Oil Reclaim (Homer Street Plant)	0.5	1370	3.98*3
#2 Pickle Line General Drainage	0.36	47	0.08
By-Product Coke Plant and Melt Shop	13.0	4.5	0.09
Lagoon	37.0	1.5	0.26
	Approximate Total		8

*1 Loading on Oct. 15, 1968.

*2 Loading on Oct. 16, 1968 (not included in total)

*3 Loading on Oct. 18, 1968.

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MAJOR SOURCES OF CYANIDES, AMMONIA AND PHOSPHATES

Origin	Waste Flow MGD	Cyanides (as HCN) Conc. ppm	Cyanides (as HCN) Loading tons/day	Ammonia (as N) Conc. ppm	Ammonia (as N) Loading tons/day	Phosphates (as PO_4) Conc. ppm	Phosphates (as PO_4) loading tons/day
Furnace, Foundry, Boiler House Tin Plate and Cleaning Lines.	1.7	-	-	-	-	11.0	0.06
By-Product Coke Plant	6.2	16.2	0.50	39.5	1.40	-	-
Combined Coke Plant and Melt Shop	13.0	-	-	-	-	0.8	0.03
Lagoon	37.0	0.06	0.01	13.75	1.93*	0.22	0
Approximate Total			0.51		3.3		0.09

*Ammonia loading from phenol plant was 0.62 tons/day.

SUMMARY OF NET WASTE LOADINGS
(Tons per day)

SAMPLE POINT #	AREAS SERVED	FLOW MGD	BOD 5	SUSP. SOLIDS	TOTAL IRON	TOTAL CHROMIUM	ETHER SOLUBLES	PHENOLS	CYANIDE AS HCN	AMMONIA AS N	COD	PHOSPHATES AS PO_4
	MAIN PLANT											
2	COLD ROLLING AREA; UNIVERSAL PLATE MILL; NORTH SOAKING PITS.	4.3	0.36	1.01	0	0	0.9	0	-	-	0.22	-
4	YARD; NORTH SOAKING PITS, 2-HI HOT MILL	1.5	0	0	0.04	-	0.23[1] 11.0[2]	0	-	-	0.46	-
6	PICKLE BUILDING, COLD ROLLING AISLE, N.E. PLATE FINISHING.	0.47	0.02	0	1.38	-	0.01	0	-	-	0.09	0
7	FURNACE; FOUNDRY; CENTRAL BOILER HOUSE; TIN PLATE AND CLEANING LINES.	1.7	0.08	0	0	0.07	0.16	0[1] 0.008[2]	-	-	0	0.06
9[4]	FOUNDRY, SERVICE BUILDING ELECTRIC REPAIR SHOP.	1.0	0.37	0	0	-	0.36	0	-	-	0.16	-
16	ANNEALING; SOUTH COLD ROLLING AREA, OIL RECLAIM.	0.1	0.20	0.03	0	-	0.08	0	-	-	0	-
	HOMER STREET PLANT											
21	BATCH ANNEAL, TEMPER MILL, #3 PICKLE LINE.	1.96	0	0	0.06	-	1.30	0	-	-	0.43	-
22	BATCH ANNEAL, TEMPER MILL	1.5	0.30	0	0	-	0.50	0	-	-	1.67	-
23	COLD ROLLING, OIL RECLAIM, GENERAL DRAINAGE.	0.5	1.86	0.28	0	-	3.98[3]	0	-	-	3.40	-
24	#2 PICKLE LINE, GENERAL DRAINAGE.	0.36	0.02	0	0.16	0.02	0.08	0	-	-	0.11	-

[1] LOADING ON OCT. 15, 1968.

[2] LOADING ON OCT. 16, 1968 (NOT INCLUDED IN TOTAL)

[3] LOADING ON OCT. 18, 1968.

[4] GRAB SAMPLE

[5] LOADING IN COMBINED EFFLUENT TO KENILWORTH SLIP.

SUMMARY OF NET WASTE LOADINGS - continued

(Tons per day)

SAMPLE POINT#	AREAS SERVED	FLOW MGD	BOD 5	SUSP. SOLIDS	TOTAL IRON	TOTAL CHROMIUM	ETHER SOLUBLES	PHENOLS	CYANIDE AS HCN	AMMONIA AS N	COD	PHOSPHATES AS PO_4
	BAY FRONT PLANT											
25	BY-PRODUCT COKE PLANT	6.2	3.69	0.19	0	-	0.09	0.19	0.50	1.40	8.68	-
26	MELT SHOP	6.8	0.65	55.0	5.20	-	0.03	0	-	-	0	0.03
36	LAGOON (EFFLUENT)	37.0	0.56	0.74	0.37	-	0.26	0	0.01	1.93	0	0
41	PICKLE LIQUOR DISPOSAL.	0.056	-	-	15.25	-	-	-	-	-	-	-
	TOTAL		8.11	57.25	22.46	0.09	7.98	0.19	0.51	3.33	15.22	0.09

DISCUSSION OF FINDINGS

The Company has instituted several waste abatement measures since the last previous major industrial wastes survey conducted in April, 1966. During the 1968 survey not all of these facilities were operating as effectively as had been anticipated. Work was continuing to improve the efficiency of these facilities.

TOTAL PLANT LOADINGS (NET)
(tons per day)

	1963	1966	March 1967	June 1967	December 1967	October 1968
BOD_5	5.4	6.1	7.8	42	11	8
Suspended Solids	82	146	83	115	58	57
Total Iron	28	45	65	38	44	22.5
Total Chromium	-	-	-	-	-	0.09
Ether Solubles	0.44	3.6	6.0	22	7.7	8
Phenols	0.28	0.31	0.13	0.07	0.39	0.19
Cyanide	0.50	0.63	0.62	0.27	0.06	0.51
Sulphide	2.3	2.9	0.42	0.47	0	0
Ammonia	3.9	6.0	4.2	-	0.13	3.3
Phosphates	-	-	-	-	-	0.09

Discrepancies occurred in the loadings of BOD_5, suspended solids, iron, phenols and cyanides when comparing the analytical results for the melt shop and the by-product and coke plant area effluents with the loadings found in the combined stream discharging to the Kenilworth Slip.

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These discrepancies appeared to be due to inaccurate estimates of the flows. The Company was initiating a flow measuring programme in order to arrive at more accurate figures. The concentrations in the combined effluent to the Kenilworth Slip were also found to vary considerably thus causing difficulties in collecting representative samples. Therefore, loadings found in the separate streams appeared to be more representative of the existing conditions.

(1) Individual Contaminants

Suspended Solids

The suspended solids loading discharged to Hamilton Harbour had been reduced by about 60% since the 1966 survey. Of the remaining 57 tons per day the melt shop slurry accounted for 55 tons per day. Although this figure may be somewhat inaccurate, it is apparent that this slurry accounts for the major portion of the suspended solids loading. It was estimated that the total suspended solids loading from Dofasco could be reduced to the order to 3 tons per day if all of the melt shop slurry were discharged to the Link-Belt Thickener, provided, of course, that the efficiency of the thickener was not reduced.

Biochemical Oxygen Demand

The BOD_5 loading appeared to be in the same range as in 1966 and 1967; the major sources being the coke plant (45% of total) and the Homer Street cold mill (23% of total).

Iron

Seventy-four per cent of the total iron loading discharged to Burlington Bay originated in the pickling operation. Spent pickle liquor containing 15.25 tons per day of iron was dumped close to the shore of the bay. Alternate methods of disposal of these wastes were being investigated by the Company.

That portion of the melt shop slurry discharged directly to Burlington Bay also contributed considerably to the iron loading (22% of total).

Ether Solubles

The amount of ether solubles or oil discharged from the coke plant appeared to have been reduced considerably since 1966 (loading 1.32 tons per day in 1966; 0.09 tons per day in 1968).

Of the 8 tons per day of ether solubles discharged to Burlington Bay, 4 tons (50%) originated at the Homer Street cold mill and 1.30 tons per day (16% of total) from the annealing and temper mill in the Homer Street plant.

Water-oil emulsions used as a coolant in the cold rolling operations were discharged to oil reclaim units. Several tests have been conducted by the Company in order to break the emulsions and retain the oil. It was reported that no satisfactory solution had yet been found but work on this project was continuing.

Baffles have been installed around the Ottawa Street sewer outfall in an attempt to skim off free oil. Although some

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oil was retained and collected in a tank, observations at the site indicated that a major portion of the oil escaped to Burlington Bay.

Phenol, Cyanide, Sulphide and Ammonia

Although the phenol loading discharged to Burlington Bay has been reduced by about 60% since 1966, the loading from the coke plant to the Kenilworth Slip was still high (6,250 ppb). High concentrations were also found in the effluent from both the north soaking pits and the 2-Hi Hot Mill on October 16, 1968.

High cyanide and ammonia concentrations were found in the coke plant sewer to the Kenilworth Slip. An ammonia loading of 1.93 tons per day was found in the lagoon effluent although the loadings computed from all of the influents did not yield as high a value. This may be due to batch discharges during evenings which would not be included in the influent samples collected.

No sulphide was found in samples taken in December 1967 or during this survey. It appeared that this problem has been eliminated with the installation of the H_2S absorbers.

(2) Efficiency of Waste Control Facilities

Scale Pits

The slurry generated by the removal of scale during hot rolling was passed through scale pits before being discharged to sewer.

Samples taken of the effluent from the scale pit serving

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the universal plate mill indicated that the concentrations of suspended solids and total iron were relatively low. At the time of the survey these concentrations were lower than in the raw water supply. Although these concentrations may rise when sludge accumulates on the bottom of the pit the efficiency at the time of the survey appeared to be quite good.

Relatively low concentrations of ether solubles were found in the effluent indicating that most of the oil was removed by the belt-type oil skimming device.

Dorr Thickener

Blast furnace gas wash water (9.6 MGD) containing a high concentration of suspended solids and iron was discharged to the Dorr Thickener.

	Suspended Solids (ppm)	Total Iron (ppm)
Influent	4,412	478
Effluent	98	30
Removal	97.8%	93.7

Although wastewater from the dewatering of sludge which originated in the Link-Belt Thickener has been directed to the Dorr Thickener since 1967, the efficiency of suspended solids removal by the Dorr Thickener has not decreased. The lower efficiency in iron removal (98.5% in 1966; 93.7% in 1968) may be due to this new stream of wastewater possibly containing

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a high proportion of finely divided iron which does not readily settle out. In spite of the reduction in the percentage of iron being removed, the Dorr Thickener was considered to be operating efficiently.

Sludge collected in the Dorr Thickener was disposed of on Company property. The thickener overflow was discharged to the lagoon where the waste loading was further reduced.

Link-Belt Thickener

About 7.2 MGD of melt shop slurry was directed to the Link-Belt Thickener which has been designed for a flow of 18 MGD.

	Suspended Solids (ppm)	Total Iron (ppm)
Influent	3,765	535
Effluent	48	20.7
Removal	98.7%	96.1%

The thickener was anticipated to remove 140 tons per day of solids. It was found, however, that about 186 tons settled out on October 21, 1968, and 84 tons on October 22, 1968.

The efficiency of the thickener appeared to be quite good during the survey. However, it may decrease if the total melt shop effluent (13 MGD) is directed to it. Difficulties may then also occur with the sludge removal facilities since the amount of sludge settling out at certain times appeared to be considerably higher than anticipated.

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The underflow from the Link-Belt Thickener was pumped to centrifuges and the overflow discharged to the lagoon. The dewatered sludge from the centrifuges was disposed of on Company property and the water from these units was directed to the Dorr Thickener.

Biological Phenol Oxidation Plant

A bleed-off of flushing liquor in the primary coolers and of cooling water from the final coolers of the by-product coke plant was discharged via a balancing tank to the biological phenol oxidation plant. A flow of 60,000 gallons per day (design flow: 87,500 gallons per day) was diluted with Bay water to 144,000 gallons per day and a nutrient (phosphoric acid) added. The oxidation took place in two aeration tanks, each equipped with a surface aerator.

	Phenols (lbs/day)	Cyanide as HCN (lbs/day)
Influent	450	15.9
Effluent	0.03	2.85
Removal	99.99%	82.1%

The efficiency in phenol removal was extremely good. The phenol concentration in the effluent discharged to the lagoon was found to be 24 ppb.

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Lagoon

Effluents from the Dorr Thickener (9.6 MGD), Link-Belt Thickener (7.2 MGD), phenol oxidation plant (0.144 MGD), as well as cooling water from the blast furnaces and the north coke plant (20.2 MGD) were discharged to the lagoon. At the time of construction the volume of this lagoon was 24.79 million gallons. With a total flow of about 37.0 MGD the theoretical retention time in the lagoon was computed to be about 15 hours. Thus, the efficiency of the lagoon could not be calculated from results obtained during a 6-hour survey. A comparison of waste loadings discharged to the lagoon and loadings in the lagoon effluent found during the survey indicated that considerable reduction of suspended solids (85%), iron (68 - 84%), phenols (between 60 and 90%), and cyanide (between 70 and 90%) took place. The concentrations of suspended solids (8 - 18 ppm), total iron (4.9 - 5.1 ppm), phenols (4 ppb), and cyanide (0.03 - 0.1) found in the effluent showed that the lagoon contributed considerably to the improvement of the wastewater quality.

ACCIDENTAL SPILLAGES AND EMERGENCY DISCHARGES

Accidental spillages should be reported to the Commission through the Division of Industrial Wastes as soon as they are discovered. According to the Ontario Water Resources Commission Act, Section 27(1), the discharge of any material, whether deliberate or accidental, which has the ability and potential to impair water quality is an offence. A critical

examination of the processing facilities at Dominion Foundries and Steel Limited, as at any industrial plant, would contribute towards minimizing impairment of the receiving body of water resulting from accidents, errors or negligence. The aim of such a survey should be the development and implementation of measures for containing spills and eliminating operating errors. At Dofasco, the existing large lagoon is a valuable asset to this programme.

In a large industrial complex there are procedures that are carried out from time to time which result in the discharge of contaminants. Examples include equipment wash-downs and de-scaling of lines. These are planned events, and therefore sufficient time to develop adequate waste handling procedures is available. Prior to the event the Commission should be informed of the nature of the discharge expected and the procedures planned to prevent water impairment. Since the characteristics of the waste effluents from the various operations would vary widely, it is recommended that the Division of Industrial Wastes be consulted during the planning stages to determine the objectives to be achieved in each instance.

OILS AND GREASES

In the Hamilton Harbour area, impairment of the water by oil is a major cause for concern. Oil is not only aesthetically objectionable when seen floating on water or along shorelines but it is also harmful to aquatic life and imparts tastes and odours to the water. It is felt that emphasis should be placed on the control of oil from all sources in the area. Of particular importance in this respect were certain discharges to

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the Ottawa Street sewer. Greatly improved control of the oil-bearing wastes to this sewer is required.

IRON

The 1964-65 OWRC biological survey of Burlington Bay revealed that there was an area of several hundred acres near the steel mills devoid of aquatic life, including sludgeworms. The report stated the area of absence of sludgeworms in the bay coincided very closely with the area where the iron content of the sediments exceeded 25% and suggested the iron had a toxic effect on the worms. Therefore, the need to prevent further accumulations of iron is apparent and if a balanced biological habitat is to be achieved, the iron already in the bay must be removed.

The melt shop slurry to the Kenilworth Slip and the spent pickling liquor contained unacceptable quantities of iron. Some 20 tons per day (net loading) were lost from these two sources.

CONCLUSIONS AND RECOMMENDATIONS

A number of waste control measures have been instituted at Dominion Foundries and Steel Limited since the previous OWRC industrial wastes survey conducted in 1966. The results of these measures are evident in the calculated waste loadings discharged to Burlington Bay.

However, excessive quantities of suspended solids, iron, phenols, cyanide and ammonia were still being discharged to Burlington Bay.

The following items are considered to require immediate attention to improve existing facilities or to develop new waste control procedures.

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1) The melt shop slurry discharge to the Kenilworth Slip. Adequate settling to remove the suspended solids and iron must be provided.

2) The procedure for disposing of spent pickle liquor. A suitable method of treatment, disposal or regeneration must be found and implemented.

3) The discharge from the Main and Homer Street plants to the Ottawa Street sewer. Methods of retaining and removing the oil in the oil-bearing wastes must be found and implemented.

4) The discharges to the Kenilworth Slip containing phenol, cyanide and ammonia. The sources of these contaminants should be found and the appropriate facilities or procedures implemented to prevent their loss to the Bay.

5) The lagoon at the Bay Front plant. Significant quantities of solids had accumulated in the lagoon. Plans for its dredging should now be developed.

6) The results of the Company's waste effluent monitoring programme should be submitted to the Commission at regular and frequent intervals.

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The possibility of an accidental loss of oil to Burlington Bay from Dominion Foundries and Steel Limited is always present. The availability of a portable floating oil boom to contain any free oil on the waters of the Bay in such an event would be a valuable asset. It is recommended that the Company, either by itself or in co-operation with other interested parties in the area, consider the purchase of such a facility and its means of deployment.

Prepared by:

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.....
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Approved by:

R. C Stewart
.....
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District Engineer,
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KHE/vs

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton **Report to:** K. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco

Date Sampled: Oct. 21/68 **by:** J. Luyt By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Iron as Fe.		Phenols in ppb	Cyanide as HCN	Ammonia Nitrogen as N			
		Total	Susp.	Diss.		Tot.	Diss.						
T-3632		4390	3952	438	7.4	437.	0.0	---	1.9	---			
T-3633		590	84	506	7.5	20.4	0.0	120	1.0	6.5			

T-3632	30.	Influent to Dorr Thickener	Comp. 9:30 - 4:00
T-3633	31.	Effluent from Dorr Thickener	Comp. 9:30 - 4:00

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

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Municipality: Hamilton **Report to:** K. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco

Date Sampled: Oct. 21/68 **by:** J. Luyt By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Iron as Fe.		Phenols in ppb	Cyanide as HCN	Ammonia as Nitrogen N			
		Total	Susp.	Diss.		Tot.	Diss.						
T-3634		5508	5192	316	10.7	610.	0.0	---	0.02	---			
T-3635		356	32	324	9.2	17.4	0.0	4	< 0.01	3.5			

< = less than

T-3634 32. Influent to Link-Belt Thickener - Comp. 9:30 - 4:00

T-3635 33. Effluent from Link-Belt Thickener. Comp. 9:30 - 4:00

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

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Municipality: Hamilton **Report to:** K. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco

Date Sampled: Oct. 21/68 **by:** J. Luyt By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Iron as Fe.		Phenols in ppb	Cyanide as HCN	Ammonia as N			
		Total	Susp.	Diss.		Tot.	Diss.						
T-3636		436	44	392	8.7	14.	0.0	50	0.35	5.0			
T-3637		412	49	363	8.4	18.6	0.0	---	---	---			

T-3636 34. South Influent to Lagoon - Comp. 9:30 a.m. - 4:00 p.m.

T-3637 272. Combined By-Product Coke Plant and Melt Shop Effluent - Grab 10:00 a.m.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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Municipality: Hamilton **Report to:** K.M. Eggers **c.c.** Chem. Lab.* /rd

Source: Dofasco - Bay Front

Date Sampled: 21/16/68 **by:** P. Kresin By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			C.O.D.	pH at Lab.	Phenols in ppb	Ether Solubles	Iron as Fe.		Cyanide as HCN		
		Total	Susp.	Diss.					Tot.	Diss.			
T-3638	9.0	482	118		90	7.5	6	0	84.	0.0	0.50		
T-3639	6.0	448	8		14	8.0	4	3	4.88	0.0	0.03		

Lab. No.	Sulphide as H_2S	Phosphates as PO_4	Total Kjeldahl Nitrogen as N.		Ammonia as N.	Chloride as Cl.
T-3638	0.0	0.26	13		9.4	43
T-3639	0.0	0.20	18.		14.5	54

T-3638 35. No. 3 Blast Furnace Cooling Water - Comp. 9:30 a.m. - 3:30 p.m.

T-3639 36. Lagoon Effluent - Composite 9:30 a.m. - 3:30 p.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

Municipality: Hamilton **Report to:** K.H. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco, Bay Front

Date Sampled: 21/10/68 **by:** P. Kresin

Lab. No.	5-Day B.O.D.	Solids			C.O.D.	pH at Lab.	Phenols in ppb	Ether Solubles	Cyanide as HCN	Sulphide as H_2S	Ammonia as N		
		Total	Susp.	Diss.									
T-3640	---	8982	27	8955	4400	8.9	700,000*	74*	30.0	10.	2900.		
T-3641	---	3112	7	3105	1600	8.8	250,000*	9*	5.0	0.0	1100.		
T-3642	---	3446	35	3411	410	7.9	24	14	2.1	0.0	950.		

* The ether solubles results are lower than the phenol results because of losses by evaporation of some of the phenols during the ether soluble test.

T-3640	37.	Phenol Plant Influent - Grab 11:40 a.m.
T-3641	38.	Phenol Plant Influent with Dilution water - Grab - 11:40 a.m.
T-3642	39.	Phenol Plant Effluent - Composite 9:30 a.m. - 3:30 p.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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= 1 lb./100,000 Imp. Gals.

Municipality: Hamilton Report to: K.H. Eggers * c.c. Chem. Lab.* /rd

Source: Dofasco, Homer Street Plant

Date Sampled: Oct. 21/68 by: K.H. Eggers

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles								
		Total	Susp.	Diss.									
T-3643					130,360								

T-3643 40. Cold mill coolant discharge - grab 10:30 a.m.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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= 1 lb./100,000 Imp. Gals.

Municipality: Hamilton Report to: K.H. Eggers * c.c. Chem. Lab.* /rd

Source: Dofasco, Main Plant

Date Sampled: Oct. 21/68 by: K. Eggers By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Acidity as $CaCO_3$	Iron as Fe.						
		Total	Susp.	Diss.									
T-3644					0.2	248,000	54,500						

T-3644 41. Spent Pickle Liquor - Grab 10:30 a.m.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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Municipality: Hamilton **Report to:** K.H. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco, Bay Front Plant

Date Sampled: Oct. 22/68 **by:** K.H. Eggers

By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Iron as Fe.		Ether Solubles	Phenols in ppb
		Total	Susp.	Diss.			Tot.	Diss.		
T-3645	70	7368	4872	2496	7.5	650	520.	0.07	tr.	24
T-3646	13	550	112	438	7.6	80	40.	0.07	3	40

T-3645	30A	Dorr Thickener Influent - Composite 9:15 a.m. - 4:00 p.m.
T-3646	31A	Dorr Thickener Effluent - Composite 9:15 a.m. - 4:00 p.m.

5M-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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= 1 lb./100,000 Imp. Gals.

Municipality: Hamilton **Report to:** K.H. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco, Bay Front Plant

Date Sampled: Oct. 22/68 **by:** K.H. Eggers By A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.C.D.	Iron as Fe.		Ether Solubles		Phenols in ppb		
		Total	Susp.	Diss.			Tot.	Diss.					
T-3647	18	2602	2338	264	8.9	25	460.	0.0	trace *		3		
T-3648	3.6	402	64	338	8.7	5	24.	0.0	3		3		

* Trace is less than 2 ppm

T-3647	32A	Link Belt Thickener Influent - Composite 9:15 a.m. - 4:00 p.m.
T-3648	33A	Link Belt Thickener Effluent - Composite 9:15 a.m. - 4:00 p.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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Municipality: Hamilton **Report to:** K.H. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco - Bay Front

Date Sampled: 22/10/68 **by:** P. Kresin by A.A.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Ether Solubles	Phenols in ppb	Iron as Fe.		Phosphate as PO_4
		Total	Susp.	Diss.					Tot.	Diss.	
T-3649	13	472	146	326	7.6	59	2	6	46.1	0.12	---
T-3650	4.0	422	18	404	8.1	8	0	4	5.1	0.09	---

Lab. No.	Nitrogen as Kjeldahl	Ammonia as N	Sulphide as H_2S	Chloride as Cl.	Cyanide as HCN.
T-3649	---	7.5	0.0	48	3.6
T-3650	---	13.	0.0	62	0.1

T-3649	35A	No. 3 Blast Furnace Cooling Water - Composite 9:30 a.m. - 3:30 p.m.
T-3650	36A	Lagoon Outfall - Composite - 9:30 a.m. - 3:30 p.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

Municipality: Hamilton **Report to:** K.H. Eggers * **c.c.** Chem. Lab.* /rd

Source: Dofasco Bay Front

Date Sampled: 22/10/68 **by:** P. Kresin

Lab. No.	5-Day B.O.D.	Solids			C.O.D.	pH at Lab.	Ether Solubles	Phenols in ppb	Cyanide as HCN	Sulphide as H_2S	Ammonia as N.		
		Total	Susp.	Diss.									
T-3651	---	9476	46		4900	8.8	144*	800,000*	23.5	0.1	2600.		
T-3652	---	2928	11		1625	8.8	32*	350,000*	8.0	0.0	800.		
T-3653	---	3262	33		335	8.0	2	24	1.9	0.0	800.		

* The ether soluble results are lower than the phenol results because of evaporation of some phenols during the ether soluble test.

T-3651	37A	Phenol Plant Influent - Grab - 11:30 a.m.
T-3652	38A	Phenol Plant Influent with dilution water - Grab - 11:30 a.m.
T-3653	39A	Phenol Plant Effluent - Composite 9:30 a.m. - 3:30 p.m.

5M-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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= 1 lb./100,000 Imp. Gals.

Municipality: Hamilton Report to: K. Eggers c.c. Chem. Lab.

Source: Dofasco - Main Plant

(rj)

Date Sampled: Oct. 15/68 by: K.E. & J.L.

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Iron as Fe (by AAS)		Ether Solubles	Phenols in ppb			
		Total	Susp.	Diss.			TOT.	Diss.					
T-3516	16	522	66	456	81	7.1	18.2	0.0	44	0			
T-3517	35	566	103	463	178	6.9	26.	0.0	33	2			
T-3518	24	482	47	435	39	7.0	10.8	0.0	11	2			
T-3519	240	424	94	330	680	7.1	3.4	0.18	113	4			

T-3516	2	Cold Rolling Aisle, Universal Plate Mill	Composite 9.30 AM - 3.30 PM
T-3517	4	Yard, North Soaking, & 2 Hi. Hot Mill	" " "
T-3518	5	South Soaking Pit	" " "
T-3519	16	Annealing, South Cold Rolling Area, Oil Recovery	" " "

10M-66-22696

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K. Eggers c.c. Chem. Lab.

Source: Dofasco - Main Plant

Date Sampled: Oct. 15/68 by: P.K. (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	IRON AS Fe		Phenols in ppb	Tin as Sn	Chromium as Cr		Ether Solubles
		Total	Susp.	Diss.			TOT.	Diss.			Tot.	Hexa.	
T-3520	33	2102	33	2069	110	1.9	360	350.	35	1.3	0.17	0.00	6
T-3521	30	402	71	331	89	8.6	12.4	0.0	15	3.2	8.0	2.75	20

T-3520	6	Pickle Bldg. Cold Rolling N.E. Plate Finishing	Comp.	9.30 AM - 3.30 PM
T-3521	7	Furnace, Foundry, Tin Plate & Cleaning Lines	"	9.30 AM - 3.30 PM

12M-68-22690

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K. Eggers c.c. Chem. Lab.

Source: Dofasco - Main Plant

Date Sampled: Oct. 15/68 by: PK. & K.L. (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab	ether Solubles	Phenols in ppb	Tin as Sn	IRON Fe (by AAS)			
		Total	Susp.	Diss.						TOT.	DISS.		
T-3522	14	412	67	345	62	7.5	13	120	3.6	10.4	0.09		
T-3523	7.0	524	72	452	30	7.1	3	4	---	14.5	0.0		
T-3524	14	284	45	239	68	7.3	20	15	0.02	0.05	0.02		

T-3522	8	Electro - Tinning Lines Composite 9.30 AM - 3.30 PM
T-3523	1	Scale Pit, Universal Plate Mill Comp. 9.30 AM - 3.30 PM
T-3524	3	Tin Plate Inspection Comp. 9.30 AM - 3.30 PM

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K. Eggers c.c. Chem. Lab.

Source: Dofasco - Main Plant

Date Sampled: Oct. 15/68 by: J.L. (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	IRON AS Fe (by AAS)		Ether Solubles	Phenols in ppb	Phosphate as PO_4	Chloride as Cl	CHROMIUM as Cr.	
		Total	Susp.	Diss.			TOT.	DISS.					HEX	TOT
T-3525	>110**	454	**	**	142	7.2	1.66	0.02	74	6	---	---	---	---
T-3526	> 80 **	456	73	383	98	7.8	1.81	0.0	16	3	---	---	---	---
T-3527	>170**	368	57	311	189	7.9	0.29	0.0	16	35	---	---	---	---
T-3528	>100**	304	44	260	121	7.9	0.64	0.0	12	6	---	---	---	---
T-3529	1200	828	249	579	3250	7.1	13.4	9.6	352	15	---	---	---	---
T-3530	**	208	3	205	16	7.6	0.27	0.0	5	0	---	---	---	---
T-3531	70	548	89	459	140	5.0	133.	0.36	11	12	1.7	43	0.00	0.78

	Kjeldahl as N
T-3531	2.4

> greater than

** Sample exhausted, Test could not be performed.

T-3525	9	M69 manhole Grab 10.30 AM
T-3526	10	Effluent to Depew St. Sewer Grab 11.00 AM
T-3527	11	Annealing & South Cold Rolling to Beach Rd. Grab 11.00 AM
T-3528	12	Guard House to Beach Rd. Grab 11.00 AM
T-3529	17	Oil Reclaim Unit - Main Plant Grab 3.00 PM
T-3530	13	Truck Repair Melt Shop to Beach Rd. - Manhole #101 Grab 11.00 AM
T-3531	14	Ottawa St., Sewer to Bay Grab 11.30 AM

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K. Eggers c.c. Chem. Lab.

Source: Dofasco - Main Plant

Date Sampled: Oct. 15/68 by: P.K. (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	IRON AS Fe		Phenols in ppb	Phosphate as PO_4	Ammonia as N	Kjeldahl as N	Chloride as Cl
		Total	Susp.	Diss.			TOT.	DISS.					
T-3532	* > 32	490	101	389	113	5.5	4.8	0.0	2	2.7	1.7	2.2	46
	Ether Solubles												
				* Sample exhausted - (for ether solubles, please submit a separate 40 oz. sample in future).									
T-3532	15	Raw Water - Untreated Comp. 1.30 - 3.30 pm (hourly)											

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.H. Eggers c.c. Chem. Lab.

Source: Dofasco (Main Plant)

Date Sampled: Oct. 16/68 by: K.H. (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Iron as Fe (by AAS)		Ether Solubles	Phenols in ppb	Total Chromium as Cr		
		Total	Susp.	Diss.			TOT.	DISS.					
T-3557	26	510	59	451	44	6.0	15.6	0.02	3	3	---		
T-3558	90	758	252	506	161	9.2	21.	0.13	44	20	---		
T-3559	16	286	18	268	55	7.3	2.8	0.0	9	400	0.02		
T-3560	26	544	116	428	167	6.6	24.	0.09	1465	4	---		
T-3561	12	492	48	444	30	6.4	9.8	0.13	0	0	---		
T-3562	620	496	256	240	880	6.7	2.36	2.36	196	3	---		

T-3557	1A	Scale Pit, Universal Plate Mill	Composite 9.30 AM - 3.30 PM
T-3558	2A	Cold Rolling Area, Universal Plate Mill	" " "
T-3559	3A	Tin Plate Inspection	" " "
T-3560	4A	Yard, North Soaking, 2 Hi-Hot Mill	" " "
T-3561	5A	South Soaking Pit	" " "
T-3562	16A	Annealing South Cold Rolling Area Oil Recovery	" " "

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton

Report to: K. Eggers

c.c. Chem.Lab. 11

Source: Dofasco, Main Plant

Date Sampled: Oct. 16/68 by: P.K.

ge

Lab. No.	5-Day B.O.D.	Solids			Nitrogen as Kjeldahl	Phosphate as PO_4	Phenols in ppb	Chloride as Cl	pH at Lab.	Tin as Sn	COD	Ether Solubles	
		Total	Susp.	Diss.									
T 3563	55	3518	124	3394	6.0	1.5	25	33	1.2	--	185	3	
T 3564	61	548	90	458	1.2	11.	1000	32	5.0	3.5	119	23	
T 3565	12	470	30	440	3.4	1.5	--	49	5.8	--	38	3	

	Chromium as Cr		Iron as Fe (by A.A.S.)	
	Total	Hex.	Tot.	Diss.
T 3563	--	--	1050.	910.
T 3564	8.5	2.68	14.5	0.36
T 3565	0.08	0.00	12.6	--

T 3563	6A	Pickle Bldg., Cold Rolling, & N.E. Plate Finishing	Comp. 9:30 AM - 3:30 PM
T 3564	7A	Furnace, Foundry, Tin Plate & Cleaning Lines	" " "
T 3565	18	Treated Water	" " "

10M-60-22630

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.Eggers c.c. Chem.Lab.*

Source: Dofasco, Main Plant + Homer St.Plant

Date Sampled: Oct. 16/68 by: P.K.

ge

Lab. No.	5-Day B.O.D.	Solids			Nitrogen as Kjeldahl	Phosphate as PO_4	Chloride as Cl	Tin as Sn	phenols in ppb	Ether Solubles	COD	pH at Lab.	
		Total	Susp.	Diss.									
T 3566	63	592	108	484	--	--	--	4.0	250	28	130	5.7	
T 3567	230	912	458	454	5.0	5.5	41	1.7	40	293	435	3.6	

	IRON AS FE (by A.A.S.) Tot.	Diss.	Chromium as Cr. Total	Hex.
T 3566	16.8	0.36	---	---
T 3567	32.3	1.1	3.5	0.00

T 3566	8A	Electro Tinning Lines	Comp. 9:30 AM - 3:30 PM
T 3567	19	Ottawa Street sewer	(Main Plant Outfall) Comp. 11:00 AM - 3:00 PM

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.Eggers c.c. Chem. Lab.

Source: Dofasco, Main Plant & Homer St. Plant

Date Sampled: Oct. 16/68 by: P,K.

Lab. No.	5-Day B.O.D.	Solids			IRON AS (by A.A.S.)	FE	Phosphate as PO_4	Nitrogen as Kjeldahl	Chloride as Cl	pH at Lab.	Ether Solubles		COD
		Total	Susp.	Diss.	Tot.	Diss.							
T 3568	36	534	123	411	34.6	0.57	3.7	5.0	47	4.5	2		109

T 3568 15A Raw water Comp. 9:30 AM. - 3:30 PM.

5M-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K. Eggers * c.c. Chem. Lab.

Source: Dofasco, Homer Street Plant.

Date Sampled: Oct. 17/68 by: P.K (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	IRON AS Fe. (by AAS)		Ether Solubles	Phenols on Oily layer	Phenols on Aqueous layer		Phenols in ppb
		Total	Susp.	Diss.			Tot.	Diss.					
T-3582	110	1472	116		2000	2.7	216.	80.	268	---	---		0
T-3583	---	**	**		25,000	---	---	---	80 % *	100	40		---
T-3584	95	218	92		540	7.5	14.5	0.0	104	---	---		10
T-3585	780	450	154		1340	6.6	30.2	5.3	604	---	---		12
T-3586	520	718	79		1050	6.0	12.3	1.1	---	---	---		10
T-3587	49	1354	111		259	4.5	87.3	82.	80	---	---		10

	Tin as Sn	Chromium as Cr. Hex.	Chromium as Cr. Tot.
T-3585	---	10.0	14.0
T-3586	0.2	85.	90.
T-3587	---	---	---

** very oily will not dry

* percent by volume

T-3582	20	No. 3 Pickle Line	Comp. 9.30 AM - 3.30 PM
T-3583	21	Batch Anneal	Grab 10.00 AM
T-3584	22	Batch Anneal & Temper Mill	Comp. 9.30 AM - 3.30 PM
T-3585	23	Cold Rolling & General Drainage	Comp. 9.30 AM - 3.30 PM
T-3586	23B	" " " " "	Grab 2.00 PM
T-3587	24	No. 2 Pickle Line	Comp. 9.30 AM - 3.30 PM

SM-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.H. Eggers * c.c. Chem. Lab.

Source: Dofasco, Bay Front Plant

Date Sampled: Oct. 17/68 by: K.H. Eggers (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Iron as Fe		Phenols in ppb	Cyanide as HCN	Sulphide as H_2S	Free Ammonia as N	Ether Solubles
		Total	Susp.	Diss.			Tot.	Diss					
T-3588	170	396	14	382	330	6.8	1.17	0.0	7500	14.4	0.0	40.	3
T-3589	36	1666	1334	332	75	7.2	277.	0.0	8	---	---	---	trace
T-3590	46	402	44	358	89	6.9	10.8	0.0	1250	3.6	0.1	13.	7
T-3591	58.	838	402	436	152	7.2	129.	0.04	---	---	---	---	---

Lab. No.	Chloride as Cl	Phosphate as PO_4	Total Kjeldahl as N
T-3590	73	0.70	15.4
T-3591	---	---	---

T-3588	25	By-Product Coke Plant # 1,2,3, Comp. 9.15 AM - 3.30 PM
T-3589	26	Melt Shop Slurry (Pump House) " " "
T-3590	27	Combined By-Product Coke Plant and Melt Shop Effluent Comp. 9.15 AM - 3.30 PM
T-3591	28	" " " " " " " " Grab 2.00 PM

SM-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.H. Eggers c.c. Chem.Lab.

Source: Dofasco, Bay Front Plant

Date Sampled: Oct. 18/68 by: KH. Eggers ge

Lab. No.	5-Day B.O.D.	Solids			Cyanide as HCN	Sulphide as H_2S	Free Ammonia as N	Ether Solubles	PH at Lab	(by AAS) Iron as Fe		Phenols in ppb	COD
		Total	Susp.	Diss.						Tot.	Diss		
T 3603	72	490	16	474	18.1	0.0	39.	3	8.2	2.88	0.67	5000	371
T 3604	6.0	2320	1998	322	--	--	--	2	9.5	36.3	0.12	15	30
T 3605	26	522	151	371	4.8	0.3	--	2	8.4	52.5	0.12	1250	110
T 3606	2.2	356	9	347	< 0.01	---	---	trace*	8.4	2.87	0.55	6	70

	NITROGEN AS N		Chloride as Cl	Phosphate as PO_4
	Free Ammonia	Total Kjeldahl		
T 3605	13.	13.8	74	0.9
T 3606	3.4	3.6	53	0.42

< less than
* Trace is less than 2 ppm

T 3603	25A	By Product Coke Plant # 1,2,3,	Composite 9:00 AM - 3:30 PM
T 3604	26A	Melt Shop Slurry	" " "
T 3605	27A	Combined by Product Coke Plant and Melt Shop Effluent	" " "
T 3606	29A	Bay Front Pumphouse Raw Bay Service Water	Grab 11:00 AM

5M-60-11403-65

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

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

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

Municipality: Hamilton Report to: K.H. Eggers c.c. Chem.Lab.*

Source: Dofasco, Bay Front Plant

Date Sampled: Oct, 22/68 by: K.H.E.

ge

Lab. No.	5-Day B.O.D.	Solids			IRON AS FE		Ether Solubles	Phenols in ppb	COD	pH at Lab.			
		Total	Susp.	Diss.	Tot.	Diss.							
T 3556	16	458	95	363	4.4	0.18	3	12	48	8.4			

T 3556 34A South Lagoon Influent Composite at 9:15 AM- 4:00 PM

5M-60-11403-65