# EFFLUENT LOADINGS FROM SELECTED INDUSTRIES INTO THE GREAT LAKES: IRON AND STEEL PLANTS, PULP AND PAPER MILLS, CHEMICAL MANUFACTURERS, PETROLEUM REFINERS, FOUNDRIES, AND ELECTROPLATERS

FINAL REPORT

February 1984

EPA Contract No. 68-01-6700

Whitescarver Associates Inc.

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# I. INTRODUCTION

## A. Objective and Scope of Survey

The objective of this survey is to document the estimated reduction from 1967 to 1982 of certain pollutants of concern in the effluents of selected major industries that are located in EPA Region V, and discharge either into, or into tributaries of the Great Lakes. The scope of the survey is limited to only those industries located in EPA's Region V States (i.e., Michigan, Wisconsin, Illinois, Indiana, Ohio, and Minnesota) The survey only includes effluents that discharge directly (i.e., those dischargers with NPDES permits) into Lake Michigan, Lake Superior, Lake Huron, Lake St. Clair (including the St. Clair and Detroit Rivers), and the western half of Lake Erie. The survey's purpose is to support the region's documentation of the progress in reducing industrial waste loads, to assess the cost to industry, and to determine water quality improvements. Discharges from Canada and discharges into Lake Ontario and the eastern half of Lake Erie (i.e., discharges from facilities in New York and Pennsylvania) were not included in the survey.

The sources of data for the survey included (1) EPA Effluent Guidelines Division (EGD) data bases and Development Documents, (2) EPA Water Planning and Standards Division Economic Impact Analysis Reports,(3) EPA STORET system data base, (4) EPA Industrial Facilities Discharge (IFD) files, (5) International Joint Commission publications, and (6) EPA Region V and State information. Effluent data were collected for three time periods: 1968, 1976, and 1982. The treatment costs to industry in achieving these effluent loading reductions are reported where data were available from EGD sources.

This survey was performed in two independent phases. The Phase 1 report included the two most significant industrial categories; Iron and Steel Manufacturing, and Pulp, Paper, and Paperboard Manufacturing. Four major industrial categories identified for study in Phase 2 included (1) Organic and Inorganic Chemical Manufacturing, (2) Petroleum Refining, (3) Ferrous and Nonferrous Foundries, and (4) Electroplating. This report presents the results of the survey for all six industrial categories.

## B. Industrial Categories Included in Phase 1 and 2 Surveys

The following six major industries were surveyed as categorized by Standard Industrial Classification (SIC) codes:

1. Iron and Steel Manufacturing (Phase 1)

   SIC 3312 - Blast Furnaces (including coke ovens)
   - Steel Works
   - Rolling Mills

   SIC 3313 - Electrometallurgical Products
   SIC 3315 - Steel Wire Drawing
   SIC 3316 - Cold Rolled Steel Sheets, Strips, and Bars
   SIC 3317 - Steel Pipe and Tubes

2. Pulp, Paper, and Paperboard Manufacturing (Phase 1)

SIC 2611 - Pulp Mills
SIC 2621 - Paper Mills (except building paper mills)
SIC 2631 - Paperboard Mills
SIC 2641 - Paper Coating and Glazing Mills
SIC 2661 - Building Paper and Building Board Mills

3. Organic and Inorganic Chemicals (Phase 2)

SIC 2812 - Alkalies and Chlorine
SIC 2813 - Industrial Gases
SIC 2816 - Inorganic Pigments
SIC 2819 - Industrial Inorganic Chemicals
SIC 2865 - Cyclic Crudes, Dyes, and Organic Pigments
SIC 2869 - Industrial Organic Chemicals

4. Petroleum Refining (Phase 2)

SIC 2911 - Petroleum Refineries

5. Ferrous and Nonferrous Foundries (Phase 2)

SIC 3321 - Gray Iron Foundries
SIC 3322 - Malleable Iron Foundries
SIC 3324 - Steel Investment Foundries
SIC 3325 - Steel Foundries
SIC 3361 - Aluminum Foundries
SIC 3362 - Brass, Bronze, and Copper Foundries
SIC 3369 - Nonferrous Foundries

6. Electroplating (Phase 2)

SIC 3471 - Electroplating, Polishing, Anodizing, and Coating

C. Drainage Basins Used in the Survey

Each drainage basin connected to the Great Lakes was categorized using the U.S. Water Resources Council (WRC) accounting units since these are used in the EPA STORET and Industrial Facilities Discharge (IFD) Files. The smaller cataloguing units were not used since such level of subdivision was not required in the survey. The effluent loadings from each facility are presented and totaled to show the pollutant loadings to each of the Great Lakes (excluding Lake Ontario and the eastern half of Lake Erie). The following WRC accounting units presented by lake as shown in Figure 1 were used in the survey.

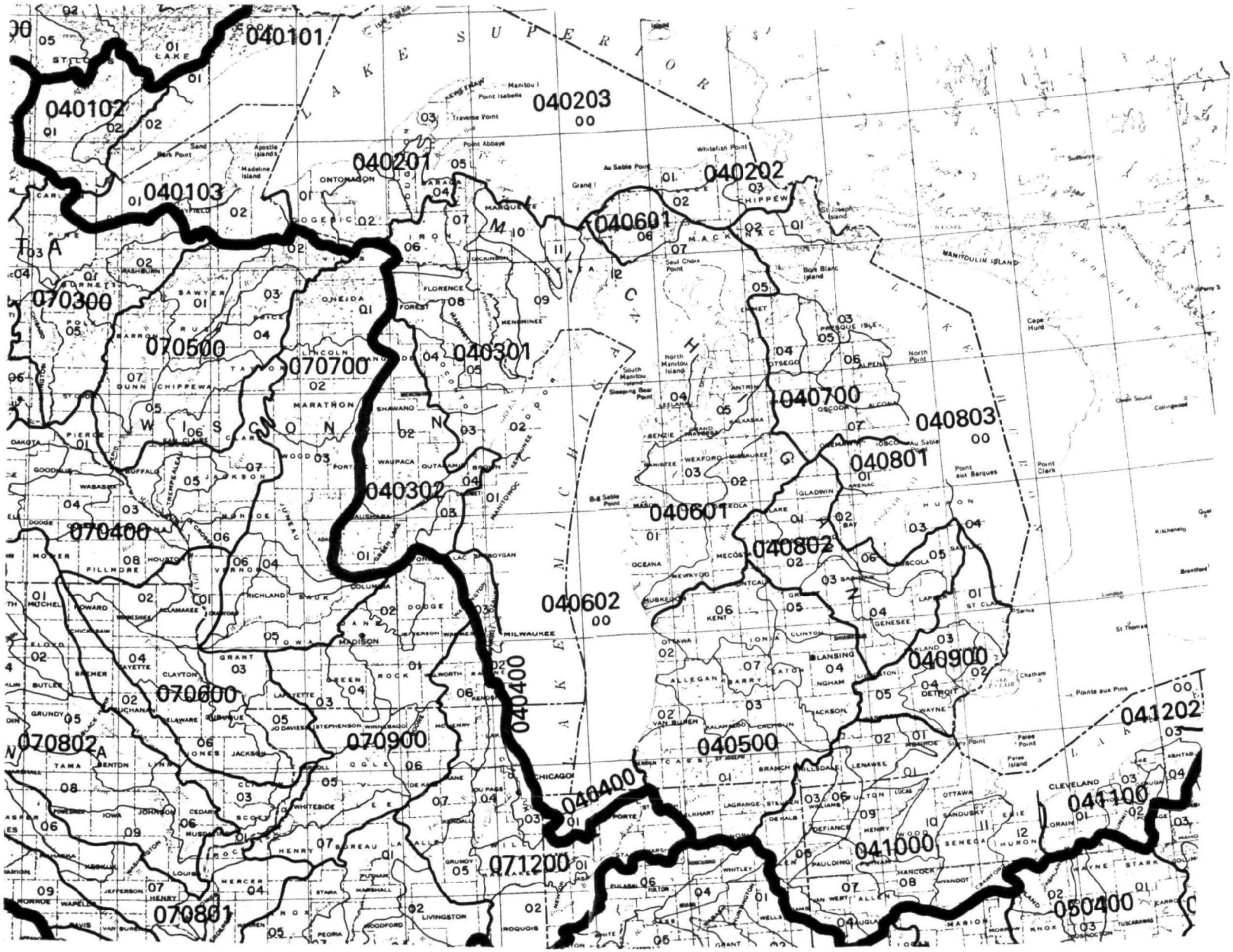



Figure 1
WRC Accounting Units (Basins)

Lake Superior

040101
040102
040103
040201
040202

Lake Michigan

040301
040302
040400
040500
040601

Lake Huron

040700
040801
040802

Lake St. Clair (includes St. Clair and Detroit Rivers)

040900

Lake Erie (western half)

041000
041100

D. Effluent Parameters Included in the Survey

This selection of effluent parameters to be considered was dictated mainly by the extent of the data bases used. For the iron and steel industries, complete data were generally available for (1) total suspended solids (TSS), (2) oil and grease, and (3) flow for the entire time period (1967-1982). Adequate data for comparison were also available for (1) ammonia, (2) cyanide, and (3) phenols for most of the time period. Data were also available for total metals and total organic pollutants. These data are adequate for comparison purposes even though they were derived from calculations based on technical assumptions.

For the pulp and paper industries only data for (1) total suspended solids (TSS), (2) biochemical oxygen demand (BOD), and (3) flow were consistently available. Other data were recorded for (1) zinc, (2) oil and grease, (3) phenols, (4) sulfate, and (5) phosphate but were not extensive enough for comparison purposes.

For the chemical manufacturers, data were generally available for (1) flow, (2) total suspended solids (TSS), (3) biochemical oxygen demand (BOD), (4) chemical oxygen demand (COD), (5) chloride, (6) ammonia, and (7) total phosphorus.

For the petroleum refineries, data were generally available for (1) flow, (2) TSS, (3) BOD, (4) COD, (5) phenols, (6) ammonia, and (7) oil and grease (O&G).

For both the foundries and electroplaters, some data were available for (1) flow, (2) TSS, (3) COD, (4) oil and grease, (5) ammonia, (6) total phosphorus, and (7) total metals.

It should be noted that complete data for all parameters for each facility were not available for all of facilities within an industrial category.

## E. Data Bases Used in the Survey

Several computerized data bases and literature references were used in this survey. The following six data sources were used most extensively for the collection of information:

1. EPA Effluent Guidelines Division (EGD) data bases and Development Documents used for technical support for the appropriate effluent guidelines. Data used include flow, pollutant loadings, plant production, raw waste loads, effluent limitations, and treatment costs for the period from 1974 through 1980.

2. EPA Water Planning and Standards Division Economic Analysis Impact Reports. Main references are the reports Economic Analysis of Proposed Effluent Limitations and Standards for the Foundry Industry (November 1982), and Economic Analysis of the Proposed Effluent Limitations and Standards for the Petroleum Refining Industry (November 1982)

3. EPA STORET System data. Data used include industrial discharge flows by pipe, pollutant concentrations and loadings, and permit limits for the period from 1980 through 1982 from discharge monitoring reports (DMRs).

4. EPA Industrial Facilities Discharge (IFD) files. Data used include industry identification by WRC accounting units, SIC codes, and States.

5. International Joint Commission (IJC), Great Lakes Regional Office publications. Main references are the reports Tne Response of the Pulp and Paper Paper Industry in the Great Lakes Basin to Pollution Abatement Programs (October 1981); A Review of the Pollution Abatement Programs Relating to the Petroleum Refinery Industry in the Great Lakes Basin (November 1982); Inventory of Major Municipal and Industrial Point Source Discharges in the Great Lakes Basin (July 1979); and Remedial Programs Subcommittee Report of Great Lakes Water Quality (July 1978).

6. Data from the States of Indiana, Michigan, Wisconsin, Ohio, and Minnesota from industrial wastewater surveys, monitoring investigations, permit applications, and discharge monitoring reports (DMRs).

In some cases, data for each specific time period (i.e., 1968, 1976, and 1982) were not consistently available, especially for foundries and electroplaters. Available data were used within a narrow range of years for each time period. For example, if the earliest data found were for years 1967 through 1971, they were used for the early time period (i.e., designated as 1968). Data for the 1976 mid-point period ranged between 1975 and 1978 and data for 1982 were from 1981 and 1983 in some cases. For some of the foundries and electroplating facilities, data were only available for the early period (i.e., 1968) and the most recent period (i.e., 1982), and not for the mid-1970's.

In many cases data for each time period, especially 1968 and 1976, represent a single reference point and not a statistically representative daily

average derived from a large population. Therefore a great degree of variability may be found between these data presented and that from other sources.

F. Data Estimation Methods

Effluent loading data were not available for all of the facilities for all parameters of interest. For the 1968 period, data for 32 of the total 197 facilities (26 percent) had to be estimated. For the 1976 period, data for 21 of the 184 facilities (11 percent) had to be estimated. In both cases, data for foundries and electroplaters represent the majority of the unavailable data. For the 1982 period no data had to be estimated for the 170 facilities and all values represent actual effluent loadings.

Data were estimated by one of two methods or by comparison of the two methods as stated below:

1. The mean value for any one parameter in pounds per million gallons (lbs/mg) was calculated from the other facilities' data within the same industrial category for the same time period. This mean value (e.g., 171 lbs of TSS per MG) was then multiplied by the flow in MGD to estimate parameter loading for each facility which only had flow data.

2. In some cases where data on flow and some of the parameters (i.e., TSS) were available, values for other parameters were estimated by using the percent reduction of TSS as the same reduction of other parameters (i.e., COD). For example, if TSS from 1968 to 1976 showed a 45% reduction, it was assumed that COD also showed a 45% reduction.

These methods of data estimation may produce slightly inaccurate loading valves for each time period, especially for 1968, but the percent reductions should not be affected since the same methods were used for each of the two time periods of concern (i.e., 1968 and 1976). In all cases, facilities for which data were estimated are noted in the effluent loading tables.

## II. SUMMARY OF SURVEY RESULTS

This section presents the results of the survey for all six industrial categories. Sections 3 through 8 present the detailed results for each facility for each year. The effluent flows and parameter loadings (daily averages), the calculated equivalent concentrations in mg/l, and the overall percent reductions are presented for each year in this section.

### A. Effluent Loadings

Table 1 presents the total flow in mgd and effluent loadings in lbs/day for 11 parameters for each of the six industrial categories for the three periods. The totals for all six industrial categories are also presented. These totals should not be considered to include all possible loadings for each of the 11 parameters since data for certain parameters were not available for each category and therefore are not presented (i.e., shown as blanks in the table).

### B. Equivalent Concentrations

Table 2 presents the calculated equivalent effluent concentrations in mg/l for each industrial category. These concentrations better reflect the history of regulatory control of effluent discharges since they do not incorporate effluent reductions due to facility shutdown or production decreases, discharge to POTW, or non-process discharges caused by economic situations, business decisions, or other factors. It should be noted that the concentration for one paramenter, oil and grease, for electroplaters increased from 3.81 mg/l to 5.58 mg/l.

### C. Percent Reductions

Table 3 presents the calculated percent reductions for both effluent loadings in lbs/day and equilvalent concentrations in mg/l. These percent reduction values are very similar to values reported by IJC for selected industries (i.e., iron and steel, pulp and paper, and petroleum refining). It should be noted that the concentrations for oil and grease show an increase for the electroplating category as noted in the table.

TABLE 1: EFFLUENT LOADINGS SUMMARY (lbs/day)

| PERIOD | NO. OF PLANTS | FLOW (mgd) | CHLORIDE | BOD | TSS | PHOS. | O&G | METALS | COD | AMMONIA | ORGANICS | PHENOLS | CYANIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRON AND STEEL PLANTS | | | | | | | | | | | | | |
| 1968 | 23 | 2,694 | | | 643,391 | | 174,996 | 21,288 | | 38,048 | 8,477 | 16,145 | 4,875 |
| 1976 | 15 | 2,418 | | | 213,968 | | 103,009 | 14,535 | | 23,635 | 4,104 | 4,678 | 3,660 |
| 1982 | 15 | 1,641 | | | 163,895 | | 45,941 | 9,356 | | 15,574 | 809 | 167 | 562 |
| PULP AND PAPER MILLS | | | | | | | | | | | | | |
| 1967 | 39 | 295 | | 974,178 | 830,654 | | | | | | | | |
| 1977 | 39 | 276 | | 188,520 | 170,436 | | | | | | | | |
| 1982 | 35 | 158 | | 63,207 | 72,061 | | | | | | | | |
| CHEMICAL MANUFACTURERS | | | | | | | | | | | | | |
| 1968 | 38 | 432 | 3,325,702 | 26,445 | 284,346 | 927 | | | 204,628 | 18,393 | | | |
| 1976 | 38 | 392 | 2,140,319 | 15,645 | 50,050 | 915 | | | 115,510 | 12,822 | | | |
| 1982 | 34 | 328 | 513,178 | 6,669 | 31,697 | 152 | | | 42,491 | 3,950 | | | |
| PETROLEUM REFINERIES | | | | | | | | | | | | | |
| 1968 | 16 | 456 | | 85,961 | 61,116 | | 16,860 | | 187,786 | 13,944 | | 1,878 | |
| 1976 | 13 | 258 | | 9,187 | 13,287 | | 3,700 | | 26,452 | 3,417 | | 64 | |
| 1982 | 9 | 156 | | 3,255 | 3,338 | | 1,052 | | 18,872 | 834 | | 51 | |
| FOUNDRIES | | | | | | | | | | | | | |
| 1968 | 56 | 88 | | | 52,585 | 373 | 6,864 | 2,133 | 60,782 | 9,645 | | | |
| 1976 | 56 | 86 | | | 12,510 | 99 | 3,235 | 622 | 14,182 | 2,501 | | | |
| 1982 | 56 | 68 | | | 10,568 | 97 | 674 | 60 | 4,968 | 704 | | | |
| ELECTROPLATERS | | | | | | | | | | | | | |
| 1968 | 25 | 5.63 | | | 8,988 | 184 | 179 | 173 | 1,064 | 26 | | | |
| 1976 | 23 | 3.44 | | | 224 | 14 | 149 | 28 | 133 | 17 | | | |
| 1982 | 21 | 2.97 | | | 263 | 4 | 160 | 10 | 62 | 13 | | | |
| ALL SIX INDUSTRIAL CATEGORIES | | | | | | | | | | | | | |
| 1968 | 197 | 3,971 | 3,325,702 | 1,086,584 | 1,881,080 | 1,484 | 198,899 | 23,594 | 454,260 | 80,056 | 8,477 | 18,023 | 4,875 |
| 1976 | 184 | 3,433 | 2,140,319 | 213,352 | 460,475 | 1,028 | 110,093 | 15,185 | 156,277 | 42,392 | 4,104 | 4,742 | 3,660 |
| 1982 | 170 | 2,354 | 513,178 | 73,131 | 281,822 | 253 | 47,827 | 9,426 | 66,393 | 21,075 | 809 | 218 | 562 |

TABLE 2: EQUIVALENT EFFLUENT CONCENTRATIONS SUMMARY (mg/l)

| PERIOD | NO. OF PLANTS | FLOW (mgd) | CHLORIDE | BOD | TSS | PHOS. | O&G | METALS | COD | AMMONIA | ORGANICS | PHENOLS | CYANIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRON AND STEEL PLANTS | | | | | | | | | | | | | |
| 1968 | 23 | 2,694 | | | 28.64 | | 7.79 | .95 | | 1.69 | .38 | .72 | .22 |
| 1976 | 15 | 2,418 | | | 10.61 | | 5.11 | .72 | | 1.17 | .20 | .23 | .18 |
| 1982 | 15 | 1,641 | | | 11.98 | | 3.36 | .68 | | 1.14 | .06 | .01 | .04 |
| PULP AND PAPER MILLS | | | | | | | | | | | | | |
| 1967 | 39 | 295 | | 395.96 | 337.62 | | | | | | | | |
| 1977 | 39 | 276 | | 81.90 | 74.04 | | | | | | | | |
| 1982 | 35 | 158 | | 47.97 | 54.69 | | | | | | | | |
| CHEMICAL MANUFACTURERS | | | | | | | | | | | | | |
| 1968 | 38 | 432 | 923.07 | 7.34 | 78.92 | .26 | | | 56.80 | 5.11 | | | |
| 1976 | 38 | 392 | 654.68 | 4.79 | 15.31 | .28 | | | 35.33 | 3.92 | | | |
| 1982 | 34 | 328 | 187.60 | 2.44 | 11.59 | .06 | | | 15.53 | 1.44 | | | |
| PETROLEUM REFINERIES | | | | | | | | | | | | | |
| 1968 | 16 | 456 | | 22.60 | 16.07 | | 4.43 | | 49.38 | 3.67 | | .49 | |
| 1976 | 13 | 258 | | 4.27 | 6.18 | | 1.72 | | 12.29 | 1.59 | | .03 | |
| 1982 | 9 | 156 | | 2.50 | 2.57 | | .81 | | 14.51 | .64 | | .04 | |
| FOUNDRIES | | | | | | | | | | | | | |
| 1968 | 56 | 88 | | | 71.65 | .51 | 9.35 | 2.91 | 82.82 | 13.14 | | | |
| 1976 | 56 | 86 | | | 17.44 | .14 | 4.51 | .87 | 19.77 | 3.49 | | | |
| 1982 | 56 | 68 | | | 18.63 | .17 | 1.19 | .11 | 8.76 | 1.24 | | | |
| ELECTROPLATERS | | | | | | | | | | | | | |
| 1968 | 25 | 5.63 | | | 191.42 | 3.92 | 3.81 | 3.68 | 22.66 | .55 | | | |
| 1976 | 23 | 3.44 | | | 7.81 | .49 | 5.19 | .98 | 4.64 | .59 | | | |
| 1982 | 21 | 2.97 | | | 10.62 | .16 | 5.58 | .40 | 2.50 | .52 | | | |

TABLE 3: PERCENT REDUCTIONS FOR LOADINGS AND CONCENTRATIONS FROM 1968 TO 1982

| | FLOW (mgd) | CHLORIDE | BOD | TSS | PHOS. | O&G | METALS | COD | AMMONIA | ORGANICS | PHENOLS | CYANIDE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IRON AND STEEL PLANTS** | | | | | | | | | | | | |
| Loading | 39% | | | 75% | | 74% | 56% | | 59% | 90% | 99% | 88% |
| Concentration | -- | | | 58% | | 57% | 28% | | 33% | 84% | 99% | 82% |
| **PULP AND PAPER MILLS** | | | | | | | | | | | | |
| Loading | 46% | | 94% | 91% | | | | | | | | |
| Concentration | -- | | 87% | 84% | | | | | | | | |
| **CHEMICAL MANUFACTURERS** | | | | | | | | | | | | |
| Loading | 24% | 85% | 75% | 89% | 70% | | | 79% | 79% | | | |
| Concentration | -- | 80% | 67% | 85% | 77% | | | 73% | 72% | | | |
| **PETROLEUM REFINERIES** | | | | | | | | | | | | |
| Loading | 66% | | 96% | 95% | | 94% | | 90% | 94% | | 97% | |
| Concentration | -- | | 89% | 84% | | 82% | | 71% | 83% | | 92% | |
| **FOUNDRIES** | | | | | | | | | | | | |
| Loading | 23% | | | 80% | 74% | 90% | 97% | 92% | 93% | | | |
| Concentration | -- | | | 74% | 67% | 87% | 96% | 89% | 91% | | | |
| **ELECTROPLATERS** | | | | | | | | | | | | |
| Loading | 47% | | | 97% | 98% | 11% | 94% | 94% | 50% | | | |
| Concentration | -- | | | 94% | 96% | * | 89% | 89% | 5% | | | |
| **ALL SIX INDUSTRIAL CATEGORIES** | | | | | | | | | | | | |
| Loading | 41% | 85% | 93% | 85% | 83% | 76% | 60% | 85% | 74% | 90% | 99% | 88% |

(*) denotes negative reductions or percent increase

## III. IRON AND STEEL MANUFACTURING

### A. Plants Included in the Survey

Twenty-three (23) major iron and steel manufacturing plants located in the Region V Great Lakes drainage area were identified. All 23 plants have at sometime discharged process wastewater directly to the Great Lakes. Of these 23 plants, 4 currently discharge only to municipal wastewater treatment systems (POTW). Four other plants have shutdown (one since 1976 and three since 1968).

Table 4 lists the 23 major iron and steel manufacturing plants used in the survey by lake basin. The discharge status for each plant for each time period (i.e., 1968, 1976, and 1982) is presented.

### B. Survey Methods

The Iron and Steel Manufacturing plants were identified from the EPA's IFD file plant listings and cross-referenced with the EPA EGD plant inventory in the Final Development Document for Iron and Steel Manufacturing. The IFD file was found to be more complete since EGD did not include all plants in their inventory (21 of the 23 plants). Therefore, the list of plants from the IFD file was used as the basis for identifying plants to include in the survey. Each plant was identified by SIC code and WRC accounting unit based on information in the IFD file.

The flow and effluent loading data for each plant for 1968 were derived from the 1976 EGD data for 8 subcategories as presented in the six volumes of the Final Development Document. The following steps and assumptions were made in relating the 1976 data to the 1968 time period.

1. Production data in tons per day (TPD) for 1968 were assumed to be similar to production data for 1976.

2. Flow values in gallons per ton (GPT) for 1968 were assumed to be similar to the 1976 time period.

3. Flow rates in MGD were calculated using TPD x GPT/1,000,000 = MGD.

4. The appropriate 1968 treatment level for each plant for each subcategory was identified.

5. The appropriate discharge concentration (mg/l) for each treatment level was identified from Table 5.

6. The flow (MGD) multiplied by the concentration (mg/l) times the 8.34 conversion factor equaled loading (lbs/day).

7. The subcatagory totals for each parameter were then added together for each plant.

The calculated values were compared with actual loading values from State and IJC references, where available.

TABLE 4: MAJOR IRON AND STEEL MANUFACTURING PLANTS (SIC 3312 - 3317)

| LAKE SUPERIOR | 1968 | 1976 | 1982 |
|---|---|---|---|
| BASIN 40102 | | | |
| 1. U.S. Steel Corporation - Duluth, MN | Direct | Closed | Closed |
| **LAKE MICHIGAN** | | | |
| BASIN 40400 | | | |
| 1. Environdyne/Wisconsin Steel Corp. - Chicago, IL | Direct | POTW | Closed |
| 2. Interlake/Chicago Furnace - Chicago, IL | Direct | POTW | POTW |
| 3. U.S. Steel Corporation/South Chicago Works - Chicago, IL | Direct | Zero/POTW | Zero/POTW |
| 4. Inland Steel - Indiana Harbor - E. Chicago, IN | Direct/POTW | Direct/POTW | Direct/POTW |
| 5. Bethlehem Steel Corporation - Chesterton, IN | Direct | Direct/Well | Direct/Well |
| 6. Jones and Laughlin Steel Corporation - E. Chicago, IN | Direct/POTW | Direct/POTW | Direct/POTW |
| 7. U.S. Steel Corporation/Gary Works - Gary, IN | Direct | Direct | Direct |
| 8. Republic Steel Corporation - Chicago, IL | Direct | POTW | POTW |
| 9. U.S. Steel Corporation - Waukegan, IL | Direct/POTW | Closed | Closed |
| 10. National Steel Corporation - Portage, IN | Direct | Direct | Direct |
| **LAKE ST. CLAIR** | | | |
| BASIN 40900 | | | |
| 1. National (Great Lakes) Steel Corporation - Ecorse, MI | Direct | Direct | Direct |
| 2. McLouth Steel Products - Trenton, MI | Direct | Direct | Direct |
| 3. Rouge Steel (Ford) Company - Dearborn, MI | Direct | Direct/POTW | Direct/POTW |
| 4. McLouth Steel Products - Gibraltar, MI | Direct | Direct | Direct |
| 5. National (Great Lakes) Steel Corporation - Zug Island, MI | Direct | Direct | Direct/POTW |
| 6. National (Great Lakes) Steel Corporation - (80" Mill), River Rouge, MI | Direct | Direct | Direct |
| **LAKE ERIE** | | | |
| BASIN 41100 | | | |
| 1. Jones and Laughlin Steel Corporation - Cleveland, OH | Direct | Direct | Direct |
| 2. Republic Steel Corporation - Cleveland, OH | Direct | Direct | Direct |
| 3. U.S. Steel Corporation - Lorain, OH | Direct | Direct | Direct* |
| 4. U.S. Steel Corporation - Cuyahoga, OH | Direct | Direct | Direct |
| 5. U.S. Steel Corporation/Central Furnace - Cleveland, OH | Direct | Closed | Closed |
| 6. Interlake Steel Company - Toledo, OH | Direct | POTW | POTW |

* Coke Plant Closed November 1983

TABLE 5: Iron and Steel Discharge Concentrations for Different Treatment Levels (mg/l)

| COKEMAKING | Raw Waste | Dirty Water Quench | BPT | BAT |
|---|---|---|---|---|
| Flow (GPT) | 162 | 5 | 225 | 153 |
| TSS | 50 | 50 | 100 | 66 |
| O&G | 75 | 75 | 15 | 5 |
| Ammonia | 600 | 600 | 100 | 7 |
| Cyanide | 50 | 50 | 16 | 3 |
| Phenols | 300 | 300 | 36 | 0.02 |
| Total Organics | 113.6 | 113.6 | 26.75 | 0.515 |
| Total Metals | 2.6 | 2.6 | 1.5 | 0.7 |

| SINTERING | Once-Through Clarification | BPT | BAT |
|---|---|---|---|
| Flow (GPT) | 1460 | 120 | 120 |
| TSS | 39 | 39 | 39 |
| O&G | 7 | 7 | 7 |
| Ammonia | 6 | 7 | 7 |
| Cyanide | 0.2 | 0.2 | 0.2 |
| Phenols | 0.2 | 0.2 | 0.2 |
| Total Organics | 0.03 | 0.03 | 0.03 |
| Total Metals | 1.22 | 1.27 | 0.455 |

| IRON MAKING | Once-Through Clarification | BPT | BAT |
|---|---|---|---|
| Flow (GPT) | 3200 | 125 | 70 |
| TSS | 50 | 42 | 22 |
| Ammonia | 20 | 60 | 6 |
| Cyanide | 4 | 4 | 0.03 |
| Phenols | 2.3 | 2.3 | 0.01 |
| Total Organics | 0.16 | 0.16 | 0.16 |
| Total Metals | 15.0 | 15.0 | 0.455 |

| STEEL MAKING | Once-Through Clarification | BPT | BAT |
|---|---|---|---|
| BOF | | | |
| Flow (GPT) | 50-1100 | 50-1100 | 50-1100 |
| TSS | 36-50 | 36-38 | 22 |
| Total Metals | 1.78-2.24 | 1.78-1.88 | 0.25 |
| ARC | | | |
| Flow (GPT) | 2100 | 110 | 110 |
| TSS | 47 | 47 | 22 |
| Total Metals | 25.97 | 25.97 | 1.5 |

| CONTINUOUS CASTING | Once-Through Clarification | BPT | BAT |
|---|---|---|---|
| Flow (GPT) | 3400 | 125 | 25 |
| TSS | 40 | 25 | 25 |
| O&G | 10 | 10 | 10 |
| Total Metals | 1.62 | 1.62 | 1.31 |

| HOT FORMING | Once-Through Scale Pit | Once-Through Clarification | BPT | BAT |
|---|---|---|---|---|
| Flow (GPT) | Flows from Development Document | | | |
| TSS | 75 | 40 | 15 | 15 |
| O&G | 25 | 15 | 5 | 5 |
| Total Metals | 0.50 | 0.148 | 0.074 | 0.074 |

FINISHING

Average concentrations and discharge flows for each plant in Development Document.

The 1976 flow values and effluent loadings were derived from the actual 1976 production levels and effluent loading values for each plant as presented in the Development Document. The same calculation process was used as described above but different treatment levels were identified based on Regional and State information. Calculated values were compared with EGD and State effluent loading values to verify accuracy where data were available.

The data for the 1982 time period were calculated from the monthly loading values for each pipe for each plant in the STORET data base. The actual effluent loading values for each month were averaged over the one year period. In some cases where only effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x 8.34
(conversion factor)

The 1982 data is presented without modification (except for gross and obvious entry errors) from the STORET computer printouts. The 1982 loading values for total metals and organics were calculated in a similar manner to the values for 1968 and 1976 since no consistent effluent data for those parameters were found in the STORET data base.

## C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1968, 1976, and 1982) and presents the data by plant and lake basin. The following parameters are presented: flow (mgd), TSS, oil and grease, ammonia, total phenolics, total cyanide, total organics, and total metals (mainly iron).

Table 6 presents the estimated 1968 effluent loadings for 23 plants.

Table 7 presents the actual 1976 effluent loadings data for 15 plants based on EGD and State information.

Table 8 presents the most recent data from the STORET data base for 15 plants which includes monthly values from 1980 through 1982. Graphs showing pollutant loadings by time period are included in the Appendix.

## D. Cost of Effluent Reductions

The capital costs for each iron and steel manufacturing plant were derived from the EGD cost summaries for both BPT and BAT levels of effluent reduction. These costs include cost of in-place facilities and additional required costs as of July 1, 1981 needed to meet the appropriate effluent limitations for TSS, oil and grease, phenolics, ammonia, and cyanide and other regulated parameters. The capital costs do not include annual maintenance costs.

The capital cost summary is presented in Table 9 by WRC accounting unit. Data were available for only 17 plants in the Great Lakes area from the EGD cost

TABLE 6: EFFLUENT LOADINGS FROM IRON AND STEEL PLANTS IN 1968 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | O&G | Ammonia | Cyanide | Phenols | Total Organics | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40102 | U.S. Steel Corporation - Duluth, MN | .34 | 142 | 212 | 1,698 | 142 | 849 | 321 | 7 |
| | SUBTOTAL | .34 | 142 | 212 | 1,698 | 142 | 849 | 321 | 7 |
| LAKE MICHIGAN | | | | | | | | | |
| Basin 40400 | Environdyne/Wisconsin Steel - Chicago, IL | 18.10 | 9,870 | 2,824 | 1,824 | 214 | 2,410 | 231 | 506 |
| | Interlake/Chicago Furnance - Chicago, IL | 3.17 | 1,302 | 1,002 | 8,148 | 706 | 3,981 | 1,500 | 207 |
| | U.S. Steel/Chicago Works - Chicago, IL | 28.01 | 13,796 | 2,237 | 178 | 36 | 21 | 1 | 1,415 |
| | Inland Steel - Indiana Harbor, IN | 975.60 | 127,363 | 37,194 | 3,562 | 372 | 639 | 904 | 6,021 |
| | Bethlehem Steel - Chesterton, IN | 141.06 | 17,649 | 5,882 | 154 | 31 | 176 | 582 | 87 |
| | Jones and Laughlin Steel - E. Chicago, IN | 324.90 | 74,347 | 15,715 | 969 | 181 | 191 | 92 | 1,436 |
| | U.S. Steel/Gary Works - Gary, IN | 766.60 | 237,578 | 62,103 | 377 | 399 | 91 | 1,432 | 3,660 |
| | Republic Steel - Chicago, IL | .88 | 450 | 163 | 10 | 16 | 92 | 1 | 62 |
| | U.S. Steel Corporation - Waukegan, IL | 30.32 | 9,771 | 3,624 | 34 | 7 | 38 | 125 | 306 |
| | National Steel Corp. - Portage, IN | 25.59 | 4,356 | 1,245 | 28 | 6 | 32 | 106 | 259 |
| | SUBTOTAL | 2,314.23 | 496,482 | 131,989 | 15,284 | 1,968 | 7,671 | 4,974 | 13,959 |
| LAKE ST. CLAIR | | | | | | | | | |
| Basin 40900 | National Steel Co. - Ecorse, MI | 50.13 | 9,407 | 3,135 | 55 | 11 | 63 | 207 | 46 |
| | National Steel Co. - Zug Island, MI | 22.44 | 9,358 | 526 | 7,809 | 1,072 | 2,517 | 825 | 2,720 |
| | National Steel Co. - River Rouge, MI | 58.19 | 36,398 | 12,133 | 64 | 15 | 72 | 240 | 243 |
| | McLouth Steel - Trenton, MI | 50.39 | 17,757 | 4,798 | 55 | 11 | 63 | 1 | 598 |
| | McLouth Steel - Gibraltar, MI | 7.35 | 1,929 | 630 | 12 | 4 | 11 | 30 | 243 |
| | Ford Motor Company - Dearborn, MI | 81.59 | 18,461 | 4,060 | 3,299 | 619 | 626 | 288 | 1,790 |
| | SUBTOTAL | 270.09 | 93,310 | 25,282 | 11,294 | 1,732 | 3,352 | 1,591 | 5,640 |
| LAKE ERIE | | | | | | | | | |
| Basin 41100 | Jones and Laughlin Steel - Cleveland, OH | 8.82 | 5,113 | 1,449 | 203 | 41 | 23 | 2 | 309 |
| | Republic Steel - Cleveland, OH | 54.42 | 32,942 | 10,396 | 1,782 | 241 | 592 | 196 | 804 |
| | Interlake Steel - Toledo, OH | 1.67 | 697 | 613 | 5,017 | 432 | 2,464 | 929 | 107 |
| | U.S. Steel Corporation - Lorain, OH | 33.09 | 12,669 | 4,321 | 2,360 | 210 | 1,138 | 427 | 157 |
| | U.S. Steel Corporation - Cuyahoga, OH | 8.27 | 1,035 | 345 | 10 | 29 | 10 | 34 | 5 |
| | U.S. Steel Corporation - Cleveland, OH | 2.40 | 1,001 | 389 | 400 | 80 | 46 | 3 | 300 |
| | SUBTOTAL | 109.27 | 53,457 | 17,513 | 9,772 | 1,033 | 4,273 | 1,591 | 1,682 |
| | 1968 TOTAL | 2,693.93 | 643,391 | 174,996 | 38,048 | 4,875 | 16,145 | 8,477 | 21,288 |

TABLE 7: EFFLUENT LOADINGS FROM IRON AND STEEL PLANTS IN 1976 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | O&G | Ammonia | Cyanide | Phenols | Total Organics | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40400 | Inland Steel - Indiana Harbor, IN | 990.75 | 38,390 | 11,622 | 2,869 | 1,211 | 166 | 904 | 6,021 |
| | Bethlehem Steel - Chesterton, IN | 145.56 | 18,553 | 5,954 | 222 | 13 | 8 | 2 | 149 |
| | Jones and Laughlin Steel - E. Chicago, IN | 274.24 | 36,231 | 11,545 | 2,408 | 293 | 166 | 93 | 663 |
| | U.S. Steel/Gary Works - Gary, IN | 607.66 | 36,682 | 51,239 | 2,156 | 110 | 26 | 1,432 | 1,169 |
| | National Steel Corp. - Portage, IN | 25.59 | 2,505 | 251 | 24 | 4 | 15 | 52 | 184 |
| | SUBTOTAL | 2,043.80 | 132,361 | 80,611 | 7,679 | 1,631 | 381 | 2,483 | 8,186 |
| LAKE ST. CLAIR | | | | | | | | | |
| Basin 40900 | National Steel Co. - Ecorse, MI | 50.13 | 9,407 | 3,135 | 47 | 8 | 28 | 102 | 46 |
| | National Steel Co. - Zug Island, MI | 22.44 | 9,358 | 526 | 7,809 | 1,072 | 2,517 | 825 | 2,720 |
| | National Steel Co. - River Rouge, MI | 58.19 | 10,919 | 3,640 | 55 | 9 | 33 | 118 | 54 |
| | McLouth Steel - Trenton, MI | 50.39 | 17,757 | 4,798 | 55 | 11 | 63 | 1 | 598 |
| | McLouth Steel - Gibraltar, MI | 7.35 | 643 | 210 | 8 | 2 | 5 | 15 | 123 |
| | Ford Motor Company - Dearborn, MI | 80.38 | 18,232 | 4,169 | 2,290 | 458 | 263 | 18 | 1,779 |
| | SUBTOTAL | 268.88 | 66,316 | 16,478 | 10,264 | 1,560 | 2,909 | 1,079 | 5,320 |
| LAKE ERIE | | | | | | | | | |
| Basin 41100 | Jones and Laughlin Steel - Cleveland, OH | 8.82 | 1,553 | 1,843 | 610 | 41 | 23 | 2 | 284 |
| | Republic Steel - Cleveland, OH | 54.42 | 8,149 | 2,104 | 2,696 | 210 | 211 | 95 | 626 |
| | U.S. Steel Corporation - Lorain, OH | 33.69 | 4,554 | 1,628 | 2,360 | 210 | 1,138 | 427 | 114 |
| | U.S. Steel Corporation - Cuyahoga, OH | 8.27 | 1,035 | 345 | 26 | 8 | 16 | 18 | 5 |
| | SUBTOTAL | 105.20 | 15,291 | 5,920 | 5,692 | 469 | 1,388 | 542 | 1,029 |
| | 1976 TOTAL | 2,417.88 | 213,968 | 103,009 | 23,635 | 3,660 | 4,678 | 4,104 | 14,535 |

TABLE 8: EFFLUENT LOADINGS FROM IRON AND STEEL PLANTS IN 1982 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | O&G | Ammonia | Cyanide | Phenols | Total Organics | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40400 | Inland Steel - Indiana Harbor, IN | 318.04 | 40,227 | 3,845 | 561 | 53 | 36 | 23 | 2,196 |
| | Bethlehem Steel - Chesterton, IN | 145.56 | 32,470 | 1,853 | 856 | 35 | 12 | 1 | 141 |
| | Jones and Laughlin Steel - E. Chicago, IN | 195.11 | 9,388 | 2,519 | 1,675 | 112 | 9 | 6 | 658 |
| | U.S. Steel/Gary Works - Gary, IN | 597.39 | 12,385 | 22,468 | 803 | 7 | 20 | 126 | 678 |
| | National Steel Corp. - Portage, IN | 25.59 | 1,501 | 65 | 22 | 4 | 3 | 17 | 134 |
| | SUBTOTAL | 1,281.99 | 95,971 | 30,750 | 3,917 | 211 | 80 | 173 | 3,807 |
| LAKE ST. CLAIR | | | | | | | | | |
| Basin 40900 | National Steel Co. - Ecorse, MI | 27.09 | 1,465 | 535 | 27 | 3 | 3 | 18 | 25 |
| | National Steel Co. - Zug Island, MI | 32.16 | 9,007 | 2,697 | 175 | 6 | 1 | 29 | 2,707 |
| | National Steel Co. - River Rouge, MI | 58.19 | 10,919 | 3,640 | 59 | 20 | 6 | 39 | 54 |
| | McLouth Steel - Trenton, MI | 50.39 | 11,906 | 1,426 | 55 | 17 | 6 | 1 | 598 |
| | McLouth Steel - Gibraltar, MI | .53 | 66 | 71 | 5 | 0 | 0 | 0 | 5 |
| | Ford Motor Company - Dearborn, MI | 80.38 | 17,315 | 1,426 | 2,290 | 19 | 6 | 18 | 1,718 |
| | SUBTOTAL | 248.74 | 50,678 | 9,795 | 2,611 | 65 | 22 | 105 | 5,107 |
| LAKE ERIE | | | | | | | | | |
| Basin 41100 | Jones and Laughlin Steel - Cleveland, OH | 8.82 | 4,943 | 633 | 415 | 3 | 3 | 2 | 284 |
| | Republic Steel - Cleveland, OH | 54.42 | 3,982 | 1,839 | 6,467 | 269 | 55 | 95 | 18 |
| | U.S. Steel Corporation - Lorain, OH | 33.69 | 5,018 | 2,684 | 2,034 | 9 | 6 | 426 | 114 |
| | U.S. Steel Corporation - Cuyahoga, OH | 12.86 | 3,303 | 240 | 130 | 5 | 1 | 8 | 26 |
| | SUBTOTAL | 109.79 | 17,246 | 5,396 | 9,046 | 286 | 65 | 531 | 442 |
| | 1982 TOTAL | 1,640.52 | 163,895 | 45,941 | 15,574 | 562 | 167 | 809 | 9,356 |

TABLE 9: BPT and BAT Capital Cost Summary for Iron and Steel Plants in 1978 dollars (x 1,000)

| | | No. of Plants | Inplace Costs | Required Costs | Total Costs |
|---|---|---|---|---|---|
| **Lake Michigan** | | | | | |
| Basin 40400 | BPT | 8 | 205,416 | 12,115 | 217,531 |
| | BAT | 8 | 3,802 | 8,365 | 12,167 |
| **Lake St. Clair** | | | | | |
| Basin 40900 | BPT | 4 | 59,589 | 25,367 | 84,956 |
| | BAT | 3 | 1,465 | 1,735 | 3,200 |
| **Lake Erie** | | | | | |
| Basin 41100 | BPT | 5 | 67,233 | 13,595 | 80,828 |
| | BAT | 5 | 4,439 | 3,038 | 7,477 |
| Subtotal | BPT | 17 | 332,238 | 51,077 | 383,315 |
| | BAT | 16 | 9,706 | 13,138 | 22,844 |
| TOTAL | | 17 | 341,944 | 64,215 | 406,159 |
| AVERAGE | | -- | 20,114 | 3,777 | 23,892 |

summaries. Costs are presented in 1978 dollars and it is estimated that at the present time the required costs have been expended to achieve BPT and BAT requirements.

## IV PULP, PAPER, AND PAPERBOARD MANUFACTURING

### A. Mills Included in the Survey

Thirty-nine (39) major pulp, paper, and paperboard mills located in the Region V Great Lakes drainage area were identified. All of these 39 mills have at sometime discharged process wastewater directly to the Great Lakes. Of these 39 mills, two currently discharge to municipal wastewater treatment systems (POTW). One mill shutdown in 1982 while one mill has zero discharge. The remaining 35 mills currently discharge process wastewater directly to the Great Lakes drainage area.

Table 10 lists the 39 major pulp and paper mills identified by lake basin used in the survey. Each mill's discharge status is also presented for each of the three time periods (i.e., 1967, 1977, and 1982). The years 1967 and 1977 were used since more complete data were available as compared to 1968 and 1976.

### B. Survey Methods

The pulp and paper mills that discharge directly to the Great Lakes area were identified from the EPA IFD file cross-referenced with the EPA EGD inventory used in the Final Development Document for the Pulp and Paper Industry. In addition, Appendix IV of the IJC report on the Pulp and Paper Industry, the STORET system, and State files were reviewed to obtain the list of 39 mills. Each mill was identified by SIC code and WRC accounting unit based on information in the IFD file.

The TSS and BOD effluent loading data from the EGD inventory and the IJC report for 1977 period were compared. In all cases for the 25 mills for which both sources had data, the values were within 10 percent. Values from neither source were consistently higher or lower. Therefore, the highest value from either source was used as the 1977 loading value for that particular mill. Flow data were not included in the IJC report, so all flow values were taken from the EGD information. Flows were calculated by multiplying the daily production rate (tons per day or TPD) by the appropriate flow factor (kgal/ton). Loading values from these sources were verified with State information. In all cases, excellent correlation was found among all references.

The effluent loading data for 1967 were derived from the 1977 data. The discharge trends as reported by IJC in Tables 2 and 3 of the Pulp and Paper Industry report were used as the basis for the 1967 loadings. Each mill in each State (i.e., Michigan, Wisconsin, and Ohio) was assumed to be discharging TSS and BOD loads at the same ratio in 1967 on a statewide basis. For example, Table 2 of the IJC report shows that in 1967, 4.68 times as many TSS were being discharged by mills in Michigan than in 1977 (100.2 megagrams per day divided by 21.4 megagrams per day). It was therefore assumed that all mills in Michigan were discharging 4.68 times as many TSS in 1967 as they were in 1977. These factors were calculated for each State for both TSS and BOD and applied to the 1977 data to derive the 1967 data. All loading values for 1967 were verified against State data, where available, and adjustments were made if necessary. Data for two unidentified mills in Minnesota obtained from the IJC Remedial Programs Subcommittee Report were added to the totals for 1967 and 1977. No mills in Minnesota currently discharge to the Great Lakes.

TABLE 10: PULP AND PAPER MILLS (SIC 2611 - 2661)

| LAKE SUPERIOR | 1967 | 1977 | 1982 |
|---|---|---|---|
| BASIN 40103 | | | |
| 1. James River/Dixie Northern, Inc. - Ashland, WI | Direct | Direct | Direct |
| 2. Superior Fiber Products - Superior, WI | Direct | Direct | Direct |
| BASIN 40201 | | | |
| 1. Champion International Corp. - Ontonagon, MI | Direct | Direct | Direct |
| BASIN 40202 | | | |
| 1. Kimberly Clark Corp. - Munising, MI | Direct | Direct | Direct |
| **LAKE MICHIGAN** | | | |
| BASIN 40301 | | | |
| 1. Mead Corporation - Escanaba, MI | Direct | Direct | Direct |
| 2. Scott Paper Co. - Marinette, WI | Direct | Direct | Direct |
| 3. Scott Paper Co. - Oconto Falls, WI | Direct | Direct | Direct |
| 4. Badger Paper Mill - Peshtigo, WI | Direct | Direct | Direct/POTW |
| 5. Meneminee Paper Co. - Meneminee, MI | Direct | Direct | POTW |
| 6. Niagara Paper Co. - Niagara, WI | Direct | Direct | Direct |
| 7. George Whiting Paper Co. - Menasha, WI | Direct | Direct | POTW |
| BASIN 40302 | | | |
| 1. Thilmany (Hammermill) Paper Co. - Kaukauna, WI | Direct | Direct | Direct |
| 2. Green Bay Packaging Co. - Green Bay, WI | Direct | Direct | Direct |
| 3. Consolidated Papers Co. - Appleton, WI | Direct | Direct | Closed |
| 4. Fort Howard Paper Co. - Green Bay,WI | Direct | Direct | Direct |
| 5. Midtec Paper Co. - Kimberly, WI | Direct | Direct | Direct |
| 6. Kerwin (Riverside) Paper Co. - Appleton, WI | Direct | Direct | Direct |
| 7. Kimberly Clark Corp. - Neenah, WI | Direct | Direct | Direct |
| 8. Appleton Papers Co. - Combined Locks, WI | Direct | Direct | Direct |
| 9. Bergstrom Paper Co. - Neenah, WI | Direct | Direct | Direct |
| 10. James River/Dixie Northern, Inc. - Green Bay, WI | Direct | Direct/POTW | Direct/POTW |
| 11. Shawano Paper Mill - Shawano, WI | Direct | Direct | Direct |
| 12. Nicolet Paper Co. - DePere, WI | Direct | Direct | Direct |
| 13. Wisconsin Tissue Mill - Menasha, WI | Direct | Direct | Direct |
| 14. Proctor & Gamble (Charmin) Co. - Green Bay, WI | Direct | Direct/POTW | Direct/POTW |
| BASIN 40500 | | | |
| 1. Menasha Corporation - Otsego, MI | Direct | Direct | Direct |
| 2. Watervliet Paper Co. - Watervliet, MI | Direct | Direct | Zero |
| 3. French Paper Co. - Niles, MI | Direct | Direct | Direct |
| 4. Simplicity Pattern Co. - Niles, MI | Direct | Direct | Direct |
| 5. Plainwell Paper Co. - Plainwell, MI | Direct | Direct | Direct |
| BASIN 40601 | | | |
| 1. Packaging Corporation of America - Filer City, MI | Direct | Direct | Direct |
| 2. Manistique Pulp and Paper Co. - Manistique, MI | Direct | Direct | Direct |
| **LAKE HURON** | | | |
| BASIN 40700 | | | |
| 1. Fletcher Paper Co. - Alpena, MI | Direct | Direct | Direct/POTW |
| 2. Proctor and Gamble Co. - Cheboygan, MI | Direct | Direct | Direct |
| 3. Abitibi Corporation - Alpena, MI | Direct | Direct | Direct |
| **LAKE ST. CLAIR** | | | |
| BASIN 40900 | | | |
| 1. Dunn Paper Co. - Port Huron, MI | Direct | Direct | Direct |
| 2. Port Huron Paper Co. - Port Huron, MI | Direct | Direct | Direct |
| **LAKE ERIE** | | | |
| BASIN 41000 | | | |
| 1. Simplex Industries - Palmyra, MI | Direct | Direct | Direct |
| BASIN 41100 | | | |
| 1. Chase Bag Co. - Chagrin Falls, OH | Direct | Direct | Direct |

The flow and effluent loading data for the 1982 time period were calculated from the loading and flow data by pipe found in the STORET data base. The actual effluent loading values for each month were averaged over the one year period. In some cases where only average effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x
8.34 (conversion factor)

All loading values calculated from the STORET data base were verified and modified, if necessary, with data obtained from the appropriate States. In cases where major inconsistencies were noted, values from the State references were used.

## C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1967, 1977, and 1982) and presents data by mill and lake basin. The following parameters are presented: flow (mgd), TSS, and BOD. Data for oil and grease, phosphate, sulfate, and phenolics from several references were also found for a few mills but are not presented.

Table 11 presents the estimated 1967 effluent loadings of TSS and BOD and flow for 39 mills based on discharge trends reported by IJC and State information.

Table 12 presents the actual 1977 effluent loadings for TSS and BOD and flow for 39 mills based on IJC, EGD and State information.

Table 13 presents the actual 1982 effluent loadings for TSS and BOD and flow for 35 mills based on current STORET data verified with State information. Graphs showing effluent loadings by time period are included in the Appendix.

## D. Cost of Effluent Reductions

The capital and annual costs for pulp and paper mills were derived from the EGD cost estimates developed for each mill to meet BPT levels of effluent reduction. The capital costs represent the cost to industry to install complete BPT systems which are required to meet BPT limits. The annual costs represent the yearly cost of operation, maintenance, and depreciation.

The costs for the pulp and paper mills are presented in Table 14 by lake basin. Data were available for only 27 of the 39 mills in the survey. Costs are presented in 1974 dollars and do not include cost incurred by mills with BPT treatment systems already in place at that time.

If the average costs per mill are applied to all 35 mills, a total capital cost of 270 million dollars and annual costs of 85 million dollars is estimated for pulp and paper mills to achieve BPT levels of effluent reduction.

TABLE 11: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1967 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40103 | James River/Dixie Northern,Inc. - Ashland, WI | 7.54 | 3,818 | 3,764 |
| | Superior Fiber Products - Superior, WI | 1.31 | 6,361 | 15,065 |
| Basin 40201 | Champion International Corp. - Ontonagon, MI | 11.65 | 106,422 | 48,138 |
| Basin 40202 | Kimberly Clark Corporation - Munising, MI | 1.27 | 1,441 | 2,534 |
| | TWO MILLS IN MINNESOTA | 76.48 | 98,334 | 319,229 |
| | SUBTOTAL | 98.25 | 216,376 | 388,730 |
| LAKE MICHIGAN | | | | |
| Basin 40301 | Mead Corporation - Escanaba, MI | 35.53 | 211,598 | 68,790 |
| | Scott Paper Company - Marinette, WI | 3.94 | 10,890 | 12,750 |
| | Scott Paper Company - Oconto Falls, WI | 10.89 | 6,314 | 52,527 |
| | Badger Paper Mill - Peshtigo, WI | 5.96 | 13,200 | 18,850 |
| | Meneminee Paper Co. - Meneminee, MI | 3.55 | 2,471 | 13,094 |
| | Niagara Paper Co. - Niagara, WI | 6.20 | 28,545 | 23,164 |
| | George Whiting Paper Co. - Menasha, WI | .35 | 1,509 | 521 |
| Basin 40302 | Thilmany (Hammermill) Paper Company - Kaukauna, WI | 2.57 | 30,855 | 16,636 |
| | Green Bay Packaging - Green Bay, WI | 1.60 | 2,880 | 9,649 |
| | Consolidated Papers - Appleton, WI | 8.73 | 27,555 | 36,496 |
| | Fort Howard Paper Company - Green Bay, WI | 11.72 | 27,005 | 31,105 |
| | Midtec Paper Co. - Kimberly, WI | 6.97 | 14,955 | 8,231 |
| | Kerwin (Riverside) Paper Co. - Appleton, WI | 2.23 | 6,953 | 1,593 |
| | Kimberly Clark Corp. - Neenah, WI | 6.40 | 5,068 | 10,771 |
| | Appleton Papers Co. - Combined Locks, WI | 6.40 | 11,055 | 16,320 |
| | Bergstrom Paper Co. - Neenah, WI | 4.50 | 21,968 | 20,101 |
| | James River/Dixie Northern - Green Bay, WI | 4.50 | 23,265 | 57,895 |
| | Shawano Paper Mills - Shawano, WI | 4.22 | 2,172 | 1,514 |
| | Nicolet Paper Co. - DePere, WI | 3.06 | 6,930 | 13,688 |
| | Wisconsin Tissue Mills - Menasha, WI | 1.80 | 6,105 | 7,630 |
| | Proctor & Gamble (Charmin) Co.- Green Bay, WI | 14.82 | 24,334 | 45,892 |
| Basin 40500 | Menasha Corp. - Kalamazoo, MI | 2.56 | 6,767 | 9,861 |
| | Watervliet Paper Co. - Watervliet, MI | 3.60 | 2,883 | 5,914 |
| | French Paper Co. - Niles, MI | 1.67 | 1,338 | 2,957 |
| | Simplicity Pattern Co. - Niles, MI | 1.23 | 309 | 2,112 |
| | Plainwell Paper Co. - Plainwell, MI | 3.89 | 7,015 | 10,138 |
| Basin 40601 | Packaging Corp. of America - Filer City, MI | 6.80 | 8,532 | 4,646 |
| | Manistique Pulp and Paper - Manistique, MI | 9.98 | 16,268 | 21,965 |
| | SUBTOTAL | 175.66 | 528,738 | 524,810 |

TABLE 11: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1967 (lbs/day)
(Continued)

| LAKE HURON | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40700 | Fletcher Paper Co. - Alpena, MI | .80 | 1,919 | 3,802 |
| | Proctor and Gamble Co. - Cheboygan, MI | 2.49 | 721 | 12,672 |
| | Abitibi Corporation - Alpena, MI | 3.30 | 72,000 | 31,700 |
| | SUBTOTAL | 6.59 | 74,640 | 48,174 |
| LAKE ST. CLAIR | | | | |
| Basin 40900 | Dunn Paper Co. - Port Huron, MI | 3.80 | 6,469 | 2,852 |
| | Port Huron Paper Co. - Port Huron, MI | 9.24 | 3,412 | 5,702 |
| | SUBTOTAL | 13.04 | 9,881 | 8,554 |
| LAKE ERIE | | | | |
| Basin 41000 | Simplex Industries - Palmyra, MI | .31 | 140 | 170 |
| Basin 41100 | Chase Bag Co. - Chagrin Falls, OH | 1.51 | 880 | 3,740 |
| | SUBTOTAL | 1.82 | 1,020 | 3,910 |
| | 1967 TOTAL | 295.36 | 830,654 | 974,178 |

TABLE 12: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1977 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40103 | James River/Dixie Northern,Inc.- Ashland, WI | 7.54 | 797 | 743 |
| | Superior Fiber Products - Superior, WI | 1.31 | 249 | 1,545 |
| Basin 40201 | Champion International Corp. - Ontonagon, MI | 12.35 | 7,062 | 4,378 |
| Basin 40202 | Kimberly Clark Corporation - Munising, MI | 1.27 | 308 | 264 |
| | TWO MILLS IN MINNESOTA | 56.71 | 51,410 | 57,458 |
| | SUBTOTAL | 79.18 | 59,826 | 64,388 |
| LAKE MICHIGAN | | | | |
| Basin 40301 | Mead Corporation - Escanaba, MI | 42.64 | 17,187 | 5,500 |
| | Scott Paper Company - Marinette, WI | 3.94 | 1,107 | 1,254 |
| | Scott Paper Company - Oconto Falls, WI | 10.89 | 5,433 | 41,557 |
| | Badger Paper Mill - Peshtigo, WI | 5.96 | 392 | 447 |
| | Menominee Paper Co. - Menominee, MI | 3.55 | 528 | 1,364 |
| | Niagara Paper Co. - Niagara, WI | 6.20 | 6,138 | 9,756 |
| | George Whiting Paper Co. - Menasha, WI | .16 | 143 | 201 |
| Basin 40302 | Thilmany (Hammermill) Paper Company - Kaukauna, WI | 2.57 | 10,389 | 6,413 |
| | Green Bay Packaging - Green Bay, WI | 1.60 | 102 | 607 |
| | Consolidated Papers - Appleton, WI | 8.73 | 865 | 4,976 |
| | Fort Howard Paper Company - Green Bay, WI , | 11.72 | 11,066 | 5,730 |
| | Midtec Paper Co. - Kimberly, WI | 6.97 | 6,054 | 7,155 |
| | Kerwin (Riverside) Paper Co. - Appleton, WI | 2.33 | 480 | 447 |
| | Kimberly Clark Corp. - Neenah, WI | 6.40 | 279 | 166 |
| | Appleton Papers Co. - Combined Locks, WI | 6.40 | 3,047 | 4,150 |
| | Bergstrom Paper Co. - Neenah, WI | 4.50 | 13,719 | 8,527 |
| | James River/Dixie Northern - Green Bay, WI | 4.50 | 2,377 | 5,725 |
| | Shawano Paper Mills - Shawano, WI | 4.22 | 245 | 875 |
| | Nicolet Paper Co. - DePere, WI | 3.06 | 675 | 1,193 |
| | Wisconsin Tissue Mills - Menasha, WI | 1.80 | 235 | 173 |
| | Proctor & Gamble (Charmin) Co.- Green Bay, WI | 14.82 | 3,567 | 1,927 |
| Basin 40500 | Menasha Corp. - Kalamazoo, MI | .93 | 2,728 | 2,173 |
| | Watervliet Paper Co. - Watervliet, MI | 3.60 | 616 | 616 |
| | French Paper Co. - Niles, MI | .45 | 286 | 308 |
| | Simplicity Pattern Co. - Niles, MI | .19 | 66 | 220 |
| | Plainwell Paper Co. - Plainwell, MI | 3.89 | 1,499 | 1,056 |
| Basin 40601 | Packaging Corp. of America - Filer City, MI | 6.00 | 1,823 | 484 |
| | Manistique Pulp and Paper - Manistique, MI | 8.82 | 3,476 | 2,288 |
| | SUBTOTAL | 176.84 | 94,522 | 115,288 |

TABLE 12: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1977 (lbs/day)
(Continued)

| LAKE HURON | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40700 | Fletcher Paper Co. - Alpena, MI | .80 | 410 | 396 |
| | Proctor and Gamble Co. - Cheboygan, MI | 2.49 | 154 | 1,320 |
| | Abitibi Corporation - Alpena, MI | 3.30 | 13,992 | 5,676 |
| | SUBTOTAL | 6.59 | 14,556 | 7,392 |
| LAKE ST. CLAIR | | | | |
| Basin 40900 | Dunn Paper Co. - Port Huron, MI | 2.17 | 572 | 396 |
| | Port Huron Paper Co. - Port Huron, MI | 9.24 | 729 | 594 |
| | SUBTOTAL | 11.41 | 1,301 | 990 |
| LAKE ERIE | | | | |
| Basin 41000 | Simplex Industries - Palmyra, MI | .19 | 55 | 88 |
| Basin 41100 | Chase Bag Co. - Chagrin Falls, OH | 1.51 | 176 | 374 |
| | SUBTOTAL | 1.70 | 231 | 462 |
| | 1977 TOTAL | 275.72 | 170,436 | 188,520 |

TABLE 13: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1982 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40103 | James River/Dixie Northern, Inc. - Ashland, WI | 8.60 | 1,357 | 1,635 |
| | Superior Fiber Products - Superior, WI | 1.30 | 36 | 538 |
| Basin 40201 | Champion International Corp. - Ontonagon, MI | 11.75 | 10,350 | 11,240 |
| Basin 40202 | Kimberly Clark Corporation - Munising, MI | 3.82 | 192 | 237 |
| | SUBTOTAL | 25.47 | 11,935 | 13,650 |
| LAKE MICHIGAN | | | | |
| Basin 40301 | Mead Corporation - Escanaba, MI | 30.63 | 6,600 | 7,573 |
| | Scott Paper Company - Marinette, WI | 3.69 | 1,682 | 1,288 |
| | Scott Paper Company - Oconto Falls, WI | 1.41 | 371 | 813 |
| | Badger Paper Mill - Peshtigo, WI | 3.61 | 3,000 | 2,406 |
| | Niagara Paper Company - Niagara, WI | 5.60 | 1,841 | 2,760 |
| | George Whiting Paper Co. - Menasha, WI | (Discharge to POTW) | | |
| Basin 40302 | Thilmany (Hammermill) Paper Company - Kaukauna, WI | 2.57 | 3,901 | 1,941 |
| | Green Bay Packaging - Green Bay, WI | 1.65 | 430 | 1,022 |
| | Consolidated Papers - Appleton, WI | (Closed 1982) | | |
| | Fort Howard Paper Company - Green Bay, WI | 11.72 | 7,821 | 7,724 |
| | Midtec Paper Co. - Kimberly, WI | 6.97 | 1,771 | 2,065 |
| | Kerwin (Riverside) Paper Co. - Appleton, WI | 1.75 | 1,725 | 1,562 |
| | Kimberly Clark Corp. - Neenah, WI | 3.26 | 331 | 286 |
| | Appleton Papers Co. - Combined Locks, WI | 4.70 | 1,907 | 860 |
| | Bergstrom Paper Co. - Neenah, WI | 4.44 | 2,174 | 2,660 |
| | James River/Dixie Northern, Inc.- Green Bay, WI | 8.62 | 2,460 | 5,986 |
| | Shawano Paper Mills - Shawano, WI | 1.90 | 248 | 1,139 |
| | Nicolet Paper Co. - DePere, WI | 3.57 | 863 | 1,424 |
| | Wisconsin Tissue Mills - Menasha, WI | 1.85 | 819 | 564 |
| | Proctor & Gamble (Charmin) Co. - Green Bay, WI | 3.19 | 3,430 | 941 |
| Basin 40500 | Menasha Corp. - Kalamazoo, MI | .39 | 23 | 46 |
| | French Paper Co. - Niles, MI | .66 | 384 | 287 |
| | Simplicity Pattern Co. - Niles, MI | .28 | 66 | 220 |
| | Plainwell Paper Co. - Plainwell, MI | 2.67 | 2,319 | 1,703 |
| Basin 40601 | Packaging Corp. of America - Filer City, MI | 5.30 | 2,150 | 540 |
| | Manistique Pulp and Paper Co.- Manistique, MI | 5.16 | 692 | 277 |
| | SUBTOTAL | 115.59 | 47,008 | 46,087 |

TABLE 13: EFFLUENT LOADINGS FROM PULP AND PAPER MILLS IN 1982 (lbs/day)
(Continued)

| LAKE HURON | FACILITY NAME | FLOW (mgd) | TSS | BOD |
|---|---|---|---|---|
| Basin 40700 | Fletcher Paper Co. - Alpena, MI | .51 | 120 | 456 |
| | Proctor and Gamble Co. - Cheboygan, MI | 1.72 | 110 | 97 |
| | Abitibi Corporation - Alpena, MI | 3.20 | 11,500 | 1,400 |
| | SUBTOTAL | 5.43 | 11,730 | 1,953 |
| LAKE ST. CLAIR | | | | |
| Basin 40900 | Dunn Paper Co. - Port Huron, MI | 2.60 | 660 | 396 |
| | Port Huron Paper Co. - Port Huron, MI | 7.53 | 639 | 977 |
| | SUBTOTAL | 10.13 | 1,299 | 1,373 |
| LAKE ERIE | | | | |
| Basin 41000 | Simplex Industries - Palmyra, MI | .18 | 67 | 90 |
| Basin 41100 | Chase Bag Co. - Chagrin Falls, OH | .77 | 22 | 54 |
| | SUBTOTAL | .95 | 89 | 144 |
| | 1982 TOTAL | 157.57 | 72,061 | 63,207 |

TABLE 14: BPT Capital and Annual Cost Summary for Pulp and Paper Mills in 1974 dollars (x 1,000)

| | No. of Mills | Capital Costs | Annual Costs |
|---|---|---|---|
| **Lake Superior** | | | |
| Basin 40103 | 1 | 5,100 | 1,545 |
| **Lake Michigan** | | | |
| Basin 40301 | 5 | 52,150 | 15,900 |
| Basin 40302 | 10 | 101,835 | 32,150 |
| Basin 40500 | 4 | 13,870 | 4,920 |
| Basin 40601 | 2 | 16,700 | 6,250 |
| Total | 21 | 184,555 | 59,220 |
| **Lake Huron** | | | |
| Basin 40700 | 1 | 2,950 | 830 |
| **Lake St. Clair** | | | |
| Basin 40900 | 2 | 11,700 | 3,010 |
| **Lake Erie** | | | |
| Basin 41000 | 1 | 1,850 | 660 |
| Basin 41100 | 1 | 2,170 | 770 |
| Total | 2 | 4,020 | 1,430 |
| TOTAL | 27 | 208,325 | 66,035 |
| AVERAGE | -- | 7,716 | 2,446 |

## V. ORGANIC AND INORGANIC CHEMICAL MANUFACTURING

### A. Plants Included in the Survey

Thirty-eight (38) major organic and inorganic chemical manufacturing plants located in the Region V Great Lakes drainage area were identified. All 38 plants have at some time discharged process wastewater directly to the Great Lakes drainage area. Of these 38 plants, two (2) have shutdown since 1976 and two (2) no longer discharge process wastewater. Ten (10) of the plants are classified as organic chemical manufacturers whereas 28 plants are classified as inorganic chemical manufacturers according to the SIC codes in the IFD file.

### B. Survey Methods

The chemical manufacturing plants were identified from the EPA's IFD file plant listings and cross-referenced with the appropriate State inventories. The IFD file was found to be fairly complete. The EGD inventory did not include many plants (only 7 of the 38 plants). Therefore, the list of plants from the IFD file verified with State data was used as the basis for identifying plants to include in the survey. Each plant was identified by SIC code, WRC accounting unit, and lake basin based on information in the IFD file.

The flow and effluent loading data for each plant for the 1968 time period were derived from State files and IJC references. State monitoring reports, early permits applications, and discharge monitoring reports (DMRs) were reviewed for appropriate data. Data was either reproduced or transcribed directly from the State files as appropriate. Verification and collection of data not obtained from visits to the State offices was performed by telephone.

Flow values and effluent loadings for each plant for the 1976 time period were also collected from the appropriate State offices and verified with EGD and IJC data where available.

The data for the 1982 time period were calculated from the monthly loading values for each pipe for each plant in the STORET data base. The actual effluent loading values for each month were averaged over the entire one year period. In some cases where only effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x 8.34
(conversion factor)

The 1982 data is presented without modification from the STORET computer printouts. The flow rates include all discharges that are monitored on a routine basis. These discharges contain wastewater other than process wastewater, such as storm runoff, cooling water, etc. No method of calculating only process wastewater flow was identified. Therefore, some flow values for 1982 may be higher than actual process wastewater discharge rates (as presented

for 1968 and 1976). Most data points including flow obtained from the STORET system were verified with existing State data in files or by telephone contact and modified, if appropriate.

## C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1968, 1976, and 1982) and presents the data by plant and lake basin. The following parameters are presented: flow (mgd), TSS, BOD, COD, ammonia, chloride, and total phosphorus.

Table 15 presents the 1968 effluent loadings for 38 plants based on State and IJC information. Data for six (6) plants were estimated as noted in the table.

Table 16 presents the 1976 effluent loadings data for 38 plants based on State, EGD, and IJC information.

Table 17 presents the most recent data from the STORET data base for 34 plants which includes monthly average values from 1982 verified with State information. Graphs showing effluent loadings by time period are included in the Appendix.

## D. Cost of Effluent Reductions

The average capital costs and annual costs for the organic and inorganic chemical manufacturing plants were derived from the EGD model plant cost summaries for BPT and BAT (BPT only for organic chemical plants) levels of effluent reduction. The model plant cost summaries are found in the final Inorganic Chemical Development Document (EPA 440/1-82/00) and the proposed Organic Chemical Development Document (EPA 440/1-83/009-b). These costs include the capital cost of installing treatment facilities needed to meet the appropriate BPT and BAT effluent limitations, as well as the annual operation, maintenance, and amortization costs. Since specific EGD cost data was available for only two of the inorganic chemical manufacturers and none of the organic chemical manufacturers, the average costs per plant were calculated using the following assumptions: (1) all 10 inorganic chemical subcategories were assumed to be represented equally within the 28 inorganic chemical manufacturers, and (2) the types of organic chemical manufacturers were distributed among the 10 organic manufacturing plants in a similar manner to those inventoried by EGD. The gross cost summary is presented in Table 18 by lake basin for both organic and inorganic manufacturers. Costs are presented in 1977 dollars.

TABLE 15: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1968 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Ansul Co. - Marinette, WI | .85 | 148 | 1,477 | 23 | 1,422 | 2.0 | 1,042 |
| | Fromm Laboratories, Inc. - Grafton, WI | .01 | 7 | 4 | 0 | 70 | .0 | 0 |
| Basin 40400 | Union Carbide Corp. - Gary, IN | 46.30 | 682 | 18,011 | 1,250 | 322,665 | 92.6 | 3,929 |
| | DuPont Co. - E. Chicago, IN | 1.90 | 1,009 | 739 | 51 | 13,241 | 3.8 | 46 |
| | Hansen's Laboratory - Milwaukee, WI | .05 | 6 | 12 | 1 | 12 | 2.0 | 0 |
| Basin 40500 | Hexcel Corporation - Zeeland, MI (EST.) | .16 | 118 | 62 | 4 | 558 | .3 | 4 |
| | BASF Wyandotte (Pigment) - Holland, MI | .53 | 219 | 1,450 | 4 | 3,694 | 4.8 | 704 |
| Basin 40601 | Dow Chemical Co. - Ludington, MI | 28.60 | 114,500 | 12,750 | 6,279 | 1,331,100 | 57.0 | 686 |
| | Morton Chemical Co. - Manistee, MI | .85 | 7,514 | 331 | 73 | 49,374 | 2.0 | 20 |
| | Hooker Chemical Co. - Montague, MI | 16.70 | 5,980 | 4,007 | 34 | 220,806 | 18.0 | 136 |
| | Martin Marietta Corp. - Manistee, MI | .51 | 2 | 17 | 14 | 48 | .3 | 5 |
| | SUBTOTAL | 96.46 | 130,185 | 38,860 | 7,733 | 1,942,990 | 182.8 | 6,572 |
| LAKE HURON | | | | | | | | |
| Basin 40802 | Dow Chemical Co. - Midland, MI | 90.40 | 9,633 | 3,399 | 46 | 111,987 | 13.9 | 444 |
| | Bay Chemical Co. - Bay City, MI (EST.) | 1.00 | 736 | 389 | 27 | 6,969 | 2.0 | 24 |
| | SUBTOTAL | 91.40 | 10,369 | 3,788 | 73 | 118,956 | 15.9 | 468 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 40900 | Diamond Crystal Salt Co.- St.Clair, MI (EST.) | 11.00 | 8,096 | 4,279 | 297 | 226,850 | 22.0 | 264 |
| | Monsanto Corporation - Trenton, MI | 22.98 | 4,408 | 8,939 | 211 | 7,283 | 345.0 | 552 |
| | Pennwalt Corporation - Wyandotte, MI | 28.76 | 4,715 | 25,280 | 2,992 | 8,779 | 58.0 | 2,110 |
| | BASF Wyandotte Corp.(North) - Wyandotte, MI | 69.90 | 23,160 | 41,193 | 3,137 | 240,589 | 86.0 | 6,563 |
| | BASF Wyandotte Corp.(South) - Wyandotte, MI | 9.62 | 31,747 | 60,974 | 260 | 55,743 | 67.0 | 1,387 |
| | SUBTOTAL | 142.26 | 72,126 | 140,665 | 6,897 | 539,244 | 578.0 | 10,876 |

TABLE 15: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1968 (Continued)

| LAKE ERIE | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 41000 | Stauffer Chemical Co. - Weston, MI | .23 | 165 | 510 | 6 | 1,630 | 9.2 | 346 |
| | Air Products and Chemicals - N.Baltimore, OH | .05 | 13 | 18 | 1 | 0 | 1.0 | 5 |
| | Vistron Corporation - Lima, OH | 2.87 | 250 | 2,000 | 1,530 | 10,000 | 6.9 | 7 |
| | USCO Services (Uniroyal) - Port Clinton, OH | .45 | 119 | 175 | 6 | 3,136 | .7 | 309 |
| Basin 41100 | RMI Company (Na & Cl Plant) - Ashtabula, OH | 3.82 | 2,500 | 1,321 | 92 | 23,672 | 6.8 | 82 |
| | RMI Company (Metals Plant) - Ashtabula, OH | 1.44 | 204 | 305 | 1 | 2,100 | 2.5 | 12 |
| | Olin Corporation - Ashtabula, OH | .40 | 240 | 4,345 | 11 | 26,957 | .8 | 10 |
| | General Tire and Rubber Co. - Ashtabula, OH | .41 | 68 | 252 | 21 | 644 | 4.0 | 34 |
| | SCM Corporation (Plant #1) - Ashtabula, OH | 1.22 | 98 | 514 | 33 | 10,110 | 2.4 | 29 |
| | SCM Corporation (Plant #2) - Ashtabula, OH | 1.74 | 325 | 703 | 24 | 10,269 | 9.4 | 308 |
| | Diamond Shamrock Corp.- Painesville, OH | 79.80 | 63,929 | 7,991 | 1,345 | 592,679 | 91.0 | 1,915 |
| | LCP Chemical (IMC Chemical) - Ashtabula, OH | 2.91 | 243 | 128 | 8 | 2,301 | .6 | 8 |
| | Diamond Shamrock Corp.- Ashtabula, OH (EST.) | .83 | 611 | 323 | 22 | 5,784 | 1.7 | 26 |
| | Glyco Chemicals, Inc. - Painesville, OH | 1.53 | 1,400 | 596 | 41 | 10,663 | 3.1 | 5,300 |
| | Zircoa Products/Corning Glass - Solon, OH | .11 | 62 | 686 | 3 | 5,452 | 3.3 | 7 |
| | Lubrizol Corp. - Wickliffe, OH | .13 | 235 | 48 | 4 | 905 | .0 | 6 |
| | Hall Chemical Co. - Wickliffe, OH (EST.) | .18 | 132 | 70 | 5 | 1,250 | .4 | 0 |
| | Dupont Company - Cleveland, OH | 1.20 | 340 | 240 | 250 | 3,500 | 2.4 | 7 |
| | Harshaw Chemical Co. - Cleveland, OH | 1.50 | 70 | 740 | 263 | 7,188 | 2.5 | 96 |
| | SDS Biotech Inc. - Concord, OH (EST.) | .90 | 662 | 350 | 24 | 6,272 | 1.8 | 22 |
| | SUBTOTAL | 101.72 | 71,666 | 21,315 | 3,690 | 724,512 | 150.5 | 8,529 |
| | 1968 TOTAL | 431.84 | 284,346 | 204,628 | 18,393 | 3,325,702 | 927.2 | 26,445 |

TABLE 16: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1976 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Ansul Co. - Marinette, WI | .70 | 154 | 592 | 1 | 1,915 | 1.7 | 67 |
| | Fromm Laboratories, Inc. - Grafton, WI | .00 | 6 | 17 | 2 | 6 | .1 | 2 |
| Basin 40400 | Union Carbide Corp. - Gary, IN | 115.20 | 11,290 | 23,270 | 2,152 | 40,018 | 172.8 | 2,760 |
| | DuPont Co. - E. Chicago, IN | 5.02 | 602 | 1,224 | 1,303 | 2,505 | 4.0 | 40 |
| | Hansen's Laboratory - Milwaukee, WI | .05 | 5 | 10 | 1 | 12 | 2.0 | 9 |
| Basin 40500 | Hexcel Corporation - Zeeland, MI | .13 | 10 | 90 | 1 | 689 | .1 | 4 |
| | BASF Wyandotte Corp. (Pigment) - Holland, MI | .81 | 195 | 2,123 | 943 | 880 | 1.6 | 536 |
| Basin 40601 | Dow Chemical Co. - Ludington, MI | 28.60 | 935 | 104 | 35 | 110,420 | 10.2 | 6 |
| | Morton Chemical Co. - Manistee, MI | .71 | 26 | 143 | 1 | 37,400 | 1.0 | 15 |
| | Hooker Chemical Co. - Montague, MI | 9.36 | 598 | 1,997 | 280 | 43,735 | 14.0 | 4 |
| | Martin Marietta Corp. - Manistee, MI | .71 | 260 | 278 | 75 | 280,000 | 1.0 | 21 |
| | SUBTOTAL | 161.29 | 14,081 | 29,848 | 4,794 | 517,580 | 208.4 | 3,464 |
| LAKE HURON | | | | | | | | |
| Basin 40802 | Dow Chemical Co. - Midland, MI | 90.40 | 579 | 606 | 23 | 6,731 | .9 | 154 |
| | Bay Chemical Co. - Bay City, MI | .95 | 206 | 194 | 1 | 551 | 1.9 | 56 |
| | SUBTOTAL | 91.35 | 785 | 800 | 24 | 7,282 | 2.8 | 210 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 40900 | Diamond Crystal Salt Co.- St. Clair, MI | 11.00 | 5,950 | 3,145 | 218 | 226,850 | 16.2 | 194 |
| | Monsanto Corporation - Trenton, MI | 13.08 | 763 | 1,547 | 175 | 5,672 | 436.3 | 94 |
| | Pennwalt Corporation - Wyandotte, MI | 29.80 | 6,659 | 25,280 | 2,992 | 742 | 44.7 | 2,110 |
| | BASF Wyandotte Corp.(North) - Wyandotte, MI | 40.30 | 8,506 | 45,772 | 3,737 | 1,075,520 | 80.5 | 6,563 |
| | BASF Wyandotte Corp.(South) - Wyandotte, MI | 23.70 | 7,871 | 978 | 35 | 204,374 | 45.8 | 1,387 |
| | SUBTOTAL | 117.88 | 29,749 | 76,722 | 7,157 | 1,513,158 | 623.5 | 10,348 |

TABLE 16: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1976 (Continued)

| LAKE ERIE | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 41000 | Stauffer Chemical Co. - Weston, MI | .14 | 41 | 208 | 2 | 904 | 2.3 | 98 |
| | Air Products and Chemicals - N.Baltimore, OH | .05 | 13 | 18 | 1 | 0 | 1.0 | 4 |
| | Vistron Corporation - Lima, OH | 2.32 | 193 | 1,544 | 278 | 7,720 | 38.1 | 39 |
| | USCO Services (Uniroyal) - Port Clinton, OH | 1.40 | 36 | 53 | 64 | 949 | 7.6 | 15 |
| Basin 41100 | RMI Company (Na & Cl Plant) - Ashtabula, OH | 3.82 | 2,500 | 772 | 90 | 20,254 | 5.7 | 18 |
| | RMI Company (Metals Plant) - Ashtabula, OH | .04 | 2 | 9 | 1 | 212 | .0 | 2 |
| | Olin Corporation - Ashtabula, OH | .45 | 57 | 91 | 10 | 2,386 | .1 | 12 |
| | General Tire and Rubber Co. - Ashtabula, OH | .29 | 27 | 159 | 99 | 322 | .4 | 14 |
| | SCM Corporation (Plant #1) - Ashtabula, OH | .80 | 34 | 242 | 11 | 5,707 | 1.5 | 67 |
| | SCM Corporation (Plant #2) - Ashtabula, OH | 2.36 | 1,674 | 3,621 | 33 | 52,828 | 3.5 | 71 |
| | Diamond Shamrock Corp.- Painesville, OH | .17 | 13 | 34 | 5 | 901 | 9.2 | 1 |
| | LCP Chemical (IMC Chemical) - Ashtabula, OH | 3.95 | 21 | 11 | 1 | 288 | 5.9 | 8 |
| | Diamond Shamrock Corp.- Ashtabula, OH | .83 | 55 | 29 | 2 | 526 | 1.2 | 4 |
| | Glyco Chemicals, Inc. - Painesville, OH | .29 | 256 | 113 | 8 | 1,538 | .4 | 1,004 |
| | Zircoa Products/Corning Glass - Solon, OH | .05 | 33 | 11 | 1 | 1,877 | .1 | 9 |
| | Lubrizol Corp. - Wickliffe, OH | .16 | 25 | 48 | 3 | 96 | .0 | 6 |
| | Hall Chemical Co. - Wickliffe, OH | .18 | 15 | 8 | 3 | 142 | .0 | 5 |
| | Dupont Company - Cleveland, OH | 1.37 | 102 | 170 | 75 | 1,361 | 2.0 | 2 |
| | Harshaw Chemical Co. - Cleveland, OH | 2.10 | 233 | 68 | 161 | 3,293 | .2 | 19 |
| | SDS Biotech Inc. - Concord, OH | .90 | 105 | 931 | 1 | 995 | 1.4 | 225 |
| | SUBTOTAL | 21.67 | 5,435 | 8,140 | 847 | 102,299 | 80.6 | 1,623 |
| | 1976 TOTAL | 392.20 | 50,050 | 115,510 | 12,822 | 2,140,319 | 915.2 | 15,645 |

TABLE 17: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1982 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Ansul Co. - Marinette, WI | .95 | 27 | 7 | .0 | 160 | .3 | 52 |
| | Fromm Laboratories Inc. - Grafton, WI | .01 | 1 | 4 | .6 | 27 | .3 | 2 |
| Basin 40400 | Union Carbide Corp. - Gary, IN | 115.00 | 7,820 | 3,565 | 920.0 | 7,216 | 23.0 | 1,610 |
| | DuPont Co. - E. Chicago, IN | 4.45 | 195 | 138 | 32.5 | 349 | .2 | 13 |
| | Hansen's Laboratory - Milwaukee, WI | .17 | 0 | 2 | .0 | 0 | .1 | 6 |
| Basin 40500 | Hexcel Corporation - Zeeland, MI | .25 | 4 | 32 | .1 | 245 | .1 | 2 |
| | BASF Wyandotte Corp. (Pigment) - Holland, MI | .60 | 104 | 1,080 | 14.8 | 7,497 | 1.3 | 24 |
| Basin 40601 | Dow Chemical Co. - Ludington, MI | 12.87 | 62 | 399 | 21.2 | 12,304 | 2.6 | 8 |
| | Morton Chemical Co. - Manistee, MI | .52 | 12 | 16 | 1.1 | 15,262 | .5 | 10 |
| | Martin Marietta Corp. - Manistee, MI | 2.14 | 243 | 232 | 60.3 | 167,139 | .5 | 20 |
| | Hooker Chemical Co. - Montague, MI | 4.70 | 82 | 274 | 38.4 | 5,997 | 1.9 | 3 |
| | SUBTOTAL | 141.65 | 8,550 | 5,749 | 1,089.0 | 216,196 | 30.7 | 1,750 |
| LAKE HURON | | | | | | | | |
| Basin 40802 | Dow Chemical Co. - Midland, MI | 54.92 | 2,121 | 2,220 | 84.5 | 24,657 | 3.3 | 885 |
| | Bay Chemical Co. - Bay City, MI | 2.73 | 265 | 747 | 4.5 | 0 | 1.4 | 50 |
| | SUBTOTAL | 57.65 | 2,386 | 2,967 | 89.0 | 24,657 | 4.7 | 935 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 40900 | Diamond Crystal Salt Co.- St. Clair, MI | (Storm Runoff Only) | | | | | | |
| | Monsanto Corporation - Trenton, MI | 16.73 | 4 | 1,336 | 441.0 | 3,489 | 38.9 | 120 |
| | Pennwalt Corporation - Wyandotte, MI | 30.52 | 3,072 | 11,662 | 1,760.0 | 342 | 20.6 | 478 |
| | BASF Wyandotte Corp.(North) - Wyandotte, MI | 7.44 | 1,570 | 8,450 | 5.1 | 102,835 | 14.9 | 1,426 |
| | BASF Wyandotte Corp.(South) - Wyandotte, MI | 50.11 | 7,263 | 6,456 | 121.6 | 139,175 | 24.5 | 1,720 |
| | SUBTOTAL | 104.80 | 11,909 | 27,904 | 2,327.7 | 245,841 | 98.9 | 3,744 |

TABLE 17: EFFLUENT LOADINGS FROM INORGANIC AND ORGANIC CHEMICAL MANUFACTURERS IN 1982 (Continued)

| LAKE ERIE | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Chloride | Phosphorus | BOD |
|---|---|---|---|---|---|---|---|---|
| Basin 41000 | Stauffer Chemical Co. - Weston, MI | .05 | 8 | 2 | .4 | 48 | .0 | 1 |
| | Air Products and Chemicals - N.Baltimore, OH | .03 | 1 | 5 | .2 | 0 | .0 | 1 |
| | USCO Services (Uniroyal) - Port Clinton, OH | .14 | 8 | 5 | 1.2 | 134 | .9 | 7 |
| | Vistron Corporation - Lima, OH | 2.40 | 328 | 125 | 188.0 | 2,294 | 2.4 | 6 |
| Basin 41100 | RMI Company (Na & Cl Plant) - Ashtabula, OH | 10.00 | 1,357 | 310 | 80.0 | 9,560 | 5.0 | 10 |
| | Diamond Shamrock Corp.- Ashtabula, OH | .17 | 13 | 6 | 1.4 | 163 | .2 | 2 |
| | Diamond Shamrock Corp.- Painesville, OH | (Closed 1977) | | | | | | |
| | Dupont Company - Cleveland, OH | .82 | 75 | 170 | 65.0 | 1,361 | .8 | 2 |
| | General Tire and Rubber Co. - Ashtabula, OH | .38 | 32 | 44 | 3.0 | 364 | .4 | 12 |
| | Glyco Chemicals, Inc. - Painesville, OH | (No Process Discharge) | | | | | | |
| | Hall Chemical Co. - Wickliffe, OH | .18 | 18 | 6 | 1.4 | 132 | .0 | 3 |
| | Harshaw Chemical Co. - Cleveland, OH | 1.43 | 92 | 68 | 71.0 | 1,367 | .2 | 19 |
| | LCP Chemical (IMC Chemical) - Ashtabula, OH | 3.95 | 21 | 12 | 1.0 | 267 | 3.9 | 9 |
| | Lubrizol Corp. - Wickliffe, OH | .16 | 25 | 48 | 2.2 | 80 | .0 | 6 |
| | Olin Corporation - Ashtabula, OH | (Closed 1981) | | | | | | |
| | RMI Company (Metals Plant) - Ashtabula, OH | .04 | 2 | 9 | .3 | 38 | .0 | 2 |
| | SCM Corporation (Plant #1) - Ashtabula, OH | 1.07 | 89 | 36 | 8.6 | 1,023 | 1.1 | 16 |
| | SCM Corporation (Plant #2) - Ashtabula, OH | 2.43 | 6,728 | 4,828 | 19.4 | 8,323 | 2.4 | 43 |
| | SDS Biotech Inc. - Concord, OH | .45 | 23 | 186 | .5 | 430 | .5 | 92 |
| | Zircoa Products/Corning Glass - Solon, OH | .05 | 33 | 11 | 1.0 | 900 | .0 | 9 |
| | SUBTOTAL | 23.75 | 8,852 | 5,871 | 444.6 | 26,484 | 17.8 | 240 |
| | 1982 TOTAL | 327.85 | 31,697 | 42,491 | 3,950.3 | 513,178 | 152.1 | 6,669 |

TABLE 18: BPT Capital and Annual Cost Summary for Organic and Inorganic Chemical Manufacturing Plants in 1977 dollars (x 1,000)

| ORGANIC CHEMICAL MANUFACTURERS | No. of Plants | Capital Costs | Annual Costs |
|---|---|---|---|
| **Lake Michigan** | | | |
| Basin 40400 | 1 | 716 | 178 |
| Basin 40500 | 2 | 1,436 | 335 |
| Total | 3 | 2,152 | 513 |
| **Lake St. Clair** | | | |
| Basin 40900 | 2 | 1,486 | 326 |
| **Lake Erie** | | | |
| Basin 41000 | 1 | 795 | 185 |
| Basin 41100 | 4 | 2,872 | 669 |
| Total | 5 | 3,667 | 854 |
| TOTAL | 10 | 7,305 | 1,693 |
| AVERAGE | -- | 731 | 169 |

| INORGANIC CHEMICAL MANUFACTURERS | No. of Plants | Capital Costs | Annual Costs |
|---|---|---|---|
| **Lake Michigan** | | | |
| Basin 40301 | 1 | 461 | 273 |
| Basin 40400 | 3 | 4,964 | 2,626 |
| Basin 40601 | 4 | 4,013 | 2,696 |
| Total | 8 | 9,438 | 5,595 |
| **Lake Huron** | | | |
| Basin 40802 | 2 | 913 | 541 |
| **Lake St. Clair** | | | |
| Basin 40900 | 3 | 3,930 | 2,432 |
| **Lake Erie** | | | |
| Basin 41000 | 3 | 1,542 | 925 |
| Basin 41100 | 12 | 18,499 | 12,529 |
| Total | 15 | 20,041 | 13,454 |
| TOTAL | 28 | 34,322 | 22,022 |
| AVERAGE | -- | 1,226 | 787 |

## VI. PETROLEUM REFINING

### A. Refineries Included in the Survey

Sixteen (16) major petroleum refineries located in the Region V Great Lakes drainage area were identified. All 16 refineries have at some time discharged process wastewater directly to the Great Lakes drainage basin. Of these 16 refineries, five (5) have shutdown since 1972, one (1) has not discharged process wastewater since 1974, and one (1) currently dischrges to a POTW. There are currently nine (9) refineries discharging process wastewater to the Great Lakes drainage basin.

### B. Survey Methods

The petroleum refineries were identified from the EPA's IFD file plant listings and cross-referenced with the EPA EGD plant inventory in the Final Development Document for petroleum refining. The IFD file was found to be more complete since EGD did not include all refineries in their inventory (11 of the 16 refineries). Therefore, the list of refineries from the IFD file was used as the basis for identifying plants to include in the survey. The list was verified with IJC reports on petroleum refineries and State information. Each refinery was identified by WRC accounting unit and lake basin based on information in the IFD file.

The flow and effluent loading data for each refinery for 1968 were derived from State files and IJC references. State monitoring reports, early permit applications, and discharge monitoring reports (DMRs) were reviewed for appropriate data. Data was either reproduced or transcribed directly from State files as appropriate.

Flow values and effluent loadings for the 1976 time period were also collected from the appropriate State offices for each refinery. Collected data were compared with EGD and IJC effluent loading values to verify accuracy where data was available.

The data for the 1982 time period were calculated from the monthly loading values for each pipe for each plant in the STORET data base. The actual effluent loading values for each month were averaged over the entire one year period. In some cases where only effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x 8.34
(conversion factor)

The 1982 data are presented without modification (except for obvious entry errors) from the STORET computer printouts. Data points obtained from the STORET system were verified with State and IJC data where available.

## C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1968, 1976, and 1982) and presents the data by refinery and lake basin. The following parameters are presented: flow (mgd), TSS, oil and grease, ammonia, total phenolics, BOD, and COD.

Table 19 presents the 1968 effluent loadings for 16 refineries based on State and IJC information.

Table 20 presents the 1976 effluent loadings data for 13 refineries based on EGD, IJC, and State information.

Table 21 presents the most recent data from the STORET data base for 9 refineries which includes monthly values for 1982 verified with State and IJC information. Graphs showing effluent loadings by time period are included in the appendix.

## D. Cost of Effluent Reductions

The capital and annual costs for 11 of the 16 refineries were derived from the EPA Economic Impact Analysis of Effluent Limitations and Standards for the Petroleum Refining Industry (EPA-440/2-82-007). These costs include the capital cost of required treatment facilities and annual costs needed to meet the appropriate BAT effluent limitations. Annual costs include operation, maintenance, and amortization costs.

The cost summary is presented in Table 22 by WRC accounting unit and lake basin. Costs are presented in 1977 dollars.

TABLE 19: EFFLUENT LOADINGS FROM PETROLEUM REFINERIES IN 1968 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD | COD | Ammonia | O&G | Phenols |
|---|---|---|---|---|---|---|---|---|
| Basin 40102 | Phillips Petroleum Co.- Cloquet, MN (EST.) | 1.71 | 35 | 50 | 70 | 22 | 15 | 2.2 |
| Basin 40103 | Murphy Oil Co. - Superior, WI | .68 | 113 | 595 | 3,390 | 340 | 164 | 680.5 |
| | SUBTOTAL | 2.39 | 148 | 645 | 3,460 | 362 | 179 | 682.7 |
| LAKE MICHIGAN | | | | | | | | |
| Basin 40400 | Energy Cooperative - E.Chicago, IN (EST.) | 3.60 | 26 | 2,051 | 5,660 | 478 | 377 | 103.6 |
| | American Oil Co. - Whiting, IN | 127.10 | 4,200 | 18,452 | 20,918 | 2,688 | 5,271 | 175.1 |
| | Cities Services Oil Co. - E. Chicago, IN | 63.00 | 5,741 | 3,872 | 23,774 | 398 | 2,252 | 82.0 |
| | Mobil Oil Co. - E. Chicago, IN | 2.70 | 1,244 | 1,897 | 1,019 | 106 | 492 | 89.0 |
| | Sinclair Oil Co. - E. Chicago, IN | 3.90 | 1,230 | 4,419 | 1,472 | 520 | 1,700 | 111.0 |
| Basin 40500 | Lakeside Refining Co. - Kalamazoo, MI | .59 | 103 | 36 | 243 | 5 | 75 | 2.4 |
| | Crystal Refinery - Carson City, MI (EST.) | .84 | 506 | 907 | 3,786 | 298 | 103 | 21.9 |
| | SUBTOTAL | 201.73 | 13,050 | 31,634 | 56,872 | 4,493 | 10,270 | 585.0 |
| LAKE HURON | | | | | | | | |
| Basin 40801 | Osceola Refining Co. - Iosco, MI | .30 | 42 | 52 | 173 | 6 | 6 | 1.4 |
| Basin 40802 | Total Petroleum, Inc. - Alma, MI | .58 | 121 | 96 | 787 | 198 | 5 | 96.0 |
| | Dow Bay Refinery - Bay City, MI | 155.71 | 21,027 | 15,231 | 59,935 | 1,230 | 4,018 | 461.0 |
| | SUBTOTAL | 156.59 | 21,190 | 15,379 | 60,895 | 1,434 | 4,029 | 558.4 |
| LAKE ERIE | | | | | | | | |
| Basin 41000 | Standard Oil Company - Lima, OH | 3.17 | 2,508 | 4,733 | 28,934 | 6,544 | 288 | .7 |
| | Standard Oil Company - Toledo, OH | 35.30 | 18,800 | 23,500 | 20,300 | 706 | 600 | 42.0 |
| | Sun Oil Company - Toledo, OH | 1.91 | 2,220 | 2,470 | 5,065 | 190 | 492 | 6.8 |
| | Gulf Oil Co. - Toledo, OH | 54.50 | 3,200 | 7,600 | 12,260 | 215 | 1,002 | 2.0 |
| | SUBTOTAL | 94.88 | 26,728 | 38,303 | 66,559 | 7,655 | 2,382 | 51.5 |
| | 1968 TOTAL | 455.59 | 61,116 | 85,961 | 187,786 | 13,944 | 16,860 | 1,877.6 |

TABLE 20: EFFLUENT LOADINGS FROM PETROLEUM REFINERIES IN 1976 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD | COD | Ammonia | O&G | Phenols |
|---|---|---|---|---|---|---|---|---|
| Basin 40102 | Phillips Petroleum Co. - Cloquet, MN | 1.71 | 40 | 28 | 55 | 7 | 15 | .2 |
| Basin 40103 | Murphy Oil Co. - Superior, WI | .17 | 48 | 49 | 322 | 22 | 15 | .2 |
| | SUBTOTAL | 1.88 | 88 | 77 | 377 | 29 | 30 | .4 |
| LAKE MICHIGAN | | | | | | | | |
| Basin 40400 | Energy Cooperative, Inc.- E. Chicago, IN | 3.60 | 10 | 355 | 1,396 | 109 | 169 | 16.1 |
| | American Oil Co. - Whiting, IN | 129.90 | 1,609 | 1,340 | 5,160 | 730 | 1,980 | 27.2 |
| | C.F. Petroleum (Sinclair) - E. Chicago, IN | 4.76 | 1,091 | 560 | 1,797 | 728 | 344 | 8.0 |
| | Cities Services Oil Co. - E. Chicago, IN | (No Process Discharge) | | | | | | |
| | Mobil Oil Co. - E. Chicago, IN | (Closed 1972) | | | | | | |
| Basin 40500 | Lakeside Refining Co. - Kalamazoo, MI | 1.08 | 24 | 39 | 165 | 1 | 53 | .3 |
| | Crystal Refinery - Carson City, MI (EST.) | .84 | 195 | 157 | 934 | 68 | 46 | 3.4 |
| | SUBTOTAL | 140.18 | 2,929 | 2,451 | 9,452 | 1,636 | 2,592 | 55.0 |
| LAKE HURON | | | | | | | | |
| Basin 40801 | Osceola Refining Co. - Iosco, MI | .16 | 9 | 6 | 46 | 4 | 0 | .1 |
| Basin 40802 | Total Petroleum, Inc. - Alma, MI | .34 | 21 | 24 | 158 | 2 | 10 | .2 |
| | Dow Bay Refinery - Bay City, MI | (Closed 1976) | | | | | | |
| | SUBTOTAL | .50 | 30 | 30 | 204 | 6 | 10 | .3 |
| LAKE ERIE | | | | | | | | |
| Basin 41000 | Standard Oil Company - Lima, OH | 4.36 | 1,340 | 1,668 | 2,602 | 667 | 205 | .5 |
| | Standard Oil Company - Toledo, OH | 46.00 | 7,407 | 3,683 | 9,816 | 755 | 500 | 4.0 |
| | Sun Oil Company - Toledo, OH | 2.32 | 1,134 | 1,009 | 3,356 | 131 | 321 | 1.5 |
| | Gulf Oil Co. - Toledo, OH | 63.20 | 359 | 269 | 645 | 193 | 42 | 2.0 |
| | SUBTOTAL | 115.88 | 10,240 | 6,629 | 16,419 | 1,746 | 1,068 | 8.0 |
| | 1976 TOTAL | 258.44 | 13,287 | 9,187 | 26,452 | 3,417 | 3,700 | 63.7 |

TABLE 21: EFFLUENT LOADINGS FROM PETROLEUM REFINERIES IN 1982 (lbs/day)

| LAKE SUPERIOR | FACILITY NAME | FLOW (mgd) | TSS | BOD | COD | Ammonia | O&G | Phenols |
|---|---|---|---|---|---|---|---|---|
| Basin 40102 | Phillips Petroleum Co.- Cloquet, MN | (Closed 1979) | | | | | | |
| Basin 40103 | Murphy Oil Co. - Superior, WI | .25 | 52 | 86 | 417 | 35 | 55 | 3.7 |
| | SUBTOTAL | .25 | 52 | 86 | 417 | 35 | 55 | 3.7 |
| LAKE MICHIGAN | | | | | | | | |
| Basin 40400 | Energy Cooperative, Inc.- E. Chicago, IN | .77 | 75 | 162 | 637 | 12 | 13 | 5.2 |
| | American Oil Co. - Whiting, IN | 114.80 | 506 | 444 | 3,680 | 212 | 254 | 1.0 |
| | C.F. Petroleum - E. Chicago, IN | (Closed 1977) | | | | | | |
| Basin 40500 | Lakeside Refining Co. - Kalamazoo, MI | 1.26 | 21 | 34 | 132 | 0 | 41 | .2 |
| | Crystal Refinery - Carson City, MI | (Discharge to POTW) | | | | | | |
| | SUBTOTAL | 116.83 | 602 | 640 | 4,449 | 224 | 308 | 6.4 |
| LAKE HURON | | | | | | | | |
| Basin 40801 | Osceola Refining Co. - Iosco, MI | .11 | 7 | 7 | 12 | 2 | 1 | .0 |
| Basin 40802 | Total Petroleum, Inc. - Alma, MI | .50 | 74 | 158 | 233 | 5 | 19 | .5 |
| | SUBTOTAL | .61 | 80 | 165 | 245 | 7 | 21 | .5 |
| LAKE ERIE | | | | | | | | |
| Basin 41000 | Standard Oil Company - Lima, OH | 5.10 | 1,076 | 1,176 | 1,876 | 463 | 238 | 34.9 |
| | Standard Oil Company - Toledo, OH | 30.59 | 1,275 | 765 | 10,970 | 36 | 350 | 4.0 |
| | Sun Oil Company - Toledo, OH | 2.60 | 253 | 423 | 915 | 69 | 80 | 1.4 |
| | Gulf Oil Co. - Toledo, OH | (Closed 1981) | | | | | | |
| | SUBTOTAL | 38.29 | 2,604 | 2,364 | 13,761 | 568 | 668 | 40.3 |
| | 1982 TOTAL | 155.98 | 3,338 | 3,255 | 18,872 | 834 | 1,052 | 50.9 |

TABLE 22: BAT Capital and Annual Cost Summary for Petroleum Refineries in 1977 Dollars (x 1,000)

| | No. of Refineries | Capital Costs | Annual Costs |
|---|---|---|---|
| **Lake Superior** | | | |
| Basin 40103 | 1* | 145 | 47 |
| **Lake Michigan** | | | |
| Basin 40400 | 2 | 2,995 | 433 |
| Basin 40500 | 1 | 130 | 40 |
| Total | 3 | 3,125 | 473 |
| **Lake Huron** | | | |
| Basin 40801 | 1 | 160 | 50 |
| Basin 40802 | 1* | 330 | 103 |
| Total | 2 | 490 | 153 |
| **Lake Erie** | | | |
| Basin 41000 | 2* | 152 | 419 |
| | 3 | 972 | 388 |
| Total | 5 | 1,124 | 807 |
| TOTAL | 11 | 4,884 | 1,480 |
| AVERAGE | -- | 444 | 135 |

Note: Costs reflect two levels of treatment. Level 1 is flow reduction to 73% of model flow plus equalization and filtration. Level 2 is all of Level 1 plus activated carbon or rotating biological contactors (RBCs). All costs are for Level 1 treatment except those noted by an asterisk (*).

## VII. FERROUS AND NONFERROUS FOUNDRIES

### A. Foundries Included in the Survey

Fifty-six (56) ferrous and nonferrous foundries in the Region V Great Lakes drainage area were identified. All 56 plants currently discharge process wastewater directly to the Great Lakes drainage basin. For the purposes of this survey, ferrous foundries include foundries which cast gray iron, malleable iron, and steel. Non-ferrous foundries include foundries which cast aluminum, copper, brass, zinc, magnesium, titanium, lead, and bronze.

### B. Survey Methods

The foundries were identified from EPA's IFD file plant listings and cross-referenced with the EPA EGD plant inventory and State information. The IFD file was found to be more complete since EGD did not include all foundries in their inventory (23 of the 56 plants). Therefore, the list of foundries from the IFD file was used as the basis for identifying foundries to include in the survey. Each foundry was identified by SIC code, WRC accounting unit, and lake basin based on information in the IFD file.

The flow and effluent loading data for each foundry for 1968 were collected from State files which included monitoring surveys, early permit applications, and discharge monitoring reports (DMRs) where available. In many cases, no data for 1968 were found for foundries. This lack of data is noted on the table where appropriate. Data had to be estimated for 35 of the 56 foundries for the 1968 time period.

Flow values and effluent loadings for the 1976 time period were also obtained from State information for each foundry. State data were verified with EGD foundry inventory data where available. Data had to be estimated for 10 of the 56 foundries.

The data for the 1982 time period were calculated from the monthly loading values for each pipe for each foundry in the STORET data base. The actual effluent loading values for those parameters monitored were averaged over the entire one year period. In some cases where only effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x 8.34
(conversion factor)

The 1982 data are presented without modification from the STORET computer printouts. STORET data were verified with State information, where available.

## C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1968, 1976, and 1982) and presents the data by foundry and lake basin. The following parameters are presented: flow (mgd), TSS, oil and grease, ammonia, total phosphorus, COD, and total metals. Total metals includes iron, copper, nickel, zinc, total chromium, lead, and cadmium.

Table 23 presents the estimated 1968 effluent loadings for 56 foundries based on State information.

Table 24 presents the 1976 effluent loadings data for 56 foundries based on EGD and State information.

Table 25 presents the most recent data from the STORET data base for 56 foundries which includes average monthly values from 1982 verified with State information. Graphs showing effluent reductions by time period are included in the Appendix.

## D. Cost of Effluent Reductions

The capital and annual costs for foundries were derived from the EGD cost summaries for the BPT levels of effluent reduction. These costs include capital and annual costs of treatment facilities needed to meet the appropriate BPT effluent limitations. The annual costs include operation, maintenance, and amortization costs. These cost estimates were derived from average costs for each type of foundry (e.g., gray iron and copper) as presented in the report Economic Analysis of Proposed Effluent Limitations and Standards for the Foundry Industry (EPA-440/2-82-016)

The cost summary for the foundries is presented in Table 26 by lake basin and WRC accounting unit. Costs are presented in 1978 dollars.

TABLE 23: EFFLUENT LOADINGS FROM FOUNDRIES IN 1968 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Brillion Iron Works - Brillion, WI | .12 | 68 | 71 | 13.3 | .4 | 5 | 2.78 |
| | Gilson Bros. Co. - Plymouth, WI (EST.) | .05 | 19 | 32 | 6.2 | .5 | 13 | .25 |
| | Medalist State Foundry - Cedar Grove, WI (EST.) | .08 | 3 | 49 | 9.7 | 1.8 | 2 | .04 |
| | Tecumseh Products Co. - Sheboygan, WI (EST.) | .02 | 63 | 8 | .8 | .5 | 2 | .06 |
| | Waupaca Foundry (#1) - Waupaca, WI | .14 | 615 | 83 | 15.5 | 2.0 | 131 | 2.73 |
| Basin 40302 | Neenah Brass & Al Foundry - Neenah, WI | .45 | 1,485 | 266 | 49.9 | 4.1 | 238 | 166.71 |
| | Neenah Foundry (Plant #2) - Neenah, WI (EST.) | .75 | 2,563 | 212 | 28.6 | 3.3 | 238 | 201.80 |
| | McQuay - Perfex, Inc. - Berlin, WI | ND | ND | ND | ND | ND | ND | ND |
| | Universal Foundry Co. - Oshkosh, WI | ND | ND | ND | ND | ND | ND | ND |
| Basin 40400 | American Steel Foundries - E. Chicago, IN | .50 | ND | ND | ND | ND | ND | ND |
| | Ampco Metal Division - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Badger Die Casting Corp. - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Blaw-Knox & Mill Machines - E. Chicago, IN | .43 | ND | ND | ND | ND | ND | ND |
| | Briggs & Stratton Corp - W. Allis, WI | ND | ND | ND | ND | ND | ND | ND |
| | Dayton Malleable Inc. - Cedarburg, WI | ND | ND | ND | ND | ND | ND | ND |
| | Federal Malleable Co. - W. Allis, WI | ND | ND | ND | ND | ND | ND | ND |
| | Grey Iron Foundry - W. Allis, WI | ND | ND | ND | ND | ND | ND | ND |
| | Howmet Corporation - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Milwaukee Malleable & Grey Iron - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Motor Casting Co.(Plt #1) - W. Allis, WI | ND | ND | ND | ND | ND | ND | ND |
| | Motor Casting Co.(Plt #2) - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Pelton Cast Steel Co. - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Stroh Die Casting Corporation - Milwaukee, WI | ND | ND | ND | ND | ND | ND | ND |
| | Wehr Steel Co. - W. Allis, WI | ND | ND | ND | ND | ND | ND | ND |
| | ESTIMATED LOADINGS FOR 17 FOUNDRIES | 3.86 | 2,188 | 2,286 | 428.0 | 28.0 | 972 | 1,025.00 |
| Basin 40500 | Attwood Corp. - Lowell, MI | .18 | 22 | 107 | .0 | 1.4 | 10 | 15.15 |
| | Auto Specialties - St. Joseph, MI | .71 | 154 | 510 | 78.9 | 1.9 | 30 | .04 |
| | Bohn Aluminum and Brass - Holland, MI | .16 | 50 | 120 | 66.2 | .8 | 7 | .18 |
| | Brooks Foundry - Albion, MI (EST.) | .22 | 125 | 130 | 24.4 | .9 | 1 | 6.33 |
| | Campbell, Wyant, & Cannon - S. Haven, MI (EST.) | .08 | 45 | 368 | 8.9 | 17.8 | 41 | 12.25 |
| | Du-Well Products, Inc. - Bangor, MI | .20 | 123 | 233 | 22.2 | 14.0 | 10 | 63.60 |
| | Dynac Corp. - St. Joseph, MI | .16 | 81 | 38 | .0 | .1 | 24 | .37 |
| | Hoover Ball & Bearing Co. - Adrian, MI | .38 | 10 | 31 | .2 | 2.1 | 6 | 4.00 |
| | Hoover Universal, Inc. - Charlotte, MI | .16 | 345 | 95 | 17.8 | 1.8 | 10 | .84 |
| | Hoover NSK Bearing Co. - Ann Arbor, MI (EST.) | .05 | 28 | 30 | 5.6 | 1.6 | 40 | .18 |
| | New Products Corp. - Benton Harbor, MI | .08 | 45 | 47 | 8.9 | .3 | 60 | .14 |
| | Nelson Metal Products - Grandville, MI | .79 | 32 | 387 | .0 | .1 | 273 | .87 |
| | Reynolds Metals - Grand Rapids, MI | .46 | 0 | 32 | .1 | .2 | 20 | .06 |
| | Sundstrand Heat Transfer - Dowagiac, MI | .31 | 176 | 51 | 34.4 | 3.2 | 13 | 3.27 |
| Basin 40601 | Campbell, Wyant, & Cannon - Muskegon, MI (EST.) | .92 | 523 | 545 | 102.2 | 2.0 | 41 | 115.58 |
| | East Jordan Iron Works, Inc. - E. Jordan, MI | 1.82 | 947 | 259 | 202.1 | .0 | 31 | 19.20 |
| | Great Lakes Casting Corp. - Ludington,MI (EST.) | .03 | 17 | 18 | 3.3 | .3 | 2 | 1.00 |
| | Sealed Power Co. - Muskegon Hgts, MI (EST.) | 1.14 | 648 | 675 | 126.6 | 100.5 | 60 | 15.29 |
| | Westran Corp. - Muskegon, MI (EST.) | .58 | 329 | 343 | 64.4 | 1.2 | 20 | .08 |
| | SUBTOTAL | 13.88 | 10,704 | 7,027 | 1,318.1 | 190.7 | 2,299 | 1,657.80 |

TABLE 23: EFFLUENT LOADINGS FROM FOUNDRIES IN 1968 (lbs/day) (Continued)

| LAKE HURON | FACILITY NAME | | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40802 | GMC - Chevrolet Motors - Bay City, MI | (EST.) | 11.20 | 6,362 | 6,632 | 1,244.0 | 56.6 | 495 | 55.70 |
| | Eaton Corporation - Vassar, MI | (EST.) | .69 | 392 | 409 | 76.0 | 1.2 | 41 | 6.94 |
| | GMC-Chevrolet Metal Castings-Saginaw, MI | | 28.00 | 16,599 | 8,248 | 358.0 | 41.0 | 1,238 | 47.20 |
| | | SUBTOTAL | 39.89 | 23,353 | 15,289 | 1,678.0 | 98.8 | 1,774 | 109.84 |
| LAKE ST.CLAIR | | | | | | | | | |
| Basin 40900 | New Haven Foundry, Inc. - New Haven, MI | (EST.) | 18.96 | 10,769 | 11,227 | 2,106.0 | 38.9 | 829 | 200.02 |
| | GMC - Central Foundry - Pontiac, MI | (EST.) | 6.70 | 3,806 | 3,967 | 744.0 | 27.5 | 1,550 | 70.69 |
| | | SUBTOTAL | 25.66 | 14,575 | 15,194 | 2,850.0 | 66.4 | 2,379 | 270.71 |
| LAKE ERIE | | | | | | | | | |
| Basin 41000 | Webster Manufacturing Co. - Tiffin, OH | (EST.) | .02 | 345 | 12 | 3.6 | .9 | 3 | .21 |
| | Bohn Aluminum and Brass - Butler, IN | (EST.) | .05 | 28 | 30 | 6.0 | .7 | 2 | .17 |
| | Kitchen Quip, Inc. - Waterloo, IN | (EST.) | .02 | 12 | 12 | 2.2 | 1.3 | 1 | 1.00 |
| | Hoover Ball & Bearing Co.- Saline, MI | | .46 | 203 | 586 | 51.8 | 3.2 | 127 | 46.87 |
| | Brush Wellman Co. - Elmore, OH | | 3.23 | 1,642 | 18,818 | 3,204.0 | 8.4 | 84 | .45 |
| | Chrysler Corp./Amplex - Van Wert, OH | | .43 | 142 | 85 | 47.8 | .8 | 5 | 8.19 |
| | Chase Brass & Copper - Montpelier, OH | | .15 | 636 | 89 | 16.6 | .8 | 4 | .36 |
| Basin 41100 | Chase Brass & Copper - Euclid, OH | | 4.20 | 945 | 3,640 | 466.5 | 1.1 | 185 | 37.24 |
| | | SUBTOTAL | 8.56 | 3,953 | 23,272 | 3,798.5 | 17.2 | 411 | 94.49 |
| | | 1968 TOTAL | 87.99 | 52,585 | 60,782 | 9,644.6 | 373.0 | 6,864 | 2,132.84 |

TABLE 24: EFFLUENT LOADINGS FROM FOUNDRIES IN 1976 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Brillion Iron Works - Brillion, WI | | .12 | 13 | 18 | .1 | .1 | 2 | .00 |
| | Gilson Bros. Co. - Plymouth, WI | | .00 | 8 | 8 | .2 | 3.4 | 7 | .14 |
| | Medalist State Foundry - Cedar Grove, WI | | .06 | 0 | 12 | .2 | .1 | 1 | .02 |
| | Tecumseh Products Co. - Sheboygan, WI | | .10 | 26 | 2 | .2 | .0 | 2 | .01 |
| | Waupaca Foundry (#1) - Waupaca, WI | | .16 | 15 | 29 | .3 | .0 | 2 | 1.31 |
| Basin 40302 | McQuay - Perfex, Inc. - Berlin, WI | | .06 | 49 | 9 | 1.7 | .1 | 22 | .29 |
| | Neenah Brass & Al Foundry - Neenah, WI | | .50 | 744 | 144 | 6.8 | .0 | 0 | 29.95 |
| | Neenah Foundry (Plant #2) - Neenah, WI | | .75 | 1,284 | 115 | 3.9 | .8 | 20 | 95.80 |
| | Universal Foundry Co. - Oshkosh, WI | | .44 | 34 | 94 | .0 | .5 | 5 | .00 |
| Basin 40400 | American Steel Foundries - E.Chicago, IN | (EST.) | .14 | 24 | 2 | 3.9 | .1 | 4 | .70 |
| | Ampco Metal Division - Milwaukee, WI | | .15 | 6 | 23 | .4 | .1 | 4 | .63 |
| | Badger Die Casting Corp. - Milwaukee, WI | | .04 | 1 | 6 | .2 | .0 | 1 | .03 |
| | Blaw-Knox & Mill Machines - E. Chicago, IN | (EST.) | .57 | 97 | 87 | 15.9 | .6 | 7 | 2.85 |
| | Briggs & Stratton Corp - W. Allis, WI | | 1.30 | 476 | 237 | 9.1 | .1 | 48 | 108.63 |
| | Dayton Malleable Inc. - Cedarburg, WI | | .00 | 5 | 3 | .0 | .1 | 1 | .22 |
| | Federal Malleable Co. - W. Allis, WI | | .00 | 2 | 4 | .0 | .9 | 2 | .08 |
| | Grey Iron Foundry - W. Allis, WI | | .11 | 11 | 17 | .0 | .1 | 6 | 2.04 |
| | Howmet Corporation - Milwaukee, WI | | .58 | 15 | 88 | 1.7 | .6 | 13 | .07 |
| | Milwaukee Malleable & Grey Works - Milwaukee,WI | | .07 | 9 | 5 | .1 | .0 | 4 | .10 |
| | Motor Casting Co.(Plt #1) - W. Allis, WI | | .16 | 40 | 24 | .3 | .1 | 2 | .06 |
| | Motor Casting Co.(Plt #2) - Milwaukee, WI | | .04 | 1 | 6 | .1 | .0 | 1 | .06 |
| | Pelton Cast Steel Co. - Milwaukee, WI | | .00 | 26 | 12 | .3 | .0 | 3 | 3.76 |
| | Stroh Die Casting Corporation - Milwaukee, WI | | .02 | 1 | 3 | .0 | .0 | 5 | .05 |
| | Wehr Corporation - W. Allis, WI | | .08 | 4 | 44 | .0 | .1 | 11 | .28 |
| Basin 40500 | Attwood Corp. - Lowell, MI | | .16 | 57 | 99 | 20.7 | .6 | 14 | 14.02 |
| | Auto Specialties - St. Joseph, MI | | 1.64 | 165 | 243 | 66.2 | 2.2 | 74 | 32.20 |
| | Bohn Aluminum and Brass - Holland, MI | | .16 | 27 | 24 | 4.5 | .2 | 4 | .02 |
| | Brooks Foundry - Albion, MI | (EST.) | .22 | 38 | 33 | 6.2 | .2 | 10 | 1.10 |
| | Campbell, Wyant, & Cannon - S. Haven, MI | | .08 | 28 | 368 | 10.4 | 4.6 | 24 | 3.00 |
| | Du-Well Products, Inc. - Bangor, MI | | .33 | 43 | 50 | .9 | 3.5 | 6 | 5.81 |
| | Dynac Corp. - St. Joseph, MI | (EST.) | .16 | 28 | 24 | 4.4 | .1 | 14 | .80 |
| | Hoover Ball & Bearing Co. - Adrian, MI | (EST.) | .38 | 65 | 58 | 10.6 | .4 | 10 | 1.90 |
| | Hoover Universal, Inc. - Charlotte, MI | | .16 | 29 | 42 | .2 | 2.8 | 6 | .40 |
| | Hoover NSK Bearing Co. - Ann Arbor, MI | | .05 | 12 | 3 | .2 | .4 | 2 | .09 |
| | New Products Corp. - Benton Harbor, MI | | .07 | 12 | 18 | 1.3 | .3 | 3 | .07 |
| | Nelson Metal Products - Grandville, MI | | .03 | 34 | 185 | .0 | .0 | 161 | 1.33 |
| | Reynolds Metals - Grand Rapids, MI | (EST.) | .46 | 79 | 70 | 12.9 | .5 | 12 | 2.30 |
| | Sundstrand Heat Transfer - Dowagiac, MI | | .31 | 24 | 151 | .3 | .8 | 8 | 1.55 |
| Basin 40601 | Campbell, Wyant, & Cannon - Muskegon, MI | | .92 | 330 | 25 | .5 | .5 | 24 | 54.78 |
| | East Jordan Iron Works, Inc. - E. Jordan, MI | | 1.82 | 170 | 277 | 50.9 | 2.3 | 18 | 9.10 |
| | Great Lakes Casting Corp. - Ludington,MI | | .03 | 3 | 14 | .2 | .0 | 0 | .00 |
| | Sealed Power Co. - Muskegon Hgts, MI | | 1.14 | 47 | 675 | 2.3 | 32.3 | 41 | 7.25 |
| | Westran Corp. - Muskegon, MI | | .58 | 42 | 66 | .9 | .3 | 15 | .04 |
| | | SUBTOTAL | 14.16 | 4,122 | 3,417 | 238.8 | 59.8 | 618 | 382.84 |

TABLE 24: EFFLUENT LOADINGS FROM FOUNDRIES IN 1976 (lbs/day) (Continued)

| LAKE HURON | FACILITY NAME | | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40802 | GMC- Chevrolet Motors Div.- Bay City, MI | | 11.20 | 670 | 1,089 | 62.8 | 13.8 | 291 | 26.40 |
| | Eaton Corporation - Vassar, MI | | .69 | 360 | 31 | .6 | .3 | 24 | 3.29 |
| | GMC-Chevrolet Metal Castings-Saginaw, MI | | 28.00 | 2,719 | 4,400 | 370.0 | 4.7 | 728 | 58.00 |
| | | SUBTOTAL | 39.89 | 3,749 | 5,520 | 433.4 | 18.8 | 1,043 | 87.69 |
| LAKE ST.CLAIR | | | | | | | | | |
| Basin 40900 | New Haven Foundry, Inc. - New Haven, MI | | 18.96 | 949 | 3,162 | 189.7 | 9.5 | 493 | 94.80 |
| | GMC - Central Foundry - Pontiac, MI | | 6.70 | 1,485 | 1,018 | 471.0 | 6.7 | 912 | 33.50 |
| | | SUBTOTAL | 25.66 | 2,434 | 4,180 | 660.7 | 16.2 | 1,405 | 128.30 |
| LAKE ERIE | | | | | | | | | |
| Basin 41000 | Webster Manufacturing Co. - Tiffin, OH | | .02 | 345 | 8 | 2.6 | .0 | 2 | .10 |
| | Bohn Aluminum and Brass - Butler, IN | (EST.) | .05 | 9 | 8 | 1.4 | .0 | 1 | .80 |
| | Kitchen Quip, Inc. - Waterloo, IN | (EST.) | .02 | 3 | 4 | .8 | .0 | 0 | .00 |
| | Hoover Ball & Bearing Co.- Saline, MI | | .12 | 30 | 70 | .5 | .8 | 2 | 2.10 |
| | Brush Wellman Co. - Elmore, OH | | 1.88 | 1,066 | 286 | 1,044.0 | 2.1 | 49 | 1.57 |
| | Chrysler Corp./Amplex - Van Wert, OH | | .17 | 8 | 26 | .4 | .2 | 3 | .00 |
| | Chase Brass & Copper - Montpelier, OH | (EST.) | .15 | 26 | 25 | 1.2 | .2 | 4 | .75 |
| Basin 41100 | Chase Brass & Copper - Euclid, OH | (EST.) | 4.20 | 719 | 638 | 117.0 | 1.0 | 109 | 17.65 |
| | | SUBTOTAL | 6.61 | 2,206 | 1,065 | 1,167.9 | 4.3 | 170 | 22.97 |
| | | 1976 TOTAL | 86.32 | 12,510 | 14,182 | 2,500.8 | 99.1 | 3,235 | 621.81 |

TABLE 25: EFFLUENT LOADINGS FROM FOUNDRIES IN 1982 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|
| Basin 40301 | Brillion Iron Works - Brillion, WI | .32 | 0 | 7 | 1.4 | .3 | 11 | 2.77 |
| | Gilson Bros. Co. - Plymouth, WI | .02 | 2 | 1 | .2 | 8.4 | 1 | .09 |
| | Medalist State Foundry - Cedar Grove, WI | .06 | 0 | 2 | .5 | .1 | 7 | .01 |
| | Tecumseh Products Co. - Sheboygan, WI | .09 | 2 | 3 | .6 | .1 | 4 | .01 |
| | Waupaca Foundry (#1) - Waupaca, WI | .38 | 138 | 15 | 1.6 | .7 | 7 | 3.38 |
| Basin 40302 | McQuay - Perfex, Inc. - Berlin, WI | .21 | 10 | 7 | 1.6 | .3 | 47 | .84 |
| | Neenah Brass & Al Foundry - Neenah, WI | .05 | 6 | 2 | .3 | .0 | 0 | .21 |
| | Neenah Foundry (Plant #2) - Neenah, WI | .02 | 3 | 1 | .2 | .0 | 0 | .00 |
| | Universal Foundry Co. - Neenah, WI | .39 | 25 | 19 | 2.1 | .4 | 192 | 3.11 |
| Basin 40400 | American Steel Foundries - E. Chicago, IN | .14 | 3 | 5 | 1.1 | .2 | 2 | .04 |
| | Ampco Metal Division - Milwaukee, WI | .13 | 13 | 5 | 1.0 | .3 | 1 | .02 |
| | Badger Die Casting Corp. - Milwaukee, WI | .02 | 1 | 1 | .0 | .0 | 1 | .00 |
| | Blaw-Knox & Mill Machines - E. Chicago,IN | .57 | 75 | 20 | 4.1 | .5 | 7 | 4.80 |
| | Briggs & Stratton Corp - W. Allis, WI | .00 | 12 | 15 | .0 | .0 | 1 | 12.80 |
| | Dayton Malleable Inc. - Cedarburg, WI | .01 | 9 | 5 | 1.0 | .2 | 11 | .02 |
| | Federal Malleable Co. - W. Allis, WI | .01 | 82 | 22 | 4.7 | 5.6 | 2 | .21 |
| | Grey Iron Foundry - W. Allis, WI | .18 | 6 | 21 | 1.0 | .1 | 4 | 1.18 |
| | Howmet Corporation - Milwaukee, WI | .44 | 9 | 20 | 4.0 | .5 | 9 | .19 |
| | Milwaukee Malleable & Grey Iron - Milwaukee,WI | .27 | 1 | 1 | .2 | .0 | 0 | .00 |
| | Motor Casting Co.(Plt #1) - W. Allis, WI | .09 | 18 | 4 | .4 | .2 | 0 | 4.25 |
| | Motor Casting Co.(Plt #2) - Milwaukee, WI | .03 | 2 | 1 | .1 | .0 | 5 | .12 |
| | Pelton Cast Steel Co. - Milwaukee, WI | .00 | 0 | 1 | .1 | .0 | 0 | .02 |
| | Stroh Die Casting Corporation - Milwaukee, WI | .01 | 0 | 1 | .0 | .1 | 2 | .04 |
| | Wehr Steel Co. - W. Allis, WI | .02 | 27 | 9 | .1 | .0 | 14 | .02 |
| Basin 40500 | Attwood Corp. - Lowell, MI | .16 | 21 | 185 | 10.3 | .3 | 1 | 1.02 |
| | Auto Specialties - St. Joseph, MI | .78 | 45 | 27 | 24.0 | .6 | 25 | 3.26 |
| | Bohn Aluminum and Brass - Holland, MI | .42 | 10 | 86 | .0 | .3 | 1 | .07 |
| | Brooks Foundry - Albion, MI | .22 | 4 | 7 | .0 | .1 | 1 | .55 |
| | Campbell, Wyant, & Cannon - S. Haven, MI | .08 | 2 | 5 | .0 | .0 | 0 | .03 |
| | Du-Well Products, Inc. - Bangor, MI | .16 | 0 | 44 | .2 | .5 | 1 | .48 |
| | Dynac Corp. - ST. Joseph, MI | .02 | 1 | 1 | .0 | .0 | 1 | .00 |
| | Hoover Ball & Bearing Co.- Adrian, MI | .24 | 8 | 55 | .6 | .6 | 5 | .36 |
| | Hoover Universal, Inc. - Charlotte, MI | .16 | 26 | 55 | .3 | .6 | 1 | .36 |
| | Hoover NSK Bearing Co. - Ann Arbor, MI | .04 | 1 | 6 | .5 | .0 | 0 | .08 |
| | New Products Corp. - Benton Harbor, MI | .07 | 9 | 2 | .1 | .0 | 1 | .03 |
| | Nelson Metal Products - Grandville, MI | .78 | 103 | 27 | 1.8 | .7 | 1 | .33 |
| | Reynolds Metals - Grand Rapids, MI | .46 | 51 | 12 | .5 | .5 | 2 | .15 |
| | Sundstrand Heat Transfer - Dowagiac, MI | .46 | 61 | 16 | .4 | .8 | 32 | .44 |
| Basin 40601 | Campbell, Wyant, & Cannon - Muskegon, MI | .25 | 44 | 29 | .1 | .0 | 1 | 2.02 |
| | East Jordan Iron Works, Inc. - E. Jordan, MI | 1.90 | 106 | 67 | 14.4 | 1.6 | 5 | .64 |
| | Great Lakes Casting Corp. - Ludington,MI | .08 | 10 | 2 | .2 | .0 | 1 | .51 |
| | Sealed Power Co. - Muskegon, MI | .07 | 9 | 66 | .7 | .2 | 3 | .44 |
| | Westran Corp. - Muskegon, MI | .13 | 7 | 5 | .9 | .1 | 2 | .04 |
| | SUBTOTAL | 9.94 | 963 | 885 | 81.3 | 24.8 | 412 | 44.92 |

TABLE 25: EFFLUENT LOADINGS FROM FOUNDRIES IN 1982 (lbs/day) (Continued)

| LAKE HURON | FACILITY NAME | FLOW (mgd) | TSS | COD | Ammonia | Phosphorus | O&G | Total Metals |
|---|---|---|---|---|---|---|---|---|
| Basin 40802 | GMC- Chevrolet Motors Division - Bay City, MI | 10.70 | 3,359 | 2,420 | 37.4 | 44.0 | 40 | 4.40 |
| | Eaton Corporation - Vassar, MI | .21 | 7 | 8 | 1.6 | .2 | 2 | .07 |
| | GMC - Chevrolet Metal Castings - Saginaw, MI | 28.87 | 5,292 | 1,010 | 396.9 | 11.0 | 107 | 2.67 |
| | SUBTOTAL | 39.78 | 8,658 | 3,438 | 435.9 | 55.2 | 149 | 7.14 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 40900 | New Haven Foundry, Inc. - New Haven, MI | 15.80 | 640 | 553 | 171.0 | 13.3 | 58 | 5.37 |
| | GMC - Central Foundry - Pontiac, MI | .77 | 102 | 27 | 5.9 | .6 | 26 | .26 |
| | SUBTOTAL | 16.57 | 742 | 580 | 176.9 | 13.9 | 84 | 5.63 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 41000 | Webster Manufacturing Co. - Tiffin, OH | .04 | 2 | 1 | .3 | .0 | 0 | .01 |
| | Bohn Aluminum and Brass - Butler, IN | .05 | 2 | 2 | .4 | .1 | 0 | .08 |
| | Kitchen Quip, Inc. - Waterloo, IN | .02 | 2 | 1 | .1 | .6 | 1 | .17 |
| | Hoover Ball & Bearing Co.- Saline, MI | .16 | 23 | 14 | 1.7 | .2 | 2 | .37 |
| | Chase Brass & Copper - Montpelier, OH | .15 | 13 | 5 | 1.1 | .1 | 3 | .32 |
| | Chrysler Corp./Amplex - Van Wert, OH | .55 | 75 | 19 | 1.1 | .5 | 7 | .18 |
| | Brush Wellman Co. - Elmore, OH | .13 | 23 | 5 | 1.4 | .2 | 2 | .29 |
| Basin 41100 | Chase Brass & Copper - Euclid, OH | .50 | 66 | 18 | 3.8 | .9 | 14 | 1.37 |
| | SUBTOTAL | 1.60 | 206 | 65 | 9.9 | 2.6 | 29 | 2.79 |
| | 1982 TOTAL | 67.89 | 10,568 | 4,968 | 704.0 | 96.5 | 674 | 60.48 |

TABLE 26: BPT Capital and Annual Cost Summary for Foundries in 1978 Dollars (x 1,000)

| | No. of Foundries | Capital Costs | Annual Costs |
|---|---|---|---|
| **Lake Michigan** | | | |
| Basin 40301 | 5 | 658.6 | 136.6 |
| Basin 40302 | 4 | 533.7 | 116.9 |
| Basin 40400 | 15 | 2,511.2 | 471.1 |
| Basin 40500 | 14 | 1,545.7 | 491.4 |
| Basin 40601 | 5 | 607.1 | 220.8 |
| Total | 43 | 5,856.3 | 1,436.8 |
| **Lake Huron** | | | |
| Basin 40802 | 3 | 401.9 | 84.0 |
| **Lake St. Clair** | | | |
| Basin 40900 | 2 | 259.0 | 57.0 |
| **Lake Erie** | | | |
| Basin 41000 | 7 | 765.7 | 221.9 |
| Basin 41100 | 1 | 142.9 | 27.0 |
| Total | 8 | 908.6 | 248.9 |
| TOTAL | 56 | 7,425.8 | 1,826.7 |
| AVERAGE | -- | 132.6 | 32.6 |

## VIII. ELECTROPLATING AND OTHER METAL FINISHING

### A. Plants Included in the Survey

Twenty-five (25) electroplating and other metal finishing facilities located in the Region V Great Lakes drainage area were identified. All 25 facilities have discharged process wastewater directly to the Great Lakes drainage basin. One facility has not discharged process wastewater since 1968. One facility has discharged process wastewater to a POTW since 1975. Two other facilities have closed since 1980. These 25 facilities include electroplating, anodizing, coating, and polishing facilities.

### B. Survey Methods

The electroplating facilities were identified from EPA's IFD file plant listings and cross-referenced with the EPA EGD plant inventory and State information. The IFD file was found to be more complete since EGD did not include all facilities in their inventory (only 7 of the 25 plants). Therefore, the list of plants from the IFD file was used as the basis for identifying plants to include in the survey. Each plant was identified by SIC code, WRC accounting unit and lake basin based on information in the IFD file.

The flow and effluent loading data for each facility for 1968 were collected from State files which include monitoring surveys, permit applications, and discharge monitoring reports (DMRs). Data had to be estimated for 8 of the 25 facilities.

Flow values and effluent loadings for the 1976 period were also collected from State files and values were compared with EGD effluent loading values to verify accuracy where data were available. Data had to be estimated for 10 of the 25 facilities.

The data for the 1982 time period were calculated from the monthly loading values for each pipe for each plant in the STORET data base which was verified with State information. The actual effluent loading values for each month were averaged over the entire one year period. In some cases where only effluent concentration data in mg/l were recorded, loadings in lbs/day were calculated using the average flow rate in mgd with the following formula:

Average load (lbs/day) = average concentration (mg/l) x
average flow (mgd) x 8.34
(conversion factor)

### C. Survey Results

The effluent flow rates and pollutant loadings are presented in tabular form. Each table represents a separate time period (i.e., 1968, 1976, and 1982) and presents the data by plant and lake basin. The following parameters are presented: flow (mgd), TSS, oil and grease, ammonia, COD, total phosphorus, and total metals. Total metals includes copper, total chromium, zinc, nickel, lead, and aluminum.

Table 27 presents the 1968 effluent loadings for 25 facilities based on State information.

Table 28 presents the 1976 effluent loadings data for 23 plants based on State and EGD information.

Table 29 presents the most recent data from the STORET data base for 21 plants which includes monthly values from 1982 verified with State information. Graphs showing effluent reduction by time period are included in the Appendix.

## D. Cost of Effluent Reductions

The capital and annual costs for each electroplating facility cannot be derived from the EGD cost summaries without detailed information on specific plant operations and wastewater treatment requirements for each facility.

Generally capital costs for a mid-sized electroplating facility (i.e., flow rate of .15 MGD) using batch process operations would be approximately $184,000 which includes sludge handling costs. Annual costs average about $78,000 including sludge handling costs. Using these gross figures a total capital cost of $3,864,000 and annual costs of $1,638,000 for the 21 facilities would be required to meet BPT limitations.

TABLE 27: EFFLUENT LOADINGS FROM ELECTROPLATING FACILITIES IN 1968 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | | FLOW (mgd) | TSS | COD | O&G | Ammonia | Phosphorus | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40400 | S.K. Williams Co. - Wauwatosa, WI | | .27 | 13 | 51 | 9 | .1 | .8 | 1.24 |
| Basin 40500 | Bronson Plating Co. - Bronson, MI | | .13 | 11 | 22 | 4 | .0 | .0 | 2.64 |
| | Home Plating Co. - Sturgie, MI | | .02 | 1 | 2 | 1 | .0 | .5 | .06 |
| | Indian Head Co. - Belding, MI | (EST.) | 1.14 | 271 | 217 | 36 | 7.5 | 25.8 | 37.70 |
| | Keene Products, Inc. - Elkhart, IN | (EST.) | .03 | 7 | 6 | 1 | .0 | .7 | .99 |
| | Portage Metal Finishing - 3 Rivers, MI | (EST.) | .05 | 12 | 10 | 2 | .0 | 1.0 | 1.65 |
| | Michigan Tube Co. - Eau Claive, MI | | .05 | 8 | 10 | 2 | .0 | .1 | 1.49 |
| | Lear Siegler Co. Inc. - Mendon, MI | | .12 | 8 | 17 | 4 | 6.0 | 1.0 | .62 |
| | Valley Industries, Inc. - Quincy, MI | (EST.) | .05 | 12 | 10 | 2 | .0 | 1.0 | 1.65 |
| | | SUBTOTAL | 1.86 | 343 | 344 | 61 | 13.6 | 31.0 | 48.04 |
| LAKE ST.CLAIR | | | | | | | | | |
| Basin 40900 | Belleville Plating Co. - Belleville, MI | (EST.) | .19 | 45 | 36 | 6 | .1 | 4.3 | 6.28 |
| | | SUBTOTAL | .19 | 45 | 36 | 6 | .1 | 4.3 | 6.28 |
| LAKE ERIE | | | | | | | | | |
| Basin 41000 | Bechtel-McLaughlin - Sandusky, OH | | .10 | 32 | 19 | 3 | .0 | 17.7 | 4.76 |
| | Edgerton Metal Products - Edgerton, OH | | .15 | 42 | 29 | 5 | .1 | 3.4 | .07 |
| | Farley Industries - Toledo,OH | | .35 | 72 | 40 | 17 | 1.1 | 2.7 | 4.00 |
| | Hayes-Albion Corp. - Bryan, OH | | .07 | 3 | 5 | 2 | .0 | 2.4 | 2.30 |
| | ITT Aerospace Optical - Ft.Wayne, IN | (EST.) | .30 | 71 | 57 | 10 | .1 | 6.8 | 9.92 |
| | National Machinery Co. - Tiffin, OH | | .09 | 7 | 25 | 3 | .0 | .1 | 2.97 |
| | Ohio Decorative Products, Inc.-Spencerville,OH | | .05 | 48 | 97 | 2 | 5.0 | 68.6 | 11.47 |
| | Ohio Electro Polishing Co. - Venedocia, OH | | .02 | 5 | 4 | 9 | .0 | .5 | .15 |
| | Stanadyne Corp. - Garrett, IN | | .38 | 90 | 72 | 12 | 2.2 | 8.6 | 1.60 |
| | Weatherhead - Antwerp, OH | | .56 | 6,297 | 25 | 3 | .3 | .1 | 18.51 |
| Basin 41100 | True Temper Corp. - Geneva, OH | | .82 | 1,778 | 104 | 26 | 1.2 | 23.1 | 58.00 |
| | Bedford Anodizing - Walton Hills, OH | (EST.) | .01 | 3 | 2 | 0 | .0 | .2 | .33 |
| | Standadyne Corporation - Elyria, OH | | .58 | 138 | 111 | 18 | .3 | 13.1 | .93 |
| | Valley Mold and Iron - Hubbard, OH | (EST.) | .00 | 2 | 1 | 0 | .0 | .0 | .07 |
| | TRW, Inc. - Cuyahoga, OH | | .10 | 12 | 93 | 3 | 1.5 | 1.2 | 3.31 |
| | | SUBTOTAL | 3.58 | 8,599 | 683 | 112 | 11.8 | 148.4 | 118.39 |
| | | 1968 TOTAL | 5.63 | 8,988 | 1,064 | 179 | 25.5 | 183.6 | 172.71 |

TABLE 28: EFFLUENT LOADINGS FOR ELECTROPLATING FACILITIES IN 1976 (lbs/day)

| LAKE MICHIGAN | FACILITY NAME | | FLOW (mgd) | TSS | COD | O&G | Ammonia | Phosphorus | Total Metals |
|---|---|---|---|---|---|---|---|---|---|
| Basin 40400 | S.K. Williams Co. - Wauwatosa, WI | | (Discharge to POTW) | | | | | | |
| Basin 40500 | Bronson Plating Co. - Bronson, MI | | .13 | 5 | 8 | 5 | .4 | .3 | .85 |
| | Home Plating Co. - Sturgis, MI | | .02 | 1 | 0 | 8 | .1 | .0 | .15 |
| | Indian Head Co. - Belding, MI | | 1.14 | 14 | 28 | 19 | 3.5 | 2.9 | 6.75 |
| | Keene Products, Inc. - Elkhart, IN | (EST.) | .03 | 2 | 1 | 1 | .1 | .1 | .18 |
| | Portage Metal Finishing - 3 Rivers, MI | | .00 | 0 | 1 | 0 | .0 | .0 | .02 |
| | Michigan Tube Co. - Eau Claire, MI | | .00 | 0 | 3 | 0 | .4 | .0 | .02 |
| | Lear Siegler Co. Inc. - Mendon, MI | | .12 | 24 | 44 | 29 | 5.0 | 6.0 | 2.05 |
| | Valley Industries, Inc. - Quincy, MI | (EST.) | .05 | 3 | 1 | 2 | .2 | .1 | .29 |
| | | SUBTOTAL | 1.48 | 49 | 86 | 64 | 9.7 | 9.4 | 10.31 |
| LAKE ST.CLAIR | | | | | | | | | |
| Basin 40900 | Belleville Plating Co. - Belleville, MI | | .19 | 2 | 3 | 7 | .0 | .0 | .09 |
| | | SUBTOTAL | .19 | 2 | 3 | 7 | .0 | .0 | .09 |
| LAKE ERIE | | | | | | | | | |
| Basin 41000 | Bechtel - McLaughlin - Sandusky, OH | | .12 | 10 | 3 | 5 | .4 | .3 | 7.02 |
| | Edgerton Metal Products - Edgerton, OH | | .02 | 10 | 0 | 1 | .0 | .1 | 1.24 |
| | Farley Industries - Toledo, OH | | (No Process Discharge) | | | | | | |
| | Hayes-Albion Corp. - Bryan, OH | (EST.) | .07 | 5 | 2 | 3 | .2 | .2 | .41 |
| | ITT Aerospace Optical - Ft.Wayne, IN | (EST.) | .30 | 20 | 7 | 11 | .9 | .8 | 1.76 |
| | Ohio Decorative Products,Inc.-Spencerville,OH | | .03 | 2 | 1 | 1 | 2.0 | .1 | .87 |
| | Ohio Electro Polishing Co. - Venedocia, OH | | .03 | 5 | 2 | 0 | .1 | .1 | .04 |
| | National Machinery Co. - Tiffin, OH | (EST.) | .08 | 5 | 2 | 3 | .2 | .2 | .47 |
| | Stanadyne Corp. - Garrett, IN | (EST.) | .38 | 35 | 9 | 14 | 1.2 | 1.2 | 2.23 |
| | Weatherhead - Antwerp, OH | | .28 | 23 | 7 | 1 | .8 | .7 | 1.02 |
| Basin 41100 | True Temper Corp. - Geneva, OH | | .36 | 50 | 9 | 35 | 1.1 | .9 | 2.12 |
| | Valley Mold and Iron - Hubbard, OH | (EST.) | .00 | 0 | 0 | 0 | .0 | .0 | .01 |
| | Bedford Anodizing - Walton Hills, OH | (EST.) | .01 | 1 | 0 | 0 | .0 | .1 | .06 |
| | TRW, Inc. - Cuyahoga, OH | (EST.) | .10 | 7 | 2 | 4 | .3 | .3 | .59 |
| | Stanadyne Corp. - Elyria, OH | (EST.) | .58 | 68 | 14 | 22 | 1.8 | 1.5 | 3.41 |
| | | SUBTOTAL | 1.77 | 173 | 44 | 78 | 7.2 | 5.0 | 17.84 |
| | | 1976 TOTAL | 3.44 | 224 | 133 | 149 | 16.9 | 14.4 | 28.24 |

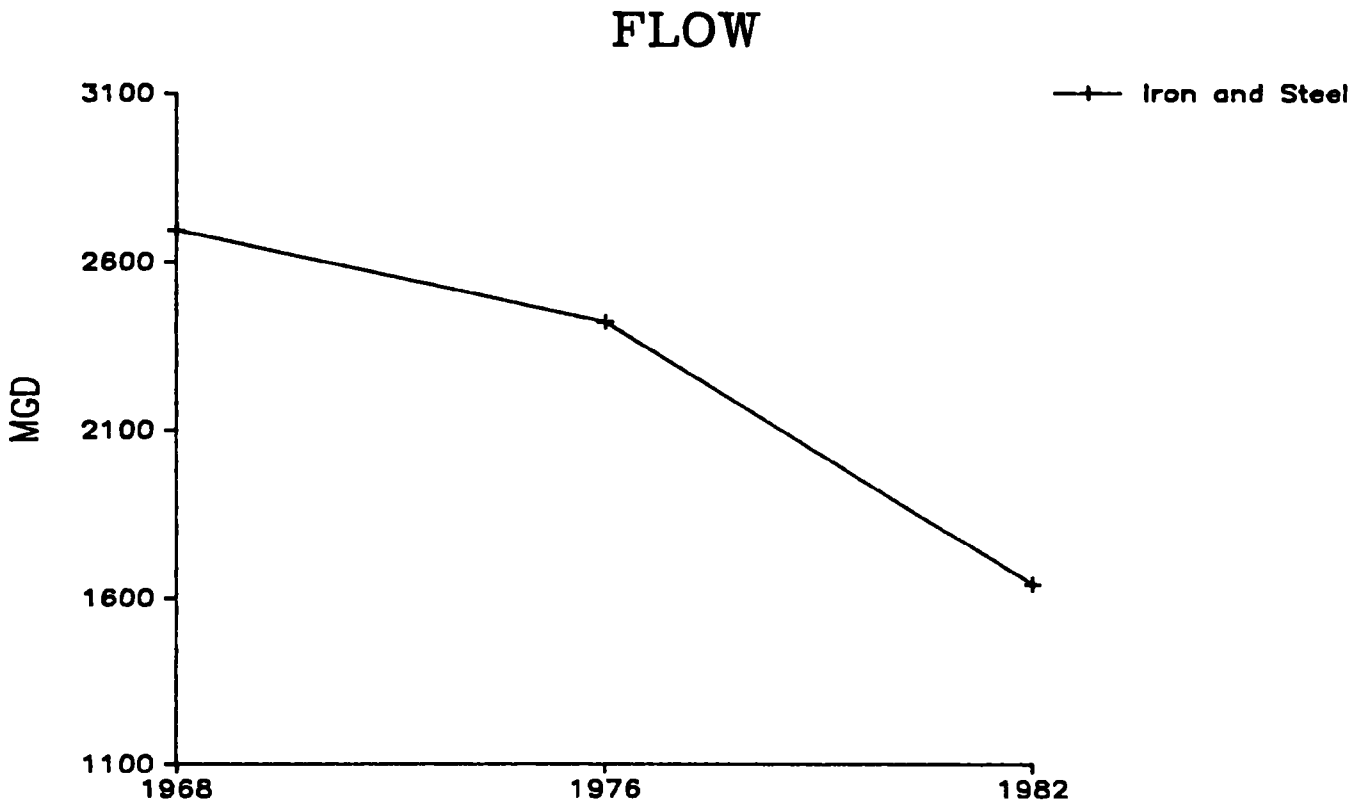
TABLE 29: EFFLUENT LOADINGS FROM ELECTROPLATING FACILITIES IN 1982 (lbs/day)

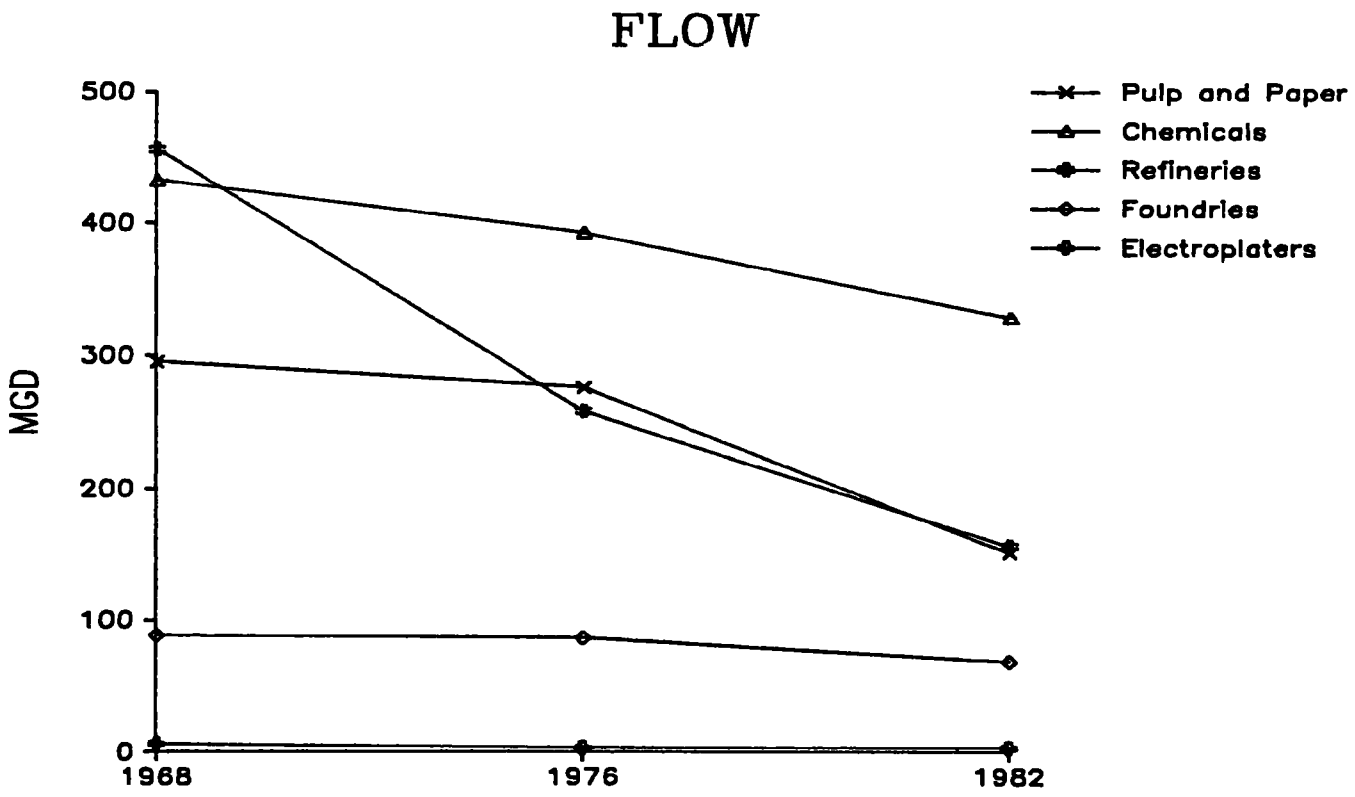
| LAKE MICHIGAN | FACILITY NAME | FLOW (mgd) | TSS | COD | O&G | Ammonia | Phosphorus | Total Metals |
|---|---|---|---|---|---|---|---|---|
| Basin 40400 | S.K. Williams Co. - Wauwatosa, WI | (Discharge to POTW) | | | | | | |
| Basin 40500 | Bronson Plating Co. - Bronson, MI | .32 | 55 | 42 | 33 | 4.4 | .0 | 2.07 |
| | Home Plating Co. - Sturgis, MI | .09 | 32 | 2 | 1 | .3 | 1.0 | .20 |
| | Indian Head Co. - Belding, MI | .53 | 14 | 13 | 28 | 1.5 | .4 | 1.16 |
| | Keene Products, Inc. - Elkhart, IN | .03 | 2 | 1 | 1 | .1 | .0 | .32 |
| | Portage Metal Finishing - 3 Rivers, MI | .01 | 14 | 16 | 0 | .0 | 1.2 | 1.36 |
| | Michigan Tube Co. - Eau Claire, MI | .00 | 0 | 1 | 0 | .0 | .0 | .02 |
| | Lear Siegler Co. Inc. - Mendon, MI | .31 | 5 | 86 | 12 | 1.1 | .1 | 1.75 |
| | Valley Industries, Inc. - Quincy, MI | .05 | 3 | 1 | 2 | .4 | .0 | .11 |
| | SUBTOTAL | 1.33 | 126 | 161 | 77 | 7.8 | 2.7 | 6.98 |
| LAKE ST.CLAIR | | | | | | | | |
| Basin 40900 | Belleville Plating Co. - Belleville, MI | .06 | 1 | 1 | 2 | .2 | .0 | .13 |
| | SUBTOTAL | .06 | 1 | 1 | 2 | .2 | .0 | .13 |
| LAKE ERIE | | | | | | | | |
| Basin 41000 | Farley Industries - Toledo,OH | (No Process Discharge) | | | | | | |
| | National Machinery Co. - Tiffin, OH | .08 | 2 | 23 | 2 | .2 | .1 | .10 |
| | Edgerton Metal Products - Edgerton, OH | .02 | 1 | 0 | 1 | .0 | .0 | .09 |
| | Weatherhead - Antwerp, OH | .31 | 16 | 41 | 39 | .9 | .3 | .60 |
| | Bechtel - McLaughlin - Sandusky, OH | .13 | 13 | 3 | 5 | .4 | .1 | .28 |
| | Hayes-Albion Corp. - Bryan, OH | (Closed 1980) | | | | | | |
| | ITT Aerospace Optical - Ft. Wayne, IN | .06 | 2 | 2 | 1 | .2 | .0 | .10 |
| | Ohio Decorative Products,Inc.-Spencerville,OH | .05 | 2 | 1 | 1 | .2 | .2 | .11 |
| | Stanadyne Corp - Garrett, IN | .03 | 1 | 1 | 0 | .1 | .0 | .07 |
| | Ohio Electro Polishing Co. - Venedocia, OH | .03 | 2 | 1 | 0 | .1 | .0 | .06 |
| Basin 41100 | Bedford Anodizing - Walton Hills, OH | .01 | 4 | 0 | 0 | .0 | .0 | .02 |
| | Valley Mold and Iron - Hubbard, OH | .00 | 0 | 0 | 0 | .0 | .0 | .00 |
| | True Temper Corp. - Geneva, OH | (Closed 1982) | | | | | | |
| | TRW, Inc. - Cleveland, OH | .74 | 91 | 18 | 27 | 2.0 | .6 | 1.61 |
| | Stanadyne Corp. - Elyria, OH | .20 | 30 | 6 | 7 | .7 | .2 | .82 |
| | SUBTOTAL | 1.58 | 137 | 0 | 80 | 4.5 | 1.3 | 3.30 |
| | 1982 TOTAL | 2.97 | 263 | 162 | 160 | 12.5 | 3.9 | 10.41 |

## APPENDIX A

### Flow Graph and Bar Charts Illustrating Effluent Flow and Loadings from the Six Industrial Categories

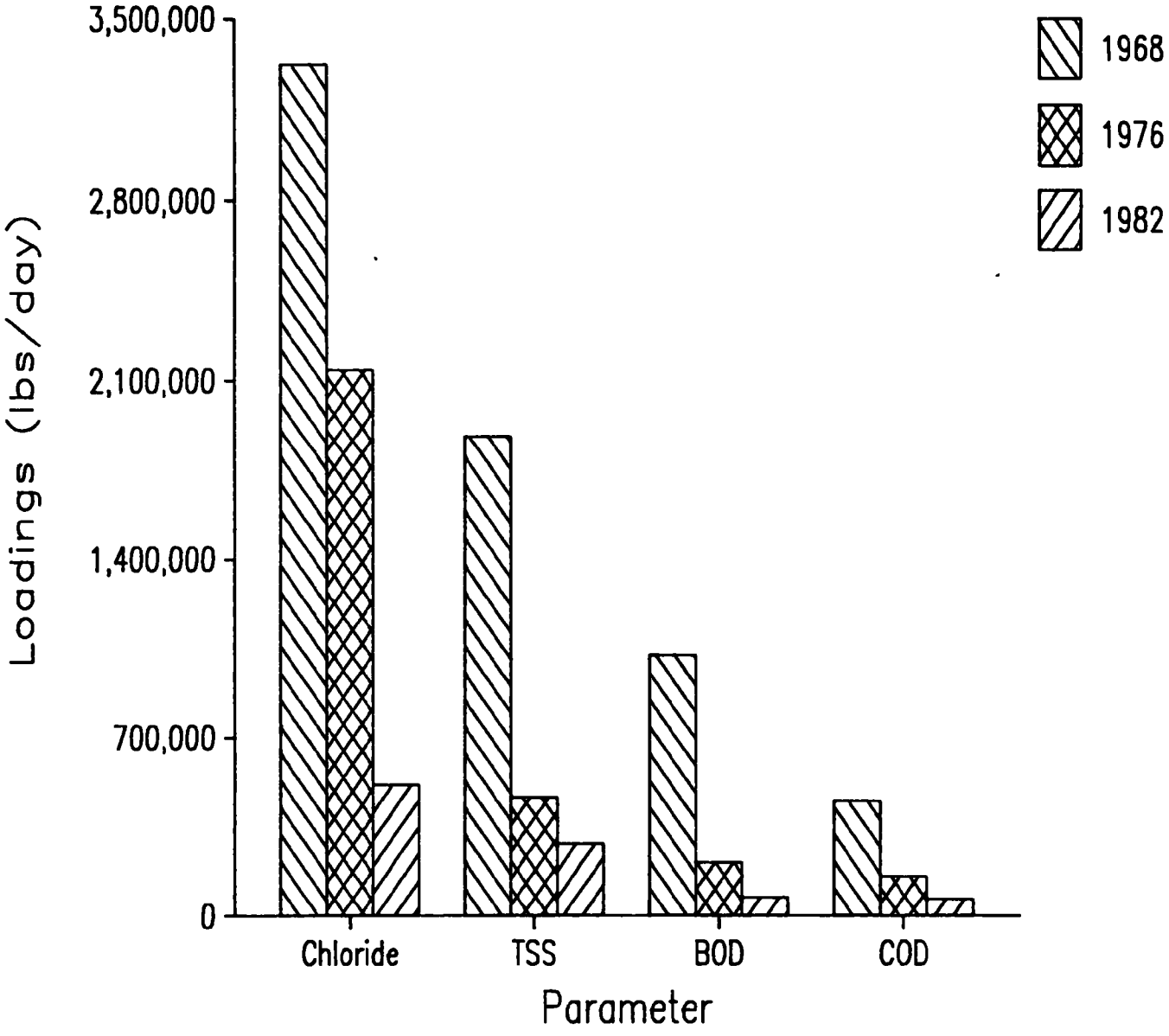

| Graph No. | | Page No. |
|---|---|---|
| 1. | Effluent Flow for all Six Industrial Categories..... | A-2 |
| 2. | Effluent Loadings for Chloride, TSS, BOD, and COD for all Six Industrial Categories..... | A-3 |
| 3. | Effluent Loadings for O & G, Ammonia, Total Metals, Phenols, Total Organics, Cyanide, and Phosphorus for all Six Industrial Categories..... | A-4 |
| 4. | Effluent Loadings for Iron and Steel Plants..... | A-5 |
| 5. | Effluent Loadings for Pulp and Paper Mills..... | A-6 |
| 6. | Effluent Loadings for Chemical Manufacturers..... | A-7 |
| 7. | Effluent Loadings for Petroleum Refineries..... | A-8 |
| 8. | Effluent Loadings for Foundries..... | A-9 |
| 9. | Effluent Loadings for Electroplaters..... | A-10 |

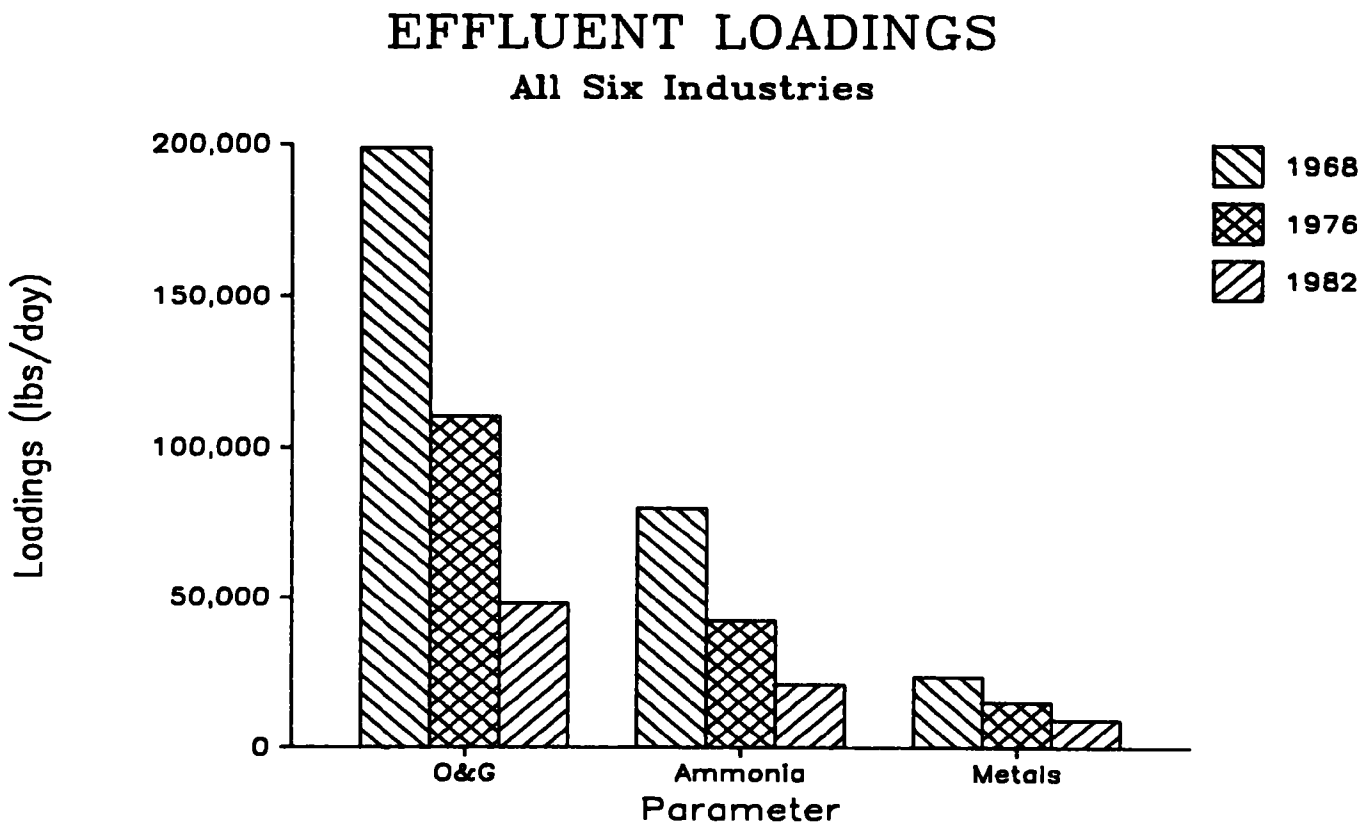

FLOW
Iron and Steel
MGD
3100
2600
2100
1600
1100
1968
1976
1982

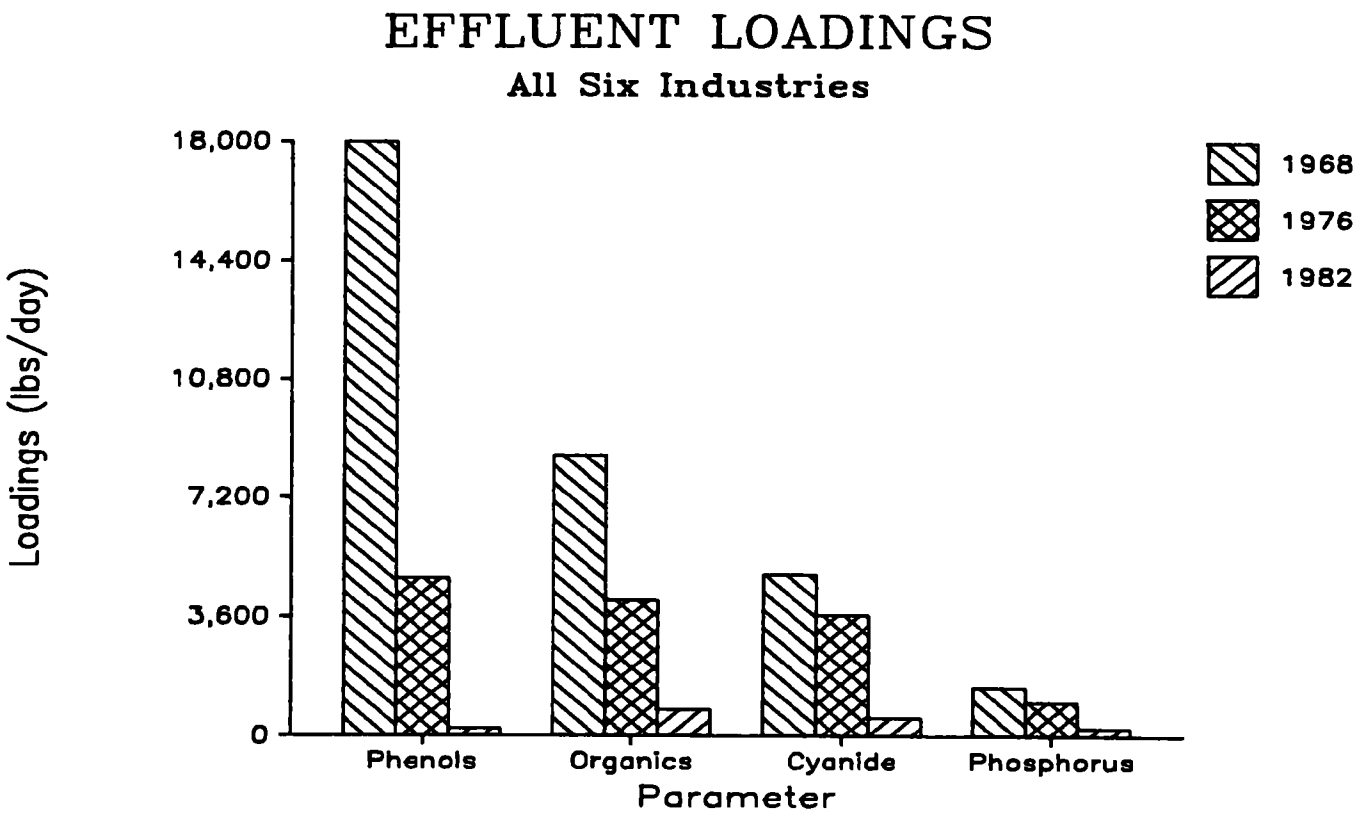

FLOW
Pulp and Paper
Chemicals
Refineries
Foundries
Electroplaters
MGD
500
400
300
200
100
0
1968
1976
1982

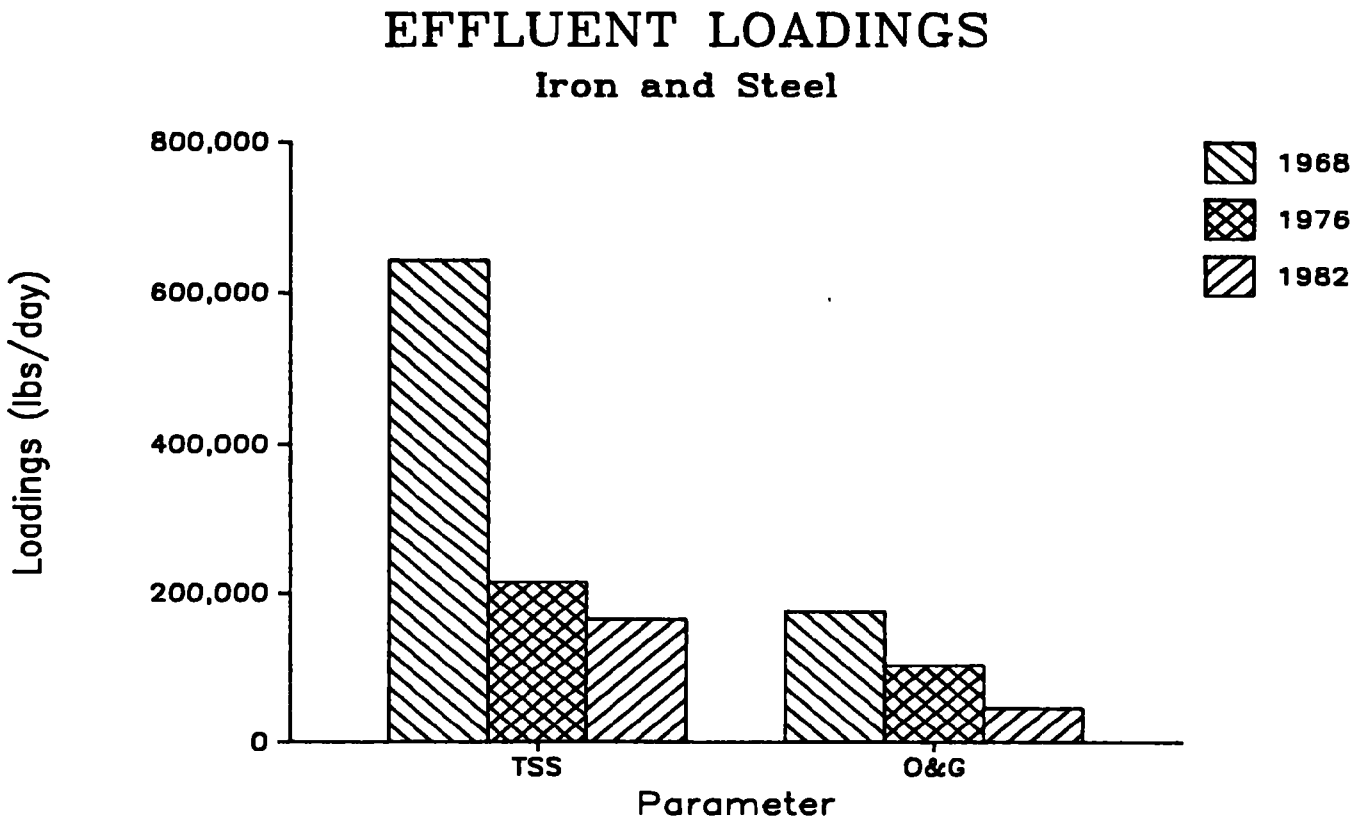
# EFFLUENT LOADINGS

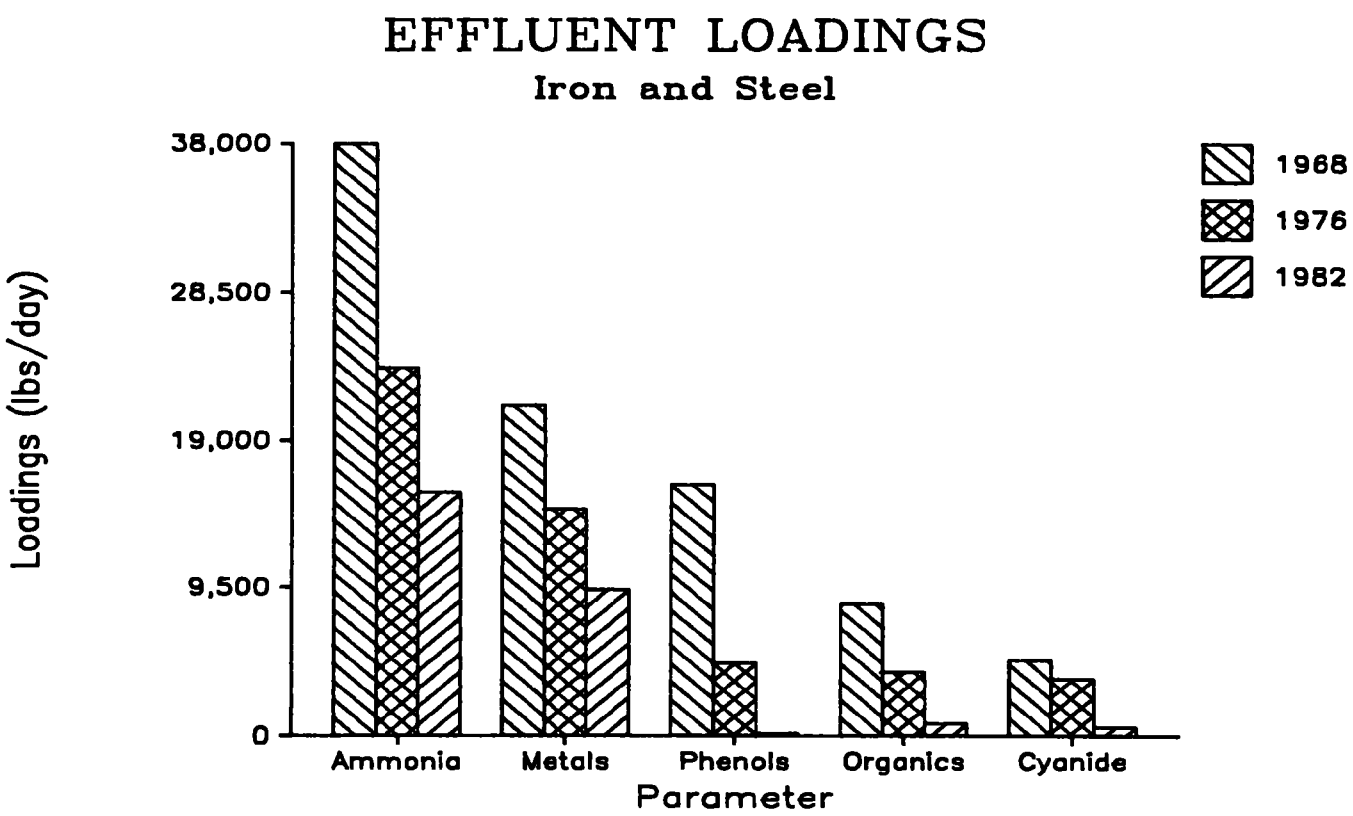
## All Six Industries




EFFLUENT LOADINGS
All Six Industries
Loadings (lbs/day)
200,000
150,000
100,000
50,000
0
O&G
Ammonia
Metals
Parameter
1968
1976
1982

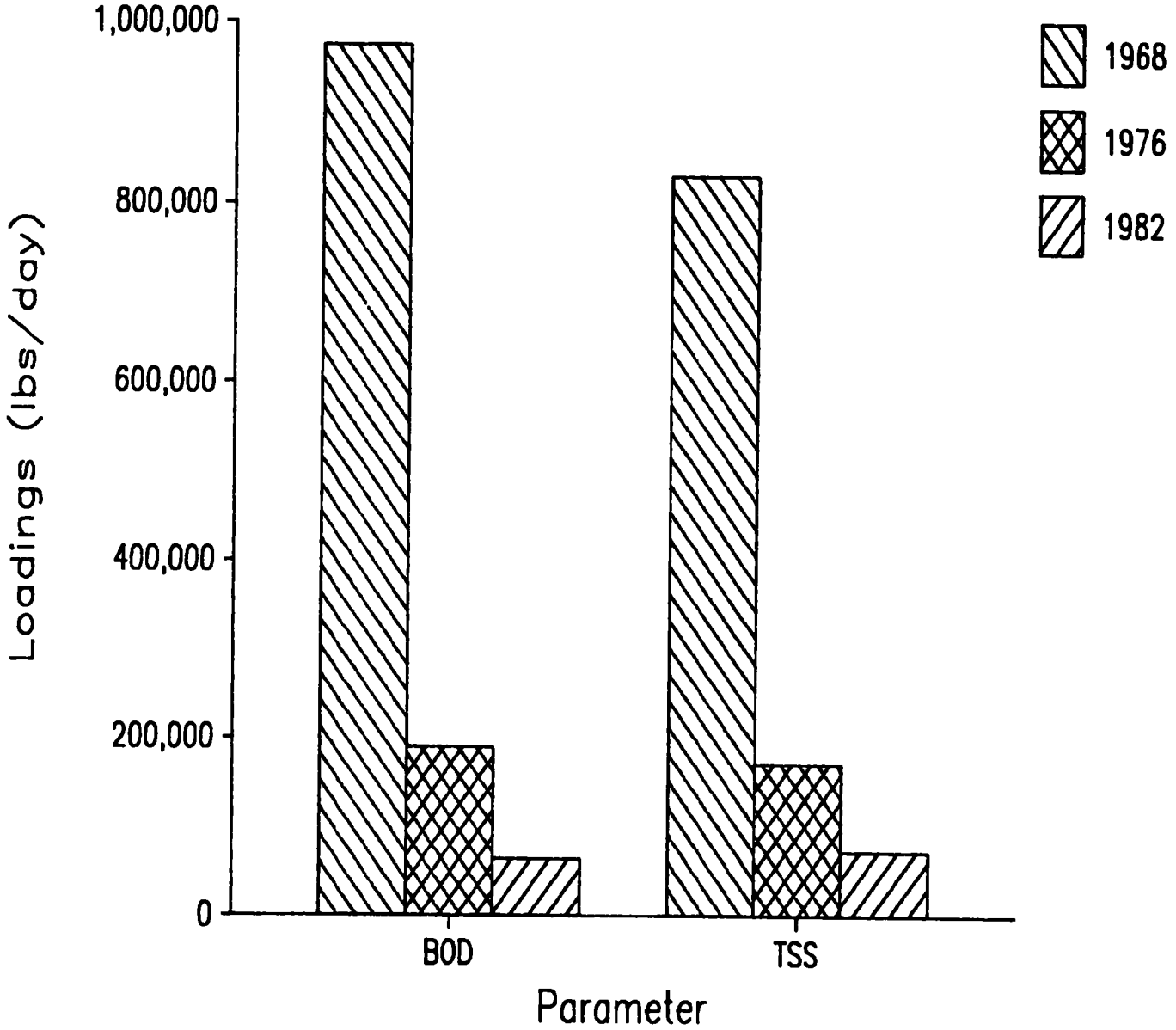

EFFLUENT LOADINGS
All Six Industries
Loadings (lbs/day)
18,000
14,400
10,800
7,200
3,600
0
Phenols
Organics
Cyanide
Phosphorus
Parameter
1968
1976
1982

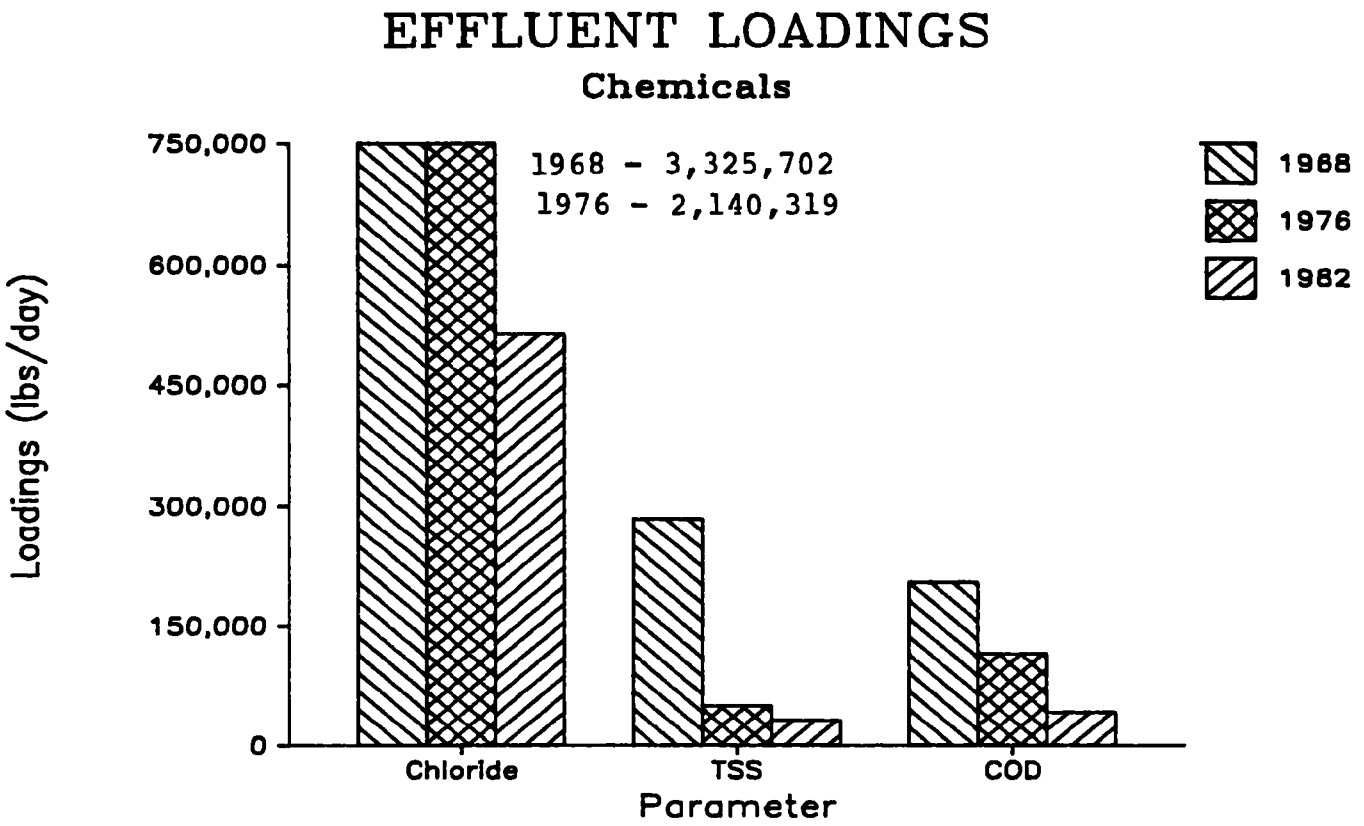

EFFLUENT LOADINGS
Iron and Steel
800,000
600,000
400,000
200,000
0
Loadings (lbs/day)
TSS
O&G
Parameter
1968
1976
1982

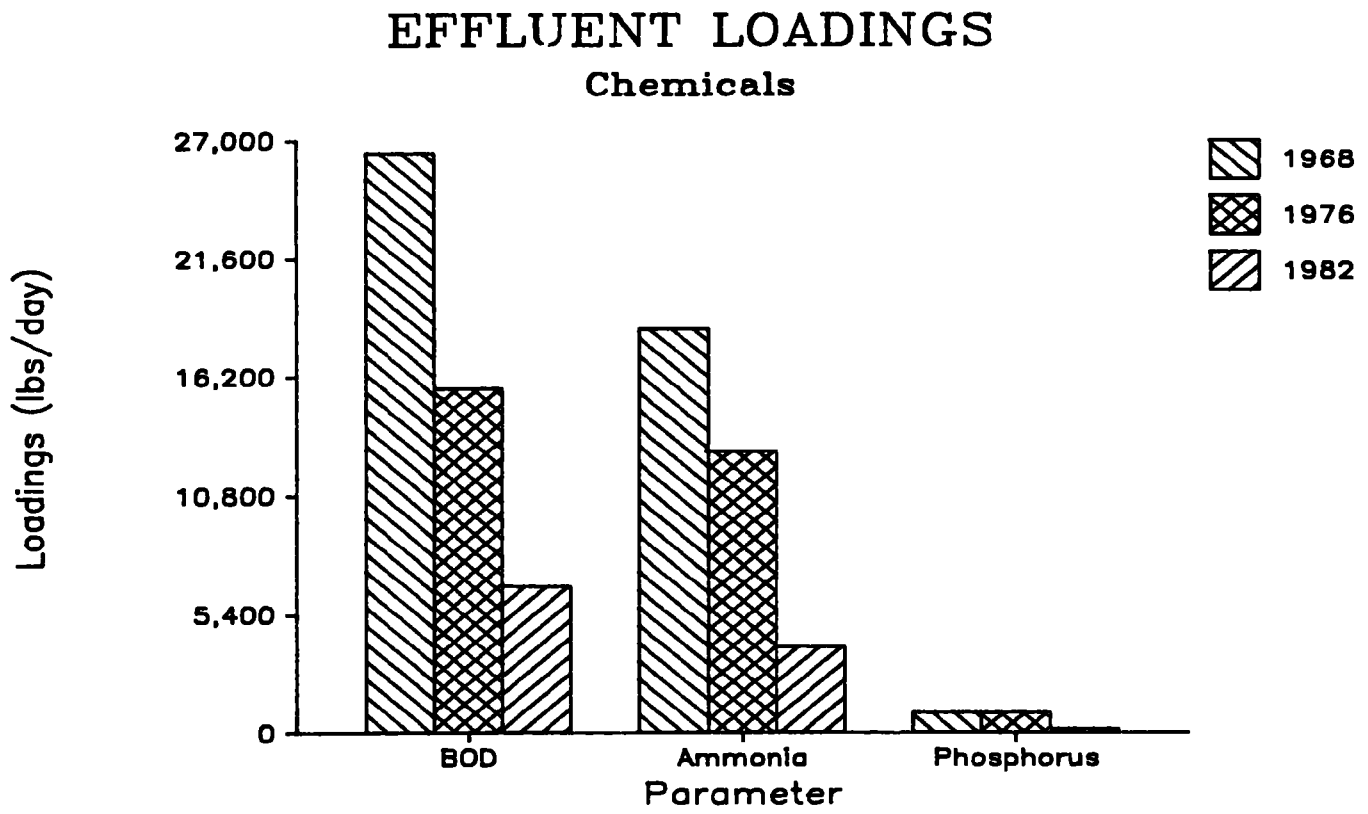

EFFLUENT LOADINGS
Iron and Steel
38,000
28,500
19,000
9,500
0
Loadings (lbs/day)
Ammonia
Metals
Phenols
Organics
Cyanide
Parameter
1968
1976
1982

# EFFLUENT LOADINGS

## Pulp and Paper

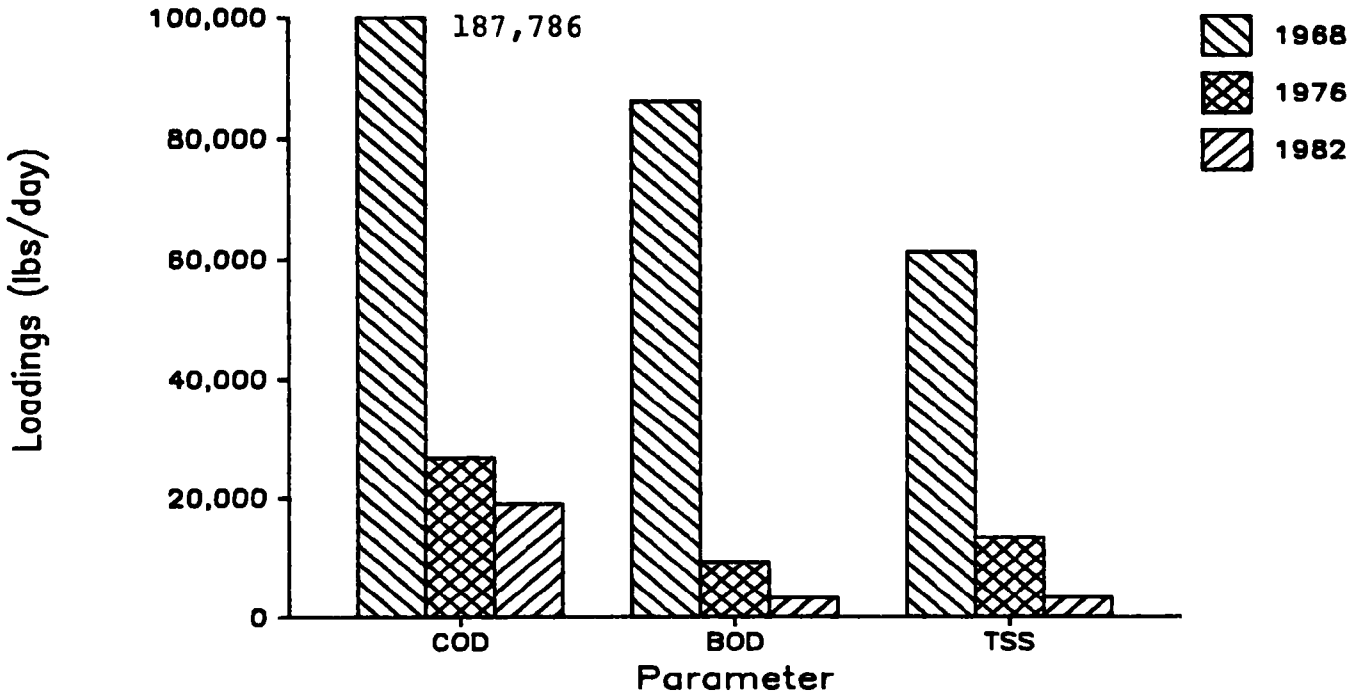



EFFLUENT LOADINGS
Chemicals
1968 - 3,325,702
1976 - 2,140,319
750,000
600,000
450,000
300,000
150,000
0
Loadings (lbs/day)
Chloride
TSS
COD
Parameter
1968
1976
1982


EFFLUENT LOADINGS
Chemicals
27,000
21,600
16,200
10,800
5,400
0
Loadings (lbs/day)
BOD
Ammonia
Phosphorus
Parameter
1968
1976
1982

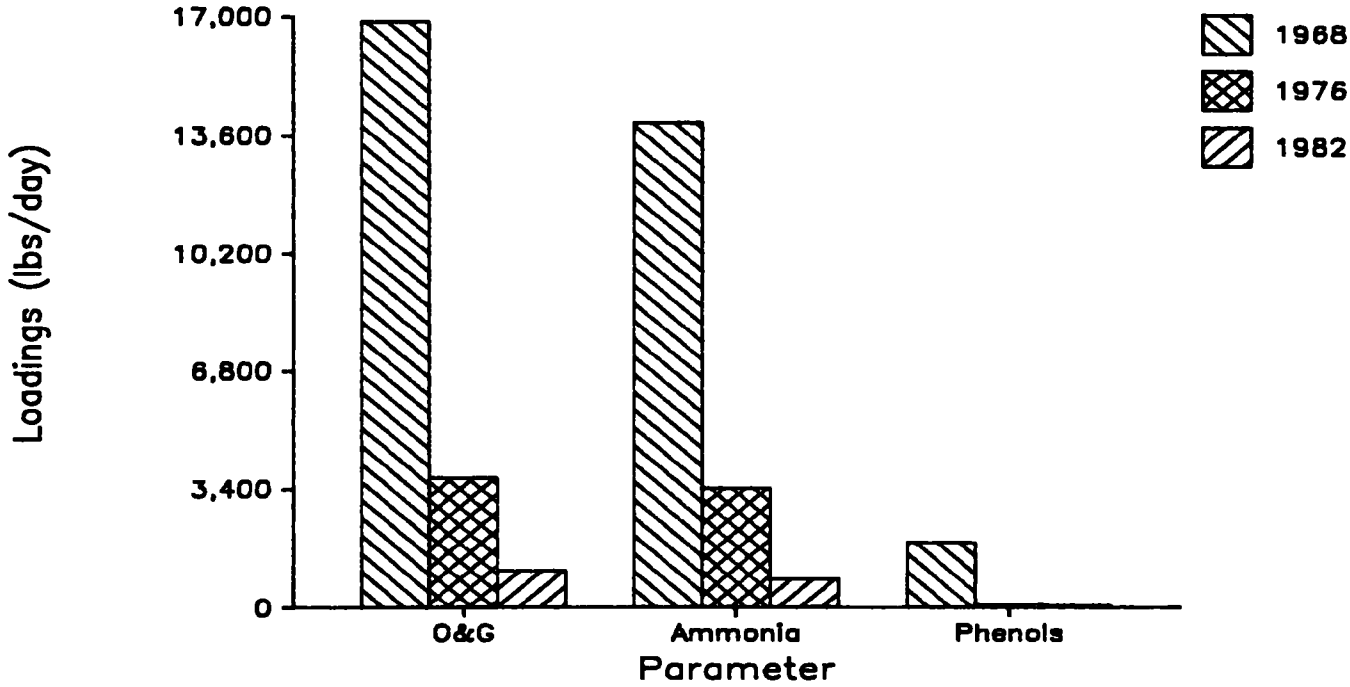
# EFFLUENT LOADINGS

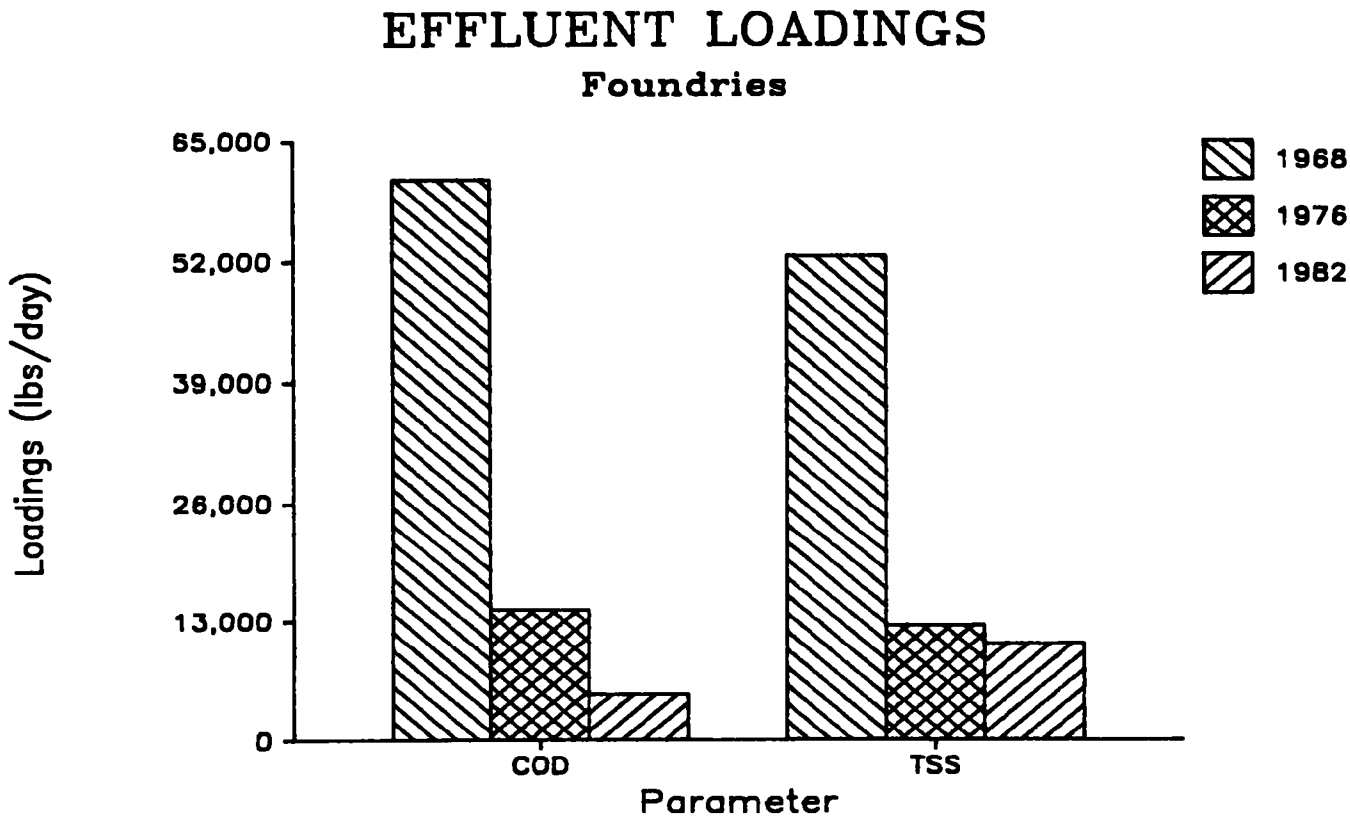
**Refineries**

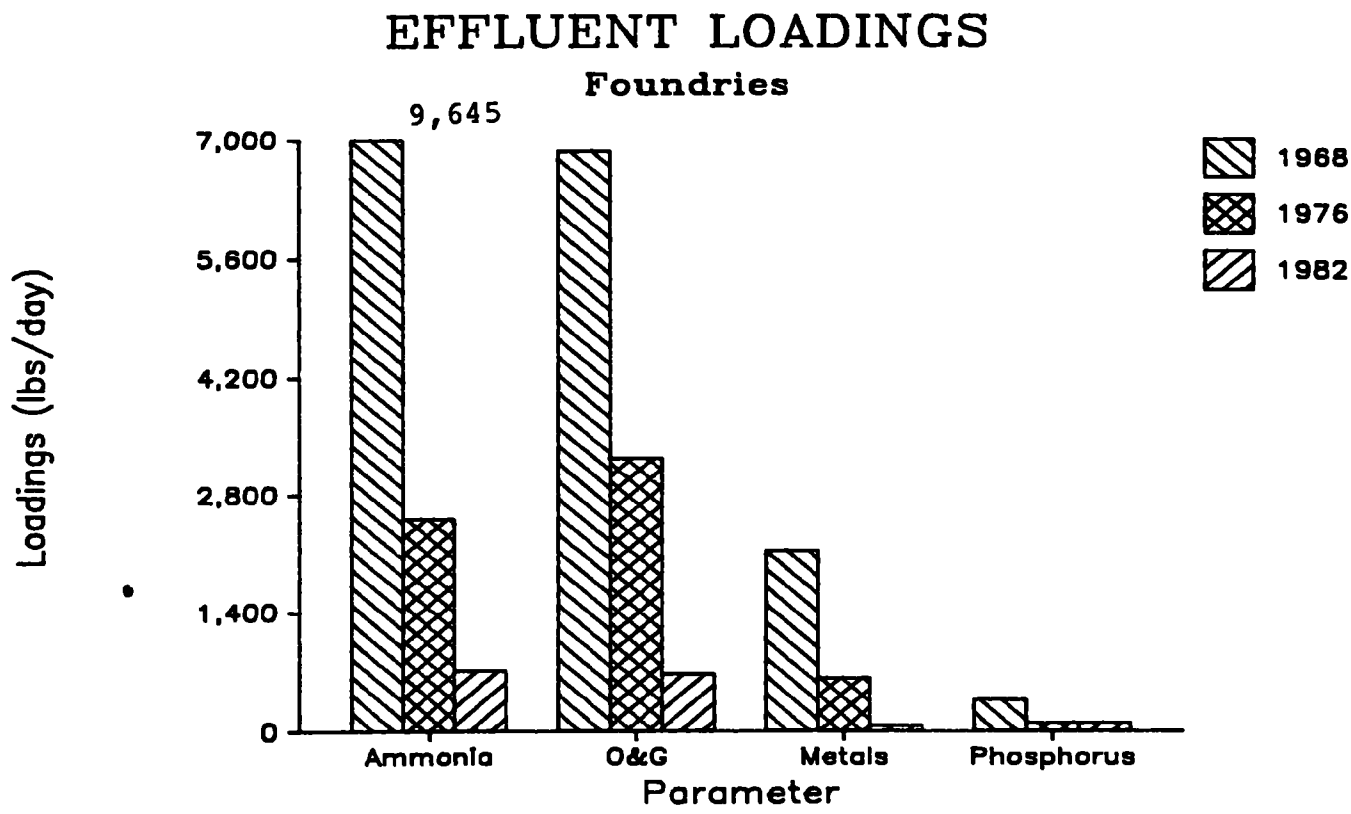


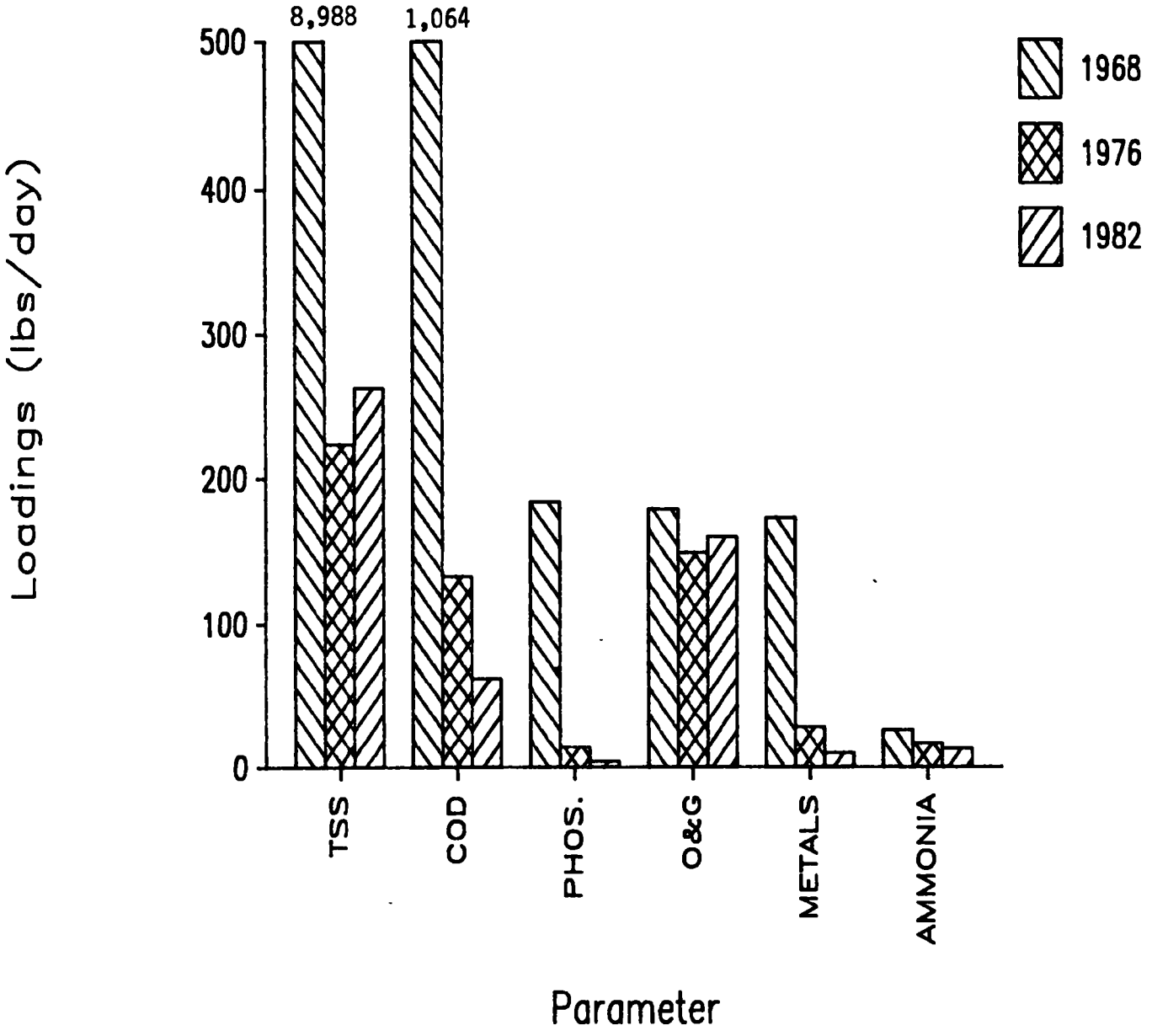

# EFFLUENT LOADINGS

**Refineries**




EFFLUENT LOADINGS
Foundries
65,000
52,000
39,000
26,000
13,000
0
Loadings (lbs/day)
COD
TSS
Parameter
1968
1976
1982


EFFLUENT LOADINGS
Foundries
9,645
7,000
5,600
4,200
2,800
1,400
0
Loadings (lbs/day)
Ammonia
O&G
Metals
Phosphorus
Parameter
1968
1976
1982

# EFFLUENT LOADINGS

## Electroplaters