United States Environmental Protection Agency

Pesticides and Toxic Substances (TS-779)

EPA 560/4-91-012

September 1991

Toxics in the Community

National and Local Perspectives

The 1989 Toxics Release Inventory National Report

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TOXICS IN THE COMMUNITY

NATIONAL AND LOCAL PERSPECTIVES

The 1989 Toxics Release Inventory National Report

A report on data collected under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986.

United States Environmental Protection Agency
Office of Toxic Substances
Economics and Technology Division
Washington, DC 20460
September 1991

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MESSAGE FROM THE ADMINISTRATOR

This year's National Report is the third annual analysis of the releases of some 320 chemicals and compounds to air, water, and land from selected manufacturing facilities. The data collected under the authority of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) have been used by industry, public interest groups, state and local governments, the U.S. Congress and the Environmental Protection Agency (EPA) to target major opportunities for reducing risks to public health and the environment.

The Toxic Release Inventory (TRI) is a unique resource. It was envisioned from the outset to make data publicly available so that knowledge could be a catalyst for pollution prevention activities at the community, state, and federal levels. Pollution prevention avoids the creation of waste and is a different focus from pollution control, which concentrates on managing and disposing of waste. More and more states are implementing pollution prevention or toxic use reduction laws using TRI as the framework for their environmental accounting. Later chapters of this Report describe in more detail a variety of the activities that TRI has stimulated to prevent pollution.

The data in this Report offer signs of progress. There has been a decrease in total emissions of 1.3 billion pounds for the period 1987 to 1989 and of 720.8 million pounds between 1988 and 1989. Improved emissions estimates, changes in accounting procedures, and a better understanding of the TRI requirements account for at least some of these decreases. At the same time it is worth noting that during the threes year period covered by the Report there were also modest increases in economic activity in the manufacturing sector of our economy. While we cannot yet determine precisely how much of the reported decreases are real reductions in emissions, I am encouraged by the downward trend in releases.

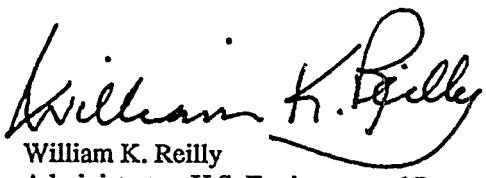
The data also tell us that there are still many opportunities to reduce risk. I am excited by numerous private sector activities underway to prevent pollution in communities throughout our country.

TRI data are being used as benchmarks for several major new programs at the EPA, such as implementation of the Clean Air Act Amendments. These Amendments mandate substantial reductions in air emissions during the next few years. It is also the measuring stick for our 33/50 Program, a voluntary, cooperative effort between EPA and industry to reduce emissions of 17 selected chemicals by 33 percent by 1992, 50 percent by 1995. To date, hundreds of major corporations have voluntarily committed to reduce hundreds of millions of pound of toxins.

We now recognize that pollution prevention is a global challenge and that pollution does not respect national boundaries. One of the most exciting advances this past year is the use of the TRI concept abroad. Canada has already initiated its own version of a toxic release inventory. EPA is providing information to help design, implement, and manage toxic release inventories in Europe, Scandinavia, and Japan. And we're discussing the idea with Mexico for the border area; reliable monitoring of emissions there is a requisite for the growth expected to accompany a North American Free Trade Agreement. Ultimately it is only through a global effort that we will be able to assure our children of a healthier environment.

Public awareness is essential to our success. Knowledge in the hands of the public has proved to be a powerful force for change. I encourage each of you to take advantage of the opportunity to learn about toxics in your community and to exercise creativity in working to improve the quality of the environment. We at the Environmental Protection Agency are finding that our most effective pollution prevention activities are those developed in partnership with the public and industry. The Toxic Release Inventory is a dynamic tool. It will expand in future years to contain even more information that we can use to prevent pollution and measure our progress.

I welcome your support and suggestions to help us make it as useful a tool as possible.



William K. Reilly
Administrator, U.S. Environmental Protection Agency

PREFACE

As in the past, the preparation of this year's Toxics Release Inventory (TRI) National Report has proven to be quite a challenge. Many people in both the public and private sectors contributed to its preparation and I thank them for their input. In particular, the helpful comments of the EPA review team were a cornerstone in making this National Report a reality. Their commendable performance in the evaluation of the National Report under tight deadlines is hereby noted and appreciated.

TRI provides a wealth of information for those involved in the protection of human health and the environment, and this year's National Report attempts to enumerate a variety of ways the data are being used in such efforts. In addition, the National Report provides a standard analysis of the 1989 data (including its relation to previous years' data) and highlights a new initiative (the 33/50 Program) and a new law (the Pollution Prevention Act of 1990), both of which rely heavily on TRI as the yardstick of their success.

In the spirit of "Right-to-Know" we have attempted this year to provide users of the data with helpful tips and suggestions for understanding the information collected under TRI. We are most eager that data users understand what the data does (and does not) mean.

Due to the helpful comments from users of prior National Reports, this year we have included an index and a glossary. We hope you will find these enhancements useful. As always, we encourage and welcome such helpful recommendations for improving the utility of this National Report.

Kenneth L. Mitchell, Ph.D.
National Report Project Manager

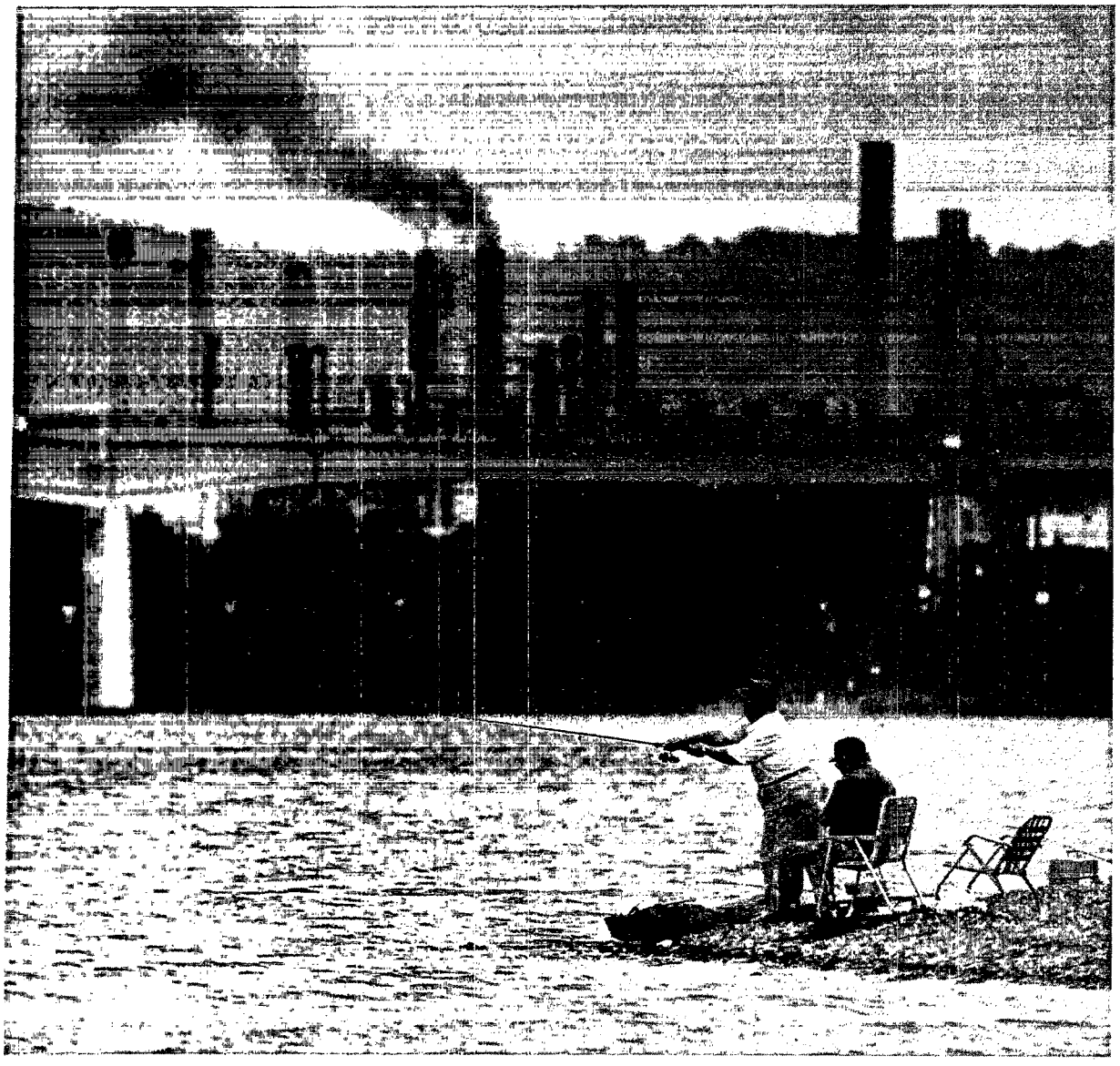


Photo: Daniel J. Kasztelan

OVERALL INCREASES AND DECREASES

Releases and transfers totaled 5.7 billion pounds in 1989.

In 1989, 22,569 facilities submitted forms to the Toxics Release Inventory (TRI). The environmental releases and transfers reported by these facilities totaled 5.7 billion pounds. Almost three-quarters (74 percent) of this total was released on site to air, water, land or underground injection wells; the remaining 26 percent was transferred off site to either publicly owned treatment plants (POTWs) or off-site treatment, storage, or disposal facilities.

Total reported TRI releases and transfers were 11 percent less in 1989 than in 1988...

The Toxics Release Inventory shows a downward shift in total reported releases and transfers of TRI chemicals from 1987 to 1989. From 1987 (the first year of TRI reporting) to 1988, total TRI releases and transfers fell by 548.8 million pounds. Between 1988 and 1989, the year of the data analyzed in this report, this total dropped by another 720.8 million pounds. This amounts to a total decrease from 1987 to 1989 of 19 percent, and a decrease from 1988 to 1989 of 11 percent.

...even though 7% more facilities reported to EPA in 1989.

The number of TRI facilities and forms continued to increase, with 7 percent more facilities reporting to TRI in 1989 than in 1988. This increase may, to some degree, reflect the 1989 TRI reporting threshold of 25,000 pounds for the manufacture or process of TRI chemicals, which is lower than the 1988 reporting threshold of 50,000 pounds for these types of activities. The facilities reporting to TRI in 1989 together submitted 81,891 forms, an increase of 9 percent over the previous year. At the same time, it is worth noting that during the three-year period covered by this TRI National Report there were also modest increases in economic activity in the reporting (manufacturing) sector of the U.S. economy.

Some decreases represented true reductions; others reflected different estimation methods or other factors.

Despite the increase in facilities and forms, both releases and transfers decreased between 1988 and 1989. While some of these reported decreases were due to true reductions in releases and transfers, others were due to changes in estimation methods, a better understanding of the reporting requirements, corrections of errors in previous submissions, and other factors.

Every category of TRI release or transfer showed a decrease in reported amounts between 1988 and 1989.

In 1989, TRI facilities reported 532.3 million pounds less total on-site releases to either air, water, land, or underground injection wells than in 1988. Total TRI transfers to publicly owned treatment works (POTWs) and other off-site waste management facilities for treatment, storage, or disposal decreased by a smaller absolute amount, 188.5 million pounds. Every category of TRI release or transfer showed a decrease in reported TRI amounts between 1988 and 1989, especially off-site transfers (excluding those to POTWs) and total air emissions, which each dropped by 168.6 million pounds.

Over 1/2 of the total decreases in reported releases and transfers between 1988 and 1989 was accounted for by only 127 individual facilities.

The overall net decrease in TRI releases and transfers between 1988 and 1989 may obscure the data reported by individual facilities, some of which show an opposing tendency. Indeed, over half (59 percent) of the total decreases between the amounts facilities reported to TRI in 1988 and the amounts they reported in 1989 was accounted for by only 127 individual facilities, each of which showed decreases of over 1.5 million pounds between the two years. In view of the fact that almost as many facilities showed increases in TRI amounts as showed decreases, it appears that a relatively small number of facilities accounted for the net decrease in TRI releases and transfers from 1988 to 1989. Often the large changes in the TRI amounts reported by individual facilities involved a single chemical and a single route of release or transfer. Therefore, the analyses in this 1989 TRI National Report often demonstrate the role of single facilities in the geographical, environmental, and chemical makeup of TRI releases and transfers.

Hydrochloric acid was the TRI chemical with the largest decrease in releases and transfers from 1988 to 1989.

Of the 300 individual TRI chemicals and 20 chemical categories included in the data for this National Report, total releases and transfers *decreased* for 171, *increased* for 95, and remained the same for four between 1988 and 1989. Another 50 chemicals had no reports of releases or transfers for either year. Decreases in reported releases and transfers in excess of 10 million pounds between 1988 and 1989 for 14 chemicals totaled 572.2 million pounds, compared to a *net* decrease for all TRI chemicals of 720.8 million pounds. With 130.0 million pounds less in TRI releases and transfers from 1988 to 1989, hydrochloric acid was the chemical with the largest TRI decrease. The chemical with the largest TRI increase was isopropyl alcohol (manufacturing -- strong acid process), with 4.8 million pounds more releases and transfers than in the preceding year.[1]

ENVIRONMENTAL DISTRIBUTION OF TRI RELEASES AND TRANSFERS

Of the 1989 TRI total, 42% was released to air.

In 1989, larger amounts of TRI chemicals were emitted to air than were released in any other manner or transferred off site. Of the 1989 TRI releases and transfers, 42 percent (2.4 billion pounds) was released to air. Underground injection wells received the next greatest amount, accounting for 21 percent of the TRI total (1.2 billion pounds), followed by off-site transfers (16 percent, or 913.1 million pounds).

Different states stood out for various types of releases or transfers. For example, in 1989 Texas was the number one state for air emissions and for discharges to underground injection wells. Louisiana was first for TRI discharges to surface water and was second for underground injection releases. Indiana was number one for TRI on-site land releases. Often, one or two facilities played a significant role in a state's releases and transfers. In the case of Indiana's on-site land releases, for example, 89 percent was accounted for by the releases of a single facility.

Air emissions were the top form of release or transfer for 3 of the 5 TRI chemical classes.

Air emissions, the top form of environmental release for TRI overall, were also predominant in three TRI chemical classes, the halogenated organics (84 percent of total releases and transfers for the class), the non-halogenated organics (68 percent),

and the non-metallic inorganics (70 percent). Over half (54 percent) of all TRI mineral acids/salts[2] were discharged to underground injection wells, while metals and metal compounds were primarily released on-site to land (51 percent) or transferred to off-site facilities (42 percent). Often the individual chemicals within a class reflect the overall pattern for the class. For example, 91 percent of 1,1,1-trichloroethane (a TRI halogenated organic chemical) was released to air, while 61 percent of hydrochloric acid (a TRI mineral acid/salt) was released to underground injection wells.[3]

CHEMICAL DISTRIBUTION OF TRI RELEASES AND TRANSFERS

The top 25 TRI chemicals accounted for 83 percent of all TRI releases and transfers in 1989.

The 25 chemicals with the largest TRI releases and transfers accounted for 83 percent of the 1989 TRI total. Releases and transfers of ammonium sulfate (solution) were greater than those of any other TRI chemical in 1989, accounting for 13 percent (750.6 million pounds) of the TRI total. Facilities also reported large amounts of hydrochloric acid, methanol, ammonia, toluene, and sulfuric acid. The total releases and transfers of each of these chemicals contributed over 5 percent to the TRI total. However, the TRI chemicals with the largest release and transfer amounts were not always those reported most often. Ammonium sulfate (solution), ranked number one for overall TRI releases and transfers, was number 49 in TRI for the number of forms submitted by facilities. Toluene, the chemical with the largest number of forms submitted to TRI in 1989, ranked fifth for amount of TRI total releases and transfers. While the average release and/or transfer amount per form was 2.5 million pounds for ammonium sulfate (solution), an average of 82,740 pounds was reported per form for toluene.

Releases and transfers of 10 TRI chemicals each dropped by over 24 million pounds from 1988 to 1989.

Ten chemicals showed the largest net decrease between 1988 and 1989. Each dropped by more than 24 million pounds. Despite these decreases, these chemicals are still among the top 25 for the largest total releases and transfers in 1989. These top 25 chemicals remained the same from 1988 to 1989, with one exception: chromium compounds moved up two places from number 26 to number 24 to become a top 25 chemical, while trichloroethylene moved down from number 23 to number 26. In both years, ammonium sulfate (solution), hydrochloric acid, methanol, and ammonia were released or transferred in the largest amounts, and the top 25 chemicals accounted for 83 percent of total TRI releases and transfers.

GEOGRAPHIC DISTRIBUTION OF TRI RELEASES AND TRANSFERS

Texas was the state with the largest TRI releases and transfers.

As in 1988, Texas was the state with the largest TRI releases and transfers. With releases and transfers totaling 792.8 million pounds, Texas claimed a significantly larger percent of the 1989 TRI total than did Louisiana, the second-ranked state (473.5 million pounds). Texas alone accounted for 14 percent of all TRI releases and

transfers in 1989. The majority of facilities reporting TRI releases and transfers were located in states in the eastern half of the country and in Texas and California. Relatively few facilities were located in the western half of the United States.

California had the largest number of facilities reporting to TRI in 1989.

California had the largest number of facilities (1,694) reporting TRI releases and transfers in 1989, accounting for 8 percent of all facilities reporting releases and transfers. Four other states—Ohio, Illinois, Texas, and Pennsylvania—also had over 1,000 facilities each reporting to TRI.

Brazoria, Texas, and Jefferson Parish, Louisiana, were the two counties with the largest TRI releases and transfers in 1989...

State TRI releases and transfers were often concentrated in just a few counties and cities. Brazoria, Texas, and Jefferson Parish, Louisiana, were the number one- and two-ranked counties in 1989, respectively. These counties each contributed a significant amount to their state's total releases and transfers, representing 28 and 41 percent of those totals, respectively. The city of Alvin, Texas, located in Brazoria County, was the top-ranked city for 1989 TRI releases and transfers. Westwego, Louisiana, located in Jefferson Parish, was ranked second. Each of these cities accounted for over 90 percent of the releases and transfers of their counties.

...however, an individual facility accounted for over 90% of the total TRI releases and transfers of each of these two counties.

Although the top cities and counties are significant geographic indicators in the analysis of TRI data, often a very small number of facilities can be found to account for the majority of the releases and transfers of those regions. For example, the Monsanto facility in Alvin, Texas accounted for 92 percent of the total releases and transfers of Brazoria County. Likewise, the American Cyanamid facility in Westwego, Louisiana contributed 98 percent to the total TRI releases and transfers of Jefferson County. While these are by far the most dramatic examples of the contributions which individual facilities may make to the TRI totals for a given region, they serve to demonstrate the importance of facility-level analyses to TRI geographic data.

Pennsylvania transferred the largest amount of TRI chemicals out of state, while Louisiana received the most.

Off-site transfers of TRI chemicals in waste are often shipped across state borders to receiving facilities for treatment, storage, or disposal. Only Vermont, Puerto Rico, Hawaii, American Samoa, and the U.S. Virgin Islands did not receive any off-site transfers originating from outside their own jurisdiction. A total of 384.2 million pounds (38 percent) of TRI off-site transfers were shipped across state lines in 1989. Pennsylvania was the number-one exporter of wastes across state borders, shipping 43.2 million pounds, or 56 percent of its off-site transfers, out of state. Thus, while Pennsylvania reported total TRI releases and transfers of 194.2 million pounds, its final amount of in-state waste was 19.8 million pounds less than that total. (The 19.8 million pounds is less than the state's total export of 43.2 million pounds because of transfers received from other states). Louisiana was the state with the largest net import of TRI wastes, importing 29.6 million pounds more from other states than it exported to them.

INDUSTRIAL DISTRIBUTION OF TRI RELEASES AND TRANSFERS

The Chemical industry accounted for 48% of total TRI releases and transfers in 1989.

The Chemicals and Allied Products industry accounted for the largest share of total TRI releases and transfers in 1989 as in 1988, contributing almost half (48 percent) to that 1989 total. The Chemical industry also had the largest number of facilities reporting TRI releases and transfers, with 19 percent of the total number of facilities reporting to TRI in 1989. Facilities in the Chemical industry reported releases and transfers totaling 2.8 billion pounds, more than three times the releases and transfers of the second-ranked industry, the Primary Metal Industries, which accounted for 756.8 million pounds (13 percent of the 1989 TRI total). The Multiple SIC Codes category ranked third overall with releases and transfers of 437.3 million pounds (8 percent of the 1989 TRI total), followed by the Paper and Allied Products industry, with 313.3 million pounds (5 percent). (This category includes facilities reporting more than one two-digit Standard Industrial Classification (SIC) code among codes 20-39 that are covered by TRI reporting requirements--see Chapter 3.) The Tobacco Products industry reported the smallest amount of releases and transfers to TRI, 1.5 million pounds (0.03 percent).

TRI AND POLLUTION PREVENTION

11% of all TRI facilities reported attempts at waste minimization.

The TRI reporting Form R currently contains an optional section in which facilities can voluntarily report information on their efforts to minimize chemical waste generation. This portion of the form also requests facility production information, in order to make possible a calculation of how much chemical wastes were reduced (or increased) relative to the facility's production levels. Eleven percent of the TRI facilities, or 2,415 out of the 22,569 facilities submitting forms to TRI in 1989, reported attempts to minimize TRI chemical wastes. The forms containing waste minimization information represented 6 percent of all forms received in 1989. These levels of waste minimization reporting were very similar to those in 1987 and 1988.

10 of the top 50 TRI facilities in 1989 reported waste minimization efforts.

Ten of the 50 facilities with the largest releases and transfers in 1989—and two of the top five facilities—reported waste minimization data on at least one of the TRI chemicals they reported. The American Cyanamid Company in Westwego, Louisiana, the second-ranked TRI facility for total releases and transfers in 1989, reported waste minimization information on three of the 23 TRI chemicals it reported in 1989. Fourth-ranked Vulcan Chemicals (Wichita, Kansas) reported waste minimization information on two of its 28 reported TRI chemicals.

Within the 1989 subset of TRI forms containing complete waste minimization data for both 1988 and 1989 (a total of 2,240 forms), TRI chemical *absolute* waste generation decreased by 13 percent between the years (69.0 million pounds). When production levels are factored into this decrease, it becomes a 28 percent net *relative* reduction (142.0 million pounds). The larger number indicates that the overall productivity associated with the reported chemicals at these facilities increased from 1988 to 1989, and that the chemical waste generation associated with the chemicals did not increase at a comparable rate.

Sulfuric acid, cited on 96 forms in the waste minimization subset, accounted for the largest *absolute* amount of waste reduction (14.5 million pounds). When production data were factored into the calculation, zinc compounds accounted for the largest quantities of *relative* waste reduction. Among the 16 chemicals for which more than one million pounds each of absolute waste reduction was achieved, 1,1,1-trichloroethane was the most frequently reported, with waste minimization data on 262 forms. Carbonyl sulfide was the least frequently reported, with waste minimization data on only four forms.

The Pollution Prevention Act of 1990 prioritizes pollution prevention over waste treatment.

In October 1990, President Bush signed the Pollution Prevention Act of 1990 into law, which is based on the premise that the generation of pollution should be reduced or eliminated and that such *source reduction* is more desirable than end-of-pipe pollution *control*. This legislation greatly expands the Environmental Protection Agency's (EPA) role in encouraging industrial source reduction and recycling in all its regulatory and nonregulatory programs, as well as in collecting and assessing data about such activities.

The Pollution Prevention Act of 1990 establishes mandatory waste minimization reporting to TRI, starting in 1991.

Among other provisions, the Pollution Prevention Act of 1990 mandates that EPA collect data about the source reduction, recycling, and treatment of each chemical reported on a TRI Form R. This requirement, which will first affect the 1991 TRI data due by July 1, 1992, will significantly expand the TRI database. For the first time, EPA will obtain estimates of the total quantities of TRI chemicals in wastes that have been reduced at the source or recycled. It will then be possible to assess trends in source reduction and recycling over the coming years, as well as document which methods are most common and what are the most compelling reasons for facilities to undertake pollution prevention initiatives. This information will be invaluable as EPA, the public, and industry attempt to identify opportunities for prevention and recycling, and track the nation's progress toward better waste management strategies.

THE 33/50 PROGRAM CHEMICALS

The 33/50 Program requests voluntary commitments from companies to reduce releases and transfers of 17 target chemicals.

In February 1991, EPA announced that it had asked over 600 American companies to voluntarily reduce releases and transfers of 17 selected toxic chemicals. This voluntary initiative, known as the 33/50 Program, aims for a stepwise reduction of 17 target chemicals from 33 percent by the end of 1992 to 50 percent by the end of 1995, compared to 1988 release and transfer amounts. EPA selected the 33/50 Program chemicals based upon criteria including health and environmental effects, potential for high exposure, volume of production and release, and potential for pollution reduction. EPA believes that the 33/50 Program will work in conjunction with its overall pollution prevention strategy to promote pollution reduction in advance of statutory timetables. EPA intends to provide support to participating companies by organizing opportunities for communication, exchange, and technical assistance.

Of the 17 chemicals selected by EPA for the 33/50 Program, the top five for overall TRI releases and transfers in 1989 were toluene, xylene (mixed isomers), 1,1,1-trichloroethane, methyl ethyl ketone, and dichloromethane. These top five chemicals accounted for approximately 75 percent of the releases and transfers of the total 17 chemicals. Between 1988 and 1989, the TRI ranking of four of these chemicals rose, while dichloromethane's rank remained constant. While the net decrease for all TRI chemicals between 1988 and 1989 was 11 percent, that of the 33/50 subgroup was 8 percent.

The 33/50 chemicals accounted for 23% of all TRI releases and transfers in 1989.

The 33/50 chemicals occupied a significant place within TRI. Combined, they accounted for almost one-fourth (23 percent) of the 1989 total TRI releases and transfers. A significant proportion (70 percent) of the 33/50 chemicals is released in the form of air emissions, indicating that air pollution is a particular problem associated with this subgroup. Together, air emissions of the 33/50 chemicals accounted for 40 percent of the overall total for all TRI chemicals released in this manner. Out of the 33/50 chemicals, cadmium compounds showed the largest percentage decrease from 1988 to 1989 (52 percent). Mercury compounds showed the highest increase (165 percent).

TRI IN OTHER PROGRAMS AND POLICIES

TRI has been instrumental in the development of new pollution prevention initiatives.

The Toxics Release Inventory, the most comprehensive national database on toxic chemicals released and transferred to all parts of the environment, has affected public policy since it inception in 1986. Government officials have used TRI data to help set environmental priorities and to shape regulations. Perhaps the most important use of TRI data is in the development of pollution prevention initiatives. A number of state legislatures, motivated by TRI data, have passed pollution prevention laws. TRI data have helped focus attention on facilities where pollution prevention efforts can be most effectively directed.

States are using TRI data in the development of environmental policies and regulations.

Most states are using TRI data to varying degrees, according to information obtained from state TRI coordinators and from the EPA's records of meetings with states. Delaware, among other states, reports that the influence and utilization of TRI data have been significant in several areas. TRI represents a primary source of information in the development of state regulations concerning pollutants being released or having potential to be released into the environment. In Delaware, for example, TRI data have been used as a reference in the development of new surface water quality standards and air toxics regulation. TRI data are being used by many states in pollution prevention activities, discharge permit development, compliance reviews and inspection targeting, and regulatory programs. Texas, Louisiana, and Ohio, as well as other states with large TRI releases and transfers, have made particularly widespread use of TRI data in updating their environmental agenda.

TRI data are having an impact at the federal level...

TRI data are also having an impact at the federal level. Congress and EPA have used TRI data in the development of new legislation and the implementation of existing regulatory programs. EPA has made widespread use of TRI data in conjunction with other Agency databases for purposes of permitting, inspection and enforcement

targeting, compliance reviews, risk screening, and pollution prevention. TRI data are used in the implementation of Federal legislation including the Pollution Prevention Act of 1990, the 33/50 Program, the 1990 Clean Air Act Amendments, the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), the Clean Water Act, and the Safe Drinking Water Act.

. . . as well as at the level of public interest and community groups and industries.

TRI has also inspired a variety of responses from public interest groups, citizen groups, universities, and industries. An examination of reports produced by such groups in response to TRI shows that air emissions received the most attention, followed by surface water discharges. Many reports examined a particular industrial sector, focusing upon human health risks and sometimes ecological dangers such as ozone layer depletion or threats to wildlife. Most frequently, public interest groups worked to influence specific state policies, while some focused on policy changes at the national level. Many groups are working towards the institution of pollution prevention or toxics use reduction laws, often including citizen empowerment as one of their aims.

In response to public attention to TRI totals and their own increased awareness of their toxic chemical releases and transfers, many companies are announcing pollution reduction goals and efforts. The Chemical Manufacturers Association (CMA) is using TRI data to track progress of member companies under its Responsible Care Program, adopted in 1989, and is publishing reports based on TRI data from those companies.

Many TRI chemicals are being studied for their health and environmental effects or are regulated under other programs.

The health and environmental effects of many TRI chemicals are being studied, tested, or otherwise addressed in several other programs, including the TSCA Section 4 testing program; the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) re-registration and data call-in program; the Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profile program; and the National Toxicology Program (NTP) testing program.

Many TRI chemicals are the subject of environmental laws and regulations, such as the Clean Air Act Amendments of 1990, RCRA, CERCLA (the "Superfund" legislation), the Clean Water Act, the Safe Drinking Water Act, and other sections of the Emergency Planning and Community Right-to-Know Act (EPCRA) besides Section 313, which created the TRI reporting requirements.

THE TRI DATABASE

Changes are continually being made to the TRI database.

In addition to changes to the TRI chemical list by the removal and addition of chemicals, or the lowering of threshold amounts for the reporting of a chemical, there are a variety of other situations which affect the content of the TRI database. Many changes in the TRI database result from facilities submitting revised estimates of their releases and transfers. To help facilities with questions about how to report,

EPA has prepared industry-specific guidance documents, annually refines its detailed reporting instructions, and maintains a toll-free telephone line to answer questions and provide further information. EPA also conducts a variety of activities, including phone checks and site visits, in order to evaluate reported data.

EPA places an emphasis upon data entry accuracy.

Because of the potential for variation in data entry, EPA places a major emphasis upon data entry accuracy. Because computers can only retrieve data in exactly the format requested, each year EPA has expanded its efforts to standardize certain data fields, such as county names, which facilities may report differently. The TRI facility identification number, which is assigned to each facility when it first reports to TRI, permits consistent identification and easy retrieval of cross-year data despite changes in facility name or address. Chemicals are identified in the TRI database in one of four different ways: as individual chemicals, as chemical categories (such as nickel compounds), as mixtures/trade name products, and as trade secrets. The name of each TRI listed chemical and chemical category has been standardized in the database.

TRI data can best be understood and interpreted by first understanding the reporting form and instructions.

The TRI reporting form (Form R) includes a variety of facility information and chemical-specific information. Some of these include latitude/longitude of facility location; a technical and public contact name and telephone number; parent company information; EPA identification numbers such as RCRA numbers and National Pollutant Discharge Elimination System (NPDES) permit numbers for surface water discharges; the facility's Dun and Bradstreet number; information on the destination of off-site transfers; the names of the rivers, lakes, and streams receiving surface water discharges; the Standard Industrial Classification (SIC) code(s) for manufacturing establishments within the facility (SIC 20 to 39); activities related to the TRI chemical at the facility; maximum amount of the chemical on site at any time during the reporting year; releases of the chemical to the environment on site or transfers of the chemical in waste to off site locations; basis of estimate for the releases or transfers; waste treatment methods and efficiency; and optional information on waste minimization.

A special analysis in this year's report (Chapter 8) explains many of these items and provides some guidance to users of the database in understanding these data; it also includes explanations of how reporting thresholds are calculated and what exemptions apply, qualifiers for certain chemicals, and other insights. One of the best ways a user of the TRI data can become acquainted with what the data do and do not mean is to read a copy of the reporting form and instructions, which are available from the EPA Hotline (1-800-535-0202).

TRI data are publicly available in several forms.

TRI data are available to the public in hard copy, magnetic tape, compact disk, and computer microfiche. All three years are available as a public database on the National Library of Medicine's Toxicology Data Network (TOXNET).

NOTES

1. Only facilities which manufacture isopropyl alcohol by the "strong acid process" are required to report to TRI. However, since this method of manufacture has been replaced, to a large extent, by other manufacturing processes, some of the releases and transfers reported to TRI may have been reported in error.

2. Prior to 1989 reporting, sodium hydroxide (solution) was deleted from the TRI chemical list. Because this chemical represented the single base in this TRI class, the chemical class name "acids/bases/salts," used in the 1987 and 1988 National Reports, has been changed to "mineral acids/salts" throughout this report. See Chapter 2, Box 2-A, for further discussion of TRI chemical delistings.

3. The TRI chemical classes are: non-halogenated organics; mineral acids/salts; metals and metal compounds; halogenated organics; and non-metallic inorganics. (See Chapter 3.) In figures and tables throughout this report, class names are abbreviated as: organics; mineral acids/salts; metals; halo-organics; and non-metals.

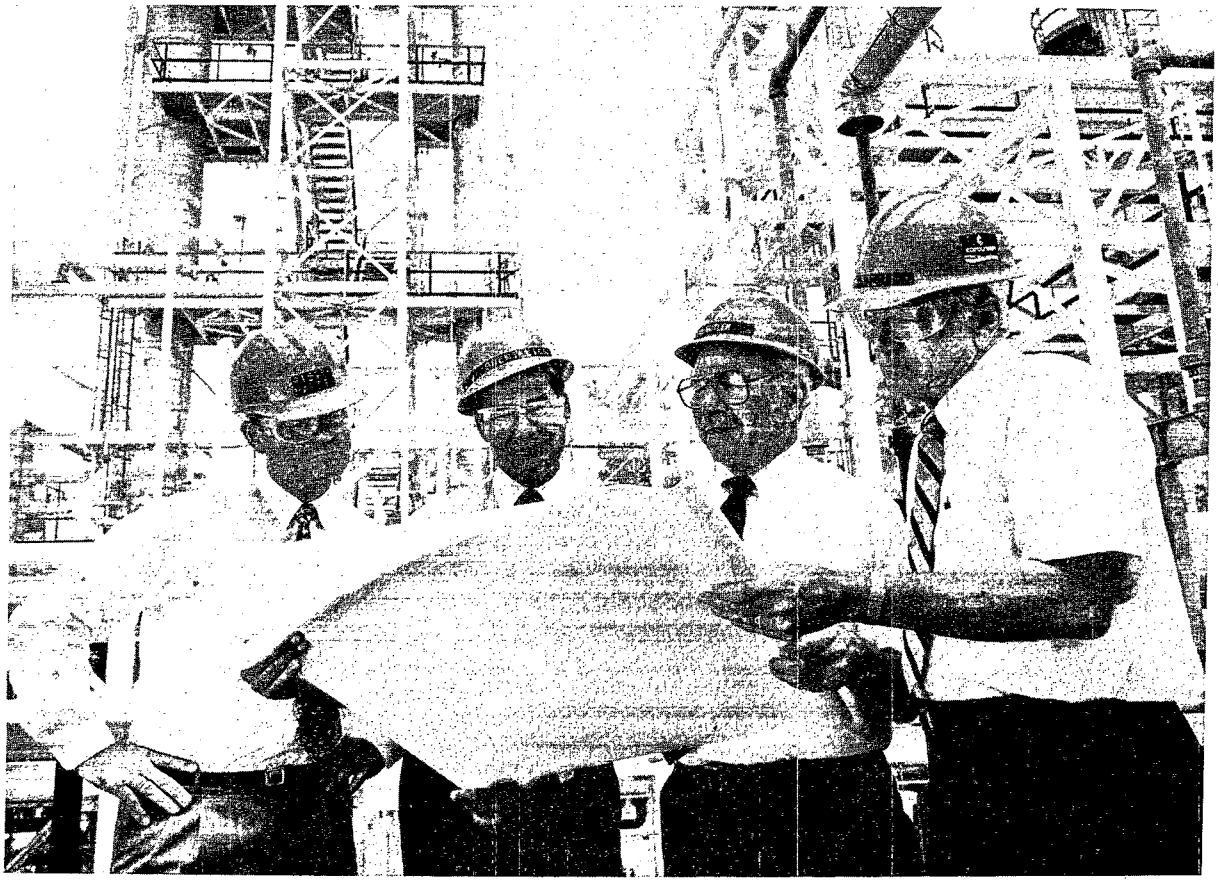


Photo: David King Gleason

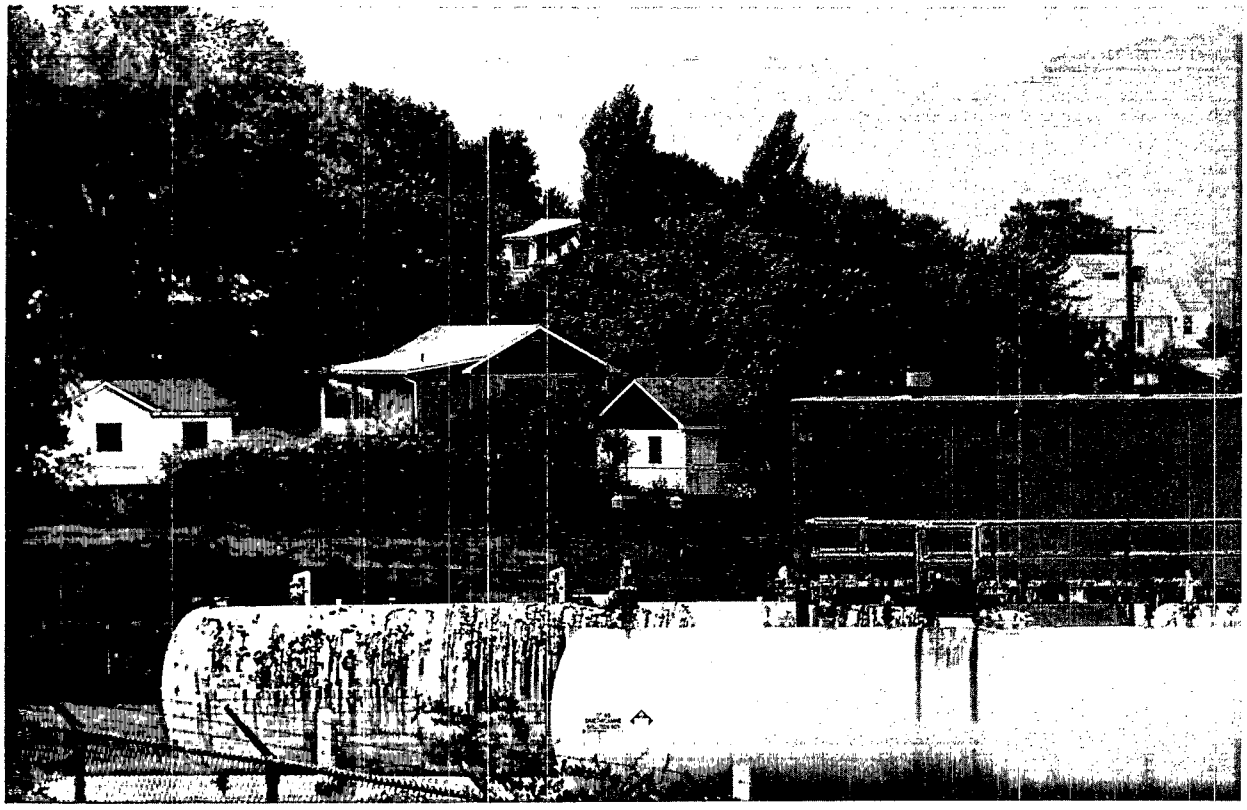


Photo: Daniel J. Kasztelan

CHAPTER 1. THE TOXICS RELEASE INVENTORY: AN INTRODUCTION

The Toxics Release Inventory (TRI), the first national database of information on toxic chemical releases and transfers by manufacturing facilities, has had far-reaching effects on every sector of public life—on Congress and federal, state and local government agencies, the press, public interest groups, industry, and the public itself. This report, the third TRI National Report, presents a summary of the TRI data as reported for 1989, as well as comparisons to the previous two years of TRI data. The patterns of industrial toxic pollution that emerge—the overall chemical, geographical, environmental, and industrial distribution—provide a backdrop against which more detailed analysis can be made.

This year's report also reflects the growing concern of the many public and private groups and the U.S. Environmental Protection Agency (EPA) with pollution prevention. As an approach to the problem of industrial waste generation, pollution prevention emphasizes the reduction or elimination of waste at its source. One valuable tool in the evaluation of industrial trends and the setting of environmental priorities is TRI. Now, as TRI enters its fourth year of reporting, EPA believes that the TRI data are more accurate and complete than before, preparing the way for use of this data in pollution prevention efforts at the federal, state, and facility level.

The Pollution Prevention Act of 1990, described in Chapter 5, greatly expands EPA's role in encouraging industrial source reduction and recycling in all of its regulatory and nonregulatory programs. One result of the Act, with great implications for the role of TRI in pollution prevention, is expanded TRI reporting requirements. Beginning with 1991, TRI facilities will be required to submit information concerning source reduction, recycling and treatment of each chemical reported on a TRI form. These data, which will significantly expand the TRI database, will enhance the effectiveness of TRI in promoting and assessing pollution prevention efforts.

TRI also plays a vital role in EPA's new 33/50 Program, described in Chapter 6. This program aims for the reduction of releases and transfers of 17 high-priority TRI chemicals. To facilitate the 33/50 Program, which is voluntary, EPA has contacted facilities that have reported large TRI releases and transfers to obtain pollution prevention commitments. TRI will be valuable in assessing the program and directing further efforts.

States and public interest groups are also launching a variety of initiatives prompted by TRI data, detailed in Chapter 7. As the understanding by government, industry and the public improves in response to TRI data, more programs are being developed to address problems of local urgency. In accord with the community focus of the legislation creating TRI, this year's TRI National Report provides more facility perspectives than were introduced last year. As noted frequently throughout this report, TRI data are often most meaningful when examined in light of the impact

of releases and transfers reported by individual facilities.[1] This year's report also attempts to provide the reader with the kinds of cross–cutting analyses that demonstrate the effects of facility releases and transfers upon regional, industrial, and environmental conditions and trends.

THE LAW

The Emergency Planning and Community Right–to–Know Act (EPCRA) of 1986 establishes requirements for federal, state, and local governments and facilities regarding emergency planning and community "right–to–know" reporting on a number of chemicals. Chemicals subject to this law include Occupational Safety and Health Act chemicals; hazardous substances under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); extremely hazardous substances under EPCRA Section 302; and the chemicals listed as toxic under EPCRA Section 313 (see below).

This legislation builds upon EPA's Chemical Emergency Preparedness Program (CEPP) and numerous state and local programs aimed at helping communities better assess potential chemical emergencies. The community right–to–know provisions are aimed at increasing the public availability of information about the presence and environmental releases of chemicals in the community. The federal government, states, and communities, utilizing information available under the provisions of this law, will be better able to improve chemical safety and protect public health and the environment.

EPCRA, also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, contains four major sections: emergency planning (Sections 301–303), emergency release notification (Section 304), community right–to–know reporting requirements (Sections 311 and 312), and toxic chemical release inventory reporting (Section 313). Information from these four sources will aid states and communities in the development of a broad understanding of the chemical hazards within an entire community, as well as those of individual facilities.

Section 313 of EPCRA requires EPA to establish an inventory of the toxic chemical releases and transfers of certain facilities. Facilities subject to TRI reporting requirements (see below) must complete a Toxic Chemical Release Inventory Reporting Form (Form R) for each toxic chemical that they manufacture, process or otherwise use in excess of established thresholds. The Form R, which is due to the EPA and the states by July 1 of each year, covers activities occurring at the facility during the previous calendar year. In addition, the law mandates that EPA compile the Form R reports into an annual inventory of releases and transfers—the Toxics Release Inventory—and make the inventory available to the public in a computerized database.

WHO MUST REPORT TO TRI?

TRI requirements for 1989 covered facilities in all 50 states and other U.S. jurisdictions, including the District of Columbia, Puerto Rico, American Samoa, the Northern Mariana Islands, and the U. S. Virgin Islands, which met the following conditions:

- they manufactured (defined to include importation) or processed in excess of 25,000 pounds any of the 302 individual chemicals and 20 chemical categories listed for required TRI reporting *or* they used in any other manner 10,000 pounds or more of a TRI chemical (termed "otherwise used");

- they were engaged in general manufacturing activities (meaning that they were classified within Standard Industrial Classification (SIC) Codes 20–39; see Appendix C for full list); and,

- they employed the equivalent of ten or more full–time employees.

Facilities that meet the requirements for filing a Form R must report to EPA even if they have no releases or transfers.

WHICH TOXIC CHEMICALS WERE REPORTED FOR 1989?

The 1989 TRI reporting requirements covered 302 individual toxic chemicals and 20 categories of chemical compounds. A list of these chemicals and categories is contained in Appendix B.

The TRI chemicals vary widely in the frequency, amounts, and industrial processes in which they are used. The list runs from familiar chemicals, such as ammonia, benzene, and copper, to more obscure chemicals, such as 4–dimethylaminoazobenzene. TRI chemicals are manufactured not only as products, but also are incorporated into a wide variety of other products such as solvents, disinfectants, dyes, and catalysts, to name a few.

The original list of TRI chemicals also covered a range of toxicity. Some of these chemicals may cause immediate effects at low levels, some may cause similar effects only after prolonged low–level exposure, and others may not cause effects until very high concentrations are reached. (See Chapter 3, Box 3–B.) These latter chemicals may be subject to removal (delisting) from the TRI list as a part of EPA's ongoing review process. (See Chapter 2, Box 2–A and Chapter 3, Box 3–F.)

WHAT CONSTITUTES A TRI RELEASE OR TRANSFER?

TRI calls for facilities to report the amounts of the listed toxic chemicals that are released directly to air, water, land, or injected in underground wells. In addition, facilities must report amounts of chemicals that are transported (transferred) off site to facilities that treat, store, or dispose of the chemical wastes. Releases and transfers include, but are not limited to, the following:

- emissions of materials to the air;
- wastewater discharges into rivers, streams, or other bodies of water;
- releases to land on site, including landfill, surface impoundment, land treatment, or other mode of land disposal;
- disposal of wastes in underground injection wells;
- transfers of wastewater to publicly owned treatment works (POTWs), hereafter referred to as transfers to POTWs or transfers to public sewage; and,
- transfers of wastes to other off–site facilities for treatment, storage, or disposal.

Both routine releases and accidental spills or leaks must be reported. Facilities must report even if their releases comply with all environmental laws and permits. TRI data do not indicate regulatory violations on the part of facilities because many of the chemicals are regulated for some types of releases and not others.

Each release or transfer is the amount of TRI chemical in the waste being released or transferred. Throughout this report reference is made to TRI releases and/or transfers. This is the amounts (pounds) of TRI chemicals in these categories. (See Chapter 3, Box 3–A for a further discussion of releases and transfers.)

WHAT TO REPORT?

EPA requires that facilities submit a complete TRI data form (EPA Form R) for *each* TRI chemical they manufactured, processed, or otherwise used in 1989 if they met the threshold and other requirements established by TRI. In other words, a facility that must report on four TRI chemicals must submit four separate forms. TRI information is reported on a five–page form, a sample of which is reproduced in Appendix A. The basic information required by the form falls into six categories:

- *Facility Information.* In addition to a facility's name and address, TRI requires reporting of the following: a technical and a public contact person, geographical data (latitude, longitude, and county name), various business and regulatory

identification numbers, and the names of receiving streams or water bodies. Information on the facility's parent company is also required. (See Chapter 8 for further discussion of required facility information.)

- *Activity and Use Information.* The identity of the TRI chemical being reported, along with information on the activities involving the chemical at the facility and the maximum quantity present on site during the reporting year. (See Chapter 3 for further discussion of maximum quantity on-site reporting.)

- *Chemical Releases and Transfers.* Annual quantities of the TRI chemical released on–site to air, water, land, or underground injection and quantities transferred to off–site facilities.

- *Off–site Transfer Information.* The names, addresses, and other identifying information for all sites (including POTWs) to which the reporting facility transfers wastes containing the TRI chemical. The type of treatment, storage, or disposal at the off–site locations (excluding (POTWs) is also reported.

- *Waste Treatment.* TRI also calls for data on the types of on–site methods used to treat wastestreams containing TRI chemicals and the efficiency of these methods in removing the TRI chemicals. Release and transfer amounts are reported *after* any such treatment.

- *Waste Minimization.* TRI forms for 1989 included an *optional* section allowing facilities to report activities that reduced their waste generation and the effect that these activities had on their generation of TRI chemical wastes (*prior* to waste treatment).

EPCRA, TRI AND COMMUNITY RIGHT–TO–KNOW

A primary intent of the Emergency Planning and Community Right–to–Know Act is to provide the public with information on toxic chemicals in their communities. This report is one vehicle by which data collected under the Act are being made available. The information may also be obtained in either printed or electronic format through other means. (See Box 1–A.)

The National Library of Medicine (NLM) has worked with EPA to establish a publicly available database of TRI information. The TRI data are part of NLM's Toxicology Data Network (TOXNET) system. Users with a personal computer or a terminal and conventional communications software can call into the NLM system to obtain TRI data for a nominal fee. Chapter 8 discusses this and additional means by which the public may obtain TRI data.

BOX 1–A. GETTING ACCESS TO TRI DATA

The *TRI Reporting Center* is the national repository for all TRI reports submitted to EPA. The Center can accommodate limited requests for information on individual facilities. Hard copies of TRI reports for 1990 should be available by Fall, 1991. For specific requests, submit the name and address of the facility of interest to:

EPCRA Reporting Center
P. O. Box 23779
Washington, D. C. 20026-3779
Attn: Public Inquiry

Individual states can also provide copies of or access to TRI forms. Appendix D contains a list of state offices that can be contacted for forms or further information.

TRI data for all years can be accessed by computer through the National Library of Medicine's Toxicology Data Network (TOXNET) database. Chapter 9 contains information about the TOXNET system.

TRI data are also available in the following formats: magnetic tape; microcomputer floppy disk for individual state data; CD–ROM (compact disk); and microfiche for both state data and the national inventory. These versions of TRI data can be purchased from The National Technical Information Service (NTIS) or the U.S Government Printing Office (GPO). For ordering information, contact the EPCRA Hotline at 800–535–0202 or the TRI User Support telephone number at 202–382–3531.

Chapter 8 provides the reader with additional information about the available forms of TRI data.

LIMITATIONS OF TOXICS RELEASE INVENTORY REPORTING

Subsequent chapters of this report show how TRI offers insights into industrial sources of environmental releases and transfers of chemicals. Like any information system, however, TRI has limitations that must be accounted for in any responsible use of the data. Limitations include the chemicals and facilities covered and the quality of the data estimated and reported. A further limitation is the lack of information on the specific reasons why changes occurred from year to year at a given facility.

TRI Coverage of Toxic Chemical Releases and Transfers

The set of chemicals identified for reporting under TRI was drawn by Congress from lists developed independently by the states of Maryland and New Jersey for their own reporting purposes. The chemicals vary widely in toxicity, and in some cases small reported releases of highly toxic chemicals may be of more concern than larger releases of less toxic chemicals. Moreover, the list of chemicals currently covered does not include all toxic chemicals of concern being released or transferred

by facilities into the environment. EPA maintains an on–going process of reviewing the TRI chemicals, adding new chemicals of concern, or deleting chemicals that are no longer of concern.

Toxic chemical wastes are generated from many different sources, including manufacturing and non–manufacturing industrial processes, use and disposal of consumer products, agricultural uses of chemicals, and mobile sources such as automobiles. TRI reporting requirements only cover manufacturing industries. Other businesses, such as warehouses, dry cleaners, and mining operations, may be substantial sources of chemical releases and transfers, but are not currently included under TRI reporting requirements.

Furthermore, not all manufacturing releases of TRI chemicals are covered by the reporting requirements. Facilities with fewer than ten full–time employees, and those manufacturing, processing, or using the designated chemicals below threshold amounts, are not required to report. Federal facilities, including those operated by the Department of Defense, are not legally required to report, although EPA has encouraged them to do so.

TRI facilities that are able to justify their need to claim a trade secret are permitted to report all TRI information under a generic chemical name, although these reports account for only a small fraction of the total TRI releases and transfers in each year of TRI reporting.

Data Quality

TRI only requires facilities to report data that are already known or reasonably ascertainable to them. EPA does not require companies to verify the data that they submit. Thus, much of the data reported were estimated with unknown accuracy. However, as facilities have gained experience in reporting, TRI data quality is considered to be improving. For this year's report, comparisons of the 1989 data will be made primarily to the 1988 data, because the 1988 data are considered to be more accurate than data for 1987.

FAILURE TO COMPLY WITH TRI REQUIREMENTS

Facilities that fail to comply with the TRI reporting requirements may be the subject of enforcement actions by EPA and assessed civil penalties of up to $25,000 per day per chemical for each violation. The penalty may be much higher if a facility failed to report several TRI chemicals, because each failure to report is considered a separate violation.

TRI DATA AND RISK

This report contains aggregate information on the on–site release of toxic chemicals to the environment and the transfer of these chemicals to off–site locations for treatment, storage, or disposal. This information alone does not indicate the risk

these chemicals pose to human health or to the environment. As mentioned above, small releases of highly toxic chemicals may pose greater risks than very large releases of less toxic materials. A determination of risk depends on the individual release conditions, such as type and frequency of release, extent of exposure, environmental conditions, and so on. TRI data are best used to suggest cases in which more detailed assessments of risk might be necessary. Throughout this report, readers should bear in mind the highly variable nature of TRI chemicals, and the fact that large amounts of TRI releases do not necessarily translate into a large potential for toxic effects. (See Chapter 3, Box 3-B.)

TRI REPORTING CHANGES

For the 1989 TRI reporting year, the reporting threshold for manufacturing or processing a chemical was lowered, as mandated by EPCRA legislation. In 1988, facilities were required to report to TRI if they manufactured or processed in excess of 50,000 pounds of a listed toxic chemical. In 1989, the thresholds for manufacturing and processing were reduced to 25,000 pounds for each. The threshold for "otherwise use" has remained at 10,000 pounds of TRI chemical per year.

Since the 1988 TRI National Report, EPA removed (delisted) terephthalic acid from the TRI list, after determining that there were not sufficient data to support toxicity concerns for the chemical. The delisting of terephthalic acid did not greatly affect TRI total releases and transfers. Chapter 2 discusses the role of terephthalic acid in the TRI database in greater detail.

SCOPE OF THIS REPORT

This report analyzes TRI data at the facility, state, and national level. Also examined are the federal, state, and local programs developed to facilitate public access and response to TRI data, as well as those promoting pollution prevention.

Chapter 2 discusses the impact of revisions and other changes to the database, as well as the delisting of terephthalic acid, upon TRI data for all three years. This chapter is primarily intended for readers who are familiar with TRI National Reports from prior years, although it would be useful to any reader interested in an overview of changes to the TRI data.

Chapter 3 and *Chapter 4* are the overall presentations of the TRI data for 1989. While Chapter 3 summarizes the data for the current year, Chapter 4 discusses the 1989 TRI totals in relation to other years, primarily 1988, and examines the major changes.

Chapter 5 presents the currently available TRI waste minimization data, both for 1989 and the previous TRI reporting years. It also describes the Pollution Prevention Act of 1990 and how it will expand TRI reporting requirements in future years.

Chapters 6 and 7 each focus upon various responses to TRI data. Chapter 6 analyzes the status of the 17 chemicals and chemical categories included in EPA's 33/50 Program, prompted by the Pollution Prevention Act of 1990. This chapter focuses upon the place of these 17 chemicals within overall TRI data and upon the industries contributing heavily to their releases and transfers. Chapter 7 details the federal, state, local, and regional initiatives which have been motivated by TRI data and by EPCRA. This chapter also describes the status of TRI chemicals in other testing and regulatory programs.

Chapter 8 provides the interested reader with guidance for using the TRI database. Included in this chapter is a detailed discussion of the nature of the information submitted to EPA by TRI facilities, as well as its implications for the TRI database, and an analysis of yearly variations in the database. Also briefly discussed are the forms of TRI data available to the public.

NOTES

1. Facility–specific information (other than that obtained from the TRI database) was derived by telephone communication, except where otherwise noted.

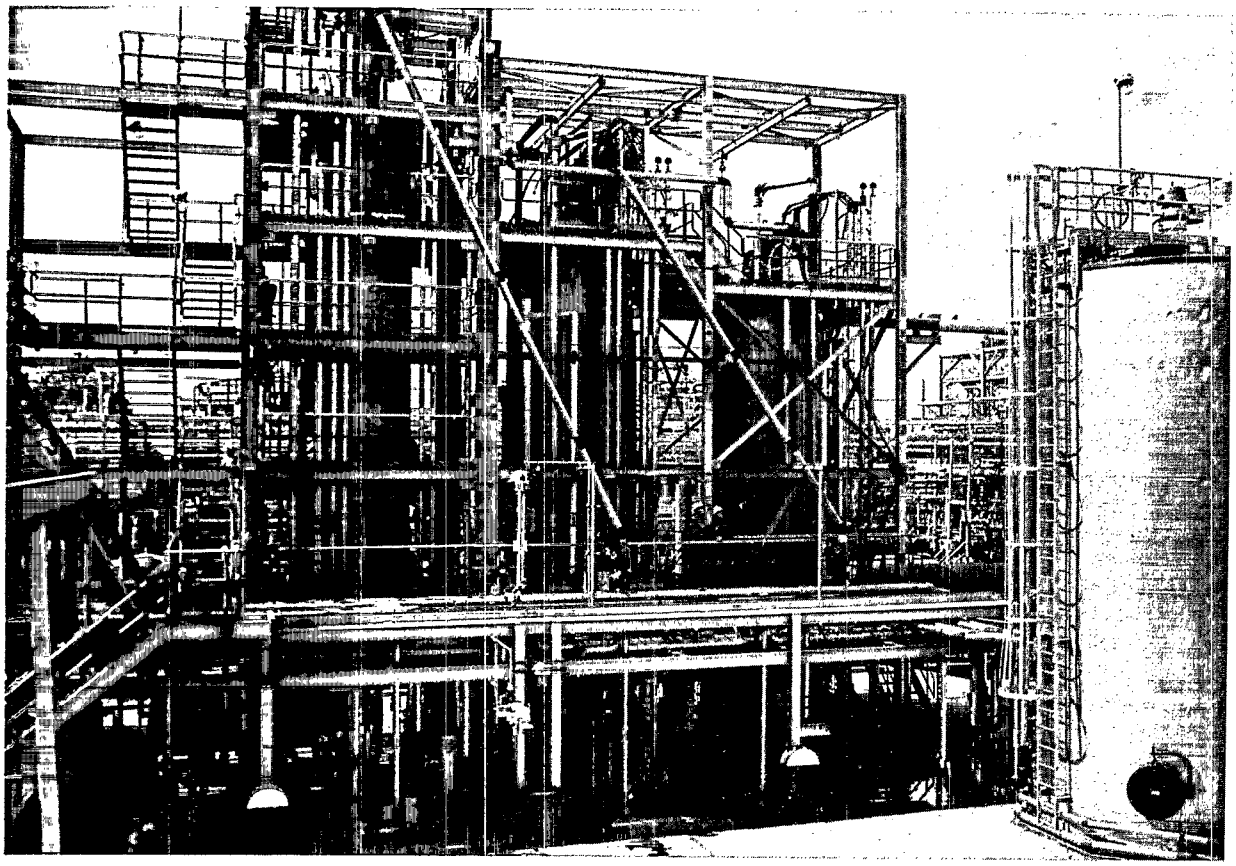


Photo: Monsanto

CHAPTER 2. CHANGES TO 1987 AND 1988 TOXICS RELEASE INVENTORY DATA

INTRODUCTION

EPA has revised and corrected the 1987 and 1988 TRI data and has deleted several chemicals from the TRI list since its 1988 TRI National Report.

Many changes have been made to the TRI database since the Environmental Protection Agency (EPA) described the 1987 Toxics Release Inventory (TRI) data in the June 1989 report, *The Toxics Release Inventory*, and the 1988 data in the September 1990 TRI report, *Toxics in the Community: National and Local Perspectives*. EPA is continually updating the TRI database to incorporate revisions and late reports submitted by facilities and to make corrections in the database. In addition, changes have been made to the list of chemicals subject to TRI reporting. Since 1989 reporting, EPA has removed (delisted) terephthalic acid and three copper pigments from the TRI list.[1] (See Box 2-A.) Overall, the picture of releases and transfers for 1987 and 1988 has changed very little, as a result of these changes, from that described in the September 1990 report.

This chapter explains why and how the current version of the 1987 and 1988 data used in the analyses in this 1989 TRI National Report differs from the 1987 and 1988 data previously reported in the 1988 TRI National Report. The chapter is primarily for the benefit of readers who are already familiar with the 1987 and 1988 TRI data, found in the National TRI Reports covering those years or in other accounts based on those reports.[2] Other readers, for whom this report is a first introduction to TRI, may wish to read only the last section of this chapter, which summarizes the current 1988 data (excluding terephthalic acid) that will be used for comparisons to 1989 throughout the remainder of this report.

TYPES OF CHANGES TO TRI DATA

Revisions submitted by facilities account for most of the changes to the 1987 and 1988 TRI data.

The TRI data for reporting years 1987 and 1988 shown in this report will in some instances vary from the previous version of TRI data for 1987 and 1988 contained in the 1988 TRI National Report. These variances are principally the result of revisions to TRI data submitted by facilities to EPA. These data changes are presumed to result in more accurate data. Thus, the current version of the TRI data for reporting years 1987 and 1988 contained in this report is likely to more accurately reflect chemical releases and transfers than the 1988 version of the National Report or other analyses based on earlier versions of the database.[3]

EPA accepts revisions to previous years' data to account for companies' increased knowledge of the reporting requirements of the Toxics Release Inventory or of their own operations involving TRI chemicals. Revisions may be the result of improved estimation techniques or other factors. An example of a change due to improved understanding is that many facilities originally reported mineral acid discharges (such as phosphoric acid, sulfuric acid, or hydrochloric acid) to surface water, or transfers of mineral acids to publicly owned treatment works (POTWs) or other off-

BOX 2-A. CHANGES IN THE TRI CHEMICAL LIST

The Emergency Planning and Community Right-To-Know Act, which created TRI, originally listed 309 individual chemicals and 20 chemical categories. (The final rule for TRI reporting--53-FR-4500, published February 16, 1988--contained a list of 308 individual chemicals. The discrepancy results from the incorporation of "cyanide" into the chemical category covering "cyanide compounds" in the final rule.) Since then, EPA has removed several chemicals from the TRI list because the Agency concluded that these chemicals do not pose a significant toxic threat to humans or the environment. Other chemicals have been added to the TRI list. Still others have been proposed for deletion or addition, but final decisions have not yet been made. These changes and proposals are summarized below:

Deletions to TRI made prior to 1989 reporting:
- aluminum oxide (non-fibrous forms)
- C.I. Acid Blue #9, diammonium salt
- C.I. Acid Blue #9, disodium salt
- melamine crystal
- sodium hydroxide (solution)
- sodium sulfate (solution)
- titanium dioxide

Deletions to TRI made after 1989 reporting (will affect 1990 reporting):
- terephthalic acid
- C.I. Pigment Green 7
- C.I. Pigment Blue 15
- C.I. Pigment Green 36*

Chemicals proposed for deletion:
- butyl benzyl phthalate
- ammonium sulfate (solution)
- sulfuric acid (non-aerosol forms)

Additions to TRI made after 1989 reporting (will affect 1990 reporting):
- allyl alcohol
- m-dinitrobenzene
- dinitrotoluene (mixed isomers)
- creosote
- p-dinitrobenzene
- isosafrole
- 2,3-dichloropropene
- o-dinitrobenzene
- toluene diisocyanate (mixed isomers)

Additions to TRI made after 1989 reporting (will affect 1991 reporting):
- bromotrifluoromethane (Halon 1301)
- trichlorofluoromethane (CFC-11)

BOX 2-A, continued.

- dichlorodifluoromethane (CFC-12)
- dichlorotetrafluoroethane (CFC-114)
- (mono)chloropentafluoroethane (CFC-115)
- dibromotetrafluoroethane (Halon 2402)
- bromochlorodifluoromethane (Halon 1211)

It should be noted that while the non-fibrous forms of aluminum oxide were deleted from the TRI list prior to the 1989 reporting deadline of July 1, 1990, the deletion occurred after the 1989 Reporting Form R and Instructions was printed in January 1990. Thus, *all* forms of aluminum oxide were included on the list of chemicals subject to TRI reporting requirements in the instructions for reporting for the calendar year 1989. Facilities, therefore, may have reported all forms of aluminum oxide in their total for this chemical instead of just the fibrous forms. Because the actual amount of the non-fibrous and the fibrous forms could not be determined from the totals reported, all forms of aluminum oxide have been excluded from the analyses in the 1989 National Report, as they were excluded from the 1988 National Report in anticipation of this situation. Thus, although there were 302 individual chemicals on the TRI list in 1989, the exclusion of all forms of aluminum oxide and of terephthalic acid from this analysis brings the total number of TRI chemicals analyzed in the 1989 National Report to 300 individual chemicals and 20 chemical categories.

Because the delisting of the chemicals from the TRI list causes an apparent reduction of releases and transfers from 1987 to 1988 to 1989, meaningful data comparisons for the three years require an adjustment of the 1987 and 1988 data to exclude data on the delisted chemicals. This adjustment allows analysis of those chemicals common to all years.

Delisted chemicals, including terephthalic acid and all forms of aluminum oxide, are excluded from all tables and analyses in this report, other than where specifically noted within this chapter.

site facilities, even when the mineral acid wastes had been neutralized prior to discharge or transfer. However, mineral acids that are neutralized prior to release or transfer should be reported as zero release or transfer. Many facilities have gone back and updated their previous submissions to reflect this. These changes benefit the database by providing a more accurate cross-year comparison.

Other types of changes to the database include the addition of data from late forms and EPA's correction of data entry errors and other database problems. These corrections are continually being made as needed. (See Chapter 8.)

CHANGES TO THE 1987 TRI DATA

Changes to the TRI database resulted in only a small net change in total TRI releases and transfers for 1987.

The current 1987 data include 773 more facilities and 2,096 more forms than the previous 1987 data as published in the 1988 TRI National Report. Revisions and other changes to the database resulted in a relatively small net change in total TRI

Table 2–1. Summary of Changes in 1987 TRI Data.

	PREVIOUS 1987 DATA(a)	CURRENT 1987 DATA(b)	CURRENT 1987 DATA(b) (excluding delisted chemicals)(c)
Number of Facilities	18,846	19,619	19,617
Number of Forms	66,757	68,853	68,800
Total TRI Releases and Transfers (Pounds)	6,977,432,542	7,014,020,433	7,011,244,040

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.
(c) This column excludes terephthalic acid, which was delisted after the 1989 reporting deadline. This is the only difference between the data shown in this column and the preceeding column. All three columns reflect delistings made prior to the 1989 reporting deadline, and they exclude all forms of aluminum oxide. (See Box 2-A.) The same applies to other tables and figures in this chapter with similar headings.

releases and transfers for 1987. That total changed from 6.98 billion pounds to 7.01 billion pounds, or under 1 percent more than previously reported. Changes to the 1987 data scarcely affected the nationwide environmental, geographical, or industrial distribution of TRI totals. (See Table 2-1.)

Total *direct releases* to air, water, land and underground injection wells changed 2 percent, from 5.0 to 5.1 billion pounds, while total *transfers* to facilities that treat, store, or dispose of wastes, including POTWs, changed almost 4 percent, from 2.0 to 1.9 billion pounds. Air emissions changed from 2.6 billion pounds to 2.7 billion pounds, or 71.1 million pounds larger than previously reported. On-site releases to water, land and underground injection wells, and transfers to public sewage were also larger than previously reported, but changed by smaller amounts. While *total* transfers decreased, only off-site transfers, and *not* transfers to public sewage, were less than previously reported, a change of 75.2 million pounds. (See Table 2-2.)

Changes to 1987 data for most states and other TRI reporting jurisdictions were relatively small. These changes resulted in small shifts in overall patterns of geographical distribution. TRI total releases and transfers in Texas moved downward by 27 million pounds, from 883.5 million pounds to 856.9 million pounds, and in Louisiana moved upward by 13 million pounds, from 844.2 to 857.0 million pounds. As a result, total TRI releases and transfers in 1987 were slightly larger in Louisiana than in Texas. (See Table 2-3.)

Changes split fairly evenly among industries, producing only minor shifts in industrial rankings. The changes resulted in a downward adjustment in total TRI releases and transfers for six industries and an upward adjustment for 13 industries. The Paper industry had the largest upward adjustment (17.2 million pounds larger), while the Chemical industry had the largest downward adjustment (12.4 million pounds smaller). (See Table 2-4.)

Similarly, few top-ranked chemicals were affected by data changes. Methanol showed the largest change in TRI total releases and transfers (40.0 million pounds larger), moving it from fourth largest to third largest for total TRI releases and transfers. (See Table 2-5.)

HOW DELISTED CHEMICALS AFFECT CURRENT 1987 DATA

Terephthalic acid has been deleted from the TRI list since the 1988 TRI National Report.

Since the 1988 TRI National Report, EPA removed (delisted) terephthalic acid from the TRI list because the Agency determined there were not sufficient data to support toxicity concerns for the chemical. The following section describes how the current 1987 data are affected if terephthalic acid is excluded from the totals, as it is throughout the rest of this report. The exclusion of delisted chemicals makes the data from prior reporting years comparable to data from subsequent years.

The 1987 TRI total drops by 2.8 million pounds when terephthalic acid is subtracted.

Adjusting for the removal of terephthalic acid does not greatly affect the aggregate totals for the *current* 1987 TRI data, which already reflects previous delistings. Facilities reported the release and transfer of 2.8 million pounds of terephthalic acid in 1987, or 0.04 percent of total TRI releases and transfers for 1987. (See Table 2-6.) Removal of terephthalic acid drops the total TRI releases and transfers for that year from 7.014 billion pounds to 7.011 billion pounds. (See Table 2-1.)

Terephthalic acid totals were not evenly distributed across states, industries, or type of environmental release. However, terephthalic acid represented a small portion of the totals, and the adjustment for terephthalic acid does not affect the rankings of releases and transfers for 1987, by type of release or transfer, by state or other reporting jurisdiction, or by industry.

Table 2–2. Environmental Distribution of TRI Releases and Transfers: Previous and Current 1987 Data.

TYPE OF RELEASE/TRANSFER	PREVIOUS 1987 DATA(a)		CURRENT 1987 DATA(b)		CURRENT 1987 DATA(b) (excluding delisted chemicals)	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Air	2,575,968,562	36.92	2,647,021,136	37.74	2,646,562,852	37.75
Surface Water	403,072,288	5.78	411,413,602	5.87	411,337,177	5.87
Land	730,895,340	10.48	736,708,835	10.50	736,695,585	10.51
Underground	1,298,736,401	18.61	1,319,128,528	18.81	1,319,128,528	18.81
Total Releases	5,008,672,591	71.78	5,114,272,101	72.91	5,113,724,142	72.94
Public Sewage	614,834,961	8.81	621,025,083	8.85	620,972,725	8.86
Off-Site	1,353,924,990	19.40	1,278,723,249	18.23	1,276,547,173	18.21
Total Transfers	1,968,759,951	28.22	1,899,748,332	27.09	1,897,519,898	27.06
Total Releases and Transfers	6,977,432,542	100.00	7,014,020,433	100.00	7,011,244,040	100.00

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table 2–3. TRI Total Releases and Transfers by State: Previous and Current 1987 Data.

STATE	PREVIOUS 1987 DATA(a)		CURRENT 1987 DATA(b)		CURRENT 1987 DATA(b) (excluding delisted chemicals)	
	Pounds	Rank	Pounds	Rank	Pounds	Rank
Alabama	137,371,499	19	140,002,005	19	139,904,755	19
Alaska	36,116,006	34	38,049,252	34	38,049,252	34
American Samoa	56,250	53	27,750	53	27,750	53
Arizona	73,393,460	25	73,364,952	26	73,364,952	26
Arkansas	80,819,715	24	81,430,737	24	81,430,737	24
California	227,243,845	11	230,124,038	11	230,123,788	11
Colorado	20,686,628	40	20,683,049	40	20,683,049	40
Connecticut	61,782,879	29	61,415,477	29	61,414,977	29
Delaware	16,380,748	45	14,879,000	45	14,879,000	45
District of Columbia	0	54	0	54	0	54
Florida	303,881,804	4	304,203,462	4	304,203,462	4
Georgia	144,537,387	17	144,410,220	17	144,406,250	17
Hawaii	3,251,517	47	3,190,308	48	3,190,308	48
Idaho	17,295,379	44	20,235,238	42	20,235,238	42
Illinois	266,457,734	7	273,083,202	6	273,069,578	6
Indiana	256,797,097	8	258,944,627	8	258,906,627	8
Iowa	53,410,874	31	54,611,028	31	54,611,028	31
Kansas	134,864,113	20	135,396,762	20	135,396,762	20
Kentucky	120,587,051	21	122,744,422	21	122,744,422	21
Louisiana	844,168,455	2	857,025,287	1	857,025,287	1
Maine	20,014,629	41	20,320,231	41	20,320,231	41
Maryland	43,296,676	32	43,621,076	33	43,621,076	33
Massachusetts	72,617,029	26	74,592,205	25	74,591,166	25
Michigan	268,882,394	6	268,937,331	7	268,937,331	7
Minnesota	63,726,041	28	66,805,909	27	66,805,909	27
Mississippi	164,281,523	16	164,688,623	16	164,688,623	16
Missouri	194,188,617	14	180,643,714	14	180,643,714	14
Montana	34,470,134	36	34,470,134	36	34,470,134	36
Nebraska	19,464,420	42	19,674,673	43	19,674,673	43
Nevada	2,288,293	50	3,399,743	47	3,399,743	47
New Hampshire	19,145,059	43	19,279,910	44	19,279,910	44
New Jersey	172,675,162	15	174,702,414	15	174,696,005	15
New Mexico	21,775,058	39	21,775,058	39	21,775,058	39
New York	194,344,217	13	192,517,595	13	192,511,831	13
North Carolina	138,049,052	18	142,384,201	18	141,337,456	18
North Dakota	1,072,921	52	1,075,533	52	1,075,533	52
Ohio	411,114,056	3	421,258,342	3	421,257,342	3
Oklahoma	56,767,725	30	57,096,728	30	57,096,728	30
Oregon	36,115,002	35	37,012,026	35	37,012,026	35
Pennsylvania	228,145,364	10	230,915,500	10	230,914,750	10
Puerto Rico	23,742,284	38	23,885,898	38	23,885,898	38
Rhode Island	13,692,203	46	14,719,187	46	14,719,187	46
South Carolina	85,655,766	23	88,677,529	23	87,650,797	23
South Dakota	3,093,401	48	3,093,401	49	3,093,401	49
Tennessee	293,726,678	5	293,596,122	5	293,568,667	5
Texas	883,548,503	1	856,939,856	2	856,932,215	2
Utah	252,944,126	9	252,302,704	9	252,302,704	9
Vermont	2,565,828	49	2,192,828	50	2,192,828	50
Virgin Islands	2,123,058	51	2,123,058	51	2,123,058	51
Virginia	216,151,241	12	227,614,658	12	227,231,658	12
Washington	41,533,699	33	44,979,258	32	44,979,258	32
West Virginia	66,618,005	27	65,582,369	28	65,467,105	28
Wisconsin	96,712,911	22	95,624,673	22	95,623,673	22
Wyoming	33,789,026	37	33,697,130	37	33,697,130	37
TOTAL	6,977,432,542		7,014,020,433		7,011,244,040	

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table 2–4. TRI Total Releases and Transfers by Industry: Previous and Current 1987 Data.

SIC CODE	INDUSTRY	PREVIOUS 1987 DATA(a)		CURRENT 1987 DATA(b)		CURRENT 1987 DATA(b) (excluding delisted chemicals)	
		Pounds	Rank	Pounds	Rank	Pounds	Rank
20	Food	67,048,081	13	66,500,670	14	66,500,670	14
21	Tobacco	7,268,625	21	7,268,625	21	7,268,625	21
22	Textiles	68,613,808	12	67,965,969	13	67,789,187	13
23	Apparel	2,650,724	22	2,709,835	22	2,709,835	22
24	Lumber	31,804,406	19	32,342,544	19	32,340,494	19
25	Furniture	61,182,687	15	65,166,552	15	65,166,552	15
26	Paper	377,958,408	4	395,148,751	4	395,148,751	4
27	Printing	63,380,815	14	71,200,630	12	71,200,630	12
28	Chemicals	3,331,892,430	1	3,319,477,595	1	3,316,931,884	1
29	Petroleum	182,108,630	9	176,693,200	9	176,686,450	9
30	Plastics	190,996,017	8	194,437,019	8	194,437,019	8
31	Leather	41,965,475	17	32,577,268	18	32,577,268	18
32	Stone/Clay	57,634,258	16	59,055,730	16	59,055,730	16
33	Primary Metals	947,963,814	2	958,272,396	2	958,272,396	2
34	Fabr. Metals	233,597,136	6	241,406,904	6	241,406,904	6
35	Machinery	78,172,754	10	77,831,560	11	77,831,560	11
36	Electrical	220,944,128	7	222,529,336	7	222,529,336	7
37	Transportation	296,186,174	5	300,889,604	5	300,889,604	5
38	Measure./Photo.	78,145,426	11	78,795,702	10	78,795,702	10
39	Miscellaneous	35,558,546	18	37,006,141	17	37,006,141	17
Multiple codes 20-39		579,638,062	3	582,812,531	3	582,767,431	3
No codes 20-39		22,722,138	20	23,931,871	20	23,931,871	20
	TOTAL	6,977,432,542		7,014,020,433		7,011,244,040	

(a) Data as of April 6, 1990, the version used in the 1988 National Report.
(b) Data as of April 19, 1991, the version used in this 1989 National Report.

Off-site transfers, other than to public sewage, accounted for the largest portion of the terephthalic acid total (78 percent). Terephthalic acid represented less than 0.2 percent of total off-site transfers, other than to public sewage, for 1987. Air emissions accounted for another 16 percent of terephthalic acid releases and transfers. Terephthalic acid represented less than 0.02 percent of total air emissions for 1987. (See Table 2-2.)

North Carolina and South Carolina had the largest releases and transfers of terephthalic acid among TRI reporting jurisdictions, contributing 38 percent and 37 percent of the total TRI amounts for that chemical, respectively. Still, terephthalic acid represented only 0.7 percent of North Carolina's total TRI releases and transfers and 1 percent of South Carolina's total. The chemical was released in much smaller quantities in 16 additional states. (See Table 2-3.)

The Chemical industry accounted for over 91 percent of the releases and transfers of terephthalic acid. Terephthalic acid represented less than 0.1 percent of the Chemical industry's 1987 total, however. Only three other industries (Textile Mill Products, Petroleum Refining, and Lumber and Wood Products) reported *any* releases or transfers of the chemical. (See Table 2-4.)

For complete listings of current 1987 data, excluding terephthalic acid, for comparison to 1988 and 1989 data, see Appendix E, Tables E1-E5 and Figures E-1 and E-2.

CHANGES TO THE 1988 TRI DATA

As discussed above under "Types of Changes to TRI Data," EPA has updated the 1988 TRI data to incorporate revisions and late reports submitted by facilities as well as EPA-initiated database corrections and changes. In particular, significant changes were made to the amounts of releases and transfers reported by several facilities. Some of these changes were noted in Box 3-C in the 1988 TRI National Report, and as footnotes to several tables, but were not reflected in the analyses in that report because they were received after the data for the report had been compiled.

Table 2–5. The 25 Chemicals with the Largest TRI Total Releases and Transfers: Previous and Current 1987 Data.

CHEMICAL	PREVIOUS 1987 DATA(a) Pounds	Rank	CURRENT 1987 DATA(b) Pounds	Rank
Ammonium sulfate (solution)	814,932,127	1	819,811,808	1
Hydrochloric acid	644,856,938	2	629,430,160	2
Sulfuric acid	478,195,883	3	461,180,636	4
Methanol	435,550,127	4	475,580,381	3
Ammonia	402,143,039	5	407,877,084	5
Toluene	362,178,333	6	374,224,061	6
Phosphoric acid	340,343,982	7	349,150,324	7
Acetone	252,961,335	8	257,737,211	8
Xylene (mixed isomers)	224,213,405	9	212,014,063	9
Methyl ethyl ketone	197,310,127	10	200,222,071	10
Zinc compounds	193,484,430	11	194,342,566	11
1,1,1-Trichloroethane	189,130,017	12	194,262,283	12
Copper	170,892,545	13	171,787,897	13
Dichloromethane	155,627,785	14	157,976,591	14
Carbon disulfide	136,423,873	15	136,423,873	15
Chlorine	121,511,240	16	121,613,188	16
Ammonium nitrate (solution)	115,406,312	17	113,623,178	17
Zinc (fume or dust)	97,538,784	18	100,710,674	18
Nitric acid	75,078,121	19	87,483,284	19
Freon 113	64,410,204	20	65,846,024	20
Trichloroethylene	62,206,897	21	64,061,370	21
Ethylene	60,942,381	22	61,669,073	22
Styrene	59,433,848	23	42,158,046	31
Glycol ethers	58,622,937	24	60,329,644	24
Manganese compounds	57,269,705	25	61,319,527	23
Ethylene glycol	50,002,667	26	50,795,771	25
SUBTOTAL	5,820,667,042		5,820,835,017	
TOTAL FOR ALL OTHERS	1,156,765,500		1,193,185,416	
GRAND TOTAL	6,977,432,542		7,014,020,433	

(a) Data as of April 6, 1990, the version of the database in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database in this 1989 National Report.

Table 2–6. TRI Releases and Transfers of Terephthalic Acid, 1987 and 1988 Current Data (a).

TYPE OF RELEASE/TRANSFER	TRI RELEASES AND TRANSFERS 1988 Pounds	1987 Pounds
Air	848,180	458,284
Surface Water	23,883	76,425
Land	2,809,977	13,250
Underground	0	0
Total Releases	3,682,040	547,959
Public Sewage	54,245	52,358
Off-site Transfers	2,886,993	2,176,076
Total Transfers	2,941,238	2,228,434
Total Releases and Transfers	6,623,278	2,776,393
Percent of TRI Grand Total	0.10	0.04
Total For All Others	6,426,484,611	7,011,244,040
TRI Grand Total	6,433,107,889	7,014,020,433

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table 2–7. Summary of Changes in 1988 TRI Data.

	PREVIOUS 1988 DATA(a)	CURRENT 1988 DATA(b)	CURRENT 1988 DATA(b) (excluding delisted chemicals)
Number of Facilities	19,762	21,147	21,144
Number of Forms	71,131	75,259	75,194
TRI Total Releases and Transfers (Pounds)	6,241,030,746	6,433,107,889	6,426,484,611

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Changes to the 1988 TRI data resulted in a small net change in total releases and transfers for 1988.

The current 1988 data include 1,385 more facilities and 4,128 more forms than the previous 1988 data reported in the 1988 TRI National Report. The total releases and transfers reported in these data changed the database from 6.2 billion pounds to 6.4 billion pounds, or 3 percent larger than previously recorded. (See Table 2-7.)

Total *direct releases* to air, water, land, and underground injection changed 5 percent, from 4.57 to 4.78 billion pounds, while total *transfers* off site to POTWs and other facilities that treat, store, or dispose of wastes changed 1 percent, from 1.67 billion pounds to 1.66 billion pounds. Specifically, releases to air and underground injection were, respectively, 7 percent and 10 percent larger than previously reported, while on-site releases to surface water and land were, respectively, 14 percent and 4 percent smaller than previously reported. Transfers to public sewage were 0.08 percent larger, while transfers to other off-site locations were 2 percent smaller than previously reported. These changes resulted in some small shifts in the environmental distribution of total TRI releases and transfers. (See Figure 2-1 and Table 2-8.)

Table 2–8. Environmental Distribution of TRI Releases and Transfers: Previous and Current 1988 Data.

TYPE OF RELEASE/TRANSFER	PREVIOUS 1988 DATA(a)		CURRENT 1988 DATA(b)		CURRENT 1988 DATA(b) (excluding delisted chemicals)	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Air	2,427,570,103	38.90	2,596,489,763	40.36	2,595,641,583	40.39
Surface Water	361,594,238	5.79	309,585,500	4.81	309,561,617	4.82
Land	561,556,882	9.00	537,320,984	8.35	534,511,007	8.32
Underground	1,215,343,908	19.47	1,334,164,262	20.74	1,334,164,262	20.76
Total Releases	4,566,065,131	73.16	4,777,560,509	74.27	4,773,878,469	74.28
Public Sewage	570,551,308	9.14	570,982,925	8.88	570,928,680	8.88
Off-Site	1,104,414,307	17.70	1,084,564,455	16.86	1,081,677,462	16.83
Total Transfers	1,674,965,615	26.84	1,655,547,380	25.73	1,652,606,142	25.72
Total Releases and Transfers	6,241,030,746	100.00	6,433,107,889	100.00	6,426,484,611	100.00

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

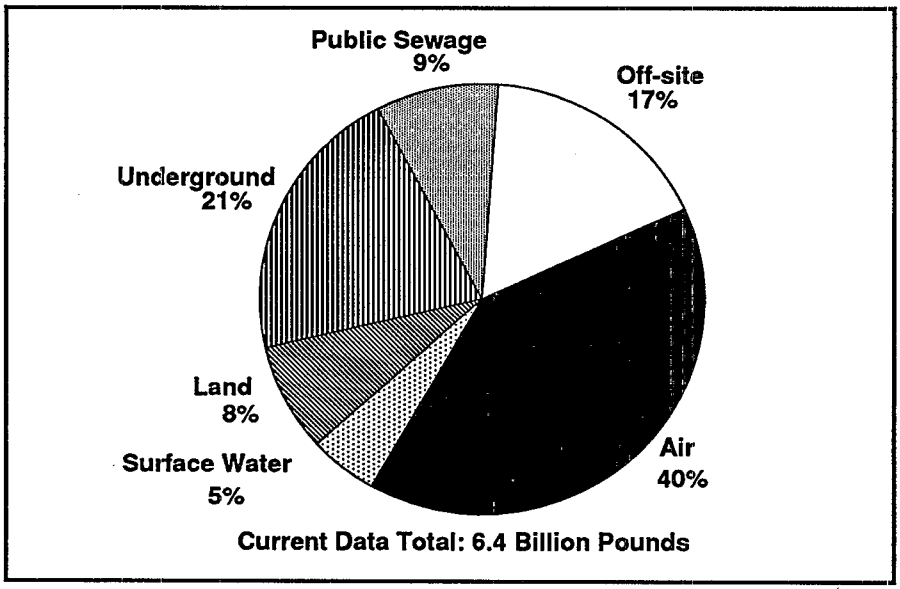


Figure 2–1. Environmental Distribution of TRI Total Releases and Transfers, 1988 Current Data. (Data as of April 19, 1991, excluding delisted chemicals.)

Data changes resulted in some shifts in the geographical distribution for 1988.

Data changes for several states were relatively large. These changes resulted in some shifts in the overall geographical distribution. For example, Texas and Louisiana switched between number one and number two rankings, as reported in the 1988 National Report and this report, for total releases and transfers in the United States in reporting year 1988. The first place ranking of Texas was noted in the 1988 TRI National Report, but was not reflected in the tables and analyses throughout that

Table 2–9. TRI Total Releases and Transfers by State: Previous and Current 1988 Data.

STATE	PREVIOUS 1988 DATA(a)		CURRENT 1988 DATA(b)		CURRENT 1988 DATA(b) (excluding delisted chemicals)	
	Pounds	Rank	Pounds	Rank	Pounds	Rank
Alabama	84,062,842	22	134,144,345	19	133,823,095	19
Alaska	26,476,465	38	25,835,408	39	25,835,408	39
American Samoa	29,500	53	29,500	53	29,500	53
Arizona	74,657,306	24	76,571,876	24	76,571,876	24
Arkansas	72,272,458	25	73,646,504	25	73,646,504	25
California	201,568,789	9	201,145,891	9	201,145,891	9
Colorado	21,132,981	42	20,315,392	42	20,315,392	42
Connecticut	53,449,946	30	54,074,965	31	54,074,963	31
Delaware	10,692,005	46	11,433,629	46	11,433,629	46
District of Columbia	1,000	54	1,000	54	1,000	54
Florida	249,655,746	6	157,842,599	15	157,842,599	15
Georgia	131,410,860	18	134,333,420	18	134,327,682	18
Hawaii	2,964,331	49	2,990,331	49	2,990,331	49
Idaho	15,105,613	44	15,413,798	44	15,413,798	44
Illinois	251,302,153	5	255,835,959	5	255,795,896	5
Indiana	276,346,921	4	278,485,310	4	278,474,410	4
Iowa	58,668,674	28	59,728,579	29	59,728,579	29
Kansas	174,468,243	13	175,678,901	11	175,678,901	11
Kentucky	131,319,642	19	119,369,745	21	119,369,745	21
Louisiana	741,206,814	1	767,322,419	2	767,322,419	2
Maine	21,965,123	41	22,410,829	40	22,410,079	40
Maryland	33,340,174	36	33,700,863	36	33,700,863	36
Massachusetts	70,821,565	26	67,656,004	27	67,655,031	27
Michigan	231,681,301	8	248,188,792	7	248,188,792	7
Minnesota	65,506,519	27	67,696,352	26	67,696,352	26
Mississippi	120,820,916	20	124,951,451	20	124,951,451	20
Missouri	184,627,555	12	174,291,061	12	174,291,061	12
Montana	35,467,330	34	35,483,710	34	35,483,710	34
Nebraska	22,649,337	40	22,054,650	41	22,054,650	41
Nevada	4,874,292	47	3,203,848	47	3,203,848	47
New Hampshire	15,171,504	43	15,626,045	43	15,626,045	43
New Jersey	162,741,774	15	167,428,301	14	167,422,375	14
New Mexico	24,398,821	39	30,690,321	37	30,690,321	37
New York	172,106,105	14	173,344,219	13	173,337,442	13
North Carolina	136,857,071	17	139,379,133	16	135,700,224	17
North Dakota	1,394,580	52	1,405,179	52	1,405,179	52
Ohio	375,989,294	3	366,426,700	3	366,424,531	3
Oklahoma	51,720,309	31	56,175,944	30	56,175,944	30
Oregon	33,604,243	35	33,937,750	35	33,937,750	35
Pennsylvania	201,102,129	10	212,888,712	8	212,887,962	8
Puerto Rico	28,842,935	37	29,020,010	38	29,020,010	38
Rhode Island	12,568,955	45	14,534,583	45	14,534,583	45
South Carolina	82,177,534	23	84,745,617	23	82,708,402	23
South Dakota	3,059,629	48	3,133,336	48	3,133,336	48
Tennessee	249,417,227	7	254,567,815	6	254,482,845	6
Texas	724,477,706	2	882,245,450	1	882,235,358	1
Utah	137,472,389	16	139,379,010	17	139,379,010	16
Vermont	2,374,596	50	2,374,414	50	2,374,414	50
Virgin Islands	1,633,634	51	1,633,634	51	1,633,634	51
Virginia	196,619,903	11	198,412,692	10	198,127,692	10
Washington	50,338,221	32	51,037,598	32	51,037,598	32
West Virginia	57,901,379	29	61,644,748	28	61,513,704	28
Wisconsin	105,049,429	21	103,861,574	22	103,860,824	22
Wyoming	45,464,978	33	45,377,973	33	45,377,973	33
TOTAL	6,241,030,746		6,433,107,889		6,426,484,611	

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this1989 National Report.

report, because the changes to the database that resulted in this ranking were not made until after the data for the report had been compiled. Total releases and transfers in Louisiana for 1988 changed by 26.1 million pounds, from 741.2 million pounds to 767.3 million pounds, a 4 percent increase. Total releases and transfers in Texas changed by 157.8 million pounds, from 724.5 million pounds to 882.2 million pounds, a 22 percent increase. (See Table 2-9.)

Large changes were also made to the total releases and transfers of facilities reporting in Alabama and Florida. Totals in Alabama changed from 84.1 million pounds to 134.1 million pounds, a change of 60 percent. As a result, Alabama moved up in TRI rank from number 22 to number 19 for total releases and transfers. Current 1988 data totals in Florida became 92 million pounds smaller than previously reported, a 37 percent decrease from 249.7 million pounds to 157.8 million pounds. Florida changed rank from number six to number 15 for total releases and transfers nationwide. Other states with large changes in releases and transfers include Michigan, Pennsylvania, New Mexico, Kentucky, Missouri, and Ohio.

Changes to the 1988 data produced only small shifts in the industrial distribution of TRI totals. The Chemical industry had the largest change in total releases and transfers between previous and current data. Totals for the Chemical industry changed by 161.1 million pounds, or 6 percent larger than previously reported, while changes for several industries resulted in smaller totals than previously reported: Paper (29.2 million pounds less, 6 percent change); Tobacco (13.0 million pounds less, 86 percent change); and Leather and Leather Products (10.4 million pounds, 28 percent change). The change in total TRI amounts reported by the Tobacco industry is a large *percentage* change, because in 1988 that industry ranked next to lowest for total TRI releases and transfers, indicating that a decrease of 13.0 million pounds would represent a relatively large share of its total releases and transfers. The Tobacco industry's change can be largely attributed to a Georgia Pacific facility in Brunswick, Georgia which corrected its SIC code from 21 (Tobacco) to 26 (Paper); this change was noted in the 1988 TRI National Report. (See Table 2-10.)

Some changes were made in the total releases and transfers for the top-ranked chemicals in 1988.

Revisions and other changes to the 1988 data resulted in some differences in the total releases and transfers for the top-ranked chemicals and produced small shifts in the ranking of the chemicals. Carbon disulfide showed one of the largest changes, 41.6 million pounds, resulting in a 33 percent larger total than previously reported. Carbon disulfide changed in rank from 17th to 15th largest for total TRI releases and transfers. Adjustments in previous data for ammonium sulfate (solution), ammonia, dichloromethane, and methanol resulted in larger totals than previously reported. On the other hand, the changes in release and transfer amounts for several mineral acids (phosphoric acid, sulfuric acid, and hydrochloric acid) resulted in smaller totals for these chemicals than previously reported. These changes may be in part the result of facilities revising their estimates to correct for the fact that mineral acids that have been neutralized are supposed to be reported to TRI as a zero amount of release or transfer rather than the amount that was neutralized. (See Table 2-11.)

Table 2–10. TRI Total Releases and Transfers by Industry: Previous and Current 1988 Data.

SIC CODE	INDUSTRY	PREVIOUS 1988 DATA(a		CURRENT 1988 DATA(b)		CURRENT 1988 DATA(b) (excluding delisted chemicals)	
		Pounds	Rank	Pounds	Rank	Pounds	Rank
20	Food	72,901,891	11	74,661,932	12	74,661,932	12
21	Tobacco	15,058,947	21	2,043,866	21	2,043,866	21
22	Textiles	59,325,071	15	56,155,873	16	55,772,745	16
23	Apparel	1,919,695	22	1,791,580	22	1,791,580	22
24	Lumber	33,368,043	19	34,699,804	18	34,690,254	18
25	Furniture	62,795,289	13	69,796,539	14	69,796,539	14
26	Paper	370,343,051	4	341,154,953	4	341,154,953	4
27	Printing	60,541,926	14	71,164,372	13	71,164,372	13
28	Chemicals	2,883,479,294	1	3,044,592,324	1	3,038,435,724	1
29	Petroleum	104,236,707	9	105,043,707	9	105,025,957	9
30	Plastics	189,126,061	7	194,467,628	7	194,467,128	7
31	Leather	37,806,234	17	27,365,484	19	27,365,484	19
32	Stone/Clay	55,182,710	16	60,636,262	15	60,636,262	15
33	Primary Metals	857,866,507	2	859,637,567	2	859,637,567	2
34	Fabr. Metals	215,112,500	6	222,726,927	6	222,726,927	6
35	Machinery	75,332,062	10	81,243,000	10	81,243,000	10
36	Electrical	182,384,794	8	183,382,575	8	183,382,575	8
37	Transportation	261,180,095	5	274,984,804	5	274,984,804	5
38	Measure./Photo.	64,367,648	12	77,304,683	11	77,304,683	11
39	Miscellaneous	36,043,356	18	39,465,007	17	39,465,007	17
	Multiple codes 20-39	579,516,521	3	590,112,901	3	590,057,151	3
	No codes 20-39	23,142,344	20	20,676,101	20	20,676,101	20
	TOTAL	6,241,030,746		6,433,107,889		6,426,484,611	

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

HOW DELISTED CHEMICALS AFFECT CURRENT 1988 DATA

As mentioned above, since the 1988 TRI National Report, EPA has removed (delisted) terephthalic acid from the TRI list because the Agency determined there were not sufficient data to support toxicity concerns for the chemical. The following section describes how the current 1988 data change if terephthalic acid is excluded from the totals, as it is throughout this report. Excluding delisted chemicals makes 1988 data more readily comparable to data from 1989 and subsequent years.

The 1988 TRI total drops by 6.4 million pounds when terephthalic acid is removed.

Adjusting for the removal of terephthalic acid does not greatly affect the aggregate totals for the current 1988 TRI data. Facilities reported the release and transfer of 6.4 million pounds of terephthalic acid in 1988, or 0.10 percent of total TRI releases and transfers for 1988 (See Table 2-6 on p.9). Removal of terephthalic acid drops the total TRI releases and transfers for 1988 from 6.433 billion pounds to 6.426 billion pounds. (See Table 2-7.)

Table 2–11. The 25 Chemicals with the Largest TRI Total Releases and Transfers: Previous and Current 1988 Data.

CHEMICAL	PREVIOUS 1988 DATA(a)		CURRENT 1988 DATA(b)		CURRENT 1988 DATA(b) (excluding delisted chemicals)	
	Pounds	Rank	Pounds	Rank	Pounds	Rank
Ammonium sulfate (solution)	745,528,007	1	797,584,853	1	797,584,853	1
Hydrochloric acid	635,720,989	2	625,649,199	2	625,649,199	2
Methanol	435,639,693	3	455,128,084	3	455,128,084	3
Sulfuric acid	386,060,541	4	361,866,996	5	361,866,996	5
Ammonia	356,101,165	5	386,590,599	4	386,590,599	4
Toluene	333,315,437	6	349,388,787	6	349,388,787	6
Acetone	249,703,395	7	256,870,228	7	256,870,228	7
Phosphoric acid	241,602,716	8	198,390,464	9	198,390,464	9
Zinc compounds	209,127,626	9	207,190,179	8	207,190,179	8
Xylene (mixed isomers)	181,771,506	10	190,607,150	11	190,607,150	11
1,1,1-Trichloroethane	180,418,488	11	194,137,772	10	194,137,772	10
Methyl ethyl ketone	156,490,232	12	161,203,453	12	161,203,453	12
Chlorine	147,050,483	13	147,810,634	14	147,810,634	14
Dichloromethane	134,212,442	14	155,059,038	13	155,059,038	13
Manganese compounds	114,926,157	15	115,390,045	16	115,390,045	16
Ammonium nitrate (solution)	107,223,350	16	105,151,890	17	105,151,890	17
Carbon disulfide	82,748,299	17	124,361,347	15	124,361,347	15
Nitric acid	81,288,357	18	88,835,422	18	88,835,422	18
Freon 113	68,545,125	19	73,763,331	19	73,763,331	19
Zinc (fume or dust)	66,013,145	20	68,630,760	20	68,630,760	20
Glycol ethers	62,255,269	21	64,889,165	21	64,889,165	21
Ethylene glycol	55,713,223	22	55,694,015	24	55,694,015	24
Copper compounds	53,087,237	23	64,178,993	22	64,178,993	22
Trichloroethylene	52,616,792	24	57,816,129	23	57,816,129	23
n-Butyl alcohol	52,004,930	25	53,701,608	25	53,701,608	25
SUBTOTAL	5,189,164,604		5,359,890,141		5,359,890,141	
TOTAL FOR ALL OTHERS	1,051,866,142		1,073,217,748		1,066,594,470	
GRAND TOTAL	6,241,030,746		6,433,107,889		6,426,484,611	

(a) Data as of April 6, 1990, the version of the database used in the 1988 National Report.
(b) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Terephthalic acid totals were not evenly distributed across states, industries, or type of environmental release. However, terephthalic acid represents a small portion of the totals, and the adjustment for terephthalic acid does not affect the rankings of releases and transfers for 1988, by type of release or transfer, by state or reporting jurisdiction, or by industry.

Off-site transfers and on-site releases to land accounted for the largest portions of the terephthalic acid total (44 and 42 percent, respectively). Terephthalic acid represented less than 0.3 percent of total off-site transfers and only 0.5 percent of total releases to land for 1988. (See Table 2-8.)

North Carolina and South Carolina had the largest releases and transfers of terephthalic acid, contributing 56 percent and 31 percent, respectively, of total TRI amounts for this chemical. Terephthalic acid represented 2.6 percent of North Carolina's 1988 total releases and transfers and 2.4 percent of South Carolina's total. The chemical was released in much smaller quantities in 15 additional states and reporting jurisdictions. (See Table 2-9.)

Although terephthalic acid represented less than 0.2 percent of the Chemical industry's TRI releases and transfers in 1988, the Chemical industry accounted for over 92 percent of the 1988 TRI releases and transfers of terephthalic acid. Only four other industries (Textiles, Petroleum, Lumber, and Plastics) reported *any* releases or transfers of the chemical. (See Table 2-10.)

THE CURRENT 1988 TRI TOTALS, EXCLUDING DELISTED CHEMICALS: DATA FOR COMPARISON TO 1989

The 1988 TRI data are used as the basis of comparison with 1989 TRI data.

The current 1988 TRI data, excluding delisted chemicals, are used in this year's National Report as the basis of comparison with 1989 data. The 1988 TRI data are also the baseline for comparisons in the 33/50 Program. (See Chapter 6.) The reason for this decision is primarily the higher quality of the database for reporting year 1988, as compared to 1987. Because 1987 was the first year of reporting under TRI, facilities had no experience with the process. For 1988, reporting facilities were more experienced with TRI and generally submitted more accurate data. In addition, the quality of data entry improved from 1987 to 1988, and many improvements to the database have been made, such as the standardization of some items. (See Chapter 8.) For these reasons, EPA believes that the 1988 TRI data provide a more accurate picture of toxic chemical releases in the United States than do the 1987 TRI data.

The following sections present the *current 1988 data, excluding delisted chemicals.* The data exclude chemicals delisted before the 1989 reporting deadline, terephthalic acid, and all forms of aluminum oxide. These summary data are used throughout this report whenever comparisons to 1989 data are made.

Environmental Distribution of TRI Releases and Transfers, 1988

Facilities released and transferred 6.4 billion pounds of TRI chemicals in 1988.

Overall, 21,144 manufacturing facilities reported a total of 6.4 billion pounds of environmental releases and transfers of chemicals in wastes for 1988. Three-quarters of this amount (4.8 billion pounds) was released on site directly into the air, water, land, or underground wells; the other quarter (1.7 billion pounds) was transferred off site to waste management facilities such as POTWs, incinerators, or landfills. (See Table 2-8.)

Air emissions were the largest of all the release and transfer categories.

Larger amounts of TRI chemicals were emitted to air in 1988 than were released on site to water, land, or underground injection, or were transferred off site. Over one-third (2.6 billion pounds) of the TRI total was emitted to air. Underground injection wells received 1.3 billion pounds (21 percent). Facilities disposed of 534.5 million pounds (8 percent of the TRI total) on land at the facility site and discharged 309.6 million pounds (5 percent) to surface water. (See Figure 2-1 and Table 2-8.)

In addition to direct releases to the environment, TRI facilities transferred 570.9 million pounds of TRI chemicals (9 percent of the TRI total) to POTWs and transferred another 1.1 billion pounds (17 percent) to off-site facilities (other than POTWs) for treatment, storage, or disposal. Together, these transfers comprised 26 percent of the TRI total.

Major Chemicals in TRI, 1988

25 chemicals comprised 83% of the 1988 TRI total.

The 25 chemicals with the largest current TRI totals (adjusted for delisted chemicals) accounted for 83 percent (5.4 billion pounds) of all TRI releases and transfers in 1988. Ammonium sulfate (solution) and hydrochloric acid together made up one-fifth of all releases and transfers and were the only chemicals with a TRI total of greater than 500 million pounds each. A total of 17 TRI chemicals and chemical categories were released and transferred in quantities of over one million pounds, while 82 chemicals were reported in amounts smaller than 1,000 pounds, or not at all. (See Table 2-11.)

Individual chemicals played distinctive roles in the distribution of releases and transfers. Ammonium sulfate (solution) accounted for over one-third of TRI discharges to underground injection, one-third of TRI transfers to POTWs, and one-fifth of TRI releases to surface water. Phosphoric acid, ammonium sulfate (solution), and sulfuric acid accounted for three-quarters of all discharges to surface water. Ammonium sulfate (solution) and hydrochloric acid accounted for over two-thirds of all discharges to underground wells. Zinc compounds and manganese compounds represented 37 percent of all on-site land releases. Releases to air were more evenly distributed over a broader range of chemicals. Of the top seven chemicals for total TRI releases and transfers, six were also the top chemicals for releases to air, accounting for over 50 percent of air releases in 1988. Ammonium sulfate (solution) and methanol accounted for over half of transfers to public sewage. (See Table 2-12.)

Mineral acids/salts and non-halogenated organic chemicals accounted for 69% of the 1988 TRI total.

Two chemical classes--mineral acids/salts[5] and non-halogenated organics--accounted for 69 percent of TRI releases and transfers for 1988.[6] Non-halogenated organics accounted for 35 percent of the TRI total, while mineral acids/salts accounted for 34 percent. Releases to air were dominated by non-halogenated organics, which accounted for 58 percent of air emissions. The class of mineral acids/salts dominated discharges to surface water, accounting for 79 percent of such discharges, as well as constituting 87 percent of discharges to underground injection wells in 1988. Metals and metal compounds comprised the largest portion of TRI releases to land (74 percent). Transfers to public sewage were mostly made up of mineral acids/salts (57

Table 2–12.. Environmental Distribution of the 25 Chemicals with the Largest TRI Releases and Transfers, 1988 Current Data (a), Excluding Delisted Chemicals.

TRI RANK	CHEMICAL	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDER-GROUND Pounds	PUBLIC SEWAGE Pounds	OFF-SITE Pounds	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	Ammonium sulfate (solution)	715,824	70,933,465	13,425,305	520,144,631	187,698,362	4,667,266	797,584,853	12.41
2	Hydrochloric acid	59,157,413	3,947,399	4,175,637	396,940,339	35,895,804	125,532,607	625,649,199	9.74
3	Methanol	219,902,305	16,640,067	12,735,399	26,352,320	112,968,925	66,529,068	455,128,084	7.08
4	Ammonia	273,248,627	24,274,559	8,659,916	50,702,149	23,273,890	6,431,458	386,590,599	6.02
5	Sulfuric acid	16,858,801	36,746,708	3,608,355	138,707,333	54,424,308	111,521,491	361,866,996	5.63
6	Toluene	279,098,033	256,256	734,325	1,436,666	3,545,661	64,317,846	349,388,787	5.44
7	Acetone	201,804,056	1,134,507	423,091	3,117,541	14,110,213	36,280,820	256,870,228	4.00
8	Zinc compounds	7,148,533	1,051,933	114,741,901	104,016	1,509,445	82,634,351	207,190,179	3.22
9	Phosphoric acid	1,824,577	122,650,414	51,791,692	54,961	13,804,117	8,264,703	198,390,464	3.09
10	1,1,1-Trichloroethane	173,827,947	96,280	187,646	1,000	304,625	19,720,274	194,137,772	3.02
11	Xylene (mixed isomers)	148,959,342	204,008	560,532	122,728	4,158,563	36,601,977	190,607,150	2.97
12	Methyl ethyl ketone	129,633,557	76,743	155,299	258,762	933,074	30,146,018	161,203,453	2.51
13	Dichloromethane	127,592,367	347,594	157,155	664,750	2,963,249	23,333,923	155,059,038	2.41
14	Chlorine	133,483,355	6,659,900	428,097	107,624	3,137,620	3,994,038	147,810,634	2.30
15	Carbon disulfide	123,893,367	39,237	43,186	13,400	159,369	212,788	124,361,347	1.94
16	Manganese compounds	1,666,253	681,638	83,873,034	6,815,820	1,842,325	20,510,975	115,390,045	1.80
17	Ammonium nitrate (solution)	2,946,157	8,436,348	16,022,104	67,941,000	7,595,242	2,211,039	105,151,890	1.64
18	Nitric acid	11,039,482	1,472,340	1,330,445	25,485,930	23,298,790	26,208,435	88,835,422	1.38
19	Freon 113	67,426,079	32,629	27,799	5,965	104,693	6,166,166	73,763,331	1.15
20	Zinc (fume or dust)	3,385,725	849,294	27,016,965	279,010	840,678	36,259,088	68,630,760	1.07
21	Glycol ethers	47,842,531	238,286	104,421	362,198	8,676,061	7,665,668	64,889,165	1.01
22	Copper compounds	4,345,960	184,309	44,923,573	167,457	425,039	14,132,655	64,178,993	1.00
23	Trichloroethylene	51,422,615	13,800	21,190	390	79,126	6,279,008	57,816,129	0.90
24	Ethylene glycol	13,394,395	3,743,401	897,807	2,897,139	17,067,214	17,694,059	55,694,015	0.87
25	n-Butyl alcohol	37,519,177	150,610	175,794	3,009,660	4,525,613	8,320,754	53,701,608	0.84
SUBTOTAL		2,138,136,478	300,861,725	386,220,668	1,245,692,789	523,342,006	765,636,475	5,359,890,141	83.40
TOTAL FOR ALL OTHERS		457,505,105	8,699,892	148,290,339	88,471,473	47,586,674	316,040,987	1,066,594,470	16.60
GRAND TOTAL		2,595,641,583	309,561,617	534,511,007	1,334,164,262	570,928,680	1,081,677,462	6,426,484,611	100.00

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

percent) and non-halogenated organics (35 percent). Non-halogenated organics, mineral acids/salts, and metals and metal compounds represented about equal portions of off-site transfers (33, 27, and 28 percent, respectively). (See Figure 2-2 and Table 2-13.)

Carcinogens in TRI, 1988

Carcinogens made up 7% of the 1988 TRI total.

Releases and transfers of the 123 carcinogens on the TRI list constituted approximately 7 percent (468.7 million pounds) of total TRI releases and transfers for 1988. (Chapter 3 explains the definition of carcinogens used here and throughout this report. Appendix B lists all TRI chemicals and indicates which are considered carcinogens.) The 25 carcinogens with the largest releases and transfers accounted for 98 percent of the total for all carcinogens. (See Table 2-14.)

Dichloromethane alone accounted for one-third (155.1 million pounds) of the carcinogen total. Releases and transfers of styrene, the second-ranked carcinogen, accounted for 9 percent (44 million pounds) of all TRI carcinogen releases and transfers.

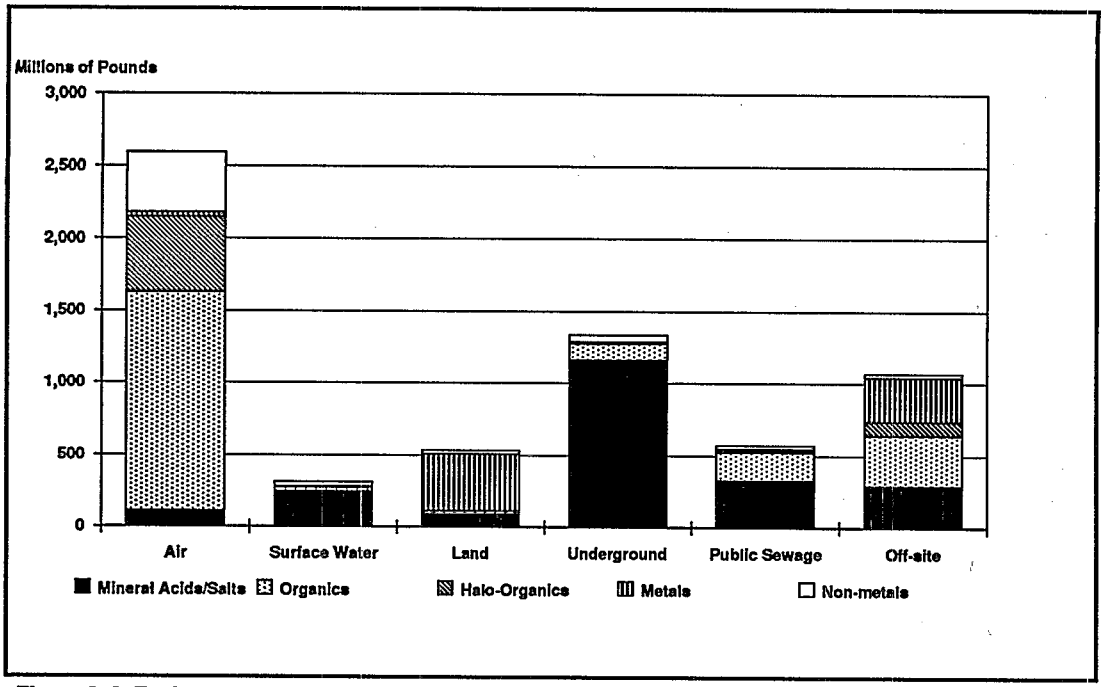


Figure 2–2. Environmental Distribution by Chemical Class of TRI Releases and Transfers, 1988 Current Data. Data as of April 19, 1991, excluding delisted chemicals.

Table 2–13. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1988 Current Data (a), Excluding Delisted Chemicals.

CHEMICAL CLASS	AIR	SURFACE WATER	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Percent
Organics	1,517,743,853	27,335,501	20,330,846	116,710,489	201,766,177	353,003,219	2,236,890,085	34.81
Mineral Acids/Salts	106,638,396	244,586,200	90,475,509	1,155,621,473	324,577,974	288,475,466	2,210,375,018	34.39
Metals	29,732,583	4,541,677	394,617,720	7,944,721	9,504,011	306,907,290	753,248,002	11.72
Halo-organics	517,582,533	2,049,407	684,170	3,047,006	8,395,816	92,222,350	623,981,282	9.71
Non-metals	421,607,287	30,969,922	28,375,804	50,840,573	26,492,833	29,421,498	587,707,917	9.15
Mixtures	2,159,061	58,960	26,958	0	186,188	11,555,465	13,986,632	0.22
Trade Secrets	177,870	19,950	0	0	5,681	92,174	295,675	0.00
TOTAL	2,595,641,583	309,561,617	534,511,007	1,334,164,262	570,928,680	1,081,677,462	6,426,484,611	100.00

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Over 60 percent of the total amount of the top 25 carcinogens was emitted to air, and another 23 percent was transferred off-site to treatment, storage, and disposal facilities (other than POTWs).

Table 2–14. The 25 Carcinogens with the Largest TRI Total Releases and Transfers, 1988 Current Data (a), Excluding Delisted Chemicals.

CARC RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS	PERCENT OF GRAND TOTAL	PERCENT OF CARCINOGEN TOTAL
		Pounds		
1	Dichloromethane	155,059,038	2.41	32.57
2	Styrene	44,105,951	0.69	9.26
3	Tetrachloroethylene	37,760,219	0.59	7.93
4	Benzene	32,240,533	0.50	6.77
5	Formaldehyde	30,294,966	0.47	6.36
6	Chloroform	26,882,013	0.42	5.65
7	Asbestos (friable)	26,881,508	0.42	5.65
8	Lead	22,124,055	0.34	4.65
9	Chromium	21,477,835	0.33	4.51
10	Acrylonitrile	10,823,106	0.17	2.27
11	1,2-Dichloroethane	9,678,918	0.15	2.03
12	Nickel	8,857,710	0.14	1.86
13	1,3-Butadiene	7,450,951	0.12	1.57
14	Ethylene oxide	5,130,144	0.08	1.08
15	Polychlorinated biphenyls (PCBs)	5,108,185	0.08	1.07
16	Carbon tetrachloride	5,029,696	0.08	1.06
17	Propylene oxide	4,720,951	0.07	0.99
18	Di-(2-ethylhexyl) phthalate	3,557,333	0.06	0.75
19	Isopropyl alcohol (mfg strong acid process)	2,893,619	0.05	0.61
20	Vinyl chloride	2,113,831	0.03	0.44
21	1,4-Dichlorobenzene	2,061,951	0.03	0.43
22	Epichlorohydrin	1,265,862	0.02	0.27
23	1,4-Dioxane	1,168,883	0.02	0.25
24	Acrylamide	1,032,979	0.02	0.22
25	Hexachlorobenzene	970,287	0.02	0.20
SUBTOTAL		468,690,524	7.29	98.45
TOTAL FOR OTHER CARCINOGENS		7,374,446	0.11	1.55
CARCINOGEN TOTAL		476,064,970	7.41	100.00
TOTAL FOR ALL OTHER TRI CHEMICALS		5,950,419,641	92.59	
GRAND TOTAL		6,426,484,611	100.00	

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Geographical Distribution of TRI Releases and Transfers, 1988

Texas and Louisiana accounted for 26% of the 1988 TRI totals.

Texas and Louisiana ranked first and second for total TRI releases and transfers, with 882.2 and 767.3 million pounds, respectively.(See Table 15.) Together, the two states accounted for 26 percent of the 1988 TRI totals. Texas manufacturers discharged the largest share of their TRI totals to underground injection wells (57 percent) and the second largest share to air (21 percent). Louisiana facilities also discharged the largest share of their TRI totals underground (55 percent), with their second and third largest shares going to surface water (21 percent) and air (20

Table 2–15. Environmental Distribution of TRI Releases and Transfers by State, 1988 Current Data (a), Excluding Delisted Chemicals.

TRI RELEASE/ TRANSFER RANK	STATE	FACILITIES	FORMS	AIR	SURFACE WATER	LAND	UNDER-GROUND
		Number	Number	Pounds	Pounds	Pounds	Pounds
19	Alabama	404	1,622	103,776,591	7,028,175	4,597,573	1,734,717
39	Alaska	6	43	21,559,455	4,270,715	1,470	1,018
53	American Samoa	2	3	29,500	0	0	0
24	Arizona	181	570	16,524,427	9,850	53,666,705	0
25	Arkansas	324	1,056	48,144,044	7,446,947	1,938,400	7,036,201
9	California	1,814	5,804	87,576,268	10,841,490	8,327,894	1,586,643
42	Colorado	182	530	11,544,097	89,262	2,799,989	2,500
31	Connecticut	431	1,418	25,163,260	6,080,120	1,686,891	250
46	Delaware	61	239	5,255,245	574,601	130,117	0
54	District of Columbia	1	1	250	250	0	0
15	Florida	492	1,375	50,510,607	6,954,327	35,787,608	34,651,596
18	Georgia	636	2,109	84,540,402	3,114,036	9,180,936	59,467
49	Hawaii	26	91	874,145	10,000	205,745	1,051,509
44	Idaho	48	150	4,167,683	296,220	10,343,306	0
5	Illinois	1,303	4,557	106,469,341	14,169,602	11,528,036	7,340,184
4	Indiana	812	3,023	108,894,449	4,919,826	63,074,424	34,820,400
29	Iowa	357	1,096	43,580,568	1,386,013	635,730	0
11	Kansas	207	759	25,623,437	852,224	485,599	90,767,460
21	Kentucky	310	1,345	46,824,685	1,698,529	5,496,107	30,000,250
2	Louisiana	301	1,845	156,308,314	159,630,432	2,446,045	423,480,276
40	Maine	101	365	16,986,237	427,629	955,633	0
36	Maryland	206	734	17,870,085	3,769,763	2,666,875	2
27	Massachusetts	635	1,914	27,364,455	669,383	918,516	4,000
7	Michigan	862	3,493	104,664,073	1,161,419	18,568,668	8,254,322
26	Minnesota	367	1,183	52,359,462	2,753,804	598,018	0
20	Mississippi	258	873	57,614,773	2,292,657	9,001,245	46,806,563
12	Missouri	535	1,967	51,497,533	1,940,914	39,484,139	1,000
34	Montana	24	122	2,396,407	124,874	32,910,607	0
41	Nebraska	149	421	16,634,000	309,718	57,487	0
47	Nevada	36	94	702,676	250	1,841,221	0
43	New Hampshire	147	408	12,025,104	522,962	429,118	0
14	New Jersey	867	3,001	38,424,145	1,417,157	2,871,740	2,500
37	New Mexico	35	136	2,134,493	750	28,267,882	0
13	New York	885	2,879	95,151,687	2,073,539	3,138,702	251
17	North Carolina	859	2,777	92,996,669	693,840	16,855,763	0
52	North Dakota	29	70	1,190,859	1,800	2,552	0
3	Ohio	1,458	5,368	138,717,978	5,789,574	30,361,247	56,920,293
30	Oklahoma	191	696	35,415,190	367,955	1,792,409	6,354,214
35	Oregon	208	696	20,080,651	304,196	1,032,032	1
8	Pennsylvania	1,099	4,063	89,055,541	4,357,140	16,882,039	750
38	Puerto Rico	177	548	15,663,614	123,110	110,825	0
45	Rhode Island	197	534	7,541,842	385,395	115,048	0
23	South Carolina	386	1,516	64,719,499	1,402,086	1,299,247	0
48	South Dakota	44	77	2,499,867	2,400	1	0
6	Tennessee	541	1,817	137,986,604	6,317,450	13,582,064	49,906,110
1	Texas	1,158	5,545	188,584,544	5,432,684	53,963,001	506,266,603
16	Utah	120	447	121,213,290	346,471	15,220,877	0
50	Vermont	56	152	1,519,293	113,058	24,341	0
51	Virgin Islands	1	18	1,490,792	2,500	140,342	0
10	Virginia	435	1,488	122,117,046	19,874,790	5,065,455	1,373
32	Washington	327	995	28,171,023	13,511,390	914,524	0
28	West Virginia	112	674	34,877,684	3,163,397	895,376	0
22	Wisconsin	713	2,372	45,790,635	492,893	6,937,071	250
33	Wyoming	28	115	2,817,064	42,050	15,274,367	27,113,559
TOTAL	21,144	75,194	2,595,641,583	309,561,617	534,511,007	1,334,164,262	570,928,680

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table 2–15, continued.

STATE	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Percent
Alabama	1,181,076	15,504,963	133,823,095	2.08
Alaska	1,000	1,750	25,835,408	0.40
American Samoa	0	0	29,500	0.00
Arizona	4,545,448	1,825,446	76,571,876	1.19
Arkansas	1,110,236	7,970,676	73,646,504	1.15
California	49,769,799	43,043,797	201,145,891	3.13
Colorado	677,098	5,202,446	20,315,392	0.32
Connecticut	2,952,254	18,192,188	54,074,963	0.84
Delaware	2,777,469	2,696,197	11,433,629	0.18
District of Columbia	250	250	1,000	0.00
Florida	16,658,111	13,280,350	157,842,599	2.46
Georgia	8,386,480	29,046,361	134,327,682	2.09
Hawaii	835,250	13,682	2,990,331	0.05
Idaho	484,374	122,215	15,413,798	0.24
Illinois	59,890,106	56,398,627	255,795,896	3.98
Indiana	14,011,107	52,754,204	278,474,410	4.33
Iowa	6,315,114	7,811,154	59,728,579	0.93
Kansas	3,378,348	54,571,833	175,678,901	2.73
Kentucky	2,381,707	32,968,467	119,369,745	1.86
Louisiana	3,538,703	21,918,649	767,322,419	11.94
Maine	2,733,209	1,307,371	22,410,079	0.35
Maryland	3,990,356	5,403,782	33,700,863	0.52
Massachusetts	15,994,256	22,704,421	67,655,031	1.05
Michigan	16,656,741	98,883,569	248,188,792	3.86
Minnesota	5,983,733	6,001,335	67,696,352	1.05
Mississippi	1,367,239	7,868,974	124,951,451	1.94
Missouri	67,039,926	14,327,549	174,291,061	2.71
Montana	1,312	50,510	35,483,710	0.55
Nebraska	875,885	4,177,560	22,054,650	0.34
Nevada	20,305	639,396	3,203,848	0.05
New Hampshire	506,940	2,141,921	15,626,045	0.24
New Jersey	55,278,775	69,428,058	167,422,375	2.61
New Mexico	36,116	251,080	30,690,321	0.48
New York	24,876,264	48,096,999	173,337,442	2.70
North Carolina	6,880,589	18,273,363	135,700,224	2.11
North Dakota	52,681	157,287	1,405,179	0.02
Ohio	24,585,482	110,049,957	366,424,531	5.70
Oklahoma	514,095	11,732,081	56,175,944	0.87
Oregon	7,067,786	5,453,084	33,937,750	0.53
Pennsylvania	15,232,035	87,360,457	212,887,962	3.31
Puerto Rico	8,026,055	5,096,406	29,020,010	0.45
Rhode Island	1,937,624	4,554,674	14,534,583	0.23
South Carolina	2,665,860	12,621,710	82,708,402	1.29
South Dakota	156,884	474,184	3,133,336	0.05
Tennessee	24,723,756	21,966,861	254,482,845	3.96
Texas	40,473,335	87,515,191	882,235,358	13.73
Utah	915,043	1,683,329	139,379,010	2.17
Vermont	72,761	644,961	2,374,414	0.04
Virgin Islands	0	0	1,633,634	0.03
Virginia	37,712,424	13,356,604	198,127,692	3.08
Washington	978,065	7,462,596	51,037,598	0.79
West Virginia	3,536,365	19,040,882	61,513,704	0.96
Wisconsin	21,132,503	29,507,472	103,860,824	1.62
Wyoming	10,350	120,583	45,377,973	0.71
TOTAL	570,928,680	1,081,677,462	6,426,484,611	100.00

Table 2–16. Environmental Distribution of TRI Releases and Transfers by Industry, 1988 Current Data(a), Excluding Delisted Chemicals.

TRI RELEASE/ TRANSFER RANK	SIC CODE	INDUSTRY	FACILITIES	FORMS	AIR	SURFACE WATER	LAND	UNDER-GROUND
			Number	Number	Pounds	Pounds	Pounds	Pounds
12	20	Food	1,550	2,887	20,741,798	3,417,244	3,322,848	3,524,659
21	21	Tobacco	18	48	925,144	13,050	750	0
16	22	Textiles	416	921	36,600,202	1,049,617	196,446	0
22	23	Apparel	34	58	1,102,649	250	40,849	0
18	24	Lumber	658	1,868	29,655,851	100,819	52,930	0
14	25	Furniture	462	1,757	63,449,789	2,111	74,936	0
4	26	Paper	610	2,407	214,214,878	37,883,402	10,486,465	0
13	27	Printing	343	719	60,761,366	32,090	41,566	40,000
1	28	Chemicals	4,023	21,045	841,990,290	231,082,520	129,944,343	1,089,332,591
9	29	Petroleum	376	3,110	55,632,457	3,228,820	2,526,759	20,486,919
7	30	Plastics	1,426	3,554	163,978,279	630,492	175,837	3,004
19	31	Leather	136	386	14,292,925	680,755	353,215	0
15	32	Stone/Clay	583	1,391	25,810,737	991,433	3,042,996	6,580,250
2	33	Primary Metals	1,526	5,905	236,176,078	17,690,853	288,722,148	40,922,970
6	34	Fabr. Metals	2,798	8,455	125,080,222	1,516,348	4,271,255	490,120
10	35	Machinery	953	2,517	57,314,854	473,769	215,483	0
8	36	Electrical	1,666	5,270	119,271,427	769,245	1,464,142	43,720
5	37	Transportation	1,124	4,695	210,004,437	369,876	1,237,763	82,600
11	38	Measure./Photo.	365	1,047	51,315,350	685,863	490,743	250
17	39	Miscellaneous	395	1,002	29,555,598	54,024	273,341	1
3		Multiple codes 20-39	1,395	5,362	226,232,681	8,595,137	85,023,765	172,656,366
20		No codes 20-39	287	790	11,534,571	293,899	2,552,427	812
		TOTAL	21,144	75,194	2,595,641,583	309,561,617	534,511,007	1,334,164,262

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

percent), respectively. Releases in Texas and Louisiana accounted for over two-thirds of nationwide releases to underground injection wells. Discharges to surface water in Louisiana accounted for over half of the total TRI releases to surface water in all reporting jurisdictions.

Nine states had TRI totals greater than 200 million pounds and together accounted for over half (3.5 billion pounds) of TRI total releases and transfers in 1988. Facilities in the Gulf Coast, Great Lakes, and Mid-Atlantic states, as well as California, generally had the largest TRI releases and transfers, while smaller amounts were generated in the Rocky Mountain and Great Plains regions of the country.

The environmental distribution of TRI totals varied geographically. Facilities in three-quarters of all states and other reporting jurisdictions emitted the largest share of their releases and transfers to air. Facilities in five Western states (Montana, New Mexico, Arizona, Idaho, and Nevada) disposed of most of their TRI wastes on site to land. Underground injection was the leading mode of release or transfer in five states (Wyoming, Texas, Louisiana, Kansas, and Hawaii). Missouri was the only

Table 2–16, continued.

INDUSTRY	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Percent
Food	37,219,832	6,435,551	74,661,932	1.16
Tobacco	791,940	312,982	2,043,866	0.03
Textiles	14,725,076	3,201,404	55,772,745	0.87
Apparel	470,143	177,689	1,791,580	0.03
Lumber	213,016	4,667,638	34,690,254	0.54
Furniture	412,621	5,857,082	69,796,539	1.09
Paper	46,771,915	31,798,293	341,154,953	5.31
Printing	3,465,021	6,824,329	71,164,372	1.11
Chemicals	329,798,446	416,287,534	3,038,435,724	47.28
Petroleum	13,486,676	9,664,326	105,025,957	1.63
Plastics	4,904,930	24,774,586	194,467,128	3.03
Leather	9,770,874	2,267,715	27,365,484	0.43
Stone/Clay	1,345,132	22,865,714	60,636,262	0.94
Primary Metals	21,403,152	254,722,366	859,637,567	13.38
Fabr. Metals	17,486,764	73,882,218	222,726,927	3.47
Machinery	2,978,861	20,260,033	81,243,000	1.26
Electrical	18,929,416	42,904,625	183,382,575	2.85
Transportation	7,642,773	55,647,355	274,984,804	4.28
Measure./Photo.	5,421,418	19,391,059	77,304,683	1.20
Miscellaneous	453,842	9,128,201	39,465,007	0.61
Multiple codes 20-3	30,988,774	66,560,428	590,057,151	9.18
No codes 20-39	2,248,058	4,046,334	20,676,101	0.32
TOTAL	570,928,680	1,081,677,462	6,426,484,611	100.00

jurisdiction in which facilities sent the largest portion of their TRI wastes (38 percent) to POTWs. New Jersey facilities transferred most of their TRI wastes off site (41 percent). (See Table 2-15.)

Industrial Distribution of 1988 TRI Releases and Transfers

The Chemical industry generated almost 1/2 of the TRI total for 1988.

The Chemical industry and the Primary Metals industry generated more TRI releases and transfers than any other industry in 1988, together accounting for 60 percent of the TRI total. The Chemical industry reported 3.0 billion pounds (47 percent of the TRI total), and the Primary Metals industry reported 859.6 million pounds (13 percent). No other industry accounted for more than 350 million pounds of TRI releases and transfers. The five industries with the smallest TRI totals (Apparel and Other Finished Products made from Fabrics and Other Similar Materials, Tobacco, Leather, Lumber, and Miscellaneous Manufacturing Industries) together accounted for less than 2 percent of the TRI total. (See Table 2-16.)

Chemical facilities reported more releases and transfers than any other industry in every environmental category except land disposal. Facilities from the Primary Metals industry reported the largest on-site disposals to land (288.7 million pounds).

Underground injection and air emissions comprised 36 percent and 28 percent, respectively, of the Chemical industry's total in 1988, while discharges to surface water comprised only 8 percent. On-site land releases and off-site transfers accounted for the largest portion of the Primary Metals industry totals (34 and 30 percent, respectively). The Paper industry, ranked fourth for total TRI releases and transfers, reported air emissions as the largest fraction (63 percent) of its TRI totals, and it was the fourth-largest contributor to total air emissions after the Chemical industry, the Primary Metals industry, and the Multiple Codes category.

Facilities in TRI, 1988

More than 1/2 of the 21,144 facilities that reported to TRI in 1988 were in 10 states.

Excluding facilities that reported only delisted chemicals, a total of 21,144 facilities reported to TRI from all 50 states and from four of the other five reporting jurisdictions: the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and American Samoa. No facilities reported from the Commonwealth of the Northern Mariana Islands. More than half of the facilities were located in ten states. Each of these ten states had more than 800 facilities reporting, for a total of 11,117 facilities. California had the largest number of TRI facilities, with 1,814 facilities reporting in 1988. (See Table 2-15.)

Just 50 facilities reported 37% of all releases and transfers in 1988.

The overall patterns of geographical, industrial, and chemical distribution were heavily influenced by a small number of TRI facilities reporting large releases and transfers. The 50 facilities with the largest total releases and transfers for 1988 reported 37 percent (2.4 billion pounds) of all releases and transfers reported by the total of 21,144 TRI facilities in 1988. Five facilities reported amounts of over 100 million pounds each, and ten more reported more than 50 million pounds each. Four of these top 15 facilities were located in Louisiana, three in Texas, and two in Kansas. (See Table 2-17.)

Table 2–17. Top 50 Facilities for Total Releases and Transfers, 1988 Current Data (a), Excluding Delisted Chemicals.

TRI RANK	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	28	Monsanto Co.	Alvin	Brazoria	TX	193,500,680	3.01
2	28	American Cyanamid Co.	Westwego	Jefferson	LA	176,418,250	2.75
3	Mult	Shell Oil Co. - Norco Mfg.	Norco	St Charles	LA	158,662,990	2.47
4	28	Du Pont Beaumont Works	Beaumont	Jefferson	TX	123,333,929	1.92
5	33	Amax Magnesium	Tooele	Tooele	UT	109,750,090	1.71
6	28	Vulcan Chemicals	Wichita	Sedgwick	KS	92,011,960	1.43
7	28	BP Chemicals Green Lake	Port Lavaca	Calhoun	TX	78,225,900	1.22
8	28	Freeport McMoran, Agrico Chem. Div.	Uncle Sam	St James	LA	63,327,150	0.99
9	28	Freeport McMoran, Agrico Chem. Div.	Donaldsonville	St James	LA	61,820,000	0.96
10	Mult	Inland Steel Co.	East Chicago	Lake	IN	61,364,500	0.95
11	28	BP Chemicals Inc.	Lima	Allen	OH	57,746,450	0.90
12	28	Triad Chemical (b)	Donaldsonville	Ascension	LA	54,919,664	0.85
13	28	Du Pont Johnsonville Plant	New Johnsonville	Humphreys	TN	52,691,910	0.82
14	28	Columbian Chemicals Co.	Saint Louis	St Louis	MO	52,477,645	0.82
15	28	Racon Inc.	Wichita	Sedgwick	KS	51,221,354	0.80
16	28	Du Pont Delisle Plant	Pass Christian	Harrison	MS	49,101,867	0.76
17	28	Allied-Signal Inc.	Hopewell	Hopewell City	VA	44,758,492	0.70
18	28	Courtaulds Fibers Inc.	Lemoyne	Mobile	AL	44,144,655	0.69
19	28	Sterling Chemicals Inc.	Texas City	Galveston	TX	42,987,500	0.67
20	28	Tennessee Eastman Co.	Kingsport	Sullivan	TN	42,690,619	0.66
21	28	Avtex Fibers Front Royal Inc.	Front Royal	Warren	VA	37,731,700	0.59
22	28	BASF Corp.	Geismar	Ascension	LA	37,350,244	0.58
23	28	Arcadian Corp.	Geismar	Ascension	LA	37,319,500	0.58
24	28	Monsanto Co.	Cantonment	Escambia	FL	36,249,190	0.56
25	33	Asarco Inc.	Hayden	Gila	AZ	35,930,150	0.56
26	33	Asarco Inc.	East Helena	Lewis And Clark	MT	32,968,162	0.51
27	20	Upjohn Co. (c)	Portage	Kalamazoo	MI	31,512,450	0.49
28	28	Du Pont Louisville Works	Louisville	Jefferson	KY	31,305,496	0.49
29	28	Du Pont	Victoria	Victoria	TX	30,496,013	0.47
30	33	National Steel	Ecorse	Wayne	MI	30,309,133	0.47
31	33	Midwest Steel Corp.	Portage	Porter	IN	29,404,715	0.46
32	33	Herculaneum Smelter	Herculaneum	Jefferson	MO	28,890,351	0.45
33	28	Allied-Signal Inc.	Elizabeth	Union	NJ	28,290,620	0.44
34	28	Wycon Chemical Co.	Cheyenne	Laramie	WY	28,135,426	0.44
35	28	Monsanto Co.	Cahokia	St Clair	IL	26,710,619	0.42
36	28	Filtrol Corp.	Vernon	Los Angeles	CA	23,533,250	0.37
37	33	Phelps Dodge Mining Co.	Playas	Hidalgo	NM	22,837,254	0.36
38	38	Eastman Kodak Co.	Rochester	Monroe	NY	22,579,428	0.35
39	28	Unocal Chemicals Div.	Kenai	Kenai Peninsula	AK	20,822,000	0.32
40	28	Ciba-Geigy Corp.	Glens Falls	Warren	NY	20,237,150	0.31
41	28	Air Products & Chemicals Inc.	Pasadena	Harris	TX	17,297,340	0.27
42	28	BASF Corp.	Lowland	Hamblen	TN	17,218,950	0.27
43	33	Cyprus Miami Mining Corp.	Claypool	Gila	AZ	16,909,011	0.26
44	28	Pfizer Pigments Inc.	East Saint Louis	St Clair	IL	16,760,052	0.26
45	36	3M Mag Media & Consumer Prod.	Hutchinson	Mc Leod	MN	16,645,979	0.26
46	Mult	Union Camp Corp.	Savannah	Chatham	GA	16,357,150	0.25
47	28	Mississippi Chemical Corp.	Yazoo City	Yazoo	MS	15,467,006	0.24
48	28	Chevron Chemical Co.	Rock Springs	Sweetwater	WY	15,220,250	0.24
49	Mult	Elkem Metals Co.	Marietta	Washington	OH	14,635,574	0.23
50	33	Copper Range Co.	White Pine	Ontonagon	MI	14,356,995	0.22
		SUBTOTAL				2,364,636,763	36.80
		TOTAL FOR ALL OTHERS				4,061,847,848	63.20
		GRAND TOTAL				6,426,484,611	100.00

(a) Data as of April 19, 1991,the version of the database used in this 1989 National Report.
(b) Triad Chemical has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for their 1988 total releases and transfers is 27,252,982 pounds.
(c) The Upjohn Co. has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for their 1988 total releases and transfers is 13,209,150 pounds.

NOTES

1. Terephthalic acid was delisted *after* the 1989 reporting deadline, so facilities did submit forms describing their releases and transfers of this chemical. These data have been excluded from analyses throughout this report. Delistings of other chemicals occur periodically. See Box 2-A for the status of delistings that have occurred or are proposed.

2. The TRI National Reports covering the 1987 and 1988 data are available from the EPCRA Hotline at 800-535-0202.

3. For purposes of this report, "previous" 1987 and 1988 data refers to data from the April 6, 1990 version of EPA's TRI database, which were used in the 1988 TRI National Report; and "current" 1987 and 1988 data refers to data from the April 19, 1991 version of the database, which are used in this report. Previous 1987 and 1988 data are only discussed in this chapter; the other chapters of this National Report are based on the April 19, 1991 data for the TRI reporting years 1987, 1988, and 1989.

4. These three copper pigments (C.I. Pigment Green 7, C.I. Pigment Blue 15, and C.I. Pigment Green 36) were included within the chemical category "copper compounds," which will still exist as a chemical category under TRI reporting requirements.

5. Prior to 1989 reporting, sodium hydroxide (solution) was deleted from the TRI chemical list. Because this chemical represented the single base in this TRI class, the chemical class name "acids/bases/salts," used in the 1987 and 1988 National Reports, has been changed to "mineral acids/salts" throughout this report. See Chapter 2, Box 2-A for further discussion of the reporting of mineral acids.

6. The TRI chemical classes are: non-halogenated organics; mineral acids/salts; metals and metal compounds; halogenated organics; and non-metallic inorganics. (See Chapter 3.) In figures and tables throughout this report, class names are abbreviated as: organics; mineral acids/salts; metals; halo-organics; and non-metals.

Photo: Sheila A. Ferguson

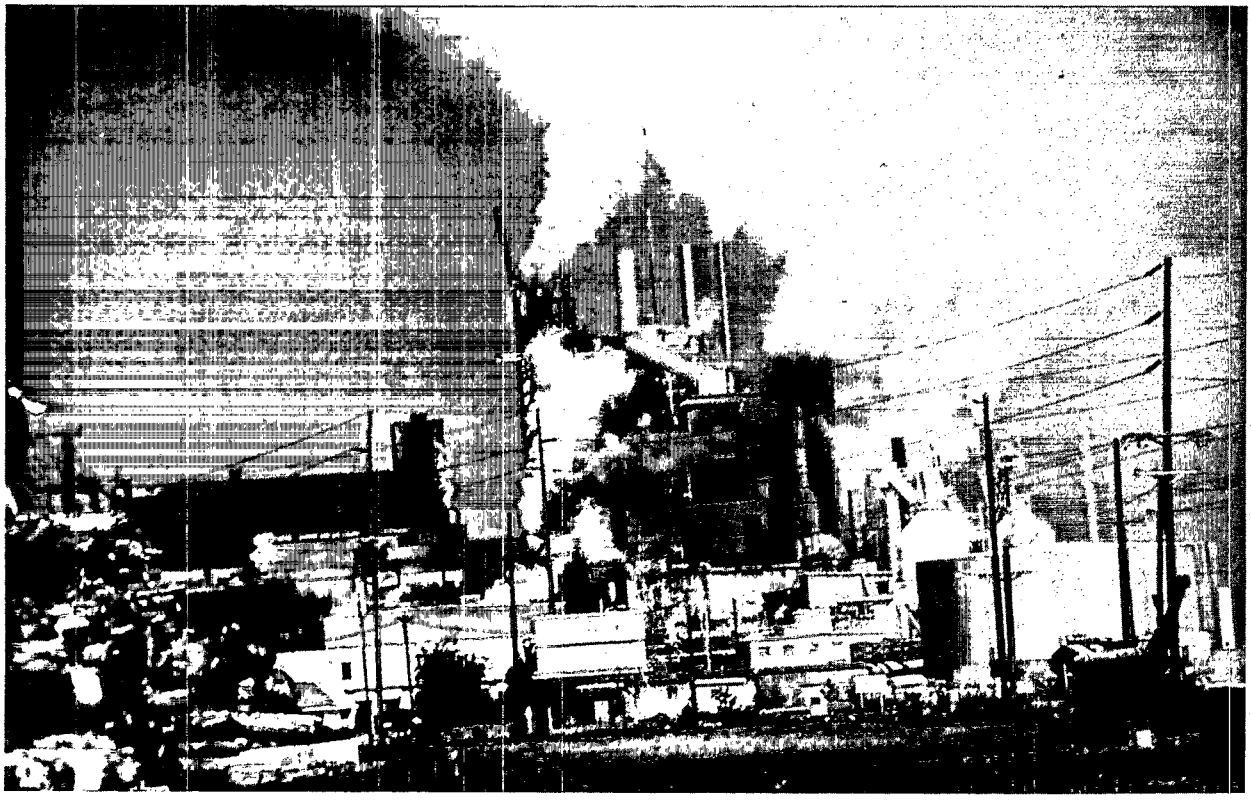


Photo: EPA DocuAmerica

OVERVIEW

TRI releases and transfers totaled 5.7 billion pounds in 1989.

In 1989, 22,569 facilities reported to the Toxics Release Inventory (TRI), submitting a total of 81,891 forms. Of these facilities, 92 percent (20,812 facilities) reported environmental releases and transfers totaling 5.7 billion pounds, while the remaining 8 percent reported no releases or transfers of TRI chemicals. Of this total, 74 percent was released directly into air, water, land or underground injection wells, and the other 26 percent was transferred off site to either public sewage or other off-site treatment, storage, or disposal facilities. (See Figure 3-1; Box 3-A; and Chapter 4, Table 4-1.)

TRI releases and transfers can be examined from a variety of complementary perspectives, and the following analyses examine the major factors influencing TRI totals, which are: the chemicals involved (major chemicals, chemical classes, and carcinogens), their environmental distribution (mode of environmental release and transfer), their geographical pattern (states, counties and cities), their industrial distribution (types of industries contributing heavily to releases and transfers, such as the Chemical or Primary Metals industries), and the major facilities involved. While the examination of these elements of the TRI data is necessary to a broad understanding of the factors determining the overall patterns of TRI releases and transfers, these analyses cannot be directly translated into the potential human and environmental risks posed by such releases. (See Box 3-B and discussion in this chapter on health and environmental effects.)

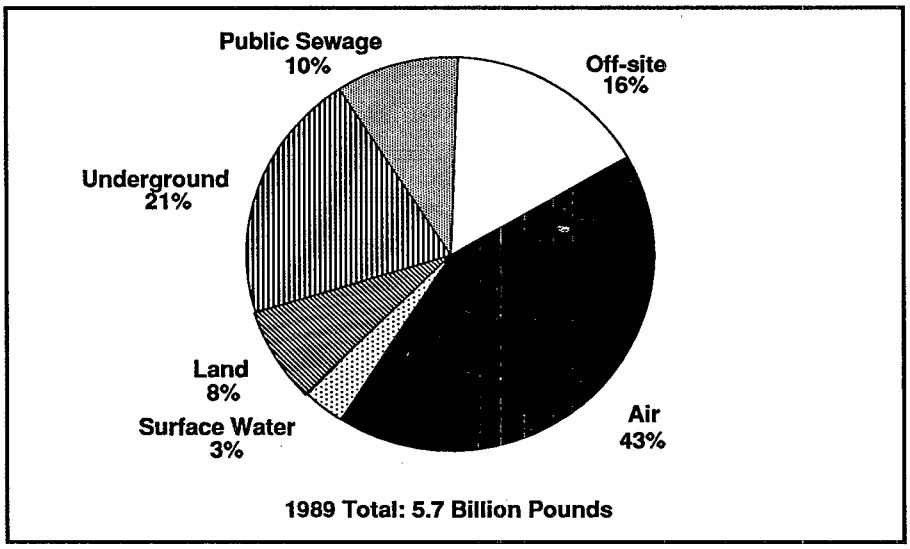


Figure3–1. Environmental Distribution of TRI Releases and Transfers in 1989.

BOX 3-A. TRI TOTAL RELEASES AND TRANSFERS DEFINED

Throughout this report, TRI data presentations often refer to "total releases and transfers." While it is useful for comparative purposes to deal with a single sum in this manner, the reader should recognize that this aggregate total ignores some significant distinctions. "Releases" refer to discharges on site to the air, water, underground injection or land. Facilities determine these numbers after taking into account any reductions in waste achieved by on-site treatment methods. "Transfers" refer to wastes that are sent off site for treatment, storage, or disposal. The "transfers" are reported in two categories--transfers to publicly owned treatment works (referred to in this report as POTWs or "public sewage") and other off-site transfers. The other off-site locations include incinerators, underground wells, landfills and other treatment, storage, or disposal sites to which the reporting facility transfers wastes containing TRI chemicals.

Even within the category of releases, there are further distinctions to bear in mind. Certain land releases, for example, are placed in disposal units which are designed and permitted to receive toxic materials. These wastes are therefore managed to significantly reduce potential for further migration in the environment. Off-site facilities may subject chemicals to varying degrees and types of treatment to reduce the amount and/or toxicity of chemicals that are released to the environment. Releases to the air and water, on the other hand, are not subject to further containment or control.

All analyses in this report are based upon the April 19, 1991 version of the TRI database. The Environmental Protection Agency (EPA) is constantly changing and updating this database to add late or revised forms submitted by facilities and to make various database corrections. Therefore, information retrieved from the database after April 19, 1991 may differ from the data presented in this report. An additional difference is that the database includes forms for chemicals that have subsequently been removed from the TRI chemical list (delisted). These forms have not been included in analyses throughout this report. (See Chapter 2.)

Chemical Composition of TRI Releases and Transfers

The top 25 TRI chemicals in 1989 represented 83% of total releases and transfers for the year.

Of the 300 chemicals and 20 chemical categories analyzed in this report, 282 (88 percent) were reported in 1989 (See Box 3-C and Chapter 2, Box 2-A.) Although all but six of these reported chemicals were released and/or transferred to some extent, the top 25 chemicals of the 276 with reported releases and transfers accounted for 83 percent of the 1989 total TRI releases and transfers. While the individual TRI ranking of each of the top 25 chemicals may have shifted from its 1988 position, there was only one new addition to the top 25: chromium compounds replaced

trichlorethylene as number 24 for overall TRI releases and transfers (while trichloroethane moved to number 26 for 1989 total TRI releases and transfers). Ammonium sulfate (solution) and hydrochloric acid once again ranked as the top one and two TRI chemicals, respectively, and together accounted for 22 percent (1.2 billion pounds) of all TRI releases and transfers. (See Figure 3-2 and Table 3-1.)

Table 3-1. The 25 Chemicals with the Largest TRI Releases and Transfers, 1989.

TRI RELEASE/ TRANSFER RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS		FORMS WITH RELEASES AND TRANSFERS(a)		TOTAL FORMS(b)		AVERAGE RELEASE/ TRANSFER PER FORM(c)
		Pounds	Percent	Forms	Percent	Number	Percent	Pounds
1	Ammonium sulfate (solution)	750,649,064	13.16	301	0.42	376	0.46	1,996,407
2	Hydrochloric acid	495,609,047	8.69	2,536	3.50	3,250	3.97	152,495
3	Methanol	408,119,093	7.15	2,418	3.34	2,521	3.08	161,888
4	Ammonia	377,248,848	6.61	2,846	3.93	3,120	3.81	120,913
5	Toluene	322,521,176	5.65	3,898	5.38	3,942	4.81	81,817
6	Sulfuric acid	318,395,014	5.58	3,391	4.68	5,547	6.77	57,399
7	Acetone	255,502,080	4.48	2,685	3.71	2,723	3.33	93,831
8	Xylene (mixed isomers)	185,442,035	3.25	3,472	4.79	3,525	4.30	52,608
9	1,1,1-Trichloroethane	185,026,191	3.24	3,826	5.28	3,893	4.75	47,528
10	Zinc compounds	164,799,357	2.89	1,746	2.41	1,935	2.36	85,168
11	Methyl ethyl ketone	156,992,642	2.75	2,441	3.37	2,464	3.01	63,715
12	Chlorine	141,428,470	2.48	1,445	2.00	1,779	2.17	79,499
13	Dichloromethane	130,355,581	2.28	1,523	2.10	1,552	1.90	83,992
14	Manganese compounds	119,825,790	2.10	550	0.76	638	0.78	187,815
15	Carbon disulfide	100,150,670	1.76	80	0.11	90	0.11	1,112,785
16	Phosphoric acid	98,660,456	1.73	1,507	2.08	2,638	3.22	37,400
17	Nitric acid	74,861,200	1.31	1,460	2.02	1,924	2.35	38,909
18	Ammonium nitrate (solution)	73,313,949	1.28	161	0.22	222	0.27	330,243
19	Freon 113	67,837,298	1.19	1,472	2.03	1,483	1.81	45,743
20	Glycol ethers	65,736,857	1.15	1,776	2.45	1,822	2.22	36,080
21	Ethylene glycol	57,792,359	1.01	1,280	1.77	1,469	1.79	39,341
22	Zinc (fume or dust)	57,487,663	1.01	571	0.79	625	0.76	91,980
23	Copper compounds	54,465,732	0.95	1,092	1.51	1,254	1.53	43,434
24	Chromium compounds	50,881,050	0.89	1,260	1.74	1,363	1.66	37,330
25	n-Butyl alcohol	50,095,319	0.88	1,162	1.60	1,177	1.44	42,562
	SUBTOTAL	4,763,196,941	83.48	44,899	61.99	51,332	62.66	92,792
	TOTAL FOR ALL OTHERS	942,473,439	16.52	27,529	38.01	30,559	37.32	30,841
	GRAND TOTAL	5,705,670,380	100.00	72,428	100.00	81,891	100.00	69,674

(a) Forms reporting releases and transfers greater than zero.
(b) Total number of forms reporting the chemical, including those reporting no releases and transfers.
(c) Calculated based upon total number of forms.

BOX 3-B. TRI DATA AND EXPOSURE

The 4.2 billion pounds of TRI releases and 1.5 billion pounds of transfers are not an indicator of actual human or environmental exposure to these chemicals. Several factors should be kept in mind when considering the impact of TRI releases and transfers.

First, environmental releases do not always result in exposure. Landfills and underground injection are disposal methods designed to isolate wastes, and result in zero or minimal exposure unless they fail unexpectedly. TRI reveals that 2.4 billion pounds of TRI chemicals were released directly to the air, and 189.0 million pounds to surface water in 1989. These releases cannot be equated directly to exposure, since each chemical in each individual release circumstance meets a different fate after release. Dilution may render exposure concentrations so small as to be of no concern, and releases may be chemically transformed or degraded to harmless byproducts. Each release scenario has its own unique characteristics.

TRI chemicals may also be transferred to public sewage and other off-site facilities, where they may undergo treatment (which may destroy or isolate a potentially toxic chemical) prior to ultimate disposal. The transfers also shift the location of materials, so that TRI chemicals in wastes generated in New Jersey, for example, may be sent to Ohio for treatment and/or disposal. A knowledge of the disposition of these materials is needed for any meaningful interpretation of potential risks.

Lastly, TRI chemicals cover a broad spectrum of toxicity concerns. Total release or transfer amounts only give part of the story--a small release of a highly toxic chemical might be of much greater concern than a large release of a low-toxicity substance. The number of pounds of chemical releases cannot be directly translated into a quantitative assessment of risk to humans or other organisms. Route and duration of exposure, for example, is extremely important. For example, 1989 releases and transfers of xylene (mixed isomers) were 1.85 times greater than those of carbon disulfide (185.4 million pounds versus 100.2 million pounds, respectively). Yet carbon disulfide is considered to be approximately 20 times more potent than xylene when chronic exposure occurs by ingestion (eating or drinking). Therefore, depending on the degree and type of exposure to these two chemicals, one might be more concerned about exposure to carbon disulfide than to xylene. Furthermore, the same chemical may be more potent through one route of exposure (such as inhalation) than another (such as absorption through skin). For example, tetrachloroethylene is 15 times more potent when ingested than when inhaled. In all cases, more site-specific information is needed to assess potential concerns than is provided by TRI data alone. TRI can serve as an indicator of toxic chemical releases and transfers that may warrant additional examination.

BOX 3-C. INDIVIDUAL CHEMICALS VS. CHEMICAL CATEGORIES

The TRI list in effect at the time of 1989 reporting included 302 individual chemicals[1] and 20 categories of chemical compounds. Each chemical category incorporates closely-related individual chemicals. Fifteen categories are metal compound categories, such as lead compounds and mercury compounds, while others are organic compound categories (glycol ethers, chlorophenols, and polybrominated biphenyls). Appendix B contains a list of the TRI chemicals and chemical compounds.

Not all related chemicals are reported as categories, however. In some cases, related chemicals appear on the list as individual entries. For example, zinc (fume or dust), zinc compounds (a chemical category), and Zineb (a chemical that contains zinc) are listed separately. Likewise, the different forms of xylene--m-xylene, o-xylene, and p-xylene, and xylene (mixed isomers)--are all listed individually. If reported amounts for all forms of xylene were combined, aggregate xylene releases would rank higher.

Except when information is presented concerning TRI chemical classes, data presented in this report do not combine releases and transfers of related chemicals that are listed individually. Chemical categories alone represent aggregates of related compounds.

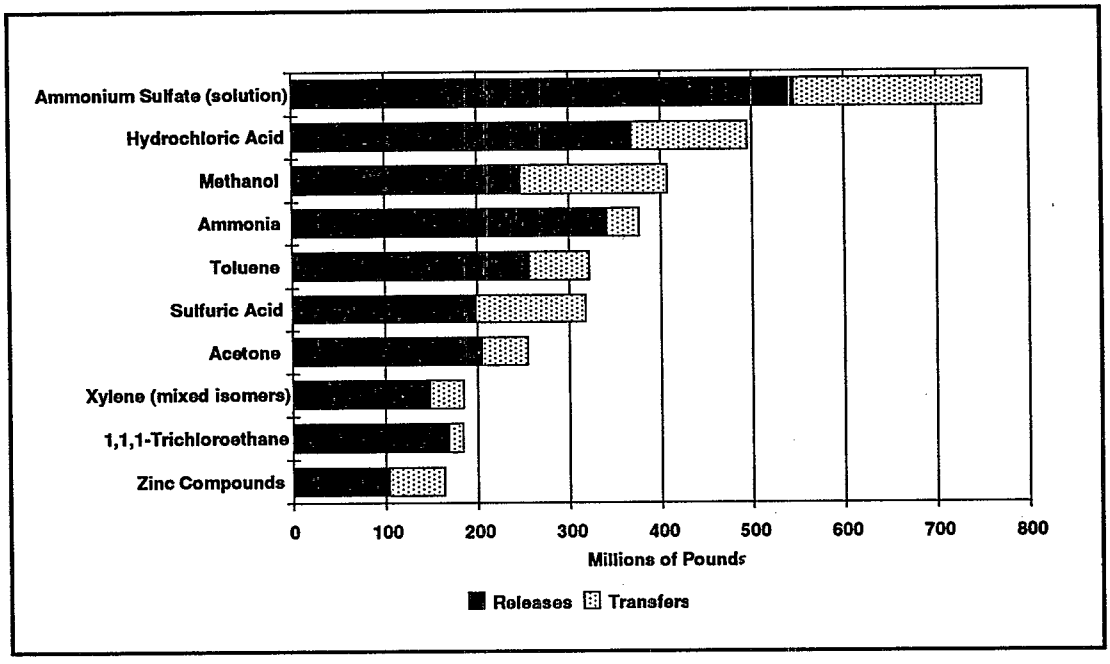


Figure 3–2. The Ten Chemicals with the Largest TRI Total Releases and Transfers, 1989.

Environmental Distribution of TRI Releases and Transfers

Of total 1989 TRI releases and transfers, 42% was released to air.

Larger amounts of TRI chemicals were emitted to air in 1989 than were released in any other manner or transferred off site. Of the TRI total, 43 percent (2.4 billion pounds) was released to air. Underground injection wells received the next greatest amount, 1.2 billion pounds (21 percent), followed by off-site transfers (913.1 million pounds or 16 percent), transfers to public sewage (551.0 million pounds or 10 percent), on-site land releases (444.7 million pounds or 8 percent), and, finally, surface water discharges (189.0 million pounds or 3 percent). (See Figure 3-1.)

Geographical Distribution of TRI Releases and Transfers

TRI reporting requirements cover the following jurisdictions: the 50 states, the District of Columbia, American Samoa, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands. For purposes of this report, the term "states" includes all 50 states as well as the other reporting jurisdictions. In 1989 facilities from all 50 states, American Samoa, Puerto Rico, and the U.S. Virgin Islands reported TRI releases and transfers to EPA.

Texas, the top state, accounted for 14% of TRI releases and transfers in 1989...

As in 1988, Texas was the state with the largest amount of TRI releases and transfers. With its releases and transfers totalling 792.8 million pounds, Texas claimed a significantly larger TRI total than the second-ranked state, Louisiana, which had total TRI releases and transfers of 473.5 million pounds. Texas alone was responsible for 14 percent of all TRI releases and transfers. (See Figure 3-3, Map 3-1, and Table 3-2.)

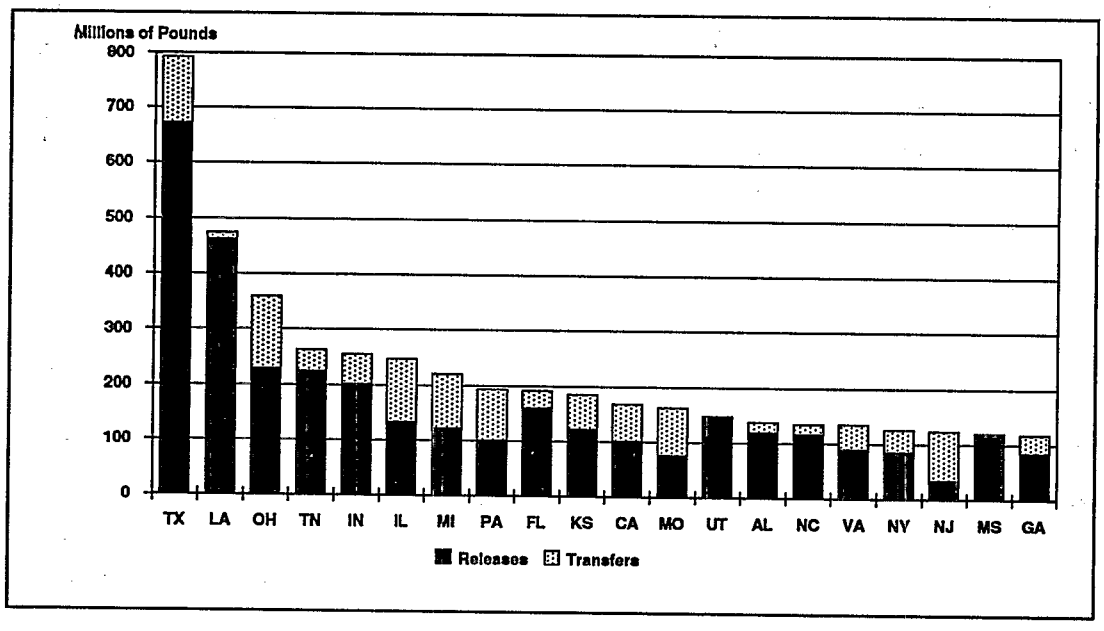
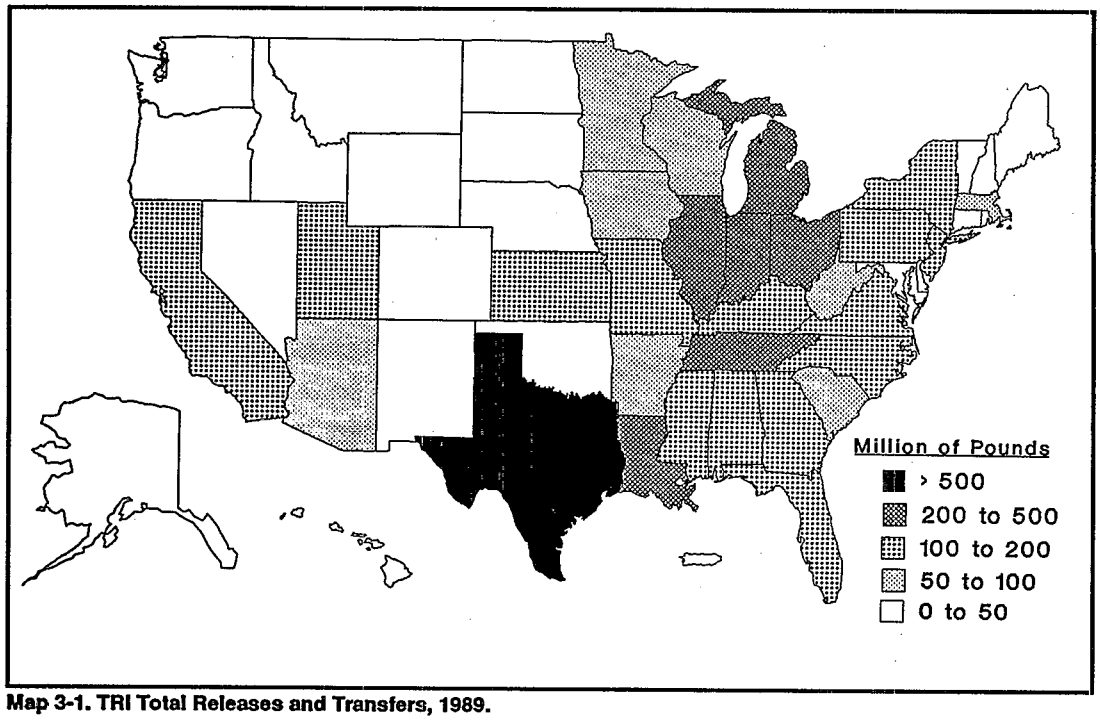


Figure 3-3. The 20 States with the Largest TRI Total Releases and Transfers, 1989.

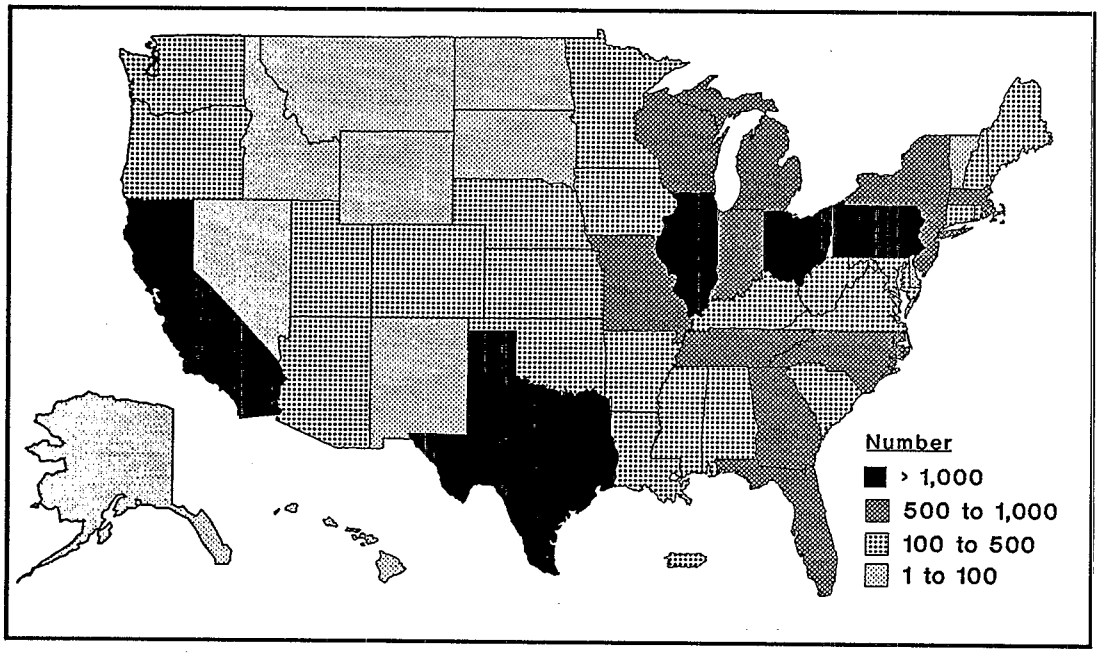
Table 3-2. TRI Releases and Transfers by State, 1989.

TRI RELEASE/ TRANSFER RANK	STATE	TOTAL RELEASES AND TRANSFERS		FACILITIES(a)		TOTAL FORMS(b)		AVERAGE RELEASES AND TRANSFERS PER FACILITY
		Pounds	Percent	Number	Percent	Number	Percent	Pounds
14	Alabama	137,761,513	2.41	456	2.02	1,796	2.19	302,109
38	Alaska	24,986,799	0.44	6	0.03	48	0.06	4,164,467
53	American Samoa	27,750	0.00	2	0.01	3	0.00	13,875
29	Arizona	50,764,830	0.89	201	0.89	651	0.79	252,561
25	Arkansas	78,955,945	1.38	356	1.58	1,163	1.42	221,786
11	California	168,825,335	2.96	1,864	8.26	5,962	7.28	90,572
42	Colorado	16,357,496	0.29	207	0.92	623	0.76	79,022
32	Connecticut	42,963,065	0.75	442	1.96	1,461	1.78	97,202
45	Delaware	11,919,774	0.21	66	0.29	270	0.33	180,603
54	District of Columbia	0	0.00	0	0.00	0	0.00	0
9	Florida	192,044,588	3.37	535	2.37	1,568	1.91	358,962
20	Georgia	117,888,623	2.07	726	3.22	2,468	3.01	162,381
47	Hawaii	3,402,365	0.06	29	0.13	101	0.12	117,323
43	Idaho	15,739,859	0.28	52	0.23	169	0.21	302,690
6	Illinois	247,813,608	4.34	1,379	6.11	5,018	6.13	179,705
5	Indiana	255,023,626	4.47	890	3.94	3,298	4.03	286,543
28	Iowa	55,143,195	0.97	386	1.71	1,199	1.46	142,858
10	Kansas	185,131,051	3.24	238	1.05	904	1.10	777,862
21	Kentucky	111,422,816	1.95	350	1.55	1,500	1.83	318,351
2	Louisiana	473,546,487	8.30	310	1.37	1,835	2.24	1,527,569
40	Maine	18,581,543	0.33	112	0.05	386	0.47	165,907
36	Maryland	29,251,518	0.51	230	1.02	805	0.98	127,181
27	Massachusetts	56,214,698	0.99	678	3.00	2,055	2.51	82,913
7	Michigan	220,137,364	3.86	912	4.04	3,800	4.64	241,379
24	Minnesota	81,932,154	1.44	433	1.92	1,400	1.71	189,220
19	Mississippi	120,617,983	2.11	301	1.33	1,088	1.33	400,724
12	Missouri	163,105,846	2.86	588	2.61	2,279	2.78	277,391
33	Montana	39,103,261	0.69	25	0.11	122	0.15	1,564,130
39	Nebraska	20,623,709	0.36	158	0.70	469	0.57	130,530
49	Nevada	3,295,677	0.06	43	0.19	100	0.12	76,644
44	New Hampshire	14,392,899	0.25	149	0.66	411	0.50	96,597
18	New Jersey	124,333,859	2.18	839	3.72	3,155	3.85	148,193
34	New Mexico	34,173,505	0.60	41	0.18	166	0.20	833,500
17	New York	126,275,855	2.21	906	4.01	2,935	3.58	139,377
15	North Carolina	135,058,190	2.37	923	4.09	3,062	3.74	146,325
51	North Dakota	1,358,104	0.02	25	0.11	75	0.90	54,324
3	Ohio	358,677,545	6.29	1,565	6.93	5,922	7.23	229,187
31	Oklahoma	46,752,043	0.82	210	0.93	753	0.92	222,629
35	Oregon	31,499,505	0.55	233	1.03	784	0.96	135,191
8	Pennsylvania	194,216,839	3.40	1,157	5.13	4,449	5.43	167,862
37	Puerto Rico	26,826,844	0.47	179	0.79	557	0.68	149,871
46	Rhode Island	10,878,502	0.19	204	0.90	556	0.68	53,326
23	South Carolina	86,615,836	1.52	441	1.95	1,778	2.17	196,408
48	South Dakota	3,351,837	0.06	53	0.23	108	0.13	63,242
4	Tennessee	263,400,319	4.62	587	2.60	2,064	2.52	448,723
1	Texas	792,810,307	13.90	1,205	5.34	5,899	7.20	657,934
13	Utah	148,915,352	2.61	118	0.52	457	0.56	1,261,995
50	Vermont	1,970,055	0.03	58	0.26	148	0.18	33,966
52	Virgin Islands	1,274,235	0.02	1	0.00	19	0.02	1,274,235
16	Virginia	134,592,526	2.36	472	2.09	1,660	2.03	285,154
30	Washington	48,706,760	0.85	342	1.52	1,106	1.35	142,417
26	West Virginia	58,992,213	1.03	114	0.51	670	0.82	517,476
22	Wisconsin	99,963,906	1.75	744	3.30	2,488	3.04	134,360
41	Wyoming	18,050,866	0.32	28	0.12	128	0.16	644,674
	TOTAL	5,705,670,380	100.00	22,569	100.00	81,891	100.00	252,810

(a) Total number of facilities reporting to TRI, including those reporting zero releases and transfers.
(b) Total number of forms reporting, including those reporting zero releases and transfers.



Map 3-1. TRI Total Releases and Transfers, 1989.



Map 3-2. Facilities Reporting to TRI, 1989.

The majority of facilities reporting TRI releases and transfers were located in states in the eastern half of the country and in Texas and California. Relatively fewer facilities were located in states in the western half of the U.S. (See Map 3-2.)

. . . and California accounted for 8% of all facilities reporting to TRI.

As in 1988, California had the largest number of facilities (1,864) reporting to TRI, accounting for 8 percent of all facilities reporting. Four other states, Ohio, Illinois, Texas, and Pennsylvania, also had over 1,000 facilities each reporting to TRI. (See Table 3-2.)

A single county in Louisiana represented 41% of the state's total releases and transfers in 1989.

State TRI releases and transfers were often concentrated in just a few counties and cities. Brazoria, Texas, and Jefferson Parish, Louisiana, were the number one- and two-ranked counties in 1989. These counties each contributed a significant portion to their state's total releases and transfers, representing 28 and 41 percent of the total releases and transfers in Texas and Louisiana, respectively. (See Table 3-3.) The city of Alvin, Texas, located in Brazoria County, was the top-ranked city and

Table 3-3. The Top 25 Counties with the Largest TRI Total Releases and Transfers, 1989.

TRI RANK	COUNTY	STATE	TOTAL RELEASES AND TRANSFERS Number	PERCENT OF TRI TOTAL Percent	PERCENT OF STATE TOTAL Percent	STATE TOTAL Pounds
1	Brazoria	TX	225,447,996	3.95	28.44	792,810,307
2	Jefferson	LA	196,108,289	3.44	41.41	473,546,487
3	Sedgwick	KS	154,109,629	2.70	83.24	185,131,051
4	Ascension	LA	141,752,206	2.48	29.93	473,546,487
5	Harris	TX	132,825,660	2.33	16.75	792,810,307
6	Tooele	UT	119,458,175	2.09	80.22	148,915,352
7	Jefferson	TX	111,046,679	1.95	14.01	792,810,307
8	Los Angeles	CA	79,856,790	1.40	47.30	168,825,335
9	Polk	FL	75,673,943	1.33	39.40	192,044,588
10	Lake	IN	72,486,534	1.27	28.42	255,023,626
11	Calhoun	TX	69,008,250	1.21	8.70	792,810,307
12	Cook	IL	66,559,508	1.17	26.86	247,813,608
13	St Louis	MO	65,188,780	1.14	39.97	163,105,846
14	Humphreys	TN	62,226,193	1.09	23.62	263,400,319
15	Mobile	AL	58,492,275	1.03	42.46	137,761,513
16	Allen	OH	58,001,380	1.02	16.17	358,677,545
17	Wayne	MI	57,535,048	1.01	26.14	220,137,364
18	Jefferson	KY	56,767,217	0.99	50.95	111,422,816
19	Galveston	TX	52,783,494	0.93	6.66	792,810,307
20	Sullivan	TN	49,181,587	0.86	18.67	263,400,319
21	Hopewell City	VA	46,748,824	0.82	34.73	134,592,526
22	St Clair	IL	46,470,224	0.81	18.75	247,813,608
23	Harrison	MS	42,896,317	0.75	35.56	120,617,983
24	Lewis And Clark	MT	36,632,896	0.64	93.68	39,103,261
25	Shelby	TN	33,442,929	0.59	12.70	263,400,319
	SUBTOTAL		2,110,700,823	36.99		
	TOTAL FOR ALL OTHERS		3,594,969,557	63.01		
	GRAND TOTAL		5,705,670,380	100.00		

Table 3-4. The 50 Cities with the Largest TRI Total Releases and Transfers, 1989.

TRI RANK	CITY	COUNTY	STATE	FACILITIES Number	FORMS Number	TOTAL RELEASES AND TRANSFERS Pounds	PERCENT OF TRI TOTAL Percent	PERCENT OF STATE TOTAL Percent	STATE TOTAL Pounds
1	Alvin	Brazoria	TX	4	60	212,577,627	3.73	26.81	792,810,307
2	Westwego	Jefferson	LA	3	31	192,352,553	3.37	40.62	473,546,487
3	Wichita	Sedgwick	KS	40	192	154,105,879	2.70	83.24	185,131,051
4	Tooele	Tooele	UT	1	5	119,060,425	2.09	79.95	148,915,352
5	Beaumont	Jefferson	TX	19	212	98,481,930	1.73	12.42	792,810,307
6	Geismar	Ascension	LA	10	171	84,356,736	1.48	17.81	473,546,487
7	Saint Louis	Saint Louis	MO	132	536	83,467,311	1.46	51.17	163,105,846
8	Port Lavaca	Calhoun	TX	2	59	68,881,379	1.21	8.69	792,810,307
9	New Johnsonville	Humphreys	TN	4	21	62,226,193	1.09	23.62	263,400,319
10	East Chicago	Lake	IN	10	80	60,546,214	1.06	23.74	255,023,626
11	Lima	Allen	OH	16	89	57,916,046	1.02	16.15	358,677,545
12	Donaldsonville	Ascension	LA	5	29	57,367,893	1.01	12.11	473,546,487
13	Mulberry	Polk	FL	8	30	57,049,013	1.00	29.71	192,044,588
14	Louisville	Jefferson	KY	66	353	56,746,077	0.99	50.93	111,422,816
15	Texas City	Galveston	TX	12	216	52,671,822	0.92	6.64	792,810,307
16	Axis	Mobile	AL	4	48	50,757,832	0.89	36.84	137,761,513
17	Pasadena	Harris	TX	44	362	49,908,270	0.87	6.30	792,810,307
18	Kingsport	Sullivan	TN	9	112	48,589,036	0.85	18.45	263,400,319
19	Hopewell	Hopewell City	VA	9	51	46,882,164	0.82	34.83	134,592,526
20	Pass Christian	Harrison	MS	1	8	42,517,217	0.75	35.25	120,617,983
21	East Helena	Lewis and Clark	MT	2	12	36,625,629	0.64	93.66	39,103,261
22	Memphis	Shelby	TN	71	319	32,934,818	0.58	12.50	263,400,319
23	Victoria	Victoria	TX	6	43	32,595,372	0.57	4.11	792,810,307
24	Vernon	Los Angeles	CA	16	57	32,402,603	0.57	19.19	168,825,335
25	Chicago	Cook	IL	274	947	29,688,929	0.52	11.98	247,813,608
26	Cincinnati	Clermont	OH	118	466	29,207,395	0.51	8.14	358,677,545
27	Hutchinson	Mc Leod	MN	5	29	29,184,520	0.51	35.62	81,932,154
28	Orange	Orange	TX	12	80	28,052,241	0.49	3.54	792,810,307
29	Kalamazoo	Portage	MI	23	99	26,586,278	0.47	12.08	220,137,364
30	Cantonment	Escambia	FL	4	33	26,547,870	0.47	13.82	192,044,588
31	Lowland	Hamblen	TN	1	9	25,624,950	0.45	9.73	263,400,319
32	Cahokia	St Clair	IL	1	20	25,261,353	0.44	10.19	247,813,608
33	Portage	Porter	IN	3	8	24,650,412	0.43	9.67	255,023,626
34	Rochester	Monroe	NY	56	238	23,136,578	0.41	18.32	126,275,855
35	Deer Park	Harris	TX	12	167	22,919,218	0.40	2.89	792,810,307
36	Newark	Essex	NJ	63	276	21,972,160	0.39	17.67	124,333,859
37	Cleveland	Cuyahoga	OH	136	547	21,208,532	0.37	5.91	358,677,545
38	Houston	Harris	TX	147	621	21,129,212	0.37	2.67	792,810,307
39	Marietta	Washington	OH	9	65	20,928,840	0.37	5.84	358,677,545
40	Playas	Hidalgo	NM	1	7	20,847,699	0.37	61.01	34,173,505
41	Kenai	Kenai Peninsula	AK	3	23	18,683,465	0.33	23.66	78,955,945
42	Philadelphia	Philadelphia	PA	67	315	18,125,175	0.32	9.33	194,216,839
43	Aurora	Beaufort	NC	1	7	17,852,400	0.31	13.22	135,058,190
44	Ecorse	Wayne	MI	2	28	17,815,385	0.31	8.09	220,137,364
45	Indianapolis	Marion	IN	89	377	17,798,636	0.31	6.98	255,023,626
46	Cordova	Rock Island	IL	1	29	17,631,532	0.31	7.11	247,813,608
47	Herculaneum	Jefferson	MO	1	9	17,110,851	0.30	10.49	163,105,846
48	Baytown	Harris	TX	10	164	16,864,804	0.30	2.13	792,810,307
49	Corpus Christi	Nueces	TX	15	161	16,861,467	0.30	2.13	792,810,307
50	Savannah	Chatham	GA	22	98	16,688,729	0.29	14.16	117,888,623
	SUBTOTAL			1,570	7,919	2,363,398,670	41.42		
	TOTAL FOR ALL OTHERS			20,999	73,972	3,342,271,710	58.58		
	GRAND TOTAL			22,569	81,891	5,705,670,380	100.00		

Westwego, Louisiana, in Jefferson Parish, was ranked second. (See Table 3-4.) Each of these cities was responsible for over 90 percent of the releases and transfers in their counties.

Industrial Distribution of TRI Releases and Transfers

Facilities in the Chemical industry accounted for almost 1/2 of all TRI releases and transfers in 1989.

Overall, there was little change in the industrial rankings from 1988. The Chemical industry dominated TRI releases and transfers, accounting for almost half of the 1989 TRI total. The TRI total of this industry, 2.7 billion pounds (48 percent of TRI total releases and transfers), was more than 3.5 times greater than the TRI releases and transfers reported by the second-ranked Primary Metals industry, which accounted for 756.8 million pounds (13 percent) of the TRI total. In contrast to these high-impact industries, which played a large role in TRI totals, the eight industrial categories with the smallest amounts of releases and transfers each represented less than 1 percent of the TRI total. (See Figure 3-4 and Table 3-5. Appendix C outlines the Standard Industrial Classification (SIC) system used to define the industrial categories.)

Facilities with operations falling within more than one industrial category (grouped in this report under the Multiple Codes classification) ranked third in total releases and transfers in 1989, accounting for 8 percent (437.3 million pounds) of the TRI total. This group consists of diversified facilities which engage in a range of activities that cut across several traditional industrial sectors. For example, a petrochemical company which both refines petroleum and manufactures petroleum

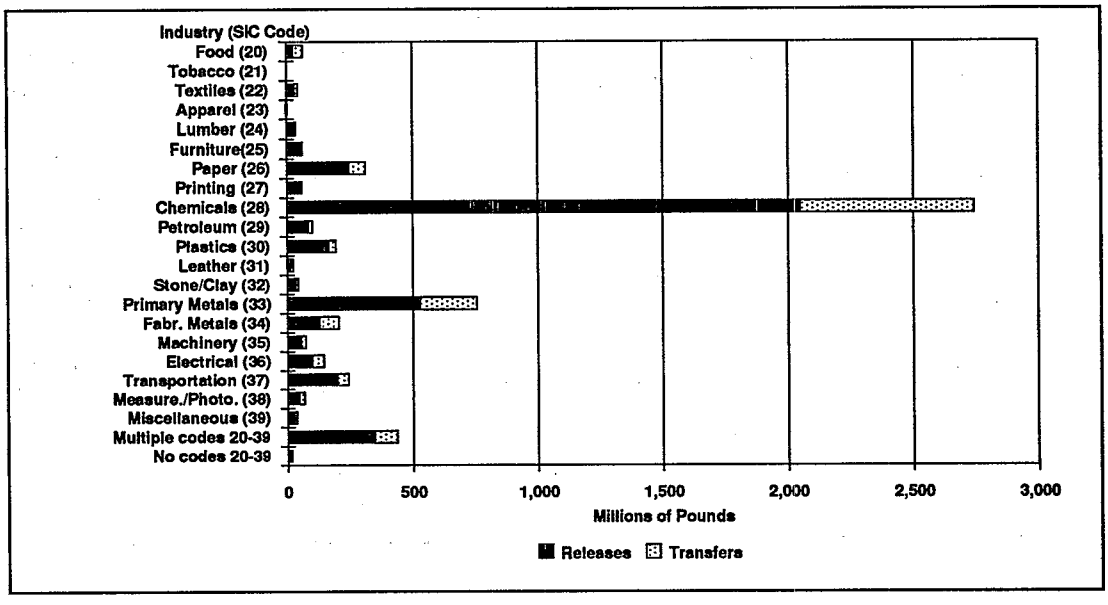


Figure 3–4. TRI Total Releases and Transfers by Industry, 1989.

Table 3-5. TRI Releases and Transfers by Industry, 1989.

TRI RELEASE/ TRANSFER RANK	SIC CODE	INDUSTRY	TOTAL RELEASES AND TRANSFERS		FACILITIES (a)		AVERAGE RELEASES AND TRANSFERS PER FACILITY	NUMBER OF CHEMICALS PER FACILITY	
			Pounds	Percent	Number	Percent	Pounds	Average	Maximum
12	20	Food	67,803,337	1.19	1,779	7.88	38,113	2	32
22	21	Tobacco	1,485,626	0.03	17	0.08	87,390	2	4
16	22	Textiles	46,081,356	0.81	466	2.06	98,887	2	12
21	23	Apparel	2,059,373	0.04	47	0.21	43,816	2	6
18	24	Lumber	37,824,596	0.66	715	3.17	52,902	3	17
13	25	Furniture	65,369,507	1.15	484	2.14	135,061	4	21
4	26	Paper	313,254,241	5.49	624	2.76	502,010	4	17
14	27	Printing	60,923,661	1.07	374	1.66	162,897	2	16
1	28	Chemicals	2,745,768,071	48.12	4,259	18.87	644,698	5	85
9	29	Petroleum	103,136,599	1.81	412	1.83	250,332	8	47
7	30	Plastics	194,502,619	3.41	1,611	7.14	120,734	3	14
19	31	Leather	24,861,979	0.44	136	0.60	182,809	3	13
15	32	Stone/Clay	47,485,910	0.83	620	2.75	76,590	3	30
2	33	Primary Metals	756,808,577	13.26	1,649	7.31	458,950	4	33
6	34	Fabr. Metals	207,383,999	3.63	2,968	13.15	69,873	3	26
10	35	Machinery	74,922,470	1.31	1,026	4.55	73,024	3	25
8	36	Electrical	145,758,174	2.55	1,702	7.54	85,639	3	23
5	37	Transportation	245,316,145	4.30	1,194	5.29	205,457	4	28
11	38	Measure./Photo.	69,535,397	1.22	408	1.81	170,430	3	69
17	39	Miscellaneous	38,886,447	0.68	382	1.69	101,797	3	17
3		Multiple codes 20-39	437,278,275	7.66	1,448	6.42	301,988	4	44
20		No codes 20-39	19,224,021	0.34	248	1.10	77,516	3	55
		TOTAL	5,705,670,380	100.00	22,569	100.00	252,810	4	85

(a) Total number of facilities reporting to TRI, including those reporting no releases and transfers.

products would report under both the Petroleum Refining (SIC 29) and Chemical Products (SIC 28) industries, and its releases and transfers would be ranked in the Multiple Codes category.

TRI Facilities

The top 50 TRI facilities accounted for 1/3 of TRI releases and transfers in 1989.

The overall TRI patterns of chemical, environmental, geographical, and industrial distribution were deeply influenced by a small number of individual facilities reporting releases and transfers significantly larger than those reported by all others. The top 50 facilities reporting to TRI in 1989 are presented in Table 3-6. These 50 facilities were responsible for over one-third (2.0 billion pounds) of all TRI releases and transfers. The Monsanto Company facility in Alvin, Texas, was the first-ranked facility for total TRI releases and transfers, reporting 206.5 million pounds of releases and transfers, most of which was in the form of underground injection of ammonium sulfate (solution). The American Cyanamid Company of Westwego,

Table 3-6. The 50 TRI Facilities with the Largest Total Releases and Transfers, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	28	Monsanto Co.	Alvin	TX	206,533,205	3.62
2	28	American Cyanamid Co.	Westwego	LA	192,350,800	3.37
3	33	Magnesium Corp. of America	Tooele	UT	119,060,425	2.09
4	28	Vulcan Chemicals	Wichita	KS	92,349,716	1.62
5	28	Du Pont Beaumont Works	Beaumont	TX	88,094,984	1.54
6	28	BP Chemicals	Port Lavaca	TX	65,543,672	1.15
7	Mult	Inland Steel Co.	East Chicago	IN	57,273,300	1.00
8	28	Du Pont	New Johnsonville	TN	57,022,345	1.00
9	28	BP Chemicals Inc.	Lima	OH	56,731,350	0.99
10	28	Atochem N.A.— Racon Facility	Wichita	KS	54,505,751	0.96
11	28	Columbian Chemicals Co.	Saint Louis	MO	52,461,020	0.92
12	28	Tennessee Eastman Co.	Kingsport	TN	45,253,659	0.79
13	28	Courtaulds Fibers Inc.	Lemoyne	AL	44,397,570	0.78
14	28	Du Pont Delisle Plant	Pass Christian	MS	42,517,217	0.75
15	28	BASF Corp.	Geismar	LA	40,802,088	0.72
16	28	Du Pont	Louisville	KY	39,829,058	0.70
17	33	Asarco Inc.	East Helena	MT	36,615,059	0.64
18	28	Allied Signal	Hopewell	VA	34,748,970	0.61
19	28	Du Pont Victoria Site	Victoria	TX	32,314,457	0.57
20	28	Kaiser Aluminum & Chemical Corp. (a)	Mulberry	FL	32,013,400	0.56
21	28	Filtrol Corp.	Vernon	CA	29,595,850	0.52
22	Mult	3M Consumer AV& Consumer Prod.	Hutchinson	MN	28,998,967	0.51
23	28	Triad Chemical	Donaldsonville	LA	26,152,046	0.46
24	28	BASF Corp.	Lowland	TN	25,624,950	0.45
25	28	Monsanto Co.	Cantonment	FL	25,622,958	0.45
26	28	Monsanto Co.	Cahokia	IL	25,261,353	0.44
27	28	Arcadian Corp.	Geismar	LA	24,967,500	0.44
28	33	National Steel Corp.	Portage	IN	24,586,030	0.43
29	28	The Upjohn Co.	Kalamazoo	MI	22,997,339	0.40
30	33	Phelps Dodge Mining Co.	Playas	NM	20,847,699	0.37
31	28	Sterling Chemicals Inc.	Texas City	TX	20,574,970	0.36
32	28	Union Oil Co.	Kenai	AK	18,558,521	0.33
33	38	Eastman Kodak Co.	Rochester	NY	18,123,187	0.32
34	28	Du Pont Sabine River Works	Orange	TX	18,010,133	0.32
35	28	Texasgulf Inc.	Aurora	NC	17,852,400	0.31
36	28	3M	Cordova	IL	17,631,532	0.31
37	33	National Steel	Ecorse	MI	17,562,820	0.31
38	28	Freeport McMoran,Agrico Chem. Div.	Donaldsonville	LA	17,254,750	0.30
39	33	Herculaneum Smelter	Herculaneum	MO	17,110,851	0.30
40	33	Asarco Inc.	Hayden	AZ	16,574,800	0.29
41	33	Copper Range Co.	White Pine	MI	16,330,870	0.29
42	28	Pfizer Pigments Inc.	East Saint Louis	IL	16,071,496	0.28
43	Mult	Elkem Metals Co.	Marietta	OH	15,771,470	0.28
44	33	Kennecott Utah Copper	Bingham Canyon	UT	15,473,300	0.27
45	28	Freeport McMoran Agrico Chemical Div.	Uncle Sam	LA	15,410,826	0.27
46	28	Air Products Mfg. Corp.	Pasadena	TX	15,190,634	0.27
47	28	Coastal Chem Inc.	Cheyenne	WY	15,133,055	0.27
48	29	Amoco Oil Co.	Texas City	TX	14,217,928	0.25
49	28	Mississippi Chemical Corp.	Yazoo City	MS	14,176,423	0.25
50	33	Cyprus Miami Mining Corp.	Claypool	AZ	13,660,904	0.24
		SUBTOTAL			1,975,763,608	34.63
		TOTAL FOR ALL OTHERS			3,729,906,772	65.37
		GRAND TOTAL			5,705,670,380	100.00

(a) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their total releases and transfers is 4,487,000 pounds.

Louisiana, ranked a close second with 192.4 million pounds. These two facilities *each* contributed more to TRI totals than did combined facilities in each of 46 of the other states and reporting jurisdictions, and they each contributed more to TRI total releases and transfers than did the ninth-ranked state out of the 1989 TRI total.

The releases and transfers of these top 50 facilities affected every geographical, industrial, and chemical analysis presented throughout this chapter. The enormous role played by individual facilities suggests that the most telling analyses of TRI data will be those that examine the data at the facility level. (See Box 3-D.) While individual facilities provide a critical focus of analysis throughout this report, the scope of the national summary statistics presented here sometimes precludes such detail. However, the high-impact facilities for the top chemicals, the individual states, and the industrial categories are discussed in this chapter.

A small number of facilities can have a significant impact on the environmental distribution of TRI releases and transfers, both nationally and within a narrower region. This is made clear by the impact of the top facilities upon TRI environmental distribution totals. For example, three facilities in St. Louis, Missouri ranked in the top ten facilities for transfers to public sewage: Columbian Chemicals Company, Mallinkrodt Specialty, and Monsanto Company. Together, these three facilities were responsible for 13 percent (71.0 million pounds) of all TRI transfers to POTWs in 1989, and represented 93 percent of such transfers for the state of Missouri. Due to the impact of these facilities, Missouri was the first-ranked state for TRI transfers to public sewage in 1989. (See Table 3-2; and Appendix F, Table F-5.)

One of the reasons that a few facilities can often play such a dominant role in a particular mode of environmental release or transfer is that the releases and transfers of many facilities often are predominantly discharged to one part of the environment. Two-thirds (34) of the top 50 facilities with the largest 1989 releases and transfers released 90 percent or more of their TRI amounts in a single type of release or transfer. For example, Phelps Dodge Mining Company in Playas, New Mexico (ranked 30th in overall TRI releases and transfers) discharged 98 percent of its total releases and transfers (20.4 million pounds) to on-site land disposal. Since Phelps Dodge Mining was a top TRI facility for total releases and transfers reported, the facility was also one of the top TRI facilities for on-site land releases (ranked third), accounting for 5 percent of all such releases. (See Table 3-6, and Appendix F, Table F-3.)

TRI Parent Companies

The top 10 TRI parent companies accounted for about 1/4 of all TRI releases and transfers in 1989.

While the impact of individual facilities is discussed throughout this report, parent companies also have nationwide influence. The top ten parent companies (ranked by total releases and transfers) operated a total of 410 facilities, or 2 percent of all TRI facilities, and accounted for a little more than one-fourth of all TRI releases and transfers in 1989. With 88 facilities, Du Pont was the top-ranked parent company, reporting TRI releases and transfers of 349.3 million pounds--6 percent of the

BOX 3-D. THE IMPACT OF ONE FACILITY ON TRI DATA ANALYSES

The large releases and transfers of a single TRI facility often have a significant impact upon TRI totals. This can be illustrated by examining the top facility for TRI releases and transfers in 1989, the Monsanto Company facility in Alvin, Texas.

Of the 20,812 TRI facilities reporting releases and transfers in 1989, this single facility accounted for approximately 4 percent of the total TRI releases and transfers in that year. Monsanto's Alvin facility represented one-fourth of all releases and transfers in the state of Texas, which in 1989 was ranked as the number one state for overall TRI releases and transfers.

This Monsanto facility is classified as a member of the Chemical industry (SIC 28), ranking number one for that industry in 1989 with 8 percent of all releases and transfers for SIC Code 28.

Monsanto reported the largest TRI releases and transfers of ammonium sulfate (solution), the number-one ranked chemical in 1989. In fact, Monsanto's releases and transfers of ammonium sulfate (solution) represented the largest single amount reported by any facility for one chemical in the TRI database. This Monsanto facility's releases and transfers of 200.0 million pounds of ammonium sulfate (solution) represented 27 percent of all releases and transfers for that chemical.

This facility's releases and transfers also had a significant impact on TRI environmental distribution totals. All of the facility's 200.0 million pounds of ammonium sulfate (solution) was released on site to underground injection wells. Monsanto also discharged 5.8 million pounds of other chemicals in this manner, accounting for a total underground injection discharge of 205.8 million pounds. Monsanto's ammonium sulfate (solution) release was primarily responsible for this facility's number-one ranking for TRI underground injection, representing 17 percent of all such releases in 1989.

(See Appendix F, Table F-1; Appendix G, Table G-1; Appendix H, Table H-1; and Appendix I, Table I-1.)

national total. Other top-ranked parent companies included Monsanto, American Cyanamid, BP America, and Renco Group (includes Magnesium Corporation of America). (See Table 3-7.)

The number of facilities reporting from these top ten parent companies ranged from one (Vulcan Chemicals) to 136 (General Motors).[2] As a consequence, the average releases and transfers per facility varied considerably. Du Pont's 88 facilities, while reporting the largest TRI total for a parent company, produced an average of 4.0 million pounds of releases and transfers per facility. In contrast, the two TRI facilities operated by the fifth-ranked Renco Group reported an average of 59.5 million pounds per facility. (See Table 3-7.)

Table 3-7. The Ten Parent Companies with the Largest TRI Total Releases and Transfers, 1989.

TRI RANK	PARENT COMPANY	FACILITIES		TOTAL RELEASES AND TRANSFERS		AVERAGE RELEASES AND TRANSFERS PER FACILITY
		Number	Percent	Pounds	Percent	Pounds
1	Du Pont	88	0.39	349,275,844	6.12	3,969,044
2	Monsanto Co.	33	0.15	293,833,577	5.15	8,904,048
3	American Cyanamid Co.	29	0.13	202,092,889	3.54	6,968,720
4	BP America	25	0.11	123,971,863	2.17	4,958,875
5	Renco Group	2	0.01	119,079,722	2.09	59,539,861
6	3M Co.	53	0.23	108,727,958	1.91	2,051,471
7	Vulcan Chemicals	1	0.00	92,349,716	1.62	92,349,716
8	General Motors Co.	136	0.60	90,279,073	1.58	663,817
9	Eastman Kodak Co.	24	0.11	79,258,257	1.39	3,302,427
10	Phelps Dodge Corp.	19	0.08	77,423,843	1.36	4,074,939
	SUBTOTAL	410	1.82	1,536,292,742	26.93	3,747,055
	TOTAL FOR ALL OTHER FACILITIES	22,159	98.18	4,169,377,638	73.07	188,157
	GRAND TOTAL	22,569	100.00	5,705,670,380	100.00	252,810

Table 3-8. The Ten Parent Companies with the Largest Number of TRI Facilities, 1989.

TRI RANK	PARENT COMPANY	FACILITIES		TOTAL RELEASES AND TRANSFERS		AVERAGE RELEASES AND TRANSFERS PER FACILITY
		Number	Percent	Pounds	Percent	Pounds
1	General Electric Co.	138	0.61	38,890,268	0.68	281,814
2	General Motors Co.	136	0.60	90,279,073	1.58	663,817
3	Du Pont	88	0.39	349,275,844	6.12	3,969,044
4	Allied-Signal Co.	86	0.38	52,921,041	0.93	615,361
5	Borden Inc.	70	0.31	8,806,357	0.15	125,805
6	Cooper Industries Inc.	69	0.31	4,374,775	0.08	63,403
7	Westinghouse Electric Corp.	67	0.30	13,654,595	0.24	203,800
8	United Technologies Corp.	66	0.29	10,487,983	0.18	158,909
9	International Paper	64	0.28	22,864,152	0.40	357,252
10	Georgia-Pacific Corp.	65	0.29	19,348,757	0.34	297,673
	SUBTOTAL	849	3.76	610,902,845	10.71	719,556
	TOTAL FOR ALL OTHERS	21,720	96.24	5,094,767,535	89.29	234,566
	GRAND TOTAL	22,569	100.00	5,705,670,380	100.00	252,810

The parent companies operating the greatest number of TRI facilities did not necessarily report the largest TRI totals. For example, General Electric operated the largest number of facilities of any parent company, but its 138 facilities released and transferred 38.9 million pounds (an average of 281,814 pounds per facility, well below the average for the top ten parent companies). The Cooper Industries, which operated 69 facilities, reported only 4.4 million pounds of releases and transfers (an average of 63,403 pounds per facility). Altogether, the ten parent companies with the largest number of facilities accounted for 4 percent of TRI facilities, and contributed 11 percent to total TRI releases and transfers in 1989. (See Table 3-8.)

TRI CHEMICALS

With 13% of total TRI releases and transfers, ammonium sulfate (solution) was the top-ranking TRI chemical in 1989.

Releases and transfers of ammonium sulfate (solution) were greater than those of any other TRI chemical in 1989, accounting for 13 percent of the TRI total (750.6 million pounds). Ammonium sulfate (solution) is produced for use as an agricultural fertilizer, is generated as a non-commercial by-product of different chemical manufacturing processes involving sulfuric acid and ammonium compounds, and is a by-product of coke ovens used to make steel. (See Figure 3-2 and Table 3-1.)

Facilities also reported large amounts of hydrochloric acid, methanol, ammonia, toluene, and sulfuric acid. The total releases and transfers of each of these chemicals contributed over 5 percent to the TRI total. Together, the 25 chemicals with the largest releases and transfers accounted for 83 percent of the TRI total.

Because TRI reporting requirements are triggered by a threshold amount for the manufacture, process, or other use of a chemical and not by the amounts of the facility's final releases and transfers, some forms received by EPA indicated that no releases or transfers of a chemical occurred. This may best be illustrated by comparing the information in Tables 3-1 and 3-9. For example, sulfuric acid was reported more often than any other chemical in 1989, with 5,547 forms submitted (or 7 percent of all TRI forms). Of these forms, however, only 3,391 indicated that there were releases and transfers associated with the chemical. This may be explained by the fact that some facilities may have activities involving sulfuric acid that preclude its release or transfer. In fact, many facilities use sulfuric acid to neutralize basic wastes, a process which consumes all the acid as it reacts with the base to form a salt and water.

The chemicals released and transferred in the largest amounts were not necessarily those reported by the most facilities. For example, ammonium sulfate (solution), ranked number one for TRI total releases and transfers, ranked 49th in number of forms reporting releases and transfers. In contrast, 1,1,1-trichloroethane was number two for having the most forms reporting releases and transfers, but ranked only ninth in total releases and transfers. Thus, a smaller group of facilities released larger amounts of the ammonium sulfate (solution) as compared to 1,1,1-trichloroethane, which was released in smaller amounts by more facilities. (See Tables 3-1 and 3-9.)

Table 3-9. The 25 Chemicals Reported on the Most TRI Forms, 1989.

TRI RELEASE/ TRANSFER RANK	FORMS RANK	CHEMICAL	TOTAL FORMS(a) Number	Percent
6	1	Sulfuric acid	5,547	6.77
5	2	Toluene	3,942	4.81
9	3	1,1,1-Trichloroethane	3,893	4.75
8	4	Xylene (mixed isomers)	3,525	4.30
2	5	Hydrochloric acid	3,250	3.97
4	6	Ammonia	3,120	3.81
7	7	Acetone	2,723	3.33
16	8	Phosphoric acid	2,638	3.22
3	9	Methanol	2,521	3.08
11	10	Methyl ethyl ketone	2,464	3.01
37	11	Copper	2,011	2.46
10	12	Zinc compounds	1,935	2.36
17	13	Nitric acid	1,924	2.35
20	14	Glycol ethers	1,822	2.22
12	15	Chlorine	1,779	2.17
13	16	Dichloromethane	1,552	1.90
19	17	Freon 113	1,483	1.81
21	18	Ethylene glycol	1,469	1.79
24	19	Chromium compounds	1,363	1.66
28	20	Styrene	1,318	1.61
54	21	Nickel	1,285	1.57
47	22	Chromium	1,277	1.56
23	23	Copper compounds	1,254	1.53
25	24	n-Butyl alcohol	1,177	1.44
34	25	Manganese	1,078	1.32
		SUBTOTAL	56,350	68.81
		TOTAL FOR ALL OTHERS	25,541	31.19
		TOTAL	81,891	100.00

(a) Total number of forms reporting the chemical, including those reporting no releases and transfers.

The average amount of releases and transfers of a TRI chemical, per form reported to TRI for that chemical, demonstrates that of the top 25 TRI chemicals, ammonium sulfate (solution) and carbon disulfide had a few facilities reporting large total releases and transfers. For ammonium sulfate (solution), the average release and transfer per form was 2.5 million pounds, and for carbon disulfide the average was 1.3 million pounds. Of the top 25 TRI chemicals, glycol ethers had the smallest average release of 37,014 pounds per form. (See Table 3-1.)

Manufacturers reported total releases and transfers of 1,000 pounds or less for 20 chemicals, including three (safrole, 4-aminobiphenyl, and bis(chloromethyl) ether) released in amounts under 15 pounds. In addition, facilities submitted TRI forms for six chemicals, but reported no associated releases or transfers, while no forms at all were submitted for 58 chemicals. (See Appendix B.)

Top Facilities for the Release and Transfer of TRI Chemicals

Single facilities often had a significant impact on regional and state TRI totals.

Individual facilities can have a significant influence on the geographical, industrial, and environmental distribution patterns of a TRI chemical. For example, the Magnesium Corporation of America facility in Tooele, Utah, reported 78 percent (110.2 million pounds) of all TRI releases and transfers for chlorine. Consequently, chlorine is the chemical with the largest releases and transfers in the state of Utah and the Magnesium Corporation is the state's number one facility for total releases and transfers. (See Table 3-10; Appendix G, Table G-1; and Appendix H, Tables H-1 and H-2.) All of this facility's chlorine is released in the form of air emissions, making the Magnesium Corporation the number one facility for total TRI air emissions. Because of the volume of its chlorine emissions, the Magnesium Corporation was the facility with the largest total releases and transfers in the Primary Metals industry (SIC 33) and chlorine was ranked the number two TRI chemical for that industry (See Appendix F, Table F-1; and Appendix I, Tables I-1 and I-2.)

The circumstances for chlorine, largely determined by a single facility, differ from those of a chemical such as methanol. Although the Union Camp Corporation facility in Savannah, Georgia, was the facility with the largest releases and transfers of this chemical, its releases and transfers accounted for only 3 percent (11.2 million pounds) of all TRI methanol releases. Together, the top ten facilities for methanol releases and transfers represented just 17 percent of the methanol total. Despite the fact that the releases and transfers of methanol by Union Camp did not account for an overwhelming share of the TRI methanol total, they did have a significant impact on a state level. Methanol was the chemical with the largest releases and transfers in the state of Georgia, with Union Camp accounting for 40 percent of the state's total releases and transfers of this chemical. (See Appendix G, Table G-1; and Appendix H, Table H-1.) Union Camp was the top facility for all releases and transfers in the state of Georgia, representing 11 percent of the state's total. The facility's methanol releases accounted for 83 percent of its total releases and transfers. (See Table 3-10; and Appendix H, Table H-2.)

While not a dominant contributor to TRI total releases and transfers, Union Camp did affect TRI industrial and environmental distribution patterns. The facility emitted 98 percent of its methanol to air and thus ranked tenth among the facilities with the largest TRI releases and transfers to air (84 percent of its total air releases were methanol). (See Appendix F, Table F-1.) Union Camp ranked fourth for total TRI releases and transfers for facilities reporting under multiple SIC codes, and methanol was the chemical with the second-largest releases and transfers for the Multiple SIC Code category. Union Camp accounted for 26 percent of the total methanol released and transferred by this industrial category. (See Appendix I, Tables I-1 and I-2.)

Table 3-10. Total Releases and Transfers by Media for the Top TRI Facility in Each State, 1989.

TRI STATE RANK	STATE	FACILITY NAME	TOTAL RELEASES AND TRANSFERS	AIR	SURFACE WATER	UNDER-GROUND	LAND	PUBLIC SEWAGE	OFF-SITE	TOTAL
			Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent
14	Alabama	Courtaulds Fibers Inc.	44,397,570	98.37	0.13	0.00	1.42	0.00	0.80	100.00
38	Alaska	Union Oil Co.	18,558,521	98.65	1.30	0.00	0.04	0.00	0.00	100.00
53	American Samoa	VCS Samoa Packing Co.	26,250	100.00	0.00	0.00	0.00	0.00	0.00	100.00
29	Arizona	Asarco Inc.	16,574,800	4.96	0.01	0.00	95.02	0.01	0.00	100.00
25	Arkansas	Agricultural Minerals Corp.	11,582,300	98.29	1.67	0.00	0.01	0.00	0.03	100.00
11	California	Filtrol Corp.	29,595,850	1.00	0.00	0.00	0.00	99.00	0.00	100.00
42	Colorado	CF&I Steel Corp.	1,766,944	2.48	2.71	0.00	24.69	0.00	70.13	100.00
32	Connecticut	Pfizer Inc.	6,183,136	11.72	67.88	0.00	0.00	0.00	20.39	100.00
45	Delaware	Newark Assembly Plant	2,366,693	99.75	0.00	0.00	0.00	0.11	0.14	100.00
9	Florida	Kaiser Aluminum & Chemical (a)	32,013,400	0.00	0.00	100.00	0.00	0.00	0.00	100.00
20	Georgia	Union Camp Corp.	13,463,088	97.97	1.62	0.00	0.00	0.00	0.41	100.00
47	Hawaii	Dole Packaged Foods Co.	1,292,550	0.76	0.00	0.00	0.00	99.24	0.00	100.00
43	Idaho	Kerr-Mcgee Vanadium Facility	4,207,446	5.60	0.00	0.00	94.40	0.00	0.00	100.00
6	Illinois	Monsanto Co.	25,261,353	11.55	0.00	0.00	0.00	86.12	2.34	100.00
5	Indiana	Inland Steel Co.	57,273,300	4.39	1.77	11.77	78.27	0.00	3.81	100.00
28	Iowa	3M Co.	4,507,566	95.96	0.00	0.00	0.00	0.00	4.04	100.00
10	Kansas	Vulcan Chemicals	92,349,716	0.90	0.00	99.09	0.00	0.00	0.01	100.00
21	Kentucky	Du Pont	39,829,058	1.66	0.00	97.92	0.00	0.39	0.03	100.00
2	Louisiana	American Cyanamid Co.	192,350,800	0.32	0.17	99.51	0.00	0.00	0.01	100.00
40	Maine	Georgia-Pacific Corp.	2,499,584	98.44	1.35	0.00	0.00	0.00	0.21	100.00
36	Maryland	Westvaco Corp.	7,940,335	73.45	0.00	0.00	0.00	26.55	0.00	100.00
27	Massachusetts	Monsanto Co.	8,043,889	3.10	0.00	0.00	0.00	82.35	14.55	100.00
7	Michigan	The Upjohn Co.	22,997,339	29.91	0.78	18.38	0.03	7.63	43.27	100.00
24	Minnesota	3M Consumer AV & Consumer Prod.	28,998,967	88.49	0.00	0.00	0.00	0.90	10.61	100.00
19	Mississippi	Du Pont Delisle Plant	42,517,217	12.93	0.00	87.02	0.00	0.00	0.05	100.00
12	Missouri	Columbian Chemicals Co.	52,461,020	0.12	0.00	0.00	0.00	99.87	0.00	100.00
33	Montana	Asarco Inc.	36,615,059	0.52	0.00	0.00	99.48	0.00	0.00	100.00
39	Nebraska	Goodyear Tire & Rubber Co.	3,186,771	96.19	0.00	0.00	0.00	0.22	3.59	100.00
49	Nevada	Kerr-Mcgee Chemical Corp.	2,072,700	1.13	0.04	0.00	98.74	0.01	0.07	100.00
44	New Hampshire	Hadco Corp.	1,575,165	92.85	0.00	0.00	0.00	2.35	4.80	100.00
18	New Jersey	Merck & Co. Inc.	7,875,472	4.30	0.00	0.00	0.00	60.27	35.42	100.00
34	New Mexico	Phelps Dodge Mining Co.	20,847,699	2.37	0.00	0.00	97.63	0.00	0.00	100.00
17	New York	Eastman Kodak Co.	18,123,187	92.67	2.31	0.00	0.36	0.03	4.64	100.00
15	North Carolina	Texasgulf Inc.	17,852,400	12.67	0.27	0.00	87.06	0.00	0.00	100.00
51	North Dakota	Sioux Manufacturing Corp.	336,535	100.00	0.00	0.00	0.00	0.00	0.00	100.00
3	Ohio	BP Chemicals Inc.	56,731,350	6.37	0.21	93.30	0.00	0.00	0.12	100.00
31	Oklahoma	Agricultural Minerals Corp.	9,014,287	44.52	2.14	52.37	0.03	0.00	0.94	100.00
35	Oregon	Boise Cascade Papers	6,985,349	8.52	0.00	0.00	0.00	91.43	0.05	100.00
8	Pennsylvania	USS Fairless Works	12,893,470	1.64	0.22	0.00	76.78	0.00	21.36	100.00
37	Puerto Rico	Abbott Chemicals Inc.	3,784,744	97.91	0.00	0.00	0.00	1.91	0.18	100.00
46	Rhode Island	Olin Hunt Specialty	1,072,546	2.03	0.00	0.00	0.00	89.49	8.48	100.00
23	South Carolina	Westinghouse Electric Corp.	8,303,320	95.06	0.00	0.00	0.00	0.00	4.94	100.00
48	South Dakota	3M Co.	1,096,305	74.87	0.00	0.00	0.00	0.00	25.13	100.00
4	Tennessee	Du Pont	57,022,345	14.00	0.07	85.93	0.00	0.00	0.00	100.00
1	Texas	Monsanto Co.	206,533,205	0.31	0.00	99.65	0.04	0.00	0.00	100.00
13	Utah	Magnesium Corp.of America	119,060,425	100.00	0.00	0.00	0.00	0.00	0.00	100.00
50	Vermont	General Electric Co.	231,389	47.24	0.00	0.00	0.00	0.10	52.66	100.00
52	Virgin Islands	Hess Oil Virgin Islands Corp.	1,274,235	90.99	0.09	0.00	8.92	0.00	0.00	100.00
16	Virginia	Allied Signal	34,748,970	0.98	26.86	0.00	0.00	71.57	0.58	100.00
30	Washington	Weyerhaeuser Co.	8,472,600	3.30	96.70	0.00	0.00	0.00	0.00	100.00
26	West Virginia	Wheeling-Pittsburgh Steel	10,543,249	29.94	2.01	0.00	68.03	0.00	0.02	100.00
22	Wisconsin	Fort Howard Steel Inc.	7,440,000	0.00	0.00	0.00	0.00	100.00	0.00	100.00
41	Wyoming	Coastal Chem Inc.	15,133,055	6.66	0.00	93.34	0.00	0.00	0.00	100.00

(a) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding 1989 releases and transfers. The revised amount for their total releases and transfers is 4,487,000 pounds, all of which is underground injection.

Environmental Distribution of TRI Chemicals

The environmental distribution of individual TRI chemicals varied widely.

Within the overall environmental distribution of TRI releases and transfers, the distribution of individual TRI chemicals varied considerably. Some chemicals were usually released directly from a facility site, while others were more often transferred off site. Many chemicals were characterized by general modes of release or transfer, as with ammonium sulfate (solution), which was primarily discharged to underground injection wells (61 percent) and transferred to public sewage (27 percent). Another example is carbon disulfide, almost all of which was emitted to air (99.6 percent). (See Figure 3-1 and Table 3-11.)

The environmental distribution of the TRI chemicals with the largest total releases and transfers can be reflected within overall TRI totals. For example, hydrochloric acid was predominantly discharged to underground injection wells (61 percent) and transferred offsite (20 percent). Because hydrochloric acid was the number two TRI chemical in 1989 for overall releases and transfers, it figured prominently in TRI totals for these two modes of release, accounting for 26 percent of all TRI underground injection and for 11 percent of all TRI off-site transfers. (See Tables 3-11 and 3-12.)

Table 3-11. Environmental Distribution of the 25 Chemicals with the Largest TRI Releases and Transfers, 1989.

TRI RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	SURFACE WATER Percent	LAND Percent	UNDER-GROUND Percent	PUBLIC SEWAGE Percent	OFF-SITE Percent	TOTAL Percent
1	Ammonium sulfate (solution)	750,649,064	0.11	9.14	2.04	61.45	26.81	0.45	100.00
2	Hydrochloric acid	495,609,047	12.26	0.62	0.86	60.69	5.69	19.89	100.00
3	Methanol	408,119,093	48.94	4.18	1.90	5.68	26.71	12.58	100.00
4	Ammonia	377,248,848	64.81	6.44	2.00	17.29	7.63	1.84	100.00
5	Toluene	322,521,176	79.20	0.05	0.12	0.19	0.96	19.47	100.00
6	Sulfuric acid	318,395,014	7.62	6.37	1.48	46.98	13.47	24.08	100.00
7	Acetone	255,502,080	77.97	0.40	0.10	1.77	5.18	14.58	100.00
8	Xylene (mixed isomers)	185,442,035	79.53	0.10	0.25	0.04	2.08	18.00	100.00
9	1,1,1-Trichloroethane	185,026,191	91.13	0.01	0.04	0.00	0.13	8.69	100.00
10	Zinc compounds	164,799,357	2.84	0.53	59.87	0.09	1.23	35.43	100.00
11	Methyl ethyl ketone	156,992,642	81.30	0.04	0.10	0.13	0.49	17.94	100.00
12	Chlorine	141,428,470	93.58	1.70	0.21	0.33	1.99	2.20	100.00
13	Dichloromethane	130,355,581	83.83	0.17	0.01	0.57	1.14	14.28	100.00
14	Manganese compounds	119,825,790	1.42	0.69	70.92	0.84	5.48	20.66	100.00
15	Carbon disulfide	100,150,670	99.64	0.03	0.00	0.02	0.13	0.17	100.00
16	Phosphoric acid	98,660,456	1.82	27.54	50.74	0.09	11.74	8.06	100.00
17	Nitric acid	74,861,200	7.03	1.06	0.66	41.43	18.51	31.30	100.00
18	Ammonium nitrate (solution)	73,313,949	4.71	12.08	10.33	61.02	9.68	2.18	100.00
19	Freon 113	67,837,298	93.21	0.02	0.04	0.00	0.10	6.62	100.00
20	Glycol ethers	65,736,857	72.49	0.23	0.22	0.56	13.17	13.34	100.00
21	Ethylene glycol	57,792,359	22.27	6.48	1.48	14.84	28.68	26.24	100.00
22	Zinc (fume or dust)	57,487,663	6.06	0.23	34.68	0.00	0.23	58.80	100.00
23	Copper compounds	54,465,732	6.95	0.26	74.81	0.31	0.68	17.00	100.00
24	Chromium compounds	50,881,050	2.55	0.94	60.96	0.12	1.93	33.51	100.00
25	n-Butyl alcohol	50,095,319	73.03	1.84	0.22	2.82	11.58	10.52	100.00
	SUBTOTAL	4,763,196,941	41.06	3.81	7.89	22.97	10.69	13.57	100.00
	TOTAL FOR ALL OTHERS	942,473,439	50.02	0.79	7.31	9.18	4.42	28.29	100.00
	GRAND TOTAL	5,705,670,380	42.54	3.31	7.79	20.70	9.66	16.00	100.00

Table 3-12. The Top Five Chemicals with the Largest TRI Amounts for Each Type of Release and Transfer, 1989.

TRI RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
Air			
5	Toluene	255,437,878	10.52
4	Ammonia	244,505,074	10.07
3	Methanol	199,729,091	8.23
7	Acetone	199,209,247	8.21
9	1,1,1-Trichloroethane	168,617,910	6.95
	SUBTOTAL	1,067,499,200	43.98
	TOTAL FOR ALL OTHERS	1,359,562,706	56.02
	TOTAL	2,427,061,906	100.00
Surface Water			
1	Ammonium sulfate (solution)	68,588,044	36.30
16	Phosphoric acid	27,166,278	14.38
4	Ammonia	24,278,102	12.85
6	Sulfuric acid	20,296,873	10.74
3	Methanol	17,058,674	9.03
	SUBTOTAL	157,387,971	83.29
	TOTAL FOR ALL OTHERS	31,565,913	16.71
	TOTAL	188,953,884	100.00
Land Releases			
10	Zinc compounds	98,670,391	22.19
14	Manganese compounds	84,979,282	19.11
16	Phosphoric acid	50,063,162	11.26
23	Copper compounds	40,746,031	9.16
24	Chromium compounds	31,015,338	6.97
	SUBTOTAL	305,474,204	68.69
	TOTAL FOR ALL OTHERS	139,262,346	31.31
	TOTAL	444,736,550	100.00
Underground Injection			
1	Ammonium sulfate (solution)	461,238,592	39.06
2	Hydrochloric acid	300,798,693	25.47
6	Sulfuric acid	149,583,139	12.67
4	Ammonia	65,209,385	5.52
18	Ammonium nitrate (solution)	44,738,000	3.79
	SUBTOTAL	1,021,567,809	86.51
	TOTAL FOR ALL OTHERS	159,263,372	13.49
	TOTAL	1,180,831,181	100.00
Public Sewage			
1	Ammonium sulfate (solution)	201,258,790	36.52
3	Methanol	109,011,890	19.78
6	Sulfuric acid	42,874,496	7.78
4	Ammonia	28,777,748	5.22
2	Hydrochloric acid	28,180,243	5.11
	SUBTOTAL	410,103,167	74.42
	TOTAL FOR ALL OTHERS	140,931,529	25.58
	TOTAL	551,034,696	100.00
Off-site Transfers			
2	Hydrochloric acid	98,579,539	10.80
6	Sulfuric acid	76,658,766	8.40
5	Toluene	62,789,885	6.88
10	Zinc compounds	58,396,436	6.40
3	Methanol	51,361,695	5.63
	SUBTOTAL	347,786,321	38.09
	TOTAL FOR ALL OTHERS	565,265,842	61.91
	TOTAL	913,052,163	100.00

Almost three-quarters (72 percent) of hydrochloric acid's total releases and transfers were accounted for by the ten TRI facilities releasing it in the largest volumes, indicating that hydrochloric acid may also figure heavily in the geographic totals for the states where these top facilities are located. This is apparent in the case of the top two facilities releasing this chemical, Vulcan Chemicals and Atochem N.A.--Racon facility, both located in Wichita, Kansas. Combined, these two facilities represented over one-fourth (26 percent) of the total TRI releases and transfers of hydrochloric acid in 1989. They contributed almost exclusively to making hydrochloric acid the number one TRI chemical for the state of Kansas, accounting for 99.9 percent of the state's hydrochloric acid total. (See Appendix G, Table G-1; and Appendix H, Table H-1.) The mode of release or transfer employed by these two facilities affected the distribution totals for the state of Kansas: the state ranked third in TRI for total underground injection, and fifth for total off-site transfers, reflecting the two principal modes of release of hydrochloric acid. (See Table 3-13.)

Table 3-13. The Ten States with the Largest TRI Amounts of Each Type of Release or Transfer, 1989.

AIR				SURFACE WATER				LAND			
TRI Rank	State	Releases and Transfers Pounds	Percent	TRI Rank	State	Releases and Transfers Pounds	Percent	TRI Rank	State	Releases and Transfers Pounds	Percent
1	Texas	179,835,644	7.41	2	Louisiana	46,176,116	24.44	5	Indiana	50,535,962	11.36
4	Tennessee	152,493,721	6.28	6	Illinois	16,749,906	8.86	9	Florida	38,982,675	8.77
3	Ohio	133,123,376	5.48	30	Washington	15,563,117	8.24	33	Montana	36,448,109	8.20
13	Utah	130,030,848	5.36	16	Virginia	11,098,016	5.87	29	Arizona	32,321,380	7.27
2	Louisiana	125,753,121	5.18	11	California	10,664,607	5.64	34	New Mexico	31,011,069	6.97
5	Indiana	112,989,667	4.66	25	Arkansas	9,087,408	4.81	3	Ohio	30,356,849	6.83
14	Alabama	103,600,370	4.27	14	Alabama	7,479,987	3.96	12	Missouri	27,548,952	6.19
6	Illinois	94,550,683	3.90	9	Florida	6,603,113	3.49	15	North Carolina	25,781,211	5.80
7	Michigan	91,443,144	3.77	3	Ohio	6,093,263	3.22	7	Michigan	23,435,499	5.27
15	North Carolina	89,617,877	3.69	1	Texas	6,057,544	3.21	1	Texas	21,285,930	4.79
	SUBTOTAL	1,213,438,451	50.00		SUBTOTAL	135,573,077	71.75		SUBTOTAL	317,707,636	71.44
	TOTAL	2,427,061,906	100.00		TOTAL	188,953,884	100.00		TOTAL	444,736,550	100.00

UNDERGROUND				PUBLIC SEWAGE				OFF-SITE			
TRI Rank	State	Releases and Transfers Pounds	Percent	TRI Rank	State	Releases and Transfers Pounds	Percent	TRI Rank	State	Releases and Transfers Pounds	Percent
1	Texas	464,048,094	39.30	12	Missouri	76,552,047	13.89	3	Ohio	101,726,593	11.14
2	Louisiana	285,933,028	24.21	18	New Jersey	61,234,010	11.11	1	Texas	85,304,289	9.34
10	Kansas	91,610,915	7.76	6	Illinois	58,494,457	10.62	7	Michigan	84,093,091	9.21
3	Ohio	59,024,950	5.00	11	California	46,990,077	8.53	8	Pennsylvania	77,462,655	8.48
9	Florida	55,865,018	4.73	1	Texas	36,278,806	6.58	10	Kansas	60,146,816	6.59
4	Tennessee	54,996,660	4.66	16	Virginia	34,703,601	6.30	6	Illinois	56,868,758	6.23
19	Mississippi	43,303,000	3.67	3	Ohio	28,352,514	5.15	22	Wisconsin	38,377,567	4.20
21	Kentucky	39,000,000	3.30	4	Tennessee	21,095,980	3.83	5	Indiana	37,787,841	4.14
5	Indiana	32,703,116	2.77	22	Wisconsin	16,962,170	3.08	18	New Jersey	28,841,231	3.16
41	Wyoming	14,125,832	1.20	8	Pennsylvania	16,422,194	2.98	17	New York	26,323,155	2.88
	SUBTOTAL	1,140,610,613	96.59		SUBTOTAL	397,085,856	72.06		SUBTOTAL	596,931,996	65.38
	TOTAL	1,180,831,181	100.00		TOTAL	551,034,696	100.00		TOTAL	913,052,163	100.00

Chemical Classes

In this report, TRI chemicals and categories have been grouped into the following five classes, based on certain common characteristics:

- non-halogenated organics;
- mineral acids/salts;[3]
- metals and metal compounds;
- halogenated organics; and
- non-metallic inorganics.[4]

These chemical classes illuminate general patterns in the TRI data which would be difficult to discern in the analysis of over 300 individual TRI chemicals and chemical categories. Appendix B identifies the class of each TRI chemical.

Mixtures and trade secrets are treated separately because they cannot be combined with the other TRI chemicals in any other fashion. Under TRI requirements, facilities report chemicals as mixtures if they used mixtures or trade name products (such as a commercially available cleaning solvent) known to contain TRI chemicals, but could not identify the exact chemical contained in the mixture.[5] Therefore, the release and transfer amounts of chemicals in mixtures cannot be added to their appropriate chemical classes. Facilities claiming trade secrets are required to provide generic names for trade secret chemicals, but these names do not necessarily give sufficient information about chemical structure to allow classification.

Non-halogenated organics made up 37% of TRI releases and transfers in 1989 . . .

Non-halogenated organics accounted for the largest percentage (37 percent) of total releases and transfers in 1989, followed by mineral acids/salts (32 percent). Metals and metal compounds, halogenated organics, and non-metallic inorganics made up comparable percentages of the TRI total, accounting for 11, 10, and 10 percent, respectively. Mixtures and trade secret chemicals together made up less than 0.2 percent of the TRI releases and transfers. The five chemicals with the largest releases and transfers for each chemical class are presented in Table 3-14. For each chemical class, the top five chemicals represented over 60 percent of the TRI class total, with overall patterns similar to those of 1988. (See Figure 3-5.)

The top mixtures are presented in Table 3-15. Together, two mixtures accounted for over one-half of total TRI releases and transfers of mixtures.

The environmental distribution of each chemical class varied from the pattern seen for overall TRI releases and transfers. Many non-halogenated organic, halogenated organic, and non-metallic inorganic chemicals evaporate readily, making air emissions their most common form of release. Air emissions accounted for 68 percent, 84

Table 3-14. The Five Chemicals with the Largest TRI Total Releases and Transfers for Each Chemical Class, 1989.

TRI RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS		
		Pounds	Percent of Class Total	Percent of Grand Total
	ORGANICS (NON-HALOGENATED)			
3	Methanol	408,119,093	19.47	
5	Toluene	322,521,176	15.38	
7	Acetone	255,502,080	12.19	
8	Xylene (mixed isomers)	185,442,035	8.84	
11	Methyl ethyl ketone	156,992,642	7.49	
	SUBTOTAL	1,328,577,026	63.37	
	TOTAL FOR ALL OTHERS	768,091,656	36.63	
	TOTAL FOR CLASS	2,096,668,682		36.75
	MINERAL ACIDS/SALTS			
1	Ammonium sulfate (solution)	750,649,064	40.82	
2	Hydrochloric acid	495,609,047	26.95	
6	Sulfuric acid	318,395,014	17.31	
16	Phosphoric acid	98,660,456	5.37	
17	Nitric acid	74,861,200	4.07	
	SUBTOTAL	1,738,174,781	94.52	
	TOTAL FOR ALL OTHERS	100,745,476	5.48	
	TOTAL FOR CLASS	1,838,920,257		32.23
	METALS AND METAL COMPOUNDS			
10	Zinc compounds	164,799,357	25.25	
14	Manganese compounds	119,825,790	18.36	
22	Zinc (fume or dust)	57,487,663	8.81	
23	Copper compounds	54,465,732	8.35	
24	Chromium compounds	50,881,050	7.80	
	SUBTOTAL	447,459,592	68.57	
	TOTAL FOR ALL OTHERS	205,083,290	31.43	
	TOTAL FOR CLASS	652,542,882		11.44
	HALO-ORGANICS			
9	1,1,1-Trichloroethane	185,026,191	32.96	
13	Dichloromethane	130,355,581	23.22	
19	Freon 113	67,837,298	12.08	
26	Trichloroethylene	48,976,806	8.73	
32	Tetrachloroethylene	30,058,581	5.35	
	SUBTOTAL	462,254,457	82.35	
	TOTAL FOR ALL OTHERS	99,080,439	17.65	
	TOTAL FOR CLASS	561,334,896		9.84
	NON-METALLIC COMPOUNDS			
4	Ammonia	377,248,848	69.10	
12	Chlorine	141,428,470	25.91	
56	Asbestos (friable)	8,944,353	1.64	
62	Arsenic compounds	7,046,988	1.29	
64	Chlorine dioxide	6,995,636	1.28	
	SUBTOTAL	541,664,295	99.22	
	TOTAL FOR ALL OTHERS	4,284,472	0.78	
	TOTAL FOR CLASS	545,948,767		9.57
52	MIXTURES	9,978,418		0.17
157	TRADE SECRETS	276,478		0.00
	GRAND TOTAL	5,705,670,380		100.00

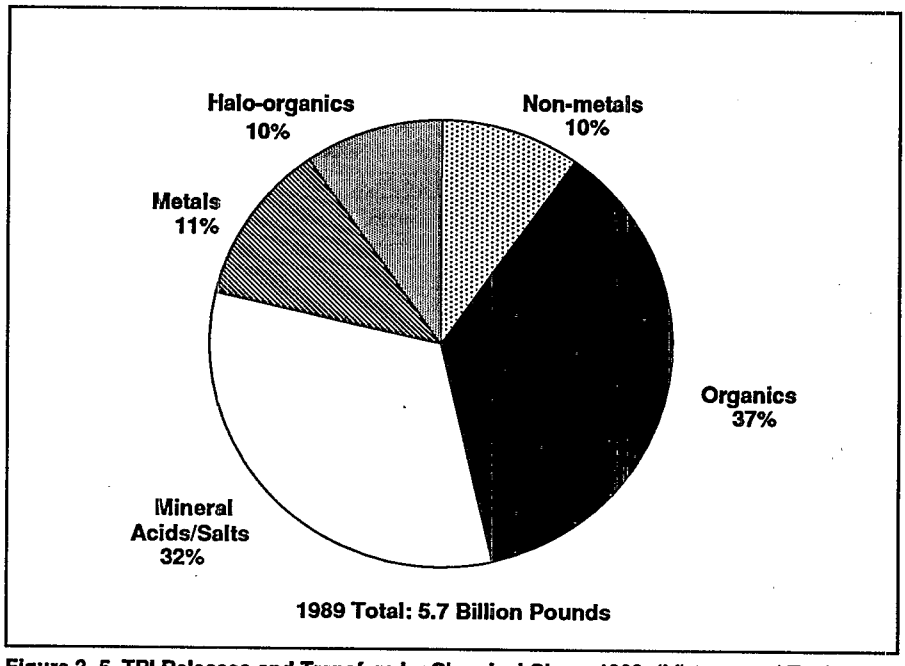


Figure 3–5. TRI Releases and Transfers by Chemical Class, 1989. (Mixtures and Trade Secrets together accounted for < 0.2 percent of the TRI total.)

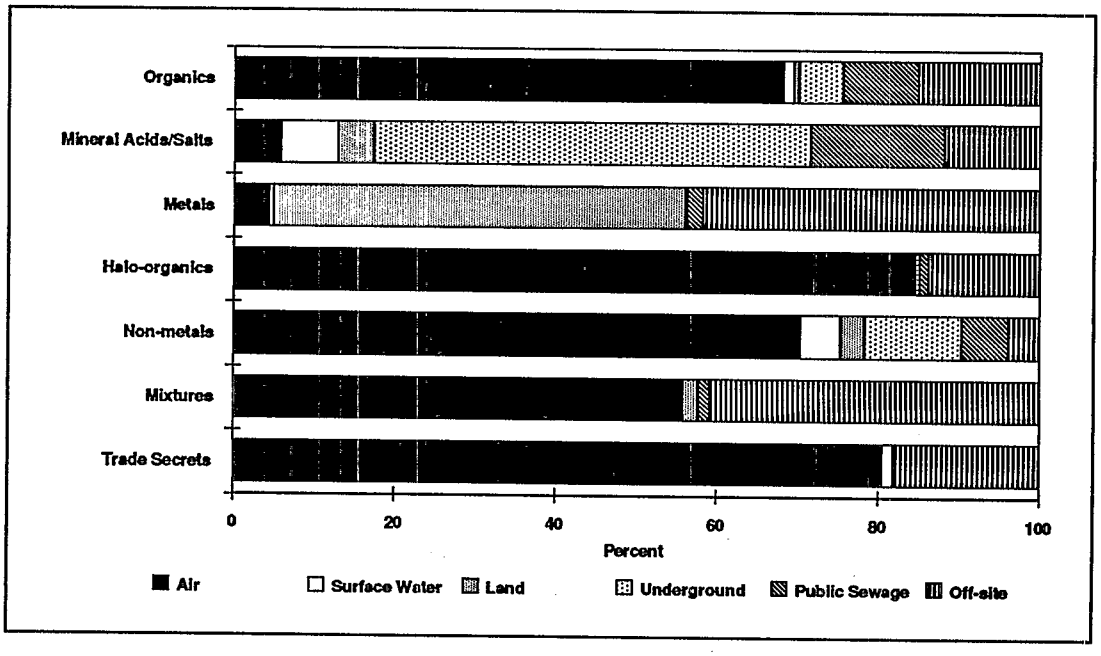


Figure 3–6. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1989.

Table 3-15. The 25 Mixture and Trade Name Products with the Largest Releases and Transfers, 1989.

NAME OF MIXTURE	TRI FORMS Number	TOTAL RELEASES AND TRANSFERS Pounds	Percent
Nonchlorinated Solvents in Waste Fuel	2	2,865,500	28.72
Aromatic Hydrocarbon Mixture	1	2,522,023	25.27
Solvent Blend-5892	1	864,039	8.66
Kemvar Topcoat Varnish	1	758,300	7.60
Solvaset Ypn4-02D - 67.11% 1,1,1 Trichloroethane	1	431,500	4.32
Max Etch 20 Replenisher, 30% Ammonium Hydroxide, 12% Amm. Carbonate	1	401,650	4.03
Polyester Resin	4	398,384	3.99
Troco API Thread Compound	1	264,960	2.66
Acme Flow Resins - 40% Methylenebis	1	189,100	1.90
1-1-1 Trichloroethane Adhesives	1	136,418	1.37
Alkanolamines	5	115,200	1.15
Refractory Material - 10-15% Aluminum Oxide	1	78,131	0.78
Chlorinated Solvents in Waste Fuel	2	76,770	0.77
Hazardous Waste Solid Nos U159 Na 9189 Methyl Ethyl Letonein Soil	1	62,416	0.63
Resin Solution	1	57,344	0.57
Unsaturated Polyester Resin/Styrene Suppressed	1	55,374	0.55
High Solids Spray Coating	1	54,150	0.54
Phenolic Resin Powder	1	53,600	0.54
Waste Paint Residue Solid N.O.S.	1	50,000	0.50
Maintance 4000 Ep	1	48,040	0.48
Acme-Flow 2010A Resin - 9.99% Bis	1	40,500	0.41
Genesolv Dms Solvent	1	38,000	0.38
Autofroth Foam	2	36,000	0.36
Phenol-Formaldehyde Resen in Water Solution	1	35,332	0.35
Heavy Aromatic Naphtha (Contains Naphthalene)	2	30,540	0.31
SUBTOTAL	36	9,663,271	96.84
TOTAL FOR ALL OTHERS	72	315,147	3.16
TOTAL	108	9,978,418	100.00

percent, and 70 percent, respectively, of total TRI releases and transfers of the non-halogenated organic, halogenated organic, and non-metallic inorganic chemical classes. The majority (54 percent) of mineral acids/salts were discharged to underground injection wells. Metals and metal compounds were primarily released to land on-site (51 percent) or transferred to off-site facilities (42 percent), where they are often eventually disposed of to the land. A total of 56 percent of mixtures was emitted to air, with 41 percent transferred off site. All classes were discharged to surface water to some degree, but mineral acids/salts were the principal class contributing to TRI totals for such discharges. (See Figure 3-6.)

Of the top five chemicals released to surface water, three (ammonium sulfate solution, phosphoric acid, and sulfuric acid[6]) fell into the mineral acids/salts class, together accounting for 61 percent of all releases to surface water in 1989. (See Table 3-12.) The top four facilities for releases to surface water were Arcadian Corporation (Geismar, Louisiana); 3M (Cordova, Illinois); Freeport McMoran,

Agrico Chemical Division (Uncle Sam, Louisiana), and Allied Signal (Hopewell, Virginia). (See Appendix F, Table F-2.) Over 90 percent of each of their total surface water discharges were comprised of mineral acids/salts.

Health and Environmental Effects of TRI Chemicals

Many factors influence the potential health and environmental effects of TRI releases and transfers.

Because the effects associated with TRI chemicals vary widely, an awareness of the chemical composition of individual releases and transfers is necessary to interpret potential health and environmental significance. For example, chronic exposure (long-term) to benzene is known to cause leukemia in humans, whereas Freon 113 is of more concern due to its potential to deplete stratospheric ozone. Similarly, the potencies of TRI chemicals vary considerably: some are toxic at relatively low concentrations, while larger amounts of other chemicals are of comparable toxicity. (See Boxes 3-B and 3-E.)

Most data compiled in this report present various aggregations of releases and transfers, broken down by chemical, by industry, by geography, or by their form of release or transfer to the environment. None of these data aggregates, however, directly reveal the health and environmental impacts of such releases and transfers. The health and environmental impacts of TRI releases and transfers depend on, among other factors, the types of potential toxicity effects associated with each individual chemical.

Numerous other factors influence the nature and extent to which any TRI release or transfer may cause health or environmental harm; among them are the following:

- the nature and degree of toxicity of each chemical;
- the route(s) of the release;
- duration of the release;
- the route(s) of exposure;
- the persistence, bioconcentration, transport, and nature of the environmental degradation of the chemical; and
- various local factors, such as human and wildlife population patterns, atmospheric and climatic conditions, patterns of drinking water use, and sources of food supply.

As a result of these and other factors, a few pounds of a highly toxic chemical released to the environment may be of far greater concern than a greater quantity of a less toxic chemical.

Such complex factors are beyond the scope of this National Report. However, EPA has developed a two-volume book, *Toxic Chemical Release Inventory Risk Screening Guide*, to assist state and local officials and others in screening for potential risks posed by TRI releases at particular locales.[7] The guide sets forth a qualitative screening process designed to help set "priorities for follow-up activities and to determine the data that would be most useful for such evaluations." Follow-up work could include collecting data to be used for performing a rigorous quantitative risk assessment in order to determine the actual risk posed to humans and other environmental organisms.

BOX 3-E. TOXICITY INDICES FOR SCREENING THE RISKS OF TRI RELEASES

EPA has generated many different toxicity lists under various environmental laws, including the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Emergency Planning and Community Right-to-Know Act. Each law requires EPA to consider different types of toxic effects in different parts of the environment (air, water, and land) and, thus, the resulting lists often differ from each other. The different toxicity indices used in these lists are summarized below.

Reportable Quantities (RQs)
This list defines the minimum threshold (pounds) of a chemical release which, when equaled or exceeded, requires reporting under Superfund requirements. RQs are determined for each chemical depending on the type of exposure and effects of concern for releases, including the following effects: Human Health and Terrestrial Toxicity (Acute Toxicity, Chronic Toxicity, and Carcinogenic Potential), and Aquatic Toxicity (Acute and Chronic).

Threshold Planning Quantities (TPQs)
This list applies to extremely hazardous substances that may pose a danger in the event of a chemical accident. The list defines threshold planning quantities--the amounts of each of the 360 Extremely Hazardous Substances (listed under Title III Section 302 of the Emergency Planning and Community Right-to-Know Act) that, if present at the facility, trigger requirements to develop plans to avoid and respond to potential chemical accidents. TPQs are based on acute toxicity as well as the tendency of a chemical to become airborne. Therefore, if a chemical was ranked relatively high based upon its acute toxicity, but had little tendency to become airborne and disperse in the environment, it would be assigned a lower TPQ ranking.

Reference Doses (RfDs)
Reference doses (RfDs) represent a threshold dose for non-carcinogenic effects below which no adverse effect is expected to occur. They are estimates of a daily exposure to a substance, over a lifetime, that is unlikely to result in harm. RfDs are meant to protect sensitive subpopulations as well as the average population. RfDs are estimated for different types of exposures: Inhalation Exposure and Oral Exposure.

Ambient Water Quality Criteria (AWQC)
Ambient Water Quality Criteria (AWQC) are estimates of concentrations of chemicals in surface waters (fresh or salt) that are not expected to harm the most sensitive aquatic organisms. AWQC may be set depending on the length of exposure, ranked for Acute Toxicity and Chronic Toxicity.

There is no universally accepted "ranking" of chemicals from most toxic to least toxic. In fact, there are many different lists of toxic chemicals developed by different organizations and used for a wide range of purposes. EPA, Congress, and the scientific community have created a variety of lists focusing on chemicals with shared attributes due to physical and chemical characteristics or because of similar toxicity concerns. Lists focusing upon particular issues support coordinated regulatory efforts.

BOX 3-F. THE TRI LIST OF TOXIC CHEMICALS

What is a toxic chemical? The question is difficult to answer, because toxic effects depend not only on the intrinsic properties of a chemical, but also on the conditions in which people or the environment are exposed to it. Chemicals vary greatly in their physical make-up, in the ways that they travel through the environment, in the potential routes and levels of exposure, and in their fate in the environment or in biological systems. Furthermore, the issue of which signs or symptoms are considered as toxic effects depends considerably on one's perspective: is drowsiness a toxic effect? Or is toxicity defined by irreversibility?

Congress created the TRI list by combining chemical lists previously developed for similar reporting laws in New Jersey and Maryland. These states had based their respective lists partly on toxicity information, but also on considerations of the amount produced or used in the state, the regulatory status, the presence in the environment, and professional judgment about potential hazards. Thus, the TRI list covers a spectrum of toxicity concerns, including acute and chronic effects.

Under the Emergency Planning and Community Right-to-Know Act (EPCRA), EPA is authorized to make additions to the TRI list if any of the following criteria are met:

- The chemical is expected to cause significant adverse acute human health effects at concentration levels reasonably likely to exist beyond facility site boundaries as a result of releases. Acute effects occur rapidly as a result of short-term exposure usually to high concentrations of a chemical.
- The chemical is expected to cause human cancer, birth defects, nervous system effects, gene mutations that can be passed on to the next generation, or other chronic health effects--effects associated with repeated exposure to a chemical over a long period of time.
- The chemical is expected to cause significant and sufficiently serious adverse effects on the environment due to its toxicity, its toxicity and persistence (its tendency to remain in an unchanged form, rather than breaking down into smaller chemical parts), or its toxicity and tendency to bioaccumulate (to become increasingly concentrated in plant and animal tissues). However, Congress imposed a limit for chemicals with adverse environmental effects: no more than 25 percent of all TRI chemicals can be listed solely on the basis of such effects. Thus, the law is designed to emphasize potential harm to humans.

Conversely, if EPA finds that a chemical does not meet any of these criteria, the Agency can remove the chemical from the TRI list.

EPA has developed a number of indices related to the toxicity of various chemicals. Several of these indices, described in Box 3-E, are useful in risk screening. The basis for the EPCRA Section 313 list of toxic chemicals is detailed in Box 3-F.

TRI Carcinogens

Of the individual TRI chemicals, 123 are considered carcinogenic for purposes of this report, and 81 of these were reported by facilities as being released and transferred in 1989. (See Box 3-G and Appendix B.) Seven percent (411.5 million pounds) of TRI total releases and transfers were comprised of carcinogens. The 25 carcinogens with the largest releases and transfers accounted for 99 percent of the TRI carcinogenic total. (See Table 3-16.)

The top 25 TRI carcinogens made up 99% of the total releases and transfers of all TRI carcinogens.

Table 3-16. The 25 Carcinogens with the Largest Releases and Transfers, 1989.

TRI RANK	CARCINOGEN RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS		
			Percent of Pounds	Percent of Carcinogens	Grand Total
13	1	Dichloromethane	130,355,581	31.68	2.28
28	2	Styrene	41,169,973	10.00	0.72
32	3	Tetrachloroethylene	30,058,581	7.30	0.53
33	4	Formaldehyde	30,042,348	7.30	0.53
35	5	Benzene	28,591,407	6.95	0.50
36	6	Chloroform	27,325,508	6.64	0.48
42	7	Lead	19,872,648	4.83	0.35
47	8	Chromium	13,403,332	3.26	0.23
50	9	Acrylonitrile	12,280,895	2.98	0.22
53	10	1,2-Dichloroethane	9,509,848	2.31	0.17
54	11	Nickel	9,493,108	2.31	0.17
56	12	Asbestos (friable)	8,944,353	2.17	0.16
59	13	Isopropyl alcohol (mfg.–strong acid process)	7,661,243	1.86	0.13
66	14	1,3-Butadiene	6,136,125	1.49	0.11
71	15	Acrylamide	4,625,675	1.12	0.08
72	16	Carbon tetrachloride	4,607,809	1.12	0.08
76	17	Polychlorinated biphenyls (PCBs)	4,233,611	1.03	0.07
82	18	Di-(2-ethylhexyl) phthalate	3,708,811	0.90	0.07
83	19	Ethylene oxide	3,447,067	0.84	0.06
93	20	Propylene oxide	2,414,341	0.59	0.04
100	21	1,4-Dichlorobenzene	1,725,392	0.42	0.03
101	22	1,4-Dioxane	1,516,708	0.37	0.03
102	23	Epichlorohydrin	1,487,562	0.36	0.03
104	24	Hexachlorobenzene	1,458,420	0.35	0.03
106	25	Vinyl chloride	1,363,697	0.33	0.02
		SUBTOTAL FOR CARCINOGENS	405,434,043	98.52	7.11
		TOTAL FOR CARCINOGENS	411,505,400	100.00	7.21
		TOTAL FOR ALL OTHER TRI CHEMICALS	5,294,164,980	92.79	
		GRAND TOTAL	5,705,670,380	100.00	

BOX 3-G. CLARIFICATION OF THE BASIS FOR CARCINOGEN LISTINGS

The Section 313 reporting requirements contain a "*de minimus*" limitation, defining reportable concentrations of TRI chemicals in mixtures. When the rule was developed, EPA adopted the *de minimus* percentages from the Occupational Safety and Health Administration's (OSHA) hazard communications standards (29 CFR 1910.1200), because much of the information that an industry would possess concerning mixtures would most likely be from the Material Safety Data Sheet (MSDS) on that mixture (the Hazard Communication Standard under OSHA requires the preparation and distribution of MSDSs). The OSHA *de minimus* limitation is 0.1 percent if the chemical is a carcinogen or suspect carcinogen, by virtue of appearing in one of three sources:

(1)National Toxicology Program (NTP), "Annual Report on Carcinogens" (latest edition);

(2)International Agency for Research on Cancer (IARC), "Monographs" (latest editions); or,

(3)29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

The *de minimus* limitation is 1.0 percent for chemicals that do not meet the above OSHA criteria.

The carcinogen designations in this report refer to any chemical that EPA determined met the above OSHA criteria for the 0.1 percent *de minimus* limitation.

The following chart lists the top 25 carcinogens for TRI releases and transfers in 1989, and indicates which OSHA source criteria each chemical met.

Chemical	NTP(a)	IARC(b)	OSHA(c)
Acrylamide	---	2B	----
Acrylonitrile	P	2A	Z
Asbestos(friable)	P	1	----
Benzene	P	1	----
1,3-Butadiene	P	2B	----
Carbon tetrachloride	P	2B	----
Chloroform	P	2B	----
Chromium(VI)	P	1	----
1,4-Dichlorobenzene	P	2B	----
1,2-Dichloroethane	--	2B	----
Dichloromethane	P	2B	----
Di-(2-ethylhexyl) phthalate	P	2B	----
1,4-Dioxane	P	2B	----
Epichlorohydrin	--	2B	----
Ethylene oxide	P	2A	Z
Formaldehyde	P	2A	----
Hexachlorobenzene	P	2B	----

Isopropyl alcohol (manufacturing--strong acid process)	P	1	----
Lead	---	2B	Z
Nickel	P	1	----
Polychlorinated biphenyls	P	2A	----
Propylene oxide	P	2A	----
Styrene	---	2B	----
Tetrachloroethylene	P	2B	----
Vinyl chloride	P	1	Z

(a) National Toxicology Program (NTP) Bioassay Results: P = Positive
(b) International Agency for Research on Cancer (IARC) Classification: 1 - The agent is carcinogenic to humans; 2A - The agent is probably carcinogenic to humans; 2B - The agent is possibly carcinogenic to humans.
(c) OSHA List of Hazardous Substances (29 CFR 1910 Subpart Z).

Dichloromethane accounted for about 1/3 of releases and transfers of all TRI carcinogens.

Dichloromethane dominated releases and transfers of carcinogens, accounting for 32 percent (130.4 million pounds) of the TRI carcinogenic total. (See Table 3-16.) Dichloromethane was the only carcinogen that was also in the top 25 TRI chemicals with the largest releases and transfers. (See Table 3-1.) Styrene, ranked number two for TRI carcinogenic releases and transfers, accounted for 10 percent (41.2 million pounds) of total TRI releases and transfers of these chemicals. Other top carcinogens were tetrachloroethylene (30.1 million pounds), formaldehyde (30 million pounds), and benzene (28.6 million pounds). (See Chapter 6 for further discussion of dichloromethane, tetrachloroethylene, and benzene.)

The top 50 facilities for carcinogenic releases and transfers accounted for 109.0 million pounds, or 26 percent, of the carcinogenic total. The Du Pont Towanda Plant in Towanda, Pennsylvania, ranked as the number one facility, with 9.8 million pounds of releases and transfers of carcinogens (2 percent of the carcinogenic total). Eastman Kodak in Rochester, New York, ranked second with 7.4 million pounds. Other top facilities included the Upjohn Company (Kalamazoo, Michigan), GE Plastics (Mount Vernon, Indiana), and BP Chemicals (Port Lavaca, Texas). (See Table 3-17.)

Du Pont Towanda and Eastman Kodak in Rochester, New York, both facilities in the Measuring/Photographic industry (SIC 38) (Measuring, Analyzing, and Controlling Instuments; Photographic, Medical and Optical Goods; Watches and Clocks), are ranked first and second, respectively, for total TRI releases and transfers of dichloromethane. In fact, 100 percent of Du Pont's carcinogenic releases and transfers, and 96 percent of Eastman Kodak's, were accounted for by dichloromethane. This chemical is the highest-volume TRI carcinogen, with these two facilities representing 13 percent of its total TRI releases and transfers. While more than these two facilities contributed substantially to releases and transfers of dichloromethane, the totals for some TRI carcinogens were deeply influenced by a single source. Over three-quarters (77 percent) of the TRI releases of the carcinogen hexachlorobenzene, for example, were accounted for by one facility, Fermenta Asc. of Houston, Texas. (See Appendix G, Table G-2.)

Table 3-17. The Top 50 TRI Facilities for TRI Total Carcinogenic Releases and Transfers, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL TRI CARCINOGENIC RELEASES AND TRANSFERS	
					Pounds	Percent
1	38	Du Pont Towanda Plant	Towanda	PA	9,758,732	2.37
2	38	Eastman Kodak Co.	Rochester	NY	7,372,980	1.79
3	28	The Upjohn Co.	Kalamazoo	MI	6,064,108	1.47
4	28	GE Plastics	Mount Vernon	IN	5,841,154	1.42
5	28	BP Chemicals	Port Lavaca	TX	3,736,322	0.91
6	37	General Motors Corp.	Monroe	LA	3,610,567	0.88
7	28	Celanese Engineering Resins	Bishop	TX	3,445,840	0.84
8	28	Angus Chemical Co.	Sterlington	LA	2,688,140	0.65
9	Mult	Abbott Chemicals Inc.	Barceloneta	PR	2,597,740	0.63
10	28	Eli Lilly & Co.	Clinton	IN	2,564,500	0.62
11	28	GE Chemicals Inc.	Washington	WV	2,501,305	0.61
12	28	Monsanto Co.	Alvin	TX	2,440,000	0.59
13	28	BP Chemicals Inc.	Lima	OH	2,433,950	0.59
14	33	Kennecott Utah Copper	Bingham Canyon	UT	2,352,850	0.57
15	38	Anitec Image Corp.	Binghamton	NY	2,345,128	0.57
16	28	Rohm & Haas DVI	Philadelphia	PA	2,158,988	0.52
17	28	Eli Lilly & Co.	Shadeland	IN	2,129,022	0.52
18	28	American Cyanamid Co.	Westwego	LA	1,879,100	0.46
19	Mult	Hickory Springs Manufacturing	Conover	NC	1,849,848	0.45
20	Mult	Shell Oil Co.	Deer Park	TX	1,724,252	0.42
21	33	Cyprus Miami Mining Corp.	Claypool	AZ	1,718,070	0.42
22	28	Monsanto Co.	Luling	LA	1,642,434	0.40
23	33	Wheeling-Pittsburgh Steel	Follansbee	WV	1,570,005	0.38
24	28	Sterling Chemicals Inc.	Texas City	TX	1,556,720	0.38
25	28	Monsanto Co.	Muscatine	IA	1,556,578	0.38
26	28	PPG Industries Inc.	Westlake	LA	1,543,617	0.38
27	Mult	Inland Steel Co.	East Chicago	IN	1,531,500	0.37
28	28	Hercules Inc.	Magna	UT	1,449,628	0.35
29	28	Monsanto Co.	Cahokia	IL	1,429,400	0.35
30	28	Ferro Corp.	Hammond	IN	1,422,950	0.35
31	26	Quin-T Corporation	Erie	PA	1,401,500	0.34
32	28	Fermenta Asc	Houston	TX	1,327,309	0.32
33	33	National Steel	Ecorse	MI	1,309,390	0.32
34	28	Mobay Corp.	Baytown	TX	1,301,322	0.32
35	None	PPM Inc.	Philadelphia	PA	1,264,900	0.31
36	28	Norden Laboratories	Lincoln	NE	1,254,500	0.30
37	28	Merck & Co. Inc.	Albany	GA	1,236,550	0.30
38	33	Johnstown Corp.	Johnstown	PA	1,232,010	0.30
39	33	USS Clairton Works	Clairton	PA	1,220,319	0.30
40	37	Friction Inc.	Irvine	CA	1,212,250	0.29
41	28	Ameripol Synpol Co.	Port Neches	TX	1,203,006	0.29
42	28	GE Plastics	Ottawa	IL	1,202,000	0.29
43	39	Lamotite	Cleveland	OH	1,147,496	0.28
44	28	American Cyanamid Co.	Kalamazoo	MI	1,145,903	0.28
45	33	GNB Inc.	Frisco	TX	1,143,022	0.28
46	29	Coastal Refining & Marketing	Corpus Christi	TX	1,118,420	0.27
47	28	Du Pont Beaumont Works	Beaumont	TX	1,111,292	0.27
48	33	Armco Steel Co. L.P.	Middletown	OH	1,089,500	0.26
49	28	Dow Chemical Co.	Plaquemine	LA	1,086,265	0.26
50	33	GNB Inc.	Vernon	CA	1,061,575	0.26
		SUBTOTAL			108,983,957	26.48
		TOTAL FOR ALL OTHER CARCINOGENS			302,521,443	73.52
		TOTAL FOR ALL CARCINOGENS			411,505,400	100.00

Almost 2/3 of the releases and transfers of TRI carcinogens went to air.

The majority of carcinogenic releases (266.6 million pounds or 65 percent) were emitted to air, followed by 22 percent transferred to off-site facilities. This is in contrast to the environmental distribution pattern exhibited by all other TRI releases and transfers, where only 43 percent of the total was emitted to air, 21 percent was released to underground injection wells, and 16 percent was transferred off site. Most TRI carcinogenic releases and transfers were of non-halogenated organic and halogenated organic chemicals, many of which are volatile and therefore often end up in the air. Non-halogenated organic and halogenated organic chemicals are more likely to be released to air than chemicals such as metals and metal compounds and mineral acids/salts, as demonstrated by the environmental distribution of TRI totals for each of these classes. (See Table 3-18 and Chapter 6 for further discussion of non-halogenated organic and halogenated organic chemicals.)

As noted in the discussion of the major TRI chemicals, individual chemicals are usually released or transferred in one or two predominant ways. This can also be the case with individual carcinogens. For example, 84 percent of dichloromethane was emitted to air and 14 percent was transferred off site. (See Table 3-18.) In the case of dichloromethane, it is notable that the Du Pont Towanda Plant emitted only 29 percent (2.8 million pounds) to air and transferred the majority (71 percent or 7.0 million pounds) off site, while Eastman Kodak emitted 99 percent of its dichloromethane releases to air.

GEOGRAPHY OF TRI RELEASES AND TRANSFERS

The Role of States in TRI Releases and Transfers

The top 10 states for TRI releases and transfers accounted for 56% of the 1989 TRI total.

Texas facilities reported the largest TRI total releases and transfers of any other state or other reporting jurisdiction in 1989, with releases and transfers of 792.8 million pounds, accounting for 14 percent of all TRI releases and transfers. Louisiana ranked second with 473.5 million pounds (8 percent of the TRI total). Together, the top ten states accounted for 56 percent of the national total. American Samoa had the smallest quantity of releases and transfers with only 27,750 pounds, and the District of Columbia reported no releases and transfers. (See Figure 3-3, Map 3-1, and Table 3-2.)

The state of California, which ranked 11th in total TRI releases and transfers, had the largest number of facilities (1,864) reporting to TRI. Alaska, with only six facilities reporting to TRI, had the largest average releases/transfers per facility (4.2 million pounds) and four other states and other reporting jurisdiction had averages greater than one million pounds: Louisiana, Montana, Utah, and the U.S. Virgin Islands. (See Table 3-2.) Except in Louisiana, the size of this average can be explained for each of these states by the fact that they had relatively few facilities.

In many states, one or two facilities dominated the state's total releases and transfers. In some cases, facilities were among the top 50 facilities for total TRI releases and transfers. In other cases, however, none of a state's facilities ranked in the top 50 TRI facilities, although they had a significant impact at the state and local levels. (See Table 3-10; and Appendix H, Table H-2.)

The number one facility for overall TRI releases and transfers in the country, the Monsanto Company in Alvin, Texas, accounted for 26 percent of Texas's total TRI releases and transfers. (See Table 3-10; and Appendix H, Table H-2.) The effect of this Monsanto facility upon TRI trends is discussed in detail in Box 3-D.

An example of a facility that significantly affected state, but not national, totals can be seen in the state of Maryland, which in 1989 was ranked as the 36th state for total TRI releases and transfers (29.3 million pounds). Not one of its facilities ranked in the top 50 for total TRI releases and transfers. The number one facility in the state, which belonged to the Westvaco Corporation in Luke, accounted for 7.9 million

Table 3-18. Environmental Distribution of the 25 Carcinogens with the Largest Releases and Transfers, 1989.

TRI RANK	CARC. RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	SURFACE WATER Percent	LAND Percent	UNDER-GROUND Percent
13	1	Dichloromethane	130,355,581	83.83	0.17	0.01	0.57
28	2	Styrene	41,169,973	80.89	0.12	0.48	0.00
32	3	Tetrachloroethylene	30,058,581	84.85	0.20	0.04	0.17
33	4	Formaldehyde	30,042,348	41.79	2.79	0.72	27.78
35	5	Benzene	28,591,407	86.33	0.59	0.40	2.34
36	6	Chloroform	27,325,508	88.81	4.17	0.26	0.24
42	7	Lead	19,872,648	4.34	0.16	29.27	0.00
47	8	Chromium	13,403,332	7.02	0.50	24.87	0.01
50	9	Acrylonitrile	12,280,895	35.70	0.03	0.04	47.15
53	10	1,2-Dichloroethane	9,509,848	43.22	2.34	0.01	11.01
54	11	Nickel	9,493,108	9.60	0.90	13.80	0.20
56	12	Asbestos (friable)	8,944,353	0.42	0.01	12.01	0.00
59	13	Isopropyl alcohol (mfg. strong acid process)	7,661,243	72.91	0.14	0.02	0.24
66	14	1,3-Butadiene	6,136,125	90.24	2.34	0.24	0.02
71	15	Acrylamide	4,625,675	0.54	0.16	0.02	95.79
72	16	Carbon tetrachloride	4,607,809	73.08	0.34	0.04	2.65
76	17	Polychlorinated biphenyls (PCBs)	4,233,611	0.00	0.01	0.02	0.00
82	18	Di-(2-ethylhexyl) phthalate	3,708,811	29.09	0.08	0.70	0.02
83	19	Ethylene oxide	3,447,067	87.67	0.10	1.09	0.47
93	20	Propylene oxide	2,414,341	74.31	0.34	0.19	11.18
100	21	1,4-Dichlorobenzene	1,725,392	91.99	0.38	0.01	0.01
101	22	1,4-Dioxane	1,516,708	51.42	16.25	2.22	0.00
102	23	Epichlorohydrin	1,487,562	31.47	0.29	0.17	13.26
104	24	Hexachlorobenzene	1,458,420	0.31	0.02	0.00	0.05
106	25	Vinyl chloride	1,363,697	93.05	0.22	0.29	0.03
		SUBTOTAL FOR CARCINOGENS	405,434,043	65.45	0.83	3.03	5.38
		TOTAL FOR CARCINOGENS	411,505,400	64.78	0.82	3.08	5.42
		TOTAL FOR ALL OTHER TRI CHEMICALS	5,294,164,980	40.81	3.51	8.16	21.88
		GRAND TOTAL	5,705,670,380	42.54	3.31	7.79	20.70

pounds (or 27 percent) of the state's total releases and transfers. Westvaco emitted 73 percent (5.8 million pounds) of its total releases and transfers to air and transferred the remaining 27 percent (2.1 million pounds) to public sewage. The facility's air releases accounted for one-third of all of Maryland's air releases, while its transfers to public sewage accounted for almost two-thirds of the state's discharges to POTWs. (See Tables 3-10 and 3-19; and Appendix H, Table H-2.)

Westvaco released and transferred 4.5 million pounds of methanol, with 2.5 million pounds to air and 2.1 million pounds to public sewage plants. Methanol accounted for over half of Westvaco's total releases and transfers. Westvaco was responsible for 87 percent of the state's methanol releases and transfers, making methanol the chemical in Maryland with the largest releases and transfers, totaling 5.2 million pounds. Westvaco's second-largest release was 1.0 million pounds of hydrochloric acid. Hydrochloric acid was the fifth-ranked chemical in Maryland, with Westvaco accounting for 48 percent of this total. (See Appendix H, Table H-1.)

Table 3-18. Continued.

CHEMICAL	PUBLIC SEWAGE Percent	OFF-SITE Percent	TOTAL Percent
Dichloromethane	1.14	14.28	15.41
Styrene	1.01	17.50	18.51
Tetrachloroethylene	1.65	13.10	14.75
Formaldehyde	19.90	7.02	26.91
Benzene	3.92	6.42	10.34
Chloroform	3.91	2.62	6.53
Lead	0.24	65.99	66.23
Chromium	2.36	65.24	67.60
Acrylonitrile	6.42	10.67	17.08
1,2-Dichloroethane	16.00	27.43	43.42
Nickel	1.96	73.54	75.50
Asbestos (friable)	0.46	87.10	87.57
Isopropyl alcohol (mfg.-- strong acid process)	7.95	18.74	26.68
1,3-Butadiene	0.47	6.68	7.15
Acrylamide	0.72	2.77	3.49
Carbon tetrachloride	0.08	23.82	23.90
Polychlorinated biphenyls (PCBs)	0.00	99.97	99.97
Di-(2-ethylhexyl) phthalate	6.11	64.00	70.12
Ethylene oxide	9.90	0.76	10.66
Propylene oxide	13.60	0.38	13.98
1,4-Dichlorobenzene	1.56	6.03	7.59
1,4-Dioxane	15.69	14.41	30.11
Epichlorohydrin	2.07	52.76	54.82
Hexachlorobenzene	0.00	99.61	99.61
Vinyl chloride	0.58	5.84	6.42
SUBTOTAL FOR CARCINOGENS	3.78	21.54	25.32
TOTAL FOR CARCINOGENS	3.78	22.12	25.89
TOTAL FOR ALL OTHER TRI CHEMICALS	10.11	15.53	25.64
GRAND TOTAL	9.66	16.00	25.66

Table 3-19. Environmental Distribution of the TRI Total Releases and Transfers of Each State, 1989.

TRI RANK	STATE	TOTAL RELEASES AND TRANSFERS	AIR	SURFACE WATER	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE	TOTAL
		Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent
14	Alabama	137,761,513	75.20	5.43	3.75	1.11	0.97	13.53	100.00
38	Alaska	24,986,799	78.20	21.73	0.04	0.00	0.00	0.02	100.00
53	American Samoa	27,750	100.00	0.00	0.00	0.00	0.00	0.00	100.00
29	Arizona	50,764,830	24.87	0.00	63.67	0.00	7.96	3.50	100.00
25	Arkansas	78,955,945	53.67	11.51	2.92	16.90	0.99	14.01	100.00
11	California	168,825,335	48.09	6.32	3.74	1.02	27.83	12.99	100.00
42	Colorado	16,357,496	60.75	0.75	5.47	0.01	4.08	28.94	100.00
32	Connecticut	42,963,065	48.57	10.99	0.79	0.00	5.30	34.35	100.00
45	Delaware	11,919,774	52.41	5.45	0.66	0.00	27.51	13.97	100.00
54	District of Columbia	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Florida	192,044,588	30.19	3.44	20.30	29.09	8.50	8.48	100.00
20	Georgia	117,888,623	63.40	4.90	2.37	0.01	7.97	21.36	100.00
47	Hawaii	3,402,365	20.13	0.28	6.21	35.17	37.84	0.36	100.00
43	Idaho	15,739,859	25.99	1.96	57.50	0.00	12.15	2.40	100.00
6	Illinois	247,813,608	38.15	6.76	4.21	4.32	23.60	22.95	100.00
5	Indiana	255,023,626	44.31	2.12	19.82	12.82	6.11	14.82	100.00
28	Iowa	55,143,195	76.11	2.20	0.28	0.00	12.75	8.67	100.00
10	Kansas	185,131,051	15.53	0.36	0.20	49.48	1.93	32.49	100.00
21	Kentucky	111,422,816	39.40	0.69	0.56	35.00	1.89	22.45	100.00
2	Louisiana	473,546,487	26.56	9.75	0.75	60.38	0.01	2.55	100.00
40	Maine	18,581,543	81.01	1.94	2.37	0.00	6.75	7.94	100.00
36	Maryland	29,251,518	61.11	7.73	6.65	0.00	11.16	13.35	100.00
27	Massachusetts	56,214,698	42.88	2.27	0.14	0.00	20.03	34.68	100.00
7	Michigan	220,137,364	41.54	0.30	10.65	2.52	6.79	38.20	100.00
24	Minnesota	81,932,154	74.94	1.72	0.10	0.00	5.94	17.30	100.00
19	Mississippi	120,617,983	49.84	2.62	7.09	35.90	0.93	3.63	100.00
12	Missouri	163,105,846	28.47	0.77	16.89	0.00	46.93	6.93	100.00
33	Montana	39,103,261	6.40	0.27	93.21	0.00	0.08	0.05	100.00
39	Nebraska	20,623,709	70.96	1.29	0.50	0.00	4.59	22.66	100.00
49	Nevada	3,295,677	20.79	0.03	69.32	0.00	0.44	9.41	100.00
44	New Hampshire	14,392,899	75.65	1.06	0.43	0.00	5.10	17.75	100.00
18	New Jersey	124,333,859	24.31	0.69	2.55	0.00	49.25	23.20	100.00
34	New Mexico	34,173,505	8.26	0.00	90.75	0.00	0.35	0.65	100.00
17	New York	126,275,855	63.52	1.37	1.73	0.00	12.54	20.85	100.00
15	North Carolina	135,058,190	66.36	0.67	19.09	0.00	4.09	9.79	100.00
51	North Dakota	1,358,104	89.29	0.13	0.09	0.00	4.94	5.56	100.00
3	Ohio	358,677,545	37.12	1.70	8.46	16.46	7.90	28.36	100.00
31	Oklahoma	46,752,043	63.32	0.83	1.99	13.14	0.78	19.94	100.00
35	Oregon	31,499,505	59.37	1.07	6.15	0.00	23.61	9.80	100.00
8	Pennsylvania	194,216,839	40.57	1.17	9.92	0.00	8.46	39.88	100.00
37	Puerto Rico	26,826,844	50.67	0.08	0.17	0.00	22.83	26.25	100.00
46	Rhode Island	10,878,502	55.42	4.87	0.00	0.00	13.06	26.66	100.00
23	South Carolina	86,615,836	78.94	1.38	1.21	0.00	4.41	14.06	100.00
48	South Dakota	3,351,837	78.69	1.64	0.00	0.00	2.91	16.76	100.00
4	Tennessee	263,400,319	57.89	2.25	4.06	20.88	8.01	6.90	100.00
1	Texas	792,810,307	22.68	0.76	2.68	58.53	4.58	10.76	100.00
13	Utah	148,915,352	87.32	0.16	10.65	0.00	0.51	1.36	100.00
50	Vermont	1,970,055	57.31	6.93	2.04	0.00	3.93	29.80	100.00
52	Virgin Islands	1,274,235	90.99	0.09	8.92	0.00	0.00	0.00	100.00
16	Virginia	134,592,526	57.42	8.25	0.66	0.00	25.78	7.89	100.00
30	Washington	48,706,760	56.98	31.95	0.86	0.00	1.63	8.58	100.00
26	West Virginia	58,992,213	53.61	4.13	17.26	0.00	5.80	19.20	100.00
22	Wisconsin	99,963,906	40.23	0.24	4.17	0.00	16.97	38.39	100.00
41	Wyoming	18,050,866	20.12	0.46	1.07	78.26	0.00	0.10	100.00
	TOTAL	5,705,670,380	42.54	3.31	7.79	20.70	9.66	16.00	100.00

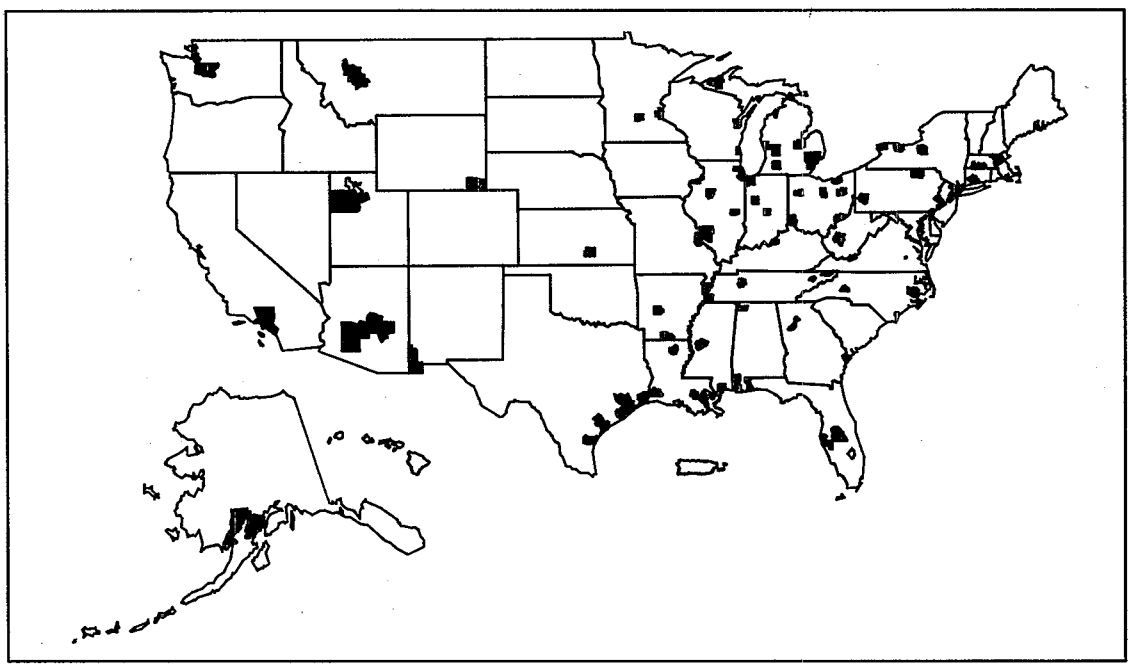
The Role of Counties in TRI Releases and Transfers

The top 25 counties accounted for 37% of all TRI releases and transfers in 1989.

TRI state totals were often concentrated in one or a few counties. In fact, facilities in the top 25 counties[8] (ranked by releases and transfers) out of a nationwide total of over 3,000 counties accounted for 37 percent of all TRI releases and transfers in the nation in 1989. Brazoria County, Texas, and Jefferson Parish, Louisiana, were the top two counties in the nation, accounting for 225.4 million pounds and 196.1 million pounds, respectively. Brazoria County contributed 28 percent to the total releases and transfers of Texas, and Jefferson Parish contributed 41 percent of Louisiana's TRI total. The third ranked county, Sedgewick County, Kansas, accounted for 83 percent of its state's total. (See Map 3-3 and Table 3-3.)

Five Texas counties were in the TRI top 25 and accounted for 75 percent of the state's total releases and transfers. Of the top 25 counties, four of them accounted for at least 50 percent of their respective state's total: Sedgewick County, Kansas (83 percent of the state total); Tooele County, Utah (80 percent of the state total); Jefferson County, Kentucky (51 percent of the state total); and Lewis and Clark County, Montana (94 percent of the state total). (See Map 3-3 and Table 3-3.)

In most cases, just a few facilities were responsible for most of a county's releases and transfers. For example, in four of the top five counties, four or fewer facilities accounted for at least 75 percent of the county's total releases and transfers. (See Table 3-20.)



Map 3–3. Top 100 Counties for TRI Total Releases and Transfers, 1989.

The Role of Cities in TRI Releases and Transfers

Facilities in only 50 cities accounted for 41% of all TRI releases and transfers in 1989.

The localized concentrations of TRI state totals are further shown by the fact that facilities in just 50 cities accounted for 2.4 billion pounds, or 41 percent, of the total national TRI releases and transfers in 1989.[9] These 50 cities included only 7 percent (1,570 facilities) of the total TRI facilities nationwide. Alvin, Texas, which ranked sixth in 1988, was the number one city with the largest releases and transfers in 1989. Other top-ranked cities included Westwego, Louisiana; Wichita, Kansas; Tooele, Utah; and Beaumont, Texas. (See Table 3-4.)

As in 1987 and 1988, the most industrialized cities (those with the most facilities reporting to TRI) were not always the ones with the largest releases and transfers. For example, 136 facilities in Cleveland, Ohio (with a population of roughly 570,000), reported releases and transfers totaling 21.2 million pounds, or 7 percent of the state's total, whereas in Lima, Ohio (with a population of about 47,000), just 16 facilities accounted for 57.9 million pounds of releases and transfers, or 16 percent of the state's total. (See Table 3-4.)

The releases and transfers of top-ranked cities, like top-ranked counties, were often dominated by releases and transfers from just a few individual facilities. For example, while 23 facilities in Kalamazoo, Michigan, reported total releases and transfers of 26.6 million pounds, just one facility, the Upjohn Company, accounted for 87 percent (23 million pounds) of this total. In Louisville, Kentucky, 66 facilities

Table 3-20. Major Facilities in the Five Counties with the Largest TRI Total Releases and Transfers, 1989.

COUNTY	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS	PERCENT OF COUNTY TOTAL
Brazoria	TX	28	Monsanto Co.	Alvin	206,533,205	91.61
Jefferson	LA	28	American Cyanamid Co.	Westwego	192,350,800	98.08
Sedgwick	KS	28	Vulcan Chemicals	Wichita	92,349,716	
Sedgwick	KS	28	Atochem N.A.-Racon Facility	Wichita	54,505,751	
			SUBTOTAL		146,855,467	95.29
Ascension	LA	28	BASF Corp.	Geismar	40,802,088	
Ascension	LA	28	Triad Chemical	Donaldsonville	26,152,046	
Ascension	LA	28	Arcadian Corp.	Geismar	24,967,500	
Ascension	LA	28	Freeport McMoran, Agrico Chem. Div.	Donaldsonville	17,254,750	
			SUBTOTAL		109,176,384	77.02
Harris	TX	28	Air Products Mfg Corp.	Pasadena	15,190,634	11.44
			TOTAL FOR NINE FACILITIES		926,138,341	

reported total releases and transfers of 56.7 million pounds, but one facility alone, Du Pont, generated 70 percent (39.8 million pounds) of that total. (See Tables 3-4 and 3-6.)

Geography of TRI Chemicals and Chemical Classes

Methanol, ammonium sulfate (solution), and toluene were top TRI chemicals in many states.

The chemical composition of TRI totals varied from state to state. Methanol and ammonium sulfate (solution) were the TRI chemicals most often ranked number one out of a state's total releases and transfers in 1989 (ten and eight times, respectively). Toluene, while not ranked as the number one chemical in a state or other reporting jurisdiction as often as methanol or ammonium sulfate (solution), was ranked as a top ten chemical for total TRI releases and transfers in 47 states, while methanol was ranked in the top ten chemicals for state releases and transfers 40 times and ammonium sulfate (solution) was a top chemical 22 times. (See Appendix H, Table H-1. See Chapter 6 for further discussion of the role of toluene in TRI totals.)

In contrast to these fairly ubiquitous chemicals, carbon disulfide, although ranked 15th in TRI total releases and transfers, was a top ten chemical for only four states and other reporting jurisdictions: Alabama, Louisiana, Puerto Rico, and Tennessee. It ranked as the number one chemical in Alabama, with 45.5 million pounds representing 33 percent of the total releases and transfers for the state, as well as 45 percent of all TRI carbon disulfide releases and transfers. The Courtaulds Fibers facility, located in Axis, Alabama, was responsible for 96 percent (43.7 million pounds) of the state's carbon disulfide releases and transfers. (See Table 3-10; and Appendix H, Tables H-1 and H-2.)

As the role of individual chemicals varied within each state, so did that of the chemical classes. The chemical class distribution seen in each state is largely determined by the state's dominant industries, which often show a concentration of particular chemicals and classes. For example, 81 percent of the releases and transfers in Kansas were composed of mineral acids/salts in 1989 and 12 percent were non-halogenated organics. Eighty-six percent of the releases and transfers in Kansas were reported by facilities in the Chemical industry, a majority of whose releases were mineral acids/salts. (See Tables 3-10, 3-21, 3-22; and Appendix H, Table H-2.)

Geography of TRI Carcinogens

Texas was the top state for the release and transfer of TRI carcinogens.

Texas, the number one state for total TRI releases and transfers, was also the number one state for releases and transfers of TRI carcinogens, accounting for 10 percent (42.9 million pounds) of the TRI carcinogenic total in 1989. Pennsylvania ranked second, with 8 percent (32.8 million pounds) of the carcinogenic total. Although Pennsylvania was number two for carcinogenic releases, it ranked eighth in total TRI releases and transfers. Consequently, a higher percentage (17 percent) of Pennsylvania's state total was carcinogenic as opposed to Texas, where only 5 percent of the state total was carcinogenic. Other states with large releases and

Table 3-21. TRI Total Releases and Transfers in Each State by Chemical Class, 1989.

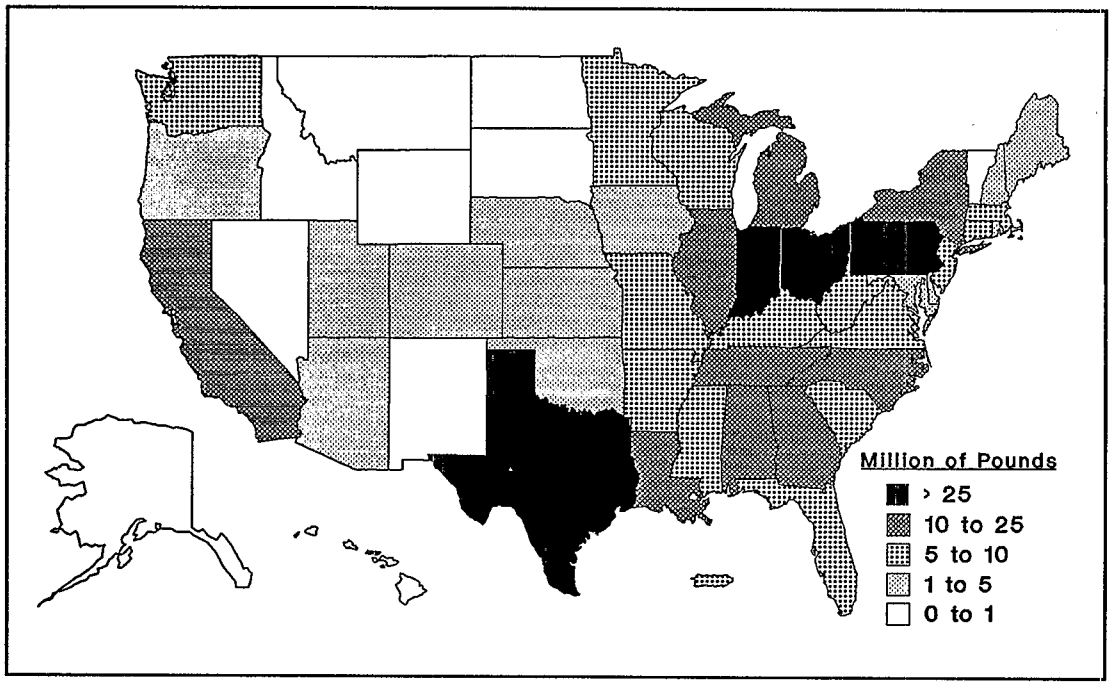
TRI RANK	STATE	TOTAL RELEASES AND TRANSFERS Pounds	ORGANICS Percent	MINERAL ACIDS/SALTS Percent	METALS Percent	HALO-ORGANICS Percent	NON-METALS Percent	MIXTURES Percent	TRADE SECRETS Percent	TOTAL Percent
14	Alabama	137,761,513	66.65	9.31	8.44	10.05	5.48	0.08	0.00	100.00
38	Alaska	24,986,799	12.95	10.93	0.01	1.08	75.03	0.00	0.00	100.00
53	American Samoa	27,750	0.00	0.00	0.00	0.00	100.00	0.00	0.00	100.00
29	Arizona	50,764,830	17.69	9.41	59.00	10.82	2.87	0.21	0.00	100.00
25	Arkansas	78,955,945	32.33	28.81	10.75	9.95	18.15	0.00	0.00	100.00
11	California	168,825,335	28.99	27.57	5.20	25.95	12.13	0.16	0.00	100.00
42	Colorado	16,357,496	36.09	11.52	13.81	34.94	3.40	0.24	0.00	100.00
32	Connecticut	42,963,065	38.76	8.55	9.05	42.19	1.45	0.00	0.00	100.00
45	Delaware	11,919,774	75.93	7.51	2.33	11.52	2.71	0.00	0.00	100.00
54	District of Columbia	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Florida	192,044,588	26.26	52.33	1.45	5.09	14.80	0.07	0.00	100.00
20	Georgia	117,888,623	54.45	14.70	12.12	11.67	7.06	0.01	0.00	100.00
47	Hawaii	3,402,365	17.55	73.24	0.15	2.55	6.52	0.00	0.00	100.00
43	Idaho	15,739,859	8.25	45.04	2.07	7.74	36.90	0.00	0.00	100.00
6	Illinois	247,813,608	34.46	32.52	16.60	11.10	5.25	0.07	0.00	100.00
5	Indiana	255,023,626	34.92	19.48	24.58	15.44	3.50	2.07	0.00	100.00
28	Iowa	55,143,195	58.88	3.49	5.28	12.13	20.23	0.00	0.00	100.00
10	Kansas	185,131,051	12.42	80.51	1.31	3.30	2.46	0.00	0.00	100.00
21	Kentucky	111,422,816	37.33	39.73	13.96	7.10	1.87	0.02	0.00	100.00
2	Louisiana	473,546,487	20.26	55.66	0.66	2.39	21.01	0.02	0.00	100.00
40	Maine	18,581,543	45.57	21.57	2.78	18.19	11.90	0.00	0.00	100.00
36	Maryland	29,251,518	42.91	17.59	13.14	14.10	12.04	0.21	0.00	100.00
27	Massachusetts	56,214,698	52.12	17.58	4.90	23.43	1.07	0.86	0.04	100.00
7	Michigan	220,137,364	50.40	11.57	26.96	8.93	2.09	0.06	0.00	100.00
24	Minnesota	81,932,154	78.87	5.23	1.98	12.06	1.86	0.00	0.00	100.00
19	Mississippi	120,617,983	32.12	41.35	5.16	7.61	13.76	0.00	0.00	100.00
12	Missouri	163,105,846	24.88	44.88	19.36	8.51	2.17	0.20	0.00	100.00
33	Montana	39,103,261	3.94	1.54	92.66	0.23	1.63	0.00	0.00	100.00
39	Nebraska	20,623,709	36.82	7.44	19.85	16.30	19.58	0.00	0.00	100.00
49	Nevada	3,295,677	23.73	6.67	66.35	1.16	2.09	0.00	0.00	100.00
44	New Hampshire	14,392,899	37.67	7.79	5.08	37.56	11.90	0.00	0.00	100.00
18	New Jersey	124,333,859	64.13	14.55	11.37	7.34	2.61	0.00	0.00	100.00
34	New Mexico	34,173,505	3.14	12.28	82.02	2.55	0.02	0.00	0.00	100.00
17	New York	126,275,855	48.79	12.40	11.01	25.07	2.72	0.00	0.01	100.00
15	North Carolina	135,058,190	53.14	16.19	9.30	16.54	4.83	0.00	0.00	100.00
51	North Dakota	1,358,104	77.69	5.35	1.56	12.32	3.08	0.00	0.00	100.00
3	Ohio	358,677,545	35.16	29.80	20.07	8.33	5.92	0.72	0.00	100.00
31	Oklahoma	46,752,043	28.23	33.18	4.58	10.21	23.72	0.09	0.00	100.00
35	Oregon	31,499,505	67.34	5.03	6.93	12.95	7.74	0.00	0.00	100.00
8	Pennsylvania	194,216,839	41.80	15.53	20.37	17.13	5.17	0.00	0.00	100.00
37	Puerto Rico	26,826,844	59.70	8.01	0.46	26.78	5.05	0.00	0.00	100.00
46	Rhode Island	10,878,502	54.33	9.05	4.61	31.18	0.83	0.00	0.00	100.00
23	South Carolina	86,615,836	68.94	4.21	6.44	15.17	5.23	0.00	0.00	100.00
48	South Dakota	3,351,837	61.43	3.75	2.68	25.63	6.20	0.31	0.00	100.00
4	Tennessee	263,400,319	52.62	29.64	7.24	6.45	4.04	0.00	0.00	100.00
1	Texas	792,810,307	29.15	54.97	4.03	4.67	7.17	0.01	0.00	100.00
13	Utah	148,915,352	1.53	8.91	8.44	4.57	76.55	0.00	0.00	100.00
50	Vermont	1,970,055	46.29	19.99	4.07	25.38	4.27	0.00	0.00	100.00
52	Virgin Islands	1,274,235	95.40	0.00	0.44	0.22	3.94	0.00	0.00	100.00
16	Virginia	134,592,526	56.54	30.76	2.48	7.07	2.99	0.00	0.16	100.00
30	Washington	48,706,760	33.89	39.79	3.33	15.67	7.32	0.00	0.00	100.00
26	West Virginia	58,992,213	55.01	8.85	18.07	13.33	4.68	0.06	0.00	100.00
22	Wisconsin	99,963,906	40.70	22.14	22.83	11.84	2.49	0.00	0.00	100.00
41	Wyoming	18,050,866	8.69	79.46	0.07	0.17	11.60	0.00	0.00	100.00
TOTAL		5,705,670,380	36.75	32.23	11.44	9.84	9.57	0.17	0.00	100.00

Table3-22. TRI Releases and Transfers of Each Industry by Chemical Class, 1989.

SIC CODE	INDUSTRY	TOTAL RELEASES AND TRANSFERS	ORGANICS	MINERAL ACIDS/ SALTS	METALS	HALO-ORGANICS	NON-METALS	MIXTURES	TRADE SECRETS	TOTAL
		Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
20	Food	67,803,337	15.48	50.92	1.09	1.56	30.86	0.09	0.00	100.00
21	Tobacco	1,485,626	54.03	0.01	1.32	0.02	44.63	0.00	0.00	100.00
22	Textiles	46,081,356	58.27	14.53	0.79	18.64	7.78	0.00	0.00	100.00
23	Apparel	2,059,373	44.40	9.97	7.72	32.21	4.80	0.90	0.00	100.00
24	Lumber	37,824,596	87.86	0.99	1.05	2.17	3.65	4.29	0.00	100.00
25	Furniture	65,369,507	93.25	0.59	0.28	5.84	0.04	0.00	0.00	100.00
26	Paper	313,254,241	61.73	20.66	1.92	8.11	7.51	0.06	0.00	100.00
27	Printing	60,923,661	89.78	0.87	0.47	8.65	0.23	0.00	0.00	100.00
28	Chemicals	2,745,768,071	31.65	51.79	2.75	4.06	9.73	0.01	0.01	100.00
29	Petroleum	103,136,599	55.12	5.26	3.10	0.41	36.12	0.00	0.00	100.00
30	Plastics	194,502,619	68.62	2.33	3.95	23.39	1.44	0.27	0.00	100.00
31	Leather	24,861,979	52.40	23.65	9.31	2.99	11.65	0.00	0.00	100.00
32	Stone/Clay	47,485,910	31.70	24.30	18.90	6.73	12.16	6.20	0.00	100.00
33	Primary Metals	756,808,577	6.62	18.38	52.63	4.23	17.99	0.14	0.00	100.00
34	Fabr. Metals	207,383,999	42.98	20.50	12.61	23.42	0.43	0.06	0.00	100.00
35	Machinery	74,922,470	31.64	7.28	12.83	47.49	0.68	0.05	0.03	100.00
36	Electrical	145,758,174	32.82	14.52	9.74	40.71	1.89	0.31	0.00	100.00
37	Transportation	245,316,145	63.40	5.54	3.70	26.17	1.15	0.04	0.00	100.00
38	Measure./Photo.	69,535,397	40.93	2.13	2.11	54.34	0.49	0.00	0.00	100.00
39	Miscellaneous	38,886,447	65.67	1.60	8.00	23.23	1.44	0.07	0.00	100.00
Mult	Multiple codes 20-39	437,278,275	45.76	12.08	19.24	14.49	7.84	0.59	0.00	100.00
None	No codes 20-39	19,224,021	39.09	27.84	3.03	22.69	7.34	0.01	0.00	100.00
TOTAL		5,705,670,380	36.75	32.23	11.44	9.84	9.57	0.17	0.00	100.00

transfers of carcinogens were Indiana (27.5 million pounds), Ohio (25.6 million pounds), and Louisiana (21.3 million pounds). (See Figure 3-7, Map 3-4, and Table 3-23.)

The particular carcinogens released and transferred by each state varied considerably. Texas, which had the largest total carcinogenic releases and transfers, accounted for only 2.5 percent (3.3 million pounds) of the nation's TRI releases and transfers of dichloromethane, the number one carcinogen. Indiana was the state with the largest releases and transfers of this carcinogen, accounting for 14.2 million pounds, or 11 percent of the dichloromethane total. Three facilities in Indiana were responsible for 72 percent of the state's dichloromethane releases and transfers: General Electric Plastics in Mount Vernon (5.8 million pounds), Eli Lilly &



Map 3–4. Total Releases and Transfers of Carcinogens.

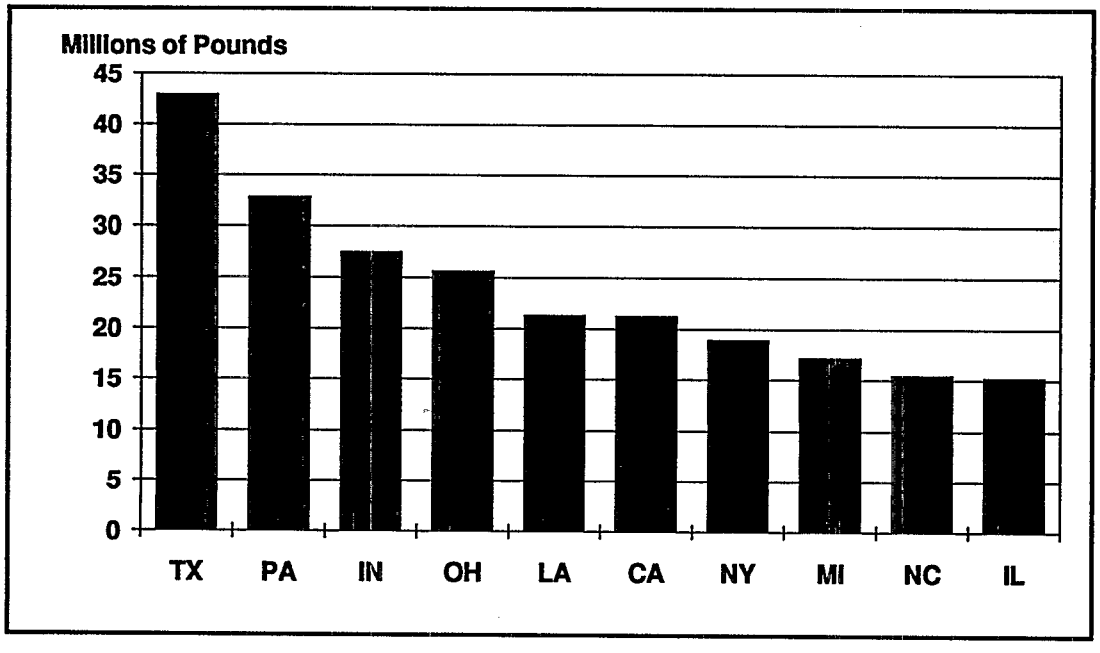


Figure 3–7. The Ten States with the Largest Carcinogenic Releases and Transfers, 1989.

Table 3-23. TRI Total Carcinogenic Releases and Transfers by State, 1989.

TRI RANK	CARC. RANK	STATE	CARCINOGENIC RELEASES AND TRANSFERS			TOTAL RELEASES AND TRANSFERS
			Pounds	Percent of Carc. Total	Percent of State Total	Pounds
14	13	Alabama	10,297,989	2.50	7.48	137,761,513
38	45	Alaska	302,184	0.07	1.21	24,986,799
53	53	American Samoa	0	0.00	0.00	27,750
29	33	Arizona	3,141,195	0.76	6.19	50,764,830
25	28	Arkansas	5,336,292	1.30	6.76	78,955,945
11	6	California	21,213,798	5.16	12.57	168,825,335
42	34	Colorado	3,103,477	0.75	18.97	16,357,496
32	15	Connecticut	8,188,481	1.99	19.06	42,963,065
45	41	Delaware	1,149,949	0.28	9.65	11,919,774
54	54	District of Columbia	0	0.00	0.00	0
9	16	Florida	7,600,174	1.85	3.96	192,044,588
20	11	Georgia	12,253,418	2.98	10.39	117,888,623
47	49	Hawaii	96,327	0.02	2.83	3,402,365
43	42	Idaho	902,263	0.22	5.73	15,739,859
6	10	Illinois	15,142,669	3.68	6.11	247,813,608
5	3	Indiana	27,493,691	6.68	10.78	255,023,626
28	29	Iowa	4,881,991	1.19	8.85	55,143,195
10	35	Kansas	2,817,761	0.68	1.52	185,131,051
21	21	Kentucky	6,602,511	1.60	5.93	111,422,816
2	5	Louisiana	21,261,343	5.17	4.49	473,546,487
40	39	Maine	1,648,714	0.40	8.87	18,581,543
36	37	Maryland	2,013,651	0.49	6.88	29,251,518
27	24	Massachusetts	5,742,330	1.40	10.21	56,214,698
7	8	Michigan	17,116,398	4.16	7.78	220,137,364
24	25	Minnesota	5,714,368	1.39	6.97	81,932,154
19	22	Mississippi	6,308,639	1.53	5.23	120,617,983
12	17	Missouri	7,550,967	1.83	4.63	163,105,846
33	44	Montana	381,067	0.09	0.97	39,103,261
39	38	Nebraska	1,999,068	0.49	9.69	20,623,709
49	52	Nevada	60,187	0.01	1.83	3,295,677
44	36	New Hampshire	2,119,057	0.51	14.72	14,392,899
18	18	New Jersey	7,511,749	1.83	6.04	124,333,859
34	47	New Mexico	122,159	0.03	0.36	34,173,505
17	7	New York	18,880,805	4.59	14.95	126,275,855
15	9	North Carolina	15,404,669	3.74	11.41	135,058,190
51	48	North Dakota	97,012	0.02	7.14	1,358,104
3	4	Ohio	25,613,151	6.22	7.14	358,677,545
31	32	Oklahoma	3,233,560	0.79	6.92	46,752,043
35	31	Oregon	3,665,815	0.89	11.64	31,499,505
8	2	Pennsylvania	32,801,168	7.97	16.89	194,216,839
37	27	Puerto Rico	5,459,541	1.33	20.35	26,826,844
46	40	Rhode Island	1,325,514	0.32	12.18	10,878,502
23	19	South Carolina	7,259,579	1.76	8.38	86,615,836
48	46	South Dakota	144,293	0.04	4.30	3,351,837
4	12	Tennessee	11,783,238	2.86	4.47	263,400,319
1	1	Texas	42,912,618	10.43	5.41	792,810,307
13	30	Utah	4,688,934	1.14	3.15	148,915,352
50	50	Vermont	92,089	0.02	4.67	1,970,055
52	43	Virgin Islands	383,714	0.09	30.11	1,274,235
16	20	Virginia	6,693,004	1.63	4.97	134,592,526
30	26	Washington	5,613,359	1.36	11.52	48,706,760
26	14	West Virginia	9,251,588	2.25	15.68	58,992,213
22	23	Wisconsin	6,042,055	1.47	6.04	99,963,906
41	51	Wyoming	85,827	0.02	0.48	18,050,866
		TOTAL	411,505,400	100.00	7.21	5,705,670,380

Company in Clinton (2.6 million pounds), and Eli Lilly & Company in Shadeland (1.9 million pounds). (See Appendix G, Tables G-1 and G-2; and Appendix H, Table H-3.)

TRI Environmental Distribution by State

In each state, environmental distribution patterns depend upon the particular types of TRI facilities within that state and the environmental distribution of the TRI chemicals that those facilities release and transfer. Compare, for example, the environmental distribution of releases and transfers in New Jersey with those in Kansas. New Jersey transferred one-half of all its TRI chemicals in waste to public sewage, and approximately one-quarter to air and one-quarter off site. Kansas, on the other hand, released one-half of its TRI amounts to underground injection wells, while one-third was transferred off site and most of the remainder released to air. As noted earlier, individual facilities often governed these totals: Vulcan Chemical, in Wichita, Kansas, contributed half of that state's total TRI releases and transfers, and accounted for approximately 100 percent of that state's underground injection total (91.5 million pounds). (See Table 3-19.)

In 1989, Texas was the number 1 state for TRI air releases and underground injection. Louisiana was ranked 1st for surface water discharges.

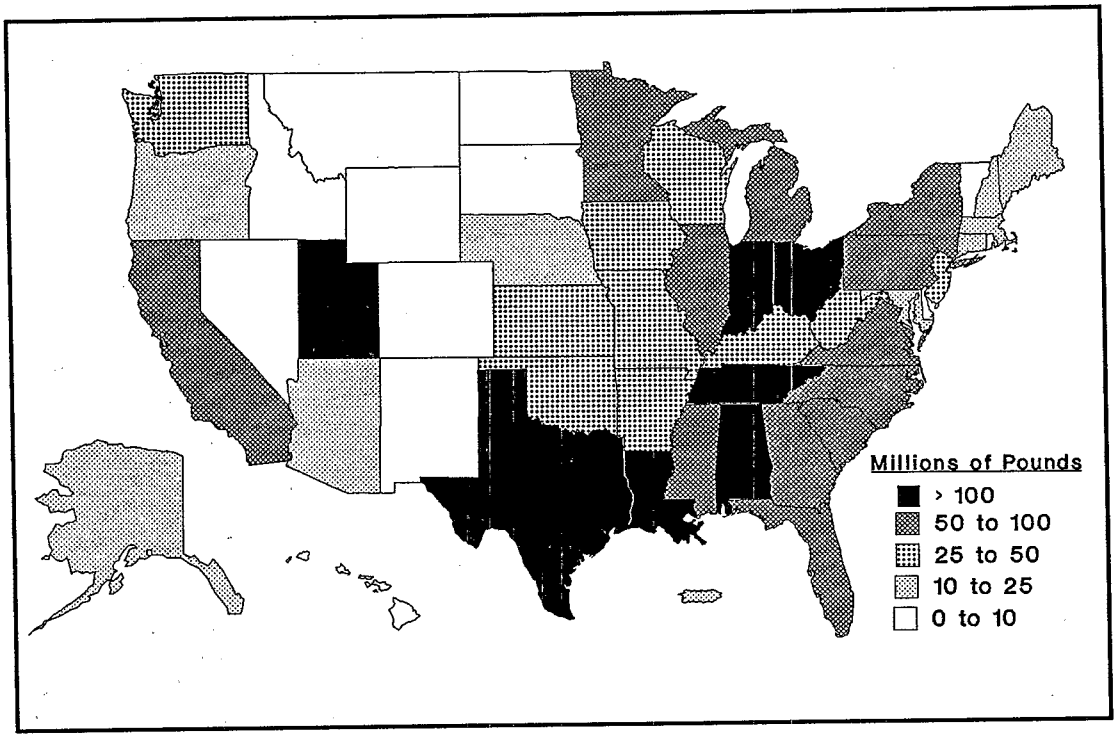
For each type of environmental release, different states predominated. For example, Texas was the number one state for total air releases and releases to underground injection wells. Louisiana dominated releases to surface water and was second for underground injection wells. Indiana topped the on-site land releases, whereas Ohio was number one for off-site transfers. Missouri ranked first for transfers to public sewage. One or two facilities often played a significant role in a state's environmental releases. For example, 89 percent (44.8 million pounds) of Indiana's on-site land releases were from one facility: Inland Steel in East Chicago. (See Maps 3-5 through 3-10 and Table 3-13.)

TRI Industrial Distribution by State

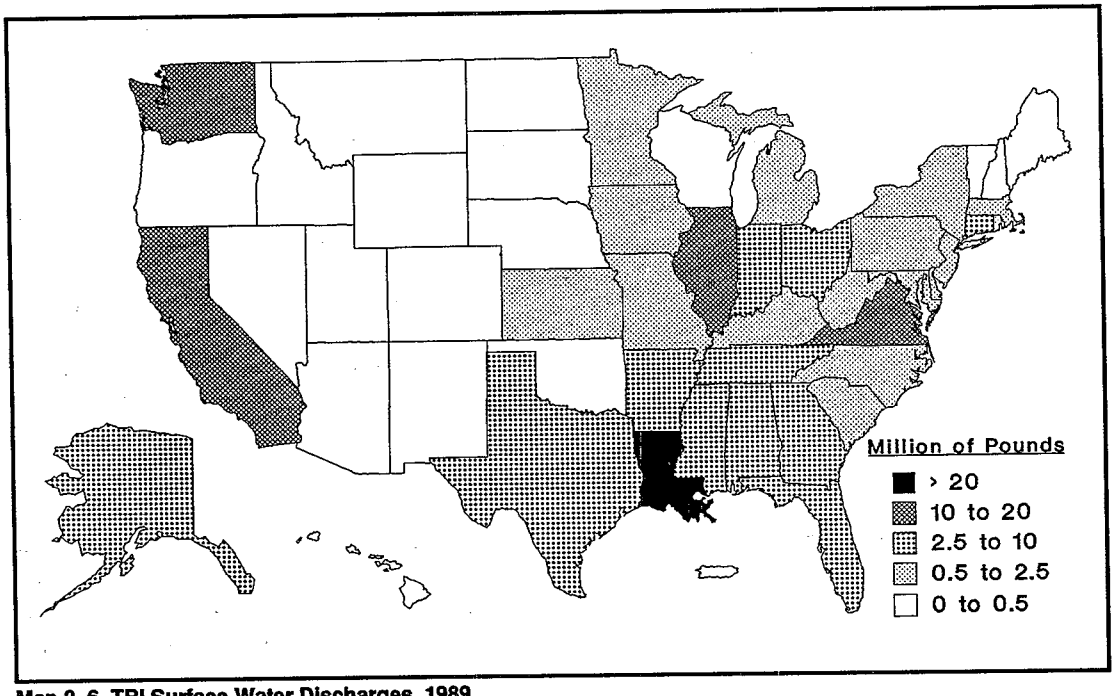
The types of industries located in a state clearly influence its chemical and environmental distribution. While the Chemical industry is by far the most dominant industry as relates to national TRI totals, it is not necessarily so in every state. For example, in Oregon the Paper industry accounted for 35 percent of the state's 1989 TRI releases and transfers, due largely to Boise Cascade Papers in Saint Helens, the facility with the largest releases and transfers in the state (accounting for 22 percent of the state TRI total). (See Appendix H, Tables H-2 and H-4.)

Interstate Commerce in TRI Chemicals

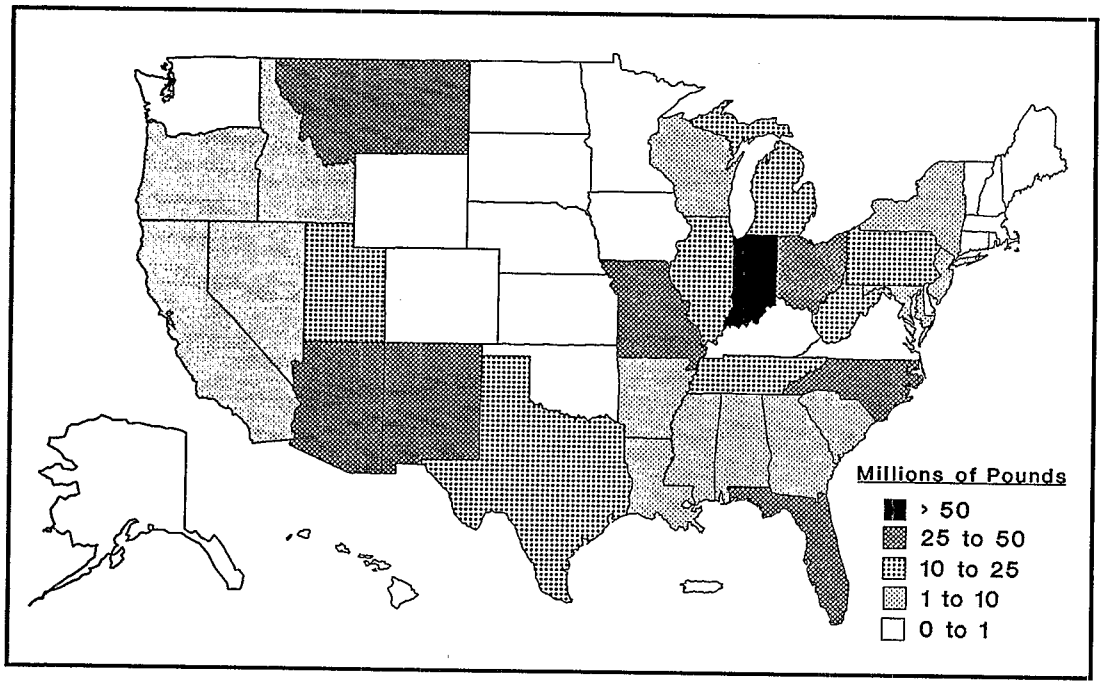
Off-site transfers are often shipped across state borders to off-site facilities for treatment, storage, and/or disposal. In fact, of the 53 jurisdictions reporting releases and transfers to TRI in 1989, only American Samoa and the U.S. Virgin Islands did not send off-site transfers out of their jurisdiction. And only Vermont, Puerto Rico, Hawaii, American Samoa, and the U.S. Virgin Islands did not receive any off-site transfers originating from out of their own jurisdiction. Thus, the large majority of states shipped at least part of their off-site transfers out-of-state, but they also



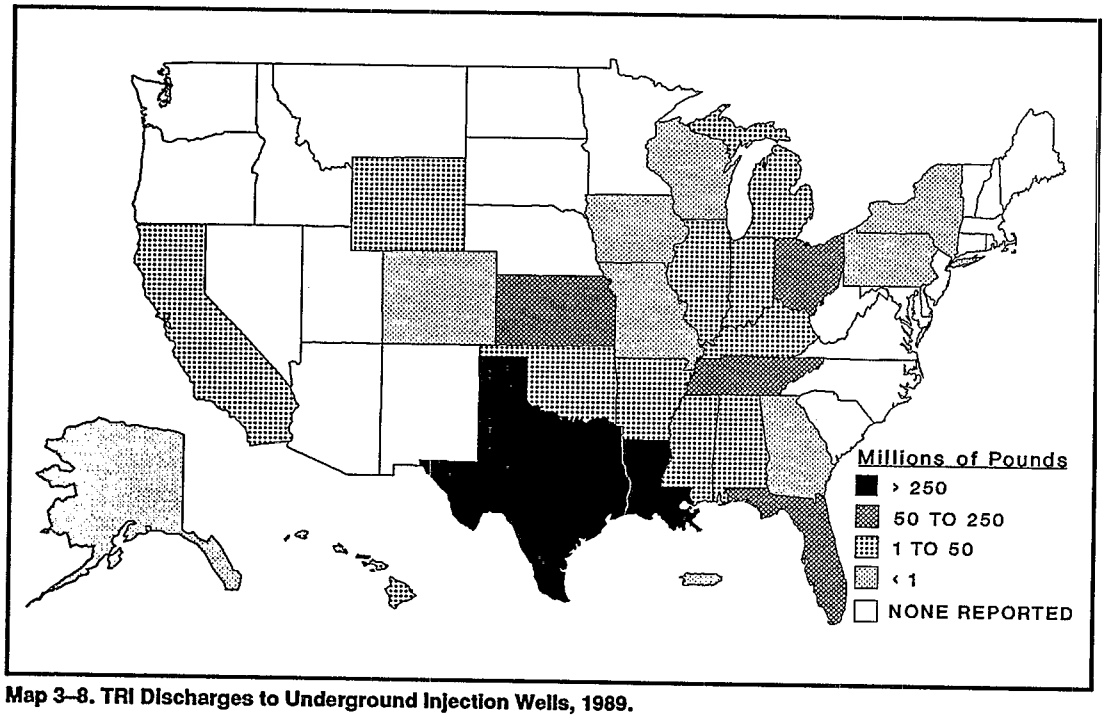
Map 3–5. TRI Total Air Emissions, 1989.



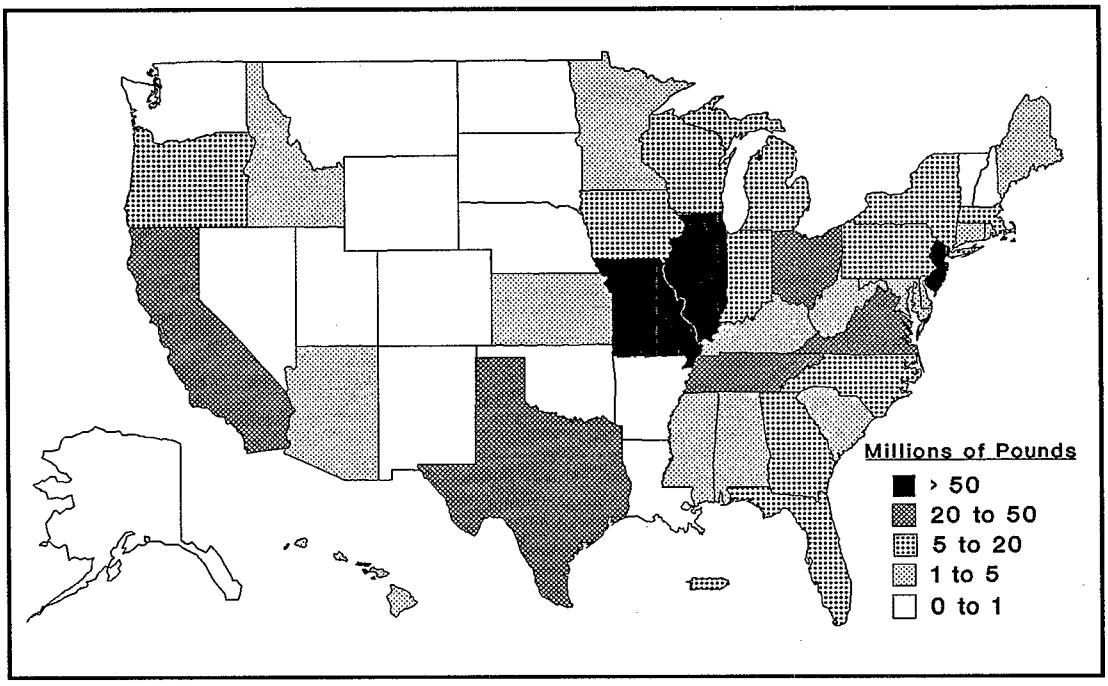
Map 3–6. TRI Surface Water Discharges, 1989.



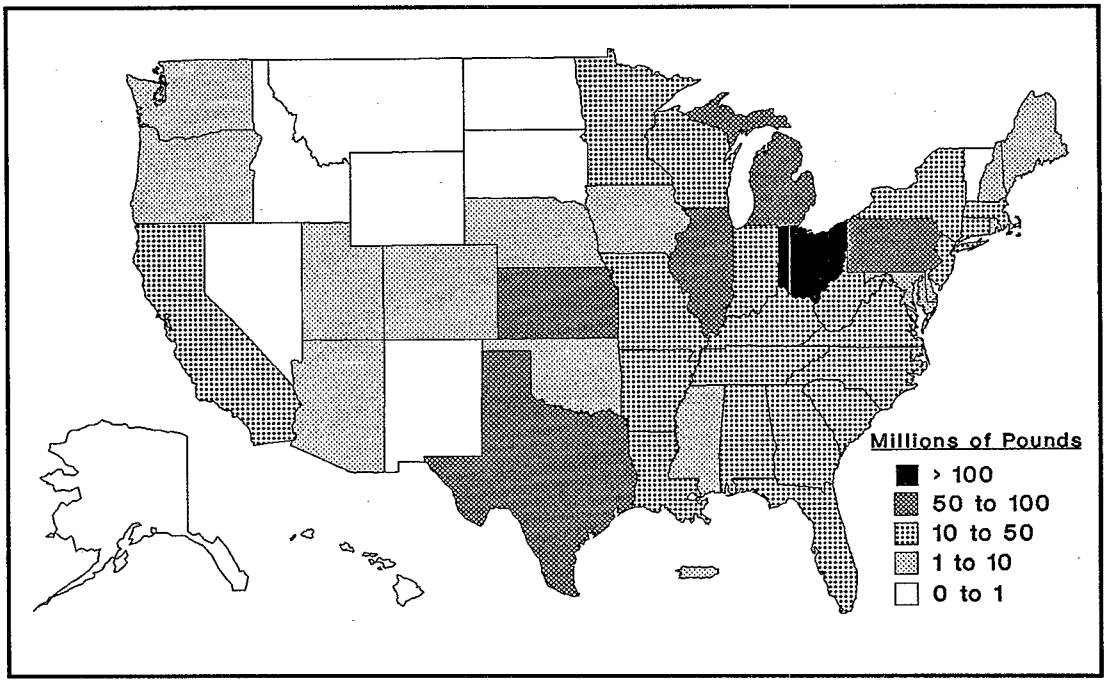
Map 3–7. TRI On–site Land Releases, 1989.



Map 3–8. TRI Discharges to Underground Injection Wells, 1989.



Map 3–9. TRI Transfers to Public Sewage, 1989.



Map 3–10. TRI Off–site Transfers, 1989.

Table 3-24. TRI Off-Site Transfers Sent Out of State and Received from Out of State by Each State, 1989.

TOTAL TRI RANK	STATE	WASTE RECEIVED FROM OUT-OF-STATE FACILITIES		WASTE SENT TO OUT-OF-STATE FACILITIES			NET DIFFERENCE(a)
		Pounds	Rank	Pounds	Rank	Percent of Off-site Transfers	Pounds
14	Alabama	22,533,436	5	8,764,718	16	47.02	13,768,718
38	Alaska	1,250	48	3,500	50	60.87	-2,250
53	American Samoa	0	54	0	53		0
29	Arizona	1,747,208	26	1,004,952	37	56.61	742,256
25	Arkansas	8,241,618	16	9,739,281	11	88.02	-1,497,663
11	California	1,374,803	28	4,988,605	23	22.74	-3,613,802
42	Colorado	495,830	35	3,260,943	26	68.89	-2,765,113
32	Connecticut	4,365,207	21	9,560,593	12	64.78	-5,195,386
45	Delaware	37,628	43	1,409,244	34	84.64	-1,371,616
54	District of Columbia	500	49	0	54		500
9	Florida	1,011,737	30	9,551,002	13	58.62	-8,539,265
20	Georgia	2,926,398	24	12,898,149	8	51.23	-9,971,751
47	Hawaii	0	52	750	51	6.07	-750
43	Idaho	451,085	37	346,323	43	91.66	104,762
6	Illinois	24,448,301	3	18,882,319	4	33.20	5,565,982
5	Indiana	15,724,127	8	13,743,954	6	36.37	1,980,173
28	Iowa	84,232	40	2,090,119	33	43.74	-2,005,887
10	Kansas	1,850,367	25	2,876,674	28	4.78	-1,026,307
21	Kentucky	9,299,039	12	8,224,099	18	32.88	1,074,940
2	Louisiana	33,522,216	2	3,922,866	25	32.53	29,599,350
40	Maine	52,506	42	935,885	39	63.44	-883,379
36	Maryland	1,034,262	29	2,833,006	29	72.53	-1,798,744
27	Massachusetts	5,367,706	20	11,642,038	10	59.72	-6,274,332
7	Michigan	22,075,620	6	18,535,479	5	22.04	3,540,141
24	Minnesota	5,846,934	19	8,699,059	17	61.38	-2,852,125
19	Mississippi	373,361	39	3,964,566	24	90.64	-3,591,205
12	Missouri	5,859,735	18	8,110,193	19	71.72	-2,250,458
33	Montana	471,922	36	15,815	49	86.87	456,107
39	Nebraska	25,458	44	819,476	40	17.53	-794,018
49	Nevada	680,143	33	240,775	44	77.64	439,368
44	New Hampshire	72,315	41	2,464,009	31	96.43	-2,391,694
18	New Jersey	20,665,331	7	12,313,964	9	42.70	8,351,367
34	New Mexico	428,330	38	213,495	45	96.85	214,835
17	New York	8,418,967	15	13,001,614	7	49.39	-4,582,647
15	North Carolina	3,291,667	23	6,481,609	22	49.01	-3,189,942
51	North Dakota	1,500	47	72,491	47	96.01	-70,991
3	Ohio	47,411,311	1	34,308,405	2	33.73	13,102,906
31	Oklahoma	9,209,257	13	2,275,207	32	24.40	6,934,050
35	Oregon	793,335	31	1,019,568	36	33.04	-226,233
8	Pennsylvania	23,357,544	4	43,160,017	1	55.72	-19,802,473
37	Puerto Rico	0	51	145,125	46	2.06	-145,125
46	Rhode Island	687,787	32	2,530,593	30	87.26	-1,842,806
23	South Carolina	10,581,098	11	3,215,517	27	26.41	7,365,581
48	South Dakota	14,819	45	430,006	42	76.55	-415,187
4	Tennessee	5,881,819	17	6,778,797	21	37.27	-896,978
1	Texas	13,371,928	9	24,523,627	3	28.75	-11,151,699
13	Utah	1,608,226	27	1,153,108	35	57.09	455,118
50	Vermont	0	50	570,661	41	97.22	-570,661
52	Virgin Islands	0	53	0	52		0
16	Virginia	4,009,818	22	7,739,383	20	72.88	-3,729,565
30	Washington	596,101	34	962,271	38	23.02	-366,170
26	West Virginia	8,672,419	14	8,810,540	15	77.80	-138,121
22	Wisconsin	10,648,742	10	8,964,936	14	23.36	1,683,806
41	Wyoming	3,246	46	17,333	48	99.51	-14,087
	Unknown/Foreign (b)	8,588,470					

(a) The net difference is equal to the amount of waste received from out-of-state facilities minus the amount of waste sent to out-of-state facilities. Therefore, a negative number indicates that a state shipped more wastes out-of-state than it received, resulting in a net export. A positive number indicates that a state received more wastes from out-of-state than it sent out-of-state, resulting in a net import.
(b) The receiving state could not be determined from the form or the waste was shipped to a foreign country.

received TRI chemicals in wastes sent from other states. A total of 384.2 million pounds (38 percent) of TRI off-site transfers were shipped across state lines. This amount represents 6 percent of all TRI total releases and transfers. (See Table 3-24.)

Seven states ranked among the top ten for both those states sending TRI off-site transfers to other states and those states receiving such wastes from other states. These states were Pennsylvania, Ohio, Texas, Illinois, Michigan, Indiana and New Jersey. Thus, to a large extent, states in which facilities sent significant TRI amounts across the state border also received comparable amounts from out of state. In some cases, the wastes containing TRI chemicals were sent to a foreign country or the off-site location is unknown because the TRI facility did not supply the full address correctly. (See Table 3-24.)

Most states both ship wastes out of state and have waste management facilities that receive wastes from TRI facilities in other states. Facilities send their wastes out of state for a variety of reasons. Waste management facilities within the state may not handle the particular wastes needing off-site treatment, storage, or disposal. Facilities may prefer to send their wastes to another facility owned by the same parent company so that they can closely control how the waste is handled. The distance and cost of transporting the wastes may be less to a nearby facility that happens to be across state lines. (See Appendix H, Table H-5 for a tabulation of each state's TRI off-site transfers and where they were sent.)

Pennsylvania facilities reported the largest net export of TRI chemicals in 1989.

Pennsylvania was the number one exporter of TRI chemicals in wastes across state borders, shipping 43.2 million pounds, or 56 percent of its total off-site transfers, out-of-state. Thus, Pennsylvania sent more of its off-site transfers to out-of-state treatment, storage, or disposal locations than to in-state locations. On the other hand, Pennsylvania ranked fourth for the amount of TRI chemicals in waste received from other states. A total of 23.4 million pounds of TRI chemicals in wastes was shipped to Pennsylvania treatment, storage, or disposal locations from out-of-state facilities. The net result of the amount of waste Pennsylvania transferred out-of-state minus the amount of waste transferred into the state from other states was 19.8 million pounds. In other words, Pennsylvania transferred more TRI chemicals in wastes to other states (19.8 million pounds more) than it received. Therefore, while Pennsylvania generated total TRI releases and transfers of 194.2 million pounds, it ended up with 19.8 million pounds (or 10 percent) less of TRI chemicals in wastes in-state due to the net difference in interstate transfers. (See Tables 3-2 and 3-24.) Texas ranked as the second state exporting TRI chemicals, with a net export of 11.2 million pounds, Georgia was third with 10.0 million pounds, Florida was fourth with 8.5 million pounds, and Massachusetts was fifth with a net export of 6.3 million pounds. (See Figure 3-8 and Table 3-24.)

The top five facilities in Pennsylvania and in Texas for shipping TRI chemicals in wastes out-of-state are presented in Table 3-25. The Du Pont Towanda plant in Towanda, Pennsylvania, sent 7.5 million pounds (almost 100 percent of the facility's off-site transfers and 71 percent of its total releases and transfers) to other states. The Occidental Chemical Corporation in Deer Park, Texas, was the facility in that state

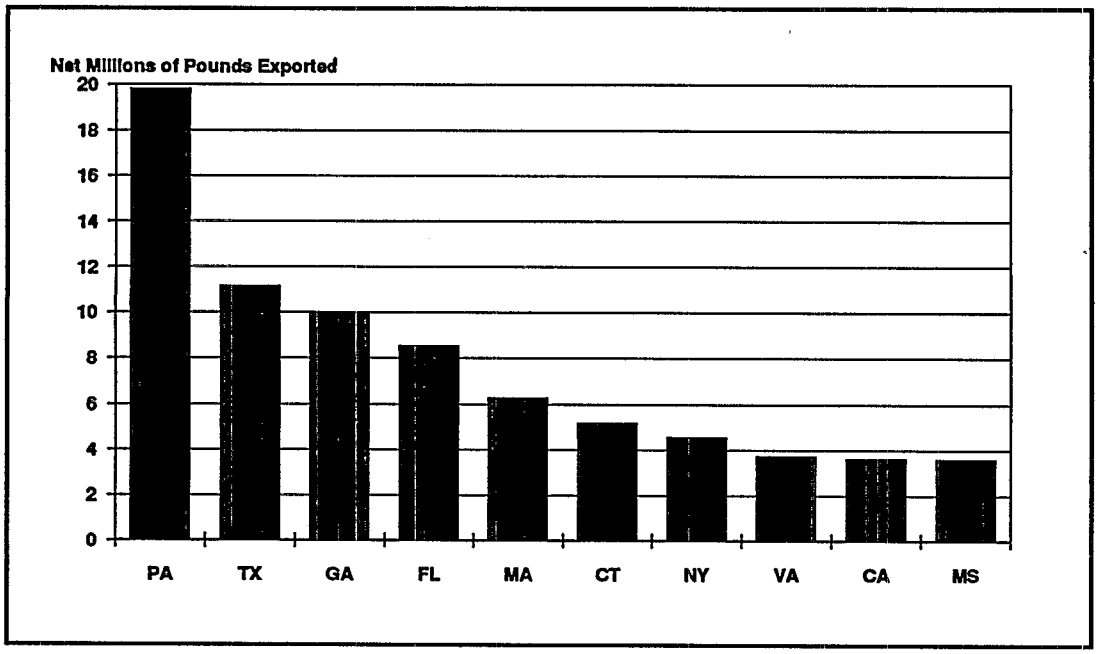


Figure 3–8. The Ten States with the Largest Net Export of TRI Off–site Transfers to Other States, 1989.

which sent the largest amount of TRI chemicals in wastes out-of-state, a total of 6.1 million pounds (100 percent of the facility's off-site transfers and 96 percent of its total releases and transfers). In most cases, the majority of TRI chemicals in wastes sent out of state by a facility were sent to one state. For example, a total of 96 percent (7.2 million pounds) of the Du Pont Towanda Plant's out-of-state transfers were sent to Ohio and all of Occidental Chemical Corporation's out-of-state transfers were shipped to Louisiana.

Louisiana was the state with the largest net import of TRI chemicals in wastes.

Louisiana was the state with the largest net import of TRI chemicals in wastes, importing 29.6 million pounds more from other states than it exported to them. Thus, while Louisiana generated TRI releases and transfers totalling 473.5 million pounds, the state ended up with an additional 29.6 million pounds (6 percent more) of TRI chemicals in wastes from other states. Other top states with large net imports were Alabama (13.8 million pounds), Ohio (13.1 million pounds), New Jersey (8.4 million pounds), and South Carolina (7.4 million pounds). (See Figure 3-9 and Table 3-24.)

Toluene was the chemical with the largest amount of off-site transfers sent out-of-state, a total of 37.2 million pounds, which accounted for 11 percent of all out-of-state transfers. Other chemicals with large out-of-state transfers were zinc compounds (20.8 million pounds), methanol (20.0 million pounds), acetone (17.2

Table 3-25. The Five Facilities in Pennsylvania and Texas with the Largest Off-Site Transfers Sent Out-of-State, 1989.

SHIPPING STATE	SIC CODE	FACILITY NAME	CITY		TRANSFERS SENT OUT-OF-STATE Pounds	RECEIVING STATE
PA	38	Du Pont Towanda Plant	Towanda		8,692	IL
					124	NJ
					290,043	NY
					7,229,400	OH
				TOTAL	7,528,259	
PA	28	Rohm & Haas Delaware Valley	Bristol		3,904	AL
					1,048,389	KY
					37,602	LA
					404,470	NJ
					18,665	SC
					1,298,897	TX
				TOTAL		2,811,927
PA	28	Lord Corp.	Saegertown		1,598,950	OH
				TOTAL	1,598,950	
PA	28	Heico Chemicals Inc.	Delaware Water Gap		1,471,000	NJ
				TOTAL		1,471,000
PA	28	Rohm & Haas DVI	Philadelphia		1,380,666	NJ
					28,342	SC
				TOTAL	1,409,008	
TX	28	Occidental Chemical Corp.	Deer Park		6,052,000	LA
				TOTAL	6,052,000	
TX	33	North Star Steel Texas Inc.	Rose City		3,510,551	LA
				TOTAL	3,510,551	
TX	28	Du Pont	La Porte		2,312,281	IL
					243,716	LA
					911,531	WV
				TOTAL	3,467,528	
TX	28	Fermenta Asc	Houston		289,858	AL
					100,915	AR
					1,647,352	LA
				TOTAL	2,038,125	
TX	33	Lone Star Steel Co.	Lone Star		23,464	AR
					1,257,000	LA
					8,277	OK
				\TOTAL	1,288,741	

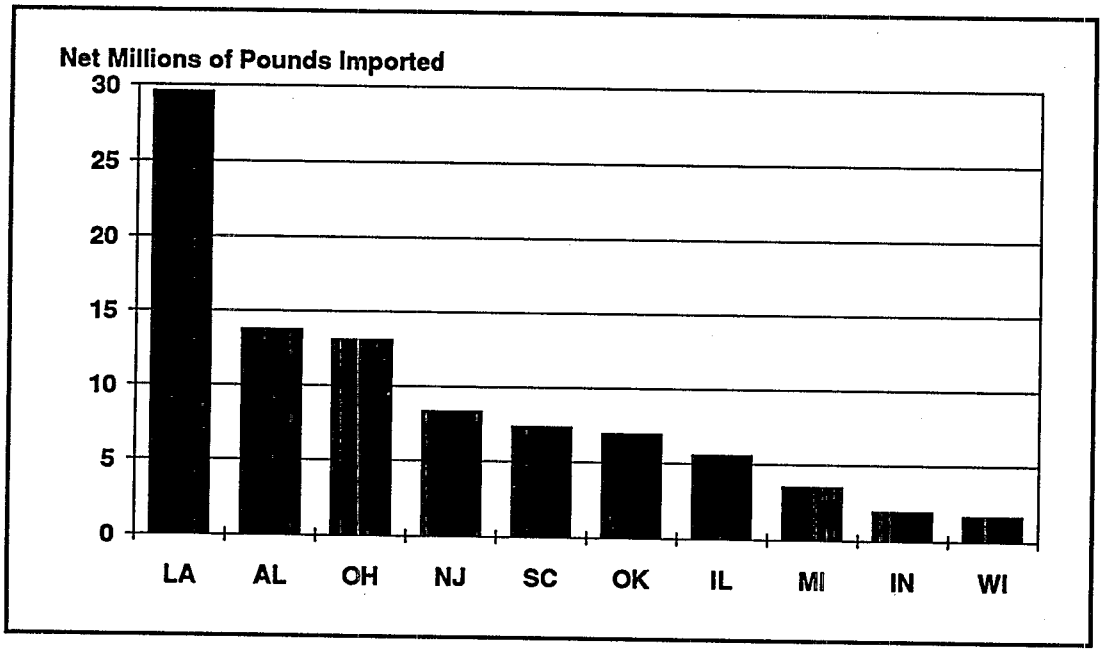


Figure 3–9. The Ten States with the Largest Net Import of TRI Off–site Transfers from Other States, 1989.

million pounds), and xylene (mixed isomers) (17.2 million pounds). The top 25 chemicals with the largest amounts sent across state lines accounted for 78 percent of all TRI off-site transfers shipped out of state. (See Table 3-26.)

INDUSTRIAL PATTERNS OF TRI RELEASES AND TRANSFERS

Industry groups discussed in this report are based on the Standard Industrial Classification (SIC) codes, described in Appendix C. The SIC codes, which were developed by the U.S. Office of Management and Budget to identify industrial sectors, consist of four digits. The first two digits are used for identifying broad industrial sectors, and the last two digits represent a facility's specialty within this sector. For example, SIC 26, the Paper and Allied Products category, includes sectors from pulp mills to manufacturers of envelopes. This category consists of 17 four-digit classifications, including Paperboard Mills (SIC code 2631), Sanitary Food Containers (SIC code 2656), and Stationery Tablets (SIC code 2678). While facilities are required to report their four-digit SIC codes to TRI, the analysis in this report is usually based upon the broader two-digit SIC code categories. It should be noted that facilities must list all of the SIC codes within the range of 20-39 (the manufacturing sector) that cover their activities involving TRI chemicals. Those

Table 3-26. The 25 TRI Chemicals with the Largest Off-Site Transfers Sent Out-of-State, 1989.

RANK	CHEMICAL	OFF-SITE TRANSFERS SENT OUT-OF-STATE	
		Pounds	Percent
1	Toluene	37,207,737	10.69
2	Zinc compounds	20,755,969	5.96
3	Methanol	19,991,068	5.74
4	Acetone	17,224,782	4.95
5	Xylene (mixed isomers)	17,219,642	4.95
6	Sulfuric acid	16,899,620	4.85
7	Zinc (fume or dust)	16,270,438	4.67
8	Methyl ethyl ketone	16,027,763	4.60
9	Hydrochloric acid	14,737,386	4.23
10	Dichloromethane	13,139,482	3.77
11	1,1,1-Trichloroethane	8,775,652	2.52
12	Nitric acid	8,027,124	2.31
13	Ethylene glycol	7,335,965	2.11
14	Copper	6,497,121	1.87
15	Manganese	5,981,521	1.72
16	Lead compounds	5,867,310	1.68
17	Lead	5,482,466	1.57
18	Manganese compounds	5,394,685	1.55
19	Chromium compounds	5,114,497	1.47
20	Styrene	4,197,401	1.21
21	Glycol ethers	4,048,289	1.16
22	Nickel compounds	3,978,177	1.14
23	Polychlorinated biphenyls (PCBs)	3,823,703	1.10
24	Chlorobenzene	3,801,965	1.09
25	Copper compounds	3,738,969	1.07
	SUBTOTAL	271,538,732	77.98
	TOTAL FOR ALL OTHERS	76,677,927	22.02
	GRAND TOTAL	348,216,659	100.00

diversified facilities which listed more than one two-digit SIC code were categorized for this report in the Multiple Codes category (Multiple SIC codes 20-39). The facilities which reported to TRI that were not associated with any of the SIC codes 20-39 were categorized together in the No Codes group.[10]

Reports from facilities in more than one industrial category (Multiple Codes) may lead to the underestimation of the amount of chemicals released and transferred by some industries. For instance, the Primary Metals industry (SIC 33) was frequently one of the two (or more) SIC codes reported by facilities with multiple classifications, but the releases and transfers from those facilities cannot be assigned to those of the Primary Metals industry because the portion which originated from the metals operations versus other activities is not known. (See Box 3-H and discussion later in this chapter on four-digit SIC codes in 1989 TRI data. See Chapter 8 for how the SIC codes are reported.)

Overall Industrial Distribution of TRI Releases and Transfers

The Chemical industry accounted for 43% of total TRI releases and transfers in 1989.

As in 1988, the Chemical industry dominated TRI releases and transfers, accounting for almost half (48 percent) of the TRI total. That industry reported releases and transfers totaling 2.8 billion pounds, more than three times the releases and transfers of the second-ranked industry, Primary Metals, which represented 756.8 million pounds (13 percent of the 1989 TRI total). The Multiple Codes sector ranked third overall with 437.3 million pounds (8 percent of the TRI total), followed by the Paper industry with 313.3 million pounds (5 percent). The Tobacco industry reported the smallest amount, 1.5 million pounds (0.03 percent). (See Figure 3-4 and Table 3-5.)

With 19 percent of the total number of facilities reporting to TRI in 1989, the Chemical industry also had the largest number of facilities reporting TRI releases and transfers. The Fabricated Metal Products industry ranked second with 13 percent of the total TRI facilities reporting, followed by the Electrical industry ("Electronic and Other Electrical Equipment and Components, except Computer Equipment"), with 8 percent. Those industries with the most TRI facilities, however, were not necessarily those with the largest total releases and transfers. For example, the Fabricated Metals industry, which ranked second for the number of facilities reporting to TRI, was ranked sixth for total TRI releases and transfers, whereas the Primary Metals industry, which ranked fifth for the number of facilities, ranked second in releases and transfers. The average volume reported per facility in the Fabricated Metals industry was 69,873 pounds, versus 458,950 pounds for the Primary Metals industry. The Chemical industry had the largest average of 644,698 pounds per facility, while the Food and Kindred Products Industry had the smallest with 38,113 pounds. (See Table 3-5.)

The average number of chemicals reported per facility in each industry ranged from eight for the Petroleum industry, to two for the Food, the Tobacco, the Textiles, the Apparel, and the Printing, Publishing, and Allied Industries. A chemical facility, the Tennessee Eastman Company facility in Kingsport, Tennessee, reported the most number of chemicals of any single facility with a total of 85 chemicals. The facility's total releases and transfers (45.3 million pounds) were among the largest for any industry, resulting in the company being ranked twelfth in the nation for total TRI releases and transfers. Although this facility reported a large number of chemicals, three-fourths of all its releases and transfers were due to acetone (33.8 million pounds), with the top five reported chemicals (acetone, methanol, ammonium sulfate (solution), ethylene glycol, and toluene) accounting for 93 percent (41.9 million pounds) of the facility's total releases and transfers. (See Tables 3-5 and 3-6.)

Examination of the top facilities in each industry sector reveals that in some cases, one or two facilities accounted for a large proportion of the releases and transfers of the industry. For example, in the ninth-ranked TRI industry, the Petroleum industry (SIC 29), the top two facilities, the Amoco Oil Company in Texas City, Texas, (14.2

million pounds) and the Citgo Petroleum Corporation in Lake Charles, Louisiana (10.6 million pounds) together accounted for approximately one-fourth of the entire industry's releases and transfers. (See Appendix I, Table I-1.)

In contrast to the pattern exhibited by the Petroleum industry, in the Fabricated Metals industry, ranked sixth for TRI releases and transfers by industry with 207.4 million pounds, the number one facility accounted for only 2 percent of the industry total. This was Double Eagle Steel Coating Company, Dearborn, Michigan, with 3.4 million pounds of TRI releases and transfers. In addition, the top ten facilities in the industry accounted for only 9 percent (18.7 million pounds) of the Fabricated Metal industry's total releases and transfers. (See Appendix I, Table I-1.)

Major Chemicals in TRI Industries

There are several ways to analyze the relationship between the industrial sectors and TRI chemicals. Here, the contribution of each industrial category to the total releases and transfers of individual chemicals is considered, along with the role that individual chemicals played within the TRI releases and transfers of a particular industry.

The Chemical industry accounted for 91% of releases and transfers of ammonium sulfate (solution), the number 1 TRI chemical in 1989 . . .

Of the industrial sectors contributing heavily to the releases and transfers of the top 25 TRI chemicals in 1989, the Chemical industry played a major role. The Chemical industry was responsible for 91 percent of the total releases and transfers of ammonium sulfate (solution), 78 percent of hydrochloric acid, and 86 percent of carbon disulfide. The Chemical industry accounted for one-half or more of the releases and transfers of nine of the top 25 chemicals, which accords with the fact that it represented close to half of all TRI releases and transfers. (See Appendix G, Table G-3.)

...while the Transportation industry was number 1 for the release and transfer of 1,1,1-tricholoroethane.

Some of the top 25 TRI chemical totals were affected relatively little by the Chemical industry. In the case of 1,1,1-trichloroethane, which ranked ninth in total releases and transfers, the Chemical industry accounted for only 4 percent of the total. Instead, the Transportation Equipment industry was the predominant industry in releases and transfers of this chemical, contributing 18 percent to its total. Other industries which accounted for 10 percent or more of this chemical's total TRI releases and transfers were: Fabricated Metals (13 percent), Primary Metals (12 percent), Electric and Electrical (11 percent), and Multiple SIC Codes (10 percent). (See Appendix G, Tables G-1 and G-3; and Appendix I, Table I-1.) (See Chapter 6 for further discussion of 1,1,1-trichloroethane.)

Industrial chemical releases and transfers may also be analyzed to show the role that particular chemicals played within each industrial sector. The top 25 chemicals for total TRI releases and transfers accounted for 80 percent or more of the total releases and transfers in 15 individual industrial categories and for more than 50 percent in all of the categories. (See Appendix I, Table I-3.) For example, 96 percent of all releases and transfers in the Printing industry involved the top 25 TRI chemicals. In fact, 70 percent of the Printing industry's total was due to just one of the top 25

chemicals, toluene. (See Appendix I, Table I-2.) The top facility for total releases and transfers within the Printing industry was R.R. Donnelley & Sons Company in Warsaw, Indiana, accounting for 7 percent of the industry's TRI total for toluene and ranking fourth nationwide for overall releases and transfers of this chemical. (See Appendix G, Table G-1 and Appendix I, Table I-1. For further discussion of the role of toluene in TRI and within the Printing industry, see Chapter 6.)

The Stone, Clay, Glass and Concrete Products industry had the greatest share of its releases and transfers contributed by chemicals *not* in the TRI top 25 (as ranked by total TRI releases and transfers), with 40 percent of the industry's total due to other chemicals. Of the top ten chemicals released and transferred by facilities in this industry, four were not among the TRI top 25 chemicals: lead compounds, mixtures, asbestos (friable), and formaldehyde. (See Appendix I, Tables I-2 and I-3.)

1,1,1-Trichloroethane was the chemical with the highest releases and transfers for the largest number of industries.

The chemical which appeared the greatest number of times as the number one chemical for an industry was 1,1,1-trichloroethane. This chemical ranked first in releases and transfers in the following industries: Apparel, Fabricated Metals, Electrical, and Industrial and Commercial Machinery and Computer Equipment. While the Transportation industry released and transferred 1,1,1-trichloroethane in the largest amounts, this chemical was not the top chemical within this industry, but ranked second to xylene (mixed isomers). Other chemicals which appeared several times as the top chemical in an industry included ammonia (three times) and toluene (three times). (See Appendix I, Table I-2.)

Chemical Classes in TRI Industries

The distribution of chemical classes in each industry often differs. For example, half of the releases and transfers in the Chemical industry were mineral acids/salts and a third were non-halogenated organics. In the Petroleum industry, over one-half of releases and transfers were non-halogenated organics and approximately one-third were non-metallic inorganic chemicals. For the Measuring/Photographic industry, 54 percent of the releases and transfers reported were halogenated organics and 41 percent were non-halogenated organics. Releases and transfers of metals and metal compounds accounted for approximately half of the total releases and transfers of the Primary Metals industry, followed by mineral acids/salts (18 percent) and non-metallic inorganic chemicals (18 percent). (See Table 3-22.)

Facilities in the Chemical industry led the releases and transfers of non-halogenated organics, mineral acids/salts, halogenated organics, non-metallic inorganics, and trade secrets.

Another way of examining the relationship between industrial sector and chemical class is to note the contribution of each industry to the total releases and transfers of a particular chemical class. For example, facilities in the Transportation industry were accountable for 11 percent of all releases and transfers of halogenated organics. Facilities in the Chemical industry led the releases and transfers of non-halogenated organics (42 percent), mineral acids/salts (77 percent), halogenated organics (20 percent), and non-metallic inorganics (49 percent), and trade secrets (91 percent). Facilities in the Primary Metals industry led releases and transfers of metals and metal compounds (61 percent), and the Stone/Clay/Glass industry accounted for the largest amount (30 percent) of mixtures. The role played by the

Chemical industry in total TRI releases and transfers indicates that this industry could deeply affect several chemical classes even if that chemical class did not stand out in the releases and transfers reported by facilities in the industry. For example, while the Chemical industry accounted for almost one-half of the releases and transfers of non-metallic inorganics, non-metallic inorganics represented only 10 percent of all releases and transfers of the Chemical industry. (See Tables 3-22 and 3-27.)

While the Chemical industry was accountable for the largest percentage (20 percent) of the releases and transfers of halogenated organics, other industries contributed in a significant fashion. Three industries each accounted for approximately 11 percent of the class total: The Transportation industry, the Multiple Codes category, and the Electrical industry. Another example can be seen in the case of the non-metallic inorganics. The Chemical industry accounted for one-half of all releases and transfers in this class, but the Primary Metals industry also contributed a significant portion, representing one-fourth of the total. (See Table 3-27.)

Table 3-27. TRI Releases and Transfers within Each Chemical Class by Industry, 1989.

SIC CODE	INDUSTRY	ORGANICS Percent	MINERAL ACIDS/ SALTS Percent	METALS Percent	HALO-ORGANICS Percent	NON-METALS Percent	MIXTURES Percent	TRADE SECRETS Percent
20	Food	0.50	1.88	0.11	0.19	3.83	0.63	0.00
21	Tobacco	0.04	0.00	0.00	0.00	0.12	0.00	0.00
22	Textiles	1.28	0.36	0.06	1.53	0.66	0.00	0.00
23	Apparel	0.04	0.01	0.02	0.12	0.02	0.19	0.00
24	Lumber	1.58	0.02	0.06	0.15	0.25	16.28	0.00
25	Furniture	2.91	0.02	0.03	0.68	0.00	0.00	0.00
26	Paper	9.22	3.52	0.92	4.52	4.31	1.99	0.00
27	Printing	2.61	0.03	0.04	0.94	0.03	0.00	0.00
28	Chemicals	41.45	77.32	11.58	19.88	48.94	2.18	91.00
29	Petroleum	2.71	0.29	0.49	0.07	6.82	0.00	0.00
30	Plastics	6.37	0.25	1.18	8.10	0.51	5.22	0.00
31	Leather	0.62	0.32	0.35	0.13	0.53	0.00	0.00
32	Stone/Clay	0.72	0.63	1.38	0.57	1.06	29.50	0.00
33	Primary Metals	2.39	7.57	61.04	5.71	24.94	10.58	0.00
34	Fabr. Metals	4.25	2.31	4.01	8.65	0.16	1.29	0.00
35	Machinery	1.13	0.30	1.47	6.34	0.09	0.36	9.00
36	Electrical	2.28	1.15	2.18	10.57	0.51	4.58	0.00
37	Transportation	7.42	0.74	1.39	11.44	0.51	0.95	0.00
38	Measure./Photo.	1.36	0.08	0.22	6.73	0.06	0.02	0.00
39	Miscellaneous	1.22	0.03	0.48	1.61	0.10	0.26	0.00
Mult	Multiple codes 20-39	9.54	2.87	12.89	11.29	6.28	25.95	0.00
None	No codes 20-39	0.36	0.29	0.09	0.78	0.26	0.01	0.00
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Carcinogens in TRI Industries

Facilities in the Chemical and Primary Metals industries released and transferred the most TRI carcinogens in 1989.

The Chemical industry released and transferred the largest absolute amount of TRI carcinogens in 1989. The Chemical industry's carcinogenic releases and transfers totalled 135.9 million pounds, accounting for 33 percent of the TRI carcinogenic total. The Upjohn Company facility in Kalamazoo, Michigan, was the facility with the largest releases and transfers of carcinogens (6.1 million pounds) in this industry. This facility ranked third for total TRI carcinogenic releases and transfers. (See Figure 3-10, and Tables 3-17 and 3-28.)

The Primary Metals industry ranked second, with carcinogenic releases and transfers of 41 million pounds (10 percent). The Kennecott Utah Copper facility in Bingham Canyon, Utah, was the top facility in this industry for carcinogenic releases (2.4 million pounds) and ranked 14th for total TRI carcinogenic releases and transfers. The Rubber and Miscellaneous Plastic Products industry was third in rank with 40.8 million pounds (10 percent). The Hickory Springs Manufacturing facility in Verona, Mississippi, had the largest total carcinogenic releases and transfers (1.1 million pounds) in this industry. (See Figure 3-10, Tables 3-17 and 3-28.)

While those industrial sectors with the largest total TRI releases and transfers often also reported large releases of carcinogens, this was not always the case. The percentage of an industry's releases and transfers represented by TRI carcinogens

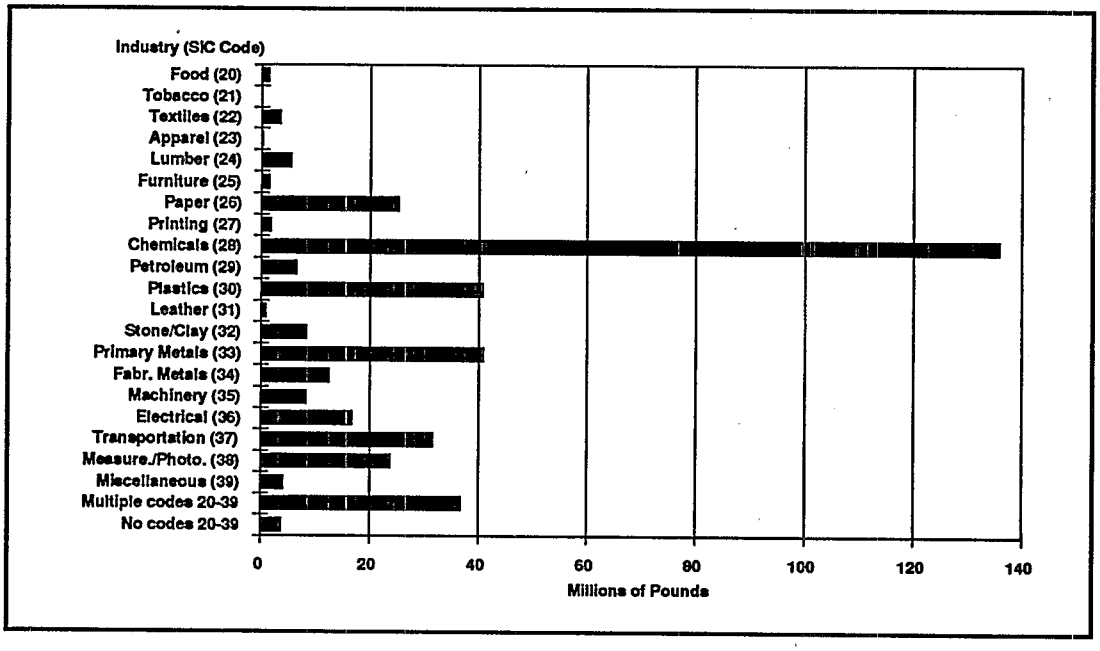


Figure 3–10. TRI Carcinogenic Releases and Transfers by Industry, 1989.

Table 3-28. TRI Total Carcinogenic Releases and Transfers by Industry, 1989.

TRI RANK	CARC. RANK	SIC CODE	INDUSTRY	CARCINOGENIC RELEASES AND TRANSFERS			TRI TOTAL RELEASES AND TRANSFERS
				Pounds	Percent of TRI Carcinogenic Total	Percent of Industry Total	Pounds
12	19	20	Food	1,344,404	0.33	1.98	67,803,337
22	22	21	Tobacco	28,997	0.01	1.95	1,485,626
16	16	22	Textiles	3,528,595	0.86	7.66	46,081,356
21	21	23	Apparel	285,858	0.07	13.88	2,059,373
18	13	24	Lumber	5,486,399	1.33	14.50	37,824,596
13	18	25	Furniture	1,542,084	0.37	2.36	65,369,507
4	6	26	Paper	25,359,240	6.16	8.10	313,254,241
14	17	27	Printing	1,853,544	0.45	3.04	60,923,661
1	1	28	Chemicals	135,933,044	33.03	4.95	2,745,768,071
9	12	29	Petroleum	6,568,392	1.60	6.37	103,136,599
7	3	30	Plastics	40,842,919	9.93	21.00	194,502,619
19	20	31	Leather	929,998	0.23	3.74	24,861,979
15	10	32	Stone/Clay	8,507,963	2.07	17.92	47,485,910
2	2	33	Primary Metals	40,970,895	9.96	5.41	756,808,577
6	9	34	Fabr. Metals	12,596,124	3.06	6.07	207,383,999
10	11	35	Machinery	8,382,715	2.04	11.19	74,922,470
8	8	36	Electrical	16,822,384	4.09	11.54	145,758,174
5	5	37	Transportation	31,677,043	7.70	12.91	245,316,145
11	7	38	Measure./Photo.	23,882,561	5.80	34.35	69,535,397
17	14	39	Miscellaneous	4,219,385	1.03	10.85	38,886,447
3	4	Mult	Multiple codes 20-39	36,896,207	8.97	8.44	437,278,275
20	15	None	No codes 20-39	3,846,649	0.93	20.01	19,224,021
			TOTAL	411,505,400	100.00	7.21	5,705,670,380

varied considerably from industry to industry. For example, the Measuring/Photographic industry, which ranked 11th in total TRI releases and transfers, claimed the largest percentage of TRI carcinogens in its total releases and transfers, with approximately one-third of this total classified as TRI carcinogens. (See Table 3-28.) On the other hand, only 5 percent of the Chemical industry's releases and transfers were carcinogens. (Compare Figures 3-4 and 3-10; see Table 3-28.)

Of the top 25 TRI carcinogens, facilities in the Chemical industry were responsible for more than half of the releases and transfers of ten of these chemicals. For example, the industry accounted for 96 percent of all releases and transfers of acrylonitrile and 87 percent of 1,3-butadiene. Carcinogens whose releases and transfers were dominated by other industries include chloroform, three-fourths of which was released and transferred by facilities in the Paper industry, while only 15 percent was from facilities in the Chemical industry. (See Appendix G, Table G-4.) All of the Tobacco industry's carcinogenic releases and transfers consisted of only one chemical, styrene. In contrast, the Apparel industry had no releases or transfers of styrene. However, 55 percent of the carcinogenic releases and transfers reported by facilities in the Apparel industry consisted of dichloromethane and 42 percent of tetrachloroethylene. (See Appendix I, Table I-4.)

Environmental Distribution of TRI Releases and Transfers by Industry

All but 4 industries released over 1/2 of their total releases and transfers to air.

At least half of the TRI releases and transfers of a majority of industries went to air. The Tobacco and the Furniture and Fixtures industries each released 93 percent of their releases and transfers to air, while only four industries released less than half of their total releases and transfers to air: the Food industry (28 percent), the Chemical industry (27 percent), the Stone/Clay/Glass industry (48 percent), and the Primary Metals industry (31 percent). (See Figure 3-11 and Table 3-29.)

The Paper industry discharged the largest proportion (13 percent) of its releases and transfers to surface water, while approximately half of the other industrial sectors discharged less than 1 percent of their totals to surface water. On-site land releases played a significant role in the overall releases and transfers both in the Primary Metals industry and in the Multiple Codes category, accounting for 32 percent and 17 percent, respectively, of the releases and transfers of each. As in the case of surface water, over half of the industrial sectors had less than 1 percent of their total releases and transfers involved in on-site land releases.

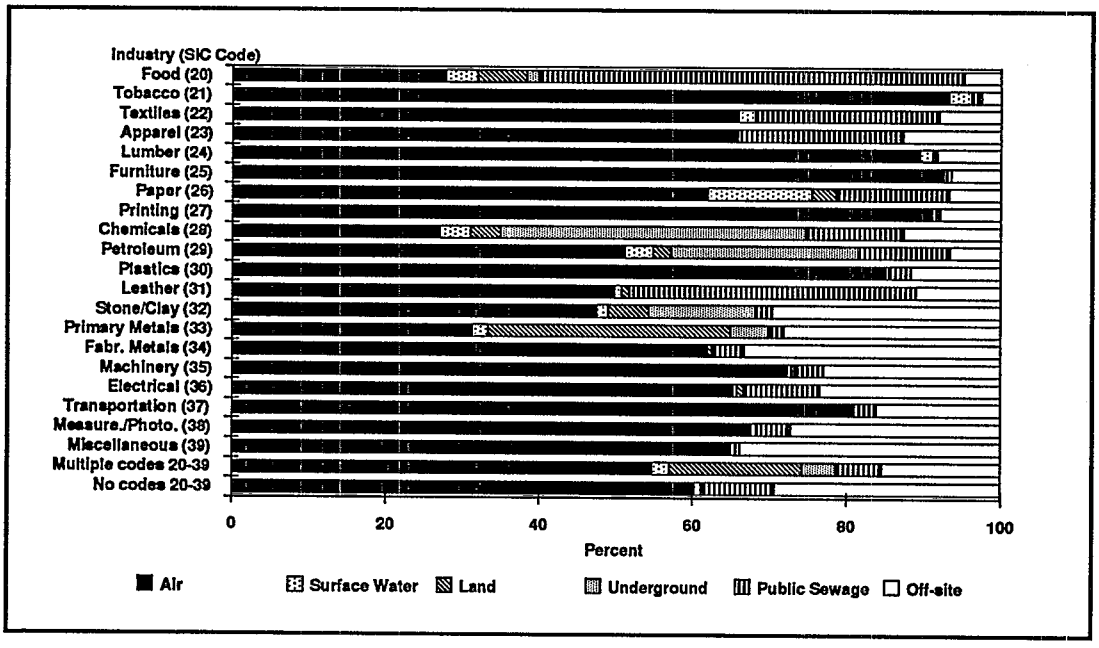


Figure 3–11. The Environmental Distribution of TRI Releases and Transfers of Each Industry, 1989.

Only nine industrial sectors had discharges to underground injection wells greater than 1 percent of their total releases and transfers, and such discharges played a significant role in only three of these: the Chemical industry (40 percent of its total releases and transfers), the Petroleum industry (24 percent of its total), and the Stone/Clay/Glass industry (14 percent of its total).

Facilities in most industries reported transfers to POTWs. Such transfers played significant roles in the Food industry and the Leather industry, accounting for 55 percent of releases and transfers of the former and 37 percent of the latter. Off-site transfers were reported by facilities in all industrial categories, and for approximately one-third of these industries this type of transfer accounted for at least 20 percent of their total releases and transfers.

Geographical Distribution of TRI Industries

Chemical industry totals were concentrated in Texas and Louisiana.

Although releases and transfers of the Chemical industry occurred in most states, the releases and transfers in two states, Texas and Louisiana, dominated this industry's total. Facilities in Texas contributed 658.6 million pounds (24 percent) of the

Table 3-29. The Environmental Distribution of TRI Releases and Transfers of Each Industry, 1989.

TRI RANK	SIC CODE	INDUSTRY	TOTAL RELEASES AND TRANSFERS	AIR	SURFACE WATER	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE	TOTAL
			Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent
12	20	Food	67,803,337	27.77	4.15	6.41	1.63	55.26	4.79	100.00
22	21	Tobacco	1,485,626	93.14	3.04	0.10	0.00	1.11	2.61	100.00
16	22	Textiles	46,081,356	65.90	2.16	0.10	0.00	23.79	8.04	100.00
21	23	Apparel	2,059,373	65.78	0.01	0.02	0.00	21.42	12.76	100.00
18	24	Lumber	37,824,596	89.42	1.74	0.30	0.00	0.19	8.36	100.00
13	25	Furniture	65,369,507	92.51	0.00	0.03	0.00	0.93	6.52	100.00
4	26	Paper	313,254,241	61.94	13.46	3.17	0.00	14.68	6.75	100.00
14	27	Printing	60,923,661	90.85	0.01	0.00	0.00	1.23	7.91	100.00
1	28	Chemicals	2,745,768,071	27.07	3.98	3.89	39.75	12.65	12.66	100.00
9	29	Petroleum	103,136,599	51.20	3.65	2.31	24.35	11.82	6.66	100.00
7	30	Plastics	194,502,619	85.04	0.36	0.12	0.01	2.74	11.72	100.00
19	31	Leather	24,861,979	49.83	0.92	1.03	0.00	37.15	11.06	100.00
15	32	Stone/Clay	47,485,910	47.52	1.47	5.39	13.84	2.09	29.69	100.00
2	33	Primary Metals	756,808,577	31.25	2.09	31.61	4.87	2.02	28.15	100.00
6	34	Fabr. Metals	207,383,999	61.83	0.15	0.52	0.16	4.06	33.28	100.00
10	35	Machinery	74,922,470	72.30	0.53	0.41	0.00	3.79	22.96	100.00
8	36	Electrical	145,758,174	65.29	0.46	0.95	0.03	9.78	23.48	100.00
5	37	Transportation	245,316,145	80.50	0.05	0.07	0.00	3.18	16.20	100.00
11	38	Measure./Photo.	69,535,397	67.64	0.62	0.14	0.00	4.36	27.24	100.00
17	39	Miscellaneous	38,886,447	64.74	0.09	0.14	0.00	1.20	33.83	100.00
3		Multiple codes 20-39	437,278,275	54.80	2.18	17.30	4.40	5.91	15.41	100.00
20		No codes 20-39	19,224,021	60.27	0.87	0.23	0.00	9.32	29.32	100.00
TOTAL			5,705,670,380	42.54	3.31	7.79	20.70	9.66	16.00	100.00

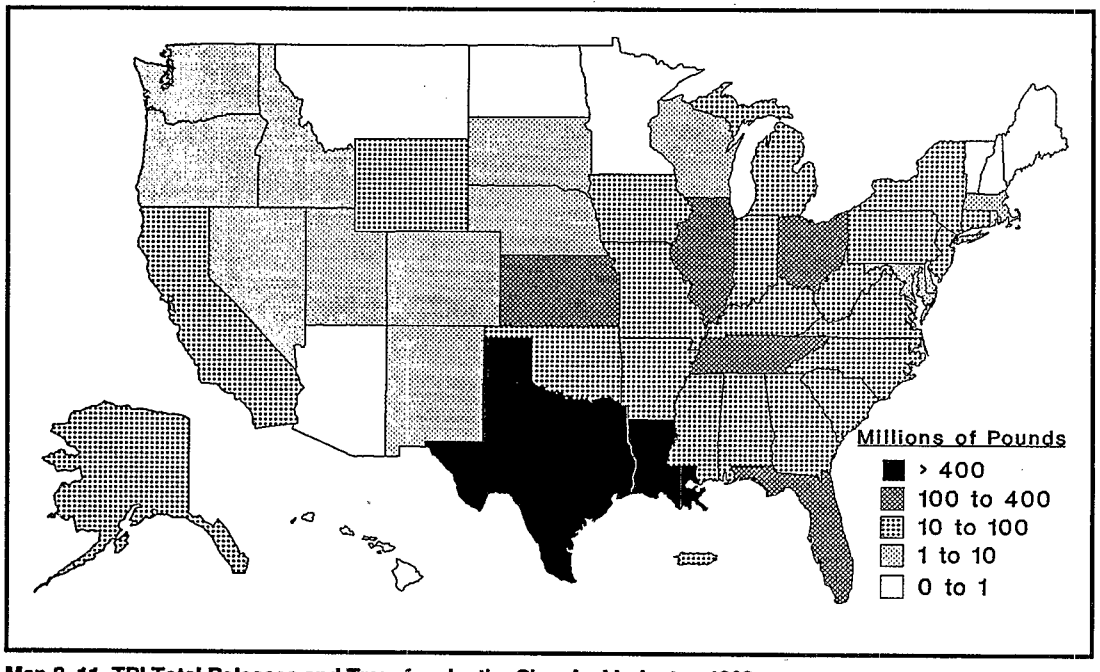
Chemical industry's total 2.75 billion pounds, and facilities in Louisiana accounted for 421.6 million pounds (15 percent) of that total. (See Map 3-11; and Appendix I, Table I-5.)

In examining the geographical distribution of other industries, a situation similar to that in the Chemical industry, where facilities in one or two states dominated the industry's releases and transfers, was often seen. An example is the distribution of the Textiles industry. The releases and transfers of facilities in this industry in North Carolina (10.6 million pounds), South Carolina (7 million pounds), and Georgia (6.7 million pounds) together accounted for just over half of the industry total. (See Map 3-12; and Appendix I, Table I-5.)

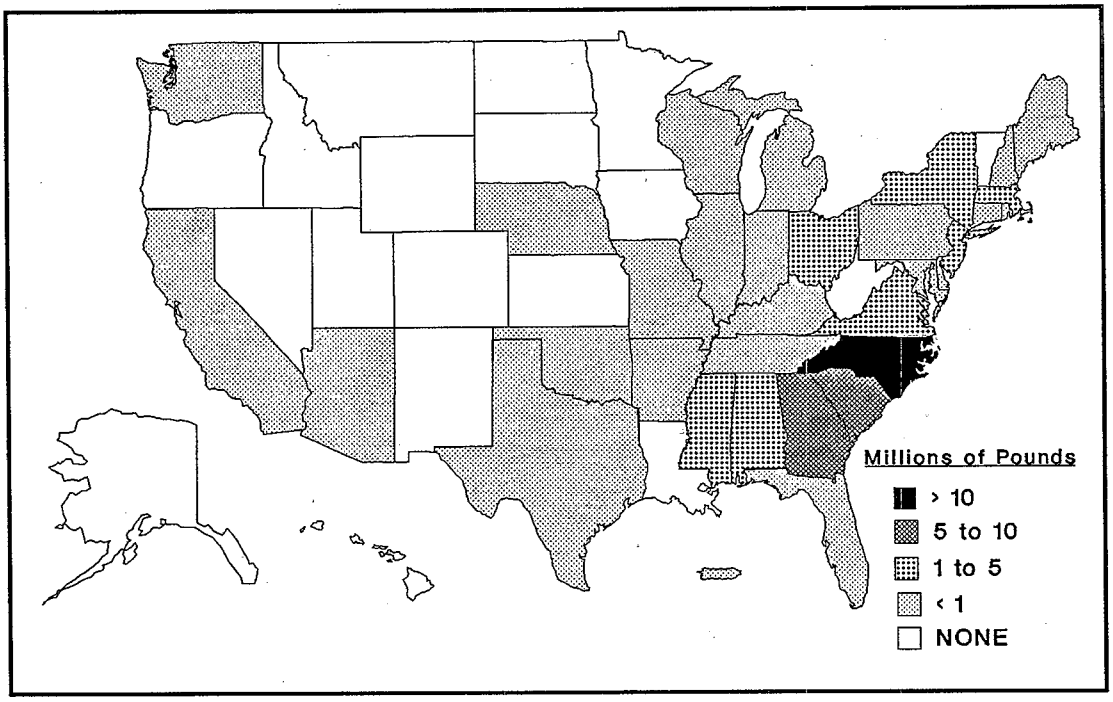
In contrast to the large role of a few states in the releases and transfers of a particular industry, there were some industries where no particular state had a conclusive impact. For example, in the Electrical industry, facilities in no one state contributed more than 10 percent to that industry's total releases and transfers. (See Map 3-13; and Appendix I, Table I-5.)

Four-digit SIC Codes

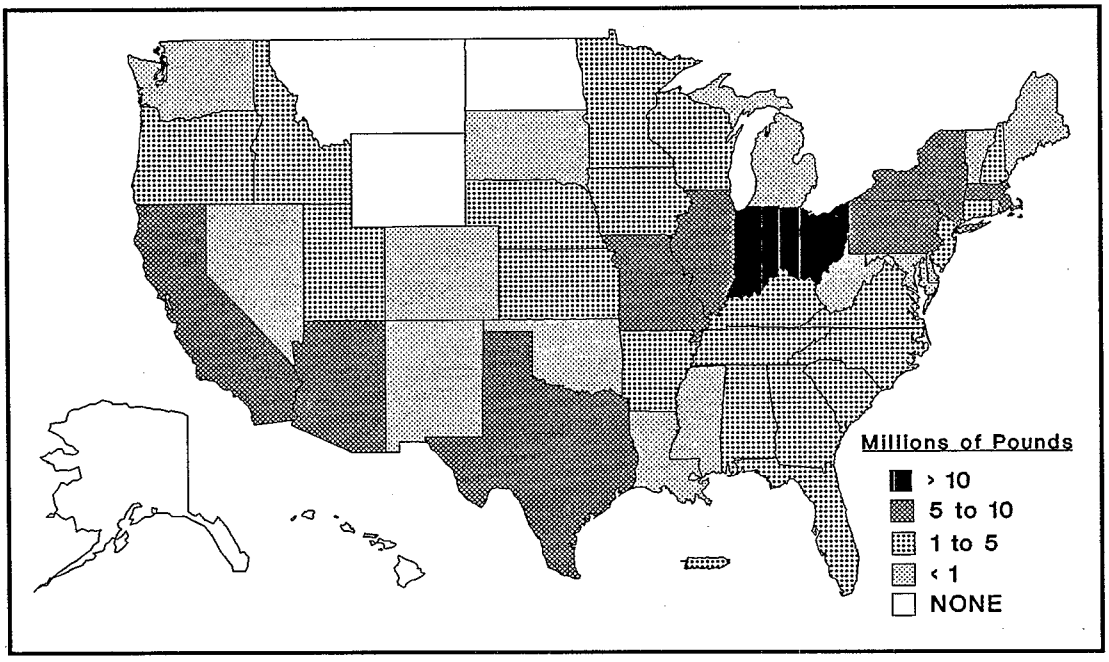
The industrial analyses throughout this report have been based upon broad industrial categories, as defined by the first two digits of the four-digit SIC codes. (See Appendix C and Chapter 8.) However, further insights into industrial patterns can be gained by analyzing facilities on the basis of all four digits of their SIC codes. A brief evaluation is given below. Box 3-H examines several facility examples.



Map 3–11. TRI Total Releases and Transfers by the Chemical Industry, 1989.



Map 3–12. TRI Total Releases and Transfers by the Textiles Industry, 1989.



Map 3–13. TRI Total Releases and Transfers by the Electrical Industry, 1989.

83% of TRI facilities reported only a single four-digit SIC Code.

A single four-digit SIC code was reported by 83 percent of TRI facilities in 1989. In fact, 80 percent of the facilities in every two-digit category reported only one four-digit code per facility. In most cases, the releases and transfers reported by facilities, whether with one or more four-digit SIC code, were comparable. For example, 89 percent of the facilities in the Food industry (SIC 20) reported only one four-digit code, and these facilities accounted for 90 percent of all releases and transfers in the Food industry. There was one industry, however, where this general trend differed markedly. A total of 82 percent of all facilities reporting in the Chemical industry (SIC 28) reported just one four-digit code, and 18 percent reported more than one. However, the 18 percent of Chemical facilities reporting more than one four-digit code within SIC Code 28 accounted for the majority (54 percent) of the Chemical industry's releases and transfers. (See Table 3-30.)

Table 3-30. TRI Facilities Reporting a Single and a Multiple 4-Digit SIC Code Within Each Industrial Category, 1989.

SIC CODE	INDUSTRY		TRI FACILITIES		TOTAL RELEASES AND TRANSFERS	
			Number	Percent of industry total	Pounds	Percent of industry total
20	Food	Single 4-digit	1,577	88.65	60,815,622	89.69
		Multiple 4-digit	202	11.35	6,987,715	10.31
		TOTAL	1,779	100.00	67,803,337	100.00
21	Tobacco	Single 4-digit	16	94.12	1,466,926	98.74
		Multiple 4-digit	1	5.88	18,700	1.26
		TOTAL	17	100.00	1,485,626	100.00
22	Textiles	Single 4-digit	395	84.76	40,235,133	87.31
		Multiple 4-digit	71	15.24	5,846,223	12.69
		TOTAL	466	100.00	46,081,356	100.00
23	Apparel	Single 4-digit	42	89.36	1,910,643	92.78
		Multiple 4-digit	5	10.64	148,730	7.22
		TOTAL	47	100.00	2,059,373	100.00
24	Lumber	Single 4-digit	657	91.89	34,540,476	91.32
		Multiple 4-digit	58	8.11	3,284,120	8.68
		TOTAL	715	100.00	37,824,596	100.00
25	Furniture	Single 4-digit	445	91.94	58,074,530	88.84
		Multiple 4-digit	39	8.06	7,294,977	11.16
		TOTAL	484	100.00	65,369,507	100.00
26	Paper	Single 4-digit	521	83.49	218,258,726	69.67
		Multiple 4-digit	103	16.51	94,995,515	30.33
		TOTAL	624	100.00	313,254,241	100.00
27	Printing	Single 4-digit	301	80.48	42,734,170	70.14
		Multiple 4-digit	73	19.52	18,189,491	29.86
		TOTAL	374	100.00	60,923,661	100.00
28	Chemicals	Single 4-digit	3,471	81.50	1,256,960,205	45.78
		Multiple 4-digit	788	18.50	1,488,807,866	54.22
		TOTAL	4,259	100.00	2,745,768,071	100.00
29	Petroleum	Single 4-digit	375	91.02	80,475,494	78.03
		Multiple 4-digit	37	8.98	22,661,105	21.97
		TOTAL	412	100.00	103,136,599	100.00

Table 3–30, continued.

SIC CODE	INDUSTRY		TRI FACILITIES TRANSFERS		TOTAL RELEASES AND	
			Number	Percent of industry total	Pounds	Percent of industry total
30	Plastics	Single 4-digit	1,450	90.01	174,685,098	89.81
		Multiple 4-digit	161	9.99	19,817,521	10.19
		TOTAL	1,611	100.00	194,502,619	100.00
31	Leather	Single 4-digit	129	94.85	24,542,225	98.71
		Multiple 4-digit	7	5.15	319,754	1.29
		TOTAL	136	100.00	24,861,979	100.00
32	Stone/Clay/Glass	Single 4-digit	588	94.84	46,909,286	98.79
		Multiple 4-digit	32	5.16	576,624	1.21
		TOTAL	620	100.00	47,485,910	100.00
33	Primary Metals	Single 4-digit	1,453	88.11	668,246,579	88.30
		Multiple 4-digit	196	11.89	88,561,998	11.70
		TOTAL	1,649	100.00	756,808,577	100.00
34	Fabricated Metals	Single 4-digit	2,676	90.16	183,651,778	88.56
		Multiple 4-digit	292	9.84	23,732,221	11.44
		TOTAL	2,968	100.00	207,383,999	100.00
35	Machinery	Single 4-digit	974	94.93	70,960,234	94.71
		Multiple 4-digit	52	5.07	3,962,236	5.29
		TOTAL	1,026	100.00	74,922,470	100.00
36	Electrical	Single 4-digit	1,574	92.48	127,931,934	87.77
		Multiple 4-digit	128	7.52	17,826,240	12.23
		TOTAL	1,702	100.00	145,758,174	100.00
37	Transportation	Single 4-digit	1,112	93.13	221,749,801	90.39
		Multiple 4-digit	82	6.87	23,566,344	9.61
		TOTAL	1,194	100.00	245,316,145	100.00
38	Measure./Photo.	Single 4-digit	384	94.12	67,812,476	97.52
		Multiple 4-digit	24	5.88	1,722,921	2.48
		TOTAL	408	100.00	69,535,397	100.00
39	Miscellaneous	Single 4-digit	370	96.86	35,961,844	92.48
		Multiple 4-digit	12	3.14	2,924,603	7.52
		TOTAL	382	100.00	38,886,447	100.00
	None In 20-39	Single 4-digit	221	89.11	16,752,624	87.14
		Multiple for none in 20-39	27	10.89	2,471,397	12.86
		TOTAL FOR NONE	248	100.00	19,224,021	100.00
		TOTAL FOR SINGLE 4-DIGIT SIC CODES	18,731		3,434,675,804	
		PERCENT OF GRAND TOTAL	82.99		60.20	
		TOTAL FOR MULT. 4-DIGIT SIC CODES WITHIN ONE 2-DIGIT CATEGORY	2,390		1,833,716,301	
		PERCENT OF GRAND TOTAL	10.59		32.14	
		TOTAL FOR MULT. 4-DIGIT SIC CODES IN MORE THAN ONE 2-DIGIT CATEGORY	1,448		437,278,275	
		PERCENT OF GRAND TOTAL	6.42		7.66	
		GRAND TOTAL	22,569		5,705,670,380	

Table 3-31. The 25 Industries (Classified by 4-Digit SIC Code) with the Largest TRI Total Releases and Transfers, 1989.

TRI RELEASE/ TRANSFER RANK	SIC CODE	INDUSTRY AND TRANSFERS	FACILITIES(a) WATER	FORMS(b)	TOTAL RELEASES		AIR	SURFACE
			Number	Number	Pounds		Percent	Percent
1	2869	Industrial organic chemicals, n.e.c. (b)	305	2,390	327,218,513		20.44	0.97
2	3339	Primary smelting/refining of nonferrous metals, n.e.c	23	108	198,622,561		61.40	3.96
3	3312	Blast furnaces, steel works, rolling mills	143	1,103	179,651,066		16.24	2.12
4	2816	Inorganic pigments	39	192	179,233,022		8.88	0.10
5	2819	Industrial inorganic chemicals, n.e.c.	285	1,010	156,321,182		14.07	3.78
6	2873	Nitrogenous fertilizers	64	263	131,189,664		86.64	5.55
7	3331	Primary smelting/refining of copper	8	77	91,212,014		5.44	0.03
8	2911	Petroleum refining	170	2,315	73,688,476		51.95	3.70
9	2821	Plastics materials, synthetic resins	322	1,875	70,162,842		54.90	1.21
10	3711	Motor vehicles and passenger car bodies	59	818	65,614,527		87.92	0.02
11	2611	Pulp mills	31	223	62,002,349		33.95	55.88
12	2834	Pharmaceutical preparations	131	442	58,714,944		38.19	4.45
13	2813	Industrial gases	142	212	56,454,007		3.25	0.07
14	2621	Paper mills, except building paper mills	139	592	55,073,083		66.37	5.35
15	2851	Paints, varnishes, lacquers, enamels	598	3,452	49,349,617		38.68	0.01
16	3321	Gray iron foundries	135	559	48,817,217		26.15	0.48
17	3861	Photographic equipment and supplies	62	343	47,689,842		64.21	0.89
18	3714	Motor vehicle parts and accesories	367	1,259	47,261,289		67.66	0.19
19	3079	Miscellaneous plastics products	344	923	46,488,703		84.88	0.04
20	3089	Plastics products, n.e.c.	321	777	42,504,748		84.33	1.39
21	3411	Metal cans	190	869	41,359,255		91.19	0.00
22	2874	Phosphatic fertilizers	27	110	40,945,946		21.30	3.90
23	2511	Wood household furniture, except upholstered	212	976	40,429,280		97.22	0.00
24	2865	Cyclic (coal tar) crudes, dyes, organic pigments	76	617	39,919,762		15.78	0.65
25	2631	Paperboard mills	61	260	38,622,046		52.20	1.41
		SUBTOTAL	4,254	21,765	2,188,545,955			
		TOTAL FOR ALL OTHERS	18,315	60,126	3,517,124,425			
		GRAND TOTAL	22,569	81,891	5,705,670,380			

(a) Only facilities and forms reporting a single SIC Code were counted.
(b) n.e.c. is not elsewhere classified

Given that the two-digit SIC codes most frequently reported in 1989 were the Chemical (SIC 28) and Primary Metals (SIC 33) industries, it is not surprising that many of the top 25 four-digit codes fell into these two SIC categories. The number one four-digit industry for TRI releases and transfers, Industrial Organic Chemicals (SIC 2869) with releases and transfers of 327.2 million pounds, accounted for 6 percent of total TRI releases and transfers. Other top four-digit industries were Primary Smelting (SIC 3339) (198.6 million pounds), Blast Furnaces (SIC 3312) (179.7 million pounds), Inorganic Pigments (SIC 2816) (179.2 million pounds), and Industrial Inorganic Chemicals (SIC 2819) (156.3 million pounds). (See Table 3-31.)

Despite the fact that the Chemical industry and, to a lesser extent, the Primary Metals industry, dominated the industrial releases and transfers, not all of the top four-digit SIC code industries belonged to these two industries. In fact, 11 of the top

Table 3-31, continued.

INDUSTRY	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE LAND	
	Percent	Percent	Percent	Percent
Industrial organic chemicals, n.e.c. (b)	56.33	11.59	10.36	0.31
Primary smelting/refining of nonferrous metals, n.e	0.01	0.00	1.45	33.18
Blast furnaces, steel works, rolling mills	16.88	1.04	39.76	23.96
Inorganic pigments	47.98	36.29	6.52	0.23
Industrial inorganic chemicals, n.e.c.	26.17	25.24	12.97	17.77
Nitrogenous fertilizers	5.94	0.30	0.13	1.43
Primary smelting/refining of copper	0.00	0.01	0.01	94.51
Petroleum refining	21.65	11.87	7.82	3.02
Plastics materials, synthetic resins	0.00	7.43	36.34	0.13
Motor vehicles and passenger car bodies	0.00	2.01	10.05	0.00
Pulp mills	0.00	5.48	4.32	0.37
Pharmaceutical preparations	8.43	14.20	31.79	2.94
Industrial gases	0.00	0.00	96.67	0.01
Paper mills, except building paper mills	0.00	13.14	10.93	4.21
Paints, varnishes, lacquers, enamels	0.06	4.09	57.16	0.06
Gray iron foundries	0.00	0.10	31.08	42.20
Photographic equipment and supplies	0.00	4.48	30.28	0.14
Motor vehicle parts and accesories	0.00	8.88	23.11	0.15
Miscellaneous plastics products	0.02	1.67	13.38	0.01
Plastics products, n.e.c.	0.00	7.29	6.82	0.17
Metal cans	0.00	0.13	8.68	0.00
Phosphatic fertilizers	0.00	0.00	0.36	74.44
Wood household furniture, except upholstered	0.00	0.19	2.55	0.05
Cyclic (coal tar) crudes, dyes, organic pigments	0.14	64.46	18.07	0.91
Paperboard mills	0.00	29.42	3.21	13.76

25 fell into other broad industrial categories. For example, Petroleum Refining (SIC 2911) ranked eighth in TRI releases and transfers for the four-digit industries, whereas the broader Petroleum Refining and Related Industries Category (SIC 29) ranked ninth overall when comparing two-digit industries. (See Tables 3-5 and 3-31.)

The four-digit industries with the largest releases and transfers were not always those with the largest number of facilities. The Electroplating industry (SIC 3471), a member of the Fabricated Metals industry, had the largest number of facilities (709 facilities) of any four-digit grouping, but it did not rank in the top 25 four-digit code industries for releases and transfers. Other four-digit industries with large number of facilities were Paints (SIC 2851), Motor Vehicle Parts (SIC 3714), Wood Preserving (SIC 2491), and Miscellaneous Plastic Products (SIC 3079). (See Tables 3-31 and 3-32.)

Table 3-32. The 25 Industries (Classified by 4-Digit SIC Code) with the Largest Number of TRI Facilities, 1989.

TRI FACIL. RANK	SIC CODE	INDUSTRY	FACILITIES(a) Number	FORMS(a) Number	TOTAL RELEASES AND TRANSFERS Pounds	AIR Percent	SURFACE WATER Percent
1	3471	Electroplating, plating, polishing, anodizing, coloring	709	2,099	24,441,524	35.02	0.23
2	2851	Paints, varnishes, lacquers, enamels	598	3,452	49,349,617	38.68	0.01
3	3714	Motor vehicle parts and accesories	367	1,259	47,261,289	67.66	0.19
4	2491	Wood preserving	354	1,128	2,096,865	48.50	0.37
5	3079	Miscellaneous plastics products	344	923	46,488,703	84.88	0.04
6	2821	Plastics materials, synthetic resins	322	1,875	70,162,842	54.90	1.21
7	3089	Plastics products, n.e.c. (b)	321	777	42,504,748	84.33	1.39
8	2899	Chemical and chemical preparations, n.e.c.	309	1,306	9,710,243	42.05	0.10
9	2869	Industrial organic chemicals, n.e.c.	305	2,390	327,218,513	20.44	0.97
10	2819	Industrial inorganic chemicals, n.e.c.	285	1,010	156,321,182	14.07	3.78
11	3499	Fabricated metal products, n.e.c.	275	674	15,185,115	75.21	0.27
12	3679	Electronic components, n.e.c.	242	639	16,875,860	73.74	0.11
13	3479	Coating, engraving and allied services, n.e.c.	237	655	25,588,328	23.95	0.03
14	3069	Fabricated rubber products, n.e.c.	216	501	22,542,973	85.05	0.01
15	2511	Wood household furniture, except upholstered	212	976	40,429,280	97.22	0.00
16	2891	Adhesives and sealants	197	672	6,990,763	47.36	0.06
17	3411	Metal cans	190	869	41,359,255	91.19	0.00
18	3732	Boat building and repairing	183	460	22,712,909	91.41	0.00
19	3672	Cathode ray television picture tubes	175	581	8,024,990	39.38	0.05
20	2911	Petroleum refining	170	2,315	73,688,476	51.95	3.70
21	3674	Semiconductors and related devices	162	842	22,423,567	36.26	1.55
22	2048	Prepared feeds for animals and fowls, n.e.c.	160	303	292,948	36.55	13.65
23	2842	Specialty cleaning, polishing, sanitation preparartions	160	521	834,382	55.60	0.26
24	2086	Bottled and canned soft drinks and carbonted waters	160	254	522,470	13.92	1.29
25	2893	Printing ink	156	466	3,826,248	67.59	0.02
		SUBTOTAL	6,809	26,947	1,076,853,090		
		TOTAL FOR ALL OTHERS	15,760	54,944	4,628,817,290		
		GRAND TOTAL	22,569	81,891	5,705,670,380		

(a) Only facilities and forms reporting a single SIC Code were counted.
(b) n.e.c. is not elsewhere classified

An individual four-digit industry can differ significantly from the trends and patterns seen within its broader two-digit industrial sector. This can be illustrated by looking at the environmental distribution of releases and transfers. The Primary Metals industry exhibited the following environmental distribution: 32 percent in on-site land releases, 31 percent in air emissions, and 28 percent in off-site transfers. (See Table 3-29.) In contrast, the Primary Smelting industry (3339) which was the four-digit code in the Primary Metals industry associated with the largest releases and transfers within that industry, emitted 61 percent of its releases and transfers to air and released 33 percent on site to land. (See Table 3-31.)

MAXIMUM AMOUNT OF CHEMICALS ON-SITE

Maximum amount codes describe the largest volume of the TRI chemical on site at a facility during the year.

Facilities reporting a particular chemical to TRI are required to indicate the maximum amount of that chemical at the facility at any time during the calendar year. The maximum amount is to be calculated based on all quantities of the chemical on site (in storage tanks, process vessels, on-site shipping containers, and

Table 3-32, continued.

INDUSTRY	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE
	Percent	Percent	Percent	Percent
Electroplating, plating, polishing, anodizing, colori	1.09	0.00	12.70	50.94
Paints, varnishes, lacquers, enamels	0.06	0.00	4.09	57.16
Motor vehicle parts and accesories	0.15	0.00	8.88	23.11
Wood preserving	0.95	0.00	0.68	49.51
Miscellaneous plastics products	0.01	0.02	1.67	13.38
Plastics materials, synthetic resins	0.13	0.00	7.43	36.34
Plastics products, n.e.c. (b)	0.17	0.00	7.29	6.82
Chemical and chemical preparations, n.e.c.	0.05	0.00	29.05	28.75
Industrial organic chemicals, n.e.c.	0.31	56.33	11.59	10.36
Industrial inorganic chemicals, n.e.c.	17.77	26.17	25.24	12.97
Fabricated metal products, n.e.c.	0.10	0.00	4.09	20.33
Electronic components, n.e.c.	0.16	0.00	7.05	18.94
Coating, engraving and allied services, n.e.c.	0.57	0.00	2.13	73.32
Fabricated rubber products, n.e.c.	0.25	0.00	1.22	13.47
Wood household furniture, except upholstered	0.05	0.00	0.19	2.55
Adhesives and sealants	0.06	0.00	2.51	50.01
Metal cans	0.00	0.00	0.13	8.68
Boat building and repairing	0.23	0.00	0.50	8.30
Cathode ray television picture tubes	0.13	0.00	15.89	44.55
Petroleum refining	3.02	21.65	11.87	7.82
Semiconductors and related devices	5.65	0.22	29.52	26.81
Prepared feeds for animals and fowls, n.e.c.	0.90	0.00	35.50	14.21
Specialty cleaning, polishing, sanitation preparartio	0.34	0.00	32.80	10.99
Bottled and canned soft drinks and carbonted wate	0.15	0.00	65.26	19.38
Printing ink	0.14	0.00	1.81	30.44

so on). There are 11 ranges which are to be used for indicating the maximum amount of a chemical, covering a range from zero to 99 pounds up to a range of one billion pounds or greater. (See Table 3-33.) It should be noted that facilities are not required to indicate the length of time that the maximum amount is present.

The number of forms reported per maximum amount code are presented in Figure 3-12. The largest number of forms (32,093 forms) were reported for the maximum amount range of 10,000 to 99,999 pounds, followed by 25,674 forms reported for the range of 1,000 to 9,999 pounds. These two categories accounted for approximately 71 percent of all forms reported. There were 14 forms in the 500 million to 1 billion pounds category, and three forms reported in the 1 billion pounds or greater range.

Chemicals with the largest numbers of TRI forms submitted often tended to be among the chemicals most often reported for a particular maximum amount code. For example, sulfuric acid was reported on the most TRI forms (5,547 forms or 7 percent of the total forms reported), and it was among the top ten chemicals reported

BOX 3-H. FACILITIES REPORTING MULTIPLE SIC CODES

TRI facilities reported as many as 12 different four-digit SIC codes per facility in 1989. Many of these were all in the same two-digit category and, thus, the facility was analyzed for purposes of this report in that two-digit SIC category. Six percent of the facilities, however, reported multiple SIC codes that fell into more than one two-digit category and, therefore, were categorized as Multiple SIC Code facilities. (See Table 3-5.)

Inland Steel Company, East Chicago, Indiana, led the Multiple Codes category in 1989 with a total of 57.3 million pounds of releases and transfers, the seventh largest amount for any TRI facility. It reported as a Primary Metals facility (SIC 33) (with the four-digit code 3312 for Steel Works/Blast Furnaces) and as a Stone/Clay/Glass facility (SIC 32) (with the four-digit code 3274 for Lime operations). If the facility had been solely a Primary Metals facility, it would have ranked second in that industry behind Magnesium Corporation of America in Tooele, Utah. If the facility had been only in the Stone/Clay/Glass industry, it would have been the first-ranked facility in that industry, far exceeding the 6.3 million pounds of releases and transfers of Harshaw Chemical Company (Jackson, Mississippi), the number one facility for the Stone/Clay/Glass industry. (See Table 3-6, and Appendix I, Table I-1.)

Inland Steel reported releasing 34 TRI chemicals, primarily as on-site land releases (44.8 million pounds, or 78 percent of its TRI total). The facility was the number one facility for on-site land releases, accounting for 10 percent of all such releases. Another 12 percent (6.7 million pounds) of Inland Steel's releases and transfers was discharged to underground injection wells, which resulted in the facility being ranked 25th in underground injection. (See Appendix F, Tables F-3 and F-4.)

Manganese compounds accounted for the largest releases and transfers (38.8 million pounds or 68 percent) of Inland Steel's TRI total. Other top chemicals were hydrochloric acid (6.9 million pounds) and zinc compounds (5.3 million pounds). These three chemicals accounted for a total of 89 percent of the facility's releases and transfers in 1989.

The 3M Consumer AV and Consumer Products facility in Hutchinson, Minnesota, reported the next-largest releases and transfers for Multiple SIC Code facilities (29 million pounds) and was the 22nd-ranked TRI facility for total releases and transfers. It reported under Paper Products (SIC 26) (with the four-digit SIC code 2672 for Coated and Laminated Paper) and under Electronic and other Electrical Equipment (SIC 36) (with the four-digit code 3695 for Magnetic and Optical Recording Media). The facility's total releases and transfers exceeded those for all other Paper facilities as well as for any facility reporting solely in the Electrical industry. (See Table 3-6, and Appendix I, Table I-1.)

3M's releases and transfers were less diversified than those of Inland Steel, representing a total of 17 chemicals. A total of 25.7 million pounds (88 percent) was emitted to air. The facility ranked fourth in the nation in total TRI air releases. (See Appendix F, Table F-1.) Two chemicals accounted for 96 percent of 3M's total releases and transfers: methyl ethyl ketone (18.2 million pounds) and toluene (9.6 million pounds). The majority of the releases and transfers of these two chemicals were air releases, and together they accounted for 97 percent of the facility's total air emissions.

Table 3-33. Ranges Used for Reporting the Maximum Amount On Site at Any Time During the Calendar Year, 1989.

RANGE CODE	WEIGHT RANGE IN POUNDS	
	From	To
01	0	99
02	100	999
03	1,000	9,999
04	10,000	99,999
05	100,000	999,999
06	1,000,000	9,999,999
07	10,000,000	49,999,999
08	50,000,000	99,999,999
09	100,000,000	499,999,999
10	500,000,000	999,999,999
11	1 billion	more than 1 billion

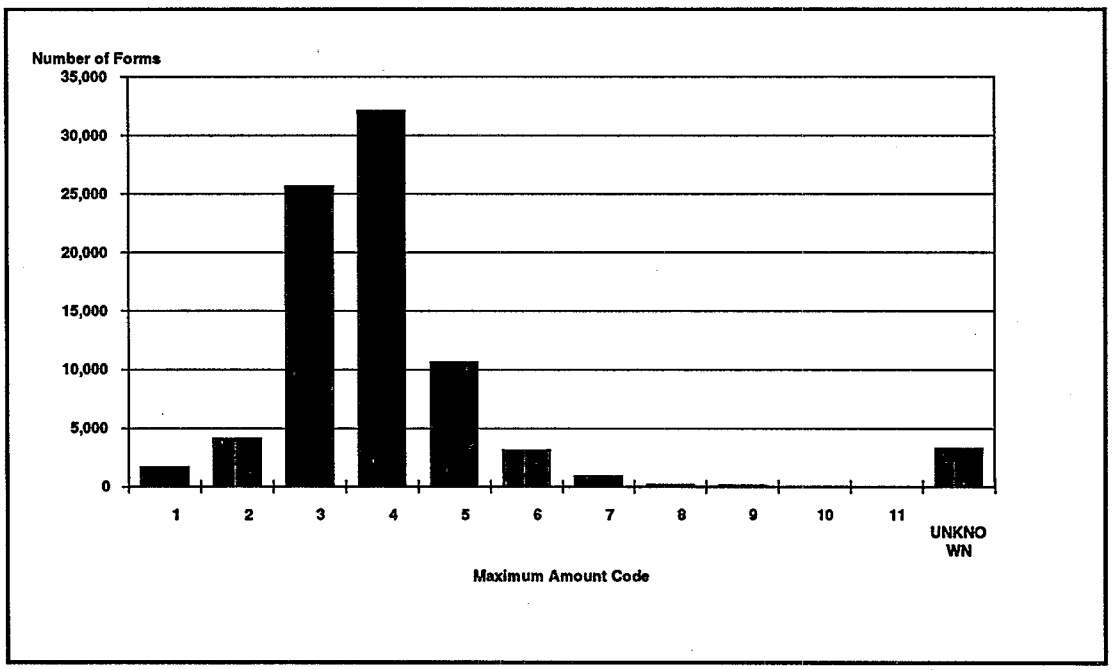


Figure 3–12. The Number of TRI Forms Reported per Maximum Amount Code, 1989.

Table 3-34. The Number of TRI Forms by Maximum Amount Code for the Top 25 Chemicals (Ranked by Number of Forms), 1989.

TRI FORMS RANK	CHEMICAL	MAXIMUM AMOUNT CODE												
		1 Number	2 Number	3 Number	4 Number	5 Number	6 Number	7 Number	8 Number	9 Number	10 Number	11 Number	UNKNOWN Number	TOTAL FORMS Number
1	Sulfuric acid	27	175	1,640	2,182	972	215	69	19	13	0	0	235	5,547
2	Toluene	55	249	1,453	1,362	423	118	81	16	7	1	0	177	3,942
3	1,1,1-Trichloroethane	36	175	1,979	1,303	139	19	9	1	0	0	0	232	3,893
4	Xylene (mixed isomers)	40	236	1,384	1,237	318	82	64	15	6	0	0	143	3,525
5	Hydrochloric acid	75	155	1,152	1,269	379	82	11	3	3	0	0	121	3,250
6	Ammonia	48	157	907	1,360	383	54	36	31	8	0	0	136	3,120
7	Acetone	73	303	1,150	824	182	37	14	2	1	1	0	136	2,723
8	Phosphoric acid	20	110	927	1,152	238	63	18	0	11	0	0	99	2,638
9	Methanol	62	143	764	1,020	310	99	19	8	2	0	0	94	2,521
10	Methyl ethyl ketone	54	183	1,037	862	164	26	7	3	2	1	0	125	2,464
11	Copper	18	44	382	817	471	154	26	6	8	1	0	84	2,011
12	Zinc compounds	21	47	455	935	328	63	9	2	6	0	2	67	1,935
13	Nitric acid	17	134	808	700	130	44	2	2	6	1	0	80	1,924
14	Glycol ethers	22	69	610	835	194	34	7	1	1	0	0	49	1,822
15	Chlorine	16	116	645	526	240	143	24	0	2	0	0	67	1,779
16	Dichloromethane	24	73	648	605	107	21	7	3	0	0	0	64	1,552
17	Freon 113	7	58	775	491	49	11	2	0	0	0	0	90	1,483
18	Ethylene glycol	16	43	380	684	217	53	21	3	0	1	0	51	1,469
19	Chromium compounds	21	53	304	703	165	44	14	3	2	0	0	54	1,363
20	Styrene	9	36	313	626	176	58	28	3	2	1	0	66	1,318
21	Nickel	19	52	340	578	189	42	3	1	4	0	0	57	1,285
22	Chromium	31	64	331	539	203	33	7	2	5	0	1	61	1,277
23	Copper compounds	14	22	344	603	172	40	11	0	6	0	0	42	1,254
24	n-Butyl alcohol	36	81	471	434	92	23	7	0	0	0	0	33	1,177
25	Manganese	25	41	274	473	167	34	7	3	2	1	0	51	1,078
SUBTOTAL		786	2,819	19,473	22,120	6,408	1,592	503	127	97	8	3	2,414	56,350
TOTAL FOR ALL OTHERS		895	1,315	6,201	9,973	4,181	1,531	444	91	54	6	0	850	25,541
GRAND TOTAL		1,681	4,134	25,674	32,093	10,589	3,123	947	218	151	14	3	3,264	81,891

on the most forms for eight of the 11 maximum amount codes. There were two chemicals which were reported with maximum amounts of 1 billion or greater: zinc compounds, reported twice in this range and chromium, reported once. (See Table 3-34.)

As with TRI chemicals for which many forms were submitted, states receiving high numbers of TRI forms also often could be found as top states (for number of TRI forms) for a particular maximum amount code. California was the state with the largest total number of forms submitted (5,962 forms, or 7 percent of the TRI total number of forms received), and also ranked as a top five TRI state for eight of the maximum amount ranges. Forms reporting maximum amounts of 1 billion pounds or more came from facilities in Michigan, Montana, and New York. (See Table 3-35.)

When TRI forms are classified by industry, those industries with high numbers of forms submitted are often also prominent in particular maximum amount ranges. The Chemical industry had by far the largest number of forms reporting (23,179 forms or 28 percent of the TRI total), and this industry ranked first or second for number of forms reported in almost all of the maximum amount ranges. For the maximum amount range of one billion pounds or more, all three forms reporting

Table 3-35. The Number of TRI Forms by Maximum Amount Code by State, 1989.

STATE	MAXIMUM AMOUNT CODE												TOTAL
	1	2	3	4	5	6	7	8	9	10	11	UNKNOWN	FORMS
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Alabama	48	88	486	697	289	102	18	2	7	0	0	59	1,796
Alaska	1	4	6	2	19	15	0	0	1	0	0	0	48
American Samoa	0	0	2	1	0	0	0	0	0	0	0	0	3
Arizona	11	52	280	222	38	10	2	1	1	0	0	34	651
Arkansas	15	60	376	460	163	47	6	4	1	0	0	31	1,163
California	202	415	2,091	2,097	650	161	65	9	4	1	0	267	5,962
Colorado	3	42	254	217	63	22	6	1	0	0	0	15	623
Connecticut	12	65	546	566	157	26	5	1	0	1	0	82	1,461
Delaware	3	6	30	142	57	15	6	5	0	0	0	6	270
District of Columbia	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	43	96	524	580	193	36	23	2	12	0	0	59	1,568
Georgia	36	108	709	1,098	334	65	12	6	4	0	0	96	2,468
Hawaii	4	4	21	32	14	21	1	0	0	0	0	4	101
Idaho	4	10	56	58	17	10	6	1	0	0	0	7	169
Illinois	49	213	1,520	2,220	649	153	45	15	3	0	0	151	5,018
Indiana	36	146	1,115	1,318	413	120	25	7	3	2	0	113	3,298
Iowa	11	71	484	389	151	36	13	0	2	0	0	42	1,199
Kansas	12	50	261	349	117	66	18	3	2	1	0	25	904
Kentucky	30	55	400	602	256	77	19	5	1	1	0	54	1,500
Lotiisiana	61	113	287	594	397	204	97	35	10	2	0	35	1,835
Maine	11	20	135	152	39	8	1	0	0	0	0	20	386
Maryland	8	32	206	372	102	34	8	1	2	0	0	40	805
Massachusetts	39	101	787	870	144	26	3	0	3	0	0	82	2,055
Michigan	71	215	1,196	1,604	430	91	21	8	1	1	1	161	3,800
Minnesota	67	113	583	444	98	17	9	5	2	0	0	62	1,400
Mississippi	50	50	313	431	142	42	14	7	5	0	0	34	1,088
Missouri	62	117	679	924	305	51	22	4	6	1	0	108	2,279
Montana	1	3	28	33	26	18	7	0	2	0	1	3	122
Nebraska	15	27	159	172	47	16	5	4	0	0	0	24	469
Nevada	3	8	28	38	12	4	2	0	1	0	0	4	100
New Hampshire	18	24	169	153	21	4	0	0	0	0	0	22	411
New Jersey	39	87	751	1,432	469	145	48	4	5	0	0	175	3,155
New Mexico	1	12	47	64	25	8	2	1	2	0	0	4	166
New York	36	122	1,012	1,175	361	66	22	0	4	0	1	136	2,935
North Carolina	86	160	1,142	1,147	320	56	14	0	7	0	0	130	3,062
North Dakota	1	7	25	29	4	5	2	0	0	0	0	2	75
Ohio	112	243	1,786	2,491	841	157	40	6	8	0	0	238	5,922
Oklahoma	11	24	230	290	108	42	14	8	3	0	0	23	753
Oregon	13	55	282	284	88	22	0	0	1	0	0	39	784
Pennsylvania	86	192	1,332	1,796	611	198	60	7	5	0	0	162	4,449
Puerto Rico	10	30	158	221	80	20	8	2	0	1	0	27	557
Rhode Island	1	28	254	222	33	3	0	1	0	0	0	14	556
South Carolina	37	72	587	707	244	54	3	0	4	0	0	70	1,778
South Dakota	7	7	52	29	3	1	0	0	0	0	0	9	108
Tennessee	49	104	676	796	253	92	16	2	0	0	0	76	2,064
Texas	133	318	1,340	2,071	1,014	506	206	52	24	3	0	232	5,899
Utah	6	15	144	153	76	31	6	1	3	0	0	22	457
Vermont	2	11	56	55	6	2	0	0	0	0	0	16	148
Virgin Islands	0	0	0	8	2	0	6	0	3	0	0	0	19
Virginia	45	93	570	659	180	35	8	0	0	0	0	70	1,660
Washington	28	72	360	388	120	63	8	2	5	0	0	60	1,106
West Virginia	13	20	119	237	166	76	11	4	3	0	0	21	670
Wisconsin	36	148	997	948	218	32	12	0	1	0	0	96	2,488
Wyoming	3	6	23	54	24	12	2	2	0	0	0	2	128
TOTAL FOR STATE	1,681	4,134	25,674	32,093	10,589	3,123	947	218	151	14	3	3,264	81,891
PERCENT OF TRI TOTAL	2.05	5.05	31.35	39.19	12.93	3.81	1.16	0.27	0.18	0.02	0.00	3.99	100.00

Table 3-36. The Number of TRI Forms by Maximum Amount Code by Industry, 1989.

SIC CODE		INDUSTRY MAXIMUM AMOUNT CODE												TOTAL FORMS
		1	2	3	4	5	6	7	8	9	10	11UNKNOWN		
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
20	Food	67	249	1,286	1,310	203	18	19	3	5	0	0	147	3,307
21	Tobacco	0	3	8	13	3	1	0	0	0	0	0	2	30
22	Textiles	35	98	454	343	36	1	1	0	2	0	0	52	1,022
23	Apparel	0	5	51	32	0	1	0	0	0	0	0	5	94
24	Lumber	13	152	689	960	128	4	2	0	4	0	0	137	2,089
25	Furniture	74	154	1,066	416	25	2	0	0	1	0	0	98	1,836
26	Paper	166	211	751	875	296	91	7	1	1	0	0	87	2,486
27	Printing	58	64	408	196	34	5	0	0	0	0	0	56	821
28	Chemicals	279	547	3,821	10,885	5,011	1,481	391	96	52	8	0	608	23,179
29	Petroleum	100	121	451	993	674	569	261	52	16	0	0	56	3,293
30	Plastics	71	243	1,603	1,602	369	23	10	2	2	1	0	222	4,148
31	Leather	18	36	184	133	20	2	0	0	0	0	0	13	406
32	Stone/Clay	29	56	419	708	216	83	34	7	6	0	0	68	1,626
33	Primary Metals	166	281	1,701	2,408	1,126	446	103	25	27	1	3	250	6,537
34	Fabr. Metals	148	648	3,934	3,108	504	74	16	9	16	0	0	499	8,956
35	Machinery	110	158	1,224	1,031	191	18	5	0	2	0	0	152	2,891
36	Electrical	66	356	2,572	1,787	355	61	13	2	2	2	0	256	5,472
37	Transportation	76	282	1,913	2,000	449	33	11	2	2	1	0	180	4,949
38	Measure./Photo.	7	50	513	428	86	7	1	1	0	0	0	52	1,145
39	Miscellaneous	12	72	500	316	67	6	3	0	1	1	0	52	1,030
	Multiple codes 20-39	129	263	1,882	2,329	724	186	61	17	11	0	0	220	5,822
	No codes 20-39	57	85	244	220	72	11	9	1	1	0	0	52	752
TOTAL FOR INDUSTRY		1,681	4,134	25,674	32,093	10,589	3,123	947	218	151	14	3	3,264	81,891
PERCENT OF TRI TOTAL		2.05	5.05	31.35	39.19	12.93	3.81	1.16	0.27	0.18	0.02	0.00	3.99	100.00

Table 3-37. Facilities, Chemicals, and Releases and Transfers Associated with Forms Reporting Maximum Amounts Onsite of 500 Million Pounds or Greater (Maximum Amount Codes 10 and 11), 1989.

MAX. AMT. CODE	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	CHEMICAL	AIR	SURFACE WATER
							Pounds	Pounds
11	33	Asarco Inc.	East Helena	Lewis and Clark	MT	Zinc Compounds	23,900	0
11	33	Bethlehem Steel Corp.	Lackawanna	Erie	NY	Zinc Compounds	24,250	13,000
11	33	Quanex Corp.	Jackson	Jackson	MI	Chromium	33	0
10	30	Charloma Fiberglass Inc.	Cherryvale	Montgomery	KS	Methyl Ethyl Ketone (b)	0	0
10	28	Chevron Chemical Co.	St James	St James	LA	Ethylbenzene	44,600	59
10	28	Chevron Chemical Co.	St James	St James	LA	Styrene	36,800	72
10	39	Coatings Inc. & Co.	Bayamon	Bayamon	PR	Toluene	0	0
10	28	Du Pont Victoria Site	Victoria	Victoria	TX	Nitric Acid	0	0
10	28	Du Pont Victoria Site	Victoria	Victoria	TX	Cyclohexane	112,927	30
10	28	Eli Lilly & Co.	Clinton	Vermillion	IN	Acetone	381,000	250
10	28	Eli Lilly & Co.	Clinton	Vermillion	IN	Acetonitrile	141,000	250
10	37	G & O Manufacturing Co.	New Haven	New Haven	CT	Copper	0	0
10	36	Gates Energy Products	Warrensburg	Johnson	MO	Lead Compounds	4	0
10	36	GE Appliances	Louisville	Jefferson	KY	Polychlorinated Biphenyls	0	0
10	28	Mobil Chemical Co.	Houston	Harris	TX	Propylene	266,000	0
10	33	Quanex Corp.	Jackson	Jackson	MI	Manganese	2,827	28
10	28	Refiners Marketing Co.	Terminal Island	Los Angeles	CA	Ethylene Glycol	0	0

were from the Primary Metals industry, however, which agrees with the fact that the two chemicals reported in these volumes, as noted above, were metals. (See Table 3-36.)

Maximum amount on-site did not necessarily indicate the size of a facility's releases and transfers.

In interpreting the maximum amounts reported on site for any one facility, it should be remembered that this information is not necessarily indicative of the amount of releases and transfers associated with that facility. Facilities reporting in the highest maximum amount codes 10 and 11 may have reported relatively small releases and transfers of the chemical of concern. (See Table 3-37.) The reverse is also true: a chemical whose maximum amount on site is small may generate large releases and transfers. For example, the Stone Container Corporation facility in Panama City, Florida, reported a maximum amount on-site at any one time of methanol in the zero to 99 pound range (code 01). However, this facility reported releases and transfers of methanol of 8.6 million pounds. Stone Container is a pulp and paper mill. Methanol is produced during the processing of the wood. Most of the methanol (95 percent) at this facility is transferred to a POTW with the remainder released to air, resulting in a reported minimum amount (99 pounds or less) of methanol on site at any one time during 1989.

Table 3–37, continued.

FACILITY NAME	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	LAND	UNDER-GROUND
	Pounds	Pounds	Pounds	Pounds	Pounds
Asarco Inc.	107	0	29,031,807	29,007,800	0
Bethlehem Steel Corp.	0	50,000	367,250	280,000	0
Quanex Corp.	0	0	33	0	0
Charloma Fiberglass Inc.	0	0	0	0	0
Chevron Chemical Co.	0	2,331	46,990	0	0
Chevron Chemical Co.	0	1,622	38,494	0	0
Coatings Inc. & Co.	0	0	0	3,920	23,261,680
Du Pont Victoria Site	0	0	23,265,600	237	109,460
Du Pont Victoria Site	0	0	222,654	250	0
Eli Lilly & Co.	0	0	381,500	250	0
Eli Lilly & Co.	0	0	141,500	0	0
G & O Manufacturing Co	0	250	250	0	0
Gates Energy Products	3	0	7	0	0
GE Appliances	0	21,300	21,300	0	0
Mobil Chemical Co.	0	250	266,250	0	0
Quanex Corp.	0	0	2,855	0	0
Refiners Marketing Co.	0	0	0		

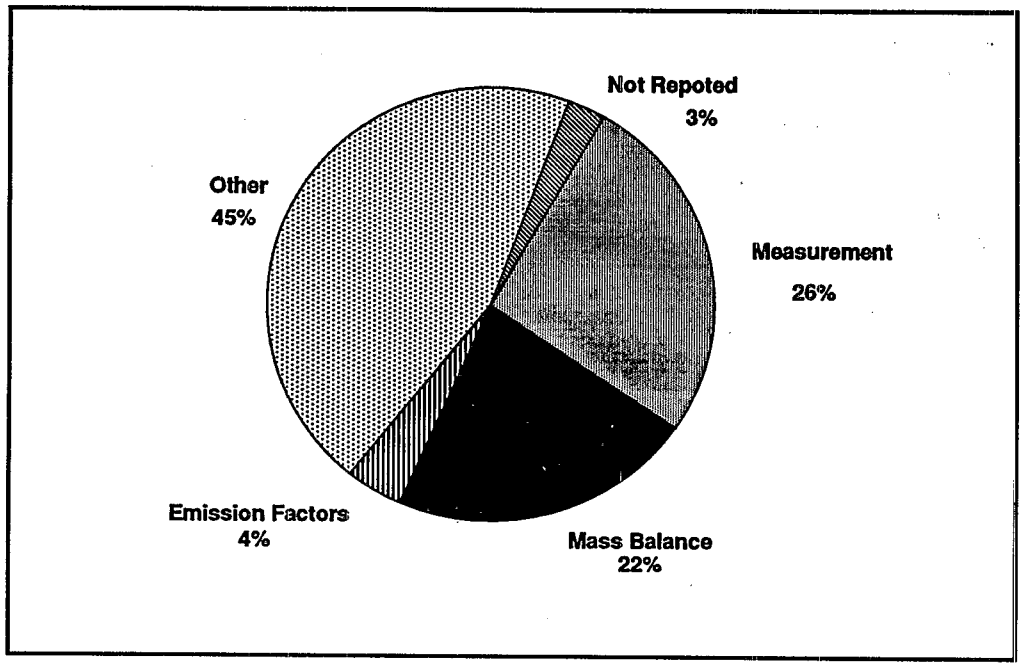


Figure 3–13. Basis of Estimate for TRI Total Releases and Transfers, 1989.

Table 3-38. TRI Releases and Transfers by Basis of Estimate by Type of TRI Release or Transfer, 1989.

TYPE OF TRI RELEASE OR TRANSFER	BASIS OF ESTIMATE							
	MEASUREMENT		MASS BALANCE		EMISSION FACTOR		OTHER	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
TOTAL AIR EMISSIONS	302,647,356	12.47	815,577,090	33.60	202,234,634	8.33	1,013,047,308	41.74
Fugitive Air Emissions	27,581,380	3.70	252,194,774	33.82	92,488,067	12.40	341,763,583	45.83
Point Source Air Emissions	275,065,976	16.36	563,382,316	33.51	109,746,567	6.53	671,283,725	39.92
SURFACE WATER	102,606,076	54.30	24,729,882	13.09	1,662,554	0.88	56,646,228	29.98
TOTAL LAND	214,688,022	48.27	43,854,228	9.86	3,536,913	0.80	161,972,568	36.42
Landfill	65,309,734	37.73	11,588,008	6.70	3,335,171	1.93	88,003,169	50.85
Land Treatment	13,689,804	62.14	1,981,866	9.00	32,725	0.15	5,487,394	24.91
Surface Impoundment	43,558,064	38.82	20,941,835	18.67	11,939	0.01	45,037,562	40.14
Other Land Disposal	92,130,420	67.04	9,342,519	6.80	157,078	0.11	23,444,193	17.06
Unknown Land Disposal	0	0.00	0	0.00	0	0.00	250	32.05
UNDERGROUND INJECTION	384,510,749	32.56	22,387,653	1.90	143,582	0.01	770,886,413	65.28
PUBLIC SEWAGE	141,234,855	25.63	185,335,533	33.63	28,166,238	5.11	189,080,592	34.31
OFF-SITE TRANSFERS	359,326,501	39.35	169,922,398	18.61	8,200,014	0.90	356,299,630	39.02
TOTAL RELEASES AND TRANSFERS	1,505,013,559	26.38	1,261,806,784	22.11	243,943,935	4.28	2,547,932,739	44.66

HOW FACILITIES ESTIMATED TRI RELEASES AND TRANSFERS

Reports to TRI must indicate how release and transfer amounts were estimated.

TRI regulations require facilities to report chemical releases and transfers to the extent that data are available or reasonably ascertainable, and to indicate how they arrive at the reported amounts. Estimates are usually based upon monitoring data, mass balance, emissions factors, or other approaches such as engineering calculations and/or judgment (or some combination of these methods). Whichever method is used, it must reflect the best information available at the facility. If more than one method is used to arrive at the reported amount, facilities are to report the principal method by which the amount is derived. This reporting of basis of estimate is tied to each type of release or transfer for each chemical.

26% of TRI releases and transfers were based on monitoring data or measurement.

In 1989 the largest portion of the pounds of TRI releases and transfers (2.5 billion pounds, or 45 percent) was based on "*other*" approaches such as engineering calculations or best engineering judgment. Another 26 percent (1.5 billion pounds) was based on *monitoring data or measurements*, 22 percent (1.3 billion pounds) was based on *mass balance calculations*,[11] and a small fraction (147 million pounds, or 4 percent) was based on published *emission factors*.[12] Methods of estimation for the remaining 3 percent were not indicated. (See Figure 3-13.)

Table 3-38,

TYPE OF TRI RELEASE OR TRANSFER	BASIS OF ESTIMATE: NOT REPORTED		TOTAL RELEASES AND TRANSFERS	
	Pounds	Percent	Pounds	Percent
TOTAL AIR EMISSIONS	93,555,518	3.85	2,427,061,906	100.00
Fugitive Air Emissions	31,640,431	4.24	745,668,235	100.00
Point Source Air Emissions	61,915,087	3.68	1,681,393,671	100.00
SURFACE WATER	3,309,144	1.75	188,953,884	100.00
TOTAL LAND	20,684,819	4.65	444,736,550	100.00
Landfill	4,839,788	2.80	173,075,870	100.00
Land Treatment	840,497	3.81	22,032,286	100.00
Surface Impoundment	2,644,456	2.36	112,193,856	100.00
Other Land Disposal	12,359,548	8.99	137,433,758	100.00
Unknown Land Disposal	530	67.95	780	100.00
UNDERGROUND INJECTION	2,902,784	0.25	1,180,831,181	100.00
PUBLIC SEWAGE	7,217,478	1.31	551,034,696	100.00
OFF-SITE TRANSFERS	19,303,620	2.11	913,052,163	100.00
TOTAL RELEASES AND TRANSFER	146,973,363	2.58	5,705,670,380	100.00

Different methods prevailed for different environmental forms of release or transfer. Direct measurement was used for 54 percent of all discharges to surface water, while only 12 percent of all air emissions were measured. The largest share of air emissions was based on "other" approaches (42 percent), as was the largest share of discharges to underground wells (65 percent). Estimates of on-site land releases were based largely on measurement (48 percent) and "other" methods (36 percent). Estimated transfers to public sewage treatment plants were divided among "other" methods and emission factors (34 percent each) and measurement (26 percent). Similarly, estimates for other off-site transfers were divided largely between measurement and "other" (39 percent each). Mass balance calculations were not the most common method used for any type of release or transfer, but did account for 34 percent each of the estimates for total air emissions and for transfers to public sewage. (See Table 3-38.)

The choice of method of estimate varies according to the type of industrial process, the TRI chemical, mode of release or transfer, and economic and technical feasibility at a particular plant. Some differences arise from the fact that certain releases, such as on-site land releases, are more readily contained and collected for measurement, while others, such as fugitive air releases, are more dispersed, uncontained, and difficult to measure. Also, facilities are more likely to know the amount of wastes that must be physically transported away from the site (off-site transfers), because shipments by barrel, rail, or truck have built-in measurements. However, the facility still must have a method of calculating the concentration of the particular TRI chemical in the wastes, because it is the pounds of a particular TRI chemical, and not the facility's total wastes, which are reported to EPA.

Facilities' accuracy in using these different methods also differs widely among facilities, for one facility from year to year, or from one process to another. Individual facilities frequently change their basis of estimate, which may result in increases or decreases for reported amounts of a chemical that may not relate to any change in level of waste production or degree of environmental control from one year to the next. (See Box 4-B.)

NOTES

1. As stated above and in Box 2-A, 302 individual chemicals were on the TRI list at the time of 1989 reporting. However, as explained in Box 2-A, terephthalic acid and *all* aluminum oxide (fibrous and non-fibrous forms) reports have been excluded from this analysis. Therefore, only *300* individual chemicals are analyzed in this report.

2. While a parent company operates at least two facilities, not all these facilities may be required to report to TRI. Hence, Vulcan Chemicals is a parent company with only one facility reporting to TRI.

3. Prior to 1989 reporting, sodium hydroxide (solution) was deleted from the TRI chemical list. Because this chemical represented the single base in this TRI class, the chemical class name "acids/bases/salts," used in the 1987 and 1988 National Reports, has been changed to "mineral acids/salts" throughout this report. See Chapter 2, Box 2-A, for further discussion of TRI chemical delistings.

4. In figures and tables throughout this report, class names will be abbreviated as: organics; mineral acids/salts; metals; halo-organics; and non-metals.

5. Most suppliers are now required to notify their customers of the identities and amounts of TRI chemicals in the mixtures or trade name products that they market. Supplier notification requirements were fully implemented for the first time in calendar year 1989; therefore, many facilities purchasing chemical mixtures became aware of the identity and amount of the TRI chemicals in these mixtures. The 1989 data should more accurately reflect the composition of TRI chemicals in wastes, and there may be decreased reporting of wastes in the mixture category as a result of the supplier notification requirements, as facilities are able to report more mixture components under the specific chemical names.

6. Reported discharges of phosphoric and sulfuric acid may be artificially high due to incorrect facility reporting of TRI mineral acids in wastes that have been neutralized prior to discharge. The 1989 TRI data should reflect the TRI reporting requirements more accurately than those of prior years.

7. *Toxic Chemical Release Inventory Risk Screening Guide*, EPA 560/2-89-002 (Washington, DC: U.S. Environmental Protection Agency, July 1989).

8. The term "counties" in this report includes counties, parishes, and similar governmental jurisdictions such as independent cities that are not incorporated into any county. (See Chapter 8.)

9. TRI facilities report individual city names, rather than standard metropolitan statistical areas (SMSAs) which include a city and its surrounding suburbs. Facilities in large metropolitan areas may be located in any of various suburbs, each with a different name. Thus, many large metropolitan areas do not appear on the list because the reporting TRI facilities are scattered in suburbs with different names.

10. There are four possible reasons for which facilities might be included in this category: 1) they did not fill out the SIC code section of their TRI forms completely or correctly; 2) they were not among SIC codes 20-39, but did not understand that they were not required to report; 3) they were not among SIC codes 20-39, but voluntarily reported their activities involving TRI chemicals; 4) they reported SIC codes in 20-39, but the data were entered into the TRI database incorrectly.

11. Mass balance calculations relate to an entire industrial process or piece of process equipment. If there were no wastestream, the amount of a chemical leaving a process or piece of equipment (output) would equal the amount entering (input). If the amount of chemicals in the input and output streams for the process are known, the amount of chemicals in the wastestream can be found by calculating the difference in the input and output amounts, accounting for any accumulation or depletion of the chemical inside the equipment or process, such as by chemical reaction.

12. Emission factors are published estimates based on the average measured emissions at several facilities in the same industry for the same general type of industrial process. Emission factors usually express releases as a ratio of amount released to process/equipment throughput.

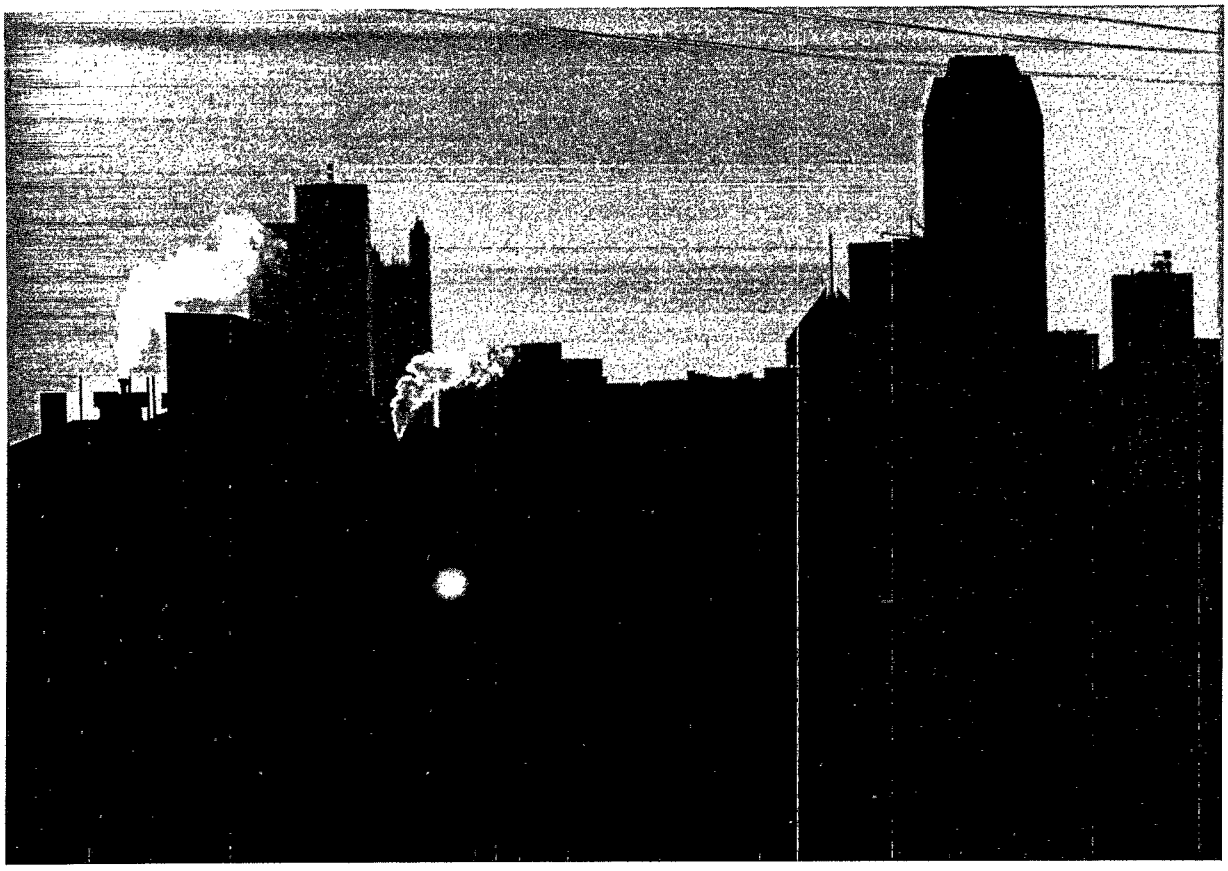


Photo: Daniel J. Kasztelan

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CHAPTER 4. COMPARING 1989 TRI RELEASES AND TRANSFERS TO PREVIOUS YEARS

INTRODUCTION

Total reported TRI releases and transfers were 1.3 billion pounds less in 1989 than in 1987.

Total reported releases and transfers of TRI chemicals (excluding delisted chemicals) were 1.3 billion pounds less in 1989 than in 1987, amounting to an overall change of 19 percent. While this change in the TRI numbers is certainly encouraging, total releases and transfers of TRI chemicals, as reported only by those manufacturing facilities meeting the TRI reporting requirements, still exceeded 5.7 billion pounds in 1989. (See Table 4-1.)

While some of these reported decreases are due to true reductions in releases and transfers, others are due to factors such as changes in estimation methods, a better understanding of the reporting requirements, corrections of errors in previous submissions, and other factors. For a more thorough discussion related to possible reasons for increases and decreases, see Box 4-B.

The first part of this chapter discusses the changes in total TRI releases and transfers, and is followed by discussions addressing the changes specific to each of the various TRI release or transfer categories: air, water, land, underground injection, and off-site transfers either to public sewage or other waste management facilities for treatment, storage, or disposal. While data are available for 1987, this chapter primarily compares TRI data for 1988 and 1989 because the 1988 data are considered to be more reliable than the 1987 data for a variety of reasons. (See Chapter 2.)[1]

Table 4–1. TRI Total Facilities, Forms, and Releases and Transfers, 1987-1989.

	1989	1988	1987	CHANGE 1988-1989		CHANGE 1987-1989	
	Number	Number	Number	Number	Percent	Number	Percent
Total Forms Submitted	81,891	75,194	68,800	6,697	8.91	13,091	19.03
Forms with Releases/Transfers	72,428	66,807	60,546	5,621	8.41	11,882	19.62
Total Facilities	22,569	21,144	19,617	1,425	6.74	2,952	15.05
Facilities with Releases/Transfers	20,812	19,616	18,082	1,196	6.10	2,730	15.10
	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Percent
TRI Total Releases and Transfers	5,705,670,380	6,426,484,611	7,011,244,040	-720,814,231	-11.22	-1,305,573,660	-18.62

In order to compare data for more than one year, it is necessary to standardize the data by removing the forms for those chemicals that have been removed from the TRI reporting list (*delisted* chemicals). None of the analyses in this chapter or the rest of the report include forms for delisted chemicals, except in Chapter 2 where such changes to the database are explained.

As noted repeatedly throughout this report, individual facilities played a significant, often dominant, role in specific increases and decreases, including the overall changes in TRI releases and transfers. For example, the 20 facilities with the largest decreases in total TRI releases and transfers from 1988 to 1989 represented a combined decrease of 555.1 million pounds (compare this to the overall net decrease of 720.8 million pounds reported by *all* TRI facilities for this time period). (See Chapter 8 for a discussion of linking facility data across years.) Of the 22,569 facilities reporting to TRI in 1989, just 127 showed decreases of over 1.5 million pounds each between 1988 and 1989, and those decreases accounted for 59 percent of all 1989 decreases by TRI facilities. In view of this, and the fact that almost as many facilities showed increases in their TRI amounts as showed decreases, it appears that a relatively small number of facilities with large decreases accounted for a substantial portion of the net decrease in TRI totals from 1988 to 1989. (See Appendix F, Table F-7 and Chapter 8.)

The facilities with the greatest decreases and increases emerge frequently as major contributors to the changes described herein. Overall, most large changes at individual facilities involved a single chemical and a single route of release or transfer, as discussed below.

Overview of Changes in Total TRI Releases and Transfers from 1988 to 1989

Even though the number of TRI facilities and forms increased, total TRI releases and transfers decreased by 11% from 1988 to 1989.

Total releases and transfers of TRI chemicals (excluding delisted chemicals) dropped 11 percent (720.8 million pounds) from 1988 to 1989, despite the fact that the number of TRI facilities and forms increased. Seven percent more facilities reported to TRI in 1989 than in 1988, for a total of 22,569 facilities in 1989. These TRI facilities together submitted 81,891 forms in 1989, an increase of 9 percent over the previous year. (See Table 4-1 and Box 4-A.) Possible explanations for changes in TRI releases and transfers are discussed in Box 4-B.

The net decrease of 720.8 million pounds from 1988 to 1989 was the result of 1.6 billion pounds of decreases, partially offset by 889.7 million pounds of increases. The number of facilities showing increases between 1988 and 1989 (11,148) exceeded the number showing decreases (10,775); however, the number of facilities showing decreases in excess of *1 million pounds* (226) was considerably more than the number showing increases of that magnitude (135).

BOX 4-A. FACILITIES THAT REPORTED TO TRI IN ONLY ONE YEAR

Reasons why a facility may have reported in only one year:

- The facility may have met TRI reporting requirements in only one year. For example, a facility may have reported to TRI in 1987 and/or 1988, but not in 1989, for any of the following reasons: a) it may no longer retain the equivalent of ten or more full-time employees; b) its industrial activities may have changed from a manufacturing sector required to report to TRI (SIC Codes 20-39, shown in Appendix C) to a non-manufacturing sector; c) it may not have manufactured, processed, or otherwise used any TRI chemicals during 1989; or d) it may not have manufactured, processed, or otherwise used any of the TRI chemicals in quantities exceeding the reporting thresholds in 1989. (Note that the reporting threshold for manufacture or processing of TRI chemicals was 75,000 pounds for 1987, 50,000 pounds for 1988, and 25,000 pounds for 1989. The reporting threshold for *otherwise use* of TRI chemicals remained unchanged—10,000 pounds for all three years.)

- The facility may have reported in one year when in fact it was not required to report.

- The facility may have gone out of business. (The facility would still be required to report any chemical that exceeded the TRI threshold prior to cessation of operations.)

- The facility may be new—that is, it may have started operations after an annual reporting deadline.

- A facility may have been part of another TRI facility on the same site in one year but since then has changed ownership. When part of a facility changes ownership, the part that is sold receives a new TRI facility identification number and thus appears in the database as a new facility, while the rest of the facility retains the old number.

BOX 4-B. SOME REASONS FOR CHANGES IN TRI RELEASES AND TRANSFERS

This TRI National Report presents data on chemicals reported to TRI in several types of aggregate analyses, such as groupings by chemical, chemical class, state or other reporting jurisdiction, industry category (SIC code), type of release or transfer, or for subsets of these showing the greatest change between different reporting years. When these analyses are at the national level, attention is necessarily focused upon the net effect of many individual facility reports. Data from facilities reporting large amounts, or large changes between years, may obscure the data reported by many other facilities, perhaps showing an opposing tendency.

The following list, with facility examples, is offered as an aid in understanding the variety and complexity of reasons that facility amounts may increase or decrease from year to year. All changes refer to comparisons between 1988 and 1989 TRI data unless otherwise noted, but the general reasons are applicable to changes between any two years. Where a specific facility is given as an example, the facility was selected for mention primarily on the basis of information readily available and not necessarily because it is noteworthy. Facility-specific information was derived by telephone communication, unless starred. All starred examples are taken from the report prepared by Information Research for the Louisiana Chemical Association, *Louisiana Chemical Industry Emissions Report, 1988-1989: A Compilation & Comparison of Toxic Release Inventory Data*, Baton Rouge, October 1990. (See Chapter 7.)

Box 4–B, continued.

Possible Reasons for Increases/Decreases at the Facility Level

- More or fewer accidents or spills than in previous years: Ashland Chemical* (Plaquemine, Louisiana) reported an increase in toxic releases because of a product tank fire caused by lighting, resulting in the release of over 1.5 million pounds of methanol to air and 297,000 pounds of methanol to land.

- Changes in production resulting from temporary or permanent plant shutdown or addition of a new part of the facility: AMPRO Fertilizer Inc.* in Donaldsonville, Louisiana, decreased its water emissions (surface water discharges and public sewage transfers) by 48,000 pounds (26 percent), partially because of an extended shutdown. An interesting example of how shutdowns can confuse TRI data analysis is the case of Colt Industries, which had two TRI facilities in Bowling Green, Kentucky—one on Griffin Drive and one on Russellville Road. Formerly, the Russellville Road facility machined parts for carburetors, which were assembled and tested at the Griffin Drive facility. Because of lowered demand for carburetors, these two facilities were consolidated at the Russellville Road site in the fall of 1990; therefore, both facilities had to report for 1990 but only one will report in 1991. In the 1991 database it is therefore possible that the consolidated plant will appear to have an increase, yet its releases and transfers total might be less than the combined total for the two separate facilities in the preceding years.

- Replacing listed toxic chemicals with non-listed chemicals (or vice versa), often accompanied by other process changes: Occidental Chemical Corporation* in Addis, Louisiana, reported decreases attributed to the elimination of toluene use, formulation modifications to decrease vinyl chloride monomer stripping, and changes to raw materials which are more easily treated. By using a higher grade of carbon monoxide, Rubicon* in Geismar, Louisiana, decreased its reported TRI amounts of carbon tetrachloride by over 96,000 pounds.

- Changes in the basis of estimate, which result in apparent changes in total releases and transfers or their distribution among environmental media, sometimes without any actual change in facility operations. See, for example, the case of BASF Corporation in Freeport, Texas, described in the section on Air Emissions below.

- Correcting a previous reporting error or misunderstanding: An artificial "increase" or "decrease" may appear in the data because a facility had incorrectly reported in the previous year but not filed a revision. The possible reasons for error range widely, including misunderstanding of reporting requirements, mathematical calculation errors, typographical errors in filling out the Form R (for example, adding an extra zero, so that a release of 270,000 pounds appears as 2.7 million pounds), failure to report a chemical that should have been reported or including one that should not have been, and many others. Facilities are encouraged, and in some cases required, to correct previous errors, but this has not been done in every case.

- Revisions of approach to calculating TRI amounts, due to changes or clarification in reporting guidance: CF Industries, Inc.* (Donaldsonville), Exxon Chemical, Baton Rouge Resin Finishing Plant* (Baton Rouge), Farmland Industries* (Pollock), Nalco* (Garyville), and other Louisiana facilities reported increased TRI water releases as the result of additional EPA guidance on the reporting of ammonia; several Louisiana chemical facilities reported increased on-site land releases as the result of EPA guidance concerning reporting of phosphoric acid for phosphate operations. The resulting recalculation of land releases was estimated by the Louisiana Chemical Association* to account for almost half of Louisiana's total on-site land releases, which increased from 818,000 pounds to 4.4 million pounds from 1988 to 1989.

Box 4–B, continued.

- Reusing or recycling wastes in one year but not in the other: Wastes may be recycled or reused at the facility or sent off site for that purpose. If a particular *TRI chemical* is being recycled/reused, the amounts of that chemical in the wastes generated do not have to be reported as releases or transfers. Exxon Chemical*, Baton Rouge Chemical Plant, reported decreases in off-site transfers of phthalic anhydride and maleic anhydride (decreases of 348,000 and 56,000 pounds, respectively) as the result of recycling those chemicals as fuel. Usually, recycling/reuse results in a decrease in TRI amounts, as facilities seek ways to reduce their toxic releases and transfers. Sometimes, however, due to the composition and toxicity of the wastes, the TRI chemical may be recycled or reused in one year and not in the next, resulting in an increase.

Additional Reasons for Decreases at the Facility Level

- Installation of new equipment: Dow Chemical USA* in Plaquemine, Louisiana, decreased toxic air emissions due to installation of a new vent recovery system at a propylene glycol plant.

- Process changes: IMC Fertilizer, Inc.* in Sterlington, Louisiana, reduced toxic air emissions of ammonia and methanol 60 percent by a process modification that diverted the wastestream for combustion rather than discharge.

- Elimination of unnecessary releases, without necessarily having to make major changes in processes or equipment: Grant Chemical*, in Zachary, Louisiana, decreased its air emissions 62 percent, as the result of expanded leak detection monitoring.

- Improved maintenance programs: Vista Chemical* at Lake Charles, Louisiana, decreased its air emissions 19 percent due to a voluntary non-halogenated organics compliance program which included monitoring and improved maintenance of valves, pumps, and other equipment.

- Results from corporate programs to reduce waste generation and/or to control pollution: BASF Corporation in Freeport, Texas, uses benzene as an extraction agent in the making of nylon and reduced benzene releases by 57 percent (529,000 pounds) between 1988 and 1989. The decreases were attributed to a 5-year reduction program for this and other toxic chemicals involving both process changes and installation of new equipment. The facility has installed a two-phase stripper for wastewater and has eliminated the use of benzene in one process area. This was done by the installation of a catalytic cracking unit in 1989 to replace the benzene extraction process. Underground injection of benzene has been a special matter for attention at this facility because benzene is one of the 33/50 Program chemicals (see Chapter 6), and this facility's underground injection of benzene decreased 73 percent (431,000 pounds) between the two years.

- Neutralizing mineral acids before release or transfer: TRI reporting instructions indicate that releases or transfers of mineral acids that have been neutralized prior to release or transfer should be reported as zero. Some facilities that reported in 1988 may have incorrectly reported release or transfer amounts for the neutralized chemicals and not done so in 1989.

- Shifting most or all industrial activities to a non-manufacturing industrial sector which is outside of the SIC codes 20 through 39 which are required to report to TRI.

Box 4-B, continued.

Additional Reasons for Increases at the Facility Level

- Change in threshold amount for TRI reporting: A chemical not reported in 1988 might have to be reported in 1989 because of the threshold reduction from 50,000 to 25,000 pounds for manufacture or processing. The facility might have manufactured or processed 30,000 pounds of a chemical in 1988, and not been required to report its releases and transfers to TRI, and then manufactured or processed the identical amount in 1989 and been required to report it. The releases and transfers of that chemical would appear as an *increase* in the database, although the environmental effect in the two years may have been identical. In fact, the difference in threshold could make a real decrease appear as an increase. A facility might have manufactured and released 49,999 pounds of a chemical in 1988 and not been required to report it, and 25,001 pounds in 1989 and reported it; so an actual *decrease* of 24,998 pounds would appear as a 25,001 *increase* in the totals for that facility.

- Increased production, sometimes including new plants on the same TRI facility site: Exxon Chemical, Baton Rouge Chemical Plant*, reported increased air emissions from the first year's operation of a new methyl ethyl ketone plant (as well as better data for estimating emissions). Many facilities experienced increased production between 1988 and 1989, which resulted in increased wastes and increased TRI releases and transfers in some cases, but not all. (See Chapter 5.)

- Increases as the result of plant cleanup, which are not necessarily related to waste generation from standard processes: Vulcan Chemicals* (Geismar, Louisiana) increased off-site transfers as the result of pond closures, spill clean-ups, and process vessel cleanouts.

Combinations of Increases and Decreases at the Facility Level for the Same Chemical

Sometimes partially offsetting considerations confuse the question of whether or not there is real environmental "progress": Uniroyal Chemical* in Geismar, Louisiana, decreased its particulate point source emissions to air to one-third of the regulatory standard by installing a scrubber on an incinerator. However, total TRI air releases *increased* due to improved estimation of fugitive air emissions underestimated in previous years.

Some facilities have achieved a lowering of routine emissions over the year, but the total for the reporting year increased because of a single abnormal release or spill.

Total TRI releases decreased by 532.3 million pounds from 1988 to 1989, while total TRI transfers fell by 188.5 million pounds.

Total TRI releases and *total TRI transfers* each decreased by 11 percent between 1988 and 1989. In 1989, TRI facilities together reported 532.3 million pounds less *total releases* to either air, water, land or underground injection wells than in the previous year. *Total TRI transfers* to publicly owned treatment works (POTWs) and other waste management facilities for treatment, storage or disposal decreased by a smaller amount, 188.5 million pounds, but started at a much lower total (1.7 billion pounds in 1988 as compared to 4.8 billion pounds of TRI *releases* in 1988).

All of the TRI release or transfer categories showed decreases from 1988 to 1989.

Decreases were seen from 1988 to 1989 for every category of TRI release or transfer, especially off-site transfers and total air emissions, which each declined by 168.6 million pounds. Total air emissions include both *point source* and *fugitive air emissions*. Point source emissions are those emissions released from a smokestack, vent, or other confined air stream, while fugitive air emissions are emissions that are not released from a confined air stream, such as equipment leaks or evaporation

from surface impoundments. Fugitive air emissions decreased by a much smaller amount than point source air emissions from 1988 to 1989 (38.2 million pounds as compared to a net decrease of 130.4 million pounds for point source air emissions). (See Figure 4-1 and Table 4-2.)

Discharges to underground injection wells dropped by the next highest *absolute* amount, 153.3 million pounds from 1988 to 1989. Surface water discharges decreased by a smaller *absolute* amount (120.6 million pounds) than the other release and transfer categories discussed above, but by the largest *percentage* decrease—39 percent—of any TRI release or transfer category.

On-site land releases were associated with the next highest *percentage* decrease, 17 percent, dropping by 89.8 million pounds from 1988 to 1989, while transfers to POTWs changed the least both in *absolute* and *percentage* terms, decreasing by 19.9 million pounds or 3 percent.

Changes in Environmental Distribution, for 1988 and 1989

In both 1988 and 1989, total releases made up 74% of the total TRI releases and transfers, while total transfers accounted for the other 26%.

In both 1988 and 1989, total releases to air, water, land and underground injection wells made up 74 percent of the total TRI releases and transfers. The remaining 26 percent of the total was transferred off site, either to POTWs or to other waste management facilities for treatment, storage or disposal. (See Figure 4-2, Table 4-2;and Boxes 4-D and 4-E.)

The environmental distribution of TRI chemicals remained consistent from 1988 –1989, with air emissions accounting for the largest share of the total in both years.

The environmental distribution of TRI chemicals changed little from 1988 to 1989. The largest release or transfer category in 1989, total air emissions, increased from 40 percent of the 1988 total TRI releases and transfers to 43 percent of the 1989 total. Fugitive air emissions were a slightly larger share (31 percent) of total air releases in 1989 than in 1988 (when they comprised 30 percent of the total). Underground injection, the second largest release or transfer component in 1989, comprised 21 percent of the total in 1989 for the second year in a row, while total on-site land releases represented 8 percent of the total in both years. (See Figure 4-3.)

The relative share of transfers to public sewage increased from 9 to 10 percent between 1988 and 1989. Off-site transfers contributed 16 percent of the total TRI amount in 1989 as compared to 17 percent in 1988.

Surface water discharges, with the lowest reported releases and transfers in both years, represented 3 percent of the 1989 total and 5 percent of the 1988 total TRI releases and transfers.

Changes in Chemical Distribution, 1988 to 1989

Of the 300 individual TRI chemicals and 20 chemical categories analyzied in this report, total TRI releases and transfers decreased from 1988 to 1989 for 171 chemicals, increased for 95, and remained the same for four. Another 50 chemicals had no releases or transfers reported during either year or had no TRI reports filed for either year.

Total TRI releases and transfers of 66 chemicals changed by more than 1 million pounds each from 1988 to 1989.

Total TRI releases and transfers of 54 chemicals decreased by more than 1 million pounds from 1988 to 1989. At the same time, total releases and transfers of 12 TRI chemicals increased by this amount. However, only decreases were recorded for the 14 chemicals changing by more than 10 million pounds. Because their combined decrease totaled 572.8 million pounds, these 14 chemicals heavily influenced the overall change in total TRI releases and transfers from 1988 to 1989.

Despite these changes, the list of the top 25 chemicals for total TRI releases and transfers remained the same from 1988 to 1989, with two exceptions: chromium compounds were on the 1989 list, but not on the 1988 list, while trichloroethylene was on the 1988 list only. In both 1988 and 1989, ammonium sulfate (solution), hydrochloric acid, methanol, and ammonia ranked first through fourth, respectively, in reported total TRI releases and transfers, and the top 25 chemicals accounted for 83 percent of total TRI releases and transfers. (See Chapter 2, Table 2-12; and Chapter 3, Table 3-1.)

Total TRI releases and transfers of hydrochloric acid decreased by 130.0 million pounds from 1988 to 1989...

Total TRI releases and transfers of hydrochloric acid, the second-ranked chemical for total releases and transfers in 1989, decreased the most from 1988 to 1989. The 1989 total for hydrochloric acid was 130.0 million pounds (or 21 percent) less than the prior year's total. Underground injection of hydrochloric acid decreased by 96.1 million pounds. Smaller decreases in off-site transfers and transfers to public sewage of hydrochloric acid, totaling 27.0 million pounds and 7.7 million pounds, respectively, also played roles in the overall net reduction of hydrochloric acid from 1988 to 1989. The decrease in off-site transfers of hydrochloric acid resulted primarily from the effect of data from Allied-Signal Inc. in Elizabeth, New Jersey, which had

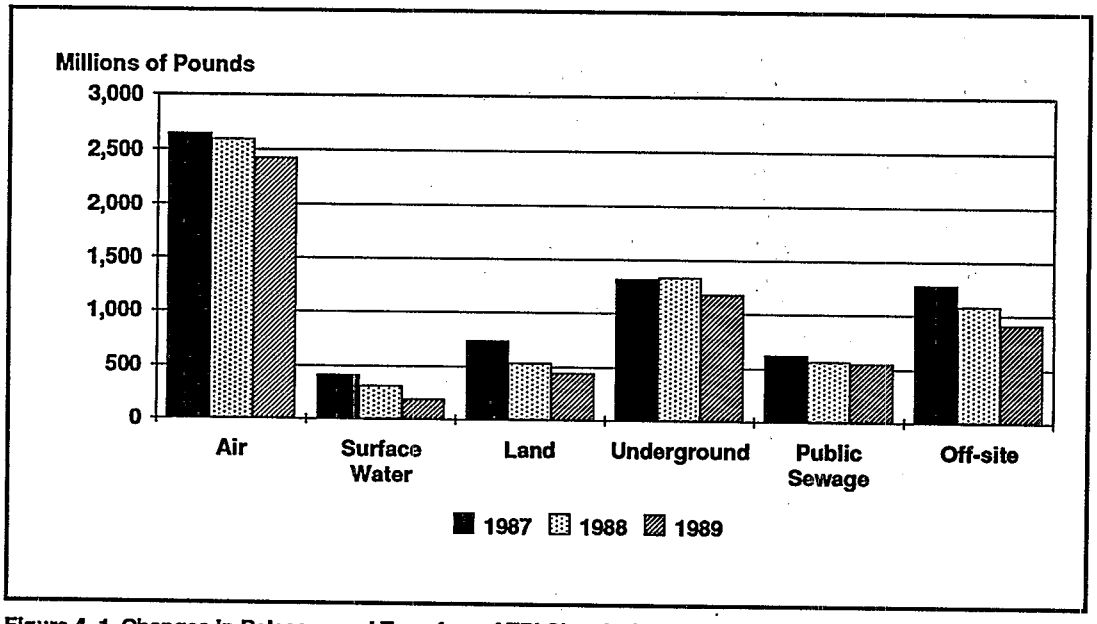


Figure 4–1. Changes in Releases and Transfers of TRI Chemicals, 1987–1989.

a process shut-down during the fourth quarter of 1988. That facility reported 26.3 million pounds of off-site transfers of hydrochloric acid in 1988 and zero pounds in 1989. (See Figure 4-4 and Table 4-3.)

Total releases and transfers of phosphoric acid, the chemical ranked sixteenth in 1989 for total TRI releases and transfers, were *cut in half* from 1988 to 1989. This 99.7-million-pound reduction for phosphoric acid was the second largest chemical-specific decrease in absolute terms. The decrease is primarily attributable to a decrease in releases to surface water of 95.5 million pounds. (See Table 4-3.)

...while total releases and transfers of phosphoric acid decreased by 99.7 million pounds...

Table 4–2. Environmental Distribution of the Changes in TRI Releases and Transfers, 1987-1989.

TYPE OF RELEASE OR TRANSFER	RELEASE OR TRANSFER 1989 Pounds	RELEASE OR TRANSFER 1988 Pounds	RELEASE OR TRANSFER 1987 Pounds	CHANGE 1987-1989 Pounds	CHANGE 1987-1989 Percent	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Air	2,427,061,906	2,595,641,583	2,646,562,852	-219,500,946	-8.29	-168,579,677	-6.49
Surface Water	188,953,884	309,561,617	411,337,177	-222,383,293	-54.06	-120,607,733	-38.96
Land	444,736,550	534,511,007	736,695,585	-291,959,035	-39.63	-89,774,457	-16.80
Underground Injection	1,180,831,181	1,334,164,262	1,319,128,528	-138,297,347	-10.48	-153,333,081	-11.49
Public Sewage	551,034,696	570,928,680	620,972,725	-69,938,029	-11.26	-19,893,984	-3.48
Off-site	913,052,163	1,081,677,462	1,276,547,173	-363,495,010	-28.47	-168,625,299	-15.59
TRI Total Releases and Transfers	5,705,670,380	6,426,484,611	7,011,244,040	-1,305,573,660	-18.62	-720,814,231	-11.22

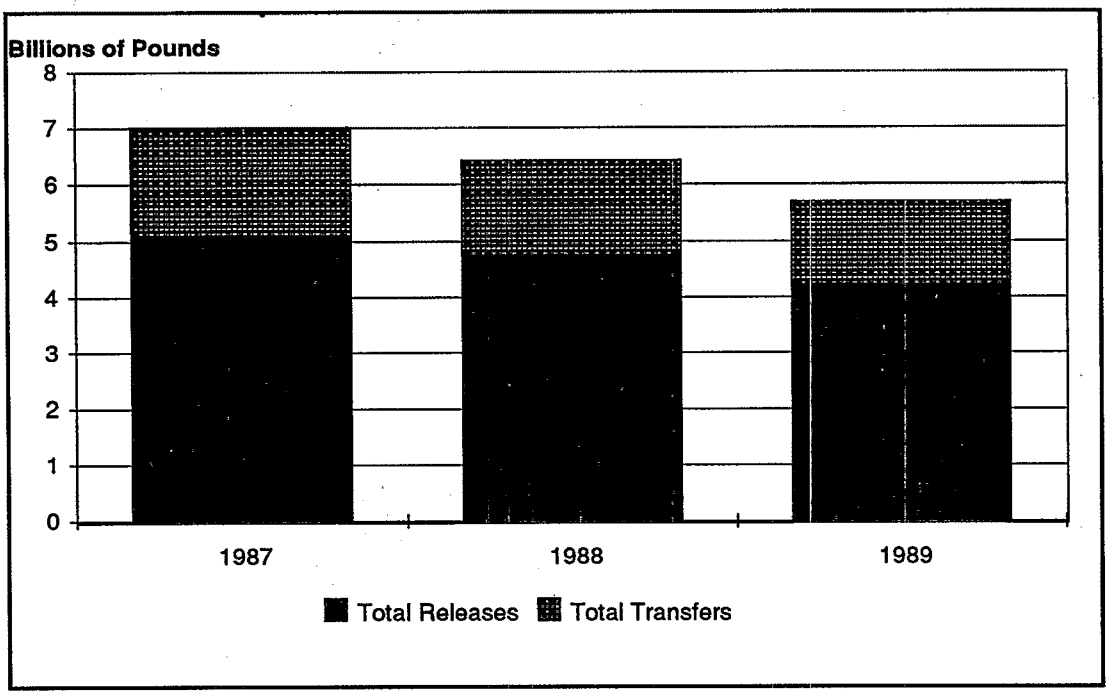


Figure 4–2. TRI Total Releases and Transfers, 1987–1989.

...and total releases and transfers of methanol decreased by 47.0 million pounds.

Total releases and transfers of methanol, the third-ranked chemical in 1989 for total releases and transfers, decreased by 47.0 million pounds, the third largest decrease. Methanol decreases were more evenly distributed among the release and transfer categories than either hydrochloric acid or phosphoric acid. The largest changes in methanol were for total air emissions and off-site transfers, which decreased by 20.2 million pounds and 15.2 million pounds, respectively, between 1988 and 1989. (See Table 4-3.)

The 4th-largest decrease in total releases and transfers from 1988 to 1989 was recorded for ammonium sulfate (solution).

The top-ranked chemical in 1989 for total TRI releases and transfers, ammonium sulfate (solution), was associated with the fourth-largest decrease from 1988 to 1989—46.9 million pounds, a 6 percent change. Large decreases in underground injection of this chemical, totaling 58.9 million pounds, were partially offset by increases in transfers to POTWs (an increase of 13.6 million pounds) and on-site land releases (an increase of 1.9 million pounds). The three facilities showing the largest decreases for this chemical in underground injection were all located in Texas—Sterling Chemicals, Inc. in Texas City, with a 36.0-million-pound decrease; Du Pont Beaumont Works in Beaumont, with a 34.0-million-pound decrease; and BP Chemicals in Port Lavaca, with a 12.0-million-pound decrease. (See Figure 4-5; Table 4-3; and Appendix F, Table F-7.)

Total releases and transfers of several TRI chemicals each decreased by both more than 1 million pounds and 50%.

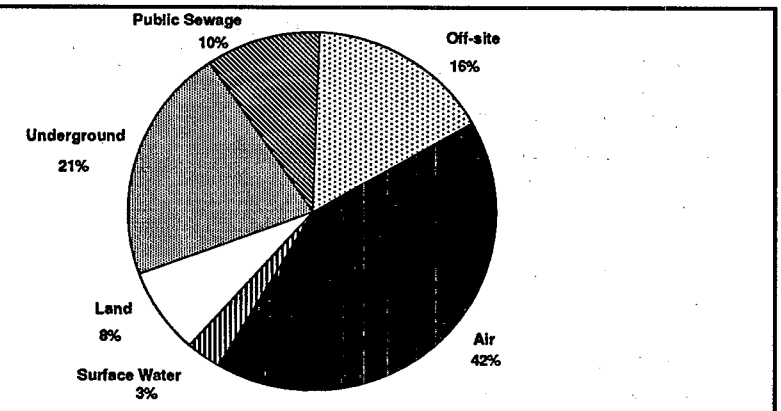
Of the 54 TRI chemicals associated with decreases in total releases and transfers *greater than one million pounds* each, seven also decreased by *greater than 50 percent*: phosphoric acid (with a decrease of 50 percent, 99.7 million pounds, as discussed above); asbestos (friable) (with a decrease of 67 percent, 17.9 million pounds); chlorine dioxide (with a decrease of 52 percent, 7.5 million pounds); barium (with a decrease of 53 percent, 4.3 million pounds); m-xylene (with a decrease of 59 percent, 2.1 million pounds); nitrobenzene (with a decrease of 68 percent, 1.5 million pounds); and antimony (with a decrease of 53 percent, 1.2 million pounds).

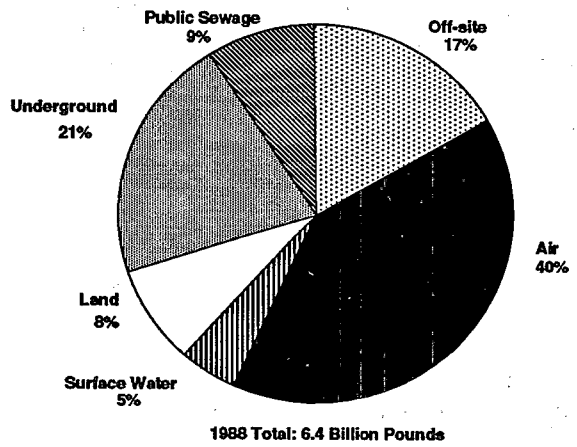
Total releases and transfers of isopropyl alcohol (manufacturing—strong acid process)[2] *increased* by the largest *absolute* amount—4.8 million pounds, followed closely by increases in propylene of 4.7 million pounds. (See Table 4-3.)

Changes in Chemical Class, 1988 to 1989

Total releases and transfers of mineral acids/salts decreased by a larger amount than any other TRI chemical class from 1988 to 1989...

Total releases and transfers of mineral acids/salts[3] decreased by the largest amount of any TRI chemical class—371.5 million pounds, a 17 percent decrease.[4] The class of mineral acids/salts made up a similar share of the total TRI releases and transfers in 1989 (32 percent) and 1988 (34 percent). (Mixtures and trade secrets cannot be assigned to chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.) (See Figure 4-6; Table 4-4.; Chapter 2, Table 2-13; Chapter 3, Table 3-14.)





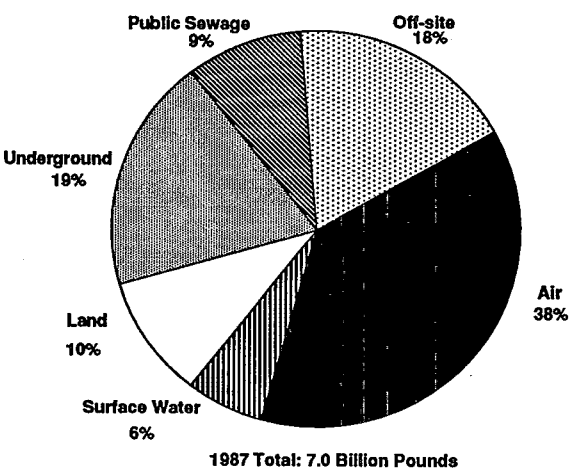


Figure 4–3. Environmental Distribution of TRI Releases and Transfers, 1987–1989.

...largely due to the 130.0-million-pound decrease in hydrochloric acid releases and transfers.

Total releases and transfers of five mineral acids/salts each decreased by more than 30 million pounds over the year, with hydrochloric acid alone decreasing by 130.0 million pounds. Decreases were seen for mineral acids/salts for all release and transfer categories except air, which increased by less than one million pounds. Surface water discharges and underground injection of mineral acids/salts decreased by the largest amounts, 115.6 million pounds and 159.6 million pounds, respectively. Decreased off-site transfers of mineral acids/salts totaling 70.0 million pounds also played a large role in the overall decrease observed for this chemical class. (See Table 4-4.)

Total releases and transfers of the non-halogenated organics class fell by the 2nd-largest amount of any TRI chemical class between 1988 and 1989...

The non-halogenated organics class was associated with the second-largest decrease in total TRI releases and transfers of any TRI chemical class, a decrease of 140.2 million pounds or 6 percent. In 1989, this chemical class represented 37 percent of the total TRI releases and transfers, up 2 percent from 1988. Total releases and transfers of three non-halogenated organic chemicals—methanol, toluene, and carbon disulfide—each decreased by greater than 24 million pounds, thereby influencing the direction of the overall change for this class. Air emissions and off-site transfers of non-halogenated organics decreased the most from 1988 to 1989, by 89.2 million pounds and 34.3 million pounds, respectively. (See Table 4-4.)

Table 4–3. Changes in TRI Releases and Transfers for the Top Ten Increasing TRI Chemicals and the Top Ten Decreasing TRI Chemicals (a), 1988-1989.

CHEMICAL	CHANGE IN AIR 1988-1989		CHANGE IN SURFACE WATER 1988-1989		CHANGE IN LAND 1988-1989		CHANGE IN UNDERGROUND 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
THE TEN TRI CHEMICALS WITH THE LARGEST DECREASES IN TRI TOTAL RELEASES AND TRANSFERS								
Hydrochloric acid	1,585,072	2.68	-885,899	-22.44	70,950	1.70	-96,141,646	-24.22
Phosphoric acid	-27,132	-1.49	-95,484,136	-77.85	-1,728,530	-3.34	38,055	69.24
Methanol	-20,173,214	-9.17	418,607	2.52	-4,970,872	-39.03	-3,159,104	-11.99
Ammonium sulfate (solution)	138,908	19.41	-2,345,421	-3.31	1,882,868	14.02	-58,906,039	-11.32
Sulfuric acid	7,396,787	43.87	-16,449,835	-44.77	1,117,797	30.98	10,875,806	7.84
Zinc compounds	-2,466,641	-34.51	-184,863	-17.57	-16,071,510	-14.01	51,277	49.30
Ammonium nitrate (solution)	507,480	17.23	417,259	4.95	-8,449,279	-52.74	-23,203,000	-34.15
Toluene	-23,660,155	-8.48	-82,895	-32.35	-332,209	-45.24	-816,273	-56.82
Dichloromethane	-18,320,364	-14.36	-121,378	-34.92	-141,017	-89.73	82,639	12.43
Carbon disulfide	-24,098,419	-19.45	-6,396	-16.30	-42,933	-99.41	3,200	23.88
THE TEN TRI CHEMICALS WITH THE LARGEST INCREASES IN TRI TOTAL RELEASES AND TRANSFERS								
Isopropyl alcohol (mfg.- strong acid proc.)	3,673,860	192.14	9,168	498.26	1,643	11735.71	18,441	—
Propylene	-833,513	-3.42	-9,120	-90.85	250	—	0	—
Manganese compounds	30,949	1.86	144,879	21.25	1,106,248	1.32	-5,810,302	-85.25
Acrylamide	-1,023	-3.93	4,248	135.98	236	31.22	3,551,980	404.09
Chromium compounds	534,757	70.16	156,013	48.78	176,468	.57	-23,543	-28.48
Cyclohexane	4,057,619	31.55	55	0.27	8,924	22.66	32,772	10.16
Nickel compounds	-32,906	-13.14	-14,219	-10.99	504,128	20.07	44,618	19.86
Ethylbenzene	1,574,434	22.60	465	2.86	-112,950	-55.95	-7,939	-11.60
Ethylene glycol	-521,428	-3.89	516	0.01	-41,477	-4.62	5,681,802	196.12
Acrylonitrile	186,861	4.45	-1,882	-32.04	2,312	107.53	1,227,835	26.91

(a) Based on TRI total releases and transfers.

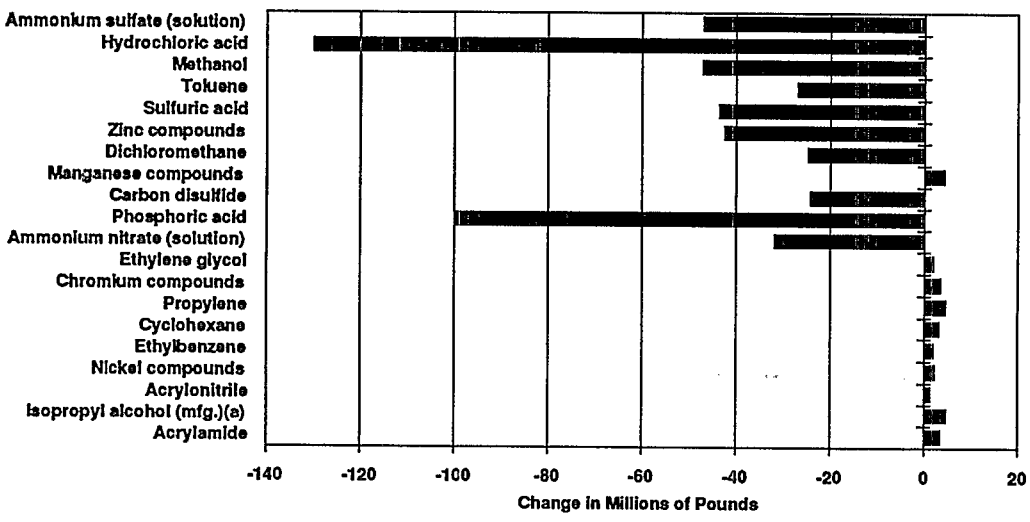
...while metals and metal compounds were associated with the 3rd-largest decrease.

Total releases and transfers of metals and metal compounds decreased by the third largest amount, 100.7 million pounds (a decrease of 13 percent) from 1988 to 1989, largely the result of decreases in zinc compounds, manganese and zinc (fume or dust) totaling 42.4 million pounds, 12.6 million pounds, and 11.1 million pounds, respectively. Significant decreases in on-site land releases (61.7 million pounds) and off-site transfers (34.2 million pounds) were factors in the overall decrease of this chemical class. (See Table 4-4.)

Total releases and transfers of halogenated organics decreased by 62.6 million pounds (10 percent) from 1988 to 1989, mostly due to approximately equal decreases of fugitive and point source air emissions, although decreases in off-site transfers also played a role in the overall decrease for this class. Releases and transfers of one halogenated organic, dichloromethane, fell by 24.7 million pounds. (See Table 4-4 and Chapter 6.)

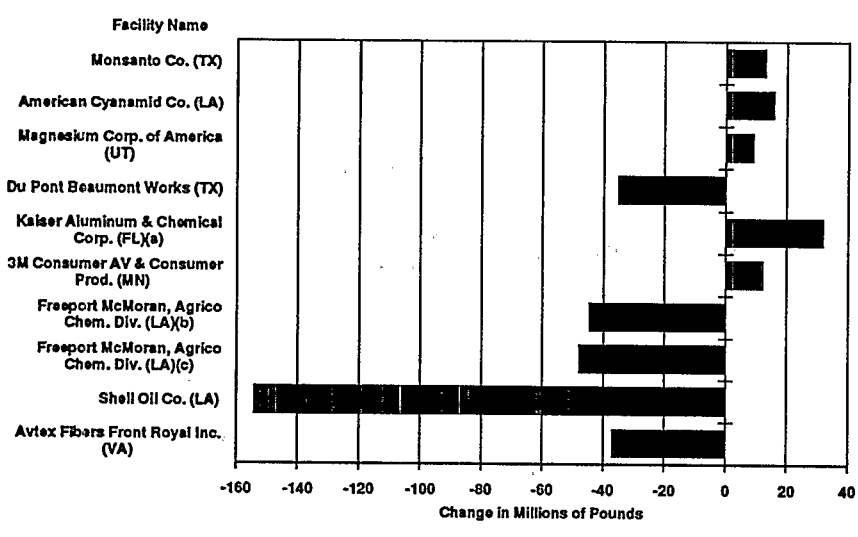
Table 4–3, continued.

CHEMICAL	CHANGE IN PUBLIC SEWAGE 1988-1989		CHANGE IN OFF-SITE 1988-1989		CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
THE TEN TRI CHEMICALS WITH THE LARGEST DECREASES IN TRI TOTAL RELEASES AND TRANSFERS						
Hydrochloric acid	-7,715,561	-21.49	-26,953,068	-21.47	-130,040,152	-20.78
Phosphoric acid	-2,217,811	-16.07	-310,454	-3.76	-99,730,008	-50.27
Methanol	-3,957,035	-3.50	-15,167,373	-22.80	-47,008,991	-10.33
Ammonium sulfate (solution)	13,560,428	7.22	-1,266,533	-27.14	-46,935,789	-5.88
Sulfuric acid	-11,549,812	-21.22	-34,862,725	-31.26	-43,471,982	-12.01
Zinc compounds	518,830	34.37	-24,237,915	-29.33	-42,390,822	-20.46
Ammonium nitrate (solution)	-497,000	-6.54	-613,401	-27.74	-31,837,941	-30.28
Toluene	-448,118	-12.64	-1,527,961	-2.38	-26,867,611	-7.69
Dichloromethane	-1,481,322	-49.99	-4,722,015	-20.24	-24,703,457	-15.93
Carbon disulfide	-26,834	-16.84	-39,295	-18.47	-24,210,677	-19.47
THE TEN TRI CHEMICALS WITH THE LARGEST INCREASES IN TRI TOTAL RELEASES AND TRANSFERS						
Isopropyl alcohol (mfg. strong acid proc.)	449,816	282.83	614,696	74.90	4,767,624	164.76
Propylene	5,603	1120.60	5,546,047	363.81	4,709,267	18.18
Manganese compounds	4,723,730	256.40	4,240,241	20.67	4,435,745	3.84
Acrylamide	19,596	144.73	17,659	15.98	3,592,696	347.80
Chromium compounds	-709,802	-41.98	3,431,157	25.19	3,565,050	7.53
Cyclohexane	-111,538	-78.73	-598,207	-20.11	3,389,625	20.72
Nickel compounds	-398,887	-61.45	2,314,303	34.71	2,417,037	23.17
Ethylbenzene	60,443	11.91	655,684	19.43	2,170,137	19.49
Ethylene glycol	-493,094	-2.89	-2,527,975	-14.29	2,098,344	3.77
Acrylonitrile	-167,838	-17.56	210,501	19.14	1,457,789	13.47



(a) Strong acid process

Figure 4–4. TRI Chemicals with the Greatest Changes in TRI Total Releases and Transfers, 1988–1989. (The ten TRI chemicals with the greatest increases and the ten greatest decreases in TRI total releases and transfers, listed in descending order according to 1989 TRI total releases and transfers.)



(a) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their total releases and transfers is 4,487,000 pounds. Therefore, this facility's increase in total releases and transfers from 1988 to 1989 is 4,487,000 pounds. (b) of Donaldson, LA. (c) of Uncle Sam, LA.

Figure 4–5. TRI Facilities with the Greatest Changes in Total TRI Releases and Transfers, 1988–1989. (Facilities reporting the five greatest increases and five greatest decreases for total TRI releases and transfers, shown in descending order according to 1989 total TRI releases and transfers.)

Non-metallic inorganics showed a decrease in total releases and transfers of 41.8 million pounds (7 percent) from 1988 to 1989, as total releases and transfers of four members of this class—asbestos (friable), ammonia, chlorine dioxide and chlorine—each fell by more than six million pounds.

Changes for Carcinogens, 1988 to 1989

Total releases and transfers of TRI carcinogens decreased by 14% from 1988 to 1989.

Total releases and transfers of the 123 TRI chemicals that are considered carcinogens fell by 14 percent from 1988 to 1989, a steeper rate of decrease than that observed for *all* TRI chemicals (11 percent) over the same period of time. (Chapter 3, Box 3-G, defines TRI carcinogens, and Appendix B lists all TRI chemicals, indicating those which are considered carcinogens.)

In 1989, as well as in 1988, 7 percent of TRI total releases and transfers were comprised of carcinogens. Furthermore, in both years the 25 carcinogens with the largest total releases and transfers accounted for over 98 percent of the total releases and transfers for *all* carcinogens, while the top ten carcinogens represented over 83 percent of the carcinogenic total. (See Chapter 2, Table 2-14; and Chapter 3, Table 3-16.)

4 carcinogens in particular contributed to the net reduction in total releases and transfers of TRI carcinogens.

The 64.6-million-pound net reduction in total releases and transfers of TRI carcinogens was largely due to the decreases of four carcinogens: dichloromethane (which decreased by 24.7 million pounds), asbestos (friable) (which decreased by 17.9 million pounds), chromium (which decreased by 8.1 million pounds), and tetrachloroethylene (which decreased by 7.7 million pounds). For asbestos (friable),

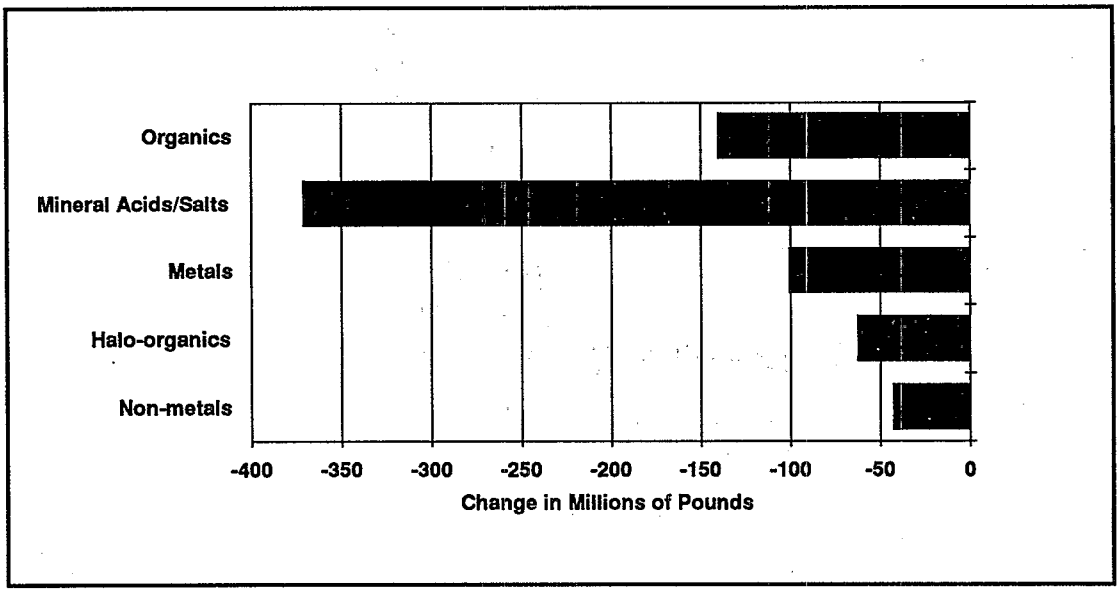


Figure 4–6. Changes in TRI Total Releases and Transfers by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to TRI total releases and transfers for 1989.)

Table 4–4. Changes in TRI Total Releases and Transfers by Chemical Class, 1988-1989.

CHEMICAL CLASS	CHANGE IN AIR 1988-1989		CHANGE IN SURFACE WATER 1988-1989		CHANGE IN LAND 1988-1989		CHANGE IN UNDERGROUND 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Organics	-89,220,121	-5.88	287,020	1.05	-8,047,902	-39.58	-2,596,971	-2.23
Mineral Acids/Salts	876,419	0.82	-115,586,057	-47.26	-8,022,557	-8.87	-159,615,539	-13.81
Metals	-890,027	-2.99	-975,136	-21.47	-61,715,116	-15.64	-6,035,608	-75.97
Halo-organics	-45,393,842	-8.77	7,755	0.38	-376,151	-54.98	37,258	1.22
Non-metals	-37,411,414	-8.87	-4,268,308	-13.78	-11,775,014	-41.50	14,877,029	29.26
Mixtures	3,414,762	158.16	-56,907	-96.52	162,283	601.98	750	—
Trade Secrets	44,546	25.04	-16,100	-80.70	0	—	0	—
TOTAL	-168,579,677	-6.49	-120,607,733	-38.96	-89,774,457	-16.80	-153,333,081	-11.49

this change represented a 67 percent decrease. The large decrease in total releases and transfers of dichloromethane resulted mainly from decreases in total air emissions of 18.3 million pounds and smaller decreases in transfers to public sewage (1.5 million pounds) and off-site transfers (4.7 million pounds). (See Figure 4-7 and Table 4-5. See Chapter 6 for further of discussion of dichloromethane.)

Total releases and transfers of 6 carcinogens each decreased by over 50% and 100,000 pounds.

In addition to asbestos (friable), five other carcinogens decreased by *over 50 percent* and *over 100,000 pounds* each: nitrilotriacetic acid (90 percent, 424,000 pounds), toluene-2,6-diisocyanate (70 percent, 383,000 pounds), hydrazine sulfate (78 percent, 279,000 pounds), 3,3'-dichlorobenzidine (90 percent, 203,000 pounds) and urethane (90 percent, 137,000 pounds).

While total releases and transfers for nine TRI carcinogens decreased by more than one million pounds each between 1988 and 1989, only three TRI carcinogens were associated with increases of that magnitude. The carcinogen with the greatest *percentage* increase in total releases and transfers was acrylamide, which increased by 348 percent (3.6 million pounds) from 1988 to 1989. Almost all of the increase for this chemical was due to a 3.6-million-pound increase in underground injection (404 percent).

Sixteen industries showed decreases in total releases and transfers of TRI carcinogens from 1988 to 1989. In two of these cases (for the Multiple Codes category and the Chemical industry), the industry-wide decrease exceeded 10 million pounds each. (See Table 4-6.)

Table 4–4, continued.

CHEMICAL CLASS	CHANGE IN PUBLIC SEWAGE 1988-1989		CHANGE IN OFF-SITE 1988-1989		CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Organics	-6,393,308	-3.17	-34,250,121	-9.70	-140,221,403	-6.27
Mineral Acids/Salts	-19,337,692	-5.96	-69,769,335	-24.19	-371,454,761	-16.81
Metals	3,093,239	32.55	-34,182,472	-11.14	-100,705,120	-13.37
Halo-organics	-2,349,685	-27.99	-14,571,721	-15.80	-62,646,386	-10.04
Non-metals	5,155,625	19.46	-8,337,068	-28.34	-41,759,150	-7.11
Mixtures	-56,732	-30.47	-7,472,370	-64.67	-4,008,214	-28.66
Trade Secrets	-5,431	-95.60	-42,212	-45.80	-19,197	-6.49
TOTAL	-19,893,984	-3.48	-168,625,299	-15.59	-720,814,231	-11.22

Facilities in the Plastics industry and those reporting no SIC codes in 20-39 were associated with a net industry-wide increase in total releases and transfers of TRI carcinogens of 3.0 million pounds and 1.4 million pounds, respectively. For the No Codes category, this change represented a 56 percent increase. (See Table 4-6.)

Michigan registered the largest decrease in total TRI releases and transfers of TRI carcinogens, while Louisiana showed the largest increase.

Michigan led all other states with the largest decrease in total releases and transfers of TRI carcinogens from 1988 to 1989—12.2 million pounds. (See Table 4-7.) This state-wide decrease represented a 42-percent decrease in total releases and transfers of TRI carcinogens, the second largest *percentage* decrease. Only Oklahoma showed a larger percentage reduction for such releases and transfers, 43 percent (a decrease of 2.4 million pounds). In addition to these two states, 13 other states were each associated with a net decrease in total releases and transfers of TRI carcinogens greater than one million pounds. However, only one state, Louisiana, registered an increase in total releases and transfers of TRI carcinogens exceeding that amount. For Louisiana, such releases and transfers increased from 19.8 million pounds in 1988 to 21.3 million pounds in 1989, an increase of 7 percent.

Changes in Geographical Distribution, 1988 to 1989

Louisiana and Texas were associated with the two largest decreases in total TRI releases and transfers from 1988 to 1989.

In 1989, for the second straight year, Texas and Louisiana were ranked number one and number two, respectively, for total TRI releases and transfers even though these states reported the two largest *absolute decreases* in total releases and transfers from 1988 to 1989 of any state or TRI reporting jurisdiction (hereafter referred to as states). (See Figure 4-8; Table 4-8; Chapter 2, Table 2-15; and Chapter 3, Table 3-2.)

The net decrease in total releases and transfers totaled 293.8 million pounds in Louisiana...

In Louisiana, the 293.8-million-pound net decrease in total releases and transfers from 1988 to 1989 was spread out among the TRI release and transfer categories, with the exception of on-site land releases, which increased by 1.1 million pounds. Underground injection and surface water discharges both decreased in this state more than the other TRI release and transfer categories (by 137.5 million pounds and 113.5 million pounds, respectively.) (See Table 4-8.)

...and 89.4 million pounds in Texas.

Texas showed a net decrease in total releases and transfers from 1988 to 1989 of 89.4 million pounds. Underground injection of TRI chemicals fell by 42.2 million pounds in this state, while on-site land releases dropped by 32.7 million pounds. (See Table 4-8.)

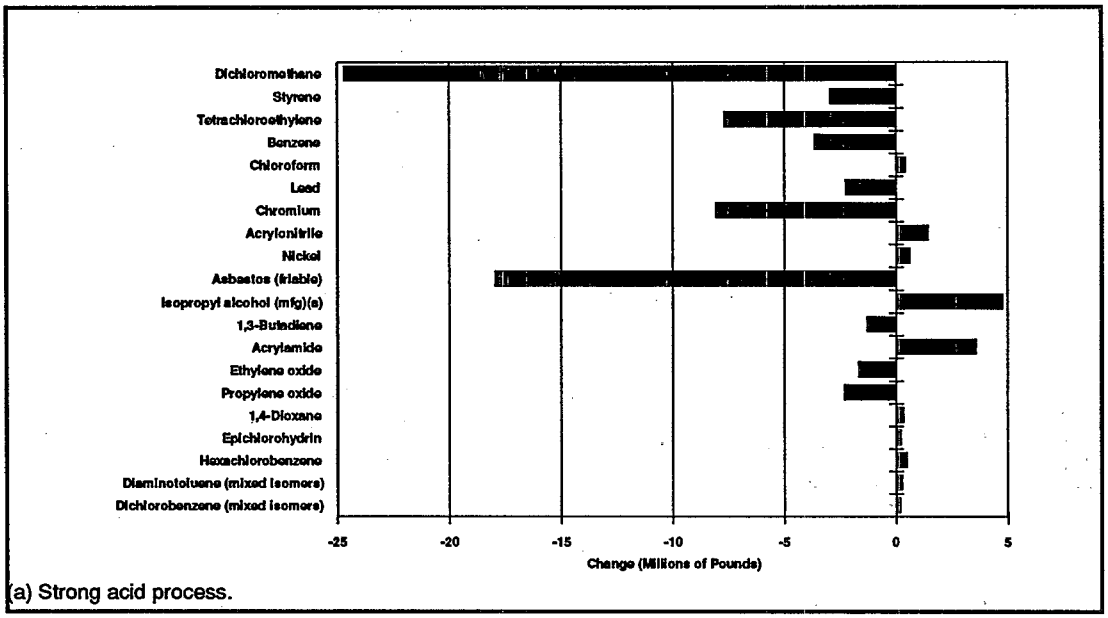
A total of 32 states showed decreases in total TRI releases and transfers from 1988 to 1989 greater than 1 million pounds each.

In addition to Louisiana and Texas, 30 other reporting jurisdictions showed *decreases* in total TRI releases or transfers from 1988 to 1989 greater than 1 million pounds each. For 13 of these—Virginia, New York, New Jersey, California, Michigan, Wyoming, Arizona, Indiana, Pennsylvania, Georgia, Massachusetts, Missouri, and Connecticut—the decreases exceeded 10 million pounds each.

Table 4–5. Changes in TRI Releases and Transfers for the Top Ten Decreasing TRI Carcinogens and the Top Ten Increasing Carcinogens (a), 1988-1989.

CHEMICAL	CHANGE IN AIR 1988-1989		CHANGE IN SURFACE WATER 1988-1989		CHANGE IN LAND 1988-1989		CHANGE IN UNDERGROUND 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
THE TEN TRI CARCINOGENS WITH THE LARGEST DECREASES IN TRI TOTAL RELEASES AND TRANSFERS								
Dichloromethane	-18,320,364	-14.36	-121,378	-34.92	-141,017	-89.73	82,639	12.43
Asbestos (friable)	-10,180	-21.38	-9,649	-92.34	-8,547,228	-88.84	0	—
Chromium	496,008	111.33	-6,144	-8.40	-5,959,695	-64.13	-1,806	-72.27
Tetrachloroethylene	-6,837,385	-21.14	25,777	77.45	-93,353	-87.95	-22,245	-30.79
Benzene	-3,196,920	-11.47	121,665	257.55	-13,871	-10.83	-101,674	-13.20
Styrene	-1,110,472	-3.23	-7,906	-13.38	-46,641	-19.20	-165	-100.00
Propylene oxide	-1,263,873	-41.33	-104,412	-92.81	-7,153	-61.50	-843,780	-75.76
Lead	-182,873	-17.50	-28,073	-46.71	-1,983,111	-25.42	0	—
Ethylene oxide	-1,612,287	-34.79	-41,293	-92.07	-16,988	-31.06	5,094	45.79
1,3-Butadiene	-1,083,090	-16.36	-269,070	-65.23	7,006	89.63	1,500	—
THE TEN TRI CARCINOGENS WITH THE LARGEST INCREASES IN TRI TOTAL RELEASES AND TRANSFERS								
Isopropyl alcohol (mfg. strong acid proc.)	3,673,860	192.14	9,168	498.26	1,643	11,735.71	18,441	—
Acrylamide	-1,023	-3.93	4,248	135.98	236	31.22	3,551,980	404.09
Acrylonitrile	186,861	4.45	-1,882	-32.04	2,312	107.53	1,227,835	26.91
Nickel	593,578	186.81	-779	-0.90	193,762	17.36	4,401	30.26
Hexachlorobenzene	-403	-8.07	334	8,350.00	0	—	300	73.17
Chloroform	1,277,187	5.56	50,406	4.63	1,734	2.53	28,336	78.71
1,4-Dioxane	194,180	33.15	43,123	21.21	22,021	188.18	0	—
Diaminotoluene (mixed isomers)	-1,874	-8.88	-1,330	-40.45	-65	-22.03	-79,000	-45.40
Epichlorohydrin	-4,051	-0.86	2,528	147.23	1,729	222.24	128,900	188.73
Dichlorobenzene (mixed isomers)	-25,772	-15.74	145	362.50	0	—	0	—

(a) Based on TRI total releases and transfers.



(a) Strong acid process.

Figure 4–7. TRI Carcinogens with the Greatest Changes in TRI Total Releases and Transfers, 1988–1989. (The ten TRI carcinogens with the greatest increases and the ten greatest decreases in TRI total releases and transfers, shown in descending order of 1989 TRI total releases and transfers).

Table 4–5, continued.

CHEMICAL	CHANGE IN PUBLIC SEWAGE 1988-1989		CHANGE IN OFF-SITE 1988-1989		CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
THE TEN TRI CARCINOGENS WITH THE LARGEST DECREASES IN TRI TOTAL RELEASES AND TRANSFERS						
Dichloromethane	-1,481,322	-49.99	-4,722,015	-20.24	-24,703,457	-15.93
Asbestos (friable)	-26,896	-39.47	-9,343,202	-54.53	-17,937,155	-66.73
Chromium	-95,833	-23.27	-2,507,033	-22.28	-8,074,503	-37.59
Tetrachloroethylene	-124,002	-20.02	-650,430	-14.18	-7,701,638	-20.40
Benzene	17,598	1.60	-475,924	-20.59	-3,649,126	-11.32
Styrene	-56,431	-11.97	-1,714,363	-19.22	-2,935,978	-6.66
Propylene oxide	-78,854	-19.36	-8,538	-48.10	-2,306,610	-48.86
Lead	-73,992	-60.86	16,642	0.13	-2,251,407	-10.18
Ethylene oxide	-21,812	-6.01	4,209	19.21	-1,683,077	-32.81
1,3-Butadiene	-15,802	-35.21	44,630	12.22	-1,314,826	-17.65
THE TEN TRI CARCINOGENS WITH THE LARGEST INCREASES IN TRI TOTAL RELEASES AND TRANSFERS						
Isopropyl alcohol (mfg.-strong acid proc.)	449,816	282.83	614,696	74.90	4,767,624	164.76
Acrylamide	19,596	144.73	17,659	15.98	3,592,696	347.80
Acrylonitrile	-167,838	-17.56	210,501	19.14	1,457,789	13.47
Nickel	-64,471	-25.73	-91,093	-1.29	635,398	7.17
Hexachlorobenzene	-130	-81.25	488,032	50.59	488,133	50.31
Chloroform	-159,137	-12.97	-755,031	-51.34	443,495	1.65
1,4-Dioxane	80,922	51.50	7,579	3.59	347,825	29.76
Diaminotoluene (mixed isomers)	4,572	154.93	359,043	48.14	281,346	29.70
Epichlorohydrin	-42,643	-58.11	135,237	20.82	221,700	17.51
Dichlorobenzene (mixed isomers)	-137,850	-75.47	376,258	302.51	212,781	45.20

Table 4–6. Change in Total Releases and Transfers of TRI Carcinogens by Industry, 1988-1989.

SIC CODE	INDUSTRY	TOTAL RELEASES AND TRANSFERS OF TRI CARCINOGENS 1989 Pounds	1988 Pounds	CHANGE 1988-1989 Pounds	Percent
20	Food	1,344,404	7,444,326	-6,099,922	-81.94
21	Tobacco	28,997	123,972	-94,975	-76.61
22	Textiles	3,528,595	3,389,652	138,943	4.10
23	Apparel	285,858	417,702	-131,844	-31.56
24	Lumber	5,486,399	4,924,708	561,691	11.41
25	Furniture	1,542,084	2,855,003	-1,312,919	-45.99
26	Paper	25,359,240	25,862,434	-503,194	-1.95
27	Printing	1,853,544	1,420,325	433,219	30.50
28	Chemicals	135,933,044	147,817,444	-11,884,400	-8.04
29	Petroleum	6,568,392	6,846,996	-278,604	-4.07
30	Plastics	40,842,919	37,892,620	2,950,299	7.79
31	Leather	929,998	853,303	76,695	8.99
32	Stone/Clay	8,507,963	14,129,127	-5,621,164	-39.78
33	Primary Metals	40,970,895	48,252,285	-7,281,390	-15.09
34	Fabr.Metals	12,596,124	13,986,817	-1,390,693	-9.94
35	Machinery	8,382,715	9,262,117	-879,402	-9.49
36	Electrical	16,822,384	23,238,656	-6,416,272	-27.61
37	Transportation	31,677,043	38,934,043	-7,257,000	-18.64
38	Measure./Photo.	23,882,561	26,945,517	-3,062,956	-11.37
39	Miscellaneous	4,219,385	4,832,605	-613,220	-12.69
	Multiple codes 20-39	36,896,207	54,167,782	-17,271,575	-31.89
	No codes 20-39	3,846,649	2,467,536	1,379,113	55.89
TOTAL		411,505,400	476,064,970	-64,559,570	-13.56

Wyoming's state-wide decrease of 27.3 million pounds is particularly noteworthy because it represents a 60 percent decrease over the year. Chevron Chemical Company in Rock Springs, Wyoming, and Coastal Chemical Inc. in Cheyenne, Wyoming, reported a combined decrease from 1988 to 1989 in total releases and transfers of 28.1 million pounds. (See Map 4-1; Table 4-8; and Appendix F, Table F-7.)

While the total releases and transfers decreased nationwide from 1988 to 1989, 15 states and other reporting jurisdictions reported an *increase*, led by the state of Florida. Florida's increase totaled 34.2 million pounds (a 22-percent increase), the largest absolute and percentage increase. Significant *increases* were also reported for Minnesota (14.2 million pounds, or 21 percent), Utah (9.5 million pounds, or 7 percent), Kansas (9.5 million pounds, or 5 percent), Tennessee (8.9 million pounds, or 4 percent) and Arkansas (5.3 million pounds, or 7 percent). (See Figure 4-9, Map 4-1, and Table 4-8.)

2 Louisiana parishes led all other counties in decreases of total TRI releases and transfers from 1988 to 1989.

In addition to providing information on the changes in total TRI releases and transfers at the state level, TRI data can be used to reveal changes at the county level. (See Map 4–2.) Such an analysis shows that two Louisiana parishes (the name for counties in this state), St. Charles and St. James, led all other counties in changes in total TRI releases and transfers from 1988 to 1989 with decreases of 154.6 million

Table 4–7. Change in Total Releases and Transfers of TRI Carcinogens by State, 1988-1989.

STATE	TOTAL RELEASES AND TRANSFERS OF CARCINOGENS		CHANGE IN TOTAL RELEASES AND TRANSFERS OF CARCINOGENS 1988-1989	
	1989 Pounds	1988 Pounds	Pounds	Percent
Alabama	10,297,989	10,280,060	17,929	0.17
Alaska	302,184	274,367	27,817	10.14
American Samoa	0	0	0	—
Arizona	3,141,195	3,321,419	-180,224	-5.43
Arkansas	5,336,292	5,396,422	-60,130	-1.11
California	21,213,798	24,629,750	-3,415,952	-13.87
Colorado	3,103,477	3,598,141	-494,664	-13.75
Connecticut	8,188,481	12,186,080	-3,997,599	-32.80
Delaware	1,149,949	1,611,112	-461,163	-28.62
District of Columbia	0	0	0	—
Florida	7,600,174	7,443,338	156,836	2.11
Georgia	12,253,418	13,362,399	-1,108,981	-8.30
Hawaii	96,327	118,125	-21,798	-18.45
Idaho	902,263	1,140,387	-238,124	-20.88
Illinois	15,142,669	17,489,868	-2,347,199	-13.42
Indiana	27,493,691	28,551,666	-1,057,975	-3.71
Iowa	4,881,991	6,268,067	-1,386,076	-22.11
Kansas	2,817,761	2,291,075	526,686	22.99
Kentucky	6,602,511	9,168,619	-2,566,108	-27.99
Louisiana	21,261,343	19,831,133	1,430,210	7.21
Maine	1,648,714	2,215,795	-567,081	-25.59
Maryland	2,013,651	2,514,798	-501,147	-19.93
Massachusetts	5,742,330	6,538,895	-796,565	-12.18
Michigan	17,116,398	29,300,360	-12,183,962	-41.58
Minnesota	5,714,368	5,157,729	556,639	10.79
Mississippi	6,308,639	6,270,041	38,598	0.62
Missouri	7,550,967	8,352,044	-801,077	-9.59
Montana	381,067	263,423	117,644	44.66
Nebraska	1,999,068	2,147,596	-148,528	-6.92
Nevada	60,187	62,865	-2,678	-4.26
New Hampshire	2,119,057	2,964,350	-845,293	-28.52
New Jersey	7,511,749	9,995,583	-2,483,834	-24.85
New Mexico	122,159	86,010	36,149	42.03
New York	18,880,805	26,736,178	-7,855,373	-29.38
North Carolina	15,404,669	15,657,225	-252,556	-1.61
North Dakota	97,012	114,975	-17,963	-15.62
Ohio	25,613,151	31,910,577	-6,297,426	-19.73
Oklahoma	3,233,560	5,679,052	-2,445,492	-43.06
Oregon	3,665,815	3,841,415	-175,600	-4.57
Pennsylvania	32,801,168	32,784,111	17,057	0.05
Puerto Rico	5,459,541	5,974,963	-515,422	-8.63
Rhode Island	1,325,514	1,487,120	-161,606	-10.87
South Carolina	7,259,579	7,136,364	123,215	1.73
South Dakota	144,293	147,571	-3,278	-2.22
Tennessee	11,783,238	15,471,752	-3,688,514	-23.84
Texas	42,912,618	51,693,445	-8,780,827	-16.99
Utah	4,688,934	3,967,863	721,071	18.17
Vermont	92,089	121,568	-29,479	-24.25
Virgin Islands	383,714	621,950	-238,236	-38.30
Virginia	6,693,004	6,986,933	-293,929	-4.21
Washington	5,613,359	5,558,409	54,950	0.99
West Virginia	9,251,588	10,417,526	-1,165,938	-11.19
Wisconsin	6,042,055	6,833,659	-791,604	-11.58
Wyoming	85,827	90,797	-4,970	-5.47
TOTAL	411,505,400	476,064,970	-64,559,570	-13.56

pounds and 110.5 million pounds, respectively. The next-largest change in total TRI releases and transfers from 1988 to 1989, an increase of 51.6 million pounds, was reported for Polk County, Florida. (See Tables 4-9 and 4-10.)

Changes in Industrial Distribution, 1988 to 1989

The top 10 industries for total TRI releases and transfers remained the same from 1988 to 1989.

In both 1988 and 1989, the same ten industries led all others in total TRI releases and transfers. The Chemical industry generated the largest share of the total in both years, followed by the Primary Metals industry, Multiple SIC Codes category, the Paper industry, the Transportation industry and the Fabricated Metals industry, in that order. Rounding out the top ten in both years were the Plastics industry, the Electrical industry, the Petroleum industry and the Machinery industry. (See Chapter 2, Table 2-16; and Chapter 3, Table 3-15.)

Most TRI industries were associated with decreases in total TRI releases and transfers from 1988 to 1989 greater than 1 million pounds each.

Despite the fact that industry rankings did not change significantly from 1988 to 1989, most TRI industries were associated with decreases in total TRI releases and transfers greater than 1 million pounds each over the same period of time. The 292.7-million-pound overall decrease for the Chemical industry, which led the industry-wide decreases, was spread out among four release and transfer categories: surface water discharges (121.7-million-pound decrease), air emissions (98.7-million-pound decrease), off-site transfers (68.8-million-pound decrease), and on-site land releases (23.2-million-pound decrease). These decreases for the Chemical industry were only partially offset by increases in underground injection and transfers to POTWs of 2.2 million pounds and 17.4 million pounds, respectively. Most of the facilities reporting large changes in total releases and transfers from 1988 to 1989 were Chemical facilities. For example, 14 of the top 20 decreasing facilities for total releases and transfers, including four of the top five, reported as members of the Chemical industry in 1988, as did 12 of the top 20 increasing facilities. (See Figure 4-10; Table 4-11; and Appendix F, Table F-7.)

Diversified facilities (those facilities reporting multiple SIC codes) were associated with the next largest overall decrease—152.8 million pounds (a 26 percent decrease), while the Primary Metals industry was associated with a decrease of 102.8 million pounds (a 12 percent decrease). Five of the six TRI release or transfer categories showed significant decreases for the Primary Metals industry, most notably on-site land releases (with a 49.5-million-pound reduction) and off-site transfers (with a 41.7-million-pound decrease). (See Table 4-11.)

9 TRI industries were each associated with a decrease in total TRI releases and transfers greater than 10 million pounds.

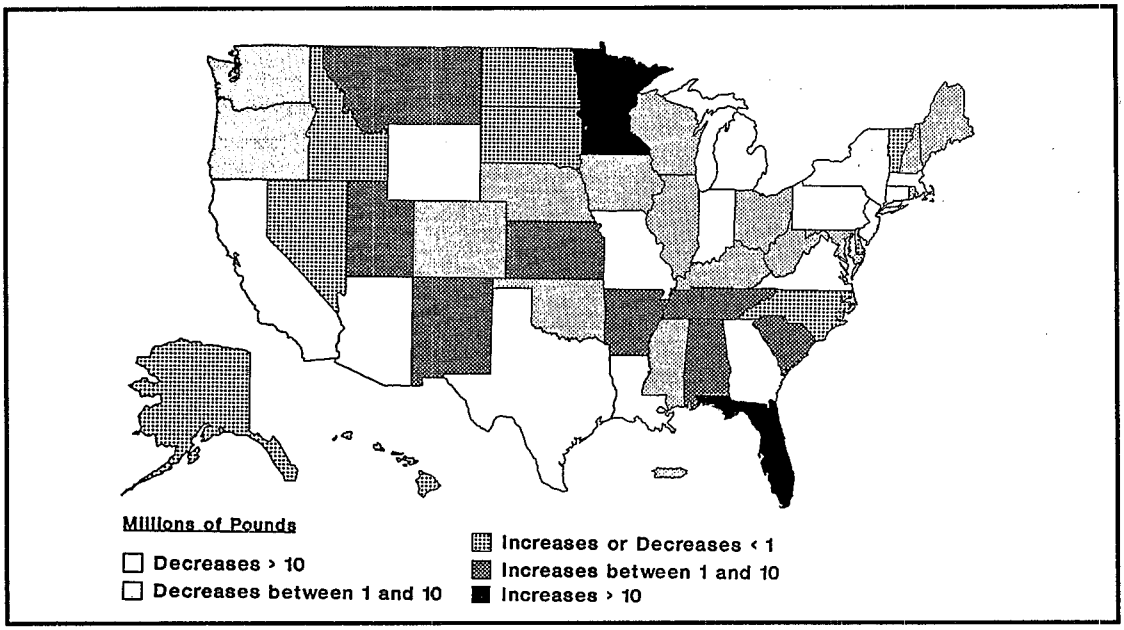
In addition to the three industries mentioned above with decreases in total TRI releases and transfers in excess of 100 million pounds between 1988 and 1989, six other industries were each associated with a net decrease in total releases and transfers greater than 10 million pounds.

Only the Lumber industry was associated with a net increase in total TRI releases and transfers greater than 1 million pounds between 1988 and 1989.

Only the Lumber industry registered a net increase in total TRI releases and transfers greater than 1 million pounds. The largest changes for particular types of releases and transfers contributing to this net increase of 3.1 million pounds (an increase of 9 percent) were a 4.2-million-pound increase in total air emissions and a partially off-setting decrease of 1.5 million pounds in off-site transfers.

Table 4–8. Changes in TRI Total Releases and Transfers by State, 1988-1989.

STATE	CHANGE IN AIR 1988-1989		CHANGE IN SURFACE WATER 1988-1989		CHANGE IN LAND 1988-1989		CHANGE IN UNDERGROUND 1988-1989		CHANGE IN PUBLIC SEWAGE 1988-1989		CHANGE IN OFF-SITE 1988-1989		CHANGE IN TOTAL RELEASES AND TRANS. 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Alabama	-176,221	-0.17	451,812	6.43	575,360	12.51	-200,970	-11.59	152,765	12.93	3,135,672	20.22	3,938,418	2.94
Alaska	-2,019,147	-9.37	1,158,111	27.12	8,695	591.50	-18	-1.77	-250	-25.00	4,000	228.57	-848,609	-3.28
American Samoa	-1,750	-5.93	0	—	0	—	0	—	0	—	0	—	-1,750	-5.93
Arizona	-3,901,615	-23.61	-7,600	-77.16	-21,345,325	-39.77	0	—	-502,347	-11.05	-50,159	-2.75	-25,807,046	-33.70
Arkansas	-5,772,109	-11.99	1,640,461	22.03	369,294	19.05	6,305,314	89.61	-327,707	-29.52	3,094,188	38.82	5,309,441	7.21
California	-6,383,043	-7.29	-176,883	-1.63	-2,016,810	-24.22	141,468	8.92	-2,779,722	-5.59	-21,105,566	-49.03	-32,320,556	-16.07
Colorado	-1,607,446	-13.92	33,352	37.36	-1,904,549	-68.02	-1,000	-40.00	-9,663	-1.43	-468,590	-9.01	-3,957,896	-19.48
Connecticut	-4,297,029	-17.08	-1,357,350	-22.32	-1,348,116	-79.92	-250	-100.00	-676,467	-22.91	-3,432,686	-18.87	-11,111,898	-20.55
Delaware	991,745	18.87	75,392	13.12	-51,206	-39.35	0	—	501,378	18.05	-1,031,164	-38.25	486,145	4.25
District of Columbia	-250	-100.00	-250	-100.00	0	—	0	—	-250	-100.00	-250	-100.00	-1,000	-100.00
Florida	7,474,607	14.80	-351,214	-5.05	3,195,067	8.93	21,213,422	61.22	-341,838	-2.05	3,011,945	22.68	34,201,989	21.67
Georgia	-9,794,537	-11.59	2,660,833	85.45	-6,392,854	-69.63	-52,667	-88.57	1,008,540	12.03	-3,868,374	-13.32	-16,439,059	-12.24
Hawaii	-189,132	-21.64	-500	-5.00	5,627	2.73	145,163	13.81	452,200	54.14	-1,324	-9.68	412,034	13.78
Idaho	-76,749	-1.84	12,447	4.20	-1,292,702	-12.50	0	—	1,427,449	294.70	255,616	209.15	326,061	2.12
Illinois	-11,918,658	-11.19	2,580,304	18.21	-1,090,788	-9.46	3,372,372	45.94	-1,395,649	-2.33	470,131	0.83	-7,982,288	-3.12
Indiana	4,095,218	3.76	498,255	10.13	-12,538,462	-19.88	-2,117,284	-6.08	1,577,852	11.26	-14,966,363	-28.37	-23,450,784	-8.42
Iowa	-1,609,208	-3.69	-175,453	-12.66	-482,937	-75.97	250	—	714,735	11.32	-3,032,771	-38.83	-4,585,384	-7.68
Kansas	3,130,975	12.22	-177,053	-20.78	-111,337	-22.93	843,455	0.93	191,127	5.66	5,574,983	10.22	9,452,150	5.38
Kentucky	-2,919,271	-6.23	-925,733	-54.50	-4,868,229	-88.58	8,999,750	30.00	-275,963	-11.59	-7,957,483	-24.14	-7,946,929	-6.66
Louisiana	-30,555,193	-19.55	-113,454,316	-71.07	1,118,073	45.71	-137,547,248	-32.48	-3,478,952	-98.31	-9,858,296	-44.98	-293,775,932	-38.29
Maine	-1,933,781	-11.38	-67,569	-15.80	-515,414	-53.93	0	—	-1,479,726	-54.14	167,954	12.85	-3,828,536	-17.08
Maryland	4,257	0.02	-1,507,827	-40.00	-720,734	-27.03	-2	-100.00	-726,990	-18.22	-1,498,049	-27.72	-4,449,345	-13.20
Massachusetts	-3,262,177	-11.92	608,504	90.91	-838,493	-91.29	-4,000	-100.00	-4,732,829	-29.59	-3,211,338	-14.14	-11,440,333	-16.91
Michigan	-13,220,929	-12.63	-500,493	-43.09	4,866,831	26.21	-2,698,934	-32.70	-1,707,425	-10.25	-14,790,478	-14.96	-28,051,428	-11.30
Minnesota	9,039,825	17.26	-1,340,590	-48.68	-519,461	-86.86	0	—	-1,115,103	-18.64	8,171,131	136.16	14,235,802	21.03
Mississippi	2,496,422	4.33	865,844	37.77	-446,014	-4.96	-3,503,563	-7.49	-250,996	-18.36	-3,495,161	-44.42	-4,333,468	-3.47
Missouri	-5,062,604	-9.83	-678,921	-34.98	-11,935,187	-30.23	-750	-75.00	9,512,121	14.19	-3,019,874	-21.08	-11,185,215	-6.42
Montana	105,068	4.38	-19,049	-15.25	3,537,502	10.75	0	—	28,334	2,159.60	-32,304	-63.96	3,619,551	10.20
Nebraska	-1,999,855	-12.02	-43,758	-14.13	45,595	79.31	0	—	71,027	8.11	496,050	11.87	-1,430,941	-6.49
Nevada	-17,630	-2.51	900	360.00	443,501	24.09	0	—	-5,675	-27.95	-329,267	-51.50	91,829	2.87
New Hampshire	-1,136,527	-9.45	-369,946	-70.74	-367,236	-85.58	0	—	227,215	44.82	413,348	19.30	-1,233,146	-7.89
New Jersey	-8,196,623	-21.33	-554,185	-39.11	296,384	10.32	-2,500	-100.00	5,955,235	10.77	-40,586,827	-58.46	-43,088,516	-25.74
New Mexico	688,162	32.24	-750	-100.00	2,743,187	9.70	0	—	83,231	230.45	-30,646	-12.21	3,483,184	11.35
New York	-14,940,678	-15.70	-347,967	-16.78	-951,780	-30.32	-1	-0.40	-9,047,317	-36.37	-21,773,844	-45.27	-47,061,587	-27.15
North Carolina	-3,378,792	-3.63	210,456	30.33	8,925,448	52.95	0	—	-1,350,578	-19.63	-5,048,568	-27.63	-642,034	-0.47
North Dakota	21,763	1.83	-96	-5.33	-1,300	-50.94	0	—	14,343	27.23	-81,785	-52.00	-47,075	-3.35
Ohio	-5,594,602	-4.03	303,689	5.25	-4,398	-0.01	2,104,657	3.70	3,767,032	15.32	-8,323,364	-7.56	-7,746,986	-2.11
Oklahoma	-5,813,637	-16.42	20,314	5.52	-861,045	-48.04	-212,704	-3.35	-147,890	-28.77	-2,408,939	-20.53	-9,423,901	-16.78
Oregon	-1,379,106	-6.87	32,956	10.83	905,533	87.74	-1	-100.00	369,447	5.23	-2,367,074	-43.41	-2,438,245	-7.18
Pennsylvania	-10,265,681	-11.53	-2,078,321	-47.70	2,380,753	14.10	-231	-30.80	1,190,159	7.81	-9,897,802	-11.33	-18,671,123	-8.77
Puerto Rico	-2,070,469	-13.22	-100,675	-81.78	-65,865	-59.43	250	—	-1,901,391	-23.69	1,944,984	38.16	-2,193,166	-7.56
Rhode Island	-1,513,274	-20.07	143,978	37.36	-115,048	-100.00	0	—	-517,209	-26.69	-1,654,528	-36.33	-3,656,081	-25.15
South Carolina	3,655,952	5.65	-204,719	-14.60	-252,949	-19.47	0	—	1,156,928	43.40	-447,778	-3.55	3,907,434	4.72
South Dakota	137,697	5.51	52,715	2,196.46	25	2,500.00	0	—	-59,479	-37.91	87,543	18.46	218,501	6.97
Tennessee	14,507,117	10.51	-394,124	-6.24	-2,877,639	-21.19	5,090,550	10.20	-3,627,776	-14.67	-3,780,654	-17.21	8,917,474	3.50
Texas	-8,748,900	-4.64	624,860	11.50	-32,677,071	-60.55	-42,218,509	-8.34	-4,194,529	-10.36	-2,210,902	-2.53	-89,425,051	-10.14
Utah	8,817,558	7.27	-106,881	-30.85	645,521	4.24	0	—	-156,236	-17.07	336,380	19.98	9,536,342	6.84
Vermont	-390,225	-25.68	23,405	20.70	15,862	65.17	0	—	4,577	6.29	-57,978	-8.99	-404,359	-17.03
Virgin Islands	-331,390	-22.23	-1,310	-52.40	-26,699	-19.02	0	—	0	—	0	—	-359,399	-22.00
Virginia	-44,839,807	-36.72	-8,776,774	-44.16	-4,170,943	-82.34	-1,373	-100.00	-3,008,823	-7.98	-2,737,446	-20.50	-63,535,166	-32.07
Washington	-417,992	-1.48	2,051,727	15.19	-496,111	-54.25	0	—	-185,589	-18.98	-3,282,873	-43.99	-2,330,838	-4.57
West Virginia	-3,249,682	-9.32	-729,142	-23.05	9,287,859	1,037.31	0	—	-114,877	-3.25	-7,715,649	-40.52	-2,521,491	-4.10
Wisconsin	-5,575,754	-12.18	-248,722	-50.46	-2,772,204	-39.96	0	0.00	-4,170,333	-19.73	8,870,095	30.06	-3,896,918	-3.75
Wyoming	815,430	28.95	40,123	95.42	-15,081,668	-98.74	-12,987,727	-47.90	-10,100	-97.58	-103,165	-85.56	-27,327,107	-60.22
TOTAL	-168,579,677	-6.49	-120,607,733	-38.96	-89,774,457	-16.80	-153,333,081	-11.49	-19,893,984	-3.48	-168,625,299	-15.59	-720,814,231	-11.22



Map 4–1. Changes in TRI Total Releases and Transfers by State, 1988–1989.

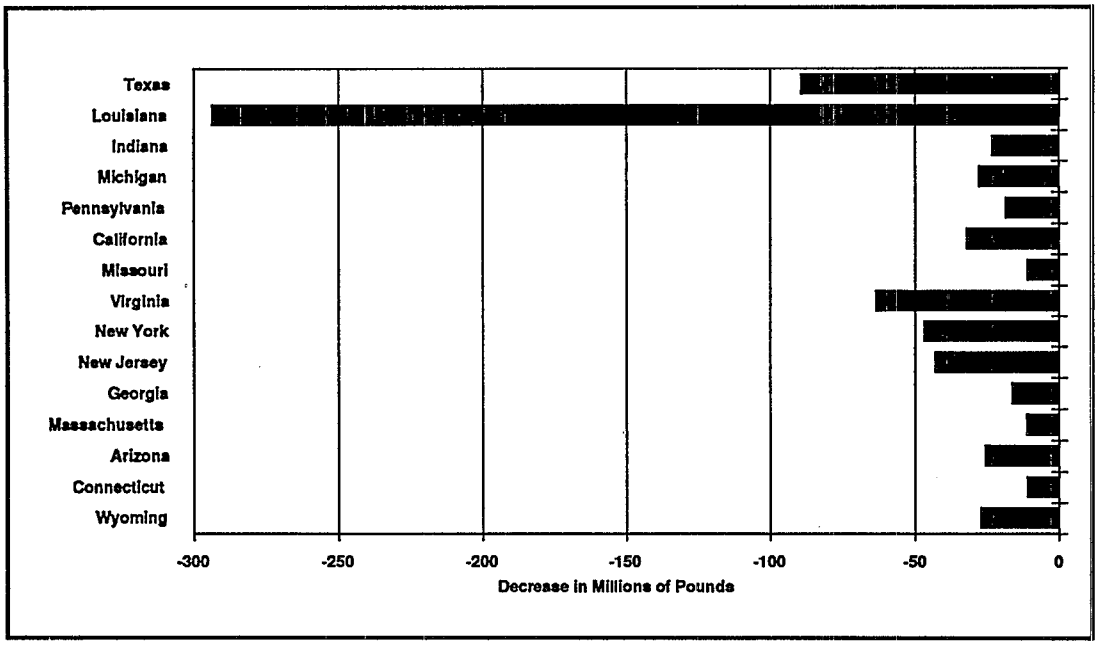


Figure 4–8. States with Decreases in TRI Total Releases and Transfers Greater than 10 Million Pounds, 1988–1989. (States shown in descending order according to TRI total releases and transfers for 1989.)

The following sections detail the changes between 1988 and 1989 in each separate type of TRI release or transfer: air emissions, discharges to surface water, on-site land releases, underground injection, transfers to POTWs, and off-site transfers to other waste management facilities for storage, treatment, or disposal.

AIR EMISSIONS

Total TRI air emissions decreased by 6% from 1988 to 1989.

Total air emissions of TRI chemicals (excluding delisted chemicals) dropped 6 percent (168.6 million pounds) from 1988 to 1989. In both years, however, total air emissions represented a similar share of the total TRI releases and transfers (40 percent in 1988 versus 43 percent in 1989). Point source air emissions (which made up 70 percent of the total air emissions in 1988, and 69 percent in 1989) decreased by a larger absolute amount than fugitive air emissions, with a reduction of 130.4 million pounds, as compared to a reduction of 38.2 million pounds for fugitive air emissions. (See Table 4-2.)

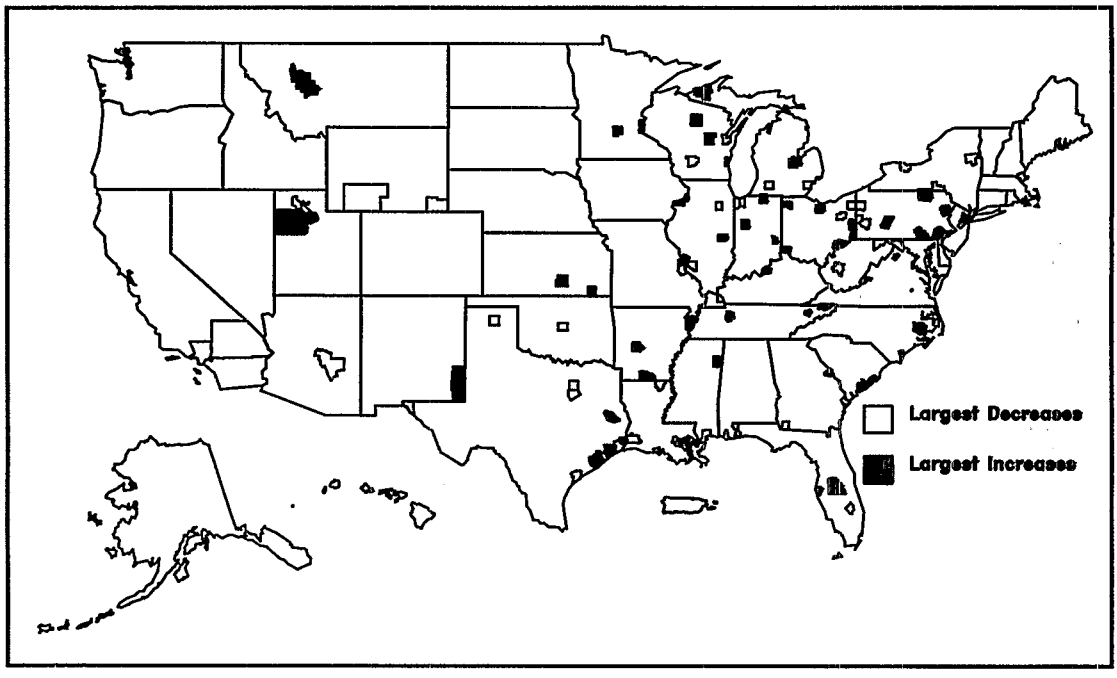
The 168.6-million-pound net change in total air emissions from 1988 to 1989 was the result of decreases totaling 559.9 million pounds, partially offset by increases totaling 391.3 million pounds. The number of facilities showing increases in total TRI air emissions (10,031) exceeded the number showing decreases (9,290); however, more facilities showed decreases over 10 million pounds (70 facilities) than increases of that magnitude (44 facilities). Of the facilities showing decreases of 10 million pounds or more, 11 reported in 1988 but not in 1989. Furthermore, six of the facilities showing increases of more than 10 million pounds reported in 1989 but not in 1988.

These net changes on a national level mask more drastic increases, decreases or changes in the relative share of point source and fugitive air emissions at the individual facility level. For example, total air emissions decreased by 25 percent at BASF Corporation, Freeport, Texas, between 1988 and 1989, but the relative roles of fugitive and point source emissions at the facility reversed, going from 12 percent fugitive in 1988 to 72 percent fugitive in 1989. In absolute amounts, the fugitive emissions increased and the point source emissions decreased, whereas in fact no changes had been made in industrial processes. The change resulted from a different basis of estimate in the two years. Although the *total* pounds for the two years are both considered by the facility to be accurate on the basis of mass balance information, the facility indicated that the breakdown between the two kinds of releases is much more reliable for 1989 because of improved monitoring data.

Chemical Distribution

Total air emissions of 28 TRI chemicals decreased by greater than 1 million pounds each from 1988 to 1989...

Total air emissions of 165 TRI chemicals decreased from 1988 to 1989. In 28 of these cases, the decreases exceeded 1 million pounds each. Air emissions of five of these chemicals each decreased by greater than 10 million pounds: ammonia (with a decrease of 28.7 million pounds), carbon disulfide (24.1 million pounds), toluene (23.7 million pounds), methanol (20.2 million pounds), and dichloromethane (18.3



Map 4–2. The 50 Counties with the Largest Increases and the 50 Counties with the Largest Decreases in TRI Total Releases and Transfers, 1988–1989.

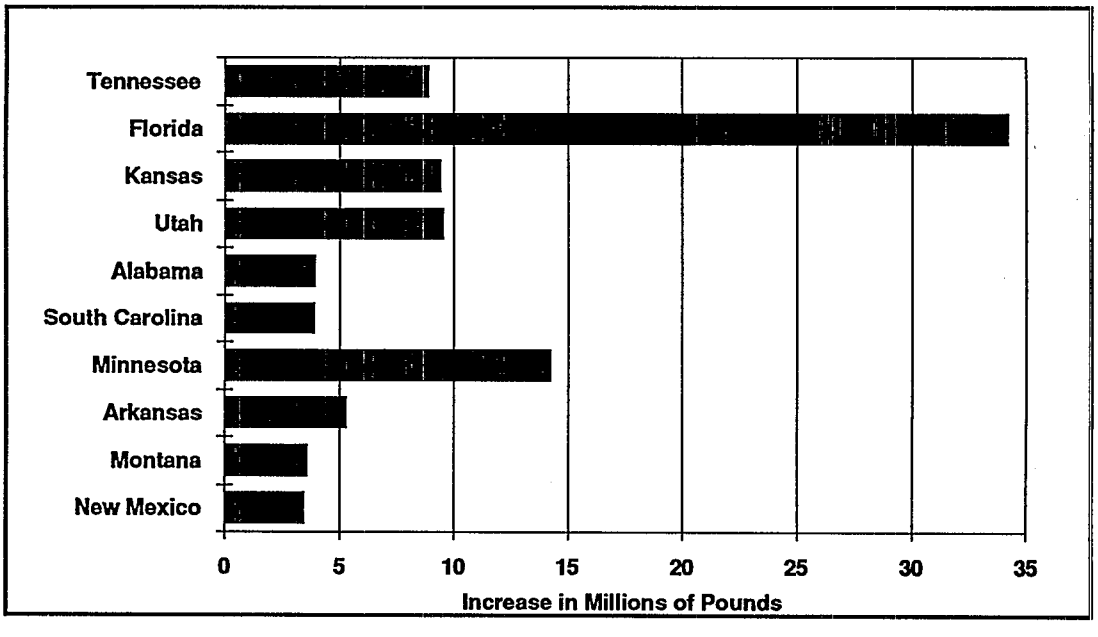


Figure 4–9. States With Increases in TRI Total Releases and Transfers Greater than 1 Million Pounds, 1988–1989. (States shown in descending order according to TRI total releases and transfers for 1989.)

Table 4–9. The 50 Counties with the Largest Decreases in TRI Total Releases and Transfers, 1988-1989.

COUNTY	STATE	CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989	TOTAL RELEASES AND TRANSFERS		TRI FACILITIES	
			1989	1988	1989	1988
		Pounds	Pounds	Pounds	Number	Number
St Charles	LA	-154,627,602	19,297,526	173,925,128	10	10
St James	LA	-110,482,596	26,425,108	136,907,704	9	10
Jefferson	TX	-44,859,123	111,046,679	155,905,802	36	32
Warren	VA	-39,081,438	254,620	39,336,058	2	3
Union	NJ	-31,440,287	16,479,619	47,919,906	75	74
Ascension	LA	-25,015,359	141,752,206	166,767,565	19	16
Gila	AZ	-22,603,457	30,235,704	52,839,161	2	2
Lake	IN	-20,604,059	72,486,534	93,090,593	49	49
Wayne	MI	-19,145,047	57,535,048	76,680,095	168	165
Warren	NY	-18,574,109	1,945,929	20,520,038	7	6
Los Angeles	CA	-15,249,424	79,856,790	95,106,214	712	708
Sweetwater	WY	-14,962,235	340,162	15,302,397	3	3
Calhoun	TX	-14,332,915	69,008,250	83,341,165	7	7
El Paso	TX	-14,163,985	1,963,746	16,127,731	24	23
Laramie	WY	-13,079,117	15,549,559	28,628,676	2	2
Jefferson	MO	-11,805,576	19,346,518	31,152,094	13	13
Hopewell City	VA	-11,404,160	46,748,824	58,152,984	8	7
Escambia	FL	-10,928,565	26,832,934	37,761,499	9	9
Hutchinson	TX	-10,802,997	5,837,520	16,640,517	7	9
Alleghany	VA	-10,581,221	10,331,994	20,913,215	3	3
Galveston	TX	-10,082,621	52,783,494	62,866,115	17	19
Orange	CA	-9,273,706	18,016,156	27,289,862	228	229
Morehouse	LA	-9,001,450	50	9,001,500	1	2
Middlesex	NJ	-8,768,342	27,995,872	36,764,214	143	137
Marshall	KY	-8,701,422	9,925,508	18,626,930	8	7
Decatur	GA	-8,591,538	522,106	9,113,644	7	6
Kalamazoo	MI	-8,185,357	26,739,280	34,924,637	30	27
Beaver	PA	-7,295,716	7,730,271	15,025,987	25	28
Stark	OH	-6,599,003	13,599,122	20,198,125	62	59
Monroe	NY	-6,475,865	23,870,007	30,345,872	67	62
Harrison	MS	-6,406,438	42,896,317	49,302,755	10	8
Kanawha	WV	-5,668,670	17,847,799	23,516,469	12	14
Chatham	GA	-5,658,089	19,108,460	24,766,549	28	27
Philadelphia	PA	-5,598,314	18,125,175	23,723,489	67	66
Oklahoma	OK	-5,293,283	2,755,881	8,049,164	34	36
Trumbull	OH	-5,283,623	9,998,261	15,281,884	37	36
Ellis	TX	-4,992,481	1,955,320	6,947,801	17	14
San Bernardino	CA	-4,829,202	7,720,198	12,549,400	70	69
St John the Baptist	LA	-4,738,543	2,801,847	7,540,390	11	7
Essex	MA	-4,703,329	3,839,530	8,542,859	80	75
Brown	WI	-4,486,393	11,419,949	15,906,342	29	28
Porter	IN	-4,399,815	29,994,093	34,393,908	19	18
St Clair	IL	-4,392,112	46,470,224	50,862,336	20	18
Allegheny	PA	-4,300,153	17,580,310	21,880,463	92	87
Sauk	WI	-3,998,851	239,408	4,238,259	9	9
Grundy	IL	-3,908,248	2,884,420	6,792,668	9	9
Broome	NY	-3,899,892	6,833,563	10,733,455	23	21
Calcasieu	LA	-3,819,820	29,985,409	33,805,229	23	22
Mercer	PA	-3,813,047	4,668,869	8,481,916	19	15
Dallas	TX	-3,769,270	7,783,447	11,552,717	182	180
SUBTOTAL		-790,677,865	1,219,365,616	2,010,043,481	2,544	2,486
TOTAL FOR ALL OTHERS		69,863,634	4,486,304,764	4,416,441,130	20,025	18,658
GRAND TOTAL		-720,814,231	5,705,670,380	6,426,484,611	22,569	21,144

Table 4–10. The 50 Counties with the Largest Increases in TRI Total Releases and Transfers, 1988-1989.

COUNTY	STATE	CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989	TOTAL RELEASES AND TRANSFERS		TRI FACILITIES	
			1989	1988	1989	1988
		Pounds	Pounds	Pounds	Number	Number
Polk	FL	51,551,574	75,673,943	24,122,369	55	50
Jefferson	LA	14,545,483	196,108,289	181,562,806	24	25
St Louis County & City(a)	MO	13,725,857	25,913,039	12,187,182	92	55
Mc Leod	MN	12,163,451	29,227,745	17,064,294	8	8
Brazoria	TX	11,085,729	225,447,996	214,362,267	21	22
Orange	TX	10,453,347	31,705,771	21,252,424	14	13
Tooele	UT	9,707,335	119,458,175	109,750,840	4	3
Hamblen	TN	9,514,971	29,030,975	19,516,004	22	20
Waupaca	WI	8,894,327	10,404,866	1,510,539	8	9
Beaufort	NC	8,232,028	18,457,742	10,225,714	7	7
Brooke	WV	7,105,210	11,657,501	4,552,291	9	9
Jefferson	KY	6,680,267	56,767,217	50,086,950	69	60
Jefferson	OH	6,230,187	7,736,272	1,506,085	6	6
Sedgwick	KS	5,504,137	154,109,629	148,605,492	43	38
Defiance	OH	5,364,070	9,786,113	4,422,043	7	7
Rock Island	IL	5,165,776	18,642,204	13,476,428	20	17
Union	AR	5,155,232	13,502,918	8,347,686	14	12
Washington	MN	4,616,164	11,997,197	7,381,033	5	5
Douglas	IL	3,877,187	14,334,723	10,457,536	3	2
Essex	NJ	3,856,890	30,108,232	26,251,342	99	100
Saginaw	MI	3,843,678	11,715,235	7,871,557	12	10
Sullivan	TN	3,780,075	49,181,587	45,401,512	14	14
Lewis and Clark	MT	3,640,618	36,632,896	32,992,278	4	4
Lea	NM	3,575,627	3,581,750	6,123	2	1
Tippecanoe	IN	3,289,253	13,923,178	10,633,925	19	19
Mississippi	AR	3,045,603	20,214,418	17,168,815	16	15
Salt Lake	UT	2,989,176	21,660,501	18,671,325	49	49
Montgomery	KS	2,800,036	6,364,427	3,564,391	8	8
Hamilton	OH	2,740,767	31,855,876	29,115,109	140	136
Humphreys	TN	2,607,434	62,226,193	59,618,759	4	5
Charleston	SC	2,550,543	8,310,363	5,759,820	19	17
Lincoln	WI	2,538,380	2,602,980	64,600	5	3
Huron	OH	2,513,791	3,349,573	835,782	11	9
Elkhart	IN	2,489,587	9,894,838	7,405,251	79	60
Monroe	MS	2,236,281	9,915,260	7,678,979	7	5
Monroe	PA	2,212,986	3,975,673	1,762,687	8	9
Garland	AR	2,195,311	10,920,736	8,725,425	8	7
York	PA	2,192,772	7,039,531	4,846,759	59	52
Richmond	GA	2,106,060	9,377,408	7,271,348	30	26
Ontonagon	MI	2,095,804	16,560,408	14,464,604	2	2
Angelina	TX	2,017,341	4,179,156	2,161,815	12	15
Marshall	WV	1,928,404	5,541,094	3,612,690	6	4
Fayette	IN	1,922,850	2,786,425	863,575	5	5
Cambria	PA	1,921,473	3,011,988	1,090,515	13	9
Bradford	PA	1,918,828	11,508,130	9,589,302	6	5
Washington	OH	1,819,246	24,285,756	22,466,510	13	14
Ozaukee	WI	1,815,083	6,573,488	4,758,405	9	10
Chambers	TX	1,804,789	4,237,655	2,432,866	2	2
Chester	PA	1,798,419	6,512,632	4,714,213	41	39
New Hanover	NC	1,797,640	14,682,619	12,884,979	13	12
SUBTOTAL		277,617,077	1,512,692,321	1,235,075,244	1,146	1,034
TOTAL FOR ALL OTHERS		-998,431,308	4,192,978,059	5,191,409,367	21,423	20,110
GRAND TOTAL		-720,814,231	5,705,670,380	6,426,484,611	22,569	21,144

(a) Some facilities in this area reported being located in St. Louis County in one year but St. Louis City (as the county designation) in another year. Therefore, comparison was made for all facilities in the area.

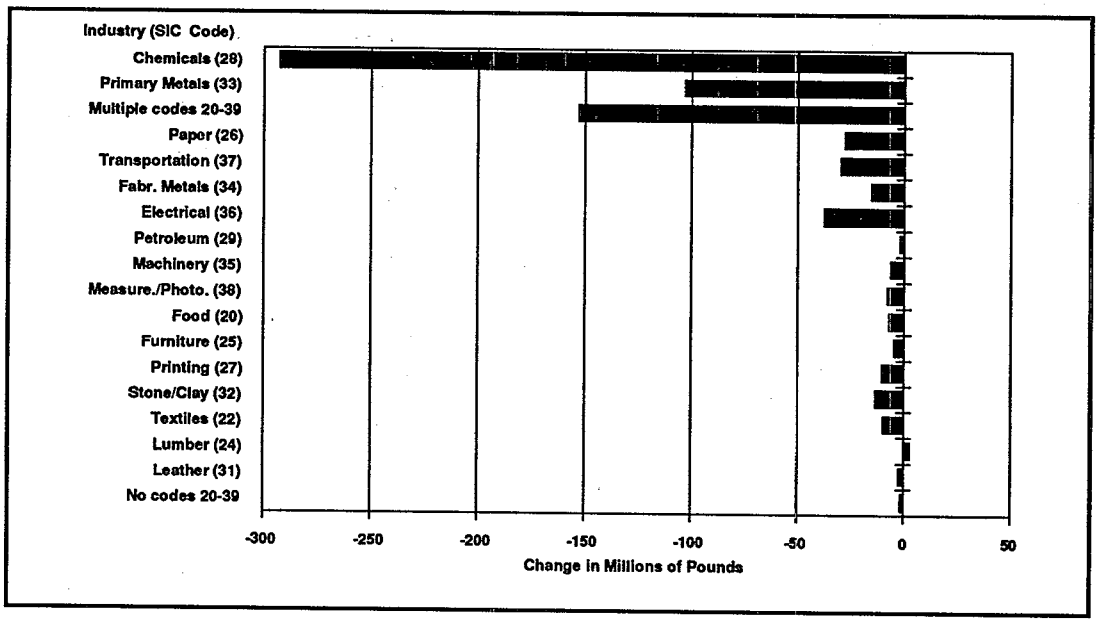


Figure 4–10. Industries with Changes in TRI Total Releases and Transfers Greater than 1 Million Pounds, 1988–1989. (Industries shown in descending order according to TRI total releases and transfers for 1989.)

million pounds). Despite these significant decreases, toluene and methanol were the first- and third-ranked TRI chemicals for total air emissions in 1989 (ammonia was ranked second). (See Figure 4-11 and Table 4-12.)

The 24.1-million-pound decrease in carbon disulfide air emissions resulted largely from the late 1988 closing of Avtex Fibers Front Royal Inc., a Chemical plant (SIC 28) formerly in Front Royal, Virginia. This facility reported 34.0 million pounds of carbon disulfide air emissions in 1988 and did not report in 1989. (See Appendix F, Table F-8.)

...while total air emissions of only 9 TRI chemicals increased by greater than 1 million pounds each.

Total air emissions from 1988 to 1989 increased for 95 TRI chemicals, but only nine of these chemicals showed increases in air emissions greater than 1 million pounds each. (Four TRI chemicals showed no change in air emissions between 1988 and 1989. An additional 56 TRI chemicals were not associated with air releases in either year because no TRI reports were filed or because no air emissions were reported.) Sulfuric acid topped this list, with an increase of 7.4 million pounds (from 16.9 million pounds in 1988 to 24.3 million pounds in 1989), followed by cyclohexane, which was associated with a 4.1-million-pound increase in air emissions. (See Figure 4-12 and Table 4-12.)

Chemical Classes

Air emissions of 3 chemical classes each decreased by more than 37 million pounds from 1988 to 1989.

Air emissions of four of the five chemical classes decreased from 1988 to 1989. (Mixtures and trade secrets cannot be assigned to specific chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.) Three of these class-wide decreases exceeded 37 million pounds each: those of the non-halogenated organics (with an 89.2-million-pound or 6-percent reduction), halogenated organics (45.4 million pounds, 9 percent) and non-metallic inorganics (37.4 million pounds, 9 percent). Despite these changes, each chemical class comprised a remarkably similar share of the total air emissions in both 1988 and 1989, with non-halogenated organics, halogenated organics and non-metallic inorganics accounting for 59 percent, 20 percent, and 16 percent, respectively, of the overall air total in both years. (See Figure 4-13 and Table 4-4.)

The changes in air emissions of a few individual chemicals heavily influenced the changes in each chemical class from 1988 to 1989. For example, the combined decrease in air emissions of three non-halogenated organics—carbon disulfide, toluene, and methanol—totaled 67.9 million pounds (out of a net decrease in air emissions for the non-halogenated organics class of 89.2 million pounds). (See Figure 4-13 and Table 4-4.)

Table 4–11. Changes in TRI Releases and Transfers by Industry, 1988-1989.

SIC CODE	INDUSTRY	CHANGE IN AIR 1988-1989		CHANGE IN SURFACE WATER 1988-1989		CHANGE IN LAND 1988-1989		CHANGE IN UNDERGROUND 1988-1989	
		Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
20	Food	-1,914,336	-9.23	-605,609	-17.72	1,020,263	30.70	-2,418,943	-68.63
21	Tobacco	458,585	49.57	32,042	245.53	761	101.47	0	—
22	Textiles	-6,232,524	-17.03	-52,864	-5.04	-150,442	-76.58	0	—
23	Apparel	252,026	22.86	0	0.00	-40,349	-98.78	0	—
24	Lumber	4,167,837	14.05	556,534	552.01	59,716	112.82	0	—
25	Furniture	-2,975,143	-4.69	-291	-13.78	-55,315	-73.82	0	—
26	Paper	-20,189,760	-9.43	4,273,785	11.28	-543,520	-5.18	1	—
27	Printing	-5,412,326	-8.91	-27,376	-85.31	-40,502	-97.44	-40,000	-100.00
28	Chemicals	-98,682,682	-11.72	-121,667,588	-52.65	-23,161,998	-17.82	2,181,978	0.20
29	Petroleum	-2,821,627	-5.07	539,998	16.72	-142,568	-5.64	4,629,446	22.60
30	Plastics	1,429,345	0.87	68,628	10.88	64,784	36.84	12,296	409.32
31	Leather	-1,904,081	-13.32	-452,381	-66.45	-96,032	-27.19	0	—
32	Stone/Clay	-3,244,334	-12.57	-293,544	-29.61	-482,326	-15.85	-9,750	-0.15
33	Primary Metals	348,064	0.15	-1,879,958	-10.63	-49,475,671	-17.14	-4,030,690	-9.85
34	Fabr. Metals	3,144,581	2.51	-1,211,966	-79.93	-3,184,709	-74.56	-151,427	-30.90
35	Machinery	-3,145,121	-5.49	-76,805	-16.21	92,876	43.10	250	—
36	Electrical	-24,103,739	-20.21	-100,605	-13.08	-77,763	-5.31	4,690	10.73
37	Transportation	-12,536,396	-5.97	-240,658	-65.06	-1,062,034	-85.80	-81,600	-98.79
38	Measure./Photo.	-4,281,945	-8.34	-257,176	-37.50	-391,680	-79.81	-250	-100.00
39	Miscellaneous	-4,382,374	-14.83	-19,421	-35.95	-217,647	-79.62	-1	-100.00
	Multiple codes 20	13,394,211	5.92	934,800	10.88	-9,381,361	-11.03	-153,428,269	-88.86
	No codes 20-39	52,062	0.45	-127,278	-43.31	-2,508,940	-98.30	-812	-100.00
	TOTAL	-168,579,677	-6.49	-120,607,733	-38.96	-89,774,457	-16.80	-153,333,081	-11.49

Air emissions of only two metals and metal compounds changed (either *increased* or *decreased*) from 1988 to 1989 by more than 1 million pounds each: zinc compounds, with a decrease of 2.5 million pounds, and manganese, with an increase of 1.2 million pounds. The class as a whole registered a decrease in air emissions of 890,000 pounds from 1988 to 1989.

Air emissions of metals and metal compounds decreased by less than 1 million pounds...

Total air emissions of mineral acids/salts increased by 876,000 pounds as combined increases in air emissions of sulfuric acid and hydrochloric acid totaling 9.0 million pounds offset decreases in air emissions of nitric acid and hydrogen fluoride of 5.8 million pounds and 2.1 million pounds, respectively.

...while air emissions of mineral acids/salts increased by less than 1 million pounds.

Carcinogens

Total air emissions of TRI carcinogens decreased by 28.8 million pounds from 1988 to 1989. This 10 percent reduction exceeded the rate of decrease in air emissions seen for *all* TRI chemicals (6 percent). Between 1988 and 1989, air emissions of 48 of the 123 TRI carcinogens decreased, 32 increased, and one remained the same. (No air emissions for 42 carcinogens were reported in either year.) (Chapter 3, Box 3-G, defines TRI carcinogens, and Appendix B lists all TRI chemicals, indicating those which are considered carcinogens.)

Total TRI air emissions of carcinogens decreased by 10% from 1988 to 1989.

Table 4–11, continued..

INDUSTRY	CHANGE IN PUBLIC SEWAGE 1988-1989		CHANGE IN OFF-SITE 1988-1989		CHANGES IN TOTAL RELEASES AND TRANSFERS 1988-1989	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Food	248,693	0.67	-3,188,663	-49.55	-6,858,595	-9.19
Tobacco	-775,382	-97.91	-274,246	-87.62	-558,240	-27.31
Textiles	-3,760,969	-25.54	505,410	15.79	-9,691,389	-17.38
Apparel	-28,940	-6.16	85,056	47.87	267,793	14.95
Lumber	-142,553	-66.92	-1,507,192	-32.29	3,134,342	9.04
Furniture	196,679	47.67	-1,592,962	-27.20	-4,427,032	-6.34
Paper	-784,361	-1.68	-10,656,857	-33.51	-27,900,712	-8.18
Printing	-2,716,843	-78.41	-2,003,664	-29.36	-10,240,711	-14.39
Chemicals	17,427,038	5.28	-68,764,401	-16.52	-292,667,653	-9.63
Petroleum	-1,294,705	-9.60	-2,799,902	-28.97	-1,889,358	-1.80
Plastics	430,355	8.77	-1,969,917	-7.95	35,491	0.02
Leather	-533,598	-5.46	482,587	21.28	-2,503,505	-9.15
Stone/Clay	-352,505	-26.21	-8,767,893	-38.35	-13,150,352	-21.69
Primary Metals	-6,135,207	-28.66	-41,655,528	-16.35	-102,828,990	-11.96
Fabr. Metals	-9,070,717	-51.87	-4,868,690	-6.59	-15,342,928	-6.89
Machinery	-136,229	-4.57	-3,055,501	-15.08	-6,320,530	-7.78
Electrical	-4,669,215	-24.67	-8,677,769	-20.23	-37,624,401	-20.52
Transportation	164,640	2.15	-15,912,611	-28.60	-29,668,659	-10.79
Measure./Photo.	-2,387,038	-44.03	-451,197	-2.33	-7,769,286	-10.05
Miscellaneous	13,503	2.98	4,027,380	44.12	-578,560	-1.47
Multiple codes 20	-5,129,745	-16.55	831,488	1.25	-152,778,876	-25.89
No codes 20-39	-456,885	-20.32	1,589,773	39.29	-1,452,080	-7.02
TOTAL	-19,893,984	-3.48	-168,625,299	-15.59	-720,814,231	-11.22

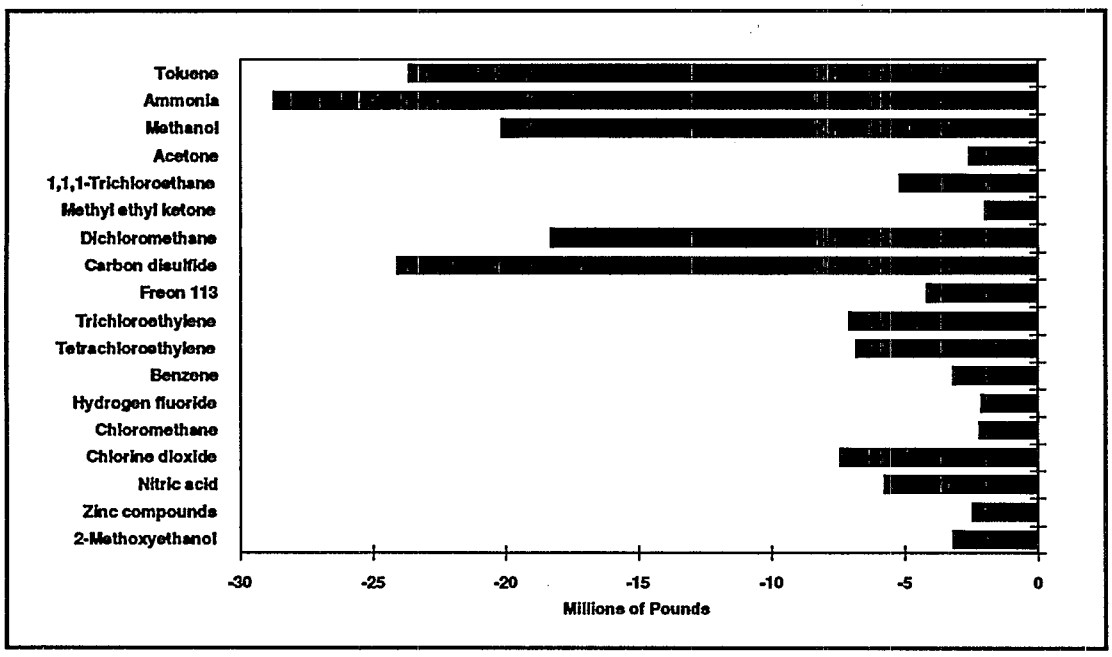


Figure 4–11. TRI Chemicals with Decreases in Air Emissions Greater than 2 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 air emission totals.)

Dichloromethane was the TRI carcinogen associated with the largest reduction in total air emissions from 1988 to 1989.

Three of the top four carcinogens for air emissions in 1989—dichloromethane (ranked first), tetrachloroethylene (third), and benzene (fourth)—accounted for most of the net decrease in air emissions of TRI carcinogens from 1988 to 1989. Air emissions of dichloromethane decreased from 127.6 million pounds to 109.3 million pounds, a decrease of 18.3 million pounds or 14 percent. Tetrachloroethylene and benzene air emissions dropped by 6.8 million pounds (21 percent) and 3.2 million pounds (11 percent), respectively. (These three chemicals are 33/50 Program chemicals; see Chapter 6.) (See Figure 4-14 and Table 4-13.)

Four additional carcinogens each registered decreases in air emissions between 1 and 2 million pounds: ethylene oxide, propylene oxide, styrene (the second-ranked carcinogen in 1989 for air emissions), and 1,3-butadiene. Air emissions of seven TRI carcinogens *increased* by more than 150,000 pounds each, but in only two of these cases did the increase exceed 1 million pounds.(See Figure 4-14 and Table 4-13.)

Geographical Distribution

39 states were each associated with a decrease in total TRI air emissions between 1988 and 1989.

Thirty-nine states and other reporting jurisdictions each showed decreases in total air emissions from 1988 to 1989, while 15 each showed increases. Virginia facilities were collectively associated with the largest net change in total air emissions from

Table 4–12. TRI Chemicals with Changes in Total Air Emissions Greater than 1 Million Pounds, 1988-1989.

CHEMICAL	AIR 1989 Pounds	AIR 1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Ammonia	244,505,074	273,248,627	-28,743,553	-10.52
Carbon disulfide	99,794,948	123,893,367	-24,098,419	-19.45
Toluene	255,437,878	279,098,033	-23,660,155	-8.48
Methanol	199,729,091	219,902,305	-20,173,214	-9.17
Dichloromethane	109,272,003	127,592,367	-18,320,364	-14.36
Chlorine dioxide	6,991,386	14,429,737	-7,438,351	-51.55
Trichloroethylene	44,325,687	51,422,615	-7,096,928	-13.80
Tetrachloroethylene	25,504,477	32,341,862	-6,837,385	-21.14
Nitric acid	5,261,804	11,039,482	-5,777,678	-52.34
1,1,1-Trichloroethane	168,617,910	173,827,947	-5,210,037	-3.00
Freon 113	63,232,772	67,426,079	-4,193,307	-6.22
2-Methoxyethanol	2,684,683	5,892,813	-3,208,130	-54.44
Benzene	24,683,026	27,879,946	-3,196,920	-11.47
Acetone	199,209,247	201,804,056	-2,594,809	-1.29
Zinc compounds	4,681,892	7,148,533	-2,466,641	-34.51
Chloromethane	8,874,868	11,099,002	-2,224,134	-20.04
Hydrogen fluoride	9,980,154	12,109,097	-2,128,943	-17.58
Methyl ethyl ketone	127,631,835	129,633,557	-2,001,722	-1.54
Carbonyl sulfide	17,989,672	19,685,072	-1,695,400	-8.61
Ethylene oxide	3,022,203	4,634,490	-1,612,287	-34.79
Naphthalene	3,313,367	4,899,997	-1,586,630	-32.38
Xylene (mixed isomers)	147,486,804	148,959,342	-1,472,538	-0.99
Propylene oxide	1,794,137	3,058,010	-1,263,873	-41.33
Chlorine	132,348,111	133,483,355	-1,135,244	-0.85
Styrene	33,301,802	34,412,274	-1,110,472	-3.23
Ethylene	41,382,226	42,485,343	-1,103,117	-2.60
1,3-Butadiene	5,537,449	6,620,539	-1,083,090	-16.36
p-Xylene	4,720,073	5,730,802	-1,010,729	-17.64
Acetaldehyde	7,524,224	6,468,299	1,055,925	16.32
Manganese	2,733,568	1,499,243	1,234,325	82.33
Chloroform	24,268,093	22,990,906	1,277,187	5.56
Ethylbenzene	8,540,486	6,966,052	1,574,434	22.60
Hydrochloric acid	60,742,485	59,157,413	1,585,072	2.68
Total for Mixtures	5,573,823	2,159,061	3,414,762	158.16
Isopropyl alcohol (mfg.- strong acid process)	5,585,904	1,912,044	3,673,860	192.14
Cyclohexane	16,919,721	12,862,102	4,057,619	31.55
Sulfuric acid	24,255,588	16,858,801	7,396,787	43.87
SUBTOTAL	2,147,458,471	2,304,632,570	-157,174,099	-6.82
TOTAL FOR ALL OTHERS	279,603,435	291,009,013	-11,405,578	-3.92
GRAND TOTAL	2,427,061,906	2,595,641,583	-168,579,677	-6.49

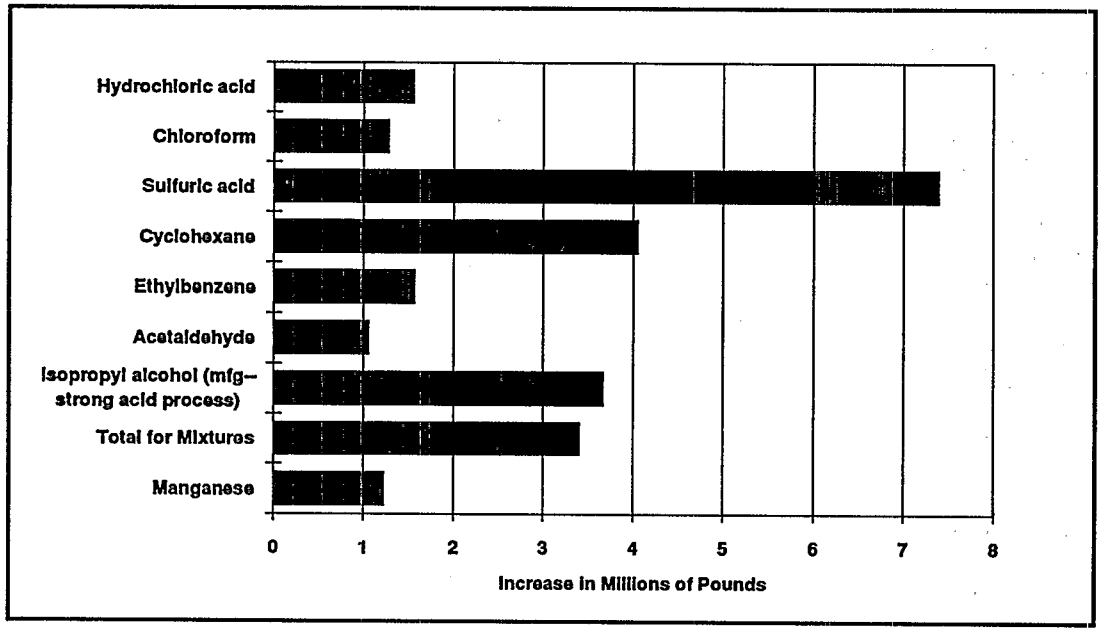


Figure 4–12. TRI Chemicals with Increases in Emissions to Air Greater than 1 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 air emission totals.)

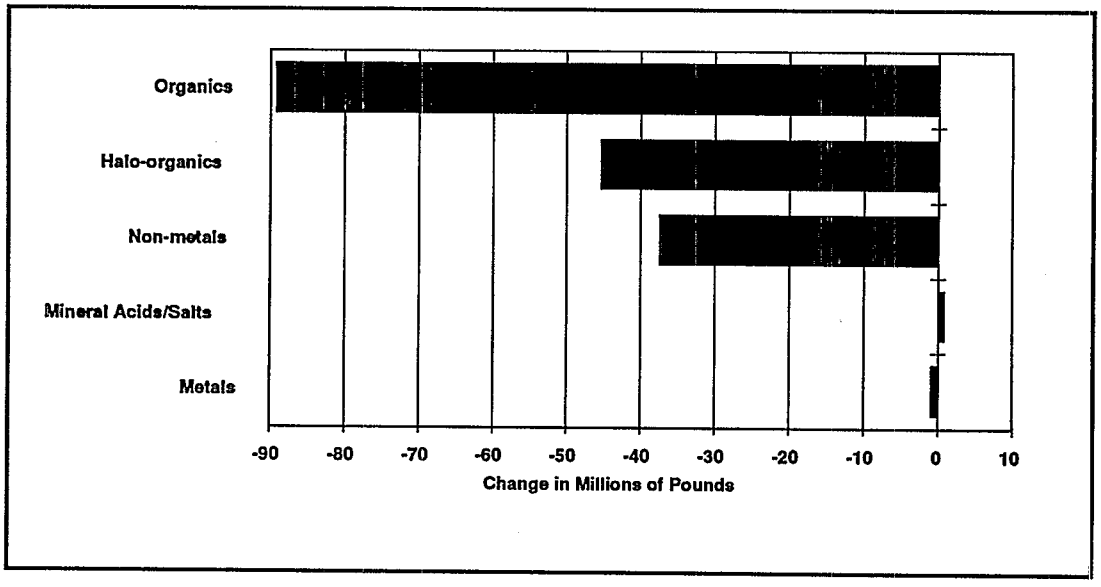


Figure 4–13. Changes in TRI Air Emissions by Chemical Class, 1988–1989. (Classes shown in descending order according to 1989 air emission totals.)

1988 to 1989—a decrease of 44.8 million pounds (37 percent), a substantial portion of which was due to the shutdown of the Avtex Fibers facility in Front Royal (see discussion above.) (See Map 4-3; Table 4-8; and Appendix F, Table F-8.)

Facilities in Louisiana, the second-ranked state for total TRI releases and transfers in 1989, were associated with the next largest state-wide decrease in TRI air emissions—a 31.0-million-pound decrease, while New York showed a net decrease in air emissions of 14.9 million pounds. The two facilities in New York reporting the largest decreases in air emissions were Eastman Kodak Company in Rochester and IBM in Endicott, which reported decreases in air emissions of 4.8 million pounds and 3.5 million pounds, respectively. Three additional states showed decreases in total air emissions from 1988 to 1989 larger than ten million pounds each: Michigan (13.2 million pounds or 13 percent), Illinois (11.9 million pounds or 11 percent) and Pennsylvania (10.3 million pounds or 12 percent). (See Figure 4-15; Map 4-3; Table 4-8; and Appendix F, Table F-8.)

Tennessee showed the largest state-wide increase in total air emissions between 1988 and 1989.

Tennessee was associated with the largest state-wide increase in total air emissions from 1988 to 1989—14.5 million pounds (an increase from 138.0 million pounds in 1988 to 152.5 million pounds in 1989). Total TRI air emissions also increased significantly in Minnesota (an increase of 9.0 million pounds, 17 percent), Utah (8.8 million pounds, 7 percent), and Florida (7.5 million pounds, 15 percent), while Indiana, South Carolina, Kansas and Mississippi were also associated with increases in total air emissions greater than 2 million pounds each. (See Map 4-3 and Table 4-8.)

For each of the four states with the largest net increases in air emissions from 1988 to 1989, an individual facility reported a change in air emissions which substantially contributed to the state-wide change: 3M Consumer AV & Consumer Products in Hutchinson, Minnesota (9.4-million-pound increase in air emissions); Magnesium Corporation of America in Tooele, Utah (9.3-million-pound increase); BASF Corporation in Lowland, Tennessee (8.4-million-pound increase); and Royster Co. in Mulberry, Florida (6.4-million-pound increase). (See Figure 4-16; and Appendix F, Table F-8.)

Industrial Distribution

The Chemical industry was associated with the largest decrease in total TRI air emissions between 1988 and 1989...

In 1989, for the second year in a row, facilities in the Chemical industry contributed the largest share of TRI total air emissions—31 percent (as compared to 32 percent for 1988), even though this industry was associated with the largest net decrease in air emissions from 1988 to 1989. This decrease of 98.7 million pounds (12 percent) surpassed the next highest decrease reported by an individual industry (the Electrical industry) by a factor of four. Ten of the top 20 decreasing facilities (for air emissions from 1988 to 1989) were members of the Chemical industry in 1988. (See Figure 4-17; Table 4-11; and Appendix F, Table F-8.)

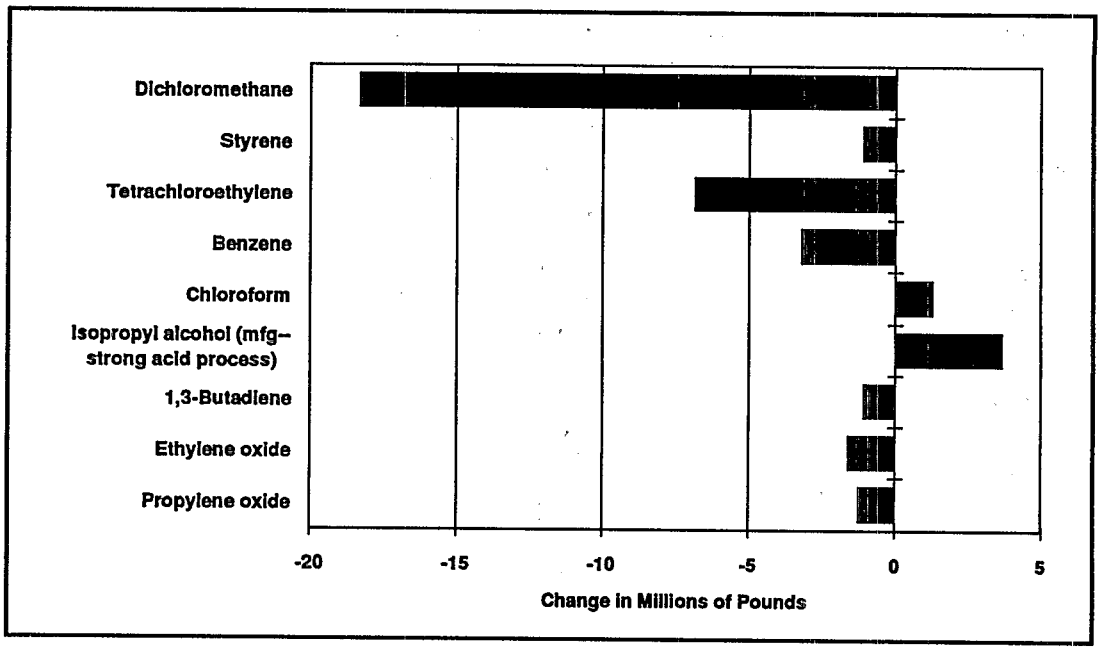


Figure 4–14. TRI Carcinogens with Changes in Air Emissions Greater than 1 Million Pounds, 1988–1989. (Carcinogens shown in descending order according to 1989 air emission totals.)

...and the Electrical industry lowered such releases by the 2nd-largest amount.

The highest *percentage* decrease, 20 percent, was associated with facilities in the Electrical industry, which collectively lowered air emissions by 24.1 million pounds from 1988 to 1989 (to 95.2 million pounds in 1989). This was also the second largest industry-wide decrease in air emissions from 1988 to 1989.

Both the Paper industry and the Transportation industry reduced their air emissions by greater than 10 million pounds between 1988 and 1989. Three Paper facilities were among the top 20 facilities for largest decreases in total air emissions from 1988 and 1989: American Tape Company in Marysville, Michigan (which reported 3.1 million pounds of air emissions in 1988 and did not report in 1989); Temple-Inland Incorporated in Evadale, Texas (which was associated with a 2.4-million-pound decrease in total air emissions); and International Paper in Selma, Alabama (which was associated with a decrease in total air emissions of 2.1 million pounds). An additional ten industries reduced air emissions by greater than 1 million pounds each. (See Figure 4-17; Table 4-11; and Appendix F, Table F-8.)

8 industries were associated with increases in total TRI air emissions from 1988 to 1989.

Facilities in eight industries were associated with increases in air emissions from 1988 to 1989. Diversified facilities reporting multiple SIC codes were associated with a net increase of 13.4 million pounds (6 percent), the largest *absolute* increase recorded for any industry or industrial category between 1988 and 1989. Three Multiple SIC Code facilities reported far more air emissions in 1989 than in 1988: 3M Consumer AV & Consumer Products in Hutchinson, Minnesota (with a 9.4-

Table 4–13. TRI Carcinogens with Changes in Total Air Emissions Greater than 100,000 Pounds, 1988-1989.

CHEMICAL	AIR 1989 Pounds	AIR 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Dichloromethane	109,272,003	127,592,367	-18,320,364	-14.36
Tetrachloroethylene	25,504,477	32,341,862	-6,837,385	-21.14
Benzene	24,683,026	27,879,946	-3,196,920	-11.47
Ethylene oxide	3,022,203	4,634,490	-1,612,287	-34.79
Propylene oxide	1,794,137	3,058,010	-1,263,873	-41.33
Styrene	33,301,802	34,412,274	-1,110,472	-3.23
1,3-Butadiene	5,537,449	6,620,539	-1,083,090	-16.36
1,2-Dichloroethane	4,110,042	4,570,925	-460,883	-10.08
Toluene-2,6-diisocyanate	49,891	491,469	-441,578	-89.85
Carbon tetrachloride	3,367,248	3,711,371	-344,123	-9.27
1,4-Dichlorobenzene	1,587,229	1,862,869	-275,640	-14.80
Lead	862,031	1,044,904	-182,873	-17.50
Vinyl chloride	1,268,887	1,436,427	-167,540	-11.66
2-Nitropropane	225,222	387,119	-161,897	-41.82
Urethane	3,450	145,373	-141,923	-97.63
Toluene-2,4-diisocyanate	122,503	230,001	-107,498	-46.74
Acrylonitrile	4,383,748	4,196,887	186,861	4.45
1,4-Dioxane	779,892	585,712	194,180	33.15
Chromium	941,526	445,518	496,008	111.33
Nickel	911,327	317,749	593,578	186.81
Formaldehyde	12,556,026	11,879,491	676,535	5.69
Chloroform	24,268,093	22,990,906	1,277,187	5.56
Isopropyl alcohol (mfg.- strong acid process)	5,585,904	1,912,044	3,673,860	192.14
SUBTOTAL	264,138,116	292,748,253	-28,610,137	-9.77
TOTAL FOR ALL TRI CARCINOGENS	266,593,331	295,430,768	-28,837,437	-9.76
TOTAL FOR ALL TRI CHEMICALS	2,427,061,906	2,595,641,583	-168,579,677	-6.49

million-pound increase in total air emissions); Brunswick Defense in Willard, Ohio (which did not report in 1988 but had 2.4 million pounds of air emissions in 1989); and Elkem Metals Company in Marietta, Ohio (with a 2.3-million-pound increase in total air emissions). The Lumber industry and the Fabricated Metals industry were associated with the next two highest *absolute* increases in total air emissions from 1988 to 1989—4.2 million pounds (an increase of 14 percent) and 3.1 million pounds (an increase of 3 percent), respectively. (See Figure 4-17; Table 4-11; and Appendix F, Table F-8.)

DISCHARGES TO SURFACE WATER

Discharges to surface water of TRI chemicals decreased by 39% from 1988 to 1989.

Discharges to surface water of TRI chemicals (excluding delisted chemicals) declined by 39 percent (120.6 million pounds) from 1988 to 1989, by far the largest *percentage* decrease for any mode of TRI release or transfer. In 1989, surface water discharges comprised a slightly lower percentage of the total TRI releases and transfers than in the previous year (3 percent as compared to 5 percent in 1988). (See Table 4-2.)

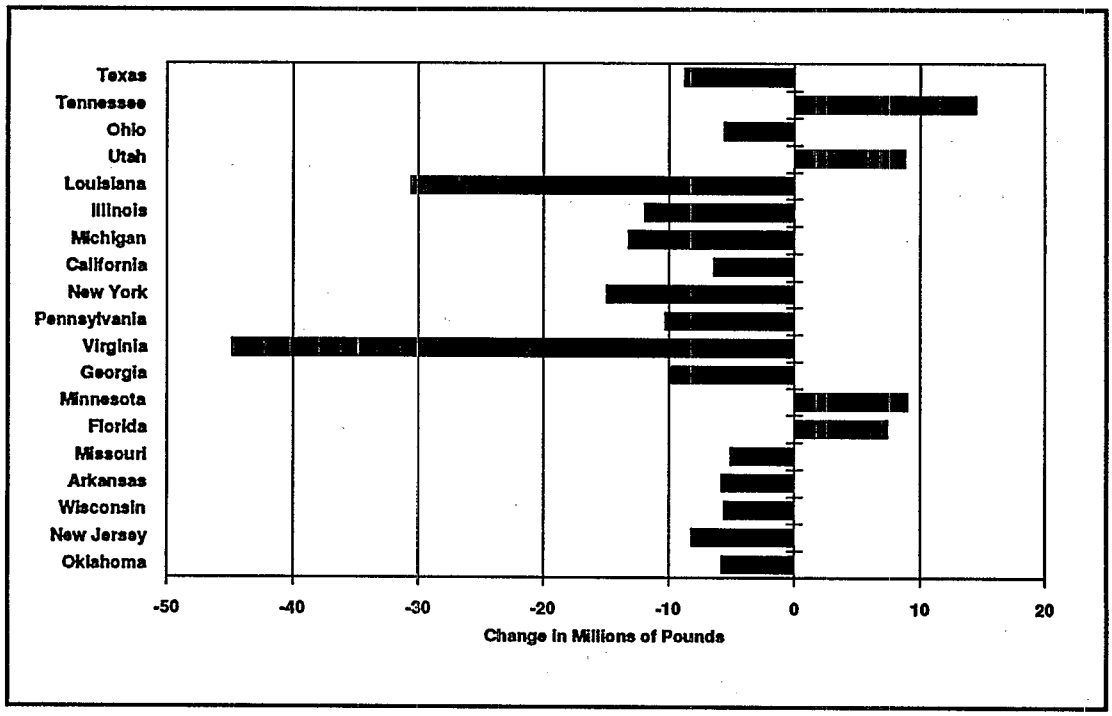
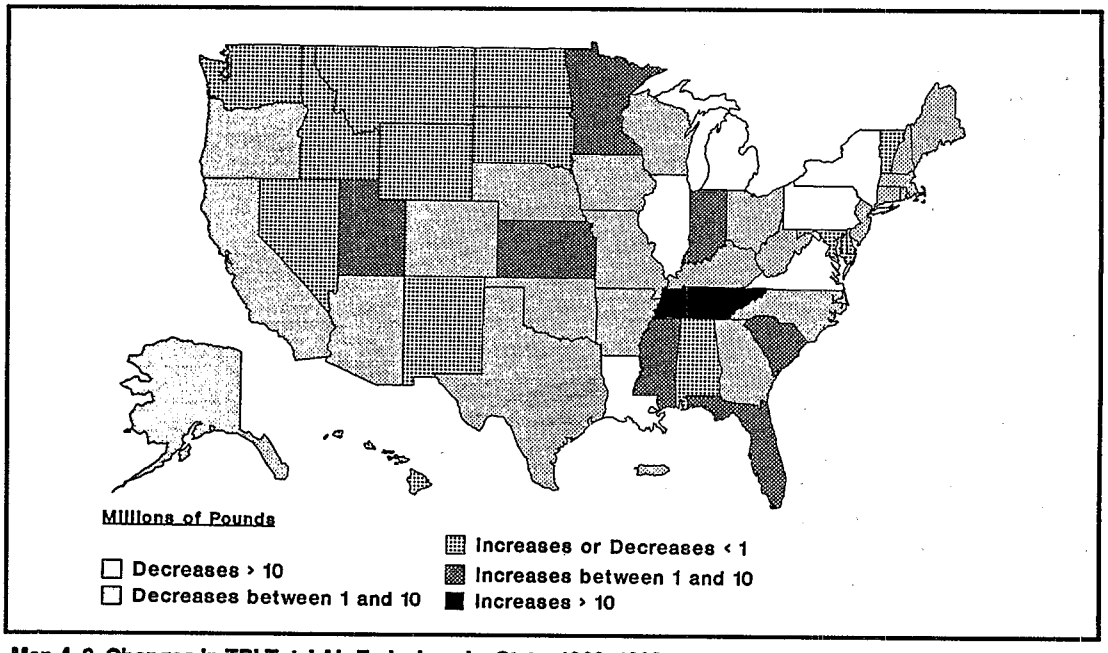
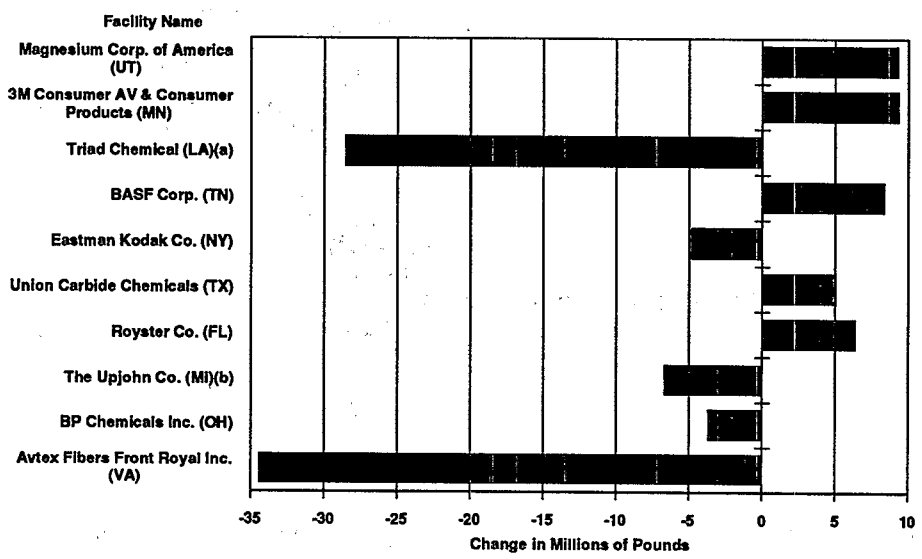


Figure 4–15. States with Changes in TRI Air Emisssions Greater than 5 Million Pounds, 1988–1989. (States shown in descending order according to 1989 air emission totals.)



Map 4–3. Changes in TRI Total Air Emissions by State, 1988–1989.



(a) Triad Chemical has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for this facility's total 1988 air emissions is 26,689,860 pounds. Therefore, the change in total air emissions between 1988 and 1989 for this facility becomes a decrease of 1,409,975 pounds.

(b) The Upjohn Co. has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for this facility's 1988 total air emissions is 7,427,500 pounds. The change in total air emissions between 1988 and 1989 for this facility becomes a decrease of 548,680 pounds.

Figure 4–16. TRI Facilities with the Greatest Changes in Air Emissions, 1988–1989. (Facilities reporting the five greatest increases and five greatest decreases for total air emissions, shown in descending order according to 1989 air emission totals.)

The 120.6-million-pound net decrease in TRI surface water discharges was the result of 152.2 million pounds of decreases, partially offset by 31.6 million pounds of increases. The number of facilities showing decreases for surface water discharges (1,309) exceeded the number reporting increases (1,136). The number of facilities showing decreases in surface water discharges in excess of 10 million pounds (seven facilities) slightly exceeded those showing increases of that magnitude (five facilities). The two largest decreasing facilities for surface water discharges together reported 96.0 million pounds less surface water discharges in 1989 than in 1988, compared to a total of only 4.8 million pounds of increases shown by the top two facilities with increased water discharges. The influence of these facilities upon changes in TRI for surface water discharges can be demonstrated by the fact if that the top five facilities reporting decreases in TRI surface water discharges were removed from the TRI database, the net change in surface water discharges would be an *increase*.

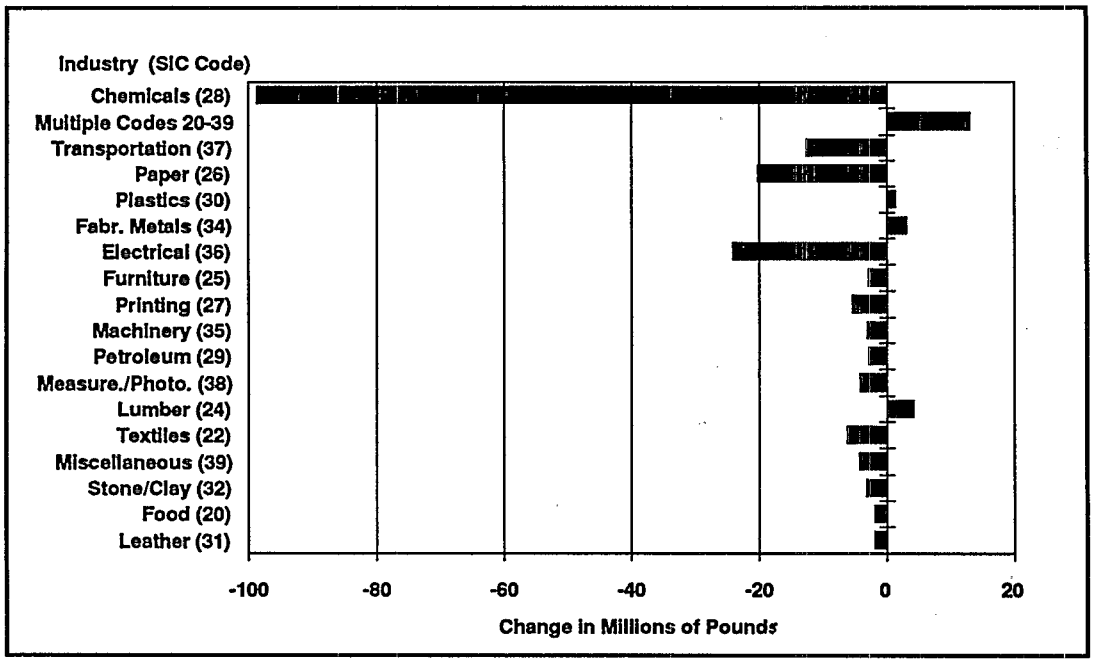


Figure 4–17. Industries with Changes in TRI Air Emissions Greater than 1 Million Pounds, 1988–1989. (Industries shown in descending order according to 1989 air emission totals.)

Chemical Distribution

Of the 300 TRI chemicals and 20 chemical categories analyzed in this report, surface water discharge amounts decreased for 123 TRI chemicals, increased for 90, and stayed the same for seven between 1988 and 1989. (An additional 100 TRI chemicals were not associated with surface water discharges in either year, either because no TRI reports were filed or because no surface water discharges were reported.)

Phosphoric acid was associated with the largest decrease in TRI surface water discharges from 1988 to 1989.

Surface water discharges decreased by greater than 1 million pounds each for only four TRI chemicals: phosphoric acid (a decrease of 95.5 million pounds), sulfuric acid (a decrease of 16.4 million pounds), chlorine (a decrease of 4.3 million pounds), and ammonium sulfate (solution) (a decrease of 2.3 million pounds). No TRI chemicals were associated with a net increase in surface water discharges larger than 1 million pounds. In the case of phosphoric acid, the discharges to surface water were cut by 78 percent. Two Agrico Chemical Company (a division of Freeport McMoran Inc.) facilities in Louisiana were responsible for a large portion of the decrease in reported amounts of phosphoric acid. Despite this significant decrease, phosphoric acid was the TRI chemical discharged to surface water in the second-largest amount in 1989. Large percentage reductions in surface water discharges were also recorded for sulfuric acid and chlorine—45 and 64 percent, respectively. (See Figures 4-18 and 4-19; Table 4-14; and Appendix F, Table F-9.)

Surface water discharges of ammonium sulfate (solution), the top-ranked chemical in 1989 for discharges to surface water, decreased by the fourth largest amount (2.3 million pounds), but by only 3 percent. As in other cases, this net overall change does not necessarily show variations at individual facilities. Because of the prevalence of this chemical in reports of surface water discharges, this overall change is the net result of many off-setting *increases* and *decreases*. The Allied Signal plant in Hopewell, Virginia, showed a decrease in surface water discharges of ammonium sulfate (solution) of 9 million pounds between 1988 and 1989, or almost four times as much as the net decrease for all facilities. On the other hand, the 3M facility in Cordova, Illinois, increased its surface water discharges of ammonium sulfate (solution) from 11.8 million pounds in 1988 to 14.6 million pounds in 1989. This 2.8-million-pound *increase* in surface water discharges of ammonium sulfate (solution) for a single facility exceeded the amount of the net *decrease* in surface water discharges of this chemical for *all* facilities. (See Table 4-14; and Appendix F, Table F-9.)

Surface water discharges for an additional three chemicals each declined by more than 500,000 pounds from 1988 to 1989. For one of these chemicals—zinc (fume or dust)—1988 surface water discharges were cut by 84 percent. (See Table 4-14.)

All net increases in surface water discharges of TRI chemicals were smaller than 1 million pounds each.

Net increases in surface water discharges of TRI chemicals from all facilities combined were less than 800,000 pounds per chemical. Reported discharges of n-butyl alcohol went up 770,000 pounds (511 percent), the largest absolute amount. Methanol and ammonium nitrate (solution) discharges increased by the next highest absolute amounts—419,000 pounds and 417,000 pounds, respectively—bringing the 1989 surface water total up to 17.1 million pounds for methanol and 8.9 million pounds for ammonium nitrate (solution). (See Table 4-14.)

Chemical Classes

The mineral acids/salts chemical class heavily influenced the overall change for surface water discharges from 1988 to 1989.

While discharges to surface water decreased for three of the five TRI chemical classes, one chemical class, mineral acids/salts, had the most influence upon the overall change for such releases. The largest share of mineral acids/salts reductions was in discharges of phosphoric acid (see discussion above), and, to a lesser extent, in those of sulfuric acid. Overall, surface water discharges of mineral acids/salts were cut almost in half, dropping from 244.6 million pounds in 1988 to 129.0 million pounds in 1989, enough to lower the contribution of this class from 79 to 68 percent of the surface water total. The non-halogenated organics and non-metallic inorganics classes each comprised a larger share of the overall surface water totals in 1989 (15 percent as compared to 9 percent in 1988 for non-halogenated organics, and 14 percent as compared to 10 percent in 1988 for non-metallic inorganics). (See Figure 4-20 and Table 4-4.)

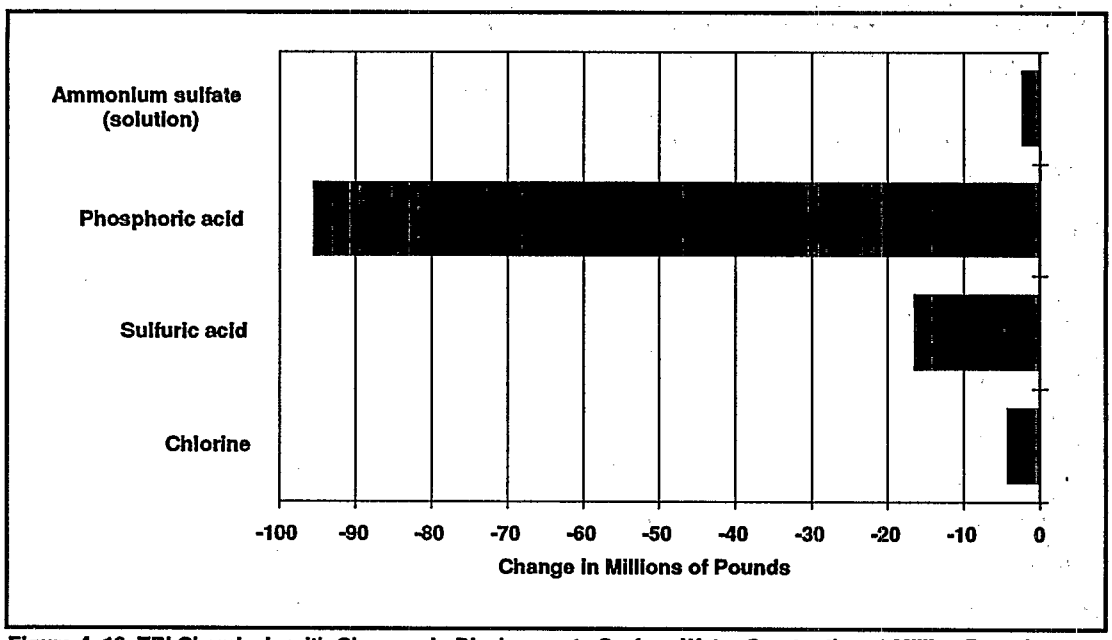
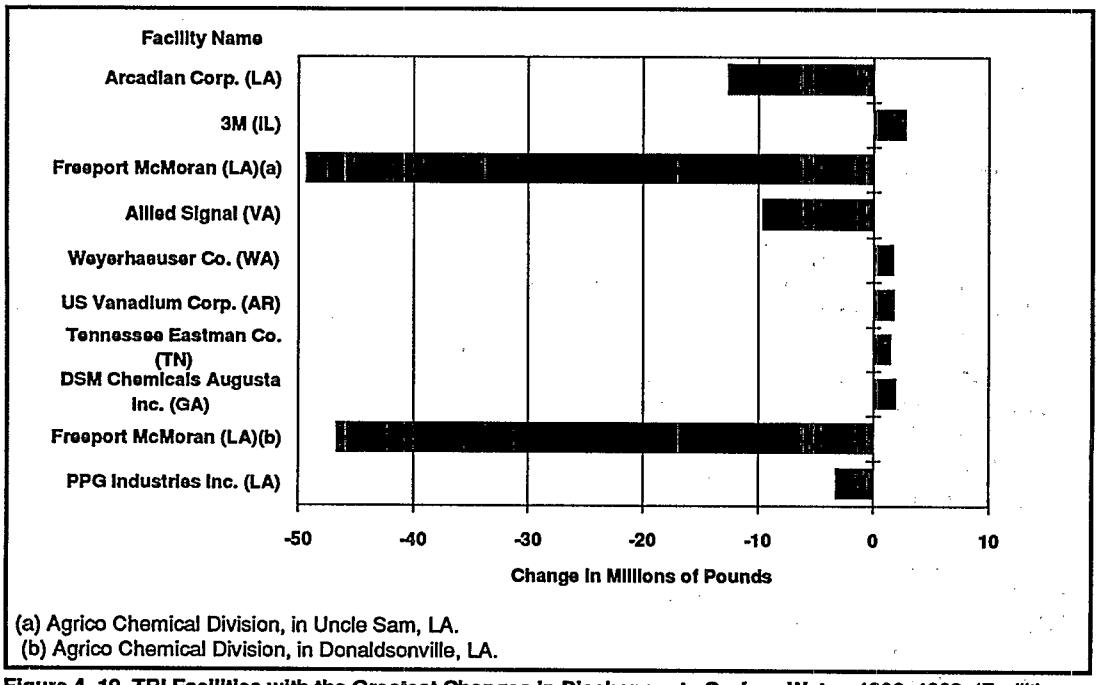


Figure 4–18. TRI Chemicals with Changes in Discharges to Surface Water Greater than 1 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 total surface water discharges.)



(a) Agrico Chemical Division, in Uncle Sam, LA.
(b) Agrico Chemical Division, in Donaldsonville, LA.

Figure 4–19. TRI Facilities with the Greatest Changes in Discharges to Surface Water, 1988–1989. (Facilities reporting the five greatest increases and five greatest decreases for total surface water discharges, shown in descending order according to 1989 surface water totals.)

Table 4–14. TRI Chemicals with Changes in Discharges to Surface Water Greater Than 100,000 Pounds, 1988-1989.

CHEMICAL	SURFACE WATER 1989 Pounds	SURFACE WATER 1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Phosphoric acid	27,166,278	122,650,414	-95,484,136	-77.85
Sulfuric acid	20,296,873	36,746,708	-16,449,835	-44.77
Chlorine	2,398,641	6,659,900	-4,261,259	-63.98
Ammonium sulfate (solution)	68,588,044	70,933,465	-2,345,421	-3.31
Hydrochloric acid	3,061,500	3,947,399	-885,899	-22.44
Zinc (fume or dust)	134,450	849,294	-714,844	-84.17
Nitric acid	796,450	1,472,340	-675,890	-45.91
Methyl isobutyl ketone	445,538	762,108	-316,570	-41.54
1,3-Butadiene	143,434	412,504	-269,070	-65.23
Zinc compounds	867,070	1,051,933	-184,863	-17.57
Formaldehyde	838,689	1,010,336	-171,647	-16.99
Manganese	148,175	319,188	-171,013	-53.58
Hydrogen fluoride	79,368	204,828	-125,460	-61.25
Dichloromethane	226,216	347,594	-121,378	-34.92
4,4'-Isopropylidenediphenol	2,629	121,172	-118,543	-97.83
sec-Butyl alcohol	6,411	122,291	-115,880	-94.76
Acetone	1,020,255	1,134,507	-114,252	-10.07
Propylene oxide	8,091	112,503	-104,412	-92.81
Benzene	168,904	47,239	121,665	257.55
Naphthalene	146,486	22,373	124,113	554.74
Manganese compounds	826,517	681,638	144,879	21.25
Diethanolamine	578,925	433,603	145,322	33.51
Chromium compounds	475,846	319,833	156,013	48.78
1,2-Dichloroethane	222,814	41,017	181,797	443.22
tert-Butyl alcohol	221,906	14,989	206,917	1,380.46
Ammonium nitrate (solution)	8,853,607	8,436,348	417,259	4.95
Methanol	17,058,674	16,640,067	418,607	2.52
n-Butyl alcohol	920,129	150,610	769,519	510.93
SUBTOTAL	155,701,920	275,646,201	-119,944,281	-43.51
TOTAL FOR ALL OTHERS	33,251,964	33,915,416	-663,452	-1.96
GRAND TOTAL	188,953,884	309,561,617	-120,607,733	-38.96

The non-metallic inorganics were associated with the 2nd-largest class-wide decrease in surface water discharges from 1988 to 1989.

Surface water discharges of the non-metallic inorganics decreased by the next largest amount, dropping from 31.0 million pounds in 1988 to 26.7 million pounds in 1989 (a 14 percent reduction). Decreases in chlorine surface water discharges totaling 4.3 million pounds (a 64 percent decrease) were behind most of the overall decrease in surface water discharges for this class. PPG Industries, Inc. (Westlake, Louisiana) reported 3.2 million pounds less surface water discharges of chlorine in 1989 than in 1988 as the result of the first full year's operation of a new chlorine removal system.[5] Surface water discharges of metals and metal compounds fell by a smaller amount—975,000 pounds (a 21 percent reduction). (See Table 4-4.)

A small increase (less than 288,000 pounds) was recorded for the non-halogenated organic chemical class, which covered the greatest number of TRI chemicals in both 1988 and 1989. This net increase in surface water discharges of non-halogenated organics was the result of many small chemical-specific changes, the largest of which was a 770,000-pound increase in surface water discharges of n-butyl alcohol. Surface water discharges of halogenated organics increased by an even smaller amount than non-halogenated organics—8,000 pounds.

Carcinogens

Total surface water discharges of TRI carcinogens decreased 9% between 1988 and 1989.

Total surface water discharges of TRI carcinogens dropped 9 percent (340,000 pounds) from 1988 to 1989, primarily due to decreases in surface water discharges of a few chemicals, particularly 1,3-butadiene (with a 269,000-pound decrease, a 65 percent reduction). In both 1988 and 1989, total surface water discharges of TRI carcinogens (3.4 million pounds in 1989 and 3.7 million pounds in 1988) represented less than 2 percent of the surface water discharges for *all* TRI chemicals. (See Figure 4-21 and Table 4-15.) (Chapter 3 defines TRI carcinogens, and Appendix B lists all TRI chemicals, indicating those which are considered carcinogens.)

Surface water discharges of the carcinogen discharged to surface water in 1989 in the second-largest amount, formaldehyde, decreased by 172,000 pounds, which was the second-largest reduction in surface water discharges from 1988 to 1989. In addition to 1,3-butadiene and formaldehyde, surface water discharges of twenty-six other carcinogens decreased, although in all but two of these cases (dichloromethane and propylene oxide), by less than 50,000 pounds each.

Surface water discharges of 1,2-dichloroethane increased by the largest amount of any TRI carcinogen from 1988 to 1989.

From 1988 to 1989, surface water discharges of 25 TRI carcinogens increased, led by 1,2-dichloroethane, which increased by 182,000 pounds (443 percent). Benzene followed, with an increase in surface water discharges of 122,000 pounds or 258 percent. Surface water discharges of chloroform, which accounted for a larger

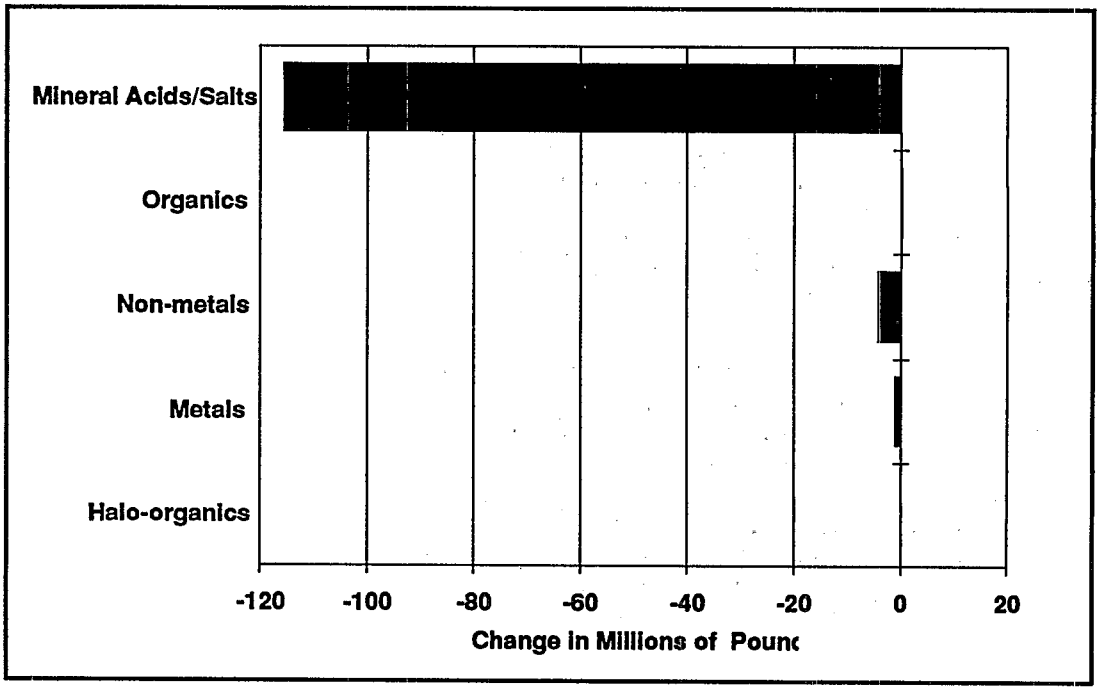


Figure 4–20. Changes in TRI Discharges to Surface Water by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to 1989 total surface water discharges.)

percentage of the surface water total than any other TRI carcinogen in 1989, increased by the third largest amount—50,000 pounds (a 5 percent increase) to 1.1 million pounds in 1989.

Geographical Distribution

The largest state-wide decrease in TRI surface water discharges from 1988 to 1989 occurred in Louisiana.

From 1988 to 1989, 31 states and other reporting jurisdictions experienced net decreases in surface water discharges, while 22 others experienced increases. The largest state-wide change (a decrease of 113.5 million pounds, or 71 percent) in surface water discharges over this time period occurred in Louisiana. In both years, discharges to surface water in Louisiana far surpassed those of any other state. However, in 1989, Louisiana represented a much smaller percentage of the overall surface water totals than in 1988 (24 percent, as compared to 52 percent in 1988). Louisiana's net decrease of 113.5 million pounds was largely due to four facilities, which together reported 118.2 million pounds less surface water discharges in 1989 than in 1988. (See Figure 4-22; Map 4-4; Table 4-8; and Appendix F, Table F-9.)

Louisiana's net decrease in surface water discharges of 113.5 million pounds between 1988 and 1989 was largely due to decreases in amounts reported to TRI by four facilities. These four facilities—two Agrico Chemical Company (a division of Freeport McMoran) plants in Uncle Sam and in Donaldsonville, Arcadian Corporation in Geismar, and PPG Industries Inc. in Westlake—had a combined decrease in reported surface water discharges of 118.8 million pounds. (See Appendix F, Table F-9.)

Virginia was the state with the 2nd-largest net decrease in surface water discharges from 1988 to 1989.

The next highest state-wide decrease in surface water discharges occurred in Virginia. This net decrease totaled 8.8 million pounds (a 44 percent decrease). The Allied Signal plant in Hopewell, Virginia, the fourth-largest decreaser for surface water discharges from 1988 to 1989, reported 9.6 million pounds less surface water discharges in 1989 than in the previous year. In addition to Virginia, four other states (Pennsylvania, Maryland, Connecticut, and Minnesota) each showed decreases in surface water discharges exceeding 1 million pounds. (See Table 4-8; and Appendix F, Table F-9.)

Georgia showed the largest state-wide increase in surface water discharges from 1988 to 1989.

The largest state-wide *increase* in surface water discharges, which occurred in Georgia, was considerably smaller than the largest state-wide *decrease* discussed above. In Georgia, surface water discharges increased by 2.7 million pounds (an increase of 85 percent), compared to the 113.5-million-pound net decrease for Louisiana. DSM Chemicals Augusta Inc. in Augusta, Georgia, contributed to this state-wide increase by reporting 2.0 million pounds more surface water discharges in 1989 than in 1988. TRI data from Illinois, Washington, Arkansas and Alaska also showed increases in surface water discharges greater than 1 million pounds each. (See Map 4-4; Table 4-8; and Appendix F, Table F-9.)

Table 4–15. TRI Carcinogens with Changes in Discharges to Surface Water Greater than 10,000 Pounds, 1988-1989.

CHEMICAL	SURFACE WATER 1989 Pounds	SURFACE WATER 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
1,3-Butadiene	143,434	412,504	-269,070	-65.23
Formaldehyde	838,689	1,010,336	-171,647	-16.99
Dichloromethane	226,216	347,594	-121,378	-34.92
Propylene oxide	8,091	112,503	-104,412	-92.81
Ethylene oxide	3,558	44,851	-41,293	-92.07
Lead	32,028	60,101	-28,073	-46.71
Thiourea	971	16,951	-15,980	-94.27
Tetrachloroethylene	59,061	33,284	25,777	77.45
1,4-Dioxane	246,443	203,320	43,123	21.21
Chloroform	1,139,691	1,089,285	50,406	4.63
Benzene	168,904	47,239	121,665	257.55
1,2-Dichloroethane	222,814	41,017	181,797	443.22
SUBTOTAL	3,089,900	3,418,985	-329,085	-9.63
TOTAL FOR ALL TRI CARCINOGENS	3,389,635	3,729,894	-340,259	-9.12
TOTAL FOR ALL TRI CHEMICALS	188,953,884	309,561,617	-120,607,733	-38.96

Industrial Distribution

The Chemical industry was associated with a larger 1988-1989 decrease in surface water discharges by far than any other TRI industry.

The Chemical industry, which generated the largest share of total TRI discharges to surface water in both 1988 and 1989 (58 percent in 1989 and 75 percent in 1988), was associated with the largest net decrease in surface water discharges of any TRI industry—121.7 million pounds (a 53-percent reduction). Eleven of the top 20 decreasing facilities for surface water discharges from 1988 to 1989 reported as members of this industry in 1988. These 11 facilities were associated with a combined decrease in surface water discharges of 126.1 million pounds. (See Figure 4-23; Table 4-11; and Appendix F, Table F-9.)

Two other industries, the Primary Metals and Fabricated Metals industries, each showed a net decrease in surface water discharges from 1988 to 1989 greater than 1 million pounds. In the case of the Fabricated Metals industry, 1988 surface water totals were cut by 80 percent (1.2 million pounds).

Only the Paper industry showed an increase in surface water discharges greater than 1 million pounds from 1988 to 1989.

Only one industry, the Paper industry, was associated with an increase in surface water discharges greater than 1 million pounds. The Paper industry increased discharges to surface water by 4.3 million pounds from 1988 to 1989. The Lumber industry reported a much smaller *absolute* increase (557,000 pounds) than the Paper industry, but a larger *percentage* increase (552 percent, as compared to 11 percent for the Paper industry). (See Figure 4-23 and Table 4-11.)

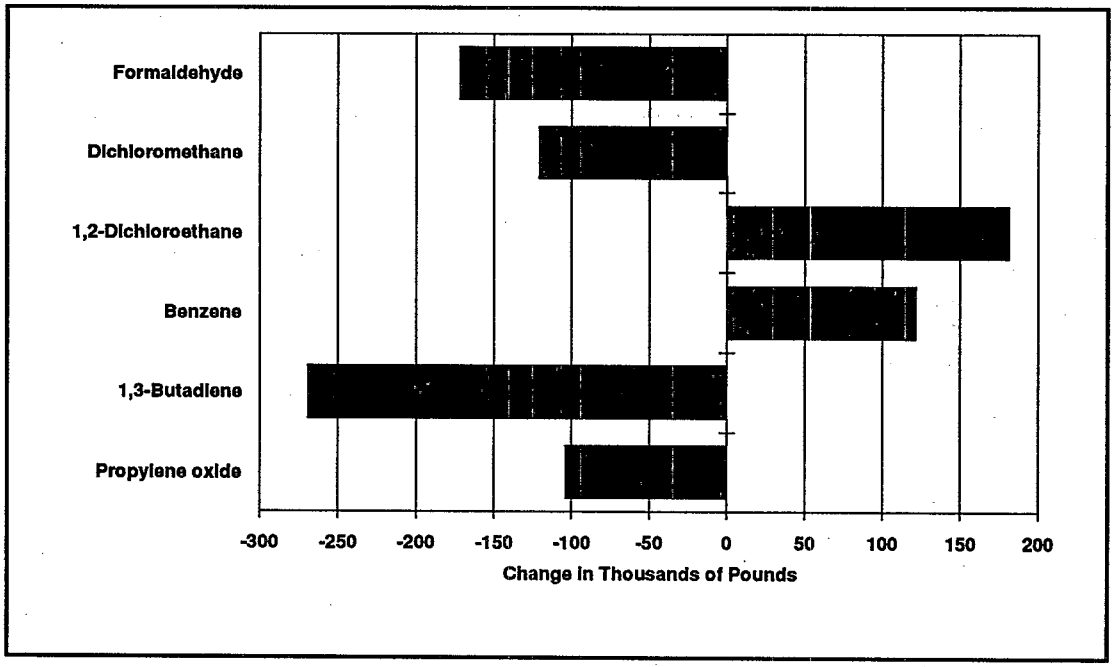


Figure 4–21. TRI Carcinogens with Changes in Discharges to Surface Water Greater than 100,000 Pounds, 1988–1989. (Carcinogens shown in descending order according to 1989 total surface water discharges.)

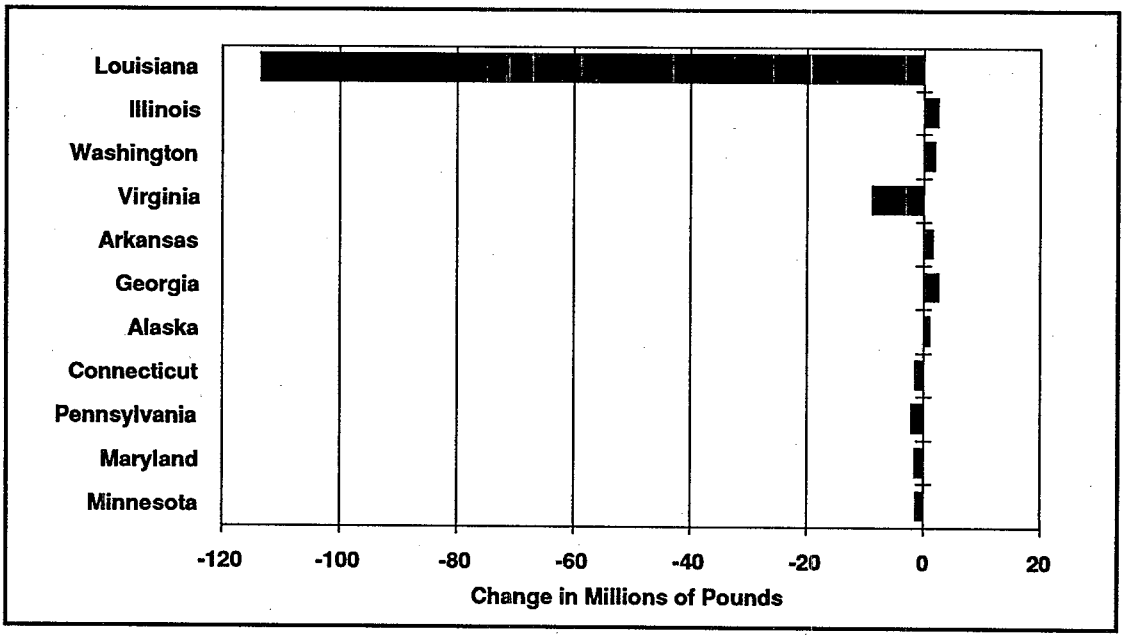
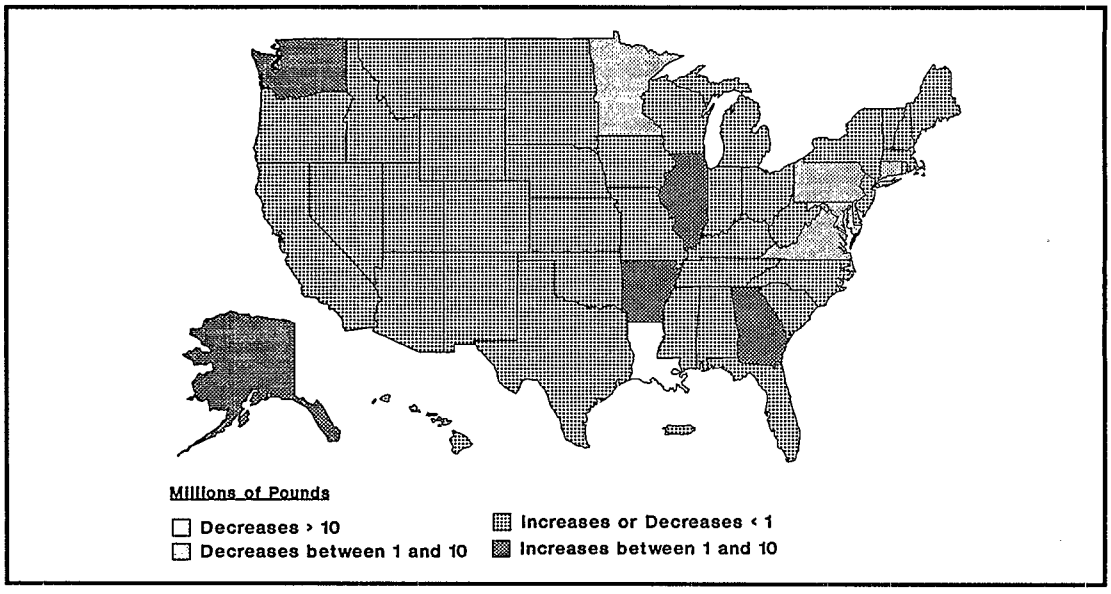


Figure 4–22. States with Changes in TRI Discharges to Surface Water Greater than 1 Million Pounds, 1988–1989. (States shown in descending order according to 1989 total surface water discharges.)



Map 4–4. Changes in TRI Surface Water Discharges by State, 1988–1989.

ON-SITE LAND RELEASES

On-site land releases of TRI chemicals decreased by 17% between 1988 and 1989.

On-site land releases of TRI chemicals (excluding delisted chemicals) dropped 89.8 million pounds (a 17-percent decrease) from 1988 to 1989. Only surface water discharges of TRI chemicals decreased by a larger *percentage* (39 percent). In *absolute* terms, however, the 89.8-million-pound decrease in on-site land releases was one of the two smallest decreases recorded for any TRI release or transfer category. (Transfers to POTWs declined by a smaller amount, as discussed below.) In both 1988 and 1989, on-site land releases made up 8 percent of the total TRI releases and transfers. (See Table 4-2.)

The 89.8-million-pound net decrease in TRI on-site land releases from 1988 to 1989 was the result of 182.7 million pounds of decreases partially offset by 92.9 million pounds of increases. The number of facilities showing increases (908) exceeded by one the number of facilities showing decreases. However, the number of facilities showing decreases in excess of 10 million pounds (38) was greater than those showing increases of that magnitude (22). The effect of the top decreasing facilities for on-site land releases could be shown by removing the top nine decreasing facilities for such releases from the database. If this were done, the net result would be an increase in on-site land releases from 1988 to 1989.

Only 1 land disposal method—land treatment—increased in TRI amounts from 1988 to 1989.

The TRI reporting Form R requests that TRI facilities indicate how their on-site land releases were placed into the environment. The form provides four choices of land disposal methods: (1) landfills; (2) surface impoundments[6] (ponds or pits where

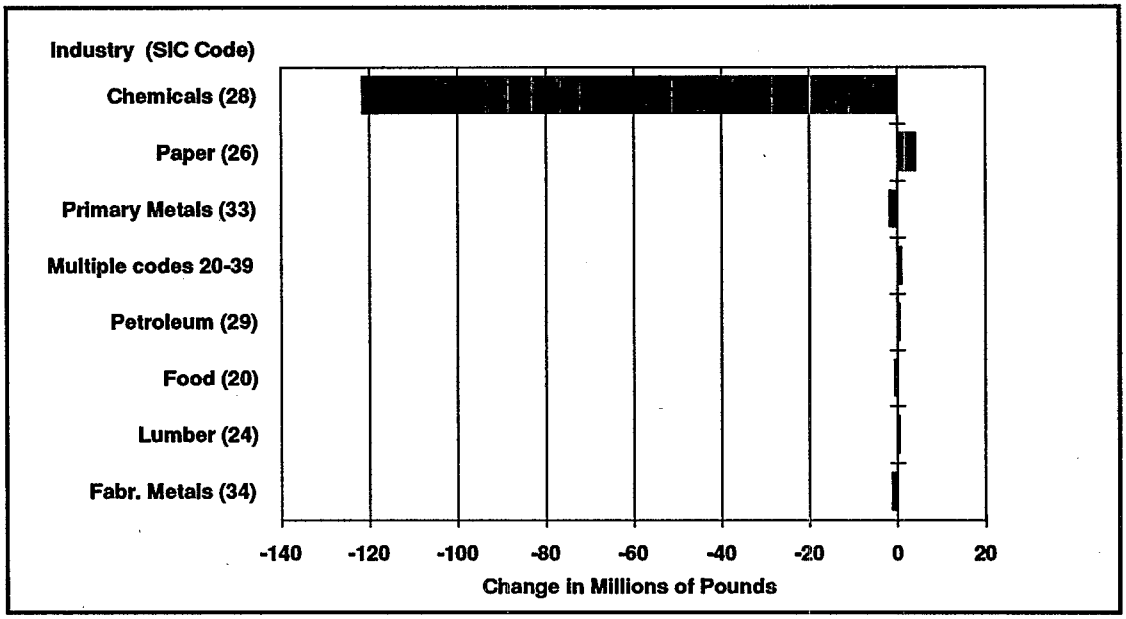


Figure 4—23. Industries with Changes in TRI Discharges to Surface Water Greater than 500,000 Pounds, 1988–1989. (Industries shown in descending order according to 1989 total surface water discharges.)

liquid wastes are left to evaporate and from which the remaining sludge is removed); (3) land treatment, land application, or farming; and (4) other land disposal, including leaks and spills.

While total TRI on-site land releases decreased by 89.8 million pounds from 1988 to 1989, releases for one land disposal method—land treatment—increased between 1988 and 1989 (by 8.1 million pounds, or 58 percent). On the other hand, landfill releases and other land disposal each decreased by greater than 35.0 million pounds from 1988 to 1989. Releases to surface impoundments fell by 9 percent (11.8 million pounds). (See Table 4-16.)

Chemical Distribution

On-site land releases decreased for 109 TRI chemicals, increased for 75, and stayed the same for nine between 1988 and 1989. (An additional 127 TRI chemicals were not associated with on-site land releases in either year, either because no TRI reports were filed or because no on-site land releases were reported.)

On-site land releases of 17 TRI chemicals decreased by greater than 1 million pounds from 1988 to 1989.

On-site land releases of 17 TRI chemicals decreased by greater than 1 million pounds each from 1988 to 1989. On-site land releases of only three TRI chemicals increased by at least this amount. The largest change in on-site land releases (a decrease of 16.1 million pounds) was recorded for zinc compounds. Asarco Incorporated in Hayden, Arizona, reported 10 million pounds less on-site land release of zinc compounds in 1989 than in 1988, out of a facility-wide net decrease for all TRI chemicals of 19.4 million pounds. Herculaneum Smelter in Herculaneum, Missouri,

also was associated with a significant decrease in on-site land releases of zinc compounds between 1988 and 1989—9.2 million pounds. Despite the relatively large net decrease in on-site land releases of zinc compounds, these compounds still made up a larger share (22 percent) of the total on-site land releases in 1989 than any other TRI chemical. (See Figure 4-24 and Figure 4-25; Table 4-17; and Appendix F, Table F-10.)

On-site land releases of manganese decreased by the second-largest amount—12.9 million pounds, cutting the 1988 on-site land release totals for this chemical by 63 percent. Elkem Metals Co. (Marietta, Ohio) contributed to this net decrease by reporting 8.1 million pounds less on-site land releases of manganese in 1989 than in 1988. The next two largest decreases in on-site land releases from 1988 to 1989 were reported for asbestos (friable) and ammonium nitrate (solution). On-site land releases of these two chemicals decreased by 89 percent (8.5 million pounds) and 53 percent (8.4 million pounds), respectively. (See Figure 4-24 and Table 4-17.)

On-site land releases of three TRI chemicals increased by greater than 1 million pounds each.

The three TRI chemicals showing increases in on-site land releases greater than 1 million pounds each were ammonium sulfate (solution) (which increased by 1.9 million pounds or 14 percent), sulfuric acid (1.1 million pounds, 31 percent), and manganese compounds (1.1 million pounds, 1 percent). Manganese compounds and ammonium sulfate (solution) were ranked second and seventh, respectively, for total on-site land releases in 1989. (See Figure 4-24 and Table 4-17.)

Chemical Classes

Between 1988 and 1989, 4 chemical classes were each associated with a net decrease in on-site land releases greater than 8 million pounds.

On-site land releases decreased from 1988 to 1989 by more than 8 million pounds for each of four TRI chemical classes: metals and metal compounds, non-metallic inorganics, non-halogenated organics, and mineral acids/salts. For halogenated organics, on-site land releases were cut by only 376,000 pounds, but this represented a 55 percent change. (Mixtures and trade secrets cannot be assigned to specific

Table 4–16. Change in TRI On-site Land Releases by Type of Land Disposal Method, 1988-1989.

TYPE OF LAND DISPOSAL METHOD	RELEASE 1989 Pounds	RELEASE 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Other Land	137,433,758	182,693,095	-45,259,337	-24.77
Landfill	173,075,870	208,699,576	-35,623,706	-17.07
Surface Impoundment	112,193,856	123,948,169	-11,754,313	-9.48
Land Treatment	22,032,286	13,969,324	8,062,962	57.72
Unknown	780	5,200,843	-5,200,063	-99.99
TOTAL LAND RELEASES	444,736,550	534,511,007	-89,774,457	-16.80

chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.) (See Figure 4-26 and Table 4-4.)

Metals and metal compounds strongly influenced the decrease in TRI on-site land releases from 1988 to 1989.

Over two-thirds of the net decrease in on-site land releases from 1988 to 1989 can be attributed to the 61.7-million-pound reduction (a 16 percent decrease) in on-site land releases of metals and metal compounds. In both years, metals and metal compounds made up almost 75 percent of the total on-site land releases of TRI chemicals. On-site land releases of ten metals and metal compounds decreased by over 1 million pounds each from 1988 to 1989, while on-site land releases of only one member of this class, manganese compounds, increased by more than this amount. The most notable decreases in on-site land releases of metals and metal compounds were those for zinc compounds (a 16.1-million-pound reduction, or 14 percent) and manganese (a 12.9-million-pound reduction, or 63 percent). In addition, on-site land releases of lead compounds and zinc (fume or dust) each fell by 7.1 million pounds. (See Table 4-4.)

On-site land releases of nonmetallic inorganics decreased by 42% between 1988 and 1989.

On-site land releases of non-metallic inorganics dropped 42 percent (11.8 million pounds) from 1988 to 1989. An 89 percent decrease in on-site land releases of asbestos (friable), amounting to 8.5 million pounds, was the largest such change seen for chemicals in this class. Other decreases in on-site land releases over one million pounds each for members of this class were seen for arsenic compounds (a decrease of 1.4 million pounds) and ammonia (a decrease of 1.1 million pounds).

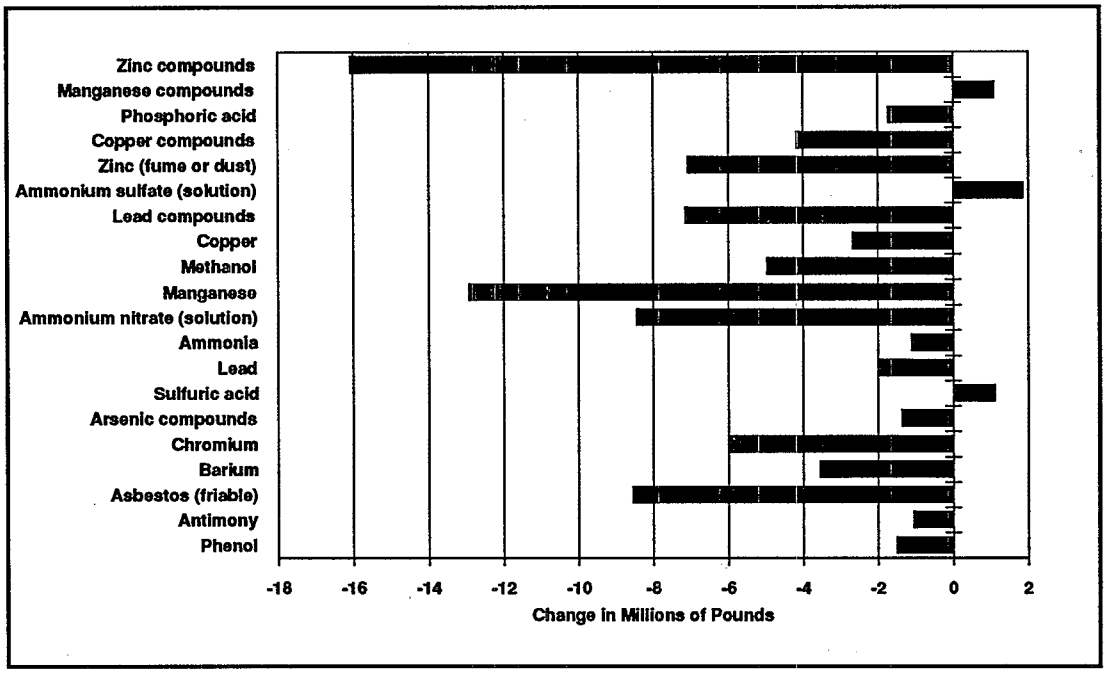


Figure 4–24. TRI Chemicals with Changes in On–site Land Releases Greater than 1 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 on-site land release totals.)

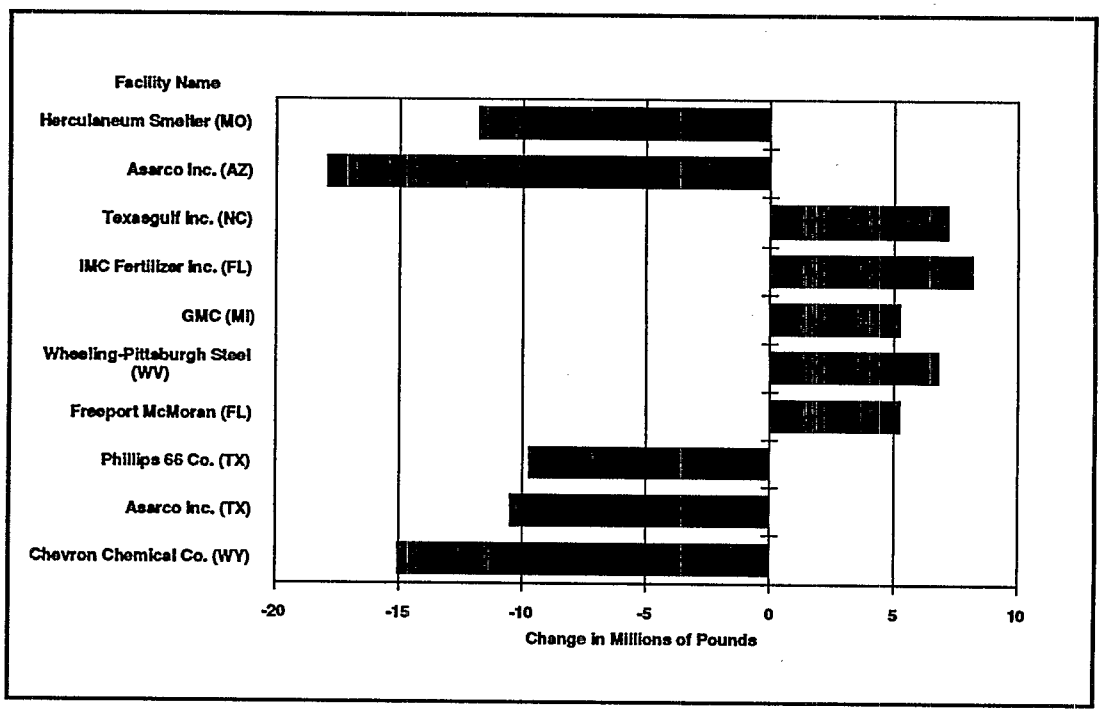


Figure 4–25. TRI Facilities with the Greatest Changes in On-site Land Releases, 1988–1989. (Facilities reporting the five greatest increases and the five greatest decreases for on-site land disposal, shown in descending order according to 1989 on-site land release totals.)

On-site land releases of mineral acids/salts decreased by 8.0 million pounds (9 percent) from 1988 and 1989. Significant reductions in on-site land releases of ammonium nitrate (solution) (a decrease of 8.4 million pounds, 53 percent) and phosphoric acid (a decrease of 1.7 million pounds, 3 percent) were partially offset by increases in on-site land releases of ammonium sulfate (solution) (an increase of 1.9 million pounds, 14 percent), and sulfuric acid (an increase of 1.1 million pounds, 31 percent).

As was the case for the mineral acids/salts class, on-site land releases of non-halogenated organics also decreased by 8 million pounds from 1988 to 1989, although this *absolute* change represented a much higher *percentage* change for non-halogenated organics—40 percent as compared to 9 percent for the mineral acids/salts class. Decreases in on-site land releases of methanol (a decrease of 5.0 million pounds, 39 percent) and phenol (a decrease of 1.5 million pounds, 80 percent) dominated the changes in on-site land releases for the non-halogenated organics class. (See Table 4-4.)

Table 4–17. TRI Chemicals with Changes in Total On-site Land Releases Greater than 1 Million Pounds, 1988-1989.

CHEMICAL	LAND 1989 Pounds	LAND 1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Zinc compounds	98,670,391	114,741,901	-16,071,510	-14.01
Manganese	7,574,227	20,489,853	-12,915,626	-63.03
Asbestos (friable)	1,073,901	9,621,129	-8,547,228	-88.84
Ammonium nitrate (solution)	7,572,825	16,022,104	-8,449,279	-52.74
Lead compounds	13,980,721	21,126,105	-7,145,384	-33.82
Zinc (fume or dust)	19,933,962	27,016,965	-7,083,003	-26.22
Chromium	3,333,921	9,293,616	-5,959,695	-64.13
Methanol	7,764,527	12,735,399	-4,970,872	-39.03
Copper compounds	40,746,031	44,923,573	-4,177,542	-9.30
Barium	2,527,527	6,075,936	-3,548,409	-58.40
Copper	10,027,388	12,694,152	-2,666,764	-21.01
Lead	5,817,158	7,800,269	-1,983,111	-25.42
Phosphoric acid	50,063,162	51,791,692	-1,728,530	-3.34
Phenol	370,039	1,882,284	-1,512,245	-80.34
Arsenic compounds	4,004,799	5,377,184	-1,372,385	-25.52
Ammonia	7,553,741	8,659,916	-1,106,175	-12.77
Antimony	557,336	1,612,571	-1,055,235	-65.44
Manganese compounds	84,979,282	83,873,034	1,106,248	1.32
Sulfuric acid	4,726,152	3,608,355	1,117,797	30.98
Ammonium sulfate (solution)	15,308,173	13,425,305	1,882,868	14.02
SUBTOTAL	386,585,263	472,771,343	-86,186,080	-18.23
TOTAL FOR ALL OTHERS	58,151,287	61,739,664	-3,588,377	-5.81
GRAND TOTAL	444,736,550	534,511,007	-89,774,457	-16.80

Carcinogens

On-site land releases of TRI carcinogens decreased by 57% between 1988 and 1989.

On-site land releases of TRI carcinogens decreased by 16.8 million pounds (57 percent) from 1988 to 1989, lowering the carcinogenic land releases total to 12.7 million pounds in 1989. This decrease also lowered the percentage that carcinogens made up of total TRI on-site land releases, from 6 percent in 1988 to 3 percent in 1989. (Chapter 3, Box 3-G, defines TRI carcinogens, and Appendix B lists all TRI carcinogens, indicating those which are considered carcinogens.)

On-site land releases of asbestos (friable) decreased by 89% from 1988 to 1989.

Of all the TRI carcinogens, total on-site land releases of asbestos (friable) decreased by the largest amount from 1988 to 1989—8.5 million pounds or 89 percent. Chromium (the second-ranked TRI carcinogen for on-site land releases in 1989) also decreased by both large *absolute* and *percentage* amounts: 6.0 million pounds, and 64 percent, respectively. Lead, which made up the largest share of on-site land releases of carcinogens in 1989, decreased by 25 percent—2.0 million pounds, the third largest amount of on-site land release reduction for a TRI carcinogen from

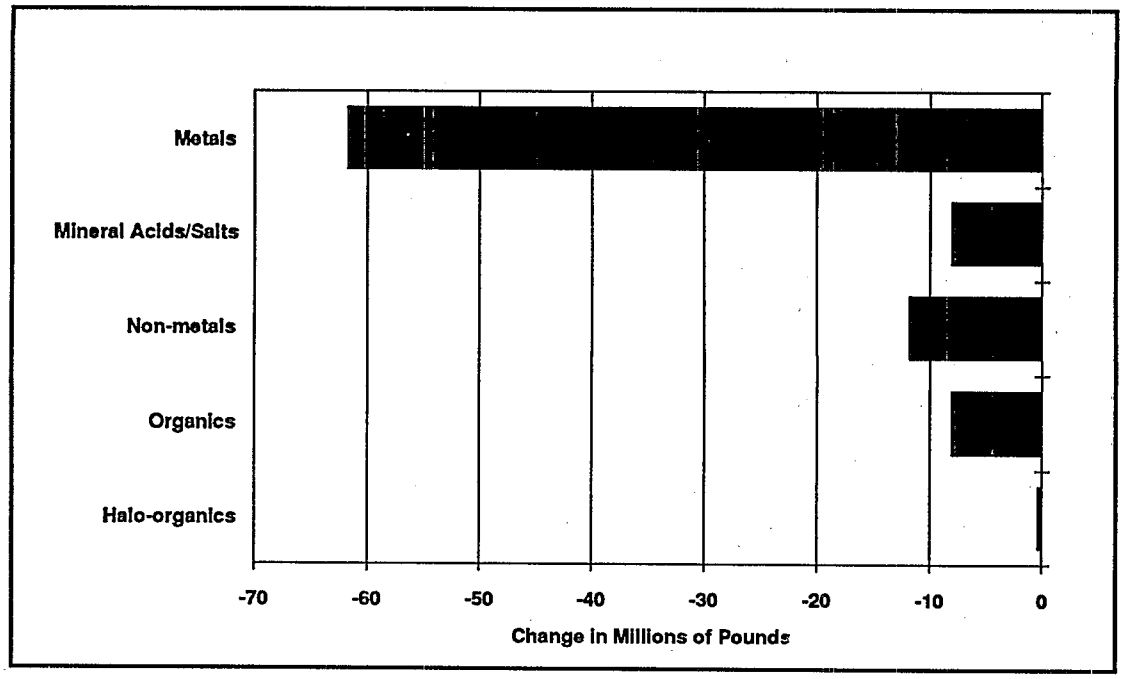


Figure 4–26. Changes in TRI On-site Land Release by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to 1989 on–site land release totals.)

1988 to 1989. Total on-site land releases of 21 other TRI carcinogens also decreased, although in amounts less than 300,000 pounds each. (See Figure 4-27 and Table 4-18.)

On-site land releases of only 1 TRI carcinogen increased by more than 50,000 pounds from 1988 to 1989.

On-site land releases of 20 TRI carcinogens increased from 1988 to 1989; however, on-site land releases of only one TRI carcinogen, nickel, increased by more than 50,000 pounds. On-site land releases of nickel were 194,000 pounds (17 percent) higher in 1989 than in 1988. As a result, nickel was the third-ranked TRI carcinogen for on-site land releases in 1989.

Geographical Distribution

West Virginia showed a 1,037% increase in total on-site land releases from 1988 to 1989.

From 1988 to 1989, 33 states registered decreases in TRI on-site land releases, while 19 others showed increases. West Virginia's net change in on-site land releases is particularly striking because it represents a *1,037 percent* change (from 895,000 pounds in 1988 to 10.2 million pounds in 1989). Two West Virginia facilities were each associated with increases in TRI on-site land releases greater than 2 million pounds: Wheeling-Pittsburgh Steel in Follansbee (with a 6.8-million-pound increase); and LCP Chemicals in Moundsville (with a 2.5-million-pound increase). (See Figures 4-25 and 4-28; Map 4-5; Table 4-8; and Appendix F, Table F-10.)

Texas showed the largest *absolute* change in on-site land releases—a 32.7-million-pound decrease. This 61-percent reduction lowered the state's 1989 on-site land releases total to 21.3 million pounds. Three facilities contributed largely to the state-wide decrease in Texas—Asarco Incorporated in El Paso, Phillips 66 Company in Borger, and Chapparral Steel Company in Midlothian. Together these three facilities were associated with a decrease in on-site land releases from 1988 to 1989 of 25.5 million pounds.

Texas was associated with the largest absolute decrease in on-site land releases from 1988 to 1989.

The second-largest state-wide decrease, from facilities in Arizona, totaled 21.3 million pounds, a 40-percent reduction. Asarco Inc. in Hayden, Arizona alone decreased on-site land releases of TRI chemicals by 17.9 million pounds, while Cyprus Miami Mining Corporation in Claypool, Arizona, reduced on-site land releases by 3.2 million pounds from 1988 to 1989.

Three other states each showed decreases in on-site land releases from 1988 to 1989 greater than 10 million pounds—Wyoming (a decrease of 15.1 million pounds), Indiana (a decrease of 12.5 million pounds), and Missouri (a decrease of 11.9 million pounds). For Wyoming, on-site land releases totals were cut by *99 percent* between 1988 and 1989. Chevron Chemical Co. in Rock Springs, Wyoming, played a large role in the overall change in on-site land releases for the state by decreasing on-site land releases of TRI chemicals by 15.0 million pounds. Two Indiana facilities were among the 20 facilities with the greatest 1988 to 1989 decrease in on-site land releases—USS Gary Works in Gary and Inland Steel Company in East Chicago, with decreases of 5.9 million pounds and 5.2 million pounds, respectively. A Missouri facility, Herculaneum Smelter in Herculaneum, reported 11.8 million

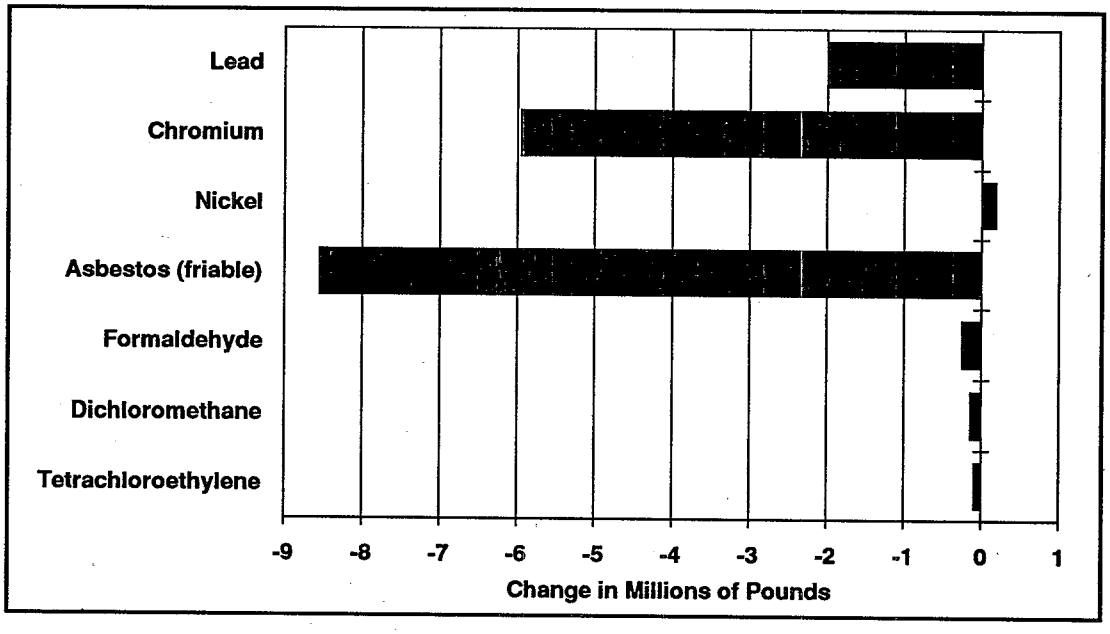


Figure 4–27. TRI Carcinogens with Changes in On-site Land Releases Greater than 50,000 Pounds, 1988–1989.
(Carcinogens shown in descending order according to 1989 on–site land release totals.)

Table 4–18. TRI Carcinogens with Changes in Total On-Site Land Releases Greater Than 10,000 Pounds, 1988-1989.

CHEMICAL	LAND 1989 Pounds	LAND 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Asbestos (friable)	1,073,901	9,621,129	-8,547,228	-88.84
Chromium	3,333,921	9,293,616	-5,959,695	-64.13
Lead	5,817,158	7,800,269	-1,983,111	-25.42
Formaldehyde	214,925	461,716	-246,791	-53.45
Dichloromethane	16,138	157,155	-141,017	-89.73
Tetrachloroethylene	12,791	106,144	-93,353	-87.95
Styrene	196,300	242,941	-46,641	-19.20
Arsenic	147,776	181,267	-33,491	-18.48
Ethylene oxide	37,712	54,700	-16,988	-31.06
Benzene	114,219	128,090	-13,871	-10.83
Carbon tetrachloride	1,616	14,759	-13,143	-89.05
Toluene-2,6-diisocyanate	11,930	510	11,420	2,239.22
1,4-Dioxane	33,723	11,702	22,021	188.18
Bis(2-ethylhexyl) adipate	46,659	1,200	45,459	3,788.25
Nickel	1,310,015	1,116,253	193,762	17.36
SUBTOTAL	12,368,784	29,191,451	-16,822,667	-57.63
TOTAL FOR ALL TRI CARCINOGENS	12,654,650	29,470,437	-16,815,787	-57.06
TOTAL FOR ALL TRI CHEMICALS	444,736,550	534,511,007	-89,774,457	-16.80

pounds less on-site land releases in 1989 than in 1988, resulting in the third-greatest facility-specific decrease in on-site land releases in the nation. (See Figures 4-25 and 4-28, Map 4-5, and Appendix F, Table F-10.)

A total of 15 states showed decreases in on-site land releases from 1988 to 1989 greater than 1 million pounds each.

Ten more states, for a total of 15 states, showed decreases in on-site land releases from 1988 to 1989 larger than 1 million pounds each. For Georgia, Kentucky, Virginia, Colorado and Connecticut, these decreases represented a *percentage* decrease of 68 percent or more for each state. (See Map 4-5 and Table 4-8.)

Industrial Distribution

Together 3 TRI industries decreased on-site land releases by 82.0 million pounds from 1988 to 1989.

Of the 22 TRI industry categories, 17 showed decreases in on-site land releases from 1988 to 1989. The three industry categories which together had facilities that reported over 94 percent of the total TRI on-site land releases in both 1989 and 1988—the Primary Metals industry, Chemical industry and the Multiple SIC Codes category—collectively reported an 82.0-million-pound net decrease in on-site land releases. The largest offsetting industry-wide change was the 1.0-million-pound increase in on-site land releases associated with the Food industry. (See Figure 4-29 and Table 4-11.)

The Primary Metals industry reduced on-site land releases by 49.5 million pounds (17 percent), the largest industry-wide decrease, while the Chemical industry was associated with a 23.2-million-pound decrease (18 percent). Facilities reporting in

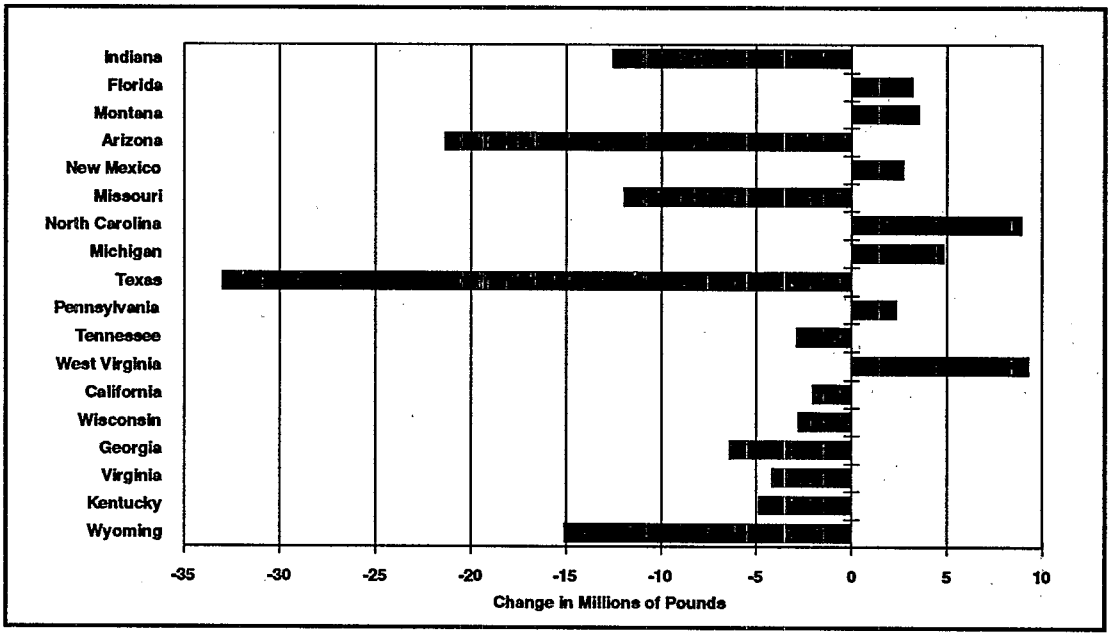
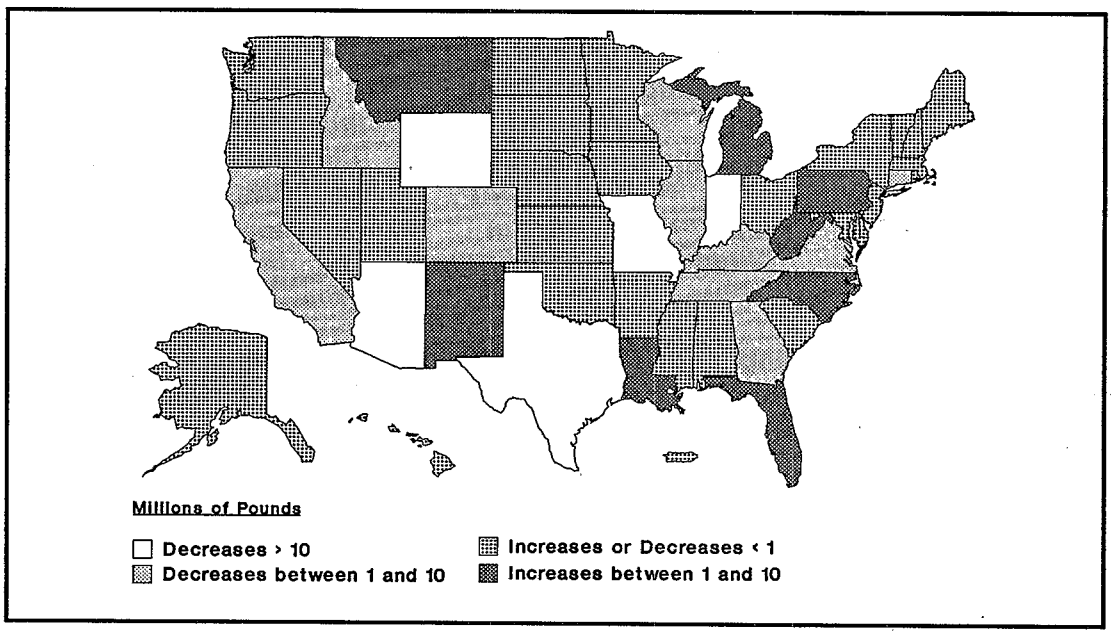


Figure 4–28. States with Changes in TRI On-site Land Releases Greater than 2 Million Pounds, 1988–1989.
(States shown in descending order according to 1989 on–site land release totals.)



Map 4–5. Changes in TRI Total On–site Land Releases by State, 1988–1989.

the Multiple SIC Code category together reported 9.4 million pounds less TRI on-site land releases in 1989 than in 1988. All of the top 20 facilities for decreases in on-site land releases from 1988 to 1989 were members of one of these three industry categories. (See Figure 4-29; Table 4-11; and Appendix F, Table F-10.)

3 other industries were each associated with a decrease in TRI on-site land releases greater than 1 million pounds.

Three additional industry categories (the Fabricated Metals industry, the facilities reporting no SIC Codes in 20-39, and the Transportation industry) each showed an *absolute* decrease in on-site land releases greater than 1 million pounds, and each of these changes represented a decrease of 70 percent or more. In addition, the following industries also showed large *percentage* decreases in on-site land releases from 1988 to 1989, although the *absolute* changes for the industries were small: Apparel industry (99 percent), Miscellaneous Manufacturing (80 percent), Printing industry (97 percent), Measuring/Photographic industry (80 percent), Textiles industry (77 percent), and Furniture industry (74 percent). (See Table 4-11.)

UNDERGROUND INJECTION

Underground injection is a disposal method by which chemical wastes are injected into deep underground wells. Because underground injection requires certain special geological conditions in order to prevent contamination of groundwater, its geographical distribution is less variable than that of other types of release or transfer. Geological conditions for disposal of hazardous and non-hazardous wastes are reviewed in detail and are subject to extensive modeling. Depths of these operations vary greatly from 2000 feet to more than 10,000 feet. The injection formations must be separated from the lowermost underground sources of drinking water by geologically competent, non-permeable formations.

A demonstration must be made for injection of hazardous waste (pursuant to RCRA 3004(f)) that the waste will remain in the designated formation for 10,000 years or until such time as the waste is no longer hazardous.

Unless special problems develop, the deep well injection of hazardous and non-hazardous wastes, which is strictly regulated by the permit process, is not expected to result in exposures to toxic chemicals.

Underground injection of TRI chemicals decreased by 11% from 1988 to 1989.

Underground injection of TRI chemicals (excluding delisted chemicals) dropped 153.3 million pounds (an 11 percent decrease) from 1988 to 1989. Underground injection was a major release method for TRI chemicals in 1988 and 1989, accounting for 21 percent of total TRI releases and transfers in both years. Only air emissions made up a larger share of the total TRI releases and transfers. (See Table 4-2.)

The 153.3-million-pound net decrease in TRI underground injection from 1988 to 1989 was the result of 272.8 million pounds of decreases in amounts reported by facilities partially offset by 119.4 million pounds of increases. The number of facilities showing decreases (86) exceeded the number reporting increases (69), and the number of facilities showing decreases in excess of 10 million pounds (18) only

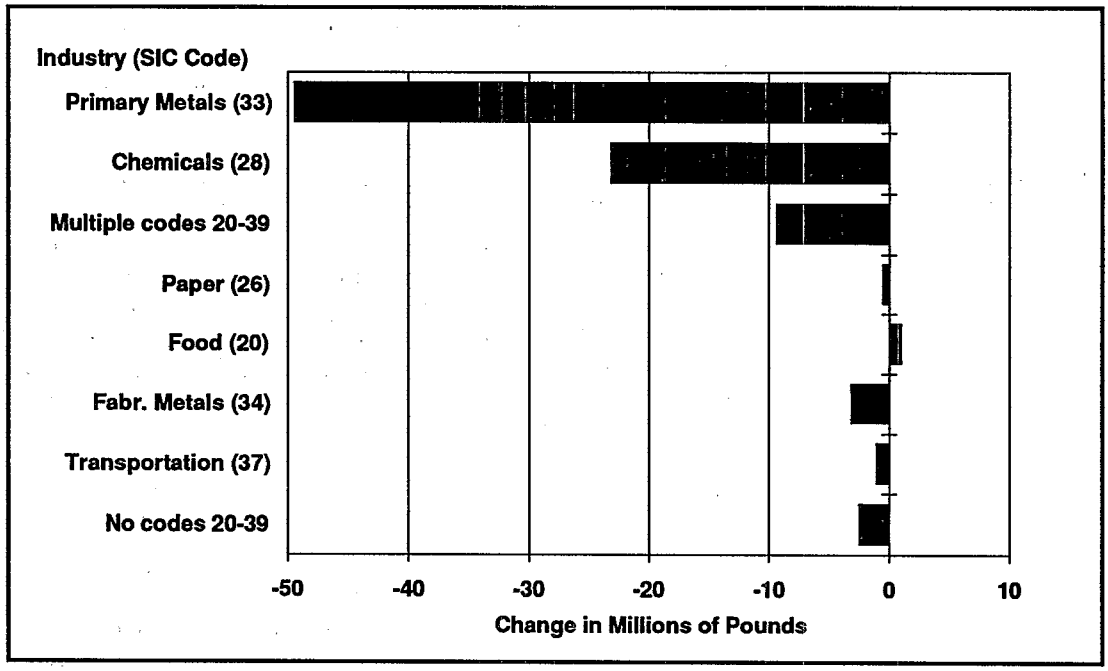


Figure 4–29. Industries with Changes in TRI On–site Land Releases Greater than 500,000 Pounds, 1988–1989. (Industries shown in descending order according to 1989 on–site land release totals.)

slightly exceeded those showing increases of that magnitude (16). If data for the facility reporting the largest decrease in underground injection from 1988 to 1989 were removed from the database, the net change from 1988 to 1989 would have been an increase in underground injection. (See Figure 4-30; and Appendix F, Table F-11.)

Chemical Distribution

Reported TRI releases to underground injection wells decreased for 77 chemicals, increased for 67, and stayed the same for nine between 1988 and 1989. An additional 167 TRI chemicals were not associated with discharges to underground injection wells in either year, either because no TRI reports were filed or because no discharges to underground injection wells were reported.

Underground injection of hydrochloric acid decreased by the largest amount from 1988 to 1989.

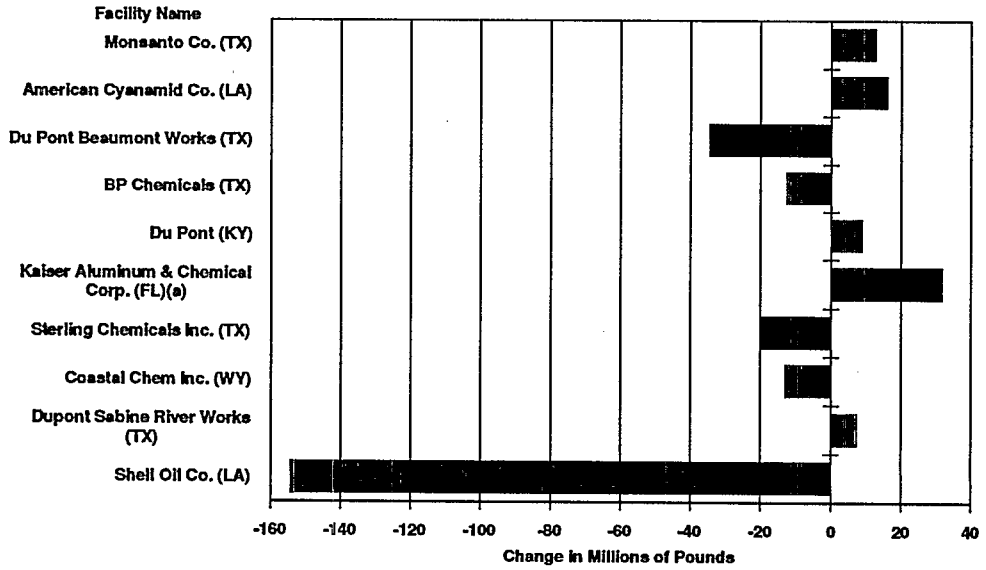
From 1988 to 1989, the individual underground injection totals of nine TRI chemicals decreased by over 1 million pounds each, while nine others were associated with an increase of that magnitude. Hydrochloric acid led these changes with a 96.1-million-pound decrease in underground injection. Underground injection of ammonium sulfate (solution) fell by the second largest amount, 58.9 million pounds. Sterling Chemicals, Inc. (Texas City, Texas) and Du Pont Beaumont Works (Beaumont, Texas) were associated with decreases between 1988 and 1989 in underground injection of ammonium sulfate (solution) totaling 36.0 million pounds and 34.0 million pounds, respectively. These two chemicals (ammonium sulfate

(solution) and hydrochloric acid) were the TRI chemicals injected in underground wells in the largest amounts in both 1988 and 1989. In the latter year, ammonium sulfate (solution) and hydrochloric acid made up 39 percent (461.2 million pounds) and 25 percent (300.8 million pounds) of the TRI underground injection total, respectively. (See Figures 4-30 and 4-31; Table 4-19; and Appendix F, Table F-11.)

Underground injection of three TRI chemicals, in particular, decreased by over 50 percent and by more than 1 million pounds each: manganese compounds (an 85 percent decrease, 5.8 million pounds), vinyl acetate (a decrease of 60 percent, 1.9 million pounds), and n-butyl alcohol (a decrease of 53 percent, 1.6 million pounds). Furthermore, underground injection of propylene oxide was 76 percent lower in 1989 than in 1988 due to an 844,000-pound decrease in such releases. (See Table 4-19.)

Underground injection of ammonia and sulfuric acid increased the most from 1988 to 1989.

Two TRI chemicals showed increases in underground injection greater than 10 million pounds each between 1988 and 1989: ammonia and sulfuric acid, the fourth- and third-ranked TRI chemicals for underground injection in 1989, respectively. Underground injection of ammonia rose by the largest amount, 14.5 million pounds, to reach 65.2 million pounds in 1989, while underground injection of sulfuric acid increased by 10.9 million pounds. A Sterling Chemicals, Incorporated facility in Texas City, Texas contributed to this ammonia increase by injecting 16.3 million



(a) Kaiser Aluminum and Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their discharges to underground injection wells is 4,487,000 pounds. This facility did not report to TRI in 1988; therefore the change in its underground releases from 1988 to 1989 is 4,487,000.

Figure 4–30. TRI Facilities with the Greatest Changes in Underground Injection, 1988–1989. (Facilities reporting the five greatest increases and five greatest decreases for underground injection, shown in decsending order according to 1989 underground injection totals.)

pounds more ammonia in underground wells in 1989 than in 1988. Underground injection of two other chemicals, ethylene glycol and acrylamide, increased by significant *percentages* between 1988 and 1989, 196 percent (a 5.7-million-pound increase), and 404 percent (a 3.6-million-pound increase), respectively. (See Figure 4-31 and Table 4-19.)

Chemical Classes

Underground injection of mineral acids/salts decreased by the largest amount of any TRI chemical class from 1988 to 1989, 159.6 million pounds...

Underground injection of mineral acids/salts dropped 159.6 million pounds (from 1.2 billion pounds in 1988 to 996.0 million pounds in 1989) primarily as a result of the significant decreases in underground injection of three chemicals, most notably hydrochloric acid. Three chemicals in this class were each associated with an increase in underground injection from 1988 to 1989 of over one million pounds: sulfuric acid (with an increase of 10.9 million pounds), nitric acid (with an increase of 5.5 million pounds), and hydrogen cyanide (with an increase of 1.8 million pounds). In both years, mineral acids/salts made up over 80 percent of the total underground injection. (Mixtures and trade secrets cannot be assigned to specific chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.)(See Figure 4-32 and Table 4-4.)

...while underground injection of non-halogenated organics fell by 2.6 million pounds.

Non-halogenated organics accounted for the next largest share of the total underground injection in 1989 (10 percent) and 1988 (9 percent). Underground injection of this chemical class fell by 2.6 million pounds from 1988 to 1989 as the net result of increases and decreases, including changes of over 1 million pounds each in the underground injection totals of ten individual organic chemicals.

Underground injection of the metals and metal compounds class decreased by over three-quarters (76 percent) from 1988 to 1989. However, since this chemical class accounted for less than 1 percent of total underground injection in both years, this decrease had little impact on TRI underground injection totals. The 6.0-million-pound net decrease in underground injection of this chemical class was due almost entirely to a 5.8-million-pound decrease (an 85 percent decrease) in underground injection of manganese compounds. (See Table 4-4.)

Underground injection of non-metallic inorganics increased by the largest amount of any TRI chemical class from 1988 to 1989.

Non-metallic inorganics, which made up the third-largest share of the total underground injection in both years (6 percent in 1989 and 4 percent in 1988), increased by the largest amount from 1988 to 1989—14.9 million pounds or 30 percent. The 14.5-million-pound increase in underground injection of ammonia was almost wholly responsible for the net increase in underground injection of this class. Ammonia was injected in underground injection wells in such large amounts in 1989 (65.2 million pounds) and in 1988 (50.7 million pounds) that it was, by far, the dominant chemical in this class in both years in terms of underground injection. Underground injection of halogenated organics also increased, but by a much smaller amount than non-metallic inorganics—37,000 pounds (a 1 percent increase).

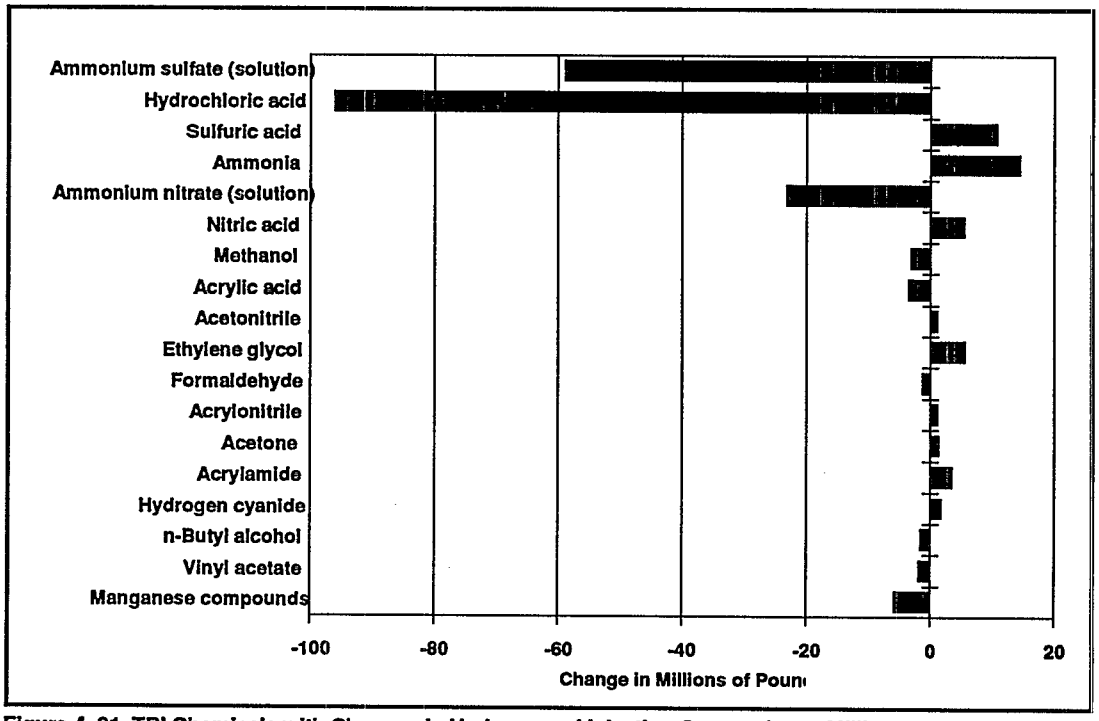


Figure 4–31. TRI Chemicals with Changes in Underground Injection Greater than 1 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 underground injection totals.)

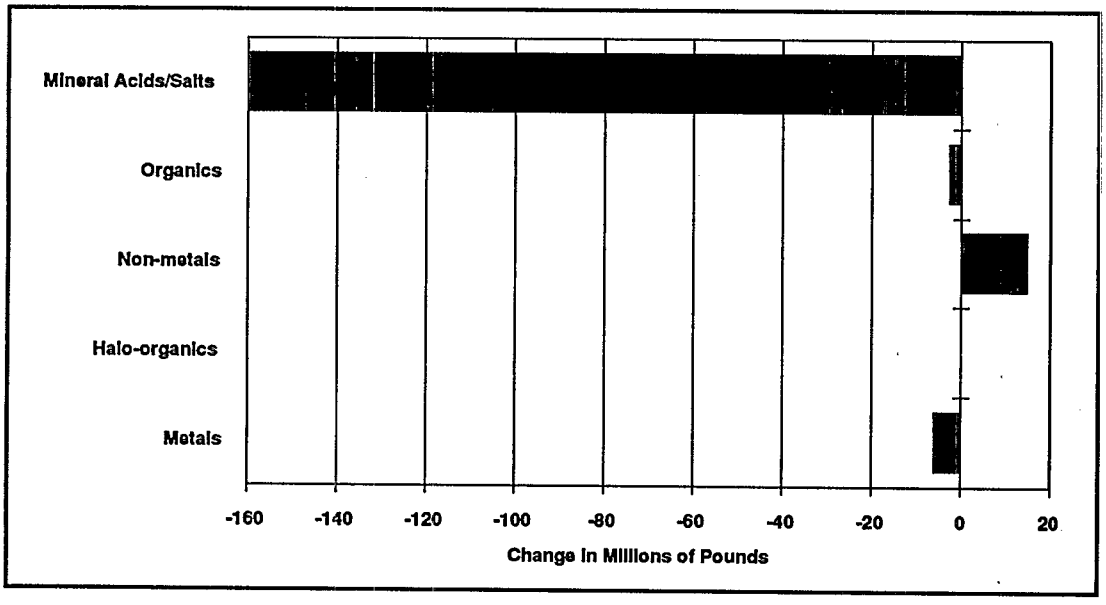


Figure 4–32. Changes in TRI Underground Injection by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to 1989 underground injection totals.)

Carcinogens

Underground injection of TRI carcinogens increased by 1.7 million pounds from 1988 to 1989.

Despite the net decrease in underground injection for all TRI chemicals, underground injection of TRI carcinogens *increased* from 1988 to 1989, moving from 20.7 million pounds to 22.3 million pounds, an increase of 1.7 million pounds. Underground injection of 16 carcinogens increased, though in all but two cases by amounts smaller than 130,000 pounds each. Acrylamide and acrylonitrile, the third- and second-ranked TRI carcinogens for underground injection in 1989, increased by the largest amounts: 3.6 million pounds (from 879,000 to 4.4 million pounds), and 1.2 million pounds (from 4.6 to 5.8 million pounds), respectively. (See Figure 4-33 and Table 4-20.) (Chapter 3, Box 3-G, defines TRI carcinogens, and Appendix B lists all TRI chemicals, indicating those which are considered carcinogens.)

While underground injection totals decreased for 18 carcinogens from 1988 to 1989, only formaldehyde decreased by more than 1 million pounds. Yet even with this sizable decrease (1.3 million pounds), formaldehyde remained the top-ranked carcinogen for underground injection in 1989, with 8.3 million pounds reported.

Table 4–19. TRI Chemicals with Changes in Underground Injection Greater than 500,000 Pounds, 1988-1989.

CHEMICAL	UNDERGROUND 1989 Pounds	UNDERGROUND 1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Hydrochloric acid	300,798,693	396,940,339	-96,141,646	-24.22
Ammonium sulfate (solution)	461,238,592	520,144,631	-58,906,039	-11.32
Ammonium nitrate (solution)	44,738,000	67,941,000	-23,203,000	-34.15
Manganese compounds	1,005,518	6,815,820	-5,810,302	-85.25
Acrylic acid	18,728,000	22,262,010	-3,534,010	-15.87
Methanol	23,193,216	26,352,320	-3,159,104	-11.99
Vinyl acetate	1,296,265	3,211,259	-1,914,994	-59.63
n-Butyl alcohol	1,414,099	3,009,660	-1,595,561	-53.01
Formaldehyde	8,347,000	9,608,524	-1,261,524	-13.13
Propylene oxide	270,000	1,113,780	-843,780	-75.76
Toluene	620,393	1,436,666	-816,273	-56.82
Acetaldehyde	1,924,529	2,505,109	-580,580	-23.18
Cyanide compounds	4,475,622	3,694,179	781,443	21.15
Acrylonitrile	5,790,548	4,562,713	1,227,835	26.91
Acetonitrile	18,033,180	16,769,010	1,264,170	7.54
Acetone	4,526,483	3,117,541	1,408,942	45.19
Hydrogen cyanide	3,534,070	1,737,850	1,796,220	103.36
Acrylamide	4,430,980	879,000	3,551,980	404.09
Nitric acid	31,017,845	25,485,930	5,531,915	21.71
Ethylene glycol	8,578,941	2,897,139	5,681,802	196.12
Sulfuric acid	149,583,139	138,707,333	10,875,806	7.84
Ammonia	65,209,385	50,702,149	14,507,236	28.61
SUBTOTAL	1,158,754,498	1,309,893,962	-151,139,464	-11.54
TOTAL FOR ALL OTHERS	22,076,683	24,270,300	-2,193,617	-9.04
GRAND TOTAL	1,180,831,181	1,334,164,262	-153,333,081	-11.49

Geographical Distribution

The 2 largest state-wide decreases in underground injection from 1988 to 1989 occurred in Louisiana and Texas.

Louisiana and Texas played the largest roles in the nationwide decrease in underground injection from 1988 to 1989. In fact, 12 of the top 20 facilities with the largest TRI decreases for underground injection were located in either Texas or Louisiana, including three of the top four of these facilities. Louisiana showed a state-wide decrease of 137.5 million pounds from 1988 to 1989 (a 32-percent decrease), which left the state with a 1989 underground injection total of 285.9 million pounds. Texas was associated with a much smaller, although still significant, net decrease in underground injection of 42.2 million pounds (an 8 percent decrease). Texas and Louisiana were ranked first and second, respectively, for underground injection in both years, together accounting for 70 percent of the total underground injection in 1988 and 64 percent of the total underground injection in 1989. (See Figures 4-30 and 4-34; Map 4-6; Table 4-8; and Appendix F, Table F-11.)

Ten additional states each showed either an increase *or* a decrease in underground injection greater than 2 million pounds, although only the state-wide changes reported for Wyoming and Florida (a *decrease* of 13.0 million pounds, and an *increase* of 21.2 million pounds, respectively) came close to matching the magnitude of net changes for underground injection observed for Louisiana and Texas. In each of these states, one or two facilities were associated with a net change in underground injection which approached or exceeded the state-wide change in such discharges. For example, Coastal Chemical Incorporated in Cheyenne, Wyoming reported 13.0 million pounds less underground injection in 1989 than in the prior year, and the state-wide net decrease in underground injection for *all* facilities in the state from 1988 to 1989 was also 13.0 million pounds.

Industrial Distribution

The Chemical industry was associated with an increase in underground injection of 2.2 million pounds from 1988 to 1989...

The industry accounting for 92 percent of total TRI underground injection in 1989 (and 82 percent in 1988), the Chemical industry, showed an increase in underground injection of 2.2 million pounds from 1988 to 1989. (See Figure 4-35.)

...while the Petroleum industry showed an even larger increase in underground injection of 4.6 million pounds.

Besides the Chemical industry, the only other industry registering an increase in underground injection greater than one million pounds from 1988 to 1989 was the Petroleum Refining industry. Facilities in this industry together reported 25.1 million pounds of underground injection in 1989, an increase of 4.6 million pounds (23 percent) over the prior year. One Petroleum Refining facility, the Amoco Oil Company plant in Texas City, Texas, was associated with an increase in underground injection of 4.2 million pounds from 1988 to 1989, the largest single contribution to the Petroleum industry's net change in underground injection between the two years. (See Figure 4-35; Table 4-11; and Appendix F, Table F-11.)

These industry-wide changes in underground injection were dwarfed by the decrease for the Multiple SIC Codes category, however. Facilities in the Multiple SIC Codes category together reported 153.4 million pounds less underground injection

Table 4–20. TRI Carcinogens with Changes in Underground Injection Greater than 10,000 Pounds, 1988-1989.

CHEMICAL	UNDERGROUND 1989 Pounds	UNDERGROUND 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Formaldehyde	8,347,000	9,608,524	-1,261,524	-13.13
Propylene oxide	270,000	1,113,780	-843,780	-75.76
1,2-Dichloroethane	1,046,661	1,455,484	-408,823	-28.09
4,4'-Methyenedianiline	96,000	460,250	-364,250	-79.14
Hydrazine sulfate	76,957	355,000	-278,043	-78.32
Benzene	668,610	770,284	-101,674	-13.20
Diaminotoluene (mixed isomers)	95,000	174,000	-79,000	-45.40
Tetrachloroethylene	50,005	72,250	-22,245	-30.79
2-Nitropropane	237,000	257,000	-20,000	-7.78
1,4-Dichlorobenzene	250	15,000	-14,750	-98.33
2,4,6-Trichlorophenol	0	12,000	-12,000	-100.00
Isopropyl alcohol (mfg-strong acid process)	18,441	0	18,441	—
Carbon tetrachloride	122,043	98,054	23,989	24.47
Chloroform	64,338	36,002	28,336	78.71
Dichloromethane	747,389	664,750	82,639	12.43
Epichlorohydrin	197,200	68,300	128,900	188.73
Acrylonitrile	5,790,548	4,562,713	1,227,835	26.91
Acrylamide	4,430,980	879,000	3,551,980	404.09
SUBTOTAL	22,258,422	20,602,391	1,656,031	8.04
TOTAL FOR ALL TRI CARCINOGENS	22,316,775	20,655,142	1,661,633	8.04
TOTAL FOR ALL TRI CHEMICALS	1,180,831,181	1,334,164,262	-153,333,081	-11.49

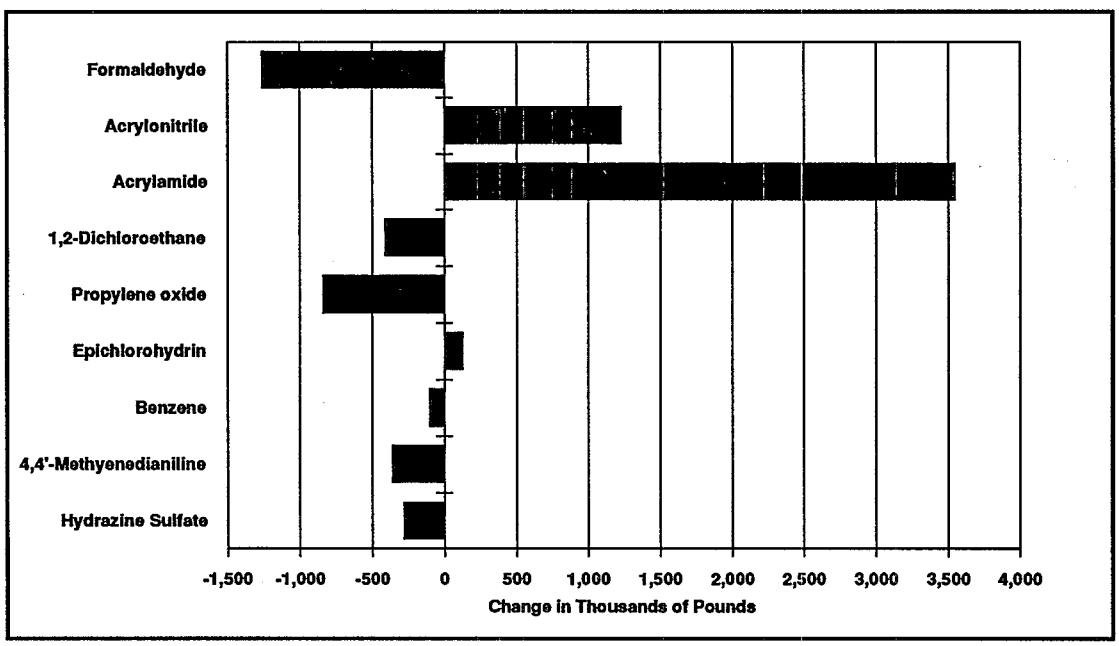


Figure 4–33. TRI Carcinogens with Changes in Underground Injection Greater than 100,000 Pounds, 1988–1989. (Carcinogens shown in descending order according to 1989 underground injection totals.)

in 1989 than in 1988, which corresponds to an 89-percent decrease. In addition, the Primary Metals industry and the Food industry also showed decreases between the two years in underground injection greater than 1 million pounds each.

TRANSFERS TO PUBLIC SEWAGE

Transfers to public sewage of TRI chemicals decreased by 3% from 1988 to 1989.

Transfers to public sewage of TRI chemicals (excluding delisted chemicals) decreased by both the smallest *absolute* and *percentage* amounts of any TRI release or transfer category between reporting years 1988 and 1989—a decrease of 19.9 million pounds or 3 percent. This small national decrease is the net result of partially offsetting increases and decreases of the many different TRI chemicals in wastes sent to publicly owned treatment works (POTWs) by TRI facilities all over the nation. The significance of the national net change as compared to local variations depends on one's perspective. The net decrease may suggest some progress in the National Pretreatment Program (see Box 4-C) and indicate a slightly reduced burden of industrial wastes on POTWs nationwide, but citizens or public officials will more likely be interested in local decreases or increases than in the nationwide net change. (See Table 4-2.)

The 19.9-million-pound net decrease in transfers to public sewage from 1988 to 1989 was the result of 120.8 million pounds of decreases, partially offset by 100.9 million pounds of increases. The number of facilities showing increases (3,009)

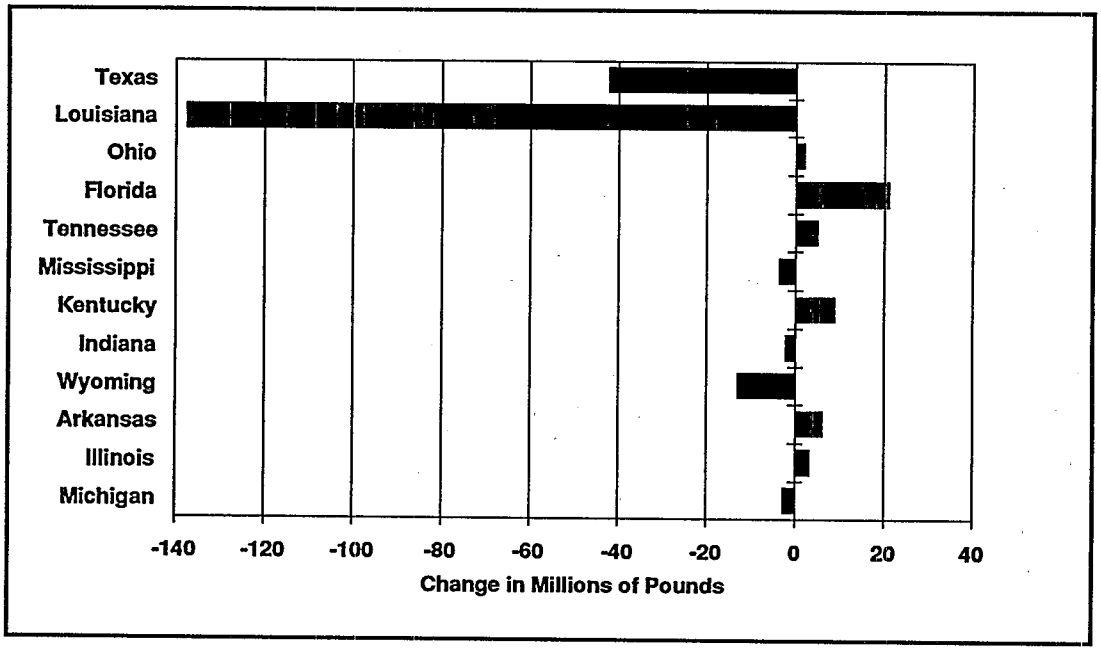
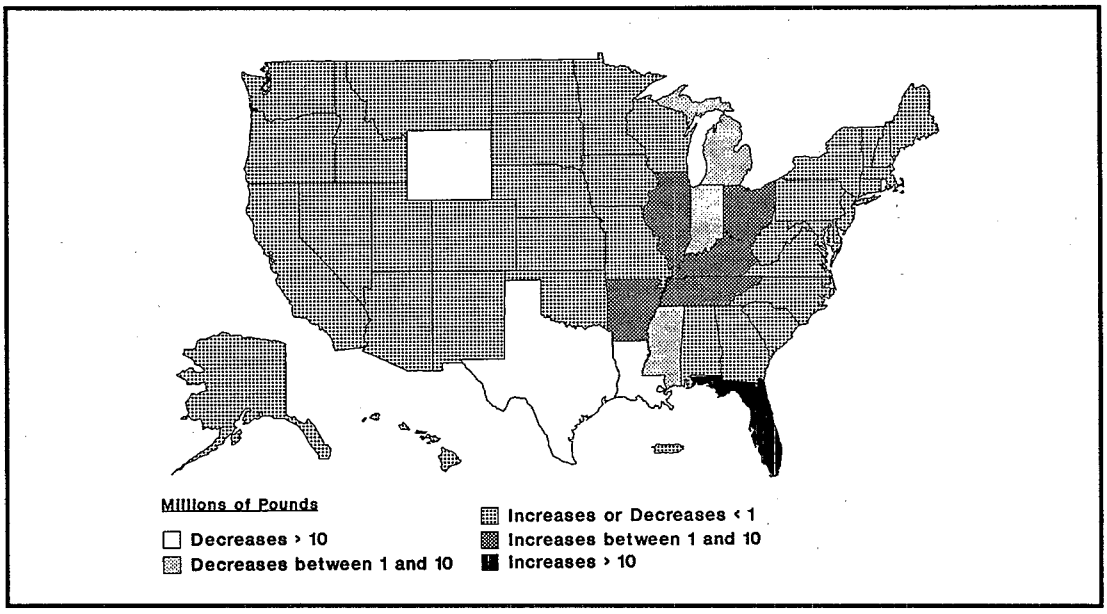


Figure 4–34. States with Changes in TRI Underground Injection Greater than 1 Million Pounds, 1988–1989. (States shown in descending order according to 1989 underground injection totals.)



Map 4–6. Changes in Underground Injection by State, 1988–1989.

exceeded the number showing decreases (2,964). In addition, the number of facilities associated with decreases in excess of 10 million pounds (21) was almost twice the number showing increases of that magnitude (11). The eight facilities with the largest decreases in transfers to public sewage would have to be removed from the database to make the net change in transfers to public sewage from 1988 to 1989 an increase.

Increases in the amount of transfers to public sewage at the individual facility level were more dramatic between 1988 and 1989 than decreases. The largest increase for a single facility was the 8.7-million-pound increase associated with Phthalchem in Cincinnati, Ohio, compared to the largest decrease of 3.4 million pounds associated with Fruit of the Loom Inc. in St. Martinville, Louisiana. Total increases associated with the ten facilities with the largest increases for transfers to public sewage between the two years totaled 39.9 million pounds, whereas total decreases for the top ten decreasing facilities for such transfers totaled 24.6 million pounds. It is clear that many facilities contributed to the overall decrease in public sewage transfers, rather than a few facility changes dominating, as in the case of some other types of TRI releases or transfers (for example, underground injection). See Box 4-D for some of the reasons why public sewage transfers might increase or decrease at the facility level, as well as other issues relevant to interpreting changes in public sewage transfers from one year to the next. (See Figure 4-36 and Appendix F, Table F-12.)

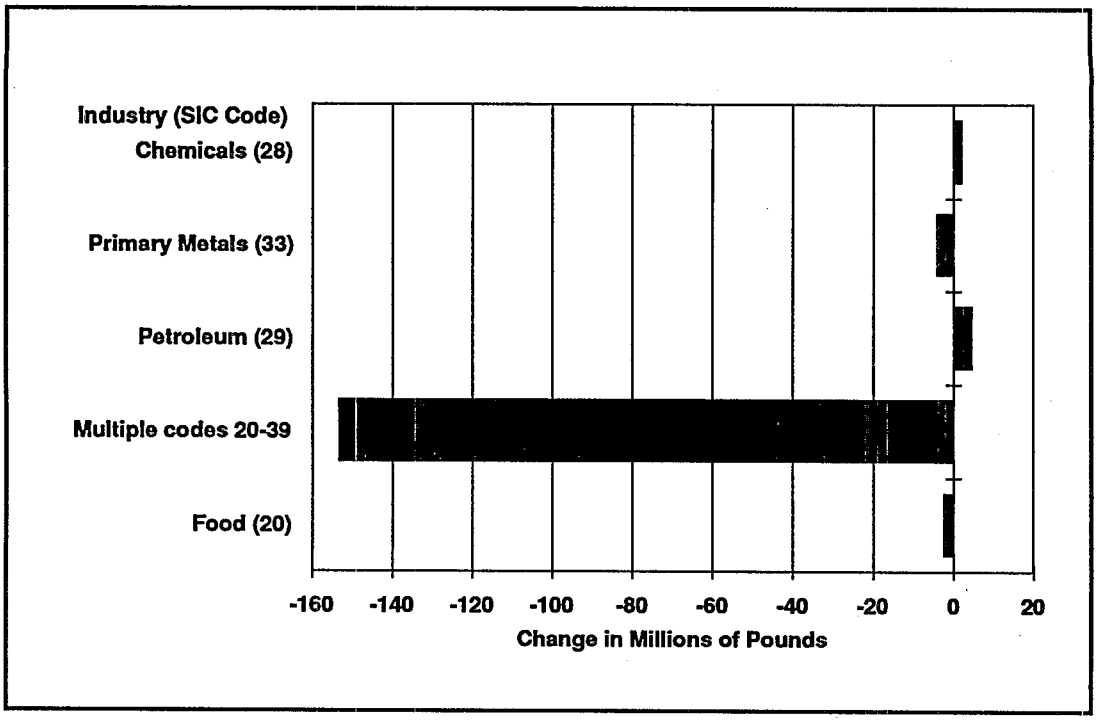


Figure 4–35. Industries with Changes in TRI Underground Injection Greater than 1 Million Pounds, 1988–1989. (Industries shown in descending order according to 1989 underground injection totals.)

Chemical Distribution

Transfers to public sewage of sulfuric acid and nitric acid decreased the most from 1988 to 1989.

Large decreases in transfers to public sewage of sulfuric acid (11.5 million pounds, a 21 percent decrease), and nitric acid (9.4 million pounds, a 41 percent decrease) contributed to the net decrease in these transfers between 1988 and 1989. The Air Products Manufacturing Corporation facility in Pasadena, Texas, reported 7.3 million pounds less transfers to public sewage of nitric acid in 1989 than in 1988. Transfers to public sewage of hydrochloric acid fell 7.7 million pounds (a 21 percent decrease) over the same time period. (See Figure 4-37; Table 4-21; and Appendix F, Table F-12.) Some of the deceases in mineral acids may be the results of past errors in reporting neutralized acids. (See Box 4-D.)

Transfers to public sewage of 8 TRI chemicals each decreased by more than 1 million pounds from 1988 to 1989...

Transfers to public sewage of five additional chemicals, including the second-ranked TRI chemical for public sewage in both 1988 and 1989—methanol, decreased by greater than 1 million pounds each from 1988 to 1989. Transfers to public sewage of two of these, vinyl acetate and cyanide compounds, dropped by greater than 87 percent each.

...while ammonium sulfate (solution) led all other TRI chemicals in increases of transfers to public sewage.

Transfers to public sewage of ammonium sulfate (solution), the TRI chemical transferred to POTWs in the largest amounts in both 1988 and 1989 (187.7 million pounds in 1988 and 201.3 million pounds in 1989), increased by the largest amount

BOX 4-C. THE NATIONAL PRETREATMENT PROGRAM

Facilities discharging toxic chemicals to publicly owned treatment works (POTWs) are subject to many federal, state and local regulations, as are the receiving plants. The National Pretreatment Program, developed under the Clean Water Act (see Chapter 7 for a discussion of the Clean Water Act), regulates industrial wastewater discharges in several ways:

- it requires certain industries to treat their wastes before sending them to a POTW;
- it prohibits certain discharges that would either interfere with a POTW's operation or pass through untreated; and
- it issues standards regulating the level of certain pollutants that various industries can discharge to the POTWs.

The program also requires approximately 1,500 POTWs to establish and enforce their own pollutant-specific discharge limitations for industrial users through an EPA- or state-approved pretreatment program. Together, federal and local limitations combine general and site-specific considerations: the capability of technology to remove certain pollutants from industrial effluents, the ability of the POTW to handle certain quantities and types of incoming wastes, and local health and environmental objectives for water and sludge quality.

from 1988 to 1989—13.6 million pounds.[7] Three facilities each showed an increase in transfers to public sewage of ammonium sulfate (solution) greater than 5 million pounds: Phthalchem (Cincinnati, Ohio, with an 8.7-million-pound increase); Old Bridge Chemicals Inc. (Old Bridge, New Jersey, with a 5.7-million-pound increase); and Mallinckrodt Specialty (St. Louis, Missouri, with a 5.6-million-pound increase.).

This net *increase* in transfers to public sewage of ammonium sulfate (solution) masks many offsetting increases and decreases in the public sewage transfers of this chemical by individual facilities. For example, this was the chemical responsible for 95 percent of the *decrease* in public sewage transfers reported by the facility with the second largest decrease in such transfers from 1988 to 1989 (Ciba-Geigy Corporation in Queensbury, New York and for 99 percent of the increase in transfers to public sewage of the TRI facility showing the largest increase in such transfers between the two years (Phthalchem, Cincinnati, Ohio).

Transfers to public sewage of four TRI chemicals (ammonia, manganese compounds, formaldehyde, and n-butyl alcohol), in addition to ammonium sulfate (solution), each increased by over 1 million pounds. The increase in transfers to public sewage of manganese compounds of 4.7 million pounds represented a 256-percent *increase* for these compounds. (See Figure 4-37 and Table 4-21.)

BOX 4-D. INTERPRETING CHANGES IN PUBLIC SEWAGE TRANSFERS BETWEEN YEARS

TRI data raise many questions about the reasons for and effects of changes in transfers to public sewage—questions that are more effectively addressed at the local level, in light of specific situations for particular manufacturing facilities and the publicly owned treatment works (POTWs) receiving their wastes, rather than on a nationwide scale. Among the factors to consider in evaluating reasons for local changes and their possible environmental impact are the following:

- Did new or revised pretreatment standards for a particular industry cause a reduction in transfers to public sewage? As of 1989, EPA had issued categorical pretreatment standards for 39 industrial categories, and other new and revised standards were under development. Pretreatment standards generally affect specific subsets of the broad industrial categories indicated by two-digit SIC codes. For example, Storage Battery manufacturers (SIC 3691) are one subset of the larger Electronic and Other Electrical Equipment industry (SIC 36), and separate pretreatment requirements have been developed for six different subcategories of Storage Battery manufacturers.

- Did a decrease in reported transfers to public sewage result from a TRI facility's actual reductions in activities involving a particular TRI chemical, from more extensive treatment prior to discharging to sewage systems, or from a shift to a different route (such as off-site transfers to facilities other than POTWs or direct on-site releases to surface water)?

- Did transfers to public sewage increase because of new restrictions in other areas (such as the land disposal restrictions under the Resource Conservation and Recovery Act or tighter controls on air emissions that curbed on-site releases)? If so, did the change represent a short-term response to an immediate problem or a longer-term decision about waste management?

- Did an increase/decrease correspond to a change in the level of the facility's production or use of the TRI chemical(s)? Was it the result of stronger or weaker environmental controls for the same amount of production? (Facilities may have provided data on the change in production levels in the optional waste minimization section. Some production increases may be accompanied by a relative waste decrease; see Chapter 5.)

- Can the mix of TRI chemicals in the wastes of the manufacturing facility be effectively or efficiently removed by the POTW without producing large amounts of hazardous sludge or other emissions there? The removal rate for different pollutants varies from 0 to 99 percent.

- Are alternative means of reuse, treatment, or disposal of TRI chemical wastes available? What are the environmental pluses and minuses of transfers to public sewage compared to the alternatives?

- Did locally established pretreatment standards (local limits) reduce pollutant discharge? Over 1,500 publicly owned treatment works nationwide have approved local pretreatment programs to control industrial discharges to sewers, and most of these POTWs have set local limits. Local limits account for local environmental factors and characteristics of the POTW, and are designed to protect the POTW, the health and safety of

BOX 4-E. CONTINUED

its workers, its sewage sludge, and the receiving waters. In many cases, local limits are more stringent than national categorical pretreatment standards; the POTW is responsible for applying the more stringent of either a local limit or its corresponding categorical standard.

- A further complication in considering the possible environmental impact of a given amount of transfer to public sewage, or of a given increase or decrease, is that transfers to POTWs are only one of many ways that TRI chemicals may eventually end up in surface water or affect water quality, and only part of those transfers end up in the water. TRI data indicate only what *goes* to POTWs, not the degree of treatment the chemicals receive there or what portion of them is ultimately discharged to air, land, or water. National TRI data can give background information for examining individual situations, but do not definitively measure environmental progress in wastewater management.

Chemical Class

Transfers to public sewage of the mineral acids/bases and non-halogenated organics chemical classes decreased the most from 1988 to 1989.

Between 1988 and 1989, mineral acids/salts and non-halogenated organics registered the largest decreases in transfers to public sewage, which is not surprising since seven of the eight chemicals for which such transfers decreased by more than 1 million pounds each were members of one of these classes. Transfers to public sewage for the mineral acids/salts class fell by 19.3 million pounds (6 percent), while such transfers for non-halogenated organics dropped by the second-largest amount, 6.4 million pounds (3 percent). Together these two chemical classes made up over 90 percent of the transfers to public sewage in both 1988 and 1989. (Mixtures and trade secrets cannot be assigned to specific chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.) (See Figure 4-38 and Table 4-4.)

The largest *percentage* decrease in transfers to POTWs from 1988 to 1989 of any of the five chemical classes (28 percent) was associated with halogenated organics. Transfers to public sewage of dichloromethane were cut in half, from 3.0 million pounds in 1988 to 1.5 million pounds in 1989, contributing largely to the overall 2.3-million-pound decrease for this class. (See Chapter 6 for further information on dichloromethane.) (See Table 4-21.)

Between 1988 and 1989, transfers to public sewage for non-metallic inorganics increased by 5.2 million pounds...

Transfers to public sewage of non-metallic inorganics increased by the largest amount in *absolute* terms—5.2 million pounds (a 20 percent increase). The net increase in such transfers of one non-metallic inorganic, ammonia, alone totaled 5.5 million pounds. Ammonia is a common chemical found in both household and industrial wastes. It is also generated within typical POTWs as a result of biological transformations of organic matter. Ammonia is toxic to fish.

...and for metals and metal compounds by 3.1 million pounds.

Transfers to public sewage of metals and metal compounds increased by 33 percent (an increase of 3.1 million pounds) from 1988 to 1989. This change was driven by the increase in such transfers of manganese compounds (which increased from 1.8 million pounds in 1988 to 6.6 million pounds in 1989). Metals and metal compounds

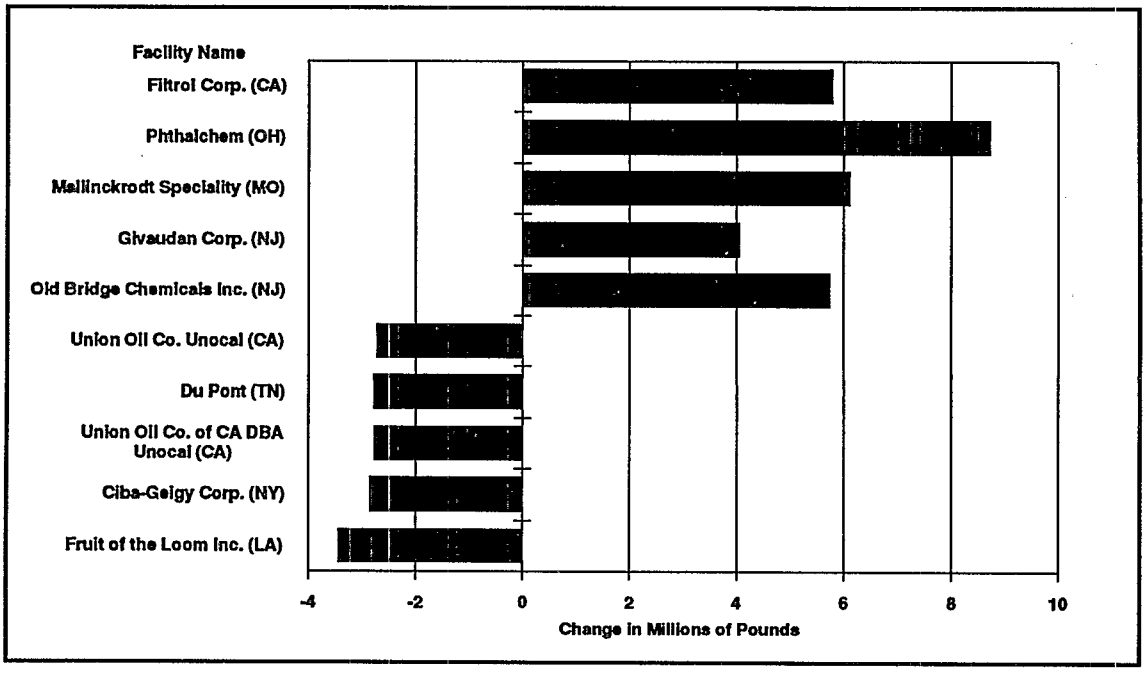


Figure 4–36. TRI Facilities with the Greatest Changes in Transfers to Public Sewage, 1988–1989. (Facilities reporting the five greatest increases and the five greatest decreases for transfers to public sewage, shown in descending order according to 1989 public sewage transfer totals.)

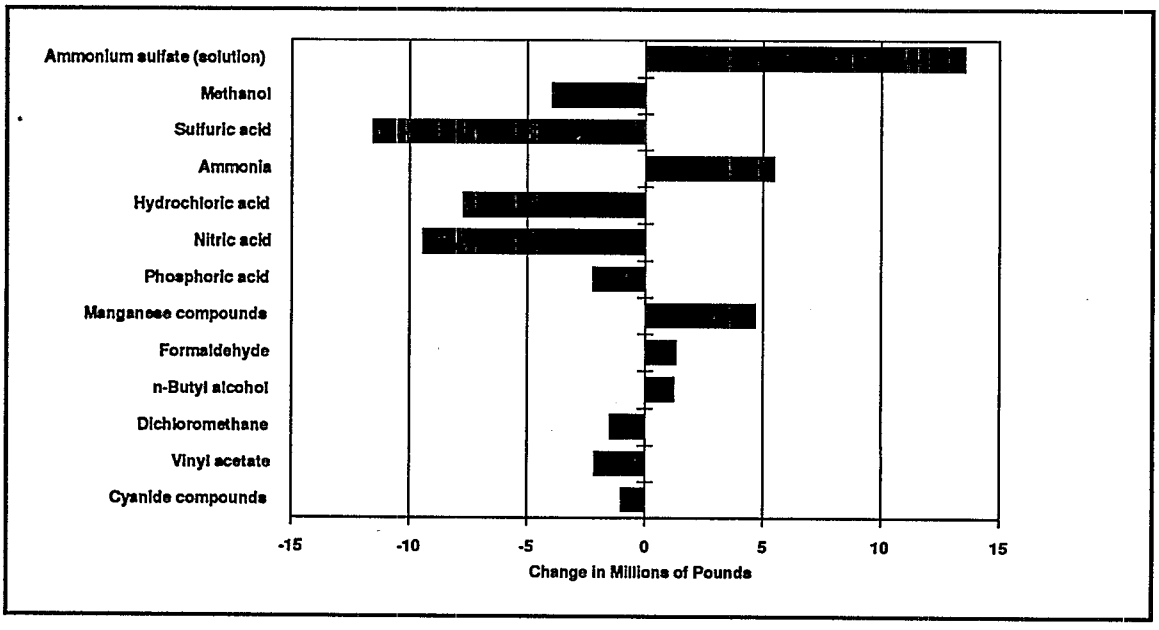


Figure 4–37. TRI Chemicals with Changes in Transfers to Public Sewage Greater than 1 Million Pounds, 1988–1989. (Chemicals shown in descending order according to 1989 public sewage transfer totals.)

Table 4–21. TRI Chemicals with Changes in Transfers to Public Sewage Greater than 500,000 Pounds, 1988-1989.

CHEMICAL	PUBLIC SEWAGE 1989 Pounds	PUBLIC SEWAGE 1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Sulfuric acid	42,874,496	54,424,308	-11,549,812	-21.22
Nitric acid	13,856,793	23,298,790	-9,441,997	-40.53
Hydrochloric acid	28,180,243	35,895,804	-7,715,561	-21.49
Methanol	109,011,890	112,968,925	-3,957,035	-3.50
Phosphoric acid	11,586,306	13,804,117	-2,217,811	-16.07
Vinyl acetate	179,068	2,319,733	-2,140,665	-92.28
Dichloromethane	1,481,927	2,963,249	-1,481,322	-49.99
Cyanide compounds	146,625	1,149,125	-1,002,500	-87.24
Acetone	13,223,941	14,110,213	-886,272	-6.28
Phenol	5,151,231	5,889,184	-737,953	-12.53
Zinc (fume or dust)	130,101	840,678	-710,577	-84.52
Chromium compounds	981,119	1,690,921	-709,802	-41.98
Biphenyl	890,452	1,428,610	-538,158	-37.67
Zinc compounds	2,028,275	1,509,445	518,830	34.37
p-Cresol	1,507,037	744,568	762,469	102.40
n-Butyl alcohol	5,799,413	4,525,613	1,273,800	28.15
Formaldehyde	5,977,311	4,622,975	1,354,336	29.30
Manganese compounds	6,566,055	1,842,325	4,723,730	256.40
Ammonia	28,777,748	23,273,890	5,503,858	23.65
Ammonium sulfate (solution)	201,258,790	187,698,362	13,560,428	7.22
SUBTOTAL	479,608,821	495,000,835	-15,392,014	-3.11
TOTAL FOR ALL OTHERS	71,425,875	75,927,845	-4,501,970	-5.93
GRAND TOTAL	551,034,696	570,928,680	-19,893,984	-3.48

can often be removed effectively from the effluent water at the POTW, but tend to accumulate in the resulting sludge solids and may pose a disposal problem if the level of toxic constituents precludes beneficial use of the sludge. The metals of greatest concern for public sewage (such as lead, lead compounds, and copper) were not among the large increasers for this class, however.

Carcinogens

Transfers to public sewage of TRI carcinogens decreased by 5% from 1988 to 1989.

Transfers to public sewage of TRI carcinogens decreased by 5 percent (838,000 pounds) from 1988 to 1989, a slightly steeper rate of decrease than that seen for transfers to public sewage of *all* TRI chemicals (3 percent). Transfers to public sewage of dichloromethane, the second-ranked carcinogen for transfers to public

sewage in 1988, decreased by the largest amount—1.5 million pounds (50 percent), lowering the chemical's rank to third in 1989. Over the same year, transfers of nitrilotriacetic acid to public sewage were almost discontinued due to a 99-percent decrease of 262,000 pounds. (See Figure 4-39 and Table 4-22.) (See Chapter 3 for the definition of carcinogens used in this report and Appendix B, which identifies the TRI chemicals that are carcinogens.)

Formaldehyde registered a significant increase in transfers to POTWs from 1988 to 1989.

Transfers to public sewage of formaldehyde, the top-ranked carcinogen for such transfers in both 1988 and 1989, were 1.4 million pounds (30 percent) higher in 1989 than in the previous year. Other chemical-specific increases in transfers to public sewage for TRI carcinogens were less than 500,000 pounds each.

Geographical Distribution

New York showed the largest state-wide decrease in transfers to public sewage from 1988 to 1989.

Fourteen states, most notably New York, each showed net decreases in transfers to public sewage from 1988 to 1989 that were greater than 1 million pounds. New York's 9.0-million-pound reduction (a 36-percent decrease) was the largest state-

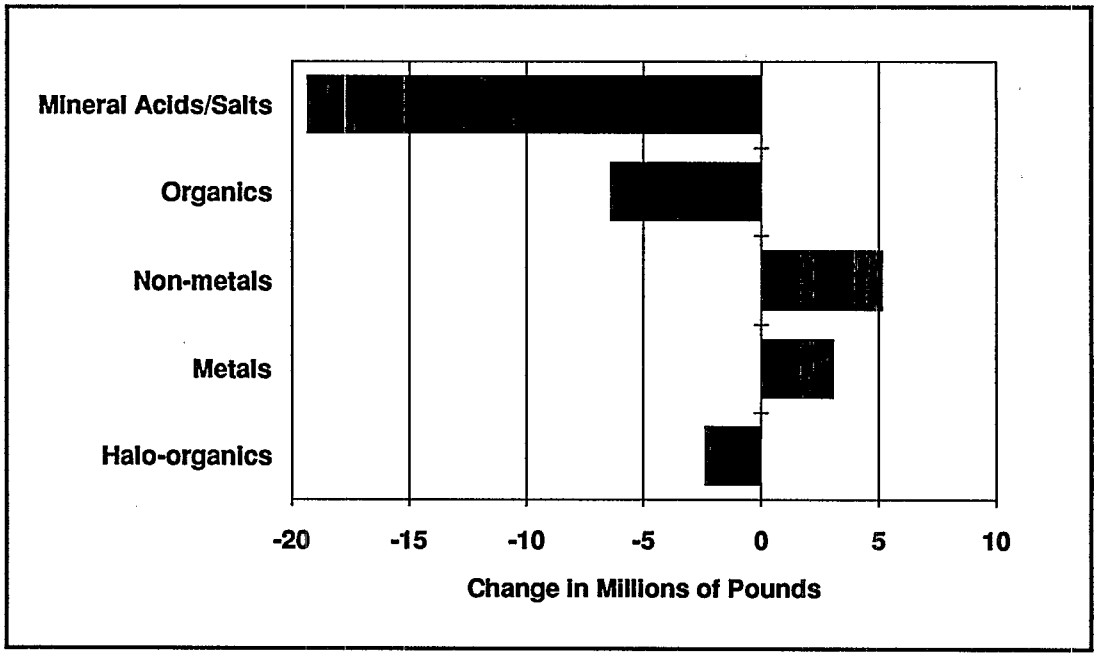


Figure 4–38. Changes in TRI Transfers to Public Sewage by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to 1989 public sewage totals.)

wide decrease in transfers to public sewage over this time period. Three facilities in particular contributed to this net change: Ciba-Geigy Corporation in Queensbury (with a 2.8-million-pound decrease); Lederle Laboratories in Pearl River (with a 1.6-million-pound decrease); and Anitec Image Corporation in Binghamton (with a 1.4-million-pound decrease). (See Figures 4-36 and 4-40; Map 4-7; Table 4-8; and Appendix F, Table F-12.)

Louisiana and Maine were associated with significant *percentage* reductions in transfers to public sewage from 1988 to 1989.

The net change in transfers to public sewage in Louisiana is worthy of mention because it represented a 98-percent decrease in such transfers (from 3.5 million pounds in 1988 to 60,000 pounds in 1989). Maine also showed a significant *percentage* decrease in public sewage transfers (54 percent), due largely to the 1.5-million-pound decrease associated with the Irving Tanning Co. of Hartland, Maine. (See Appendix F, Table F-12.)

Transfers to public sewage increased by more than 1 million pounds from 1988 to 1989 in each of 8 states.

Eight states showed increases in transfers to public sewage greater than 1 million pounds each from 1988 and 1989. The most dramatic net increases in such transfers occurred in Missouri (a 9.5-million-pound increase, or 14 percent), New Jersey (a 6.0-million-pound increase or 11 percent), and Ohio (a 3.8-million-pound increase or 15 percent). Missouri and New Jersey were the first- and third-ranked states for transfers to public sewage in both 1988 and 1989, while Ohio was ranked ninth in both years. Two St. Louis facilities, in particular, contributed to the net increase in such transfers seen for Missouri: Mallinckrodt Specialty and a Monsanto Company facility, which reported a 6.1-million-pound increase and 2.2-million-pound increase in transfers to public sewage, respectively. (See Figure 4-40; Map 4-7; Table 4-8; and Appendix F, Table F-12.)

Phthalchem in Cincinnati, Ohio was the facility with the largest increase in transfers to public sewage from 1988 to 1989. The 8.7-million-pound increase for this facility was offset to a large degree, however, by many smaller decreases elsewhere in the state, including the 1.2-million-pound decrease in transfers to POTWs associated with the Henkel Corporation in Cincinnati, which did not report to TRI in 1989. (See Appendix F, Table F-12.)

Industrial Distribution

The Chemical industry registered the largest increase in transfers to public sewage from 1988 to 1989.

In 1988, Chemical facilities were the source of 58 percent (330.0 million pounds) of the total TRI transfers to POTWs. One year later, as a result of an industry-wide *increase* in transfers to public sewage of 17.4 million pounds, the Chemical industry's share of this total rose to 63 percent. The net increase was spread out among many Chemical facilities. For example, 14 of the top 20 facilities, and all of the top five for increases in transfers to public sewage from 1988 to 1989, reported as members of the Chemical industry in 1988. Five additional industries were associated with increases in such transfers; however, in all of these cases, the increases were each smaller than 500,000 pounds. (See Figure 4-41 and Table 4-11.)

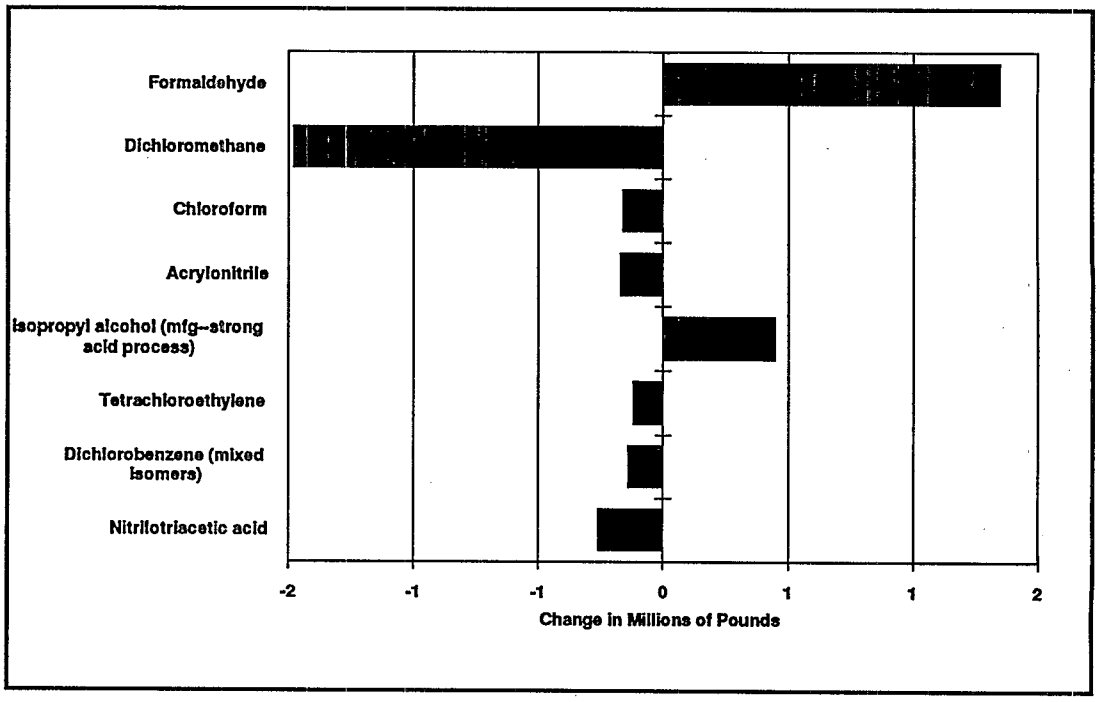


Figure 4–39. TRI Carcinogens with Changes in Transfers to Public Sewage Greater than 100,000 Pounds, 1988–1989. (Carcinogens shown in descending order according to 1989 public sewage transfer totals.)

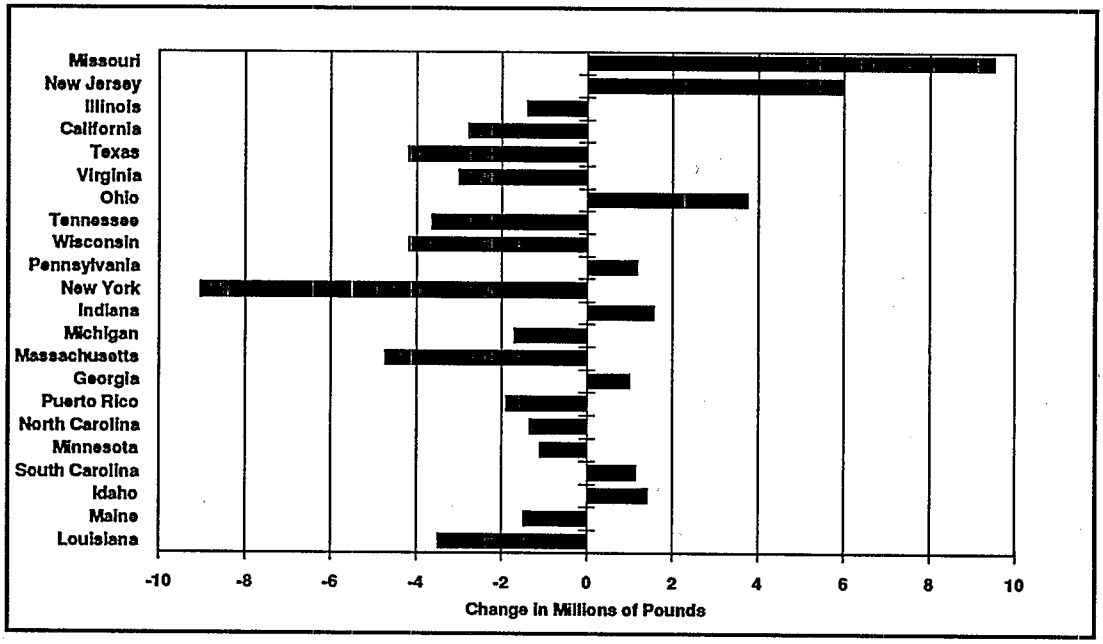
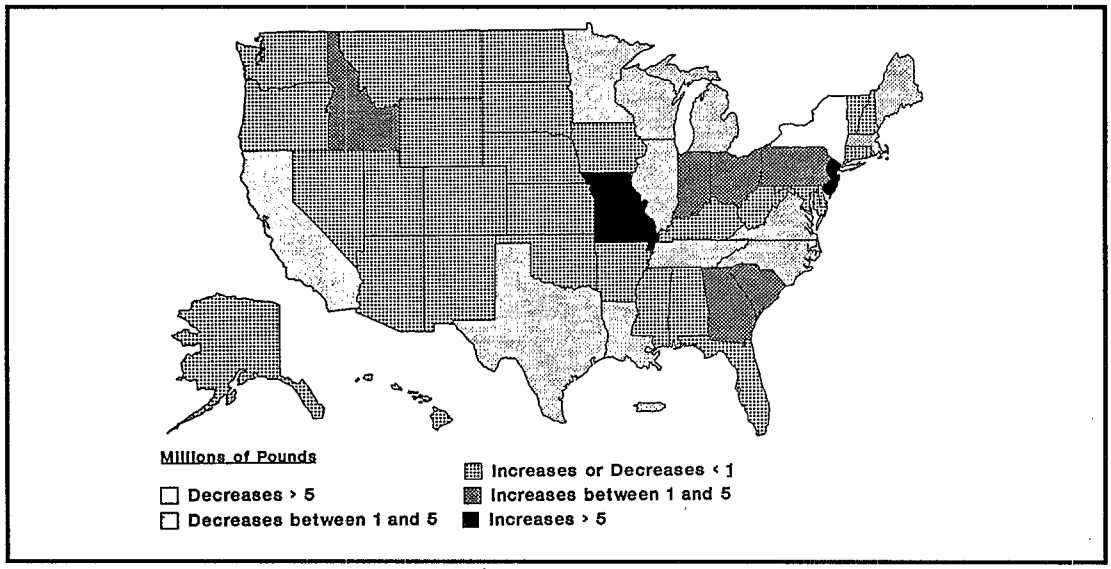


Figure 4–40. States with Changes in TRI Transfers to Public Sewage Greater than 1 Million Pounds, 1988–1989. (States shown in descending order according to 1989 public sewage transfer totals.)

Table 4–22. TRI Carcinogens with Changes in Transfers to Public Sewage Greater than 10,000 Pounds, 1988-1989.

CHEMICAL	PUBLIC SEWAGE		CHANGE 1988-1989	
	1989 Pounds	1988 Pounds	Pounds	Percent
Dichloromethane	1,481,927	2,963,249	-1,481,322	-49.99
Nitrilotriacetic acid	2,750	264,882	-262,132	-98.96
Acrylonitrile	787,903	955,741	-167,838	-17.56
Chloroform	1,067,436	1,226,573	-159,137	-12.97
Dichlorobenzene (mixed isomers)	44,813	182,663	-137,850	-75.47
Tetrachloroethylene	495,320	619,322	-124,002	-20.02
Chromium	315,982	411,815	-95,833	-23.27
Propylene oxide	328,422	407,276	-78,854	-19.36
Lead	47,589	121,581	-73,992	-60.86
Nickel	186,085	250,556	-64,471	-25.73
Styrene	414,860	471,291	-56,431	-11.97
Epichlorohydrin	30,742	73,385	-42,643	-58.11
Asbestos (friable)	41,252	68,148	-26,896	-39.47
Ethylene oxide	341,253	363,065	-21,812	-6.01
Ethyl acrylate	9,278	27,657	-18,379	-66.45
Thiourea	9,263	26,634	-17,371	-65.22
1,3-Butadiene	29,072	44,874	-15,802	-35.21
p-Cresidine	25,750	37,750	-12,000	-31.79
1,4-Dichlorobenzene	26,951	37,997	-11,046	-29.07
Benzene	1,120,613	1,103,015	17,598	1.60
Acrylamide	33,136	13,540	19,596	144.73
1,2-Dichloroethane	1,521,282	1,477,242	44,040	2.98
Di-(2-ethylhexyl) phthalate	226,769	168,491	58,278	34.59
1,4-Dioxane	238,040	157,118	80,922	51.50
Isopropyl alcohol (mfg.- strong acid process)	608,856	159,040	449,816	282.83
Formaldehyde	5,977,311	4,622,975	1,354,336	29.30
SUBTOTAL	15,412,655	16,255,880	-843,225	-5.19
TOTAL FOR ALL TRI CARCINOGENS	15,540,832	16,378,535	-837,703	-5.11

Decreases in transfers to public sewage from 1988 to 1989 were spread more evenly among industries than the increases. Eight industries reported decreases in transfers to public sewage greater than 1 million pounds each. The largest decrease was associated with the Fabricated Metals industry, whose transfers to public sewage decreased by more than half (52 percent), from 17.5 million pounds in 1988 to 8.4 million pounds in 1989. Facilities in the Printing industry slashed their transfers to POTWs by over three-quarters (78 percent, from 3.5 million pounds in 1988 to 748,000 pounds in 1989). Two Cookson Graphics facilities in Holyoke, Massachusetts, greatly influenced the net change in transfers to POTWs for the Printing industry by together reporting 3.0 million pounds less of such transfers in 1989 than in 1988. Another large *percentage* reduction showed in the Tobacco industry, whose TRI facilities decreased transfers to POTWs by 98 percent (775,000 pounds) from 1988 to 1989. (See Figure 4-41; Table 4-11; and Appendix F, Table F-12.)



Map 4–7. Changes in TRI Transfers to Public Sewage by State, 1988–1989.

OFF-SITE TRANSFERS

This section discusses changes in "*off-site transfers*," which include transfers to waste management facilities other than POTWs, for treatment, storage or disposal. (Changes in transfers to public sewage are discussed above.) Off-site receiving facilities might be owned by the reporting facility or its parent company. They may be enterprises such as incinerators or landfills. (See Box 4-E for a general discussion of off-site transfers and Chapter 3 for an analysis of 1989 off-site transfers.)

TRI off-site transfers decreased by 168.6 million pounds from 1988 to 1989.

Off-site transfers of TRI chemicals (excluding delisted chemicals) to waste management facilities other than POTWs dropped from 1.1 billion pounds in 1988 to 913.1 million pounds in 1989, a decrease of 168.6 million pounds, marking the largest *absolute* decrease recorded for any of the TRI release or transfer categories. In 1989, off-site transfers accounted for a slightly lower percentage of the total TRI releases and transfers than in the previous year (16 percent as compared to 17 percent in 1988). (See Table 4-2.)

The 168.6-million-pound net decrease in off-site transfers from 1988 to 1989 was the result of 456.6 million pounds of decreases, partially offset by 288.0 million pounds of increases. The number of facilities showing increases (6,104) exceeded the number showing decreases (5,803). However, the number of facilities showing decreases in off-site transfers from 1988 to 1989 in excess of 10 million pounds (82) was considerably larger than the number showing increases of that magnitude (43).

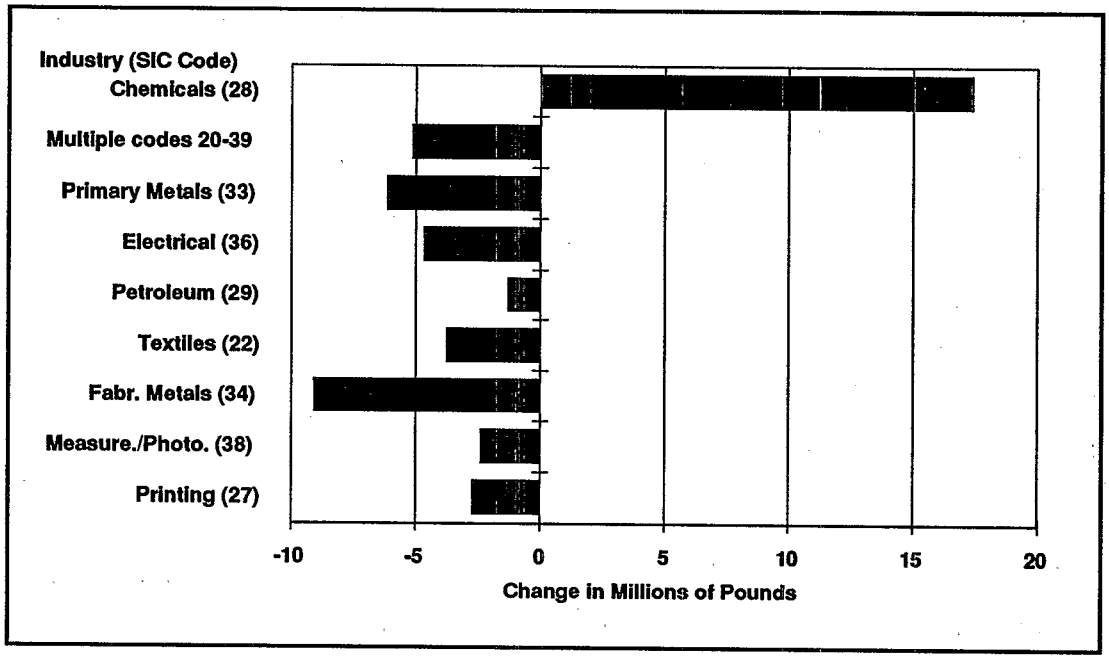


Figure 4–41. Industries with Changes in TRI Transfers to Public Sewage Greater than 1 Million Pounds, 1988–1989. (Industries shown in descending order according to public sewage transfer totals.)

More than 20 decreasing facilities showing decreases would have to be removed from the database to make the net change in off-site transfers from 1988 to 1989 an increase.

In addition to the general reasons why a facility's TRI amounts might decrease or increase between two years (see Box 4-B), off-site transfers may change for the following reasons: 1) breakdowns in on-site treatment equipment could result in greater off-site transfers in one of the two years; 2) a change in the composition of wastes sent off site made them acceptable for recycling or reuse in one year, but not the other (transfers of materials sent for recycling or reuse are currently exempt from TRI reporting); 3) regulatory restrictions or the capacity limitations of on-site treatment equipment made off-site transfers necessary in one year and not another; and 4) in the case of mineral acids, it is possible that in a previous year a facility incorrectly reported amounts of neutralized acids. Mineral acids that have been neutralized prior to transfer should be reported as zero.

Chemical Distribution

Off-site transfers decreased for 140 TRI chemicals, increased for 100, and remained the same for two chemicals between 1988 and 1989. (An additional 78 TRI chemicals were not associated with off-site transfers in either year, either because no reports were filed or because no off-site transfers were reported.) Most large changes in off-site transfers of TRI chemicals (excluding delisted chemicals) between 1988

and 1989 were decreases. Off-site transfers of 30 chemicals decreased by more than one million pounds each, while off-site transfers increased in such large amounts for only seven TRI chemicals. (See Figure 4-42 and Table 4-23.)

Off-site transfers of 4 TRI chemicals decreased by greater than 15 million pounds each from 1988 to 1989.

Off-site transfers of four TRI chemicals (sulfuric acid, hydrochloric acid, zinc compounds, and methanol) decreased by more than 15 million pounds each from 1988 to 1989. Sulfuric acid, the second-ranked chemical for off-site transfers in both 1988 and 1989, led these decreases in off-site transfers with a 34.9-million-pound reduction (from 111.5 million pounds in 1988 to 76.7 million pounds in 1989). One facility (Ciba-Geigy Corporation in Queensbury, New York) alone showed a decrease from 1988 to 1989 in off-site transfers of sulfuric acid totaling 14.2 million pounds. The other three top chemicals for decreases in off-site transfers, hydrochloric acid, zinc compounds, and methanol, decreased by 27.0 million pounds, 24.2 million pounds, and 15.2 million pounds, respectively. Despite these significant decreases, zinc compounds and methanol remained among the top five chemicals for off-site transfers in 1989 for the second year in a row, and hydrochloric acid was in the top-ranked position in both years. (See Figure 4-42 and Table 4-23.)

While in many cases only a few individual facilities greatly influenced the overall changes in off-site transfers of specific chemicals, some single facilities experienced changes for a chemical greater than or in a different direction than the net change for all facilities for that chemical. For example, while net off-site transfers of zinc compounds decreased by 24.2 million pounds from 1988 to 1989, Wheeling-Pittsburgh Steel Corporation in Mingo Junction, Ohio, increased its off-site transfers of zinc compounds by 6.1 million pounds, from 320,000 pounds in 1988 to 6.4 million pounds in 1989.

Propylene registered the largest increase in off-site transfers from 1988 to 1989.

Off-site transfers of propylene increased by the largest absolute amount—5.5 million pounds (from 1.5 million pounds in 1988 to 7.1 million pounds in 1989). The TRI facility with the largest increase in propylene off-site transfers, Genesis Polymers (Marysville, Michigan), increased such transfers by 5.7 million pounds. Following propylene were manganese compounds, chromium compounds and lead compounds, which were associated with increases in off-site transfers from 1988 to 1989 of 4.2 million pounds, 3.4 million pounds, and 3.1 million pounds, respectively. (See Chapter 6 for a discussion of chromium compounds and lead compounds, two of the 33/50 Program chemicals.)

Chemical Classes

In both 1989 and 1988, three chemical classes—non-halogenated organics, metals and metal compounds, and mineral acids/salts—made up the bulk of the off-site transfers, with the other two chemical classes (halogenated organics and non-metallic inorganics) together comprising less than 12 percent of the total off-site transfers. (Mixtures and trade secrets cannot be assigned to specific chemical classes; see Chapter 3 for an explanation of chemical classes and Appendix B for a complete list of TRI chemicals, with their classes indicated.)

BOX 4-E. OFF-SITE TRANSFERS OF CHEMICAL WASTES

TRI facilities are required to report the amount of TRI chemicals in wastes transferred off site, as well as the locations to which these chemicals are transferred. (Off-site transfers of materials sent for recycling or reuse are currently exempt from TRI reporting, however, because the recycled/reused materials are considered products rather than wastes.)[3]

The ultimate disposition of chemicals transferred to off-site facilities varies and the amounts of TRI chemicals sent to off-site facilities for storage, disposal, or treatment do not directly indicate the amount or type of chemicals eventually released to the environment. Off-site facilities may store chemicals or release them to the environment in essentially the same form in which they were received. Chemicals may, for example, be deposited directly in landfills or injected into underground wells. Alternatively, off-site facilities may subject chemicals to varying degrees and types of treatment to reduce the amount and/or toxicity of chemicals that are released to the environment.

TRI forms indicate the amounts of chemicals initially transported off-site and the activities to be applied to the chemicals (like incineration). The final volume of release that occurs is not reported. Off-site transfer amounts described in this chapter should be interpreted with this distinction in mind.

Off-site transfers of the mineral acids/salts class decreased the most between 1988 and 1989.

Off-site transfers decreased for all five chemical classes, most notably for the mineral acids/salts class. The 69.8-million-pound reduction (a 24-percent decrease) in mineral acids/salts was largely the result of the large decreases in sulfuric acid and hydrochloric acid noted above. Off-site transfers of only two of the 12 TRI chemicals and chemical compounds in this class increased from 1988 to 1989. Off-site transfers of these two chemicals, hydrogen cyanide and hydrazine sulfate, each increased by less than 2,000 pounds, however. (See Figure 4-43 and Table 4-4.)

Off-site transfers decreased by more than 34 million pounds each for the non-halogenated organics and the metals and metal compounds classes.

Off-site transfers decreased by just over 34.0 million pounds each for the non-halogenated organics and the metals and metal compounds classes, representing 10 percent and 11 percent drops, respectively. Methanol registered the largest decrease for the non-halogenated organics class, with a 15.2-million-pound reduction, as noted above, while off-site transfers of 12 other non-halogenated organic chemicals each decreased by over 1 million pounds. Off-site transfers of only two non-halogenated organics, propylene and glycol ethers, each *increased* by at least that amount. Off-site transfers of zinc compounds decreased by 24.2 million pounds from 1988 to 1989, contributing largely to the 34.2-million-pound net decrease in off-site transfers seen for the metals and metal compounds class. (See Table 4-23.)

Similarly, more than one chemical figured prominently in the net 14.6-million-pound reduction in off-site transfers of halogenated organics. This net decrease was attributable to four chemicals in particular: dichloromethane, 1,1,1-trichloroethane, trichloroethylene, and Freon 113, the first three of which are 33/50 Program chemicals. (See Chapter 6 for further discussion of 33/50 Program chemicals). Off-

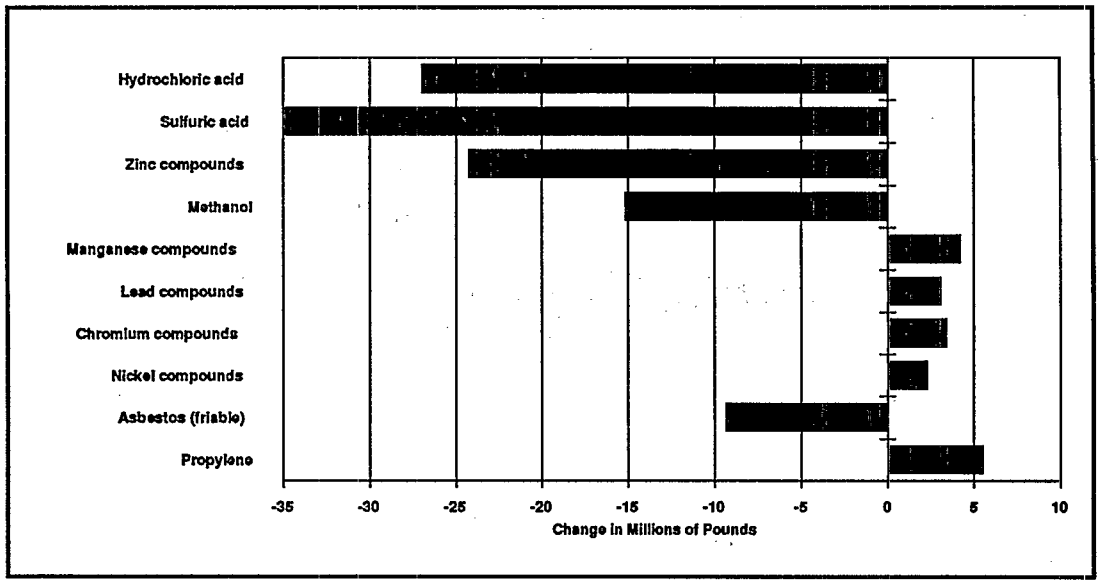


Figure 4–42. TRI Chemicals with the Greatest Changes in Off–site Transfers, 1988–1989. (Chemicals associated with the five greatest increases and the five greatest decreases in off-site transfers, shown in descending order according to 1989 off–site transfer totals.)

site transfers of these four chemicals each decreased by more than 1.5 million pounds from 1988 to 1989. Dichloromethane off-site transfers dropped the most, falling from 23.3 million pounds in 1988 to 18.6 million pounds in 1989.

Of the five TRI chemical classes, off-site transfers of non-metallic inorganics decreased by the largest *percentage* amount (28 percent), but the smallest *absolute* amount (8.3 million pounds). A significant change in off-site transfers of asbestos (friable) heavily influenced the overall change in off-site transfers for this class. This 9.3-million-pound decrease in off-site transfers of asbestos (friable) was offset partially by a smaller increase in off-site transfers of arsenic compounds totaling 1.4 million pounds.

Carcinogens

Off-site transfers of TRI carcinogens decreased by 19.4 million pounds from 1988 to 1989.

Off-site transfers of TRI carcinogens dropped from 110.4 million pounds in 1988 to 91.0 million pounds in 1989, a 19.4-million-pound decrease. Despite this significant decrease, TRI carcinogens made up 10 percent of the total off-site transfers to waste management facilities (other than POTWs) in both years. (Chapter 3 defines TRI carcinogens, and Appendix B lists all TRI chemicals, indicating those which are considered carcinogens.)

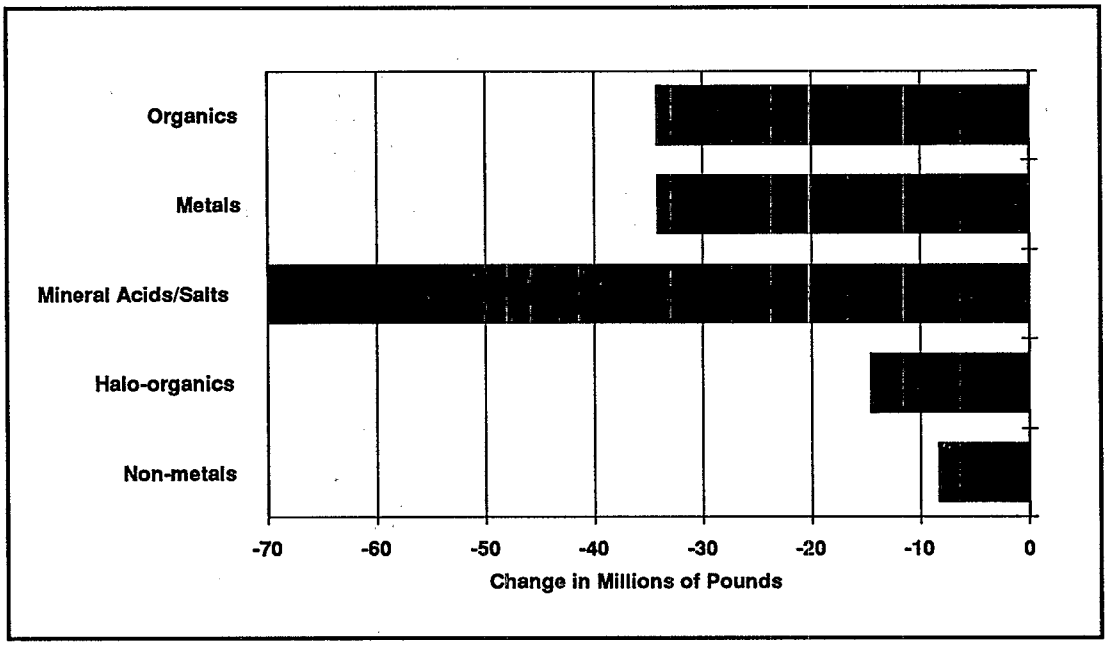


Figure 4–43. Changes in TRI Off–site Transfers by Chemical Class, 1988–1989. (Chemical classes shown in descending order according to 1989 off–site transfer totals.)

Off-site transfers of 28 TRI carcinogens decreased from 1988 to 1989, for each of four of these chemicals in amounts greater than 1 million pounds. While off-site transfers of 37 carcinogens increased from 1988 to 1989, the largest increase was less than 1.0 million pounds (0.6 million pounds). (See Figure 4-44 and Table 4-24.)

Off-site transfers of the carcinogen asbestos (friable) decreased the most from 1988 to 1989.

Asbestos (friable), the fourth-ranked TRI carcinogen for off-site transfers in 1989, showed the largest decrease for off-site transfers from 1988 to 1989 among the carcinogens. Off-site transfers of this chemical were cut in half from 1988 to 1989 due to a 9.3-million-pound decrease. Smaller, although still significant, *absolute* decreases in off-site transfers were recorded for the following TRI carcinogens: dichloromethane, chromium and styrene. Off-site transfers of these three chemicals each decreased by more than 1 million pounds from 1988 to 1989. Dichloromethane was the TRI carcinogen transferred off-site in the largest amounts in 1989, 18.6 million pounds, while chromium and styrene were ranked third and fifth, respectively, for off-site transfers of carcinogens in 1989.

Geographical Distribution

New Jersey showed the largest decrease in TRI off-site transfers from 1988 to 1989.

In 33 states, there was a net change (either an increase *or* a decrease) in off-site transfers greater than 1 million pounds. The greatest net decrease in off-site transfers for a state occurred in New Jersey. Off-site transfers for New Jersey TRI facilities totaled 28.8 million pounds in 1989, a decrease for that state of 40.6 million pounds (58 percent) over the previous year. Two New Jersey facilities made significant

Table 4–23. TRI Chemicals with Changes in Off-site Transfers Greater than 1 Million Pounds, 1988-1989.

CHEMICAL	OFF-SITE 1989 Pounds	OFF-SITE 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
Sulfuric acid	76,658,766	111,521,491	-34,862,725	-31.26
Hydrochloric acid	98,579,539	125,532,607	-26,953,068	-21.47
Zinc compounds	58,396,436	82,634,351	-24,237,915	-29.33
Methanol	51,361,695	66,529,068	-15,167,373	-22.80
Asbestos (friable)	7,790,975	17,134,177	-9,343,202	-54.53
Total for Mixtures	4,083,095	11,555,465	-7,472,370	-64.67
Aluminum (fume or dust)	15,308,236	22,586,151	-7,277,915	-32.22
Copper compounds	9,260,237	14,132,655	-4,872,418	-34.48
Methyl isobutyl ketone	6,344,859	11,074,659	-4,729,800	-42.71
Dichloromethane	18,611,908	23,333,923	-4,722,015	-20.24
Copper	14,211,613	18,152,800	-3,941,187	-21.71
1,1,1-Trichloroethane	16,076,457	19,720,274	-3,643,817	-18.48
Xylene (mixed isomers)	33,376,628	36,601,977	-3,225,349	-8.81
n-Butyl alcohol	5,269,601	8,320,754	-3,051,153	-36.67
Nitric acid	23,432,733	26,208,435	-2,775,702	-10.59
Hydrogen fluoride	4,618,991	7,153,063	-2,534,072	-35.43
Ethylene glycol	15,166,084	17,694,059	-2,527,975	-14.29
Chromium	8,744,197	11,251,230	-2,507,033	-22.28
Zinc (fume or dust)	33,800,113	36,259,088	-2,458,975	-6.78
Phthalic anhydride	3,546,530	5,966,456	-2,419,926	-40.56
Methyl ethyl ketone	28,166,723	30,146,018	-1,979,295	-6.57
Phenol	4,450,815	6,353,268	-1,902,453	-29.94
Styrene	7,205,848	8,920,211	-1,714,363	-19.22
Trichloroethylene	4,604,388	6,279,008	-1,674,620	-26.67
Freon 113	4,494,178	6,166,166	-1,671,988	-27.12
Toluene	62,789,885	64,317,846	-1,527,961	-2.38
Ammonium sulfate (solution)	3,400,733	4,667,266	-1,266,533	-27.14
Nitrobenzene	108,436	1,371,395	-1,262,959	-92.09
p-Xylene	86,349	1,324,628	-1,238,279	-93.48
m-Xylene	287,999	1,515,972	-1,227,973	-81.00
Glycol ethers	8,768,086	7,665,668	1,102,418	14.38
Arsenic compounds	2,817,025	1,424,000	1,393,025	97.82
Nickel compounds	8,981,388	6,667,085	2,314,303	34.71
Lead compounds	18,716,125	15,616,088	3,100,037	19.85
Chromium compounds	17,052,690	13,621,533	3,431,157	25.19
Manganese compounds	24,751,216	20,510,975	4,240,241	20.67
Propylene	7,070,492	1,524,445	5,546,047	363.81
SUBTOTAL	708,391,069	871,454,255	-163,063,186	-18.71
TOTAL FOR ALL OTHERS	204,661,094	210,223,207	-5,562,113	-2.65
GRAND TOTAL	913,052,163	1,081,677,462	-168,625,299	-15.59

contributions to that state's 40.6-million-pound net reduction in off-site transfers: Allied-Signal Inc. in Elizabeth and Raritan River Steel Company in Perth Amboy. These two facilities together reported 33.0 million pounds less off-site transfers in 1989 than in 1988. Due to a process shut-down, the Allied-Signal facility alone contributed 28.2 million pounds to this combined decrease. (See Figures 4-45 and 4-46; Table 4-8; and Appendix F, Table F-13.)

Thirty-six additional states each showed a decrease in pounds of TRI chemicals transferred off-site in 1989 as compared to 1988. For New York and California, the state-wide decreases in off-site transfers represented percentage reductions of almost one half (45 percent and 49 percent, respectively). (See Table 4-8.)

The largest state-wide increase in off-site transfers from 1988 to 1989 occurred in Wisconsin...

Wisconsin was associated with the largest state-wide increase in off-site transfers between 1988 and 1989—8.9 million pounds (an increase from 29.5 million pounds in 1988 to 38.4 million pounds in 1989). The three facilities reporting the largest increases in off-site transfers in that state were two Waupaca Foundry Inc. facilities in Waupaca and Charter Processing in Saukville, which respectively transported 8.7 (the combined total for the two Waupaca plants) and 2.0 million pounds more TRI chemicals off site in 1989 than in 1988. (See Figures 4-45 and 4-47; Table 4-8; and Appendix F, Table F-13.)

... and Minnesota showed the 2nd-largest state-wide increase.

Minnesota facilities together showed the next highest state-wide increase in off-site transfers. This 8.2-million-pound increase brought the state's off-site transfer total up to 14.2 million pounds in 1989. Two 3M facilities were primarily accountable for this state-wide increase in off-site transfers: 3M Chemolite Center in Cottage Grove, with a 5.1-million-pound increase in off-site transfers, and 3M Consumer AV & Consumer Products in Hutchinson, with a 2.8-million-pound increase. (See Appendix F, Table F-13.)

Industrial Distribution

The Chemical and Primary Metals industries registered the 2 largest decreases in off-site transfers of TRI chemicals from 1988 to 1989.

The most dramatic industry-wide changes in off-site transfers from 1988 to 1989 were associated with the Chemical and Primary Metals industries, the two industries which also dominated off-site transfers in both 1988 and 1989. In both years, the Chemical and Primary Metals industries accounted for 38 percent and 23 percent, respectively, of total TRI off-site transfers. The Chemical industry decreased off-site transfers the most between the two years, by 68.8 million pounds (from 416.3 million pounds in 1988 to 347.5 million pounds in 1989), while facilities in the Primary Metals industry collectively reduced off-site transfers by 41.7 million pounds to 213.1 million pounds in 1989. Four of the top five decreasing facilities for off-site transfers from 1988 to 1989 were members of either the Chemical industry (SIC 28) or Primary Metals industry (SIC 33): Allied-Signal Inc. (Elizabeth, New Jersey, SIC 28), Ciba-Geigy Corporation (Queensbury, New York, SIC 28), National Steel (Ecorse, Michigan, SIC 33), and Republic Engineered Steels Inc. (Canton, Ohio, SIC 33). (See Figure 4-48; and Appendix F, Table F-13.)

Table 4–24. TRI Carcinogens with Changes in Off-site Transfers Greater than 10,000 Pounds, 1988-1989.

CHEMICAL	OFF-SITE 1989 Pounds	1988 Pounds	CHANGE 1988-1989 Pounds	Percent
Asbestos (friable)	7,790,975	17,134,177	-9,343,202	-54.53
Dichloromethane	18,611,908	23,333,923	-4,722,015	-20.24
Chromium	8,744,197	11,251,230	-2,507,033	-22.28
Styrene	7,205,848	8,920,211	-1,714,363	-19.22
Polychlorinated biphenyls (PCBs)	4,232,348	5,104,473	-872,125	-17.09
Chloroform	715,733	1,470,764	-755,031	-51.34
Tetrachloroethylene	3,936,927	4,587,357	-650,430	-14.18
Formaldehyde	2,108,397	2,711,924	-603,527	-22.25
Vinyl chloride	79,626	653,787	-574,161	-87.82
Benzene	1,836,035	2,311,959	-475,924	-20.59
3,3'-Dichlorobenzidine	22,195	224,205	-202,010	-90.10
Nitrilotriacetic acid	34,105	191,003	-156,898	-82.14
Nickel	6,981,352	7,072,445	-91,093	-1.29
Carbon tetrachloride	1,097,405	1,184,831	-87,426	-7.38
1,4-Dichlorobenzene	104,091	138,882	-34,791	-25.05
Benzoic trichloride	4,117	22,572	-18,455	-81.76
2-Nitropropane	581	13,695	-13,114	-95.76
o-Toluidine	20,016	32,170	-12,154	-37.78
Ethyl acrylate	121,040	108,666	12,374	11.39
Lead	13,113,842	13,097,200	16,642	0.13
Acrylamide	128,199	110,540	17,659	15.98
Ethylene thiourea	22,451	2,500	19,951	798.04
1,1,2,2-Tetrachloroethane	174,099	152,618	21,481	14.08
Cadmium	239,648	217,612	22,036	10.13
4,4'-Methyenedianiline	306,171	280,887	25,284	9.00
Hydrazine	68,818	43,123	25,695	59.59
1,3-Butadiene	409,847	365,217	44,630	12.22
Toluene-2,6-diisocyanate	104,275	57,075	47,200	82.70
Bis(2-ethylhexyl) adipate	257,427	205,846	51,581	25.06
Toluene-2,4-diisocyanate	269,662	202,580	67,082	33.11
1,2-Dibromoethane	122,348	33,861	88,487	261.32
Epichlorohydrin	784,801	649,564	135,237	20.82
Di-(2-ethylhexyl) phthalate	2,373,762	2,233,846	139,916	6.26
Arsenic	237,299	64,219	173,080	269.52
Acrylonitrile	1,310,242	1,099,741	210,501	19.14
Diaminotoluene (mixed isomers)	1,104,838	745,795	359,043	48.14
Dichlorobenzene (mixed isomers)	500,636	124,378	376,258	302.51
1,2-Dichloroethane	2,608,364	2,132,084	476,280	22.34
Hexachlorobenzene	1,452,751	964,719	488,032	50.59
Isopropyl alcohol (mfg.- strong acid process)	1,435,377	820,681	614,696	74.90
SUBTOTAL	90,671,753	110,072,360	-19,400,607	-17.63
TOTAL FOR ALL CARCINOGENS	91,010,177	110,400,194	-19,390,017	-17.56
TOTAL FOR ALL TRI CHEMICALS	913,052,163	1,081,677,462	-168,625,299	-15.59

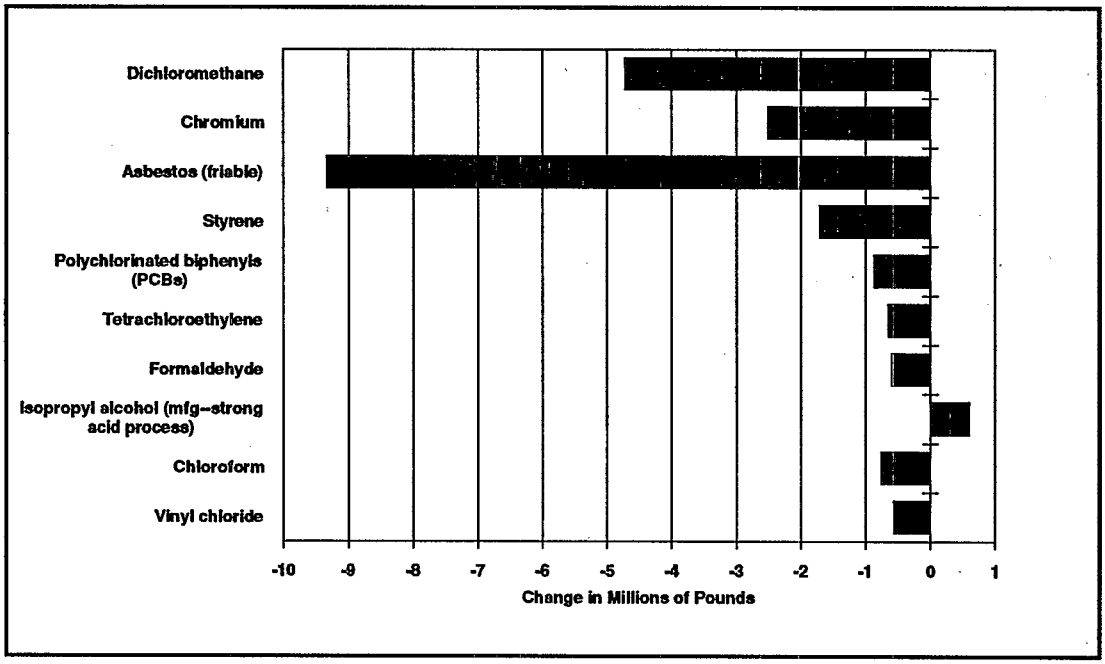


Figure 4–44. TRI Carcinogens with Changes in Off–site Transfers Greater than 500,000 Pounds, 1988–1989.
(Carcinogens shown in descending order according to 1989 off–site transfer totals.)

14 more industries showed decreases in off-site transfers from 1988 to 1989.

Fourteen additional industries were associated with decreases in off-site transfers from 1988 to 1989, while only a total of six industries showed increases. In only two of the latter cases were the industry-wide increases greater than 1 million pounds each. The industry-wide increases in off-site transfers for some industries were dwarfed by many of the industry-wide decreases in off-site transfers for others. For example, the decrease reported by the Chemical industry was 17 times greater than the increase reported by the largest increasing industry for off-site transfers, the Miscellaneous Manufacturing industry (SIC code 39). Furthermore, the top seven industries for decreases of off-site transfers from 1988 to 1989 were each associated with changes greater than the increase seen for the Miscellaneous industry. (See Figure 4-48 and Table 4-11.)

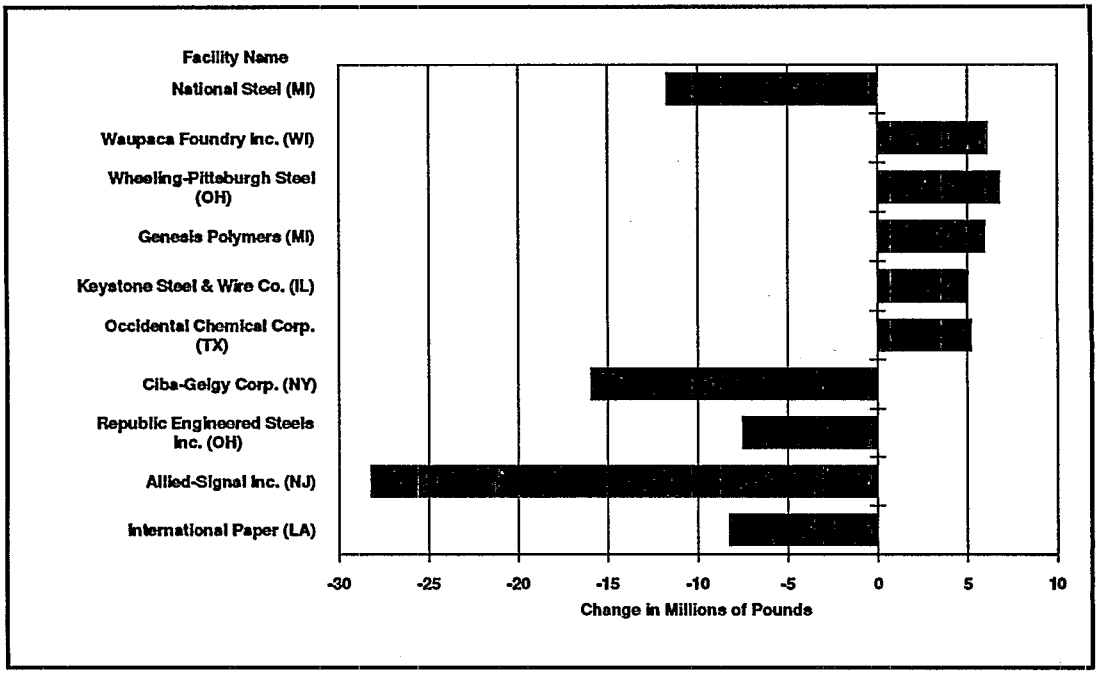


Figure 4–45. TRI Facilities with the Greatest Changes in Off–site Transfers, 1988–1989. (Facilities reporting the five greatest increases and the five greatest decreases in off-site transfers, shown in descending order according to 1989 offsite transfer totals.)

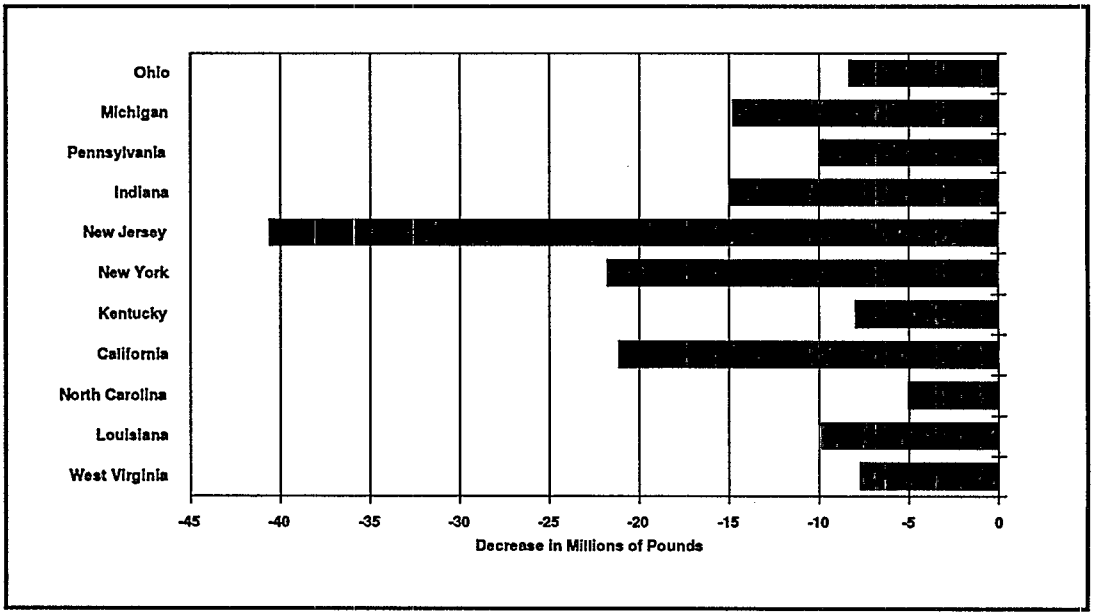


Figure 4–46. States with Decreases in TRI Off–site Transfers Greater than 5 Million Pounds, 1988–1989. (States shown in descending order according to 1989 off–site transfer totals.)

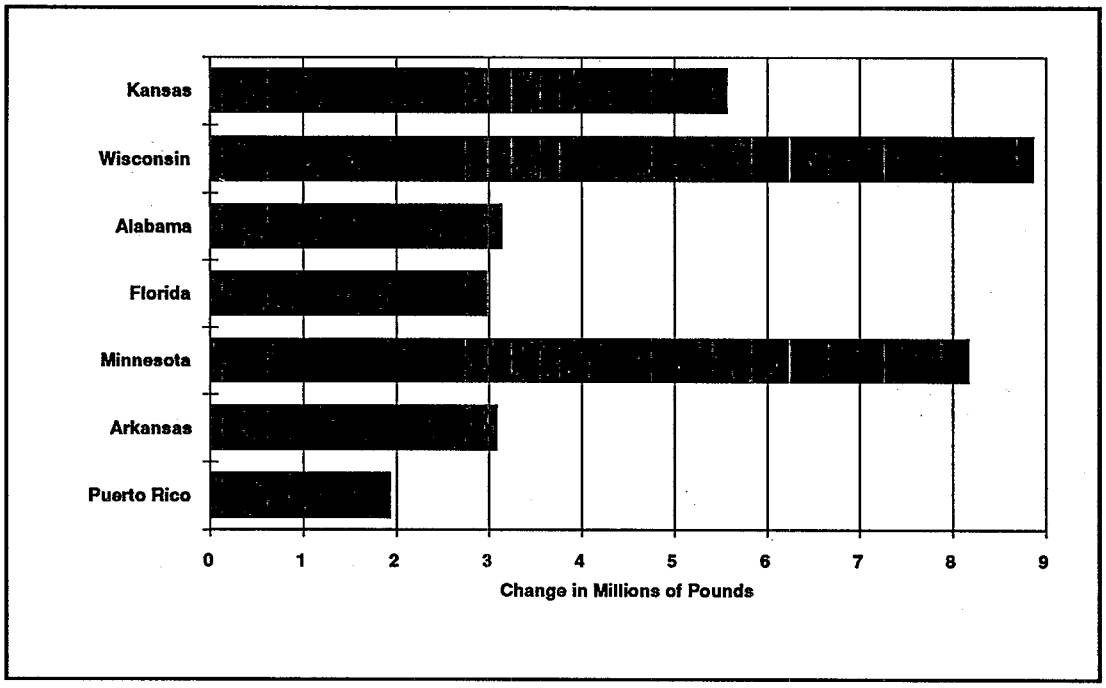


Figure 4–47. States with Increases in TRI Off–site Transfers Greater than 1 Million Pounds, 1988–1989.
(States shown in descending order according to 1989 off–site transfer totals.)

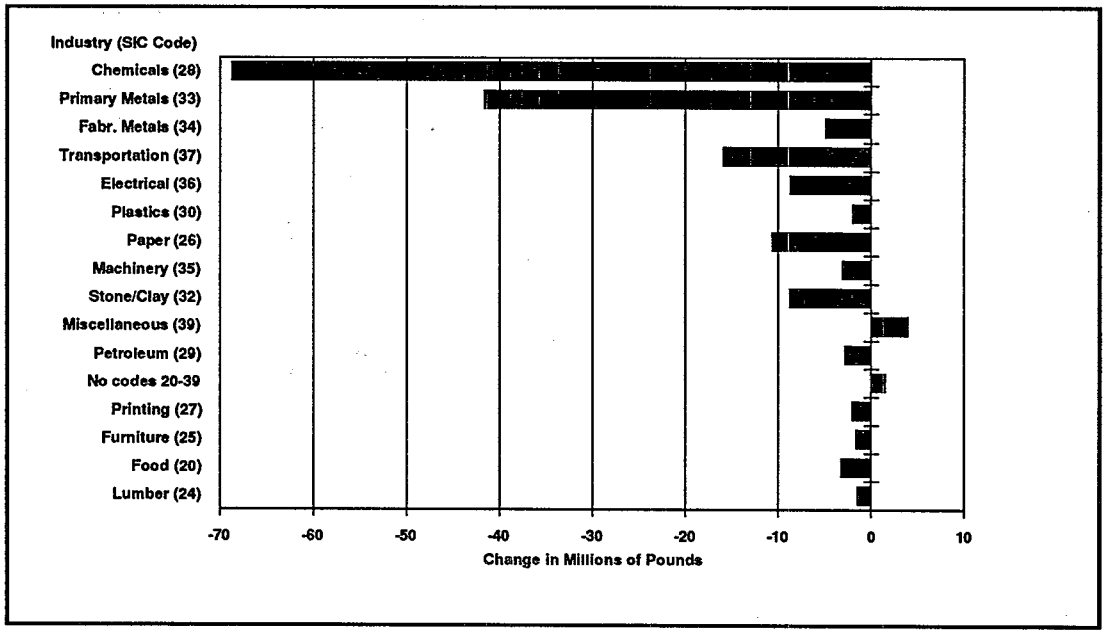


Figure 4–48. Industries with Changes in TRI Off–site Transfers Greater than 1 Million Pounds, 1988–1989.
(Industries shown in descending order according to 1989 off–site transfer totals.)

NOTES

1. Comparisons of TRI data are complicated by the fact that each year some facilities are entering the system for the first time, and other facilities are dropping out. Furthermore, a particular facility may report a given chemical in only one of two years. A change between years that appears to be an increase or a decrease may be entirely or in part the result of these changes in reporting. If a facility reported in 1988 but not in 1989, it is counted as a decrease in this report. Similarly, a facility reporting on a chemical in 1989 but not in 1988 is counted as an increase. (See Box 4-A for possible reasons why an individual facility may not report the same chemical in two different years or may not report to TRI at all in one of two years.) For these reasons, in the second TRI national report (1988), when comparing data for 1987 and 1988, a subset of the total data was examined. This subset consisted of "matched data," data for chemicals reported in *both* years by facilities that reported in *both* years. A subset ("matched data") of the overall TRI data was not analyzed for this report because overall totals for 1988 and 1989 were not sufficiently different than the totals from the subsets of matched facilities and matched chemicals to warrant the complexities of a three-year analysis of "matched" data. (See Chapter 8 for further discussion of facilities and forms reported in one or more years and for methods of analysis.)

2. Only facilities which manufacture isopropyl alcohol by the "strong acid process" are required to report. However, since this method of manufacture has been replaced, to a large extent, by other manufacturing processes, some of the releases and transfers reported to TRI may have been reported in error.

3. Prior to 1989 reporting, sodium hydroxide (solution) was deleted from the TRI chemical list. Because this chemical represented the single base in this TRI class, the chemical class name "acids/bases/salts", used in the 1987 and 1988 National Reports, has been changed to "mineral acids/salts" throughout this report. See Chapter 2, Box 2-A,{old number} for further discussion of TRI chemical delistings.

4. The TRI chemical classes are: non-halogenated organics; mineral acids/salts; metals and metal compounds; halogenated organics; and non-metallic inorganics. (See Chapter 3.) In figures and tables throughout this report, class names are abbreviated as: organics; mineral acids/salts; metals; halo-organics; and non-metals.

5. From report prepared by Information Research for the Louisiana Chemical Association, *Louisiana Chemical Industry Emissions Report, 1988-1989: A Comopilation and Comparison of Toxic Release Inventory Data*, Baton Rouge, October 1990.

6. Releases to surface impoundments include only those intended for "final disposal."

7. Much of the ammonium sulfate (solution) probably resulted from the addition of sulfuric acid to an ammonia-laden wastestream to neutralize it. The salt thus produced (ammonium sulfate (solution)) primarily affects water quality by the introduction of ammonia.

8. This recycle/reuse "loophole" will close with calendar year 1991 reports, due July 1, 1992. (See Chapter 5.)

Photo: Daniel J. Kasztelan

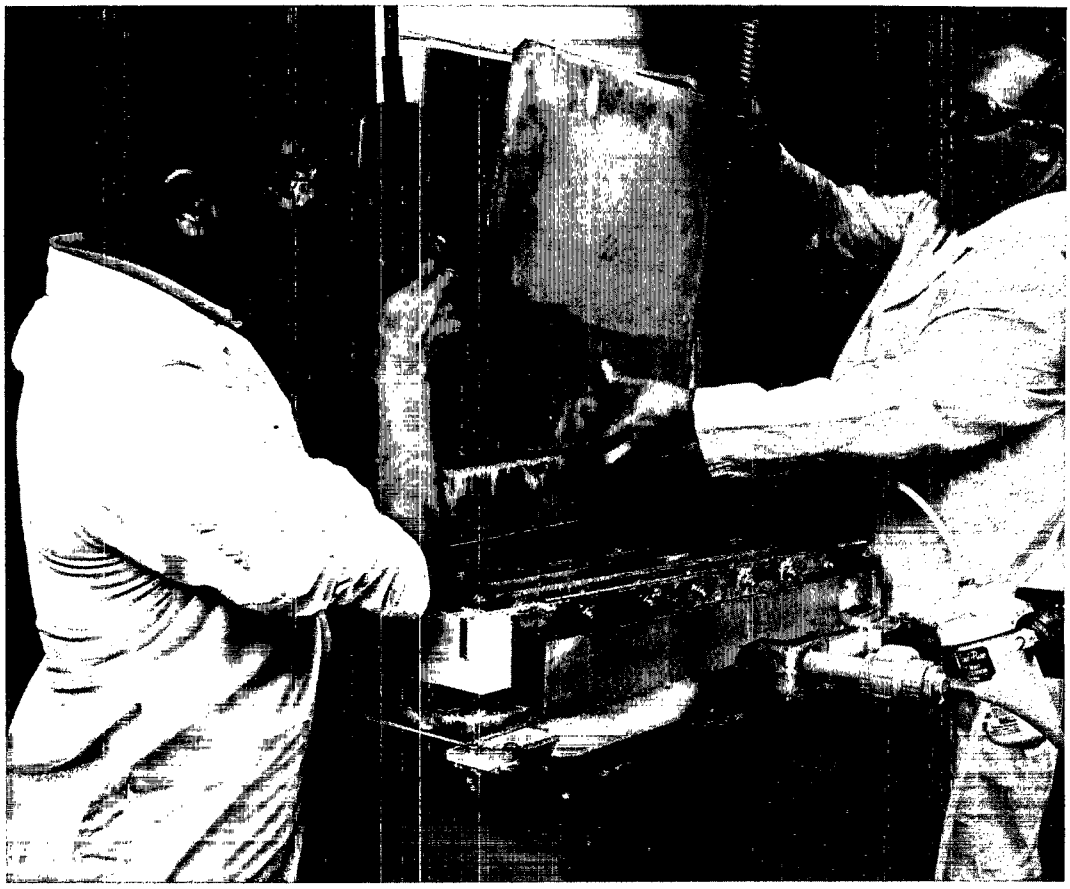


Photo: General Dynamics

CHAPTER 5. POLLUTION PREVENTION

INTRODUCTION

TRI will help assess pollution prevention efforts.

The Toxics Release Inventory (TRI) is one of several recent tools that is helping the public, legislative bodies, and industry better understand the nature and magnitude of chemicals in the environment, spurring new approaches to environmental protection. In the early years of the environmental movement, efforts focused upon regulatory action to control where and how chemical wastes would enter the air, land, and water. More recently, efforts have shifted from the control of pollution to the prevention of pollution. In this decade, the Pollution Prevention Act of 1990, the Clean Air Act Amendments, and other governmental as well as private initiatives will provide a new approach to the management of toxic chemicals in our communities. TRI will be a valuable tool in the measurement of this change, because it will provide information on efforts by reporting facilities to prevent or reduce toxic chemical pollution.

Source reduction makes the prevention of pollution a priority over waste treatment.

Source reduction (also called pollution prevention), is the prevention or reduction of pollution at the place of its origin. Source reduction is the option of choice in the waste management hierarchy because it eliminates or reduces the amount of waste that must be managed in the future. In order of preference, the waste management hierarchy consists of the following actions: source reduction, recycling, treatment, and disposal (including storage) or any other direct release to the environment, making disposal or other release into the environment the least desirable option.

The TRI Form R currently contains a voluntary waste minimization reporting section.

Under current TRI reporting requirements, facilities have the option to provide information on waste minimization activities for reported chemicals. Waste minimization activities include both source reduction and recycling. The current optional section of Form R allows respondent facilities to provide the following four data elements: an indication of the type of waste minimization activity undertaken; estimates of the quantities of the TRI chemical in wastes generated in both the current reporting year and the prior year or the percentage change from the prior year quantity with an indication if the change was an increase or a decrease; an index of activity or production level directly related to the reported chemical at the facility; and, an indication of the reason why the waste minimization activity was implemented. The facility may report either a percentage change or the actual "wastes generated" in both the current and prior years. The waste generated is the pounds of a TRI chemical contained in a facility's wastestream before any on-site treatment or disposal occurs or before the wastes are transferred to a publicly owned treatment work (POTW) or other off-site facility for treatment, reuse, or disposal. (See Figure 5-1.)

Because this section of the TRI reporting form contains information that was voluntarily submitted, these data have several limitations. Many facilities with decreases in releases and transfers from 1988 to 1989, as well as prior years, did not

8. POLLUTION PREVENTION: OPTIONAL INFORMATION ON WASTE MINIMIZATION (Indicate actions taken to reduce the amount of the chemical being released from the facility. See the instructions for coded items and an explanation of what information to include.)				
A. Type of Modification (enter code)	B. Quantity of the Chemical in Wastes Prior to Treatment or Disposal		C. Index	D. Reason for Action (enter code)
	Current reporting year (pounds/year)	Prior year (pounds/year)	Or percent change (Check (+) or (-))	
M	_____	_____	☐ + ☐ - _____ %	☐.☐	R

Figure 5–1. The Optional Waste Minimization Section of TRI Form R, 1989.

provide waste minimization data and their decreases in TRI releases and transfers may have occurred for reasons other than waste minimization. The data, therefore, do not provide reliable national estimates of the total quantity of wastes minimized, nor do they provide a reliable basis for making conclusions regarding the most commonly used minimization methods or the reasons for which waste minimization was undertaken. The data do provide valuable insights into the potential avenues by which waste minimization can be achieved, reasons for implementation within individual facilities, and methods of assessing the success of programs to reduce wastes.

The remainder of this chapter contains three distinct analyses. The first section discusses which of the top TRI *facilities* reported the voluntary waste minimization data. The second section analyzes *quantities* of change in waste generation between 1988 and 1989, as reported on a subset of forms with sufficient waste minimization data for quantitative analysis. Finally, the third section looks at *cumulative changes* in waste generation over the four-year period between 1986 and 1989, which can be derived from a subset of forms from facilities that reported waste minimization on the same chemical in 1987, 1988 and 1989.

These analyses of TRI waste minimization data are followed by a description of the Pollution Prevention Act of 1990 and its initial implementation, including a preview of how these legislative requirements will affect future analyses of changes in waste generation. Such a preview takes into account future increased TRI waste minimization reporting, which will be mandatory rather than voluntary.

FACILITIES REPORTING WASTE MINIMIZATION

Of all facilities reporting to TRI in 1989, 11% reported attempts to minimize TRI chemical wastes.

Eleven percent of all TRI facilities, or 2,415 out of the 22,569 TRI facilities that filed forms in 1989, reported attempts to minimize TRI chemical wastes containing one or more of the chemicals reported to TRI. The forms containing waste minimization information represented 6 percent of all TRI forms submitted for 1989 (4,845 TRI forms out of a total of 81,891 filed forms). These levels of waste minimization reporting were very similar to those in 1987 and 1988. (Note that waste minimization is reported for *one* TRI chemical per form.)

10 of the 50 top TRI facilities reported waste minimization data.

Ten of the 50 facilities reporting the largest releases and transfers for 1989—and two of the top five facilities—reported waste minimization data on at least one of the TRI chemicals they reported. American Cyanamid Company, the second-ranked facility (a Chemical Products manufacturer in Westwego, Louisiana), reported waste minimization on three of the 23 chemicals it reported in 1989. Fourth-ranked Vulcan Chemicals (a Chemical Products facility in Wichita, Kansas) reported waste minimization on two of its 28 TRI chemicals. (See Table 5-1.)

Seven other facilities out of the top 50 reported waste minimization, including Du Pont facilities in New Johnsonville, Tennessee and Pass Christian, Mississippi; Atochem in Wichita, Kansas; Allied Signal in Hopewell, Virginia; Arcadian Corporation in Geismar, Louisiana; National Steel Corporation in Portage, Indiana; Union Oil Company in Kenai, Alaska; and Herculaneum Smelter in Herculaneum, Missouri. Herculaneum Smelter and National Steel Corporation are both Primary Metals facilities; all the other facilities are Chemical manufacturers.

WASTE MINIMIZATION DATA REPORTED IN 1989

Creating a Subset

The subset of 1989 waste minimization forms reported waste generation and production data for 1988 and 1989.

Although 6 percent of all TRI forms submitted in 1989 had some waste minimization data, the full set of waste minimization forms could not be analyzed for information on the volumes of waste reduced. Many forms did not contain volume data or contained incomplete data. For this reason, a subset of waste minimization forms was chosen that met the following criteria:

- contained data on the volume of the TRI chemical in the wastes generated in the current (1989) and prior year (1988), prior to any on-site treatment, and
- contained a production index.

A total of 2,240 forms was included in this subset.

A total of 2,240 forms out of the total 4,845 waste minimization forms met the above criteria and was included in the subset.

Reported Waste Minimization of TRI Chemicals in Waste

Voluntary waste minimization information showed a 13% reduction in waste generation, 1988-1989.

The 2,240 waste minimization forms for 1989 included in the subset reported amounts of certain TRI chemicals in waste generated for both 1988 and 1989. TRI chemical waste generation for the subset was 514.2 million pounds in 1988 and 445.2 million pounds in 1989, accounting for an overall reduction of 13 percent (69.0 million pounds).[1] (See Figure 5-2.)

Table 5-1. Top 50 Facilities for TRI Total Transfers and Releases, Showing Waste Minimization Forms Reported, 1989.

TRI RELEASE AND TRANSFER RANK(a) 1989	1988	1987	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent	FORMS Number	FORMS WITH WASTE MINIMIZATION Number
1	1	3	28	Monsanto Co.	Alvin	Brazoria	TX	206,533,205	3.62	23	0
2	2	1	28	American Cyanamid Co.	Westwego	Jefferson	LA	192,350,800	3.37	23	3
3	5	8	33	Magnesium Corp. of America	Tooele	Tooele	UT	119,060,425	2.09	5	0
4	6	12	28	Vulcan Chemicals	Wichita	Sedgwick	KS	92,349,716	1.62	28	2
5	4	6	28	Du Pont Beaumont Works	Beaumont	Jefferson	TX	88,094,984	1.54	35	0
6	7	7	28	BP Chemicals	Port Lavaca	Calhoun	TX	65,543,672	1.15	24	0
7	10	27	Mult	Inland Steel Co.	East Chicago	Lake	IN	57,273,300	1.00	34	0
8	13	9	28	Du Pont	New Johnsonvil	Humphreys	TN	57,022,345	1.00	10	1
9	11	11	28	BP Chemicals Inc.	Lima	Allen	OH	56,731,350	0.99	24	0
10	15	30	28	Atochem N.A.— Racon Facility	Wichita	Sedgwick	KS	54,505,751	0.96	10	3
11	14	18	28	Columbian Chemicals Co.	Saint Louis	St Louis	MO	52,461,020	0.92	4	0
12	20	21	28	Tennessee Eastman Co.	Kingsport	Sullivan	TN	45,253,659	0.79	81	0
13	18	20	28	Courtaulds Fibers Inc.	Lemoyne	Mobile	AL	44,397,570	0.78	8	0
14	16	19	28	Du Pont Delisle Plant	Pass Christian	Harrison	MS	42,517,217	0.75	8	1
15	22	32	28	BASF Corp.	Geismar	Ascension	LA	40,802,088	0.72	36	0
16	28	38	28	Du Pont	Louisville	Jefferson	KY	39,829,058	0.70	13	0
17	26	28	33	Asarco Inc.	East Helena	Lewis And Clar	MT	36,615,059	0.64	10	0
18	17	17	28	Allied Signal	Hopewell	Hopewell City	VA	34,748,970	0.61	17	4
19	29	33	28	Du Pont Victoria Site	Victoria	Victoria	TX	32,314,457	0.57	32	0
20	—	—	28	Kaiser Aluminum & Chemical Corp. (b)	Mulberry	Polk	FL	32,013,400	0.56	1	0
21	36	39	28	Filtrol Corp.	Vernon	Los Angeles	CA	29,595,850	0.52	4	0
22	45	48	Mult	3M Consumer AV & Consumer Products	Hutchinson	Mc Leod	MN	28,998,967	0.51	17	0
23	12	40	28	Triad Chemical	Donaldsonville	Ascension	LA	26,152,046	0.46	6	0
24	42	49	28	BASF Corp.	Lowland	Hamblen	TN	25,624,950	0.45	9	0
25	24	41	28	Monsanto Co.	Cantonment	Escambia	FL	25,622,958	0.45	22	0
26	35	24	28	Monsanto Co.	Cahokia	St Clair	IL	25,261,353	0.44	20	0
27	23	14	28	Arcadian Corp.	Geismar	Ascension	LA	24,967,500	0.44	9	6
28	31	51	33	National Steel Corp.	Portage	Porter	IN	24,586,030	0.43	5	1
29	27	45	28	The Upjohn Co.	Kalamazoo	Kalamazoo	MI	22,997,339	0.40	29	0
30	37	64	33	Phelps Dodge Mining Co.	Playas	Hidalgo	NM	20,847,699	0.37	7	0
31	19	22	28	Sterling Chemicals Inc.	Texas City	Galveston	TX	20,574,970	0.36	31	0
32	39	31	28	Union Oil Co.	Kenai	Kenai Peninsul	AK	18,558,521	0.33	8	1
33	38	42	38	Eastman Kodak Co.	Rochester	Monroe	NY	18,123,187	0.32	69	0
34	57	95	28	Du Pont Sabine River Works	Orange	Orange	TX	18,010,133	0.32	35	0
35	75	69	28	Texasgulf Inc.	Aurora	Beaufort	NC	17,852,400	0.31	7	0
36	54	72	28	3M	Cordova	Rock Island	IL	17,631,532	0.31	29	0
37	30	36	33	National Steel	Ecorse	Wayne	MI	17,562,820	0.31	26	0
38	9	15	28	Freeport McMoran,Agrico Chemical Div.	Donaldsonville	Ascension	LA	17,254,750	0.30	6	0
39	32	23	33	Herculaneum Smelter	Herculaneum	Jefferson	MO	17,110,851	0.30	9	4
40	25	25	33	Asarco Inc.	Hayden	Gila	AZ	16,574,800	0.29	8	0
41	50	—	33	Copper Range Co.	White Pine	Ontonagon	MI	16,330,870	0.29	6	0
42	44	71	28	Pfizer Pigments Inc.	East Saint Louis	St Clair	IL	16,071,496	0.28	8	0
43	49	305	Mult	Elkem Metals Co.	Marietta	Washington	OH	15,771,470	0.28	8	0
44	56	4	33	Kennecott Utah Copper	Bingham Canyo	Salt Lake	UT	15,473,300	0.27	14	0
45	8	13	28	Freeport McMoran, Agrico Chemical Div.	Uncle Sam	St James	LA	15,410,826	0.27	5	0
46	41	34	28	Air Products Mfg. Corp.	Pasadena	Harris	TX	15,190,634	0.27	12	0
47	34	29	28	Coastal Chem Inc.	Cheyenne	Laramie	WY	15,133,055	0.27	9	0
48	80	110	29	Amoco Oil Co.	Texas City	Galveston	TX	14,217,928	0.25	25	0
49	47	58	28	Mississippi Chemical Corp.	Yazoo City	Yazoo	MS	14,176,423	0.25	8	0
50	43	88	33	Cyprus Miami Mining Corp.	Claypool	Gila	AZ	13,660,904	0.24	12	0
				SUBTOTAL				1,975,763,608	34.63	889	26
				TOTAL FOR ALL OTHERS				3,729,906,772	65.37	81,002	4,819
				GRAND TOTAL				5,705,670,380	100.00	81,891	4,845

(a) — Indicates facilities that did not report in that year.
(b) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their total releases and transfers is 4,487,000 pounds.

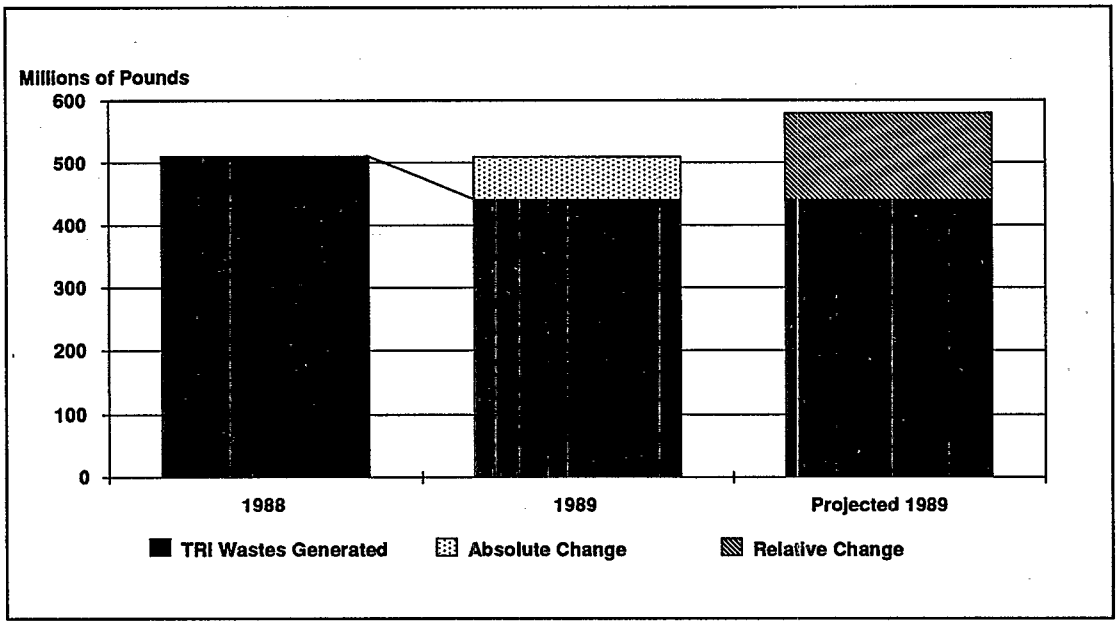


Figure 5–2. Absolute and Relative Change in TRI Waste Generation, 1988–1989 (for subset of 2,240 forms.

Facilities in the waste minimization subset also provided *production index* data with their forms. The production index is an indicator selected by the facility (such as number of cars produced, pounds of chemicals produced, or other factors as appropriate) to quantify overall levels of production activity as associated with the reported chemical. The production index is reported as a ratio of current year to prior year production: if production has doubled, the production index is 2.0; if it has halved, the index is 0.5; if it has not changed, the index is 1.0.

The *production index* allows the change in waste generation to be compared to the change in level of production associated with the reported chemical.

The production index provides an important additional perspective to TRI waste minimization data. The waste volumes reported above represent *absolute* changes in waste generation for the current and prior year, that is, changes in the amount of the TRI chemical in wastes at a facility without regard to changes in production. Another way to examine the data is to use production indices to calculate *relative* changes in waste generation, or, rather, examine waste generated as a function of a facility's production level. Waste generation data for the current year are evaluated to determine whether more, less, or equal waste generation took place that year relative to what would be expected by the relationship between the prior year's production level and the volume of the TRI chemical in wastes generated then. (See Box 5-A.)

BOX 5-A. ABSOLUTE AND RELATIVE WASTE MINIMIZATION: THE IMPACT OF PRODUCTION INDEX DATA

The availability of production index data lends additional perspective to an understanding of waste minimization. The following three examples show the impact of a modest increase in production, a large increase in production and a decrease in production. These examples look at data as reported in 1989 for the two years 1989 and 1988.

1) A MODEST INCREASE IN PRODUCTION

The Cincinnati Milacron-Heald Corp. plant in Fountain Inn, South Carolina, reported on waste minimization efforts for the methanol used at this facility. Production involving this chemical increased by 20 percent (production index of 1.2) from 1988 to 1989.

Waste Generation in 1988: 60,000 pounds
Waste Generation in 1989: 56,015 pounds
Production Index, 1988-1989: 1.2

Calculation of Absolute Change:

56,015 pounds actual 1989 waste	-	60,000 pounds actual 1988 waste	=	- 3,985 pounds absolute change in waste generated 1988 to 1989 (decrease)

Calculation of Relative Change

a) Projected Waste Generation:		60,000 pounds actual 1988 waste	x	1.2 production index	=	72,000 pounds projected 1989 waste
b)	56,015 pounds actual 1989 waste	-	72,000 pounds projected 1989 waste		=	- 15,985 pounds relative change in waste generated 1988 to 1989 (decrease)

This facility, therefore, reduced its methanol waste generation by 3,985 ponnds between 1988 and 1989. This would, however, have been a greater reduction if production had not increased, as is indicated by the larger relative decrease of 15,985 pounds. On the other hand, the facility's production increase was not so large as to cause a relative *increase* in waste generated.

BOX 5–A, continued.

2) A LARGE INCREASE IN PRODUCTION

The Woodford Marco Manufacturing company in Forest Grove, Oregon, reported waste minimization data for the chemical toluene. This facility reported that production associated with the use of toluene at this facility doubled from 1988 to 1989 (production index of 2.0).

Waste Generation in 1988: 18,430 pounds
Waste Generation in 1989: 26,624 pounds
Production Index, 1988-1989: 2.0

Calculation of Absolute Change:

26,624 pounds actual 1989 waste	-	18,430 pounds actual 1988 waste	=	+ 8,194 pounds absolute change in waste generated 1988 to 1989 (increase)

Calculation of Relative Change:

a) Projected Waste Generation:		18,430 actual 1988 waste	x	2.0 production index	=	36,860pounds projected 1989 waste
b)	26,624 pounds actual 1989 waste	-	36,860 pounds projected 1989 waste	=		- 10,236 pounds relative change in waste generated 1988 to 1989 (decrease)

This facility had a large increase in production, leading to an increase in the actual amount of toluene wastes generated. The calculation resulting in a relative *decrease* in waste generation shows that despite increased production, the amount of waste per unit of production did decrease, indicating successful waste minimization efforts.

3) A DECREASE IN PRODUCTION

The Engineering Fasteners Division of the Eaton Corporation in Cincinnati, Ohio, reported waste minimization data for the chemical 1,1,1-trichloroethane. They reported that production associated with the use of 1,1,1-trichloroethane at this facility decreased from 1988 to 1989 by 20 percent (production index of 0.8).

Waste Generation in 1988: 74,000 pounds
Waste Generation in 1989: 62,000 pounds
Production Index, 1988-1989: 0.8

BOX 5-A, continued.

Calculation of Absolute Change:

62,000 pounds actual 1989 waste	-	74,000 pounds actual 1988 waste	=	- 12,000 absolute change in waste generated 1988 to 1989 (decrease)

Calculation of Relative Change:

a) Projected Waste Generation:		74,000 actual 1988 waste	x	0.8 production index	=	59,200 pounds projected 1989 waste
b)	62,000 pounds actual 1989 waste	-	59,200 pounds projected 1989 waste		=	+ 2,800 pounds relative change in waste generated 1988 to 1989 (increase)

For this facility, the absolute reduction in 1,1,1-trichloroethane wastes was primarily due to the decrease in production reported. Because the relative change in waste generated was an increase, however, the amount of waste per unit of production had actually *increased*.

The subset showed a net 24% relative reduction in waste generated from 1988 to 1989.

Relative change in waste generation between 1988 and 1989 (quantity of waste prevented if the relative change is a negative one, or a reduction) can be calculated in a two step process.[2] First, the production index for 1989 is multiplied by the actual amount of waste generated in 1988, resulting in the 1989 projected waste, the amount of waste expected if no waste minimization took place. The amount of *projected* waste for 1989 is then subtracted from the *actual* amount of waste produced in 1989, revealing the amount of *relative* change between the two years. (See Box 5-A.) Because waste minimization reporting is presently voluntary, in most cases the relative change will indicate a *decrease* in waste generation. However, in some instances the change in waste generation shows a relative *increase*, perhaps because the facility chose to report the results of waste minimization efforts even when those efforts were not entirely successful. For 1988-89 the net relative change for all the facilities in the subset was a decrease of 141.9 million pounds, that is, a relative *reduction* of 141.9 million pounds, or 24 percent.

The amount of the overall *relative* change in waste generation for 1988-89 (a reduction of 141.9 million pounds) differed from the *absolute* change (a reduction of 69.0 million pounds) because the effect of production increases (production index greater than 1.0) for some facilities outweighed the impact of decreases (production

index less than 1.0) for others. (See Figure 5-2.) In other words, although production at certain facilities or industries may have declined, overall production at TRI facilities in this waste minimization subset increased between 1988 and 1989, and the decrease in waste generated per unit of product was not enough to offset it. This increase in production indicates that *increases* in TRI releases and transfers at some facilities may occur at the same time as legitimate waste minimization efforts. Both relative and absolute changes can be significant, for different reasons: the relative change may be more relevant for assessing a facility's progress in waste minimization efforts, whereas the absolute change may be more relevant for characterizing the potential impact of the industry's present activities involving the TRI chemical.

An example of production increases with an associated increase in waste generation is the Alcan Powders and Pigments company in Union, New Jersey, which *increased* its generation of copper in wastes by 42,003 pounds between 1988 and 1989, yet during the same period increased its production associated with the use of copper by 40 percent. (That is, the production index for 1989 compared to 1988 was 1.4.) The amount of *absolute* change was a waste increase of 42,003 pounds. Yet because the wastes increased by a lesser amount than would be expected on the basis of the production increase, the facility experienced a *relative reduction* of 1,465 pounds.

It should be noted that calculations of relative change based on production indices have certain limitations. Such calculations assume the amount of waste generated is directly related to production levels and source reduction or recycling activities only and is *not* affected by other factors, such as accidental spills, rainfall producing run-off from the site, or the purity of raw materials. Box 5-B discusses these limitations in more detail.

BOX 5-B. UNCERTAINTIES AND LIMITATIONS IN THE CALCULATION OF CHANGE IN WASTE GENERATION OVER TIME

Calculations of change in waste generation compare two amounts of a TRI chemical in wastes which were measured or estimated at two different points in time. The limitations in the interpretation of these numbers and the value of the change based on these numbers should be kept in mind when examining the data and assessing the conclusions drawn from them.

Absolute Change

Absolute change is the actual difference between the amounts of the TRI chemical in wastes generated in two different years. The difference in the amounts can be due to source reduction or recycling activities, but may also be due, in part, to such factors such as:

- Source reduction or recycling may have been applied to only one source of the waste at the facility, and any increases or decreases in waste generation may have been due to the other sources.

BOX 5-B, continued.

- No decrease in waste generation does not necessarily indicate that source reduction was not applied. Pollution prevention projects may take several years to become effective in reducing actual wastes, and results in the calendar year in which the activity was implemented may be minimal.

- The quantity of waste generated is often estimated rather than measured exactly. If the methods of estimating or measuring are changed from one year to the next, a change in the reported amount of waste may be solely due to the change in measuring technique.

- Changes in production levels may affect the overall amount of waste generated.

Relative Change

In addition to the factors cited above, the calculation of relative change has further limitations. Calculation of relative change based on a production index assumes that, other things being equal, the total amount of waste generated before treatment would be expected to increase as production rises (or that waste generation would decrease as production falls). That is, the amount of waste per unit of product is assumed to be the same at any level of production; therefore, multiplying the waste generated in the prior year would give the amount of waste that should be expected to be generated at the new production level. This *projected* amount of waste is then compared to the *actual* waste generated at the new production level. If the actual waste generated is less than the projected amount, the decrease is considered as the quantity of pollution prevented by the source reduction or recycling activities. However, factors other than the change in production level and source reduction or recycling may cause the actual waste generated to rise or fall. For example,

- Using a production index to project waste generation from one year to the next assumes that the amount of waste is a direct function of production. This may not be the case, for example, where surface water discharges come from storm run-off, in which case the amount of waste is related to the amount of rainfall in a given year. Also, more accidental spills in one year than another cause an increase or decrease in the reported change in waste generated between the years.

- As production rises, separate batch runs may be replaced by a continuous one with different waste characteristics.

- Calculating one production index to apply to all sources of wastes containing the TRI chemical may be difficult at a complex, multi-product facility. The TRI chemical may be used in many different processes. Over the course of a year each different process may have changed production levels by a different amount.

- Over the short term of a few years changes in the production process itself may not affect waste generation as significantly as source reduction and recycling activities. However, applying production indices to a base year five or six years in the past may not be appropriate if things other than production levels have changed significantly.

- Over a longer period of time a plant may change the type of product it manufactures, so that the TRI chemical is being used in an entirely different process with entirely different waste characteristics.

Geographical Distribution

Louisiana facilities reported the largest absolute and relative reduction in the subset.

Within the waste minimization subset, facilities in Louisiana reported waste minimization data showing the largest overall amounts of both absolute and relative waste reduction. Utah facilities reported the second highest level of *absolute* waste reduction, while Missouri facilities reported the second highest level of *relative* waste reduction. Fourteen of the top 20 waste minimization states had greater relative than absolute waste decreases (indicating increased levels of production for the facilities reporting waste minimization in those states). (See Figure 5-3 and Table 5-2.)

In addition to Louisiana and Utah, facilities in six other states reported more than four million pounds of absolute waste reduction each: Missouri, Virginia, Michigan, Pennsylvania, North Carolina and Ohio. Facilities in Nevada, Oregon, and Montana reported reducing their TRI wastes by more than 70 percent, while facilities in two additional states, Maine and Utah, reduced their wastes by more than half.

Waste Minimization by Industry

Primary Metals facilities reported the largest absolute waste reduction, while Chemical facilities had the largest relative waste reduction.

Within the waste minimization subset, facilities in the Primary Metals industry reported the largest amounts of *absolute* waste reduction (31.1 million pounds, for a 27 percent decrease), and the second largest amounts of *relative* waste reduction (a reduction of 28.8 million pounds, or a 25 percent decrease) in 1989. The Chemical

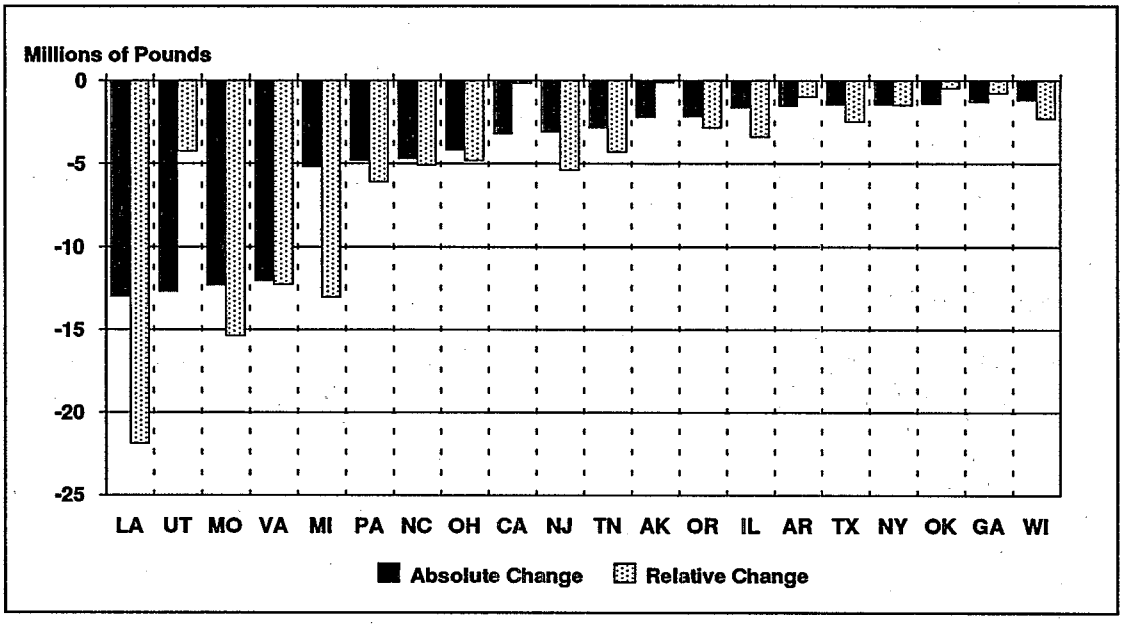


Figure 5–3. The 20 States Reporting the Largest Absolute Decrease in TRI Waste Generation, 1988–1989 (for subset of 2,240 forms).

Table 5-2. TRI Waste Minimization Data by State (Subset of 2,240 forms), 1988-1989.

STATE	FACILITIES	FORMS	RELEASES AND TRANSFERS 1989	WASTE GENERATED 1989	WASTE GENERATED 1988	ABSOLUTE CHANGE(a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE(c)	
	Number	Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
Louisiana	22	46	42,941,366	52,489,398	65,466,927	-12,977,529	-19.82	74,400,209	-21,910,811	-29.45
Utah	8	11	349,767	10,363,856	23,067,762	-12,703,906	-55.07	14,633,032	-4,269,176	-29.17
Missouri	27	46	18,121,554	17,878,036	30,185,887	-12,307,851	-40.77	33,290,642	-15,412,606	-46.30
Virginia	25	54	37,883,079	38,331,880	50,381,429	-12,049,549	-23.92	50,621,727	-12,289,847	-24.28
Michigan	45	79	7,626,594	7,684,916	12,915,466	-5,230,550	-40.50	20,712,159	-13,027,243	-62.90
Pennsylvania	62	131	24,625,847	28,307,940	33,157,040	-4,849,100	-14.62	34,375,727	-6,067,787	-17.65
North Carolina	72	140	11,283,450	13,514,393	18,228,974	-4,714,581	-25.86	18,623,968	-5,109,575	-27.44
Ohio	93	189	9,837,068	11,685,099	15,876,959	-4,191,860	-26.40	16,508,335	-4,823,236	-29.22
California	110	174	4,094,407	38,925,764	42,147,545	-3,221,781	-7.64	39,089,206	-163,442	-0.42
New Jersey	72	130	10,378,750	14,101,786	17,197,043	-3,095,257	-18.00	19,509,921	-5,408,135	-27.72
Tennessee	34	62	17,054,158	17,307,600	20,157,119	-2,849,519	-14.14	21,624,572	-4,316,972	-19.96
Alaska	1	1	18,548,021	18,593,625	20,811,999	-2,218,374	-10.66	18,730,799	-137,174	-0.73
Oregon	13	29	802,302	877,459	3,054,882	-2,177,423	-71.28	3,728,271	-2,850,812	-76.46
Illinois	60	92	3,524,654	4,611,203	6,263,041	-1,651,838	-26.37	8,012,850	-3,401,647	-42.45
Arkansas	19	45	5,315,790	4,829,429	6,358,084	-1,528,655	-24.04	5,833,215	-1,003,786	-17.21
Texas	51	107	6,455,000	7,399,151	8,855,991	-1,456,840	-16.45	9,855,713	-2,456,562	-24.93
New York	54	79	3,905,586	3,897,964	5,339,319	-1,441,355	-27.00	5,392,217	-1,494,253	-27.71
Oklahoma	15	28	2,758,829	2,486,388	3,918,835	-1,432,447	-36.55	2,964,055	-477,667	-16.12
Georgia	38	55	1,752,644	1,589,705	2,901,773	-1,312,068	-45.22	2,380,206	-790,501	-33.21
Wisconsin	25	51	1,500,030	1,942,384	3,149,000	-1,206,616	-38.32	4,227,984	-2,285,600	-54.06
Iowa	25	42	4,762,459	2,818,379	3,966,783	-1,148,404	-28.95	3,714,045	-895,666	-24.12
Mississippi	19	29	6,592,365	6,628,999	7,628,874	-999,875	-13.11	13,087,140	-6,458,141	-49.35
South Carolina	21	33	2,734,865	4,017,286	4,946,767	-929,481	-18.79	5,079,562	-1,062,276	-20.91
Florida	25	54	1,299,653	2,009,997	2,833,780	-823,783	-29.07	2,809,743	-799,746	-28.46
Massachusetts	48	68	2,169,239	3,393,601	4,209,744	-816,143	-19.39	4,942,070	-1,548,469	-31.33
Colorado	16	28	1,007,090	1,139,960	1,854,863	-714,903	-38.54	2,186,897	-1,046,937	-47.87
Idaho	4	6	3,345,556	3,377,494	3,973,436	-595,942	-15.00	3,992,785	-615,291	-15.41
West Virginia	7	13	781,412	1,019,881	1,557,136	-537,255	-34.50	1,938,080	-918,199	-47.38
Rhode Island	16	23	941,922	676,675	1,123,002	-446,327	-39.74	951,660	-274,985	-29.90
Maine	14	23	352,108	435,080	879,698	-444,618	-50.54	826,313	-391,233	-47.35
Arizona	18	41	700,867	823,188	1,190,899	-367,711	-30.88	1,359,533	-536,345	-39.45
Delaware	5	7	923,405	923,005	1,243,532	-320,527	-25.78	1,331,255	-408,250	-30.67
Washington	28	50	1,520,775	1,668,102	1,975,665	-307,563	-15.57	2,097,123	-429,021	-20.46
Maryland	14	27	1,086,354	1,018,064	1,322,405	-304,341	-23.01	1,321,965	-303,901	-22.99
Minnesota	13	16	543,090	572,935	857,379	-284,444	-33.18	859,096	-286,161	-33.31
Nebraska	7	8	313,403	314,619	465,506	-150,887	-32.41	448,556	-133,937	-29.86
Connecticut	31	47	2,729,540	3,245,090	3,393,384	-148,294	-4.37	3,553,206	-308,116	-8.67
New Hampshire	11	13	748,631	714,353	831,922	-117,569	-14.13	872,192	-157,839	-18.10
Vermont	5	6	70,816	84,212	130,405	-46,193	-35.42	105,790	-21,578	-20.40
New Mexico	2	2	187,964	119,515	133,837	-14,322	-10.70	125,253	-5,738	-4.58
Nevada	2	3	4,603	4,603	18,133	-13,530	-74.62	17,727	-13,124	-74.03
South Dakota	4	5	56,368	57,867	63,317	-5,450	-8.61	57,685	182	0.32
Wyoming	1	1	750	5,600	10,000	-4,400	-44.00	6,000	-400	-6.67
Montana	1	1	12,540	1,176	4,140	-2,964	-71.59	2,070	-894	-43.19
Virgin Islands	0	0	0	0	0	0	—	0	0	—
American Samoa	0	0	0	0	0	0	—	0	0	—
District of Columbia	0	0	0	0	0	0	—	0	0	—
Hawaii	0	0	0	0	0	0	—	0	0	—
North Dakota	2	2	32,701	31,951	31,620	331	1.05	25,298	6,653	26.30
Indiana	35	50	26,585,441	6,035,685	3,812,766	2,222,919	58.30	3,835,691	2,199,994	57.36
Kansas	14	21	56,708,091	57,407,222	54,930,333	2,476,889	4.51	62,216,822	-4,809,600	-7.73
Puerto Rico	14	22	3,713,807	8,071,123	5,189,454	2,881,669	55.53	7,534,018	537,105	7.13
Alabama	14	22	1,427,920	13,613,716	10,450,700	3,163,016	30.27	14,313,143	-699,427	-4.89
Kentucky	13	28	428,890	28,123,667	5,710,905	22,412,762	392.46	42,896,041	-14,772,374	-34.44
TOTAL	1,275	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Change = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

Table 5-3. TRI Waste Minimization Data by Industry (Subset of 2,240 forms), 1988-1989.

SIC CODE	INDUSTRY	FORMS	RELEASES AND TRANSFERS 1989	WASTE GENERATED 1989	WASTE GENERATED 1988	ABSOLUTE CHANGE(a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE(c)	
		Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
20	Food	51	1,571,137	1,653,655	2,481,343	-827,688	-33.36	2,725,873	-1,072,218	-39.33
21	Tobacco	5	662,056	541,261	915,208	-373,947	-40.86	1,281,011	-739,750	-57.75
22	Textiles	40	1,892,189	3,346,636	4,132,162	-785,526	-19.01	5,197,848	-1,851,212	-35.61
23	Apparel	1	49,594	49,594	73,500	-23,906	-32.53	73,500	-23,906	-32.53
24	Lumber	43	635,073	486,925	674,164	-187,239	-27.77	617,981	-131,056	-21.21
25	Furniture	68	2,852,029	1,801,068	2,392,595	-591,527	-24.72	2,172,614	-371,546	-17.10
26	Paper	51	4,519,967	4,708,685	6,309,867	-1,601,182	-25.38	6,030,700	-1,322,015	-21.92
27	Printing	33	3,921,541	2,002,106	2,913,655	-911,549	-31.29	3,611,457	-1,609,351	-44.56
28	Chemicals	489	201,616,189	233,752,435	263,882,397	-30,129,962	-11.42	285,833,291	-52,080,856	-18.22
29	Petroleum	19	2,323,656	2,346,170	3,176,950	-830,780	-26.15	4,809,201	-2,463,031	-51.21
30	Plastics	170	10,925,638	10,967,975	15,202,455	-4,234,480	-27.85	15,064,757	-4,096,782	-27.19
31	Leather	11	209,941	160,542	200,000	-39,458	-19.73	171,619	-11,077	-6.45
32	Stone/Clay	36	419,089	444,537	1,042,162	-597,625	-57.34	1,110,824	-666,287	-59.98
33	Primary Metals	148	54,901,327	83,455,813	114,551,961	-31,096,148	-27.15	112,222,318	-28,766,505	-25.63
34	Fabr. Metals	279	8,412,971	13,574,496	16,566,332	-2,991,836	-18.06	16,915,303	-3,340,807	-19.75
35	Machinery	87	3,379,003	3,581,771	5,361,317	-1,779,546	-33.19	7,316,885	-3,735,114	-51.05
36	Electrical	254	7,537,455	10,711,792	13,166,062	-2,454,270	-18.64	14,723,215	-4,011,423	-27.25
37	Transportation	135	7,659,962	34,833,335	15,743,195	19,090,140	121.26	56,435,489	-21,602,154	-38.28
38	Measure./Photo.	75	14,369,213	15,067,152	16,929,951	-1,862,799	-11.00	17,203,566	-2,136,414	-12.42
39	Miscellaneous	40	1,809,354	1,371,751	1,747,176	-375,425	-21.49	1,934,906	-563,155	-29.11
	Multiple codes 20-3	187	20,591,310	19,858,490	25,422,489	-5,563,999	-21.89	30,578,254	-10,719,764	-35.06
	No codes 20-39	18	282,827	454,832	1,290,519	-835,687	-64.76	990,955	-536,123	-54.10
	TOTAL	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Generation = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

industry reported the second highest level of absolute waste reduction (30.1 million pounds or 11 percent) and the largest amount of relative waste reduction (52.1 million pounds or 18 percent). (See Figure 5-4 and Table 5-3.)

It is possible for the change in waste generation between two years to be an *absolute increase*, while the relative change is a *relative decrease*. If production tripled between two years, yet wastes doubled, the result would be a relative decrease in waste compared to what would be expected from this production level. (See Box 5-A, above.) The Transportation industry was the only industrial category whose facilities in this subset reported a net increase in absolute quantities of waste (19.1 million pounds or a 121 percent increase), but the same industry ranked third for overall relative waste decreases, with a drop of 21.6 million pounds or a 38 percent decrease. This was primarily due to one facility, the Toyota Motor Manufacturing facility in Georgetown, Kentucky, which experienced an eight-fold production increase (production index of 8.0), resulting in an *increase* in waste generation of 15 TRI chemicals of 22.7 million pounds, but a relative *decrease* of 14.5 million pounds. Indeed, the other facilities in the Transportation industry in this subset reported production decreases (on 55 forms) more often than production increases (on 49 forms; 31 forms reported no change).

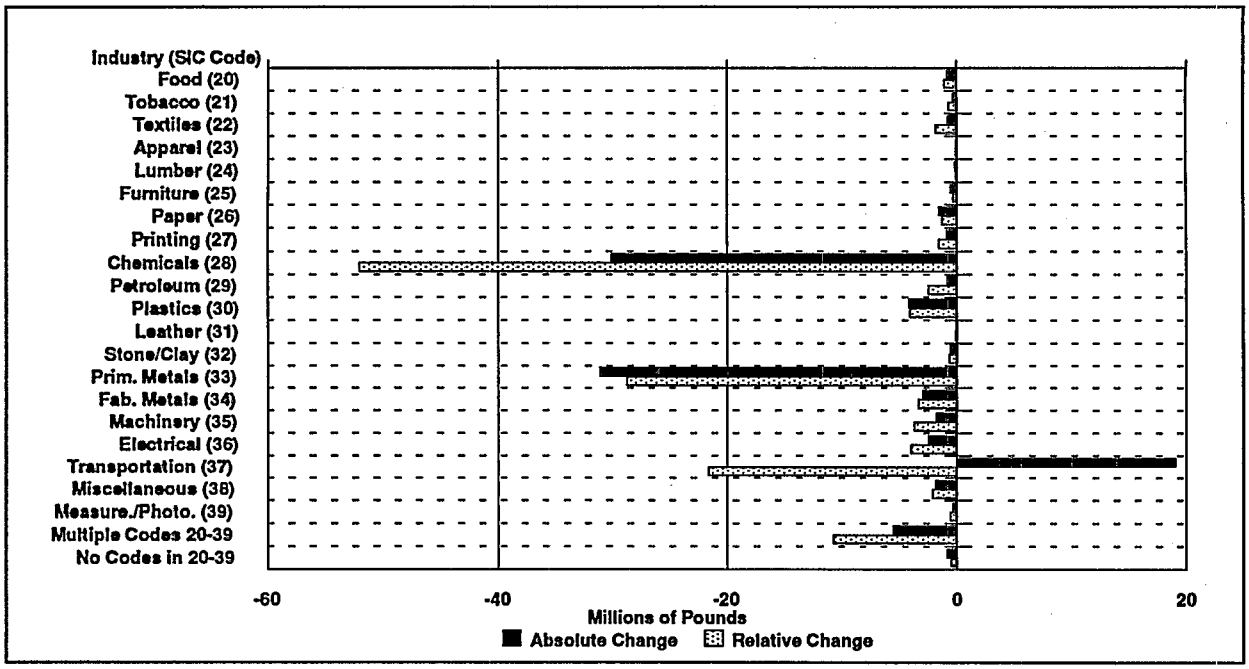


Figure 5–4. Amount of Absolute and Relative Change in TRI Waste Generation by Industry, 1988–1989 (for subset of 2,240 forms).

While the Primary Metals industry reported higher absolute waste decreases than relative waste decreases, this was again due to a few facilities, and not necessarily due to an overall industry decline in production. The Herculaneum Smelter in Herculaneum, Missouri, for example, reported overall absolute decreases of 11.9 million pounds and a relative decrease of 31.8 million pounds in the face of a 10 percent increase in production.

Changes in waste generation by the Chemical industry facilities in this subset were more complex. Overall, almost half of the forms with full waste minimization data (224 out of 489 forms for SIC 28) reported production increases. When the changes in waste generation of these forms reporting production increases are totaled, the net absolute decrease in waste generated is less than 500,000 pounds, while the net relative decrease is over 26 million pounds. This wide disparity between absolute and relative decrease is the result of many facilities reporting no decrease in waste generated (either absolutely or relatively), offset by a few facilities with large *relative decreases* accompanied by large *absolute increases* (due to increased production). An example of a facility reporting waste minimization data, but not showing a decrease in waste generation is the Himont U.S.A. plant in Lake Charles, Louisiana. This facility reported an absolute increase in wastes of two chemicals of 4.0 million pounds that corresponded to a relative *increase* of 2.7 million pounds, when waste generation is compared to the reported production increase of 30 percent associated with these chemicals at that facility. An example of a facility that also reported an increase in both production and absolute waste generation, but did

decrease its waste generation relative to production is the Atochem N.A. plant in Wichita, Kansas. This facility reported an increase in production of 10 percent and an absolute increase in waste generated of 3.3 million pounds for three chemicals, but in this case the corresponding change was a relative *decrease* in waste generated of 1.9 million pounds.

Of the 22 industrial categories covered by TRI, 14 showed a net relative waste decrease greater than the net absolute waste decrease for their facilities in the subset. Only the Transportation industry had an absolute increase in waste generation, and no industrial category had a net increase in relative waste generation. (See Table 5-3.)

Waste Minimization Methods

Substitution of raw materials accounted for the most absolute and relative waste reduction.

The TRI Form R asks facilities to specify which type of source reduction methods was used to achieve waste minimization: recycling/reuse on-site; recycling/reuse off-site; equipment/technology modifications; process procedure modifications; reformulation/redesign of product; substitution of raw materials; improved housekeeping, training, or inventory control; or other waste minimization techniques. Within the waste minimization subset, *substitution of raw materials* achieved the largest amount of both absolute and relative waste reduction (28.2 and 30.6 million pounds, respectively). *Process changes* achieved the second largest reductions in both categories (24.4 million pounds absolute reductions and 30.4 million pounds relative reductions). Process changes were also the most frequently reported method of waste minimization (reported on 390 forms), while *improved housekeeping* was the second most frequently reported method (350 forms). (See Figure 5-5 and Table 5-4.)

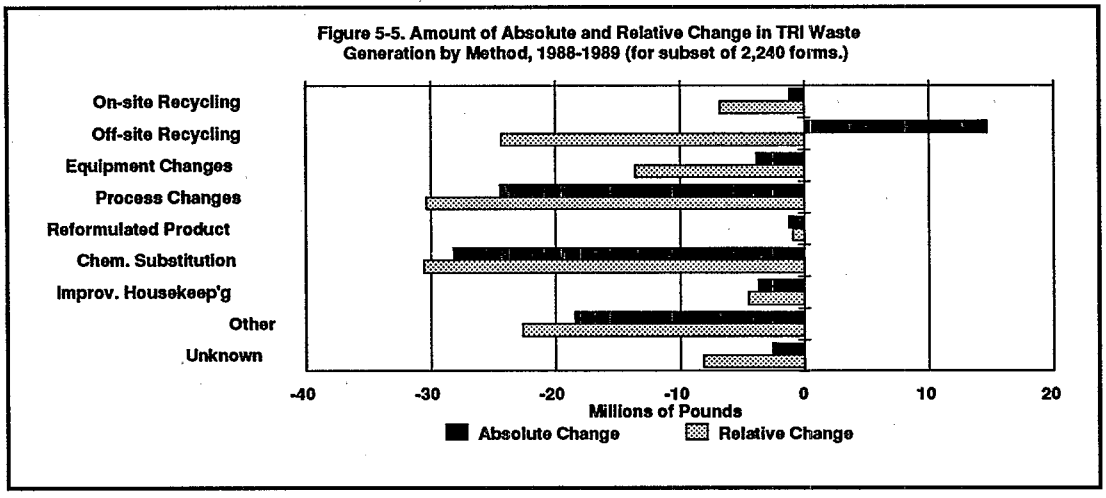


Figure 5–5. Amount of Absolute and Relative Change in TRI Waste Generation by Method, 1988–1989 (for subset of 2,240 forms).

Table 5-4. TRI Waste Minimization Data by Method (Subset of 2,240 forms), 1988-1989.

METHOD	FORMS	RELEASES AND TRANSFERS 1989	WASTE GENERATED		ABSOLUTE CHANGE(a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE (c)	
	Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
Recycling/Reuse On-Site	316	27,526,493	45,665,856	46,870,574	-1,204,718	-2.57	52,457,817	-6,791,961	-12.95
Recycling/Reuse Off-Sit	323	31,579,726	94,457,543	79,744,405	14,713,138	18.45	118,816,053	-24,358,510	-20.50
Equipment Changes	251	73,769,250	81,920,001	85,774,937	-3,854,936	-4.49	95,513,582	-13,593,581	-14.23
Process Changes	390	105,494,373	107,138,246	131,574,960	-24,436,714	-18.57	137,499,468	-30,361,222	-22.08
Reformulation	68	4,644,557	4,128,639	5,358,408	-1,229,769	-22.95	5,063,593	-934,954	-18.46
Substitution	225	52,958,197	53,224,808	81,422,311	-28,197,503	-34.63	83,792,636	-30,567,828	-36.48
Improved Housekeeping	350	10,894,816	12,696,188	16,434,165	-3,737,977	-22.75	17,191,687	-4,495,499	-26.15
Other	214	34,115,319	35,282,345	53,742,717	-18,460,372	-34.35	57,934,995	-22,652,650	-39.10
Unknown	103	9,558,790	10,657,395	13,252,983	-2,595,588	-19.58	18,751,736	-8,094,341	-43.17
TOTAL	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Generation = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

The method cited least often was *product reformulation/redesign* (68 forms, or 3 percent of the total). This method also achieved the lowest quantity of relative waste reduction (935,000 pounds). Furthermore, it was the only method for which absolute waste reduction was larger than the relative waste reduction. This finding indicates that production for reformulated products dropped as a whole between 1988 and 1989. While this drop is not explained on the TRI forms, it may be that the complexity of reformulating a product contributes to temporary slowing of production while this process is under way. Conversely, it may be that reformulation of a product is more likely to be considered when production levels are already down.

Reasons for Waste Minimization

Self-initiated review accounted for the most absolute and relative waste reduction.

Self-initiated review was the most frequently cited reason for implementing waste minimization (860 forms) in the subset, and also produced the greatest overall absolute and relative amounts of reduction (26.3 and 71.2 million pounds, respectively). (See Figure 5-6 and Table 5-5.)

The category of *reduction of process costs* was cited on 403 forms, and produced absolute reductions in waste of 12.1 million pounds, an 11 percent reduction. The category *other reasons*, such as discontinuation of a product line, was cited less often (348 forms) but produced a larger quantity (16.4 million pounds) and percent (24 percent) of absolute waste reduction.

Other reasons for waste minimization included on the Form R are: regulatory requirement for the waste and treatment/disposal costs reduction.

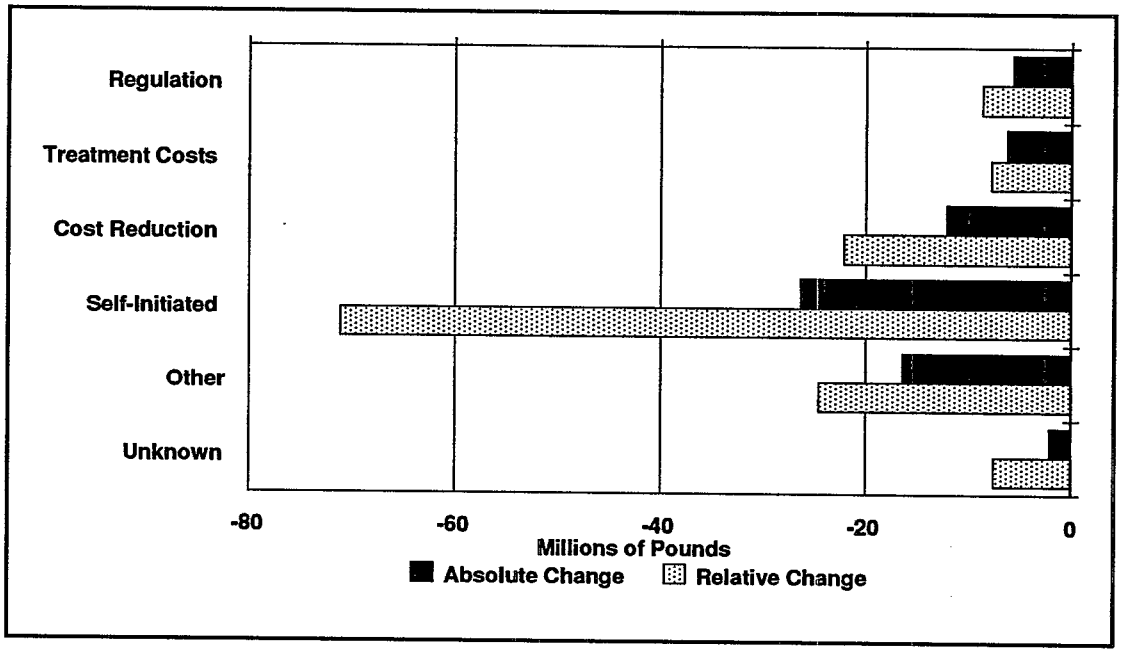


Figure 5–6. Amount of Absolute and Relative Change in TRI Waste Generation by Reason, 1988–1989 (for subset of 2,240 forms).

Table 5-5. TRI Waste Minimization Data by Reason (Subset of 2,240 forms), 1988-1989.

REASON	FORMS	RELEASES AND TRANSFER 1989	WASTE GENERATED 1989	WASTE GENERATED 1988	ABSOLUTE CHANGE(a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE(c)	
	Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
Regulation	188	27,312,613	26,211,627	31,946,205	-5,734,578	-17.95	34,884,499	-8,672,872	-24.86
Treatment/Disposal Cost	377	22,145,813	23,519,496	29,831,057	-6,311,561	-21.16	31,282,538	-7,763,042	-24.82
Process Costs	403	69,981,296	101,951,884	114,047,410	-12,095,526	-10.61	124,085,953	-22,134,069	-17.84
Self-Initiated Review	860	186,996,987	233,975,943	260,263,463	-26,287,520	-10.10	305,139,100	-71,163,157	-23.32
Other	348	36,078,880	51,032,647	67,463,364	-16,430,717	-24.36	75,626,744	-24,594,097	-32.52
Unknown	64	8,025,932	8,479,424	10,623,961	-2,144,537	-20.19	16,002,733	-7,523,309	-47.01
TOTAL	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Generation = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

Table 5-6. TRI Chemicals with More than One Million Pounds Absolute Waste Reduction (Subset of 2,240 forms), 1988-1989.

CHEMICAL	FORMS	RELEASES AND TRANSFERS 1989	WASTE GENERATED 1989	1988	ABSOLUTE CHANGE (a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE(c)	
	Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
Sulfuric acid	96	31,784,060	26,431,340	40,916,797	-14,485,457	-35.40	32,998,117	-6,566,777	-19.90
Zinc compounds	44	13,774,111	21,942,476	33,304,802	-11,362,326	-34.12	35,545,950	-13,603,474	-38.27
Ammonium sulfate (solution	13	34,315,269	34,373,269	45,571,562	-11,198,293	-24.57	46,834,869	-12,461,600	-26.61
Phosphoric acid	40	16,398,445	16,964,846	25,329,761	-8,364,915	-33.02	30,318,129	-13,353,283	-44.04
Toluene	156	19,732,102	20,243,542	28,029,392	-7,785,850	-27.78	26,360,928	-6,117,386	-23.21
Ammonia	65	34,178,248	36,260,288	41,596,767	-5,336,479	-12.83	42,724,886	-6,464,598	-15.13
Methanol	69	22,492,765	23,810,017	28,801,818	-4,991,801	-17.33	32,682,925	-8,872,908	-27.15
1,1,1-Trichloroethane	262	13,011,744	12,431,310	16,294,418	-3,863,108	-23.71	16,792,629	-4,361,319	-25.97
Lead compounds	23	4,596,582	4,739,784	7,323,361	-2,583,577	-35.28	8,356,559	-3,616,775	-43.28
Acetone	108	7,086,255	6,625,290	9,124,008	-2,498,718	-27.39	9,857,045	-3,231,755	-32.79
Freon 113	123	7,410,807	5,778,829	7,714,169	-1,935,340	-25.09	11,782,733	-6,003,904	-50.96
Trichloroethylene	51	2,810,509	2,868,363	4,626,103	-1,757,740	-38.00	4,400,234	-1,531,871	-34.81
Carbonyl sulfide	4	14,067,080	14,067,080	15,671,600	-1,604,520	-10.24	17,305,080	-3,238,000	-18.71
Methyl ethyl ketone	101	7,077,833	7,379,516	8,726,769	-1,347,253	-15.44	10,211,095	-2,831,579	-27.73
Styrene	22	814,668	1,283,118	2,501,848	-1,218,730	-48.71	2,375,228	-1,092,110	-45.93
Ammonium nitrate (solution)	7	4,868,064	4,867,994	5,913,253	-1,045,259	-17.68	6,616,440	-1,748,446	-26.43
SUBTOTAL	1,184	234,418,542	240,067,062	321,446,428	-81,379,366	-25.32	335,162,847	-95,095,785	-28.37
TOTAL FOR ALL OTHERS	1,056	116,122,979	205,103,959	192,729,032	12,374,927	6.42	251,858,720	-46,754,761	-18.56
GRAND TOTAL	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Generation = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

Chemicals Subject to Waste Minimization

Sulfuric acid and zinc compound wastes were reduced more than those of any other TRI chemicals.

Sulfuric acid, cited on 96 forms, accounted for the largest quantities of *absolute* waste reduction in the subset (a decrease of 14.5 million pounds), and zinc compounds accounted for the largest quantities of *relative* waste reduction (13.6 million pounds) in the waste minimization subset. Among the 16 chemicals for which more than one million pounds each of absolute waste reduction was achieved, 1,1,1-trichloroethane was the most frequently reported, with waste minimization data on 262 forms, and carbonyl sulfide was the least frequently reported, with waste minimization data on only four forms. (See Table 5-6.)

Among the carcinogens on the TRI chemical list, dichloromethane wastes accounted for the largest *relative* reductions (1.2 million pounds) and styrene wastes accounted for the largest *absolute* reductions (also 1.3 million pounds) in the waste minimization subset. Arsenic, a carcinogen for which only one waste minimization form was filed, was reduced by 89 percent (980,000 pounds) on both the relative and absolute scales. Diethyl sulfate, on the other hand, accounted for the largest

percentile *increase* in absolute waste generation (785 percent). The relative waste generation for diethyl sulfate increased by only 4 percent, however, indicating that the bulk of the absolute increase was due to production increases. (See Table 5-7.)

MATCHED FORMS REPORTING WASTE MINIMIZATION FOR ALL REPORTING YEARS

Creating a Subset

The 2nd subset included waste minimization data in all reporting years.

A second subset of waste minimization data was created by compiling forms from facilities that provided waste minimization data on the same TRI chemical in each reporting year, 1987, 1988 and 1989. These forms allowed a cumulative estimate of waste minimization for the period 1986 through 1989. As in the case above, several criteria were used to exclude incomplete or apparently inaccurate forms from this subset. Each of the forms retained in the subset:

- contained volume data for each year: 1986, 1987, 1988 and 1989;
- contained data on production index; and,
- reported consistent volume data between years, so that, for example, the amount reported as "current year" waste in 1987 equaled the amount that was reported on matched forms in 1988 as the "prior year" amount. In this case, both these amounts refer to waste generated in 1987.

This subset contained 123 forms.

Based on these criteria, 123 matching forms from 89 facilities were selected for analysis. This analysis constitutes a sample investigation of waste minimization between 1986 and 1989. Because it covers such a small number of forms, and because the waste minimization section itself is a voluntary part of TRI, this data can not be used to generalize about the nation as a whole. However, they do provide a sample of *cumulative* changes in waste generation over the course of four years.

Absolute and Relative Change, 1986-1989

Absolute levels of waste generation in the matched set increased by 589,000 pounds from 1986 to 1989.

Combining rates of waste generation between 1986-1987, 1987-1988 and 1988-1989 provides a cumulative measure of change over the four years from 1986 to 1989 for all of the 89 facilities taken together. Although 61 of the 123 forms indicated individual reductions totaling 1.5 million pounds over the period from 1986 to 1989, 55 of the forms indicated increases totaling 2.1 million pounds. Seven forms indicated no change in waste generated over the same period. Thus, the cumulative total absolute change in waste generation, as reported on waste minimization forms for this subset, was actually an *increase* in waste generated of 589,000 pounds. (See Table 5-8.)

Absolute waste generation increased in the 2nd year of the subset, while relative waste generation decreased during the same year.

Increases in waste generation, measured in absolute terms, were greatest between 1987 and 1988 (343,000 pounds), yet *relative reductions* in waste were also greatest between those years. This apparently paradoxical effect indicates that production among the 89 facilities in the subset increased substantially between those years. As Figure 5-7 shows, while total releases and transfers reported on this subset of forms

Table 5-7. Relative and Absolute Change in Waste Generation of TRI Carcinogens (Subset of 2,240 forms), 1988-1989.

CHEMICAL	FORMS	RELEASES AND TRANSFERS 1989	WASTE GENERATED 1989	1988	ABSOLUTE CHANGE (a)		PROJECTED 1989 WASTE GENERATION(b)	RELATIVE CHANGE (c)	
	Number	Pounds	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Percent
Dichloromethane	83	14,801,079	14,808,618	15,788,545	-979,927	-6.21	16,011,989	-1,203,371	-7.52
Styrene	22	814,668	1,283,118	2,501,848	-1,218,730	-48.71	2,375,228	-1,092,110	-45.98
Arsenic	1	121,000	120,000	1,100,000	-980,000	-89.09	1,100,000	-980,000	-89.09
Lead	34	217,750	679,159	618,366	60,793	9.83	1,239,755	-560,596	-45.22
Chromium	21	662,667	1,014,656	1,422,681	-408,025	-28.68	1,503,115	-488,459	-32.50
Chloroform	3	1,203,887	1,244,260	1,643,015	-398,755	-24.27	1,682,624	-438,364	-26.05
Formaldehyde	17	142,794	154,617	630,887	-476,270	-75.49	589,191	-434,574	-73.76
Tetrachloroethylene	51	3,659,659	2,696,368	3,463,693	-767,325	-22.15	3,091,146	-394,778	-12.77
Nickel	32	349,904	2,873,572	2,511,576	361,996	14.41	3,082,744	-209,172	-6.79
Benzene	7	1,224,043	1,200,272	1,870,209	-669,937	-35.82	1,393,645	-193,373	-13.88
Di-(2-ethylhexyl) phthalate	10	112,503	159,118	443,481	-284,363	-64.12	326,345	-167,227	-51.24
Isopropyl alcohol (mfg.- - strong acid process)	10	142,227	127,663	190,745	-63,082	-33.07	208,252	-80,589	-38.70
Ethylene oxide	12	150,944	225,959	435,090	-209,131	-48.07	279,628	-53,669	-19.19
Asbestos (friable)	3	52,146	51,726	73,559	-21,833	-29.68	95,307	-43,581	-45.73
Propylene oxide	3	26,426	25,921	54,773	-28,852	-52.68	55,334	-29,413	-53.16
Carbon tetrachloride	3	164,929	107,833	200,274	-92,441	-46.16	120,723	-12,890	-10.68
1,2-Dichloroethane	2	86,412	78,617	73,708	4,909	6.66	86,876	-8,259	-9.51
Bis(2-ethylhexyl) adipate	1	2,577	2,594	19,803	-17,209	-86.90	9,902	-7,308	-73.80
1,4-Dioxane	3	39,053	38,770	37,797	973	2.57	45,293	-6,523	-14.40
1,2-Dibromoethane	1	14,800	14,800	28,100	-13,300	-47.33	19,670	-4,870	-24.76
1,3-Butadiene	3	226,559	226,389	203,072	23,317	11.48	230,454	-4,065	-1.76
Acrylonitrile	2	5,581	5,581	8,392	-2,811	-33.50	9,461	-3,880	-41.01
Vinyl chloride	1	129,909	129,909	130,772	-863	-0.66	130,772	-863	-0.66
Toluene-2,4-diisocyanate	3	544	72,629	72,799	-170	-0.23	72,729	-100	-0.14
Cadmium	2	2,911	2,161	1,617	544	33.64	2,258	-97	-4.30
Toluene-2,6-diisocyanate	2	330	18,399	18,499	-100	-0.54	18,399	0	0.00
3,3'-Dimethoxybenzidine	1	750	32	20	12	60.00	26	6	23.08
Diethyl sulfate	1	750	239	27	212	785.19	230	9	3.91
Thiourea	1	0	2,200	1,316	884	67.17	2,106	94	4.46
C.I. Solvent Yellow 14	1	1,500	923	182	741	407.14	746	177	23.73
o-Anisidine	1	1,500	649	300	349	116.33	450	199	44.22
1,4-Dichlorobenzene	1	38,095	38,095	45,516	-7,421	-16.30	36,413	1,682	4.62
Acrylamide	1	0	35,705	104,417	-68,712	-65.81	31,325	4,380	13.98
SUBTOTAL	339	24,397,897	27,440,552	33,695,079	-6,254,527	-18.56	33,852,136	-6,411,584	-18.94
TOTAL FOR ALL OTHERS	1,901	326,143,624	417,730,469	480,480,381	-62,749,912	-13.06	553,169,431	-135,438,962	-24.48
GRAND TOTAL	2,240	350,541,521	445,171,021	514,175,460	-69,004,439	-13.42	587,021,567	-141,850,546	-24.16

(a) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(b) Projected Waste Generation = 1988 Waste Generated x Production Index
(c) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

Table 5-8. Cumulative Change in TRI Waste Generation (Based on 123 forms), 1986-1989.

	1986-1989 REPORTING		1986-1987 REPORTING		1987-1988 REPORTING		1988-1989 REPORTING	
	ABSOLUTE CHANGE Pounds	RELATIVE CHANGE Pounds	ABSOLUTE CHANGE Pounds	RELATIVE CHANGE Pounds	ABSOLUTE CHANGE Pounds	RELATIVE CHANGE Pounds	ABSOLUTE CHANGE Pounds	RELATIVE CHANGE Pounds
TOTAL REDUCTION	-1,488,863	-6,473,712	-772,820	-1,568,309	-406,045	-3,077,206	-1,617,323	-2,035,434
TOTAL INCREASES	2,077,774	1,277,774	748,133	652,559	748,754	524,727	1,888,212	1,621,849
TOTAL	588,911	-5,195,938	-24,687	-915,750	342,709	-2,552,479	270,889	-413,585

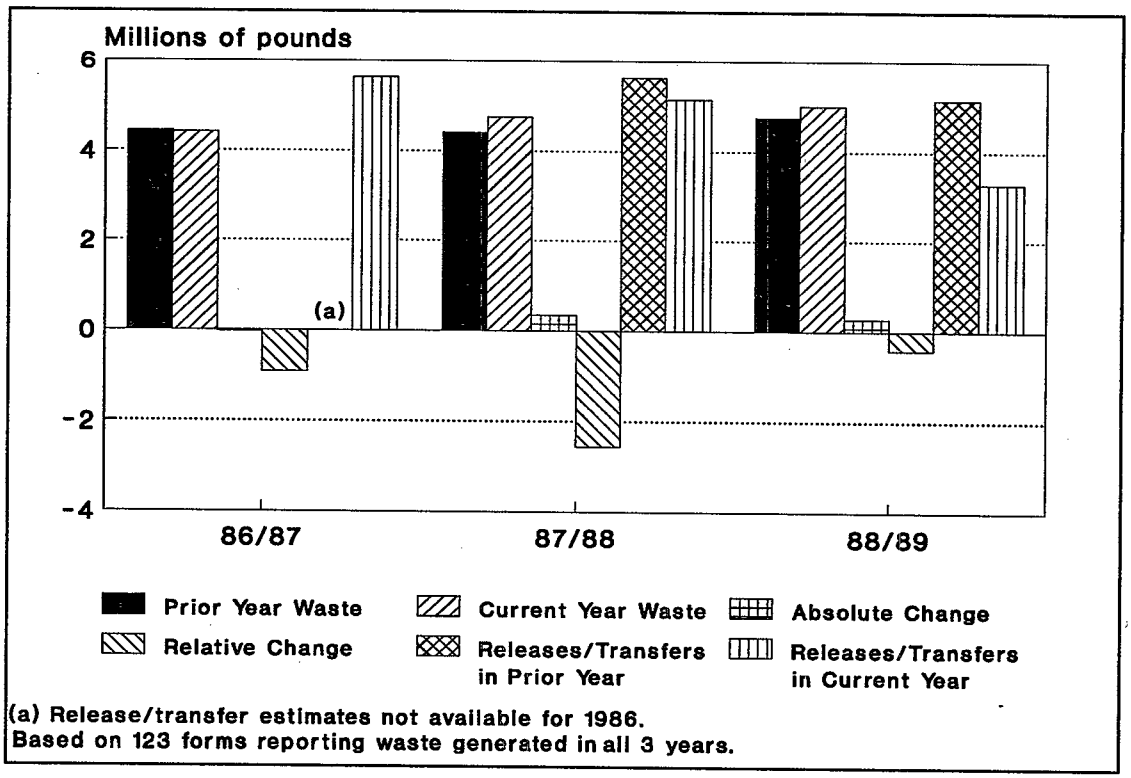


Figure 5–7. Change in Waste Generation and TRI Releases and Transfers, 1986–1989.

Table 5-9. The 25 TRI Facilities with the Largest Cumulative Absolute Waste Reductions (Subset of 89 facilities, 123 forms), 1986-1989.

TRI RANK	FACILITY NAME	CITY	STATE	ABSOLUTE CHANGE IN WASTE GENERATED 1986-1989 Pounds	RELATIVE CHANGE IN WASTE GENERATED 1986-1989 Pounds	TOTAL RELEASES AND TRANSFERS 1989 Pounds	1988 Pounds	1987 Pounds
1	Universal Materials Inc.	Mogadore	OH	-518,865	-894,837	35,285	374,333	38,600
2	Becton Dickinson & Co.	Holdrege	NE	-151,200	-13,088	14,800	76,775	127,285
3	Semicon Associates	Lexington	KY	-77,625	-128,250	9,125	95,000	160,750
4	Campbell Soup Co. Swanson Div.	Fayetteville	AR	-75,000	-89,000	100,000	90,000	115,200
5	Arlon Inc. Flexible Tech. Div.	East Providence	RI	-71,100	-19,883	305,587	410,000	542,500
6	Atmosphere Annealing Inc.	Lansing	MI	-68,000	-52,230	15,900	23,300	30,500
7	Imperial Cantrell Mfg. Co. Inc.	Jellico	TN	-45,847	-40,156	1,576	1,384	1,676
8	Archer Daniels Midland	Lincoln	NE	-41,740	-45,100	302	5,318	28,027
9	Corona Products	Corona	CA	-36,540	2,142	10,805	10,895	27,250
10	Porelon Inc.	Cookeville	TN	-34,410	-34,554	109,890	132,200	105,500
11	E. L. Wiegand Div.	Vernon	AL	-29,033	215	3,258	4,735	20,842
12	Essex Specialty Products Inc.	Hillsdale	MI	-29,000	-11,320	100,710	133,460	94,960
13	Great Western Foam Products Corp.	Hayward	CA	-26,072	-11,438	47,100	58,725	69,597
14	Los Angeles Galvanizing Co.	Huntington Park	CA	-24,571	-1,966,240	0	0	0
15	Allied Signal Aerospace Co. Fluid Systems Div	Tempe	AZ	-23,154	-136,703	133,439	117,050	263,100
16	Alcatel Transcom	Portsmouth	RI	-21,600	-4,320	26,400	41,100	37,600
17	Cambridge Instruments Reichert Jung Div.	Cheektowaga	NY	-21,406	-66,917	19,003	27,319	52,361
18	New Dimension Plating Inc.	Hutchinson	MN	-17,360	-17,360	18,590	23,200	26,700
19	Cincinnati Milacron-Heald Corp Fountain Inn	Fountain Inn	SC	-13,985	-195,985	250	250	250
20	M-Tron Industries Inc.	Yankton	SD	-11,220	-515,160	25,780	24,700	31,900
21	Schlage Lock Co. Lcn Closers Div.	Princeton	IL	-9,453	-27,972	6,700	43,503	47,112
22	Sossner Tap & Tool Corp.	Brunswick	GA	-8,600	-52,520	1,250	500	2,400
23	Harris Corp. Farinon Div. Sa Ops	San Antonio	TX	-8,030	-8,856	14,860	15,935	8,200
24	Drexel Heritage Furnishings Plt 33	Morganton	NC	-6,244	-1,344	21,894	25,928	24,550
25	Fina Oil & Chemical Co.	Windsor	NJ	-5,106	5,594	82,181	102,890	100,240
		TOTAL		-1,375,161	-4,325,282	1,104,685	1,838,500	1,957,100

did decrease from 1987 to 1988 despite increases in actual waste generation and production levels, a larger decrease in releases and transfers was achieved from 1988 to 1989, when relative decreases in waste generation were not as large.

Relative levels of waste generation in the matched set decreased by 5.2 million pounds from 1986 to 1989.

The cumulative amount of *relative* change in waste generated, on the other hand, was a *decrease* of 5.2 million pounds between 1986 and 1989. This overall decrease resulted from total reported relative decreases of 6.5 million pounds, offset by total reported relative increases of 1.3 million pounds. (See Table 5-8.) In order to put this amount into perspective, it may be useful to realize that 5.2 million pounds of relative reduction represents only one-tenth of one percent of total TRI releases and transfers in 1989.

Some facilities reported reductions in waste but increases in releases and transfers.

In this report, relative changes are calculated by choosing 1986 as the base year and multiplying the waste generation for that year by the production indices for 1986-1987, 1987-1988, and 1988-1989 to yield "projected 1989 waste generation." (This projection will be valid only to the extent that the processes and products associated with the waste generation do not significantly change their character.) The relative change is the reported 1989 waste generation minus the projected 1989 waste

generation. Therefore, a negative relative change means that less of the TRI chemical was in the waste in 1989 than would have been expected if waste generation were solely related to the level of production since 1986.[3]

Facilities Reporting on Waste Minimization, 1986-1989

Out of this subset, the 25 facilities reporting the largest cumulative *absolute decreases* in waste generation between 1986 and 1989 together reported reductions of 1.4 million pounds. Universal Materials Inc. of Mogadore, Ohio accounted for more than a third of that total with a cumulative reduction of 519,000 pounds. The only other facility that reported a cumulative absolute reduction of more than one hundred thousand pounds was Becton Dickinson & Company of Holdredge, Nebraska (151,000 pounds). (See Table 5-9.)

These two facilities with the greatest cumulative absolute reductions in waste *generation* also had lower overall *releases and transfers*, as might be expected. This was not the case for each of the top 25 facilities in this subset, however. Three facilities, each with absolute cumulative reduction in waste generation of more than eight thousand pounds, reported *increases* in releases and transfers between 1986 and 1989 (Porelon, Incorporated in Cookeville, Tennessee; Essex Specialty Products Incorporated in Hillsdale, Michigan; and Harris Corporation, Farinon Division in San Antonio, Texas), demonstrating that reducing generation of wastes (before on-site treatment or disposal) does not always reduce releases and transfers. There are several possible reasons for this: 1) treatment of waste may be less effective or efficient as waste generation is reduced; 2) the basis of estimating TRI releases and transfers may change, leading to an increase on paper only of total releases and transfers; 3) it may be that wastes generated from previous years and stored or dumped on site are disposed of in a year when waste generation from on-going production processes is being reduced, so that the "old" wastes increase overall releases and transfers despite more efficient processes, or 4) wastes that were previously reused or recycled on site or sent off site for reuse or recycling, and thus not required to be reported to TRI, were no longer handled in this manner and now had to be reported as releases or transfers. (See Chapter 4).

The 25 facilities reporting the largest cumulative *relative decreases* in waste generation, 1986-1989, reported reductions of 6.3 million pounds. Two facilities, Los Angeles Galvanizing Company (Huntington Park, California), and Alcan Powders & Pigments (Union, New Jersey) each reported more than 1 million pounds of relative reductions (2.0 and 1.2 million pounds respectively). Despite the significant relative reduction reported by Alcan Powders & Pigments, the facility reported a 60,000-pound increase in absolute waste generation. There were significant increases in production at this facility, with an almost ten-fold production increase (index of 9.9) between 1987 and 1988 with much smaller increases for the other two periods. The releases and transfers reported by Alcan Powders & Pigments increased by 92,000 pounds, or 32,000 pounds more than its waste generation

Table 5-10. The 25 TRI Facilities with the Largest Cumulative Relative Waste Reductions (Subset of 89 facilities, 123 forms), 1986-1989.

TRI RANK	FACILITY NAME	CITY	STATE	ABSOLUTE CHANGE IN WASTE GENERATED 1986-1989 Pounds	RELATIVE CHANGE IN WASTE GENERATED 1986-1989 Pounds	TOTAL RELEASES AND TRANSFERS 1989 Pounds	1988 Pounds	1987 Pounds
1	Los Angeles Galvanizing Co.	Huntington Park	CA	-24,571	-1,966,240	0	0	0
2	Alcan Powders & Pigments	Union	NJ	60,377	-1,231,990	152,922	110,919	60,942
3	Universal Materials Inc.	Mogadore	OH	-518,865	-894,837	35,285	374,333	38,600
4	M-Tron Industries Inc.	Yankton	SD	-11,220	-515,160	25,780	24,700	31,900
5	American Combining Corp.	Arverne	NY	4,700	-469,580	71,500	96,000	134,000
6	Cincinnati Milacron-Heald Corp Fountain Inn Div.	Fountain Inn	SC	-13,985	-195,985	250	250	250
7	Allied Signal Aerospace Co. Fluid Systems Div	Tempe	AZ	-23,154	-136,703	133,439	117,050	263,100
8	Semicon Associates	Lexington	KY	-77,625	-128,250	9,125	95,000	160,750
9	Hamilton Standard	Windsor Locks	CT	0	-110,520	55,250	76,228	14,000
10	Campbell Soup Co. Swanson Div.	Fayetteville	AR	-75,000	-89,000	100,000	90,000	115,200
11	Advanced Printed Circuit Technology	Tempe	AZ	26,250	-88,875	1,250	117,750	101,250
12	Cambridge Instruments Reichert Jung Div.	Cheektowaga	NY	-21,406	-66,917	19,003	27,319	52,361
13	Sossner Tap & Tool Corp.	Brunswick	GA	-8,600	-52,520	1,250	500	2,400
14	Atmosphere Annealing Inc.	Lansing	MI	-68,000	-52,230	15,900	23,300	30,500
15	Martin Industries	Athens	AL	9,480	-45,902	31,080	29,600	11,200
16	Archer Daniels Midland	Lincoln	NE	-41,740	-45,100	302	5,318	28,027
17	Woodford Marco Mfg. Inc.	Forest Grove	OR	16,435	-40,623	26,624	18,430	10,708
18	Imperial Cantrell Mfg. Co. Inc.	Jellico	TN	-45,847	-40,156	1,576	1,384	1,676
19	Porelon Inc.	Cookeville	TN	-34,410	-34,554	109,890	132,200	105,500
20	Schlage Lock Co. Lcn Closers Div.	Princeton	IL	-9,453	-27,972	6,700	43,503	47,112
21	Arlon Inc. Flexible Technologies Div.	East Providence	RI	-71,100	-19,883	305,587	410,000	542,500
22	National Airmotive Corp.	Oakland	CA	-1,502	-19,822	29,310	33,823	17,700
23	New Dimension Plating Inc.	Hutchinson	MN	-17,360	-17,360	18,590	23,200	26,700
24	Oakley Tube Div.	Englewood	CO	0	-13,825	33,780	12,050	12,050
25	Becton Dickinson & Co.	Holdrege	NE	-151,200	-13,088	14,800	76,775	127,285
			TOTAL	-1,097,796	-6,317,092	1,199,193	1,939,632	1,935,711

increased from 1986 to 1988. Six other facilities among the top 25 reported increases in releases and transfers that were larger than any increases in absolute waste generation they might have reported. (See Table 5-10.)

THE POLLUTION PREVENTION ACT OF 1990

In October 1990, President Bush signed the Pollution Prevention Act of 1990 into legislation, which is based on the premise that "wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible" and that "source reduction is fundamentally different and more desirable than waste management and pollution control."[4] This legislation greatly expands the Environmental Protection Agency's (EPA) role in encouraging industrial source reduction and recycling in all its regulatory and nonregulatory programs, as well as in collecting and assessing data about such activities.

The Pollution Prevention Act of 1990 establishes a greater impetus for pollution prevention through many regulatory channels.

The law was enacted in part because Congress concluded that even where feasible, opportunities for source reduction are often not realized because of institutional barriers, such as governmental and industrial regulations which focus upon treatment and disposal and regulations which focus on a single type of pollution rather than using a multimedia (air, land, and water) approach.[5] Because businesses and industry often need further information and technical resources in order to overcome these and other barriers to adopting source reduction practices, the Act provides for the establishment of EPA-administered grants to state technical assistance programs, promoting the use of source reduction techniques. Some provisions of the Act require EPA to establish a clearinghouse for dissemination of source reduction information to businesses and the public, review EPA regulations and programs to assess their impact on source reduction efforts, develop source reduction training workshops and guidance documents for staff of regulatory and enforcement programs, assure public access to data collected under federal environmental statutes, submit biennial reports to Congress on source reduction programs, and expand TRI reporting requirements covering source reduction and recycling activities (see below).

To carry out the provisions of this Act, EPA has adopted a strategy to implement the policy of pollution prevention throughout all its offices, programs, and activities. An Office of Pollution Prevention has been established to coordinate all agency pollution prevention activities, and a Pollution Prevention Advisory Committee of top-level agency staff will ensure that a pollution prevention strategy is the preferred approach emphasized in agency activities affecting all environmental media. One of the first major Agency programs developed specifically in response to the Pollution Prevention Act of 1990 is the 33/50 Program, which involves the voluntary cooperation of industry in reducing environmental releases of specific TRI chemicals. (See Chapter 6.) The Pollution Prevention Act of 1990 also provides for the establishment of a state matching grant program whose aim is to promote source reduction techniques in the business sector.

Other EPA initiatives include the establishment of the Pollution Prevention Information Clearinghouse (PPIC) for the dissemination of pollution prevention information to federal, state, and local governments, industry and trade associations, public interest groups, academic and other public and private institutions. The American Institute for Pollution Prevention, comprised of experts in association with professional societies and trade associations, was jointly established by EPA and the University of Cincinnati in 1989, before the passage of the Pollution Prevention Act of 1990, to develop analyses, techniques, and programs to assist government and the private sector in further pollution prevention efforts.

Effect of Pollution Prevention Legislation on TRI for 1991

The Pollution Prevention Act of 1990 mandates reporting of source reduction and recycling data on the TRI Form R beginning with TRI reporting year 1991.

Among other provisions, the Pollution Prevention Act of 1990 mandates that EPA collect data about the source reduction, recycling and treatment activities applied to each chemical reported on a TRI form (Form R). These requirements will expand and make mandatory the current section of the form on waste minimization (Section

8) and will significantly expand the amount of information available on source reduction and recycling activities. This additional data will be collected beginning with the 1991 reporting year (reports due by July 1, 1992). For the first time under TRI, EPA will obtain national estimates of the total quantities of TRI chemicals entering wastestreams and being recycled. EPA will also be able to assess future trends in quantities of chemicals entering wastestreams and being recycled, as well as document which source reduction and recycling activities are most common and the reasons for implementing those activities. This information will be invaluable as EPA, the public, and industry attempt to identify opportunities for prevention of toxic chemical waste and to track the nation's progress in reduction and recycling.

The information required by the Pollution Prevention Act of 1990 includes the following:

- The amount of reported chemical entering any wastestream or directly released to the environment prior to recycling, treatment or disposal during the reporting (calendar) year, the percentage change in this quantity from the previous year, and estimates of the amounts anticipated in the two years following the reporting year.

- The amount of reported chemical recycled at the facility or elsewhere during the reporting year, the process of recycling used, the percentage change in this quantity from the previous year, and estimates of the amounts anticipated in the two years following the reporting year.

- The amount of the reported chemical treated at the facility or elsewhere and the percentage change in this quantity from the previous year.

- The amount of the reported chemical that was released to the environment through catastrophic or one-time events not associated with production processes.

- The source reduction activity(ies) implemented for the reported chemical during the reporting year and the method used to identify that activity(ies).

- A ratio, or index, of production or other activity in the reporting year compared to production or other activity in the previous year. The ratio or index should reflect the use or manufacture of the reported chemical at the facility.

As a result of these new mandatory questions that will be effective beginning with the 1991 reporting year, EPA will be able to document the extent of the implementation of the waste management hierarchy at each TRI facility for reported chemicals. As information on the quantities of reported chemicals sent off-site for recycling (and the type of recycling involved), was not mandated to be collected under TRI in the past, the addition of such information to TRI will close what has been termed a "recycling loop-hole." In addition, the projection of quantities that may enter wastestreams or be recycled in future years will both encourage industry to plan ahead and provide EPA and the public with important information about the potential for continued source reduction programs. The data on the type of source

reduction activities implemented and the reasons those activities were implemented will aid in identifying which activities are most common and which methods are best for identifying those activities. This will aid in the transfer of technology and pollution prevention initiatives.

NOTES

1. These reductions, as well as other decreases or increases reported in this chapter, apply only to the specific TRI chemicals for which the facilities supplied waste minimization data. The production levels and amount of waste generated for other TRI chemicals at the same facilities are not known.

2. A minus sign on a table in this chapter indicates a decrease.

3. The choice of the 1986 base year is arbitrary. Alternatively, changes could be calculated using 1987 or 1988 as a base year. However, only relative year-to-year changes using the same base year may be legitimately added together.

4. Pollution Prevention Act, Public Law 101-508, Section 6602(4).

5. Pollution Prevention Act, Public Law 101-508, Section 6602(3).

Photo: Steve Delaney

CHAPTER 6. THE 33/50 PROGRAM CHEMICALS

INTRODUCTION

The 33/50 Program is one of EPA's recent pollution prevention initiatives.

On February 7, 1991, the Environmental Protection Agency (EPA) announced that it had asked over 600 American companies to voluntarily reduce releases and transfers of 17 high-priority toxic chemicals. This voluntary initiative, known as the 33/50 Program, aims for a step-wise reduction in the releases and transfers of 17 target chemicals from 33 percent by the end of 1992 to 50 percent by the end of 1995. Reduction will be measured against 1988 TRI data. Since the inception date of the 33/50 Program, EPA has requested this commitment from other facilities with releases and transfers of these 17 chemicals. Approximately 6,000 companies, encompassing about 12,000 facilities, have received such requests.

EPA selected the 33/50 Program chemicals based upon criteria including health and environmental effects, possibility of exposure, volume of production and release, and potential for pollution prevention. Because air emissions accounted for over 70 percent of the releases and transfers of the 17 selected chemicals, the program overlaps with the Clean Air Act Amendments of 1990, administered by EPA. EPA believes that the 33/50 Program and the Clean Air Act Amendments will work in conjunction to promote pollution reduction in advance of statutory timetables. EPA intends to provide support to participating companies by organizing opportunities for communication, information exchange, and technical assistance.

EPA includes the 33/50 Program within its broader pollution prevention strategy (see Chapter 5), and expects that the program will reinforce regulatory initiatives by inspiring innovative responses from the private sector. Crucial to the success of the program is the Toxics Release Inventory, which provides data permitting the evaluation of the program's progress and the status of its target chemicals relative to overall trends. In order to illuminate TRI data from both a chemical and an industrial perspective, this chapter examines the 33/50 chemicals not only in the context of TRI reporting but also with regard to their physical characteristics and their manufacturing uses.

As with any examination of increases and decreases in TRI releases and transfers, several factors must be considered in the evaluation of the success of the program. For example, decreases in TRI releases and transfers between reporting years may represent a combination of "paper" and "true" reductions. In addition, many pollution prevention activities were initiated prior to the inception of the 33/50 Program, and EPA intends that the 33/50 Program recognize these efforts. Thus, EPA will seek to identify facility decreases in TRI releases and transfers which are due to pollution prevention initiatives prior to or in conjunction with the 33/50 Program. EPA plans to evaluate the 33/50 Program by looking at reductions made in

each year between the baseline (1988) and 1995. For further discussion of why a facility might report more or less releases and transfers to TRI from year to year, see Chapter 4, Box 4-B.

33/50 Chemicals Within TRI

The 33/50 Program targets 17 chemicals in TRI.

The 17 chemicals selected by EPA to be included in the 33/50 Program are: benzene, cadmium and compounds, carbon tetrachloride, chloroform, chromium and compounds, cyanides, dichloromethane, lead and compounds, mercury and compounds, methyl ethyl ketone, methyl isobutyl ketone, nickel and compounds, tetrachloroethylene, 1,1,1-trichloroethane, trichloroethylene, toluene, and the xylenes. Table 6-1 lists the 17 chemicals in the 33/50 Program, as well as the chemical classes to which they belong.

Table 6-1 Classification of TRI Chemicals in the 33/50 Program.

TRI CHEMICAL NAME	33/50 CHEMICAL NAME	TRI CHEMICAL CLASS	33/50 CHEMICAL CLASS
Cadmium Compounds Cadmium	Cadmium and Compounds	Metals and Metal Compounds	Metals and Metal Compounds
Chromium Compounds Chromium	Chromium and Compounds	Metals and Metal Compounds	Metals and Metal Compounds
Lead Compounds Lead	Lead and Compounds	Metals and Metal Compounds	Metals and Metal Compounds
Mercury Compounds Mercury	Mercury and Compounds	Metals and Metal Compounds	Metals and Metal Compounds
Nickel Compounds Nickel	Nickel and Compounds	Metals and Metal Compounds	Metals and Metal Compounds
Benzene	Benzene	Non-Halogenated Organics	Non-Halogenated Organics
Methyl Ethyl Ketone	Methyl Ethyl Ketone	Non-Halogenated Organics	Non-Halogenated Organics
Methyl Isobutyl Ketone	Methyl Isobutyl Ketone	Non-Halogenated Organics	Non-Halogenated Organics
Toluene	Toluene	Non-Halogenated Organics	Non-Halogenated Organics
Xylene (mixed isomers) m-Xylene o-Xylene p-Xylene	Xylenes	Non-Halogenated Organics	Non-Halogenated Organics
Carbon Tetrachloride	Carbon Tetrachloride	Halogenated Organics	Halogenated Organics
Chloroform	Chloroform (Trichloromethane)	Halogenated Organics	Halogenated Organics
Dichloromethane	Methyl Chloride (Dichloromethane)	Halogenated Organics	Halogenated Organics
Tetrachloroethylene	Tetrachloroethylene (Perchloroethylene)	Halogenated Organics	Halogenated Organics
1,1,1-Trichloroethane	1,1,1-Trichloroethane (Methyl Chloroform)	Halogenated Organics	Halogenated Organics
Trichloroethylene	Trichloroethylene	Halogenated Organics	Halogenated Organics
Cyanide Compounds Hydrogen Cyanide	Cyanides Cyanides	Mineral Acids/Salts Mineral Acids/Salts	Cyanides Cyanides

These 33/50 chemicals accounted for 23% of 1989 TRI releases and transfers.

The 33/50 chemicals occupy a significant place within TRI. Combined, they accounted for almost one-fourth (23 percent, or 1.3 billion pounds) of 1989 total TRI releases and transfers. A significant proportion of the 33/50 chemicals was released in the form of air emissions, indicating that air pollution is the overall problem associated with this TRI sub-group, although the characteristics of individual chemicals vary widely.

The overall releases and transfers of the 33/50 chemicals decreased between 1988 and 1989 . . . but at a lower rate than that of the overall TRI chemicals.

Of the top five 33/50 chemicals for TRI releases and transfers, none fell in TRI ranking from 1988 to 1989. Toluene, the first-ranked 33/50 chemical, moved from sixth to fifth place for overall TRI releases and transfers. Xylenes (mixed isomers), the second-ranked 33/50 chemical, shifted from eleventh to eighth place within the TRI total. 1,1,1-Trichloroethane, the number three 33/50 chemical, moved from tenth to ninth in TRI, and methyl ethyl ketone, fourth in 33/50 rankings, shifted from twelfth to eleventh between 1988 and 1989. Only dichloromethane, the fifth 33/50 chemical, held steady for both years of TRI reporting at number thirteen. Although in each case releases and transfers of the 33/50 chemical in question *decreased*, the *rates* of decrease were not as great as those of a majority of other chemicals on the TRI list. The average decrease per TRI chemical in TRI releases and transfers from 1988 and 1989 was 11 percent, while that of the chemicals in the 33/50 sub-group was 8 percent. Some 33/50 chemicals moved up in TRI rank between 1988 and 1989 while still showing a decrease in releases and transfers between the two years (see, for example, 1,1,1-trichloroethane). (See Table 6-2.)

Air emissions made up over 2/3 of 33/50 releases and transfers.

Air emissions accounted for about 70 percent of all 33/50 releases and transfers in 1989, as opposed to TRI overall, where air emissions accounted for 43 percent of total releases and transfers. In fact, air emissions of the 17 chemicals in the 33/50 Program made up 40 percent of *all* TRI chemicals released in this manner. The second-largest 33/50 category was off-site transfers, which accounted for 28 percent of the off-site transfers of *all* TRI chemicals in 1989. Analysis of the 33/50 chemicals allows a close examination of the chemicals and industries contributing to these environmental distribution totals. (See Figure 6-1 and Chapter 3, Figure 3-6.)

Map 6-1 shows the geographical distribution of 1989 TRI releases and transfers of the 33/50 chemicals. States in which total releases and transfers of 33/50 chemicals were over 50 million pounds in 1989 were California, Illinois, Indiana, North Carolina, New York, Michigan, Minnesota, Ohio, Pennsylvania, and Texas. See Appendix J, Table J-1 for the distribution of 33/50 chemicals by state.

The top seven 33/50 chemicals accounted for approximately 84 percent of the releases and transfers of the total seventeen. (See Figure 6-2.) In order to better understand the significance of these high-volume chemicals to the 33/50 pollution prevention initiative, it is necessary to examine them in relation to the various types of industries which contribute heavily to their releases and transfers. In all cases, TRI facility data are essential both in locating industries and practices which

resulted in releases and transfers of large volumes of a particular chemical and in identifying chemicals manufactured, processed, or otherwise used in a broad range of manufacturing activities.

Table 6-2. Total TRI Releases and Transfers of 33/50 Chemicals, 1988-1989.

TRI RANK 1989	TRI RANK 1988	CHEMICAL	TOTAL RELEASES AND TRANSFERS 1989 Pounds	TOTAL RELEASES AND TRANSFERS 1988 Pounds	CHANGE 1988-1989 Pounds	CHANGE 1988-1989 Percent
		Metals				
125	105	Cadmium compounds	759,865	1,583,940	-824,075	-52.03
148	153	Cadmium	387,918	344,879	43,039	12.48
24	26	Chromium compounds	50,881,050	47,316,000	3,565,050	7.53
47	45	Chromium	13,403,332	21,477,835	-8,074,503	-37.59
30	31	Lead compounds	34,498,469	38,650,362	-4,151,893	-10.74
42	43	Lead	19,872,648	22,124,055	-2,251,407	-10.18
189	211	Mercury compounds	57,028	21,526	35,502	164.93
165	160	Mercury	159,405	297,061	-137,656	-46.34
49	55	Nickel compounds	12,849,203	10,429,364	2,419,839	23.20
54	59	Nickel	9,493,108	8,857,710	635,398	7.17
		Organics				
35	34	Benzene	28,591,407	32,240,533	-3,649,126	-11.32
11	12	Methyl ethyl ketone	156,992,642	161,224,422	-4,231,780	-2.62
29	27	Methyl isobutyl ketone	38,849,703	44,511,920	-5,662,217	-12.72
5	6	Toluene	322,521,176	349,388,537	-26,867,361	-7.69
8	11	Xylene (mixed isomers)	185,442,035	190,575,168	-5,133,133	-2.69
103	82	m-Xylene	1,465,778	3,574,030	-2,108,252	-58.99
95	89	o-Xylene	2,242,661	2,965,855	-723,194	-24.38
70	67	p-Xylene	4,811,223	7,108,608	-2,297,385	-32.32
		Halo-organics				
72	75	Carbon tetrachloride	4,607,809	5,029,696	-421,887	-8.39
36	39	Chloroform	27,325,508	26,882,013	443,495	1.65
13	13	Dichloromethane	130,355,581	155,059,038	-24,703,457	-15.93
32	32	Tetrachloroethylene	30,058,581	37,760,219	-7,701,638	-20.40
9	10	1,1,1-Trichloroethane	185,026,191	195,398,302	-10,372,111	-5.31
26	23	Trichloroethylene	48,976,806	57,816,129	-8,839,323	-15.29
		Cyanides				
58	60	Cyanide compounds	7,791,895	8,672,222	-880,327	-10.15
78	86	Hydrogen cyanide	4,184,475	3,115,671	1,068,804	34.30
		TOTAL FOR 33/50 CHEMICALS	1,321,605,497	1,432,425,095	-110,819,598	-7.74
		TOTAL FOR ALL OTHERS	4,384,064,883	5,000,222,531	-616,157,648	-3.56
		TRI GRAND TOTAL	5,705,670,380	6,432,647,626	-726,977,246	-11.30

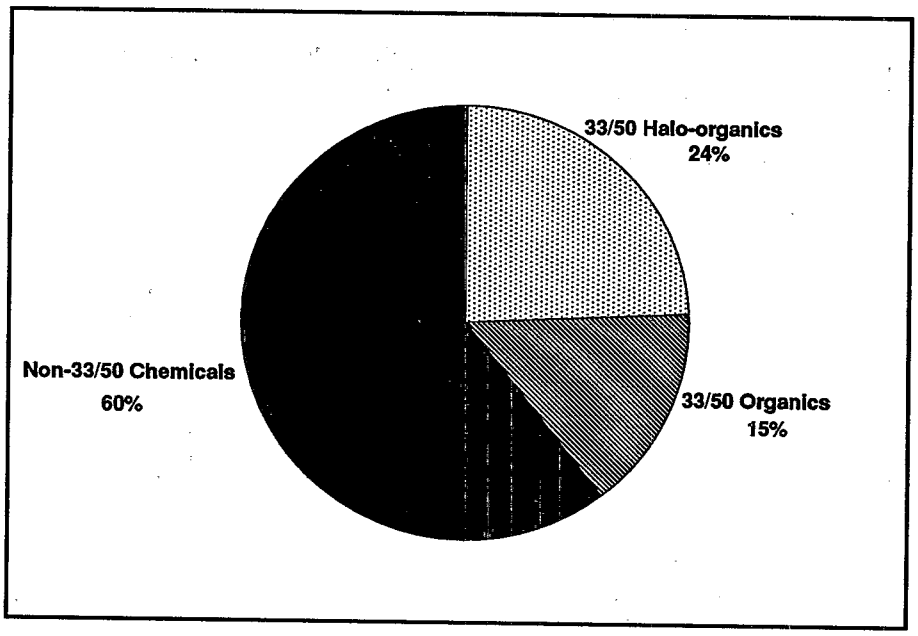


Figure 6-1. TRI Total Air Emissions, 1989. (33/50 Metals < 0.5 Percent; Hydrogen Cyanide and Cyanide Compounds < 0.1 Percent.)

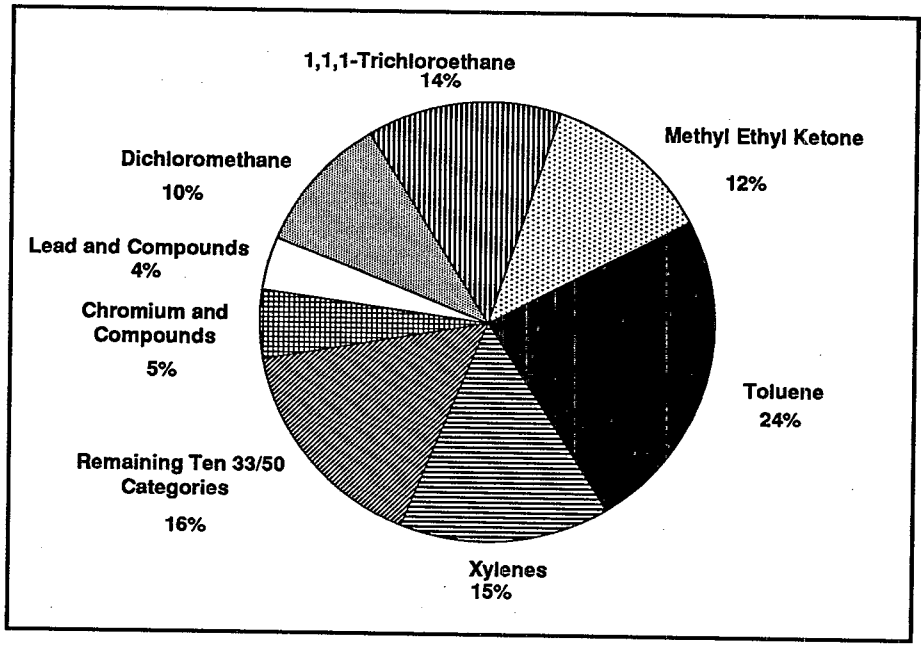


Figure 6-2. Total TRI Releases and Transfers of 33/50 Chemicals, 1989.

33/50-Intensive Industries

Over 1/2 of the TRI releases and transfers of 33/50-intensive industries are 33/50 chemicals.

As defined in this report, "33/50-intensive industries" are not necessarily those whose facilities released and transferred the largest amounts of the 17 chemicals targeted by the 33/50 Program. Instead, 33/50-intensive industries are those for which 33/50 chemicals comprised more than half of their total TRI releases and transfers. The label "33/50-intensive" is useful primarily to identify which industries may have activities involving a specific 33/50 chemical as a major component or by-product of their manufacturing processes, but does not indicate absolute volumes of releases and transfers of 33/50 chemicals.

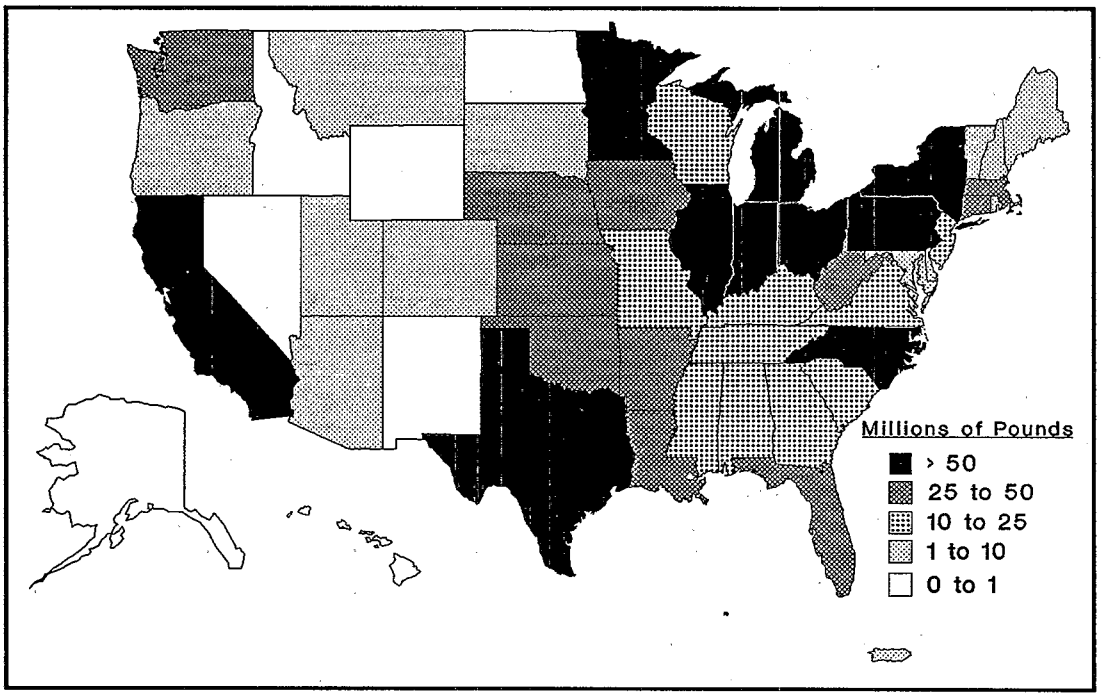
Most 33/50-intensive industries did not contribute large amounts to total TRI releases and transfers . . .

Most 33/50-intensive industries were not major contributors to TRI totals (with the exception of the Transportation and Plastics industries). For example, facilities in the top TRI industry in 1989, the Chemical industry, accounted for 18 percent of all 33/50 releases and transfers. However, only 9 percent of the *total* releases and transfers reported by facilities in the Chemical industry fell into the overall 33/50 category. In contrast, 89 percent of the releases and transfers reported by facilities in the Printing industry involved 33/50 chemicals, making this a 33/50-intensive industry. However, the Printing industry accounted for only 4 percent of all 33/50 releases and transfers. See Table 6-3 and Appendix J, Table J-2, which shows the releases and transfers of the 33/50 chemicals by industry.

Table 6-3. 33/50-Intensive Industries, 1989. (a)

	PRINTING SIC 27	MISCELLANEOUS SIC 39	FURNITURE SIC 25	MACHINERY SIC 35	APPAREL SIC 23
PERCENT OF TOTAL 33/50 RELEASES AND TRANSFERS	4.11	1.97	3.23	3.63	0.10
33/50 RELEASES AND TRANSFERS AS PERCENT OF TRI TOTAL FOR THIS INDUSTRY	89.14	66.79	65.24	64.07	62.52
TOP FIVE 33/50 CHEMICALS IN EACH INDUSTRY	Toluene	Toluene	Toluene	1,1,1-Trichloroethane	1,1,1-Trichloroethane
	1,1,1- Trichloroethane	Methyl ethyl ketone	Xylene (mixed isomers)	Xylene (mixed isomers)	Methyl ethyl ketone
	Methyl ethyl ketone	1,1,1-Trichloroethane	Methyl ethyl ketone	Trichloroethylene	Toluene
	Xylene (mixed isomers)	Xylene (mixed isomers)	1,1,1-Trichloroethane	Toluene	Dichloromethane
	Dichloromethane	Dichloromethane	Methyl isobutyl ketone	Methyl ethyl ketone	Xylene (mixed isomers)
TOTAL 33/50 CHEMICALS	54,306,578	25,971,829	42,649,661	48,000,815	1,287,555
TOTAL TRI CHEMICALS	60,923,661	38,886,447	65,369,507	74,922,470	2,059,373

(a) The term "33/50 - intensive industry" indicates that over half of the releases and transfers of a particular industry were in the 33/50 sub-group.



Map 6-1.Total TRI Releases and Transfers by State for 33/50 Program Chemicals.

Table 6-3, continued.

	TRANSPORTATION SIC 37	LUMBER SIC 24	TEXTILES SIC 22	MEASURE./PHOTO. SIC 38
PERCENT OF TOTAL 33/50 RELEASES AND TRANSFERS	10.81	1.63	1.78	2.64
33/50 RELEASES AND TRANSFERS AS PERCENT OF TRI TOTAL FOR THIS INDUSTRY	58.22	56.83	50.93	50.24
TOP FIVE 33/50 CHEMICALS IN EACH INDUSTRY	Xylene (mixed isomers) 1,1,1Trichloroethane Toluene Methyl ethyl ketone Methyl isobutyl ketone	Xylene (mixed isomers) Toluene Methyl ethyl ketone Methyl isobutyl ketone 1,1,1-Trichloroethane	Methyl ethyl ketone 1,1,1-Trichloroethane Toluene Xylene (mixed isomers) Tetrachloroethylene	Dichloromethane 1,1,1-Trichloroethane Toluene Methyl ethyl ketone Trichloroethylene
TOTAL 33/50 CHEMICALS	142,833,736	21,495,580	23,469,903	34,933,886
TOTAL TRI CHEMICALS	245,316,145	37,824,596	46,081,356	69,535,397

... instead, large TRI industries often had a greater impact upon 33/50 totals.

Many industries which released and transferred a large share of 33/50 chemicals out of their total TRI releases and transfers did not necessarily do so in *amounts* that had a significant impact upon 33/50 totals. High-impact industries, such as the Chemical industry, usually released much higher volumes of 33/50 chemicals than did 33/50-intensive industries. For example, the greatest amount of TRI releases and transfers of 33/50 chemicals reported by any 33/50-intensive industry was 142.8 million pounds, reported by facilities in the Transportation industry, as opposed to 239.7 million pounds of 33/50 chemicals reported by facilities in the Chemical industry. (See Appendix J, Table J-2.)

The 33/50 chemicals may be grouped according to *chemical class*, and chemical-specific information can play a particularly useful role in the examination of changes in reported releases and transfers. Such a classification, which is based on similar chemical characteristics, is useful in the examination of TRI data. Chemical classification provides an important perspective to TRI data, which clearly shows the concentration of particular chemicals within certain industries.[1] The remainder of this chapter will discuss the 33/50 chemicals within the context of their chemical classes, including an analysis of the industries and processes that play a leading role in their use, production, and release and transfer.

33/50 CHEMICALS BY CLASS: CHEMICAL AND INDUSTRIAL PERSPECTIVES

Metals and Metal Compounds

Of the 33/50 chemicals, 5 are in the metals and metal compounds class.

Five of the 33/50 chemicals fall within the class of metals and metal compounds. These 33/50 metals and their compounds are: cadmium, cadmium compounds, chromium, chromium compounds, lead, lead compounds, mercury, mercury compounds, nickel, and nickel compounds.[2] Combined, these metals accounted for 11 percent of releases and transfers of the 33/50 sub-group in 1989. The metals (and not their compounds) all exist naturally in trace amounts; however, mining, purification, use, and incineration concentrate their presence in the environment. Their relative mobility and tendency to bioaccumulate heighten their environmental impact. Metals are used commercially as alloys, catalysts, and in batteries and in metal plating processes.

Facilities in the Primary Metals industry accounted for 45% of the release and transfer of 33/50 metals and metal compounds.

1989 releases and transfers in this 33/50 class were heavily affected by facilities in the Primary Metals industry and the Chemical industry. Of the total releases and transfers of the 33/50 chemicals in this class, the Primary Metals industry contributed 45 percent (64.1 million pounds), while the Chemical industry accounted for 20 percent (28.2 million pounds). The industries following in importance were the Multiple SIC Codes category (10 percent), Fabricated Metals (5 percent), and Stone/Clay/Glass (5 percent). All of these industries contributed heavily to releases and transfers of at least three of the ten chemicals and chemical compounds listed above; facilities in the Primary Metals industry, for example, made this the number-one industry for seven out of these ten. (See Table 6-4 and Appendix J, Table J-2.)

Table 6-4. Top Five Industries for Total TRI Releases and Transfers of 33/50 Metals, 1989.

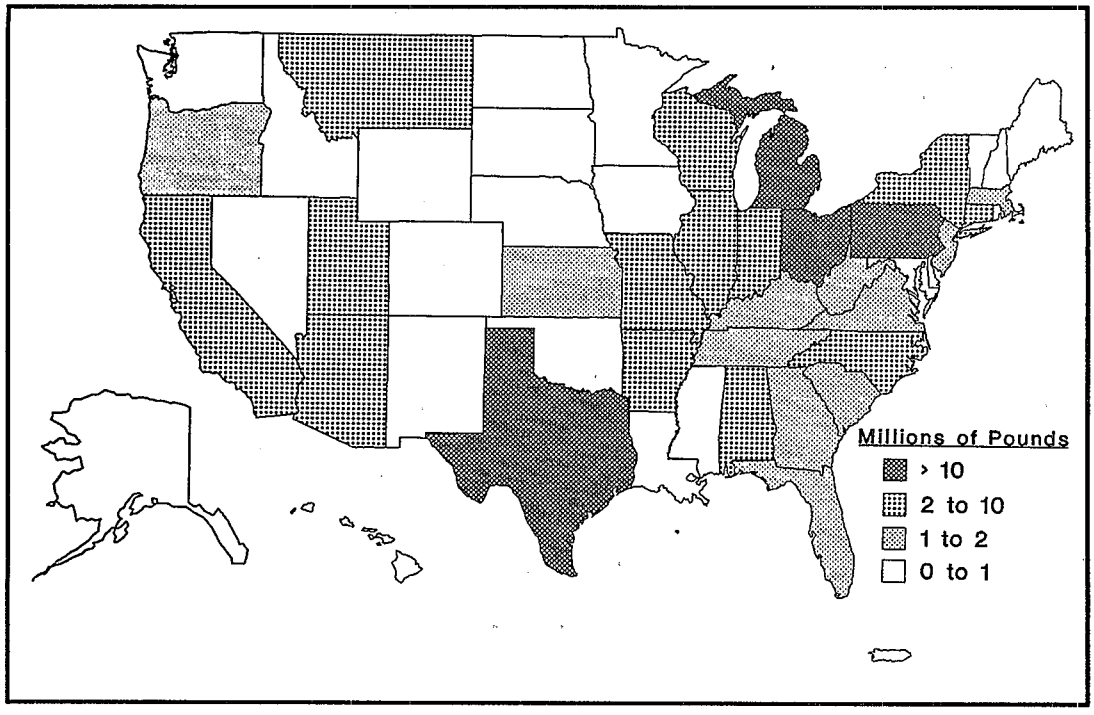
SIC CODE	INDUSTRY	RELEASES AND TRANSFERS OF 33/50 METALS Pounds	PERCENT OF TOTAL 33/50 METALS RELEASES AND TRANSFERS	PERCENT OF TOTAL TRI METALS RELEASES AND TRANSFERS	PERCENT OF TRI TOTAL RELEASES AND TRANSFERS
33	Primary Metals	64,069,025	45.00	9.82	1.12
28	Chemicals	28,169,764	19.79	4.32	0.49
	Multiple Codes 20-39	14,201,473	9.98	2.18	0.25
34	Fabr. Metals	7,400,393	5.20	1.13	0.13
32	Stone /Clay	6,644,176	4.67	1.02	0.12
	SUBTOTAL	120,484,831	84.63	18.46	2.11
	TOTAL FOR ALL OTHERS	21,877,195	15.37	3.35	0.38
	TOTAL FOR ALL INDUSTRIES	142,362,026	100.00	21.82	2.50

However, *none* of these industries may be described as 33/50-intensive; although facilities in the Chemical, Primary Metals, and Fabricated Metals industries released and transferred the majority of 33/50 metals and metal compounds, 33/50 chemicals accounted for less than 50 percent of their total TRI releases and transfers. Although facilities in the Primary Metals industry, for example, dominated the release and transfer of each 33/50 metal and metal compound, 33/50 chemicals as a group constituted only 16 percent of the industry's total releases and transfers. Metals and metal compounds accounted for slightly over half (52 percent) of the industry's 33/50 releases and transfers.

Off-site transfers made up 52% of all releases and transfers of 33/50 metals and metal compounds.

Releases and transfers of 33/50 metals and metal compounds occurred principally in the form of off-site transfers, accounting for 52 percent (74.4 million pounds) of their TRI total releases and transfers. On-site land releases followed, representing 41 percent (58.8 million pounds) of total releases and transfers for this 33/50 chemical class. It should be noted that off-site transfers can also end up in the form of deposits to land. Air emissions contributed 4 percent to the total, leaving discharges to surface water, underground injection discharges, and transfers to public sewage to account for only 2 percent, combined. (See Table 6-5.) Map 6-2 shows the release and transfer totals for 33/50 metals and metal compounds by state. States whose TRI facilities reported combined releases and transfers of 33/50 metals and metal compounds over 10 million pounds in 1989 were Michigan, Ohio, Pennsylvania, and Texas.

Because of the prominence of two industrial categories within this chemical class, overall totals for individual chemicals, mode of release or transfer, and geographic distribution could be heavily influenced by a single industry or a single facility.



Map 6-2. Total TRI Releases and Transfers by State for 33/50 Metals.

Chromium and Chromium Compounds

Chromium is a silver white metal, found in nature in minerals such as chromite, $FeOCr_2O_3$, its most important source. Chromite contains the impurities magnesium and aluminum with interstitial impurities of metal silicates. United States production of chromite ceased in 1961, as the Defense Production Act was phased out, but the United States continues to be one of the world's leading consumers of chromite, producing chromium alloys, refractories, and chemicals. In 1987, the United States consumed over 110 million pounds of chromite ore and 750 million pounds of the metal and its alloys. Three-quarters of these needs were met by direct imports and one-quarter by secondary production from recycling commodities such as stainless scrap metal. U.S. imports come mainly from South Africa, Zimbabwe, Yugoslavia, and Turkey.

One of the most important uses of pure chromium is for plating. Decorative plate is usually electrodeposited, while the process of chromizing may be required where a more functional coating is needed, such as in high-temperature tools. In this process a layer of chromium is applied at a temperature which causes inward diffusion to form a composition gradient. Chromium is also used extensively for alloying with iron to form stainless steels, high strength steels, and electrical resistance wires. It is alloyed with nickel, manganese, and iron to form various stainless steels, with nickel in varying quantities to form special heat-resistant alloys, and with cobalt to produce

cutting tools. Chromium tanning is also the most widely used leather tanning process, which explains the prominence of the Leather Industry in TRI total releases and transfers of this metal.

Chromium compounds have a number of applications in lithography, textile printing, tanning, dyeing, photography, and the manufacture of dyes, pigments, wallpaper, electric cells, explosives, matches, and rubber goods. Zinc chromate is widely used in metal primers. Chromic salts, particularly chloride and oxide, are used as textile mordants, paint pigments, and in refractory brick. Chromium compounds are also used in various stages of chemical manufacturing processes.

While small amounts of chromium in food serve as an essential nutrient, the three major forms of chromium (with valences of II, III, and VI) differ in their effects upon human health. Lung cancer has been associated with the hexavalent (VI) compounds. Chromic acid is corrosive to the skin. Chromium compounds have adverse effects upon aquatic life.[3]

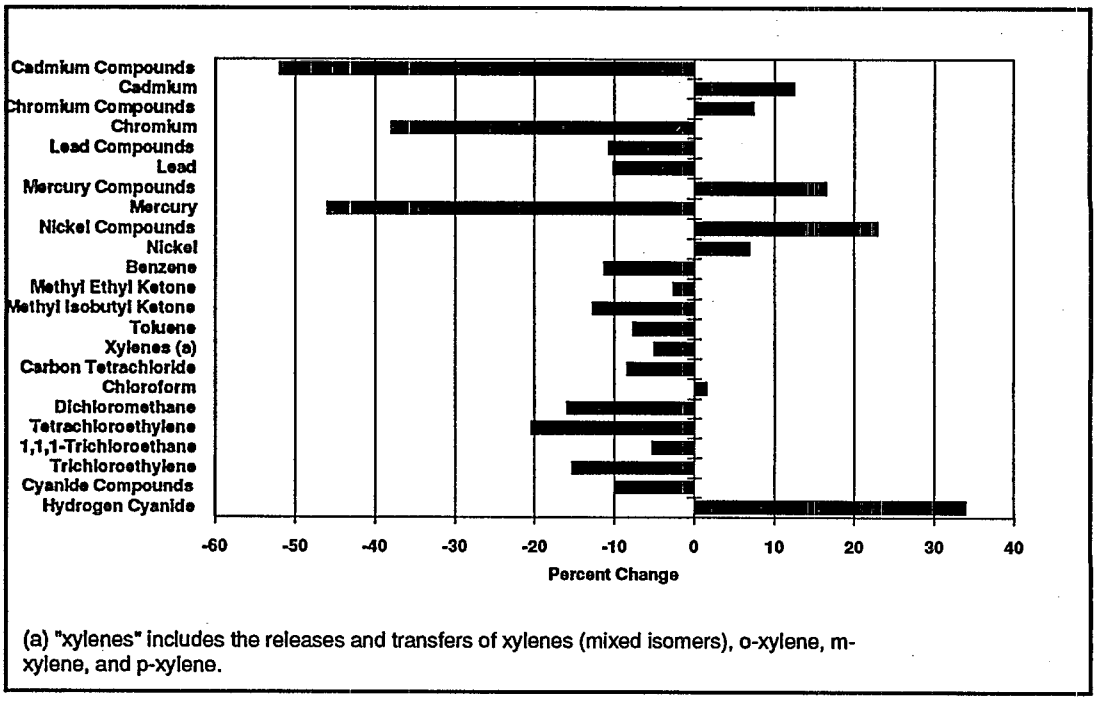
Chromium enters the environment through oil, gas, and coal combustion and from chemical manufacture, primary metal production, chrome plating, and as a water treatment in agent in cooling towers, usually in the form of air emissions. Chromium is removed from the atmosphere by precipitation and fallout, and its residence time there is estimated to be less than ten days. Chromium remains in water and soil for several years.

Chromium compounds were ranked number 24 for total TRI releases and transfers in 1989.

Releases and transfers of chromium compounds accounted for slightly less than 1 percent of the 1989 TRI total, and represented 36 percent of the releases and transfers of all 33/50 metals and metal compounds (50.9 million pounds). Releases and transfers of these compounds increased 7 percent between the 1988 and 1989 TRI reporting periods, marking a move from number 26 to number 24 in overall TRI chemical rankings. (See Figure 6-3.) Releases and transfers were dominated by facilities in the Chemical industry, the Primary Metals industry, Multiple SIC Codes, the Fabricated Metals industry, and the Transportation industry, respectively. Together, facilities in the Chemical and Primary Metals industries accounted for 72 percent of all TRI releases and transfers of chromium compounds in 1989. (See Appendix J, Table J-2.) Overall, 61 percent of all releases and transfers of chromium compounds in 1989 were in the form of on-site land releases, followed by off-site transfers (34 percent). Out of the class of 33/50 metals and metal compounds, chromium compounds accounted for 53 percent of all on-site land releases and 23 percent of all off-site transfers. (See Table 6-5.)

Chromium was number 47 for total TRI releases and transfers in 1989.

Chromium was the number 47 chemical for TRI total releases and transfers in 1989, and accounted for 9 percent (13.4 million pounds) of total releases and transfers for all 33/50 metals and metal compounds. (See Table 6-2.) The top industries for releases and transfers of chromium were Primary Metals, Fabricated Metals, Machinery, Leather, and Multiple SIC Codes, in order of prominence. Facilities in the Primary Metals industry contributed 46 percent to total TRI releases and transfers of chromium, and facilities in all top five industries combined comprised



(a) "xylenes" includes the releases and transfers of xylenes (mixed isomers), o-xylene, m-xylene, and p-xylene.

Figure 6-3. Percent Change in Releases and Transfers of 33/50 Chemicals, 1988-1989.

86 percent of this total. Together, facilities in the fourth- and fifth-ranked industries, Leather and Transportation, contributed only 8 percent to total releases and transfers of chromium in 1989, so clearly facilities in the top three industries were the primary sources of releases and transfers of chromium. (See Appendix J, Table J-2.)

The environmental distribution of chromium was dominated by off-site transfers, which accounted for 65 percent of total TRI releases and transfers of this chemical in 1989. The second-ranked form of release for chromium was on-site land releases, which accounted for one-fourth of the total releases and transfers of chromium. (See Table 6-5.)

One of the top five industries for the TRI release and transfer of chromium was 33/50-intensive, the Machinery industry, which ranked third for 1989 TRI releases and transfers of chromium. Metals and metal compounds did not account for a large proportion of this industry's total 33/50 releases and transfers. Only 9 percent of the Machinery industry's total 33/50 releases and transfers were 33/50 metals and metal compounds. As indicated in the general discussion of 33/50 metals, above, facilities in the Primary Metals industry released and transferred a much more significant proportion of their own 33/50 total (52 percent of total 33/50 releases and transfers) in the 33/50 metals and metal compounds class. (See Appendix J, Table J-2.)

Lead and Lead Compounds

Lead rarely occurs in the elemental state, but exists widely throughout the world in a variety of lead compound-containing ores. Lead ores often contain silver and zinc; other metals commonly associated with lead ores are copper, arsenic, antimony, and bismuth. Most of the world production of arsenic, antimony, and bismuth arises from their separation from lead ores.

There are about 30 lead mines in operation in the United States, but eight mines in southeastern Missouri provide over 90 percent of the total lead ore. This region contains the nation's largest refineries of lead from primary sources. Lead is also obtained as a by-product of copper refining. Domestic consumption of lead in recent years has been about 2.5 billion pounds. Direct production accounted for approximately one-third of this total, and recovery from secondary sources constituted the remainder. In 1988, 20 companies with 27 plants accounted for 96 percent of the total domestic secondary lead production. About three-quarters of the lead consumed in the United States is used in storage batteries, one-tenth for oxides and chemicals including gasoline additives, one-tenth for sheet lead, solder, pipes, and other miscellaneous products, and the remainder for ammunition and miscellaneous uses. Lead is used by the electronics industry to shield product components which emit radiation, explaining the prominence of the electronics industry in lead releases and transfers.

Many of the uses of lead compounds have declined radically because of regulatory actions that have resulted from the recognition of their toxic effects. In prior years, the function of lead compounds as additives to gasoline to increase octane ratings dominated their use, but this has changed drastically with the advent of unleaded gasoline. Other uses, such as in paints, have also been significantly scaled back or eliminated.

Long-term exposure to inorganic lead compounds, or lead, can affect the central nervous system, peripheral nerves, and kidneys. Symptoms of lead poisoning may be non-specific in the early stages, often resembling illnesses such as sore muscles, fatigue, headache, and digestive disturbances. Later symptoms include anemia, decreased grip strength, and severe abdominal cramping. While some symptoms are reversible, later effects may be more permanent. Organic lead compounds, particularly tetraethyl lead, tend to focus upon the nervous system. The most visible clinical sign of poisoning is encephalopathy and associated toxic delirium, psychosis, convulsions, and delusions. Physical manifestations are less apparent than those associated with inorganic lead compounds. Non-fatal exposure may result in complete, though prolonged, recovery. Lead and its compounds are highly toxic to aquatic life. Adverse effects have also been noted in birds and land animals exposed to these substances.[4]

Lead compounds were number 30 in TRI for total releases and transfers.

Lead compounds ranked number 30 for TRI total releases and transfers in 1989, marking a change in place from number 31 in 1988, as well as an 11 percent decrease. Within the 33/50 metals metal compounds class, lead compounds ac-

counted for 24 percent (34.5 million pounds) of total releases and transfers. Major industrial contributors to these totals were the Primary Metals industry, the Stone/Clay/Glass industry, [Electronic and] Electrical industry, the Multiple SIC Codes category, and the Chemical industry, respectively. With a 63 percent (21.9 million pounds) contribution to total TRI releases and transfers of lead compounds, the facilities in the Primary Metals industry were by far the largest contributors to TRI totals for lead compounds. The Stone/Clay/Glass industry accounted for 11 percent (3.9 million pounds) of the TRI total, while the Electrical industry, the Multiple SIC Codes category, and the Chemical industry combined contributed 22 percent in roughly equal proportions. The remaining industries combined contributed only 3 percent to total releases and transfers of lead compounds. As noted for 33/50 metals and metal compounds overall, none of the top five industries for the release and transfer of lead compounds were 33/50-intensive industries. The environmental distribution of lead compounds was dominated by off-site transfers (54 percent) and on-site land releases (41 percent), respectively. (See Tables 6-2 and 6-5; and Appendix J, Table J-2.)

Lead was ranked number 42 for total TRI releases and transfers in 1989.

The third-ranked metal within the 33/50 metals and metal compounds class, lead was number 42 for 1989 TRI total releases and transfers. (See Table 6-2.) Lead represented 14 percent (19.9 million pounds) of the releases and transfers of 33/50 metals and metal compounds. Industries whose facilities contributed heavily to total TRI releases and transfers of lead showed significant variation from those for the metals examined above. While the Primary Metals industry remained number one for the release and transfer of lead, it accounted for 75 percent (14.8 million pounds)

Table 6-5. Enviromental Distribution of Total TRI Releases and Transfers of 33/50 Metals, 1989.

CHEMICAL	AIR		SURFACE WATER		LAND		UNDER-GROUND	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Chromium compounds	1,296,947	2.55	475,846	0.94	31,015,338	60.96	59,110	0.12
Chromium	941,526	7.02	67,013	0.50	3,333,921	24.87	693	0.01
Lead compounds	1,587,768	4.60	114,301	0.33	13,980,721	40.53	1,424	0.00
Lead	862,031	4.34	32,028	0.16	5,817,158	29.27	0	0.00
Nickel compounds	217,461	1.69	115,113	0.90	3,015,745	23.47	269,258	2.10
Nickel	911,327	9.60	85,383	0.90	1,310,015	13.80	18,946	0.20
Cadmium compounds	85,579	11.26	1,888	0.25	247,333	32.55	886	0.12
Cadmium	34,262	8.83	2,746	0.71	103,163	26.59	0	0.00
Mercury compounds	4,004	7.02	13	0.02	260	0.46	36	0.06
Mercury	25,235	15.83	1,555	0.98	4,942	3.10	0	0.00
SUBTOTAL	5,966,140	4.19	895,886	0.63	58,828,596	41.32	350,353	0.25
TOTAL FOR ALL OTHERS	2,421,095,766	43.52	188,057,998	3.38	385,907,954	6.94	1,180,480,828	21.22
TRI GRAND TOTAL	2,427,061,906	42.54	188,953,884	3.31	444,736,550	7.79	1,180,831,181	20.70

of total TRI lead releases and transfers in 1989, a far greater amount than the second-ranked industry, the Electronic and Electrical industry, which contributed 5 percent (1.0 million pounds) to total lead releases and transfers. The next industries, following in order of significance, were Stone/Clay/Glass, Multiple SIC Codes, and Transportation. (See Appendix J, Table J-2.)

Facilities in the Primary Metals industry accounted for 3/4 of TRI releases and transfers of lead in 1989.

The top five industries combined accounted for 91 percent (18.1 million pounds) of total TRI releases and transfers of lead; however, as noted above, facilities in the Primary Metals industry were responsible for three-quarters of the lead total. One of these industries, Transportation, was 33/50-intensive, with 58 percent of its total releases and transfers accounted for by 33/50 chemicals. Only 10 percent of its total 33/50 releases and transfers, however, was in the class of 33/50 metals and metal compounds. Off-site transfers accounted for 66 percent of lead releases and transfers, with on-site land releases contributing another 29 percent. (See Table 6-5 and Appendix J, Table J-2.)

Nickel and Nickel Compounds

Nickel is a silver-grey metal found in a concentration of about .01 percent in meteorites and igneous rocks which contain higher concentrations of other ores. It is a common element found in all parts of the environment. There are three principal classes of nickel compound-containing ores: the sulfide ores, pentlandite and pyrrhotite; the silicate, gamerite ore; and the arsenide ores. A fourth class, the antimonide ores, are not of sufficient importance to be classified as commercial ores. The United States produced about ten million pounds of nickel from domestically mined ores in 1985 (the only nickel mine in the United States closed

Table 6-5, continued.

CHEMICAL	PUBLIC SEWAGE		OFF-SITE		TOTAL RELEASES AND TRANSFERS	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
Chromium compounds	981,119	1.93	17,052,690	33.51	50,881,050	100.00
Chromium	315,982	2.36	8,744,197	65.24	13,403,332	100.00
Lead compounds	98,130	0.28	18,716,125	54.25	34,498,469	100.00
Lead	47,589	0.24	13,113,842	65.99	19,872,648	100.00
Nickel compounds	250,238	1.95	8,981,388	69.90	12,849,203	100.00
Nickel	186,085	1.96	6,981,352	73.54	9,493,108	100.00
Cadmium compounds	11,069	1.46	413,110	54.37	759,865	100.00
Cadmium	8,099	2.09	239,648	61.78	387,918	100.00
Mercury compounds	1,034	1.81	51,681	90.62	57,028	100.00
Mercury	3,272	2.05	124,401	78.04	159,405	100.00
SUBTOTAL	1,902,617	1.34	74,418,434	52.27	142,362,026	100.00
TOTAL FOR ALL OTHERS	549,132,079	9.87	838,633,729	15.07	5,563,308,354	100.00
TRI GRAND TOTAL	551,034,696	9.66	913,052,163	16.00	5,705,670,380	100.00

permanently in the middle of that year). In addition, partially processed ores yielded 62 million pounds, 114 million pounds were recovered from scrap metals, and another 315 million pounds was imported in refined form.

In 1985, 42 percent of nickel was used in stainless and heat-resistant steels, 15 percent in high-nickel alloys, 15 percent in electroplating, 8 percent in super alloys, and 5 percent in other uses. Other commercial uses are in ceramics, special chemical vessels, nickel-cadmium storage batteries, electric circuits, a dying process for polypropylene, green glass coloring, and fuel cells. Nickel and nickel compounds are also used as industrial catalysts.

The most commonly seen toxic effect of nickel and its compounds is skin sensitization, as in the case of jewelry and the resulting "nickel itch." Nickel salts and elemental nickel, the latter of which can be deposited in the lungs by inhalation of nickel dust and particulates, are carcinogenic to the lungs and nasal passages. Overexposure to nickel carbonyl (usually during nickel production by the Mond process) can result in a variety of pulmonary and nerve symptoms. In severe exposures, delayed symptoms can lead to death.[5] Nickel compounds are carcinogenic.

Nickel particles in the atmosphere remain aloft from a week to a month depending on size and conditions. Nickel persists for years in water, and its compounds have half-lives greater than 200 days in this medium. Nickel and its compounds are highly toxic to aquatic life and plants, and cause adverse reproductive and developmental effects in animals.

Nickel compounds were number 49 for total TRI releases and transfers in 1989.

Nickel compounds were ranked 49th in total TRI releases and transfers in 1989, and contributed 9 percent (12.8 million pounds) to total releases and transfers of 33/50 metals and metal compounds. Top-ranked industries were, in order of significance, the Primary Metals industry, Multiple SIC Codes, the Chemical industry, Miscellaneous Manufacturing, and the Fabricated Metals industry. Together, facilities in these top five industries accounted for 87 percent of total 1989 TRI releases and transfers of nickel compounds. Nickel compounds were released primarily in the form of off-site transfers (70 percent) and on-site land releases (23 percent). (See Table 6-5; and Appendix J, Table J-2.)

Nickel was number 54 for total TRI releases and transfers in 1989.

Nickel was at number 54 for TRI total releases and transfers in 1989, and it made up 7 percent (9.5 million pounds) of the total volume of 33/50 metals and metal compounds releases and transfers. Since 1988, nickel moved from TRI rank 59, marking a 7 percent increase in this one-year period. Top industries for the release and transfer of nickel were, in order of prominence, the Primary Metals industry, the Fabricated Metals industry, the Transportation industry, the Machinery industry, and the Multiple SIC Codes category. (See Table 6-2; and Appendix J, Table J-2.)

Nickel was the TRI chemical with the 21st greatest number of forms submitted, which means that many facilities had activities involving nickel and/or its release and transfer. (See Chapter 3, Table 3-9.)

As with the 33/50 metals and metal compounds previously discussed, nickel releases and transfers were dominated by off-site transfers (74 percent) and on-site land releases (14 percent). Nickel was also released in the form of air emissions (10 percent). (See Table 6-5.)

Cadmium and Cadmium Compounds

Cadmium is a soft silver-white metal that occurs naturally in a compound state. Cadmium is usually obtained from the smelting and refining of zinc ores. Domestic production and imports of cadmium total about 8 million pounds, with imports accounting for slightly over one-half of that amount. Cadmium compounds such as cadmium oxide, cadmium sulfide, cadmium sulfate, and cadmium chloride have a variety of uses in fields including photography, analytical chemistry, printing, electroplating and paint manufacturing.

Cadmium plating, which accounts for about one-third of domestic consumption, helps protect iron, steel, and many alloys against corrosion. Batteries, especially the nickel-cadmium variety, use about one-fourth of the domestic supply. The Weston cell, noted for its nearly constant potential, uses cadmium sulfate as the electrolyte. Early experiments with nickel-cadmium batteries in electric-powered automobiles point to the chance of a dramatic increase in this use. Roughly one-fifth of cadmium is used in pigments. Cadmium yellow (sulfide) is one of the brightest and most permanent pigments, as is cadmium red (sulfoselenide). Less significant uses of cadmium compounds include cadmium laurate as a plasticizer in vinyl chloride, cadmium nitrate as a fixing agent in textiles, and cadmium halides in photography.

Cadmium can cause kidney and liver damage, anemia, and irritation of the respiratory tract. Exposure to high levels of airborne cadmium can result in pulmonary edema and death. Chronic low-level exposure can result in fibrosis of the lung and lung cancer.[6]

Atmospheric cadmium takes the form of fine particulate matter, which is dispersed by wind. Cadmium compounds are relatively mobile in water unless binding and adsorption by substances such as clay and iron oxide limit mobility. TRI data contain limited information on the combustion of fossil fuels and no information on the incineration of municipal wastes, both of which are estimated to be the greatest sources of atmospheric cadmium. The use of cadmium-containing phosphate fertilizers is a substantial source of cadmium soil releases. Natural weathering releases significant amounts of cadmium to surface water and groundwater. Above-average concentrations of cadmium result in significant detrimental effects upon aquatic life, where cadmium tends to bioaccumulate, particularly in the hepatopancreas of crabs. Once absorbed, cadmium has a half-life of 10 to 50 years in the human body.

Cadmium compounds were ranked number 125 for total TRI releases and transfers in 1989.

At number 125 for TRI total releases and transfers, cadmium compounds contributed 0.5 percent (800,000 pounds) to total releases and transfers of 33/50 metals and metal compounds in 1989. Cadmium compound releases and transfers moved down

in TRI rank from number 105 in 1988, reflecting a decrease of 52 percent between 1988 and 1989 TRI reporting years. Cadmium compound releases and transfers were dominated by the Primary Metals industry, the Chemical industry, the Electronic and Electrical industry, the Plastics industry, and the Fabricated Metals industry. Together, facilities in the Chemical and Primary Metals industries accounted for 61 percent of TRI cadmium compound releases and transfers, contributing 37 and 24 percent, respectively. Uses of cadmium compounds as accelerators in butyl rubber production and as plasticers in vinyl chloride probably account for the prominence of the Plastics industry. The environmental distribution for cadmium compounds was distributed among off-site transfers (54 percent), on-site land releases (33 percent), and air emissions (11 percent). (See Tables 6-2 and 6-5; and Appendix J, Table J-2.)

Cadmium was number 148 for total TRI releases and transfers in 1989.

Cadmium was ranked number 148 for 1989 total TRI releases and transfers, and constituted 0.3 percent (388,000 pounds) to total releases and transfers of 33/50 metals and metal compounds. The top industries for releases and transfers of cadmium were, in order of prominence, Primary Metals, Fabricated Metals, Multiple SIC Codes, Chemicals, and Plastics. The Primary Metals and Fabricated Metals industries combined accounted for 81 percent of total releases and transfers of cadmium. Environmental distribution totals for cadmium showed 62 percent of cadmium going to off-site transfers and 27 percent to on-site land releases. (See Tables 6-2 and 6-5; and Appendix J, Table J-2.)

Mercury and Mercury Compounds

Mercury, a silver-white metal, exists as a liquid at room temperature. It occurs naturally and its history of human use traces to ancient times. Mercury compound-containing ore is found in rocks of all classes and is recovered almost exclusively from the mineral cinnabar (mercuric sulfide). The majority of American mining sites are concentrated in the western United States (California, Nevada, and Alaska). In 1985, U.S. production and imports of mercury were roughly equivalent, with a combined total of approximately 2.7 million pounds.

The largest domestic use of mercury is for electrical systems, followed by its use as a catalyst for the chlorine and caustic chemical industries. Mercury compounds are used as pigments, antibacterials, antiseptics, and pyrotechnics. The domestic pattern of mercury compound use is changing with recent regulation. For example, phenylmercuric acetate is no longer permitted in paint to control mildew and act as a fungicide.

Mercury and its compounds are very toxic and affect a variety of body systems. Inorganic forms generally affect the lungs and abdominal organs, while organic compounds tend to attack the central nervous system, including the brain. Severe poisoning from organic compounds may produce irreversible brain damage, resulting in the loss of higher functions.

Natural outgassing of mercury from minerals is a major source of atmospheric mercury. Releases from industrial applications, such as mining and smelting of ores, processing and use of mercury compounds, and coal combustion, are estimated at 5.5 million pounds worldwide.[7] Because its residence time in the atmosphere is estimated to be between months and years, mercury travels long distances before it is deposited to land or water. Release to surface waters also results from industrial processes and the weathering of mercury-bearing minerals. Ground and soil contamination occurs through fertilizers and fungicides containing mercury compounds and as a result of landfill disposal of products such as electrical switches and thermometers. Mercury compounds released to the environment are stable and change slowly between organic and inorganic forms. Bio-magnification of mercury in the food chain, as seen with methylmercury in fish, presents a particular hazard in areas where mercury has been released even at relatively low levels.

Mercury was number 165 and mercury compounds were number 189 for TRI releases and transfers in 1989.

Mercury was ranked number 165 for total TRI releases and transfers in 1989, accounting for 0.1 percent of total 33/50 releases and transfers of metals and metal compounds (159,000 pounds), while mercury compounds were ranked within TRI at number 189, contributing 0.04 percent (57,000 pounds) to 33/50 releases and transfers within the metals and metal compounds class. Mercury moved from number 160 to 165 between 1988 and 1989; however, this change marked a *decrease* of releases and transfers of 46 percent. Releases and transfers of mercury compounds, however, *increased* by 165 percent (or, have more than doubled) since 1988, moving mercury compounds from number 211 to number 189 in 1989. (See Table 6-2.)

Facilities in the Chemical industry, the Electrical industry, the Multiple SIC Codes category, the Primary Metals industry, and the Transportation industry and the No Codes category (both at fifth place), respectively, accounted for the largest releases and transfers of mercury in 1989. The Chemical industry was responsible for 81 percent of total TRI releases and transfers of mercury, while the Electrical industry contributed 13 percent. For mercury compounds, top industries in order of prominence were the Electrical industry, the Chemical industry, the Plastics industry, the No Codes category, and the Primary Metals industry. The Electrical industry accounted for 66 percent of total releases and transfers of mercury compounds in 1989, while the Chemical industry accounted for 30 percent. For mercury compounds, 91 percent of releases and transfers was in the form of off-site transfers, followed by air emissions (7 percent). The releases and transfers of mercury were primarily composed of off-site transfers (78 percent) and air emissions (16 percent). (See Table 6-5; and Appendix J, Table J-2.)

Impact of 33/50 Metals and Metal Compounds upon TRI Totals

The significant industries for the releases and transfers of 33/50 chemicals of this class were the Chemical and Primary Metals industries. These industries, and often individual facilities within them, had a marked effect upon overall TRI patterns involving metals and metal compounds.

33/50 metals and metal compounds contributed 13% to 1989 on-site land releases and 8% to total off-site transfers.

Releases and transfers of all 33/50 metals and metal compounds affected the 1989 TRI industrial, geographic, and environmental totals. Chromium compounds ranked number five for overall TRI on-site releases to land in 1989, and the combined class of 33/50 metals and metal compounds accounted for 13 percent of the TRI total on-site land releases. Off-site transfers of the 33/50 class of metals and metal compounds represented 8 percent of the off-site transfer total for all TRI chemicals in 1989. It should be noted that air emissions made up the third-largest release or transfer category for the 33/50 metals and metal compounds, although they constituted a very small share of total TRI air emissions, due to the prominence of other chemical classes (see below). (See Table 6-5.)

Non-Halogenated Organic Chemicals

The chemical class of non-halogenated organics includes the 33/50 chemicals benzene, toluene, the xylenes, methyl ethyl ketone and methyl isobutyl ketone. The term "non-halogenated" refers to the absence of elements known as the halogens, including fluorine, chlorine, bromine, iodine, and astatine. This category may be broken into two subgroups for descriptive purposes: the aromatic chemicals and the ketones.

Benzene, toluene, and the xylenes belong to a group of compounds known as aromatic compounds (so named for their odors). Benzene, toluene, and the xylenes are produced as a major by-product of petroleum refining. They are used in gasolines, solvents, and as raw materials for plastics and other chemicals industry products. These chemicals contribute to smog formation, and benzene is a known human carcinogen.

Methyl ethyl ketone and methyl isobutyl ketone belong to a group of compounds known as ketones. They are common chemical solvents and intermediates noted for their contribution to smog formation. Because of their pleasant scents, ketones have been used in the flavoring and perfume industries.

33/50 non-halogenated organics made up 13% of total TRI releases and transfers and 56% of all 33/50 releases and transfers.

This 33/50 class, as a group including benzene, toluene, the xylenes, methyl ethyl ketone and methyl isobutyl ketone, accounted for 13 percent of total TRI releases and transfers and 56 percent of total 33/50 releases and transfers in 1989. Releases and transfers of 33/50 non-halogenated organic chemicals were headed by facilities in the Chemical industry, which accounted for 19 percent (144.4 million pounds) of total releases and transfers of 33/50 non-halogenated organics. Facilities in the

Multiple SIC Codes category were ranked second, with a 13 percent (99.2 million pounds) contribution to this 33/50 total, followed by facilities in the Transportation industry, which represented 11 percent (84.6 million pounds) of releases and transfers of all 33/50 non-halogenated organics. With a 6.8 percent contribution to total releases and transfers of 33/50 non-halogenated organics, the Plastics industry was ranked fourth. The Printing industry was ranked fifth, with 6.7 percent of the total. (See Table 6-6.)

Unlike the class of 33/50 metals and metal compounds, this class contained a broader range of facilities in industries which contributed significantly to total releases and transfers. In addition to the five industries listed above, six other industries each contributed over 25 million pounds of 1989 total releases and transfers of chemicals in this 33/50 class: the Paper industry (48.6 million pounds), the Fabricated Metals industry (44.7 million pounds), the Furniture industry (38.8 million pounds), the Petroleum industry (29.7 million pounds), the Primary Metals industry (28.3 million pounds), and the Electrical industry (25.1 million pounds). (See Appendix J, Table J-2.)

Two of the top five industries in the 33/50 non-halogenated organics class, the Transportation and Printing industries, were 33/50-intensive. Over half (58 percent) of the total releases and transfers of facilities in the Transportation industry fell into the general 33/50 category. Of this 33/50 total, 59 percent was in the 33/50 non-halogenated organics class, indicating that these chemicals played a large role within the overall releases and transfers of facilities in this industry. (See Appendix J, Table J-2.)

Table 6-6. Top Five Industries for Total TRI Releases and Transfers of 33/50 Organics, 1989.

SIC CODE	INDUSTRY	RELEASES AND TRANSFERS OF 33/50 ORGANICS (Pounds)	PERCENT OF TOTAL 33/50 ORGANICS RELEASES AND TRANSFERS	PERCENT OF TOTAL TRI ORGANICS RELEASES AND TRANSFERS	PERCENT OF TRI TOTAL RELEASES AND TRANSFERS
28	Chemicals	144,355,512	19.48	6.88	2.53
	Multiple Codes 20-39	99,181,444	13.39	4.73	1.74
37	Transportation	84,596,216	11.42	4.03	1.48
30	Plastics	50,681,089	6.84	2.42	0.89
27	Printing	49,029,420	6.62	2.34	0.86
	SUBTOTAL	378,814,261	51.13	18.07	6.64
	TOTAL FOR ALL OTHERS	362,102,364	48.87	17.27	6.35
	TOTAL FOR ALL INDUSTRIES	740,916,625	100.00	35.34	12.99

The 33/50 non-halogenated organics were even more significant to facilities in the Printing industry, which was fifth overall for releases and transfers of 33/50 non-halogenated organics in 1989. In 1989, 89 percent of the total TRI releases and transfers of facilities in the Printing industry fell within the 33/50 class. A large proportion, or 91 percent, of these 33/50 releases and transfers was in the 33/50 non-halogenated organics class. Toluene's use as a solvent for ink may be the reason for its role in the releases and transfers of the Printing industry.

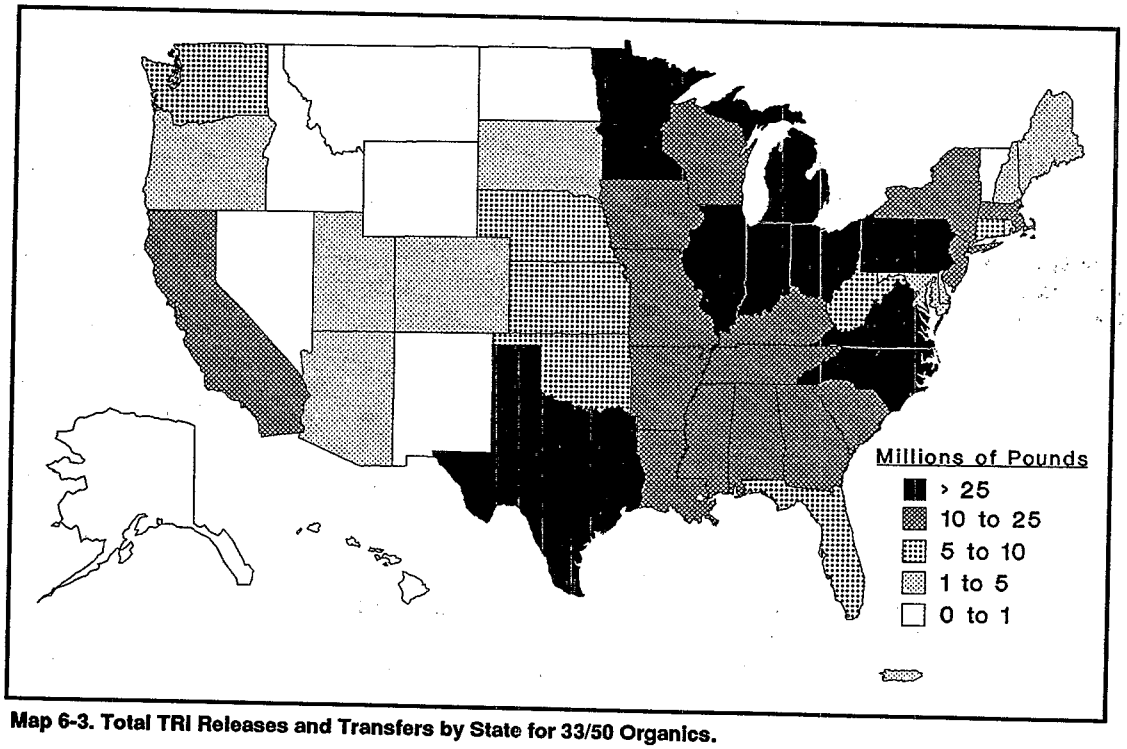
Air emissions made up 80% of releases and transfers of 33/50 non-halogenated organics.

This 33/50 class was dominated by air emissions, which accounted for 80 percent of total releases and transfers, followed by off-site transfers, which represented 18 percent of the total releases and transfers of 33/50 non-halogenated organics. While these totals were relatively consistent with those for the overall TRI class of non-halogenated organics, air emissions were significantly higher for the 33/50 subgroup. The overall TRI distribution for this chemical class was comprised of 68 percent air emissions, followed by 9 percent off-site transfers, with the difference mostly made up by underground injection (5 percent). (See Table 6-7; and Chapter 3, Figure 3-6.)

Map 6-3 shows the state distribution of releases and transfers of the 33/50 non-halogenated organics. States with over 25 million pounds of releases and transfers of 33/50 non-halogenated organics in 1989 were Indiana, Illinois, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, Texas, and Virginia.

Table 6-7. Enviromental Distribution of Total TRI Releases and Transfers of 33/50 Organics, 1989.

CHEMICAL	AIR		SURFACE WATER		LAND		UNDER-GROUND	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Toluene	255,437,878	79.20	173,361	0.05	402,116	0.12	620,393	0.19
Methyl ethyl ketone	127,631,835	81.30	66,267	0.04	163,877	0.10	200,698	0.13
Methyl isobutyl ketone	30,682,832	78.98	445,538	1.15	20,891	0.05	81,850	0.21
Benzene	24,683,026	86.33	168,904	0.59	114,219	0.40	668,610	2.34
Xylene (mixed isomers)	147,486,804	79.53	184,952	0.10	468,064	0.25	70,161	0.04
m-Xylene	1,167,356	79.64	2,642	0.18	5,730	0.39	0	0.00
o-Xylene	1,799,130	80.22	3,134	0.14	3,480	0.16	0	0.00
p-Xylene	4,720,073	98.11	2,016	0.40	2,285	0.05	0	0.00
SUBTOTAL	593,608,934	80.12	1,046,814	0.14	1,180,662	0.16	1,641,712	0.22
TOTAL FOR ALL OTHERS	1,833,452,972	36.93	187,907,070	3.78	443,555,888	8.93	1,179,189,469	23.75
TRI GRAND TOTAL	2,427,061,906	42.54	188,953,884	3.31	444,736,550	7.79	1,180,831,181	20.70



Map 6-3. Total TRI Releases and Transfers by State for 33/50 Organics.

Table 6-7, continued.

CHEMICAL	PUBLIC SEWAGE		OFF-SITE		TOTAL RELEASES AND TRANSFERS	
Pounds	Percent	Pounds	Percent	Pounds	Percent	
Toluene	3,097,543	0.96	62,789,885	19.47	322,521,176	100.00
Methyl ethyl ketone	763,242	0.49	28,166,723	17.94	156,992,642	100.00
Methyl isobutyl ketone	1,273,733	3.28	6,344,859	16.33	38,849,703	100.00
Benzene	1,120,613	3.92	1,836,035	6.42	28,591,407	100.00
Xylene (mixed isomers)	3,855,426	2.08	33,376,628	18.00	185,442,035	100.00
m-Xylene	2,051	0.14	287,999	19.65	1,465,778	100.00
o-Xylene	132,761	5.92	304,156	13.56	2,242,661	100.00
p-Xylene	500	0.01	86,349	1.79	4,811,223	100.00
SUBTOTAL	10,245,869	1.38	133,192,634	17.98	740,916,625	100.00
TOTAL FOR ALL OTHERS	540,788,827	10.89	779,859,529	15.71	4,964,753,755	100.00
TRI GRAND TOTAL	551,034,696	9.66	913,052,163	16.00	5,705,670,380	100.00

Toluene

Toluene is a clear, sweet-smelling, colorless liquid that is found in nature in the tolu tree and as a component of crude oil. Toluene is derived from catalytic reforming of petroleum, by fractional distillation of coal-tar light oil, and by natural conversion. Toluene is one of the highest-volume chemicals produced domestically; in 1985, it was the 27th highest volume chemical produced in the United States.

Most of the toluene produced in the United States remains in gasoline. Only about 11 percent is isolated, and a portion of that is used as an additive to gasoline to improve octane ratings. Toluene is used in the production of benzene, phenol, caprolactam, explosives, detergents, and polyurethane resins. It is also used in pharmaceuticals synthesis and as an anthelminthic agent against roundworms and hookworms. Toluene is an important solvent for paints and coatings, gums, resins, most oils, rubber, and vinyl organosols. It is a diluent and thinner in nitrocellulose lacquers and an adhesive solvent in plastic toys and model airplanes. Nail polish is one of a number of common consumer products containing toluene.

Exposure to high vapor concentrations of toluene (over 200 parts per million for eight hours) affects the central nervous system. Symptoms include fatigue, muscle weakness, headache, dizziness, confusion, poor coordination, nausea and vomiting. Prolonged contact can cause dry, irritated skin. Large overexposures can result in loss of consciousness and death, and liver injury has been reported in survivors of serious overexposures.[8]

Toluene readily evaporates from water and breaks down quickly in the soil. It degrades rapidly in the air (with a half-life of less than a day) to yield simple hydrocarbons, contributing to smog formation. Automobile emissions are a large source of releases of toluene to the atmosphere since gasolines typically contain five to seven percent toluene by weight. Automobile emissions are not reportable to TRI.

Toluene was the number one 33/50 chemical for total releases and transfers.

Toluene was the number one 33/50 chemical, ranked fifth in TRI total releases and transfers with a 6 percent (322.5 million pounds) contribution to the 1989 TRI total. Toluene moved up in TRI rank from number six in 1988; however, this marked a *decrease* in total releases and transfers of 8 percent. Within the overall 33/50 subgroup, toluene accounted for 24 percent of all releases and transfers, and contributed 44 percent to all releases and transfers of 33/50 non-halogenated organic chemicals. Facilities with the largest TRI releases and transfers of toluene were grouped, in order of prominence, in the Chemical industry, the Printing industry, Multiple SIC Codes, the Paper industry, and the Plastics industry. (See Table 6-2; and Appendix J, Table J-2.)

Toluene plays a large role in many 33/50-intensive industries.

Toluene played a particularly significant role within the 33/50-intensive industries. Toluene was the number one 33/50 chemical released and transferred by three 33/50-intensive industries: Printing, Miscellaneous Manufacturing, and Furniture. Toluene was among the top five 33/50 chemicals of all of the 33/50-intensive

industries. When the contribution of toluene to the 33/50 releases and transfers of each of the 33/50-intensive industries is averaged, it accounts for 28 percent, or close to one-third, of their 33/50 releases and transfers. (See Appendix J, Table J-2.)

Toluene had the 2nd-largest number of forms submitted to TRI in 1989.

Toluene was the TRI chemical with the second-largest number of forms submitted to TRI. Of the total TRI forms received in 1989, toluene accounted for almost 5 percent, indicating that a significant proportion of TRI facilities had activities involving this chemical. (See Chapter 3, Table 3-9.) The releases and transfers of toluene was not dominated by single facilities and single industries, which may be seen by the fact that the top five facilities releasing toluene accounted for only 8 percent of total releases and transfers of this chemical. (See Appendix G, Table G-1.)

Toluene accounted for 10% of 1989 total TRI air emissions.

Because toluene was released at such high volumes relative to other 33/50 chemicals, and most TRI chemicals, it had a deep effect upon environmental, geographic, and industrial trends. The environmental distribution of toluene, for example, was dominated by air emissions (79 percent of total releases and transfers of toluene), followed by off-site transfers (19 percent). The overall TRI class of non-halogenated organics reflected the distribution of toluene. Of total TRI releases and transfers for the non-halogenated organic chemical class, 68 percent went to air. Toluene alone contributed 18 percent (255.4 million pounds) to this TRI total. Toluene was the number-one TRI chemical for air emissions, contributing 10 percent to the TRI total for this mode of release. For off-site transfers, toluene accounted for 20 percent (62.8 million pounds) of the total for the TRI non-halogenated organics class. (See Table 6-7; and Chapter 3, Figure 3-6, and Tables 3-12 and 3-14.)

In 1989, toluene was a top TRI chemical in 47 states.

The states with facilities reporting the largest releases and transfers of toluene also reflected this influence. Toluene was the number two TRI chemical for Minnesota, and was also the number two TRI chemical for Kentucky and South Carolina. It was the number four and number seven TRI chemical for total releases and transfers in Indiana and Texas, respectively. In Minnesota, Kentucky, and South Carolina, air emissions made up a significant proportion of the state's total TRI releases and transfers, due in part to the effect of toluene. Out of all 55 states and jurisdictions reporting to TRI, toluene ranked in the top ten TRI chemicals for 47. In 22 states, toluene fell within the top three TRI chemicals for overall releases and transfers, demonstrating that this chemical plays a prominent role within the manufacturing sector of many states and territories. (See Chapter 3, Table 3-19; and Appendix H, Table H-1.) The fact that toluene was within the top ten TRI chemicals for 20 out of 22 SIC codes (only the Food and the Primary Metals industries did not report toluene as a top ten chemical) helps to explain the breadth of its geographic distribution. (See Appendix I, Table I-2.)

Toluene was in the top 3 33/50 chemicals for 48 states.

In 1989, toluene was the number one 33/50 chemical for total releases and transfers in 29 states. In 48 states, this chemical was among the top three 33/50 chemicals for total releases and transfers. (See Appendix J, Table J-1.)

Xylenes

The term "xylene (mixed isomers)" comprises any mixture containing two or more of the isomers ortho-xylene, meta-xylene, and para-xylene (abbreviated o-xylene, m-xylene, and p-xylene, respectively). A typical mixed xylene contains 20 percent o-xylene, 45 percent m-xylene, 20 percent p-xylene, and 15 percent impurities. Xylenes are colorless, sweet-smelling, flammable liquids that occur naturally in petroleum and coal tar. They evaporate readily. Xylene (mixed isomers), m-xylene, p-xylene, and o-xylene are each reported to TRI as separate chemicals.

Nearly all of the mixed isomers are manufactured as a catalytic reformate of petroleum. The individual isomers are isolated from this mixed xylene through further steps including crystallization, fractionation, distillation, solvent extraction and adsorption. United States refiners produced over 6.5 billion pounds of mixed xylenes in recent years, and imports add substantially to the total domestic consumption. Roughly 30 percent of the mixed xylenes is used in solvents or blended into gasolines. The remaining 70 percent is separated into components.

High-level exposure to xylenes causes irritation of the nose and throat, headache, nausea, vomiting, dizziness, fatigue, light-headedness, loss of patience, loss of appetite, reduced coordination, and unconsciousness. Toxic effects are enhanced by alcohol consumption. Xylenes are absorbed slowly through the skin, and severe lung damage can occur if xylene is inhaled. Low level, long-term exposure has not been associated with major health problems.

Air emissions from industrial sources, automobile exhaust, and solvent volatilization contribute to the major releases of xylenes. While in liquid form, xylenes are highly toxic to aquatic life and plants. In the lower atmosphere, xylenes are rapidly transformed through photo-oxidation. Worldwide releases to the environment have been estimated to be roughly 6 billion pounds annually, with virtually all of this total reaching the atmosphere.[9]

Xylene (mixed isomers) was the number 8 chemical for total TRI releases and transfers.

Xylene (mixed isomers) ranked second for 1989 releases and transfers of all 33/50 chemicals, and was number eight in 1989 TRI rankings with a contribution of 3 percent (185.4 million pounds) to total TRI releases and transfers. Xylene (mixed isomers) accounted for one-fourth of all releases and transfers in the 33/50 non-halogenated organics class. Overall releases and transfers of xylene (mixed isomers) moved from number 11 in 1988 TRI rankings, though marking a decrease in volume of 3 percent. Top industries for the release and transfer of xylene (mixed isomers) were, in order of significance, the Transportation industry, the Chemical industry, the Fabricated Metals industry, the Electrical industry, and the Multiple SIC Codes category. Together, the Transportation and Chemical industries accounted for 41 percent of total releases and transfers of xylene (mixed isomers). Like toluene, xylene (mixed isomers) was a top chemical for a significant number of industries; for 15 of the 22 SIC reporting categories, xylene (mixed isomers) was a top ten TRI chemical. (See Table 6-2; Appendix I, Table I-2.)

Reporting of xylene (mixed isomers) represented the 4th-greatest number of forms in all of TRI in 1989.

In 1989, xylene (mixed isomers) ranked fourth in all of TRI for the number of forms submitted (over 4 percent of total TRI forms received) and was one of the top ten TRI chemicals in each of 36 states and other reporting jurisdictions, indicating that it was a prominent chemical across a wide range of industrial and geographic categories. (See Chapter 3, Table 3-9; and Appendix H, Table H-1.) The wide use of mixed isomers of xylene in the production of such things as plastic soft drink bottles and polyester fibers may help account for its ubiquity.

The majority of xylene (mixed isomers) was released to air (80 percent), followed by off-site transfers (18 percent). Of total xylene (mixed isomers) air releases, 68 percent was in the form of point source emissions, with the rest as fugitive air emissions. (See Table 6-7.)

Para-xylene was number 70 for total TRI releases and transfers in 1989.

When p-xylene is manufactured, processed, or otherwise used in a state unmixed with any other isomers of xylene, it occupies a separate TRI listing, as do o-xylene and m-xylene. In 1989, p-xylene was ranked number 70 in TRI for total releases and transfers, and contributed 0.6 percent (4.8 million pounds) to 33/50 releases and transfers within the class of non-halogenated organics. The top industries for releases and transfers of p-xylene were, respectively, the Chemical industry, the Multiple SIC Codes category, the Petroleum industry, the Transportation industry, and the Measuring/Photographic industry. Facilities in the Chemical industry accounted for 78 percent of all releases and transfers of p-xylene, indicating that this chemical, instead of playing a large role in a spectrum of industries, was primarily transferred and released by facilities in a single industrial category. (See Table 6-2; and Appendix J, Table J-2.)

In 1989, p-xylene was almost exclusively released to air (98 percent), with the remainder going to off-site transfers (2 percent). However, the relatively low volumes of p-xylene releases and transfers prevented this chemical from standing out in 1989 TRI environmental or geographic totals. Only the U.S. Virgin Islands, for which p-xylene was the number two TRI chemical out of the islands' total releases and transfers, clearly showed the influence of a facility's releases and transfers of p-xylene. (See Table 6-7; and Appendix H, Table H-1.)

Ortho-xylene was number 95 for total TRI releases and transfers in 1989.

At number 95 for total TRI releases and transfers (2.2 million pounds) in 1989, o-xylene contributed 0.3 percent to total 33/50 releases and transfers in the class of non-halogenated organic chemicals. The top industries for the release and transfer of o-xylene were, in order of chemical volume, the Chemical industry, the Multiple SIC Codes category, the Petroleum industry, the Leather industry, and the Textiles industry. Again, the Chemical industry accounted for a significant proportion of total releases and transfers of o-xylene, with a contribution of 64 percent. (See Table 6-2; and Appendix J, Table J-2.)

The environmental distribution for o-xylene was made up largely of air emissions (80 percent), followed by off-site transfers (14 percent) and public sewage (6 percent), reflecting the general trend for this class of chemicals. (See Table 6-7.)

Meta-xylene was number 103 for total TRI releases and transfers in 1989.

Ranked number 103 for TRI total releases and transfers in 1989 (1.5 million pounds), m-xylene contributed 0.2 percent to total 33/50 releases and transfers of the class of non-halogenated organic chemicals. The most significant industries for the release and transfer of m-xylene were, in order of prominence, the Chemical industry, the Petroleum industry, the Primary Metals industry, the Multiple SIC Codes category, and the Leather industry. The Chemical industry accounted for 30 percent of the total releases and transfers of m-xylene. The top five industries combined were responsible for 91 percent of that total. (See Table 6-2; and Appendix J, Table J-2.)

The environmental distribution for m-xylene was divided solely between air emissions (80 percent) and off-site transfers (20 percent). (See Table 6-7.)

Methyl Ethyl Ketone

Methyl ethyl ketone, a flammable liquid, does not occur naturally. It is produced by fermentation, by the controlled oxidation of butane, or by the hydrolysis of n-butylene with aqueous sulfuric acid, followed by distillation to separate the intermediate sec-butyl alcohol, which is subsequently oxidized. The United States produced approximately 500 million pounds of methyl ethyl ketone in 1985, with current production remaining at about this level.

Methyl ethyl ketone is used as a solvent for gums, resins, nitrocellulose coatings, and vinyl films. It is used extensively in the synthetic rubber industry and in production of paraffin wax and high-grade lubricating oils. Other applications include use in cements and adhesives, organic synthesis, manufacture of smokeless powder, cleaning fluids, printing materials, and as a catalyst carrier. Methyl ethyl ketone is a common component of many household products such as lacquers, varnishes, paint remover, and glue.

Methyl ethyl ketone can enter the body either through inhalation or skin absorption. Its effects include irritation of the nose and throat, headaches, numbness in the fingers and arms, numbness and weakness in the legs, nausea, vomiting, lightheadedness, dizziness, loss of coordination, and unconsciousness. Methyl ethyl ketone has a relatively high solubility in water, and because of this and its high vapor pressure, it volatizes slowly from water and is mobile in soil. It is moderately toxic to aquatic life and contributes to smog formation.[10]

Methyl ethyl ketone was number 11 for total TRI releases and transfers in 1989.

Methyl ethyl ketone, the fourth-ranked 33/50 chemical, was number 11 for overall TRI releases and transfers (157.0 million pounds) in 1989. It contributed 3 percent to total TRI releases and transfers, marking a decrease of 3 percent from 1988. Methyl ethyl ketone contributed 12 percent to total 33/50 releases and transfers, and 21 percent to 33/50 releases and transfers of the non-halogenated organic class. Top industries were, in order of prominence, the Multiple SIC Codes category, the Plastics industry, the Chemical industry, the Transportation industry, and the Fabricated Metals industry. Multiple SIC Codes alone contributed 25 percent to

total TRI methyl ethyl ketone releases and transfers, and this industry together with the other top four industrial categories accounted for 63 percent of this total. (See Table 6-2; and Appendix J, Table J-2.)

In 1989, methyl ethyl ketone was ranked number ten in TRI for total number of forms submitted (almost 3 percent of all forms received by EPA), indicating that, like the xylenes (mixed isomers) and toluene, this chemical was manufactured, processed, or otherwise used by a large number of facilities and industries. In 1989, methyl ethyl ketone was a top ten TRI chemical for 16 of the 22 SIC codes, and was ranked within the top three TRI chemicals for several industries that did not show up with the largest TRI releases and transfers of the chemical (such as the Textiles and Apparel industries). This indicates that releases and transfers of methyl ethyl ketone cut a broad path across many industries. (See Chapter 3, Table 3-9, and Appendix I, Table I-1.)

In 1989, methyl ethyl ketone was 10th in TRI for the number of chemical forms received.

Methyl Isobutyl Ketone

Methyl isobutyl ketone is a colorless liquid produced by hydrogenation of mesityl oxide. Methyl isobutyl ketone is used as a solvent for paints, varnishes, and nitrocellulose lacquers, in the manufacture of methyl amyl alcohol, and in extraction processes including the extraction of uranium from fission products. It is also used in organic synthesis and as a denaturant for alcohol.

Elevated short-term exposure to methyl isobutyl ketone causes nose and throat irritation, nausea, vomiting, loss of appetite, diarrhea, headache, drowsiness, dizziness, and loss of balance. Repeated or long-term exposure can also result in weakness, eye irritation, stomach pain, sore throat, fatigue, insomnia, intestinal pain, enlarged liver, and colitis. Methyl isobutyl ketone is slightly toxic to aquatic life and is thought to contribute to smog formation.[11]

Methyl isobutyl ketone was ranked number 29 for total TRI releases and transfers (38.8 million pounds) in 1989, and contributed over 5 percent to 33/50 releases and transfers in the non-halogenated organics class. Since 1988, releases and transfers of methyl isobutyl ketone decreased by 13 percent. The top industries contributing to the release and transfer of methyl isobutyl ketone were, in order of significance, the Chemical industry, the Transportation industry, the Multiple SIC Codes category, the Fabricated Metals industry, and the Plastics industry. The Furniture industry was also a major contributor. Together, these top six industries accounted for 77 percent of total TRI releases and transfers of methyl isobutyl ketone in 1989. (See Table 6-2; and Appendix J, Table J-2.)

Methyl isobutyl ketone was number 29 for total TRI releases and transfers in 1989.

The overall environmental totals for methyl isobutyl ketone were divided between air emissions (79 percent), off-site transfers (16 percent), and transfers to public sewage (3 percent). (See Table 6-7.)

Benzene

Benzene is a clear, colorless, flammable liquid that occurs naturally in plants and animals and as a result of volcanoes and forest fires. It is produced by the catalytic reforming of petroleum, the pyrolysis of gasoline, the hydrodealkylation of toluene, and the fractional distillation of coal tar. Petroleum sources account for over 90 percent of U.S. production of benzene, with about 7 percent derived from coal (before World War II most benzene came from the latter source). Gasoline production processes use about one-half of the current supply. The content of benzene in gasoline averages less than one percent, but can be as high as four percent.

Benzene is used primarily as an intermediate in the manufacture of other chemicals and products, including ethylbenzene (used to produce styrene), cumene (used to produce phenol), dodecylbenzene (for detergents), cyclohexane (for nylon), nitrobenzene, maleic anhydride, chlorobenzene, diphenyl, hexachlorobenzene, and benzene sulfonic acid. Benzene has been widely used as a solvent in products such as rubber cement and paint removers; however, this use has decreased, now accounting for less than 2 percent of benzene consumption.

Short-term effects of benzene center upon the nervous system, causing drowsiness, dizziness, headache, light-headedness, nausea, and decreased coordination. Benzene vapor causes mild irritation of the respiratory tract, while very high levels result in decreased judgement, loss of balance, and ringing ears. Unconsciousness or death may result. Longer term exposure to benzene can impair the formation of red and white blood cells and platelets, and the bone marrow may be affected, causing cancer of the white blood cells (leukemia). There may be considerable variability from person to person in the cells affected and the level of red and white blood cell deficiency. Prolonged low-level exposure can damage the nervous system.[12]

Benzene is highly toxic to plants and animals, particularly aquatic life. However, the life of benzene in the environment is relatively short. Residence time in the atmosphere is only a few days before chemical reactions with other substances reduce benzene concentrations, and biodegradation acts on soil- and water-associated benzene with similar results.

Benzene was number 35 for TRI releases and transfers in 1989.

Benzene was the number 35 chemical for total TRI releases and transfers in 1989, with a 4 percent contribution to the release and transfer of 33/50 non-halogenated organic chemicals (28.6 million pounds). Since 1988, benzene moved down from number 34 in total TRI rankings, reflecting a decrease of 11 percent between 1988 and 1989 reporting periods. The top industries for the release and transfer of benzene included, in order of volume, the Primary Metals industry, the Chemical industry, the Petroleum industry, the Multiple SIC Codes category, and the No SIC Codes (20-39) category. The top two industries, Primary Metals and Chemicals, accounted for 71 percent of total TRI releases and transfers of benzene. As opposed to the non-halogenated organics discussed above, benzene did not play a prominent role in a broad range of industries; it was a top ten TRI chemical for only the Petroleum industry. (See Table 6-2; Appendix I, Table I-1; and Appendix J, Table J-2.)

In 1989, benzene was a top 10 TRI chemical for two states (Alaska and Hawaii) and was the number one TRI chemical in one jurisdiction, the U.S. Virgin Islands (only one form was submitted for the release and transfer of benzene in the U.S. Virgin Islands). (See Appendix H, Table H-1.)

The environmental distribution for benzene was, like that of the rest of the non-halogenated organics, heavily weighted in favor of air emissions (86 percent), followed by off-site transfers (6 percent) and transfers to public sewage (4 percent). (See Table 6-7.)

Impact of 33/50 Non-Halogenated Organic Chemicals upon TRI Totals

The 33/50 non-halogenated organic chemicals occupied a particularly prominent position within 1989 TRI totals. For TRI total releases and transfers by TRI class, toluene, xylene (mixed isomers), and methyl ethyl ketone played significant roles. Due to the high volumes of these chemicals released and transferred in 1989, toluene was ranked second, xylene (mixed isomers) fourth, and methyl ethyl ketone fifth as top TRI chemicals in the TRI class of non-halogenated organics.

The 33/50 non-halogenated organics contributed 15% to total TRI air emissions in 1989.

Because they were released so often as air emissions, the 33/50 non-halogenated organic chemicals also figured heavily in TRI environmental totals. Toluene was the number one TRI chemical for overall air emissions in 1989, constituting 10 percent of all TRI releases to air. The environmental distribution for non-halogenated organic chemicals, so consistent for the 33/50 chemicals within this class, were reinforced by these 33/50 non-halogenated organics even when their individual volumes were too low to allow them to stand out within top TRI rankings. Combined, the 33/50 non-halogenated organics accounted for 15 percent of all TRI emissions to air in 1989 (over 10 percent of all TRI air emissions were due to toluene alone, as noted above). (See Table 6-7.)

Halogenated Organic Chemicals

The six chlorinated organic chemicals on the 33/50 list, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethylene, 1,1,1-trichloroethane, and trichloroethylene, belong to the larger TRI class of halogenated organic chemicals. The halogenated organic chemicals all contain varying amounts of halogen(s), which in this case is chlorine (other halogens include fluorine, bromine, iodine, and astatine). Several of these chemicals deplete ozone in the upper atmosphere, making them apt targets for the 33/50 pollution prevention initiative. 1,1,1-Trichloroethane and carbon tetrachloride, both 33/50 chemicals, are ozone-depleters.

The six 33/50 halogenated organic chemicals see widespread use as industrial chemicals employed to manufacture other chemicals, as common components of many consumer products, and as solvents. Because of their photochemically reac-

tive nature, some of these chemicals contribute to smog formation. Trichloroethylene and tetrachloroethylene have short lives in the lower atmosphere, which results in smog formation but which prevents them from depleting the ozone layer.

The 33/50 halogenated organics accounted for 7% of total TRI releases and transfers in 1989.

The 33/50 halogenated organic chemicals contributed 32 percent to total releases and transfers of 33/50 chemicals, and 7 percent to total TRI releases and transfers in 1989. Releases and transfers of this 33/50 chemical class were dominated by facilities in the Chemical industry, which accounted for 14 percent of the 33/50 class total. Facilities in the Transportation industry were second, with 13 percent of the total 33/50 releases and transfers of halogenated organics, followed by facilities in the Multiple SIC Codes category (11 percent), the Fabricated Metals industry (10 percent), and the Plastics industry (10 percent). Other significant industries in the release and transfer of 33/50 halogenated organics were the Electrical industry (9 percent of total 33/50 releases and transfers of halogenated organics) and the Primary Metals industry (7 percent). (See Tables 6-2 and 6-8; and Appendix J, Table J-2.)

One of the top industries for the release and transfer of 33/50 halogenated organics, Transportation, was also 33/50-intensive. Of the Transportation industry's total 1989 releases and transfers, 58 percent fell within the overall 33/50 category. A significant share, 14 percent, of the Transportation industry's 33/50 releases and transfers were made up of 1,1,1-trichloroethane, a halogenated organic chemical. (The Transportation industry was the top industry for 1989 TRI releases and transfers of this chemical.) These figures indicate that the halogenated organics, as well as the non-halogenated organics, played a significant role in determining the 33/50-intensive status of the Transportation industry.

Table 6-8. Top Five Industries for Total TRI Releases and Transfers of 33/50 Halo-organics, 1989.

SIC CODE	INDUSTRY	RELEASES AND TRANSFERS OF 33/50 HALO-ORGANICS	PERCENT OF TOTAL 33/50 HALO-ORGANICS RELEASES AND TRANSFERS	PERCENT OF TOTAL TRI HALO-ORGANICS RELEASES AND TRANSFERS	PERCENT OF TRI TOTAL RELEASES AND TRANSFERS
		Pounds			
28	Chemicals	57,604,413	13.51	10.26	1.01
37	Transportation	53,944,712	12.65	9.61	0.95
	Multiple Codes 20-39	47,951,257	11.25	8.54	0.84
34	Fabricated Metals	43,761,683	10.26	7.80	0.77
30	Plastics	42,149,457	9.89	7.51	0.74
	SUBTOTAL	203,262,065	47.67	36.21	3.56
	TOTAL FOR ALL OTHERS	223,088,411	52.33	39.74	3.91
	TOTAL FOR ALL INDUSTRIES	426,350,476	100.00	75.95	7.47

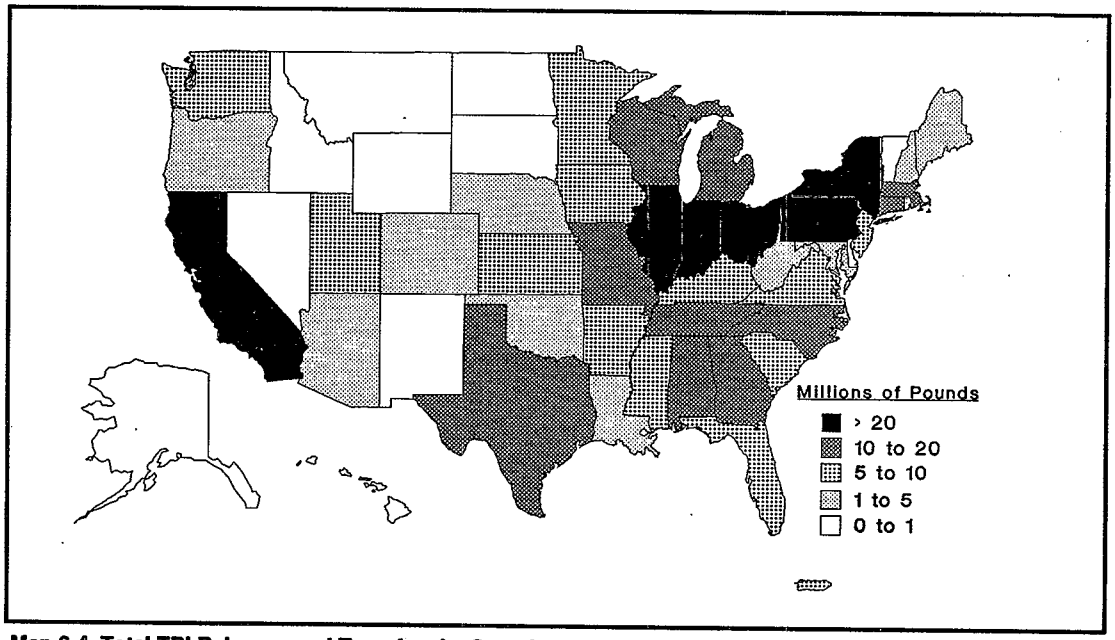
The environmental distribution of the 33/50 halogenated organic chemicals was similar to that of the 33/50 non-halogenated organics: in 1989 slightly under 88 percent of the 33/50 halogenated organics was air emissions, followed by off-site transfers (11 percent) and transfers to public sewage (1 percent). (See Table 6-9.)

Map 6-4 shows the state distribution of 33/50 halogenated organics releases and transfers. States with over 20 million pounds of 33/50 halogenated organics releases and transfers in 1989 were California, Illinois, Indiana, New York, Ohio, and Pennsylvania.

1,1,1-Trichloroethane

1,1,1-Trichloroethane (also known as methyl chloroform) is a colorless chemical with a sweet, sharp odor that evaporates quickly. 1,1,1-Trichloroethane is not a naturally occurring chemical.

The United States produced approximately 700 million pounds of 1,1,1-trichloroethane in recent years. 1,1,1-Trichloroethane was initially developed as a replacement for carbon tetrachloride because of its safer properties as a solvent. It is used as a solvent for the cleaning of precision instruments, for metal degreasing, and for textile processing. It is also employed in pesticides, aerosols, stain repellants, and printing inks. The most significant uses are in cold cleaning, vapor degreasing, adhesives, aerosols, and electronics. 1,1,1-Trichloroethane is found in a number of common household products, such as spray paints and primers, silicone lubricants, oven cleaners, drain cleaners, and spot removers.



Map 6-4. Total TRI Releases and Transfers by State for 33/50 Halo-Organics.

High levels (above 900 parts per million) of 1,1,1-trichloroethane can depress the nervous system and cause headache, dizziness, and fatigue. Impaired performance on behavioral tests was also recorded at this concentration, although test results returned to normal minutes after cessation of exposure. At very high levels (over 5,000 parts per million), 1,1,1-trichloroethane can cause unconsciousness, respiratory depression, and death.

Because of its volatile nature and extensive use as a solvent, a large proportion of total 1,1,1-trichloroethane releases occur as air emissions. A significant percentage of discharges to surface water also evaporate to the atmosphere, although 1,1,1-trichloroethane is moderately toxic to aquatic life for the time that it remains in water. It is relatively stable, with a half-life in the atmosphere of two to six years. 1,1,1-Trichloroethane is an ozone-depleter.[13]

1,1,1-Trichloroethane was the 9th-ranked chemical for total TRI releases and transfers in 1989.

In 1989, 1,1,1-trichloroethane was the third-ranked 33/50 chemical, contributing 43 percent (185 million pounds) to 33/50 releases and transfers for the class of halogenated organics and 14 percent to total 33/50 releases and transfers. 1,1,1-Trichloroethane was ranked number nine for total TRI releases and transfers, which marked a move up from number ten in 1988, as well as a decrease of 5 percent between reporting years 1988 and 1989. (See Table 6-2.)

The top industries for the release and transfer of 1,1,1-trichloroethane were, in order of importance, the Transportation industry, the Fabricated Metals industry, the Primary Metals industry, the Electrical industry, and the Multiple SIC Codes category. The Transportation industry accounted for 18 percent of total 1,1,1-trichloroethane releases and transfers.

Table 6-9. Enviromental Distribution of Total TRI Releases and Transfers of 33/50 Halo-organics, 1989.

CHEMICAL	AIR		SURFACE WATER		LAND		UNDER-GROUND	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
1,1,1-Trichloroethane	168,617,910	91.13	26,555	0.01	70,240	0.40	2,318	0.00
Dichloromethane	109,272,003	83.83	226,216	0.17	16,138	0.10	747,389	0.57
Trichloroethylene	44,325,687	90.50	15,815	0.03	1,394	0.00	390	0.00
Tetrachloroethylene	25,504,477	84.85	59,061	0.20	12,791	0.40	50,005	0.17
Chloroform	24,268,093	88.81	1,139,691	4.17	70,217	0.26	64,338	0.24
Carbon tetrachloride	3,367,248	73.08	15,656	0.34	1,616	0.40	122,043	2.65
SUBTOTAL	375,355,418	88.04	1,482,994	0.35	172,396	0.40	986,483	0.23
TOTAL FOR ALL OTHERS	2,051,706,488	38.86	187,470,890	3.55	444,564,154	8.42	1,179,844,698	22.35
TRI GRAND TOTAL	2,427,061,906	42.54	188,953,884	3.31	444,736,550	7.79	1,180,831,181	20.70

In 1989, 1,1,1-trichloroethane was a top ten TRI chemical in 16 out of the 22 SIC codes, which means that it played a major role in a broad range of industrial processes. It was the number one TRI chemical for four of these industries, the Apparel industry, the Fabricated Metals industry, the Machinery industry, and the Electrical industry. The chemical occupied a particularly significant place within the 33/50-intensive industries. 1,1,1-Trichloroethane was within the top five 33/50 chemicals for them all, with an average contribution to their overall 33/50 releases and transfers of 17 percent. (See Appendix I, Table I-1, and Appendix J, Table J-2.)

1,1,1-Trichloroethane was a top TRI chemical in 16 out of 22 SIC codes.

In 1989, 1,1,1-trichloroethane was ranked third in TRI for the number of forms submitted (slightly under 5 percent of all forms received), which would indicate that the relatively small contribution of the top five facilities was due to a broad range of facilities releasing and transferring this chemical. (See Chapter 3, Table 3-9.)

1,1,1-Trichloroethane was 3rd in TRI for the number of forms received in 1989.

The environmental distribution for 1,1,1-trichloroethane was dominated by air emissions (91 percent) followed by off-site transfers (9 percent). 1,1,1-Trichloroethane was the number five TRI chemical for total releases to air, accounting for 7 percent of all TRI air emissions in 1989. (See Table 6-9; and Chapter 3, Table 3-12.)

1,1,1-Trichloroethane accounted for 7% of all TRI air releases in 1989.

Dichloromethane

Dichloromethane (also known as methylene dichloride and methylene chloride) is primarily a synthetic substance with little natural occurrence. It is a clear colorless liquid which has a sweet odor, and evaporates readily. The United States produces roughly 500 million pounds of dichloromethane annually. The two major processes employed include the combination of methane and chlorine in a closed vessel, or methane chlorination, and methyl chloride chlorination, which begins with methyl chloride and chlorine.

Table 6-9, continued.

CHEMICAL	PUBLIC SEWAGE		OFF-SITE		TOTAL RELEASES AND TRANSFERS	
	Pounds	Percent	Pounds	Percent	Pounds	Percent
1,1,1-Trichloroethane	232,711	0.13	16,076,457	8.69	185,026,191	100.00
Dichloromethane	1,481,927	1.14	18,611,908	14.28	130,355,581	100.00
Trichloroethylene	29,132	0.06	4,604,388	9.40	48,976,806	100.00
Tetrachloroethylene	495,320	1.65	3,936,927	13.10	30,058,581	100.00
Chloroform	1,067,436	3.91	715,733	2.62	27,325,508	100.00
Carbon tetrachloride	3,841	0.08	1,097,405	23.82	4,607,809	100.00
SUBTOTAL	3,310,367	0.78	45,042,818	10.56	426,350,476	100.00
TOTAL FOR ALL OTHERS	547,724,329	10.37	868,009,345	16.44	5,279,319,904	100.00
TRI GRAND TOTAL	551,034,696	9.66	913,052,163	16.00	5,705,670,380	100.00

The two principal uses of dichloromethane are in paint removers and to depress flammability in aerosol products such as coatings, hair sprays, and room deodorants. Dichloromethane is also used as a solvent for degreasing and extraction, for foam blowing of polyurethanes, in plastics processing, in adhesive production, and in photographic film-base production.

In short-term low-level exposures, dichloromethane can cause a slight irritation of the nose and throat. At higher concentrations, it may cause mild central nervous system depression characterized by light-headedness, dizziness, nausea, numbness in hands and feet, fatigue, and reduced coordination. At high concentrations over longer periods, dichloromethane can cause liver and kidney damage. Brain damage has also been suspected. The substance is thought to be carcinogenic to humans. Very high level exposures can cause loss of consciousness and death.

Dichloromethane volatizes rapidly and almost all releases end up in the atmosphere relatively quickly. Before it is chemically transformed, it is dispersed widely and lingers in the lower atmosphere for up to a year. About one percent reaches the stratosphere where it degrades via photolysis and reaction with chlorine radicals. Small quantities of dichloromethane form in urban drinking water as a result of chlorination.[14]

Dichloromethane was number 13 for total TRI releases and transfers in 1989.

Dichloromethane was number 13 out of the total TRI list for 1989 releases and transfers (130.4 million pounds). Since 1988 it remained steady at this ranking, but marked a 16 percent decrease. The top industries for the release and transfer of dichloromethane were, in order of significance, the Chemical industry, the Plastics industry, the Measuring/Photographic industry, the Multiple SIC Codes category, and the Electrical industry. The Transportation industry also contributed significantly to total releases and transfers of dichloromethane. Combined, these six industries accounted for 89 percent of total releases and transfers of dichloromethane. The Chemical Industry alone made up 29 percent of this total. (See Table 6-2; and Appendix J, Table J-2.)

In 1989 dichloromethane was ranked number 16 in TRI for total numbers of forms submitted (almost 2 percent of all forms received), which demonstrates that a significant number of facilities had activities involving this chemical. (See Chapter 3, Table 3-9.) The environmental distribution for this chemical was divided between air releases (84 percent) and off-site transfers (14 percent) in a manner similar to that characterizing 1,1,1-trichloroethane. (See Table 6-9.)

Trichloroethylene

Trichloroethylene, a colorless liquid at room temperature, smells like chloroform. It does not occur naturally, but is instead manufactured from tetrachloroethane by treatment with alkali in the presence of water, or by thermal decomposition followed by steam distillation. United States production of trichloroethylene is on the order of 200 million pounds annually, but the quantities have been decreasing due to improved recycling practices and inexpensive imports.

Over two-thirds of domestic trichlorethylene consumption is used for vapor degreasing of fabricated metal parts. Trichloroethylene is also used as an extraction solvent for oils, fats, and waxes, as a refrigerant and heat exchange liquid, as a fumigant, as a diluent in paints and adhesives, and as a chemical intermediate. Other uses for trichloroethylene are in solvent dyeing, dry cleaning, the cleaning and drying of electronic parts, textile processing, and aerospace operations. Consumer products such as typewriter correction fluid, spot removers, and paint strippers often contain trichloroethylene. Its uses as an anesthetic, a surgical disinfectant, and as an extractant of caffeine in coffee were banned by the Food and Drug Administration in 1977.

At low levels, trichloroethylene vapors can cause irritation of the nose and throat. More elevated concentrations may result in central nervous system depression characterized by dizziness, headache, nausea, and excessive fatigue. At high concentrations (above 1,000 parts per million), loss of consciousness, tremors, lack of muscular coordination, and visual disorders can occur. Long-term exposure may result in damage to the liver or nervous system, characterized by tremors, vertigo, decreased feeling in the hands, anxiety, slowed heart rate, insomnia, and behavioral problems. Ingestion of trichloroethylene may be followed by vomiting, diarrhea, heart failure, pulmonary bleeding, damage to the nervous system, and blindness.[15]

Vapor degreasing is a major source of releases of trichloroethylene into the atmosphere. Soil and water releases also volatize rapidly. While present in water, trichloroethylene is moderately toxic to aquatic life. The life of this photoreactive chemical in the atmosphere is short, with an estimated half-life of about a week, but it is measurably present due to its continual release. To reduce atmospheric emission, recycling and recovery are receiving emphasis. Trichloroethylene is usually disposed of by incineration with a combustible fuel.

Trichloroethylene was the number 26 chemical for total TRI releases and transfers in 1989.

Trichloroethylene was ranked number 26 for total TRI releases and transfers, and contributed over 11 percent to total 33/50 releases and transfers of halogenated organic chemicals in 1989 (49 million pounds). Between the 1988 and 1989 TRI reporting periods trichloroethylene releases and transfers decreased by 15 percent, and the chemical shifted from number 23 to number 26 in overall TRI rank. The top industries for the release and transfer of trichloroethylene were the Fabricated Metals industry, the Machinery industry, the Multiple SIC Codes category, the Transportation industry, and the Electrical industry. The Fabricated Metals industry accounted for 25 percent of the TRI total for trichloroethylene, and the top five industries combined contributed 79 percent to this total. (See Table 6-2; and Appendix J, Table J-2.)

The environmental totals for this chemical followed the distribution for the halogenated organics discussed above, with the majority of releases going to air (91 percent), followed by off-site transfers (9 percent). (See Table 6-9.)

Tetrachloroethylene

Tetrachloroethylene, a synthetic chemical, is a clear liquid with a sweet odor. It is produced by the chlorination of hydrocarbons as well as by acetylene and chlorine via trichloroethylene.

The primary uses of tetrachloroethylene are as a dry cleaning solvent, a vapor degreasing solvent, a drying agent for metals and as a heat transfer medium. It is also used to destroy intestinal worms and in the manufacture of fluorocarbons.

Elevated short-term exposure results in irritation to the eyes, nose, and throat. Injury to liver, kidney, and central nervous system may occur at higher concentrations. Symptoms include nausea, headache, loss of appetite, confusion, dizziness, and unconsciousness. Deaths have been reported due to massive accidental overexposure. In a few cases, chronic effects upon the nervous system have been reported after prolonged overexposure. Tetrachloroethylene is a suspected carcinogen.

Most tetrachloroethylene is not consumed during its use and is released to the atmosphere, where it degrades within several days. The chemical is more persistent in ground water or soil, where it remains mobile for months or years.[16]

Tetrachloroethylene was the number 32 chemical for TRI releases and transfers in 1989.

In 1989 tetrachloroethylene was the number 32 chemical for total TRI releases and transfers, and contributed 7 percent to all releases and transfers of 33/50 halogenated organic chemicals (30.1 million pounds). Tetrachloroethylene held the same rank in 1988, but marked a decrease of 20 percent between the 1988 and 1989 TRI reporting periods. The top industries in the release and transfer of tetrachloroethylene were, in order of significance, the Transportation industry, the Multiple SIC Codes category, the Fabricated Metals industry, the Electronic and Electrical industry, and the Primary Metals industry. The Chemical industry also accounted for a significant proportion of total releases and transfers. Together, these six industries accounted for 79 percent of total releases and transfers of tetrachloroethylene, with the Transportation industry alone contributing 23 percent. (See Table 6-2; and Appendix J, Table J-2.)

The environmental distribution for tetrachloroethylene broke down into air emissions (85 percent), followed by off-site transfers (13 percent) and transfers to public sewage (2 percent). In 1989 tetrachloroethylene was the number six TRI chemical in the state of Colorado and the tenth-ranked TRI chemical in the state of Iowa. (See Table 6-9 and Appendix H, Table H-1.)

Chloroform

Chloroform (also known as trichloromethane) is a colorless, nonflammable liquid with a sweet smell. It is a primarily man-made compound that eventually decomposes in the environment.

The United States produces approximately 500 million pounds of chloroform annually, with imports amounting to about 50 million additional pounds. The two common methods for commercial production are the chlorination of methyl chloride, produced by the reaction of methanol and hydrogen chloride (92 percent of current production), and the chlorination of methane (8 percent of current production). Over 90 percent of the chloroform manufactured in the United States is used to make fluorocarbon-22, which is used in turn to make fluoropolymers and as an air conditioning coolant. The remainder is used as a solvent, extractant, and intermediate in the manufacture of dyes, drugs, and pesticides. It has been supplanted as an anesthetic by safer and more versatile drugs.

Chloroform is a potent anesthetic at high concentrations, and death from this use has resulted from liver damage and cardiac arrest. Chronic overexposure has been shown to cause enlargement of the liver and kidney damage, and chloroform is a suspected carcinogen. Chloroform evaporates rapidly from water and dry soil, and almost all chloroform released into the environment ends up in the atmosphere. It degrades relatively slowly, with a half-life ranging from a few months to a year, and may contribute to photochemical smog. Exposure to chloroform may cause root brittleness and chromosomal damage to certain plants, and chloroform is moderately toxic to aquatic life.

A recent Public Health Service report estimates the quantity of overall releases and transfers of chloroform to be close to TRI results.[17] The report identifies the bleaching of pulp from paper mills as the largest source of chloroform; however, the report identifies drinking water chlorination as the second-largest source of release, largely to water. Releases via drinking water are not reported to TRI. The report also identifies the decomposition of trichloroethylene, another 33/50 chemical, as a significant form of chloroform release.

Chloroform was number 36 for total TRI releases and transfers in 1989.

Chloroform was ranked number 36 for total TRI releases and transfers in 1989, with a 6 percent contribution to 33/50 releases and transfers of halogenated organic chemicals (27.3 million pounds). Chloroform moved up in TRI rank from number 39 in 1988, showing an increase in overall releases and transfers of slightly under 2 percent between reporting years. The industries which released the largest amounts of chloroform were, in order of importance, the Paper industry, the Chemical industry, the Multiple SIC Codes category, the Plastics industry, and the Transportation industry. Facilities in the Paper industry made this by far the dominant industry for the release and transfer of chloroform, accounting for 75 percent of total TRI releases and transfers of chloroform. The other four top industries combined contributed almost 25 percent to this TRI total. (See Table 6-2; and Appendix J, Table J-2.)

The general environmental distribution for this chemical was weighted towards air emissions (89 percent), followed by transfers to public sewage (4 percent), surface water discharges (4 percent), and off-site transfers (3 percent). It is notable that the largest source of chloroform to the environment, the Paper industry, is not directly

involved with its commercial manufacture or use, but releases chloroform as a byproduct of the paper bleaching process. Chloroform was the number three TRI chemical for the Paper industry. (See Table 6-9 and Appendix I, Table I-1.)

Carbon Tetrachloride

Carbon tetrachloride is a clear, heavy, non-flammable liquid that evaporates easily. It does not occur naturally, and is produced through the interaction of carbon disulfide and chlorine, as well as the chlorination of methane or other hydrocarbons at very high temperatures. In recent years, production has been on the order of 700 million pounds, but has been declining due to decreased usage. Most carbon tetrochloride today is used in the production of refrigerants such as the chlorofluorocarbons F-11 and F-12. Other uses include metal degreasing and the production of semiconductors. It is also employed as an industrial solvent. Consumer uses of carbon tetrachloride, such as a solvent in household products and as an agricultural fumigant, have ceased because of the compound's toxicity.

Elevated short term exposure to carbon tetrachloride can cause headache, dizziness, loss of coordination, and nausea. High-level exposure (1,000-2,000 parts per million for one-half to one hour) can cause unconsciousness, coma, and death. Damage to the liver and kidney can result from a single intense exposure, sometimes followed by heart failure. Ingestion of as little as 1.5 milliliters of carbon tetrachloride has caused death. Carbon tetrachloride produces liver tumors in several animal species, but data on human carcinogenicity remain limited.

Carbon tetrachloride evaporates from water within a few days. Virtually all carbon tetrachloride released ends up in the atmosphere, where it is extremely stable and contributes to ozone depletion in the upper atmosphere. The substance has a high toxicity to aquatic life, and at elevated concentrations is harmful to plants, land animals, and birds. The United States Public Health Service estimated annual release of carbon tetrachloride to be roughly twice the amount reported to TRI.[18]

Carbon tetrachloride was number 72 for total TRI releases and transfers in 1989.

Carbon tetrachloride was ranked number 72 for total TRI releases and transfers in 1989, and accounted for 1 percent of total 33/50 releases and transfers of halogenated organic chemicals (4.6 million pounds). Carbon tetrachloride moved up in TRI rankings from number 75 in 1988, marking a decrease in total releases and transfers of 8 percent. The top industries for the release and transfer of carbon tetrachloride were, in order of significance, the Chemical industry, the Multiple SIC Codes category, the Petroleum industry, the Electrical industry, and the Stone/Clay/Glass industry. Out of the total TRI releases and transfers of carbon tetrachloride, the Chemical industry accounted for 94 percent. The second-ranked Multiple Codes

category contributed 5 percent of this total, indicating that carbon tetrachloride releases and transfers were fully concentrated within facilities in a small number of industries. (See Table 6-2; and Appendix J, Table J-2.)

The environmental distribution for carbon tetrachloride was weighted slightly more in favor of off-site transfers (24 percent) than that of the other halogenated organics, but air emissions remained the dominant mode of release for carbon tetrachloride (73 percent). Underground injection (3 percent) made up the difference in this total. (See Table 6-9.)

Impact of 33/50 Halogenated Organics upon TRI Totals

The 33/50 halogenated organics accounted for 24% of all 1989 TRI air emissions and 67 percent of all air releases for the TRI halogenated organics class.

The 33/50 halogenated organics accounted for 24 percent of all TRI air emissions in 1989. As noted above, the 1989 environmental distribution for *all* TRI halogenated organics was dominated by air emissions (88 percent of TRI totals for this class), followed by off-site transfers (11 percent). The combined air emissions for the 33/50 halogenated organics made up 67 percent of the air emissions of all TRI halogenated organics, an enormous contribution considering that there were only six 33/50 chemicals in this class. Releases of 1,1,1-trichloroethane, as noted above, were major contributors to this total, accounting for 45 percent of all TRI air releases for this chemical class. Dichloromethane made up 29 percent of total TRI air emissions of halogenated organics.

As noted above, 1,1,1-trichloroethane played a significant role in a majority of industries, and it was also a top ten TRI chemical for 34 out of the total 54 states and reporting jurisdictions. (See Appendix H, Table H-1.)

Hydrogen Cyanide and Cyanide Compounds

Hydrogen cyanide and cyanide compounds are discussed within the 33/50 class "cyanides."

The cyanides' notoriety as poisons overshadows their applications in electroplating and in the extraction of precious metals from ore. The mining industry is currently not covered under the TRI requirements of Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), and facilities in this industry may be releasing and transferring significant amounts of hydrogen cyanide and cyanide compounds.

The cyanides comprise a large and varied group of chemicals.[19] They are both naturally occurring and man-made, although most environmental cyanides come from industrial processes. The most important of the cyanides are hydrogen cyanide, a colorless gas with a bitter almond odor, and sodium and potassium cyanide, both of which are colorless solids with a slight almond odor.

Domestic consumption of hydrogen cyanide has been approximately 1 billion pounds in recent years. About 80 percent of this is produced as a by-product of the manufacture of acrylonitrile, with direct synthesis accounting for the remaining 20

percent. Hydrogen cyanide is produced at about 14 locations in the United States, and there are numerous suppliers of cyanide salts and other compounds. Imports account for roughly 400,000 pounds of potassium cyanide annually.

The primary uses of hydrogen cyanide are as an intermediate in the production of adiponitrile (40 percent of hydrogen cyanide used), which in turn is used in the manufacture of nylon 6/6, as well as in the production of methyl methacrylate (30 percent), cyanuric acid (10 percent), chelating agents (7 percent), and sodium cyanide (7 percent). Miscellaneous applications, including as a fumigant and in the manufacture of ferrocyanides, acrylates, lactic acid, pharmaceuticals, and specialty chemicals accounts for the rest (6 percent). Cyanide salts and other compounds have a variety of uses, including electroplating, metal treatment, and leaching gold and silver from ore.

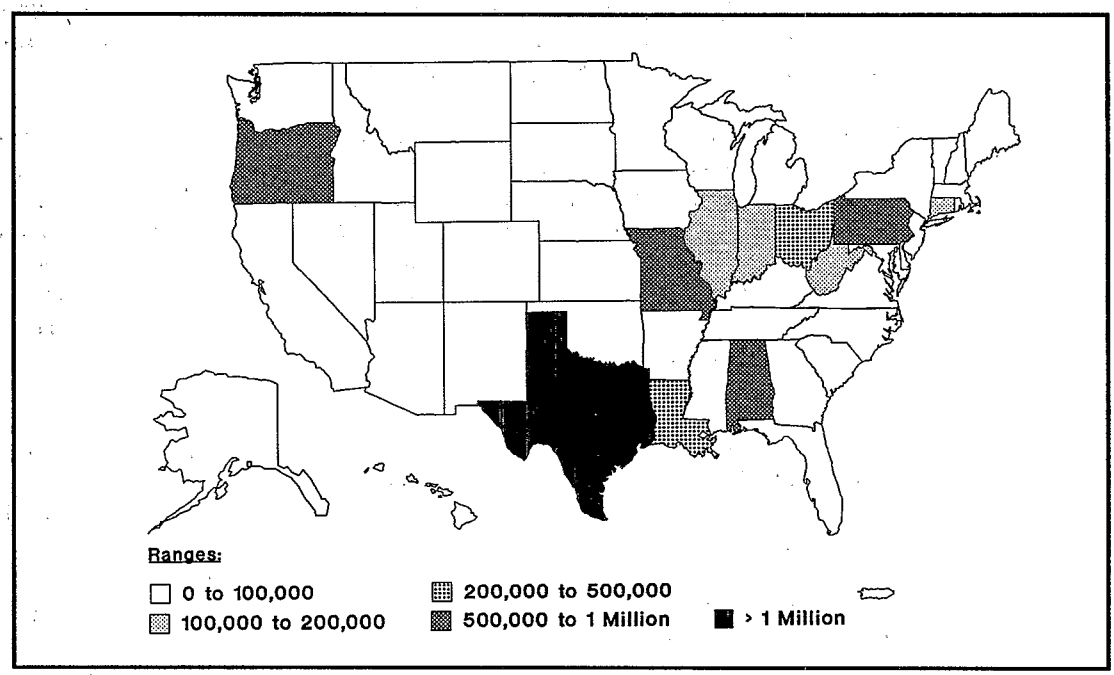
The cyanide compounds covered under EPCRA Section 313 include any compound of cyanide where a formal dissociation of the compound may occur to yield the cyanide moiety CN^-. Examples of compounds covered under the listing of cyanide compounds include potassium cyanide and metal cyanide compounds. Health effects of cyanide compounds are generally related to the ability of the substance to release the CN^- ion, which act by interfering with oxygen uptake at the cellular level. Hydrogen cyanide and its simple salts are among the most rapidly acting of all poisons. Sodium and potassium cyanide, for example, are extremely poisonous.[20]

The highly water-soluble nature of many of the cyanides contributes to their mobility and adverse environmental effects. The majority of cyanide released to the atmosphere from industrial sources is in the form of hydrogen cyanide gas. Cyanide emissions to the air have been estimated to be in excess of 44 million pounds per year. The largest single source of air emissions is vehicle exhaust, which accounts for over 90 percent of this total. This type of emission not reported under TRI. The residence time of this gas in the lower atmosphere is estimated to be between one and four years. Landfill disposal of cyanide-containing products, and the use of cyanide-containing road salts, are the biggest sources of land and soil contamination.

Map 6-5 shows the state distribution of 1989 releases and transfers of hydrogen cyanide and cyanide compounds releases and transfers. Texas was the only state with over1 million pounds of total releases and transfers of hydrogen cyanide and cyanide compounds.

The cyanide compounds were number 58 for total TRI releases and transfers in 1989.

Cyanide compounds were number 58 for total TRI releases and transfers (7.8 million pounds) in 1989. Since 1988, they moved up from number 60 in TRI rankings, marking a decrease of 10 percent. The top industries for the release and transfer of cyanide compounds were the Chemical industry, the Primary Metals industry, the Fabricated Metals industry, the Multiple SIC Codes category, and the Transportation industry. The Chemical industry accounted for 71 percent of the TRI total. (See Table 6-2; and Appendix J, Table J-2.)



Map 6-5. Total TRI Releases and Transfers by State of Hydrogen Cyanide and Cyanide Compounds.

Hydrogen cyanide was number 78 for total TRI releases and transfers in 1989.

Hydrogen cyanide was ranked number 78 for total TRI releases and transfers (4.2 million pounds) in 1989, moving from number 86 in 1988. Releases and transfers of this compound increased 34 percent between TRI reporting years. The industries playing a significant role in the release and transfer of hydrogen cyanide were, in order of importance, the Chemical industry, the Electrical industry, the Multiple SIC Codes category, and the Primary Metals industry. Facilities in these four industries combined accounted for almost 100 percent of total releases and transfers of hydrogen cyanide, with 98 percent of this represented by facilities in the Chemical industry.

The environmental distribution for cyanide compounds was divided between underground injection (57 percent), off-site transfers (31 percent), and air emissions (7 percent), with the remainder made up of discharges to surface water and transfers to public sewage. The TRI underground injection totals for cyanide compounds were primarily made up of forms from Louisiana and Texas. One TRI form represented almost 100 percent of Louisiana's total releases and transfers of cyanide compounds. These figures demonstrate that the releases and transfers of cyanide compounds were highly concentrated both industrially and geographically. (See Appendix J, Table J-1.)

The environmental distribution for hydrogen cyanide was weighted towards underground injection (84 percent of total TRI releases and transfers for this chemical), air emissions (15 percent), and off-site transfers (1 percent).

WASTE MINIMIZATION OF 33/50 CHEMICALS

Full waste minimization data on 33/50 chemicals represented 46% of all such TRI waste minimization data in 1989.

Full data on waste minimization of TRI chemicals were supplied by 1,275 facilities, on 2,240 forms, in 1989. (See Chapter 5 for a description of this subset of forms and a definition of absolute and relative change in waste generation.) While the total number of *all* forms reporting releases and transfers of the 33/50 chemicals represented almost 32 percent of all TRI forms received, there was a proportionately larger numbers of facilities choosing to report waste minimization data on the 33/50 sub-group. Of the 2,240 forms which reported full waste minimization of various TRI chemicals, forms reporting waste minimization of 33/50 chemicals represented 46 percent of that total. As a whole, 762 facilities submitted 1,024 forms with full waste minimization data for the 33/50 chemicals. (Note that *one* 33/50 chemical is reported per form.) (See Table 6-10.)

More full waste minimization data was submitted for the 33/50 chemical 1,1,1-trichloroethane than for any other TRI chemical.

The largest number of forms with full waste minimization data for *any* TRI chemical was for the 33/50 chemical 1,1,1-trichloroethane, representing almost 12 percent (262 forms out of 2,240) of all waste minimization forms received in 1989. Almost 7 percent of all TRI forms for this chemical contained full waste minimization data, compared to the average of 3 percent for all TRI chemicals. Except for chloroform, all of the 33/50 halogenated organic chemicals had significantly higher-than-average numbers of waste minimization reports. (See Figure 6-4 and Table 6-10.)

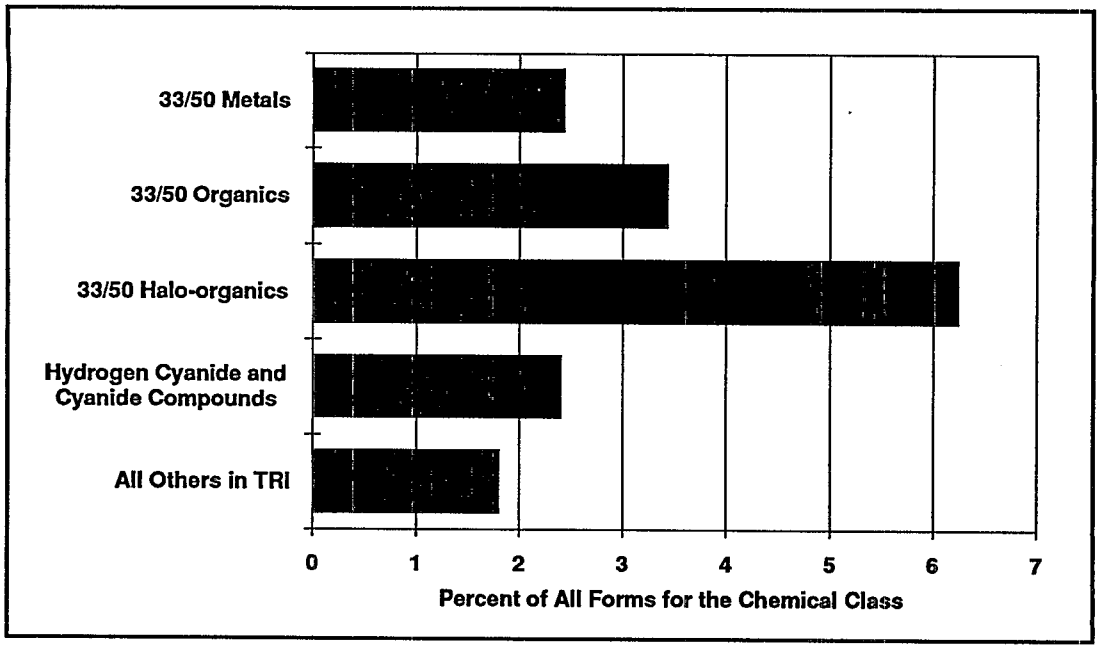


Figure 6-4. Percent of 33/50 Chemical Forms with Full Waste Minimization Data, 1989.

Table 6-10. TRI Forms with Full Waste Minimization for 33/50 Chemicals, 1989.

CHEMICAL	TOTAL FORMS		FORMS WITH FULL WASTE MINIMIZATION DATA	
	Number	Percent of all TRI Forms	Number	Percent of forms for that chemical
Cadmium compounds	142	0.17	3	2.11
Cadmium	105	0.13	2	1.90
Chromium compounds	1,363	1.66	32	2.35
Chromium	1,277	1.56	21	1.64
Lead compounds	858	1.05	23	2.68
Lead	889	1.09	34	3.82
Mercury compounds	23	0.03	0	0.00
Mercury	45	0.05	1	2.22
Nickel compounds	657	0.80	14	2.13
Nickel	1,285	1.57	32	2.49
Subtotal for Metals	6,644	8.11	162	2.44
Carbon tetrachloride	104	0.13	3	2.88
Chloroform	188	0.23	3	1.60
Dichloromethane	1,552	1.90	83	5.35
Tetrachloroethylene	687	0.84	51	7.42
1,1,1-Trichloroethane	3,893	4.75	262	6.73
Trichloroethylene	828	1.01	51	6.16
Subtotal for Halo-organics	7,252	8.86	453	6.25
Benzene	484	0.59	7	1.45
Methyl ethyl ketone	2,464	3.01	101	4.10
Methyl isobutyl ketone	1,041	1.27	19	1.83
Toluene	3,942	4.81	156	3.96
Xylene (mixed isomers)	3,525	4.30	115	3.26
m-Xylene	52	0.06	0	0.00
o-Xylene	69	0.08	1	1.45
p-Xylene	38	0.05	1	2.63
Subtotal for Organics	11,615	14.18	400	3.44
Cyanide compounds	342	0.42	9	2.63
Hydrogen cyanide	32	0.04	0	0.00
Subtotal for Cyanides	374	0.46	9	2.41
TOTAL 33/50 CHEMICALS	25,885	31.61	1,024	3.96
TOTAL FOR ALL OTHERS	56,006	68.39	1,216	2.17
GRAND TOTAL	81,891	100.00	2,240	2.74

Two other 33/50 chemicals, the non-halogenated organics toluene and xylene (mixed isomers), also had relatively high numbers of TRI forms with full waste minimization data. Toluene had the second-largest number of such forms (156 forms) and xylene (mixed isomers) had the fourth-largest (115 forms) number of waste minimization forms out of *all* TRI chemicals. (See Table 6-10.)

Out of all the TRI chemicals, the 2nd-largest number of forms with full waste minimization data was submitted for toluene.

The 33/50 halo-organics class accounted for the largest number of waste minimization forms submitted for the 33/50 chemicals.

Of all the 33/50 chemical classes, the largest number of forms with full waste minimization data was submitted for the halo-organics--453 forms, or 6 percent of *all* forms submitted for that 33/50 chemical class. (See Figure 6-4 and Table 6-10.) The waste minimization forms reported for the 33/50 halo-organics represented 44 percent of all such forms submitted for the 33/50 chemicals in 1989. (See Table 6-11.)

The 33/50 sub-group showed a 7% decrease in absolute waste generated from 1988 to 1989... however, the *relative* decrease for the 33/50 sub-group was 26 percent.

As a group, the 33/50 chemicals showed a 7 percent decrease in absolute waste generated from 1988 to 1989, as reported on the 1,024 forms with full waste minimization data. This is about half of the 13 percent decrease reported for all TRI chemicals reporting waste minimization. However, the relative decrease of 26 percent, calculated by taking into account changes in production at the facilities, was about the same as that for all TRI chemicals (24 percent) reporting waste minimization, indicating a higher increase in production, on average, for the 33/50 chemicals. (See Table 6-11.) (See Chapter 5 for further explanation of absolute and relative waste minimization.)

Of the 33/50 sub-group, toluene showed the largest absolute decrease in waste generated from 1988 to 1989.

The largest *absolute* decrease in waste generated among the 33/50 chemicals was reported for toluene--7.8 million pounds less in 1989 than in 1988. The largest absolute decrease in waste generated for a 33/50 chemical class, a 10.0-million-pound decrease (21 percent), was shown by the 33/50 non-halogenated organics class. (See Figure 6-5 and Table 6-11.)

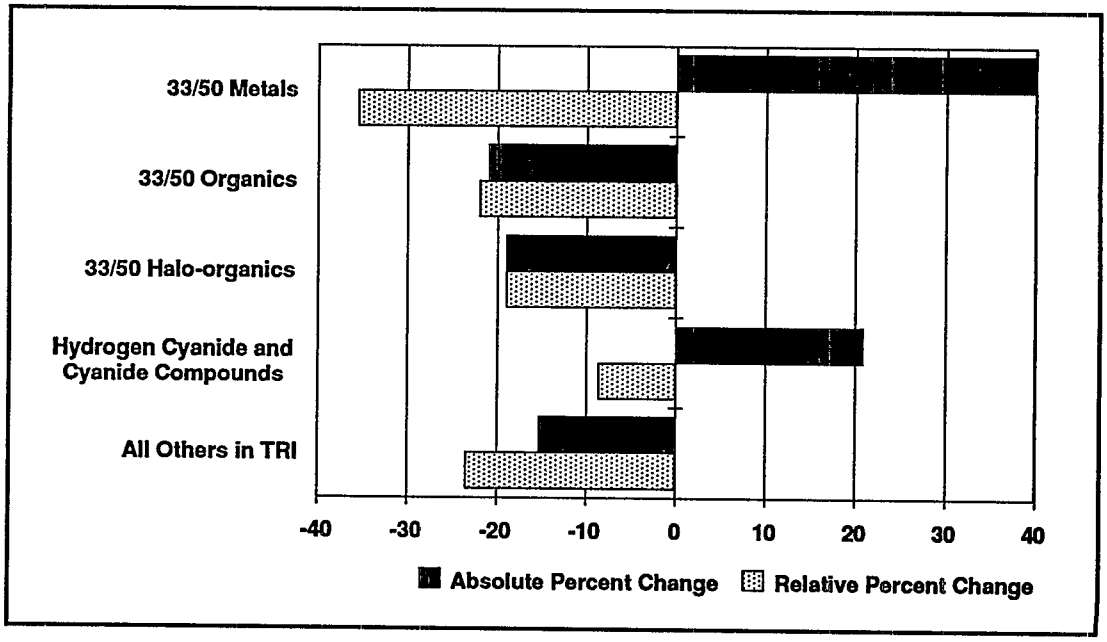


Figure 6-5. Percent Change in Waste Generation for 33/50 Chemicals, 1988-1989.

For the 33/50 sub-group, nickel compounds showed the largest relative decrease in waste generated from 1988 to 1989.

The largest *relative* decrease in waste generated was reported for the 33/50 class of metals and metal compounds, and for nickel compounds in particular, which showed a 10.0-million-pound decrease (33 percent decrease). Lead compounds recorded a 3.6-million-pound relative decrease (43 percent decrease) and chromium compounds recorded a 3.5-million-pound relative decrease (49 percent). The 33/50 chemical class with the largest relative decrease was the metals and metal compounds class, with a decrease of 19.3 million pounds (36 percent). (See Figure 6-5 and Table 6-11.)

Table 6-11. Amount of Absolute and Relative Change in Waste Generation for 33/50 Chemicals, 1988-1989 (a).

CHEMICAL	FORMS		WASTE GENERATED		ABSOLUTE CHANGE (b)	
			1989	1988		
	Number	Percent	Pounds	Pounds	Pounds	Percent
Cadmium compounds	3	0.29	43,487	96,165	-52,678	-54.78
Cadmium	2	0.20	2,161	1,617	544	33.64
Chromium compounds	32	3.13	3,677,666	1,406,398	2,271,268	161.50
Chromium	21	2.05	1,014,656	1,422,681	-408,025	-28.68
Lead compounds	23	2.25	4,739,784	7,323,361	-2,583,577	-35.28
Lead	34	3.32	679,159	618,366	60,793	9.83
Mercury compounds	0	0.00	0	0	0	---
Mercury	1	0.10	34	43	-9	-20.93
Nickel compounds	14	1.37	21,919,513	11,586,486	10,333,027	89.18
Nickel	32	3.13	2,873,572	2,511,576	361,996	14.41
Subtotal for Metals	162	15.82	34,950,032	24,966,693	9,983,339	39.99
Carbon tetrachloride	3	0.29	107,833	200,274	-92,441	-46.16
Chloroform	3	0.29	1,244,260	1,643,015	-398,755	-24.27
Dichloromethane	83	8.11	14,808,618	15,788,545	-979,927	-6.21
Tetrachloroethylene	51	4.98	2,696,368	3,463,693	-767,325	-22.15
1,1,1-Trichloroethane	262	25.59	12,431,310	16,294,418	-3,863,108	-23.71
Trichloroethylene	51	4.98	2,868,363	4,626,103	-1,757,740	-38.00
Subtotal for Halo-organics	453	44.24	34,156,752	42,016,048	-7,859,296	-18.71
Benzene	7	0.68	1,200,272	1,870,209	-669,937	-35.82
Methyl ethyl ketone	101	9.86	7,379,516	8,726,769	-1,347,253	-15.44
Methyl isobutyl ketone	19	1.86	360,889	308,905	51,984	16.83
Toluene	156	15.23	20,243,542	28,029,392	-7,785,850	-27.78
Xylene (mixed isomers)	115	11.23	7,509,397	7,735,280	-225,883	-2.92
m-Xylene	0	0.00	0	0	0	---
o-Xylene	1	0.10	16,700	45,000	-28,300	-62.89
p-Xylene	1	0.10	284	537	-253	-47.11
Subtotal for Organics	400	39.06	36,710,600	46,716,092	-10,005,492	-21.42
Cyanide compounds	9	0.88	40,963	33,882	7,081	20.90
Hydrogen cyanide	0	0.00	0	0	0	---
Subtotal for Cynanides	9	0.88	40,963	33,882	7,081	20.90
TOTAL 33/50 CHEMICALS	1,024	100.00	105,858,347	113,732,715	-7,874,368	-6.92
TOTAL FOR ALL OTHERS	1,216		339,312,674	400,442,745	-61,130,071	-15.27
GRAND TOTAL	2,240		445,171,021	514,175,460	-69,004,439	-13.42

(a) Out of subset of 1,024 forms reporting full waste minimization data.
(b) Absolute Waste Change = 1989 Waste Generated - 1988 Waste Generated
(c) Projected Waste Generation = 1988 Waste Generated x Production Index
(d) Relative Waste Change = 1989 Waste Generated - 1989 Projected Waste Generation

Table 6-11, continued.

CHEMICAL	PROJECTED 1989 WASTE GENERATION (c) Pounds	RELATIVE CHANGE Pounds	Percent
Cadmium compounds	106,962	-63,475	-59.34
Cadmium	2,258	-97	-4.30
Chromium compounds	7,218,722	-3,541,056	-49.05
Chromium	1,503,115	-488,459	-32.50
Lead compounds	8,356,559	-3,616,775	-43.28
Lead	1,239,755	-560,596	-45.22
Mercury compounds	0	0	—
Mercury	43	-9	-20.93
Nickel compounds	32,691,669	-10,772,156	-32.95
Nickel	3,082,744	-209,172	-6.79
Subtotal for Metals	54,201,827	-19,251,795	-35.52
Carbon tetrachloride	120,723	-12,890	-10.68
Chloroform	1,682,624	-438,364	-26.05
Dichloromethane	16,011,989	-1,203,371	-7.52
Tetrachloroethylene	3,091,146	-394,778	-12.77
1,1,1-Trichloroethane	16,792,629	-4,361,319	-25.97
Trichloroethylene	4,400,234	-1,531,871	-34.81
Subtotal for Halo-organics	42,099,345	-7,942,593	-18.87
Benzene	1,393,645	-193,373	-13.88
Methyl ethyl ketone	10,211,095	-2,831,579	-27.73
Methyl isobutyl ketone	329,475	31,414	9.53
Toluene	26,360,928	-6,117,386	-23.21
Xylene (mixed isomers)	8,738,858	-1,229,461	-14.07
m-Xylene	0	0	—
o-Xylene	54,000	-37,300	-69.07
p-Xylene	698	-414	-59.31
Subtotal for Organics	47,088,699	-10,378,099	-22.04
Cyanide compounds	44,851	-3,888	-8.67
Hydrogen cyanide	0	0	—
Subtotal for Cynanides	44,851	-3,888	-8.67
TOTAL 33/50 CHEMICALS	143,434,722	-37,576,375	-26.20
TOTAL FOR ALL OTHERS	443,586,845	-104,274,171	-23.51
GRAND TOTAL	587,021,567	-141,850,546	-24.16

NOTES

1. The TRI chemical classes are: non-halogenated organics; mineral acids/salts; metals and metal compounds; halogenated organics; and non-metallic inorganics. (See Chapter 3.) In figures and tables throughout this report, class names are abbreviated as: organics; mineral acids/salts; metals; halo-organics; and non-metals.

2. TRI reporting thresholds are based on the entire weight of the metal compound. However, once the reporting threshold is met, only the pounds of the *parent metal* present in wastes are supposed to be reported on the Form R. See Chapter 8 for further discussion of reporting thresholds for metals and metal compounds.

3. *Toxicological Profile for Chromium*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/10, July 1989.

4. *Toxicological Profile for Lead*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/17, June 1990.

5. *Toxicological Profile for Nickel*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ASTDR/TP-88/19, December 1988.

6. *Toxicological Profile for Cadmium*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/08, March 1989.

7. *Toxicological Profile for Mercury*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, draft, December, 1989.

8. *Toxicological Profile for Toluene*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, December 1989.

9. *Toxicological Profile for Total Xylenes*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Draft, October, 1989.

10. CCINFO Disk, The Canadian Center for Occupational Health and Safety, 1990; and, *Hawley's Condensed Chemical Dictionary*, 11th ed., New York: Van Nostrand Reinhold Company Inc., 1987.

11. CCINFO Disk, The Canadian Center for Occupational Health and Safety, 1990; and, *Hawley's Condensed Chemical Dictionary*, 11th ed., New York: Van Nostrand Reinhold Company Inc., 1987.

12. *Toxicological Profile for Benzene*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/03, May 1989.

13. *Toxicological Profile for 1,1,1-Trichloroethane*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Draft, October 1989.

14. *Toxicological Profile for Methylene Chloride*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ASTDR/TP-88/18, April 1989.

15. *Toxicological Profile for Trichloroethylene*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ASTDR/TP-88/24, October 1989.

16. *Toxicological Profile for Tetrachloroethylene*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/RP-88/22, January 1990.

17. *Toxicological Profile for Chloroform*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/09, January, 1989.

18. *Toxicological Profile for Carbon Tetrachloride*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, December, 1989.

19. The *Toxic Chemical Release Inventory Reporting Form R and Instructions*, EPA, January 1990, defines cyanide compounds as "X+CN- where X = H+ or any other group where a formal dissociation may occur. For example, KCN or Ca(CN)2."

20. *Toxicological Profile for Cyanide*, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, ATSDR/TP-88/12, December 1989.

Photo: Ciba Geigy Corp. , St. Gabriel, Louisiana

CHAPTER 7. TRI IN OTHER PROGRAMS AND POLICIES

INTRODUCTION

TRI data are used by federal and state officials and the public to set policies and establish strategies.

While most of this report examines the data submitted to the Toxics Release Inventory (TRI), this chapter describes how various federal and state officials, as well as public interest groups, are using the TRI database to create policies, promote legislation, and establish regulatory strategies. Also discussed here are other programs designed by the federal government in direct response to TRI data.

The first part of this chapter, "Uses of TRI in Other Programs and Policies," describes many examples of public and private activities that utilize TRI in some way, including pollution prevention programs, compliance reviews, fees levied on TRI facilities, and state and community right–to–know activities.

TRI chemicals are also affected by other federal regulatory programs.

The second part of this chapter, "TRI Chemicals Subject to Testing and Regulatory Programs," explains some of the available information concerning the effects of TRI chemicals, prepared in various federal programs, and the status of specific TRI chemicals in these programs. Here particular legislation and regulatory programs affecting TRI chemicals are also discussed.

USES OF TRI IN OTHER PROGRAMS AND POLICIES

TRI has affected public policy and has enhanced the environmental awareness of the American public.

The Toxics Release Inventory, the most comprehensive nationwide database on toxic chemicals released and transferred to all parts of the environment (air, land, and water), has greatly enhanced the environmental awareness of the American public, as was its intent. The press employs TRI information to highlight toxic pollution in specific localities, and citizen groups use this data to mobilize and direct public response. Many companies have responded by developing corporate policies to voluntarily reduce releases and transfers of TRI chemicals.

The Toxics Release Inventory has also affected public policy. Government regulators have used TRI data to help set environmental priorities and to shape regulations. Perhaps the most important use of TRI data is in the development of pollution prevention initiatives.[1] A number of state legislatures, motivated by TRI data, have passed pollution prevention laws. TRI data have helped focus attention on facilities where pollution prevention can be most effectively achieved.

Most states are using the TRI data to varying degrees, according to information obtained from state TRI coordinators and from the U.S. Environmental Protection Agency's (EPA) records of meetings with states.[2] States such as Delaware report that the influence and utilization of TRI data have been significant in several areas. Texas, Louisiana, and Ohio, as well as other states with large TRI releases and transfers, have made particularly widespread use of the TRI data. Even in the states where more limited use of TRI data is made, it has proven useful.

This section categorizes the types of activities conducted by federal and state governments and the public in response to TRI, including some that have been based explicitly upon TRI data. Examples of each type of activity are provided below. Also included is a case study for the State of Louisiana—a state whose facilities report major amounts of TRI wastes and a state in which TRI data are being put to extensive use (See Box 7–A.).

State Response To TRI

States have used TRI data to develop new regulations and to strengthen existing programs.

TRI data have been used by a number of states both to develop new regulations and programs and to strengthen existing ones. (See Table 7–1.) During the development of state regulations, TRI data represent a major source of information on pollutants being released or having the potential to be released into the environment. For example, TRI data have been used as a reference in the development of two regulations in Delaware: a new regulation on surface water quality standards and an air toxics regulation that is nearing completion. The Delaware Department of Natural Resources and Environmental Control reports that the TRI data were especially useful because the inclusion of fugitive air releases under total air releases provided additional substantiation for the inclusion of fugitive air releases under the air toxics regulation.

In existing regulatory programs, TRI data have served in identifying potential problems in permit programs, targeting inspections, and cross–checking compliance. Examples of these uses are provided below.

State Pollution Prevention Activities

TRI has prompted many states to enact pollution prevention laws.

The Toxics Release Inventory has influenced state environmental policy in a number of cases, most notably spurring interest in pollution prevention. (See Table 7–1.) In response to 1988 TRI data, the State of Minnesota formed a commission, made up of representatives from industry, environmental groups, and state government, to develop a state–wide pollution prevention strategy. The Minnesota Toxic Pollution Prevention Act of 1990 was passed as part of this overall strategy. This Act, one of the many state pollution prevention laws enacted since 1987, requires each TRI facility to prepare and biannually update a "toxic pollution prevention plan." The plan must identify the manufacturing processes that generate or release pollutants, assess options for reducing or eliminating wastes, and state reduction or elimination goals and a schedule for meeting those goals.

TRI data are being used by the State of Illinois to identify facilities subject to provisions contained in the Illinois Toxic Pollution Prevention Act of 1989. The Illinois EPA will examine TRI forms to determine which chemicals are to be covered by the Act. The Texas legislature has been considering several bills covering pollution prevention and waste minimization, all influenced by TRI.

The District of Columbia also passed a pollution prevention law based on TRI data. The Toxic Source Reduction Business Assistance Administration Act of 1990 addresses TRI chemicals and requires any TRI facilities to periodically submit a source reduction plan to the Mayor. (No facilities in the District of Columbia reported to TRI in 1989.)

Table 7–1. State Regulatory Programs Mobilized by TRI.(a)

STATE	POLLUTION PREVENTION INITIATIVES	PERMIT DEVELOP-MENT	COMPLIANCE REVIEWS INSPECTIONS	AIR TOXICS REGULATION	FEES	RISK ASSESSMENT	STATE RIGHT-TO-KNOW	TECHNICAL ASSISTANCE PROGRAMS
Alaska	X		X					
Califomia	X							
Connecticut		X	X	X				
Delaware	X		X	X				
Florida	X(b)							
Georgia	X							
Idaho			X	X				
Illinois	X		X	X				
Indiana	X					X	X	
Kansas					X	X		
Kentucky	X							
Louisiana	X		X					
Maine	X						X	
Maryland	X							
Massachusetts	X						X	
Minnesota	X		X		X	X	X	X
Mississippi	X							
Missouri	X(b)				X(b)	X		
Nebraska						X	X	
New Jersey	X							
New Mexico						X	X	
New York	X	X		X			X	
North Carolina	X							
Ohio	X(b)	X	X	X	X		X	
Oklahoma	X(b)		X					
Oregon	X							
Rhode Island	X							
South Carolina	X(b)						X	
South Dakota				X				
Tennessee	X							
Texas	X(b)		X	X	X		X	X
Utah			X	X		X		
Vermont	X				X			
Washington	X							
West Virginia	X							
Wisconsin	X	X	X					

(a) This table includes only those states for which information was available as of May 1991.
(b) Proposed.

BOX 7–A. CASE STUDY – LOUISIANA

Louisiana ranked second in the nation in total TRI releases and transfers in 1988 and 1989. However, from 1988 to 1989, the state reported one of the largest overall net decreases in total TRI releases and transfers, a decrease of 292.7 million pounds, which marked a decrease of 38 percent between reporting years. Some of this progress has been attributed, in part, to Louisiana's extensive use of TRI data in the promotion of environmental activities.

TRI data have become a "significant tool" for the Louisiana Department of Environmental Quality (DEQ) in its efforts to improve the quality of the state's environment. The Department reports that "TRI data have been extremely useful in providing information for legislative decisions, for various state and interstate analyses and comparisons and for augmentation of data collected in DEQ's air and water monitoring efforts... It is anticipated that TRI data will be used more extensively in the future, and will continue to have a significant impact on Louisiana's environmental program."[3]

Astounded by the high 1987 TRI releases for Louisiana, state legislators set about developing laws to promote the reduction of toxic chemical air emissions. This legislation, Act 184, was passed in June 1989 and required the Secretary of the Louisiana DEQ to develop and publish a list of up to one hundred toxic air pollutants to be targeted for reductions by December 31, 1989. The DEQ's Office of Air Quality relied upon the TRI list of chemicals when preparing this list of chemicals which, under the provisions of this Act, must be emitted at half of 1987 emission levels by December 31, 1994.

The 12 top releasers of toxic pollution in Louisiana were identified by the State after review of the 1988 TRI data. The Louisiana DEQ met with representatives of these companies to discuss ways to reduce their releases to air, water and land and to request that waste reduction plans be submitted to the DEQ. The plans were reviewed by DEQ's offices and results were published in a report entitled *Corporate Response to the DEQ's Request for Toxic Waste Reduction Plans, 1990*. It should be noted that the DEQ did not merely accept the corporate plans automatically, but rather "graded" them and is following up.

The Louisiana DEQ Office of Water Resources and the Office of Air Quality have used TRI data to estimate the amounts of pollutants which would evaporate from the waters of the Mississippi River to the air in the "Industrial Corridor" between Baton Rouge and New Orleans. The Office of Water Resources also uses TRI data to supplement data collected by the discharge monitoring program and the water quality monitoring program in order to identify sources of particular high-level pollutants and to calculate pollutant concentrations for comparison with existing monitoring data and water quality criteria for toxic pollutants.

Louisiana's DEQ also used TRI data to identify potential problem facilities and to develop a state TRI database, which was later used to produce the 1988 and 1989 Louisiana TRI reports.

TRI data represent one source of information that the state is using to create environmental criteria for assessing industrial environmental performance. Specifically, TRI data will be used to determine reductions in emissions which have occurred due to installation of DEQ-approved pollution control projects, the success of DEQ-approved emissions reduction plans implemented by the facility, and the total number of pounds of toxics emitted versus the number of jobs created.

Box 7–A , continued.

The Louisiana Industrial Tax Exemption Program was created in 1936 to boost the state economy by allowing petrochemical and other companies to expand; however, due to its impact on the Louisiana environment, the program is being modified and new regulations for tax exemption are being developed.

From October 1989 through June 1990, the Louisiana State University library received a fee waiver from EPA allowing free search time of the TRI database. The database was widely used by university personnel, industry, the Louisiana DEQ, and the general public to locate water discharges in the Mississippi River, carcinogens in Louisiana, specific company releases, Louisiana releases in general and in specific parishes, and release information on specific chemicals.

TRI data are also being used in Louisiana by the public to raise concerns about toxic chemicals released from industrial sources not subject to TRI requirements (such as certain sectors of the oil and gas industry). For example, a recent newspaper article in the state compared 1989 TRI data to releases by sectors of this industry. Comparisons such as these provide a focus for further environmental programs concerned with reduction in releases of toxic chemicals to the environment.

The Louisiana Chemical Association (LCA), which represents 86 of the 310 facilities in Louisiana which reported to TRI in 1989 or approximately two-thirds of the 139 chemical manufacturing facilities which reported, decided to make TRI data from its members available to Louisiana citizens. Using the National TRI Report as a blueprint, the LCA compiled and compared the first two years of TRI data reported by its members in a set of annual reports. The second report, comparing 1988 and 1989 TRI data, goes one step beyond the prior year report by providing reasons for the reported decreases and increases.[4] These reports were available before the public release of the national database, providing Louisiana citizens with an early look at the state data.

States and other jurisdictions utilize TRI data in pollution prevention programs which extend beyond the legislative front. North Carolina, for example, is combining information from TRI and other databases in order to identify facilities which offer the greatest opportunities for source reduction.[5] The Florida Department of Environmental Regulation has used TRI data to target facilities for technical assistance in pollution prevention.

State Permit Programs

Many states are using TRI data in their permit programs.

The States of Ohio, Connecticut, and Wisconsin are three of the states putting TRI data to use in their permit programs. The Ohio EPA Division of Water Pollution Control employs TRI data in the development of both National Pollutant Discharge Elimination System (NPDES) permits and indirect discharge permits. TRI data are screened to determine if additional pollutants should be evaluated for possible inclusion in the permits. In Connecticut, the Bureau of Water Management used TRI data to determine that additional controls were necessary in their discharge permit program, and are implementing these under the state water program. In Wisconsin, the Department of Natural Resources (Solid Waste and Water Resources Division) uses TRI as part of the information to be considered in facility audits and permits.

An additional project, initiated in part due to TRI data, is the integrated permitting program at the Eastman Kodak Company in Rochester, New York. This program, run by the New York Department of Environmental Conservation (DEC), is a facility–wide strategy to reduce and control toxic releases and transfers to all environmental media. The Rochester Eastman Kodak Company decreased its TRI releases and transfers by 4.5 million pounds between 1988 and 1989, making it one of the top facilities for overall TRI decreases. Its success has motivated the New York DEC to actively consider expanding the integrated permitting program to cover additional facilities.

State Compliance Reviews and Inspection Targeting

TRI data are being used to cross–check facilities for compliance with various environmental programs.

TRI data have been used in many states to cross–check facilities for compliance with several different environmental programs. The Texas Water Commission Water Quality Division is currently using TRI data to monitor some of the state's permitted water dischargers and, like the Texas Air Control Board, uses these data to target facilities for additional compliance and inspection activities. The State of Delaware reviewed TRI data to ensure that all TRI facilities subject to the state's Regulation for the Management of Extremely Hazardous Substances had registered under that program. The TRI air release data for the State of Delaware have also been cross–checked with permit limits, as well as release estimates reported on annual air emissions inventory reports.

The State of Oklahoma compares TRI data to information supplied in other programs. For example, the Oklahoma Department of Health compared the 1988 TRI data on point source air emissions to information in the state's air emissions inventory that had been supplied by the regulated community, thus identifying any inconsistencies between the two data sets. The Ohio EPA Division of Solid and Hazardous Waste Management plans to analyze TRI data to identify violators of requirements under the Resource Conservation and Recovery Act (RCRA).

Under a grant from EPA, the Kansas Department of Health and Environment's Right–to–Know Program is developing an expert system to identify suspect data in TRI and facilities that incorrectly failed to report. The system, scheduled to be completed in November 1991, combines the State's EPCRA database, NPDES and other permit databases, and databases of the Department of Commerce and Labor Department. The Department also plans to extend the system to address non–compliance with other Federal statutes.

TRI data are employed by many states to assist in verifying that facilities are providing data on emergency and hazardous chemical inventory forms (Tier I and II forms) to State Emergency Response Commissions, local fire departments, and local emergency planning commissions for use in emergency preparedness and community right–to–know activities, as required under Section 312 of the Emergency Planning and Community Right–to–Know Act (EPCRA).

The National Air Toxics Information Clearinghouse (NATICH)

NATICH, established as a cooperative effort by EPA and the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALPACO), is a repository of information relating to air toxics. It was established by EPA primarily to support state and local agency efforts in controlling non–criteria (toxic) air pollutants, although EPA also makes use of the information which it contains. The clearinghouse contains information on regulatory programs, contacts, permitting data, ambient standards and monitoring, source test data, and bibliographic references. In the fall of 1989, a link was established between NATICH and the TRI database, further increasing the utility of NATICH to its user community. Presently, TRI database access accounts for an average of 25 percent of the searches on NATICH, often ranking as the single highest search category in a given month. The uses of the TRI data retrieved are not known, but it is likely that these data provide an additional aid in the implementation of state and local air toxics programs.

Development of State Regulatory Proposals and Programs

TRI data have been used during the development of state regulatory programs.

In addition to strengthening existing regulation, TRI data have been used during the development of state regulatory programs. For example, in the development of Idaho's Air Toxics Program TRI data were used for source identification and the verification of emissions inventory data from other programs.

Illinois EPA's Division of Air Pollution Control used the TRI data to determine quantities of point source and fugitive air emissions of target chemicals. To support the development of regulatory proposals in response to 1987 legislation addressing air toxics, TRI data were used to determine that 77 of the 108 chemicals proposed for an air toxics list were emitted in Illinois.

Ohio state agencies are using TRI data for prioritizing air toxics and ground water quality activities. The Ohio EPA Division of Air Pollution Control uses the TRI data to identify "hot spots" for ambient air monitoring evaluations, determine county–wide levels of toxics for air pollution studies, and provide baseline data for non–routine (explosion or fire) air pollution episodes. TRI data are also utilized to estimate the release volumes of particular facilities in the assessment of proposed new sources or process modifications.

Several states have levied fees on TRI facilities.

State Fees on TRI Facilities. In order to finance their state TRI programs, a number of states have levied fees on TRI facilities. The state pollution prevention program under the Minnesota Toxic Pollution Prevention Act is funded through fees on TRI facilities. The Ohio Right–To–Know Act of 1988 established filing fees for Ohio facilities required to file TRI reports, and these fees now fully fund the TRI

program in that state. Under Ohio's fee system, each facility reporting to TRI is required to pay $50, plus $15 per Form R submitted, not to exceed $500 per facility. Ohio estimates that $150,000 will be generated through filing fees in 1990.

The 1989 Texas Toxic Chemical Release Reporting Act has also imposed fees on TRI facilities, based on the number of TRI forms submitted per facility. The fees generated can only be used to pay for costs incurred by the Texas Waste Commission during implementation of their Reporting Act. As part of a toxics reduction initiative, the Texas Air Control Board utilizes TRI data to assist in calculating fee revenues.

Kansas has established a fee system to cover all or part of the cost of implementing EPCRA in the state. Various fees are charged for each submission under the different sections of EPCRA; the fee for TRI reporting is $187 per facility.

States are using TRI data to identify locations and chemicals for more detailed risk assessment.

State Risk Assessment/Risk Screening. TRI data have been used by state agencies to screen for potential risks posed by toxic chemical releases and transfers. For example, under Utah's air toxics control program, TRI data are used to identify facilities, locations, or chemicals for more detailed risk assessment. Data have also been used in the water pollution control program in that state to identify water bodies affected by toxic chemical discharges.

Minnesota is beginning a project which will make use of multiple pollution release databases in conjunction with the analytical approach developed by EPA's Office of Toxic Substances in the TRI *Risk Screening Guide* to identify areas for more detailed risk assessment.

Right-to-know programs have been initiated to alert the public to toxic releases and transfers occurring in their states.

State Right-to-know Programs. Right-to-know programs have been initiated by states to alert the public, government, and industry to toxic releases and transfers occurring in their states. States including Illinois, Louisiana, New Jersey, New York, Minnesota, and Virginia have prepared annual reports on the volume and nature of releases and transfers in their states, by facility and geographical subdivision.

While EPCRA mandates that all TRI data be made available to the public in a national database, many states develop their own state TRI database, because it allows them earlier access and use of the TRI data submitted to them by facilities and because they can incorporate other state data. The Kansas Department of Health and Environment's Right-to-Know Program noted that TRI data submitted by the annual TRI reporting deadline of July 1 will be entered into the state's integrated EPCRA database by August, allowing the state to access the data approximately eight months before the national TRI database becomes publically available. The New York State Department of Environmental Conservation published the *New York State 1989 Toxic Release Inventory (TRI) Review* in November, 1990, containing 1989 TRI data from New York facilities six months before the national database was publicly available. The report analyzed the data by chemical, type of release or transfer, and industry, and gave further facility-specific information for some of the

releases and transfers. It also related the TRI information to the requirements of environmental regulations and permitting programs. (The State of Louisiana prepared a similar state report, the *Louisiana Toxics Release Inventory, 1989.*)

As part of its risk communication program, the Minnesota Department of Health is preparing chemical information sheets for the general public on the most common chemicals released in the state. Ohio, California, and other states have compiled the state's TRI data in the form of a state database to make TRI data more readily accessible to state and local agencies and to the public. Virginia has developed a TRI database to provide citizens ready access to state TRI data: the public may request a disk or hard copy of any available facility report. In an expanded effort, the Missouri Department of Natural Resources has begun a data management effort to process TRI data and other community right–to–know information.

State Technical Assistance Programs. Some states, such as Minnesota, are using TRI data as a means of facility identification, to target either technical assistance or facility planning requirements. In Texas, the Emergency Response Unit of the Hazardous and Solid Waste Division of the Texas Water Commission provides such technical assistance to TRI facilities.

Some states use TRI to target technical assistance to TRI facilities.

Civil Planning. The Kansas Department of Transportation (KDOT) is using TRI data to plot right–of–ways for intrastate highways. The KDOT used the TRI data to identify corridors with facilities releasing or transferring certain TRI chemicals, to be used in their civil planning process.

LOCAL GOVERNMENT RESPONSE TO TRI

More than 3,500 local emergency planning committees (LEPCs) have been formed in response to the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). LEPCs are responsible for preparing and implementing emergency response plans and for collecting chemical data and making it publicly available. Some LEPCs use TRI data along with chemical inventory information submitted by facilities under Sections 311 and 312 of EPCRA to form a chemical profile of their communities for use in response to chemical accidents. Some LEPCs are also using TRI data to carry out compliance reviews, to assist in emergency responses, and to answer questions from the community about local facilities.

Local emergency planning committees use TRI data to form a chemical profile of their communities.

In a combined federal and local effort, EPA Region 4 and the Calhoun County, Alabama LEPC used TRI information to help identify and notify facilities likely to be subject to Sections 302, 311, and 312 of EPCRA. The program was particularly effective in helping smaller facilities become aware of and respond to EPCRA. This project served as a pilot for Alabama. At present, LEPCs across Alabama are taking part in a similar compliance program modeled on the Calhoun County LEPC project.

The Fairfax County, Virginia LEPC conducted a similar program. This LEPC compared TRI submissions for its jurisdiction with the list of facilities that submitted EPCRA Section 312 Tier II forms and determined that all facilities that reported for TRI also reported for EPCRA section 311 and 312. The Fairfax County LEPC also uses TRI data to assist in responding to chemical emergencies. To facilitate LEPC's response, its hazardous materials response vehicle has a cellular telephone modem which allows the response personnel, en route to the incident, to access computerized data on storage location and chemical hazards, as well as TRI data.

The Dallas County, Texas LEPC, recipient of a fee waiver from EPA for the use of the TRI database, used this information to answer questions from the community about facilities in their areas, examine the chemicals emitted in the county, and compare these emissions to those of other Texas counties.

Regional Response To TRI

EPA Regions use TRI data for pollution prevention initiatives, compliance reviews, inspection targeting, and risk screening.

Various EPA Regional Offices are using TRI data for pollution prevention initiatives, compliance reviews, targeting purposes, and risk screening. (Map 7–1 shows EPA Regions at the end of this chapter.) For example, Region 4 is developing toxicological index profiles of Calvert City and Ashland, Kentucky using data from TRI and other sources. These index profiles will enable the region to identify areas of high, medium, and low potential risk. In addition, all Regions bordering on coastal waters have begun to use TRI data to assess pollution problems in near coastal waters and to develop regional strategies.

New England

TRI identified Region 1 (the New England states) as a major emitter of ozone–depleting chemicals. Based on this finding, the Region hosted a technology transfer workshop for industry regarding substitute chemicals in the electronics and metal finishing industries.

Using TRI data, Region 2 identified 19 facilities in New York and New Jersey, which were invited to voluntarily implement pollution prevention measures to reduce air emissions. Many of these facilities are developing comprehensive plans to reduce emissions through pollution prevention measures. Region 6 has a similar project underway in Texas and Louisiana.

Great Lakes National Program

Several EPA Regional Offices (Regions 2, 3, and 5) and states are working on a strategy for toxic reduction in the Great Lakes which will use state and federal TRI information to target potential pollution prevention activities. Currently, EPA Region 5 and the Great Lakes National Program Office are using TRI data to generate county–level data summaries of toxic chemical releases.

The Great Lakes initiative has several objectives, including the prevention and reduction of the release and deposition of harmful toxic pollutants from all sources into the Great Lakes ecosystem, and the remediation of toxic pollutants to levels that provide a) water quality and sediments capable of sustaining populations of the most sensitive native living resources (aquatic and terrestrial) that comprise the Great Lakes ecosystem; b) drinking water and fish that are safe for unlimited human and wildlife consumption; and c) air quality that protects the health of the most sensitive human populations and the integrity of the Great Lakes ecosystem. Another objective of this initiative is to provide for the further recovery of native species and enhance the biological diversity and stability of the Great Lakes Basin through the protection, restoration, and creation of important aquatic, semi–aquatic, and terrestrial plant and animal habitats.

Chesapeake Bay Program

EPA Region 3 is working on a strategy to reduce toxic runoff to the Chesapeake Bay. The Region is using TRI data as an element in the updating of their database which details toxic chemicals entering the Bay basin. The Region 3 Water Management and Pesticide Management Divisions are also using the TRI data to assist in the development of models describing runoff from point sources and non–point sources entering the Bay.

Gulf of Mexico Program

The Gulf of Mexico Program, an intergovernmental program involving federal, state, and local officials, as well as industry, citizens, and academia, is using TRI data to characterize problems in the Gulf of Mexico region and to educate the public. TRI data have been useful in focusing the direction of the program, such as addressing atmospheric deposition in the area, assessing sediments, and looking at large releasers of toxic chemicals. In one such effort, the Texas Water Commission is coordinating with EPA in developing a toxicity ranking by estuary system for agricultural, industrial, and produce waters that flow into the Gulf. The proposed scope of work for this Gulf of Mexico program would utilize TRI data.

Federal Impact Of TRI

At the federal level, Congress and EPA have used TRI data in the development of new legislation and in the implementation of existing regulatory programs. EPA has made widespread use of TRI data in conjunction with other Agency databases for purposes of permitting, inspection and enforcement targeting, compliance reviews, risk screening, and pollution prevention.

Congress and EPA have used TRI data in the development of new legislation and in the implementation of existing programs.

Pollution Prevention Act of 1990

The Pollution Prevention Act of 1990 utilizes the TRI database to assess the opportunities for addressing TRI chemicals in wastes. (See Chapter 5.) Among broad–ranging provisions to promote the incorporation of pollution prevention into EPA's regulatory and nonregulatory programs, this Act makes pollution prevention

The Pollution Prevention Act of 1990 focuses on reducing TRI pollution.

reporting mandatory by requiring each TRI facility to file (beginning with reports due July 1, 1992) a "source reduction and recycling report" along with its TRI form. This source reduction and recycling report will detail the amount of source reduction achieved for each TRI chemical, as well as the pollution prevention methods employed, and will also provide additional information about recycling at the facility.

This Act also requires EPA to report to Congress on its analysis of the data collected in the source reduction and recycling reports on an industry–by–industry basis, beginning with those industries which generate the largest quantities of TRI chemicals in their wastes.

The 33/50 Program

The 33/50 Program calls for voluntary reductions in releases and transfers of 17 toxic chemicals.

The 33/50 Program calls for certain facilities to voluntarily reduce releases and transfers of 17 selected toxic chemicals. EPA seeks a 33 percent reduction in TRI releases and transfers of the 17 target chemicals by 1992, and a 50 percent or greater reduction by 1995, compared to 1988. EPA used 1989 TRI data to develop its list of priority companies, and TRI reports from following years will be used to measure the success of the program. (See Chapter 6 for further discussion of the 33/50 Program.)

States are also becoming involved in the 33/50 Program. Indiana has used the 1988 TRI data to conduct an analysis of the 17 targeted toxic substances and their related industries. Delaware is considering the implementation of a state project similar to, but more comprehensive than, the 33/50 Program, while Florida has initiated an aggressive effort to follow up on the program. The State of Florida recently sent letters and information packages to the executive officials of 200 businesses, encouraging them to participate in the program to the maximum extent possible and offering them technical assistance with nonregulatory waste reduction.

Clean Air Act and Amendments

TRI data are being used to set priorities under the 1990 Clean Air Act Amendments.

EPA is using TRI data to implement the 1990 Clean Air Act Amendments (CAAA). The TRI data are being used to set priorities for establishing technology–based standards to reduce the sources of emissions of 189 hazardous air pollutants listed under the Hazardous Air Pollution Title of this Act. Specifically, TRI data are being used to develop a list of Source Categories (emitters of any of the 189 hazardous air pollutants), as required under Title III of the Amendments. The SIC codes, as well as facility information contained in TRI, aided in the identification of certain industrial groupings for this project. The TRI database is also a source of emissions information used to estimate potential exposure and risks from the major source categories, which will be used in the setting of priorities for development of standards.

Title III of the 1990 CAAA establishes a process by which source categories may petition to be deleted from the list. It is likely that the TRI database, among others, will be used by EPA and potential petitioners to identify particular facilities and sources within those facilities. TRI data also aid in the identification of reporting facilities that could benefit from participation in the Title III (of the CAAA) Early Reductions Program. This voluntary program allows facilities a six–year extension on compliance with Maximum Achievable Control Technology (MACT) standards in exchange for early reductions of toxic air emissions.

Also under the CAAA, EPA is using TRI data in determining whether to set lower emission cutoffs for specific substances to be designated as "major sources", thereby broadening the number of facilities subject to regulatory standards. TRI data are being used to estimate the number of facilities that would be affected by this change.

EPA has used TRI to cross–check emissions data submitted under the Clean Air Act and to identify sources emitting toxic air pollutants of concern. Additionally, the use of TRI data to identify sources and amounts of air toxics emissions was a factor in the allocation of grant money available under Section 105 of the Clean Air Act to EPA Regional Offices for distribution to state and local governmental agencies' air programs.

EPA recently used TRI data to negotiate reductions in air emissions from the 40 plants in the country reporting the largest emissions. EPA asked nine chemical companies, representing 40 facilities in 14 states, to submit plans to reduce air emissions of several toxic pollutants. The nine companies submitted plans which, when fully implemented in December 1993, will result in overall annual reductions of over 80 percent.

Resource Conservation and Recovery Act (RCRA)

TRI data assists EPA in priority setting for waste minimization efforts by EPA under RCRA. In combination with other information EPA collects on waste minimization, TRI data are used to analyze long–term trends and identify certain industry practices that warrant attention. RCRA regulations also cover the transfer of wastes off site (other than to POTWs), requiring that off–site transfers be accompanied by a manifest for tracking purposes, and that they be shipped to permitted treatment, storage, or disposal facilities only. EPA assigns identification numbers to every waste–generating or handling facility regulated under RCRA for land disposal of chemicals. In 1989, 82 percent of all TRI facilities reporting on–site land releases (representing 98 percent of all TRI on–site land releases for that year) had a RCRA identification number. Of all the TRI facilities reporting off–site transfers, 96

percent reported a RCRA number, representing 98 percent of all TRI off–site transfers in 1989. (See Chapter 8 for further discussion of the reporting of RCRA identification numbers in the TRI database.)

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund Act)

TRI data provide information that can be used in developing emission inventories for the Superfund site discovery program and in preliminary assessments of sites. TRI data are also valuable as a means of establishing liability under CERCLA.

Toxic Substances Control Act (TSCA)

EPA can use TRI data for risk screening purposes and in the selection of chemicals for test rule development under TSCA. (See discussion later in this chapter.) TRI data can be cross–checked with data collected under TSCA to identify those facilities or types of businesses which have not complied with reporting rules. TRI data represent a valuable input to TSCA's overall chemical review process, with end–points other than test rule development.

EPA uses TRI data to set priorities and determine compliance under the Clean Water Act and the Safe Drinking Water Act.

Clean Water Act and Safe Drinking Water Act

Under the Clean Water Act, EPA uses TRI data to determine priorities for development of Water Quality Criteria and Advisories, to identify pollutants for which numeric criteria are needed for water quality standards, and to check for possible unpermitted discharges. In the Ground Water Protection Program, EPA is using TRI data as a screening mechanism for possible sources of wellhead contamination of ground water in a pilot project for three counties in Maryland, Missouri, and California. Under the Safe Drinking Water Act, EPA uses TRI data to help assure that underground injection operations comply with program requirements and are properly authorized by the Underground Injection Control program. EPA is also using TRI in the development of management plans in its National Estuary Program to identify sources of toxic discharges into nationally significant estuaries.

Under the Clean Water Act, EPA issues National Pollutant Discharge Elimination System (NPDES) permits, which limit over 1,500 types of pollutants, to individual facilities or states. Of all facilities reporting surface water discharges to TRI, 92 percent had an NPDES permit number reported. (See Chapter 8 for further discussion of NPDES identification numbers in the TRI database.)

Other Federal Uses of TRI Data

Other Federal agencies are also using TRI data. For example, the Internal Revenue Service is using TRI data to identify companies emitting ozone–depleting chemicals, such as chlorofluorcarbons, to determine who is not paying the new Ozone–Depleters Excise Tax established in January 1991.

International Efforts

International interest in TRI continues to grow.

International interest in TRI continues to grow, with many countries considering similar efforts. While most of these attempts are still in the planning stage, Canada has already enacted legislation to prepare its own toxic chemical release inventory.

Canada

Canada's recently prepared "Green Plan" establishes a database of hazardous pollutants released by industry and transportation sources, including both the nature and quantity of pollutants. The plan requires Canada to establish reporting requirements by 1992, with the first reports scheduled for public release in 1994.

Europe

The European Community is also actively considering the development of a toxic chemical release inventory. An international conference, entitled "International Conference on Reporting Releases of Toxic Chemicals," will be held in Vienna, Austria from November 13 through 15, 1991 to explore the U.S. experience with TRI and assess the potential for its use in Europe. The conference, which is sponsored by the U.S. EPA in cooperation with the Organization for Economic Cooperation and Development (OECD), will focus on applications of the TRI data, the usefulness of TRI for national and local analyses, and challenges in implementing TRI. Hands–on computer demonstrations will also be provided. Representatives of the government ministries in Europe, Mexico, the Soviet Union, and the OECD countries have been invited to attend, along with their counterparts in industry, trade associations, labor organizations, and environmental and public interest groups.

Friends of the Earth (FOE), a public interest group headquartered in Britain, has built the first phase of a new right–to–know campaign around TRI. FOE, concerned that companies are telling the American and not the British public about their discharges of toxic chemicals, wrote to companies in the United Kingdom asking them to disclose data on the nature and quantity of their toxic releases and transfers. At least several companies have agreed to the request.

Dow Chemical has announced that it will report releases and transfers from its plants all around the world. Other companies have promised similar "global" reports.

Mexico

EPA has used the TRI database to determine TRI releases on or near the U.S./Mexican border. These data will be used in combination with environmental data from other EPA databases to provide U.S. and Mexican government officials with an understanding of the state of the environment at the U.S./Mexican border. Also, negotiators in the Mexico free trade talks are exploring the benefits of establishing a toxics reporting system in Mexico.

Public Response To TRI

Public interest groups have prepared newsletters, reports, and analyses using TRI data.

TRI data are being used by public interest groups, citizen groups and universities as the basis of reports and analyses. Objectives of these reports include the following:

- to promote reductions in release quantities;
- to document changes in chemical releases over time; and,
- to present possible explanations for the increases and decreases in releases and transfers reported by TRI facilities.

University researchers surveyed public interest groups concerning their uses of TRI.

Using a grant from EPA, researchers from the University of North Carolina at Chapel Hill and Texas A&M University surveyed citizen and environmental groups, state governments, and a sampling of industries concerning their uses of TRI. The research team identified 89 reports, 52 of which were produced by citizen and environmental groups. The researchers also collected seven guides, published by public interest groups, aiming to help localities in the distribution and analysis of TRI data. The survey sought information on access to TRI data, its impact, and limits to its utility.[6]

In tracking the development of public response to TRI, the research team found that a number of facilities released their 1987 data in advance of the July TRI deadline and accompanied the release with pledges of reductions. Despite these facilities' fear of a public outcry, formal response to the 1987 TRI data was slow to emerge. Only eight reports were produced in 1988. In 1989, 26 reports were published, with most of these still focusing on 1987 data.

In the 89 reports collected, air emissions received the most attention, followed by discharges to water. Often, reports focused upon high–impact facilities and high volume chemicals. Many examined a particular SIC code or industrial sector. In the evaluation of the dangers associated with TRI chemicals, human health risks were examined most often, but one–third of the reports did address ecological dangers such as ozone layer depletion and threats to wildlife.

Thirty–five percent of the reports' analyses and conclusions aimed to influence specific state policies, while 15 percent focused on policy changes at the national level. Half of the reports cited the institution of pollution prevention or toxics use reduction laws as their main policy objective, and over one–third included citizen empowerment as one of their aims.

On a national level, the Working Group on Community Right–To–Know, which represents about a dozen environmental and public interest organizations, prepares a newsletter, "Working Notes on Community Right–To–Know."

At the state level, the New Jersey Public Interest Research Group produced *Chemical Consequences: An Investigation of Toxic Chemical Use and its Impact on New Jersey*, dated May 15, 1990. This report compares TRI data to the production and use data collected under the state's Right–To–Know program and concludes that TRI releases and transfers constitute only a fraction of the full story of toxic chemicals in New Jersey. The report states that at the same time that chemical wastes are being released and transferred by manufacturers, other much larger amounts of the same chemicals not required to be reported to TRI are being transported over public roads, stored within communities, handled in the workplace, and brought into the home in the form of building materials and consumer products.

Newspapers have used TRI data to highlight toxic pollution in specific communities.

Newspaper journalists have also found that TRI data are of high local interest to communities affected by toxic chemical pollution. For example, the Cleveland *Plain Dealer* used the zip codes provided on the TRI forms filed with the Ohio EPA to identify neighborhoods where most of Ohio's pollution is centered.[7] The Louisville (Kentucky) *Courier–Journal* ran a series of articles detailing and drawing attention to particular Kentucky communities affected by TRI releases and transfers.[8] In 1988, before public availability of the TRI database, this newspaper compiled the TRI reports for the state of Kentucky and brought the information to the attention of state officials, plant managers, environmentalists and others. The information showed not only a larger quantity and wider variety of releases and transfers than officials previously believed, but that many of these releases and transfers were unregulated. After the *Courier–Journal* made the information available, officials at several agencies began investigations, particularly about "significant discrepancies" between the TRI reports and information supplied earlier by the industry to state officials.

Citizens have used TRI data to urge facilities to reduce toxic chemical emissions.

Concerned about the level of pollution in their neighborhoods, citizens in a number of areas have employed TRI data to urge representatives of nearby manufacturing facilities to reduce toxic chemical emissions. A number of facilities have responded to this public pressure by voluntarily signing "good neighbor agreements." One company affected by community concern was IBM, whose San Jose, California plant was the single largest emitter of ozone–depleting chlorofluorocarbons (CFCs) in California. In 1989, the Silicon Valley Toxics Coalition targeted IBM in its pollution prevention efforts, culminating with a march on the San Jose plant and the press release of model good neighbor agreements. The media attention IBM received convinced the industry to present a new position on ozone–depleting chemicals, with the goal of a complete phase–out of CFCs by the end of 1993. IBM announced that it would implement safe solvents in place of CFC 113, and has now adopted a water–based process in the cleaning of electronic parts. The action of the Silicon Valley Toxics Coalition demonstrates the effectiveness of TRI data in pollution prevention. The coalition has published a guidebook, *Citizen's Guide to the New Federal Right–to–Know Law: How you can get toxics informations and use it to fight pollution*, intended as a guide to other communities concerned with local pollution levels.

Industry Response To TRI

Many companies are taking steps to reduce their wastes containing TRI chemicals.

Many companies have been greatly affected by TRI reporting because their top officials had previously not fully appreciated the nature and extent of their toxic chemical releases and transfers. When confronted with the numbers, many of these companies began taking steps to reduce their wastes containing TRI chemicals, or to reduce the releases and transfers resulting from such wastes. Often they discover in the process of instituting control measures that such procedures can be economically advantageous.

Industries responding to researchers from the University of North Carolina at Chapel Hillthe conducting the survey described above reported that TRI data were most useful to them for pollution prevention efforts, emergency management, and community education. Industrial representatives also reported that the TRI data had led to more contact and cooperation between citizens and industry, leading to Good Neighbor Agreements and mutual negotiations for pollution prevention.

The Houston Regional Monitoring Corporation, a consortium of 45 companies located in the Houston, Texas, ship channel industrial complex, recently began a voluntary measurement program to assess long–term community air quality for a target list of 150 chemical compounds.[9] The current emphasis of the program was brought about in part by TRI, and Houston Regional Monitoring data are being used to assess the significance of TRI air emissions estimates, which is done by comparing actual air quality measurements to TRI reports. The initial results have been used to address public concerns concerning the air quality impact of airborne toxic emissions reported under TRI.

The *Courier–Journal* in Louisville, Kentucky reported several examples of industry responses to TRI.[10] Among these was a pledge by Monsanto, a chemical company based in St. Louis, Missouri, to reduce its air emissions, which totaled 20 million pounds at 41 plants in 1987, by 90 percent over five years. The company's manager for environmental and community relations said that TRI forced top officials to examine the company's total emissions.

CMA and other industrial associations are helping member companies meet the requirements of TRI and related legislation.

Industrial associations are becoming more involved in aggregating information on their industrial sector and in helping member companies meet the requirements and spirit of this and related legislation. The Chemical Manufacturers Association (CMA) is using TRI data to track pollution prevention progress of member companies under CMA's Responsible Care program. This program, adopted in 1989, establishes operating principles for health, safety, and the environment, and codes of management practices (such as the Community Awareness and Emergency Response Code of Management Practices). CMA published a first report on TRI data in the summer of 1991 (based on 1989 TRI data) and is planning a much–expanded and more detailed report for the following year (based on 1990 TRI data). CMA is also developing a project to encourage pollution prevention technology transfer among member facilities.

TRI CHEMICALS SUBJECT TO TESTING AND REGULATORY PROGRAMS

The first part of the chapter summarized how TRI data as a whole are being used by public and private groups in the development and implementation of environmental programs and policies. The remainder of this chapter is devoted to telling how many individual TRI chemicals are themselves subject to study, testing, and regulation under several federal statutes and programs and mentions sources of further information about the status of these chemicals.

Information On The Effects Of TRI Chemicals

The effects of TRI chemicals are being studied in several federal programs.

While TRI itself does not provide information on the effects of its listed chemicals, the health and environmental effects of many TRI chemicals are currently being studied and addressed in several other programs. These programs include the Toxic Substances Control Act (TSCA) Section 4 testing program; the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) re–registration and data call–in program; the Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profile program; and the National Toxicology Program (NTP) testing program.

In some cases, TRI chemicals are studied in these programs because of concerns raised before TRI existed or independently of TRI; in other cases, TRI chemicals are studied because of concerns raised directly from the TRI data.

Some programs, such as the TSCA Section 4 testing program, FIFRA re–registration and data call–in program, and NTP testing program, involve actual testing of the chemicals to determine their effects. Results from the tests done in these programs are useful in evaluating the health and environmental impacts of TRI releases and transfers and the potential risks posed by these releases.[11] The ATSDR toxicological profile program, on the other hand, evaluates existing information and determines harmful exposure levels and serious health effects for the chemicals. These programs are described in greater detail below. In addition, Appendix K shows the status of the specific TRI chemicals in each of these programs.

TSCA Section 4 Testing Program

57 TRI chemicals are being tested or are proposed for testing under the TSCA Section 4 testing program.

Congress enacted Section 4 of the Toxic Substances Control Act (TSCA) to respond to the concern that effects of chemicals on human health and the environment were often not adequately documented or understood. Under this law, EPA requires chemical manufacturers and processors to perform testing to develop adequate data on the health and environmental effects of potentially hazardous chemicals. According to the Act, EPA must make three "findings" before requiring testing under a test rule:

(1) that the chemical may pose an unreasonable risk to health or to the environment; or that the chemical is produced in substantial quantities, which could result in substantial or significant human exposure or substantial environmental release;

(2) that insufficient data or knowledge exist about the health or environmental effects of the chemical to reasonably determine or predict the impacts of its manufacture, processing, distribution, use and/or disposal; and

(3) that testing is needed to develop such data.

Alternatively, EPA may negotiate a testing consent order with the manufacturers and processors of the chemical.

TSCA established the Interagency Testing Committee (ITC) to provide EPA with chemical testing needs from other federal agencies that are involved in regulation and research related to environmental and health issues, such as the Food and Drug Administration, the Occupational Safety and Health Administration, and the Consumer Product Safety Commission. The ITC reviews available data on a variety of chemicals and recommends which may require EPA's priority consideration for additional testing. Both the ITC and EPA use the TRI data to help make determinations.

EPA also considers recommendations from its own program offices. For example, EPA has issued a test rule covering a number of chemicals of concern to the Office of Solid Waste, and has recently proposed testing for several chemicals being reviewed by the Office of Drinking Water as well as a substitute paint stripper (N-methylpyrrolidone) for the Consumer Product Safety Commission.

As of July 1991, 77 TRI chemicals have been reviewed or are currently being considered under the Section 4 testing program. Additional testing has been required or has been proposed for 57 of these 77 chemicals. (See Appendix K, Table K–1.) Requirements may include tests for health effects in the areas of mutagenesis, carcinogenesis, reproductive effects, developmental toxicity, and neurotoxicity; environmental effects such as effects on birds, fish, plants, and bioaccumulation; and/or environmental fate such as solubility, persistence, degradation, transport in the environment, and volatility.

EPA evaluated testing needs for 13 out of the 77 TRI chemicals, but decided not to require testing because test data were subsequently submitted by the manufacturers and processors or because EPA determined that testing on the chemicals was not needed at this time. The remaining seven chemicals of the 77 are beginning review under the Section 4 program.

More specific information on the testing required for each chemical may be found in Title 40 of the Code of Federal Regulations, Part 799; in the Public Docket at the EPA Document Control Office (TS–793), Rm. G–004 NE Mall, 401 M St. SW,

Washington, DC 20460; or by contacting the TSCA Assistance Information Hotline at 202–554–1404. For information on test results, see the Public Docket or contact the TSCA Hotline.

FIFRA Re–registration and Data Call–In Program

124 TRI chemicals are pesticides; 71 of these are required to be re–registered.

All pesticides sold or used in the United States must be registered by EPA. Issuance of registration is based on scientific studies showing that a pesticide can be used without posing unreasonable risks to people or the environment. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), pesticide registrants are responsible for making data available to EPA showing the human health and environmental effects of each pesticide in use.

Potentially harmful effects upon humans include acute reactions such as toxic poisoning and skin and eye irritation, as well as effects including cancer, birth defects, or reproductive system disorders. In addition, EPA must obtain data to estimate the residues in food and potential worker exposure. EPA also requires data on the environmental fate of each chemical, so that it can determine whether a pesticide poses a threat to ground water or surface water.

In addition to mandating the pre–market clearance of new pesticides, FIFRA requires that pesticides first registered years ago be "re–registered" to ensure that they meet current scientific standards. As part of this re–registration process, EPA reviews each pesticide chemical and determines what additional data are necessary. EPA then issues a "data call–in" notice for the pesticide, requiring the registrant to submit any needed additional data.

The mandatory timeframes for EPA and registrants to re–register pesticides were amended in 1988 to accelerate the process. As amended, FIFRA requires EPA to complete by 1997 the re–registration review of each product containing any pesticide registered before November 1, 1984. The amended provisions establish deadlines for pesticide registrants to identify and supply the data necessary for EPA to make decisions. EPA has published four lists of pesticides subject to re–registration, covering approximately 600 pesticide active ingredient cases.[12]

Registrants must first declare whether they intend to seek re–registration. Over a period of several years, registrants identify data gaps, resubmit existing studies, and perform testing to fill new data requirements. After reviewing the data, EPA determines whether a pesticide is eligible for re–registration. Once the active ingredient is eligible for re–registration, data on the end–use products containing that active ingredient, called product–specific data, must be submitted and reviewed before the pesticide product can be re–registered. EPA then will either re–register the pesticide products or take other appropriate regulatory action. When a pesticide is eligible for re–registration, EPA announces this in a Re–registration Eligibility Document (RED). The RED describes the toxicological and environmental effects of the pesticide.

Of the 124 TRI chemicals that are pesticides, 71 are subject to re–registration. Appendix K, Table K–1 provides a complete list of TRI chemicals, indicating which are subject to re–registration procedures.

To obtain a copy of the RED for individual pesticides, contact the Public Response and Program Resources Branch, Field Operations Division (H–7506C), Office of Pesticide Programs, U.S. EPA, Washington, D.C. 20460. Telephone (703) 557–4436.

For more information about a particular pesticide or EPA's pesticide re–registration and data call–in program, contact the Special Review and Re–registration Division (H–7508W), Office of Pesticide Programs, U.S. EPA, Washington, D.C. 20460. Telephone (703) 308–8000.

ATSDR Toxicological Profile Program

ATSDR Toxicological Profiles have been prepared for 115 TRI chemicals.

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, directs the Agency for Toxic Substances and Disease Registry (ATSDR) to prepare toxicological profiles for hazardous chemicals which are most commonly found at facilities on the CERCLA National Priorities List (Superfund sites) and which pose the most significant potential threat to human health, as determined by ATSDR and EPA. The resulting lists of the 225 most significant hazardous chemicals were published in the *Federal Register* on April 17, 1987, on October 20, 1988, and on October 26, 1989. Each ATSDR toxicological profile must include the following:

(1) An examination, summary, and interpretation of available toxicological information and epidemiological evaluations on the hazardous substance in order to ascertain the levels of significant human exposure for the substance and the associated acute, subacute, and chronic health effects;

(2) A determination of whether adequate information on the health effects of each substance is available or in the process of development to determine levels of exposure which present a significant risk to human health of acute, subacute, and chronic health effects; and

(3) Where appropriate, an identification of toxicological testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects in humans.

The toxicological profile is prepared in accordance with guidelines developed by ATSDR and EPA. The original guidelines were published in the *Federal Register* on April 17, 1987. Each profile will be revised and republished as necessary, but no less often than every three years.

The ATSDR toxicological profile succinctly characterizes a chemical's toxicological properties and the significant health effects associated with human exposure. Each profile reviews the key literature describing the chemical's toxicological properties. This data may be used to evaluate the significance to individuals and the public of current or potential exposures to the chemicals. The profiles are intended for health professionals at the federal, state, and local levels, interested private sector organizations and groups, and members of the public involved with Superfund sites.

Of the 225 chemicals ATSDR and EPA have listed as significant hazardous chemicals at Superfund sites and for which ATSDR must prepare toxicological profiles, 115 are also TRI chemicals. ATSDR has prepared toxicological profiles of all 115 of these chemicals. These chemicals are identified in Appendix K, Table K–1. Copies of the ATSDR toxicological profiles are available from ATSDR, Division of Toxicology, Mail Stop E–29, 1600 Clifton Road, NE, Atlanta, Georgia 30333.

National Toxicology Testing Program

The NTP testing program has tested or is currently testing 211 TRI chemicals.

The U.S. Department of Health and Human Services established the National Toxicology Program in 1978 to coordinate its efforts in toxicological research and testing, to provide information about potentially toxic chemicals to regulatory agencies and the public, and to strengthen the scientific base of toxicology. The NTP efforts aim to identify and characterize the toxicity of chemicals and develop better and less expensive methods for determining whether chemicals may be hazardous.

The NTP consists of toxicological activities underway at the National Institutes of Health's National Institute of Environmental Health Sciences (NIH/NIEHS), the Center for Disease Control's National Institute for Occupational Safety and Health (CDC/NIOSH), and the Food and Drug Administration's National Center for Toxicological Research (FDA/NCTR). These three agencies cover the costs of the NTP testing program. The NTP Executive Committee oversees the program's direction and policies. The Committee is composed of the heads of federal research and regulatory agencies concerned with human health.

Chemicals are nominated for testing by all participating agencies and are encouraged from all sectors of the public. The Executive Committee decides whether to test the chemicals in the recommended studies and also recommends priorities for testing. The NTP's chemical selection principles are listed in Box 7–B. The NTP Executive Committee operates under the principle that industry will test chemicals for health and environmental effects as intended and mandated by the Congress under legislative authorities such as FIFRA, TSCA, and the Food, Drug, and Cosmetic Act (FDCA). Therefore, the NTP focuses its resources primarily on chemicals that are not likely to be tested under these legislative authorities.

At present, 211 TRI chemicals have been or are currently being tested in the NTP testing program. These chemicals are identified in Appendix K. Testing includes studies in mutagenesis, carcinogenesis, reproductive and developmental toxicology, and toxicological characterization (such as studies on cardiac, immunologic and neurobehavioral toxicology), and chemical disposition (absorption, distribution, metabolism, and excretion). Technical Reports on NTP toxicology and carcinogenesis studies are available for public distribution. Requests for publications should be directed to: NTP Public Information Office, MD B2–04, Box 12233, Research Triangle Park, NC 27709. Telephone: (919) 541–3991.

BOX 7–B. THE NATIONAL TOXICOLOGY PROGRAM (NTP) CHEMICAL SELECTION PRINCIPLES

The NTP Executive Committee operates under the principle that industry will test chemicals for health and environmental effects as intended and mandated by the Congress under legislative authorities. Therefore, the NTP, acting under its chemical selection principles, will test:

(1) Chemicals found in the environment that are not closely associated with commercial activities;

(2) Desirable substitutes for existing chemicals, particularly therapeutic agents, that might not be developed or tested without Federal involvement;

(3) Chemicals that should be tested to improve scientific understanding of structure–activity relationships and thereby assist in defining groups of chemicals that should be tested by industry;

(4) Certain chemicals tested by industry, or by others, the additional testing of which by the Federal government is justified to verify the results;

(5) Previously tested chemicals for which other testing is desirable to cross–compare testing methods;

(6) "Old chemicals" with the potential of significant human exposure which are of social importance but which generate too little revenue to support an adequate testing program;

(7) Two or more chemicals together, when combined human exposure occurs (such testing probably cannot be required of industry if the products of different companies are involved); and

(8) In special situations, as determined by the Executive Committee, marketed chemicals which have potential for large–scale and/or intense human exposure, even if it may be possible to require industry to perform the testing.

Other Laws And Regulations Affecting TRI Chemicals

Many other regulations affect TRI chemicals.

Several other environmental laws and regulations pertain to TRI chemicals. Among these are the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Clean Water Act (CWA), and other sections of the Emergency Planning and Community Right–to–Know Act (EPCRA).

Clean Air Act and Amendments

Air emission standards were established for 6 TRI chemicals under the Clean Air Act of 1970.

Under the Clean Air Act of 1970, EPA established National Ambient Air Quality Standards for air "criteria pollutants" such as ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter. EPA also established National Emission Standards for Hazardous Air Pollutants (NESHAPS), pollutants that may pose serious health hazards but are not covered by the National Ambient Air Quality Standards. NESHAPS were established for seven hazardous air pollutants; six of those pollutants are TRI chemicals (benzene, arsenic, asbestos, vinyl chloride, beryllium, and mercury).

173 hazardous air pollutants under the 1990 Clean Air Act Amendments are TRI chemicals.

The Clean Air Act Amendments of 1990 change the approach by which EPA will control emissions of air toxics. The law lists 189 hazardous air pollutants, 173 of which are TRI chemicals, and establishes a schedule requiring EPA to set maximum achievable control technology (MACT) standards for all major sources of those pollutants over a ten–year period. Residual health risk remaining after implementation of the MACT standards may trigger additional emission reduction.

The new amendments require EPA to focus on *source categories* which emit hazardous air pollutants, such as the synthetic organic chemical manufacturing industry and the dry cleaning industry, rather than on specific pollutants. Regulations for the synthetic organic chemical manufacturing industry will require reductions of up to 110 hazardous air pollutants. EPA will publish the list of categories of major sources by November 15, 1991, and a schedule announcing when the various source categories will be regulated a year later. The amendments require EPA to publish MACT standards for 41 source categories by November 15, 1992. State and local air–pollution agencies will have primary responsibility to make sure industrial plants meet the standards.

Ozone–depleting chemicals are being phased out.

In addition to the MACT standards for emissions of air toxics, another section of the Clean Air Act Amendments requires a progressive phase–out of production of chlorofluorocarbons (CFCs) and halons by 2000 and of 1,1,1–trichloroethane (also known as methyl chloroform) by 2002 due to their ozone–depleting potential. These requirements are applicable to eight TRI chemicals: Freon–113, CFC–11, CFC–12, CFC–114, Halon 1211, Halon 1301, Halon 2402, and 1,1,1–trichloroethane.[13]

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or "Superfund"

193 TRI chemicals are CERCLA hazardous substances.

CERCLA requires any person in charge of a vessel or facility to report the release of a CERCLA hazardous substance to the National Response Center, if a quantity equal to or greater than its reportable quantity (RQ) is released to the environment in a 24–hour period. (See Chapter 3, Box 3–G for explanation of RQs.) This allows the Federal government to determine if a response action is warranted. In addition, EPCRA Section 304 requires reporting of these releases (as well as releases of other extremely hazardous substances not currently on the CERCLA Hazardous Substance list) to state and local authorities. The 193 TRI chemicals that are also CERCLA hazardous substances are subject to all of the requirements of CERCLA such as reporting, liability, financial responsibility, and cleanup.

Information reported to the National Response Center is entered into the Emergency Response Notification System (ERNS). ERNS is a national computer database and retrieval system that is used to store information on releases of oil and hazardous substances. ERNS, which is operational in all ten U.S. EPA regions and is supported by the U.S. Coast Guard, provides a mechanism for documenting and verifying incident notification information as initially reported. ERNS provides a direct source of easily accessible data that can be used to analyze spills and to support emergency planning efforts at the federal, state, and local levels.

Resource Conservation and Recovery Act (RCRA)

Hazardous wastes must be stored, treated, or disposed of in hazardous waste management facilities regulated under Federal RCRA or under authorized state programs. Hazardous waste management facilities include facilities with disposal units (such as landfills), storage facilities, and treatment facilities. Under RCRA, various criteria are used for listing wastes as hazardous. These criteria include the presence of hazardous constituents such as a toxic chemical; process–specific waste streams, which may have mixtures of chemicals; and wastes exhibiting the characteristics of ignitibility, corrosivity, reactivity and certain toxicity. The TRI database contains the RCRA identification numbers for both the TRI facilities sending wastes and for the facilities receiving wastes regulated under the RCRA program.

Clean Water Act

EPA has published water quality guidelines for 80 TRI chemicals.

Under the Clean Water Act, the discharge of any pollutant is unlawful unless it is in compliance with the Act. This provision is implemented by EPA and the states through the development of effluent guidelines, the adoption of water quality standards, and the issuance of National Pollutant Discharge Elimination System (NPDES) permits. These programs have focused on a subset of 126 priority pollutants. EPA has published water quality criteria for the 126 priority pollutants, and states are now in the process of adopting water quality standards for these priority pollutants. The states and EPA then use applicable state water quality

standards, together with industry–specific standards based on best available treatment technology, to set enforceable permit limits on the amounts of these and other toxic pollutants that cities and industries are allowed to discharge to waters of the United States. EPA is preparing to issue Federal water quality standards if states do not adopt standards as Congress has directed. Of the 126 priority pollutants, 94 are TRI chemicals. EPA has published water quality criteria for 80 of these chemicals, and a number of the TRI chemicals are covered by state water quality standards.

Safe Drinking Water Act

Drinking water standards have been set for 22 TRI chemicals.

The Safe Drinking Water Act and its amendments were designed to control contaminants in public drinking water supplies that EPA determines may have adverse effects upon human health. Under the Act, EPA is to establish National Primary Drinking Water Regulations by establishing nonenforceable health goals, named maximum contaminant level goals (MCLGs), and enforceable standards, called maximum contaminant levels (MCLs). An MCL is to be set as close to the maximum contaminant level goal as is feasible with the use of the best technology, treatment techniques, and other means generally available, taking costs into consideration. If it is not economically or technologically feasible to determine the level of a contaminant in drinking water, a treatment technique may be established instead of an MCL. EPA has set the MCLGs for carcinogenic pollutants at zero. MCLGs for noncarcinogenic agents are set by establishing the dose at which harmful effects may be observed and then compensating for uncertainties. MCLGs and MCLs have been set for 22 TRI chemicals.

In addition to setting drinking water standards, EPA also publishes health advisories. These advisories are not federally enforceable, but rather describe levels of contaminants in drinking water that are associated with adverse health effects.

Emergency Planning and Community Right–to–Know Act (EPCRA)

Many TRI chemicals must also be reported under other sections of EPCRA.

In addition to the TRI reporting requirements under Section 313 of EPCRA, other sections of EPCRA apply to TRI chemicals. Sections 301 to 303 of EPCRA require state and local efforts to develop emergency response and preparedness capabilities based on chemical information provided by facilities. Section 304 of EPCRA requires immediate emergency notification to state and local authorities when any of the 360 substances designated "extremely hazardous" are released to the environment in an amount and in a timeframe requiring notification (or when an emergency release notification under CERCLA is required). Section 312 of EPCRA requires owners/operators to submit information on amounts, storage locations, and hazards associated with hazardous chemicals present in certain quantities at their facilities to state and local emergency planners and local fire departments. The three groups of chemicals subject to reporting under EPCRA are described below; some chemicals appear in several groups. Many TRI chemicals are included in these groups of chemicals.

Facilities with Extremely Hazardous Substances must notify state and local authorities.

EPCRA Section 302 Extremely Hazardous Substances (EHS). The EHS list includes 360 chemicals, of which 56 are TRI chemicals. These chemicals were chosen to provide an initial focus for chemical emergency preparedness purposes because of their acutely toxic properties, as well as their potential to be airborne. The EHS list includes a "threshold planning quantity" (TPQ) for each substance. If, at any time, this amount or more of an EHS chemical is present at any a, the owner or operator must notify the State Emergency Response Commission (SERC) and the Local Emergency Planning Committee (LEPC) that it is a facility subject to emergency planning. The facility also names a facility representative to the LEPC. In addition, releases of reportable quantities (RQ) of these chemicals within a 24–hour period require immediate emergency notification to state and local authorities under section 304 of EPCRA. The reportable quantity is assigned under CERCLA if the EHS is also a CERCLA hazardous substance. If a final RQ has not been assigned under CERCLA, an RQ of one pound applies for reporting under EPCRA. If the EHS is also a CERCLA hazardous substance, notification of the National Response Center may also be required (subject to the Emergency Release Notification requirements under CERCLA). (See Chapter 3, Box 3–E for an explanation of TPQs and RQs.)

State and local officials must be notified about releases of CERCLA Hazardous Substances.

CERCLA Hazardous Substances. In addition to the EPCRA extremely hazardous substances, CERCLA hazardous substances now subject to the emergency notification requirements of CERCLA are also subject to the emergency release notification provisions of EPCRA. CERCLA requires immediate notification of hazardous substance releases, subject to certain limitations, to the National Response Center, which alerts federal emergency response authorities. EPCRA requires immediate notification of state and local officials. Of the 720 CERCLA substances, 193 are TRI chemicals.

Facilities must report MSDSs and annual inventories to state and local officials.

Hazardous Chemicals. Under Section 312 of EPCRA, facility owners/operators must report the amounts, locations, and potential hazards of hazardous chemicals present at or above threshold quantities at their property to the relevant SERCs, LEPCs and local fire departments. Annual inventories must include the amounts, storage location, and hazards associated with each hazardous chemical. Chemicals subject to this reporting requirement are those defined as "hazardous chemicals" under the Occupational Safety and Health Administration (OSHA) regulations. Under this definition, thousands of chemicals are subject to reporting.

SARA Section 313 Roadmaps Database

EPA's Roadmaps database contains information about regulations applicable to TRI chemicals.

A useful source of information about which federal regulations apply to each TRI chemical is the SARA Section 313 Roadmaps database developed by EPA. The Roadmaps system includes information on federal regulations, health and environmental effects, carcinogenicity and other properties, references for general information documents and on–line databases, state air and water regulations and monitoring data, and state contacts. The Roadmaps system is designed to run on an IBM–

compatible personal computer and is available on floppy disk from National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161. Telephone (703) 487–4600.

Roadmaps provides a comprehensive listing of the federal regulations which apply to each TRI chemical as well as selected specific regulatory requirements. Included are regulatory requirements for CERCLA Reportable Quantity (RQ), EPCRA Threshold Planning Quantity (TPQ), OSHA Permissible Exposure Limit (PEL), ACGIH Threshold Limit Value (TLV), Drinking Water Maximum Contaminant Level (MCL), and RCRA Toxicity Characteristic concentration. For example, a listing of federal regulations for trichloroethylene is shown in Figure 7–1. Listings can also be generated showing all TRI chemicals subject to a particular regulation, in addition to the applicable regulations for each TRI chemical. For example, Figure 7–2 shows part of the list of chemicals for which there are CERCLA RQs.

Carcinogenicity information provided on Roadmaps includes the carcinogenicity classifications by NTP, the International Agency for Research on Cancer (IARC), and EPA. NTP bioassay results and GENETOX (genetic toxicity) results are also given. For other health effects, Roadmaps indicates whether information is available on heritable mutations, developmental toxicity, reproductive toxicity, acute toxicity, chronic toxicity, and neurotoxicity based on a literature review and provides the reference for the source of information. Also noted is whether information is available on aquatic toxicity, persistence in the environment, and bioaccumulation.

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Trichloroethylene

CAS Number: 79-01-6 Update: 07/14/89 Number of Sources: 18

Federal Regulations

1. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 USC 9601 et seq.

2. CERCLA Reportable Quantity (RQ) (# indicates that an adjusted RQ has been proposed; ## indicates that the RQ may be adjusted in the future): 1000# (pounds)

3. Safe Drinking Water Act, 40 CFR 141, Subparts B and G, Maximum Contaminant Level (MCL) (* indicates value for total trihalomethanes): 5ug/L

4. Safe Drinking Water Act, 40 CFR 141, Subpart F, Maximum Contaminant Level Goal (MCLG) (non-enforceable goal based on health effects): Zero

5. Occupational Safety and Health Administration (OSHA), General Industry Standards for Toxic and Hazardous Substances as of Jan. 19, 1989, 29 CFR 1910, Subpart Z

6. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit, 8-hour time-weighted average (TWA) (R indicates transitional limit): 50.000 ppm

7. Clean Water Act Section 311 (b) (4), Oil and Hazardous Substances Liability, 40 CFR 116

8. Clean Water Act Section 307 (a), Toxic and Pretreatment Effluent Standards, 40 CFR 116

9. EPA's Office of Air and Radiation is developing or planning to develop Federal regulations under the Clean Air Act for new or additional source categories.

10. EPA's Office of Air and Radiation is assessing to determine if regulations under the Clean Air Act for any new or additional source categories are warranted.

11. Resource Conservation and Recovery Act Section 3001, Criteria for Identification or Listing, hazardous wastes and hazardous waste constituents, 40 CFR 261.

12. Resource Conservation and Recovery Act Appendix IX - Ground-Water Monitoring List, chemicals for which ground-water monitoring is required, 40 CFR 264.

13. RCRA Toxicity Characteristic, concentration at or above which a chemical exhibits Extraction Procedure toxicity, proposed 6/13/86, 51 FR 21648 (mg/L): 0.07

Figure 7-1. Example of Federal Regulations Contained in Roadmaps, 1989. (Trichloroethylene)

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14. Toxic Substances Control Act (TSCA) Sec 8(a), Chemical Substance Inventory, 40 CFR 710

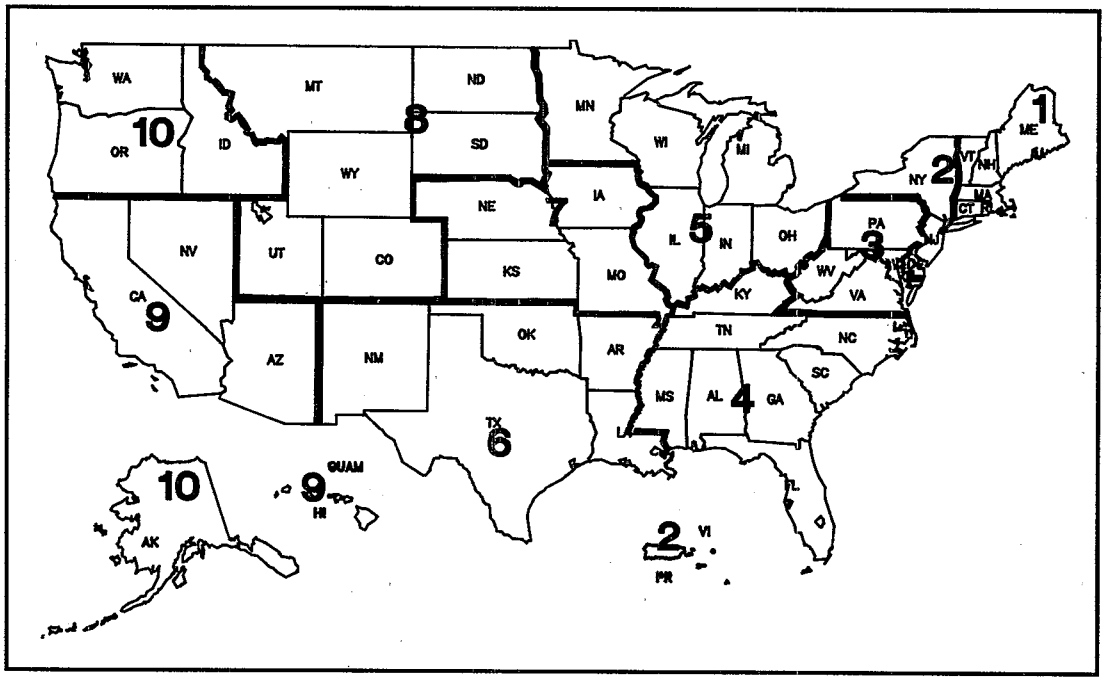
15. Toxic Substances Control Act Section 8 (e). Notices of substantial risk submitted by private sources. (OTS Public Reading Room or TSCA Assistance Office)

16. Department of Transportation (DOT) 49 CFR 172, Subpart B Tables of Hazardous Materials, Their Description, Proper Shipping, Name, Class, Label, Packaging and RQ

17. Pesticide ingredient under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 USC 136 et seq.

18. Superfund Amendments and Reauthorization Act (SARA) Section 110, priority chemicals at National Priority List (NPL) hazardous waste sites

Figure 7-1, Continued.



Map 7-1. EPA Regions.

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1 - CERCLA RQ (pounds)

1.	50-00-0	Formaldehyde	RQ=	1000#
2.	51-28-5	2,4-Dinitrophenol	RQ=	10
3.	51-79-6	Urethane (Ethyl carbamate)	RQ=	1#
4.	52-68-6	Trichlorfon	RQ=	100
5.	53-96-3	2-Acetylaminofluorene	RQ=	1#
6.	55-18-5	N-Nitrosodiethylamine	RQ=	1#
7.	55-63-0	Nitroglycerin	RQ=	10
8.	56-23-5	Carbon tetrachloride	RQ=	5000#
9.	56-38-2	Parathion	RQ=	1#
10.	57-12-5	Cyanide	RQ=	10
11.	57-14-7	1,1-Dimethyl hydrazine	RQ=	1#
12.	57-74-9	Chlordane	RQ=	1#
13.	58-89-9	Lindane	RQ=	1#
14.	60-11-7	4-Dimethylaminoazobenzene	RQ=	1#
15.	60-34-4	Methyl hydrazine	RQ=	10
16.	62-53-3	Aniline	RQ=	5000
17.	62-55-5	Thioacetamide	RQ=	1#
18.	62-56-6	Thiourea	RQ=	1#
19.	62-73-7	Dichlorvos	RQ=	10
20.	62-75-9	N-Nitrosodimethylamine	RQ=	1#
21.	63-25-2	Carbaryl	RQ=	100
22.	67-56-1	Methanol	RQ=	5000
23.	67-64-1	Acetone	RQ=	5000
24.	67-66-3	Chloroform	RQ=	5000#
25.	67-72-1	Hexachloroethane	RQ=	1#

Figure 7-2. Partial Listing of Chemicals in Roadmaps for Which There are CERLA RQs. (# indicates that an adjusted RQ has been proposed.)

NOTES

1. Pollution prevention strategies seek to reduce, avoid, or eliminate the generation of wastes and consequent releases of toxic chemicals as a more reliable and effective means of protecting workers, citizens and the environment from exposure to toxic chemicals in wastes than end–of–pipe measures. (See Chapter 5.)

2. Information on state activities in this chapter comes from EPA records and from letters and published and nonpublished state reports received from state TRI coordinators (prior to the end of May, 1991).

3. Information from the Louisiana Department of Environmental Quality's report, *Louisiana Toxics Release Inventory: 1989*, page 2.

4. *Louisiana Chemical Industry Emissions Report, 1988–1989*, prepared for the Louisiana Chemical Association by Information Research, Baton Rouge, Louisiana, October 1990.

5. As defined by EPA, source reduction involves eliminating or reducing the amount of waste generated before any treatment, recycling, or disposal. (See Chapter 5.)

6. UNC Institute for Environmental Studies, *The Toxics Release Inventory: Access, Use and Impact.* Chapel Hill, August 1991.

7. "Toxic Threats Up In The Air," *The Plain Dealer*, Cleveland, Ohio, January 27, 1991.

8. "Air of Peril: More Hazardous Chemicals Are Going Into Kentucky Skies Than Anyone Knew," and "Governments' Response Shows Usefulness of Chemical Release Report," Courier–Journal and Louisville Times Co., Louisville, Kentucky, November 27, 1988.

9. F. Scott LaGrone, "Potential Community Exposure to Toxic Chemicals," *Environmental Science and Technology*, Volume 25, Number 3, 1991.

10. "Air of Peril: More Hazardous Chemicals Are Going Into Kentucky Skies Than Anyone Knew," Courier–Journal and Louisville Times Co., Louisville, Kentucky, November 27, 1988.

11. See Chapter 3 for discussion of the relationship of chemical effects, exposure, and risk.

12. Pesticide products are normally formulations of one or more pesticidally active chemicals combined with one or more pesticidally inert ingredients. Products are regulated primarily on the basis of their pesticidally active ingredients. There are approximately 1,300 individual active ingredients, which EPA has combined into basic groups that may be regulated together as active ingredient "cases" (e.g. salts and esters of the same chemical). An example of such a grouping is 2,4–D, which includes 35 individual active ingredients.

13. Freon–113 and 1,1,1–trichloroethane have always been on the TRI list of chemicals. The others were added after the 1989 reporting period. (See Chapter 2, Box 2–A.)

Photo: Sheila A. Ferguson

CHAPTER 8. USING THE TRI DATABASE

In each of the previous two TRI National Reports, the final chapter gave examples of the many other types of analyses for which TRI data can be used, such as regional analyses and the analyses of particular chemicals. This year, the final chapter gives examples of some of the detailed issues, such as database standardization, that emerge in the maintenance and use of the TRI database. By giving insights into various features of the publicly-available TRI data, this chapter provides some guidance that EPA trusts will be useful to those involved in TRI database analysis.

QUALITY ASSURANCE OF THE TRI DATABASE

Chapter 2 outlines many of the changes in the TRI database since last year, some of which result from new facilities in the database making submissions. In an effort to insure a timely response to TRI reporting requirements, EPA has conducted numerous mass mailings to manufacturing facilities, has been working with a wide variety of trade associations, and has hosted local and national seminars. EPA continues to enforce the reporting requirements and, in particular, to locate facilities meeting TRI requirements that have not reported.

EPA accepts revised estimates from TRI facilities.

Other changes in the TRI database result from companies submitting revised estimates of their releases and transfers. Because EPA believes that in most cases these revisions result in better estimates than before, the Agency has been allowing facilities to submit revised estimates when the facilities believe that they have reached a better estimate as well as when previous submissions have been found to be in error. To help companies with questions about how to report, EPA continues to refine its detailed reporting instructions and has prepared 16 industry-specific guidance documents. In addition, EPA maintains a toll-free phone line (1-800-535-0202) to answer technical and other questions from facilities. The hotline also provides single copies of selected documents related to TRI free of charge.

EPA conducts a variety of activities to evaluate reported data.

EPA continues the practice, instituted two years ago, of contacting facilities by telephone when the data for their facility fail quality checks or when they meet certain criteria. For example, emphasis has been placed on contacting facilities with significant changes in reported releases and transfers between 1987, 1988, and 1989 submissions.

Similarly, EPA has a continuing program of site visits to evaluate the accuracy of reported release and transfer estimates. Data from these site visits are being used to quantitatively evaluate the accuracy of reported data and to educate reporting facilities on how to improve their submissions. In addition, EPA Regional auditors have a guidance manual to assist them in reviewing a facility's Form R data and evaluating the quality of the data submitted.

EPA places an emphasis upon data entry accuracy.

EPA also continues to place a major emphasis on assuring data entry accuracy within the TRI database. EPA's recent internal review of 2 percent of the TRI records showed a data entry accuracy rate in excess of 99 percent, up from 98 percent two years ago. EPA continues to expand computerized edit checking at the point of data entry. Once TRI data are received from the facilities and entered into the computer, the data quality program has several computerized checks reviewing both the accuracy of data transcription and its consistency within an individual form, flagging any errors for attention. In addition, EPA has instituted a procedure of mailing copies of all facility release and transfer information back to the reporting facilities, allowing them to verify the data in the TRI database with their own records. EPA has also greatly reduced Agency-introduced data entry errors by establishing a procedure whereby facilities can report TRI information already computerized on magnetic disks or tapes. Over 650 facilities submitted their 1989 data in this way.

As a result of these efforts, EPA believes that each year the TRI database has improved significantly, with more accurate estimates of releases and transfers.

UNDERSTANDING FORM R DATA

One of the best ways to become acquainted with what the TRI data do and do not mean is simply to read a copy of the reporting Form R and instructions. These instructions, which are available from the EPA Hotline (1-800-535-0202) provide a wealth of information, such as who must report, what to report, and how to report. EPA also provides additional guidance on specific issues in the form of a "Question and Answer" document (also available through the Hotline).

TRI filings of Toxic Chemical Release Inventory Reporting Forms (Form Rs) are to be made by all manufacturing facilities with the equivalent of ten or more full-time employees that manufacture, process, or otherwise use a TRI listed toxic chemical above the TRI reporting threshold. (See Chapter 1 and the end of this chapter for discussions of thresholds, and Appendix A for a copy of Form R.) Facilities submit a separate Form R for each TRI chemical processed, manufactured, or otherwise used at the facility in excess of an applicable threshold. On average, this is between three and four chemical forms per facility. The Form R contains information specific to each chemical on total on-site releases to air, land, surface water and underground injection; transfers to publicly owned treatment plants (POTWs), and other off-site transfers. In addition, the general type of treatment, storage or disposal of off-site transfers is given. Each chemical form also lists Standard Industrial Classification (SIC) code information, information on waste treatment applied on-site prior to release or transfer, the maximum amount of the chemical on-site during the year, and the activities undertaken by the facility with respect to the chemical. The Form R also has an optional section for reporting waste minimization information related to the chemical.

Standardization Within the TRI Database

The requirement that manufacturers meeting certain requirements submit TRI data annually using Form R is intended to provide the amalgamated TRI data with structure and consistency. While this effort has been largely successful, permitting analyses such as this National Report and the many other TRI reports (such as those discussed in Chapter 7), issues and inconsistencies will invariably arise whenever there are more than 20,000 widely different facilities reporting their diverse operations on more than 81,000 forms.

EPA works to standardize data fields which may be reported differently.

Because computers can only retrieve data in exactly the format requested, each year EPA has expanded its efforts to standardize certain data fields that facilities may report differently. For example, county names have been spelled consistently by EPA at the time of data entry. Because the parish of Saint James the Baptist in Louisiana may be reported as St. James or St. James Parish or St. James the Baptist, the computer would not recognize them as the same county. EPA enters this county name as Saint James the Baptist for all facilities in this area so that they can all be identified as being within the same county. EPA strives to attain this consistency in all applicable fields. Other examples of standardization are given below.

Facility Identification Information

The TRI facility ID number facilitates consistent cross-year analysis.

EPA generates a TRI facility identification number when entering data submitted by a facility that is reporting under TRI for the first time. The same facility ID number is used for all Form Rs from the facility, and remains the same from one year to the next. The facility ID number does not change if the facility changes ownership or operatorship.[1] The facility ID number identifies a facility at a certain location and does not change unless the facility moves. In this way, past reports from a facility are linked to the facility's current reports, allowing easy retrieval of cross-year data. Without such a facility identification number, the computer would have no reliable way to link the data related to the releases and transfers from the same physical location for different years, because the name of the facility might change or other information, such as its street address, might be spelled or reported in a different way.

Many TRI facilities submit various identification numbers to TRI.

In addition to the TRI facility identification number, facility information includes: the facility name, address, parent company (including the parent company's Dun and Bradstreet number), latitude/longitude; EPA identification numbers such as RCRA (Resource Conservation and Recovery Act) numbers, NPDES (National Pollutant Discharge Elimination System) permit numbers for surface water discharges, and Underground Injection permit numbers; and the facility's Dun and Bradstreet number. These numbers are included as supplied by the facility, not derived from other EPA databases. Facility information also includes the names and telephone numbers of the technical and public contact persons for the TRI submission.[2] Facilities also indicate whether the form contains information covering activities at the entire facility or part of the facility. (See below for discussion of partial reports.)

Under the authority of the Clean Water Act, EPA or the state issues NPDES permits to individual facilities to control discharges of chemicals to surface waters. NPDES permits limit over 1,500 types of pollutants, a subset of which (126 chemicals) have been designated as priority pollutants. Ninety-four of the specifically listed TRI chemicals are also priority pollutants. Out of a total of 2,352 TRI facilities reporting surface water discharges, 92 percent reported an NPDES number to TRI. These facilities accounted for 99 percent of all TRI discharges to surface waters in 1989. However, the permit numbers given by 9 percent of these facilities may not be correct, because they did not conform to the usual format for NPDES permit numbers.

RCRA identification numbers are obtained by certain facilities which treat, store, or dispose of certain wastes on site or transfer those wastes to off-site treatment, storage or disposal facilities. While RCRA wastes do not, for the most part, designate specific chemicals, referring instead to process-related descriptions such as spent solvents or process still-bottoms, they do encompass TRI chemicals. In 1989, a total of 82 percent of TRI facilities with on-site land releases reported one or more RCRA identification numbers in 1989 (77 percent reported the numbers in a valid format). The facilities listing one or more RCRA numbers accounted for 98 percent of the amounts of all TRI on-site land releases. Of all the TRI facilities reporting off-site transfers, 96 percent reported a RCRA number (92 percent reported in a valid format). These facilities accounted for 98 percent of all TRI off-site transfers in 1989.

Underground Injection Well Code (UIC) identification numbers are assigned by EPA or by states under the authority of the Safe Drinking Water Act to facilities injecting wastes which contain toxic chemicals into Class 1 deep wells. Facilities are only required to provide the UIC number for wells that receive the toxic chemical being reported.

Although facilities report the name of their parent company, the particular form of the name reported may vary from facility to facility for the same parent company. For example, the Du Pont chemical company has 88 facilities reporting to TRI. However, to find these facilities based on the parent company name, it is necessary to search for the name in various spellings, including variations on Du Pont and E.I. du Pont de Nemours, in order to find all of them. In addition, while a facility may not have completed the parent company designation, its own name may identify its parent company; for example, GMC, Delco Division is a General Motors Corporation facility. Facilities may also have reported parent companies at different levels, even when they should have reported the ultimate U.S. parent company.

Geographic Information

The TRI database contains information regarding the specific location of a facility: its street address, city, county, state, and zip code, as well as the latitude and longitude of the facility site. A street address is intended to furnish the facility location, but sometimes a post office box number is submitted instead, and this can differ from one reporting year to the next. Zip codes also may change as new ones are created by the Post Office.

The latitude and longitude, however, should not change unless a facility submits more precise information in a subsequent year. Latitude and longitude entries are standardized to the correct format by EPA when they are entered in the database. Also, because not all TRI submitters know the latitude and longitude of their facilities, the database provides every facility (except those in Puerto Rico) a second "assigned" latitude and longitude, which is calculated based on the facility's zip code. Thus, all facilities in one zip code have the same "assigned" latitudes and longitudes.

TRI facility location data may vary from year to year . . .

Much of the TRI facility address data can change from year to year, depending on how the facility reports the data. For example, the following TRI facility reported in 1987 as:

Diversitech General — Parent Company: Gencorp, Inc.
Yorkville Road
Columbus, MS 39702

and in 1988 as:

Gencorp Polymer Products — Parent Company: Gencorp Inc.
Yorkville Rd.
Columbus, MS 39703

and in 1989 as:

Gencorp Polymer Products — Parent Company: Gencorp Inc.
133 Yorkville Rd. East
Columbus, MS 39703

. . . but the TRI facility ID number allows consistent identification of facilities despite these variations in name and address.

Although this is the same facility, the name as it would appear in the database changed from Diversitech General to Gencorp Polymer Products and the address changed from a description of a location to a numbered address, also marking a change in zip code.

In the TRI database this facility is identified by the same facility ID number each year, and in this way can be traced from year to year despite changes of name and address. In some cases, the differences in name or address between years may be so great that it is not possible for EPA to recognize that they are associated with the same facility unless the TRI facility identification number is referenced.

While zip codes do occasionally change, this still is probably the most reliable indicator for finding all the TRI facilities within a particular geographic area.

The county designation may be used to search TRI facilities . . .

For larger geographic areas the county designation can be used. There are over 3,000 counties in the United States. For the most part, the TRI database has standardized the spelling of county names so that all TRI facilities within a county can be identified. When using counties as the basis for searching for facilities, however, it should be kept in mind that some states do not have all areas assigned to a county, but instead designate cities independently. Thus, the city of Baltimore is assigned neither to Baltimore County nor to Anne Arundel County, but has the separate designation of Baltimore City. Likewise, the city of Saint Louis, in Missouri, is an independent city and is not counted as part of Saint Louis County. Saint Louis County includes towns and cities to the north, west and south of the city, which is bordered on the east by the Mississippi River, but does not include the city itself.

...although some cities are not assigned to a county.

With 95 counties and an additional 38 independent cities, Virginia has the largest number of independent cities. The effect of these independent cities upon the quantification of releases and transfers of TRI chemicals in a particular geographic area can be seen by taking the southeast corner of Virginia, which is at the mouth of the James River and borders on North Carolina, with the Atlantic Ocean to the east. This area is made up of seven independent cities: Newport News, Norfolk, Hampton, Portsmouth, Suffolk, Virginia Beach, and Chesapeake. If these cities were to be included in one geographic area, the total releases and transfers from their TRI facilities would come to 5.3 million pounds, making this area rank seventh in the state behind other counties and independent cities. When these cities are each ranked separately against the other counties and independent cities in Virginia, top-ranked Norfolk (with 2.2 million pounds reported) moves to 13th in the state, with the six other cities having lower ranks.

In all, there were 2,040 counties and independent cities with TRI facilities reporting for the year 1989. The TRI database contains the FIPS (Federal Information Processing Standard) code corresponding to the county/independent city for each facility, which is a unique number established by the U.S. Department of Commerce for every county and independent city in the United States. It is used by many computer mapping programs, as well as in other governmental databases, for identification purposes.

Industry Information

Facilities report SIC codes describing their manufacturing activities.

By reporting a SIC code, the TRI facility indicates the type of industrial setting in which a particular TRI chemical may be manufactured, processed or otherwise used. The TRI reporting requirements apply to all facilities which carry out operations of the type described by the SIC codes for manufacturing establishments, codes 20 through 39. SIC codes have four digits. The first two digits indicate the major industry category, such as Chemical and Allied Products, while the last two digits specify the type of industry within the overall major industry category. For example, industrial organic chemicals (2869), plastics materials and synthetic resins (2821), and synthetic rubber (2822) all fall within the Chemicals and Allied Products industry (28). Or, rubber and plastics hose and belting (3052), plastic pipe (3084), and fabricated rubber products (3069) are included within the Rubber and Miscellaneous Plastics Products industry (30).[3] Appendix C outlines the Standard Industrial Classification system.

TRI facilities may have more than one establishment.

TRI requires reports by "facilities," which are defined as "all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person." However, the SIC code system defines business "establishments" as "distinct and separate economic activities [that] are performed at a single physical location".[4] Thus, a facility may have one or more establishments. EPA requires such multi-establishment facilities, wherein one or more of the establishments are non-manufacturers, to determine whether the overall facility is a "manufacturing" facility. This determination is based on the value of products shipped and/or produced by the manufacturing establishments in the facility. If a multi-establishment facility is determined to be a "manufacturing" facility, then all establishments at the facility, even non-manufacturing establishments, are subject to TRI.

Facilities may file multiple partial facility reports for a TRI chemical.

A TRI facility must report all releases and transfers of a listed chemical if it exceeds a reporting threshold for that chemical. Thresholds must be based on all activities for a chemical at the *entire* facility. Once a threshold for a chemical is exceeded, however, EPA allows the facility to report in one of two ways. The facility may file one Form R for the chemical for the entire facility, or the facility may submit separate (also called "partial") forms for each establishment (or group of establishments) that have activities involving the chemical. EPA allows multiple partial submissions to be filed for a single chemical as long as all releases and transfers of the chemical from the entire facility are reported. "Partial" does *not* mean that only part of the facility's releases and transfers of the chemical are ultimately reported to TRI, but that part is reported on one form and part on another. All releases and transfers of the chemical by the facility must be reported in some way to TRI. In 1989, 660 TRI facilities (3 percent of all TRI facilities reporting in 1989) reported data that covered part of the facility operations on 3,433 TRI forms. These forms reported 232.2 million pounds of releases and transfers, representing 4 percent of the database total.

A facility that submits one form for a chemical for the entire facility is required to include all facility SIC codes that fall within the range of 20 through 39. Facilities that submit partial forms, however, only report the manufacturing SIC codes related to the establishment (or group of establishments) to which the partial form pertains. It is possible, therefore, that a partial form could be filed that lists no SIC codes, since the establishment (or group of establishments) to which the form relates may all be non-manufacturers. (Note that only SIC codes 20-39 are required to be submitted.)

When looking at the TRI data, it may not be possible to discern whether the data are a result of activities undertaken solely by manufacturing establishments, if the data are in combination with other non-manufacturing operations, or whether the data result solely from non-manufacturing establishments. This is so because only SIC codes 20 through 39 are required to be reported to TRI, even if other activities are also covered in the reporting.

Facilities with multiple 4-digit SIC codes reported higher average releases and transfers than did facilities reporting only one 4-digit SIC code.

In 1989, 83 percent of all TRI facilities reported a single four-digit code in the range 20 through 39. Some of these forms may have indicated other SIC codes outside the 20 through 39 range but, for the purposes of this report, they are classified according to the one SIC code given in the range 20-39. (See below for a discussion of those forms and facilities not reporting any SIC code in the range 20 through 39.)

While 76 percent of all TRI forms submitted to TRI in 1989 reported a single four-digit SIC code in 20-39, only 60 percent of total TRI releases and transfers were accounted for by those forms. This difference indicates that facilities reporting manufacturing operations with multiple four-digit SIC codes in the range 20-39 reported larger average TRI releases and transfers in 1989 than did facilities reporting only one four-digit SIC code. For the purposes of this report, only SIC codes in the range 20-39 are used to classify a form or facility. (See Table 8-1.)

Most facilities were associated with a single 2-digit SIC code.

In addition, while a facility may have several operations that fall under different four-digit SIC codes, 94 percent of the TRI facilities, and a corresponding 92 percent of total TRI releases and transfers, were associated with operations that fell under only one *two-digit* SIC code industry category per facility. That is, only 1,448 facilities, with 437.3 million pounds of releases and transfers, reported multiple four-digit SIC codes that fell into more than one two-digit SIC code category. (See Chapter 3 for further information on four-digit SIC codes.)

The combination of two-digit SIC codes most often reported was SIC 32 (Stone/Clay/Glass) and SIC 33 (Primary Metals). Facilities reporting on the use of TRI chemicals in both the Stone/Clay/Glass industry and the Primary Metals industry on the same site reported a total of 59.0 million pounds, or 13.5 percent of the releases and transfers of the entire Multiple SIC Codes category. While the Stone/Clay/Glass industry was only ranked 14th for total releases and transfers for forms reporting a single two-digit category (see Chapter 3), a higher release and transfer of TRI chemicals by this industry was accounted for at facilities with complex manufacturing operations involving more than one major industrial category.

The second-largest combination of two-digit SIC codes in 1989 involved facilities producing both chemicals (SIC 28) and rubber or plastics products (SIC 30); these facilities reported 38.6 million pounds or 9 percent of the total Multiple SIC Codes category. (See Table 8-2.)

Table 8-1. Summary of SIC Code Reporting by TRI Facilities, 1989.

SIC CODE REPORTING BY INDIVIDUAL FACILITY/FORM	FACILITIES		FORMS		TOTAL RELEASES AND TRANSFERS	
	Number	Percent	Number	Percent	Pounds	Percent
A Single 4-digit SIC code	18,731	82.99	62,465	76.28	3,434,675,804	60.20
Multiple 4-digit SIC codes within a Single 2-digit SIC code	2,390	10.59	13,604	16.61	1,833,716,301	32.14
Multiple 4-digit SIC codes and multiple 2-digit SIC codes	1,448	6.42	5,822	7.11	437,278,275	7.66
TOTAL	22,569	100.00	81,891	100.00	5,705,670,380	100.00

Table 8-2. The Combination of SIC Codes Most Often Reported on TRI Multiple SIC Code Forms, 1989.

RANK	SIC CODES	INDUSTRIES	FORMS REPORTING		TOTAL RELEASES AND TRANSFERS	
			Number	Percent	Pounds	Percent
1	32 33	Stone/Clay & Primary Metals	91	1.56	59,005,482	13.49
2	28 30	Chemicals & Plastics	410	7.04	38,558,388	8.82
3	28 29	Chemicals & Petroleum	396	6.80	32,973,369	7.54
4	26 27	Paper & Printing	92	1.58	32,347,952	7.40
5	26 28	Paper & Chemicals	84	1.44	26,438,837	6.05
6	28 33	Chemicals & Primary Metals	131	2.25	23,871,300	5.46
7	33 34	Primary & Fabricated Metals	620	10.65	14,931,596	3.41
8	28 38	Chemicals & Measure./Photo	58	1.00	13,050,859	2.98
9	34 37	Fabricated Metals & Transportation	261	4.48	12,472,066	2.85
10	34 36	Fabricated Metals & Electrical	326	5.60	12,447,236	2.85
		SUBTOTAL	2469	42.41	266,097,085	60.85
TOTAL FOR MULTIPLE SIC CODES			5822	100.00	437,278,275	100.00

The Form R instructions do *not* require that the SIC code covering the majority of the operations at the facility be listed first or highlighted in any manner. Instead, 46 percent of the facilities reporting more than one SIC code in 1989 (2,664 out of 5,822 forms) listed the SIC codes in numerical order. Therefore, the SIC code listed first by a facility cannot be assumed to be the major SIC code for the facility, or to describe the role of that SIC code in the releases and transfers associated with the facility's overall manufacturing processes. If only the facility's first listed SIC code were assigned to the facility as its major industry, the industry categories such as Food (SIC 20), Tobacco (SIC 21), and Textiles (SIC 22) would be misrepresented in the database. For example, while SIC code 23 (Textiles) appears as a multiple SIC code most often with SIC code 30 (Plastics), if only the first listed SIC code were assigned to each facility about half of the releases and transfers for these forms would be counted in the Textiles industry (because its SIC code comes in numerical order before that of the Plastics industry). However, the Plastics industry reported more than four times the amount of releases and transfers reported by the Textiles industry in 1989. In order to avoid misrepresenting any industry, the facilities and forms with multiple SIC codes are kept as a separate category in this report.

TRI facilities may change their SIC codes from year to year.

TRI facilities may also change operations from year to year, resulting in a change of SIC code. While 96 percent of all TRI facilities reporting in both 1988 and 1989 did report the same two-digit code, there were 777 facilities that reported changes. An example of such a change is the Rayovac Corporation in Covington, Tennessee, which reported under SIC code 3313 (Electrometallurgical products) in 1987 and 1988, but under SIC code 2819 (Industrial inorganic chemicals) in 1989. The Flextronics Corporation in Great Falls, South Carolina reported as a facility manufacturing electronic components and accessories (SIC 3670) in 1987 and 1988, but reported as a manufacturer of computer peripheral equipment (SIC 3577) in 1989.

Some non-manufacturing facilities reported to TRI.

While TRI requires reports only from manufacturing facilities (facilities with SIC codes 20 through 39), there were 248 facilities reporting in 1989 which fell outside these industry groups or did not report a SIC code. For example, there were 29 facilities in the Nondurable Wholesale Trade industry (SIC 51), 21 TRI facilities providing business services (SIC 73), and 16 facilities in the Durable Wholesale Trade industry (SIC 50) that reported their activities involving TRI chemicals. In some cases this may have been a misunderstanding of the reporting requirements; in others it may represent a voluntary reporting of releases and transfers of TRI chemicals.

Chemical Information

Chemicals are identified in the TRI database in one of four different ways: as individual chemicals, as chemical categories (such as nickel compounds), as mixtures/trade name products, and as trade secrets. The name of each TRI chemical and chemical category has been standardized in the database. Therefore, by referencing the chemical names in this report (a full list is contained in Appendix B) it is possible to obtain all information on the individual TRI chemicals and chemical categories.

Individual chemicals are standardized by CAS numbers.

For the individual TRI chemicals, there is a data field containing a unique identifying number, assigned by the Chemical Abstracts Service (CAS) and called a CAS registry number. In this way, if a synonym for the chemical is known but not found in the TRI database because TRI uses a different name, a search based on the CAS number will produce the desired information. For example, the chemical name "methylene chloride" is not found in the TRI database. Instead, it is listed as dichloromethane. These two names are synonyms for the same chemical, which has a CAS number of 75-09-2.

Because groups of chemicals are not assigned one overall CAS number, none exist for the chemical categories. However, their spelling is standardized so that retrievals for zinc compounds, for example, will obtain all the information for this category.

The names given for mixtures/trade name products are not standardized but may indicate the TRI chemical which prompted the reports. For trade secrets, a generic name not specific enough to identify the TRI chemical is submitted. Forms submitted for mixtures/trade name products and trade secrets can be spotted as such due to their lack of a CAS number and because they are not filed as one of the 20 categories.

Chemical qualifiers denote the specific *form* of a TRI chemical that must be reported.

A number of chemicals on the TRI list are followed by a qualifier. For these chemicals, only the form denoted by the qualifier is included in both threshold and release/transfer calculations. For example, the listing for phosphorous is qualified by the term "yellow or white." This means that only manufacturing, processing, or otherwise use of phosphorous in the yellow or white chemical form requires reporting. Conversely, manufacturing, processing, or otherwise use of "black" or "red" phosphorous does not require reporting. Other qualifiers include the following:

- *Fume or Dust* - Three of the metals on the list (aluminum, vanadium, and zinc) contain the qualifier "fume or dust." Only fumes and dusts of these metals are to be counted towards thresholds and, if a threshold is met, only release and transfers of fumes and dust are to be reported to TRI. "Fume or Dust" does not refer to "wet" forms (solutions or slurries, for example) but only to dry forms of these metals.

- *Manufacturing Qualifiers* - Two of the entries to the TRI chemical list contain a qualifier relating to manufacture. For isopropyl alcohol, the qualifier is "manufacturing - strong acid process." For saccharin, the qualifier simply is "manufacturing." In the case of isopropyl alcohol, the qualifier means that only facilities which manufacture isopropyl alcohol by the strong acid process are required to report. In the case of saccharin, only manufacturers of the chemical are subject to the reporting requirements (a facility that buys saccharin to incorporate into a food product, for example, would not have to count it in threshold or release/transfer calculations).

- *Solutions* - Two substances on the list, ammonium nitrate and ammonium sulfate, are qualified by the term "solution," which refers to the physical state of these chemicals. Solid, molten, and pelletized forms of these chemicals are exempt from threshold and release determinations. Only facilities that manufacture, process, or otherwise use these chemicals in the form of a solution are required to report.

- *Friable* - The listing for asbestos is qualified by the term "friable," referring to the physical characteristic of being able to be crumbled, pulverized, or reducible to a powder with hand pressure.

- *Fibrous Forms* - The listing for aluminum oxide is qualified by the term "fibrous forms." Fibrous refers to a man-made form of aluminum oxide that is processed to produce strands or filaments which can be cut to various lengths, depending on the application.

Threshold Determinations

As noted throughout this report, the thresholds for reporting have changed over the years for the manufacturing and processing of a TRI chemical, while the threshold has remained the same for otherwise using the chemical. A facility must report all releases and transfers of a chemical if it exceeds any one or more of these three thresholds.

Facilities calculate the reporting thresholds for manufacturing, processing, and otherwise using a TRI chemical separately.

To determine whether it has exceeded a reporting threshold, a facility compares quantities of listed chemicals that it manufactures, processes, or otherwise uses to the separate respective thresholds. For example, a facility manufactures toluene for direct sale to customers. The facility also buys toluene, repackages it, and distributes it to customers. The amount of toluene manufactured is applied towards a manufacturing threshold for toluene and the amount repackaged is applied towards a processing threshold for toluene. If either threshold for toluene is exceeded, all releases and transfers of toluene must be reported, regardless of whether they are associated with manufacturing or processing activities.

Facilities are *not* required to include certain uses of listed toxic chemicals in their threshold and release/transfer calculations. These exemptions include:

Certain exemptions apply to facilities with activities involving a TRI chemical.

- use as a structural component of the facility;
- use in routine janitorial or facility grounds maintenance;
- personal uses by employees or other persons;
- use of products containing toxic chemicals for the purpose of maintaining motor vehicles operated by the facility; and,
- use of toxic chemicals contained in intake water (used for processing or non-contact cooling) or intake air (used either as compressed air or for combustion).

In addition, EPA allows exemptions for certain activities carried out in laboratories as well as for *processing* or *using* (as opposed to *manufacturing*) articles containing toxic chemicals. There is also a "de minimis" exemption, which allows facilities to discount toxic chemicals in certain mixtures in threshold and release/transfer calculations, wherein the concentration of the toxic chemical in the mixture is below a specified amount (0.1 percent by weight for carcinogens and 1 percent by weight for all others). See the Form R instructions for further discussion of these exemptions.

A number of chemical compound categories are subject to reporting. When determining whether a threshold has been met for a chemical compound category, facilities are required to sum all individual members of a category that are manufactured, processed, or otherwise used. (As always, threshold determinations must be made separately for each of these three activities.) An example of this would be the processing of three different copper compounds. The amounts of all three compounds that are processed during the course of a calendar year are added towards a single processing threshold for "copper compounds."

Chemicals that are specifically listed under TRI are not included in the chemical compound categories; their thresholds and releases/transfers are reported separately (metals and metal compounds present a special case; see below). For example, because hydrogen cyanide is specifically listed, the threshold and release/transfer calculations for this compound are made separately from the chemical category "cyanide compounds."

Metal compounds may contain more than one TRI metal, requiring separate Form Rs.

The metal compound categories present a special case. Some metal compounds may contain more than one listed metal. For example, lead chromate is both a lead compound and a chromium compound. In such cases, the facility would apply the total weight of the lead chromate to the threshold determinations for both lead compounds and chromium compounds. If an applicable threshold is exceeded, EPA requires the facility to file two separate reports, one for "lead compounds" and one for "chromium compounds," and only the amount of each parent metal released or transferred (not the total amount of the compound) would be reported on the appropriate Form R. (See below for an explanation of reporting releases and transfers of metals compounds.)

Activities and Uses On Site

On the Form R, facilities classify their activities involving TRI chemicals as manufacture, process and/ or otherwise use.

TRI facilities are required to report all activities and uses that apply to a chemical at the facility: manufacture (including importation or production for on-site use/ processing, for sale/distribution, as a by-product, or as an impurity); process (as a reactant, as a formulation component, as an article component, or for repackaging only); and otherwise use (as a chemical processing aid, as a manufacturing aid, or for ancillary or other uses such as use as a solvent or lubricant). For example, a chemical manufacturing facility that simply makes a chemical for sale to a user would

indicate that it produces the chemical for sale/distribution. However, if the same facility also used the chemical to lubricate facility production equipment, it would also indicate such other use on the Form R.

Facilities reporting *solely* the manufacture, process, or otherwise use of TRI chemicals accounted for 24%, 12% and 27%, respectively, of 1989 total TRI releases and transfers.

Facilities that reported manufacturing as their sole activity for a chemical comprised fewer than 1 percent of all TRI facilities. However, the total releases and transfers associated with only manufacturing activities were a much higher percentage, 24 percent (1.4 billion pounds) of the total releases and transfers reported in 1989. TRI facilities that reported only processing activities involving TRI chemicals represented 23 percent of all TRI facilities reporting in 1989. The total releases and transfers of TRI chemicals generated during processing-only activities were lower, on average, than those for manufacturing-only activities, representing 12 percent of the total releases and transfers (668.4 million pounds). Likewise, TRI facilities reporting only other uses of TRI chemicals in their operations accounted for 1.5 billion pounds, or 27 percent, of total releases and transfers for 1989. The facilities reporting only other uses represented 35 percent of all facilities reporting in 1989. The other 41 percent of TRI facilities reported a combination of activities associated with TRI chemicals. The total releases and transfers of TRI chemicals from facilities using the chemicals in a combination of ways was 2.1 billion pounds, or 37 percent of the TRI total for 1989. (See Figure 8-1.)

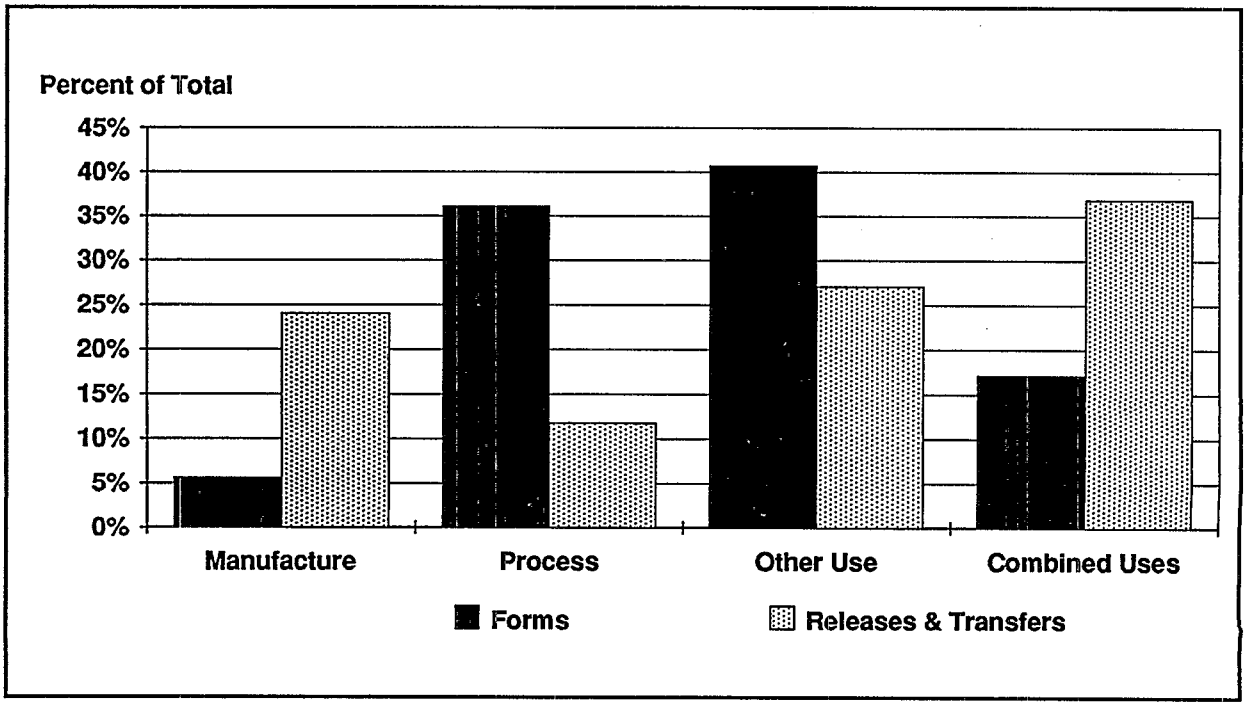

Figure 8-1. Industrial Activities and Uses, 1989. (TRI Forms and Total Releases and Transfers)

Reporting of Releases and Transfers

Facilities can report releases and transfers in ranges if the total per chemical is less than 1,000 pounds.

When reporting a release or transfer amount, a range may be indicated on the form if the amount of release or transfer to a particular environmental medium or off-site location is less than 1,000 pounds. The reporting ranges for 1989 were 0, 1 to 499 pounds, or 500 to 999 pounds. Throughout this report, the range 1 to 499 was assigned a value of 250 pounds, and if the range indicated on the form was 500 to 999, the value of 750 pounds was used. Users searching the public TRI database on the National Library of Medicine computer may find a range code listed for this value, as opposed to the system used in this report.

Facilities must indicate whether or not a certain type of release or transfer is applicable to their activities involving the TRI chemical.

Facilities are required to report an estimate of the pounds of releases and transfers that occurred during the reporting year. If the chemical could not possibly have been released to a particular medium or transferred off-site, however, the facility would report NA (not applicable) for that type of release or transfer. For example, a facility with no underground injection well would mark "NA" for underground injection of the chemical being reported on the Form R.

On the other hand, if a release *could* occur to a specific medium or a transfer occur to an off-site location, but either no release or transfer occurred or the annual aggregate release or transfer was less than 0.5 pounds, the facility would indicate that "zero" releases or transfers occurred. Indicating a "zero" release or transfer implies that the chemical *could* have been released to a particular medium or sent to a particular off-site location but, in fact, was not. A "zero" release or transfer also implies that some non-zero amount less than 0.5 pounds may have been released or transferred. EPA allows rounding of estimates that are less than 1.5 pounds down to zero.

For example, a facility may have a toxic chemical-containing wastestream that is released to the air by way of a smoke stack. However, prior to venting the wastestream out the stack, all of the toxic chemical is removed by a scrubber. Since the material released to air could contain the toxic chemical but, in actuality, did not, the facility would indicate "zero" for this release.

For any release or transfer type that did not have a positive number or a range code indicating greater than zero releases, the analyses in this report have used zero in order that numerical totals could be calculated (in order to find average amounts for a particular chemical and type of release, for example). In some cases both a range code and an actual estimate of the pounds were indicated. For this report all estimates of pounds were used and only if no estimate was given were the range codes used.

On the Form R, air emissions are separately reported as fugitive air emissions (for example, leaks from valves and evaporative losses from surface impoundments or spills) and as stack or point source air emissions (including emissions from stacks, vents, air pollution control equipment and other confined air streams). On-site land releases fall into one or more of four categories—landfills, land treatment/applica-

tion farming, surface impoundments, and other land disposal. The "other disposal" category would include spills or leaks to land as well as other types of disposal to land that cannot be classified in one of the other three categories. While the Form R indicates the amount for each of the above noted air and land release categories, these amounts were added together for purposes of this report, unless otherwise noted (for example, "releases to air" and "total air emissions" include both fugitive and stack or point source emissions).

In addition to on-site releases to air and land, Form Rs also indicate the amount of on-site releases to underground injection wells as well as to receiving streams and water bodies. The two categories of transfers found on the Form R cover transfers to publicly owned treatment works (POTWs) and transfers to other off-site locations for treatment, storage, or disposal. If more than one off-site location is used, separate amounts are reported for each location and the name and address of each site is given.

Facilities employ a variety of possible methods to estimate TRI releases and transfers.

Facilities may use monitoring data, mass balance calculations, emission factors, and other methods such as engineering calculations or best engineering judgment to estimate releases and transfers. In some instances a combination of two or more of these methods is appropriate for determination of a release or transfer estimate. Whatever the method (or combination of methods) chosen for a particular release or transfer estimate, facilities are required to indicate the principal method used to determine the amount of release or transfer reported. The principal method utilized is reported on the Form R with the following codes:

- M - Estimate based on monitoring data or measurements;
- C - Estimate based on mass balance calculations;
- E - Estimate based on published emission factors;
- O - Estimate based on other approaches such as engineering calculations or best engineering judgment.

See Chapter 3 for information about how TRI facilities estimated their releases and transfers in 1989.

Releases and Transfers of Metals and Metal Compound Categories

After a facility meets the threshold for a metal compound, only the pounds of the parent metal must be reported to TRI.

When performing threshold determinations for a metal compound category, facilities are required to include the entire weight of the metal compounds manufactured, processed, or otherwise used. However, once a threshold is met, only the pounds of the parent metal released and transferred are to be reported to TRI. If a facility processed copper sulfate, for example, it would count the entire weight of the copper portion and the sulfate portion towards a processing threshold for copper compounds. If the facility met a threshold for copper compounds, however, it would only report the pounds of copper (and not sulfate) that were released and transferred.

Since the parent metals for each of the metal compound categories are listed separately (for example, there is a specific listing for lead), their thresholds must be calculated separately from their respective categories. However, if a facility exceeds thresholds for both the parent metal and compounds of that same metal, EPA allows the facility to file one combined report since, in any event, only the pounds of parent metal are to be reported. For example, a facility exceeds a threshold for elemental chromium and for chromium compounds. The facility may submit a form for "chromium" and a form for "chromium compounds" or it may submit a single form covering releases and transfers for both. Such a combined form would indicate the chemical being reported as "chromium compounds". Thus, when a facility files a Form R indicating a metal compound category, it is not possible to tell whether the report combined or not. This type of reporting can affect year-to-year comparison of these metals. If in one year a facility reported copper separately from copper compounds, but in another year combined them in a single copper compound report, it might appear that releases and transfers of copper had decreased while releases and transfers of copper compounds had increased.

Site Names and Geographic Data for Off-site Transfers

The TRI database also contains information on the destination of off-site transfers.

Off-site transfers of TRI chemicals in wastes, including transfers to POTWs, can be sent to one or to several locations. For example, a facility may send certain wastestreams to an incinerator and other wastestreams from different operations to a landfill, even if both wastestreams contain the same TRI chemical. In such cases, the transfers are reported in separate amounts, each covering the different off-site location, even though they are included on the same Form R because the TRI chemical in the various wastestreams is the same.

Data on off site transfer locations include the site names to which chemicals are sent, addresses and RCRA identification numbers (when applicable) as well as the type of treatment, storage, or disposal that occurs to the chemicals at the off-site locations. No specific data on treatment efficiency or subsequent releases from the off-site locations are included in the TRI database, however.

The way that off-site information is reported by facilities is quite variable. For example, TRI chemical wastes are sometimes sent to sites in Canada, particularly from facilities located in Michigan near the Canadian border. In this case the facility usually leaves the state code blank, but sometimes it is submitted as CA, which indicates mistakenly that the transfer was sent to California. Another example is in the spelling of the name of the off-site location as reported by the facility. The Browning Ferris Industries company runs many landfills throughout the country that receive TRI chemical wastes. To find these, it is necessary to search for Browning Ferris, Browning-Ferris, Browning/Ferris, BFI, B.F.I., BFI Landfill, BFI Waste Systems, as well as other variations of the name.

Rivers, Lakes and Streams Receiving Surface Water Discharges

The Mississippi River received almost 1/3 of all TRI surface water discharges in 1989.

The TRI database contains the names of the rivers, lakes, and streams receiving surface water discharges. The Mississippi River, which is the longest river in the United States (over 2,300 miles long), received the greatest amount of direct surface water discharges: 61.3 million pounds, accounting for 32.5 percent of all TRI surface water discharges in 1989. (See Table 8-3.) To find TRI discharges of a more local nature it is necessary to combine different search techniques for the TRI database.

Table 8-3. Rivers with the Largest Surface Water Discharges, 1989.

RANK	RIVER/STATE		SURFACE WATER DISCHARGES Pounds	Percent
1	Mississippi River		61,331,169	32.46
		Louisiana	41,810,440	22.13
		Illinois	15,340,467	8.12
		Minnesota	1,267,056	0.67
		Missouri	1,056,674	0.56
		Arkansas	765,453	0.41
		Mississippi	732,532	0.39
		Iowa	356,667	0.19
		Kentucky	1,380	0.00
		Tennessee	500	0.00
2	Pacific Ocean		9,679,296	5.12
		California	9,562,795	5.06
		Oregon	107,001	0.06
		Hawaii	9,500	0.01
3	James River, Virginia		9,423,187	4.99
4	Grays Harbor, Washington		8,993,650	4.76
5	Quachita River, Arkansas		7,834,700	4.15
6	Tennessee River		6,855,217	3.63
		Alabama	4,644,271	2.46
		Tennessee	1,755,854	0.93
		Kentucky	455,092	0.24
7	Amelia River, Florida		5,890,140	3.12
8	Strait of Juan de Fuca		5,521,831	2.92
		Washington		
9	Ohio River		4,776,200	2.53
		Ohio	2,763,895	1.46
		West Virginia	989,274	0.52
		Indiana	328,700	0.17
		Illinois	324,650	0.17
		Pennsylvania	231,400	0.12
		Kentucky	138,281	0.07
10	Savannah River		4,586,269	2.43
		Georgia	4,586,260	2.43
		South Carolina	9	0.00
	SUBTOTAL FOR TOP 10 RIVERS		124,891,659	66.10
	GRAND TOTAL FOR ALL TRI SURFACE WATER DISCHARGES		188,953,884	100.00

Discharges to a single river may include data from several states.

For long rivers that go through several states, only the name of the river is given in this TRI data field for stream name, while the state name is found in a separate field associated with the facility address. Thus, if all forms with surface water discharges to the Tennessee River were retrieved, discharges from the states of Tennessee as well as Alabama and Kentucky would be included. These forms all represent discharges at some point along the river's 650 mile run from the Smokey Mountains in Tennessee, through northern Alabama, and back into Tennessee before reaching the Mississippi River at Paducah, Kentucky.

The stream name is usually reported as a full name, such as "Tennessee River". Sometimes, however, it is abbreviated to "Tennessee" or has an additional description, such as "Tenn. River Mile 205.4".

Some rivers with the same name may not belong to the same river system.

On the other hand, some rivers with the same name that are found in different states may not be part of one river system. For example, the Red River forms the southeast border of Oklahoma with Texas and flows through Arkansas and Louisiana into the Mississippi. Retrieving all forms with the name Red River, however, will also call up discharges to the Red River in Minnesota and the Red River of the North in North Dakota, which are not part of the Red River system originating in Oklahoma.

TRI surface water discharges may be made into a tributary or stream just a short distance upstream from the main river with a different name. For example, the Houston Ship Channel runs from downtown Houston, Texas, to the San Jacinto River, a distance of about 25 miles. In addition, there are several streams running into the Houston Ship Channel—called bayous—within the city of Houston, into which TRI discharges are made. A total of 20 TRI facilities reported discharges to the Houston Ship Channel in 1989 and an additional 11 facilities discharged into bayous that flow into the Houston Ship Channel. If the TRI forms for the different bayous in the area are added to those for the Houston Ship Channel, the results are as follows:

Houston Ship Channel	865,380 pounds
Buffalo Bayou	869,800 pounds
Sims Bayou	60,862 pounds
Green's Bayou	750 pounds
White Oak Bayou	202 pounds
Bray Bayou	42 pounds
TOTAL	1,797,036 pounds

In the TRI database, the best search criteria for surface water discharges may be the surrounding counties.

To ensure the retrieval of only the discharges in an area, the most efficient search criteria may be the counties that surround the river and streams of interest. By retrieving all forms with surface water discharges from TRI facilities in particular counties, the names of the rivers, lakes and streams can be checked against those of interest.

An example of this approach uses the portion of the Columbia River that runs from Portland, Oregon, to the Pacific Ocean. The Columbia River starts in the northeast corner of the state of Washington and runs for a total of over 1,200 miles to the Pacific Ocean. For the last 350 miles it forms the border between the states of Washington and Oregon. The city of Portland, Oregon, is located on the south bank of the Columbia River about 100 miles upstream from its mouth. To investigate surface water discharges into the Columbia from Portland downstream, TRI forms from counties in both the state of Washington, which forms the north border of the river, and Oregon are needed.

Starting with Multnomah County, in which Portland is located, we see that in 1989 facilities in Portland discharged 3,585 pounds of TRI chemicals into the Willamette River, which meets the Columbia at Portland, as well as 1,211 pounds into the Columbia River. Facilities in Clatsop County, Oregon, located on the Pacific coast, discharged another 41,400 pounds. While the total for TRI facilities located in this region of Oregon was 46,697 pounds, this amount was just 8 percent of the total being discharged to surface water. The other 92 percent (553,196 pounds) was discharged by TRI facilities located in the state of Washington. These discharges come primarily from Cowlitz County, Washington, located downstream from Portland and Clark County, across the river from Portland. (See Table 8-4.)

Waste Treatment On Site

A TRI facility may treat wastestreams containing TRI chemicals prior to release or transfer. Releases and transfers reported to TRI are amounts after any on-site waste treatment. TRI facilities must report the type(s) of waste treatment applied to each wastestream containing the TRI chemical reported and the efficiency of their treatment methods in removal of the TRI chemical. The on-site waste treatment data also include an indication of what type of wastestream (air, wastewater, non-aqueous liquid waste, or solid waste) was treated.

Unlike the release and transfer data, waste treatment data are not reported in pounds. Rather, the data provide information on the percent efficiency of the treatment in removing the TRI chemical from the wastestream. A total of 9,936 TRI facilities (44 percent of all TRI facilities) reported undertaking some kind of on-site waste treatment of wastestreams containing TRI chemicals in 1989. An equal percentage of forms (36,146 out of 81,891 forms) indicated on-site waste treatment for the wastestreams containing the chemical. Overall, the treatment efficiencies reported

Table 8-4. TRI Surface Water Discharges to the Last 100 Miles of the Columbia River, 1989.

STATE	COUNTY	STREAM NAME	SURFACE WATER DISCHARGES Pounds
OREGON			
	Multnomah	Columbia River	1,211
		Columbia Slough	1
		Willamette River	3,585
		Unknown-no name given	250
	Washington	Beaverton Creek	250
	Clatsop	Columbia River	41,400
	Columbia	(No TRI Facilities)	0
	SUBTOTAL FOR OREGON		46,697
WASHINGTON			
	Clark	Columbia River	123,360
		Gibbons Creek	203
		Lake River	500
	Cowlitz	Columbia River	428,913
		Consolidated Diking Improvement District No. 1 Ditch No. 3	220
	Wahkiakum	(No TRI Facilities)	0
	Pacific	(No TRI Facilities)	0
	SUBTOTAL FOR WASHINGTON		553,196
TOTAL FOR COLUMBIA RIVER, LAST 100 MILES			599,893

were 90 percent or better, meaning that an average of over 90 percent of the toxic chemical was removed from the wastestream through destruction, biological degradation, chemical conversion or physical removal.

Information on Waste Minimization

Waste minimization reporting describes the amount of the reported chemical in wastestreams at the facility before any treatment or disposal occurs. . .

The TRI Form R includes a voluntary reporting section (Section 8) identifying waste minimization undertaken for the chemical at the facility. (See Chapter 5 for a complete discussion of waste minimization activities relating to chemical reporting as well as analyses of these data.) Because reporting for this section is voluntary, these data cannot be assumed to be representative of a particular industry or national activity. Facilities can indicate either the amounts of the reported chemical entering wastestreams for both the current and prior year, or can indicate the percentage change from the previous year. Releases and transfers, as reported to TRI, are amounts *after* any on-site waste treatment has taken place. The amount of the TRI chemical entering the wastestream, as reported in this section of the TRI form, is the amount resulting from facility operations *before* any on-site waste treatment or disposal.

. . . thus, the releases and transfers reported by a facility are usually less than its reported waste generation.

Because TRI is intended to cover all quantities of TRI chemicals in wastes at the facility, the waste generation amount reported in this section should include all quantities of the TRI chemical in wastes as generated from all operations at the facility, even if waste minimization activity has been applied to only one wastestream. Therefore, the amount of waste *generated* is usually *greater* than or equal to (if no on-site waste treatment takes place) the total amount of *releases and transfers* reported for that chemical by the facility. This is not always the case, however, because (1) the releases and transfers may include other one-time amounts of waste, such as sludge removed from a landfill or material from the clean-up of a spill, or (2) for waste generated, the facility may have incorrectly reported only the operations to which its waste minimization activity applied, even though it should have reported all operations at the facility using that chemical. In cases where waste generation reported by a facility is *less* than its total releases and transfers, it is not possible to tell whether the facility incorrectly calculated its waste generation or correctly included clean-up wastes in its releases and transfers.

Another part of the waste minimization section often containing numbers that seem inconsistent with the rest of the data is the facility's *percent change* in waste generation. This figure should be calculated as the difference between the two years of waste generation (the current year's waste minus the previous year's waste), divided by the prior year's waste generation and multiplied by 100, to generate a percent. The resulting number is between 0 and 100, and is negative if the waste generated has decreased since the prior year. Two errors arise in making this calculation: (1) the number is not multiplied by 100, in which case the change would appear much smaller than it is in reality, or (2) the percent change is reported as a positive number instead of a negative one, even though waste generation has decreased. An analysis of the 1,559 TRI forms that reported both the actual amount of waste generated in 1988 and 1989 and the percentage change in waste generated shows that two-thirds of these forms showed a correct percent change calculation. However, of the total forms, 18 percent reported a correctly calculated number but reported the number as positive (incorrectly indicating an increase in waste generation) rather than negative. Only 1 percent of the forms showed the opposite error, reporting a negative percent change when in reality it was a positive change. (See Table 8-5.) If the facility only reported the percent change, it is not possible to identify these errors. Only when the facility reports its waste generation amounts can its reported percent change in waste generation be directly confirmed.

FORMS OF THE DATA AVAILABLE TO THE PUBLIC

TRI data are available to the public in hard copy, magnetic tape, compact disk, computer microfiche, and public database.

The Environmental Protection Agency makes the data from TRI available to the public in several different formats. TRI data for all three years are available on magnetic tape and COMFiche (a form of computer-generated microfiche). A CD-ROM (compact disks with computerized data) containing 1987, 1988, and 1989 data with search and retrieval software will be available in the fall of 1991. The CD-ROM also includes Hazardous Substance Fact Sheets describing the health and ecological

Table 8-5. Calculation of 1989 Waste Minimization Percent Change.

TYPE OF CALCULATION ERROR	FORMS	
	Number	Percent
Calculated correctly	1,039	66.65
Did not multiply by 100	13	0.83
Number correct but positive instead of negative	285	18.28
Number correct but negative instead of positive	17	1.09
Combination of above errors	3	0.19
Calculated number incorrectly	158	10.13
Number incorrect and positive instead of negative	26	1.67
Number incorrect and negative instead of positive	18	1.15
TOTAL FORMS WITH DATA TO CALCULATE PERCENT CHANGE	1,559	100.00

effects of the regulated substances. All three years of data are also available as a public database on the National Library of Medicine's Toxicology Data Network (TOXNET). (See Table 8-6.)

Along with the TRI submissions of each state and U.S. jurisdiction, the COMFiche includes an index that lists: chemical substance names, facility names, POTWs and other off-site disposal locations, facility cities, counties, and zip codes, SIC codes, and chemicals released to specific environmental media. The index also lists each media release/transfer ranked in descending order. In all there are 12 different index listings. The COMFiche also provides a directory of EPA and state TRI contacts, as well as other reference material, and is available for the nation or for individual states.

EPA has also published a directory of the over 3,000 libraries in the nation that have TRI data available. The libraries have the information primarily on COMFiche, but it is also on CD-ROM at about 650 libraries.

The National Library of Medicine provides for on-line searches of the TRI public database.

The National Library of Medicine's (NLM) system allows for on-line searches of the TRI data as well as sorting of the numerical data with printouts of the results for a nominal fee. The NLM system has menu-driven search capability so that new users, or users with limited computer skills, can search for particular facilities or other data of interest easily and efficiently. The NLM database may be accessed via modem from a personal computer, and the data can be retrieved directly on the user's computer or as printouts mailed to the user. Generally, the data generated from the NLM system relates to particular facilities and chemicals, rather than summaries of the type found in the National Report. Depending on the type of analysis required, the magnetic tape or the floppy diskette data may be more efficient (see below).

Table 8-6. Public Availability of TRI Data.

FORMAT OF DATA	TYPE OF DATA AVAILABLE									
	Years Covered			Facility Name & Address	Chemical Name	Industry SIC Code(s)	Amount of Releases/ Transfers	Off-site Transfer Name/ Address	Waste Minimiz. Waste Treatment	All data or state subsets available
	1987	1988	1989							
COMPUTER DATA										
Magnetic Tapes	X	X	X	X	X	X	X	X	X	All
CD ROMs	X	X	X	X	X	X	X	X	X	All
National Library of Medicine	X	X	X	X	X	X	X	X	X	All
COMFiche (microfiche)	X	X	X	X	X	X	X	X	X	States/All
Floppy Diskettes	X	X	X	X	X	X	X			States/All
National Report Tables		X	X	X	X	X	X	X	X	Selected
OTHER										
Mailing Labels	X	X	X	X						All
Inquiries to EPA User Support	X	X	X	X	X	X	X	X	X	States/All
Directory of Libraries										States/All

EPA has developed IBM and IBM-compatible software known as TOXIC DUMP, which allows NLM users to convert screen-captured TRI data into dBase III+ compatible files. TOXIC DUMP also loads information from the EPA state diskettes (discussed below) into dBASE. TOXIC DUMP includes preformatted reports and a simple graphics generator to allow easy manipulation of the TRI data. It requires dBASE III+ or compatible software and must be installed on a hard disk (1.5 megabytes of free memory is required). TOXIC DUMP will be available from the Hotline (1-800-535-0202) in the fall of 1991.

Subsets of the 1987, 1988, and 1989 data for each state and reporting jurisdiction are also available on floppy diskettes (either 5-1/4 or 3-1/2 inch). The diskettes include the facility location, parent company, public contact information, facility chemicals, facility SIC codes, and the amount of each type of TRI chemical release and total transfers. Not included on the floppy diskettes are the name and address of off-site transfer sites (including public sewage transfers), the names of water bodies receiving surface water discharges, and waste minimization and waste treatment information. These diskettes can be ordered in either a dBASE or Lotus 1-2-3 format. The 1989 data are also available in EXCEL format.

In addition, mailing lists displaying each facility's name and address for 1987, 1988, and 1989 are available on magnetic tape. Diskettes of these mailing lists are also available (by region) for the 1989 TRI submitters.

Table 8-6, Continued.

FORMAT OF DATA	Comments
COMPUTER DATA	
Magnetic Tapes	Available from the Government Printing Office 6250 bpi or 1600 bpi ASCII format
CD ROMs	Available from the Government Printing Office With search and retrieval software, chemical fact sheets
National Library of Medicine	For access contact the National Library of Medicine TRI representative. Search on any data field to retrieve data
COMFiche (microfiche)	Available from the Government Printing Office. Includes indices for searching
Floppy Diskettes	Available from EPA in dBase, Lotus 1-2-3, Excel
National Report Tables	Available from EPA in Lotus 1-2-3, many tables are summaries or rankings
OTHER	
Mailing Labels	Available on floppy diskettes for 1989; magnetic tape for all 3 years
Inquiries to EPA User Support	Reports generated in response to inquiry
Directory of Libraries	List of libraries where data are located

EPA has established a TRI User Support telephone line.

EPA also has established a TRI User Support telephone number (202-260-1531) that anyone can call with a specific request for TRI data or for help obtaining or using the data on any of the systems described above. In response to inquiries, EPA will mail out a printed report containing the requested data. Specific requests for data on a particular facility, for example, can be directed to the TRI User Support Staff. The staff can also help with search strategies for the NLM database and refer the user to information on health and environmental effects of the TRI chemicals.

It should be noted that the data as they appear on the magnetic tapes, diskettes and the NLM system include all reports submitted to TRI for the years in question, including those for chemicals that were subsequently delisted. Because the analyses in this report do not include data on delisted chemicals, the information retrieved from these other sources of TRI data may vary from that presented here.

Further Reference and Guidance Materials on TRI Data

While the above sections highlight general issues related to analysis of the TRI data, additional information on these and other issues is provided in a variety of EPA documents relating to TRI. In particular, each year the EPA issues reporting instructions for the Form R, detailing which facilities and which activities must be reported. The following is a list of some of the guidance documents that may be of further assistance in interpreting the TRI data.

- *Toxic Chemical Release Inventory Reporting Form R and Instructions* (Revised 1990 Version: EPA 560/4-91-007)
- *Toxic Chemical Release Inventory Questions and Answers* (1990 Version: EPA 560/4-91-003)
- *Common Synonyms for Section 313 Chemicals* (EPA 560/4-91-005)
- *The Emergency Planning and Community Right-to-Know Act: Section 313 Release Reporting Requirements* (December 1989: EPA 560/4-90-002)
- *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory* (EPA 560/4-88-002)
- *Toxics Release Inventory Risk Screening Guide* (July 1989: EPA 5602-89-002)
- *EPCRA Section 313 Quality Assurance Audit Manual* (August 1990: EPA 560/4-90-018)

There are also a number of industry-specific guidance documents that assist facilities within an industry (such as metal fabrication, electroplating operations, textile dyeing) in filling out the Form R. For the 1989 reporting year there were 14 such industry-specific documents.

Information concerning these and other related documents is available through the EPA hotline (1-800-535-0202) or the TRI User Support service (1-202-260-1531). The Hotline can also provide callers with a bibliography of TRI-related documents.

ANALYZING TRI CHANGES

This section discusses various ways to make cross-year comparisons of TRI data. As noted throughout the report, aggregate national data are only suggestive of possible overall trends. The data are often more meaningful when examined at a more detailed level, taking the conditions at particular facilities and communities into consideration.

Such cross-year comparisons depend on correctly matching a facility's new reports with the ones from previous years through the use of the TRI facility identification number. This matching may not be completely successful because of the various ways a facility may report name and location data (see above).

Chapter 4 of this report has presented the overall *decrease* in the amount of total TRI releases and transfers, and the overall *increase* in the number of facilities reporting to TRI, from 1988 to 1989. The net change in TRI releases and transfers is the result of increases at some facilities and decreases at others: some increases are due to new facilities reporting for the first time in 1989, and facilities reporting in 1987 and

1989 but not 1988; decreases are sometimes due to facilities that reported in 1988 but not in 1989. Other facilities remained constant, with no change reported in their TRI releases and transfers between the years.

If cross-year reports by the same facility are not linked, only the analysis of TRI data for that individual facility is affected.

As noted above, in the TRI database each of the forms submitted by a facility is assigned the same facility identification number in order that forms submitted by the facility in one year may be matched with the forms the facility submits in future years. While EPA has made every effort to link forms from the same facility across the years in this manner, it may not always have been successful. In the case of facilities that are not correctly matched, a decrease (that is, a facility appeared to report in 1988 but not in 1989) will be offset by an increase (that is, some "other" facility appeared to report in 1989 but not in 1988) in the analyses in this national report, to the extent that the one facility reported similar releases and transfers in both years. Because no forms are omitted from the analysis, the *total* decrease (or increase) for a type of release or transfer, or for a state, industry, or chemical, would not be affected whether or not all facility matches were correct; matching is only a factor in the analysis of the increases or decreases of *individual* facilities.

Delisted chemicals are removed from this TRI analysis for all 3 years.

As throughout this report, only facility reports on the 1989 listed TRI chemicals are included in the TRI analysis. (See Chapter 2, Box 2-A.) No reports of delisted chemicals are counted for any year, and facilities which reported only on a chemical that was subsequently delisted are not included in the analysis. Therefore, all net TRI changes are based solely on reports of the 300 TRI chemicals and 20 chemical categories analyzed in this report. Facilities that filed reports and indicated no releases and transfers are still counted as reporting, because they manufacture, process, or otherwise use the TRI chemical without generating releases or transfers.

Details of Changes from 1988 to 1989

The data show that 82 percent (18,603 out of 22,569 facilities) of all the facilities reporting in 1989 also reported for 1988. Of these facilities reporting in both years, 13 percent (2,354 facilities) reported the same total releases and transfers in both years. Of the remaining 87 percent, about an equal number of facilities filed reports reflecting increases between the two years as filed reports reflecting decreases: 41 percent reported increases and 46 percent reported decreases in their TRI releases and transfers between 1988 and 1989. (See Table 8-7.)

Table 8-7 breaks down the different categories of changes in total releases and transfers. Together, the facilities that filed TRI reports which reflected a decrease in their releases and transfers between 1988 and 1989 showed a 36 percent decrease of 1,405.2 million pounds. For facilities whose TRI reports showed an increase in TRI releases and transfers between 1988 and 1989 reporting years, the net increase was 31 percent, or 715.0 million pounds. Because this total *increase* offset only about half of the total *decrease* accounted for by the facilities with decreases, the net change for the group of facilities reporting in both 1988 and 1989 was a decrease of 11 percent, or 690.3 million pounds.

Table 8-7 . Change in TRI Total Releases and Transfers, 1988-1989.

	FACILITIES	CHANGE IN TOTAL RELEASES AND TRANSFERS		TOTAL RELEASES AND TRANSFERS	
				1989	1988
	Number	Pounds	Percent	Pounds	Pounds
Facilities Reporting in Both Years					
Decrease in TRI Total	8,534	-1,405,205,634	-36.30	2,465,453,707	3,870,659,341
No Change in TRI Total	2,354	0	0.00	24,851,234	24,851,234
Increase in TRI Total	7,715	714,955,125	30.74	3,040,663,925	2,325,708,800
SUBTOTAL FOR FACILIITES IN BOTH YEARS	18,603	-690,250,509	-11.10	5,530,968,866	6,221,219,375
Facilities Reporting in 1989 but not in 1988	3,966	174,701,514	—	174,701,514	—
Facilities Reporting in 1988 but not in 1989	2,541	-205,265,236	—	—	205,265,236
TOTAL	25,110	-720,814,231	-11.22	5,705,670,380	6,426,484,611

Only 127 facilities accounted for 59% of all decreases between 1988 and 1989 facility data.

If the facilities whose reported TRI releases and transfers showed decreases between 1988 and 1989 are looked at in further detail, the influence of a relatively small number of individual facilities upon TRI net changes becomes apparent. Of the TRI facilities with changes in reported releases and transfers between 1988 and 1989, there were 127 facilities each with a decrease of over 1.5 million pounds in their total TRI releases and transfers. These 127 facilities alone (one half of one percent of the 22,569 total facilities reporting to TRI) accounted for a total of 827.9 million pounds of decreases, or 59 percent of *all* decreases in facility releases and transfers between 1988 and 1989. A smaller number (82 facilities) of facilities showed increases of over 1.5 million pounds of TRI releases and transfers. These 82 facilities accounted for 321.5 million pounds of increases, or 45 percent of all increases in facility amounts reported to TRI between 1988 and 1989.

Increases in TRI releases and transfers between 1988 and 1989 amounts were also the result of new facilities reporting in 1989 (as thresholds for reporting were lowered or new operations were started), or from facilities reporting in 1989 and 1987 but not 1988. The 3,966 facilities included in this group accounted for 174.7 million pounds of TRI releases and transfers, constituting 24 percent of TRI increases recorded from 1988 to 1989. Some facilities dropped out of the database between 1988 and 1989, as manufacture, processing or use of the TRI chemicals at their facilities decreased or operations ceased entirely. These 2,541 facilities

Table 8-7, Continued.

TOTAL RELEASES AND TRANSFERS	TOTAL RELEASES AND TRANSFERS	
	1989 Average Pounds per facility	1988 Average Pounds per facility
Facilities Reporting in Both Years		
Decrease in TRI Total	288,898	453,557
No Change in TRI Total	10,557	10,557
Increase in TRI Total	394,124	301,453
SUBTOTAL FOR FACILIITES IN BOTH YEARS	297,316	334,420
Facilities Reporting in 1989 but not in 1988	44,050	—
Facilities Reporting in 1988 but not in 1989	—	80,781
TOTAL	227,227	255,933

accounted for 205.3 million pounds of the overall TRI decrease, contributing 15 percent to the net TRI decrease in releases and transfers between 1988 and 1989. (See Table 8-7.)

In general, releases and transfers from facilities that reported in one year only were small, with average releases and transfers of 40,000 to 80,000 pounds. Also, facilities filing reports in both years but reporting no change in total releases and transfers had the smallest average releases and transfers (11,000 pounds). (See Table 8-7.)

These data suggest that a small number of facilities with large decreases accounted for the net decrease in total TRI releases and transfers from 1988 to 1989. As noted above, almost as many facilities showed increases as showed decreases in their TRI releases and transfers. In 1989, there were 127 facilities whose 1989 TRI releases and transfers represented over 1.5 million pounds of decrease, as compared to their data as reported in 1988. The total decrease accounted for by these 127 facilities was 827.9 million pounds, almost 60 percent of the total decreases of 1.4 billion pounds for all TRI facilities whose 1988 reported releases and transfers exceeded their 1989 amounts.

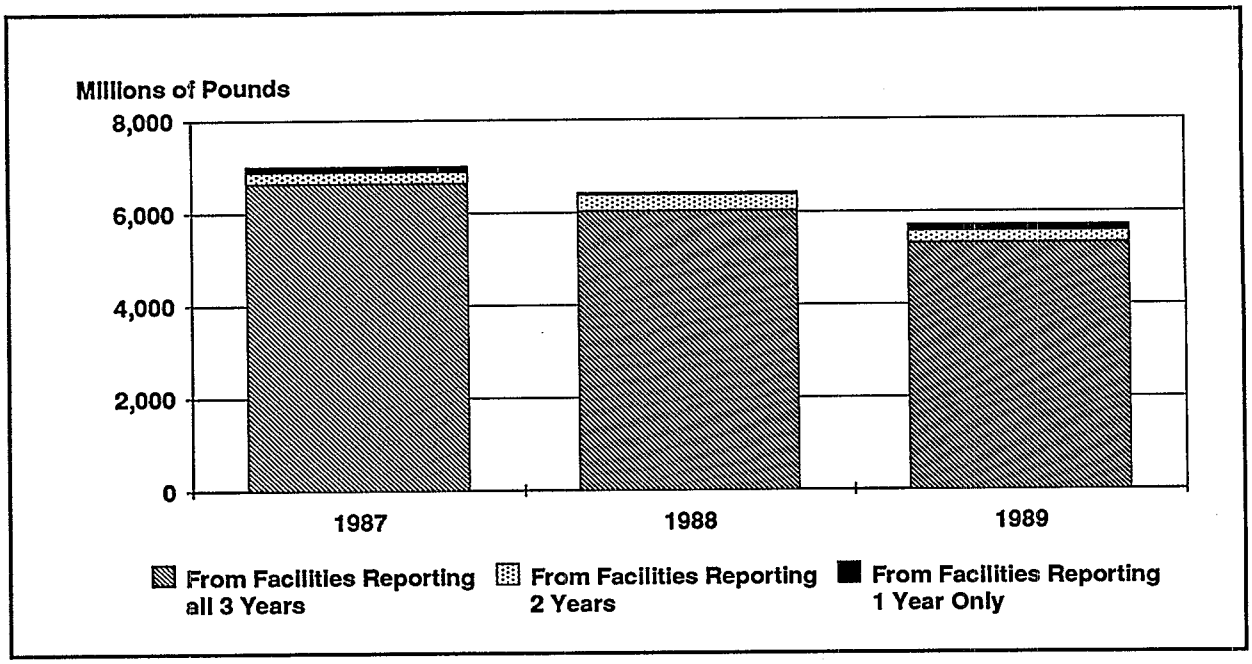

Figure 8-2. TRI Releases and Transfers Reported Across the Years.

Table 8-8. TRI Reporting in 1987, 1988 and 1989 Compared.

	FACILITIES	TOTAL RELEASES AND TRANSFERS 1989		TOTAL RELEASES AND TRANSFERS 1988		TOTAL RELEASES AND TRANSFERS 1987	
	Number	Pounds	Percent	Pounds	Percent	Pounds	Percent
Reported in All Three Years	15,432	5,322,521,888	93.28	6,019,204,349	93.66	6,636,398,975	94.65
Reported Two years only							
1989 and 1988	3,171	208,446,978	3.65	202,015,026	3.14	—	—
1989 and 1987	823	40,918,006	0.72	—	—	47,578,389	0.68
1988 and 1987	1,496	—	—	162,492,390	2.53	210,363,735	3.00
Reported in 1989 only	3,143	133,783,508	2.34	—	—	—	—
Reported in 1988 only	1,045	—	—	42,772,846	0.67	—	—
Reported in 1987 only	1,866	—	—	—	—	116,902,941	1.67
TOTAL	26,976	5,705,670,380	100.00	6,426,484,611	100.00	7,011,244,040	100.00

Details Of Changes Over Three Years, 1987 To 1989

There was an overall decrease in total TRI releases and transfers from 1987 to 1989.

As with the changes reported for the two years 1988 and 1989, there was an overall *decrease* in total TRI releases and transfers for the three years from 1987 to 1989. For the whole TRI database, the decrease for the first two years (1987 to 1988) was 8 percent, and the decrease for the next two years (1988 to 1989) was 11 percent. The net decrease in TRI releases and transfers from 1987 to 1989 was 19 percent. (See Figure 8-2.)

Over 68 percent of the TRI facilities reporting in 1989 (15,432 facilities out of the 22,569 reporting in 1989) have reported in all three years. The total releases and transfers reported by these facilities is close to 93 percent of the TRI total for each year. Thus, a number of facilities with smaller average releases and transfers have been added to or dropped from the database since 1987, while those with larger average releases and transfers have reported in all three years. (See Table 8-8.)

There were 3,143 new facilities reporting for the first time in 1989, representing 14 percent of all the 1989 TRI facilities. However, the releases and transfers on these forms were just 133.8 million pounds, or 2 percent of all TRI releases and transfers in 1989. There were 3,171 facilities reporting in only the last two years, 1988 and 1989, and these facilities reported 208.4 million pounds, or 4 percent of the 1989 TRI total releases and transfers.

Some facilities entered the database because the thresholds for reporting had dropped, because their activities involving TRI chemicals have expanded, or because of compliance efforts. Others have ceased to report. There were 1,866 facilities that reported in 1987 but not in subsequent years. Although they represented almost 10 percent of the 19,617 facilities reporting in 1987, the pounds reported by these facilities were just 2 percent of the 1987 TRI total. Likewise, 1,045 facilities submitted reports only in 1988, and an additional 1,496 reported in 1987 and 1988 but not in 1989. This total of 2,541 facilities that did not report to TRI for all three years represents 12 percent of the 21,144 facilities reporting in 1988, but their releases and transfers were just 3 percent of the 1988 TRI total.

The forms discussed above do not include delisted chemicals, so the reasons that these facilities no longer report to the TRI database may be: (1) they no longer manufacture, process or use any TRI chemicals, (2) their activities have dropped below the 1989 threshold level of 25,000 pounds when once it was above either the 1988 threshold of 50,000 pounds or the 1987 threshold of 75,000 pounds, for manufacture or processing, or (3) they may have ceased operations or have reduced their workforce to below ten employees. Also, some facilities could have changed their operations and now fall outside the manufacturing SIC codes of 20 through 39, and therefore would not be required to report to TRI, even though they may still have activities involving the TRI chemicals. (See further discussion of facilities reporting in one year and not another in Chapter 4, Box 4-A.)

TRI facilities reporting for the first time in 1989 represented only 2% of TRI total releases and transfers in 1989.

As mentioned above, the relative impact of the facilities that have been added or have ceased to report, upon total TRI releases and transfers has been small—in 1989, 93 percent (5.3 out of 5.7 billion pounds) of all releases and transfers were reported by facilities that had also reported in the previous two years. New TRI facilities, reporting for the first time in 1989, represented only 2 percent of the TRI total releases and transfers for 1989, and those reporting for two years but not all three (either 1988 and 1989, or 1987 and 1989) represented the other 5 percent.

For the 15,432 facilities that reported in all three years, total TRI releases and transfers decreased by 12 percent from 1988 to 1989 and by 20 percent over the entire period from 1987 to 1989. This is slightly more than the decrease found by including all releases and transfers reported by all facilities in each year, which was 11 percent from 1988 to 1989, and 19 percent from 1987 to 1989. The decrease in TRI releases and transfers from facilities reporting in all three years has been somewhat offset by the addition of new facilities. Therefore, in general the releases and transfers of the new facilities were offset by the absence of releases and transfers from facilities that ceased to report. (See Table 8-8.)

Details Of Facilities Reporting In All Three Years

Of the TRI total releases and transfers, 92% was reported by facilities that have reported to TRI for all 3 years.

A closer examination of the 15,432 facilities that reported to TRI in all three years indicates how they achieved their decreases. Almost 92 percent (4.9 out of 5.3 billion pounds) of the 1989 releases and transfers reported by these facilities represented chemicals that were manufactured, processed, or otherwise used at these facilities in all three years. The percentage decrease in total TRI releases and

Table 8-9. TRI Reporting by Facilities Reporting in all Three Years.

	FORMS 1989		TOTAL RELEASES AND TRANSFERS 1989			FORMS 1988		TOTAL RELEASES AND TRANSFERS 1988		
	Number	Percent	Pounds	Percent	Average Pounds	Number	Percent	Pounds	Percent	Average Pounds
Chemicals Reported in All Three Years	46,633	70.42	4,873,316,946	91.56	104,504	46,903	74.59	5,492,271,211	91.25	117,099
Chemicals Reported in Two Years Only										
1989 and 1988	8,656	13.07	246,107,648	4.62	28,432	8,691	13.82	272,625,374	4.53	31,369
1989 and 1987	1,611	2.43	30,128,063	0.57	18,701	—	—	—	—	—
1988 and 1987	—	—	—	—	—	4,344	6.91	183,950,616	3.06	42,346
Chemicals Reported in One Year Only										
Reported in 1989 only	9,321	14.08	172,969,231	3.25	18,557	—	—	—	—	—
Reported in 1988 only	—	—	—	—	—	2,944	4.68	70,357,148	1.17	23,898
Reported in 1987 only	—	—	—	—	—	—	—	—	—	—
TOTAL	66,221	100.00	5,322,521,888	100.00	80,375	62,882	100.00	6,019,204,349	100.00	95,722

transfers of these chemicals was 11 percent from 1988 to 1989, and 21 percent over the three years, 1987 to 1989. Again, this percent change is just slightly greater than the overall percent decrease, showing that generally these facility decreases were obtained by decreasing releases and transfers (through waste reduction measures, lowered production levels, waste treatment, or better understanding of TRI reporting) of TRI chemicals involved in the facility's activities for all three years, rather than substituting other chemicals for these chemicals or entirely ceasing activities involving these chemicals. Only about 3 percent of the TRI total releases and transfers for 1989 (173.0 million pounds) came from the processing, use, or manufacture of new TRI chemicals not reported by these facilities in 1988 or 1987. (See Table 8-9.)

The chemicals reported by these facilities over the entire three year period, while representing 70 percent of the TRI forms, represented 92 percent of the releases and transfers reported in 1989. (See Table 8-5.) Therefore, these chemicals had average releases and transfers significantly higher than those of the newly introduced chemicals or those whose process, use, or manufacture has been dropped. In 1989, releases and transfers of the chemicals reported for the third year in a row averaged 104,504 pounds per form, while the new chemicals reported averaged 18,557, and the chemicals reported only in the last two years averaged 28,432 pounds.

Table 8-9. TRI Reporting by Facilities Reporting in all Three Years.

	FORMS 1987		TOTAL RELEASES AND TRANSFERS 1987		
	Number	Percent	Pounds	Percent	Average Pounds
Chemicals Reported in All Three Years	47,316	80.02	6,151,917,264	92.70	130,018
Chemicals Reported in Two Years Only					
1989 and 1988	—	—	—	—	—
1989 and 1987	1,648	2.79	49,041,746	0.74	29,758
1988 and 1987	4,380	7.41	225,699,745	3.40	51,530
Chemicals Reported in One Year Only					
Reported in 1989 only	—	—	—	—	—
Reported in 1988 only	—	—	—	—	—
Reported in 1987 only	5,787	9.79	209,740,220	3.16	36,243
TOTAL	59,131	100.00	6,636,398,975	100.00	112,232

The above figures may be due in part to the changing reporting requirements. Even facilities that have reported in all three years do not have to submit a form for a chemical if their activities involving that particular chemical fall below the threshold limits. As the TRI threshold limits have fallen from 75,000 pounds in 1987, to 50,000 pounds in 1988, to 25,000 pounds in 1989 for manufacture or process of a chemical, more reports per facility may be required even with no change in the facility's operations. The data throughout this report are normalized as to the universe of chemicals being reported (that is, forms for delisted chemicals are taken out of the data for each of the three years, and facilities are also removed if they only reported delisted chemicals, as noted above). However, it is not possible to normalize the data based on changes in TRI threshold requirements because there is no indication why a facility is reporting in one year and not another.

NOTES

1. Sometimes only part of a TRI facility at a given address changes ownership. In that case, the part that is sold receives a new TRI facility ID, and the rest of the facility retains the old number.

2. While the technical contact name is required on the Form R, only the public contact of each TRI facility is included in the publicly available TRI database.

3. *Standard Industrial Classification Manual*, Executive Office of the President/Office of Management and Budget, 1987.

4. *Toxic Chemical Release Inventory Reporting Form R and Instructions*, EPA 560/4-90-007, January 1990, as cited from Section 313 of EPCRA.

APPENDIX A

TRI Form R

Form Approved OMB No.: 2070-0093
Approval Expires: 01/91

(Important: Type or print: read instructions before completing form.)

EPA U.S. Environmental Protection Agency

TOXIC CHEMICAL RELEASE INVENTORY REPORTING FORM

Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act

Public reporting burden for this collection of information is estimated to vary from 30 to 34 hours per response, with an average of 32 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch (PM-223), US EPA, 401 M St., SW, Washington, D.C. 20460 Attn: TRI Burden and to the Office of Information and Regulatory Affairs, Office of Management and Budget Paperwork Reduction Project (2070-0093), Washington, D.C. 20603.

EPA FORM R

PART I. FACILITY IDENTIFICATION INFORMATION

(This space for your optional use.)

1. 1.1 Are you claiming the chemical identity on page 3 trade secret? [ ] Yes (Answer question 1.2; Attach substantiation forms.) [ ] No (Do not answer 1.2; Go to question 1.3.)

1.2 If "Yes" in 1.1, is this copy: [ ] Sanitized [ ] Unsanitized

1.3 Reporting Year 19___

2. CERTIFICATION (Read and sign after completing all sections.)

I hereby certify that I have reviewed the attached documents and that, to the best of my knowledge and belief, the submitted information is true and complete and that the amounts and values in this report are accurate based on reasonable estimates using data available to the preparers of this report.

Name and official title of owner/operator or senior management official

Signature | Date signed

3. FACILITY IDENTIFICATION

3.1
- Facility or Establishment Name
- Street Address
- City | County
- State | Zip Code
- TRI Facility Identification Number

WHERE TO SEND COMPLETED FORMS:

1. EPCRA REPORTING CENTER
   P.O. BOX 23779
   WASHINGTON, DC 20026-3779
   ATTN: TOXIC CHEMICAL RELEASE INVENTORY

2. APPROPRIATE STATE OFFICE (See instructions in Appendix G)

3.2 This report contains information for (Check only one): a. [ ] An entire facility b. [ ] Part of a facility.

3.3 Technical Contact | Telephone Number (include area code)

3.4 Public Contact | Telephone Number (include area code)

3.5 SIC Code (4 digit) a. b. c. d. e. f.

3.6

Latitude			Longitude		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

3.7 Dun & Bradstreet Number(s) a. b.

3.8 EPA Identification Number(s) (RCRA I.D. No.) a. b.

3.9 NPDES Permit Number(s) a. b.

3.10 Receiving Streams or Water Bodies (enter one name per box) a. b. c. d. e. f.

3.11 Underground Injection Well Code (UIC) Identification Number(s) a. b.

4. PARENT COMPANY INFORMATION

4.1 Name of Parent Company | 4.2 Parent Company's Dun & Bradstreet Number

(Important: Type or print; read instructions before completing form.)

EPA

EPA FORM R
PART II. OFF-SITE LOCATIONS TO WHICH TOXIC CHEMICALS ARE TRANSFERRED IN WASTES

(This space for your optional use.)

1. PUBLICLY OWNED TREATMENT WORKS (POTWs)

1.1 POTW name		1.2 POTW name	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip

2. OTHER OFF-SITE LOCATIONS (DO NOT REPORT LOCATIONS TO WHICH WASTES ARE SENT ONLY FOR RECYCLING OR REUSE).

2.1 Off-site location name		2.2 Off-site location name	
EPA Identification Number (RCRA ID. No.)		EPA Identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	

2.3 Off-site location name		2.4 Off-site location name	
EPA Identification Number (RCRA ID. No.)		EPA Identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	

2.5 Off-site location name		2.6 Off-site location name	
EPA Identification Number (RCRA ID. No.)		EPA Identification Number (RCRA ID. No.)	
Street Address		Street Address	
City	County	City	County
State	Zip	State	Zip
Is location under control of reporting facility or parent company? [ ] Yes [ ] No		Is location under control of reporting facility or parent company? [ ] Yes [ ] No	

[ ] Check if additional pages of Part II are attached. How many? _____

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EPA EPA FORM **R**

PART III. CHEMICAL-SPECIFIC INFORMATION

(This space for your optional use.)

1. CHEMICAL IDENTITY (Do not complete this section if you complete Section 2.)

1.1	[Reserved]
1.2	CAS Number (Enter only one number exactly as it appears on the 313 list. Enter NA if reporting a chemical category.)
1.3	Chemical or Chemical Category Name (Enter only one name exactly as it appears on the 313 list.)
1.4	Generic Chemical Name (Complete only if Part I, Section 1.1 is checked "Yes." Generic name must be structurally descriptive.)

2. MIXTURE COMPONENT IDENTITY (Do not complete this section if you complete Section 1.)

Generic Chemical Name Provided by Supplier (Limit the name to a maximum of 70 characters (e.g., numbers, letters, spaces, punctuation).)

3. ACTIVITIES AND USES OF THE CHEMICAL AT THE FACILITY (Check all that apply.)

			If produce or import:		
3.1	Manufacture the chemical:	a. [ ] Produce b. [ ] Import	c. [ ] For on-site use/processing e. [ ] As a byproduct	d. [ ] For sale/ distribution f. [ ] As an impurity	
3.2	Process the chemical:	a. [ ] As a reactant d. [ ] Repackaging only	b. [ ] As a formulation component	c. [ ] As an article component	
3.3	Otherwise use the chemical:	a. [ ] As a chemical processing aid	b. [ ] As a manufacturing aid	c. [ ] Ancillary or other use	

4. MAXIMUM AMOUNT OF THE CHEMICAL ON-SITE AT ANY TIME DURING THE CALENDAR YEAR

☐☐ (enter code)

5. RELEASES OF THE CHEMICAL TO THE ENVIRONMENT ON-SITE

You may report releases of less than 1,000 pounds by checking ranges under A.1. (Do not use both A.1 and A.2)		A. Total Release (pounds/year) A.1 Reporting Ranges 0 / 1–499 / 500–999	A.2 Enter Estimate	B. Basis of Estimate (enter code)	C. % From Stormwater
5.1 Fugitive or non-point air emissions	5.1a	[ ] [ ] [ ]		5.1b ☐	
5.2 Stack or point air emissions	5.2a	[ ] [ ] [ ]		5.2b ☐	
5.3 Discharges to receiving streams or water bodies (Enter letter code for stream from Part I Section 3.10 in the box provided.) 5.3.1 ☐	5.3.1a	[ ] [ ] [ ]		5.3.1b ☐	5.3.1c %
5.3.2 ☐	5.3.2a	[ ] [ ] [ ]		5.3.2b ☐	5.3.2c %
5.3.3 ☐	5.3.3a	[ ] [ ] [ ]		5.3.3b ☐	5.3.3c %
5.4 Underground injection on-site	5.4a	[ ] [ ] [ ]		5.4b ☐	
5.5 Releases to land on-site					
5.5.1 Landfill	5.5.1a	[ ] [ ] [ ]		5.5.1b ☐	
5.5.2 Land treatment/application farming	5.5.2a	[ ] [ ] [ ]		5.5.2b ☐	
5.5.3 Surface impoundment	5.5.3a	[ ] [ ] [ ]		5.5.3b ☐	
5.5.4 Other disposal	5.5.4a	[ ] [ ] [ ]		5.5.4b ☐	

[ ] (Check if additional information is provided on Part IV–Supplemental Information.)

(Important: Type or print; read instructions before completing form.)

EPA

EPA FORM R

PART III. CHEMICAL-SPECIFIC INFORMATION (continued)

(This space for your optional use.)

6. TRANSFERS OF THE CHEMICAL IN WASTE TO OFF-SITE LOCATIONS

You may report transfers of less than 1,000 pounds by checking ranges under A.1. (Do not use both A.1 and A.2)	A. Total Transfers (pounds/year) A.1 Reporting Ranges 0 / 1–499 / 500–999	A. Total Transfers (pounds/year) A.2 Enter Estimate	B. Basis of Estimate (enter code)	C. Type of Treatment/ Disposal (enter code)
6.1.1 Discharge to POTW (enter location number from Part II, Section 1.) 1 .	[ ] [ ] [ ]		6.1.1b	
6.2.1 Other off-site location (enter location number from Part II, Section 2.) 2 .	[ ] [ ] [ ]		6.2.1b	6.2.1c M
6.2.2 Other off-site location (enter location number from Part II, Section 2.) 2 .	[ ] [ ] [ ]		6.2.2b	6.2.2c M
6.2.3 Other off-site location (enter location number from Part II, Section 2.) 2 .	[ ] [ ] [ ]		6.2.3b	6.2.3c M

[ ] (Check if additional information is provided on Part IV-Supplemental Information.)

7. WASTE TREATMENT METHODS AND EFFICIENCY

[ ] Not Applicable (NA) – Check if no on-site treatment is applied to any wastestream containing the chemical or chemical category.

A. General Wastestream (enter code)	B. Treatment Method (enter code)	C. Range of Influent Concentration (enter code)	D. Sequential Treatment? (check if applicable)	E. Treatment Efficiency Estimate	F. Based on Operating Data? Yes / No
7.1a	7.1b	7.1c	7.1d [ ]	7.1e %	7.1f [ ] [ ]
7.2a	7.2b	7.2c	7.2d [ ]	7.2e %	7.2f [ ] [ ]
7.3a	7.3b	7.3c	7.3d [ ]	7.3e %	7.3f [ ] [ ]
7.4a	7.4b	7.4c	7.4d [ ]	7.4e %	7.4f [ ] [ ]
7.5a	7.5b	7.5c	7.5d [ ]	7.5e %	7.5f [ ] [ ]
7.6a	7.6b	7.6c	7.6d [ ]	7.6e %	7.6f [ ] [ ]
7.7a	7.7b	7.7c	7.7d [ ]	7.7e %	7.7f [ ] [ ]
7.8a	7.8b	7.8c	7.8d [ ]	7.8e %	7.8f [ ] [ ]
7.9a	7.9b	7.9c	7.9d [ ]	7.9e %	7.9f [ ] [ ]
7.10a	7.10b	7.10c	7.10d [ ]	7.10e %	7.10f [ ] [ ]

[ ] (Check if additional information is provided on Part IV-Supplemental Information.)

8. POLLUTION PREVENTION: OPTIONAL INFORMATION ON WASTE MINIMIZATION

(Indicate actions taken to reduce the amount of the chemical being released from the facility. See the instructions for coded items and an explanation of what information to include.)

A. Type of Modification (enter code)	B. Quantity of the Chemical in Wastes Prior to Treatment or Disposal: Current reporting year (pounds/year)	Prior year (pounds/year)	Or percent change (Check (+) or (-))	C. Index	D. Reason for Action (enter code)
M			[ ] + [ ] - %	.	R

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EPA **EPA FORM R**

PART IV. SUPPLEMENTAL INFORMATION

Use this section if you need additional space for answers to questions in Part III. Number the lines used sequentially from lines in prior sections (e.g., 5.3.4. 6.1.2. 7.11)

(This space for your optional use.)

ADDITIONAL INFORMATION ON RELEASES OF THE CHEMICAL TO THE ENVIRONMENT ON-SITE (Part III, Section 5.3)

You may report releases of less than 1,000 pounds by checking ranges under A.1. (Do not use both A.1 and A.2)	A. Total Release (pounds/year) A.1 Reporting Ranges 0 / 1–499 / 500–999	A. Total Release (pounds/year) A.2 Enter Estimate	B. Basis of Estimate (enter code in box provided)	C. % From Stormwater
5.3 Discharges to receiving streams or water bodies 5.3.___ ☐	5.3.___a [ ] [ ] [ ]		5.3.___b ☐	5.3.___c %
(Enter letter code for stream from Part I Section 3.10 in the box provided.) 5.3.___ ☐	5.3.___a [ ] [ ] [ ]		5.3.___b ☐	5.3.___c %
5.3.___ ☐	5.3.___a [ ] [ ] [ ]		5.3.___b ☐	5.3.___c %

ADDITIONAL INFORMATION ON TRANSFERS OF THE CHEMICAL IN WASTE TO OFF-SITE LOCATIONS (Part III, Section 6)

You may report transfers of less than 1,000 pounds by checking ranges under A.1. (Do not use both A.1 and A.2)	A. Total Transfers (pounds/year) A.1 Reporting Ranges 0 / 1–499 / 500–999	A. Total Transfers (pounds/year) A.2 Enter Estimate	B. Basis of Estimate (enter code in box provided)	C. Type of Treatment/ Disposal (enter code in box provided)
6.1.___ Discharge to POTW (enter location number from Part II, Section 1.) 1 ☐	[ ] [ ] [ ]		6.1.___b ☐	
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐☐
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐☐
6.2.___ Other off-site location (enter location number from Part II, Section 2.) 2 ☐	[ ] [ ] [ ]		6.2.___b ☐	6.2.___c M ☐☐

ADDITIONAL INFORMATION ON WASTE TREATMENT METHODS AND EFFICIENCY (Part III, Section 7)

A. General Wastestream (enter code in box provided)	B. Treatment Method (enter code in box provided)	C. Range of Influent Concentration (enter code)	D. Sequential Treatment? (check if applicable)	E. Treatment Efficiency Estimate	F. Based on Operating Data? Yes / No
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]
7.___a ☐	7.___b ☐☐☐	7.___c ☐	7.___d [ ]	7.___e %	7.___f [ ] [ ]

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APPENDIX B

TRI Chemicals, 1989

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS	APPLICABLE REGULATION				HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
									ACUTE		CHRONIC			ACUTE		CHRN		
				Pounds					TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
51	O	75-07-0	Acetaldehyde	10,134,192			A	V	-	3	-	-	-	2	-	-	-	-
258	O	60-35-5	Acetamide	250			A	V	-	-	-	-	-	-	-	-	1	-
7	O	67-64-1	Acetone	255,502,080				V	-	-	-	-	2	3	-	-	-	-
38	O	75-05-8	Acetonitrile	25,322,766			A	V	-	3	2	2	1	3	-	-	-	-
—	O	53-96-3	2-Acetylaminofluorene	0			A	V	-	3	-	-	-	-	-	-	1	-
184	O	107-02-8	Acrolein	72,493		P	A	V	2	1	-	-	-	1	1	1	-	-
71	O	79-06-1	Acrylamide	4,625,675			A	V	3	3	-	-	-	-	-	-	1	-
44	O	79-10-7	Acrylic acid	19,337,422			A	V	-	3	-	-	-	-	-	-	-	-
50	O	107-13-1	Acrylonitrile	12,280,895		P	A	V	3	2	1	-	-	1	2	2	1	-
—	H	309-00-2	Aldrin	0	P		V		2	2	-	-	1	1	1	-	-	-
150	H	107-05-1	Allyl chloride	357,087			A	V	-	2	-	-	-	2	-	-	-	-
40	M	7429-90-5	Aluminum (fume or dust)	21,749,423					-	-	-	-	-	-	-	-	-	-
—	O	117-79-3	2-Aminoathraquinone	0				V	-	-	-	-	-	-	-	-	1	-
256	O	60-09-3	4-Aminoazobenzene	353				V	-	-	-	-	-	-	-	-	1	-
264	O	92-67-1	4-Aminobiphenyl	10			A	V	-	-	-	-	-	-	-	-	1	-
—	O	82-28-0	1-Amino-2-methylanthraquinone	0				V	-	-	-	-	-	-	-	-	1	-
4	N	7664-41-7	Ammonia	377,248,848					2	3	2	2	3	1	-	-	-	-
18	A	6484-52-2	Ammonium nitrate (solution)	73,313,949					-	-	-	-	-	-	-	-	-	-
1	A	7783-20-2	Ammonium sulfate (solution)	750,649,064					-	-	-	-	-	-	-	-	-	-
63	O	62-53-3	Aniline	7,000,181			A	V	3	2	-	-	-	2	-	-	-	-
214	O	90-04-0	o-Anisidine	13,855			A	V	-	-	-	-	-	-	-	-	1	-
257	O	104-94-9	p-Anisidine	254				V	-	-	-	-	-	-	-	-	-	-
—	H	134-29-2	o-Anisidine hydrochloride	0				V	-	-	-	-	-	-	-	-	1	-
147	O	120-12-7	Anthracene	389,443		P		V	-	-	-	-	-	-	-	-	-	-
116	M	7440-36-0	Antimony	1,076,230		P			-	-	-	-	1	-	2	2	-	-
143	N	7440-38-2	Arsenic	447,018	N	P			-	-	-	-	1	-	-	-	1	-
56	N	1332-21-4	Asbestos (friable)	8,944,353	N	P	A		-	-	1	-	-	-	-	-	1	-
80	M	7440-39-3	Barium	3,843,773					-	-	-	1	2	-	-	-	-	-
156	H	98-87-3	Benzal chloride	285,456				V	2	3	-	-	-	-	-	-	-	-
240	O	55-21-0	Benzamide	1,750				V	-	-	-	-	-	-	-	-	-	-
35	O	71-43-2	Benzene	28,591,407	N	P	A	V	-	3	2	-	-	1	2	-	1	1
—	O	92-87-5	Benzidine	0		P	A	V	-	3	1	-	1	1	2	-	1	-
202	H	98-07-7	Benzoic trichloride	29,392			A	V	1	2	-	-	-	-	-	-	1	-
131	H	98-88-4	Benzoyl chloride	640,388				V	-	-	-	-	-	2	-	-	-	-
160	O	94-36-0	Benzoyl peroxide	250,803				V	-	-	-	-	-	-	-	-	-	-
173	H	100-44-7	Benzyl chloride	99,897			A	V	2	2	-	-	-	1	-	-	-	-
200	M	7440-41-7	Beryllium	35,498	N	P			-	-	-	-	1	2	1	1	1	-
92	O	92-52-4	Biphenyl	2,485,293			A	V	-	-	-	-	-	-	-	-	-	-
191	H	111-44-4	Bis(2-chloroethyl) ether	53,293		P	A	V	3	2	-	-	-	3	-	-	-	-
265	H	542-88-1	Bis(chloromethyl) ether	3			A	V	1	1	-	-	-	-	-	-	1	-
212	H	108-60-1	Bis(2-chloro-1-methylethyl)ether	15,350		P		V	-	3	2	-	-	-	-	-	-	-
144	O	103-23-1	Bis(2-ethylhexyl) adipate	422,546				V	-	-	-	-	-	-	-	-	1	-
—	H	75-25-2	Bromoform	0		P	A	V	-	3	1	-	2	2	-	-	-	-
89	H	74-83-9	Bromomethane	2,646,185		P	A	V	3	2	-	-	-	3	-	-	-	-
66	O	106-99-0	1,3-Butadiene	6,136,125			A	V	-	-	-	-	-	-	-	-	1	-
119	O	141-32-2	Butyl acrylate	977,084				V	-	-	-	-	-	-	-	-	-	-
25	O	71-36-3	n-Butyl alcohol	50,095,319				V	-	3	-	-	-	-	-	-	-	-
115	O	78-92-2	sec-Butyl alcohol	1,086,111				V	-	-	-	-	-	-	-	-	-	-
75	O	75-65-0	tert-Butyl alcohol	4,405,880				V	-	-	-	-	-	-	-	-	-	-
111	O	85-68-7	Butyl benzyl phthalate	1,251,502		P		V	-	-	-	-	2	1	-	-	-	-
169	O	106-88-7	1,2-Butylene oxide	124,653			A	V	-	-	-	-	-	-	-	-	-	-
97	O	123-72-8	Butyraldehyde	2,165,033				V	-	-	-	-	-	-	-	-	-	-
—	O	4680-78-8	C.I. Acid Green 3	0				V	-	-	-	-	-	-	-	-	-	-
233	O	569-64-2	C.I. Basic Green 4	2,743				V	-	-	-	-	-	-	-	-	-	-
259	O	989-38-8	C.I. Basic Red 1	250				V	-	-	-	-	-	-	-	-	1	-
250	O	1937-37-7	C.I. Direct Black 38	750				V	-	-	-	-	-	-	-	-	1	-
—	O	2602-46-2	C.I. Direct Blue 6	0				V	-	-	-	-	-	-	-	-	1	-
—	M	16071-86-6	C.I. Direct Brown 95	0					-	-	-	-	-	-	-	-	1	-
241	O	2832-40-8	C.I. Disperse Yellow 3	1,542				V	-	-	-	-	-	-	-	-	-	-
—	O	3761-53-3	C.I. Food Red 5	0				V	-	-	-	-	-	-	-	-	1	-
260	O	81-88-9	C.I. Food Red 15	250				V	-	-	-	-	-	-	-	-	1	-

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS Pounds	APPLICABLE REGULATION			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
								ACUTE		CHRONIC			ACUTE		CHRN.		
								TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
—	O	3118-97-6	C.I. Solvent Orange 7	0			V	-	-	-	-	-	-	-	-	-	-
—	O	97-56-3	C.I. Solvent Yellow 3	0			V	-	-	-	-	-	-	-	-	1	-
242	O	842-07-9	C.I. Solvent Yellow 14	1,500			V	-	-	-	-	-	-	-	-	1	-
—	O	492-80-8	C.I. Solvent Yellow 34	0			V	-	-	-	-	-	-	-	-	1	-
—	O	128-66-5	C.I. Vat Yellow 4	0			V	-	-	-	-	-	-	-	-	-	-
148	M	7440-43-9	Cadmium	387,918		P		-	3	-	-	1	-	1	1	1	1
210	O	156-62-7	Calcium cyanamide	16,220			A V	-	-	-	-	-	-	-	-	-	-
194	O	133-06-2	Captan	48,267		A	V	-	3	2	-	-	1	-	-	-	-
188	O	63-25-2	Carbaryl	59,407		A	V	-	3	-	-	-	1	-	-	-	-
15	O	75-15-0	Carbon disulfide	100,150,670			A V	3	2	1	-	-	3	-	-	-	-
72	H	56-23-5	Carbon tetrachloride	4,607,809		P	A V	-	3	1	-	1	2	3	-	1	1
45	O	463-58-1	Carbonyl sulfide	17,990,444			A V	-	-	-	-	-	-	-	-	-	-
122	O	120-80-9	Catechol	882,689			A V	-	-	-	-	-	-	-	-	-	-
—	H	133-90-4	Chloramben	0		A	V	-	-	-	-	-	-	-	-	-	-
222	H	57-74-9	Chlordane	6,893	P	A	V	3	2	-	-	1	1	1	1	-	-
12	N	7782-50-5	Chlorine	141,428,470			A	1	2	-	-	-	1	1	1	-	-
64	N	10049-04-4	Chlorine dioxide	6,995,636				-	-	-	-	-	-	-	-	-	-
197	H	79-11-8	Chloroacetic acid	40,442			A V	1	2	1	-	1	-	-	-	-	-
—	H	532-27-4	2-Chloroacetophenone	0			A V	-	-	-	-	-	-	-	-	-	-
57	H	108-90-7	Chlorobenzene	8,589,998		P	A V	-	3	2	1	2	1	-	-	-	-
—	H	510-15-6	Chlorobenzilate	0		A	V	-	3	-	-	-	-	-	-	-	-
68	H	75-00-3	Chloroethane	5,255,383		P	A V	-	3	-	-	-	3	-	-	-	-
36	H	67-66-3	Chloroform	27,325,508		P	A V	3	3	-	-	2	2	3	2	1	1
55	H	74-87-3	Chloromethane	9,279,868		P	A	-	3	2	-	-	3	-	-	-	-
262	H	107-30-2	Chloromethyl methyl ether	130			A V	1	2	1	-	-	3	-	-	1	-
112	H	126-99-8	Chloroprene	1,239,210			A V	-	-	-	-	-	-	-	-	-	-
151	H	1897-45-6	Chlorothalonil	347,278			V	-	-	-	-	-	-	-	-	-	-
47	M	7440-47-3	Chromium	13,403,332		P		-	-	-	-	-	-	-	-	1	1
135	M	7440-48-4	Cobalt	563,788				-	-	-	-	-	-	-	-	-	-
37	M	7440-50-8	Copper	26,771,263		P		-	-	-	-	3	-	1	1	-	-
198	O	120-71-8	p-Cresidine	38,760			V	-	-	-	-	-	-	-	-	1	-
81	O	1319-77-3	Cresol (mixed isomers)	3,779,175			A V	-	3	1	-	-	1	-	-	-	-
178	O	108-39-4	m-Cresol	83,949			A V	-	-	-	-	2	-	-	-	-	-
159	O	95-48-7	o-Cresol	260,439			A V	3	-	-	-	2	-	-	-	-	-
91	O	106-44-5	p-Cresol	2,522,898			A V	-	-	-	-	2	-	-	-	-	-
69	O	98-82-8	Cumene	4,819,808			A V	-	3	-	-	-	-	-	-	-	-
134	O	80-15-9	Cumene hydroperoxide	600,562			V	-	2	-	-	-	-	-	-	-	-
231	O	135-20-6	Cupferron	3,134			V	-	-	-	-	-	-	-	-	1	-
105	M	1313-27-5	Molybdenum trioxide	1,396,999				-	-	-	-	-	-	-	-	-	-
43	O	110-82-7	Cyclohexane	19,750,323			V	-	3	-	-	-	2	-	-	-	-
149	H	94-75-7	2,4-D (acetic acid)	373,947			A V	-	-	-	-	-	-	-	-	-	-
120	H	1163-19-5	Decabromodiphenyl oxide	942,972			V	-	-	-	-	-	-	-	-	-	-
—	O	2303-16-4	Diallate	0			V	-	3	-	-	-	-	-	-	-	-
254	O	615-05-4	2,4-Diaminoanisole	500			V	-	-	-	-	-	-	-	-	1	-
261	O	39156-41-7	2,4-Diaminoanisole sulfate	250			V	-	-	-	-	-	-	-	-	1	-
224	O	101-80-4	4,4'-Diaminodiphenyl ether	6,229			V	-	-	-	-	-	-	-	-	1	-
113	O	25376-45-8	Diaminotoluene (mixed isomers)	1,228,772			V	-	3	-	-	-	-	-	-	1	-
226	O	95-80-7	2,4-Diaminotoluene	5,926			A V	-	3	-	-	-	-	-	-	1	-
—	O	334-88-3	Diazomethane	0		A	V	-	-	-	-	-	-	-	-	-	-
154	O	132-64-9	Dibenzofuran	290,174			A V	-	-	-	-	-	-	-	-	-	-
—	H	96-12-8	1,2-Dibromo-3-chloropropane	0			A V	-	2	-	-	-	-	-	-	1	-
163	H	106-93-4	1,2-Dibromoethane	187,311			A V	-	2	-	-	-	2	-	-	1	-
118	O	84-74-2	Dibutyl phthalate	990,582		P	A V	-	3	2	-	-	1	-	-	-	-
130	H	25321-22-6	Dichlorobenzene (mixed isomers)	683,546			V	-	-	2	-	-	1	2	1	1	-
87	H	95-50-1	1,2-Dichlorobenzene	3,216,166		P	V	-	3	2	2	2	1	-	-	-	-
215	H	541-73-1	1,3-Dichlorobenzene	11,720		P	V	-	-	2	-	-	1	-	-	-	-
100	H	106-46-7	1,4-Dichlorobenzene	1,725,392		P	A V	-	3	2	2	-	1	-	-	1	-
206	H	91-94-1	3,3'-Dichlorobenzidine	23,032			A V	-	3	-	-	-	-	-	-	1	-
—	H	75-27-4	Dichlorobromomethane	0		P	V	-	3	-	-	-	-	-	-	-	-
53	H	107-06-2	1,2-Dichloroethane	9,509,848		P	A V	-	3	2	-	-	3	1	3	1	-
162	H	540-59-0	1,2-Dichloroethylene	208,985		P	V	-	-	-	-	-	-	-	-	-	-

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS	APPLICABLE REGULATION			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
								ACUTE		CHRONIC			ACUTE		CHRN		
				Pounds				TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
13	H	75-09-2	Dichloromethane	130,355,581	P	A	V	-	3	2	-	2	3	-	-	1	1
168	H	120-83-2	2,4-Dichlorophenol	125,941	P		V	-	3	2	-	1	1	2	1	-	-
110	H	78-87-5	1,2-Dichloropropane	1,261,668	P	A	V	-	3	-	-	-	3	-	-	-	-
190	H	542-75-6	1,3-Dichloropropylene	55,861		A	V	-	3	1	-	-	1	-	-	1	-
227	H	62-73-7	Dichlorvos	5,767	A	V		3	2	-	-	-	1	-	-	-	-
211	H	115-32-2	Dicofol	15,588		V		-	3	-	-	-	1	-	-	-	-
—	O	1464-53-5	Diepoxybutane	0			V	2	2	-	-	-	-	-	-	1	-
79	O	111-42-2	Diethanolamine	4,077,078		A	V	-	-	-	-	-	-	-	-	-	-
82	O	117-81-7	Di-(2-ethylhexyl) phthalate	3,708,811	P	A	V	-	3	-	-	-	-	-	-	1	-
139	O	84-66-2	Diethyl phthalate	480,930	P		V	-	3	3	-	-	2	-	-	-	-
216	O	64-67-5	Diethyl sulfate	10,463		A	V	-	-	-	-	-	-	-	-	1	-
249	O	119-90-4	3,3'-Dimethoxybenzidine	753		A	V	-	3	-	-	-	-	-	-	1	-
—	O	60-11-7	4-Dimethylaminoazobenzene	0		A	V	-	3	-	-	-	-	-	-	1	-
—	O	119-93-7	3,3'-Dimethylbenzidine	0		A	V	-	3	-	-	-	-	-	-	1	-
—	O	79-44-7	Dimethylcarbamyl chloride	0		A	V	-	3	-	-	-	-	-	-	1	-
217	O	57-14-7	1,1-Dimethyl hydrazine	10,051		A	V	3	2	-	-	-	-	-	-	1	-
183	O	105-67-9	2,4-Dimethylphenol	73,791	P		V	-	3	-	-	-	1	2	-	-	-
123	O	131-11-3	Dimethyl phthalate	819,042	P	A	V	-	3	-	-	-	-	-	-	-	-
208	O	77-78-1	Dimethyl sulfate	18,187		A	V	2	1	-	-	-	2	-	-	1	-
166	O	534-52-1	4,6-Dinitro-o-cresol	149,312	P	A	V	1	1	1	-	-	1	-	-	-	-
138	O	51-28-5	2,4-Dinitrophenol	481,021	P	A	V	-	2	1	-	-	1	-	-	-	-
117	O	121-14-2	2,4-Dinitrotoluene	1,012,746	P	A	V	-	3	1	-	-	2	-	-	-	-
152	O	606-20-2	2,6-Dinitrotoluene	313,627	P		V	-	3	1	-	-	2	-	-	-	-
127	O	117-84-0	n-Dioctyl phthalate	719,442	P		V	-	-	-	-	-	-	-	-	-	-
101	O	123-91-1	1,4-Dioxane	1,516,708		A	V	-	3	-	-	-	3	-	-	1	-
—	O	122-66-7	1,2-Diphenylhydrazine	0	P	A	V	-	3	1	-	-	1	1	-	1	-
102	H	106-89-8	Epichlorohydrin	1,487,562		A	V	3	2	1	-	-	2	-	-	1	-
96	O	110-80-5	2-Ethoxyethanol	2,239,575			V	-	3	2	2	2	3	-	-	-	-
153	O	140-88-5	Ethyl acrylate	305,721		A	V	-	3	-	-	-	3	-	-	1	-
48	O	100-41-4	Ethylbenzene	13,304,664	P	A	V	-	3	3	-	2	2	3	-	-	-
221	H	541-41-3	Ethyl chloroformate	8,642			V	-	-	-	-	-	-	-	-	-	-
27	O	74-85-1	Ethylene	41,802,964			V	-	-	-	-	-	-	-	-	-	-
21	O	107-21-1	Ethylene glycol	57,792,359		A	V	-	-	-	-	3	-	-	-	-	-
—	O	151-56-4	Ethyleneimine	0		A	V	2	1	-	-	-	-	-	-	1	-
83	O	75-21-8	Ethylene oxide	3,447,067		A	V	3	2	-	-	-	2	-	-	1	-
205	O	96-45-7	Ethylene thiourea	23,476		A	V	-	-	-	-	-	3	-	-	1	-
167	O	2164-17-2	Fluometuron	142,323		V		-	-	-	-	-	-	-	-	-	-
33	O	50-00-0	Formaldehyde	30,042,348		A	V	2	2	1	-	-	2	-	-	1	-
19	H	76-13-1	Freon 113	67,837,298				-	-	-	-	-	-	-	-	-	-
180	H	76-44-8	Heptachlor	76,756	P	A	V	-	2	-	-	1	1	1	1	-	-
104	H	118-74-1	Hexachlorobenzene	1,458,420		P	A	V	-	3	1	-	1	-	-	-	1
77	H	87-68-3	Hexachloro-1,3-butadiene	4,212,851		P	A	V	-	2	2	-	1	1	1	1	-
171	H	77-47-4	Hexachlorocyclopentadiene	108,066		P	A	V	1	3	1	1	1	1	1	1	-
137	H	67-72-1	Hexachloroethane	498,714		P	A	V	-	3	2	-	1	1	1	1	-
—	H	1335-87-1	Hexachloronaphthalene	0				V	-	-	-	-	-	-	-	-	-
—	O	680-31-9	Hexamethylphosphoramide	0			A	V	-	-	-	-	-	-	-	-	1
172	N	302-01-2	Hydrazine	104,808			A		3	-	-	-	-	-	-	-	1
179	A	10034-93-2	Hydrazine sulfate	77,208					-	-	-	-	-	-	-	-	1
2	A	7647-01-0	Hydrochloric acid	495,609,047			A		2	3	-	-	-	3	-	-	-
78	A	74-90-8	Hydrogen cyanide	4,184,475					1	1	-	-	-	1	-	-	-
46	A	7664-39-3	Hydrogen fluoride	15,377,949			A		1	2	1	-	-	3	-	-	-
114	O	123-31-9	Hydroquinone	1,133,759			A	V	2	3	2	-	2	-	-	-	-
133	O	78-84-2	Isobutyraldehyde	634,728				V	-	-	-	-	-	-	-	-	-
59	O	67-63-0	Isopropyl alcohol (manufacturing)	7,661,243				V	-	-	-	-	-	-	-	-	1
126	O	80-05-7	4,4'-Isopropylidenediphenol	759,561				V	-	-	-	-	-	-	-	-	-
42	M	7439-92-1	Lead	19,872,648		P			-	3	-	-	-	-	1	1	1	1
236	H	58-89-9	Lindane	2,340	P	A	V		3	2	-	-	1	1	1	1	1	-
98	O	108-31-6	Maleic anhydride	1,914,385			A	V	-	3	-	-	-	3	-	-	-	-
207	M	12427-38-2	Maneb	18,520					-	-	-	-	-	-	-	-	-	-
34	M	7439-96-5	Manganese	29,924,164					-	-	-	1	2	-	-	-	-	-
165	M	7439-97-6	Mercury	159,405	N	P			-	1	-	-	1	1	1	1	-	1

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS	APPLICABLE REGULATION			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
								ACUTE		CHRONIC			ACUTE		CHRN.		
				Pounds				TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
3	O	67-56-1	Methanol	408,119,093	P	A	V	-	3	-	-	-	3	-	-	-	-
243	H	72-43-5	Methoxychlor	1,476	A	V		-	3	-	2	2	1	-	-	-	-
73	O	109-86-4	2-Methoxyethanol	4,501,008			V	-	-	-	1	1	-	-	-	-	-
155	O	96-33-3	Methyl acrylate	287,588			V	-	-	-	-	-	-	-	-	-	-
86	O	1634-04-4	Methyl tert-butyl ether	3,231,507		A	V	-	-	-	-	-	-	-	-	-	-
225	H	101-14-4	4,4'-Methylenebis(2-chloro aniline)	6,052		A	V	-	-	-	-	-	-	-	-	1	-
—	O	101-61-1	4,4'-Methylenebis(N,N-dimethyl)	0			V	-	-	-	-	-	-	-	-	1	-
88	O	101-68-8	Methylenebis(phenylisocyanate)	2,914,499		A	V	-	-	-	-	-	-	-	-	-	-
175	H	74-95-3	Methylene bromide	92,886			V	-	2	-	-	-	3	-	-	-	-
141	O	101-77-9	4,4'-Methyenedianiline	454,324		A	V	-	-	-	-	-	-	-	-	1	-
11	O	78-93-3	Methyl ethyl ketone	156,992,642		A	V	-	3	2	-	-	3	-	-	-	1
253	O	60-34-4	Methyl hydrazine	573		A	V	2	2	-	-	-	-	-	-	-	-
201	H	74-88-4	Methyl iodide	31,059		A	V	-	3	-	-	-	-	-	-	1	-
29	O	108-10-1	Methyl isobutyl ketone	38,849,703		A	V	-	3	-	2	2	-	-	-	-	1
199	O	624-83-9	Methyl isocyanate	38,012		A	V	2	1	-	-	-	-	-	-	-	-
60	O	80-62-6	Methyl methacrylate	7,392,226		A	V	-	3	2	-	-	3	-	-	-	-
204	O	90-94-8	Michler's ketone	26,847			V	-	-	-	-	-	-	-	-	1	-
—	O	505-60-2	Mustard gas	0			V	2	1	1	-	-	-	-	-	1	-
67	O	91-20-3	Naphthalene	6,119,710	P	A	V	-	3	-	-	2	1	2	1	-	-
252	O	134-32-7	alpha-Naphthylamine	672			V	-	3	-	-	-	1	-	-	1	-
—	O	91-59-8	beta-Naphthylamine	0			V	-	3	-	-	-	1	-	-	1	-
54	M	7440-02-0	Nickel	9,493,108	P			-	1	1	-	2	-	2	1	1	1
17	A	7697-37-2	Nitric acid	74,861,200				3	2	-	-	-	2	-	-	-	-
192	O	139-13-9	Nitrilotriacetic acid	49,555			V	-	-	-	-	-	-	-	-	1	-
251	O	99-59-2	5-Nitro-o-anisidine	750			V	-	-	-	-	-	-	-	-	1	-
129	O	98-95-3	Nitrobenzene	710,103	P	A	V	3	3	-	1	1	2	3	-	-	-
—	O	92-93-3	4-Nitrobiphenyl	0		A	V	-	-	-	-	-	-	-	-	1	-
—	O	1836-75-5	Nitrofen	0			V	-	-	-	-	-	-	-	-	1	-
—	O	51-75-2	Nitrogen mustard	0		V		1	1	-	-	-	-	-	-	1	-
176	O	55-63-0	Nitroglycerin	91,217			V	-	-	-	-	-	-	-	-	-	-
195	O	88-75-5	2-Nitrophenol	43,868	P		V	-	3	-	-	-	1	-	-	-	-
132	O	100-02-7	4-Nitrophenol	639,649	P	A	V	-	3	-	-	-	1	-	-	-	-
140	O	79-46-9	2-Nitropropane	467,256		A	V	-	2	-	-	-	-	-	-	1	-
234	O	156-10-5	p-Nitrosodiphenylamine	2,704			V	-	-	-	-	-	-	-	-	1	-
124	O	121-69-7	N,N-Dimethylaniline	785,539		A	V	-	-	-	-	-	-	-	-	-	-
—	O	924-16-3	N-Nitrosodi-n-butylamine	0			V	-	3	-	-	-	-	-	-	1	-
—	O	55-18-5	N-Nitrosodiethylamine	0		V		-	3	-	-	-	-	-	-	1	-
—	O	62-75-9	N-Nitrosodimethylamine	0	P	A	V	3	2	-	-	-	-	-	-	1	-
136	O	86-30-6	N-Nitrosodiphenylamine	560,208	P		V	-	3	-	-	-	1	-	-	-	-
—	O	621-64-7	N-Nitrosodi-n-propylamine	0	P		V	-	3	-	-	-	-	-	-	1	-
—	O	4549-40-0	N-Nitrosomethylvinylamine	0			V	-	2	-	-	-	-	-	-	1	-
—	O	59-89-2	N-Nitrosomorpholine	0		A	V	-	-	-	-	-	-	-	-	1	-
—	O	759-73-9	N-Nitroso-N-ethylurea	0			V	-	3	-	-	-	-	-	-	1	-
—	O	684-93-5	N-Nitroso-N-methylurea	0		A	V	-	3	-	-	-	-	-	-	1	-
—	O	16543-55-8	N-Nitrosonornicotine	0			V	-	-	-	-	-	-	-	-	1	-
—	O	100-75-4	N-Nitrosopiperidine	0			V	-	3	-	-	-	-	-	-	1	-
—	H	2234-13-1	Octochloronaphthalene	0			V	-	-	-	-	-	-	-	-	-	-
—	M	20816-12-0	Osmium tetroxide	0				-	2	-	-	-	-	-	-	-	-
223	O	56-38-2	Parathion	6,496	A	V		1	1	1	-	1	1	1	1	-	-
170	H	87-86-5	Pentachlorophenol	116,018	P	A	V	-	1	2	-	2	1	1	1	-	-
219	O	79-21-0	Peracetic acid	9,404			V	2	2	-	-	-	-	-	-	-	-
39	O	108-95-2	Phenol	24,963,185	P	A	V	2	3	2	-	2	2	3	2	-	-
193	O	106-50-3	p-Phenylenediamine	48,911		A	V	-	-	-	-	-	-	-	-	-	-
209	O	90-43-7	2-Phenylphenol	16,352			V	-	-	-	-	-	-	-	-	-	-
218	H	75-44-5	Phosgene	9,999		A	V	1	1	-	-	-	3	-	-	-	-
16	A	7664-38-2	Phosphoric acid	98,660,456				-	3	-	-	-	3	-	-	-	-
84	N	7723-14-0	Phosphorus (yellow or white)	3,400,677		A		1	2	-	-	-	1	-	-	-	-
74	O	85-44-9	Phthalic anhydride	4,444,673		A	V	-	3	-	-	-	-	-	-	-	-
109	O	88-89-1	Picric acid	1,266,237			V	-	-	-	-	-	-	-	-	-	-
76	H	1336-36-3	Polychlorinated biphenyls (PCBs)	4,233,611	P	A	V	-	-	-	-	-	1	1	1	1	-
—	O	1120-71-4	Propane sultone	0		A	V	-	3	-	-	-	-	-	-	1	-

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS	APPLICABLE REGULATION			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
								ACUTE		CHRONIC			ACUTE		CHRN		
				Pounds				TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
—	O	57-57-8	beta-Propiolactone	0		A	V	2	1	-	-	-	-	-	-	1	-
121	O	123-38-6	Propionaldehyde	938,986		A	V	-	-	-	-	-	-	-	-	-	-
230	O	114-26-1	Propoxur	3,524	A	V		-	-	-	-	-	-	-	-	-	-
31	O	115-07-1	Propylene	30,615,459			V	-	-	-	-	-	-	-	-	-	-
248	O	75-55-8	Propyleneimine	790		A	V	3	2	-	-	-	-	-	-	1	-
93	O	75-56-9	Propylene oxide	2,414,341		A	V	3	3	-	-	-	3	-	-	1	-
107	O	110-86-1	Pyridine	1,298,863			V	-	3	1	-	-	3	-	-	-	-
174	O	91-22-5	Quinoline	95,498		A	V	-	3	-	-	-	2	-	-	-	-
237	O	106-51-4	Quinone	2,142		A	V	-	3	-	-	-	1	-	-	-	-
228	O	82-68-8	Quintozene	4,423		A	V	-	3	2	-	-	-	-	-	-	-
232	O	81-07-2	Saccharin (manufacturing)	3,025			V	-	-	-	-	-	-	-	-	1	-
263	O	94-59-7	Safrole	13			V	-	3	-	-	-	-	-	-	1	-
158	N	7782-49-2	Selenium	265,661	P			-	1	-	1	1	-	1	1	-	-
177	M	7440-22-4	Silver	84,786	P			-	3	2	-	-	-	1	1	-	-
28	O	100-42-5	Styrene	41,169,973		A	V	-	3	-	-	-	2	-	-	1	-
246	O	96-09-3	Styrene oxide	1,000		A	V	-	-	-	-	-	-	-	-	1	-
6	A	7664-93-9	Sulfuric acid	318,395,014				3	2	-	-	-	2	-	-	-	-
161	H	79-34-5	1,1,2,2-Tetrachloroethane	215,893	P	A	V	-	3	2	-	-	1	-	2	1	-
32	H	127-18-4	Tetrachloroethylene	30,058,581	P	A	V	-	3	2	-	-	2	-	-	1	1
220	H	961-11-5	Tetrachlorvinphos	9,389			V	-	-	-	-	-	-	-	-	-	-
238	M	7440-28-0	Thallium	2,000	P			-	2	-	-	1	-	2	1	-	-
—	O	62-55-5	Thioacetamide	0			V	-	-	-	-	-	3	-	-	1	-
—	O	139-65-1	4,4'-Thiodianiline	0			V	-	-	-	-	-	-	-	-	1	-
203	O	62-56-6	Thiourea	28,225			V	-	3	-	-	-	-	-	-	1	-
142	M	1314-20-1	Thorium dioxide	449,167				-	-	-	-	-	-	-	-	-	-
94	M	7550-45-0	Titanium tetrachloride	2,411,291		A		1	1	1	-	-	-	-	-	-	-
5	O	108-88-3	Toluene	322,521,176	P	A	V	-	3	2	-	-	2	-	-	-	1
145	O	584-84-9	Toluene-2,4-diisocyanate	395,986		A	V	2	1	-	-	-	1	-	-	1	-
64	O	91-08-7	Toluene-2,6-diisocyanate	166,346			V	1	-	-	-	-	-	-	-	1	-
182	O	95-53-4	o-Toluidine	75,330		A	V	-	3	-	-	-	-	-	-	1	-
—	H	636-21-5	o-Toluidine hydrochloride	0			V	-	3	-	-	-	-	-	-	1	-
—	H	8001-35-2	Toxaphene	0	P	A	V	2	2	2	-	-	1	1	1	1	-
—	O	68-76-8	Triaziquone	0		V		-	-	-	-	-	-	-	-	1	-
235	H	52-68-6	Trichlorfon	2,647		V		-	3	1	-	-	2	-	-	-	-
90	H	120-82-1	1,2,4-Trichlorobenzene	2,538,039	P	A	V	-	3	2	1	2	-	-	-	-	-
9	H	71-55-6	1,1,1-Trichloroethane	185,026,191	P	A		-	3	2	-	-	2	-	-	-	1
108	H	79-00-5	1,1,2-Trichloroethane	1,283,312		A	V	-	3	-	-	1	2	-	2	-	-
26	H	79-01-6	Trichloroethylene	48,976,806	P	A	V	-	3	2	-	-	2	3	3	-	1
255	H	95-95-4	2,4,5-Trichlorophenol	500		A	V	-	3	2	-	-	1	-	-	-	-
229	H	88-06-2	2,4,6-Trichlorophenol	3,881	P	A	V	-	3	-	-	-	1	-	1	1	-
181	O	1582-09-8	Trifluralin	76,395	A	V		-	-	-	-	-	-	-	-	-	-
65	O	95-63-6	1,2,4-Trimethylbenzene	6,162,993			V	-	-	-	-	-	-	-	-	-	-
—	H	126-72-7	Tris(2,3-dibromopropyl) phosphate	0		V		-	3	-	-	-	-	-	-	1	-
213	O	51-79-6	Urethane	14,558		A	V	-	3	-	-	-	-	-	-	1	-
187	M	7440-62-2	Vanadium (fume or dust)	61,006				-	-	-	-	1	-	-	-	-	-
61	O	108-05-4	Vinyl acetate	7,138,898		A	V	3	3	-	-	-	2	-	-	-	-
244	H	593-60-2	Vinyl bromide	1,040		A	V	-	-	-	-	-	-	-	-	1	-
106	H	75-01-4	Vinyl chloride	1,363,697	N P	A	V	-	1	2	-	-	3	-	-	1	-
146	H	75-35-4	Vinylidene chloride	394,803	P	A	V	-	2	2	-	1	3	-	-	-	-
8	O	1330-20-7	Xylene (mixed isomers)	185,442,035		A	V	-	3	-	-	-	2	-	-	-	1
103	O	108-38-3	m-Xylene	1,465,778		A	V	-	-	-	-	-	-	-	-	-	1
95	O	95-47-6	o-Xylene	2,242,661		A	V	-	-	-	-	-	-	-	-	-	1
70	O	106-42-3	p-Xylene	4,811,223		A	V	-	-	-	-	-	-	-	-	-	1
239	O	87-62-7	2,6-Xylidine	1,950			V	-	-	-	-	-	-	-	-	-	-
22	M	7440-66-6	Zinc (fume or dust)	57,487,663	P			-	-	2	-	2	-	1	1	-	-
247	M	12122-67-7	Zineb	1,000				-	-	-	-	-	-	-	-	-	-
85	M	—	Antimony compounds	3,375,959	P	A		2	1	1	-	1	2	2	2	-	-
62	N	—	Arsenic compounds	7,046,988	N P	A		1	1	1	-	1	1	1	1	-	-
41	M	—	Barium compounds	21,012,672				-	-	-	1	2	-	-	-	-	-
196	M	—	Beryllium compounds	42,242	N P	A		-	2	1	-	1	2	1	1	-	-
125	M	—	Cadmium compounds	759,865	P	A		1	1	1	-	1	1	1	1	-	1
99	H	—	Chlorophenols	1,755,472	P		V	-	1	2	-	1	1	1	1	-	-

RANK 1989	CLASS	CAS NO.	CHEMICAL	TOTAL RELEASE AND TRANSFERS	APPLICABLE REGULATION			HEALTH/TERRESTRIAL TOXICITY					AQUATIC TOXICITY			CARC INOGEN	33/50
								ACUTE		CHRONIC			ACUTE		CHRN		
				Pounds				TPQ	RQAH	RQCH	RFDI	RFDO	RQAR	WQCA	WQCC		
24	M	—	Chromium compounds	50,881,050		P	A	1	1	1	-	-	2	-	-	-	1
128	M	—	Cobalt compounds	715,141			A	1	1	1	-	-	2	-	-	-	-
23	M	—	Copper compounds	54,465,732		P		2	2	2	-	3	1	1	1	-	-
58	A	—	Cyanide compounds	7,791,895		P	A	1	1	-	2	2	1	1	1	-	1
20	O	—	Glycol ethers	65,736,857			A	V	-	-	-	-	-	-	-	-	-	-
30	M	—	Lead compounds	34,498,469		P	A	1	2	1	-	-	3	1	1	-	1
14	M	—	Manganese compounds	119,825,790			A	1	1	1	1	2	1	-	-	-	-
189	M	—	Mercury compounds	57,028	N	P	A	2	1	1	-	1	1	1	1	-	1
49	M	—	Nickel compounds	12,849,203		P	A	1	1	1	-	2	1	2	1	-	1
—	H	—	Poly brominated biphenyls	0				V	-	-	-	-	-	-	-	-	-	-
186	N	—	Selenium compounds	66,308		P	A	1	1	1	1	1	2	1	1	-	-
185	M	—	Silver compounds	66,382		P		2	2	2	-	-	1	1	1	-	-
245	M	—	Thallium compounds	1,010		P		1	2	1	-	1	2	2	1	-	-
10	M	—	Zinc compounds	164,799,357		P		1	1	2	-	2	1	1	1	-	-
52	X	—	Total for Mixtures	9,978,418				-	-	-	-	-	-	-	-	-	-
157	T	—	Trade Secrets	276,478				-	-	-	-	-	-	-	-	-	-
			TOTAL	5,705,670,380													

Legend for Chemical Classification Table

RANK=Rank based on total releases and transfers in 1989
— indicates no releases or transfers reported in 1989

CLASS
A=Mineral acids, and salts
H=Halogenated-organics
M=Metals and metal compounds
N=Non-metallic inorganic s
O=Non-halogenated Organics
X=Mixture/component
T=Trade secret

APPLICABLE REGULATION
N=NESHAP listed air pollutant
P=Water priority pollutant
A=Air Toxics, Substances listed on Hazardous Air Pollutant List
V=Volatile organic compounds

HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY
(from Toxic Chemical Release Inventory Risk Screening Guide, EPA 560/2-89-002)

TPQ =Threshold Planning Quantities (pounds)
1= 1, 10, 100
2= 500
3= 1,000, 10,000

RQAH=Reportable Quantities Acute (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

RQCH=Reportable Quantities Chronic Mammalian Toxicity (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

RFDI=EPA Reference Dose Inhalation (mg/kg/day)
1= <0.01
2= 0.01 - 0.10
3= >= 1.0

RFDO=EPA Reference Dose Oral (mg/kg/day)
1= <0.01
2= 0.01 - 0.10
3= >= 1.0

AQUATIC ECOTOXICITY
(from Toxic Chemical Release Inventory Risk Screening Guide, EPA 560/2-89-002)

RQAR=Reportable Quantity Aquatic Toxicity (pounds)
1= 1, 10, 100
2= 1,000
3= 5,000

WQCA=Water Quality Criteria Acute (mg/l)
1= <1
2= 1 - 10
3= >= 10

WQCC=Water Quality Criteria Chronic Mammalian Toxicity (mg/l)
1= <1
2= 1 - 10
3= >= 10

CARCINOGEN
1=Listed as a "de minimis" carcinogen for purposes of TRI reporting (according to OSHA criteria)

33/50
1="33/50" INDUSTRIAL PROJECT CHEMICAL

APPENDIX C

SIC Codes 20-39

20 Food and Kindred Products

2011 Meat packing plants
2013 Sausages and other prepared meat products
2015 Poultry slaughtering and processing
2021 Creamery butter
2022 Natural, processed, and imitation cheese
2023 Dry, condensed, and evaporated dairy products
2024 Ice cream and frozen desserts
2026 Fluid milk
2032 Canned specialties
2033 Canned fruits, vegetables, preserves, jams, and jellies
2034 Dried and dehydrated fruits, vegetables, and soup mixes
2035 Pickled fruits and vegetables, vegetable sauces and seasonings, and salad dressings
2037 Frozen fruits, fruit juices, and vegetables
2038 Frozen specialties, n.e.c.*
2041 Flour and other grain mill products
2043 Cereal breakfast foods
2044 Rice milling
2045 Prepared flour mixes and doughs
2046 Wet corn milling
2047 Dog and cat food
2048 Prepared feeds and feed ingredients for animals and fowls, except dogs and cats
2051 Bread and other bakery products, except cookies and crackers
2052 Cookies and crackers
2053 Frozen bakery products, except bread
2061 Cane sugar, except refining
2062 Cane sugar refining
2063 Beet sugar
2064 Candy and other confectionary products
2066 Chocolate and cocoa products
2067 Chewing gum
2068 Salted and roasted nuts and seeds
2074 Cottonseed oil mills
2075 Soybean oil mills
2076 Vegetable oil mills, except corn, cottonseed, and soybean
2077 Animal and marine fats and oils
2079 Shortening, table oils, margarine, and other edible fats and oils, n.e.c.*
2082 Malt beverages
2083 Malt
2084 Wines, brandy, and brandy spirits
2085 Distilled and blended liquors
2086 Bottled and canned soft drinks and carbonated waters
2087 Flavoring extracts and flavoring syrups, n.e.c.*
2091 Canned and cured fish and seafoods
2092 Prepared fresh or frozen fish and seafoods
2095 Roasted coffee
2096 Potato chips, corn chips, and similar snacks
2097 Manufactured ice
2098 Macaroni, spaghetti, vermicelli, and noodles
2099 Food preparations, n.e.c.*

21 Tobacco Products

2111 Cigarettes
2121 Cigars
2131 Chewing and smoking tobacco and snuff
2141 Tobacco stemming and redrying

22 Textile Mill Products

2211 Broadwoven fabric mills, cotton
2221 Broadwoven fabric mills, manmade fiber, and silk
2231 Broadwoven fabric mills, wool (including dyeing and finishing)
2241 Narrow fabric and other smallwares mills: cotton, wool, silk, and manmade fiber
2251 Women's full length and knee length hosiery, except socks
2252 Hosiery, n.e.c.*
2253 Knit outerwear mills
2254 Knit underwear and nightwear mills
2257 Weft knit fabric mills
2258 Lace and warp knit fabric mills
2259 Knitting mills, n.e.c.*
2261 Finishers of broadwoven fabrics of cotton
2262 Finishers of broadwoven fabrics of manmade fiber and silk
2269 Finishers of textiles, n.e.c.*
2273 Carpets and rugs
2281 Yarn spinning mills
2282 Yarn texturizing, throwing, twisting, and winding mills
2284 Thread mills
2295 Coated fabrics, not rubberized
2296 Tire cord and fabrics
2297 Nonwoven fabrics
2298 Cordage and twine
2299 Textile goods, n.e.c.*

23 Apparel and Other Finished Products made from Fabrics and Other Similar Materials

2311 Men's and boys' suits, coats, and overcoats

*"Not elsewhere classified" indicated by "n.e.c."

Source: Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual*, 1987.

2789 Bookbinding and related work
2791 Typesetting
2796 Platemaking and related services

28 Chemicals and Allied Products

2812 Alkalies and chlorine
2813 Industrial gases
2816 Inorganic pigments
2819 Industrial inorganic chemicals, n.e.c.*
2821 Plastics materials, synthetic resins, and non-vulcanizable elastomers
2822 Synthetic rubber (vulcanizable elastomers)
2823 Cellulosic manmade fibers
2824 Manmade organic fibers, except cellulosic
2833 Medicinal chemicals and botanical products
2834 Pharmaceutical preparations
2835 In vitro and in vivo diagnostic substances
2836 Biological products, except diagnostic substances
2841 Soap and other detergents, except specialty cleaners
2842 Specialty cleaning, polishing, and sanitation preparations
2843 Surface active agents, finishing agents, sulfonated oils, and assistants
2844 Perfumes, cosmetics, and other toilet preparations
2851 Paints, varnishes, lacquers, enamels, and allied products
2861 Gum and wood chemicals
2865 Cyclic organic crudes and intermediates, and organic dyes and pigments
2869 Industrial organic chemicals, n.e.c.*
2873 Nitrogenous fertilizers
2874 Phosphatic fertilizers
2875 Fertilizers, mixing only
2879 Pesticides and agricultural chemicals, n.e.c.*
2891 Adhesives and sealants
2892 Explosives
2893 Printing ink
2895 Carbon black
2899 Chemicals and chemical preparations, n.e.c.*

29 Petroleum Refining and Related Industries

2911 Petroleum refining
2951 Asphalt paving mixtures and blocks
2952 Asphalt felts and coatings
2992 Lubricating oils and greases
2999 Products of petroleum and coal, n.e.c.*

30 Rubber and Miscellaneous Plastics Products

3011 Tires and inner tubes
3021 Rubber and plastics footwear
3052 Rubber and plastics hose and belting
3053 Gaskets, packing, and sealing devices
3061 Molded, extruded, and lathecut mechanical rubber products
3069 Fabricated rubber products, n.e.c.*
3081 Unsupported plastics film and sheet
3082 Unsupported plastics profile shapes
3083 Laminated plastics plate, sheet, and profile shapes
3084 Plastics pipe
3085 Plastics bottles
3086 Plastics foam products
3087 Custom compounding of purchased plastics resins
3088 Plastics plumbing fixtures
3089 Plastics products, n.e.c.*

31 Leather and Leather Products

3111 Leather tanning and finishing
3131 Boot and shoe cut stock and findings
3142 House slippers
3143 Men's footwear, except athletic
3144 Women's footwear, except athletic
3149 Footwear, except rubber, n.e.c.*
3151 Leather gloves and mittens
3161 Luggage
3171 Women's handbags and purses
3172 Personal leather goods, except women's handbags and purses
3199 Leather goods, n.e.c.*

32 Stone, Clay, Glass and Concrete Products

3211 Flat glass
3221 Glass containers
3229 Pressed and blown glass and glassware, n.e.c.*
3231 Glass products, made of purchased glass
3241 Cement, hydraulic
3251 Brick and structural clay tile
3253 Ceramic wall and floor tile
3255 Clay refractories
3259 Structural clay products, n.e.c.*
3261 Vitreous china plumbing fixtures and china and earthenware fittings and bathroom accessories
3262 Vitreous china table and kitchen articles
3263 Fine earthenware (whiteware) table and kitchen articles
3264 Porcelain electrical supplies
3269 Pottery products, n.e.c.*
3271 Concrete block and brick
3272 Concrete products, except block and brick
3273 Ready mixed concrete
3274 Lime
3275 Gypsum products
3281 Cut stone and stone products
3291 Abrasive products
3292 Asbestos products

*"Not elsewhere classified" indicated by "n.e.c."

3295 Minerals and earths, ground or otherwise treated
3296 Mineral wool
3297 Nonclay refractories
3299 Nonmetallic mineral products, n.e.c.*

33 Primary Metal Industries

3312 Steel works, blast furnaces (including coke ovens), and rolling mills
3313 Electrometallurgical products, except steel
3315 Steel wiredrawing and steel nails and spikes
3316 Cold-rolled steel sheet, strip, and bars
3317 Steel pipe and tubes
3321 Gray and ductile iron foundries
3322 Malleable iron foundries
3324 Steel investment foundries
3325 Steel foundries, n.e.c.*
3331 Primary smelting and refining of copper
3334 Primary production of aluminum
3339 Primary smelting and refining of nonferrous metals, except copper and aluminum
3341 Secondary smelting and refining of nonferrous metals
3351 Rolling, drawing, and extruding of copper
3353 Aluminum sheet, plate, and foil
3354 Aluminum extruded products
3355 Aluminum rolling and drawing, n.e.c.*
3356 Rolling, drawing, and extruding of nonferrous metals, except copper and aluminum
3357 Drawing and insulating of nonferrous wire
3363 Aluminum die-castings
3364 Nonferrous die-castings, except aluminum
3365 Aluminum foundries
3366 Copper foundries
3369 Nonferrous foundries, except aluminum and copper
3398 Metal heat treating
3399 Primary metal products, n.e.c.*

34 Fabricated Metal Products, except Machinery and Transportation Equipment

3411 Metal cans
3412 Metal shipping barrels, drums, kegs, and pails
3421 Cutlery
3423 Hand and edge tools, except machine tools and handsaws
3425 Handsaws and saw blades
3429 Hardware, n.e.c.*
3431 Enameled iron and metal sanitary ware
3432 Plumbing fixture fittings and trim
3433 Heating equipment, except electric and warm air furnaces
3441 Fabricated structural metal
3442 Metal doors, sash, frames, molding, and trim
3443 Fabricated plate work (boiler shops)
3444 Sheet metal work
3446 Architectural and ornamental metal work
3448 Prefabricated metal buildings and components
3449 Miscellaneous structural metal work
3451 Screw machine products
3452 Bolts, nuts, screws, rivets, and washers
3462 Iron and steel forgings
3463 Nonferrous forgings
3465 Automotive stampings
3468 Crowns and closures
3469 Metal stampings, n.e.c.*
3471 Electroplating, plating, polishing, anodizing, and coloring
3479 Coating, engraving and allied services, n.e.c.*
3482 Small arms ammunition
3483 Ammunition, except for small arms
3484 Small arms
3489 Ordnance and accessories, n.e.c.*
3491 Industrial valves
3492 Fluid power valves and hose fittings
3493 Steel springs, except wire
3494 Valves and pipe fittings, n.e.c.*
3495 Wire springs
3496 Miscellaneous fabricated wire products
3497 Metal foil and leaf
3498 Fabricated pipe and pipe fittings
3499 Fabricated metal products, n.e.c.*

35 Industrial and Commercial Machinery and Computer Equipment

3511 Steam, gas and hydraulic turbines, and turbine generator set units
3519 Internal combustion engines, n.e.c.*
3523 Farm machinery and equipment
3524 Lawn and garden tractors and home lawn and garden equipment
3531 Construction machinery and equipment
3532 Mining machinery and equipment, except oil and gas field machinery and equipment
3533 Oil and gas field machinery and equipment
3534 Elevators and moving stairways
3535 Conveyors and conveying equipment
3536 Overhead traveling cranes, hoists, and monorail systems
3537 Industrial trucks, tractors, trailers, and stackers
3541 Machine tools, metal cutting types
3542 Machine tools, metal forming types
3543 Industrial patterns
3544 Special dies and tools, die sets, jigs and fixtures, and industrial molds
3545 Cutting tools, machine tool accessories, and machinists' measuring devices
3546 Power driven handtools

*"Not elsewhere classified" indicated by "n.e.c."

3547 Rolling mill machinery and equipment
3548 Electric and gas welding and soldering equipment
3549 Metalworking machinery, n.e.c.*
3552 Textile machinery
3553 Woodworking machinery
3554 Paper industries machinery
3555 Printing trades machinery and equipment
3556 Food products machinery
3559 Special industry machinery, n.e.c.*
3561 Pumps and pumping equipment
3562 Ball and roller bearings
3563 Air and gas compressors
3564 Industrial and commercial fans and blowers and air purification equipment
3565 Packaging equipment
3566 Speed changers, industrial high speed drives, and gears
3567 Industrial process furnaces and ovens
3568 Mechanical power transmission equipment, n.e.c.*
3569 General industrial machinery and equipment, n.e.c.*
3571 Electronic computers
3572 Computer storage devices
3575 Computer terminals
3577 Computer peripheral equipment, n.e.c.*
3578 Calculating and accounting machines, except electronic computers
3579 Office machines, n.e.c.*
3581 Automatic vending machines
3582 Commercial laundry, drycleaning, and pressing machines
3585 Air conditioning and warm air heating equipment and commercial and industrial refrigeration equipment
3586 Measuring and dispensing pumps
3589 Service industry machinery, n.e.c.*
3592 Carburetors, pistons, piston rings, and valves
3593 Fluid power cylinders and actuators
3594 Fluid power pumps and motors
3596 Scales and balances, except laboratory
3599 Industrial and commercial machinery and equipment, n.e.c*

36 Electronic and Other Electrical Equipment and Components, Except Computer Equipment

3612 Power, distribution, and specialty transformers
3613 Switchgear and switchboard apparatus
3621 Motors and generators
3624 Carbon and graphite products
3625 Relays and industrial controls
3629 Electrical industrial appliances, n.e.c.*
3631 Household cooking equipment
3632 Household refrigerators and home and farm freezers
3633 Household laundry equipment
3634 Electrical housewares and fans
3635 Household vacuum cleaners
3639 Household appliances, n.e.c.*
3641 Electric lampbulbs and tubes
3643 Current carrying wiring devices
3644 Noncurrent carrying wiring devices
3645 Residential electric lighting fixtures
3646 Commercial, industrial, and institutional electric lighting fixtures
3647 Vehicular lighting equipment
3648 Lighting equipment, n.e.c.*
3651 Household audio and video equipment
3652 Phonograph records and pre-recorded audio tapes and disks
3661 Telephone and telegraph apparatus
3663 Radio and television broadcasting and communications equipment
3669 Communications equipment, n.e.c.*
3671 Electron tubes
3672 Printed circuit boards
3674 Semiconductors and related devices
3675 Electronic capacitors
3676 Electronic resistors
3677 Electronic coils, transformers, and other inductors
3678 Electronic connectors
3679 Electronic components, n.e.c.*
3691 Storage batteries
3692 Primary batteries, dry and wet
3694 Electric equipment for internal combustion engines
3695 Magnetic and optical recording media
3699 Electrical machinery, equipment, and supplies, n.e.c.*

37 Transportation Equipment

3711 Motor vehicles and passenger car bodies
3713 Truck and bus bodies
3714 Motor vehicle parts and accessories
3715 Truck trailers
3716 Motor homes
3721 Aircraft
3724 Aircraft engines and engine parts
3728 Aircraft parts and auxiliary equipment, n.e.c.*
3731 Ship building and repairing
3732 Boat building and repairing
3743 Railroad equipment
3751 Motorcycles, bicycles and parts
3761 Guided missiles and space vehicles
3764 Guided missile and space vehicle propulsion units and propulsion unit parts
3769 Guided missile and space vehicle parts and auxiliary equipment, n.e.c.*
3792 Travel trailers and campers
3795 Tanks and tank components
3799 Transportation equipment, n.e.c.*

*"Not elsewhere classified" indicated by "n.e.c."

38 Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks

3812 Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments
3821 Laboratory apparatus and furniture
3822 Automatic controls for regulating residential and commercial environments and appliances
3823 Industrial instruments for measurement, display, and control of process variables; and related products
3824 Totalizing fluid meters and counting devices
3825 Instruments for measuring and testing of electricity and electrical signals
3826 Laboratory analytical instruments
3827 Optical instruments and lenses
3829 Measuring and controlling devices, n.e.c.*
3841 Surgical and medical instruments and apparatus
3842 Orthopedic, prosthetic, and surgical appliances and supplies
3843 Dental equipment and supplies
3844 X-ray apparatus and tubes and related irradiation apparatus
3845 Electromedical and electrotherapeutic apparatus
3851 Ophthalmic goods
3861 Photographic equipment and supplies
3873 Watches, clocks, clockwork operated devices, and parts

39 Miscellaneous Manufacturing Industries

3911 Jewelry, precious metal
3914 Silverware, plated ware, and stainless steel ware
3915 Jewelers' findings and materials, and lapidary work
3931 Musical instruments
3942 Dolls and stuffed toys
3944 Games, toys and children's vehicles; except dolls and bicycles
3949 Sporting and athletic goods, n.e.c.*
3951 Pens, mechanical pencils, and parts
3952 Lead pencils, crayons, and artists' materials
3953 Marking devices
3955 Carbon paper and inked ribbons
3961 Costume jewelry and costume novelties, except precious metal
3965 Fasteners, buttons, needles, and pins
3991 Brooms and brushes
3993 Signs and advertising specialties
3995 Burial caskets
3996 Linoleum, asphalted-felt-base, and other hard surface floor coverings, n.e.c.*
3999 Manufacturing industries, n.e.c.*

*"Not elsewhere classified" indicated by "n.e.c."

Abbreviated Names for Industrial Categories Used in This Report

SIC Code	Abbreviated Name
20	Food
21	Tobacco
22	Textiles
23	Apparel
24	Lumber
25	Furniture
26	Paper
27	Printing
28	Chemicals
29	Petroleum
30	Plastics
31	Leather
32	Stone/Clay/Glass
33	Primary Metals
34	Fabricated Metals
35	Machinery
36	Electrical
37	Transportation
38	Measuring
39	Miscellaneous Manufacturing
	Multiple SIC Codes (20-39)
	No SIC Codes (20-39)

APPENDIX D

TRI State and Regional Contacts

Alabama
E. John Williford, Chief of Operations
Alabama Emergency Response Commission
Alabama Department of Environmental Management
1751 Congressman W.L. Dickinson Drive
Montgomery, AL 36109
(205) 271-7931

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Alaska State Emergency Response Commission
P.O. Box O
Juneau, AK 99811-1800
(907) 465-2630

American Samoa
Pati Faiai, Director
American Samoa EPA
Office of the Governor
Pago Pago, AS 96799
International Number (684) 633-2304

Arizona
Mr. Carl F. Funk, Executive Director
Arizona Emergency Response Commission
Division of Emergency Services
5636 East McDowell Road
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(602) 231-6326

Arkansas
Anna Brannon
Depository of Documents
Arkansas Department of Labor
10421 West Markham
Little Rock, AR 72205
(501) 682-4541

California
Mr. Chuck Shulock
Office of Environmental Affairs
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Sacramento, CA 95812
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(916) 324-8124
(916) 322-7236 Completed Form R Information

Colorado
Colorado Emergency Planning Commission
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220
Judy Waddill
(303) 331-4858

Commonwealth of Northern Mariana Islands
Mr. Frank Russell Meecham, III
Division of Environmental Quality
P.O. Box 1304
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Ms. Sue Vaughn, Title III Coordinator
State Emergency Response Commission
Department of Environmental Protection
State Office Building, Room 161
165 Capitol Avenue
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Mr. Robert French, Chief Program Administrator
Air Resource Section
Department of Natural Resources and Environmental Control
89 King's Highway
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District of Columbia
Mr. Frank Jasmine
District of Columbia Emergency Response Commission
Office of Emergency Preparedness
2000 14th Street, NW
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Washington, DC 20009
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Florida Emergency Response Commission
Florida Department of Community Affairs
2740 Centerview Drive
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Georgia
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Georgia Emergency Response Commission
205 Butler Street, SE
Floyd Tower East
11th Floor, Suite 1166
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Hawaii
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Idaho Emergency Response Commission
State House
Boise, ID 83720
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Emergency Planning Unit
Illinois EPA
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Indiana
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Indiana Emergency Response Commission
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Iowa
Department of Natural Resources
Records Department
900 East Grand Avenue
Des Moines, IA 50319
(515) 281-8852

Kansas
Right-to-Know Program
Kansas Department of Health and Environment
Mills Building, 5th Floor
109 S.W. 9th Street
Topeka, KS 66612
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Kentucky
Ms. Valerie Hudson
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18 Reilly Road
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Maine
Dorean Maines
State Emergency Response Commission
State House Station Number 11
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State Emergency Response Commission
Maryland Department of the Environment
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Michigan Department of Natural Resources
Environmental Response Division
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Montana Emergency Response Commission
Environmental Sciences Division
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Nebraska Emergency Response Commission
Nebraska Department of Environmental Control
P.O. Box 98922
State House Station
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Nevada
Mr. Bob King, Director
Division of Emergency Management
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Carson City, NV 89710
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New Hampshire
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State Emergency Management Agency
Title III Program
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New Jersey
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SARA Title III Section 313
Department of Environmental Protection
Division of Environmental Quality
Bureau of Hazardous Substances Information
CN-405
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50 Wolf Road/Room 326
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North Carolina
North Carolina Emergency Response Commission
North Carolina Division of Emergency Management
116 West Jones Street
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North Dakota
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North Dakota State Department of Health and Consolidated Laboratories
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Puerto Rico
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Title III-SARA Section 313
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Rhode Island
Department of Environmental Management
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South Carolina
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South Dakota
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Texas
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Utah Hazardous Chemical Emergency Response Commission
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Vermont
Dr. Jan Carney, Commissioner
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Virgin Islands
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West Virginia
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West Virginia Emergency Response Commission
West Virginia Office of Emergency Services
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Wisconsin
Department of Natural Resources
P.O. Box 7921
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Wyoming
Mr. Ed Usui, Executive Secretary
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Wyoming Emergency Management Agency
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REGIONAL CONTACTS

Region 1

Pesticides & Toxics Branch
USEPA Region 1 (APT2311)
JFK Federal Building
Boston, MA 02203
(617) 565-3230

Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont

Region 2

Pesticides & Toxics Branch
USEPA Region 2 (MS240)
Woodbridge Avenue, Building 209
Edison, NJ 08837-3679
(201) 906-6890

New Jersey, New York, Puerto Rico, Virgin Islands

Region 3

Toxics & Pesticides Branch
USEPA Region 3 (3HW42)
841 Chestnut Street
Philadelphia, PA 19107
(215) 597-1260

Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia

Region 4

Pesticides & Toxics Branch
USEPA Region 4
345 Courtland Street
Atlanta, GA 30365
(404) 347-1033

Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

Region 5

Pesticides & Toxic Substances Branch
USEPA Region 5 (5SPT-7)
230 South Dearborn Street
Chicago, IL 60604
(312) 353-5907

Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

Region 6

Pesticides & Toxic Substances Branch
USEPA Region 6 (6TPT)
1445 Ross Avenue
Dallas, TX 75202-2733
(214) 655-7244

Arkansas, Louisiana, New Mexico, Oklahoma, Texas

Region 7

Office of Congressional and Intergovernmental Liaison
USEPA Region 7 (CIGL)
726 Minnesota Avenue
Kansas City, KS 66101
(913) 551-7005

Iowa, Kansas, Missouri, Nebraska

Region 8

Toxic Substances Branch
USEPA Region 8 (8AT-TS)
999 18th Street
Denver, CO 80202-2405
(303) 293-1730

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

Region 9

Pesticides & Toxics Branch
USEPA Region 9 (A-4-3)
75 Hawthorne Street
San Francisco, CA 94105
(415) 556-5387

Arizona, California, Hawaii, Nevada, American Samoa, Guam, Commonwealth of the Northern Mariana Islands

Region 10

Pesticides & Toxic Substances Branch
USEPA Region 10 (AT083)
1200 Sixth Avenue
Seattle, WA 98101
(206) 442-4016

Alaska, Idaho, Oregon, Washington

APPENDIX E

TRI Current Data for 1987

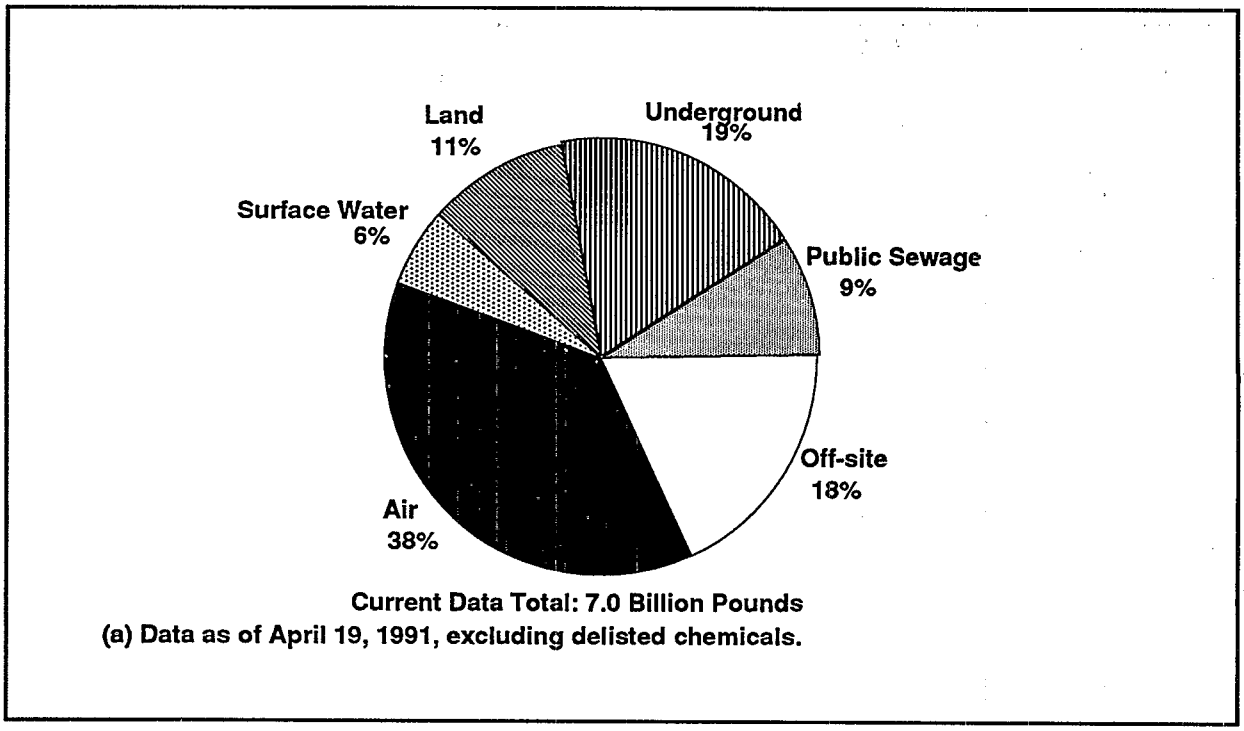

Figure E-1. Environmental Distribution of TRI Releases and Transfers, 1987 (Data as of April 19, 1991, excluding delisting chemicals).

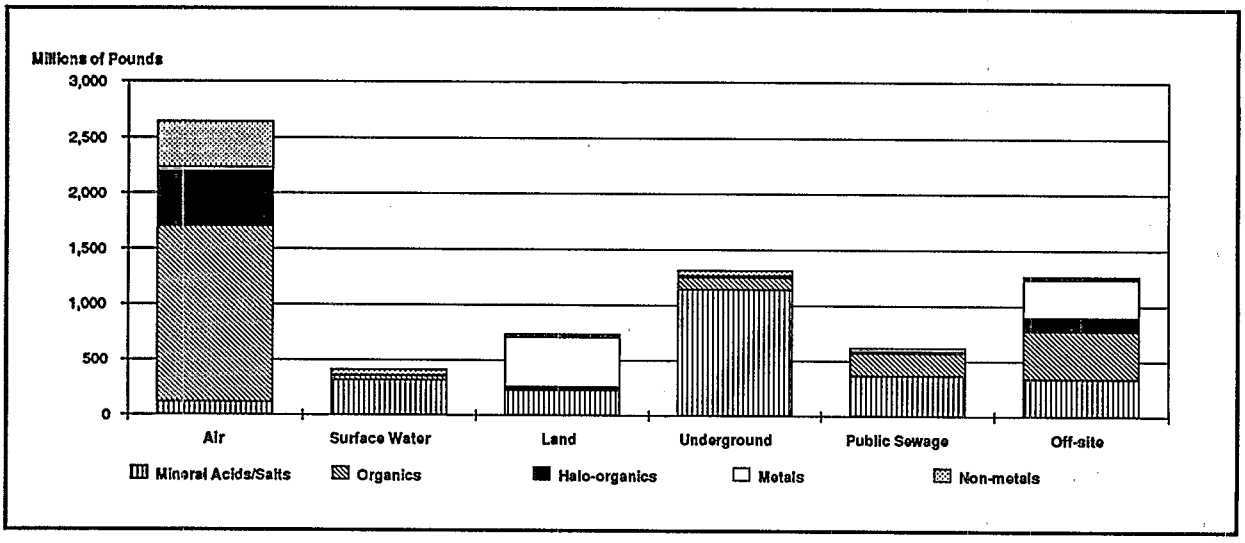

Figure E-2. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1987 data as of April 19, 1991, excluding delisted chemicals.

Table E-1. Environmental Distribution of TRI Releases and Transfers by State, 1987 Current Data (a), Excluding Delisted Chemicals.

TRI RELEASE/ TRANSFER RANK	STATE	FACILITIES	FORMS	AIR	SURFACE WATER	LAND	UNDER-GROUND
		Number	Number	Pounds	Pounds	Pounds	Pounds
19	Alabama	362	1,409	100,861,068	14,177,656	6,034,927	1,428,391
34	Alaska	7	51	31,307,268	6,727,915	13,930	0
53	American Samoa	2	3	27,750	0	0	0
26	Arizona	166	507	17,448,171	2,750	48,176,251	0
24	Arkansas	295	916	49,512,275	5,411,241	1,324,278	9,416,199
11	California	1,691	5,336	84,306,716	23,820,985	12,098,930	1,657,770
40	Colorado	160	463	10,164,949	234,128	5,243,113	1,250
29	Connecticut	397	1,329	27,507,591	9,143,021	1,147,985	0
45	Delaware	51	221	6,671,802	1,536,001	340,576	250
54	District of Columbia	0	0	0	0	0	0
4	Florida	414	1,169	50,398,631	19,351,962	180,906,946	22,572,490
17	Georgia	609	1,956	92,824,792	9,335,463	8,364,267	19,500
48	Hawaii	27	95	913,635	23,750	235,342	1,074,340
42	Idaho	48	155	5,348,238	551,799	13,799,349	0
6	Illinois	1,196	4,003	103,756,449	13,822,985	10,586,793	13,417,547
8	Indiana	739	2,633	112,110,538	5,912,105	23,927,105	32,976,624
31	Iowa	324	983	39,745,226	1,411,368	402,402	0
20	Kansas	203	715	25,380,947	1,509,863	346,599	65,957,410
21	Kentucky	291	1,254	46,330,951	1,520,087	3,646,945	25,000,250
1	Louisiana	262	1,641	144,942,711	196,201,277	1,547,797	484,943,681
41	Maine	91	337	16,168,050	913,096	320,332	0
33	Maryland	193	656	18,745,845	10,040,652	2,110,812	750
25	Massachusetts	594	1,761	31,800,019	540,208	786,077	250
7	Michigan	806	3,228	117,193,074	1,190,058	2,519,878	6,054,430
27	Minnesota	330	1,121	49,371,953	2,773,601	754,649	0
16	Mississippi	241	810	56,274,764	3,602,529	9,350,883	43,614,250
14	Missouri	512	1,793	48,100,139	2,034,160	49,300,119	1,035,570
36	Montana	25	128	2,750,456	136,622	31,414,887	0
43	Nebraska	138	406	14,401,589	1,741,506	367,880	0
47	Nevada	36	85	776,864	0	2,437,330	0
44	New Hampshire	143	430	12,896,276	882,792	606,419	0
15	New Jersey	881	3,041	43,961,492	1,722,653	1,943,341	530
39	New Mexico	35	118	3,895,129	4,316	17,219,765	0
13	New York	820	2,715	97,417,816	2,835,823	5,537,039	250
18	North Carolina	791	2,448	98,024,159	1,553,017	15,435,141	0
52	North Dakota	26	65	737,474	3,600	94,500	0
3	Ohio	1,344	4,918	140,260,887	8,027,478	29,185,878	64,927,648
30	Oklahoma	193	641	36,125,483	424,809	1,056,834	6,975,441
35	Oregon	200	627	20,353,537	371,720	1,429,422	0
10	Pennsylvania	1,029	3,737	93,223,626	6,059,925	13,017,871	16,250
38	Puerto Rico	161	507	12,951,556	298,152	72,100	988
46	Rhode Island	177	478	7,627,621	57,739	67,321	0
23	South Carolina	377	1,476	66,384,787	1,755,805	1,479,839	750
49	South Dakota	34	69	2,496,933	3,698	9	0
5	Tennessee	503	1,708	136,361,752	13,555,997	18,008,839	69,037,418
2	Texas	1,021	4,992	221,664,175	5,468,644	33,727,328	438,025,408
9	Utah	101	378	84,534,191	122,504	162,968,038	3
50	Vermont	51	137	1,236,903	102,199	55,908	0
51	Virgin Islands	1	21	2,032,803	3,250	87,005	0
12	Virginia	398	1,335	139,001,399	21,073,995	5,182,036	250
32	Washington	315	980	28,537,220	9,257,413	1,343,543	250
28	West Virginia	109	614	39,730,884	2,517,586	8,389,181	319,219
22	Wisconsin	672	2,088	49,456,964	1,475,787	1,871,681	1,500
37	Wyoming	25	113	2,507,324	91,487	410,165	30,651,671
	TOTAL	19,617	68,800	2,646,562,852	411,337,177	736,695,585	1,319,128,528

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table E-1. continued.

TRI RELEASE/ TRANSFER RANK	STATE	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
		Pounds	Pounds	Pounds	Percent
19	Alabama	1,222,542	16,180,171	139,904,755	2.00
34	Alaska	0	139	38,049,252	0.54
53	American Samoa	0	0	27,750	0.00
26	Arizona	5,749,369	1,988,411	73,364,952	1.05
24	Arkansas	1,162,413	14,604,331	81,430,737	1.16
11	California	50,170,833	58,068,554	230,123,788	3.28
40	Colorado	1,498,919	3,540,690	20,683,049	0.29
29	Connecticut	2,623,362	20,993,018	61,414,977	0.88
45	Delaware	2,922,517	3,407,854	14,879,000	0.21
54	District of Columbia	0	0	0	0.00
4	Florida	17,336,168	13,637,265	304,203,462	4.34
17	Georgia	9,663,487	24,198,741	144,406,250	2.06
48	Hawaii	931,250	11,991	3,190,308	0.05
42	Idaho	346,894	188,958	20,235,238	0.29
6	Illinois	70,220,823	61,264,981	273,069,578	3.89
8	Indiana	16,621,024	67,359,231	258,906,627	3.69
31	Iowa	6,239,644	6,812,388	54,611,028	0.78
20	Kansas	4,333,816	37,868,127	135,396,762	1.93
21	Kentucky	2,839,703	43,406,486	122,744,422	1.75
1	Louisiana	369,285	29,020,536	857,025,287	12.22
41	Maine	1,154,797	1,763,956	20,320,231	0.29
33	Maryland	6,519,469	6,203,548	43,621,076	0.62
25	Massachusetts	12,591,544	28,873,068	74,591,166	1.06
7	Michigan	15,287,530	126,692,361	268,937,331	3.84
27	Minnesota	6,637,179	7,268,527	66,805,909	0.95
16	Mississippi	5,817,590	46,028,607	164,688,623	2.35
14	Missouri	62,553,271	17,620,455	180,643,714	2.58
36	Montana	1,087	167,082	34,470,134	0.49
43	Nebraska	708,592	2,455,106	19,674,673	0.28
47	Nevada	31,906	153,643	3,399,743	0.05
44	New Hampshire	887,557	4,006,866	19,279,910	0.27
15	New Jersey	51,537,629	75,530,360	174,696,005	2.49
39	New Mexico	33,793	622,055	21,775,058	0.31
13	New York	24,896,667	61,824,236	192,511,831	2.75
18	North Carolina	6,163,858	20,161,281	141,337,456	2.02
52	North Dakota	92,226	147,733	1,075,533	0.02
3	Ohio	43,584,915	135,270,536	421,257,342	6.01
30	Oklahoma	600,666	11,913,495	57,096,728	0.81
35	Oregon	8,679,082	6,178,265	37,012,026	0.53
10	Pennsylvania	13,913,908	104,683,170	230,914,750	3.29
38	Puerto Rico	5,696,673	4,866,429	23,885,898	0.34
46	Rhode Island	2,355,280	4,611,226	14,719,187	0.21
23	South Carolina	2,589,918	15,439,698	87,650,797	1.25
49	South Dakota	147,151	445,610	3,093,401	0.04
5	Tennessee	33,844,028	22,760,633	293,568,667	4.19
2	Texas	55,884,374	102,162,286	856,932,215	12.22
9	Utah	480,244	4,197,724	252,302,704	3.60
50	Vermont	124,424	673,394	2,192,828	0.03
51	Virgin Islands	0	0	2,123,058	0.03
12	Virginia	45,113,583	16,860,395	227,231,658	3.24
32	Washington	926,935	4,913,897	44,979,258	0.64
28	West Virginia	3,183,859	11,326,376	65,467,105	0.93
22	Wisconsin	14,680,941	28,136,800	95,623,673	1.36
37	Wyoming	0	36,483	33,697,130	0.48
	TOTAL	620,972,725	1,276,547,173	7,011,244,040	100.00

Table E-2. Environmental Distribution of TRI Releases and Transfers by Industry, 1987 Current Data (a), Excluding Delisted Chemicals.

TRI RELEASE/ TRANSFER RANK	SIC CODE	INDUSTRY	FACILITIES	FORMS	AIR	SURFACE WATER	LAND	UNDER-GROUND
			Number	Number	Pounds	Pounds	Pounds	Pounds
14	20	Food	1,337	2,523	17,660,022	2,922,970	6,281,645	998,660
21	21	Tobacco	21	55	5,946,080	134,850	459	0
13	22	Textiles	397	860	40,756,149	7,648,032	320,007	0
22	23	Apparel	27	48	2,380,681	42,810	0	0
19	24	Lumber	609	1,688	27,859,116	57,682	123,063	0
15	25	Furniture	401	1,455	56,318,614	42,194	36,165	0
4	26	Paper	585	2,164	232,792,610	62,693,705	14,893,746	30,144
12	27	Printing	313	620	61,131,060	3,526	253	0
1	28	Chemicals	3,815	19,203	918,123,174	290,843,705	242,627,310	1,040,672,461
9	29	Petroleum	341	2,967	68,037,598	4,920,917	8,872,968	18,597,002
8	30	Plastics	1,250	2,989	155,709,518	357,085	196,029	50,050
18	31	Leather	127	435	14,829,932	535,107	277,433	0
16	32	Stone/Clay	530	1,409	27,098,412	680,747	3,245,294	6,319,000
2	33	Primary Metals	1,423	5,455	207,519,732	25,812,806	412,005,410	33,919,040
6	34	Fabr. Metals	2,590	7,630	119,318,295	3,009,283	3,121,137	1,261,432
11	35	Machinery	869	2,246	52,973,972	380,334	295,324	0
7	36	Electrical	1,529	4,747	120,720,875	1,104,629	4,577,873	81,736
5	37	Transportation	973	4,402	216,311,572	546,128	1,617,671	39,907
10	38	Measure./Photo.	331	1,002	53,850,639	463,907	252,566	0
17	39	Miscellaneous	361	910	27,131,173	167,302	247,123	250
3		Multiple codes 20-39	1,378	4,793	206,308,296	8,274,176	37,348,081	217,093,134
20		No codes 20-39	410	1,199	13,785,332	695,282	356,028	65,712
		TOTAL	19,617	68,800	2,646,562,852	411,337,177	736,695,585	1,319,128,528

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table E-2. continued.

TRI RELEASE/ TRANSFER RANK	SIC CODE	INDUSTRY	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
			Pounds	Pounds	Pounds	Percent
14	20	Food	34,779,656	3,857,717	66,500,670	0.95
21	21	Tobacco	989,740	197,496	7,268,625	0.10
13	22	Textiles	13,688,044	5,376,955	67,789,187	0.97
22	23	Apparel	119,581	166,763	2,709,835	0.04
19	24	Lumber	140,554	4,160,079	32,340,494	0.46
15	25	Furniture	543,685	8,225,894	65,166,552	0.93
4	26	Paper	52,711,333	32,027,213	395,148,751	5.64
12	27	Printing	2,689,383	7,376,408	71,200,630	1.02
1	28	Chemicals	363,538,293	461,126,941	3,316,931,884	47.31
9	29	Petroleum	8,116,717	68,141,248	176,686,450	2.52
8	30	Plastics	8,537,895	29,586,442	194,437,019	2.77
18	31	Leather	13,283,248	3,651,548	32,577,268	0.46
16	32	Stone/Clay	1,657,928	20,054,349	59,055,730	0.84
2	33	Primary Metals	17,895,339	261,120,069	958,272,396	13.67
6	34	Fabr. Metals	27,984,167	86,712,590	241,406,904	3.44
11	35	Machinery	3,055,982	21,125,948	77,831,560	1.11
7	36	Electrical	20,916,023	75,128,200	222,529,336	3.17
5	37	Transportation	8,319,063	74,055,263	300,889,604	4.29
10	38	Measure./Photo.	5,967,155	18,261,435	78,795,702	1.12
17	39	Miscellaneous	1,221,205	8,239,088	37,006,141	0.53
3		Multiple codes 20-39	31,847,270	81,896,474	582,767,431	8.31
20		No codes 20-39	2,970,464	6,059,053	23,931,871	0.34
		TOTAL	620,972,725	1,276,547,173	7,011,244,040	100.00

Table E-3. Environmental Distribution of the 25 Chemicals with the Largest TRI Releases and Transfers, 1987 Current Data (a), Excluding Delisted Chemicals.

TRI RANK	CHEMICAL	AIR Pounds	SURFACE WATER Pounds	LAND Pounds	UNDER-GROUND Pounds
1	Ammonium sulfate (solution)	6,470,163	96,777,491	7,324,758	504,017,819
2	Hydrochloric acid	64,417,249	8,789,928	7,924,751	413,259,594
3	Methanol	211,568,824	27,017,255	16,514,021	19,614,954
4	Sulfuric acid	16,678,968	52,489,868	11,180,079	134,801,901
5	Ammonia	287,353,133	31,444,530	5,797,598	49,647,700
6	Toluene	285,384,796	344,946	1,575,107	1,516,944
7	Phosphoric acid	1,651,343	139,524,150	185,079,516	58,504
8	Acetone	195,584,591	2,043,701	310,647	2,449,563
9	Xylene (mixed isomers)	148,666,661	295,976	513,731	686,392
10	Methyl ethyl ketone	151,527,227	75,857	59,765	75,250
11	Zinc compounds	5,887,075	1,652,009	106,399,881	706,916
12	1,1,1-Trichloroethane	162,848,874	39,054	198,855	28,325
13	Copper	2,639,032	216,247	138,344,788	453,140
14	Dichloromethane	130,129,610	377,292	85,621	559,750
15	Carbon disulfide	135,876,192	22,790	3,480	89,500
16	Chlorine	107,153,510	8,012,291	1,180,442	83,939
17	Ammonium nitrate (solution)	6,834,968	12,140,004	14,154,899	58,599,399
18	Zinc (fume or dust)	4,575,397	457,163	47,082,116	189,574
19	Nitric acid	4,477,037	1,940,396	1,289,719	25,153,042
20	Freon 113	56,519,296	26,587	21,996	617
21	Trichloroethylene	53,405,029	31,551	73,283	18,720
22	Ethylene	61,589,765	12,686	7,436	0
23	Manganese compounds	1,977,281	1,596,609	33,777,635	8,501,300
24	Glycol ethers	42,381,724	145,222	28,654	210,580
25	Ethylene glycol	15,291,337	4,380,513	726,202	4,843,362
	SUBTOTAL	2,160,889,082	389,854,116	579,654,980	1,225,566,785
	TOTAL FOR ALL OTHERS	485,673,770	21,483,061	157,040,605	93,561,743
	GRAND TOTAL	2,646,562,852	411,337,177	736,695,585	1,319,128,528

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table E-3. continued.

TRI RANK	CHEMICAL	PUBLIC SEWAGE Pounds	OFF-SITE Pounds	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	Ammonium sulfate (solution)	190,374,069	14,847,508	819,811,808	11.69
2	Hydrochloric acid	44,849,423	90,189,215	629,430,160	8.98
3	Methanol	129,502,731	71,362,596	475,580,381	6.78
4	Sulfuric acid	75,582,395	170,447,425	461,180,636	6.58
5	Ammonia	27,929,469	5,704,654	407,877,084	5.82
6	Toluene	3,562,015	81,840,253	374,224,061	5.34
7	Phosphoric acid	12,575,875	10,260,936	349,150,324	4.98
8	Acetone	14,351,807	42,996,902	257,737,211	3.68
9	Xylene (mixed isomers)	4,308,538	57,542,765	212,014,063	3.02
10	Methyl ethyl ketone	719,635	47,764,337	200,222,071	2.86
11	Zinc compounds	3,033,677	76,663,008	194,342,566	2.77
12	1,1,1-Trichloroethane	421,029	30,726,146	194,262,283	2.77
13	Copper	577,182	29,557,508	171,787,897	2.45
14	Dichloromethane	1,820,550	25,003,768	157,976,591	2.25
15	Carbon disulfide	180,511	251,400	136,423,873	1.95
16	Chlorine	3,257,502	1,925,504	121,613,188	1.73
17	Ammonium nitrate (solution)	9,813,639	12,080,269	113,623,178	1.62
18	Zinc (fume or dust)	784,851	47,621,573	100,710,674	1.44
19	Nitric acid	28,830,333	25,792,757	87,483,284	1.25
20	Freon 113	104,851	9,172,677	65,846,024	0.94
21	Trichloroethylene	130,586	10,402,201	64,061,370	0.91
22	Ethylene	250	58,936	61,669,073	0.88
23	Manganese compounds	600,211	14,866,491	61,319,527	0.87
24	Glycol ethers	6,351,233	11,212,231	60,329,644	0.86
25	Ethylene glycol	17,319,647	8,234,710	50,795,771	0.72
	SUBTOTAL	576,982,009	896,525,770	5,829,472,742	83.14
	TOTAL FOR ALL OTHERS	43,990,716	380,021,403	1,181,771,298	16.86
	GRAND TOTAL	620,972,725	1,276,547,173	7,011,244,040	100.00

Table E-4. Environmental Distribution of TRI Releases and Transfers by Chemical Class, 1987 Current Data (a), Excluding Delisted Chemicals.

CHEMICAL CLASS	AIR	SURFACE WATER	LAND	UNDER-GROUND	PUBLIC SEWAGE	OFF-SITE	TOTAL RELEASES AND TRANSFERS	
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Percent
Organics	1,582,562,638	40,632,625	25,731,840	111,971,298	206,766,648	437,520,543	2,405,185,592	34.30
Mineral Acids/Salts	114,210,557	311,946,383	227,544,853	1,141,785,522	364,247,603	333,924,766	2,493,659,684	35.57
Metals	31,234,774	6,130,460	454,627,597	10,680,110	10,449,688	340,959,727	854,082,356	12.18
Halo-organics	507,121,928	2,464,830	700,959	3,137,503	6,922,356	122,742,192	643,089,768	2.77
Non-metals	407,935,418	50,141,778	27,506,403	51,538,095	31,635,958	27,800,056	596,557,708	8.51
Mixtures	3,128,634	13,051	583,933	16,000	566,063	13,404,239	17,711,920	0.25
Trade Secrets	368,903	8,050	0	0	384,409	195,650	957,012	0.01
TOTAL	2,646,562,852	411,337,177	736,695,585	1,319,128,528	620,972,725	1,276,547,173	7,011,244,040	100.00

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

Table E-5. Top 50 Facilities for TRI Total Releases and Transfers, 1987 Current Data (a), Excluding Delisted Chemicals.

TRI RANK	SIC CODE	FACILITY NAME	CITY	COUNTY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	28	American Cyanamid Company	Westwego	Jefferson	LA	213,444,502	3.04
2	Mult	Shell Oil Company	Norco	St Charles	LA	194,233,955	2.77
3	28	Monsanto Company	Alvin	Brazoria	TX	175,647,400	2.51
4	33	Kennecott Utah Copper	Bingham Canyon	Salt Lake	UT	158,669,750	2.26
5	28	Occidental Chemical Corp.	White Springs	Hamilton	FL	92,240,300	1.32
6	28	Du Pont Beaumont Works	Beaumont	Jefferson	TX	85,470,600	1.22
7	28	BP Chemicals	Port Lavaca	Calhoun	TX	77,774,500	1.11
8	33	Amax Magnesium	Rowley	Tooele	UT	76,992,400	1.10
9	28	Du Pont Johnsonville Plant	New Johnsonville	Humphreys	TN	72,474,201	1.03
10	28	Royster Company	Mulberry	Polk	FL	72,028,250	1.03
11	28	BP Chemicals America Inc.	Lima	Allen	OH	67,392,200	0.96
12	28	Vulcan Chemicals	Wichita	Sedgwick	KS	67,289,968	0.96
13	28	Freeport McMoran, Agrico Chemical Div.	Uncle Sam	St James	LA	64,415,618	0.92
14	28	Arcadian Corporation	Geismar	Ascension	LA	59,323,250	0.85
15	28	Freeport McMoran, Agrico Chemical Div.	Saint James	St James	LA	59,083,352	0.84
16	28	Avtex Fibers Front Royal Inc.	Front Royal	Warren	VA	54,032,900	0.77
17	28	Allied-Signal, Hopewell Plant	Hopewell	Hopewell City	VA	49,840,052	0.71
18	28	Columbian Chemicals Company	St. Louis	St Louis	MO	48,914,262	0.70
19	28	Du Pont Delisle Plant	Pass Christian	Harrison	MS	46,396,867	0.66
20	28	Courtaulds North America Inc.	Lemoyne	Mobile	AL	43,139,315	0.62
21	28	Tennessee Eastman Company	Kingsport	Sullivan	TN	43,068,430	0.61
22	28	Sterling Chemicals, Inc.	Texas City	Galveston	TX	40,660,400	0.58
23	33	Herculaneum Smelter	Herculaneum	Jefferson	MO	38,847,364	0.55
24	28	Monsanto Company	Cahokia	St Clair	IL	38,672,550	0.55
25	33	Asarco Incorporated	Hayden	Gila	AZ	36,423,780	0.52
26	29	Amerada Hess Corporation	Purvis	Lamar	MS	35,906,600	0.51
27	Mult	Inland Steel Company	East Chicago	Lake	IN	31,466,950	0.45
28	33	Asarco Incorporated	East Helena	Lewis And Clar	MT	31,431,511	0.45
29	28	Wycon Chemical Company	Cheyenne	Laramie	WY	31,324,901	0.45
30	28	Racon Incorporated	Wichita	Sedgwick	KS	30,738,632	0.44
31	28	Unocal Chemicals Division	Kenai	Kenai Peninsul	AK	30,416,150	0.43
32	28	BASF Corporation	Geismar	Ascension	LA	29,881,283	0.43
33	28	Du Pont	Victoria	Victoria	TX	29,571,474	0.42
34	28	Air Products Mfg. Corp.	Pasadena	Harris	TX	28,802,500	0.41
35	28	El Paso Products Co.	Odessa	Ector	TX	28,610,810	0.41
36	33	Great Lakes Division	Ecorse	Wayne	MI	27,652,318	0.39
37	28	Ciba-Geigy Corporation	Glens Falls	Warren	NY	27,353,550	0.39
38	28	Du Pont Louisville Works	Louisville	Jefferson	KY	26,113,000	0.37
39	28	Filtrol Corporation	Vernon	Los Angeles	CA	26,035,250	0.37
40	28	Triad Chemical	Donaldsonville	Ascension	LA	25,669,234	0.37
41	28	Monsanto Company	Cantonment	Escambia	FL	23,890,550	0.34
42	38	Kodak Park	Rochester	Monroe	NY	23,212,446	0.33
43	26	ITT Rayonier Inc.	Fernandina Beach	Nassau	FL	22,129,250	0.32
44	28	W.R. Grace & Co.	Sulphur	Calcasieu	LA	21,974,323	0.31
45	28	The Upjohn Company	Portage	Kalamazoo	MI	21,583,050	0.31
46	28	Conserv, Inc.	Nichols	Polk	FL	20,101,371	0.29
47	28	Allied Signal, Inc.	Elizabeth	Union	NJ	19,489,119	0.28
48	36	3M Mag Media and Consumer Products	Hutchinson	Mc Leod	MN	18,385,527	0.26
49	28	BASF Corp. Fibers Div.	Lowland	Hamblen	TN	17,218,950	0.25
50	28	CF Industries, Inc.	Donaldsonville	Ascension	LA	16,935,750	0.24
		SUBTOTAL				2,622,370,665	37.40
		TOTAL FOR ALL OTHERS				4,388,873,375	62.60
		GRAND TOTAL				7,011,244,040	100.00

(a) Data as of April 19, 1991, the version of the database used in this 1989 National Report.

APPENDIX F

TRI Facilities with the Greatest TRI Amounts, 1989, and with the Greatest Changes, 1988-1989

Table F-1. The Top 50 TRI Facilities for Total Air Emissions, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	AIR RELEASES	
					Pounds	Percent
1	33	Magnesium Corp. of America	Tooele	UT	119,060,170	4.91
2	28	Courtaulds Fibers Inc.	Axis	AL	43,674,070	1.80
3	28	Tennessee Eastman Co.	Kingsport	TN	40,951,167	1.69
4	Mult	3M Consumer AV & Consumer Prod.	Hutchinson	MN	25,661,502	1.06
5	28	Triad Chemical	Donaldsonville	LA	25,279,885	1.04
6	28	BASF Corp.	Lowland	TN	23,879,550	0.98
7	28	Union Oil Co.	Kenai	AK	18,308,500	0.75
8	38	Eastman Kodak Co.	Rochester	NY	16,794,179	0.69
9	28	Freeport Mcmoran, Agrico Chem. Div.	Donaldsonville	LA	16,223,250	0.67
10	Mult	Union Camp Corp.	Savannah	GA	13,190,000	0.54
11	28	Mississippi Chemical Corp.	Yazoo City	MS	12,947,936	0.53
12	28	Hoechst Celanese	Narrows	VA	11,924,204	0.49
13	28	Agricultural Minerals Corp.	Blytheville	AR	11,384,750	0.47
14	28	CF Industries Inc.	Donaldsonville	LA	11,013,000	0.45
15	Mult	Westvaco Corp	Covington	VA	9,927,500	0.41
16	28	Union Carbide Chemicals	Texas City	TX	8,519,845	0.35
17	33	Reynolds Metals Co.	Sheffield	AL	8,133,150	0.34
18	28	Du Pont	New Johnsonville	TN	7,980,595	0.33
19	30	Westinghouse Electric Corp.	Hampton	SC	7,893,220	0.33
20	28	GE Plastics	Mount Vernon	IN	7,618,722	0.31
21	28	Texas Eastman Co.	Longview	TX	7,500,182	0.31
22	28	Royster Co.	Mulberry	FL	7,048,646	0.29
23	28	Dow Chemical Co.	Freeport	TX	6,999,041	0.29
24	28	The Upjohn Co.	Kalamazoo	MI	6,878,820	0.28
25	28	3M Co.	Brownwood	TX	6,586,700	0.27
26	28	Du Pont	Leland	NC	6,102,505	0.25
27	28	Eli Lilly & Co.	Shadeland	IN	6,055,905	0.25
28	29	Farmland Industries Inc.	Coffeyville	KS	5,873,891	0.24
29	26	Westvaco Corp.	Luke	MD	5,832,535	0.24
30	Mult	Shell Oil Co.	Deer Park	TX	5,545,145	0.23
31	28	Royster Phosphates Inc.	Palmetto	FL	5,543,000	0.23
32	28	Du Pont Delisle Plant	Pass Christian	MS	5,496,507	0.23
33	28	North American Rayon Corp.	Elizabethton	TN	5,486,250	0.23
34	30	General Electric Co.	Coshocton	OH	5,469,646	0.23
35	28	American Synthetic Rubber	Louisville	KY	5,418,775	0.22
36	28	Air Products & Chemicals Inc.	Calvert City	KY	5,141,950	0.21
37	28	Union Carbide C&P Co.	Institute	WV	4,985,619	0.21
38	26	Georgia Pacific Corp.	Brunswick	GA	4,876,930	0.20
39	37	Honda of America Mfg. Inc.	Marysville	OH	4,876,178	0.20
40	Mult	Anchor Continental Inc.	Columbia	SC	4,689,420	0.19
41	28	Cabot Corp.	Tuscola	IL	4,623,493	0.19
42	26	3M	Saint Paul	MN	4,593,465	0.19
43	28	Farmland Industries Inc.	Enid	OK	4,582,250	0.19
44	28	Hoechst Celanese Corp.	Rock Hill	SC	4,536,149	0.19
45	28	Bristol-Myers Squibb Co.	Syracuse	NY	4,509,613	0.19
46	None	Oxychem	Niagara Falls	NY	4,500,114	0.19
47	26	3M Co.	Knoxville	IA	4,325,372	0.18
48	28	Amoco Chemical Co.	Alvin	TX	4,174,193	0.17
49	Mult	Du Pont	Memphis	TN	4,136,425	0.17
50	38	3M Co. Visual Systems Div.	Hartford City	IN	4,129,600	0.17
		SUBTOTAL			600,883,514	24.76
		TOTAL FOR ALL OTHERS			1,826,178,392	75.24
		GRAND TOTAL			2,427,061,906	100.00

Table F-2. The Top 50 TRI Facilities for Discharges to Surface Water, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	SURFACE WATER DISCHARGES	
					Pounds	Percent
1	28	Arcadian Corp.	Geismar	LA	22,400,250	11.85
2	28	3M	Cordova	IL	14,600,000	7.73
3	28	Freeport McMoran, Agrico Chem. Div.	Uncle Sam	LA	13,332,100	7.06
4	28	Allied Signal	Hopewell	VA	9,334,845	4.94
5	26	Weyerhaeuser Co.	Cosmopolis	WA	8,193,150	4.34
6	33	US Vanadium Corp.	Hot Springs	AR	7,801,550	4.13
7	26	ITT Rayonier Inc.	Fernandina Beach	FL	5,884,740	3.11
8	26	ITT Rayonier Inc.	Port Angeles	WA	5,518,500	2.92
9	26	Louisiana-Pacific Corp.	Samoa	CA	5,012,400	2.65
10	26	Simpson Paper Co.	Eureka	CA	4,496,650	2.38
11	28	Monsanto Co.	Decatur	AL	4,319,560	2.29
12	28	Pfizer Inc.	Groton	CT	4,197,160	2.22
13	26	Ketchikan Pulp Co.	Ketchikan	AK	4,164,000	2.20
14	28	Tennessee Eastman Co.	Kingsport	TN	3,021,104	1.60
15	Mult	Elkem Metals Co.	Marietta	OH	2,490,864	1.32
16	28	Eli Lilly & Co.	Shadeland	IN	2,385,777	1.26
17	28	W. R. Grace & Co.	Sulphur	LA	2,104,800	1.11
18	28	DSM Chemicals Augusta Inc.	Augusta	GA	1,968,969	1.04
19	26	Inland Container Corp.	New Johnsonville	TN	1,691,804	0.90
20	28	W. R. Grace & Co. -Conn.	Baltimore	MD	1,614,050	0.85
21	33	LTV Steel Co. Inc.	Cleveland	OH	1,572,602	0.83
22	28	Melamine Chemicals Inc.	Donaldsonville	LA	1,229,965	0.65
23	28	Mississippi Chemical Corp.	Yazoo City	MS	1,228,487	0.65
24	28	Arcadian Corp.	Port Wentworth	GA	1,200,000	0.64
25	Mult	Inland Steel Co.	East Chicago	IN	1,014,750	0.54
26	26	Alaska Pulp Corp.	Sitka	AK	1,011,976	0.54
27	28	Arcadian Corp.	Augusta	GA	912,380	0.48
28	28	CF Industries Inc.	Donaldsonville	LA	903,150	0.48
29	Mult	3M Chemolite Center	Cottage Grove	MN	902,120	0.48
30	28	Triad Chemical	Donaldsonville	LA	872,161	0.46
31	28	ICI Americas Inc	Dighton	MA	806,400	0.43
32	Mult	ITT Rayonier Inc.	Hoquiam	WA	800,500	0.42
33	28	Ireco Inc. - Lomo Plant	Louisiana	MO	784,400	0.42
34	28	American Chrome & Chemicals	Corpus Christi	TX	754,250	0.40
35	28	Mobil Minning & Minerals Co.	Pasadena	TX	744,600	0.39
36	28	Kerr-Mcgee Chemical Corp.	Trona	CA	737,531	0.39
37	26	Union Camp Corp.	Franklin	VA	737,210	0.39
38	Mult	Phillips 66 Co.	Borger	TX	715,472	0.38
39	28	Dow Chemical Co.	Freeport	TX	709,917	0.38
40	28	Cedar Chemical Corp.	Vicksburg	MS	706,832	0.37
41	33	USS Gary Works	Gary	IN	705,100	0.37
42	28	Agrico Chemical Co.	Hahnville	LA	676,000	0.36
43	28	Du Pont Belle Plant	Belle	WV	648,677	0.34
44	28	Freeport Mcmoran, Agrico Chem. Div.	Donaldsonville	LA	638,000	0.34
45	20	Cargill Inc.	Eddyville	IA	625,000	0.33
46	26	International Paper	Mobile	AL	624,250	0.33
47	26	International Paper Co.	Moss Point	MS	595,000	0.31
48	28	TVA National Fertilizer	Muscle Shoals	AL	555,000	0.29
49	24	Wood Fiber Industries	Danville	VA	550,532	0.29
50	30	Viskase Corp.	Osceola	AR	531,700	0.28
SUBTOTAL					149,026,235	78.87
TOTAL FOR ALL OTHERS					39,927,649	21.13
GRAND TOTAL					188,953,884	100.00

Table F-3. The Top 50 TRI Facilities for On-site Land Releases, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	LAND RELEASES	
					Pounds	Percent
1	Mult	Inland Steel Co.	East Chicago	IN	44,826,050	10.08
2	33	Asarco Inc.	East Helena	MT	36,425,460	8.19
3	33	Phelps Dodge Mining Co.	Playas	NM	20,353,549	4.58
4	33	Herculaneum Smelter	Herculaneum	MO	16,678,414	3.75
5	33	Asarco Inc.	Hayden	AZ	15,749,150	3.54
6	28	Texasgulf Inc.	Aurora	NC	15,541,950	3.49
7	33	Kennecott Utah Copper	Bingham Canyon	UT	14,902,650	3.35
8	33	Copper Range Co.	White Pine	MI	14,300,000	3.22
9	33	Cyprus Miami Mining Corp.	Claypool	AZ	13,658,434	3.07
10	28	American Chrome & Chemicals	Corpus Christi	TX	12,000,000	2.70
11	33	USS Fairless Works	Fairless Hills	PA	9,900,108	2.23
12	33	Asarco Inc.	Glover	MO	9,777,313	2.20
13	Mult	Elkem Metals Co.	Marietta	OH	9,640,094	2.17
14	28	Occidental Chemical Corp.	Castle Hayne	NC	8,800,275	1.98
15	28	Occidental Chemical Corp.	White Springs	FL	8,600,000	1.93
16	Mult	Kerr-Mcgee Chemical Corp.	Hamilton	MS	8,473,000	1.91
17	Mult	IMC Fertilizer Inc.	Mulberry	FL	8,200,250	1.84
18	33	GMC, Saginaw Grey Iron Plant	Saginaw	MI	7,798,550	1.75
19	33	GMC, Central Foundary Div.	Defiance	OH	7,741,250	1.74
20	33	Chino Mines Co.	Hurley	NM	7,234,500	1.63
21	33	Wheeling-Pittsburgh Steel	Follansbee	WV	7,172,820	1.61
22	28	Agrico Chemical Co.	Mulberry	FL	5,260,000	1.18
23	33	Northwestern Steel & Wire Co.	Sterling	IL	4,820,000	1.08
24	33	Republic Engineered Steels Inc	Canton	OH	4,655,400	1.05
25	28	Kerr Mcgee Vanadium Facility	Soda Springs	ID	3,971,790	0.89
26	33	Granite City Steel	Granite City	IL	3,450,003	0.78
27	28	Conserv Inc.	Nichols	FL	3,390,000	0.76
28	28	FMC Corp.	Pocatello	ID	3,350,652	0.75
29	28	Climax Chemical Co.	Monument	NM	3,247,000	0.73
30	28	Seminole Fertilizer Corp.	Bartow	FL	2,901,262	0.65
31	28	Royster Co.	Mulberry	FL	2,855,000	0.64
32	28	Royster Phosphates Inc.	Palmetto	FL	2,846,000	0.64
33	28	Molycorp. Inc.	Mountain Pass	CA	2,840,700	0.64
34	28	Chemetals Inc.	New Johnsonville	TN	2,761,277	0.62
35	33	Jersey Miniere Zinc	Clarksville	TN	2,660,436	0.60
36	28	LCP Chemicals	Moundsville	WV	2,483,609	0.56
37	26	Nekoosa Packaging	Tomahawk	WI	2,408,800	0.54
38	26	Stone Southwest Corp.	Snowflake	AZ	2,373,038	0.53
39	33	Warren Consolidated Industries	Warren	OH	2,236,800	0.50
40	33	Armco Steel Co. L.P.	Middletown	OH	2,196,550	0.49
41	28	Kerr-Mcgee Chemical Corp.	Henderson	NV	2,046,600	0.46
42	33	Structural Metals Inc.	Seguin	TX	2,033,300	0.46
43	33	Shieldalloy Metallurgical	Newfield	NJ	2,007,400	0.45
44	33	US Vanadium Corp.	Hot Springs	AR	1,994,000	0.45
45	33	Bethlehem Steel Corp.	Sparrows Point	MD	1,854,351	0.42
46	33	Johnstown Corp.	Johnstown	PA	1,782,090	0.40
47	28	BASF Corp.	Lowland	TN	1,730,000	0.39
48	28	Eli Lilly & Co.	Shadeland	IN	1,717,777	0.39
49	33	Bethlehem Steel Corp.	Bethlehem	PA	1,682,230	0.38
50	28	US Agri-Chemicals Inc.	Fort Meade	FL	1,665,294	0.37
		SUBTOTAL			376,995,176	84.77
		TOTAL FOR ALL OTHERS			67,741,374	15.23
		GRAND TOTAL			444,736,550	100.00

Table F-4. The Top 50 TRI Facilities for Discharges to Underground Injection Wells, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	UNDERGROUND INJECTION	
					Pounds	Percent
1	28	Monsanto Co.	Alvin	TX	205,817,600	17.43
2	28	American Cyanamid Co.	Westwego	LA	191,404,650	16.21
3	28	Vulcan Chemicals	Wichita	KS	91,513,565	7.75
4	28	Du Pont Beaumont Works	Beaumont	TX	83,664,740	7.09
5	28	BP Chemicals	Port Lavaca	TX	65,251,083	5.53
6	28	BP Chemicals Inc.	Lima	OH	52,932,250	4.48
7	28	Du Pont	New Johnsonville	TN	49,000,000	4.15
8	28	BASF Corp.	Geismar	LA	39,000,260	3.30
9	28	Du Pont	Louisville	KY	39,000,000	3.30
10	28	Du Pont Delisle Plant	Pass Christian	MS	37,000,000	3.13
11	28	Kaiser Aluminum & Chemical Corp. (a)	Mulberry	FL	32,013,400	2.71
12	28	Du Pont Victoria Site	Victoria	TX	30,674,348	2.60
13	28	Monsanto Co.	Cantonment	FL	23,646,078	2.00
14	33	National Steel Corp.	Portage	IN	23,477,945	1.99
15	28	Sterling Chemicals Inc.	Texas City	TX	19,009,330	1.61
16	28	Coastal Chem Inc.	Cheyenne	WY	14,125,832	1.20
17	28	Du Pont Sabine River Works	Orange	TX	12,877,646	1.09
18	Mult	Star Enterprise	Convent	LA	9,918,905	0.84
19	28	Hoechst Celanese Chemical	Pasadena	TX	9,347,309	0.79
20	29	Amoco Oil Co.	Texas City	TX	9,230,000	0.78
21	29	Citgo Petroleum Corp.	Lake Charles	LA	9,154,300	0.78
22	28	Great Lakes Chemical Co.	El Dorado	AR	8,874,109	0.75
23	28	Cabot Corp.	Tuscola	IL	8,113,400	0.69
24	28	Witco Corp.	Hahnville	LA	7,189,350	0.61
25	Mult	Inland Steel Co.	East Chicago	IN	6,740,000	0.57
26	32	Harshaw Chemical Co.	Jackson	MS	6,300,000	0.53
27	28	ICI Americas Inc.	Mount Pleasant	TN	5,978,660	0.51
28	28	Angus Chemical Co.	Sterlington	LA	5,849,000	0.50
29	28	Uniroyal Chemical Co. Inc.	Geismar	LA	4,730,134	0.40
30	28	Agricultural Minerals Corp.	Verdigris	OK	4,721,000	0.40
31	28	Celanese Engineering Resins	Bishop	TX	4,582,040	0.39
32	33	Armco Steel Co. L.P.	Middletown	OH	4,400,000	0.37
33	28	The Upjohn Co.	Kalamazoo	MI	4,227,245	0.36
34	28	Rubicon Inc.	Geismar	LA	4,073,000	0.34
35	29	Mobil Oil Corp.	Chalmette	LA	3,986,307	0.34
36	33	Asarco Inc.	Amarillo	TX	3,963,650	0.34
37	28	Monsanto Co.	Luling	LA	3,776,800	0.32
38	28	GAF Chemicals Corp.	Texas City	TX	3,044,950	0.26
39	28	Merichem Co.	Houston	TX	2,778,192	0.24
40	28	Du Pont	La Porte	TX	2,684,999	0.23
41	33	LTV Steel Co.	Hennepin	IL	2,500,000	0.21
42	33	Bethlehem Steel Corp.	Chesterton	IN	2,440,250	0.21
43	Mult	Shell Oil Co.	Norco	LA	2,117,000	0.18
44	28	Cominco American Inc.	Borger	TX	2,006,633	0.17
45	28	Jetco Chemicals	Corsicana	TX	1,978,555	0.17
46	28	Great Lakes Chemical Corp.	El Dorado	AR	1,941,090	0.16
47	28	Ethyl Corp.	Magnolia	AR	1,800,250	0.15
48	29	Texaco Refining & Marketing	Bakersfield	CA	1,611,250	0.14
49	28	Hoechst Celanese Chemical	Bay City	TX	1,584,583	0.13
50	28	Aristech Chemical Corp.	Haverhill	OH	1,563,700	0.13
		SUBTOTAL			1,163,615,388	98.54
		TOTAL FOR ALL OTHERS			17,215,793	1.46
		GRAND TOTAL			1,180,831,181	100.00

(a) Kaiser Aluminum and Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their discharges to underground injection wells is 4,487,000 pounds.

Table F-5. The Top 50 TRI Facilities for Transfers to Public Sewage, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	PUBLIC SEWAGE TRANSFERS	
					Pounds	Percent
1	28	Columbian Chemicals Co.	Saint Louis	MO	52,394,500	9.51
2	28	Filtrol Corp.	Vernon	CA	29,300,000	5.32
3	28	Allied Signal	Hopewell	VA	24,870,800	4.51
4	28	Monsanto Co.	Cahokia	IL	21,754,141	3.95
5	28	Air Products Mfg. Corp.	Pasadena	TX	14,880,830	2.70
6	28	Pfizer Pigments Inc.	East Saint Louis	IL	12,268,482	2.23
7	28	Phthalchem	Cincinnati	OH	11,701,726	2.12
8	28	Mallinckrodt Specialty	Saint Louis	MO	9,635,635	1.75
9	28	Monsanto Co.	Saint Louis	MO	8,965,148	1.63
10	26	Stone Container Corp.	Panama City	FL	8,368,138	1.52
11	33	Fort Howard Steel Inc.	Green Bay	WI	7,440,000	1.35
12	28	Sun Chemical Corp.	Newark	NJ	7,300,250	1.32
13	Mult	Monsanto Co.	Springfield	MA	6,624,310	1.20
14	26	Boise Cascade Papers	Saint Helens	OR	6,387,027	1.16
15	28	Givaudan Corp.	Clifton	NJ	6,344,275	1.15
16	26	St. Joe Forest Products Co.	Port Saint Joe	FL	6,088,000	1.10
17	20	Kraft Food Ingredient Corp.	Memphis	TN	6,001,800	1.09
18	28	Old Bridge Chemicals Inc.	Old Bridge	NJ	5,850,100	1.06
19	28	Rohm & Haas DVI	Philadelphia	PA	5,617,355	1.02
20	26	Stone Hopewell Inc.	Hopewell	VA	5,230,000	0.95
21	Mult	Witco Corp.	Memphis	TN	4,860,506	0.88
22	20	Corn Products & Best Foods	Bedford Park	IL	4,750,000	0.86
23	28	Merck & Co. Inc.	Rahway	NJ	4,746,928	0.86
24	28	Hoffmann-La Roche Inc.	Nutley	NJ	4,641,513	0.84
25	28	Union Oil Co. Unocal	Brea	CA	4,432,800	0.80
26	29	Amoco Oil Co.	Texas City	TX	3,805,970	0.69
27	28	PMC Specialties Group	Chicago	IL	3,594,170	0.65
28	28	Alliance Chemical Inc.	Newark	NJ	3,483,000	0.63
29	26	International Paper Co.	Erie	PA	3,399,200	0.62
30	26	Simpson Pasadena Paper Co.	Pasadena	TX	3,314,100	0.60
31	28	Aqualon Co.	Hopewell	VA	3,295,300	0.60
32	20	Penford Products Co.	Cedar Rapids	IA	3,205,700	0.58
33	28	Ferro Corp.	Hammond	IN	3,061,650	0.56
34	28	PMC Specialties Group	Cincinnati	OH	2,746,540	0.50
35	28	Ethyl Petroleum Additives Inc.	Sauget	IL	2,704,789	0.49
36	28	Union Carbide Chemicals &.	South Charleston	WV	2,624,443	0.48
37	20	Beatrice/Hunt-Wesson	Memphis	TN	2,568,000	0.47
38	28	Allied-Signal Inc.	Philadelphia	PA	2,550,000	0.46
39	28	Bristol-Myers Squibb Co.	Syracuse	NY	2,541,000	0.46
40	28	Amoco Petroleum Additives Co.	Wood River	IL	2,539,600	0.46
41	28	Hercules Inc.	Parlin	NJ	2,513,377	0.46
42	26	Macon Kraft Inc.	Macon	GA	2,362,800	0.43
43	28	Arco Chemical Co.	Pasadena	TX	2,225,104	0.40
44	28	BASF Corp.	Rensselaer	NY	2,160,731	0.39
45	29	Davison Chem Div.	Cincinnati	OH	2,143,250	0.39
46	26	Westvaco Corp.	Luke	MD	2,107,800	0.38
47	36	Motorola Inc.	Mesa	AZ	2,096,450	0.38
48	20	Cargill Inc.	Memphis	TN	2,090,000	0.38
49	28	Hilton Davis Co.	Newark	NJ	2,074,449	0.38
50	26	Potlatch Corp.	Cloquet	MN	2,053,250	0.37
		SUBTOTAL			347,714,937	63.10
		TOTAL FOR ALL OTHERS			203,319,759	36.90
		GRAND TOTAL			551,034,696	100.00

Table F-6. The Top 50 TRI Facilities for Off-Site Transfers, 1989.

TRI RANK	SIC CODE	FACILITY NAME	CITY	STATE	OFF-SITE TRANSFERS	
					Pounds	Percent
1	28	Atochem N.A.— Racon Facility	Wichita	KS	54,391,847	5.96
2	33	National Steel	Ecorse	MI	16,421,165	1.80
3	33	Empire	Mansfield	OH	10,658,412	1.17
4	28	The Upjohn Co.	Kalamazoo	MI	9,950,541	1.09
5	38	Du Pont Towanda Plant	Towanda	PA	7,531,669	0.82
6	33	Waupaca Foundry Inc.	Waupaca	WI	7,198,000	0.79
7	33	Wheeling-Pittsburgh Steel	Mingo Junction	OH	7,171,700	0.79
8	28	Genesis Polymers	Marysville	MI	6,757,000	0.74
9	33	Barmet Aluminum Corp.	Livia	KY	6,706,534	0.73
10	33	Keystone Steel & Wire Co.	Peoria	IL	6,370,500	0.70
11	28	SCM Chemicals Inc.	Ashtabula	OH	6,330,000	0.69
12	39	Tricil Recovery Services Inc.	Bartow	FL	6,244,132	0.68
13	Mult	3M Chemolite Center	Cottage Grove	MN	6,140,284	0.67
14	33	Charter Processing	Saukville	WI	6,130,560	0.67
15	28	Occidental Chemical Corp.	Deer Park	TX	6,052,000	0.66
16	28	Occidental Chemical Corp.	Deer Park	TX	5,269,050	0.58
17	28	Du Pont	La Porte	TX	5,266,233	0.58
18	28	Fermenta Asc	Houston	TX	5,171,706	0.57
19	33	Nucor-Yamato Steel Co.	Barfield	AR	5,022,930	0.55
20	33	Atlantic Steel Co.	Atlanta	GA	4,986,544	0.55
21	28	Du Pont Belle Plant	Belle	WV	4,861,950	0.53
22	33	Dofasco Inc.	Detroit	MI	4,824,700	0.53
23	33	USS South Works	Chicago	IL	4,531,878	0.50
24	33	Armco Advanced Materials Corp.	Zanesville	OH	4,406,364	0.48
25	28	Du Pont Mobile Plant	Axis	AL	4,380,015	0.48
26	28	Rhone-Poulenc	Baytown	TX	4,186,000	0.46
27	28	Mobay Corp.	Baytown	TX	3,769,309	0.41
28	33	North Star Steel Texas Inc.	Rose City	TX	3,510,551	0.38
29	33	Rouge Steel Co.	Dearborn	MI	3,507,600	0.38
30	28	Du Pont Spruance Site	Richmond	VA	3,484,650	0.38
31	28	Chemical Products Corp.	Cartersville	GA	3,400,000	0.37
32	34	Double Eagle Steel Coating Co.	Dearborn	MI	3,380,600	0.37
33	28	Eli Lilly & Co.	Indianapolis	IN	3,364,600	0.37
34	28	Pfizer Pigments Inc.	East Saint Louis	IL	3,355,387	0.37
35	33	Allegheny Ludlum Corp.	Brackenridge	PA	3,233,713	0.35
36	28	Heico Chemicals Inc.	Delaware Water Gap	PA	3,125,000	0.34
37	Mult	3M Consumer AV & Consumer Prod.	Hutchinson	MN	3,077,425	0.34
38	33	Atlantic Steel Co.	Cartersville	GA	3,034,115	0.33
39	28	Rayovac Corp.	Covington	TN	2,992,834	0.33
40	33	Asarco Inc.	Omaha	NE	2,882,850	0.32
41	32	Coplay Cement Co.	Logansport	IN	2,856,400	0.31
42	28	Rohm & Haas Delaware Valley	Bristol	PA	2,837,055	0.31
43	28	Sandoz Crop Protection Corp.	Beaumont	TX	2,798,901	0.31
44	28	Merck & Co. Inc.	Rahway	NJ	2,789,870	0.31
45	33	Waupaca Foundry Inc.	Waupaca	WI	2,765,589	0.30
46	33	USS Fairless Works	Fairless Hills	PA	2,754,391	0.30
47	28	3M	Cordova	IL	2,724,155	0.30
48	33	LTV Steel Co. Inc.	Cleveland	OH	2,697,469	0.30
49	28	PPG Industries	East Point	GA	2,675,390	0.29
50	26	CPI - Kraft Div.	Wisconsin Rapids	WI	2,671,000	0.29
		SUBTOTAL			290,650,568	31.83
		TOTAL FOR ALL OTHERS			622,401,595	68.17
		GRAND TOTAL			913,052,163	100.00

Table F-7. TRI Facilities with the Greatest Changes in Total Releases and Transfers, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	TOTAL RELEASES AND TRANSFERS 1989 Pounds	TOTAL RELEASES AND TRANSFERS 1988 Pounds	CHANGE IN TOTAL RELEASES AND TRANSFERS 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
Mult	Mult	Shell Oil Co.	Norco, St Charles, LA	4,960,250	158,662,990	-153,702,740
28	28	Freeport McMoran, Agrico Chem.Div.	Uncle Sam, St James, LA	15,410,826	63,327,150	-47,916,324
28	28	Freeport McMoran,Agrico Chem. Div.	Donaldsonville, Ascension, LA	17,254,750	61,820,000	-44,565,250
—	28	Avtex Fibers Front Royal Inc.	Front Royal, Warren, VA	—	37,731,700	-37,731,700
28	28	Du Pont Beaumont Works	Beaumont, Jefferson, TX	88,094,984	123,333,929	-35,238,945
28	28	Triad Chemical (b)	Donaldsonville, Ascension, LA	26,152,046	54,919,664	-28,767,618
28	28	Allied-Signal Inc.	Elizabeth, Union, NJ	60,976	28,290,620	-28,229,644
28	28	Sterling Chemicals Inc.	Texas City, Galveston, TX	20,574,970	42,987,500	-22,412,530
33	33	Asarco Inc.	Hayden, Gila, AZ	16,574,800	35,930,150	-19,355,350
28	28	Ciba-Geigy Corp.	Queensbury, Warren, NY	1,419,950	20,237,150	-18,817,200
28	28	Chevron Chemical Co.	Rock Springs, Sweetwater, WY	166,901	15,220,250	-15,053,349
28	28	Coastal Chem Inc.	Cheyenne, Laramie, WY	15,133,055	28,135,426	-13,002,371
33	33	National Steel	Ecorse, Wayne, MI	17,562,820	30,309,133	-12,746,313
28	28	BPChemicals	Port Lavaca, Calhoun, TX	65,543,672	78,225,900	-12,682,228
28	28	Arcadian Corp.	Geismar, Ascension, LA	24,967,500	37,319,500	-12,352,000
33	33	Herculaneum Smelter	Herculaneum, Jefferson, MO	17,110,851	28,890,351	-11,779,500
28	28	Monsanto Co.	Cantonment, Escambia, FL	25,622,958	36,249,190	-10,626,232
33	33	Asarco Inc.	El Paso, El Paso, TX	460,600	10,915,974	-10,455,374
28	28	Allied Signal	Hopewell, Hopewell City, VA	34,748,970	44,758,492	-10,009,522
Mult	Mult	Phillips 66 Co.	Borger, Hutchinson, TX	2,551,080	12,184,273	-9,633,193
				SUBTOTAL		-555,077,383
				TOTAL TRI DECREASE		-1,610,470,870
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
Mult	—	Kaiser Aluminum & Chemical Corp.(c)	Mulberry, Polk, FL	32,013,400	—	32,013,400
28	28	American Cyanamid Co.	Westwego, Jefferson, LA	192,350,800	176,418,250	15,932,550
28	28	Monsanto Co.	Alvin, Brazoria, TX	206,533,205	193,500,680	13,032,525
Mult	36	3M Consumer AV & Consumer Prod.	Hutchinson, McLeod, MN	28,998,967	16,645,979	12,352,988
33	33	Magnesium Corp. of America	Tooele, Tooele, UT	119,060,425	109,750,090	9,310,335
28	28	Du Pont	Louisville, Jefferson, KY	39,829,058	31,305,496	8,523,562
28	28	BASF Corp.	Lowland, Hamblen, TN	25,624,950	17,218,950	8,406,000
Mult	Mult	IMC Fertilizer Inc.	Mulberry, Polk, FL	9,663,500	1,296,350	8,367,150
28	28	Texasgulf Inc.	Aurora, Beaufort, NC	17,852,400	9,577,150	8,275,250
28	28	Union Carbide Chemicals	Texas City, Galveston, TX	11,092,955	3,462,976	7,629,979
33	33	Wheeling-Pittsburgh Steel	Follansbee, Brooke, WV	10,543,249	3,564,998	6,978,251
28	28	Royster Co.	Mulberry, Polk, FL	9,946,646	3,315,250	6,631,396
33	33	Wheeling-Pittsburgh Steel	Mingo Junction, Jefferson, OH	7,291,899	743,531	6,548,368
28	28	Plthalchem	Cincinnati, Hamilton, OH	12,950,558	6,674,640	6,275,918
33	33	Waupaca Foundry Inc.	Waupaca, Waupaca, WI	7,366,716	1,172,850	6,193,866
28	28	Mallinckrodt Specialty	St Louis, St Louis City, MO	10,561,144	4,381,190	6,179,954
28	28	Genesis Polymers	Marysville, St Clair, MI	6,825,300	761,334	6,063,966
28	28	Filtrol Corp.	Vernon, Los Angeles, CA	29,595,850	23,533,250	6,062,600
28	28	Old Bridge Chemicals Inc.	Old Bridge, Middlesex, NJ	5,870,111	107,923	5,762,188
33	33	General Motors Corp.	Defiance, Defiance, OH	8,457,295	2,777,650	5,679,645
				SUBTOTAL		186,219,891
				TOTAL TRI INCREASE		889,656,639
				NET CHANGE(d)		-720,814,231

(a) — Means the facility did not report for that year.

(b) Triad Chemical has submited a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report,the original submission had not been removed at that time. The revised amount for this facility's 1988 total releases and transfers is 27,252,982 pounds. This facility's decrease in total releases and transfers from 1988 to 1989 is then 1,100,936 pounds.

(c) Kaiser Aluminum and Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their discharges to underground injection wells (which is their total releases and transfers) is 4,487,000 pounds. This facility's increase in total releases and transfers from 1988 to 1989 is then 4,487,000 pounds.

(d) Net Change = Total TRI Decrease + Total TRI Increase

Table F-8. TRI Facilities with the Greatest Changes in Total Air Emissions, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	AIR 1989 Pounds	AIR 1988 Pounds	CHANGE IN AIR 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
—	28	Avtex Fibers Front Royal Inc.	Front Royal, Warren, VA	—	34,410,250	-34,410,250
28	28	Triad Chemical (b)	Donaldsville, Ascension, LA	25,279,885	53,830,470	-28,550,585
28	Mult	The Upjohn Co. (c)	Kalamazoo, Kalamazoo, MI	6,878,820	13,578,000	-6,699,180
38	38	Eastman Kodak Co.	Rochester, Monroe, NY	16,794,179	21,621,312	-4,827,133
28	28	BP Chemicals Inc.	Lima, Allen, OH	3,615,300	7,286,550	-3,671,250
28	28	Monsanto Co.	Luling, St Charles, LA	796,242	4,317,291	-3,521,049
Mult	Mult	IBM	Endicott, Broome, NY	956,930	4,456,471	-3,499,541
28	28	Westvaco Corp.	Covington, Covington City, VA	2,808,647	6,293,647	-3,485,000
28	28	Quantum Chemical Corp.	Morris, Grundy, IL	1,792,650	4,866,750	-3,074,100
Mult	Mult	Union Camp Corp.	Savannah, Chatham, GA	13,190,000	16,261,250	-3,071,250
—	26	American Tape Co.	Marysville, St Clair, MI	—	3,070,624	-3,070,624
28	28	Wil-Gro Fertilizer Inc.	Pryor, Mayes, OK	1,154,000	4,186,166	-3,032,166
Mult	Mult	Westvaco Corp	Covington, Alleghany, VA	9,927,500	12,641,000	-2,713,500
28	28	Phthalchem	Cincinnati, Hamilton, OH	1,229,190	3,678,052	-2,448,862
28	28	Atlas Powder Co.	Joplin, Jasper, MO	608,350	3,008,683	-2,400,333
33	33	USS Clairton Works	Clairton, Allegheny, PA	2,928,990	5,316,551	-2,387,561
26	26	Temple-Inland Inc.	Evadale, Jasper, TX	2,146,750	4,520,000	-2,373,250
28	28	Union Oil Co.	Kenai, Kenai Peninsula, AK	18,308,500	20,660,250	-2,351,750
27	27	Maxwell Communication Corp.	Broadview, Cook, IL	1,971,228	4,231,848	-2,260,620
26	26	International Paper	Selma, Dallas, AL	1,503,105	3,643,325	-2,140,220
				SUBTOTAL		-119,988,224
				TOTAL TRI DECREASE		-559,862,284
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
Mult	36	3M Consumer Av & Consumer Products	Hutchinson, Mc Leod, MN	25,661,502	16,306,841	9,354,661
33	33	Magnesium Corp.of America	Tooele, Tooele, UT	119,060,170	109,748,910	9,311,260
28	28	BASF Corp.	Lowland, Hamblen, TN	23,879,550	15,477,550	8,402,000
28	28	Royster Co.	Mulberry, Polk, FL	7,048,646	673,250	6,375,396
28	28	Union Carbide Chemicals	Texas City, Galveston, TX	8,519,845	3,462,976	5,056,869
28	28	Royster Phosphates Inc.	Palmetto, Manatee, FL	5,543,000	1,322,000	4,221,000
37	—	GMC, Inland Fisher Guide	Monroe, Ouachita, LA	3,663,102	—	3,663,102
29	29	Farmland Industries Inc.	Coffeyville, Montgomery, KS	5,873,891	2,975,568	2,898,323
Mult	—	Brunswick Defense	Willard, Huron, OH	2,436,573	—	2,436,573
37	37	Honda of America Mfg. Inc.	Marysville, Union, OH	4,876,178	2,572,696	2,303,482
Mult	Mult	Elkem Metals Co.	Marietta, Washington, OH	3,628,512	1,339,500	2,289,012
28	—	Aristech Chemical Corp.	Haverhill, Scioto, OH	2,077,000	—	2,077,000
37	37	Ford Electronics	Connersville, Fayette, IN	2,621,090	640,850	1,980,240
25	—	Johnston Tombigbee Furniture	Columbus, Lowndes, MS	1,935,167	—	1,935,167
28	28	Ashland Chemical Inc.	Plaquemine, Iberville, LA	1,916,130	19,093	1,897,037
28	28	Terra International Inc.	Woodward, Woodward, OK	4,031,000	2,252,700	1,778,300
28	28	Freeport McMoran, Agrico Chemical Div.	Donaldsonville, Ascension, LA	16,223,250	14,463,500	1,759,750
28	—	Arcadian Corp.	Lake Charles, Calcasieu, LA	1,740,000	—	1,740,000
37	37	GMC, Delco Products Div.	Dayton, Montgomery, OH	2,265,832	546,398	1,719,434
28	28	Freeport McMoran, Agrico Chemical Div.	Hahnville, St Charles, LA	1,661,250	0	1,661,250
				SUBTOTAL		72,859,856
				TOTAL TRI INCREASE		391,282,607
				NET CHANGE(d)		-168,579,677

(a) — Means the facility did not report for that year.

(b) Triad Chemical has submitted a revision to TRI of their 1988 releases and transfers. While the revision has been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for this facility's total 1988 air emissions is 26,689,860 pounds. Therefore, the change in total air emissions between 1988 and 1989 for this facility becomes a decrease of 1,409,975 pounds.

(c) The Upjohn Co. has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for this facility's 1988 total air emissions is 7,427,500 pounds. Therefore, the change in total air emissions between 1988 and 1989 for this facilty becomes a decrease of 548,680 pounds.

(d) Net Change = Total TRI Decrease + Total TRI Increase

Table F-9. TRI Facilities with the Greatest Changes in Discharges to Surface Water, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	SURFACE WATER 1989 Pounds	SURFACE WATER 1988 Pounds	CHANGE IN SURFACE WATER 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
28	28	Freeport McMoran, Agrico Chemical Div.	Uncle Sam, St James, LA	13,332,100	62,675,000	-49,342,900
28	28	Freeport McMoran, Agrico Chemical Div.	Donaldsonville, Ascension, LA	638,000	47,299,000	-46,661,000
28	28	Arcadian Corp.	Geismar, Ascension, LA	22,400,250	34,980,250	-12,580,000
28	28	Allied Signal	Hopewell, Hopewell City, VA	9,334,845	18,930,647	-9,595,802
28	28	PPG Industries Inc.	Westlake, Calcasieu, LA	407,559	3,633,454	-3,225,895
28	33	Rayovac Corp.	Covington, Tipton, TN	29,741	1,705,878	-1,676,137
33	33	ArmcoAdvanced Materials Co.	Butler, Butler, PA	47,322	1,346,428	-1,299,106
28	None	Continental Nitrogen	Rosemount, Dakota, MN	0	940,000	-940,000
28	28	W. R. Grace & Co.	Sulphur, Calcasieu, LA	2,104,800	3,029,400	-924,600
28	28	Pfizer Inc.	Groton, New London, CT	4,197,160	5,092,090	-894,930
28	28	Laroche Chemicals Inc.	Gramercy, St James, LA	236,100	1,128,900	-892,800
28	28	W. R. Grace & Co. -Conn.	Baltimore, Baltimore, MD	1,614,050	2,487,110	-873,060
—	28	Rohm & Haas Texas Inc.	Deerpark, Harris, TX	—	658,740	-658,740
26	26	Simpson Paper Co.	Eureka, Humboldt, CA	4,496,650	5,014,100	-517,450
34	34	Pioneer Metal Finishing	Minneapolis, Hennepin, MN	0	508,424	-508,424
33	33	Commonwealth Aluminum Corp.	Lewisport, Hancock, KY	1,000	505,155	-504,155
28	28	Gardinier Inc.	Riverview, Hillsborough, FL	108	500,187	-500,079
20	20	Crossroad Farms Dairy	Indianapolis, Marion, IN	0	488,352	-488,352
31	31	W. D. Byron & Sons Inc.	Williamsport, Washington, MD	104,050	575,472	-471,422
26	26	Inland Container Corp.	New Johnsonville, Humphreys, TN	1,691,804	2,131,366	-439,562
			SUBTOTAL			-132,994,414
			TOTAL TRI DECREASE			-152,175,415
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
28	28	3M	Cordova, Rock Island, IL	14,600,000	11,800,000	2,800,000
28	28	DSM Chemicals Augusta Inc.	Augusta, Richmond, GA	1,968,969	1,897	1,967,072
33	33	US Vanadium Corp.	Hot Springs, Garland, AR	7,801,550	6,001,500	1,800,050
26	26	Weyerhaeuser Co.	Cosmopolis, Grays Harbor, WA	8,193,150	6,443,650	1,749,500
28	28	Tennessee Eastman Co.	Kingsport, Sullivan, TN	3,021,104	1,535,999	1,485,105
26	26	Alaska Pulp Corp.	Sitka, Sitka, AK	1,011,976	32,000	979,976
28	28	Arcadian Corp.	Port Wentworth, Chatham, GA	1,200,000	480,000	720,000
26	26	ITT Rayonier Inc.	Port Angeles, Clallam, WA	5,518,500	4,801,250	717,250
Mult	Mult	Phillips 66 Co.	Borger, Hutchinson, TX	715,472	34,925	680,547
28	28	Eli Lilly & Co.	Shadeland, Tippecanoe, IN	2,385,777	1,740,184	645,593
26	26	International Paper Co.	Moss Point, Jackson, MS	595,000	17,810	577,190
28	28	Melamine Chemicals Inc.	Donaldsonville, Ascension, LA	1,229,965	656,859	573,106
24	24	Wood Fiber Industries	Danville, Danville City, VA	550,532	250	550,282
26	26	Louisiana-Pacific Corp.	Samoa, Humboldt, CA	5,012,400	4,474,000	538,400
26	26	ITT Rayonier Inc.	Fernandina Beach, Nassau, FL	5,884,740	5,421,000	463,740
29	29	Exxon, Baytown Refinery	Baytown, Harris, TX	441,050	39,500	401,550
28	28	Cedar Chemical Corp.	Vicksburg, Warren, MS	706,832	308,000	398,832
26	Mult	Union Camp Corp.	Franklin, Franklin City, VA	737,210	346,610	390,600
28	28	ICI Americas Inc	Dighton, Bristol, MA	806,400	424,894	381,506
33	33	LTV Steel Co. Inc.	Cleveland, Cuyahoga, OH	1,572,602	1,201,574	371,028
			SUBTOTAL			18,191,327
			TOTAL TRI INCREASE			31,567,682
			NET CHANGE(b)			-120,607,733

(a) — Means the facility did not report for that year.
(b) Net Change = Total TRI Decrease + Total TRI Increase

Table F-10. TRI Facilities with the Greatest Changes in Total On-site Land Releases, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	LAND 1989 Pounds	LAND 1988 Pounds	CHANGE IN LAND 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
33	33	Asarco Inc.	Hayden, Gila, AZ	15,749,150	33,663,950	-17,914,800
28	28	Chevron Chemical Co.	Rock Springs, Sweetwater, WY	7,000	15,046,400	-15,039,400
33	33	Herculaneum Smelter	Herculaneum, Jefferson, MO	16,678,414	28,460,108	-11,781,694
33	33	Asarco Inc.	El Paso, El Paso, TX	8,750	10,490,274	-10,481,524
Mult	Mult	Phillips 66 Co.	Borger, Hutchinson, TX	123,968	9,876,389	-9,752,421
28	28	Engelhard Corp.	Attapulgus, Decatur, GA	0	8,580,000	-8,580,000
33	33	USS Gary Works	Gary, Lake, IN	18,738	5,924,000	-5,905,262
33	33	Chaparral Steel Co.	Midlothian, Ellis,TX	924,664	6,199,692	-5,275,028
Mult	Mult	Inland Steel Co.	East Chicago, Lake, IN	44,826,050	50,040,600	-5,214,550
28	28	Royster Phosphates Inc.	Palmetto, Manatee, FL	2,846,000	6,600,000	-3,754,000
28	28	Farmland Industries Inc.	Bartow, Polk, FL	0	3,400,113	-3,400,113
—	28	Climax Chemical Co.	Monument, Lea, NM	—	3,247,000	-3,247,000
33	33	Cyprus Miami Mining Corp.	Claypool, Gila, AZ	13,658,434	16,880,000	-3,221,566
33	33	Warren Consolidated Industries	Warren, Trumbull, OH	2,236,800	5,229,007	-2,992,207
28	28	Molycorp. Inc.	Moutain Pass, San Bernardino, CA	2,840,700	5,679,000	-2,838,300
Mult	Mult	Kohler Co.	Kohler, Sheboygan, WI	1,299,300	4,028,100	-2,728,800
33	33	Newport Steel Corp.	Newport, Campbell, KY	0	2,469,500	-2,469,500
33	33	Copperweld Steel Co.	Warren, Trumbull, OH	108,387	2,335,907	-2,227,520
28	28	Du Pont Delisle Plant	Pass Christian, Harrison, MS	0	2,200,000	-2,200,000
33	33	SKW Alloys Inc.	Calvert City, Marshall, KY	382,946	2,572,883	-2,189,937
			SUBTOTAL			-121,213,622
			TOTAL TRI DECREASE			-182,666,795
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
Mult	Mult	IMC Fertilizer Inc.	Mulberry, Polk, FL	8,200,250	0	8,200,250
28	28	Texasgulf Inc.	Aurora, Beaufort, NC	15,541,950	8,333,000	7,208,950
33	33	Wheeling-Pittsburgh Steel	Follansbee, Brooke, WV	7,172,820	346,900	6,825,920
33	33	GMC, Saginaw Grey Iron Plant	Saginaw, Saginaw, MI	7,798,550	2,529,610	5,268,940
28	28	Freeport McMoran, Agrico Chemical Div.	Mulberry, Polk, FL	5,260,000	0	5,260,000
33	33	GMC, Central Foundry Div.	Defiance, Defiance, OH	7,741,250	2,539,700	5,201,550
33	33	Asarco Inc.	East Helena, Lewis and Clark, MT	36,425,460	32,764,230	3,661,230
28	—	Climax Chemical Co.	Monument, Lea, NM	3,247,000	—	3,247,000
33	33	Kennecott Utah Copper	Bingham Canyon, Salt Lake, UT	14,902,650	11,986,000	2,916,650
28	28	LCP Chemicals	Moundsville, Marshall, WV	2,483,609	32,875	2,450,734
26	26	Nekoosa Packaging	Tomahawk, Lincoln, WI	2,408,800	750	2,408,050
33	33	Armco Steel Co. L.P.	Middletown, Butler, OH	2,196,550	277,100	1,919,450
28	28	Occidental Chemical Corp.	Castle Hayne, New Hanover, NC	8,800,275	6,905,501	1,894,774
33	33	Northwestern Steel & Wire Co.	Sterling, Whiteside, IL	4,820,000	2,959,000	1,861,000
Mult	Mult	Kerr-Mcgee Chemical Corp.	Hamilton, Monroe, MS	8,473,000	6,677,000	1,796,000
33	—	Johnstown Corp.	Johnston, Cambria, PA	1,782,090	—	1,782,090
28	—	John C. Wilson Co. Inc.	Millen, Jenkins, GA	1,610,180	—	1,610,180
33	33	Bethlehem Steel Corp.	Bethlehem, Northhampton, PA	1,682,230	140,100	1,542,130
20	20	Heublein Inc.	Madera, Madera, CA	1,400,000	0	1,400,000
28	28	Freeport McMoran, Agrico Chemical Div.	Uncle Sam, St James, LA	1,388,426	0	1,388,426
			SUBTOTAL			67,843,324
			TOTAL TRI INCREASE			92,892,338
			NET CHANGE(b)			-89,774,457

(a) — Means the facility did not report for that year.
(b) Net Change = Total TRI Decrease+ Total TRI Increase

Table F-11. TRI Facilities with the Greatest Changes in Discharges to Underground Injection Wells, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	UNDERGROUND 1989 Pounds	UNDERGROUND 1988 Pounds	CHANGE IN UNDERGROUND 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
Mult	Mult	Shell Oil Co.	Norco, St Charles, LA	2,117,000	156,363,300	-154,246,300
28	28	Du Pont Beaumont Works	Beaumont, Jefferson, TX	83,664,740	118,145,660	-34,480,920
28	28	Sterling Chemicals Inc.	Texas City, Galveston, TX	19,009,330	39,176,200	-20,166,870
28	28	Coastal Chem Inc.	Cheyenne, Laramie, WY	14,125,832	27,113,559	-12,987,727
28	28	BP Chemicals	Port Lavaca, Calhoun, TX	65,251,083	77,781,500	-12,530,417
28	28	Monsanto Co.	Cantonment, Escambia, FL	23,646,078	34,478,262	-10,832,184
33	33	National Steel, Midwest Steel Div.	Portage, Porter, IN	23,477,945	27,079,220	-3,601,275
28	28	Du Pont Delisle Plant	Pass Christian, Harrison, MS	37,000,000	40,500,000	-3,500,000
28	28	Arco Chemical Co.	Channelview, Harris, TX	1,120,400	3,502,240	-2,381,840
28	28	Angus Chemical Co.	Sterlington, Ouachita, LA	5,849,000	7,557,000	-1,708,000
28	28	Uniroyal Chemical Co. Inc.	Geismar, Ascension, LA	4,730,134	6,232,260	-1,502,126
28	28	Parke-Davis	Holland, Ottawa, MI	723,950	2,139,200	-1,415,250
28	28	Celanese Engineering Resins	Bishop, Nueces, TX	4,582,040	5,964,720	-1,382,680
28	Mult	The Upjohn Co. (b)	Kalamazoo, Kalamazoo, MI	4,227,245	5,521,000	-1,293,755
28	28	Agricultural Minerals Corp.	Verdigris, Rogers, OK	4,721,000	6,000,383	-1,279,383
33	33	Asarco Inc.	Amarillo, Potter, TX	3,963,650	5,148,390	-1,184,740
28	28	Du Pont	La Porte, Harris, TX	2,684,999	3,781,820	-1,096,821
28	28	Aristech Chemical Corp.	Haverhill, Scioto, OH	1,563,700	2,615,100	-1,051,400
28	28	Rubicon Inc.	Geismar, Ascension, LA	4,073,000	5,009,109	-936,109
28	28	Rexene Products Co.	Odessa, Ector, TX	967,424	1,882,200	-914,776
				SUBTOTAL		-268,492,573
				TOTAL TRI DECREASE		-272,752,363
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
28	—	Kaiser Aluminum & Chemical Corp. (c)	Mulberry, Polk, FL	32,013,400	—	32,013,400
28	28	American Cyanamid Co.	Westwego, Jefferson, LA	191,404,650	175,187,750	16,216,900
28	28	Monsanto Co.	Alvin, Brazoria, TX	205,817,600	192,868,500	12,949,100
28	28	Du Pont	Louisville, Jefferson, KY	39,000,000	30,000,000	9,000,000
28	28	Du Pont Sabine River Works	Orange, Orange, TX	12,877,646	5,247,517	7,630,129
28	28	Du Pont	New Johnsonville, Humphreys, TN	49,000,000	44,000,000	5,000,000
28	28	Hoechst Celanese Chemical	Pasadena, Harris, TX	9,347,309	4,700,381	4,646,928
29	29	Amoco Oil Co.	Texas City, Galveston, TX	9,230,000	5,000,000	4,230,000
28	28	Great Lakes Chemical Co.	El Dorado, Union, AR	8,874,109	4,687,472	4,186,637
28	28	BASF Corp.	Geismar, Ascension, LA	39,000,260	35,550,965	3,449,295
28	28	Du Pont Victoria Site	Victoria, Victoria, TX	30,674,348	27,358,488	3,315,860
28	28	Cabot Corp.	Tuscola, Douglas, IL	8,113,400	5,056,140	3,057,260
28	28	BP Chemicals Inc.	Lima, Allen, OH	52,932,250	50,011,750	2,920,500
28	28	Witco Corp.	Hahnville, St Charles, LA	7,189,350	5,181,810	2,007,540
28	28	Great Lakes Chemical Corp.	El Dorado, Union, AR	1,941,090	880,000	1,061,090
28	28	Wil-Gro Fertilizer Inc.	Pryor, Mayes, OK	1,061,550	8,400	1,053,150
Mult	Mult	Inland Steel Co.	East Chicago, Lake, IN	6,740,000	5,840,000	900,000
28	28	Vulcan Chemicals	Wichita, Sedgwick, KS	91,513,565	90,744,910	768,655
28	28	Arkansas Chemicals Inc.	El Dorado, Union, AR	623,000	0	623,000
29	29	Diamond Shamrock Refining	Sunray, Moore, TX	661,441	64,174	597,267
				SUBTOTAL		115,626,711
				TOTAL TRI INCREASE		119,419,282
				NET CHANGE(d)		-153,333,081

(a) — Means the facility did not report for that year.

(b) The Upjohn Co. has submitted a revision to TRI of their 1988 releases and transfers. While the revision had been entered into the version (April 19, 1991) of the TRI database used in this report, the original submission had not been removed at that time. The revised amount for this facility's 1988 TRI underground injection is 2,905,500 pounds. This facility's change in to underground injection from 1988 to 1989 is then an increase of 1,321,745 pounds.

(c) Kaiser Aluminum and Chemical Corp. has submitted a revision to TRI regardingtheir 1989 releases and transfers. The revised amount for their 1989 discharges to underground injection wells is 4,487,000 pounds. This facility's increase in underground injection from 1988 to 1989 is then 4,487,000 pounds.

(d) Netchange = Total TRI Decrease + Total TRI Increase

Table F-12. TRI Facilities with the Greatest Changes in Transfers to Public Sewage, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	PUBLIC SEWAGE 1989 Pounds	PUBLIC SEWAGE 1988 Pounds	CHANGE IN PUBLIC SEWAGE 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
—	22	Fruit of the Loom Inc.	St Martinville, St Martin, LA	—	3,433,472	-3,433,472
28	28	Ciba-Geigy Corp.	Queensbury, Warren, NY	0	2,848,750	-2,848,750
Mult	Mult	Du Pont	Memphis, Shelby, TN	1,101,960	3,878,230	-2,776,270
28	28	Union Oil Co. of CA DBA Unocal	Wilmington, Los Angeles, CA	46,649	2,802,000	-2,755,351
28	28	Union Oil Co. Unocal	Brea, Orange, CA	4,432,800	7,155,000	-2,722,200
28	28	Merck & Co. Inc.	Rahway, Union, NJ	4,746,928	7,221,029	-2,474,101
28	28	Air Products Mfg. Corp.	Pasadena, Harris, TX	14,880,830	16,985,850	-2,105,020
33	33	Fort Howard Steel Inc.	Green Bay, Brown, WI	7,440,000	9,440,000	-2,000,000
—	20	Industries Corp.	Ponce, Ponce, PR	—	1,826,917	-1,826,917
28	28	Mobay Corp.	Haledon, Passaic, NJ	1,375,455	3,049,090	-1,673,635
27	27	Cookson Graphics	Holyoke, Hampden, MA	1,000	1,643,865	-1,642,865
28	28	Lederle Laboratories	Pearl River, Rockland, NY	950,360	2,542,520	-1,592,160
28	28	Eval Co. of America	Pasadena, Harris, TX	69,541	1,531,978	-1,462,437
31	31	Irving Tanning Co.	Hartland, Somerset, ME	144,309	1,598,531	-1,454,222
28	28	Aqualon Co.	Hopewell, Hopewell City, VA	3,295,300	4,696,171	-1,400,871
38	38	Anitec Image Corp.	Binghamton, Broome, NY	1,568,100	2,962,700	-1,394,600
27	27	Cookson Graphics Inc.	Holyoke, Hampen, MA	1,000	1,337,835	-1,336,835
—	28	Henkel Corp.	Cincinnati, Hamilton, OH	—	1,200,000	-1,200,000
33	33	Armco Steel Co. L.P.	Middletown, Butler, OH	715,300	1,815,500	-1,100,200
Mult	Mult	GMC, Delco Products Div.	Livonia, Wayne, MI	1,406,007	2,463,470	-1,057,463
			SUBTOTAL			-38,257,369
			TOTAL TRI DECREASE			-120,752,192
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
28	28	Phthalchem	Cincinatti, Hamilton, OH	11,701,726	2,975,708	8,726,018
28	28	Mallinckrodt Specialty	St Louis, St Louis, MO	9,635,635	3,517,375	6,118,260
28	28	Filtrol Corp.	Vernon, Los Angeles, CA	29,300,000	23,500,000	5,800,000
28	28	Old Bridge Chemicals Inc.	Old Bridge, Middlesex, NJ	5,850,100	96,243	5,753,857
28	28	Givaudan Corp.	Clifton, Passaic, NJ	6,344,275	2,283,000	4,061,275
28	Mult	Sun Chemical Corp.	Newark, Essex, NJ	7,300,250	4,900,000	2,400,250
28	28	Monsanto Co.	St Loius, St Louis City, MO	8,965,148	6,749,084	2,216,064
28	28	Procter & Gamble Manufacturing	Sacramento, Sacramento, CA	1,709,500	0	1,709,500
28	28	Hoffmann-La Roche Inc.	Nutley, Essex, NJ	4,641,513	3,037,850	1,603,663
36	36	American Microsystems Inc.	Pocatello, Bannock, ID	1,515,860	16,836	1,499,024
28	28	PMC Specialties Group	Chicago, Cook, IL	3,594,170	2,361,645	1,232,525
Mult	Mult	Monsanto Co.	Springfield, Hampden, MA	6,624,310	5,658,311	965,999
37	37	Lowell Engineering Corp.	Alto, Kent, MI	951,211	31,300	919,911
28	28	American Cyanamid Co.	Kalamazoo, Kalamazoo, MI	1,646,950	779,500	867,450
20	20	Cargill Inc.	Memphis, Shelby, TN	2,090,000	1,236,000	854,000
28	28	Ferro Corp.	Hammond, Lake, IN	3,061,650	2,223,450	838,200
28	28	Amoco Petroleum Additives Co.	Wood River, Madison, IL	2,539,600	1,767,900	771,700
28	28	Morton International Inc.	Cinncinatti, Hamilton, OH	792,000	50,000	742,000
28	28	Amoco Performance Products Inc	Augusta, Richmond, GA	713,718	0	713,718
29	29	Amoco Oil Co.	Texas City, Galveston, TX	3,805,970	3,100,300	705,670
			SUBTOTAL			48,499,084
			TOTAL TRI INCREASE			100,858,208
			NET CHANGE(b)			-19,893,984

(a) — Means the facility did not report for that year.

(b) Net Change = Total TRI Decrease + Total TRI Increase

Table F-13. TRI Facilities with the Greatest Changes in Off-site Transfers, 1988-1989.

SIC CODE(a) 1989	SIC CODE(a) 1988	FACILITY NAME	CITY, COUNTY, STATE	OFF-SITE 1989 Pounds	OFF-SITE 1988 Pounds	CHANGE IN OFF-SITE 1988-1989 Pounds
THE TWENTY FACILITIES WITH THE LARGEST DECREASES						
28	28	Allied-Signal Inc.	Elizabeth, Union, NJ	250	28,200,000	-28,199,750
28	28	Ciba-Geigy Corp.	Queensbury, Warren, NY	1,417,450	17,345,100	-15,927,650
33	33	National Steel	Ecorse, Wayne, MI	16,421,165	28,112,813	-11,691,648
—	26	International Paper	Bastrop, Morehouse, LA	—	8,235,250	-8,235,250
33	33	Republic Engineered Steels Inc	Canton, Stark, OH	104,410	7,579,595	-7,475,185
—	28	Michigan Recovery Systems Inc.	Romulus, Wayne, MI	—	7,137,250	-7,137,250
33	33	U. S. Reduction Co.	East Chicago, Lake, IN	100,000	6,351,000	-6,251,000
28	28	Occidental Chemical Corp.	Deer Park, Harris, TX	5,269,050	11,023,524	-5,754,474
28	28	GAF Chemicals Corp.	Calvert City, Marshall, KY	396,366	5,334,265	-4,937,899
33	33	Raritan River Steel Co.	Perth Amboy, Middlesex, NJ	0	4,832,323	-4,832,323
—	33	Pasco Zinc Corp.	Torrance, Los Angeles, CA	—	4,552,986	-4,552,986
28	28	Rohm & Haas DVI	Philadelphia, Philadelphia, PA	1,409,008	5,932,251	-4,523,243
33	33	Bayou Steel Corp.	La Place, St John the Bapist, LA	513,000	4,737,300	-4,224,300
33	33	J&L Specialty Products Corp.	Midland, Beaver, PA	2,057,399	6,244,042	-4,186,643
28	28	Olin Corp.	Beaumont, Jefferson,TX	0	4,142,112	-4,142,112
37	37	Gulfstream Aerospace Corp.	Savannah, Chatham, GA	185,304	3,866,208	-3,680,904
32	32	Coplay Cement Co.	Logansport, Cass, IN	2,856,400	6,517,200	-3,660,800
33	33	Weirton Steel Corp.	Weirton, Hancock, WV	1,412,536	5,035,336	-3,622,800
32	32	Allied Automotive-Bendix Pmd	Cleveland, Bradley, TN	269,291	3,883,456	-3,614,165
34	34	Ajax Metal Processing	Warren, Macomb, MI	1,221,951	4,554,849	-3,332,898
				SUBTOTAL		-139,983,280
				TOTAL TRI DECREASE		-456,649,039
THE TWENTY FACILITIES WITH THE LARGEST INCREASES						
33	33	Wheeling-Pittsburgh Steel	Mingo Junction, Jefferson, OH	7,171,700	347,000	6,824,700
33	33	Waupaca Foundry Inc.	Waupaca, Waupaca, WI	7,198,000	1,066,650	6,131,350
28	28	Genesis Polymers	Marysville, St Clair, MI	6,757,000	752,139	6,004,861
28	28	Occidental Chemical Corp.	Deer Park, Harris, TX	6,052,000	810,125	5,241,875
33	33	Keystone Steel & Wire Co.	Peoria, Peoria, IL	6,370,500	1,305,000	5,065,500
Mult	Mult	3M Chemolite Center	Cottage Grove, Washington, MN	6,140,284	1,082,730	5,057,554
33	—	Nucor-Yamato Steel Co.	Barfield, Mississippi, AR	5,022,930	—	5,022,930
33	33	Rouge Steel Co.	Dearborn, Wayne, MI	3,507,600	57,750	3,449,850
28	28	Atochem N.A.— Racon Facility	Wichita, Sedgwick, KS	54,391,847	51,117,901	3,273,946
Mult	36	3M Consumer AV & Consumer Products	Hutchinson, Mc Leod, MN	3,077,425	316,358	2,761,067
39	39	Tricil Recovery Services Inc.	Bartow, Polk, FL	6,244,132	3,660,140	2,583,992
33	33	Waupaca Foundry Inc.	Waupaca, Waupaca, WI	2,765,589	210,050	2,555,539
28	28	Du Pont	La Porte, Harris, TX	5,266,233	2,757,267	2,508,966
34	34	Lake Erie Screw Corp.	Lakewood, Cuyahoga, OH	2,400,000	115,000	2,285,000
28	28	Heico Chemicals Inc.	Delaware Water Gap, Monroe, PA	3,125,000	854,421	2,270,579
28	28	Fermenta ASC	Houston, Harris, TX	5,171,706	2,902,605	2,269,101
28	28	3M	Cordova, Rock Island, IL	2,724,155	517,740	2,206,415
33	33	American Spring Wire Corp.	Bedford, Cuyahoga, OH	2,412,540	211,342	2,201,198
28	28	Union Carbide Chemicals	Texas City, Galveston, TX	2,109,429	0	2,109,429
33	33	Charter Processing	Saukville, Ozaukee, WI	6,130,560	4,123,000	2,007,560
				SUBTOTAL		71,831,412
				TOTAL TRI INCREASE		288,023,740
				NET CHANGE(b)		-168,625,299

(a) — Means the facility did not report for that year.
(b)Net Change = Total TRI Decrease + Total TRI Increase

APPENDIX G

Distribution of TRI Releases and Transfers by Chemical, 1989

Table G-1. The Top Ten TRI Facilities for the 25 Chemicals with the Largest Releases and Transfers, 1989.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	Ammonium sulfate	28	Monsanto Co.	Alvin	TX	200,000,000	26.64
		28	Du Pont Beaumont Works	Beaumont	TX	76,109,000	10.14
		28	American Cyanamid Co.	Westwego	LA	69,300,000	9.23
		28	BP Chemicals	Port Lavaca	TX	53,045,016	7.07
		28	Columbian Chemicals Co.	Saint Louis	MO	52,369,000	6.98
		28	BP Chemicals Inc.	Lima	OH	43,000,000	5.73
		28	Allied Signal	Hopewell	VA	31,262,000	4.16
		28	Filtrol Corp.	Vernon	CA	26,200,250	3.49
		28	3M	Cordova	IL	14,600,000	1.94
		28	Pfizer Pigments Inc.	East Saint Louis	IL	12,289,368	1.64
			SUBTOTAL			578,174,634	77.02
			TOTAL FOR CHEMICAL			750,649,064	100.00
2	Hydrochloric acid	28	Vulcan Chemicals	Wichita	KS	74,007,600	14.93
		28	Atochem N.A.— Racon Facility	Wichita	KS	53,836,350	10.86
		28	Du Pont	New Johnsonville	TN	49,029,500	9.89
		28	BASF Corp.	Geismar	LA	39,046,140	7.88
		28	Du Pont	Louisville	KY	39,019,700	7.87
		28	Du Pont Delisle Plant	Pass Christian	MS	37,258,000	7.52
		28	Kaiser Aluminum & Chemical Corp. (a)	Mulberry	FL	32,013,400	6.46
		28	Monsanto Co.	Cahokia	IL	15,590,093	3.15
		33	Magnesium Corp. of America	Tooele	UT	8,900,055	1.80
		28	Cabot Corp.	Tuscola	IL	8,319,889	1.68
			SUBTOTAL			357,020,727	72.04
			TOTAL FOR CHEMICAL			495,609,047	100.00
3	Methanol	Mult	Union Camp Corp.	Savannah	GA	11,202,000	2.74
		26	Stone Container Corp.	Panama City	FL	8,640,000	2.12
		28	Sun Chemical Corp.	Newark	NJ	7,361,000	1.80
		Mult	Westvaco Corp	Covington	VA	7,173,500	1.76
		28	American Cyanamid Co.	Westwego	LA	6,509,500	1.60
		26	St. Joe Forest Products Co.	Port Saint Joe	FL	6,490,250	1.59
		26	Boise Cascade Papers	Saint Helens	OR	6,243,160	1.53
		28	The Upjohn Co.	Kalamazoo	MI	6,134,509	1.50
		30	Westinghouse Electric Corp.	Hampton	SC	5,316,500	1.30
		26	Stone Hopewell Inc.	Hopewell	VA	5,123,000	1.26
			SUBTOTAL			70,193,419	17.20
			TOTAL FOR CHEMICAL			408,119,093	100.00
4	Ammonia	28	Triad Chemical	Donaldsonville	LA	25,711,732	6.82
		28	Union Oil Co.	Kenai	AK	18,548,021	4.92
		28	Freeport McMoran, Agrico Chem. Div.	Donaldsonville	LA	16,412,800	4.35
		28	Sterling Chemicals Inc.	Texas City	TX	16,389,500	4.34
		28	Mississippi Chemical Corp.	Yazoo City	MS	12,944,200	3.43
		28	Agricultural Minerals Corp.	Blytheville	AR	11,358,250	3.01
		28	CF Industries Inc.	Donaldsonville	LA	10,795,800	2.86
		Mult	Star Enterprise	Convent	LA	9,952,346	2.64
		28	Royster Co.	Mulberry	FL	9,459,500	2.51
		29	Amoco Oil Co.	Texas City	TX	9,362,300	2.48
			SUBTOTAL			140,934,449	37.36
			TOTAL FOR CHEMICAL			377,248,848	100.00

Table G-1. Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
5	Toluene	Mult	3M Consumer AV & Consumer Prod.	Hutchinson	MN	9,648,000	2.99
		28	American Synthetic Rubber	Louisville	KY	5,364,066	1.66
		Mult	Anchor Continental Inc.	Columbia	SC	4,690,100	1.45
		27	R. R. Donnelley & Sons Co.	Warsaw	IN	3,986,057	1.24
		28	Du Pont	La Porte	TX	3,658,721	1.13
		27	Ringier America Inc.	Corinth	MS	3,457,781	1.07
		30	Goodyear Tire & Rubber Co.	Lincoln	NE	3,005,042	0.93
		26	Permacel	New Brunswick	NJ	2,797,509	0.87
		Mult	Holliston Mills Inc.	Church Hill	TN	2,793,453	0.87
		26	3M Co.	Knoxville	IA	2,712,750	0.84
			SUBTOTAL			42,113,479	13.06
			TOTAL FOR CHEMICAL			322,521,176	100.00
6	Sulfuric acid	28	American Cyanamid Co.	Westwego	LA	89,209,450	28.02
		33	National Steel Corp.	Portage	IN	23,409,762	7.35
		28	Vulcan Chemicals	Wichita	KS	16,000,000	5.03
		26	Weyerhaeuser Co.	Cosmopolis	WA	8,170,000	2.57
		33	Fort Howard Steel Inc.	Green Bay	WI	7,440,000	2.34
		28	Great Lakes Chemical Co.	El Dorado	AR	7,204,798	2.26
		28	Arcadian Corp.	Geismar	LA	6,316,000	1.98
		32	Harshaw Chemical Co.	Jackson	MS	6,306,550	1.98
		33	Charter Processing	Saukville	WI	6,131,810	1.93
		33	Empire	Mansfield	OH	5,953,137	1.87
			SUBTOTAL			176,141,507	55.32
			TOTAL FOR CHEMICAL			318,395,014	100.00
7	Acetone	28	Tennessee Eastman Co.	Kingsport	TN	33,759,891	13.21
		28	Hoechst Celanese	Narrows	VA	11,154,230	4.37
		28	Union Carbide Chemicals	Texas City	TX	6,644,609	2.60
		28	The Upjohn Co.	Kalamazoo	MI	5,570,227	2.18
		30	General Electric Co.	Coshocton	OH	5,270,000	2.06
		28	Union Carbide C&P Co.	Institute	WV	4,554,071	1.78
		38	Eastman Kodak Co.	Rochester	NY	3,252,701	1.27
		28	Hoechst Celanese Corp.	Rock Hill	SC	3,118,233	1.22
		28	Bristol-Myers Squibb Co.	Syracuse	NY	3,030,600	1.19
		28	Eli Lilly & Co.	Shadeland	IN	2,995,230	1.17
			SUBTOTAL			79,349,792	31.06
			TOTAL FOR CHEMICAL			255,502,808	100.00
8	Xylene (mixed isomers)	28	Amoco Petroleum Additives Co.	Natchez	MS	2,605,141	1.40
		28	3M Co.	Brownwood	TX	2,305,114	1.24
		37	General Motors Corp.	Dayton	OH	2,078,392	1.12
		36	GTE Products Corp.	Versailles	KY	2,072,406	1.12
		28	PPG Industries	East Point	GA	1,689,458	0.91
		30	3M Co.	Nevada	MO	1,569,988	0.85
		37	Sterling Hts. Assembly Plant	Sterling Heights	MI	1,563,150	0.84
		28	Monsanto Co.	Cahokia	IL	1,438,000	0.78
		37	Chrysler Motors Corp.	Warren	MI	1,420,250	0.77
		34	Crown Cork & Seal Co. Inc.	Winchester	VA	1,346,000	0.73
			SUBTOTAL			18,087,899	9.75
			TOTAL FOR CHEMICAL			185,442,035	100.00

Table G-1. Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
9	1,1,1-Trichloroethane	37	Honda of America Mfg. Inc.	Marysville	OH	1,816,534	0.98
		Mult	Werthan Industries Inc.	Nashville	TN	1,582,518	0.86
		28	Hercules Inc.	Magna	UT	1,339,978	0.72
		33	Franklin Steel Co.	Franklin	PA	1,278,000	0.69
		33	Keystone Steel & Wire Co.	Peoria	IL	1,140,000	0.62
		22	JPS Automotive Products Co.	Greenville	SC	1,010,000	0.55
		33	Teledyne Casting Service	La Porte	IN	1,000,000	0.54
		36	Avx Corp.	Myrtle Beach	SC	987,026	0.53
		37	U.S. Naval Weapons Industrial	Dallas	TX	919,850	0.50
		37	Rohr Industries Inc.	Chula Vista	CA	854,482	0.46
			SUBTOTAL			11,928,388	6.45
			TOTAL FOR CHEMICAL			185,026,191	100.00
10	Zinc compounds	33	Asarco Inc.	East Helena	MT	29,031,807	17.62
		33	Herculaneum Smelter	Herculaneum	MO	12,297,109	7.46
		33	Phelps Dodge Mining Co.	Playas	NM	9,731,000	5.90
		33	Asarco Inc.	Hayden	AZ	7,871,500	4.78
		33	Asarco Inc.	Glover	MO	7,515,771	4.56
		33	Wheeling-Pittsburgh Steel	Mingo Junction	OH	6,430,900	3.90
		33	Wheeling-Pittsburgh Steel	Follansbee	WV	6,400,000	3.88
		33	Keystone Steel & Wire Co.	Peoria	IL	5,903,710	3.58
		Mult	Inland Steel Co.	East Chicago	IN	5,298,450	3.22
		33	Atlantic Steel Co.	Atlanta	GA	4,064,831	2.47
			SUBTOTAL			94,545,078	57.37
			TOTAL FOR CHEMICAL			164,799,357	100.00
11	Methyl ethyl ketone	Mult	3M Consumer AV & Consumer Prod.	Hutchinson	MN	18,168,000	11.57
		33	Reynolds Metals Co.	Sheffield	AL	4,390,000	2.80
		22	Gencorp Polymer Products	Columbus	MS	2,602,287	1.66
		30	O'Sullivan Corp.	Winchester	VA	1,838,590	1.17
		Mult	Vytech Industries Inc.	Anderson	SC	1,757,392	1.12
		Mult	R. J. Reynolds Tobacco Co.	Winston-Salem	NC	1,604,814	1.02
		37	Ford Motor Co.	Utica	MI	1,472,600	0.94
		Mult	3M Chemolite Center	Cottage Grove	MN	1,324,070	0.84
		Mult	Columbus Coated Fabrics	Columbus	OH	1,233,500	0.79
		30	IPC Corinth Div. Inc.	Corinth	MS	1,194,130	0.76
			SUBTOTAL			35,585,383	22.67
			TOTAL FOR CHEMICAL			156,992,642	100.00
12	Chlorine	33	Magnesium Corp. of America	Tooele	UT	110,160,000	77.89
		28	Cabot Corp.	Tuscola	IL	4,417,004	3.12
		33	R. Lavin & Sons Inc.	Chicago	IL	1,685,120	1.19
		26	James River Corp.	Pennington	AL	1,100,250	0.78
		26	Westvaco Corp.	Luke	MD	860,520	0.61
		26	Georgia-Pacific Corp.	Woodland	ME	850,250	0.60
		26	International Paper	Selma	AL	820,850	0.58
		28	Dow Chemical Co.	Freeport	TX	810,000	0.57
		33	Alcoa	Newburgh	IN	780,000	0.55
		33	Blasius Group Inc.	Spartanburg	SC	720,041	0.51
			SUBTOTAL			122,204,035	86.41
			TOTAL FOR CHEMICAL			141,428,470	100.00

Table G-1. Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
13	Dichloromethane	38	Du Pont Towanda Plant	Towanda	PA	9,758,732	7.49
		38	Eastman Kodak Co.	Rochester	NY	7,098,851	5.45
		28	GE Plastics	Mount Vernon	IN	5,770,054	4.43
		28	The Upjohn Co.	Kalamazoo	MI	5,622,531	4.31
		Mult	Abbott Chemicals Inc.	Barceloneta	PR	2,578,102	1.98
		28	Eli Lilly & Co.	Clinton	IN	2,563,500	1.97
		38	Anitec Image Corp.	Binghamton	NY	2,321,000	1.78
		28	Eli Lilly & Co.	Shadeland	IN	1,930,261	1.48
		Mult	Hickory Springs Manufacturing	Conover	NC	1,848,700	1.42
		28	Hercules Inc.	Magna	UT	1,416,500	1.09
			SUBTOTAL			40,908,231	31.38
			TOTAL FOR CHEMICAL			130,355,581	100.00
14	Manganese compounds	Mult	Inland Steel Co.	East Chicago	IN	38,849,050	32.42
		33	USS Fairless Works	Fairless Hills	PA	10,304,100	8.60
		Mult	Elkem Metals Co.	Marietta	OH	7,482,000	6.24
		28	Givaudan Corp.	Clifton	NJ	5,751,000	4.80
		Mult	Kerr-Mcgee Chemical Corp.	Hamilton	MS	5,049,900	4.21
		33	General Motors Corp.	Defiance	OH	4,504,296	3.76
		33	Republic Engineered Steels Inc	Canton	OH	3,741,404	3.12
		33	Waupaca Foundry Inc.	Waupaca	WI	3,096,089	2.58
		33	Northwestern Steel & Wire Co.	Sterling	IL	2,832,181	2.36
		33	LTV Steel Co. Inc.	Cleveland	OH	2,688,148	2.24
			SUBTOTAL			84,298,168	70.35
			TOTAL FOR CHEMICAL			119,825,790	100.00
15	Carbon disulfide	28	Courtaulds Fibers Inc.	Axis	AL	43,670,250	43.60
		28	BASF Corp.	Lowland	TN	23,700,000	23.66
		28	North American Rayon Corp.	Elizabethton	TN	5,423,000	5.41
		30	Teepak Inc.	Danville	IL	3,022,384	3.02
		30	Viskase Corp.	Loudon	TN	2,235,000	2.23
		30	Flexel Indiana Inc.	Covington	IN	1,972,601	1.97
		28	Cabot Corp.	Franklin	LA	1,713,340	1.71
		28	Akzo Chemicals Inc.	Axis	AL	1,461,750	1.46
		30	Viskase Corp.	Osceola	AR	1,415,700	1.41
		30	Viskase Corp.	Bedford Park	IL	1,332,050	1.33
			SUBTOTAL			85,946,075	85.82
			TOTAL FOR CHEMICAL			100,150,670	100.00
16	Phosphoric acid	28	Texasgulf Inc.	Aurora	NC	15,541,450	15.75
		28	Arcadian Corp.	Geismar	LA	15,297,000	15.50
		28	Freeport McMoran, Agrico Chem. Div.	Uncle Sam	LA	11,605,426	11.76
		28	Occidental Chemical Corp.	White Springs	FL	8,600,000	8.72
		Mult	IMC Fertilizer Inc.	Mulberry	FL	8,200,000	8.31
		28	Freeport McMoran, Agrico Chem. Div.	Mulberry	FL	4,700,000	4.76
		28	Seminole Fertilizer Corp.	Bartow	FL	2,906,840	2.95
		28	Conserv Inc.	Nichols	FL	2,270,000	2.30
		28	US Agri-Chemicals Inc.	Fort Meade	FL	1,665,294	1.69
		28	CF Industries Inc.	Plant City	FL	1,500,000	1.52
			SUBTOTAL			72,286,010	73.27
			TOTAL FOR CHEMICAL			98,660,456	100.00

Table G-1. Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
17	Nitric acid	28	Du Pont Victoria Site	Victoria	TX	23,265,600	31.08
		28	Air Products Mfg. Corp.	Pasadena	TX	7,700,000	10.29
		28	Du Pont Sabine River Works	Orange	TX	4,507,402	6.02
		28	Angus Chemical Co.	Sterlington	LA	3,203,800	4.28
		33	Armco Advanced Materials Corp.	Zanesville	OH	2,429,940	3.25
		33	Lukens Steel Co.	Coatesville	PA	1,470,750	1.96
		34	Visionmark Inc.	Sidney	OH	1,422,000	1.90
		33	Allegheny Ludlum Corp.	Brackenridge	PA	1,383,041	1.85
		35	UNC Naval Products	Uncasville	CT	1,074,520	1.44
		Mult	Delco Electronics Corp.	Kokomo	IN	1,061,006	1.42
			SUBTOTAL			47,518,059	63.47
			TOTAL FOR CHEMICAL			74,861,200	100.00
18	Ammonium nitrate	28	Monsanto Co.	Cantonment	FL	23,000,000	31.37
		28	Coastal Chem Inc.	Cheyenne	WY	13,003,200	17.74
		28	Agricultural Minerals Corp.	Verdigris	OK	4,710,250	6.42
		28	Du Pont Beaumont Works	Beaumont	TX	2,816,920	3.84
		28	Molycorp. Inc.	Mountain Pass	CA	2,700,000	3.68
		28	Allied Signal	Hopewell	VA	2,110,000	2.88
		28	PQ Corp.	Kansas City	KS	1,648,737	2.25
		28	John C. Wilson Co. Inc.	Millen	GA	1,610,180	2.20
		28	Wil-Gro Fertilizer Inc.	Pryor	OK	1,521,550	2.08
		28	Ranch Fertilizer Div.	Okeechobee	FL	1,266,495	1.73
			SUBTOTAL			54,387,332	74.18
			TOTAL FOR CHEMICAL			73,313,949	100.00
19	Freon 113	28	Du Pont Washington Works	Washington	WV	800,350	1.18
		Mult	Harrison Radiator Div.	Lockport	NY	692,350	1.02
		Mult	IBM	Rochester	MN	624,014	0.92
		Mult	Delco Electronics Corp.	Oak Creek	WI	540,850	0.80
		36	SCI Mfg. Inc.	Rapid City	SD	534,556	0.79
		37	Robert Bosch Corp.	Charleston	SC	510,000	0.75
		36	AT&T Technologies Inc.	Lees Summit	MO	509,700	0.75
		30	Baxter Healthcare Corp.	Mountain Home	AR	508,000	0.75
		37	U.S. Air Force	Fort Worth	TX	500,500	0.74
		Mult	IBM	Endicott	NY	485,200	0.72
			SUBTOTAL			5,705,520	8.41
			TOTAL FOR CHEMICAL			67,837,298	100.00
20	Glycol ethers	28	Sandoz Chemicals	Fair Lawn	NJ	1,262,580	1.92
		37	General Motors Corp.	Pontiac	MI	1,116,700	1.70
		31	Prime Tanning Co. Inc.	Berwick	ME	898,039	1.37
		37	BOC-Lansing Automotive Div.	Lansing	MI	710,000	1.08
		37	Nissan Motor Manufacturing	Smyrna	TN	686,324	1.04
		34	Crown Cork & Seal Co. Inc.	Cheraw	SC	652,500	0.99
		37	Ford Motor Co.	Avon Lake	OH	620,500	0.94
		28	PPG Industries Inc.	Oak Creek	WI	606,392	0.92
		28	Hoffmann-La Roche Inc.	Nutley	NJ	564,290	0.86
		37	General Motors Corp.	Janesville	WI	502,000	0.76
			SUBTOTAL			7,619,325	11.59
			TOTAL FOR CHEMICAL			65,736,857	100.00

Table G-1. Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
21	Ethylene glycol	28	Hoechst Celanese Chemical	Pasadena	TX	11,089,408	19.19
		20	Penford Products Co.	Cedar Rapids	IA	3,205,950	5.55
		28	Du Pont Belle Plant	Belle	WV	2,864,475	4.96
		Mult	3M Chemolite Center	Cottage Grove	MN	2,272,220	3.93
		28	Aqualon Co.	Hopewell	VA	2,239,900	3.88
		28	PD Glycol	Beaumont	TX	2,215,465	3.83
		28	Hercules Inc.	Parlin	NJ	2,182,263	3.78
		28	Tennessee Eastman Co.	Kingsport	TN	1,326,000	2.29
		28	Goodyear Tire & Rubber Co.	Apple Grove	WV	1,321,000	2.29
		28	ICI Americas Inc.	Fayetteville	NC	961,205	1.66
			SUBTOTAL			29,677,886	51.35
			TOTAL FOR CHEMICAL			57,792,359	100.00
22	Zinc (fume or dust)	33	National Steel	Ecorse	MI	14,080,165	24.49
		33	General Motors Corp.	Saginaw	MI	6,325,190	11.00
		33	Cyprus Miami Mining Corp.	Claypool	AZ	4,222,200	7.34
		33	Nucor-Yamato Steel Co.	Barfield	AR	3,675,141	6.39
		33	Empire	Mansfield	OH	3,381,860	5.88
		33	Granite City Steel	Granite City	IL	3,240,300	5.64
		33	North Star Steel Texas Inc.	Rose City	TX	2,608,417	4.54
		26	Nekoosa Packaging	Tomahawk	WI	2,437,500	4.24
		33	Jersey Miniere Zinc	Clarksville	TN	2,299,460	4.00
		33	Newport Steel Corp.	Newport	KY	1,361,602	2.37
			SUBTOTAL			43,631,835	75.90
			TOTAL FOR CHEMICAL			57,487,663	100.00
23	Copper compounds	33	Copper Range Co.	White Pine	MI	16,330,870	29.98
		33	Phelps Dodge Mining Co.	Playas	NM	10,451,400	19.19
		33	Chino Mines Co.	Hurley	NM	6,867,800	12.61
		33	Asarco Inc.	Hayden	AZ	5,828,500	10.70
		33	Asarco Inc.	East Helena	MT	1,409,667	2.59
		28	General Electric Co.	Waterford	NY	1,405,750	2.58
		Mult	Chicago Etching Corp.	Chicago	IL	880,150	1.62
		33	AT&T	Gaston	SC	834,973	1.53
		33	Marport Smelting Co.	East Chicago	IN	655,400	1.20
		33	Magma Copper Rod Inc.	Chicago	IL	488,000	0.90
			SUBTOTAL			45,152,510	82.90
			TOTAL FOR CHEMICAL			54,465,732	100.00
24	Chromium compounds	28	American Chrome & Chemicals	Corpus Christi	TX	12,047,450	23.68
		28	Occidental Chemical Corp.	Castle Hayne	NC	8,840,442	17.37
		33	Rouge Steel Co.	Dearborn	MI	4,000,250	7.86
		Mult	Elkem Metals Co.	Marietta	OH	2,651,000	5.21
		Mult	Inland Steel Co.	East Chicago	IN	1,480,350	2.91
		33	National Steel Corp.	Portage	IN	1,037,496	2.04
		33	US Vanadium Corp.	Hot Springs	AR	929,300	1.83
		32	North American Refractories	Gary	IN	880,050	1.73
		33	Inco Alloys International Inc.	Huntington	WV	826,870	1.63
		33	Republic Engineered Steels Inc	Canton	OH	701,127	1.38
			SUBTOTAL			33,394,335	65.63
			TOTAL FOR CHEMICAL			50,881,050	100.00

Table G-1.Continued.

TRI RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
25	n-Butyl alcohol	Mult	Monsanto Co.	Springfield	MA	2,004,042	4.00
		28	Ferro Corp.	Hammond	IN	1,701,450	3.40
		28	GAF Chemicals Corp.	Texas City	TX	1,303,416	2.60
		28	3M Co.	Brownwood	TX	1,034,482	2.07
		28	Reichhold Chemicals Inc.	Elizabeth	NJ	880,050	1.76
		28	Pfizer Inc.	Groton	CT	871,500	1.74
		37	Ford Motor Co.	Wixom	MI	713,950	1.43
		37	Chrysler Motors Corp.	Fenton	MO	598,250	1.19
		Mult	Ingalls Shipbuilding Inc.	Pascagoula	MS	560,000	1.12
		34	Crown Cork & Seal Co. Inc.	Cheraw	SC	538,500	1.07
			SUBTOTAL			10,205,640	20.37
			TOTAL FOR CHEMICAL			50,095,319	100.00

(a) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their releases of hydrochloric acid is 4,487,000 pounds.

Table G-2. The Top Ten TRI Facilities for Each of the 25 Carcinogens with the Largest Releases and Transfers, 1989.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	Dichloromethane	38	Du Pont Towanda Plant	Towanda	PA	9,758,732	7.49
		38	Eastman Kodak Co.	Rochester	NY	7,098,851	5.45
		28	GE Plastics	Mount Vernon	IN	5,770,054	4.43
		28	The Upjohn Co.	Kalamazoo	MI	5,622,531	4.31
		Mult	Abbott Chemicals Inc.	Barceloneta	PR	2,578,102	1.98
		28	Eli Lilly & Co.	Clinton	IN	2,563,500	1.97
		38	Anitec Image Corp.	Binghamton	NY	2,321,000	1.78
		28	Eli Lilly & Co.	Shadeland	IN	1,930,261	1.48
		Mult	Hickory Springs Manufacturing	Conover	NC	1,848,700	1.42
		28	Hercules Inc.	Magna	UT	1,416,500	1.09
			SUBTOTAL			40,908,231	31.38
			CARCINOGEN TOTAL			130,355,581	100.00
2	Styrene	37	General Motors Corporation	Monroe	LA	3,359,867	8.16
		28	Ameripol Synpol Co.	Port Neches	TX	1,002,900	2.44
		28	GE Chemicals Inc.	Washington	WV	890,000	2.16
		28	GE Plastics	Ottawa	IL	741,000	1.80
		Mult	Dow Chemical	Dalton	GA	681,450	1.66
		28	Goodyear Tire & Rubber Co.	Houston	TX	639,350	1.55
		28	Monsanto Co.	Muscatine	IA	616,816	1.50
		Mult	Dow Chemical Co.	Gales Ferry	CT	556,701	1.35
		28	Huntsman Chemical Corp.	Peru	IL	509,854	1.24
		Mult	Monsanto Co.	Addyston	OH	395,565	0.96
			SUBTOTAL			9,393,503	22.82
			CARCINOGEN TOTAL			41,169,973	100.00
3	Tetrachloroethylene	33	Alcoa	Davenport	IA	982,550	3.27
		37	Allison	Indianapolis	IN	670,730	2.23
		Mult	Schlage Lock Co.	Security	CO	617,528	2.05
		Mult	Harrison Radiator Div.	Lockport	NY	588,990	1.96
		28	PPG Industries Inc.	Westlake	LA	513,436	1.71
		Mult	Moore Business Forms	Stillwater	OK	491,430	1.63
		37	Grumman Aerospace Corp.	Bethpage	NY	469,470	1.56
		37	Aerochem Inc.	Orange	CA	462,550	1.54
		28	Monsanto Co.	Saint Louis	MO	407,000	1.35
		37	Sikorsky Aircraft	Bridgeport	CT	383,334	1.28
			SUBTOTAL			5,587,018	18.59
			CARCINOGEN TOTAL			30,058,581	100.00
4	Formaldehyde	28	Celanese Engineering Resins	Bishop	TX	3,388,500	11.28
		28	Angus Chemical Co.	Sterlington	LA	2,602,840	8.66
		28	Rohm & Haas Dvi	Philadelphia	PA	1,896,126	6.31
		28	Monsanto Co.	Luling	LA	1,642,434	5.47
		28	Monsanto Co.	Alvin	TX	1,216,000	4.05
		28	American Cyanamid Co.	Kalamazoo	MI	1,141,403	3.80
		28	Ashland Chemical Inc.	Cleveland	OH	850,601	2.83
		Mult	Monsanto Co.	Springfield	MA	575,892	1.92
		28	Monsanto Co.	Saint Louis	MO	417,080	1.39
		32	Owens-Corning Fiberglas	Newark	OH	303,069	1.01
			SUBTOTAL			14,033,945	46.71
			CARCINOGEN TOTAL			30,042,348	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
5	Benzene	33	Wheeling-Pittsburgh Steel	Follansbee	WV	1,570,005	5.49
		Mult	Inland Steel Co.	East Chicago	IN	1,231,250	4.31
		33	USS Clairton Works	Clairton	PA	1,220,319	4.27
		33	Armco Steel Co. L.P.	Middletown	OH	1,089,500	3.81
		33	Bethlehem Steel Corp.	Lackawanna	NY	1,021,001	3.57
		33	USS Gary Works	Gary	IN	989,600	3.46
		28	DSM Chemicals Augusta Inc.	Augusta	GA	906,484	3.17
		33	LTV Steel Co.Inc.	Pittsburgh	PA	833,704	2.92
		28	Aristech Chemical Corp.	Clairton	PA	692,206	2.42
		Mult	Shell Oil Co.	Deer Park	TX	574,600	2.01
			SUBTOTAL			10,128,669	35.43
			CARCINOGEN TOTAL			28,591,407	100.00
6	Chloroform	26	Georgia Pacific Corp.	Brunswick	GA	915,580	3.35
		26	Champion International Corp.	Canton	NC	861,890	3.15
		Mult	Westvaco Corp	Covington	VA	856,300	3.13
		26	Weyerhaeuser Everett	Everett	WA	766,400	2.80
		26	Federal Paper Board Co. Inc.	Riegelwood	NC	730,610	2.67
		Mult	Potlatch Corp.	Lewiston	ID	654,000	2.39
		28	Rhone-Poulenc Ag Co.	Institute	WV	611,936	2.24
		26	Westvaco Corp.	Luke	MD	607,000	2.22
		26	Procter & Gamble Cellulose Co.	Perry	FL	560,700	2.05
		26	James River Corp.	Pennington	AL	535,000	1.96
			SUBTOTAL			7,099,416	25.98
			CARCINOGEN TOTAL			27,325,508	100.00
7	Lead	33	Kennecott Utah Copper	Bingham Canyon	UT	2,352,600	11.84
		33	GNB Inc.	Frisco	TX	1,125,082	5.66
		33	GNB Inc.	Vernon	CA	1,047,710	5.27
		33	General Battery Corp.	Reading	PA	775,583	3.90
		33	National Steel	Ecorse	MI	752,600	3.79
		33	Cyprus Miami Mining Corp.	Claypool	AZ	670,200	3.37
		33	Nucor-Yamato Steel Co.	Barfield	AR	656,277	3.30
		33	Empire	Mansfield	OH	488,301	2.46
		33	National-Standard Co.	Columbiana	AL	484,080	2.44
		33	Refined Metals Corp.	Beech Grove	IN	453,883	2.28
			SUBTOTAL			8,806,316	44.31
			CARCINOGEN TOTAL			19,872,648	100.00
8	Chromium	33	Johnstown Corp.	Johnstown	PA	1,141,510	8.52
		33	Cyprus Miami Mining Corp.	Claypool	AZ	663,400	4.95
		33	Carpenter Technology Corp.	Reading	PA	493,214	3.68
		33	M E International	Ishpeming	MI	410,473	3.06
		35	Beloit Corp.	Beloit	WI	363,150	2.71
		35	Beloit Corp.	Rockton	IL	321,650	2.40
		33	Cold Metal Products Co. Inc.	Youngstown	OH	307,987	2.30
		34	Piper Impact Inc.	New Albany	MS	261,950	1.95
		33	Armco Advanced Materials Co.	Butler	PA	255,018	1.90
		33	LTV Steel Co.	East Chicago	IN	210,450	1.57
			SUBTOTAL			4,428,802	33.04
			CARCINOGEN TOTAL			13,403,332	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
9	Acrylonitrile	28	BP Chemicals Inc.	Lima	OH	2,423,750	19.74
		28	BP Chemicals	Port Lavaca	TX	1,735,026	14.13
		28	GE Chemicals Inc.	Washington	WV	1,453,040	11.83
		28	Monsanto Co.	Alvin	TX	938,000	7.64
		28	Lubrizol Petroleum Chemicals	Pasadena	TX	830,255	6.76
		28	Monsanto Co.	Muscatine	IA	660,530	5.38
		28	American Cyanamid Co.	Westwego	LA	537,850	4.38
		28	Du Pont Beaumont Works	Beaumont	TX	521,112	4.24
		28	GE Plastics	Ottawa	IL	447,800	3.65
		28	Akron Polymer Plant	Akron	OH	359,205	2.92
			SUBTOTAL			9,906,568	80.67
			CARCINOGEN TOTAL			12,280,895	100.00
10	1,2-Dichloroethane	28	Ferro Corp.	Hammond	IN	1,420,250	14.93
		35	3M	Charles Town	WV	1,009,486	10.62
		28	Uniroyal Chemical Co. Inc.	Geismar	LA	927,437	9.75
		28	PPG Industries Inc.	Westlake	LA	747,808	7.86
		38	Kodak Colorado Div.	Windsor	CO	725,405	7.63
		28	Albright & Wilson Americas	Charleston	SC	581,627	6.12
		28	National Starch & Chemical Co.	Salisbury	NC	400,474	4.21
		28	BF Goodrich	Calvert City	KY	267,388	2.81
		28	Vista Chemical Co.	Westlake	LA	259,334	2.73
		28	Rhone-Poulenc Ag Co.	Mount Pleasant	TN	258,782	2.72
			SUBTOTAL			6,597,991	69.38
			CARCINOGEN TOTAL			9,509,848	100.00
11	Nickel	37	PCC Airfoils Inc.	Mentor	OH	668,845	7.05
		33	Glenbrook Nickel Co.	Riddle	OR	524,300	5.52
		Mult	Delco Products Div.	Livonia	MI	375,091	3.95
		Mult	Murray Ohio Manufacturing Co.	Lawrenceburg	TN	360,059	3.79
		33	Zone 17 Facility	East Alton	IL	348,268	3.67
		33	Cyprus Miami Mining Corp.	Claypool	AZ	234,600	2.47
		35	Beloit Corp.	Beloit	WI	227,350	2.39
		33	Carpenter Technology Corp.	Reading	PA	225,282	2.37
		35	Beloit Corp.	Rockton	IL	219,350	2.31
		35	Graco Inc.	Minneapolis	MN	194,158	2.05
			SUBTOTAL			3,377,303	35.58
			CARCINOGEN TOTAL			9,493,108	100.00
12	Asbestos	26	Quin-T Corporation	Erie	PA	1,401,500	15.67
		37	Friction Inc.	Irvine	CA	1,212,250	13.55
		29	Coastal Refining & Marketing	Corpus Christi	TX	1,000,750	11.19
		32	Nutum Corp.	Smithville	TN	866,501	9.69
		32	Supradur Manufacturing Corp.	Windgap	PA	806,040	9.01
		32	Goetze Gasket Co.	La Grange	GA	620,000	6.93
		28	Dow Chemical Co.	Pittsburg	CA	440,000	4.92
		37	Hastings Co.	King	NC	325,207	3.64
		39	Rayloc	Morganfield	KY	311,040	3.48
		28	Dow Chemical Co.	Plaquemine	LA	240,000	2.68
			SUBTOTAL			7,223,288	80.76
			CARCINOGEN TOTAL			8,944,353	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
13	Isopropyl alcohol (manufacturing)	27	Arcata Graphics	Kingsport	TN	724,392	9.46
		28	Galaxie Chemical Corp.	Paterson	NJ	379,642	4.96
		37	General Motors Corp.	Monroe	LA	250,700	3.27
		Mult	General Motors Corp.	Anderson	IN	207,868	2.71
		24	Merrilat Industries Inc.	Jackson	OH	191,492	2.50
		None	Ganes Chemical Inc.	Pennsville	NJ	191,245	2.50
		39	Kores Nordic Usa Corp.	Summerville	SC	159,960	2.09
		26	Hub Folding Box	Mansfield	MA	150,000	1.96
		Mult	Allegheny Label Inc.	Cheswick	PA	144,569	1.89
		27	Carqueville Lithographer	Elk Grove Village	IL	126,500	1.65
			SUBTOTAL			2,526,368	32.98
			CARCINOGEN TOTAL			7,661,243	100.00
14	1,3-Butadiene	28	Texaco Chemical Co.	Port Neches	TX	746,700	12.17
		28	Akron Polymer Plant	Akron	OH	348,672	5.68
		28	Amoco Chemical Co.	Alvin	TX	339,000	5.52
		28	BASF Corp.	Chattanooga	TN	225,908	3.68
		28	Phillips 66 Co.	Borger	TX	214,000	3.49
		28	Firestone	Orange	TX	205,344	3.35
		28	Ameripol Synpol Co.	Port Neches	TX	200,106	3.26
		Mult	W. R. Grace & Co.	Owensboro	KY	186,840	3.04
		28	Lyondell Petrochemical Co.	Channelview	TX	175,000	2.85
		28	Texas Petrochemicals Corp.	Houston	TX	172,759	2.82
			SUBTOTAL			2,814,329	45.86
			CARCINOGEN TOTAL			6,136,125	100.00
15	Acrylamide	28	BP Chemicals	Port Lavaca	TX	2,001,280	43.26
		28	American Cyanamid Co.	Westwego	LA	1,341,250	29.00
		28	Sterling Chemicals Inc.	Texas City	TX	1,091,480	23.60
		28	Air Products & Chemicals Inc.	Calvert City	KY	70,250	1.52
		28	Union Carbide Chemicals	South Charleston	WV	26,021	0.56
		28	Nalco Chemical Co.	Garyville	LA	17,879	0.39
		28	Allied Colloids Inc.	Suffolk	VA	16,184	0.35
		28	American Cyanamid Co.	Wallingford	CT	12,924	0.28
		28	Nalco Chemical Co.	Bedford Park	IL	10,705	0.23
		28	Calgon Corp.	Ellwood City	PA	8,048	0.17
			SUBTOTAL			4,596,021	99.36
			CARCINOGEN TOTAL			4,625,675	100.00
16	Carbon Tetrachloride	28	Hercules Inc.	Parlin	NJ	957,860	20.79
		28	Vulcan Chemicals	Wichita	KS	453,333	9.84
		28	Du Pont Beaumont Works	Beaumont	TX	401,710	8.72
		28	Akzo Chemicals Inc.	Axis	AL	241,000	5.23
		28	Occidental Chemical Corp.	Sheffield	AL	240,250	5.21
		28	Velsicol Chemical Corp.	Memphis	TN	207,613	4.51
		28	Fermenta Asc	Houston	TX	199,810	4.34
		Mult	Dow Chemical Co.	Gales Ferry	CT	180,811	3.92
		28	Occidental Chemical Corp.	Delaware City	DE	162,570	3.53
		28	Degussa Corp.	Theodore	AL	115,907	2.52
			SUBTOTAL			3,160,864	68.60
			CARCINOGEN TOTAL			4,607,809	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
17	Polychlorinated biphenyls	None	PPM Inc.	Philadelphia	PA	1,264,900	29.88
		None	U.S. Pollution Control Inc.	Clive	UT	396,250	9.36
		None	Unison Transformer Services	Henderson	KY	288,903	6.82
		26	Champion International Corp.	Lufkin	TX	234,620	5.54
		None	PPM Inc.	Tucker	GA	193,470	4.57
		36	GE Co.	Pittsfield	MA	150,999	3.57
		36	Dynex Industries Inc.	Farmington Hills	MI	138,883	3.28
		26	P. H. Glatfelter Co.	Pisgah Forest	NC	94,775	2.24
		26	Papyrus Newton Falls	Newton Falls	NY	89,340	2.11
		None	PPM Inc.	Kansas City	MO	88,179	2.08
			SUBTOTAL			2,940,319	69.45
			CARCINOGEN TOTAL			4,233,611	100.00
18	Di(2-ethylhexyl) phthalate	28	Hatco Corp.	Fords	NJ	205,241	5.53
		28	BASF Corp.	Kearny	NJ	178,199	4.80
		30	Colonial Rubber Works Inc.	Dyersburg	TN	156,000	4.21
		30	Evanite Fiber Corp.	Corydon	IN	140,436	3.79
		39	Armstrong World Industries	Lancaster	PA	136,129	3.67
		Mult	Allegheny Label Inc.	Cheswick	PA	128,999	3.48
		36	Carlon	Clinton	IA	125,000	3.37
		39	Congoleum Corp.	Marcus Hook	PA	106,340	2.87
		36	Aerovox Inc.	New Bedford	MA	104,400	2.81
		30	H-C Industries Inc.	Biloxi	MS	97,846	2.64
			SUBTOTAL			1,378,590	37.17
			CARCINOGEN TOTAL			3,708,811	100.00
19	Ethylene oxide	28	Shell Chemical Co.	Geismar	LA	514,000	14.91
		28	Hoechst Celanese Chemical	Pasadena	TX	162,345	4.71
		35	Sterilization Services of TN	Memphis	TN	155,588	4.51
		38	Bard Urological Div.	Covington	GA	133,428	3.87
		36	Baxter Healthcare Corp.	Aibonito	PR	127,872	3.71
		Mult	Baxter Healthcare Corp.	Cleveland	MS	119,000	3.45
		38	Kendall Co.	Augusta	GA	110,524	3.21
		30	Baxter Healthcare Corp.	Mountain Home	AR	101,100	2.93
		28	Harcros Chemicals Inc.	Kansas City	KS	83,320	2.42
		20	Bioproducts Inc.	Louisville	KY	72,177	2.09
			SUBTOTAL			1,579,354	45.82
			CARCINOGEN TOTAL			3,447,067	100.00
20	Propylene oxide	28	Kelco	San Diego	CA	572,000	23.69
		28	Arco Chemical Co.	Channelview	TX	359,190	14.88
		28	Uniroyal Chemical Co. Inc.	Naugatuck	CT	247,657	10.26
		28	Arco Chemical Co.	Pasadena	TX	169,000	7.00
		28	Dow Chemical Co.	Freeport	TX	120,320	4.98
		20	U.S. Cocoa Corp.	Pennsauken	NJ	103,000	4.27
		20	American Maize Products Co.	Hammond	IN	96,650	4.00
		28	Union Carbide C&P Co.	Institute	WV	71,761	2.97
		28	Dow Chemical Co.	Plaquemine	LA	71,540	2.96
		Mult	Hi-Tek Polymers Vernon Plant	Vernon	TX	37,111	1.54
			SUBTOTAL			1,848,229	76.55
			CARCINOGEN TOTAL			2,414,341	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
21	1,4-Dichlorobenzene	28	Monsanto Co.	Cahokia	IL	958,000	55.52
		Mult	Norton Co.	Worcester	MA	325,405	18.86
		28	PPG Industries Inc.	New Martinsville	WV	289,000	16.75
		28	Standard Chlorine of Delaware	Delaware City	DE	50,256	2.91
		32	Bay State Abrasives	North Manchester	IN	38,095	2.21
		28	Phillips 66 Co.	Borger	TX	24,340	1.41
		32	Jowitt & Rodgers Co. Inc.	Philadelphia	PA	18,300	1.06
		Mult	Fuller Industries Inc.	Great Bend	KS	7,543	0.44
		28	Stanhome Inc.	Easthampton	MA	5,550	0.32
		32	Eagle Grinding Wheel Corp.	Chicago	IL	5,400	0.31
			SUBTOTAL			1,721,889	99.80
			CARCINOGEN TOTAL			1,725,392	100.00
22	1,4-Dioxane	38	Eastman Kodak Co.	Rochester	NY	168,004	11.08
		30	Fluid Systems	San Diego	CA	96,507	6.36
		28	Du Pont Mobile Plant	Axis	AL	94,308	6.22
		37	Honda of America Mfg. Inc.	Marysville	OH	85,683	5.65
		Mult	Hoechst-Celanese	Spartanburg	SC	79,100	5.22
		28	Hoechst-Celanese Corp.	Salisbury	NC	78,250	5.16
		39	Hydranautics	San Diego	CA	59,169	3.90
		28	Hercules Inc.	Hattiesburg	MS	49,000	3.23
		28	Stepan Co.	Elwood	IL	39,043	2.57
		28	Du Pont Kinston Plant	Kinston	NC	38,914	2.57
			SUBTOTAL			787,978	51.95
			CARCINOGEN TOTAL			1,516,708	100.00
23	Epichlorohydrin	Mult	Shell Oil Co.	Deer Park	TX	1,045,322	70.27
		28	Dow Chemical Co.	Freeport	TX	125,000	8.40
		28	Ciba-Geigy Corp.	Toms River	NJ	52,993	3.56
		28	Du Pont Mobile Plant	Axis	AL	43,872	2.95
		Mult	Shell Oil Co.	Norco	LA	28,600	1.92
		28	Wilmington Chemical Corp.	New Castle	DE	28,258	1.90
		28	Hercules Inc.	Chicopee	MA	26,410	1.78
		28	Hercules Inc.	Hattiesburg	MS	21,400	1.44
		28	Ciba-Geigy Corp.	Mc Intosh	AL	19,000	1.28
		28	Dow Chemical Co.	Plaquemine	LA	7,970	0.54
			SUBTOTAL			1,398,825	94.03
			CARCINOGEN TOTAL			1,487,562	100.00
24	Hexachlorobenzene	28	Fermenta Asc	Houston	TX	1,127,499	77.31
		28	Occidental Chemical Corp.	Deer Park	TX	320,140	21.95
		28	Velsicol Chemical Corp.	Memphis	TN	5,029	0.34
		28	Vulcan Materials Co.	Geismar	LA	3,084	0.21
		28	Vulcan Chemicals	Wichita	KS	1,006	0.70
		32	Ash Grove Cement Co.	Chanute	KS	500	0.03
		Mult	Marine Shale Processors Inc.	Amelia	LA	500	0.03
		28	Dow Chemical Co.	Freeport	TX	378	0.03
		28	Dow Chemical Co.	Plaquemine	LA	193	0.01
		28	PPG Industries Inc.	Westlake	LA	84	0.01
			SUBTOTAL			1,458,413	100.00
			CARCINOGEN TOTAL			1,458,420	100.00

Table G-2. Continued.

TRI CARC. RANK	CHEMICAL	SIC CODE	FACILITY NAME	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
25	Vinyl chloride	Mult	Occidental Chemical Corp.	Pottstown	PA	165,240	12.12
		28	Formosa Plastics Corp.	Delaware City	DE	129,909	9.53
		28	Borden Inc.	Illiopolis	IL	95,352	6.99
		28	Vista Chemical Co.	Oklahoma City	OK	78,521	5.76
		28	Vista Polymers	Aberdeen	MS	76,218	5.59
		28	The BF Goodrich Co.	Pedricktown	NJ	72,045	5.28
		28	Shintech Inc.	Freeport	TX	71,769	5.26
		28	Occidental Chemical Corp.	Pasadena	TX	67,018	4.91
		28	BF Goodrich Co.	Deer Park	TX	62,750	4.60
		28	Occidental Chemical Corp.	Burlington	NJ	53,135	3.90
			SUBTOTAL			871,957	63.94
			CARCINOGEN TOTAL			1,363,697	100.00

Table G-3. TRI Releases and Transfers of the Top 25 Chemicals by Each Industry, 1989.

TRI RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent
1	Ammonium sulfate (solution)	750,649,064	2.40	0.00	0.42	0.00	0.01
2	Hydrochloric acid	495,609,047	0.16	0.00	0.10	0.00	0.00
3	Methanol	408,119,093	0.22	0.00	1.10	0.00	0.40
4	Ammonia	377,248,848	5.03	0.17	0.74	0.01	0.31
5	Toluene	322,521,176	0.25	0.05	1.41	0.07	2.54
6	Sulfuric acid	318,395,014	1.46	0.00	0.34	0.04	0.02
7	Acetone	255,502,080	0.49	0.02	0.90	0.06	0.68
8	Xylene (mixed isomers)	185,442,035	0.08	0.00	1.45	0.07	4.44
9	1,1,1-Trichloroethane	185,026,191	0.04	0.00	2.53	0.21	0.16
10	Zinc compounds	164,799,357	0.11	0.01	0.30	0.01	0.00
11	Methyl ethyl ketone	156,992,642	0.44	0.00	4.91	0.15	1.78
12	Chlorine	141,428,470	1.34	0.02	0.56	0.05	0.00
13	Dichloromethane	130,355,581	0.34	0.00	0.36	0.12	0.16
14	Manganese compounds	119,825,790	0.01	0.00	0.10	0.10	0.01
15	Carbon disulfide	100,150,670	0.00	0.00	0.00	0.00	0.00
16	Phosphoric acid	98,660,456	8.21	0.00	2.42	0.06	0.24
17	Nitric acid	74,861,200	3.92	0.00	0.00	0.00	0.00
18	Ammonium nitrate (solution)	73,313,949	0.60	0.00	0.20	0.00	0.00
19	Freon 113	67,837,298	0.26	0.00	0.39	0.00	0.03
20	Glycol ethers	65,736,857	0.32	0.00	0.53	0.01	0.64
21	Ethylene glycol	57,792,359	6.78	0.00	1.53	0.02	0.21
22	Zinc (fume or dust)	57,487,663	0.04	0.00	0.00	0.00	0.01
23	Copper compounds	54,465,732	0.42	0.00	0.20	0.00	0.25
24	Chromium compounds	50,881,050	0.00	0.00	0.70	0.00	0.33
25	n-Butyl alcohol	50,095,319	0.30	0.00	0.13	0.00	1.98
SUBTOTAL		4,763,196,941	1.36	0.02	0.81	0.04	0.56
GRAND TOTAL		5,705,670,380	1.19	0.03	0.81	0.04	0.66

Table G-3. Continued.

TRI RANK	CHEMICAL	FURNITURE SIC 25 Percent	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent
1	Ammonium sulfate (solution)	0.00	1.74	0.03	90.56	0.35	0.49
2	Hydrochloric acid	0.01	5.46	0.00	78.43	0.09	0.07
3	Methanol	2.63	29.00	0.20	45.04	0.40	4.26
4	Ammonia	0.01	1.58	0.04	66.06	9.52	0.67
5	Toluene	5.65	11.18	13.27	21.76	3.77	7.16
6	Sulfuric acid	0.05	7.32	0.00	50.15	0.15	0.10
7	Acetone	2.13	6.95	0.34	46.73	0.07	11.75
8	Xylene (mixed isomers)	6.49	1.71	1.08	17.77	4.18	3.54
9	1,1,1-Trichloroethane	1.79	1.70	2.44	3.90	0.15	7.51
10	Zinc compounds	0.01	1.47	0.01	5.70	0.22	2.59
11	Methyl ethyl ketone	3.84	5.25	2.49	9.40	2.33	11.74
12	Chlorine	0.00	7.09	0.00	7.74	0.15	0.19
13	Dichloromethane	0.22	0.55	0.27	29.44	0.00	19.79
14	Manganese compounds	0.00	0.04	0.00	12.06	0.11	0.01
15	Carbon disulfide	0.00	0.19	0.00	86.23	0.38	13.11
16	Phosphoric acid	0.16	0.02	0.00	70.72	1.38	0.13
17	Nitric acid	0.04	0.02	0.43	58.17	0.00	0.12
18	Ammonium nitrate (solution)	0.00	1.74	0.00	94.20	0.00	0.00
19	Freon 113	0.00	0.00	0.02	4.65	0.03	3.32
20	Glycol ethers	2.26	1.81	2.88	14.54	0.18	2.33
21	Ethylene glycol	0.05	0.41	0.36	59.04	0.79	1.68
22	Zinc (fume or dust)	0.02	5.05	0.12	0.69	0.15	0.13
23	Copper compounds	0.02	0.70	0.15	7.97	0.07	0.18
24	Chromium compounds	0.01	0.45	0.07	45.12	0.94	0.32
25	n-Butyl alcohol	5.48	0.90	0.14	26.90	0.04	2.41
SUBTOTAL		1.28	5.79	1.22	49.03	1.45	3.49
GRAND TOTAL		1.15	5.49	1.07	48.12	1.81	3.41

Table G-3. Continued.

TRI RANK	CHEMICAL	LEATHER SIC 31 Percent	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent
1	Ammonium sulfate (solution)	0.72	0.09	1.14	0.12	0.00	0.65
2	Hydrochloric acid	0.00	0.47	7.40	2.19	0.23	0.51
3	Methanol	0.01	0.44	0.74	0.16	0.24	0.71
4	Ammonia	0.77	0.78	4.32	0.20	0.12	0.70
5	Toluene	1.12	0.96	1.66	3.61	1.60	1.84
6	Sulfuric acid	0.12	2.11	21.90	6.75	0.68	2.71
7	Acetone	0.85	0.20	0.29	1.68	0.47	3.33
8	Xylene (mixed isomers)	0.54	0.81	2.62	10.02	4.67	8.18
9	1,1,1-Trichloroethane	0.17	0.44	11.94	12.99	9.04	11.32
10	Zinc compounds	0.00	0.38	77.25	4.57	0.18	1.12
11	Methyl ethyl ketone	1.84	0.68	4.21	7.43	1.50	2.20
12	Chlorine	0.00	0.00	81.27	0.09	0.02	0.80
13	Dichloromethane	0.18	1.32	1.35	2.97	1.46	7.03
14	Manganese compounds	0.54	0.14	40.85	0.08	0.84	0.77
15	Carbon disulfide	0.00	0.09	0.00	0.00	0.00	0.00
16	Phosphoric acid	0.80	0.21	2.32	2.58	0.38	0.92
17	Nitric acid	0.00	0.06	14.69	7.13	2.29	2.79
18	Ammonium nitrate (solution)	0.00	1.16	0.43	0.00	0.00	0.90
19	Freon 113	0.00	0.19	1.75	6.44	11.04	28.43
20	Glycol ethers	2.60	0.91	1.64	33.55	2.53	7.68
21	Ethylene glycol	0.00	0.92	9.59	1.55	1.08	1.94
22	Zinc (fume or dust)	0.00	0.05	82.67	5.89	0.37	0.80
23	Copper compounds	0.00	0.01	82.80	1.76	0.53	1.59
24	Chromium compounds	2.17	3.48	27.21	3.55	1.52	0.48
25	n-Butyl alcohol	0.49	0.28	0.73	26.64	1.15	2.80
SUBTOTAL		0.48	0.60	12.50	3.59	1.17	2.51
GRAND TOTAL		0.44	0.83	13.26	3.63	1.31	2.55

Table G-3. Continued.

TRI RANK	CHEMICAL	TRANSPORTATION SIC 37 Percent	MEASURE./PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent	TOTAL Percent
1	Ammonium sulfate (solution)	0.00	0.02	0.01	1.23	0.02	1.26
2	Hydrochloric acid	0.64	0.03	0.04	3.31	0.95	4.25
3	Methanol	1.26	2.17	0.21	10.58	0.22	10.80
4	Ammonia	0.13	0.08	0.06	8.39	0.33	8.72
5	Toluene	5.80	1.08	2.47	12.31	0.44	12.76
6	Sulfuric acid	1.80	0.24	0.05	3.90	0.11	4.00
7	Acetone	9.32	3.34	2.31	7.78	0.31	8.09
8	Xylene (mixed isomers)	23.00	0.57	1.44	6.63	0.72	7.35
9	1,1,1-Trichloroethane	18.16	2.53	2.11	10.46	0.42	10.88
10	Zinc compounds	0.99	0.18	0.14	5.01	0.04	5.05
11	Methyl ethyl ketone	9.40	1.37	3.15	25.36	0.53	25.89
12	Chlorine	0.18	0.01	0.00	1.09	0.11	1.21
13	Dichloromethane	5.08	16.20	1.72	11.23	0.19	11.42
14	Manganese compounds	0.13	0.22	0.00	44.10	0.00	44.10
15	Carbon disulfide	0.00	0.00	0.00	0.00	0.00	0.00
16	Phosphoric acid	0.56	0.25	0.08	9.25	0.06	9.31
17	Nitric acid	5.04	0.15	0.17	4.82	0.14	4.96
18	Ammonium nitrate (solution)	0.00	0.10	0.00	1.39	0.00	1.39
19	Freon 113	14.79	12.89	1.00	14.29	0.47	14.76
20	Glycol ethers	19.16	0.38	0.71	5.08	0.26	5.33
21	Ethylene glycol	3.72	1.10	0.12	8.98	0.14	9.12
22	Zinc (fume or dust)	0.27	0.02	0.19	3.47	0.06	3.53
23	Copper compounds	0.71	0.52	0.02	2.91	0.01	2.92
24	Chromium compounds	2.70	0.06	0.32	11.17	0.04	11.21
25	n-Butyl alcohol	18.93	0.75	0.91	8.59	0.46	9.05
SUBTOTAL		4.14	1.31	0.66	7.70	0.29	7.99
GRAND TOTAL		4.30	1.22	0.68	7.66	0.34	8.00

Table G-4. TRI Releases and Transfers of the Top 25 Carcinogens by Each Industry, 1989.

CARC. RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent
1	Dichloromethane	130,355,581	0.34	0.00	0.36	0.12	0.16
2	Styrene	41,169,973	0.00	0.07	0.06	0.00	0.36
3	Tetrachloroethylene	30,058,581	0.00	0.00	6.73	0.40	0.46
4	Formaldehyde	30,042,348	0.01	0.00	2.32	0.00	15.18
5	Benzene	28,591,407	0.22	0.00	0.00	0.00	0.01
6	Chloroform	27,325,508	0.30	0.00	0.00	0.00	0.00
7	Lead	19,872,648	0.16	0.00	0.02	0.00	0.00
8	Chromium	13,403,332	0.33	0.00	0.00	0.00	0.16
9	Acrylonitrile	12,280,895	0.00	0.00	0.00	0.00	0.00
10	1,2-Dichloroethane	9,509,848	0.00	0.00	0.00	0.00	0.00
11	Nickel	9,493,108	0.65	0.00	0.00	0.00	0.00
12	Asbestos (friable)	8,944,353	0.00	0.00	0.00	0.00	0.00
13	Isopropyl alcohol (mfg. strong acid process)	7,661,243	0.61	0.00	1.34	0.00	3.91
14	1,3-Butadiene	6,136,125	0.10	0.00	0.00	0.00	0.00
15	Acrylamide	4,625,675	0.00	0.00	0.00	0.00	0.00
16	Carbon tetrachloride	4,607,809	0.00	0.00	0.00	0.00	0.00
17	Polychlorinated biphenyls (PCBs)	4,233,611	0.00	0.00	1.18	0.00	1.25
18	Di-(2-ethylhexyl) phthalate	3,708,811	0.00	0.00	2.35	0.21	0.62
19	Ethylene oxide	3,447,067	5.48	0.00	0.01	0.00	0.00
20	Propylene oxide	2,414,341	12.66	0.00	0.00	0.00	0.00
21	1,4-Dichlorobenzene	1,725,392	0.00	0.00	0.00	0.00	0.00
22	1,4-Dioxane	1,516,708	0.00	0.00	0.00	0.00	0.87
23	Epichlorohydrin	1,487,562	0.03	0.00	0.00	0.00	0.00
24	Hexachlorobenzene	1,458,420	0.00	0.00	0.00	0.00	0.00
25	Vinyl chloride	1,363,697	0.00	0.00	0.00	0.00	0.00
SUBTOTAL FOR CARCINOGENS		405,434,043	0.32	0.01	0.85	0.07	1.35
TOTAL FOR ALL CARCINOGENS		411,505,400	0.33	0.01	0.86	0.07	1.33
TRI GRAND TOTAL		5,705,670,380	1.19	0.30	0.81	0.04	0.66

Table G-4. Continued.

CARC. RANK	CHEMICAL	FURNITURE SIC 25 Percent	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent
1	Dichloromethane	0.22	0.55	0.27	29.44	0.00	19.79
2	Styrene	0.29	0.10	0.07	29.85	0.06	25.27
3	Tetrachloroethylene	0.05	0.68	0.65	8.68	0.01	3.27
4	Formaldehyde	0.92	3.76	0.00	60.20	0.24	0.84
5	Benzene	0.00	0.00	0.00	35.70	16.39	0.00
6	Chloroform	0.00	74.99	0.00	14.54	0.00	0.08
7	Lead	0.01	0.00	0.03	0.67	0.21	2.50
8	Chromium	0.02	0.27	0.02	2.13	2.22	0.91
9	Acrylonitrile	0.00	0.00	0.00	96.35	0.00	0.01
10	1,2-Dichloroethane	0.00	0.00	0.00	78.47	0.13	0.64
11	Nickel	0.08	0.00	0.00	2.61	1.50	0.56
12	Asbestos (friable)	0.00	15.94	0.00	14.73	12.43	0.18
13	Isopropyl alcohol (manufacturing)	6.44	6.17	16.20	14.82	0.01	6.12
14	1,3-Butadiene	0.00	0.00	0.00	86.88	1.22	0.10
15	Acrylamide	0.00	0.01	0.00	99.98	0.00	0.00
16	Carbon tetrachloride	0.00	0.00	0.00	94.25	0.60	0.01
17	Polychlorinated biphenyls (PCBs)	0.00	18.04	0.57	4.46	0.04	0.36
18	Di-(2-ethylhexyl) phthalate	9.01	0.70	0.11	16.01	0.00	36.60
19	Ethylene oxide	0.00	0.91	0.00	46.10	0.94	8.63
20	Propylene oxide	0.01	0.00	0.00	84.08	0.04	0.12
21	1,4-Dichlorobenzene	0.00	0.00	0.00	77.12	0.00	0.00
22	1,4-Dioxane	0.00	0.00	0.00	37.78	0.02	12.55
23	Epichlorohydrin	0.00	0.00	0.00	27.17	0.50	0.00
24	Hexachlorobenzene	0.00	0.00	0.00	99.93	0.00	0.00
25	Vinyl chloride	0.00	0.00	0.00	80.77	0.00	0.00
SUBTOTAL FOR CARCINOGENS		0.38	6.25	0.46	32.44	1.61	10.00
TOTAL FOR ALL CARCINOGENS		0.37	6.16	0.45	33.03	1.60	9.93
TRI GRAND TOTAL		1.15	5.49	1.07	48.12	1.81	3.41

Table G-4. Continued.

CARC. RANK	CHEMICAL	LEATHER SIC 31 Percent	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent
1	Dichloromethane	0.18	1.32	1.35	2.97	1.46	7.03
2	Styrene	0.00	1.41	0.48	0.21	0.72	1.13
3	Tetrachloroethylene	0.56	0.57	9.67	11.99	4.06	11.58
4	Formaldehyde	0.00	7.41	1.66	0.12	0.39	1.06
5	Benzene	0.00	0.00	35.78	0.00	0.00	0.00
6	Chloroform	0.00	0.00	0.00	0.00	0.00	0.00
7	Lead	0.00	4.44	74.63	2.69	0.38	4.94
8	Chromium	3.81	0.47	46.31	16.55	15.94	2.66
9	Acrylonitrile	0.00	0.00	0.00	0.00	0.00	0.00
10	1,2-Dichloroethane	0.00	0.00	0.00	1.12	10.62	0.00
11	Nickel	0.00	0.01	35.98	16.64	12.81	3.50
12	Asbestos (friable)	0.00	30.13	0.15	0.00	0.26	0.00
13	Isopropyl alcohol (manufacturing)	0.00	0.43	2.46	3.29	1.69	7.68
14	1,3-Butadiene	0.00	0.00	0.00	0.00	0.00	0.00
15	Acrylamide	0.00	0.00	0.00	0.01	0.00	0.00
16	Carbon tetrachloride	0.00	0.01	0.00	0.00	0.00	0.02
17	Polychlorinated biphenyls (PCBs)	0.18	1.07	1.74	0.96	1.09	8.83
18	Di-(2-ethylhexyl) phthalate	0.07	0.35	0.30	2.07	0.01	11.67
19	Ethylene oxide	0.00	0.00	0.02	0.00	5.01	3.71
20	Propylene oxide	0.00	0.00	0.00	0.00	0.00	0.00
21	1,4-Dichlorobenzene	0.00	3.58	0.00	0.00	0.00	0.00
22	1,4-Dioxane	0.00	0.05	2.95	2.38	1.92	1.28
23	Epichlorohydrin	0.00	0.00	0.00	0.01	0.00	0.00
24	Hexachlorobenzene	0.00	0.03	0.00	0.00	0.00	0.00
25	Vinyl chloride	0.88	0.00	0.07	0.00	0.00	0.00
SUBTOTAL FOR CARCINOGENS		0.23	2.10	9.96	3.07	2.07	4.11
TOTAL FOR ALL CARCINOGENS		0.23	2.07	9.96	3.06	2.04	4.09
TRI GRAND TOTAL		0.44	0.83	13.26	3.63	1.31	2.55

Table G-4. Continued.

CARC. RANK	CHEMICAL	TRANSPORTATION SIC 37 Percent	MEASURE./ PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent	TOTAL Percent
1	Dichloromethane	5.08	16.20	1.72	11.23	0.19	34.42
2	Styrene	29.96	0.14	1.10	8.13	0.58	39.91
3	Tetrachloroethylene	23.21	1.98	1.42	13.64	0.40	40.66
4	Formaldehyde	0.33	0.37	0.06	4.75	0.38	5.90
5	Benzene	0.44	0.00	0.00	10.57	0.87	11.89
6	Chloroform	0.06	0.00	0.00	10.03	0.00	10.10
7	Lead	3.10	0.41	0.02	4.10	1.70	9.32
8	Chromium	3.69	0.67	0.03	3.74	0.60	8.19
9	Acrylonitrile	0.01	0.03	0.00	3.60	0.00	3.63
10	1,2-Dichloroethane	0.16	7.96	0.00	0.91	0.00	9.03
11	Nickel	13.00	0.30	0.62	11.71	0.03	25.65
12	Asbestos (friable)	22.13	0.00	3.48	0.59	0.00	26.19
13	Isopropyl alcohol (manufacturing)	8.09	0.76	4.39	12.13	3.45	28.83
14	1,3-Butadiene	0.00	0.06	0.00	11.63	0.00	11.70
15	Acrylamide	0.00	0.00	0.00	0.00	0.00	0.00
16	Carbon tetrachloride	0.00	0.00	0.00	5.09	0.02	5.11
17	Polychlorinated biphenyls (PCBs)	4.24	0.00	0.00	3.23	52.75	60.22
18	Di-(2-ethylhexyl) phthalate	3.88	1.18	7.30	7.21	0.36	19.92
19	Ethylene oxide	0.00	20.65	0.67	7.65	0.21	29.18
20	Propylene oxide	0.02	1.49	0.00	1.54	0.05	3.10
21	1,4-Dichlorobenzene	0.00	0.00	0.00	19.30	0.00	19.30
22	1,4-Dioxane	10.93	11.11	3.90	14.07	0.02	40.21
23	Epichlorohydrin	0.00	0.00	0.00	72.28	0.00	72.28
24	Hexachlorobenzene	0.00	0.00	0.00	0.03	0.00	0.30
25	Vinyl chloride	0.64	0.00	0.00	17.62	0.02	18.28
SUBTOTAL FOR CARCINOGENS		7.80	5.89	1.04	9.06	0.95	24.74
TOTAL FOR ALL CARCINOGENS		7.70	5.80	1.03	8.97	0.93	24.43
TRI GRAND TOTAL		4.30	1.22	0.68	7.66	0.34	14.20

APPENDIX H

Distribution of TRI Releases and Transfers by State, 1989

Table H-1. The Top Ten TRI Chemicals with the Largest Releases and Transfers in Each State, 1989.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Alabama	Carbon disulfide	3	0.17	45,473,676	33.01
	Methanol	51	2.84	12,392,024	9.00
	Methyl ethyl ketone	39	2.17	7,901,642	5.74
	Toluene	81	4.51	7,140,426	5.18
	Xylene (mixed isomers)	88	4.90	6,288,303	4.56
	Ammonium sulfate (solution)	12	0.67	4,396,431	3.19
	Hydrochloric acid	59	3.29	3,696,213	2.68
	1,1,1-Trichloroethane	51	2.84	3,381,194	2.45
	Ammonia	79	4.40	3,261,239	2.37
	Chlorine	50	2.78	2,972,751	2.16
	SUBTOTAL	513	28.56	96,903,899	70.34
	STATE TOTAL	1,796	100.00	137,761,513	100.00
Alaska	Ammonia	4	8.33	18,742,221	75.01
	Methanol	2	4.17	3,062,911	12.26
	Hydrochloric acid	2	4.17	2,511,500	10.05
	Chloroform	2	4.17	270,811	1.08
	Sulfuric acid	3	6.25	204,000	0.82
	Xylene (mixed isomers)	3	6.25	33,458	0.13
	Toluene	3	6.25	32,238	0.13
	Benzene	3	6.25	30,873	0.12
	Acetone	1	2.08	25,016	0.10
	Cyclohexane	3	6.25	18,636	0.70
	Subtotal	26	54.17	24,931,664	99.78
	State Total	48	100.00	24,986,799	100.00
American Samoa	Ammonia	2	66.67	27,750	100.00
	Chlorine	1	33.33	0	0.00
	SUBTOTAL	3	100.00	27,750	100.00
	STATE TOTAL	3	100.00	27,750	100.00
Arizona	Zinc compounds	4	0.61	7,873,000	15.51
	Copper compounds	16	2.46	5,870,342	11.56
	Copper	21	3.23	4,915,561	9.68
	Zinc (fume or dust)	3	0.46	4,243,046	8.36
	Methanol	15	2.30	3,316,278	6.53
	Ammonium sulfate (solution)	3	0.46	3,040,467	5.99
	Acetone	28	4.30	2,726,473	5.37
	Barium	1	0.15	2,278,600	4.49
	1,1,1-Trichloroethane	50	7.68	2,078,903	4.10
	Freon 113	46	7.07	2,060,835	4.06
	SUBTOTAL	187	28.73	38,403,505	75.65
	STATE TOTAL	651	100.00	50,764,830	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Arkansas	Ammonia	72	6.19	13,459,892	17.05
	Ammonium sulfate (solution)	4	0.34	8,390,000	10.63
	Sulfuric acid	61	5.25	7,591,275	9.61
	Hydrochloric acid	34	2.92	6,547,169	8.29
	Toluene	79	6.79	5,024,898	6.36
	Methanol	39	3.35	4,796,042	6.07
	Zinc (fume or dust)	12	1.03	3,735,244	4.73
	Xylene (mixed isomers)	69	5.93	3,630,229	4.60
	Acetone	44	3.78	3,492,897	4.42
	Methyl ethyl ketone	47	4.04	3,376,946	4.28
	SUBTOTAL	461	39.64	60,044,592	76.05
	STATE TOTAL	1,163	100.00	78,955,945	100.00
California	Ammonium sulfate (solution)	30	0.50	33,243,608	19.69
	1,1,1-Trichloroethane	496	8.32	24,009,636	14.22
	Ammonia	268	4.50	16,877,889	10.00
	Methanol	122	2.05	14,071,728	8.34
	Dichloromethane	121	2.03	7,123,979	4.22
	Freon 113	189	3.17	6,845,775	4.05
	Acetone	235	3.94	5,276,401	3.13
	Toluene	202	3.39	4,659,355	2.76
	Tetrachloroethylene	93	1.56	4,319,367	2.56
	Methyl ethyl ketone	181	3.04	4,024,429	2.38
	SUBTOTAL	1,937	32.49	120,452,167	71.35
	STATE TOTAL	5,962	100.00	168,825,335	100.00
Colorado	1,1,1-Trichloroethane	30	4.82	1,840,519	11.25
	Freon 113	35	5.62	1,585,114	9.69
	Manganese	16	2.57	1,263,843	7.73
	Methanol	13	2.09	1,035,686	6.33
	n-Butyl alcohol	6	0.96	859,112	5.25
	Tetrachloroethylene	6	0.96	808,166	4.94
	Ammonium nitrate (solution)	6	0.96	726,045	4.44
	1,2-Dichloroethane	1	0.16	725,405	4.43
	Toluene	21	3.37	710,515	4.34
	Glycol ethers	8	1.28	702,080	4.29
	SUBTOTAL	142	22.79	10,256,485	62.70
	STATE TOTAL	623	100.00	16,357,496	100.00
Connecticut	1,1,1-Trichloroethane	155	10.61	9,168,761	21.34
	Methanol	31	2.12	4,278,711	9.96
	Dichloromethane	52	3.56	3,152,501	7.34
	Toluene	42	2.87	2,930,545	6.82
	Tetrachloroethylene	30	2.05	2,269,151	5.28
	Freon 113	48	3.29	2,087,940	4.86
	Nitric acid	64	4.38	1,860,002	4.33
	Acetone	25	1.71	1,406,243	3.27
	Methyl ethyl ketone	39	2.67	1,320,451	3.07
	Nickel compounds	27	1.85	1,283,200	2.99

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Connecticut (Cont.)	SUBTOTAL	513	35.11	29,757,505	69.26
	STATE TOTAL	1,461	100.00	42,963,065	100.00
Delaware	Methanol	14	5.19	2,549,802	21.39
	Xylene (mixed isomers)	7	2.59	2,037,573	17.09
	Toluene	14	5.19	1,044,778	8.77
	Carbonyl sulfide	1	0.37	680,000	5.70
	Acetone	10	3.70	559,404	4.69
	Methyl ethyl ketone	9	3.33	459,638	3.86
	Ammonium sulfate (solution)	2	0.74	410,009	3.44
	Methyl isobutyl ketone	2	0.74	387,169	3.25
	Sulfuric acid	20	7.41	323,653	2.72
	Dichloromethane	8	2.96	309,011	2.59
	SUBTOTAL	87	32.22	8,761,037	73.50
	STATE TOTAL	270	100.00	11,919,774	100.00
Florida	Hydrochloric acid	67	4.27	33,645,160	17.52
	Phosphoric acid	83	5.29	31,650,625	16.48
	Ammonia	80	5.10	27,185,024	14.16
	Ammonium nitrate (solution)	20	1.28	24,770,930	12.90
	Methanol	43	2.74	22,290,307	11.61
	Acetone	101	6.44	10,331,185	5.38
	Ammonium sulfate (solution)	6	0.38	7,551,350	3.93
	Toluene	52	3.32	5,212,915	2.71
	Dichloromethane	39	2.49	2,748,611	1.43
	Sulfuric acid	111	7.08	2,698,950	1.41
	SUBTOTAL	602	38.39	168,085,057	87.52
	STATE TOTAL	1,568	100.00	192,044,588	100.00
Georgia	Methanol	88	3.57	28,062,542	23.80
	Acetone	76	3.08	8,405,961	7.13
	Zinc compounds	78	3.16	7,674,134	6.51
	Toluene	105	4.25	6,977,337	5.92
	Xylene (mixed isomers)	114	4.62	6,733,674	5.71
	Ammonia	110	4.46	4,988,117	4.23
	Hydrochloric acid	80	3.24	4,774,095	4.05
	Ammonium sulfate (solution)	30	1.22	4,335,292	3.68
	1,1,1-Trichloroethane	88	3.57	3,974,061	3.37
	Ammonium nitrate (solution)	20	0.81	3,817,366	3.24
	SUBTOTAL	789	31.97	79,742,579	67.64
	STATE TOTAL	2,468	100.00	117,888,623	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Hawaii	Ammonium sulfate (solution)	3	2.97	2,341,216	68.81
	Hydrochloric acid	3	2.97	144,322	4.24
	Propylene	2	1.98	124,950	3.67
	Ammonia	7	6.93	120,450	3.54
	Chlorine	13	12.87	100,300	2.95
	Toluene	2	1.98	92,950	2.73
	Glycol ethers	1	0.99	68,638	2.02
	n-Butyl alcohol	1	0.99	59,774	1.76
	m-Xylene	2	1.98	50,830	1.49
	Benzene	2	1.98	48,100	1.41
	SUBTOTAL	36	35.64	3,151,530	92.63
	STATE TOTAL	101	100.00	3,402,365	100.00
Idaho	Ammonium sulfate (solution)	3	1.78	5,144,980	32.69
	Phosphorus (yellow or white)	2	1.18	3,278,377	20.83
	Ammonia	17	10.06	1,834,258	11.65
	Sulfuric acid	15	8.88	1,427,033	9.07
	Chloroform	2	1.18	655,000	4.16
	Chlorine dioxide	2	1.18	540,250	3.43
	Methanol	3	1.78	478,200	3.04
	Freon 113	4	2.37	406,525	2.58
	Acetone	7	4.14	321,113	2.04
	Glycol ethers	3	1.78	251,368	1.60
	SUBTOTAL	58	34.32	14,337,104	91.09
	STATE TOTAL	169	100.00	15,739,859	100.00
Illinois	Ammonium sulfate (solution)	17	0.34	33,345,386	13.46
	Hydrochloric acid	207	4.13	32,604,494	13.16
	Toluene	233	4.64	18,791,994	7.58
	Zinc compounds	156	3.11	14,887,089	6.01
	Sulfuric acid	340	6.78	11,746,295	4.74
	1,1,1-Trichloroethane	239	4.76	10,918,393	4.41
	Xylene (mixed isomers)	220	4.38	10,044,899	4.05
	Methanol	136	2.71	9,301,992	3.75
	Methyl ethyl ketone	150	2.99	7,081,882	2.86
	Chlorine	80	1.59	6,706,159	2.71
	SUBTOTAL	1,778	35.43	155,428,583	62.72
	STATE TOTAL	5,018	100.00	247,813,608	100.00
Indiana	Manganese compounds	24	0.73	39,775,590	15.60
	Sulfuric acid	197	5.97	28,804,647	11.29
	Acetone	124	3.76	19,288,912	7.56
	Toluene	196	5.94	18,353,853	7.20
	Dichloromethane	80	2.43	14,209,036	5.57
	Hydrochloric acid	126	3.82	11,681,181	4.58
	1,1,1-Trichloroethane	148	4.49	11,341,782	4.45
	Xylene (mixed isomers)	199	6.03	10,803,948	4.24
	Ammonia	80	2.43	7,860,441	3.08
	Methyl ethyl ketone	113	3.43	7,384,484	2.90
	SUBTOTAL	1,287	39.02	169,503,874	66.47
	STATE TOTAL	3,298	100.00	255,023,626	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Iowa	Ammonia	72	6.01	10,562,607	19.15
	Toluene	72	6.01	8,058,673	14.61
	Xylene (mixed isomers)	84	7.01	4,055,271	7.35
	Methanol	22	1.83	3,887,913	7.05
	Ethylene glycol	22	1.83	3,389,926	6.15
	1,1,1-Trichloroethane	58	4.84	3,331,080	6.04
	Methyl ethyl ketone	31	2.59	2,688,541	4.88
	Acetone	35	2.92	2,653,688	4.81
	Glycol ethers	28	2.34	1,950,508	3.54
	Tetrachloroethylene	13	1.08	1,420,388	2.58
	SUBTOTAL	437	36.45	41,998,595	76.16
	STATE TOTAL	1,199	100.00	55,143,195	100.00
Kansas	Hydrochloric acid	29	3.21	127,984,225	69.13
	Sulfuric acid	51	5.64	16,641,474	8.99
	Ammonia	44	4.87	4,459,727	2.41
	Toluene	53	5.86	3,027,056	1.64
	Xylene (mixed isomers)	47	5.20	2,781,016	1.50
	Methanol	23	2.54	2,733,213	1.48
	Ethylene	5	0.55	2,523,253	1.36
	Trichloroethylene	14	1.55	2,501,985	1.35
	Ammonium nitrate (solution)	6	0.66	2,487,627	1.34
	Propylene	5	0.55	2,283,558	1.23
	SUBTOTAL	277	30.64	167,423,134	90.43
	STATE TOTAL	904	100.00	185,131,051	100.00
Kentucky	Hydrochloric acid	53	3.53	40,700,151	36.53
	Toluene	71	4.73	10,132,050	9.09
	Aluminum (fume or dust)	16	1.07	7,769,557	6.97
	Xylene (mixed isomers)	75	5.00	5,825,287	5.23
	Methanol	31	2.07	5,696,560	5.11
	Acetone	44	2.93	2,817,078	2.53
	Zinc (fume or dust)	16	1.07	2,742,865	2.46
	Ethylene	6	0.40	2,739,968	2.46
	1,1,1-Trichloroethane	45	3.00	2,164,085	1.94
	Glycol ethers	28	1.87	2,063,577	1.85
	SUBTOTAL	385	25.67	82,651,178	74.18
	STATE TOTAL	1,500	100.00	111,422,816	100.00
Louisiana	Sulfuric acid	124	6.76	100,114,509	21.14
	Ammonia	74	4.03	97,723,992	20.64
	Ammonium sulfate (solution)	16	0.87	84,021,772	17.74
	Hydrochloric acid	87	4.74	43,443,992	9.17
	Phosphoric acid	47	2.56	28,253,030	5.97
	Methanol	72	3.92	18,474,764	3.90
	Acetonitrile	5	0.27	12,405,626	2.62
	Acrylic acid	5	0.27	7,567,763	1.60
	Carbon disulfide	9	0.49	5,595,050	1.18
	Ethylene	40	2.18	5,181,440	1.09
	SUBTOTAL	479	26.10	402,781,938	85.06
	STATE TOTAL	1,835	100.00	473,546,487	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Maine	Methanol	13	3.37	3,422,319	18.42
	Sulfuric acid	32	8.29	3,196,505	17.20
	1,1,1-Trichloroethane	26	6.74	1,771,641	9.53
	Chlorine	16	4.15	1,345,284	7.24
	Acetone	23	5.96	1,191,012	6.41
	Chloroform	7	1.81	1,149,805	6.19
	Glycol ethers	5	1.30	1,096,241	5.90
	Toluene	17	4.40	835,883	4.50
	Chlorine dioxide	7	1.81	537,049	2.89
	Xylene (mixed isomers)	16	4.15	491,690	2.65
	SUBTOTAL	162	41.97	15,037,429	80.93
	STATE TOTAL	386	100.00	18,581,543	100.00
Maryland	Methanol	18	2.24	5,201,011	17.78
	Toluene	36	4.47	2,498,798	8.54
	Ammonia	37	4.60	2,309,681	7.90
	1,1,1-Trichloroethane	35	4.35	2,181,442	7.46
	Hydrochloric acid	31	3.85	2,094,635	7.16
	Ammonium sulfate (solution)	4	0.50	1,589,042	5.43
	Manganese compounds	14	1.74	1,202,561	4.11
	Methyl ethyl ketone	23	2.86	1,036,260	3.54
	Xylene (mixed isomers)	30	3.73	926,745	3.17
	Sulfuric acid	53	6.58	904,669	3.09
	SUBTOTAL	281	34.91	19,944,844	68.18
	STATE TOTAL	805	100.00	29,251,518	100.00
Massachusetts	Toluene	105	5.11	6,933,759	12.33
	Methanol	70	3.41	5,476,058	9.74
	Sulfuric acid	163	7.93	5,417,616	9.64
	1,1,1-Trichloroethane	150	7.30	4,494,536	8.00
	Methyl ethyl ketone	62	3.02	3,917,335	6.97
	Acetone	68	3.31	3,747,316	6.67
	Freon 113	81	3.94	3,211,947	5.71
	Dichloromethane	55	2.68	2,328,925	4.14
	n-Butyl alcohol	14	0.68	2,251,310	4.00
	Trichloroethylene	44	2.14	2,062,494	3.67
	SUBTOTAL	812	39.51	39,841,296	70.87
	STATE TOTAL	2,055	100.00	56,214,698	100.00
Michigan	Zinc (fume or dust)	34	0.89	20,863,443	9.48
	Xylene (mixed isomers)	171	4.50	19,333,415	8.78
	Toluene	207	5.45	18,966,394	8.62
	Acetone	142	3.74	16,865,700	7.66
	Copper compounds	41	1.08	16,468,005	7.48
	Methanol	106	2.79	14,559,167	6.61
	Hydrochloric acid	184	4.84	11,220,302	5.10
	Sulfuric acid	240	6.32	9,013,882	4.09
	Methyl ethyl ketone	130	3.42	8,941,532	4.06
	Dichloromethane	63	1.66	7,167,027	3.26
	SUBTOTAL	1,318	34.68	143,398,867	65.14
	STATE TOTAL	3,800	100.00	220,137,364	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Minnesota	Methyl ethyl ketone	43	3.07	21,496,286	26.24
	Toluene	71	5.07	17,858,788	21.80
	Xylene (mixed isomers)	59	4.21	6,025,894	7.35
	Methanol	34	2.43	5,218,914	6.37
	1,1,1-Trichloroethane	77	5.50	3,087,818	3.77
	Acetone	57	4.07	2,962,402	3.62
	Freon 113	52	3.71	2,647,658	3.23
	Ethylene glycol	17	1.21	2,577,798	3.15
	Dichloromethane	38	2.71	2,453,275	2.99
	Ammonium sulfate (solution)	3	0.21	1,764,509	2.15
	SUBTOTAL	451	32.21	66,093,342	80.67
	STATE TOTAL	1,400	100.00	81,932,154	100.00
Mississippi	Hydrochloric acid	27	2.48	37,345,326	30.96
	Ammonia	55	5.06	15,322,054	12.70
	Toluene	74	6.80	8,645,894	7.17
	Sulfuric acid	62	5.70	6,849,747	5.68
	Xylene (mixed isomers)	67	6.16	6,519,599	5.41
	Carbonyl sulfide	2	0.18	5,681,000	4.71
	Manganese compounds	10	0.92	5,086,182	4.22
	Methyl ethyl ketone	29	2.67	4,759,275	3.95
	Methanol	35	3.22	3,660,056	3.03
	Dichloromethane	18	1.65	3,607,895	2.99
	SUBTOTAL	379	34.83	97,477,028	80.81
	STATE TOTAL	1,088	100.00	120,617,983	100.00
Missouri	Ammonium sulfate (solution)	11	0.48	68,925,548	42.26
	Zinc compounds	61	2.68	20,418,407	12.52
	Xylene (mixed isomers)	113	4.96	10,082,047	6.18
	Methanol	61	2.68	7,864,614	4.82
	Lead compounds	33	1.45	7,046,054	4.32
	Toluene	127	5.57	6,455,510	3.96
	1,1,1-Trichloroethane	100	4.39	4,214,685	2.58
	Methyl ethyl ketone	80	3.51	3,933,506	2.41
	Dichloromethane	59	2.59	3,834,778	2.35
	Ammonia	61	2.68	2,986,655	1.83
	SUBTOTAL	706	30.98	135,761,804	83.24
	STATE TOTAL	2,279	100.00	163,105,846	100.00
Montana	Zinc compounds	3	2.46	29,032,887	74.25
	Lead compounds	3	2.46	3,090,743	7.90
	Manganese compounds	2	1.64	2,423,097	6.20
	Copper compounds	2	1.64	1,419,157	3.63
	Hydrogen fluoride	5	4.10	507,765	1.30
	Arsenic compounds	3	2.46	371,585	0.95
	Xylene (mixed isomers)	5	4.10	310,349	0.79
	Formaldehyde	6	4.92	235,334	0.60
	Propylene	4	3.28	223,000	0.57
	Antimony compounds	1	0.82	207,032	0.53
	SUBTOTAL	34	27.87	37,820,949	96.72
	STATE TOTAL	122	100.00	39,103,261	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
North Carolina	Methanol	215	7.02	18,487,271	13.69
	Toluene	198	6.47	17,602,423	13.03
	Phosphoric acid	88	2.87	15,962,423	11.82
	Chromium compounds	46	1.50	8,942,665	6.62
	Methyl ethyl ketone	142	4.64	8,321,901	6.16
	Dichloromethane	57	1.86	7,951,239	5.89
	Acetone	157	5.13	7,612,308	5.64
	1,1,1-Trichloroethane	150	4.90	6,075,084	4.50
	Ammonia	128	4.18	4,565,030	3.38
	Xylene (mixed isomers)	138	4.51	2,934,328	2.17
	SUBTOTAL	1,319	43.08	98,454,672	72.90
	STATE TOTAL	3,062	100.00	135,058,190	100.00
North Dakota	Acetone	3	4.00	255,416	18.81
	Xylene (mixed isomers)	4	5.33	241,455	17.78
	Toluene	3	4.00	146,433	10.78
	Methyl isobutyl ketone	2	2.67	115,659	8.52
	Freon 113	1	1.33	105,938	7.80
	Styrene	4	5.33	66,076	4.87
	Methyl ethyl ketone	2	2.67	65,152	4.80
	1,1,1-Trichloroethane	3	4.00	57,906	4.26
	Hydrochloric acid	4	5.33	35,548	2.62
	Propylene	1	1.33	35,281	2.60
	SUBTOTAL	27	36.00	1,124,864	82.83
	STATE TOTAL	75	100.00	1,358,104	100.00
Nebraska	Toluene	23	4.90	4,226,620	20.49
	Ammonia	38	8.10	3,776,971	18.31
	Zinc compounds	19	4.05	2,152,482	10.44
	Dichloromethane	7	1.49	1,492,607	7.24
	Xylene (mixed isomers)	33	7.04	1,365,721	6.62
	1,1,1-Trichloroethane	26	5.54	952,257	4.62
	Antimony compounds	3	0.64	711,330	3.45
	Freon 113	8	1.71	650,437	3.15
	Methyl ethyl ketone	14	2.99	604,818	2.93
	Lead compounds	5	1.07	518,000	2.51
	SUBTOTAL	176	37.53	16,451,243	79.77
	STATE TOTAL	469	100.00	20,623,709	100.00
New Hampshire	Toluene	20	4.87	2,065,223	14.35
	1,1,1-Trichloroethane	41	9.98	1,854,686	12.89
	Freon 113	31	7.54	1,461,396	10.15
	Dichloromethane	16	3.89	1,439,499	10.00
	Methyl ethyl ketone	20	4.87	1,403,157	9.75
	Chlorine	3	0.73	706,250	4.91
	Chlorine dioxide	1	0.24	640,250	4.45
	Copper	18	4.38	498,566	3.46
	Hydrochloric acid	11	2.68	497,673	3.46
	Xylene (mixed isomers)	14	3.41	451,682	3.14
	SUBTOTAL	175	42.58	11,018,382	76.55
	STATE TOTAL	411	100.00	14,392,899	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
New Jersey	Methanol	112	3.55	32,248,029	25.94
	Ammonium sulfate (solution)	20	0.63	12,681,705	10.20
	Toluene	175	5.55	11,745,035	9.45
	Acetone	102	3.23	7,855,657	6.32
	Manganese compounds	15	0.48	5,830,158	4.69
	Methyl ethyl ketone	106	3.36	4,092,488	3.29
	Xylene (mixed isomers)	133	4.22	3,948,658	3.18
	Glycol ethers	92	2.92	3,934,861	3.16
	Ethylene glycol	78	2.47	3,358,483	2.70
	n-Butyl alcohol	72	2.28	3,203,648	2.58
	SUBTOTAL	905	28.68	88,898,722	71.50
	STATE TOTAL	3,155	100.00	124,333,859	100.00
New Mexico	Copper compounds	3	1.81	17,319,700	50.68
	Zinc compounds	1	0.60	9,731,000	28.48
	Hydrochloric acid	6	3.61	3,606,132	10.55
	Barium compounds	3	1.81	881,109	2.58
	Freon 113	7	4.22	598,239	1.75
	Sulfuric acid	12	7.23	577,328	1.69
	Toluene	11	6.63	354,764	1.04
	1,1,1-Trichloroethane	9	5.42	274,059	0.80
	Acetone	8	4.82	192,897	0.56
	Xylene (mixed isomers)	7	4.22	142,591	0.42
	SUBTOTAL	67	40.36	33,677,819	98.55
	STATE TOTAL	166	100.00	34,173,505	100.00
Nevada	Manganese compounds	1	1.00	2,052,000	62.26
	Toluene	4	4.00	451,653	13.70
	Acetone	4	4.00	163,954	4.97
	Sulfuric acid	12	12.00	153,616	4.66
	Manganese	3	3.00	120,050	3.64
	Xylene (mixed isomers)	3	3.00	59,891	1.82
	Methyl ethyl ketone	3	3.00	52,734	1.60
	Asbestos (friable)	1	1.00	41,500	1.26
	Nitric acid	4	4.00	28,200	0.86
	Hydrochloric acid	8	8.00	25,390	0.77
	SUBTOTAL	43	43.00	3,148,988	95.55
	STATE TOTAL	100	100.00	3,295,677	100.00
New York	Methanol	102	3.48	15,608,806	12.36
	Dichloromethane	66	2.25	12,416,330	9.83
	Toluene	156	5.32	11,459,808	9.08
	Acetone	83	2.83	9,478,629	7.51
	Hydrochloric acid	137	4.67	7,668,892	6.07
	1,1,1-Trichloroethane	168	5.72	7,539,951	5.97
	Xylene (mixed isomers)	124	4.22	5,396,844	4.27
	Freon 113	83	2.83	4,283,060	3.39
	Trichloroethylene	67	2.28	3,715,588	2.94
	Sulfuric acid	221	7.53	3,206,457	2.54
	SUBTOTAL	1,207	41.12	80,774,365	63.97
	STATE TOTAL	2,935	100.00	126,275,855	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Ohio	Ammonium sulfate (solution)	17	0.29	57,792,041	16.11
	Manganese compounds	75	1.27	27,169,314	7.57
	Hydrochloric acid	237	4.00	20,712,181	5.77
	Ammonia	171	2.89	20,087,473	5.60
	Zinc compounds	203	3.43	18,791,796	5.24
	Xylene (mixed isomers)	244	4.12	17,314,240	4.83
	Sulfuric acid	366	6.18	16,997,938	4.74
	Acetone	151	2.55	16,009,608	4.46
	1,1,1-Trichloroethane	280	4.73	15,127,987	4.22
	Toluene	283	4.78	14,966,967	4.17
	SUBTOTAL	2,027	34.23	224,969,545	62.72
	STATE TOTAL	5,922	100.00	358,677,545	100.00
Oklahoma	Ammonia	31	4.12	11,002,891	23.53
	Ammonium nitrate (solution)	5	0.66	6,639,143	14.20
	Sulfuric acid	51	6.77	5,686,869	12.16
	Methanol	18	2.39	3,411,978	7.30
	Toluene	39	5.18	2,646,108	5.66
	Hydrochloric acid	27	3.59	1,606,184	3.44
	Xylene (mixed isomers)	34	4.52	1,581,207	3.38
	1,1,1-Trichloroethane	35	4.65	1,427,126	3.05
	Methyl ethyl ketone	22	2.92	1,326,360	2.84
	Dichloromethane	15	1.99	1,272,161	2.72
	SUBTOTAL	277	36.79	36,600,027	78.29
	STATE TOTAL	753	100.00	46,752,043	100.00
Oregon	Methanol	31	3.95	10,580,973	33.59
	Acetone	45	5.74	3,319,461	10.54
	Toluene	39	4.97	2,638,757	8.38
	Ammonia	42	5.36	1,551,249	4.92
	Methyl ethyl ketone	25	3.19	1,042,958	3.31
	Formaldehyde	30	3.83	1,003,908	3.19
	1,1,1-Trichloroethane	26	3.32	909,893	2.89
	Trichloroethylene	13	1.66	885,192	2.81
	Sulfuric acid	58	7.40	831,784	2.64
	Chloroform	3	0.38	791,142	2.51
	SUBTOTAL	312	39.80	23,555,317	74.78
	STATE TOTAL	784	100.00	31,499,505	100.00
Pennsylvania	Toluene	209	4.70	23,007,378	11.85
	Methanol	130	2.92	14,181,715	7.30
	Dichloromethane	73	1.64	13,155,861	6.77
	Manganese compounds	54	1.21	11,785,254	6.07
	Sulfuric acid	269	6.05	10,968,462	5.65
	1,1,1-Trichloroethane	187	4.20	9,713,402	5.00
	Acetone	129	2.90	7,588,149	3.91
	Ammonia	144	3.24	7,297,882	3.76
	Methyl ethyl ketone	125	2.81	7,237,399	3.73
	Hydrochloric acid	147	3.30	7,035,798	3.62
	SUBTOTAL	1,467	32.97	111,971,300	57.65
	STATE TOTAL	4,449	100.00	194,216,839	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Puerto Rico	Dichloromethane	23	4.13	4,435,688	16.53
	Acetone	30	5.39	3,744,676	13.96
	Methanol	29	5.21	3,563,491	13.28
	Acetonitrile	3	0.54	1,819,517	6.78
	Ammonium sulfate (solution)	4	0.72	1,781,045	6.64
	Freon 113	30	5.39	1,529,971	5.70
	Xylene (mixed isomers)	12	2.15	1,453,902	5.42
	Ammonia	31	5.57	1,327,526	4.95
	Toluene	26	4.67	1,266,225	4.72
	Carbon disulfide	1	0.18	1,112,000	4.15
	SUBTOTAL	189	33.93	22,034,041	82.13
	STATE TOTAL	557	100.00	26,826,844	100.00
Rhode Island	Methanol	14	2.52	1,630,404	14.99
	1,1,1-Trichloroethane	48	8.63	1,331,001	12.24
	Acetone	22	3.96	1,296,850	11.92
	Toluene	19	3.42	1,233,888	11.34
	Methyl ethyl ketone	16	2.88	590,682	5.43
	Dichloromethane	14	2.52	577,457	5.31
	Ammonium sulfate (solution)	4	0.72	541,110	4.97
	Freon 113	22	3.96	495,743	4.56
	Trichloroethylene	23	4.14	474,666	4.36
	Tetrachloroethylene	14	2.52	468,416	4.31
	SUBTOTAL	196	35.25	8,640,217	79.42
	STATE TOTAL	556	100.00	10,878,502	100.00
South Carolina	Methanol	83	4.67	17,534,503	20.24
	Toluene	65	3.66	10,574,489	12.21
	Acetone	55	3.09	10,093,773	11.65
	1,1,1-Trichloroethane	75	4.22	5,625,466	6.49
	Methyl ethyl ketone	45	2.53	4,956,309	5.72
	Ammonia	69	3.88	3,451,083	3.98
	Xylene (mixed isomers)	64	3.60	3,265,358	3.77
	Ethylene glycol	56	3.15	2,687,510	3.10
	Dichloromethane	31	1.74	2,030,641	2.34
	Freon 113	22	1.24	1,745,336	2.02
	SUBTOTAL	565	31.78	61,964,468	71.54
	STATE TOTAL	1,778	100.00	86,615,836	100.00
South Dakota	Freon 113	5	4.63	667,075	19.90
	Xylene (mixed isomers)	13	12.04	665,280	19.85
	Toluene	5	4.63	644,712	19.23
	Methyl ethyl ketone	6	5.56	220,082	6.57
	Ammonia	6	5.56	179,767	5.36
	Methanol	3	2.78	165,923	4.95
	1,1,1-Trichloroethane	6	5.56	159,626	4.76
	Acetone	4	3.70	95,962	2.86
	Phosphoric acid	11	10.19	93,226	2.78
	Formaldehyde	2	1.85	89,202	2.66
	SUBTOTAL	61	56.48	2,980,855	88.93
	STATE TOTAL	108	100.00	3,351,837	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Tennessee	Hydrochloric acid	63	3.05	50,727,350	19.26
	Acetone	87	4.22	42,459,860	16.12
	Carbon disulfide	6	0.29	32,090,504	12.18
	Ammonium sulfate (solution)	11	0.53	21,541,737	8.18
	Methanol	67	3.25	18,685,579	7.09
	Toluene	119	5.77	15,944,166	6.05
	Ammonia	59	2.86	8,776,342	3.33
	Carbonyl sulfide	1	0.05	7,800,000	2.96
	1,1,1-Trichloroethane	91	4.41	7,016,863	2.66
	Xylene (mixed isomers)	107	5.18	5,182,995	1.97
	SUBTOTAL	611	29.60	210,225,396	79.81
	STATE TOTAL	2,064	100.00	263,400,319	100.00
Texas	Ammonium sulfate (solution)	27	0.46	339,378,872	42.81
	Ammonia	232	3.93	53,133,597	6.70
	Nitric acid	88	1.49	36,257,699	4.57
	Sulfuric acid	342	5.80	29,875,262	3.77
	Methanol	197	3.34	26,777,406	3.38
	Ethylene	88	1.49	23,544,124	2.97
	Toluene	245	4.15	17,690,346	2.23
	Hydrochloric acid	206	3.49	16,326,217	2.06
	Ethylene glycol	128	2.17	16,185,791	2.04
	Acetone	161	2.73	15,386,780	1.94
	SUBTOTAL	1,714	29.06	574,556,094	72.47
	STATE TOTAL	5,899	100.00	792,810,307	100.00
Utah	Chlorine	14	3.06	110,232,851	74.02
	Hydrochloric acid	22	4.81	10,586,915	7.11
	Copper	12	2.63	4,073,128	2.74
	1,1,1-Trichloroethane	24	5.25	3,809,348	2.56
	Zinc compounds	8	1.75	3,725,042	2.50
	Arsenic compounds	2	0.44	2,848,300	1.91
	Lead	5	1.09	2,390,208	1.61
	Dichloromethane	7	1.53	1,505,030	1.01
	Barium compounds	5	1.09	1,433,950	0.96
	Freon 113	16	3.50	1,071,459	0.72
	SUBTOTAL	115	25.16	141,676,231	95.14
	STATE TOTAL	457	100.00	148,915,352	100.00
Virginia	Ammonium sulfate (solution)	7	0.42	31,266,946	23.23
	Methanol	81	4.88	22,984,009	17.08
	Acetone	93	5.60	17,161,371	12.75
	Toluene	116	6.99	10,910,791	8.11
	Methyl ethyl ketone	79	4.76	6,308,527	4.69
	Xylene (mixed isomers)	91	5.48	6,076,520	4.51
	Sulfuric acid	81	4.88	4,775,847	3.55
	Ethylene glycol	35	2.11	3,564,486	2.65
	1,1,1-Trichloroethane	72	4.34	3,361,958	2.50
	Ammonia	66	3.98	2,853,086	2.12
	SUBTOTAL	721	43.43	109,263,541	81.18
	STATE TOTAL	1,660	100.00	134,592,526	100.00

Table H-1. Continued.

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
Virgin Islands	Benzene	1	5.26	331,764	26.04
	Toluene	1	5.26	319,072	25.04
	p-Xylene	1	5.26	234,000	18.36
	Xylene (mixed isomers)	1	5.26	210,172	16.49
	Ethylbenzene	1	5.26	72,072	5.66
	Asbestos (friable)	1	5.26	50,250	3.94
	Cyclohexane	1	5.26	29,100	2.28
	1,2,4-Trimethylbenzene	1	5.26	11,740	0.92
	Naphthalene	1	5.26	3,470	0.27
	Anthracene	1	5.26	2,655	0.21
	SUBTOTAL	10	52.63	1,264,295	99.22
	STATE TOTAL	19	100.00	1,274,235	100.00
Vermont	1,1,1-Trichloroethane	14	9.46	385,359	19.56
	Toluene	9	6.08	317,342	16.11
	Xylene (mixed isomers)	7	4.73	166,067	8.43
	Sulfuric acid	18	12.16	138,448	7.03
	Phosphoric acid	11	7.43	105,147	5.34
	Nitric acid	10	6.76	104,399	5.30
	Methanol	4	2.70	91,980	4.67
	Ammonia	3	2.03	83,871	4.26
	Methyl ethyl ketone	5	3.38	79,387	4.03
	Methyl isobutyl ketone	4	2.70	78,422	3.98
	SUBTOTAL	85	57.43	1,550,422	78.70
	STATE TOTAL	148	100.00	1,970,055	100.00
Washington	Sulfuric acid	79	7.14	9,186,906	18.86
	Ammonium sulfate (solution)	5	0.45	6,093,200	12.51
	Acetone	65	5.88	2,875,861	5.90
	Toluene	50	4.52	2,751,001	5.65
	Chloroform	12	1.08	2,715,876	5.58
	Methanol	31	2.80	2,682,514	5.51
	Methyl ethyl ketone	43	3.89	2,512,311	5.16
	Ammonia	56	5.06	2,426,494	4.98
	1,1,1-Trichloroethane	38	3.44	1,633,033	3.35
	Xylene (mixed isomers)	46	4.16	1,605,084	3.30
	SUBTOTAL	425	38.43	34,482,280	70.80
	STATE TOTAL	1,106	100.00	48,706,760	100.00
Wisconsin	Sulfuric acid	189	7.60	15,752,571	15.76
	Methanol	62	2.49	10,339,125	10.34
	1,1,1-Trichloroethane	152	6.11	6,092,236	6.09
	Manganese compounds	24	0.96	5,892,878	5.90
	Toluene	121	4.86	5,835,513	5.84
	Xylene (mixed isomers)	115	4.62	5,568,319	5.57
	Lead compounds	12	0.48	4,688,038	4.69
	Methyl ethyl ketone	95	3.82	4,561,308	4.56
	Glycol ethers	75	3.01	4,019,452	4.02
	Zinc (fume or dust)	21	0.84	2,634,104	2.64
	SUBTOTAL	866	34.81	65,383,544	65.41
	STATE TOTAL	2,488	100.00	99,963,906	100.00

Table H-1. Continued

STATE	CHEMICAL	TOTAL FORMS		TOTAL RELEASES AND TRANSFERS	
		Number	Percent	Pounds	Percent
West Virginia	Zinc compounds	17	2.54	6,633,423	11.24
	Acetone	15	2.24	6,028,894	10.22
	Methanol	18	2.69	5,301,324	8.99
	Ethylene glycol	13	1.94	4,358,924	7.39
	Sulfuric acid	42	6.27	3,351,608	5.68
	Ammonia	28	4.18	2,495,287	4.23
	Toluene	22	3.28	2,411,243	4.09
	Manganese compounds	6	0.90	1,915,404	3.25
	Acrylonitrile	4	0.60	1,712,042	2.90
	Chlorobenzene	3	0.45	1,678,350	2.85
	SUBTOTAL	168	25.07	35,886,499	60.83
	STATE TOTAL	670	100.00	58,992,213	100.00
Wyoming	Ammonium nitrate (solution)	3	2.34	13,004,010	72.04
	Ammonia	5	3.91	2,019,345	11.19
	Sulfuric acid	14	10.94	1,091,535	6.05
	Toluene	6	4.69	286,457	1.59
	Glycol ethers	2	1.56	266,850	1.48
	Xylene (mixed isomers)	7	5.47	210,454	1.17
	n-Butyl alcohol	1	0.78	151,000	0.84
	Methyl tert-butyl ether	2	1.56	138,050	0.76
	Propylene	4	3.13	111,114	0.62
	Hydrochloric acid	6	4.69	108,173	0.60

Table H-2. The Top Ten TRI Facilities for Total Releases and Transfers in Each State, 1989.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
14	Alabama	28	Courtaulds Fibers Inc.	Axis	44,397,570	32.23
		33	Reynolds Metals Co.	Sheffield	8,223,650	5.97
		28	Monsanto Co.	Decatur	4,623,400	3.36
		28	Du Pont Mobile Plant	Axis	4,438,912	3.22
		28	3M Co.	Decatur	2,989,470	2.17
		28	Ciba-Geigy Corp.	Mc Intosh	2,727,250	1.98
		30	3M	Guin	2,688,850	1.95
		26	Scott Paper Co.	Mobile	2,643,550	1.92
		26	U.S. Pulp & Newsprint	Coosa Pines	2,357,734	1.71
		32	Reynolds Metals Co.	Sheffield	2,341,800	1.70
			SUBTOTAL		77,432,186	56.21
			STATE TOTAL		137,761,513	100.00
38	Alaska	28	Union Oil Co.	Kenai	18,558,521	74.27
		26	Ketchikan Pulp Co.	Ketchikan	5,153,450	20.62
		26	Alaska Pulp Corp.	Sitka	1,125,649	4.50
		29	Tesoro Alaska Petroleum Co.	Kenai	104,800	0.42
		29	Mapco Alaska Petroleum Inc.	North Pole	24,235	0.10
		29	Chevron USA Inc.	Kenai	20,144	0.08
			SUBTOTAL		24,986,799	100.00
			STATE TOTAL		24,986,799	100.00
53	American Samoa	20	VCS Samoa Packing Co.	Pago Pago	26,250	94.59
		Mult	Star-Kist Samoa Inc.	Pago Pago Samoa	1,500	5.41
			SUBTOTAL		27,750	100.00
			STATE TOTAL		27,750	100.00
29	Arizona	33	Asarco Inc.	Hayden	16,574,800	32.65
		33	Cyprus Miami Mining Corp.	Claypool	13,660,904	26.91
		26	Stone Southwest Corp.	Snowflake	3,305,781	6.51
		36	Motorola Inc.	Mesa	2,761,986	5.44
		39	Hexcel Corp.	Casa Grande	2,231,040	4.39
		36	Motorola Inc.	Phoenix	1,927,035	3.80
		37	Garrett Engine Div.	Phoenix	630,459	1.24
		37	USAF	Tucson	628,145	1.24
		38	Honeywell Inc.	Phoenix	458,960	0.90
		33	Magma Copper Co.	San Manuel	458,585	0.90
			SUBTOTAL		42,637,695	83.99
			STATE TOTAL		50,764,830	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
25	Arkansas	28	Agricultural Minerals Corp.	Blytheville	11,582,300	14.67
		33	US Vanadium Corp.	Hot Springs	10,445,450	13.23
		28	Great Lakes Chemical Co.	El Dorado	9,488,426	12.02
		33	Nucor-Yamato Steel Co.	Barfield	5,126,740	6.49
		28	Ethyl Corp.	Magnolia	2,159,500	2.74
		28	Great Lakes Chemical Corp.	El Dorado	2,088,085	2.64
		30	Viskase Corp.	Osceola	1,959,200	2.48
		36	Whirlpool Corp.	Fort Smith	1,779,900	2.25
		28	Arkansas Eastman Co.	Batesville	1,260,735	1.60
		39	Ner Data Products Inc.	Blytheville	1,149,167	1.46
			SUBTOTAL		47,039,503	59.58
			STATE TOTAL		78,955,945	100.00
11	California	28	Filtrol Corp.	Vernon	29,595,850	17.53
		28	Union Oil Co. Unocal	Brea	5,756,919	3.41
		26	Louisiana-Pacific Corp.	Samoa	5,480,200	3.25
		26	Simpson Paper Co.	Eureka	5,060,500	3.00
		28	Molycorp. Inc.	Mountain Pass	3,577,700	2.12
		28	Procter & Gamble Manufacturing	Sacramento	2,299,208	1.36
		37	General Motors Corp.	Van Nuys	2,179,512	1.29
		29	Texaco Refining & Marketing	Bakersfield	1,689,687	1.00
		37	Douglas Aircraft Co.	Long Beach	1,576,414	0.93
		37	Rohr Industries	Riverside	1,536,360	0.91
			SUBTOTAL		58,752,350	34.80
			STATE TOTAL		168,825,335	100.00
42	Colorado	33	CF&I Steel Corp.	Pueblo	1,766,944	10.80
		38	Kodak Colorado Div.	Windsor	1,024,735	6.26
		Mult	Schlage Lock Co.	Security	1,016,617	6.21
		Mult	Adolph Coors Co.	Golden	985,501	6.02
		Mult	Hewlett Packard	Loveland	836,270	5.11
		28	Syntex Chemicals Inc.	Boulder	778,350	4.76
		34	Ball Packaging Products Group	Golden	715,030	4.37
		35	Storage Technology Corp.	Louisville	572,903	3.50
		37	Martin Marietta Astronautics	Littleton	552,024	3.37
		Mult	US Department of Energy	Golden	461,307	2.82
			SUBTOTAL		8,709,681	53.25
			STATE TOTAL		16,357,496	100.00
32	Connecticut	28	Pfizer Inc.	Groton	6,183,136	14.39
		28	Uniroyal Chemical Co. Inc.	Naugatuck	2,284,509	5.32
		Mult	Dow Chemical Co.	Gales Ferry	1,859,793	4.33
		37	Pratt & Whitney	North Haven	1,369,418	3.19
		35	UNC Naval Products	Uncasville	1,124,140	2.62
		39	William Prym Inc.	Dayville	1,124,045	2.62
		37	Pratt & Whitney	East Hartford	843,557	1.96
		28	Upjohn Co.	North Haven	840,157	1.96
		28	American Cyanamid Co.	Wallingford	740,720	1.72
		34	Stanadyne Automotive Products	Windsor	697,525	1.62
			SUBTOTAL		17,067,000	39.72
			STATE TOTAL		42,963,065	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
45	Delaware	37	Newark Assembly Plant	Newark	2,366,693	19.86
		28	Ciba-Geigy Corp.	Newport	2,143,400	17.98
		37	General Motors Corp.	Wilmington	1,313,064	11.02
		28	ICI Americas Inc.	New Castle	1,190,968	9.99
		28	Du Pont Edgemoor	Wilmington	825,182	6.92
		28	Standard Chlorine of Delaware	Delaware City	514,538	4.32
		28	General Chemical Corp.	Claymont	454,729	3.81
		29	Star Enterprise	Delaware City	453,911	3.81
		28	Noramco of Delaware Inc.	Wilmington	422,356	3.54
		28	Allied-Signal Inc.	Claymont	228,051	1.91
			SUBTOTAL		9,912,892	83.16
			STATE TOTAL		11,919,774	100.00
9	Florida	28	Kaiser Aluminum & Chemical Corp. (a)	Mulberry	32,013,400	16.67
		28	Monsanto Co.	Cantonment	25,622,958	13.34
		28	Royster Co.	Mulberry	9,946,646	5.18
		Mult	IMC Fertilizer Inc.	Mulberry	9,663,500	5.03
		28	Occidental Chemical Corp.	White Springs	9,510,680	4.95
		26	Stone Container Corp.	Panama City	9,152,660	4.77
		28	Royster Phosphates Inc.	Palmetto	8,389,000	4.37
		26	ITT Rayonier Inc.	Fernandina Beach	7,176,190	3.74
		26	St. Joe Forest Products Co.	Port Saint Joe	7,099,500	3.70
		39	Tricil Recovery Services Inc.	Bartow	6,263,338	3.26
			SUBTOTAL		124,837,872	65.00
			STATE TOTAL		192,044,588	100.00
20	Georgia	Mult	Union Camp Corp.	Savannah	13,463,088	11.42
		26	Macon Kraft Inc.	Macon	5,665,500	4.81
		33	Atlantic Steel Co.	Atlanta	5,072,689	4.30
		26	Georgia Pacific Corp.	Brunswick	5,041,225	4.28
		28	DSM Chemicals Augusta Inc.	Augusta	3,719,240	3.15
		26	Great Southern Paper	Cedar Springs	3,617,450	3.07
		28	Chemical Products Corp.	Cartersville	3,423,500	2.90
		33	Atlantic Steel Co.	Cartersville	3,091,793	2.62
		28	PPG Industries	East Point	2,728,643	2.31
		28	Hercules Inc.	Brunswick	2,414,148	2.05
			SUBTOTAL		48,237,276	40.92
			STATE TOTAL		117,888,623	100.00
47	Hawaii	Mult	Dole Packaged Foods Co.	Honolulu	1,292,550	37.99
		20	Maui Pineapple Co. Ltd.	Kahului	1,105,216	32.48
		29	Chevron USA Inc.	Ewa Beach	351,900	10.34
		29	Hawaiian Independent Refinery	Ewa Beach	237,030	6.97
		34	Reynolds of Hawaii Inc.	Ewa Beach	171,101	5.03
		34	Earle M. Jorgensen Co.	Ewa Beach	144,071	4.23
		20	Waialua Sugar Co. Inc.	Waialua	48,600	1.43
		30	Crain Industries Inc.	Waipahu	42,227	1.24
		20	Alpac Corp. Dba Pepsi-Cola	Honolulu	4,900	0.14
		24	Honolulu Wood Treating Co.	Ewa Beach	1,669	0.05
			SUBTOTAL		3,399,264	99.91
			STATE TOTAL		3,402,365	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
43	Idaho	28	Kerr-Mcgee Vanadium Facility	Soda Springs	4,207,446	26.73
		28	FMC Corp.	Pocatello	3,401,297	21.61
		Mult	Potlatch Corp.	Lewiston	1,929,250	12.26
		36	American Microsystems Inc.	Pocatello	1,802,660	11.45
		36	Micron Technology Inc.	Boise	1,438,953	9.14
		28	J. R. Simplot Co.	Pocatello	661,800	4.20
		35	Hewlett Packard Co.	Boise	398,240	2.53
		Mult	Monsanto Co.	Soda Springs	259,017	1.65
		Mult	J. R. Simplot Co.	Caldwell	257,640	1.64
		20	Ore-Ida Foods Inc.	Burley	198,250	1.26
			SUBTOTAL		14,554,553	92.47
			STATE TOTAL		15,739,859	100.00
6	Illinois	28	Monsanto Co.	Cahokia	25,261,353	10.19
		28	3M	Cordova	17,631,532	7.11
		28	Pfizer Pigments Inc.	East Saint Louis	16,071,496	6.49
		28	Cabot Corp.	Tuscola	12,736,893	5.14
		33	Keystone Steel & Wire Co.	Peoria	7,667,098	3.09
		33	Northwestern Steel & Wire Co.	Sterling	7,367,619	2.97
		33	Granite City Steel	Granite City	4,818,637	1.94
		20	Corn Products & Best Foods	Bedford Park	4,780,400	1.93
		33	USS South Works	Chicago	4,650,080	1.88
		28	PMC Specialties Group	Chicago	4,621,910	1.87
			SUBTOTAL		105,607,018	42.62
			STATE TOTAL		247,813,608	100.00
5	Indiana	Mult	Inland Steel Co.	East Chicago	57,273,300	22.46
		33	National Steel Corp.	Portage	24,586,030	9.64
		28	Eli Lilly & Co.	Shadeland	11,532,772	4.52
		28	GE Plastics	Mount Vernon	8,836,735	3.47
		38	3M Co. Visual Systems Div.	Hartford City	5,091,010	2.00
		28	Eli Lilly & Co.	Indianapolis	4,922,080	1.93
		33	Bethlehem Steel Corp.	Chesterton	4,754,950	1.86
		28	Eli Lilly & Co.	Clinton	4,422,500	1.73
		27	R. R. Donnelley & Sons Co.	Warsaw	4,163,554	1.63
		Mult	Delco Electronics Corp.	Kokomo	3,215,659	1.26
			SUBTOTAL		128,798,590	50.50
			STATE TOTAL		255,023,626	100.00
28	Iowa	26	3M Co.	Knoxville	4,507,566	8.17
		28	Terra International Inc.	Sergeant Bluff	4,098,600	7.43
		Mult	Climax Molybdenum Co.	Fort Madison	3,906,900	7.09
		20	Penford Products Co.	Cedar Rapids	3,209,450	5.82
		33	Alcoa	Davenport	2,573,000	4.67
		28	Monsanto Co.	Muscatine	2,313,002	4.19
		30	Norplex Oak	Postville	2,095,551	3.80
		28	Quantum Chemical Corp.	Clinton	1,670,539	3.03
		27	Meredith/Burda Co. Ltd.	Des Moines	1,310,870	2.38
		28	Diosynth Inc.	Sioux City	1,166,611	2.12
			SUBTOTAL		26,852,089	48.70
			STATE TOTAL		55,143,195	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
10	Kansas	28	Vulcan Chemicals	Wichita	92,349,716	49.88
		28	Atochem N.A.— Racon Facility	Wichita	54,505,751	29.44
		29	Farmland Industries Inc.	Coffeyville	5,899,771	3.19
		28	Farmland Industries Inc.	Lawrence	3,410,150	1.84
		Mult	Boeing Wichita	Wichita	3,184,000	1.72
		28	Koch Chemical Co.	Pittsburg	1,790,107	0.97
		28	PQ Corp.	Kansas City	1,722,749	0.93
		Mult	Texaco Refining & Marketing	El Dorado	1,669,916	0.90
		28	Procter & Gamble Mfg.	Kansas City	1,337,743	0.72
		30	Flexel Inc.	Tecumseh	1,152,600	0.62
			SUBTOTAL		167,022,503	90.22
			STATE TOTAL		185,131,051	100.00
21	Kentucky	28	Du Pont	Louisville	39,829,058	35.75
		33	Barmet Aluminum Corp.	Livia	6,851,181	6.15
		28	Air Products & Chemicals Inc.	Calvert City	5,681,750	5.10
		28	American Synthetic Rubber	Louisville	5,443,330	4.89
		28	BF Goodrich	Calvert City	2,621,543	2.35
		Mult	Aristech Chemical Corp.	Florence	2,389,783	2.14
		36	GTE Products Corp.	Versailles	2,387,813	2.14
		33	Armco Steel Co. L.P.	Ashland	1,972,653	1.77
		33	Newport Steel Corp.	Newport	1,931,304	1.73
		37	Ford Motor Co.	Louisville	1,743,558	1.56
			SUBTOTAL		70,851,973	63.59
			STATE TOTAL		111,422,816	100.00
2	Louisiana	28	American Cyanamid Co.	Westwego	192,350,800	40.62
		28	BASF Corp.	Geismar	40,802,088	8.62
		28	Triad Chemical	Donaldsonville	26,152,046	5.52
		28	Arcadian Corp.	Geismar	24,967,500	5.27
		28	Freeport Mcmoran, Agrico Chem. Div.	Donaldsonville	17,254,750	3.64
		28	Freeport McMoran, Agrico Chem. Div.	Uncle Sam	15,410,826	3.25
		28	CF Industries Inc.	Donaldsonville	11,916,150	2.52
		29	Citgo Petroleum Corp.	Lake Charles	10,581,113	2.23
		Mult	Star Enterprise	Convent	10,109,645	2.13
		28	Angus Chemical Co.	Sterlington	7,456,487	1.57
			SUBTOTAL		357,001,405	75.39
			STATE TOTAL		473,546,487	100.00
40	Maine	Mult	Georgia-Pacific Corp.	Woodland	2,499,584	13.45
		31	Prime Tanning Co. Inc.	Berwick	1,447,676	7.79
		26	International Paper	Jay	1,396,325	7.51
		26	James River Paper Co.	Bangor	1,313,695	7.07
		26	Great Northern Paper	Millinocket	1,245,230	6.70
		26	Boise Cascade Paper Group	Rumford	1,235,391	6.65
		26	S.D. Warren Co.	Westbrook	1,035,700	5.57
		30	Jones & Vining Inc.	Lewiston	891,818	4.80
		26	Lincoln Pulp & Paper Co. Inc.	Lincoln	702,117	3.78
		Mult	Pioneer Plastics Corp.	Auburn	622,921	3.35
			SUBTOTAL		12,390,457	66.68
			STATE TOTAL		18,581,543	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
36	Maryland	26	Westvaco Corp.	Luke	7,940,335	27.15
		28	W. R. Grace & Co. -Conn.	Baltimore	2,978,649	10.18
		33	Bethlehem Steel Corp.	Sparrows Point	2,906,370	9.94
		27	Maxwell Communication Corp.	Glen Burnie	1,806,520	6.18
		28	FMC Corp.	Baltimore	1,277,731	4.37
		37	General Motors Corp.	Baltimore	982,800	3.36
		Mult	American Cyanamid Co.	Havre De Grace	809,342	2.77
		20	Red Star Yeast	Baltimore	650,073	2.22
		Mult	Abc Rail Corp.	Baltimore	632,843	2.16
		31	W. D. Byron & Sons Inc.	Williamsport	505,873	1.73
			SUBTOTAL		20,490,536	70.05
			STATE TOTAL		29,251,518	100.00
27	Massachusetts	Mult	Monsanto Co.	Springfield	8,043,889	14.31
		38	Polaroid Corp.	Waltham	2,696,035	4.80
		26	James River Graphics Inc.	South Hadley	1,919,144	3.41
		28	Chemedesign Corp.	Fitchburg	1,711,216	3.04
		36	AT&T	North Andover	1,285,110	2.29
		28	ICI Americas Inc	Dighton	1,141,403	2.03
		Mult	Teledyne Rodney Metals	New Bedford	907,478	1.61
		30	Millipore Corp.	Bedford	891,500	1.59
		30	Flexcon Co. Inc.	Spencer	874,645	1.56
		26	Erving Paper Mills	Erving	857,564	1.53
			SUBTOTAL		20,327,984	36.16
			STATE TOTAL		56,214,698	100.00
7	Michigan	28	The Upjohn Co.	Kalamazoo	22,997,339	10.45
		33	National Steel	Ecorse	17,562,820	7.98
		33	Copper Range Co.	White Pine	16,330,870	7.42
		33	General Motors Corp.	Saginaw	8,825,874	4.01
		28	Genesis Polymers	Marysville	6,825,300	3.10
		28	Lomac Inc.	Muskegon	5,054,082	2.30
		33	Dofasco Inc.	Detroit	4,916,562	2.23
		33	Rouge Steel Co.	Dearborn	4,520,750	2.05
		Mult	Delco Products Div.	Livonia	3,829,459	1.74
		31	Eagle Ottawa Leather Co.	Grand Haven	3,618,750	1.64
			SUBTOTAL		94,481,806	42.92
			STATE TOTAL		220,137,364	100.00
24	Minnesota	Mult	3M Consumer AV & Consumer Prod.	Hutchinson	28,998,967	35.39
		Mult	3M Chemolite Center	Cottage Grove	9,820,143	11.99
		26	3M	Saint Paul	4,911,574	5.99
		26	Potlatch Corp.	Cloquet	2,539,850	3.10
		29	Koch Refining Co.	Saint Paul	2,053,904	2.51
		24	Andersen Corp.	Bayport	1,709,516	2.09
		Mult	ICI Composites Inc.	Winona	1,428,259	1.74
		36	Sheldahl Inc.	Northfield	1,341,690	1.64
		37	Ford Twin Cities Assembly	Saint Paul	1,267,163	1.55
		24	Crystal Cabinet Works Inc.	Princeton	1,147,967	1.40
			SUBTOTAL		55,219,033	67.40
			STATE TOTAL		81,932,154	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
19	Mississippi	28	Du Pont Delisle Plant	Pass Christian	42,517,217	35.25
		28	Mississippi Chemical Corp.	Yazoo City	14,176,423	11.75
		Mult	Kerr-Mcgee Chemical Corp.	Hamilton	9,118,563	7.56
		32	Harshaw Chemical Co.	Jackson	6,306,550	5.23
		28	Amoco Petroleum Additives Co.	Natchez	4,729,725	3.92
		22	Gencorp Polymer Products	Columbus	4,031,360	3.34
		27	Ringier America Inc.	Corinth	3,494,331	2.90
		35	Heatcraft Inc.	Grenada	2,510,357	2.08
		25	Johnston Tombigbee Furniture	Columbus	1,935,167	1.60
		Mult	Chevron USA Inc.	Pascagoula	1,813,701	1.50
			SUBTOTAL		90,633,394	75.14
			STATE TOTAL		120,617,983	100.00
12	Missouri	28	Columbian Chemicals Co.	Saint Louis	52,461,020	32.16
		33	Herculaneum Smelter	Herculaneum	17,110,851	10.49
		28	Mallinckrodt Specialty	Saint Louis	10,561,144	6.48
		33	Asarco Inc.	Glover	9,858,068	6.04
		28	Monsanto Co.	Saint Louis	9,614,895	5.89
		30	3M Co.	Nevada	3,677,722	2.25
		Mult	Syntex Agribusiness Inc.	Springfield	2,984,046	1.83
		37	Ford Motor Co.	Claycomo	2,720,023	1.67
		37	Mcdonnell Douglas Corp.	Saint Louis	2,260,750	1.39
		37	Ford Motor Co.	Hazelwood	2,219,450	1.36
			SUBTOTAL		113,467,969	69.57
			STATE TOTAL		163,105,846	100.00
33	Montana	33	Asarco Inc.	East Helena	36,615,059	93.64
		29	Exxon Co. USA	Billings	678,113	1.73
		26	Stone Container Corp.	Missoula	382,880	0.98
		33	Columbia Falls Aluminum Co.	Columbia Falls	353,000	0.90
		29	Conoco Billings Refinery	Billings	327,540	0.84
		29	Cenex Refinery	Laurel	212,725	0.54
		24	Plum Creek Manufacturing Inc	Columbia Falls	145,750	0.37
		28	Rhone Poulenc Basic Chemicals	Silverbow	96,015	0.25
		24	Louisiana Pacific Corp.	Missoula	88,342	0.23
		24	Plum Creek Timber Co. Inc.	Evergreen	37,500	0.10
			SUBTOTAL		38,936,924	99.57
			STATE TOTAL		39,103,261	100.00
39	Nebraska	30	Goodyear Tire & Rubber Co.	Lincoln	3,186,771	15.45
		33	Asarco Inc.	Omaha	2,994,600	14.52
		28	Arcadian Corp.	Laplatte	1,631,783	7.91
		28	Cominco Fertilizers	Beatrice	1,447,950	7.02
		28	Norden Laboratories	Lincoln	1,333,500	6.47
		31	Lackawanna Leather Co.	Omaha	1,288,714	6.25
		Mult	AT&T Network Systems	Omaha	517,981	2.51
		28	Farmland Industries Inc.	Beatrice	500,112	2.42
		34	Continental Food Pkg.	Omaha	477,300	2.31
		36	Imprimis Technology Inc.	Omaha	451,200	2.19
			SUBTOTAL		13,829,911	67.06
			STATE TOTAL		20,623,709	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS	
					Pounds	Percent
49	Nevada	28	Kerr-Mcgee Chemical Corp.	Henderson	2,072,700	62.89
		27	R. R. Donnelley & Sons Co.	Reno	369,179	11.20
		33	Kennametal Inc.	Fallon	226,150	6.86
		28	Aervoe-Pacific Co. Inc.	Gardnerville	127,653	3.87
		30	Carsonite International Corp.	Carson City	115,530	3.51
		34	American Buildings Co.	Carson City	53,200	1.61
		30	O'Sullivan Plastics Corp.	Yerington	53,078	1.61
		34	Martin Iron Works Inc.	Reno	52,800	1.60
		28	Pioneer Chlor Alkali Co. Inc.	Henderson	45,003	1.37
		28	Sun Chemical Corp.	Reno	29,985	0.91
			SUBTOTAL		3,145,278	95.44
			STATE TOTAL		3,295,677	100.00
44	New Hampshire	36	Hadco Corp.	Derry	1,575,165	10.94
		26	James River U.S. Holdings Inc.	Berlin	1,547,508	10.75
		Mult	Nashua Corp.	Merrimack	1,341,420	9.32
		Mult	Davidson Interior Trim	Dover	1,036,758	7.20
		Mult	Sturm Ruger Co. Inc.	Newport	597,002	4.15
		Mult	Davidson Instrument Panel	Farmington	472,184	3.28
		Mult	General Electric Co.	Somersworth	401,554	2.79
		Mult	Webster Foundry Co.	Franklin	381,834	2.65
		35	New Hampshire Ball Bearings	Peterborough	364,865	2.54
		39	Action Manufacturing Inc..	Gonic	294,150	2.04
			SUBTOTAL		8,012,440	55.67
			STATE TOTAL		14,392,899	100.00
18	New Jersey	28	Merck & Co. Inc.	Rahway	7,875,472	6.33
		28	Sun Chemical Corp.	Newark	7,361,500	5.92
		28	Givaudan Corp.	Clifton	6,406,025	5.15
		28	Hoffmann-La Roche Inc.	Nutley	6,324,696	5.09
		28	Old Bridge Chemicals Inc.	Old Bridge	5,870,111	4.72
		28	Hercules Inc.	Parlin	3,517,530	2.83
		28	Alliance Chemical Inc.	Newark	3,491,350	2.81
		28	Permacel	New Brunswick	3,060,797	2.46
		28	Sandoz Chemicals	Fair Lawn	2,273,170	1.83
		28	Kalama Chemical Inc.	Garfield	2,170,001	1.75
			SUBTOTAL		48,350,652	38.89
			STATE TOTAL		124,333,859	100.00
34	New Mexico	33	Phelps Dodge Mining Co.	Playas	20,847,699	61.01
		33	Chino Mines Co.	Hurley	7,592,371	22.22
		28	Climax Chemical Co.	Monument	3,565,250	10.43
		36	Honeywell	Albuquerque	390,016	1.14
		29	Navajo Refining Co.	Artesia	288,490	0.84
		36	Motorola Inc.	Albuquerque	209,923	0.61
		29	Bloomfield Refining Co. Inc.	Bloomfield	204,148	0.60
		36	Siemens Communication Systems	Albuquerque	175,964	0.51
		37	GE Aircraft Engines	Albuquerque	158,238	0.46
		29	Giant Refining Co.	Gallup	137,344	0.40
			SUBTOTAL		33,569,443	98.23
			STATE TOTAL		34,173,505	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
17	New York	38	Eastman Kodak Co.	Rochester	18,123,187	14.35
		28	Bristol-Myers Squibb Co.	Syracuse	7,601,013	6.02
		38	Anitec Image Corp.	Binghamton	4,785,588	3.79
		None	Oxychem	Niagara Falls	4,500,524	3.56
		28	BASF Corp.	Rensselaer	3,018,512	2.39
		Mult	Harrison Radiator Div.	Lockport	2,531,403	2.00
		28	General Electric Co.	Waterford	2,158,853	1.71
		33	Roth Bros. Smelting Corp.	East Syracuse	1,973,217	1.56
		32	Corning Inc.	Corning	1,959,120	1.55
		28	Lederle Laboratories	Pearl River	1,678,118	1.33
			SUBTOTAL		48,329,535	38.27
			STATE TOTAL		126,275,855	100.00
15	North Carolina	28	Texasgulf Inc.	Aurora	17,852,400	13.22
		28	Occidental Chemical Corp.	Castle Hayne	8,840,571	6.55
		28	Du Pont	Leland	6,648,662	4.92
		26	Champion International Corp.	Canton	3,500,866	2.59
		28	Cape Industries	Wilmington	3,019,780	2.24
		Mult	R. J. Reynolds Tobacco Co.	Winston-Salem	2,842,823	2.10
		26	Federal Paper Board Co. Inc.	Riegelwood	2,010,764	1.49
		26	Shufrod Mills Inc.	Hickory	1,998,010	1.48
		Mult	Hickory Springs Manufacturing	Conover	1,970,168	1.46
		28	ICI Americas Inc.	Fayetteville	1,944,750	1.44
			SUBTOTAL		50,628,794	37.49
			STATE TOTAL		135,058,190	100.00
51	North Dakota	30	Sioux Manufacturing Corp.	Fort Totten	336,535	24.78
		29	Amoco Oil Co.	Mandan	308,025	22.68
		35	Melroe Co.	Gwinner	186,388	13.72
		35	Steiger Tractor Inc.	Fargo	139,360	10.26
		30	3M Co.	Wahpeton	125,738	9.26
		35	Hutchinson Wil-Rich	Wahpeton	79,472	5.85
		39	Wm. Langer Jewel Bearing Plant	Rolla	25,646	1.89
		30	Mor-Tech Fab Inc.	Williston	25,089	1.85
		20	American Crystal Sugar Co.	Hillsboro	21,250	1.56
		39	Nordic Fiberglass Inc.	Devils Lake	20,057	1.48
			SUBTOTAL		1,267,560	93.33
			STATE TOTAL		1,358,104	100.00
3	Ohio	28	BP Chemicals Inc.	Lima	56,731,350	15.82
		Mult	Elkem Metals Co.	Marietta	15,771,470	4.40
		28	Phthalchem	Cincinnati	12,950,558	3.61
		33	Empire	Mansfield	10,738,009	2.99
		33	Armco Steel Co. L.P.	Middletown	9,383,640	2.62
		33	General Motors Corp.	Defiance	8,457,295	2.36
		33	Wheeling-Pittsburgh Steel	Mingo Junction	7,291,899	2.03
		28	SCM Chemicals Inc.	Ashtabula	6,374,750	1.78
		33	LTV Steel Co. Inc.	Cleveland	5,989,248	1.67
		30	General Electric Co.	Coshocton	5,629,704	1.57
			SUBTOTAL		139,317,923	38.84
			STATE TOTAL		358,677,545	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
31	Oklahoma	28	Agricultural Minerals Corp.	Verdigris	9,014,287	19.28
		28	Farmland Industries Inc.	Enid	4,585,550	9.81
		28	Terra International Inc.	Woodward	4,054,600	8.67
		Mult	Moore Business Forms	Stillwater	2,563,603	5.48
		28	Wil-Gro Fertilizer Inc.	Pryor	2,215,550	4.74
		33	Fansteel Metals	Muskogee	1,763,150	3.77
		29	Petrolite Specialty	Barnsdall	1,578,000	3.38
		34	Rogers Galvanizing Co.	Tulsa	1,464,376	3.13
		Mult	Eagle-Picher Industries Inc.	Quapaw	1,152,700	2.47
		None	3M Co.	Weatherford	1,141,798	2.44
			SUBTOTAL		29,533,614	63.17
			STATE TOTAL		46,752,043	100.00
35	Oregon	26	Boise Cascade Papers	Saint Helens	6,985,349	22.18
		Mult	3M Co.	White City	3,477,870	11.04
		26	James River Inc.	Clatskanie	1,724,618	5.48
		Mult	Oregon Overlay Div.	Portland	1,376,250	4.37
		26	James River Inc.	Portland	809,400	2.57
		28	Georgia Pacific Resins Inc.	Albany	683,871	2.17
		26	Georgia-Pacific Corp.	Toledo	614,930	1.95
		33	Glenbrook Nickel Co.	Riddle	524,300	1.66
		36	Siltec Silicon	Salem	517,246	1.64
		33	Teledyne Wah Chang Albany	Albany	483,950	1.54
			SUBTOTAL		17,197,784	54.60
			STATE TOTAL		31,499,505	100.00
8	Pennsylvania	33	USS Fairless Works	Fairless Hills	12,893,470	6.64
		38	Du Pont Towanda Plant	Towanda	10,555,545	5.43
		28	Rohm & Haas DVI	Philadelphia	7,422,634	3.82
		28	Allied-Signal Inc.	Philadelphia	4,336,500	2.23
		26	International Paper Co.	Erie	4,253,420	2.19
		33	Allegheny Ludlum Corp.	Brackenridge	3,353,913	1.73
		28	Heico Chemicals Inc.	Delaware Water Gap	3,259,731	1.68
		28	Rohm & Haas Delaware Valley	Bristol	3,112,582	1.60
		33	USS Clairton Works	Clairton	2,992,698	1.54
		33	Carpenter Technology Corp.	Reading	2,915,569	1.50
			SUBTOTAL		55,096,062	28.37
			STATE TOTAL		194,216,839	100.00
37	Puerto Rico	Mult	Abbott Chemicals Inc.	Barceloneta	3,784,744	14.11
		30	Viskase Puerto Rico Corp.	Barceloneta	2,642,750	9.85
		28	Du Pont Agrichemicals Manati	Manati	2,287,271	8.53
		28	Schering Industrial	Manati	2,044,380	7.62
		28	Eli Lilly Industries Inc.	Mayaguez	1,849,200	6.89
		28	Sterling Pharmaceuticals Inc.	Barceloneta	1,672,579	6.23
		28	Bristol-Myers Barceloneta Inc.	Barceloneta	1,181,600	4.40
		28	Merck Sharp & Dohme Quimica	Barceloneta	1,095,095	4.08
		Mult	Phillips P.R. Core	Guayama	1,090,107	4.06
		28	Squibb Mfg. Inc.	Humacao	885,791	3.30
			SUBTOTAL		18,533,517	69.09
			STATE TOTAL		26,826,844	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
46	Rhode Island	28	Olin Hunt Specialty	Lincoln	1,072,546	9.86
		27	Maxwell Communication Corp.	Providence	936,701	8.61
		28	Hoechst Celanese Corp.	Coventry	874,367	8.04
		32	GTE Products Corp.	Central Falls	589,033	5.41
		Mult	Arlon Inc.	East Providence	459,587	4.22
		28	Arkwright Inc.	Fiskeville	323,330	2.97
		34	Stanley-Bostitch Inc.	East Greenwich	321,254	2.95
		Mult	James River Corp.	Johnston	316,864	2.91
		34	Providence Metallizing Co.	Pawtucket	267,050	2.45
		28	Pacific Anchor Chemical Corp.	Cumberland	230,241	2.12
			SUBTOTAL		5,390,973	49.56
			STATE TOTAL		10,878,502	100.00
23	South Carolina	30	Westinghouse Electric Corp.	Hampton	8,303,320	9.59
		Mult	Anchor Continental Inc.	Columbia	4,716,953	5.45
		28	Hoechst Celanese Corp.	Rock Hill	4,540,085	5.24
		26	Westvaco Corp.	North Charleston	3,308,900	3.82
		26	Stone Container Corp.	Florence	3,148,985	3.64
		28	Albright & Wilson Americas	Charleston	2,607,855	3.01
		28	Amoco Chemical Co.	Wando	2,331,870	2.69
		Mult	Vytech Industries Inc.	Anderson	2,049,191	2.37
		Mult	Ethyl Corp.	Orangeburg	1,823,140	2.10
		33	AT&T	Gaston	1,806,346	2.09
			SUBTOTAL		34,636,645	39.99
			STATE TOTAL		86,615,836	100.00
48	South Dakota	28	3M Co.	Brookings	1,096,305	32.71
		36	SCI Mfg. Inc.	Rapid City	534,556	15.95
		24	Starmark Inc.	Sioux Falls	321,800	9.60
		20	John Morrell & Co.	Sioux Falls	167,330	4.99
		32	CR Industries	Springfield	98,004	2.92
		24	Merillat Industries Inc.	Rapid City	89,200	2.66
		33	Alumax Extrusions Inc.	Yankton	80,637	2.41
		35	Imprimis Technology	Aberdeen	79,739	2.38
		30	Raven Industries Inc.	Sioux Falls	77,900	2.32
		30	Telelect Inc.	Watertown	64,500	1.92
			SUBTOTAL		2,609,971	77.87
			STATE TOTAL		3,351,837	100.00
4	Tennessee	28	Du Pont	New Johnsonville	57,022,345	21.65
		28	Tennessee Eastman Co.	Kingsport	45,253,659	17.18
		28	BASF Corp.	Lowland	25,624,950	9.73
		28	ICI Americas Inc.	Mount Pleasant	6,125,905	2.33
		20	Kraft Food Ingredient Corp.	Memphis	6,062,300	2.30
		28	North American Rayon Corp.	Elizabethton	5,924,850	2.25
		Mult	Witco Corp.	Memphis	5,312,397	2.02
		Mult	Du Pont	Memphis	5,282,055	2.01
		28	Arcadian Corp.	Memphis	4,109,994	1.56
		Mult	Holliston Mills Inc.	Church Hill	3,888,942	1.48
			SUBTOTAL		164,607,397	62.49
			STATE TOTAL		263,400,319	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	Texas	28	Monsanto Co.	Alvin	206,533,205	26.05
		28	Du Pont Beaumont Works	Beaumont	88,094,984	11.11
		28	BP Chemicals	Port Lavaca	65,543,672	8.27
		28	Du Pont Victoria Site	Victoria	32,314,457	4.08
		28	Sterling Chemicals Inc.	Texas City	20,574,970	2.60
		28	Du Pont Sabine River Works	Orange	18,010,133	2.27
		28	Air Products Mfg. Corp.	Pasadena	15,190,634	1.92
		29	Amoco Oil Co.	Texas City	14,217,928	1.79
		28	American Chrome & Chemicals	Corpus Christi	12,801,950	1.61
		28	Hoechst Celanese Chemical	Pasadena	12,364,236	1.56
			SUBTOTAL		485,646,169	61.26
			STATE TOTAL		792,810,307	100.00
13	Utah	33	Magnesium Corp. of America	Tooele	119,060,425	79.95
		33	Kennecott Utah Copper	Bingham Canyon	15,473,300	10.39
		Mult	Hercules Inc.	Magna	3,009,035	2.02
		37	Thiokol Corp.	Promontory	2,031,900	1.36
		33	Nucor Steel	Plymouth	819,700	0.55
		28	Laroche Industries Inc.	Orem	692,828	0.47
		38	Litton Systems	Salt Lake City	605,132	0.41
		37	Thiokol Corp.	Clearfield	574,000	0.39
		33	Western Zirconium	Ogden	553,400	0.37
		36	UNISYS	Salt Lake City	513,462	0.34
			SUBTOTAL		143,333,182	96.25
			STATE TOTAL		148,915,352	100.00
50	Vermont	37	General Electric Co.	North Clarendon	231,389	11.75
		25	Ethan Allen Inc.	Orleans	205,325	10.42
		25	Ethan Allen Inc.	Beecher Falls	185,750	9.43
		36	IBM	Essex Junction	127,044	6.45
		28	C.E. Bradley Laboratories Inc.	Brattleboro	119,670	6.07
		34	General Electric Co.	Burlington	110,450	5.61
		Mult	Hercules Aerospace	Vergennes	80,841	4.10
		25	New England Woodcraft Inc.	Forest Dale	78,761	4.00
		25	Ethan Allen Inc.	Randolph	63,445	3.22
		36	Dowty Custom Electronics Co.	Brandon	49,097	2.49
			SUBTOTAL		1,251,772	64.68
			STATE TOTAL		1,970,055	100.00
52	Virgin Islands	29	Hess Oil Virgin Islands Corp.	St. Croix	1,274,235	100.00
			SUBTOTAL		1,274,235	100.00
			STATE TOTAL		1,274,235	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
16	Virginia	28	Allied Signal	Hopewell	34,748,970	25.82
		28	Hoechst Celanese	Narrows	11,962,337	8.89
		Mult	Westvaco Corp	Covington	10,165,680	7.55
		26	Stone Hopewell Inc.	Hopewell	5,774,250	4.29
		28	Aqualon Co.	Hopewell	5,137,560	3.82
		28	Du Pont Spruance Site	Richmond	3,822,853	2.84
		30	O'Sullivan Corp.	Winchester	3,164,496	2.35
		28	Westvaco Corp.	Covington	2,808,647	2.09
		34	Crown Cork & Seal Co. Inc.	Winchester	1,953,850	1.45
		26	Union Camp Corp.	Franklin	1,887,022	1.40
			SUBTOTAL		81,425,665	60.50
			STATE TOTAL		134,592,526	100.00
30	Washington	26	Weyerhaeuser Co.	Cosmopolis	8,472,600	17.40
		26	ITT Rayonier Inc.	Port Angeles	5,706,400	11.72
		37	BCAG	Everett	2,222,315	4.56
		26	Simpson Tacoma Kraft Co.	Tacoma	2,031,067	4.17
		28	Chevron Chemical Co.	Kennewick	1,544,672	3.17
		37	Boeing Commercial Airplanes	Auburn	1,492,774	3.06
		37	Boeing Aerospace & Electronics	Seattle	1,476,284	3.03
		Mult	Weyerhaeuser Co.	Longview	1,325,694	2.72
		37	Boeing Co.	Renton	1,175,073	2.41
		Mult	ITT Rayonier Inc.	Hoquiam	1,133,800	2.33
			SUBTOTAL		26,580,679	54.57
			STATE TOTAL		48,706,760	100.00
26	West Virginia	33	Wheeling-Pittsburgh Steel	Follansbee	10,543,249	17.87
		28	Du Pont Belle Plant	Belle	6,718,887	11.39
		28	Union Carbide C&P Co.	Institute	4,989,079	8.46
		28	Union Carbide Chemicals	South Charleston	3,742,827	6.34
		28	LCP Chemicals	Moundsville	3,038,315	5.15
		28	GE Chemicals Inc.	Washington	2,685,532	4.55
		33	Weirton Steel Corp.	Weirton	2,348,823	3.98
		28	Union Carbide Chemicals	Sistersville	2,128,246	3.61
		28	Du Pont Washington Works	Washington	2,120,988	3.60
		28	Goodyear Tire & Rubber Co.	Apple Grove	1,449,500	2.46
			SUBTOTAL		39,765,446	67.41
			STATE TOTAL		58,992,213	100.00
22	Wisconsin	33	Fort Howard Steel Inc.	Green Bay	7,440,000	7.44
		33	Waupaca Foundry Inc.	Waupaca	7,366,716	7.37
		33	Charter Processing	Saukville	6,132,060	6.13
		28	PPG Industries Inc.	Oak Creek	3,226,061	3.23
		26	CPI - Kraft Div.	Wisconsin Rapids	3,128,250	3.13
		33	Waupaca Foundry Inc.	Waupaca	2,831,117	2.83
		26	Nekoosa Packaging	Tomahawk	2,548,600	2.55
		Mult	Kohler Co.	Kohler	2,423,477	2.42
		26	James River Corp.	Green Bay	2,010,245	2.01
		26	Port Edwards Mill	Port Edwards	1,930,700	1.93
			SUBTOTAL		39,037,226	39.05
			STATE TOTAL		99,963,906	100.00

Table H-2. Continued.

TRI RANK	STATE	SIC CODE	FACILITY NAME	CITY	TOTAL RELEASES AND TRANSFERS Pounds	Percent
41	Wyoming	28	Coastal Chem Inc.	Cheyenne	15,133,055	83.84
		28	Riverton Chemical Co.	Riverton	932,502	5.17
		29	Amoco Oil Co.	Casper	464,886	2.58
		29	Frontier Refining Inc.	Cheyenne	416,504	2.31
		34	Crown Cork & Seal Co. Inc.	Worland	330,000	1.83
		28	Chevron Chemical Co.	Rock Springs	166,901	0.92
		29	Sinclair Refinery	Sinclair	140,066	0.78
		20	Western Sugar Co.	Lovell	127,066	0.70
		29	Little America Refining Co.	Casper	111,136	0.62
		28	Church & Dwight Co. Inc.	Green River	94,700	0.52
			SUBTOTAL		17,916,816	99.26
			STATE TOTAL		18,050,866	100.00

(a) Kaiser Aluminum & Chemical Corp. has submitted a revision to TRI regarding their 1989 releases and transfers. The revised amount for their total releases and transfers is 4,487,000.

Table H-3. TRI Releases and Transfers of the Top 25 Carcinogens by State, 1989.

CARC. RANK	CHEMICAL	Alabama Pounds	Alaska Pounds	American Samoa Pounds	Arizona Pounds	Arkansas Pounds	California Pounds
1	Dichloromethane	1,802,587	0	0	466,362	2,115,133	7,123,979
2	Styrene	296,817	0	0	259,793	234,890	2,477,508
3	Tetrachloroethylene	190,108	0	0	401,598	212,066	4,319,367
4	Formaldehyde	341,661	500	0	32,064	363,264	468,139
5	Benzene	1,625,628	30,873	0	1,278	42,360	433,477
6	Chloroform	2,679,012	270,811	0	77,481	635,966	656,409
7	Lead	1,202,975	0	0	683,626	798,088	1,561,572
8	Chromium	532,925	0	0	680,650	215,707	239,485
9	Acrylonitrile	182,195	0	0	0	0	1,331
10	1,2-Dichloroethane	64,027	0	0	0	64,301	2,400
11	Nickel	95,758	0	0	235,850	70,190	134,492
12	Asbestos (friable)	245,038	0	0	0	112,000	1,903,911
13	Isopropyl alcohol (mfg.-Strong acid process)	26,698	0	0	38,336	120,246	630,142
14	1,3-Butadiene	28,026	0	0	0	286	5,992
15	Acrylamide	1,225	0	0	0	0	3,988
16	Carbon tetrachloride	669,857	0	0	0	66,646	36,349
17	Polychlorinated biphenyls (PCBs)	64,000	0	0	10,232	0	118,176
18	Di-(2-ethylhexyl) phthalate	750	0	0	0	97,457	117,747
19	Ethylene oxide	0	0	0	12,001	101,250	82,199
20	Propylene oxide	2,460	0	0	0	3,501	582,083
21	1,4-Dichlorobenzene	0	0	0	0	0	0
22	1,4-Dioxane	97,408	0	0	8,039	0	242,593
23	Epichlorohydrin	64,374	0	0	0	3,438	859
24	Hexachlorobenzene	0	0	0	0	0	7
25	Vinyl chloride	750	0	0	0	0	1,054
SUBTOTAL FOR 25 CARCINOGENS		10,214,279	302,184	0	2,907,310	5,256,789	21,143,259
PERCENT OF ALL CARCINOGENS		99.19	100.00	—	92.55	98.51	99.67
TOTAL FOR ALL CARCINOGENS		10,297,989	302,184	0	3,141,195	5,336,292	21,213,798
PERCENT OF STATE TOTAL		7.48	1.21	0.00	6.19	6.76	12.57
STATE TOTAL		137,761,513	24,986,799	27,750	50,764,830	78,955,945	168,825,335

CARC. RANK	CHEMICAL	Hawaii Pounds	Idaho Pounds	Illinois Pounds	Indiana Pounds	Iowa Pounds	Kansas Pounds
1	Dichloromethane	41,701	0	4,129,213	14,209,036	852,840	608,929
2	Styrene	0	42,525	2,300,944	2,647,447	865,978	357,952
3	Tetrachloroethylene	0	48,444	1,567,960	2,736,987	1,420,388	177,512
4	Formaldehyde	0	111,059	268,470	460,634	63,275	274,281
5	Benzene	48,100	0	1,888,205	2,675,581	33,510	358,332
6	Chloroform	0	655,000	85,500	70,990	0	276,680
7	Lead	1,750	14,071	536,789	754,390	61,922	4,866
8	Chromium	0	0	776,974	556,250	308,841	43,495
9	Acrylonitrile	0	0	451,713	1,032	660,530	3,300
10	1,2-Dichloroethane	750	0	86,194	1,548,568	126,201	7,230
11	Nickel	1,500	0	799,585	333,103	85,428	4,900
12	Asbestos (friable)	0	0	1,504	52,112	0	12,460
13	Isopropyl alcohol (mfg.-Strong acid process)	0	29,100	481,528	730,812	23,212	5,698
14	1,3-Butadiene	500	0	27,505	36,589	217,000	46
15	Acrylamide	0	0	11,456	0	0	0
16	Carbon tetrachloride	0	1,000	81,123	19,824	0	464,880
17	Polychlorinated biphenyls (PCBs)	0	0	1,821	0	0	0
18	Di-(2-ethylhexyl) phthalate	0	0	102,917	172,033	126,100	1,235
19	Ethylene oxide	0	500	179,083	65,900	3,216	102,806
20	Propylene oxide	0	0	24,291	153,518	250	11,026
21	1,4-Dichlorobenzene	0	0	963,650	38,095	0	7,543
22	1,4-Dioxane	0	0	51,390	74,348	29,550	0
23	Epichlorohydrin	0	0	6,358	0	500	1,706
24	Hexachlorobenzene	0	0	0	0	0	1,506
25	Vinyl chloride	0	0	130,032	0	0	127
SUBTOTAL FOR 25 CARCINOGENS		94,301	901,699	14,954,205	27,337,249	4,878,741	2,726,510
PERCENT OF ALL CARCINOGENS		97.90	99.94	98.76	99.43	99.93	96.76
TOTAL FOR ALL CARCINOGENS		96,327	902,263	15,142,669	27,493,691	4,881,991	2,817,761
PERCENT OF STATE TOTAL		2.83	5.73	6.11	10.78	8.85	1.52
STATE TOTAL		3,402,365	15,739,859	247,813,608	255,023,626	55,143,195	185,131,051

Table H-3. Continued.

CARC. RANK	CHEMICAL	Colorado Pounds	Connecticut Pounds	Delaware Pounds	District of Columbia Pounds	Florida Pounds	Georgia Pounds
1	Dichloromethane	674,333	3,152,501	309,011	0	2,748,611	3,632,046
2	Styrene	88,428	717,965	95,976	0	2,497,432	1,451,003
3	Tetrachloroethylene	808,166	2,269,151	110,415	0	269,839	721,111
4	Formaldehyde	167,546	627,522	6,339	0	64,934	667,724
5	Benzene	34,438	46,761	69,722	0	0	914,093
6	Chloroform	0	107,566	0	0	1,157,585	2,308,834
7	Lead	197,366	156,701	0	0	287,508	678,376
8	Chromium	142,753	173,693	2,510	0	100,948	266,422
9	Acrylonitrile	0	53,125	25,470	0	133,541	76
10	1,2-Dichloroethane	725,405	3,962	450	0	0	496
11	Nickel	131,647	204,242	3,945	0	94,252	124,170
12	Asbestos (friable)	0	250	0	0	16,690	628,935
13	Isopropyl alcohol (mfg.-Strong acid process)	7,300	500	0	0	102,893	100,992
14	1,3-Butadiene	840	105,300	72,980	0	0	129,141
15	Acrylamide	10	12,924	0	0	119	3,250
16	Carbon tetrachloride	49,823	180,811	162,570	0	0	0
17	Polychlorinated biphenyls (PCBs)	500	0	0	0	0	236,630
18	Di-(2-ethylhexyl) phthalate	14,850	57,575	1,500	0	3,850	90,178
19	Ethylene oxide	19,274	43,785	29,702	0	75,614	247,794
20	Propylene oxide	30	247,657	1,240	0	1,016	15,920
21	1,4-Dichlorobenzene	0	0	50,256	0	0	2,318
22	1,4-Dioxane	0	0	0	0	0	0
23	Epichlorohydrin	0	0	28,258	0	0	15,615
24	Hexachlorobenzene	0	0	0	0	0	0
25	Vinyl chloride	0	0	174,637	0	9,150	32
SUBTOTAL FOR 25 CARCINOGENS		3,062,709	8,161,991	1,144,981	0	7,563,982	12,235,156
PERCENT OF ALL CARCINOGENS		98.69	99.68	99.57	0.00	99.52	99.85
TOTAL FOR ALL CARCINOGENS		3,103,477	8,188,481	1,149,949	0	7,600,174	12,253,418
PERCENT OF STATE TOTAL		18.97	19.06	9.65	0.00	3.96	10.39
STATE TOTAL		16,357,496	42,963,065	11,919,774	0	192,044,588	117,888,623

CARC. RANK	CHEMICAL	Kentucky Pounds	Louisiana Pounds	Maine Pounds	Maryland Pounds	Massachusetts Pounds	Michigan Pounds
1	Dichloromethane	1,508,538	587,152	42,503	567,791	2,328,925	7,167,027
2	Styrene	753,708	4,077,528	90,159	183,986	563,885	1,536,254
3	Tetrachloroethylene	588,956	732,554	92,592	41,411	258,228	357,477
4	Formaldehyde	55,992	4,536,094	162,181	10,247	767,268	2,007,883
5	Benzene	544,078	1,500,036	0	179,634	0	737,418
6	Chloroform	325,336	1,145,480	1,149,805	661,507	20,500	403,477
7	Lead	538,764	113,168	10,200	61,668	44,175	1,457,137
8	Chromium	112,431	89,312	3,478	52,272	251,281	1,166,438
9	Acrylonitrile	220,020	542,245	0	0	25,742	50,787
10	1,2-Dichloroethane	267,388	2,766,947	0	35,648	0	285,322
11	Nickel	124,104	54,715	3,986	17,833	144,445	995,031
12	Asbestos (friable)	317,240	281,245	250	0	0	2,000
13	Isopropyl alcohol (mfg.-Strong acid process)	243,238	262,861	0	71,514	398,123	180,252
14	1,3-Butadiene	325,949	417,736	0	0	0	15,990
15	Acrylamide	70,479	1,359,379	0	0	750	6,544
16	Carbon tetrachloride	32,412	428,202	0	110,094	0	90,037
17	Polychlorinated biphenyls (PCBs)	310,953	69,924	0	95	195,478	324,321
18	Di-(2-ethylhexyl) phthalate	61,226	3,651	0	672	211,858	92,360
19	Ethylene oxide	88,586	579,187	0	2,951	22,016	6,819
20	Propylene oxide	10,022	117,251	3,178	0	0	22,884
21	1,4-Dichlorobenzene	0	137	0	0	330,955	67
22	1,4-Dioxane	11,000	31,419	20,898	7	0	0
23	Epichlorohydrin	6,741	40,465	750	0	26,910	3,719
24	Hexachlorobenzene	0	3,861	0	0	0	0
25	Vinyl chloride	49,652	175,040	0	0	0	2,319
SUBTOTAL FOR 25 CARCINOGENS		6,566,813	19,915,589	1,579,980	1,997,330	5,590,539	16,911,563
PERCENT OF ALL CARCINOGENS		99.46	93.67	95.83	99.19	97.36	98.80
TOTAL FOR ALL CARCINOGENS		6,602,511	21,261,343	1,648,714	2,013,651	5,742,330	17,116,398
PERCENT OF STATE TOTAL		5.93	4.49	8.87	6.88	10.21	7.78
STATE TOTAL		111,422,816	473,546,487	18,581,543	29,251,518	56,214,698	220,137,364

Table H-3. Continued.

CARC. RANK	CHEMICAL	Minnesota Pounds	Mississippi Pounds	Missouri Pounds	Montana Pounds	North Carolina Pounds	North Dakota Pounds
1	Dichloromethane	2,453,275	3,607,895	3,834,778	0	7,951,239	0
2	Styrene	787,396	341,794	406,267	685	596,836	66,076
3	Tetrachloroethylene	209,465	42,505	683,151	0	1,158,460	0
4	Formaldehyde	715,833	346,352	681,798	235,334	1,444,563	500
5	Benzene	297,974	266,961	8,768	69,080	153,368	26,919
6	Chloroform	356,001	424,630	356,242	72,780	2,247,811	0
7	Lead	228,647	69,159	535,951	866	57,157	0
8	Chromium	194,599	312,567	305,876	0	68,152	0
9	Acrylonitrile	0	278,541	0	0	14,246	0
10	1,2-Dichloroethane	50,347	1,756	121,367	0	400,474	0
11	Nickel	246,031	81,997	225,310	0	62,988	0
12	Asbestos (friable)	0	900	0	0	347,459	0
13	Isopropyl alcohol (mfg.-Strong acid process)	112,057	85,731	58,104	0	147,792	0
14	1,3-Butadiene	14,081	2,500	0	1,362	5,250	0
15	Acrylamide	0	0	503	0	2,201	0
16	Carbon tetrachloride	0	1,000	501	960	0	3,508
17	Polychlorinated biphenyls (PCBs)	0	1,250	130,179	0	117,140	0
18	Di-(2-ethylhexyl) phthalate	3,490	98,048	132,362	0	220,611	0
19	Ethylene oxide	850	139,649	20,250	0	48,793	0
20	Propylene oxide	398	4,608	10,878	0	18,142	0
21	1,4-Dichlorobenzene	0	0	501	0	0	0
22	1,4-Dioxane	20,039	49,728	9,316	0	160,610	0
23	Epichlorohydrin	0	23,275	131	0	5,727	0
24	Hexachlorobenzene	0	0	0	0	0	0
25	Vinyl chloride	0	76,218	13,050	0	7	0
SUBTOTAL FOR 25 CARCINOGENS		5,690,483	6,257,064	7,535,283	381,067	15,229,026	97,003
PERCENT OF ALL CARCINOGENS		99.58	99.18	99.79	100.00	98.86	99.99
TOTAL FOR ALL CARCINOGENS		5,714,368	6,308,639	7,550,967	381,067	15,404,669	97,012
PERCENT OF STATE TOTAL		6.97	5.23	4.63	0.97	11.41	7.14
STATE TOTAL		81,932,154	120,617,983	163,105,846	39,103,261	135,058,190	1,358,104

CARC. RANK	CHEMICAL	Ohio Pounds	Oklahoma Pounds	Oregon Pounds	Pennsylvania Pounds	Puerto Rico Pounds	Rhode Island Pounds
1	Dichloromethane	4,339,812	1,272,161	496,930	13,155,861	4,435,688	577,457
2	Styrene	3,575,440	367,705	599,304	1,281,377	5,737	107,478
3	Tetrachloroethylene	2,431,815	854,330	71,219	975,062	179,786	468,416
4	Formaldehyde	2,333,030	61,034	1,003,908	2,179,677	7,620	11,518
5	Benzene	1,915,057	91,076	1,750	3,529,221	104,334	0
6	Chloroform	158,688	151,700	791,142	1,057,995	361,024	0
7	Lead	2,751,674	27,019	30,783	1,531,713	14,877	1,235
8	Chromium	1,225,687	143,332	42,811	2,760,023	2,800	12,865
9	Acrylonitrile	3,071,698	0	0	37,785	0	0
10	1,2-Dichloroethane	49	0	0	240,478	30,901	34,934
11	Nickel	1,380,603	74,779	527,300	954,550	1,000	25,141
12	Asbestos (friable)	316,706	24,750	16,034	2,281,990	18,960	0
13	Isopropyl alcohol (mfg.-Strong acid process)	593,929	27,764	12,278	381,775	19,861	3,900
14	1,3-Butadiene	705,801	5,438	0	77,570	0	0
15	Acrylamide	2,560	0	0	9,798	0	0
16	Carbon tetrachloride	41,552	1,480	0	11,875	0	0
17	Polychlorinated biphenyls (PCBs)	95,560	15,700	34,800	1,369,836	0	250
18	Di-(2-ethylhexyl) phthalate	161,000	17,221	8,286	480,399	250	31,928
19	Ethylene oxide	79,498	9,900	0	112,346	261,310	39,128
20	Propylene oxide	3,922	3,900	0	5,781	0	22
21	1,4-Dichlorobenzene	5	0	0	18,300	0	0
22	1,4-Dioxane	127,446	0	21,130	30,696	10,802	0
23	Epichlorohydrin	3,338	0	2,592	529	3,581	5,000
24	Hexachlorobenzene	0	0	0	0	0	0
25	Vinyl chloride	95,904	78,521	0	165,240	0	0
SUBTOTAL FOR 25 CARCINOGENS		25,410,774	3,227,810	3,660,267	32,649,877	5,458,531	1,319,272
PERCENT OF ALL CARCINOGENS		99.21	99.82	99.85	99.54	99.98	99.53
TOTAL FOR ALL CARCINOGENS		25,613,151	3,233,560	3,665,815	32,801,168	5,459,541	1,325,514
PERCENT OF STATE TOTAL		7.14	6.92	11.64	16.89	20.35	12.18
STATE TOTAL		358,677,545	46,752,043	31,499,505	194,216,839	26,826,844	10,878,502

Table H-3. Continued.

CARC. RANK	CHEMICAL	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1	Dichloromethane	1,492,607	1,300	1,439,499	2,191,324	0	12,416,330
2	Styrene	162,152	14,132	67,423	249,842	4,205	260,313
3	Tetrachloroethylene	243,070	0	196,971	327,154	0	2,406,958
4	Formaldehyde	0	0	19,967	482,498	46,053	472,042
5	Benzene	78	184	500	240,273	67,295	1,031,728
6	Chloroform	0	0	124,333	197,699	0	86,647
7	Lead	27,176	0	31,758	30,817	750	628,945
8	Chromium	19,777	250	32,981	105,541	1,501	186,732
9	Acrylonitrile	0	0	0	7,504	0	2,035
10	1,2-Dichloroethane	0	0	0	248,570	0	104,580
11	Nickel	12,441	500	68,820	63,610	2,250	168,432
12	Asbestos (friable)	0	41,500	0	80,571	0	21,666
13	Isopropyl alcohol (mfg.-Strong acid process)	0	1,069	63,735	678,465	0	294,057
14	1,3-Butadiene	0	0	0	412	105	21,953
15	Acrylamide	0	0	0	1,824	0	141
16	Carbon tetrachloride	0	0	0	965,709	0	11,628
17	Polychlorinated biphenyls (PCBs)	0	0	0	3,600	0	155,260
18	Di-(2-ethylhexyl) phthalate	16,506	1,000	29,441	495,494	0	129,583
19	Ethylene oxide	14,800	0	3,300	59,668	0	51,869
20	Propylene oxide	0	0	0	146,351	0	37,670
21	1,4-Dichlorobenzene	0	0	0	0	0	0
22	1,4-Dioxane	250	0	5,557	250	0	233,237
23	Epichlorohydrin	0	0	0	63,918	0	853
24	Hexachlorobenzene	0	0	0	0	0	0
25	Vinyl chloride	0	0	0	152,841	0	2,438
SUBTOTAL FOR 25 CARCINOGENS		1,988,857	59,935	2,084,285	6,793,935	122,159	18,725,097
PERCENT OF ALL CARCINOGENS		99.49	99.58	98.36	90.44	100.00	99.18
TOTAL FOR ALL CARCINOGENS		1,999,068	60,187	2,119,057	7,511,749	122,159	18,880,805
PERCENT OF STATE TOTAL		9.69	1.83	14.72	6.04	0.36	14.95
STATE TOTAL		20,623,709	3,295,677	14,392,899	124,333,859	34,173,505	126,275,855

CARC. RANK	CHEMICAL	South Carolina	South Dakota	Tennessee	Texas	Utah	Virginia
Pounds	Pounds	Pounds	Pounds	Pounds	Pounds		
1	Dichloromethane	2,030,641	0	3,525,556	3,282,432	1,505,030	2,111,796
2	Styrene	638,242	50,474	1,661,973	4,473,406	4,420	721,143
3	Tetrachloroethylene	890,288	1,650	743,499	551,888	18,100	150,388
4	Formaldehyde	649,442	89,202	319,746	5,611,229	8,200	603,794
5	Benzene	608,791	2,467	222,145	5,792,002	157,615	549,378
6	Chloroform	347,632	0	389,906	1,490,836	0	1,344,682
7	Lead	42,498	0	716,211	1,521,404	2,390,208	24,427
8	Chromium	233,358	250	176,252	632,118	24,816	291,298
9	Acrylonitrile	326,828	0	8,264	4,161,673	0	308,942
10	1,2-Dichloroethane	582,234	0	258,782	423,351	1,200	0
11	Nickel	206,467	250	603,842	212,255	12,254	347,032
12	Asbestos (friable)	1,019	0	960,158	1,124,873	57,860	2,778
13	Isopropyl alcohol (mfg.-Strong acid process)	256,373	0	785,206	406,406	0	47,948
14	1,3-Butadiene	6,400	0	255,801	3,443,026	0	72
15	Acrylamide	815	0	1,223	3,092,937	0	16,184
16	Carbon tetrachloride	8	0	207,864	818,577	0	34,000
17	Polychlorinated biphenyls (PCBs)	26,000	0	158,942	310,695	396,251	0
18	Di-(2-ethylhexyl) phthalate	94,008	0	333,655	32,517	22,175	101,538
19	Ethylene oxide	111,581	0	180,687	535,770	26,977	18,781
20	Propylene oxide	15,368	0	2,720	846,074	0	1,075
21	1,4-Dichlorobenzene	225	0	0	24,340	0	0
22	1,4-Dioxane	161,623	0	48,948	7,096	63,328	0
23	Epichlorohydrin	500	0	2,230	1,174,822	0	0
24	Hexachlorobenzene	0	0	5,029	1,448,017	0	0
25	Vinyl chloride	0	0	0	236,685	0	0
SUBTOTAL FOR 25 CARCINOGENS		7,230,341	144,293	11,568,639	41,654,429	4,688,434	6,675,256
PERCENT OF ALL CARCINOGENS		99.60	100.00	98.18	97.07	99.99	99.73
TOTAL FOR ALL CARCINOGENS		7,259,579	144,293	11,783,238	42,912,618	4,688,934	6,693,004
PERCENT OF STATE TOTAL		8.38	4.30	4.47	5.41	3.15	4.97
STATE TOTAL		86,615,836	3,351,837	263,400,319	792,810,307	148,915,352	134,592,526

Table H-3. Continued.

CARC. RANK	CHEMICAL	Virgin Islands Pounds	Vermont Pounds	Washington Pounds	West Virginia Pounds	Wisconsin Pounds	Wyoming Pounds
1	Dichloromethane	0	18,040	1,244,248	1,209,487	1,693,977	0
2	Styrene	0	8,686	931,207	1,366,999	879,083	0
3	Tetrachloroethylene	0	6,816	3,800	340	119,120	0
4	Formaldehyde	0	32,854	273,856	171,622	777,476	6,123
5	Benzene	331,764	0	220,195	1,651,821	7,937	79,202
6	Chloroform	0	0	2,715,876	1,062,252	899,693	0
7	Lead	0	1,924	16,408	5,866	20,063	0
8	Chromium	0	8,880	27,671	82,250	794,830	250
9	Acrylonitrile	0	0	0	1,712,042	230	0
10	1,2-Dichloroethane	0	0	15,300	1,010,236	0	0
11	Nickel	0	9,189	13,102	33,970	499,569	250
12	Asbestos (friable)	50,250	0	23,244	0	0	0
13	Isopropyl alcohol (mfg.-Strong acid process)	0	0	54,195	46,760	130,393	0
14	1,3-Butadiene	0	0	16,800	195,674	0	0
15	Acrylamide	0	0	1,000	26,021	344	0
16	Carbon tetrachloride	1,700	0	134	113,685	0	0
17	Polychlorinated biphenyls (PCBs)	0	0	38,886	0	47,132	0
18	Di-(2-ethylhexyl) phthalate	0	5,700	10,190	10,350	117,100	0
19	Ethylene oxide	0	0	0	48,398	20,829	0
20	Propylene oxide	0	0	0	113,736	7,369	0
21	1,4-Dichlorobenzene	0	0	0	289,000	0	0
22	1,4-Dioxane	0	0	0	0	0	0
23	Epichlorohydrin	0	0	0	0	1,373	0
24	Hexachlorobenzene	0	0	0	0	0	0
25	Vinyl chloride	0	0	0	0	0	0
SUBTOTAL FOR 25 CARCINOGENS		383,714	92,089	5,606,112	9,150,509	6,016,518	85,825
PERCENT OF ALL CARCINOGENS		100.00	100.00	99.87	98.91	99.58	100.00
TOTAL FOR ALL CARCINOGENS		383,714	92,089	5,613,359	9,251,588	6,042,055	85,827
PERCENT OF STATE TOTAL		30.11	4.67	11.52	15.68	6.04	0.48
STATE TOTAL		1,274,235	1,970,055	48,706,760	58,992,213	99,963,906	18,050,866

CARC. RANK	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds
1	Dichloromethane	130,355,581
2	Styrene	41,169,973
3	Tetrachloroethylene	30,058,581
4	Formaldehyde	30,042,348
5	Benzene	28,591,407
6	Chloroform	27,325,508
7	Lead	19,872,648
8	Chromium	13,403,332
9	Acrylonitrile	12,280,895
10	1,2-Dichloroethane	9,509,848
11	Nickel	9,493,108
12	Asbestos (friable)	8,944,353
13	Isopropyl alcohol (mfg.-Strong acid process)	7,661,243
14	1,3-Butadiene	6,136,125
15	Acrylamide	4,625,675
16	Carbon tetrachloride	4,607,809
17	Polychlorinated biphenyls (PCBs)	4,233,611
18	Di-(2-ethylhexyl) phthalate	3,708,811
19	Ethylene oxide	3,447,067
20	Propylene oxide	2,414,341
21	1,4-Dichlorobenzene	1,725,392
22	1,4-Dioxane	1,516,708
23	Epichlorohydrin	1,487,562
24	Hexachlorobenzene	1,458,420
25	Vinyl chloride	1,363,697
SUBTOTAL FOR 25 CARCINOGENS		405,434,043
PERCENT OF ALL CARCINOGENS		98.52
TOTAL FOR ALL CARCINOGENS		411,505,400
PERCENT OF STATE TOTAL		7.21
STATE TOTAL		5,705,670,380

TableH-4. TRI Releases and Transfers in Each State by Industry, 1989.

TRI RANK	STATE	TOTAL RELEASES AND TRANSFERS Pounds	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent
14	Alabama	137,761,513	0.67	0.00	1.46	0.00	0.27
38	Alaska	24,986,799	0.00	0.00	0.00	0.00	0.00
53	American Samoa	27,750	94.59	0.00	0.00	0.00	0.00
29	Arizona	50,764,830	0.85	0.00	0.13	0.00	0.30
25	Arkansas	78,955,945	2.11	0.02	0.17	0.00	0.88
11	California	168,825,335	3.31	0.00	0.43	0.00	0.86
42	Colorado	16,357,496	2.62	0.00	0.00	0.00	1.80
32	Connecticut	42,963,065	0.14	0.00	2.06	0.00	0.60
45	Delaware	11,919,774	0.67	0.00	0.78	0.00	0.00
54	District of Columbia	0	0.00	0.00	0.00	0.00	0.00
9	Florida	192,044,588	0.41	0.00	0.02	0.05	0.12
20	Georgia	117,888,623	0.80	0.01	5.68	0.02	0.65
47	Hawaii	3,402,365	34.07	0.00	0.00	0.00	0.70
43	Idaho	15,739,859	4.06	0.00	0.00	0.00	0.71
6	Illinois	247,813,608	2.69	0.00	0.26	0.04	0.30
5	Indiana	255,023,626	0.70	0.00	0.07	0.00	1.90
28	Iowa	55,143,195	11.47	0.00	0.00	0.00	2.20
10	Kansas	185,131,051	0.22	0.00	0.00	0.03	0.18
21	Kentucky	111,422,816	0.42	0.00	0.04	0.08	0.15
2	Louisiana	473,546,487	0.12	0.00	0.00	0.00	0.90
40	Maine	18,581,543	0.52	0.00	3.33	0.00	1.55
36	Maryland	29,251,518	3.97	0.00	0.53	0.01	0.19
27	Massachusetts	56,214,698	0.33	0.10	3.40	0.13	0.10
7	Michigan	220,137,364	0.76	0.00	0.14	0.01	0.06
24	Minnesota	81,932,154	1.37	0.00	0.00	0.00	5.25
19	Mississippi	120,617,983	0.50	0.00	3.38	0.00	1.49
12	Missouri	163,105,846	1.38	0.00	0.42	0.01	0.12
33	Montana	39,103,261	0.14	0.00	0.00	0.00	0.77
39	Nebraska	20,623,709	2.70	0.00	0.01	0.00	0.52
49	Nevada	3,295,677	0.38	0.00	0.00	0.00	0.07
44	New Hampshire	14,392,899	0.32	0.00	2.36	0.61	1.74
18	New Jersey	124,333,859	0.68	0.00	1.20	0.00	0.90
34	New Mexico	34,173,505	0.01	0.00	0.00	0.00	0.25
17	New York	126,275,855	0.66	0.04	0.96	0.23	0.09
15	North Carolina	135,058,190	1.20	0.10	7.87	0.15	1.16
51	North Dakota	1,358,104	3.17	0.00	0.00	0.00	0.06
3	Ohio	358,677,545	0.62	0.00	0.39	0.10	0.27
31	Oklahoma	46,752,043	0.24	0.00	0.24	0.00	0.13
35	Oregon	31,499,505	2.18	0.00	0.00	0.00	7.95
8	Pennsylvania	194,216,839	0.56	0.01	0.41	0.10	1.17
37	Puerto Rico	26,826,844	0.61	0.00	0.26	0.00	0.01
46	Rhode Island	10,878,502	0.01	0.00	6.24	0.00	0.14
23	South Carolina	86,615,836	0.19	0.00	8.04	0.00	0.89
48	South Dakota	3,351,837	9.01	0.00	0.00	0.00	12.43
4	Tennessee	263,400,319	4.61	0.00	0.21	0.09	0.26
1	Texas	792,810,307	0.68	0.00	0.08	0.01	0.14
13	Utah	148,915,352	0.15	0.00	0.00	0.00	0.37
50	Vermont	1,970,055	5.82	0.00	0.00	0.00	1.67
52	Virgin Islands	1,274,235	0.00	0.00	0.00	0.00	0.00
16	Virginia	134,592,526	0.56	0.48	0.79	0.01	1.70
30	Washington	48,706,760	1.82	0.00	0.03	0.21	2.29
26	West Virginia	58,992,213	0.01	0.91	0.00	0.00	1.79
22	Wisconsin	99,963,906	3.36	0.00	0.89	0.01	1.55
41	Wyoming	18,050,866	0.72	0.00	0.00	0.00	0.01
	TOTAL	5,705,670,380	1.19	0.03	0.81	0.04	0.66

Table H-4. Continued.

TRI RANK	STATE	FURNITURE SIC 25 Percent	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent
14	Alabama	0.99	11.98	0.05	52.02	0.20	2.57
38	Alaska	0.00	25.13	0.00	74.27	0.60	0.00
53	American Samoa	0.00	0.00	0.00	0.00	0.00	0.00
29	Arizona	0.65	6.51	0.67	1.04	0.01	1.37
25	Arkansas	2.34	4.66	0.03	38.90	0.16	7.94
11	California	1.60	7.96	0.36	34.22	6.76	6.03
42	Colorado	1.95	1.87	0.15	10.59	4.69	2.39
32	Connecticut	0.02	1.27	0.47	28.84	0.00	3.80
45	Delaware	0.47	1.13	0.05	58.43	3.81	1.53
54	District of Columbia	0.00	0.00	0.00	0.00	0.00	0.00
9	Florida	0.41	17.44	0.16	59.45	0.00	1.47
20	Georgia	0.50	22.40	2.22	25.29	0.04	4.67
47	Hawaii	0.00	0.00	0.00	0.05	17.31	1.24
43	Idaho	0.00	0.02	0.00	53.68	0.00	0.22
6	Illinois	0.42	2.43	3.99	46.11	1.50	4.84
5	Indiana	1.62	0.89	2.26	16.54	0.82	5.81
28	Iowa	0.57	10.29	2.57	23.86	0.00	7.25
10	Kansas	0.02	0.01	0.28	85.92	4.06	1.11
21	Kentucky	0.23	1.82	2.00	55.83	0.82	3.39
2	Louisiana	0.00	1.02	0.00	89.04	3.72	0.00
40	Maine	0.71	55.68	0.32	1.85	0.00	4.92
36	Maryland	0.00	28.60	6.97	19.84	0.02	1.44
27	Massachusetts	0.56	11.42	0.85	11.88	0.01	7.23
7	Michigan	2.26	2.79	0.10	25.62	0.28	4.42
24	Minnesota	0.06	12.57	0.76	1.00	3.05	1.26
19	Mississippi	3.13	2.02	2.90	54.80	0.52	4.92
12	Missouri	0.30	0.19	0.62	52.11	0.03	3.67
33	Montana	0.00	0.98	0.00	0.33	3.21	0.00
39	Nebraska	2.06	0.27	0.00	24.79	0.00	17.11
49	Nevada	0.00	0.00	11.20	69.46	0.06	5.36
44	New Hampshire	0.46	12.54	1.07	2.61	0.00	3.53
18	New Jersey	0.14	3.82	0.81	68.63	1.23	2.37
34	New Mexico	0.00	0.00	0.04	10.48	1.84	0.11
17	New York	1.85	5.63	1.78	26.52	0.47	2.21
15	North Carolina	13.47	9.14	1.93	38.87	0.01	6.38
51	North Dakota	0.00	0.00	0.00	0.02	22.68	36.97
3	Ohio	0.28	4.18	0.52	33.86	1.00	5.47
31	Oklahoma	0.69	2.67	0.05	45.64	5.74	2.77
35	Oregon	0.29	35.28	0.05	5.98	0.04	4.01
8	Pennsylvania	1.09	6.74	1.86	20.48	2.27	3.38
37	Puerto Rico	0.03	0.00	0.00	55.34	0.28	10.70
46	Rhode Island	0.00	1.49	8.61	26.80	0.00	2.07
23	South Carolina	1.09	10.39	1.43	21.97	0.00	17.90
48	South Dakota	0.00	0.00	0.05	32.71	0.00	6.08
4	Tennessee	1.54	2.63	2.63	61.69	0.32	4.77
1	Texas	0.07	1.30	0.15	83.07	4.04	0.65
13	Utah	0.05	0.00	0.00	2.87	0.43	0.08
50	Vermont	28.12	4.00	1.24	6.07	0.00	0.24
52	Virgin Islands	0.00	0.00	0.00	0.00	100.00	0.00
16	Virginia	7.43	8.46	3.46	48.20	0.63	5.46
30	Washington	0.17	41.08	0.00	8.10	2.51	3.61
26	West Virginia	0.00	0.00	0.00	61.89	0.58	1.09
22	Wisconsin	0.87	19.25	2.09	7.01	0.13	4.25
41	Wyoming	0.00	0.00	0.00	90.91	6.46	0.00
	TOTAL	1.15	5.49	1.07	48.12	1.81	3.41

Table H-4. Continued.

TRI RANK	STATE	LEATHER SIC 31 Percent	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent
14	Alabama	0.00	1.85	13.70	3.24	0.80	1.98
38	Alaska	0.00	0.00	0.00	0.00	0.00	0.00
53	American Samoa	0.00	0.00	0.00	0.00	0.00	0.00
29	Arizona	0.02	0.00	61.50	1.64	0.62	12.29
25	Arkansas	0.16	0.35	20.95	3.21	1.79	5.19
11	California	0.10	0.55	4.84	7.65	1.42	4.87
42	Colorado	0.03	3.48	11.77	10.39	6.33	4.32
32	Connecticut	0.00	0.03	4.30	15.60	5.79	6.61
45	Delaware	0.00	0.00	0.69	0.03	0.00	0.11
54	District of Columbia	0.00	0.00	0.00	0.00	0.00	0.00
9	Florida	0.02	0.06	0.71	1.53	0.88	1.99
20	Georgia	0.00	1.88	7.87	2.88	1.74	1.25
47	Hawaii	0.00	0.00	0.00	9.26	0.00	0.00
43	Idaho	0.00	0.00	0.00	1.38	2.53	21.35
6	Illinois	0.12	1.11	18.48	5.91	1.81	2.71
5	Indiana	0.20	1.69	20.78	2.89	1.25	5.33
28	Iowa	1.49	0.06	7.55	3.82	5.92	6.26
10	Kansas	0.00	0.38	0.15	0.53	0.87	0.88
21	Kentucky	0.07	0.63	16.35	1.54	1.46	4.39
2	Louisiana	0.00	0.04	0.27	0.71	0.04	0.10
40	Maine	13.40	0.05	0.00	1.20	0.72	4.74
36	Maryland	1.73	1.73	11.43	5.77	0.54	2.02
27	Massachusetts	0.51	0.51	1.84	8.66	1.79	12.81
7	Michigan	2.09	0.46	26.82	6.66	0.58	0.41
24	Minnesota	1.44	0.35	1.03	5.90	3.39	5.41
19	Mississippi	0.00	5.33	0.31	4.12	2.99	0.59
12	Missouri	0.78	0.43	18.66	3.33	1.02	3.12
33	Montana	0.00	0.00	94.54	0.00	0.00	0.00
39	Nebraska	6.25	0.01	15.99	5.14	4.40	6.21
49	Nevada	0.00	0.02	7.80	4.11	0.00	0.02
44	New Hampshire	0.01	0.20	7.75	7.23	6.39	20.45
18	New Jersey	1.27	0.54	3.80	6.78	1.02	1.06
34	New Mexico	0.00	0.00	83.23	0.00	0.18	2.84
17	New York	0.68	3.29	6.28	6.23	2.65	4.80
15	North Carolina	0.66	0.53	0.98	2.82	1.16	2.84
51	North Dakota	0.00	1.58	0.00	0.52	29.84	0.00
3	Ohio	0.03	1.23	21.95	7.34	2.02	3.05
31	Oklahoma	0.00	0.93	7.75	9.95	2.86	1.25
35	Oregon	0.24	0.17	9.75	2.67	0.56	6.00
8	Pennsylvania	1.14	2.14	29.89	4.12	2.06	3.83
37	Puerto Rico	1.68	0.10	0.28	1.62	1.37	4.68
46	Rhode Island	0.18	5.41	2.18	16.69	0.48	1.27
23	South Carolina	0.00	0.50	4.53	5.18	2.53	4.70
48	South Dakota	0.00	2.92	2.41	3.19	7.46	19.07
4	Tennessee	0.13	0.73	4.12	1.23	0.77	1.01
1	Texas	0.25	0.28	2.81	1.78	0.44	0.83
13	Utah	0.00	0.02	91.72	0.13	0.15	0.82
50	Vermont	0.00	3.39	1.21	9.66	4.61	11.29
52	Virgin Islands	0.00	0.00	0.00	0.00	0.00	0.00
16	Virginia	0.00	0.48	1.82	4.20	0.69	1.96
30	Washington	0.00	0.01	3.90	4.98	0.41	1.71
26	West Virginia	0.02	0.94	26.29	3.32	1.73	0.07
22	Wisconsin	2.60	1.70	28.25	7.39	5.00	4.13
41	Wyoming	0.00	0.00	0.00	1.90	0.01	0.00
	TOTAL	0.44	0.83	13.26	3.63	1.31	2.55

Table H-4. Continued.

TRI RANK	STATE	TRANSPORTATION SIC 37 Percent	MEASURE/PHOTO SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent	TOTAL Percent
14	Alabama	2.66	0.31	0.48	4.67	0.08	100.00
38	Alaska	0.00	0.00	0.00	0.00	0.00	100.00
53	American Samoa	0.00	0.00	0.00	5.41	0.00	100.00
29	Arizona	3.54	1.25	4.73	2.84	0.05	100.00
25	Arkansas	3.56	0.32	2.33	4.81	0.10	100.00
11	California	11.47	1.78	0.73	4.60	0.46	100.00
42	Colorado	5.91	8.72	0.14	22.84	0.00	100.00
32	Connecticut	14.66	1.83	4.35	9.13	1.05	100.00
45	Delaware	30.87	1.15	0.10	0.18	0.20	100.00
54	District of Columbia	0.00	0.00	0.00	0.00	0.00	0.00
9	Florida	4.69	1.07	3.47	5.80	0.24	100.00
20	Georgia	5.77	0.42	0.47	15.11	0.35	100.00
47	Hawaii	0.00	0.00	0.00	37.99	0.00	100.00
43	Idaho	0.00	0.00	0.00	16.05	0.00	100.00
6	Illinois	3.35	0.37	0.59	2.84	0.11	100.00
5	Indiana	5.94	2.20	1.31	27.10	0.69	100.00
28	Iowa	2.90	0.03	2.04	11.54	0.17	100.00
10	Kansas	1.82	0.03	0.15	3.26	0.11	100.00
21	Kentucky	4.25	0.00	1.05	5.03	0.44	100.00
2	Louisiana	1.39	0.01	0.00	3.38	0.80	100.00
40	Maine	4.40	0.07	0.04	6.49	0.02	100.00
36	Maryland	8.46	0.22	0.00	6.40	0.13	100.00
27	Massachusetts	1.33	8.98	1.01	25.90	0.66	100.00
7	Michigan	19.97	0.02	0.10	5.84	0.05	100.00
24	Minnesota	3.32	1.54	0.07	51.90	0.33	100.00
19	Mississippi	0.25	0.10	0.35	12.27	0.02	100.00
12	Missouri	8.56	0.20	0.28	4.30	0.47	100.00
33	Montana	0.03	0.00	0.00	0.00	0.00	100.00
39	Nebraska	2.05	3.74	0.00	7.60	1.15	100.00
49	Nevada	0.01	0.54	0.61	0.34	0.02	100.00
44	New Hampshire	1.20	1.20	3.90	26.45	0.00	100.00
18	New Jersey	0.64	1.37	0.08	2.34	2.12	100.00
34	New Mexico	0.47	0.00	0.00	0.32	0.24	100.00
17	New York	3.66	19.89	0.94	7.45	3.70	100.00
15	North Carolina	2.68	0.56	0.56	6.65	0.29	100.00
51	North Dakota	0.99	0.00	3.37	0.81	0.00	100.00
3	Ohio	7.53	0.26	0.48	9.33	0.10	100.00
31	Oklahoma	6.38	1.84	0.03	8.17	2.69	100.00
35	Oregon	5.03	1.22	0.07	18.50	0.00	100.00
8	Pennsylvania	2.39	5.90	2.18	7.56	0.73	100.00
37	Puerto Rico	0.00	3.85	0.31	18.62	0.28	100.00
46	Rhode Island	5.45	3.01	9.80	10.17	0.00	100.00
23	South Carolina	3.59	0.80	1.22	15.01	0.04	100.00
48	South Dakota	0.76	0.00	2.18	1.73	0.00	100.00
4	Tennessee	3.46	0.12	0.32	9.33	0.02	100.00
1	Texas	1.01	0.08	0.06	2.21	0.06	100.00
13	Utah	2.16	0.51	0.10	0.17	0.27	100.00
50	Vermont	13.53	0.00	2.14	7.00	0.00	100.00
52	Virgin Islands	0.00	0.00	0.00	0.00	0.00	100.00
16	Virginia	2.90	0.13	0.32	10.35	0.00	100.00
30	Washington	18.78	0.76	0.62	8.99	0.01	100.00
26	West Virginia	0.14	0.00	0.00	1.22	0.00	100.00
22	Wisconsin	2.71	0.30	1.36	7.12	0.05	100.00
41	Wyoming	0.00	0.00	0.00	0.00	0.00	100.00
	TOTAL	4.30	1.22	0.68	7.66	0.34	100.00

Table H-5. States Shipping and States Receiving TRI Off-Site Transfers, 1989.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	Alabama	Alaska	American Samoa	Arizona	Arkansas	California	Colorado	Connecticut
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	9,875,917	0	0	750	361,407	4,370	2,193	34,315
Alaska	0	2,250	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0
Arizona	0	0	0	770,335	0	178,863	94	0
Arkansas	236,160	0	0	13,083	1,325,583	148,834	20,803	33,474
California	0	0	0	273,916	0	16,949,626	34	12,535
Colorado	0	0	0	3,909	0	0	1,472,913	0
Connecticut	0	0	0	0	0	0	0	5,198,909
Delaware	0	0	0	0	0	0	0	10
District of Columbia	0	0	0	0	0	0	0	0
Florida	225,651	0	0	0	0	0	0	410
Georgia	138,968	0	0	0	55,872	0	0	3,470
Hawaii	0	0	0	0	0	0	0	0
Idaho	0	0	0	5,850	0	310,526	6,481	0
Illinois	5,820	0	0	4,261	10,456	20,198	618,863	90,570
Indiana	0	0	0	0	297,298	6,585	350	123,808
Iowa	0	0	0	0	0	0	0	0
Kansas	20,000	0	0	5,856	40,250	555,168	28,274	0
Kentucky	75,296	0	0	0	504,773	10,300	122,800	0
Louisiana	4,658,531	0	0	12,651	543,391	798,394	1,801	35,281
Maine	0	0	0	0	0	0	0	0
Maryland	0	0	0	0	0	0	0	0
Massachusetts	0	0	0	0	0	0	0	1,994,943
Michigan	60,158	0	0	0	108	32,914	0	711,156
Minnesota	966,530	0	0	250	0	75,446	0	0
Mississippi	0	0	0	0	16,365	0	0	0
Missouri	0	0	0	36,710	145,750	1,582	18,037	0
Montana	0	0	0	0	0	47,800	0	0
Nebraska	0	0	0	0	0	0	1,330	0
Nevada	0	0	0	3,785	0	604,501	9,582	0
New Hampshire	0	0	0	0	0	0	0	0
New Jersey	119,696	0	0	0	0	10,641	0	2,599,157
New Mexico	0	0	0	0	0	0	75,000	0
New York	3,650	0	0	0	0	15	715,500	1,201,978
North Carolina	26,190	0	0	0	0	0	0	0
North Dakota	0	0	0	0	0	0	0	0
Ohio	1,471	0	0	0	0	261,590	8,020	108,574
Oklahoma	333,920	0	0	123,000	5,205,518	8,000	667,477	0
Oregon	0	0	0	0	0	1,599	0	0
Pennsylvania	0	0	0	0	0	3,018	626,423	641,001
Puerto Rico	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	0	271,249
South Carolina	198,709	0	0	0	59,363	6	0	74,986
South Dakota	0	0	0	0	0	0	0	0
Tennessee	877,460	0	0	0	1,163,710	31,916	1,004	0
Texas	313,596	0	0	400,509	1,296,612	576,917	170,755	14,400
Unknown	459,912	0	0	59,949	38,408	101,686	250	1,604,946
Utah	0	0	0	60,473	0	1,192,097	165,872	0
Vermont	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	0	4,330
Washington	0	3,500	0	0	0	2,393	0	0
West Virginia	43,000	0	0	0	0	0	0	0
Wisconsin	0	0	0	0	0	0	0	0
Wyoming	0	0	0	0	0	3,246	0	0
TOTAL	18,640,635	5,750	0	1,775,287	11,064,864	21,938,231	4,733,856	14,759,502

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	28,331	0	3,003,646	4,225,582	0	750	1,019,293	249,829
Alaska	0	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	585,296	0
Arkansas	93,299	0	100,741	145,610	0	0	279,073	194,665
California	0	0	0	0	0	0	0	0
Colorado	0	0	0	0	0	219,754	0	0
Connecticut	0	0	1,000	0	0	0	0	0
Delaware	255,789	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0
Florida	0	0	6,741,293	26,418	0	0	10	0
Georgia	6,000	0	936,690	12,279,838	0	0	1,656	58,895
Hawaii	0	0	0	0	11,608	0	0	0
Idaho	0	0	0	0	0	31,508	0	389
Illinois	11,142	0	70,989	16,560	0	0	37,986,439	5,836,600
Indiana	21,100	0	0	10,621	0	2,250	4,547,596	24,043,887
Iowa	0	0	0	0	0	0	26,929	0
Kansas	0	0	0	0	0	0	1,100	19,266
Kentucky	0	0	9,644	312,117	0	0	461,545	1,331,760
Louisiana	226,379	0	676,954	281,810	0	0	309,779	42,073
Maine	0	0	0	0	0	0	0	0
Maryland	0	0	74	0	0	0	0	0
Massachusetts	0	0	0	0	0	0	24,000	0
Michigan	0	0	75,111	58,194	0	0	339,274	1,526,612
Minnesota	0	0	0	0	0	0	693,955	955,700
Mississippi	0	0	0	0	0	0	0	0
Missouri	0	0	0	367	0	0	4,224,256	0
Montana	0	0	0	0	0	0	0	354,438
Nebraska	0	0	0	0	0	0	0	0
Nevada	0	0	0	0	750	0	0	0
New Hampshire	0	0	0	0	0	0	0	0
New Jersey	463,232	0	23,044	43,711	0	0	21,102	0
New Mexico	0	0	0	0	0	0	0	0
New York	236,748	0	386	0	0	0	186,490	0
North Carolina	91,320	0	100,380	43,131	0	0	22,022	0
North Dakota	0	0	0	0	0	0	0	0
Ohio	32,388	0	86,557	146,627	0	0	2,248,012	1,051,892
Oklahoma	0	0	0	7,200	0	0	2,005	0
Oregon	0	0	0	0	0	2,100	0	0
Pennsylvania	57,157	0	3,600	4,866,601	0	0	26,409	140,049
Puerto Rico	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	5,000	0	0	250	250
South Carolina	109,675	0	3,569,575	1,167,546	0	0	32,192	8,030
South Dakota	0	0	0	0	0	0	0	0
Tennessee	0	0	438,587	199,924	0	0	39,909	777,422
Texas	0	0	200	1,339,010	0	0	226,466	0
Unknown	957	0	3,794	1,350	0	0	178,238	1,019,159
Utah	0	0	0	770	0	64,500	0	0
Vermont	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	450,030	0	0	0	0	0
Washington	0	0	0	0	0	56,969	0	0
West Virginia	31,516	0	0	0	0	0	0	0
Wisconsin	0	0	0	0	0	0	3,385,462	176,925
Wyoming	0	0	0	0	0	0	0	0
TOTAL	1,665,033	0	16,292,295	25,177,987	12,358	377,831	56,868,758	37,787,841

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	643,791	73,430	524,094	45,499	0	7,886	2,950	324,431
Alaska	0	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0
Arizona	17,456	0	0	0	0	0	1,002	0
Arkansas	5,092	33,081	87,978	484,493	0	91,521	120,487	163,795
California	0	0	0	0	0	0	208,604	0
Colorado	0	0	0	0	0	0	0	0
Connecticut	0	0	0	2,600	94,716	250	2,583,774	0
Delaware	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	500	0	0
Florida	0	0	0	93,000	0	5,257	0	0
Georgia	0	0	8,950	584	0	3,519	41,919	41,772
Hawaii	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	0	0
Illinois	278,391	402,202	821,999	51,347	0	280	156,377	6,564,098
Indiana	117,074	2,594	1,906,458	0	0	13,492	242,084	2,334,297
Iowa	2,688,264	0	0	0	0	0	0	296
Kansas	1,750	57,270,142	1,250	68,201	0	0	0	169,039
Kentucky	51,163	5,875	16,786,885	300	0	3,170	0	616,721
Louisiana	90,894	1,154,745	61,897	8,137,487	2,750	107,341	90,884	27,787
Maine	0	0	0	0	539,440	0	51,750	0
Maryland	0	0	0	0	0	1,072,727	0	0
Massachusetts	0	0	0	8,900	512,015	96,950	7,851,045	420
Michigan	310	7,794	682,431	3,900	21,022	195,297	61,626	65,557,612
Minnesota	197,665	0	82,767	0	0	0	0	16,500
Mississippi	0	0	0	5,526	0	0	0	0
Missouri	66,092	170,019	750	82	0	0	0	0
Montana	0	67,064	0	0	0	0	0	0
Nebraska	10,069	0	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	40,004	14,914
New Hampshire	0	0	0	0	3,150	0	48,765	0
New Jersey	0	0	19,395	0	254,750	606,911	1,601,345	54,530
New Mexico	0	0	0	0	0	0	0	0
New York	0	0	0	2,700	5,272	7,780	3,432,743	0
North Carolina	0	0	250	0	0	50,925	3,608	0
North Dakota	0	0	0	0	0	0	0	0
Ohio	168,830	214,700	593,957	0	0	137,914	729,811	6,904,912
Oklahoma	1,722	712,309	0	10,160	0	0	0	0
Oregon	0	0	0	0	0	0	0	0
Pennsylvania	23,232	0	2,299,928	0	19,450	1,174,773	183,481	56,374
Puerto Rico	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	115,605	0
South Carolina	0	0	186,239	13,000	16,400	103,673	189,123	64,225
South Dakota	7,344	0	0	0	0	0	0	0
Tennessee	1,750	10,061	737,694	15,707	0	750	8,793	65,764
Texas	69,750	16,562	143,464	3,108,167	2,728	18,109	0	245,418
Unknown	88,840	250	501	1,500	3,632	0	1,328,096	764,391
Utah	0	0	0	0	0	0	0	0
Vermont	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	206,708	399,207	0
Washington	0	0	8,600	0	0	0	0	0
West Virginia	0	0	50,097	0	0	0	0	0
Wisconsin	248,904	5,988	5,400	7,200	0	0	0	105,795
Wyoming	0	0	0	0	0	0	0	0
TOTAL	4,778,383	60,146,816	25,010,984	12,060,353	1,475,325	3,905,733	19,493,083	84,093,091

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	139,847	1,281,160	22,355	250	1,539	0	7,706	284,073
Alaska	0	0	500	0	0	0	0	500
American Samoa	0	0	0	0	0	0	0	0
Arizona	2,205	0	917,642	0	0	0	0	0
Arkansas	1,618,772	55,288	353,488	0	1	0	250	92,184
California	0	0	0	0	0	215,233	129,300	0
Colorado	0	0	0	0	0	0	0	0
Connecticut	0	0	0	0	0	0	338,156	616,344
Delaware	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0
Florida	0	900	0	0	0	0	0	83,620
Georgia	0	8,184	24,500	0	0	0	0	31,066
Hawaii	0	0	0	0	0	0	0	0
Idaho	0	0	14	0	0	5,911	0	0
Illinois	631,343	4,750	1,424,971	0	149,191	0	13,533	239,032
Indiana	64,072	1,880	875,466	0	0	2,450	1,306	322,602
Iowa	9,185	0	250	0	9,625	0	0	0
Kansas	250	0	253,162	1,176	112,134	0	0	0
Kentucky	12,462	50,915	764,257	0	19,760	0	0	118,963
Louisiana	48,989	951,030	613,896	0	36,623	0	4,791	148,242
Maine	0	0	0	0	0	0	756	0
Maryland	0	0	0	0	0	0	616	69,843
Massachusetts	0	0	0	0	0	0	1,192,357	3,021
Michigan	35,824	25,378	199,356	0	0	0	2,671	975,838
Minnesota	5,473,407	0	1,075,677	0	750	0	0	35,869
Mississippi	0	409,247	0	0	0	0	0	0
Missouri	0	0	3,197,482	0	26,500	4,381	0	523,455
Montana	0	0	0	2,391	2,620	0	0	0
Nebraska	0	0	0	0	3,854,134	0	0	0
Nevada	0	0	0	0	57	69,354	0	0
New Hampshire	0	0	0	0	0	0	91,260	0
New Jersey	0	3,842	0	0	0	0	85,148	16,527,267
New Mexico	0	0	0	0	0	0	0	0
New York	1,112	0	0	0	0	0	17,136	534,545
North Carolina	0	0	0	0	0	0	115,122	2,092
North Dakota	0	0	0	1,500	0	0	0	0
Ohio	12,550	687	29,052	0	0	0	16,711	1,382,898
Oklahoma	52,830	522,900	484,307	0	382,172	0	0	0
Oregon	0	0	0	0	0	0	0	0
Pennsylvania	0	6,900	48	0	0	0	302,396	5,631,903
Puerto Rico	0	0	0	0	0	0	0	0
Rhode Island	0	0	0	0	0	0	1,115	0
South Carolina	3,200	10,749	65,428	0	0	0	577	168,045
South Dakota	0	0	0	0	5,412	0	0	0
Tennessee	0	769,943	225,485	1,000	7,983	0	0	750
Texas	0	270,060	298,232	0	7,219	0	0	433,954
Unknown	38,944	0	500	0	0	0	226,132	414,801
Utah	0	0	21,370	10,999	0	12,800	0	0
Vermont	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	0	0	8,230	198,264
Washington	0	0	0	890	0	0	0	0
West Virginia	0	0	0	0	0	0	0	2,060
Wisconsin	6,027,474	0	460,237	0	57,890	0	0	0
Wyoming	0	0	0	0	0	0	0	0
TOTAL	14,172,466	4,373,813	11,307,675	18,206	4,673,610	310,129	2,555,269	28,841,231

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	0	401,070	1,383,503	0	501,206	2,250	433	616,316
Alaska	0	250	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	13,000	8,656
Arkansas	4,940	401,167	261,690	0	266,708	37,026	59,315	1,077,303
California	0	0	0	0	0	0	10,800	250
Colorado	1,750	0	0	0	0	0	61,799	0
Connecticut	0	205,619	9,708	0	0	0	0	9,595
Delaware	0	0	0	0	0	0	0	37,418
District of Columbia	0	0	0	0	0	0	0	0
Florida	0	0	197,127	0	0	0	0	18,007
Georgia	0	9,639	553,312	0	340,032	165,500	0	58,642
Hawaii	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	4,340	0
Illinois	0	92,500	2,450	0	55,622	2,600	0	1,641,381
Indiana	0	185,446	32,390	0	2,808,406	0	0	680,782
Iowa	0	0	0	0	0	0	0	0
Kansas	0	250	17,525	52,753	46,283	15,700	28,200	34,650
Kentucky	0	498,125	173,554	3,033	2,032,242	7,200	0	1,088,671
Louisiana	0	51,557	89,804	0	1,106,688	33,006	690	335,035
Maine	0	0	0	0	0	0	0	0
Maryland	0	29,960	3,134	0	0	0	0	655,688
Massachusetts	0	136,035	406	0	7,179	0	0	32,656
Michigan	0	843,184	13,880	0	13,594,194	0	0	1,700,443
Minnesota	0	38,000	0	11,686	8,446	308,927	295,850	2,800
Mississippi	0	0	0	0	0	0	0	0
Missouri	0	44,190	1,240	0	4,982	0	11,950	453,992
Montana	0	0	0	0	0	0	0	0
Nebraska	0	0	0	0	0	0	0	0
Nevada	2,250	0	0	0	0	0	0	0
New Hampshire	0	20,400	0	0	0	0	0	0
New Jersey	4,630	4,015,012	286,273	0	31,790	0	0	8,593,294
New Mexico	6,939	0	0	0	0	332,774	0	0
New York	0	13,321,541	8,338	0	645,479	0	0	970,318
North Carolina	0	2,300	6,743,186	0	0	0	0	303,574
North Dakota	0	0	0	3,011	0	0	0	0
Ohio	0	2,740,632	144,617	0	67,418,188	0	3,320	20,576,366
Oklahoma	113,425	0	7,804	0	5	7,047,935	1,500	0
Oregon	0	0	0	0	0	0	2,066,442	0
Pennsylvania	0	1,900,896	13,875	0	4,272,201	0	5,540	34,302,638
Puerto Rico	0	0	0	0	0	0	0	0
Rhode Island	0	279,341	0	0	0	0	0	4,807
South Carolina	0	300,561	1,613,748	0	459,552	8,800	0	92,936
South Dakota	0	0	2,063	0	0	0	0	0
Tennessee	1,500	8,091	144,497	0	22,121	4,345	0	26,550
Texas	12,250	0	180,212	88	530,325	1,352,475	0	2,123,611
Unknown	0	797,029	366,541	0	274,163	4,604	3,172	394,600
Utah	72,750	0	0	591	0	0	500	250
Vermont	0	0	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	967,778	0	0	0	0	1,583,174
Washington	0	0	0	4,340	0	0	519,159	0
West Virginia	0	360	6,140	0	7,300,781	0	0	38,252
Wisconsin	0	0	0	0	0	0	0	0
Wyoming	0	0	0	0	0	0	0	0
TOTAL	220,434	26,323,155	13,224,795	75,502	101,726,593	9,323,142	3,086,010	77,462,655

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER							
	Puerto Rico	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	28,645	10,940	1,293,658	0	2,412,633	425,860	0	0
Alaska	0	0	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	4,894	0
Arkansas	6,460	32,886	253,059	1,175	566,974	520,146	188,517	0
California	0	0	173	0	0	19,780	409,882	2,200
Colorado	0	0	0	0	0	0	208,440	0
Connecticut	138	371,202	0	0	0	0	0	124,548
Delaware	0	0	0	0	0	0	0	0
District of Columbia	0	0	0	0	0	0	0	0
Florida	5	0	0	0	0	0	0	0
Georgia	0	0	182,733	0	236,716	3,750	0	0
Hawaii	0	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	102,900	0
Illinois	0	7,800	6,900	40,000	50,327	2,313,781	0	0
Indiana	0	15,512	53,138	3,401	241,612	0	0	0
Iowa	0	0	0	2,947	0	0	0	0
Kansas	0	0	0	0	1	225,109	70,000	0
Kentucky	0	0	32,923	20,375	88,996	110,156	0	0
Louisiana	10,039	17,985	177,856	0	721,772	18,206,287	0	11,050
Maine	0	0	0	0	0	0	0	0
Maryland	0	35,793	2,531	0	0	0	0	0
Massachusetts	0	1,110,962	803	0	0	0	0	219,409
Michigan	0	24,464	8,182	0	3,309	0	0	0
Minnesota	54,800	0	10,850	287,582	0	379,768	2,750	0
Mississippi	0	6,300	0	0	345,170	0	0	0
Missouri	0	0	0	0	0	124,400	0	0
Montana	0	0	0	0	0	0	0	0
Nebraska	0	0	0	4,809	0	0	1,600	0
Nevada	0	0	0	0	0	0	2,500	0
New Hampshire	0	0	0	0	0	0	0	0
New Jersey	5,717	405,886	117,746	0	24,971	365,376	0	10,001
New Mexico	0	0	0	0	0	20,556	0	0
New York	0	276,241	0	0	0	0	0	34,798
North Carolina	0	16,490	994,386	0	346,147	0	0	0
North Dakota	0	0	0	0	0	0	0	0
Ohio	2,260	0	1	0	187,344	40,725	0	0
Oklahoma	0	0	0	0	247	538,306	0	0
Oregon	0	0	0	0	0	0	0	0
Pennsylvania	28,000	79,332	3,531	0	73,000	23,991	0	0
Puerto Rico	6,896,265	0	0	0	0	0	0	0
Rhode Island	0	369,553	1,500	0	0	0	0	0
South Carolina	3,516	28,300	8,958,415	0	1,172,942	2,200	0	0
South Dakota	0	0	0	131,721	0	0	0	0
Tennessee	0	4,469	25,877	0	11,407,410	64,828	750	0
Texas	3,454	0	295	0	834	60,780,662	159,575	0
Unknown	2,091	86,031	49,375	0	0	39,177	1,300	168,655
Utah	0	0	0	0	0	2,500	866,601	0
Vermont	0	0	0	0	0	0	0	16,322
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	0	0	0	0	104,520	0	0	0
Washington	0	0	0	0	250	0	0	0
West Virginia	0	0	0	0	201,032	999,181	0	0
Wisconsin	0	0	0	69,717	0	97,750	0	0
Wyoming	0	0	0	0	0	0	0	0
TOTAL	7,041,390	2,900,146	12,173,932	561,727	18,186,207	85,304,289	2,019,709	586,983

Table H-5. Continued.

STATE RECEIVING OFF-SITE TRANSFER	STATE SENDING OFF-SITE TRANSFER						TOTAL OFF-SITE AND TRANSFERS
	Virgin Islands	Virginia	Washington	West Virginia	Wisconsin	Wyoming	
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Alabama	0	3,025,849	750	89,625	51,221	0	32,409,353
Alaska	0	0	0	0	0	0	3,500
American Samoa	0	0	0	0	0	0	0
Arizona	0	0	0	0	18,100	0	2,517,543
Arkansas	0	60,245	12,265	76,140	43,430	0	9,567,201
California	0	0	90,680	0	1,416	0	18,324,429
Colorado	0	0	0	0	0	178	1,968,743
Connecticut	0	7,557	0	0	0	0	9,564,116
Delaware	0	0	0	200	0	0	293,417
District of Columbia	0	0	0	0	0	0	500
Florida	0	308,262	0	53,070	0	0	7,753,030
Georgia	0	12,279	0	1,750	0	0	15,206,236
Hawaii	0	0	0	0	0	0	11,608
Idaho	0	0	11,843	0	0	2,831	482,593
Illinois	0	79,700	3,504	29,148	2,699,615	0	62,434,740
Indiana	0	78,074	0	86,641	645,342	0	39,768,014
Iowa	0	0	0	0	35,000	0	2,772,496
Kansas	0	0	21,250	0	61,770	0	59,120,509
Kentucky	0	221,865	0	209,254	340,824	0	26,085,924
Louisiana	0	1,065,000	936	720,894	46,704	0	41,659,703
Maine	0	0	0	0	0	0	591,946
Maryland	0	233,723	0	0	2,900	0	2,106,989
Massachusetts	0	26,900	0	0	750	0	13,218,751
Michigan	0	14,973	0	25,568	832,449	0	87,633,232
Minnesota	0	0	0	24,394	319,972	0	11,320,341
Mississippi	0	0	0	0	0	0	782,608
Missouri	0	0	1,000	0	0	0	9,057,217
Montana	0	0	0	0	0	0	474,313
Nebraska	0	0	7,650	0	0	0	3,879,592
Nevada	0	0	1,800	0	0	0	749,497
New Hampshire	0	0	0	0	0	0	163,575
New Jersey	0	313,294	0	558,287	26,550	0	37,192,598
New Mexico	0	0	0	0	0	0	435,269
New York	0	1,313	0	136,425	0	0	21,740,508
North Carolina	0	1,122,972	0	50,758	0	0	10,034,853
North Dakota	0	0	0	0	0	0	4,511
Ohio	0	564,017	0	5,533,637	3,481,239	0	114,829,499
Oklahoma	0	0	0	0	34,450	0	16,257,192
Oregon	0	0	789,636	0	0	0	2,859,777
Pennsylvania	0	32,603	0	860,582	1,250	0	57,660,182
Puerto Rico	0	0	0	0	0	0	6,896,265
Rhode Island	0	8,670	0	0	0	0	1,057,340
South Carolina	0	445,454	0	252,673	159,675	0	19,539,513
South Dakota	0	0	0	0	0	0	146,540
Tennessee	0	112,382	0	0	89,297	1,500	17,289,229
Texas	0	4,250	646	11,789	28,735	11,261	74,152,590
Unknown	0	1	19,120	2,128	44,247	0	8,588,470
Utah	0	0	1,191	0	0	1,563	2,474,827
Vermont	0	0	0	0	0	0	16,322
Virgin Islands	0	0	0	0	0	0	0
Virginia	0	2,879,775	0	87,577	0	0	6,889,593
Washington	0	0	3,217,452	0	0	0	3,813,553
West Virginia	0	0	0	2,514,693	0	0	11,187,112
Wisconsin	0	0	0	0	29,412,631	0	40,061,373
Wyoming	0	0	0	0	0	85	3,331
TOTAL	0	10,619,158	4,179,723	11,325,233	38,377,567	17,418	913,052,163

APPENDIX I

Distribution of TRI Releases and Transfers by Industry, 1989

Table I-1. The Top Ten TRI Facilities for Total Releases and Transfers in Each Industry, 1989.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
12	20	Food	Kraft Food Ingredient Corp.	Memphis	TN	6,062,300	8.94
			Corn Products & Best Foods	Bedford Park	IL	4,780,400	7.05
			Star Enterprise Inc.	Port Arthur	TX	3,215,605	4.74
			Penford Products Co.	Cedar Rapids	IA	3,209,450	4.73
			Beatrice/Hunt-Wesson	Memphis	TN	2,590,448	3.82
			Cargill Inc.	Memphis	TN	2,129,109	3.14
			Heublein Inc.	Madera	CA	1,406,000	2.07
			Maui Pineapple Co. Ltd.	Kahului	HI	1,105,216	1.63
			A-B Contract Services Co.	Saint Louis	MO	1,070,450	1.58
			Cargill Inc.	Eddyville	IA	671,070	0.99
			SUBTOTAL			26,240,048	38.70
			TOTAL FOR INDUSTRY			67,803,337	100.00
22	21	Tobacco	Philip Morris USA	Richmond	VA	599,463	40.35
			Aristech Chemical Corp. (a)	Kenova	WV	536,657	36.12
			Liggett & Myers Tobacco Co.	Durham	NC	125,399	8.44
			Sullivan Paper Co.	West Springfield	MA	55,138	3.71
			Little Falls Color Print	Little Falls	NY	50,135	3.37
			Phillip Morris USA	Chester	VA	33,087	2.23
			Consolidated Cigar Corp.	Mc Adoo	PA	25,750	1.73
			Co-Plas Inc.	Fort Smith	AR	19,726	1.33
			American Tobacco Co.	Chester	VA	18,700	1.26
			Co-Plas Inc.	Atlanta	GA	6,176	0.42
			SUBTOTAL			1,470,231	98.96
			TOTAL FOR INDUSTRY			1,485,626	100.00
16	22	Textiles	Gencorp Polymer Products	Columbus	MS	4,031,360	8.75
			Graniteville Co.	Graniteville	SC	1,201,300	2.61
			Reeves Brothers Inc.	Spartanburg	SC	1,080,000	2.34
			Threads USA	Gastonia	NC	1,029,519	2.23
			JPS Automotive Products Co.	Greenville	SC	1,010,000	2.19
			Reeves Brothers Inc.	Rutherfordton	NC	957,750	2.08
			Queen Carpet	Dalton	GA	941,270	2.04
			Gencorp Co. Polymer Products	Toledo	OH	937,100	2.03
			Galaxy Carpet Mills Inc.	Dalton	GA	926,124	2.01
			Salem Carpet Mills Inc.	Chickamauga	GA	905,812	1.97
			SUBTOTAL			13,020,235	28.25
			TOTAL FOR INDUSTRY			46,081,356	100.00
21	23	Apparel	Geo W. Bellman & Co. Inc.	Adamstown	PA	173,024	8.40
			Glenmore Plastic Industries	Brooklyn	NY	166,250	8.07
			Buster Brown Apparel Inc.	Chattanooga	TN	150,000	7.28
			Sandusky Vinyl Products Corp.	Sandusky	OH	143,506	6.97
			Champion Products Inc.	Perry	NY	128,470	6.24
			Russell Corp.-Distribution	Marianna	FL	99,763	4.84
			Velcro USA Inc.	Manchester	NH	88,300	4.29
			Odell Co.	Watertown	MA	75,139	3.65
			Burrell Belting Co.	Skokie	IL	71,250	3.46
			Fl Aerospace Corp.	Columbus	OH	67,500	3.28
			SUBTOTAL			1,163,202	56.48
			TOTAL FOR INDUSTRY			2,059,373	100.00

Table I-1. Continued.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
18	24	Lumber	Andersen Corp.	Bayport	MN	1,709,516	4.52
			Homecrest Corp.	Goshen	IN	1,622,339	4.29
			Crystal Cabinet Works Inc.	Princeton	MN	1,147,967	3.03
			Sanderson Plumbing Products	Columbus	MS	1,081,376	2.86
			American Woodmark Corp.	Moorefield	WV	1,040,209	2.75
			Lionite Hardboard	Phillips	WI	751,990	1.99
			Schrock/WCI	Arthur	IL	660,023	1.74
			Merillat Industries_Inc.	Mount Jackson	VA	632,388	1.67
			Wood Fiber Industries	Danville	VA	556,532	1.47
			Rolscreen Co.	Pella	IA	529,850	1.40
			SUBTOTAL			9,732,190	25.73
			TOTAL FOR INDUSTRY			37,824,596	100.00
13	25	Furniture	Johnston Tombigbee Furniture	Columbus	MS	1,935,167	2.96
			Steelcase Inc.	Grand Rapids	MI	1,817,471	2.78
			Universal Bedroom Furniture	Morristown	TN	1,038,936	1.59
			Broyhill Furniture Ind. Inc.	Lenoir	NC	1,035,759	1.58
			Lane Co. Inc.	Altavista	VA	998,958	1.53
			Singer Furniture Co.	Lenoir	NC	799,000	1.22
			Kincaid Furniture Co. Inc.	Hudson	NC	724,324	1.11
			J. D. Bassett Mfg. Co.	Bassett	VA	671,913	1.03
			Bassett Superior Lines	Bassett	VA	630,429	0.96
			Allsteel Inc.	Aurora	IL	595,084	0.91
			SUBTOTAL			10,247,041	15.68
			TOTAL FOR INDUSTRY			65,369,507	100.00
4	26	Paper	Stone Container Corp.	Panama City	FL	9,152,660	2.92
			Weyerhaeuser Co.	Cosmopolis	WA	8,472,600	2.70
			Westvaco Corp.	Luke	MD	7,940,335	2.53
			ITT Rayonier Inc.	Fernandina Beach	FL	7,176,190	2.29
			St. Joe Forest Products Co.	Port Saint Joe	FL	7,099,500	2.27
			Boise Cascade Papers	Saint Helens	OR	6,985,349	2.23
			Stone Hopewell Inc.	Hopewell	VA	5,774,250	1.84
			ITT Rayonier Inc.	Port Angeles	WA	5,706,400	1.82
			Macon Kraft Inc.	Macon	GA	5,665,500	1.81
			Louisiana-Pacific Corp.	Samoa	CA	5,480,200	1.75
			SUBTOTAL			69,452,984	22.17
			TOTAL FOR INDUSTRY			313,254,241	100.00
14	27	Printing	R. R. Donnelley & Sons Co.	Warsaw	IN	4,163,554	6.83
			Ringier America Inc.	Corinth	MS	3,494,331	5.74
			R. R. Donnelley & Sons Co.	Gallatin	TN	2,469,408	4.05
			R. R. Donnelley & Sons Co.	Mattoon	IL	2,092,654	3.43
			Maxwell Communication Corp.	Broadview	IL	2,002,654	3.29
			Maxwell Communication Corp.	Glen Burnie	MD	1,806,520	2.97
			R. R. Donnelley & Sons Co.	Chicago	IL	1,600,943	2.63
			R. R. Donnelley & Sons	Lancaster	PA	1,559,970	2.56
			Maxwell Communications Corp.	Mount Morris	IL	1,537,550	2.52
			Standard Gravure Corp.	Louisville	KY	1,489,500	2.44
			SUBTOTAL			22,217,084	36.47
			TOTAL FOR INDUSTRY			60,923,661	100.00

Table I-1. Continued.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
1	28	Chemicals	Monsanto Co.	Alvin	TX	206,533,205	7.52
			American Cyanamid Co.	Westwego	LA	192,350,800	7.01
			Vulcan Chemicals	Wichita	KS	92,349,716	3.36
			Du Pont Beaumont Works	Beaumont	TX	88,094,984	3.21
			BP Chemicals	Port Lavaca	TX	65,543,672	2.39
			Du Pont	New Johnsonville	TN	57,022,345	2.08
			BP Chemicals Inc.	Lima	OH	56,731,350	2.07
			Atochem N.A.— Racon Facility	Wichita	KS	54,505,751	1.99
			Columbian Chemicals Co.	Saint Louis	MO	52,461,020	1.91
			Tennessee Eastman Co.	Kingsport	TN	45,253,659	1.65
			SUBTOTAL			910,846,502	33.17
			TOTAL FOR INDUSTRY			2,745,768,071	100.00
9	29	Petroleum	Amoco Oil Co.	Texas City	TX	14,217,928	13.79
			Citgo Petroleum Corp.	Lake Charles	LA	10,581,113	10.26
			Farmland Industries Inc.	Coffeyville	KS	5,899,771	5.72
			Mobil Oil Corp.	Chalmette	LA	4,697,970	4.56
			Exxon	Baytown	TX	2,203,450	2.14
			Davison Chem Div.	Cincinnati	OH	2,175,731	2.11
			Lyondell Petrochemical Co.	Houston	TX	2,147,172	2.08
			Koch Refining Co.	Saint Paul	MN	2,053,904	1.99
			Shell Wood River Mfg. Complex	Roxana	IL	1,808,846	1.75
			Amoco Oil Co.	Whiting	IN	1,724,131	1.67
			SUBTOTAL			47,510,016	46.07
			TOTAL FOR INDUSTRY			103,136,599	100.00
7	30	Plastics	Westinghouse Electric Corp.	Hampton	SC	8,303,320	4.27
			General Electric Co.	Coshocton	OH	5,629,704	2.89
			Teepak Inc.	Danville	IL	3,752,634	1.93
			3M Co.	Nevada	MO	3,677,722	1.89
			Goodyear Tire & Rubber Co.	Lincoln	NE	3,186,771	1.64
			O'Sullivan Corp.	Winchester	VA	3,164,496	1.63
			Baxter Healthcare Corp.	Johnson City	TN	2,760,022	1.42
			3M	Guin	AL	2,688,850	1.38
			Viskase Puerto Rico Corp.	Barceloneta	PR	2,642,750	1.36
			Viskase Corp.	Bedford Park	IL	2,565,050	1.32
			SUBTOTAL			38,371,319	19.73
			TOTAL FOR INDUSTRY			194,502,619	100.00
19	31	Leather	Eagle Ottawa Leather Co.	Grand Haven	MI	3,618,750	14.56
			S.B. Foot Tanning Co.	Cactus	TX	1,966,648	7.91
			Prime Tanning Co. Inc.	Berwick	ME	1,447,676	5.82
			Seton Co.	Newark	NJ	1,314,500	5.29
			Lackawanna Leather Co.	Omaha	NE	1,288,714	5.18
			Pfister & Vogel Tanning Co.	Milwaukee	WI	1,119,114	4.50
			Gebhardt-Vogel Tanning Co.	Milwaukee	WI	1,031,750	4.15
			Garden State Tanning	Fleetwood	PA	984,877	3.96
			Twin City Tanning	South Saint Paul	MN	815,468	3.28
			Eagle Tanning Co.	Waterloo	IA	774,244	3.11
			SUBTOTAL			14,361,741	57.77
			TOTAL FOR INDUSTRY			24,861,979	100.00

Table I-1. Continued.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
15	32	Stone/Clay	Harshaw Chemical Co.	Jackson	MS	6,306,550	13.28
			Coplay Cement Co.	Logansport	IN	2,877,030	6.06
			Dana Corp.	Robinson	IL	2,564,880	5.40
			Reynolds Metals Co.	Sheffield	AL	2,341,800	4.93
			Corning Inc.	Corning	NY	1,959,120	4.13
			Corning	Canton	NY	1,402,301	2.95
			Nutum Corp.	Smithville	TN	1,300,655	2.74
			Owens-Corning Fiberglas	Newark	OH	1,275,524	2.69
			3M	Prairie Du Chien	WI	1,071,050	2.26
			North American Refractories	Gary	IN	880,050	1.85
			SUBTOTAL			21,978,960	46.29
			TOTAL FOR INDUSTRY			47,485,910	100.00
2	33	Primary Metals	Magnesium Corp. of America	Tooele	UT	119,060,425	15.73
			Asarco Inc.	East Helena	MT	36,615,059	4.84
			National Steel Corp.	Portage	IN	24,586,030	3.25
			Phelps Dodge Mining Co.	Playas	NM	20,847,699	2.75
			National Steel	Ecorse	MI	17,562,820	2.32
			Herculaneum Smelter	Herculaneum	MO	17,110,851	2.26
			Asarco Inc.	Hayden	AZ	16,574,800	2.19
			Copper Range Co.	White Pine	MI	16,330,870	2.16
			Kennecott Utah Copper	Bingham Canyon	UT	15,473,300	2.04
			Cyprus Miami Mining Corp.	Claypool	AZ	13,660,904	1.81
			SUBTOTAL			297,822,758	39.35
			TOTAL FOR INDUSTRY			756,808,577	100.00
6	34	Fabr. Metals	Double Eagle Steel Coating Co.	Dearborn	MI	3,387,420	1.63
			Texas Chromium Corp.	Lufkin	TX	2,428,933	1.17
			Lake Erie Screw Corp.	Lakewood	OH	2,400,750	1.16
			Crown Cork & Seal Co. Inc.	Winchester	VA	1,953,850	0.94
			Crown Cork & Seal Co. Inc.	Cheraw	SC	1,548,000	0.75
			Rogers Galvanizing Co.	Tulsa	OK	1,464,376	0.71
			Reynolds Metals Co.	Houston	TX	1,443,118	0.70
			Visionmark Inc.	Sidney	OH	1,422,000	0.69
			Chromium Corp.	Cleveland	OH	1,348,451	0.65
			St. Mary Galvanizing Co.	Morgan City	LA	1,257,559	0.61
			SUBTOTAL			18,654,457	9.00
			TOTAL FOR INDUSTRY			207,383,999	100.00
10	35	Machinery	Heatcraft Inc.	Grenada	MS	2,510,357	3.35
			Lincoln Electric Co.	Cleveland	OH	1,708,977	2.28
			UNC Naval Products	Uncasville	CT	1,124,140	1.50
			Acustar Dayton Thermal	Dayton	OH	1,115,619	1.49
			3M	Charles Town	WV	1,015,110	1.35
			Briggs & Stratton Corp.	Milwaukee	WI	986,512	1.32
			Munters Corp.	Fort Myers	FL	922,592	1.23
			Rockwell Graphic Systems	Cedar Rapids	IA	884,228	1.18
			Lennox Industries Inc.	Fort Worth	TX	798,068	1.07
			Brunswick Marine Power	Stillwater	OK	786,250	1.05
			SUBTOTAL			11,851,853	15.82
			TOTAL FOR INDUSTRY			74,922,470	100.00

Table I-1. Continued.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
8	36	Electrical	Motorola Inc.	Mesa	AZ	2,761,986	1.89
			GTE Products Corp.	Versailles	KY	2,387,813	1.64
			Philips Display Components Co.	Ottawa	OH	2,240,100	1.54
			Delco Electronics Corp.	Kokomo	IN	2,225,044	1.53
			Norplex Oak-Franklin	Franklin	IN	2,160,000	1.48
			Motorola Inc.	Austin	TX	1,988,274	1.36
			Motorola Inc.	Phoenix	AZ	1,927,035	1.32
			American Microsystems Inc.	Pocatello	ID	1,802,660	1.24
			Sony Magnetic Products Inc.	Dothan	AL	1,795,457	1.23
			Whirlpool Corp.	Fort Smith	AR	1,779,900	1.22
			SUBTOTAL			21,068,269	14.45
			TOTAL FOR INDUSTRY			145,758,174	100.00
5	37	Transportation	Honda of America Mfg. Inc.	Marysville	OH	5,486,845	2.24
			General Motors Corp.	Monroe	LA	3,663,508	1.49
			General Motors Corp.	Pontiac	MI	3,295,300	1.34
			Ford Motor Co.	Utica	MI	3,281,905	1.34
			Ford Motor Co.	Claycomo	MO	2,720,023	1.11
			BOC-Lansing Automotive Div.	Lansing	MI	2,701,245	1.10
			Nissan Motor Manufacturing	Smyma	TN	2,697,270	1.10
			Sterling Hts. Assembly Plant	Sterling Heights	MI	2,691,784	1.10
			Ford Elecronics	Connersville	IN	2,655,540	1.08
			General Motors Corp.	Dayton	OH	2,613,332	1.07
			SUBTOTAL			31,806,752	12.97
			TOTAL FOR INDUSTRY			245,316,145	100.00
11	38	Measure./Photo.	Eastman Kodak Co.	Rochester	NY	18,123,187	26.06
			Du Pont Towanda Plant	Towanda	PA	10,555,545	15.18
			3M Co. Visual Systems Div.	Hartford City	IN	5,091,010	7.32
			Anitec Image Corp.	Binghamton	NY	4,785,588	6.88
			Polaroid Corp.	Waltham	MA	2,696,035	3.88
			Kodak Colorado Div.	Windsor	CO	1,024,735	1.47
			Vision Ease	Fort Lauderdale	FL	900,290	1.29
			Xerox Corp.	Oklahoma City	OK	851,035	1.22
			Du Pont	Parlin	NJ	779,550	1.12
			Eastman Kodak Co.	Rochester	NY	759,428	1.09
			SUBTOTAL			45,566,403	65.53
			TOTAL FOR INDUSTRY			69,535,397	100.00
17	39	Miscellaneous	Tricil Recovery Services Inc.	Bartow	FL	6,263,338	16.11
			Hexcel Corp.	Casa Grande	AZ	2,231,040	5.74
			Armstrong World Industries	Lancaster	PA	1,432,436	3.68
			Lamotite	Cleveland	OH	1,315,124	3.38
			Resilite Sports Products Inc.	Northumberland	PA	1,197,426	3.08
			Ner Data Products Inc.	Blytheville	AR	1,149,167	2.96
			William Prym Inc.	Dayville	CT	1,124,045	2.89
			Batesville Casket Co.	Batesville	IN	831,099	2.14
			Congoleum Corp.	Marcus Hook	PA	753,929	1.94
			Ner Data Products Inc.	Des Moines	IA	695,980	1.79
			SUBTOTAL			16,993,584	43.70
			TOTAL FOR INDUSTRY			38,886,447	100.00

Table I-1. Continued.

TRI RANK	SIC CODE	INDUSTRY	FACILITY	CITY	STATE	TOTAL RELEASES AND TRANSFERS Pounds	Percent
3	MULT.	Multiple codes 20-39	Inland Steel Co.	East Chicago	IN	57,273,300	13.10
			3M Consumer AV & Consumer Prod.	Hutchinson	MN	28,998,967	6.63
			Elkem Metals Co.	Marietta	OH	15,771,470	3.61
			Union Camp Corp.	Savannah	GA	13,463,088	3.08
			Westvaco Corp	Covington	VA	10,165,680	2.32
			Star Enterprise	Convent	LA	10,109,645	2.31
			3M Chemolite Center	Cottage Grove	MN	9,820,143	2.25
			Imc Fertilizer Inc.	Mulberry	FL	9,663,500	2.21
			Kerr-Mcgee Chemical Corp.	Hamilton	MS	9,118,563	2.09
			Monsanto Co.	Springfield	MA	8,043,889	1.84
			SUBTOTAL			172,428,245	39.43
			TOTAL FOR INDUSTRY			437,278,275	100.00
20	NONE	No codes 20-39	Oxychem	Niagara Falls	NY	4,500,524	23.41
			Citizens Gas & Coke Utility	Indianapolis	IN	1,646,747	8.57
			PPM Inc.	Philadelphia	PA	1,265,650	6.58
			General Motors Corp.	Linden	NJ	1,228,315	6.39
			3M Co.	Weatherford	OK	1,141,798	5.94
			Ganes Chemical Inc.	Pennsville	NJ	1,003,850	5.22
			U.S. Dept. of Energy	Kansas City	MO	629,224	3.27
			Harvard Industries Inc.	Bucyrus	OH	559,455	2.91
			American Cyanamid Co.	Stamford	CT	449,690	2.34
			Unison Transformer Services	Henderson	KY	448,830	2.33
			SUBTOTAL			12,874,083	66.97
			TOTAL FOR INDUSTRY			19,224,021	100.00

(a) Aristech has submitted a revision to TRI regarding their SIC code for the 1989 reporting. The correct SIC code is SIC 28 (Chemicals).

Table I-2. The Ten Chemicals with the Largest TRI Releases and Transfers in Each Industry, 1989.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS	
			Pounds	Percent
20	Food	Ammonia	18,962,651	27.97
		Ammonium sulfate (solution)	17,989,985	26.53
		Phosphoric acid	8,096,067	11.94
		Sulfuric acid	4,645,757	6.85
		Ethylene glycol	3,919,830	5.78
		Nitric acid	2,936,391	4.33
		Chlorine	1,891,167	2.79
		Acetone	1,257,737	1.85
		Methanol	914,037	1.35
		Acetaldehyde	848,622	1.25
		SUBTOTAL	61,462,244	90.65
		TOTAL FOR INDUSTRY	67,803,337	100.00
21	Tobacco	Ammonia	632,347	42.56
		Propylene	536,000	36.08
		Toluene	176,563	11.88
		Acetone	46,674	3.14
		Chlorine	30,706	2.07
		Styrene	28,997	1.95
		Zinc compounds	14,489	0.98
		2-Ethoxyethanol	7,685	0.52
		Dibutyl phthalate	5,000	0.34
		Barium compounds	4,800	0.32
		SUBTOTAL	1,483,261	99.84
		TOTAL FOR INDUSTRY	1,485,626	100.00
22	Textiles	Methyl ethyl ketone	7,702,570	16.72
		1,1,1-Trichloroethane	4,677,849	10.15
		Toluene	4,540,924	9.85
		Methanol	4,504,836	9.78
		Ammonium sulfate (solution)	3,159,201	6.86
		Ammonia	2,774,261	6.02
		Xylene (mixed isomers)	2,691,098	5.84
		Phosphoric acid	2,386,933	5.18
		Acetone	2,290,184	4.97
		Tetrachloroethylene	2,021,929	4.39
		SUBTOTAL	36,749,785	79.75
		TOTAL FOR INDUSTRY	46,081,356	100.00
23	Apparel	1,1,1-Trichloroethane	380,233	18.46
		Methyl ethyl ketone	237,100	11.51
		Toluene	213,297	10.36
		Dichloromethane	157,079	7.63
		Acetone	156,858	7.62
		Sulfuric acid	135,250	6.57
		Xylene (mixed isomers)	131,244	6.37
		Tetrachloroethylene	120,852	5.87
		Manganese compounds	115,505	5.61
		Chlorine	67,275	3.27
		SUBTOTAL	1,714,693	83.26
		TOTAL FOR INDUSTRY	2,059,373	100.00

Table I-2. Continued.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
24	Lumber	Xylene (mixed isomers)	8,229,284	21.76
		Toluene	8,197,656	21.67
		Formaldehyde	4,559,607	12.05
		Methyl ethyl ketone	2,791,419	7.38
		Acetone	1,726,581	4.56
		Methanol	1,624,465	4.29
		Total for Mixtures	1,624,004	4.29
		Methyl isobutyl ketone	1,451,803	3.84
		Ammonia	1,181,778	3.12
		n-Butyl alcohol	991,106	2.62
		SUBTOTAL	32,377,703	85.60
		TOTAL FOR INDUSTRY	37,824,596	100.00
25	Furniture	Toluene	18,222,706	27.88
		Xylene (mixed isomers)	12,037,098	18.41
		Methanol	10,748,311	16.44
		Methyl ethyl ketone	6,034,857	9.23
		Acetone	5,438,695	8.32
		1,1,1-Trichloroethane	3,307,205	5.06
		n-Butyl alcohol	2,746,109	4.20
		Methyl isobutyl ketone	2,449,943	3.75
		Glycol ethers	1,483,799	2.27
		Isopropyl alcohol (mfg.-- strong acid process)	493,450	0.75
		SUBTOTAL	62,962,173	96.32
		TOTAL FOR INDUSTRY	65,369,507	100.00
26	Paper	Methanol	118,334,484	37.78
		Toluene	36,055,332	11.51
		Hydrochloric acid	27,038,003	8.63
		Sulfuric acid	23,312,163	7.44
		Chloroform	20,490,608	6.54
		Acetone	17,751,587	5.67
		Ammonium sulfate (solution)	13,064,014	4.17
		Chlorine	10,024,514	3.20
		Methyl ethyl ketone	8,244,205	2.63
		Chlorine dioxide	6,137,251	1.96
		SUBTOTAL	280,452,161	89.53
		TOTAL	313,254,241	100.00
27	Printing	Toluene	42,789,389	70.23
		1,1,1-Trichloroethane	4,522,055	7.42
		Methyl ethyl ketone	3,906,677	6.41
		Xylene (mixed isomers)	2,004,817	3.29
		Glycol ethers	1,893,662	3.11
		Isopropyl alcohol (mfg.-- strong acid process)	1,241,327	2.04
		Acetone	863,576	1.42
		Methanol	822,857	1.35
		Dichloromethane	351,262	0.58
		Methyl isobutyl ketone	328,537	0.54
		SUBTOTAL	58,724,159	96.39
		TOTAL FOR INDUSTRY	60,923,661	100.00

Table I-2. Continued.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
28	Chemicals	Ammonium sulfate (solution)	679,801,071	24.76
		Hydrochloric acid	388,719,617	14.16
		Ammonia	249,226,683	9.08
		Methanol	183,822,306	6.69
		Sulfuric acid	159,661,072	5.81
		Acetone	119,385,491	4.35
		Carbon disulfide	86,364,204	3.15
		Toluene	70,170,774	2.56
		Phosphoric acid	69,769,025	2.54
		Ammonium nitrate (solution)	69,059,759	2.52
		SUBTOTAL	2,075,980,002	75.61
		TOTAL FOR INDUSTRY	2,745,768,071	100.00
29	Petroleum	Ammonia	35,906,702	34.81
		Toluene	12,151,551	11.78
		Xylene (mixed isomers)	7,758,193	7.52
		Propylene	6,224,680	6.04
		Benzene	4,685,674	4.54
		Ethylene	4,073,622	3.95
		Methyl ethyl ketone	3,652,527	3.54
		Phenol	2,958,555	2.87
		Ammonium sulfate (solution)	2,631,984	2.55
		1,2,4-Trimethylbenzene	2,189,894	2.12
		SUBTOTAL	82,233,382	79.73
		TOTAL FOR INDUSTRY	103,136,599	100.00
30	Plastics	Acetone	30,025,055	15.44
		Dichloromethane	25,802,067	13.27
		Toluene	23,102,515	11.88
		Methyl ethyl ketone	18,430,608	9.48
		Methanol	17,367,847	8.93
		1,1,1-Trichloroethane	13,896,282	7.14
		Carbon disulfide	13,126,985	6.75
		Styrene	10,404,661	5.35
		Xylene (mixed isomers)	6,557,946	3.37
		Zinc compounds	4,266,003	2.19
		SUBTOTAL	162,979,969	83.79
		TOTAL FOR INDUSTRY	194,502,619	100.00
31	Leather	Ammonium sulfate (solution)	5,425,972	21.82
		Toluene	3,620,225	14.56
		Ammonia	2,894,226	11.64
		Methyl ethyl ketone	2,882,455	11.59
		Acetone	2,171,883	8.74
		Glycol ethers	1,708,104	6.87
		Chromium compounds	1,106,402	4.45
		Xylene (mixed isomers)	1,009,682	4.06
		Methyl isobutyl ketone	971,886	3.91
		Manganese compounds	642,700	2.59
		SUBTOTAL	22,433,535	90.23
		TOTAL	24,861,979	100.00

Table I-2. Continued.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
32	Stone/Clay	Sulfuric acid	6,720,479	14.15
		Lead compounds	3,898,600	8.21
		Toluene	3,088,455	6.50
		Ammonia	2,945,635	6.20
		Total for Mixtures	2,944,020	6.20
		Asbestos (friable)	2,694,619	5.67
		Hydrochloric acid	2,334,393	4.92
		Formaldehyde	2,225,490	4.69
		Methanol	1,803,316	3.80
		Chromium compounds	1,769,850	3.73
		SUBTOTAL	30,424,857	64.07
		TOTAL	47,485,910	100.00
33	Primary Metals	Zinc compounds	127,313,136	16.82
		Chlorine	114,942,545	15.19
		Sulfuric acid	69,731,409	9.21
		Manganese compounds	48,953,818	6.47
		Zinc (fume or dust)	47,524,362	6.28
		Copper compounds	45,095,697	5.96
		Hydrochloric acid	36,664,016	4.84
		1,1,1-Trichloroethane	22,082,940	2.92
		Lead compounds	21,858,099	2.89
		Manganese	21,472,088	2.84
		SUBTOTAL	555,638,110	73.42
		TOTAL	756,808,577	100.00
34	Fabr. Metals	1,1,1-Trichloroethane	24,039,798	11.59
		Glycol ethers	22,056,262	10.64
		Sulfuric acid	21,490,124	10.36
		Xylene (mixed isomers)	18,576,778	8.96
		n-Butyl alcohol	13,343,558	6.43
		Trichloroethylene	12,239,131	5.90
		Methyl ethyl ketone	11,664,019	5.62
		Toluene	11,634,320	5.61
		Hydrochloric acid	10,868,895	5.24
		Zinc compounds	7,525,686	3.63
		SUBTOTAL	153,438,571	73.99
		TOTAL	207,383,999	100.00
35	Machinery	1,1,1-Trichloroethane	16,720,224	22.32
		Xylene (mixed isomers)	8,655,031	11.55
		Freon 113	7,491,315	10.00
		Trichloroethylene	7,189,550	9.60
		Toluene	5,145,074	6.87
		Methyl ethyl ketone	2,360,465	3.15
		Sulfuric acid	2,171,600	2.90
		Chromium	2,136,408	2.85
		Dichloromethane	1,903,532	2.54
		Nitric acid	1,716,432	2.29
		SUBTOTAL	55,489,631	74.06
		TOTAL	74,922,470	100.00

Table I-2. Continued.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
36	Electrical	1,1,1-Trichloroethane	20,946,321	14.37
		Freon 113	19,287,519	13.23
		Xylene (mixed isomers)	15,161,270	10.40
		Dichloromethane	9,170,339	6.29
		Sulfuric acid	8,640,177	5.93
		Acetone	8,513,166	5.84
		Toluene	5,943,189	4.08
		Trichloroethylene	5,516,372	3.78
		Glycol ethers	5,047,653	3.46
		Ammonium sulfate (solution)	4,879,034	3.35
		SUBTOTAL	103,105,040	70.74
		TOTAL	145,758,174	100.00
37	Transportation	Xylene (mixed isomers)	42,652,452	17.39
		1,1,1-Trichloroethane	33,595,538	13.69
		Acetone	23,808,311	9.71
		Toluene	18,696,192	7.62
		Methyl ethyl ketone	14,755,978	6.02
		Glycol ethers	12,594,929	5.13
		Styrene	12,333,667	5.03
		Freon 113	10,030,502	4.09
		n-Butyl alcohol	9,481,022	3.86
		Methyl isobutyl ketone	8,309,417	3.39
		SUBTOTAL	186,258,008	75.93
		TOTAL	245,316,145	100.00
38	Measure./Photo.	Dichloromethane	21,122,582	30.38
		Methanol	8,841,364	12.71
		Freon 113	8,743,651	12.57
		Acetone	8,535,825	12.28
		1,1,1-Trichloroethane	4,680,641	6.73
		Toluene	3,484,051	5.01
		Methyl ethyl ketone	2,154,911	3.10
		Trichloroethylene	1,092,691	1.57
		Xylene (mixed isomers)	1,055,202	1.52
		Sulfuric acid	760,763	1.09
		SUBTOTAL	60,471,681	86.97
		TOTAL	69,535,397	100.00
39	Miscellaneous	Toluene	7,972,183	20.50
		Acetone	5,900,746	15.17
		Methyl ethyl ketone	4,951,099	12.73
		1,1,1-Trichloroethane	3,904,689	10.04
		Xylene (mixed isomers)	2,667,587	6.86
		Dichloromethane	2,246,821	5.78
		Trichloroethylene	1,721,975	4.43
		Nickel compounds	1,196,941	3.08
		Methanol	843,183	2.17
		Freon 113	680,307	1.75
		SUBTOTAL	32,085,531	82.51
		TOTAL	38,886,447	100.00

Table I-2. Continued.

SIC CODE	INDUSTRY	CHEMICAL	TOTAL RELEASES AND TRANSFERS Pounds	Percent
MULT.	Multiple codes 20-39	Manganese compounds	52,838,721	12.08
		Methanol	43,165,851	9.87
		Methyl ethyl ketone	39,807,285	9.10
		Toluene	39,718,420	9.08
		Ammonia	31,634,605	7.23
		Acetone	19,871,522	4.54
		1,1,1-Trichloroethane	19,350,588	4.43
		Hydrochloric acid	16,399,700	3.75
		Dichloromethane	14,633,954	3.35
		Sulfuric acid	12,408,314	2.84
		SUBTOTAL	289,828,960	66.28
		TOTAL	437,278,275	100.00
NONE	No codes 20-39	Hydrochloric acid	4,685,936	24.38
		Polychlorinated biphenyls (PCBs)	2,233,202	11.62
		Toluene	1,433,478	7.46
		Xylene (mixed isomers)	1,335,569	6.95
		Ammonia	1,246,912	6.49
		Methanol	907,814	4.72
		Methyl ethyl ketone	835,469	4.35
		Acetone	801,322	4.17
		1,1,1-Trichloroethane	781,691	4.07
		Sulfuric acid	337,983	1.76
		SUBTOTAL	14,599,376	75.94
		TOTAL	19,224,021	100.00

Table I-3. TRI Releases and Transfers within Each Industry of the Top 25 Chemicals, 1989.

TRI RANK	CHEMICAL	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent	FURNITURE SIC 25 Percent
1	Ammonium sulfate (solution)	26.53	0.00	6.86	0.70	0.12	0.00
2	Hydrochloric acid	1.19	0.00	0.12	0.00	0.04	0.08
3	Methanol	1.35	0.00	9.78	0.12	4.29	16.44
4	Ammonia	27.97	42.56	6.02	1.53	3.12	0.04
5	Toluene	1.20	11.88	9.85	10.36	21.67	27.88
6	Sulfuric acid	6.85	0.01	2.33	6.57	0.21	0.23
7	Acetone	1.85	3.14	4.97	7.62	4.56	8.32
8	Xylene (mixed isomers)	0.22	0.00	5.84	6.37	21.76	18.41
9	1,1,1-Trichloroethane	0.12	0.02	10.15	18.46	0.77	5.06
10	Zinc compounds	0.27	0.98	0.12	0.44	0.00	0.02
11	Methyl ethyl ketone	1.03	0.00	16.72	11.51	7.38	9.23
12	Chlorine	2.79	2.07	1.73	3.27	0.01	0.00
13	Dichloromethane	0.66	0.00	1.01	7.63	0.54	0.45
14	Manganese compounds	0.03	0.00	0.02	5.61	0.03	0.00
15	Carbon disulfide	0.00	0.00	0.00	0.00	0.00	0.00
16	Phosphoric acid	11.94	0.00	5.18	2.70	0.61	0.24
17	Nitric acid	4.33	0.00	0.00	0.01	0.00	0.05
18	Ammonium nitrate (solution)	0.07	0.00	0.04	0.00	0.00	0.00
19	Freon 113	0.26	0.00	0.57	0.00	0.05	0.00
20	Glycol ethers	0.31	0.05	0.76	0.17	1.11	2.27
21	Ethylene glycol	5.78	0.00	1.92	0.62	0.32	0.04
22	Zinc (fume or dust)	0.03	0.00	0.00	0.00	0.01	0.02
23	Copper compounds	0.34	0.00	0.03	0.06	0.36	0.02
24	Chromium compounds	0.00	0.00	0.08	0.00	0.44	0.01
25	n-Butyl alcohol	0.23	0.00	0.14	0.00	2.62	4.20
	SUBTOTAL	95.35	60.71	84.23	83.74	70.05	93.01
	TOTAL FOR ALL OTHERS	4.65	39.29	15.77	16.26	29.95	6.99
	GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Table I-3. Continued.

TRI RANK	CHEMICAL	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent	LEATHER SIC 31 Percent
1	Ammonium sulfate (solution)	4.17	0.31	24.76	2.55	1.88	21.82
2	Hydrochloric acid	8.63	0.00	14.16	0.43	0.18	0.00
3	Methanol	37.78	1.35	6.69	1.60	8.93	0.20
4	Ammonia	1.90	0.23	9.08	34.81	1.29	11.64
5	Toluene	11.51	70.23	2.56	11.78	11.88	14.56
6	Sulfuric acid	7.44	0.02	5.81	0.47	0.16	1.52
7	Acetone	5.67	1.42	4.35	0.19	15.44	8.74
8	Xylene (mixed isomers)	1.01	3.29	1.20	7.52	3.37	4.06
9	1,1,1-Trichloroethane	1.00	7.42	0.26	0.28	7.14	1.27
10	Zinc compounds	0.77	0.02	0.34	0.35	2.19	0.00
11	Methyl ethyl ketone	2.63	6.41	0.54	3.54	9.48	11.59
12	Chlorine	3.20	0.00	0.40	0.21	0.13	0.01
13	Dichloromethane	0.23	0.58	1.40	0.00	13.27	0.92
14	Manganese compounds	0.01	0.00	0.53	0.13	0.00	2.59
15	Carbon disulfide	0.06	0.00	3.15	0.37	6.75	0.00
16	Phosphoric acid	0.01	0.01	2.54	1.32	0.07	0.30
17	Nitric acid	0.01	0.52	1.59	0.00	0.05	0.00
18	Ammonium nitrate (solution)	0.41	0.00	2.52	0.00	0.00	0.00
19	Freon 113	0.00	0.03	0.11	0.02	1.16	0.00
20	Glycol ethers	0.38	3.11	0.35	0.12	0.79	6.87
21	Ethylene glycol	0.80	0.34	1.24	0.44	0.50	0.00
22	Zinc (fume or dust)	0.93	0.11	0.01	0.80	0.04	0.00
23	Copper compounds	0.01	0.13	0.16	0.04	0.05	0.00
24	Chromium compounds	0.07	0.60	0.84	0.46	0.08	4.45
25	n-Butyl alcohol	0.14	0.12	0.49	0.02	0.62	0.98
	SUBTOTAL	88.05	95.72	85.06	66.74	85.45	91.53
	TOTAL FOR ALL OTHERS	11.95	4.28	14.94	33.26	14.55	8.47
	GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Table I-3. Continued.

TRI RANK	CHEMICAL	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent	TRANSPORT. SIC 37 Percent
1	Ammonium sulfate (solution)	1.45	1.14	0.43	0.00	3.35	0.00
2	Hydrochloric acid	4.92	4.84	5.24	1.53	1.73	1.29
3	Methanol	3.80	0.40	0.32	1.30	2.00	2.09
4	Ammonia	6.20	2.15	0.36	0.60	1.81	0.21
5	Toluene	6.50	0.71	5.61	6.87	4.08	7.62
6	Sulfuric acid	14.15	9.21	10.36	2.90	5.93	2.34
7	Acetone	1.10	0.10	2.07	1.59	5.84	9.71
8	Xylene (mixed isomers)	3.15	0.64	8.96	11.55	10.40	17.39
9	1,1,1-Trichloroethane	1.71	2.92	11.59	22.32	14.37	13.69
10	Zinc compounds	1.30	16.82	3.63	0.39	1.27	0.66
11	Methyl ethyl ketone	2.26	0.87	5.62	3.15	2.36	6.02
12	Chlorine	0.01	15.19	0.06	0.03	0.08	0.10
13	Dichloromethane	3.63	0.23	1.87	2.54	6.29	2.70
14	Manganese compounds	0.34	6.47	0.05	1.35	0.63	0.60
15	Carbon disulfide	0.18	0.00	0.00	0.00	0.00	0.00
16	Phosphoric acid	0.43	0.30	1.23	0.50	0.63	0.22
17	Nitric acid	0.09	1.45	2.57	2.29	1.43	1.54
18	Ammonium nitrate (solution)	1.80	0.04	0.00	0.00	0.45	0.00
19	Freon 113	0.28	0.16	2.11	10.00	13.23	4.09
20	Glycol ethers	1.26	0.14	10.64	2.22	3.46	5.13
21	Ethylene glycol	1.12	0.73	0.43	0.83	0.77	0.88
22	Zinc (fume or dust)	0.60	6.28	1.63	0.28	0.32	0.06
23	Copper compounds	0.01	5.96	0.46	0.39	0.59	0.16
24	Chromium compounds	3.73	1.83	0.87	1.03	0.17	0.56
25	n-Butyl alcohol	0.30	0.05	6.43	0.77	0.96	3.86
SUBTOTAL		59.79	78.64	82.55	74.42	82.16	80.38
TOTAL FOR ALL OTHERS		40.21	21.36	17.45	25.58	17.84	19.62
GRAND TOTAL		100.00	100.00	100.00	100.00	100.00	100.00

Table I-3. Continued.

TRI RANK	CHEMICAL	MEASURE./PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODES 20-39 Percent	NO CODES 20-39 Percent	TOTAL Percent
1	Ammonium sulfate (solution)	0.19	0.15	2.12	0.85	13.16
2	Hydrochloric acid	0.23	0.50	3.75	24.38	8.69
3	Methanol	12.71	2.17	9.87	4.72	7.15
4	Ammonia	0.43	0.61	7.23	6.49	6.61
5	Toluene	5.01	20.50	9.08	7.46	5.65
6	Sulfuric acid	1.09	0.39	2.84	1.76	5.58
7	Acetone	12.28	15.17	4.54	4.17	4.48
8	Xylene (mixed isomers)	1.52	6.86	2.81	6.95	3.25
9	1,1,1-Trichloroethane	6.73	10.04	4.43	4.07	3.24
10	Zinc compounds	0.43	0.59	1.89	0.36	2.89
11	Methyl ethyl ketone	3.10	12.73	9.10	4.35	2.75
12	Chlorine	0.02	0.01	0.35	0.83	2.48
13	Dichloromethane	30.38	5.78	3.35	1.29	2.28
14	Manganese compounds	0.37	0.01	12.08	0.01	2.10
15	Carbon disulfide	0.00	0.00	0.00	0.00	1.76
16	Phosphoric acid	0.35	0.21	2.09	0.29	1.73
17	Nitric acid	0.16	0.33	0.83	0.54	1.31
18	Ammonium nitrate (solution)	0.10	0.00	0.23	0.00	1.28
19	Freon 113	12.57	1.75	2.22	1.66	1.19
20	Glycol ethers	0.36	1.20	0.76	0.89	1.15
21	Ethylene glycol	0.91	0.17	1.19	0.43	1.01
22	Zinc (fume or dust)	0.02	0.28	0.46	0.18	1.01
23	Copper compounds	0.40	0.02	0.36	0.03	0.95
24	Chromium compounds	0.05	0.41	1.30	0.10	0.89
25	n-Butyl alcohol	0.54	1.17	0.98	1.20	0.88
	SUBTOTAL	89.96	81.06	83.87	72.99	83.48
	TOTAL FOR ALL OTHERS	10.04	18.94	16.13	27.01	16.52
	GRAND TOTAL	100.00	100.00	100.00	100.00	100.00

Table I-4. TRI Releases and Transfers within Each Industry of the Top 25 Carcinogens, 1989.

CARC. RANK	CHEMICAL	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent	FURNITURE SIC 25 Percent
1	Dichloromethane	33.23	0.00	13.21	54.95	3.73	18.97
2	Styrene	0.06	100.00	0.73	0.00	2.68	7.69
3	Tetrachloroethylene	0.00	0.00	57.30	42.28	2.53	0.88
4	Formaldehyde	0.13	0.00	19.71	0.00	83.11	17.83
5	Benzene	4.75	0.00	0.00	0.00	0.06	0.00
6	Chloroform	6.06	0.00	0.00	0.00	0.00	0.00
7	Lead	2.30	0.00	0.11	0.00	0.00	0.80
8	Chromium	3.33	0.00	0.00	0.00	0.40	0.16
9	Acrylonitrile	0.00	0.00	0.00	0.00	0.00	0.00
10	1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00
11	Nickel	4.59	0.00	0.00	0.00	0.00	0.48
12	Asbestos (friable)	0.00	0.00	0.00	0.00	0.00	0.00
13	Isopropyl alcohol (mfg.-strong acid process)	3.46	0.00	2.91	0.00	5.46	32.00
14	1,3-Butadiene	0.46	0.00	0.00	0.00	0.00	0.00
15	Acrylamide	0.00	0.00	0.00	0.00	0.00	0.00
16	Carbon tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00
17	Polychlorinated biphenyls (PCBs)	0.00	0.00	1.42	0.00	0.96	0.00
18	Di-(2-ethylhexyl) phthalate	0.00	0.00	2.47	2.77	0.42	21.67
19	Ethylene oxide	14.05	0.00	0.01	0.00	0.00	0.00
20	Propylene oxide	22.73	0.00	0.00	0.00	0.00	0.02
21	1,4-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00
22	1,4-Dioxane	0.00	0.00	0.00	0.00	0.24	0.00
23	Epichlorohydrin	0.04	0.00	0.00	0.00	0.00	0.00
24	Hexachlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00
25	Vinyl chloride	0.00	0.00	0.00	0.00	0.00	0.00
	SUBTOTAL	95.19	100.00	97.87	100.00	99.59	99.79
	TOTAL FOR ALL CARCINOGENS	100.00	100.00	100.00	100.00	100.00	100.00

Table I-4. Continued.

CARC. RANK	CHEMICAL	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent	LEATHER SIC 31 Percent
1	Dichloromethane	2.84	18.95	28.23	0.07	63.17	24.57
2	Styrene	0.17	1.49	9.04	0.37	25.47	0.00
3	Tetrachloroethylene	0.80	10.57	1.92	0.40	2.41	18.01
4	Formaldehyde	4.46	0.00	13.31	1.11	0.62	0.11
5	Benzene	0.00	0.00	7.51	71.34	0.00	0.00
6	Chloroform	80.80	0.00	2.92	0.00	0.05	0.00
7	Lead	0.00	0.30	0.10	0.64	1.22	0.00
8	Chromium	0.14	0.15	0.21	4.52	0.03	54.90
9	Acrylonitrile	0.00	0.00	8.70	0.00	0.00	0.00
10	1,2-Dichloroethane	0.00	0.00	5.49	0.18	0.15	0.00
11	Nickel	0.00	0.02	0.18	2.16	0.13	0.03
12	Asbestos (friable)	5.62	0.00	0.97	16.92	0.40	0.00
13	Isopropyl alcohol (mfg.- strong acid process)	1.86	66.97	0.84	0.01	1.15	0.00
14	1,3-Butadiene	0.00	0.00	3.92	1.14	0.01	0.00
15	Acrylamide	0.00	0.00	3.40	0.00	0.00	0.00
16	Carbon tetrachloride	0.00	0.00	3.19	0.42	0.00	0.00
17	Polychlorinated biphenyls (PCBs)	3.01	1.29	0.14	0.03	0.04	0.83
18	Di-(2-ethylhexyl) phthalate	0.10	0.21	0.44	0.00	3.32	0.27
19	Ethylene oxide	0.12	0.00	1.17	0.49	0.73	0.00
20	Propylene oxide	0.00	0.00	1.49	0.02	0.01	0.00
21	1,4-Dichlorobenzene	0.00	0.00	0.98	0.00	0.00	0.00
22	1,4-Dioxane	0.00	0.00	0.42	0.00	0.47	0.00
23	Epichlorohydrin	0.00	0.00	0.30	0.11	0.00	0.00
24	Hexachlorobenzene	0.00	0.00	1.07	0.00	0.00	0.00
25	Vinyl chloride	0.00	0.00	0.81	0.00	0.00	1.29
	SUBTOTAL	99.94	99.96	96.76	99.60	99.29	100.00
	TOTAL FOR ALL CARCINOGENS	100.00	100.00	100.00	100.00	100.00	100.00

Table I-4. Continued.

CARC. RANK	CHEMICAL	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent
1	Dichloromethane	20.28	4.28	30.78	22.71	54.51
2	Styrene	6.85	0.48	0.69	3.54	2.75
3	Tetrachloroethylene	2.00	7.09	28.62	14.56	20.69
4	Formaldehyde	26.16	1.22	0.28	1.41	1.89
5	Benzene	0.01	24.97	0.00	0.01	0.00
6	Chloroform	0.01	0.00	0.00	0.00	0.01
7	Lead	10.37	36.20	4.24	0.91	5.84
8	Chromium	0.74	15.15	17.61	25.49	2.12
9	Acrylonitrile	0.00	0.00	0.00	0.00	0.00
10	1,2-Dichloroethane	0.00	0.00	0.84	12.04	0.00
11	Nickel	0.01	8.34	12.54	14.51	1.98
12	Asbestos (friable)	31.67	0.03	0.00	0.27	0.00
13	Isopropyl alcohol (mfg.- strong acid process)	0.38	0.46	2.00	1.54	3.50
14	1,3-Butadiene	0.00	0.00	0.00	0.00	0.00
15	Acrylamide	0.00	0.00	0.00	0.00	0.00
16	Carbon tetrachloride	0.01	0.00	0.00	0.00	0.01
17	Polychlorinated biphenyls (PCBs)	0.53	0.18	0.32	0.55	2.22
18	Di-(2-ethylhexyl) phthalate	0.15	0.03	0.61	0.00	2.57
19	Ethylene oxide	0.00	0.00	0.00	2.06	0.76
20	Propylene oxide	0.00	0.00	0.00	0.00	0.00
21	1,4-Dichlorobenzene	0.73	0.00	0.00	0.00	0.00
22	1,4-Dioxane	0.01	0.11	0.29	0.35	0.12
23	Epichlorohydrin	0.00	0.00	0.00	0.00	0.00
24	Hexachlorobenzene	0.01	0.00	0.00	0.00	0.00
25	Vinyl chloride	0.00	0.00	0.00	0.00	0.00
	SUBTOTAL	99.91	98.54	98.84	99.96	98.96
	TOTAL FOR ALL CARCINOGENS	100.00	100.00	100.00	100.00	100.00

Table I-4. Continued.

CARC. RANK	CHEMICAL	TRANSPORT. SIC 37 Percent	MEASURE./PHOTO SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODE 20-39 Percent	NO CODES 20-39 Percent
1	Dichloromethane	20.90	88.44	53.25	39.66	6.47
2	Styrene	38.94	0.24	10.77	9.08	6.18
3	Tetrachloroethylene	22.03	2.49	10.15	11.11	3.14
4	Formaldehyde	0.31	0.47	0.43	3.87	2.96
5	Benzene	0.40	0.00	0.03	8.19	6.47
6	Chloroform	0.05	0.00	0.00	7.43	0.02
7	Lead	1.94	0.34	0.09	2.21	8.76
8	Chromium	1.56	0.38	0.09	1.36	0.20
9	Acrylonitrile	0.00	0.01	0.00	1.20	0.01
10	1,2-Dichloroethane	0.05	3.17	0.00	0.23	0.00
11	Nickel	3.90	0.12	1.40	3.01	0.06
12	Asbestos (friable)	6.25	0.00	7.37	0.14	0.00
13	Isopropyl alcohol (mfg.- strong acid process)	1.96	0.24	7.98	2.52	6.88
14	1,3-Butadiene	0.00	0.02	0.00	1.93	0.00
15	Acrylamide	0.00	0.00	0.00	0.00	0.00
16	Carbon tetrachloride	0.00	0.00	0.00	0.64	0.02
17	Polychlorinated biphenyls (PCBs)	0.57	0.00	0.00	0.37	58.06
18	Di-(2-ethylhexyl) phthalate	0.45	0.18	6.41	0.72	0.34
19	Ethylene oxide	0.00	2.98	0.55	0.71	0.19
20	Propylene oxide	0.00	0.15	0.00	0.10	0.03
21	1,4-Dichlorobenzene	0.00	0.00	0.00	0.90	0.00
22	1,4-Dioxane	0.52	0.71	1.40	0.58	0.08
23	Epichlorohydrin	0.00	0.00	0.00	2.91	0.00
24	Hexachlorobenzene	0.00	0.00	0.00	0.00	0.00
25	Vinyl chloride	0.03	0.00	0.00	0.65	0.01
SUBTOTAL		99.86	99.94	99.93	99.54	99.88
TOTAL FOR ALL CARCINOGENS		100.00	100.00	100.00	100.00	100.00

Table I-5. TRI Releases and Transfers within Each Industry by State, 1989.

STATE	FOOD SIC 20 Percent	TOBACCO SIC 21 Percent	TEXTILES SIC 22 Percent	APPAREL SIC 23 Percent	LUMBER SIC 24 Percent	FURNITURE SIC 25 Percent
Alabama	1.37	0.00	4.38	0.00	0.98	2.09
Alaska	0.00	0.00	0.00	0.00	0.00	0.00
American Samoa	0.04	0.00	0.00	0.00	0.00	0.00
Arizona	0.64	0.00	0.15	0.00	0.40	0.51
Arkansas	2.46	1.33	0.30	0.00	1.84	2.83
California	8.23	0.00	1.59	0.00	3.84	4.13
Colorado	0.63	0.00	0.00	0.00	0.78	0.49
Connecticut	0.09	0.00	1.92	0.00	0.07	0.01
Delaware	0.12	0.00	0.20	0.00	0.00	0.09
District of Columbia	0.00	0.00	0.00	0.00	0.00	0.00
Florida	1.16	0.00	0.09	4.84	0.62	1.20
Georgia	1.39	0.42	14.53	1.42	2.01	0.90
Hawaii	1.71	0.00	0.00	0.00	0.01	0.00
Idaho	0.94	0.00	0.00	0.00	0.30	0.00
Illinois	9.84	0.00	1.39	4.45	1.99	1.58
Indiana	2.62	0.23	0.40	0.56	12.82	6.33
Iowa	9.33	0.00	0.00	0.00	3.20	0.48
Kansas	0.61	0.00	0.00	2.63	0.89	0.04
Kentucky	0.70	0.00	0.10	4.10	0.45	0.40
Louisiana	0.84	0.00	0.00	0.00	1.12	0.01
Maine	0.14	0.00	1.34	0.00	0.76	0.20
Maryland	1.71	0.00	0.34	0.07	0.15	0.00
Massachusetts	0.28	3.71	4.15	3.66	0.14	0.48
Michigan	2.47	0.34	0.65	1.43	3.51	7.61
Minnesota	1.65	0.00	0.00	0.00	11.37	0.07
Mississippi	0.90	0.00	8.84	0.00	4.75	5.78
Missouri	3.31	0.00	1.48	0.68	0.51	0.75
Montana	0.08	0.00	0.00	0.00	0.79	0.00
Nebraska	0.82	0.00	0.00	0.00	0.29	0.65
Nevada	0.02	0.00	0.00	0.00	0.01	0.00
New Hampshire	0.07	0.00	0.74	4.29	0.66	0.10
New Jersey	1.24	0.00	3.25	0.00	0.29	0.27
New Mexico	0.00	0.00	0.00	0.00	0.23	0.00
New York	1.24	3.48	2.63	14.32	0.30	3.57
North Carolina	2.38	8.78	23.07	10.13	4.13	27.82
North Dakota	0.06	0.00	0.00	0.00	0.00	0.00
Ohio	3.27	0.00	3.00	17.23	2.54	1.51
Oklahoma	0.16	0.00	0.25	0.00	0.16	0.50
Oregon	1.01	0.00	0.00	0.00	6.62	0.14
Pennsylvania	1.61	1.77	1.72	9.10	6.02	3.24
Puerto Rico	0.24	0.00	0.15	0.00	0.01	0.01
Rhode Island	0.00	0.00	1.47	0.00	0.04	0.00
South Carolina	0.24	0.00	15.11	0.00	2.04	1.44
South Dakota	0.45	0.00	0.00	0.00	1.10	0.00
Tennessee	17.91	0.00	1.21	11.65	1.81	6.22
Texas	7.91	0.00	1.30	3.53	3.03	0.83
Utah	0.34	0.00	0.00	0.00	1.47	0.11
Vermont	0.17	0.00	0.00	0.00	0.09	0.85
Virgin Islands	0.00	0.00	0.00	0.00	0.00	0.00
Virginia	1.11	43.84	2.30	0.62	6.03	15.30
Washington	1.31	0.00	0.03	4.85	2.95	0.13
West Virginia	0.01	36.12	0.00	0.00	2.79	0.00
Wisconsin	4.96	0.00	1.93	0.44	4.09	1.33
Wyoming	0.19	0.00	0.00	0.00	0.01	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Table I-5. Continued.

STATE	PAPER SIC 26 Percent	PRINTING SIC 27 Percent	CHEMICALS SIC 28 Percent	PETROLEUM SIC 29 Percent	PLASTICS SIC 30 Percent	LEATHER SIC 31 Percent
Alabama	5.27	0.10	2.61	0.26	1.82	0.00
Alaska	2.00	0.00	0.68	0.14	0.00	0.00
American Samoa	0.00	0.00	0.00	0.00	0.00	0.00
Arizona	1.06	0.56	0.02	0.00	0.36	0.03
Arkansas	1.17	0.04	1.12	0.13	3.22	0.52
California	4.29	1.00	2.10	11.07	5.24	0.70
Colorado	0.10	0.04	0.06	0.74	0.20	0.02
Connecticut	0.17	0.33	0.45	0.00	0.84	0.00
Delaware	0.04	0.01	0.25	0.44	0.09	0.00
District of Columbia	0.00	0.00	0.00	0.00	0.00	0.00
Florida	10.69	0.49	4.16	0.00	1.45	0.17
Georgia	8.43	4.30	1.09	0.04	2.83	0.00
Hawaii	0.00	0.00	0.00	0.57	0.02	0.00
Idaho	0.00	0.00	0.31	0.00	0.02	0.00
Illinois	1.93	16.25	4.16	3.61	6.16	1.24
Indiana	0.72	9.47	1.54	2.03	7.62	2.08
Iowa	1.81	2.33	0.48	0.00	2.06	3.31
Kansas	0.01	0.85	5.79	7.29	1.06	0.00
Kentucky	0.65	3.66	2.27	0.88	1.94	0.32
Louisiana	1.54	0.20	15.36	17.09	0.01	0.00
Maine	3.30	0.10	0.01	0.00	0.47	10.01
Maryland	2.67	3.35	0.21	0.00	0.22	2.03
Massachusetts	2.05	0.79	0.24	0.01	2.09	1.15
Michigan	1.96	0.36	2.05	0.60	5.01	18.47
Minnesota	3.29	1.02	0.03	2.42	0.53	4.75
Mississippi	0.78	5.74	2.41	0.61	3.05	0.00
Missouri	0.10	1.67	3.10	0.04	3.08	5.14
Montana	0.12	0.00	0.00	1.22	0.00	0.00
Nebraska	0.20	0.00	0.19	0.00	1.81	5.18
Nevada	0.00	0.61	0.80	0.00	0.90	0.00
New Hampshire	0.58	0.25	0.01	0.00	0.26	0.01
New Jersey	1.52	1.66	3.11	1.48	1.52	6.33
New Mexico	0.00	0.20	0.13	0.61	0.02	0.00
New York	2.27	3.70	1.22	0.57	1.43	3.44
North Carolina	3.94	4.28	1.91	0.02	4.43	3.58
North Dakota	0.00	0.00	0.00	0.30	0.26	0.00
Ohio	4.78	3.07	4.42	3.49	10.09	0.45
Oklahoma	0.40	0.04	0.78	2.60	0.67	0.00
Oregon	3.55	0.02	0.07	0.01	0.65	0.30
Pennsylvania	4.18	5.94	1.45	4.27	3.37	8.93
Puerto Rico	0.00	0.00	0.54	0.07	1.48	1.81
Rhode Island	0.05	1.54	0.11	0.00	0.12	0.08
South Carolina	2.87	2.03	0.69	0.00	7.97	0.00
South Dakota	0.00	0.00	0.04	0.00	0.10	0.00
Tennessee	2.21	11.38	5.92	0.83	6.46	1.36
Texas	3.30	1.91	23.99	31.09	2.64	8.09
Utah	0.00	0.00	0.16	0.62	0.06	0.00
Vermont	0.03	0.04	0.00	0.00	0.00	0.00
Virgin Islands	0.00	0.00	0.00	1.24	0.00	0.00
Virginia	3.63	7.64	2.36	0.82	3.78	0.00
Washington	6.39	0.00	0.14	1.18	0.90	0.00
West Virginia	0.00	0.00	1.33	0.33	0.33	0.04
Wisconsin	6.14	3.42	0.26	0.12	2.18	10.45
Wyoming	0.00	0.00	0.60	1.13	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Table I-5. Continued.

STATE	STONE/CLAY SIC 32 Percent	PRIMARY METALS SIC 33 Percent	FABR. METALS SIC 34 Percent	MACHINERY SIC 35 Percent	ELECTRICAL SIC 36 Percent
Alabama	5.38	2.49	2.15	1.47	1.87
Alaska	0.00	0.00	0.00	0.00	0.00
American Samoa	0.00	0.00	0.00	0.00	0.00
Arizona	0.00	4.12	0.40	0.42	4.28
Arkansas	0.58	2.19	1.22	1.88	2.81
California	1.94	1.08	6.22	3.19	5.64
Colorado	1.20	0.25	0.82	1.38	0.48
Connecticut	0.02	0.24	3.23	3.32	1.95
Delaware	0.00	0.01	0.00	0.00	0.01
District of Columbia	0.00	0.00	0.00	0.00	0.00
Florida	0.25	0.18	1.41	2.27	2.62
Georgia	4.66	1.23	1.64	2.73	1.01
Hawaii	0.00	0.00	0.15	0.00	0.00
Idaho	0.00	0.00	0.10	0.53	2.31
Illinois	5.81	6.05	7.06	5.98	4.61
Indiana	9.09	7.00	3.55	4.25	9.33
Iowa	0.07	0.55	1.01	4.36	2.37
Kansas	1.48	0.04	0.47	2.14	1.12
Kentucky	1.48	2.41	0.83	2.17	3.35
Louisiana	0.36	0.17	1.62	0.27	0.31
Maine	0.02	0.00	0.11	0.18	0.60
Maryland	1.07	0.44	0.81	0.21	0.41
Massachusetts	0.60	0.14	2.35	1.34	4.94
Michigan	2.15	7.80	7.07	1.70	0.62
Minnesota	0.60	0.11	2.33	3.71	3.04
Mississippi	13.55	0.05	2.40	4.81	0.49
Missouri	1.48	4.02	2.62	2.22	3.49
Montana	0.00	4.88	0.00	0.00	0.00
Nebraska	0.01	0.44	0.51	1.21	0.88
Nevada	0.00	0.03	0.07	0.00	0.00
New Hampshire	0.06	0.15	0.50	1.23	2.02
New Jersey	1.40	0.62	4.06	1.69	0.91
New Mexico	0.00	3.76	0.00	0.08	0.67
New York	8.75	1.05	3.79	4.46	4.16
North Carolina	1.50	0.18	1.84	2.10	2.63
North Dakota	0.05	0.00	0.00	0.54	0.00
Ohio	9.30	10.40	12.70	9.65	7.50
Oklahoma	0.92	0.48	2.24	1.78	0.40
Oregon	0.11	0.41	0.41	0.24	1.30
Pennsylvania	8.74	7.67	3.85	5.33	5.11
Puerto Rico	0.05	0.01	0.21	0.49	0.86
Rhode Island	1.24	0.03	0.88	0.07	0.09
South Carolina	0.91	0.52	2.16	2.93	2.79
South Dakota	0.21	0.10	0.05	0.33	0.44
Tennessee	4.04	1.44	1.56	2.70	1.83
Texas	4.63	2.94	6.82	4.68	4.52
Utah	0.05	18.05	0.10	0.29	0.84
Vermont	0.14	0.00	0.90	0.12	0.15
Virgin Islands	0.00	0.00	0.00	0.00	0.00
Virginia	1.35	0.32	2.73	1.24	1.81
Washington	0.01	0.25	1.17	0.26	0.57
West Virginia	1.17	2.05	0.94	1.36	0.03
Wisconsin	3.58	3.73	3.56	6.67	2.83
Wyoming	0.00	0.00	0.17	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00

Table I-5. Continued.

STATE	TRANSPORTATION SIC 37 Percent	MEASURE./PHOTO. SIC 38 Percent	MISCELLANEOUS SIC 39 Percent	MULTIPLE CODE 20-39 Percent	NO CODES 20-39 Percent
Alabama	1.49	0.62	1.70	1.47	0.59
Alaska	0.00	0.00	0.00	0.00	0.00
American Samoa	0.00	0.00	0.00	0.00	0.00
Arizona	0.73	0.91	6.17	0.33	0.12
Arkansas	1.14	0.37	4.74	0.87	0.43
California	7.90	4.32	3.18	1.77	4.06
Colorado	0.39	2.05	0.06	0.85	0.00
Connecticut	2.57	1.13	4.80	0.90	2.34
Delaware	1.50	0.20	0.03	0.00	0.01
District of Columbia	0.00	0.00	0.00	0.00	0.00
Florida	3.68	2.97	17.14	2.55	2.40
Georgia	2.77	0.71	1.42	4.07	2.14
Hawaii	0.00	0.00	0.00	0.30	0.00
Idaho	0.00	0.00	0.00	0.58	0.00
Illinois	3.38	1.33	3.75	1.61	1.44
Indiana	6.17	8.05	8.58	15.80	9.21
Iowa	0.65	0.02	2.90	1.46	0.50
Kansas	1.37	0.09	0.72	1.38	1.03
Kentucky	1.93	0.00	3.00	1.28	2.54
Louisiana	2.68	0.06	0.00	3.66	1.88
Maine	0.33	0.02	0.02	0.28	0.02
Maryland	1.01	0.09	0.00	0.43	0.20
Massachusetts	0.30	7.26	1.46	3.33	1.93
Michigan	17.92	0.06	0.56	2.94	0.57
Minnesota	1.11	1.82	0.15	9.72	1.41
Mississippi	0.12	0.17	1.09	3.38	0.11
Missouri	5.69	0.48	1.16	1.60	3.98
Montana	0.01	0.00	0.00	0.00	0.00
Nebraska	0.17	1.11	0.00	0.36	1.23
Nevada	0.00	0.03	0.05	0.00	0.00
New Hampshire	0.07	0.25	1.45	0.87	0.00
New Jersey	0.33	2.45	0.26	0.66	13.74
New Mexico	0.06	0.00	0.00	0.02	0.42
New York	1.88	36.11	3.06	2.15	24.34
North Carolina	1.48	1.09	1.94	2.05	2.05
North Dakota	0.01	0.00	0.12	0.00	0.00
Ohio	11.01	1.34	4.38	7.66	1.93
Oklahoma	1.22	1.23	0.03	0.87	6.53
Oregon	0.65	0.55	0.06	1.33	0.00
Pennsylvania	1.89	16.48	10.88	3.36	7.35
Puerto Rico	0.00	1.49	0.21	1.14	0.39
Rhode Island	0.24	0.47	2.74	0.25	0.00
South Carolina	1.27	0.99	2.71	2.97	0.19
South Dakota	0.01	0.00	0.19	0.01	0.00
Tennessee	3.71	0.46	2.16	5.62	0.24
Texas	3.26	0.92	1.23	4.01	2.32
Utah	1.31	1.09	0.39	0.06	2.08
Vermont	0.11	0.00	0.11	0.03	0.00
Virgin Islands	0.00	0.00	0.00	0.00	0.00
Virginia	1.59	0.25	1.09	3.18	0.03
Washington	3.73	0.53	0.78	1.00	0.02
West Virginia	0.03	0.00	0.00	0.16	0.00
Wisconsin	1.10	0.43	3.49	1.63	0.25
Wyoming	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00

APPENDIX J

Distribution of TRI Releases and Transfers of 33/50 Program Chemicals by State and by Industry, 1989

Table J-1. The Ten 33/50 Chemicals with the Largest TRI Total Releases and Transfers in Each State, 1989.

ALABAMA

Chemical	Pounds	Percent of State TRI Totals
Methyl ethyl ketone	7,901,642	5.74
Toluene	7,140,426	5.18
Xylene (mixed isomers)	6,288,303	4.56
1,1,1-Trichloroethane	3,381,194	2.45
Chloroform	2,679,012	1.94
Trichloroethylene	1,948,862	1.41
Dichloromethane	1,802,587	1.31
Benzene	1,625,628	1.18
Lead	1,202,975	0.87
Methyl isobutyl ketone	830,901	0.60
SUBTOTAL	34,801,530	25.26
OTHER 33/50 CHEMICALS	3,490,854	2.53
STATE TRI TOTAL	137,761,513	

ALASKA

Chemical	Pounds	Percent of State TRI Totals
Chloroform	270,811	1.08
Xylene (mixed isomers)	33,458	0.13
Toluene	32,238	0.13
Benzene	30,873	0.12
Nickel compounds	500	0.00
Cadmium compounds	0	0.00
Cadmium	0	0.00
Chromium compounds	0	0.00
Chromium	0	0.00
Lead compounds	0	0.00
SUBTOTAL	367,880	1.47
OTHER 33/50 CHEMICALS	0	0.00
STATE TRI TOTAL	24,986,799	

ARKANSAS

Chemical	Pounds	Percent of State TRI Totals
Toluene	5,024,898	6.36
Xylene (mixed isomers)	3,630,229	4.60
Methyl ethyl ketone	3,376,946	4.28
Dichloromethane	2,115,133	2.68
1,1,1-Trichloroethane	1,893,860	2.40
Nickel compounds	1,095,698	1.39
Chromium compounds	961,063	1.22
Lead	798,088	1.01
Chloroform	635,966	0.81
Methyl isobutyl ketone	584,145	0.74
SUBTOTAL	20,116,026	25.48
OTHER 33/50 CHEMICALS	1,133,172	1.44
STATE TRI TOTAL	78,955,945	

ARIZONA

Chemical	Pounds	Percent of State TRI Totals
1,1,1-Trichloroethane	2,078,903	4.10
Lead compounds	1,421,948	2.80
Toluene	752,093	1.48
Lead	683,626	1.35
Chromium	680,650	1.34
Methyl ethyl ketone	556,479	1.10
Dichloromethane	466,362	0.92
Xylene (mixed isomers)	433,189	0.85
Tetrachloroethylene	401,598	0.79
Nickel	235,850	0.46
SUBTOTAL	7,710,698	15.19
OTHER 33/50 CHEMICALS	752,266	1.48
STATE TRI TOTAL	50,764,830	

CALIFORNIA

Chemical	Pounds	Percent of State TRI Totals
1,1,1-Trichloroethane	24,009,636	14.22
Dichloromethane	7,123,979	4.22
Toluene	4,659,355	2.76
Tetrachloroethylene	4,319,367	2.56
Methyl ethyl ketone	4,024,429	2.38
Xylene (mixed isomers)	3,520,579	2.09
Lead	1,561,572	0.92
Methyl isobutyl ketone	1,539,517	0.91
Chromium compounds	1,254,117	0.74
Chloroform	656,409	0.39
SUBTOTAL	52,668,960	31.20
OTHER 33/50 CHEMICALS	2,243,588	1.33
STATE TRI TOTAL	168,825,335	

COLORADO

Chemical	Pounds	Percent of State TRI Totals
1,1,1-Trichloroethane	1,840,519	11.25
Tetrachloroethylene	808,166	4.94
Toluene	710,515	4.34
Dichloromethane	674,333	4.12
Methyl ethyl ketone	401,177	2.45
Xylene (mixed isomers)	284,499	1.74
Lead	197,366	1.21
Chromium	142,753	0.87
Nickel	131,647	0.80
Carbon Tetrachloride	49,823	0.30
SUBTOTAL	5,240,798	32.04
OTHER 33/50 CHEMICALS	78,811	0.48
STATE TRI TOTAL	16,357,496	

Table J-1. Continued.

CONNECTICUT

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	9,168,761	21.34
Dichloromethane	3,152,501	7.34
Toluene	2,930,545	6.82
Tetrachloroethylene	2,269,151	5.28
Methyl ethyl ketone	1,320,451	3.07
Nickel compounds	1,283,200	2.99
Xylene (mixed isomers)	673,458	1.57
Methyl isobutyl ketone	580,868	1.35
Trichloroethylene	308,076	0.72
Chromium compounds	257,132	0.60
SUBTOTAL	21,944,143	51.08
OTHER 33/50 CHEMICALS	1,345,145	3.13
STATE TRI TOTAL	42,963,065	

DELAWARE

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	2,037,573	17.09
Toluene	1,044,778	8.77
Methyl ethyl ketone	459,638	3.86
Methyl isobutyl ketone	387,169	3.25
Dichloromethane	309,011	2.59
Carbon Tetrachloride	162,570	1.36
Tetrachloroethylene	110,415	0.93
1,1,1-Trichloroethane	78,200	0.66
Benzene	69,722	0.58
Chromium compounds	48,854	0.41
SUBTOTAL	4,707,930	39.50
OTHER 33/50 CHEMICALS	29,494	0.25
STATE TRI TOTAL	11,919,774	

FLORIDA

Chemical	Pounds	Percent of State TRI Total
Toluene	5,212,915	2.71
Dichloromethane	2,748,611	1.43
1,1,1-Trichloroethane	2,450,683	1.28
Methyl ethyl ketone	2,238,077	1.17
Xylene (mixed isomers)	2,190,867	1.14
Chloroform	1,157,585	0.60
Trichloroethylene	599,330	0.31
Lead	287,508	0.15
Tetrachloroethylene	269,839	0.14
Nickel compounds	247,182	0.13
SUBTOTAL	17,402,597	9.06
OTHER 33/50 CHEMICALS	833,269	0.43
STATE TRI TOTAL	192,044,588	

GEORGIA

Chemical	Pounds	Percent of State TRI Total
Toluene	6,977,337	5.92
Xylene (mixed isomers)	6,733,674	5.71
1,1,1-Trichloroethane	3,974,061	3.37
Dichloromethane	3,632,046	3.08
Methyl isobutyl ketone	2,591,606	2.20
Chloroform	2,308,834	1.96
Methyl ethyl ketone	1,999,001	1.70
Trichloroethylene	1,358,872	1.15
Benzene	914,093	0.78
Tetrachloroethylene	721,111	0.61
SUBTOTAL	31,210,635	26.47
OTHER 33/50 CHEMICALS	1,575,545	1.34
STATE TRI TOTAL	117,888,623	

HAWAII

Chemical	Pounds	Percent of State TRI Total
Toluene	92,950	2.73
m-Xylene	50,830	1.49
Benzene	48,100	1.41
1,1,1-Trichloroethane	42,295	1.24
Dichloromethane	41,701	1.23
o-Xylene	29,900	0.88
p-Xylene	18,550	0.55
Lead	1,750	0.05
Nickel	1,500	0.04
Chromium compounds	806	0.02
SUBTOTAL	328,382	9.65
OTHER 33/50 CHEMICALS	0	0.00
STATE TRI TOTAL	3,402,365	

IDAHO

Chemical	Pounds	Percent of State TRI Total
Chloroform	655,000	4.16
1,1,1-Trichloroethane	106,272	0.68
Chromium compounds	56,964	0.36
Tetrachloroethylene	48,444	0.31
Cadmium compounds	24,773	0.16
Xylene (mixed isomers)	18,204	0.12
Lead	14,071	0.09
Nickel compounds	3,509	0.02
Carbon Tetrachloride	1,000	0.01
Cyanide compounds	512	0.00
SUBTOTAL	928,749	5.90
OTHER 33/50 CHEMICALS	250	0.00
STATE TRI TOTAL	15,739,859	

Table J-1. Continued.

ILLINOIS

Chemical	Pounds	Percent of State TRI Total
Toluene	18,791,994	7.58
1,1,1-Trichloroethane	10,918,393	4.41
Xylene (mixed isomers)	10,044,899	4.05
Methyl ethyl ketone	7,081,882	2.86
Trichloroethylene	4,741,714	1.91
Dichloromethane	4,129,213	1.67
Benzene	1,888,205	0.76
Methyl isobutyl ketone	1,776,350	0.72
Lead compounds	1,609,661	0.65
Tetrachloroethylene	1,567,960	0.63
SUBTOTAL	62,550,271	25.24
OTHER 33/50 CHEMICALS	3,978,163	1.61
STATE TRI TOTAL	247,813,608	

INDIANA

Chemical	Pounds	Percent of State TRI Total
Toluene	18,353,853	7.20
Dichloromethane	14,209,036	5.57
1,1,1-Trichloroethane	11,341,782	4.45
Xylene (mixed isomers)	10,803,948	4.24
Methyl ethyl ketone	7,384,484	2.90
Trichloroethylene	6,836,955	2.68
Chromium compounds	4,323,348	1.70
Tetrachloroethylene	2,736,987	1.07
Benzene	2,675,581	1.05
Methyl isobutyl ketone	2,508,388	0.98
SUBTOTAL	81,174,362	31.83
OTHER 33/50 CHEMICALS	4,805,725	1.88
STATE TRI TOTAL	255,023,626	

IOWA

Chemical	Pounds	Percent of State TRI Total
Toluene	8,058,673	14.61
Xylene (mixed isomers)	4,055,271	7.35
1,1,1-Trichloroethane	3,331,080	6.04
Methyl ethyl ketone	2,688,541	4.88
Tetrachloroethylene	1,420,388	2.58
Dichloromethane	852,840	1.55
Methyl isobutyl ketone	416,148	0.75
Chromium	308,841	0.56
Trichloroethylene	149,201	0.27
Nickel	85,428	0.15
SUBTOTAL	21,366,411	38.75
OTHER 33/50 CHEMICALS	239,966	0.44
STATE TRI TOTAL	55,143,195	

KANSAS

Chemical	Pounds	Percent of State TRI Total
Toluene	3,027,056	1.64
Xylene (mixed isomers)	2,781,016	1.50
Trichloroethylene	2,501,985	1.35
Methyl ethyl ketone	2,023,836	1.09
1,1,1-Trichloroethane	1,145,789	0.62
Lead compounds	807,987	0.44
Dichloromethane	608,929	0.33
Chromium compounds	497,368	0.27
Carbon Tetrachloride	464,880	0.25
Benzene	358,332	0.19
SUBTOTAL	14,217,178	7.68
OTHER 33/50 CHEMICALS	863,408	0.47
STATE TRI TOTAL	185,131,051	

KENTUCKY

Chemical	Pounds	Percent of State TRI Total
Toluene	10,132,050	9.09
Xylene (mixed isomers)	5,825,287	5.23
1,1,1-Trichloroethane	2,164,085	1.94
Methyl ethyl ketone	1,610,878	1.45
Dichloromethane	1,508,538	1.35
Methyl isobutyl ketone	1,420,505	1.27
Lead compounds	755,027	0.68
Trichloroethylene	649,771	0.58
Tetrachloroethylene	588,956	0.53
Benzene	544,078	0.49
SUBTOTAL	25,199,175	22.62
OTHER 33/50 CHEMICALS	1,707,312	1.53
STATE TRI TOTAL	111,422,816	

LOUISIANA

Chemical	Pounds	Percent of State TRI Total
Toluene	5,141,114	1.09
Xylene (mixed isomers)	2,588,749	0.55
Cyanide compounds	1,601,504	0.34
Benzene	1,500,036	0.32
Methyl ethyl ketone	1,361,989	0.29
Chloroform	1,145,480	0.24
1,1,1-Trichloroethane	841,200	0.18
Tetrachloroethylene	732,554	0.15
Dichloromethane	587,152	0.12
Trichloroethylene	568,489	0.12
SUBTOTAL	16,068,267	3.39
OTHER 33/50 CHEMICALS	2,007,732	0.42
STATE TRI TOTAL	473,546,487	

Table J-1. Continued.

MAINE

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	1,771,641	9.53
Chloroform	1,149,805	6.19
Toluene	835,883	4.50
Xylene (mixed isomers)	491,690	2.65
Chromium compounds	202,201	1.09
Methyl ethyl ketone	180,348	0.97
Tetrachloroethylene	92,592	0.50
Trichloroethylene	71,377	0.38
Dichloromethane	42,503	0.23
Lead compounds	38,755	0.21
SUBTOTAL	4,876,795	26.25
OTHER 33/50 CHEMICALS	23,488	0.13
STATE TRI TOTAL	18,581,543	

MARYLAND

Chemical	Pounds	Percent of State TRI Total
Toluene	2,498,798	8.54
1,1,1-Trichloroethane	2,181,442	7.46
Methyl ethyl ketone	1,036,260	3.54
Xylene (mixed isomers)	926,745	3.17
Chloroform	661,507	2.26
Dichloromethane	567,791	1.94
Chromium compounds	359,167	1.23
Lead compounds	266,277	0.91
Methyl isobutyl ketone	216,142	0.74
Trichloroethylene	207,891	0.71
SUBTOTAL	8,922,020	30.50
OTHER 33/50 CHEMICALS	617,886	2.11
STATE TRI TOTAL	29,251,518	

MASSACHUSETTS

Chemical	Pounds	Percent of State TRI Total
Toluene	6,933,759	12.33
1,1,1-Trichloroethane	4,494,536	8.00
Methyl ethyl ketone	3,917,335	6.97
Dichloromethane	2,328,925	4.14
Trichloroethylene	2,062,494	3.67
Xylene (mixed isomers)	1,245,040	2.21
Methyl isobutyl ketone	350,349	0.62
Chromium compounds	343,126	0.61
Tetrachloroethylene	258,228	0.46
Chromium	251,281	0.45
SUBTOTAL	22,185,073	39.46
OTHER 33/50 CHEMICALS	594,606	1.06
STATE TRI TOTAL	56,214,698	

MICHIGAN

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	19,333,415	8.78
Toluene	18,966,394	8.62
Methyl ethyl ketone	8,941,532	4.06
Dichloromethane	7,167,027	3.26
1,1,1-Trichloroethane	5,953,813	2.70
Chromium compounds	4,566,743	2.07
Methyl isobutyl ketone	3,478,585	1.58
Trichloroethylene	2,333,544	1.06
Nickel compounds	2,112,135	0.96
Lead	1,457,137	0.66
SUBTOTAL	74,310,325	33.76
OTHER 33/50 CHEMICALS	4,015,253	1.82
STATE TRI TOTAL	220,137,364	

MINNESOTA

Chemical	Pounds	Percent of State TRI Total
Methyl ethyl ketone	21,496,286	26.24
Toluene	17,858,788	21.80
Xylene (mixed isomers)	6,025,894	7.35
1,1,1-Trichloroethane	3,087,818	3.77
Dichloromethane	2,453,275	2.99
Trichloroethylene	911,313	1.11
Methyl isobutyl ketone	781,251	0.95
Chloroform	356,001	0.43
Benzene	297,974	0.36
Nickel	246,031	0.30
SUBTOTAL	53,514,631	65.32
OTHER 33/50 CHEMICALS	846,298	1.03
STATE TRI TOTAL	81,932,154	

MISSISSIPPI

Chemical	Pounds	Percent of State TRI Total
Toluene	8,645,894	7.17
Xylene (mixed isomers)	6,519,599	5.41
Methyl ethyl ketone	4,759,275	3.95
Dichloromethane	3,607,895	2.99
Trichloroethylene	2,278,753	1.89
1,1,1-Trichloroethane	1,505,018	1.25
Methyl isobutyl ketone	1,491,760	1.24
Chloroform	424,630	0.35
Chromium	312,567	0.26
Benzene	266,961	0.22
SUBTOTAL	29,812,352	24.72
OTHER 33/50 CHEMICALS	744,633	0.62
STATE TRI TOTAL	120,617,983	

Table J-1. Continued.

MISSOURI

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	10,082,047	6.18
Lead compounds	7,046,054	4.32
Toluene	6,455,510	3.96
1,1,1-Trichloroethane	4,214,685	2.58
Methyl ethyl ketone	3,933,506	2.41
Dichloromethane	3,834,778	2.35
Trichloroethylene	1,615,895	0.99
Methyl isobutyl ketone	1,593,015	0.98
Tetrachloroethylene	683,151	0.42
Lead	535,951	0.33
SUBTOTAL	39,994,592	24.52
OTHER 33/50 CHEMICALS	1,581,870	0.97
STATE TRI TOTAL	163,105,846	

MONTANA

Chemical	Pounds	Percent of State TRI Total
Lead compounds	3,090,743	7.90
Xylene (mixed isomers)	310,349	0.79
Toluene	195,629	0.50
Chloroform	72,780	0.19
Benzene	69,080	0.18
Nickel compounds	23,334	0.06
Cadmium compounds	22,655	0.06
Methyl isobutyl ketone	15,582	0.04
Trichloroethylene	15,060	0.04
Methyl ethyl ketone	9,775	0.02
SUBTOTAL	3,824,987	9.78
OTHER 33/50 CHEMICALS	2,576	0.01
STATE TRI TOTAL	39,103,261	

NEBRASKA

Chemical	Pounds	Percent of State TRI Total
Toluene	4,226,620	20.49
Dichloromethane	1,492,607	7.24
Xylene (mixed isomers)	1,365,721	6.62
1,1,1-Trichloroethane	952,257	4.62
Methyl ethyl ketone	604,818	2.93
Lead compounds	518,000	2.51
Methyl isobutyl ketone	275,267	1.33
Tetrachloroethylene	243,070	1.18
Chromium compounds	202,836	0.98
Nickel compounds	34,714	0.17
SUBTOTAL	9,915,910	48.08
OTHER 33/50 CHEMICALS	84,156	0.41
STATE TRI TOTAL	20,623,709	

NEVADA

Chemical	Pounds	Percent of State TRI Total
Toluene	451,653	13.70
Xylene (mixed isomers)	59,891	1.82
Methyl ethyl ketone	52,734	1.60
Methyl isobutyl ketone	13,907	0.42
1,1,1-Trichloroethane	12,417	0.38
Trichloroethylene	5,940	0.18
Chromium compounds	1,400	0.40
Dichloromethane	1,300	0.40
Nickel	500	0.20
Chromium	250	0.10
SUBTOTAL	599,992	18.21
OTHER 33/50 CHEMICALS	934	0.30
STATE TRI TOTAL	3,295,677	

NEW HAMPSHIRE

Chemical	Pounds	Percent of State TRI Total
Toluene	2,065,223	14.35
1,1,1-Trichloroethane	1,854,686	12.89
Dichloromethane	1,439,499	10.00
Methyl ethyl ketone	1,403,157	9.75
Xylene (mixed isomers)	451,682	3.14
Trichloroethylene	328,242	2.28
Methyl isobutyl ketone	283,186	1.97
Tetrachloroethylene	196,971	1.37
Chloroform	124,333	0.86
Nickel	68,820	0.48
SUBTOTAL	8,215,799	57.08
OTHER 33/50 CHEMICALS	72,653	0.50
STATE TRI TOTAL	14,392,899	

NEW JERSEY

Chemical	Pounds	Percent of State TRI Total
Toluene	11,745,035	9.45
Methyl ethyl ketone	4,092,488	3.29
Xylene (mixed isomers)	3,948,658	3.18
Dichloromethane	2,191,324	1.76
1,1,1-Trichloroethane	1,957,683	1.57
Methyl isobutyl ketone	1,179,633	0.95
Carbon Tetrachloride	965,709	0.78
Lead compounds	846,696	0.68
Trichloroethylene	625,371	0.50
Chromium compounds	387,766	0.31
SUBTOTAL	27,940,363	22.47
OTHER 33/50 CHEMICALS	1,262,610	1.02
STATE TRI TOTAL	124,333,859	

Table J-1. Continued.

NEW MEXICO

Chemical	Pounds	Percent of State TRI Total
Toluene	354,764	1.04
1,1,1-Trichloroethane	274,059	0.80
Xylene (mixed isomers)	142,591	0.42
Benzene	67,295	0.20
Lead compounds	53,246	0.16
Chromium compounds	30,271	0.90
Methyl ethyl ketone	14,723	0.40
Nickel	2,250	0.10
Chromium	1,501	0.00
Lead	750	0.00
SUBTOTAL	941,450	2.75
OTHER 33/50 CHEMICALS	750	0.00
STATE TRI TOTAL	34,173,505	

NORTH CAROLINA

Chemical	Pounds	Percent of State TRI Total
Toluene	17,602,423	13.03
Chromium compounds	8,942,665	6.62
Methyl ethyl ketone	8,321,901	6.16
Dichloromethane	7,951,239	5.89
1,1,1-Trichloroethane	6,075,084	4.50
Xylene (mixed isomers)	2,934,328	2.17
Chloroform	2,247,811	1.66
p-Xylene	1,750,713	1.30
Tetrachloroethylene	1,158,460	0.86
o-Xylene	713,260	0.53
SUBTOTAL	57,697,884	42.72
OTHER 33/50 CHEMICALS	1,650,740	1.22
STATE TRI TOTAL	135,058,190	

NEW YORK

Chemical	Pounds	Percent of State TRI Total
Dichloromethane	12,416,330	9.83
Toluene	11,459,808	9.08
1,1,1-Trichloroethane	7,539,951	5.97
Xylene (mixed isomers)	5,396,844	4.27
Trichloroethylene	3,715,588	2.94
Methyl ethyl ketone	3,027,915	2.40
Lead compounds	2,811,595	2.23
Methyl isobutyl ketone	2,467,251	1.95
Tetrachloroethylene	2,406,958	1.91
Benzene	1,031,728	0.82
SUBTOTAL	52,273,968	41.40
OTHER 33/50 CHEMICALS	2,309,589	1.83
STATE TRI TOTAL	126,275,855	

NORTH DAKOTA

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	241,455	17.78
Toluene	146,433	10.78
Methyl isobutyl ketone	115,659	8.52
Methyl ethyl ketone	65,152	4.80
1,1,1-Trichloroethane	57,906	4.26
Benzene	26,919	1.98
Carbon Tetrachloride	3,508	0.26
Chromium compounds	250	0.02
Lead compounds	199	0.01
Cadmium compounds	0	0.00
SUBTOTAL	657,481	48.41
OTHER 33/50 CHEMICALS	0	0.00
STATE TRI TOTAL	1,358,104	

OHIO

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	17,314,240	4.83
1,1,1-Trichloroethane	15,127,987	4.22
Toluene	14,966,967	4.17
Methyl ethyl ketone	11,284,400	3.15
Chromium compounds	5,394,152	1.50
Dichloromethane	4,339,812	1.21
Methyl isobutyl ketone	3,051,717	0.85
Lead	2,751,674	0.77
Tetrachloroethylene	2,431,815	0.68
Benzene	1,915,057	0.53
SUBTOTAL	78,577,821	21.91
OTHER 33/50 CHEMICALS	8,732,454	2.43
STATE TRI TOTAL	358,677,545	

OKLAHOMA

Chemical	Pounds	Percent of State TRI Total
Toluene	2,646,108	5.66
Xylene (mixed isomers)	1,581,207	3.38
1,1,1-Trichloroethane	1,427,126	3.05
Methyl ethyl ketone	1,326,360	2.84
Dichloromethane	1,272,161	2.72
Tetrachloroethylene	854,330	1.83
Methyl isobutyl ketone	735,053	1.57
Chromium compounds	223,374	0.48
Chloroform	151,700	0.32
Chromium	143,332	0.31
SUBTOTAL	10,360,751	22.16
OTHER 33/50 CHEMICALS	317,488	0.68
STATE TRI TOTAL	46,752,043	

Table J-1. Continued.

OREGON

Chemical	Pounds	Percent of State TRI Total
Toluene	2,638,757	8.38
Methyl ethyl ketone	1,042,958	3.31
1,1,1-Trichloroethane	909,893	2.89
Trichloroethylene	885,192	2.81
Chloroform	791,142	2.51
Xylene (mixed isomers)	687,464	2.18
Nickel	527,300	1.67
Dichloromethane	496,930	1.58
Chromium compounds	417,363	1.32
Methyl isobutyl ketone	285,773	0.91
SUBTOTAL	8,682,772	27.56
OTHER 33/50 CHEMICALS	485,349	1.54
STATE TRI TOTAL	31,499,505	

PENNSYLVANIA

Chemical	Pounds	Percent of State TRI Total
Toluene	23,007,378	11.85
Dichloromethane	13,155,861	6.77
1,1,1-Trichloroethane	9,713,402	5.00
Methyl ethyl ketone	7,237,399	3.73
Xylene (mixed isomers)	6,989,793	3.60
Benzene	3,529,221	1.82
Trichloroethylene	3,050,700	1.57
Chromium	2,760,023	1.42
Methyl isobutyl ketone	2,320,996	1.20
Chromium compounds	2,219,941	1.14
SUBTOTAL	73,984,714	38.09
OTHER 33/50 CHEMICALS	8,630,733	4.44
STATE TRI TOTAL	194,216,839	

PUERTO RICO

Chemical	Pounds	Percent of State TRI Total
Dichloromethane	4,435,688	16.53
Xylene (mixed isomers)	1,453,902	5.42
Toluene	1,266,225	4.72
1,1,1-Trichloroethane	611,000	2.28
Chloroform	361,024	1.35
p-Xylene	201,021	0.75
Tetrachloroethylene	179,786	0.67
Benzene	104,334	0.39
Methyl isobutyl ketone	97,547	0.36
Methyl ethyl ketone	95,408	0.36
SUBTOTAL	8,805,935	32.83
OTHER 33/50 CHEMICALS	209,304	0.78
STATE TRI TOTAL	26,826,844	

RHODE ISLAND

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	1,331,001	12.24
Toluene	1,233,888	11.34
Methyl ethyl ketone	590,682	5.43
Dichloromethane	577,457	5.31
Trichloroethylene	474,666	4.36
Tetrachloroethylene	468,416	4.31
Xylene (mixed isomers)	373,651	3.43
Lead compounds	52,129	0.48
Nickel compounds	31,628	0.29
Nickel	25,141	0.23
SUBTOTAL	5,158,659	47.42
OTHER 33/50 CHEMICALS	40,142	0.37
STATE TRI TOTAL	10,878,502	

SOUTH CAROLINA

Chemical	Pounds	Percent of State TRI Total
Toluene	10,574,489	12.21
1,1,1-Trichloroethane	5,625,466	6.49
Methyl ethyl ketone	4,956,309	5.72
Xylene (mixed isomers)	3,265,358	3.77
Dichloromethane	2,030,641	2.34
p-Xylene	934,050	1.08
Tetrachloroethylene	890,288	1.03
Trichloroethylene	872,643	1.01
Lead compounds	825,538	0.95
Benzene	608,791	0.70
SUBTOTAL	30,583,573	35.31
OTHER 33/50 CHEMICALS	1,669,831	1.93

SOUTH DAKOTA

Chemical	Pounds	Percent of State TRI Total
Xylene (mixed isomers)	665,280	19.85
Toluene	644,712	19.23
Methyl ethyl ketone	220,082	6.57
1,1,1-Trichloroethane	159,626	4.76
Methyl isobutyl ketone	84,165	2.51
Trichloroethylene	30,843	0.92
Benzene	2,467	0.07
Tetrachloroethylene	1,650	0.05
Chromium compounds	750	0.02
Cyanide compounds	500	0.01
SUBTOTAL	1,810,075	54.00
OTHER 33/50 CHEMICALS	500	0.01

Table J-1. Continued.

TENNESSEE

Chemical	Pounds	Percent of State TRI Total
Toluene	15,944,166	6.05
1,1,1-Trichloroethane	7,016,863	2.66
Xylene (mixed isomers)	5,182,995	1.97
Dichloromethane	3,525,556	1.34
Trichloroethylene	1,977,404	0.75
Methyl ethyl ketone	1,960,900	0.74
Tetrachloroethylene	743,499	0.28
Lead	716,211	0.27
Nickel	603,842	0.23
Methyl isobutyl ketone	589,970	0.22
SUBTOTAL	38,261,406	14.53
OTHER 33/50 CHEMICALS	2,028,060	0.77
STATE TRI TOTAL	263,400,319	

TEXAS

Chemical	Pounds	Percent of State TRI Total
Toluene	17,690,346	2.23
Chromium compounds	12,846,242	1.62
Xylene (mixed isomers)	11,074,832	1.40
Methyl ethyl ketone	7,639,646	0.96
1,1,1-Trichloroethane	6,529,042	0.82
Benzene	5,792,002	0.73
Cyanide compounds	3,849,976	0.49
Dichloromethane	3,282,432	0.41
Hydrogen cyanide	2,874,075	0.36
Trichloroethylene	2,042,206	0.26
SUBTOTAL	73,620,799	9.29
OTHER 33/50 CHEMICALS	10,055,336	1.27
STATE TRI TOTAL	792,810,307	

UTAH

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	3,809,348	2.56
Lead	2,390,208	1.61
Dichloromethane	1,505,030	1.01
Toluene	551,067	0.37
Chromium compounds	491,610	0.33
Xylene (mixed isomers)	345,448	0.23
Methyl ethyl ketone	171,607	0.12
Benzene	157,615	0.11
Methyl isobutyl ketone	120,566	0.08
Hydrogen cyanide	75,002	0.05
SUBTOTAL	9,617,501	6.46
OTHER 33/50 CHEMICALS	129,934	0.09
STATE TRI TOTAL	148,915,352	

VERMONT

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	385,359	19.56
Toluene	317,342	16.11
Xylene (mixed isomers)	166,067	8.43
Methyl ethyl ketone	79,387	4.03
Methyl isobutyl ketone	78,422	3.98
Trichloroethylene	18,606	0.94
Dichloromethane	18,040	0.92
Chromium compounds	9,950	0.51
Nickel	9,189	0.47
Chromium	8,880	0.45
SUBTOTAL	1,091,242	55.39
OTHER 33/50 CHEMICALS	11,474	0.58
STATE TRI TOTAL	1,970,055	

VIRGIN ISLANDS

Chemical	Pounds	Percent of State TRI Total
Benzene	331,764	26.04
Toluene	319,072	25.04
p-Xylene	234,000	18.36
Xylene (mixed isomers)	210,172	16.49
Nickel compounds	2,550	0.20
Carbon Tetrachloride	1,700	0.13
Lead compounds	1,110	0.09
1,1,1-Trichloroethane	1,100	0.09
Cadmium compounds	0	0.00
Cadmium	0	0.00
SUBTOTAL	1,101,468	86.44
OTHER 33/50 CHEMICALS	0	0.00
STATE TRI TOTAL	1,274,235	

VIRGINIA

Chemical	Pounds	Percent of State TRI Total
Toluene	2,411,243	4.09
Benzene	1,651,821	2.80
Xylene (mixed isomers)	1,252,097	2.12
Chromium compounds	1,247,224	2.11
Dichloromethane	1,209,487	2.05
Chloroform	1,062,252	1.80
Methyl ethyl ketone	676,408	1.15
1,1,1-Trichloroethane	560,592	0.95
Methyl isobutyl ketone	516,643	0.88
Trichloroethylene	306,848	0.52
SUBTOTAL	10,894,615	18.47
OTHER 33/50 CHEMICALS	714,042	1.21
STATE TRI TOTAL	58,992,213	

Table J-1. Continued. (a)

WASHINGTON

Chemical	Pounds	Percent of State TRI Total
Toluene	2,751,001	5.65
Chloroform	2,715,876	5.58
Methyl ethyl ketone	2,512,311	5.16
1,1,1-Trichloroethane	1,633,033	3.35
Xylene (mixed isomers)	1,605,084	3.30
Dichloromethane	1,244,248	2.55
Trichloroethylene	699,894	1.44
Chromium compounds	477,912	0.98
Methyl isobutyl ketone	291,507	0.60
Benzene	220,195	0.45
SUBTOTAL	14,151,061	29.05
OTHER 33/50 CHEMICALS	231,634	0.48
STATE TRI TOTAL	48,706,760	

WEST VIRGINIA

Chemical	Pounds	Percent of State TRI Total
Toluene	2,411,243	4.09
Benzene	1,651,821	2.80
Xylene (mixed isomers)	1,252,097	2.12
Chromium compounds	1,247,224	2.11
Dichloromethane	1,209,487	2.05
Chloroform	1,062,252	1.80
Methyl ethyl ketone	676,408	1.15
1,1,1-Trichloroethane	560,592	0.95
Methyl isobutyl ketone	516,643	0.88
Trichloroethylene	306,848	0.52
SUBTOTAL	10,894,615	18.47
OTHER 33/50 CHEMICALS	714,042	1.21
STATE TRI TOTAL	58,992,213	

WISCONSIN

Chemical	Pounds	Percent of State TRI Total
1,1,1-Trichloroethane	6,092,236	6.09
Toluene	5,835,513	5.84
Xylene (mixed isomers)	5,568,319	5.57
Lead compounds	4,688,038	4.69
Methyl ethyl ketone	4,561,308	4.56
Dichloromethane	1,693,977	1.69
Trichloroethylene	1,278,242	1.28
Methyl isobutyl ketone	1,212,383	1.21
Chromium compounds	985,675	0.99
Chloroform	899,693	0.90
SUBTOTAL	32,815,384	32.83
OTHER 33/50 CHEMICALS	1,750,932	1.75
STATE TRI TOTAL	99,963,906	

WYOMING

Chemical	Pounds	Percent of State TRI Total
Toluene	322,521,176	5.65
Xylene (mixed isomers)	185,442,035	3.25
1,1,1-Trichloroethane	185,026,191	3.24
Methyl ethyl ketone	156,992,642	2.75
Dichloromethane	130,355,581	2.28
Chromium compounds	50,881,050	0.89
Trichloroethylene	48,976,806	0.86
Methyl isobutyl ketone	38,849,703	0.68
Lead compounds	34,498,469	0.60
Tetrachloroethylene	30,058,581	0.53
SUBTOTAL	1,183,602,234	20.22
OTHER 33/50 CHEMICALS	138,003,263	2.42
STATE TRI TOTAL	5,705,670,380	

(a) American Samoa and the District of Columbia reported no releases and transfers of 33/50 chemicals and chemical categories.

Table J-2. Total Releases and Transfers of 33/50 Chemicals in Each Industry, 1989.

CHEMICAL	FOOD SIC 20 Pounds	TOBACCO SIC21 Pounds	TEXTILES SIC22 Pounds	APPAREL SIC23 Pounds	LUMBER SIC24 Pounds	FURNITURE SIC 25 Pounds
Cadmium compounds	0	0	2,250	0	0	0
Cadmium	0	0	1,880	0	0	0
Chromium compounds	0	0	35,260	0	166,015	4,290
Chromium	44,798	0	0	0	22,110	2,521
Lead compounds	0	0	9,500	1,250	0	101
Lead	30,885	0	3,974	0	0	1,250
Mercury compounds	0	0	0	0	0	0
Mercury	0	0	0	0	0	0
Nickel compounds	90,902	0	4,172	0	0	32,180
Nickel	61,668	0	0	0	27	7,450
Carbon tetrachloride	0	0	0	0	0	0
Chloroform	81,527	0	0	0	0	0
Dichloromethane	446,690	0	466,037	157,079	204,614	292,560
Tetrachloroethylene	0	0	2,021,929	120,852	138,550	13,600
1,1,1-Trichloroethane	79,716	250	4,677,849	380,233	289,852	3,307,205
Trichloroethylene	772	0	321,842	0	750	199,888
Benzene	63,883	0	0	0	3,250	0
Methyl ethyl ketone	695,975	0	7,702,570	237,100	2,791,419	6,034,857
Methyl isobutyl ketone	1,190	0	961,286	46,500	1,451,803	2,449,943
Toluene	811,622	176,563	4,540,924	213,297	8,197,656	18,222,706
Xylene (mixed isomers)	147,322	0	2,691,098	131,244	8,229,284	12,037,098
m-Xylene	0	0	0	0	0	44,009
o-Xylene	0	0	28,800	0	0	3
p-Xylene	0	0	0	0	0	0
Cyanide compounds	0	0	532	0	250	0
Hydrogen cyanide	0	0	0	0	0	0
TOTAL 33/50 CHEMICALS	2,556,950	176,813	23,469,903	1,287,555	21,495,580	42,649,661
TOTAL FOR ALL OTHERS	65,246,387	1,308,813	22,611,453	771,818	16,329,016	22,719,846
TRI GRAND TOTAL	67,803,337	1,485,626	46,081,356	2,059,373	37,824,596	65,369,507

Table J-2. Continued.

CHEMICAL	PAPER SIC 26 Pounds	PRINTING SIC 27 Pounds	CHEMICALS SIC 28 Pounds	PETROLEUM SIC 29 Pounds	PLASTICS SIC 30 Pounds	LEATHER SIC 31 Pounds
Cadmium compounds	0	0	180,219	1,250	39,556	516
Cadmium	0	0	12,980	0	11,740	0
Chromium compounds	229,502	37,409	22,955,931	476,629	161,346	1,106,402
Chromium	36,010	2,865	285,505	297,028	122,092	510,523
Lead compounds	28,902	250	1,647,278	308,620	168,313	598
Lead	750	5,534	133,924	42,320	497,315	0
Mercury compounds	0	0	16,899	0	1,250	0
Mercury	0	0	129,490	107	0	0
Nickel compounds	1,000	0	2,559,385	529,452	41,026	0
Nickel	0	317	248,153	142,182	52,767	250
Carbon tetrachloride	0	0	4,342,980	27,481	500	0
Chloroform	20,490,608	0	3,972,607	70	20,500	0
Dichloromethane	720,537	351,262	38,375,623	4,717	25,802,067	228,472
Tetrachloroethylene	203,461	195,934	2,608,582	2,445	982,341	167,491
1,1,1-Trichloroethane	3,143,771	4,522,055	7,212,789	285,346	13,896,282	315,074
Trichloroethylene	50,847	161,532	1,091,832	49,838	1,447,767	0
Benzene	0	0	10,207,755	4,685,674	0	0
Methyl ethyl ketone	8,244,205	3,906,677	14,759,679	3,652,527	18,430,608	2,882,455
Methyl isobutyl ketone	1,136,030	328,537	10,628,436	487,237	2,590,020	971,886
Toluene	36,055,332	42,789,389	70,170,774	12,151,551	23,102,515	3,620,225
Xylene (mixed isomers)	3,166,715	2,004,817	32,944,231	7,758,193	6,557,946	1,009,682
m-Xylene	0	0	442,057	284,597	0	56,385
o-Xylene	0	0	1,430,863	256,336	0	55,303
p-Xylene	0	0	3,771,717	447,186	0	0
Cyanide compounds	0	0	5,504,152	250	756	0
Hydrogen cyanide	0	0	4,084,125	1,050	750	0
TOTAL 33/50 CHEMICALS	73,507,670	54,306,578	239,717,966	31,892,086	93,927,457	10,925,262
TOTAL FOR ALL OTHERS	239,746,571	6,617,083	2,506,050,105	71,244,513	100,575,162	13,936,717
TRI GRAND TOTAL	313,254,241	60,923,661	2,745,768,071	103,136,599	194,502,619	24,861,979

Table J-2. Continued.

CHEMICAL	STONE/CLAY SIC32 Pounds	PRIMARY METALS SIC 33 Pounds	FABR. METALS SIC 34 Pounds	MACHINERY SIC 35 Pounds	ELECTRICAL SIC 36 Pounds	TRANSPORT. SIC 37 Pounds
Cadmium compounds	14,882	282,848	27,952	2	158,551	27,006
Cadmium	5,750	183,399	130,649	1,000	8,795	2,339
Chromium compounds	1,769,850	13,843,829	1,806,209	773,670	246,579	1,373,420
Chromium	62,796	6,207,296	2,218,658	2,136,408	357,197	494,951
Lead compounds	3,898,600	21,858,099	189,707	53,296	2,974,789	225,739
Lead	882,148	14,830,145	534,212	76,028	981,810	615,921
Mercury compounds	4	500	0	0	37,608	0
Mercury	0	753	0	0	20,477	500
Nickel compounds	9,644	3,446,432	913,036	97,912	650,213	200,820
Nickel	502	3,415,724	1,579,970	1,216,450	332,404	1,234,037
Carbon tetrachloride	519	0	0	0	1,000	0
Chloroform	508	0	0	0	1,000	17,200
Dichloromethane	1,725,786	1,755,597	3,877,690	1,903,532	9,170,339	6,620,749
Tetrachloroethylene	170,092	2,906,545	3,605,064	1,220,759	3,479,727	6,977,086
1,1,1-Trichloroethane	813,339	22,082,940	24,039,798	16,720,224	20,946,321	33,595,538
Trichloroethylene	234,305	3,846,143	12,239,131	7,189,550	5,516,372	6,734,139
Benzene	1,224	10,229,271	258	500	0	127,012
Methyl ethyl ketone	1,070,979	6,607,286	11,664,019	2,360,465	3,447,079	14,755,978
Methyl isobutyl ketone	421,430	980,166	2,805,193	430,867	522,954	8,309,417
Toluene	3,088,455	5,353,260	11,634,320	5,145,074	5,943,189	18,696,192
Xylene (mixed isomers)	1,497,681	4,859,702	18,576,778	8,655,031	15,161,270	42,652,452
m-Xylene	0	280,188	32,485	0	0	27,013
o-Xylene	5,512	1,159	10,800	0	0	17,500
p-Xylene	0	660	0	0	0	10,652
Cyanide compounds	0	1,196,797	749,981	20,047	17,840	118,075
Hydrogen cyanide	0	4,300	0	0	53,250	0
TOTAL 33/50 CHEMICALS	15,674,006	124,173,039	96,635,910	48,000,815	70,028,764	142,833,736
TOTAL FOR ALL OTHERS	31,811,904	632,635,538	110,748,089	26,921,655	75,729,410	102,482,409
TRI GRAND TOTAL	47,485,910	756,808,577	207,383,999	74,922,470	145,758,174	245,316,145

Table J-2. Continued.

CHEMICAL	MEASURE./PHOTO SIC 38 Pounds	MISCELLANEOUS SIC 39 Pounds	MULTIPLE CODE 20-39 Pounds	NONE 20-39 Pounds	TOTAL RELEASES AND TRANSFERS Pounds
Cadmium compounds	3,396	1,000	19,352	1,085	759,865
Cadmium	0	250	28,136	1,000	387,918
Chromium compounds	31,861	160,307	5,683,453	19,088	50,881,050
Chromium	89,700	3,918	501,283	7,673	13,403,332
Lead compounds	146,481	9,836	2,972,145	4,965	34,498,469
Lead	80,784	3,977	814,781	336,890	19,872,648
Mercury compounds	0	0	17	750	57,028
Mercury	78	0	7,500	500	159,405
Nickel compounds	10,425	1,196,941	3,063,199	2,464	12,849,203
Nickel	28,107	58,993	1,111,607	2,500	9,493,108
Carbon tetrachloride	0	0	234,579	750	4,607,809
Chloroform	0	0	2,740,738	750	27,325,508
Dichloromethane	21,122,582	2,246,821	14,633,954	248,873	130,355,581
Tetrachloroethylene	594,779	428,259	4,100,279	120,806	30,058,581
1,1,1-Trichloroethane	4,680,641	3,904,689	19,350,588	781,691	185,026,191
Trichloroethylene	1,092,691	1,721,975	6,891,119	186,313	48,976,806
Benzene	0	1,250	3,022,369	248,961	28,591,407
Methyl ethyl ketone	2,154,911	4,951,099	39,807,285	835,469	156,992,642
Methyl isobutyl ketone	316,268	633,487	3,086,081	290,972	38,849,703
Toluene	3,484,051	7,972,183	39,718,420	1,433,478	322,521,176
Xylene (mixed isomers)	1,055,202	2,667,587	12,303,133	1,335,569	185,442,035
m-Xylene	14,270	0	266,814	17,960	1,465,778
o-Xylene	18,681	0	409,111	8,593	2,242,661
p-Xylene	8,900	0	568,231	3,877	4,811,223
Cyanide compounds	78	9,257	169,616	4,264	7,791,895
Hydrogen cyanide	0	0	41,000	0	4,184,475
TOTAL 33/50 CHEMICALS	34,933,886	25,971,829	161,544,790	5,895,241	1,321,605,497
TOTAL FOR ALL OTHERS	34,601,511	12,914,618	275,733,485	13,328,780	4,384,064,883
TRI GRAND TOTAL	69,535,397	38,886,447	437,278,275	19,224,021	5,705,670,380

APPENDIX K

TRI Chemicals in Other Federal Programs

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
Acetaldehyde	X				X
Acetamide					
Acetone	X	X	X	X	X
Acetonitrile	X				X
2-Acetylaminofluorene					X
Acrolein		X	X	X	X
Acrylamide	X				X
Acrylic acid	X				X
Acrylonitrile	X	X		X	X
Aldrin		X	X	X	X
Allyl chloride					X
Aluminum (fume or dust)		X	X		
Aluminum oxide (fibrous forms)					
2-Aminoathraquinone					X
4-Aminoazobenzene					X
4-Aminobiphenyl					X
1-Amino-2-methylanthraquinone					X
Ammonia		X		X	
Ammonium nitrate (solution)		X			X
Ammonium sulfate (solution)		X			
Aniline	X	X		X	
o-Anisidine					X
p-Anisidine					
o-Anisidine hydrochloride					X
Anthracene				X	X
Antimony				X	
Arsenic		X		X	X
Asbestos (friable)		X		X	X
Barium				X	
Benzal chloride	X				X
Benzamide					
Benzene		X		X	X
Benzidine				X	X
Benzoic trichloride					X
Benzoyl chloride					X
Benzoyl peroxide					
Benzyl chloride					X
Beryllium				X	X
Biphenyl	X	X	X		X
Bis(2-chloroethyl) ether		X		X	X
Bis(chloromethyl) ether				X	X
Bis(2-chloro-1-methylethyl)ether	X				X
Bis(2-ethylhexyl) adipate					X
Bromoform	X			X	X
Bromomethane		X	X	X	X
1,3-Butadiene					X
Butyl acrylate					X
n-Butyl alcohol	X				
sec-Butyl alcohol					X
tert-Butyl alcohol		X	X		X
Butyl benzyl phthalate	X			X	X
1,2-Butylene oxide	X				X
Butyraldehyde					X

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
C.I. Acid Blue 9, diammonium salt (DELISTED)					
C.I. Acid Blue 9, disodium salt (DELISTED)					
C.I. Acid Green 3					
C.I. Basic Green 4					
C.I. Basic Red 1					X
C.I. Direct Black 38	X				X
C.I. Direct Blue 6	X				X
C.I. Direct Brown 95	X				X
C.I. Disperse Yellow 3					X
C.I. Food Red 5					X
C.I. Food Red 15					
C.I. Solvent Orange 7					
C.I. Solvent Yellow 3					X
C.I. Solvent Yellow 14					X
C.I. Solvent Yellow 34		X			X
C.I. Vat Yellow 4					X
Cadmium				X	X
Calcium cyanamide		X	X		X
Captan		X	X		X
Carbaryl		X	X	X	
Carbon disulfide	X	X		X	X
Carbon tetrachloride		X		X	X
Carbonyl sulfide					
Catechol					
Chloramben		X	X		X
Chlordane		X	X	X	X
Chlorine		X	X		X
Chlorine dioxide		X	X		
Chloroacetic acid		X			X
2-Chloroacetophenone		X			X
1,2,3-Trichlorobenzene	X	X		X	X
Chlorobenzilate		X	X	X	X
Chloroethane	X			X	X
Chloroform		X		X	X
Chloromethane	X	X		X	X
Chloromethyl methyl ether					
Chloroprene					X
Chlorothalonil		X	X		X
Chromium		X		X	X
Cobalt				X	
Copper		X	X	X	
p-Cresidine					X
Cresol (mixed isomers)		X		X	X
m-Cresol	X	X	X		
o-Cresol	X			X	X
p-Cresol	X			X	
Cumene	X				
Cumene hydroperoxide					
Cupferron					X
Molybdenum trioxide					X
Cyclohexane	X	X			
2,4-D (acetic acid)	X	X	X	X	X
Decabromodiphenyl oxide	X				X
Diallate		X	X		

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
2,4-Diaminoanisole					
2,4-Diaminoanisole sulfate					X
4,4'-Diaminodiphenyl ether					
Diaminotoluene (mixed isomers)					X
2,4-Diaminotoluene	X				X
Diazomethane					
Dibenzofuran				X	
1,2-Dibromo-3-chloropropane		X		X	X
1,2-Dibromoethane		X		X	X
Dibutyl phthalate	X	X	X	X	X
Dichlorobenzene (mixed isomers)					X
1,2-Dichlorobenzene	X	X	X	X	X
1,3-Dichlorobenzene	X			X	
1,4-Dichlorobenzene	X	X	X	X	X
3,3'-Dichlorobenzidine				X	X
Dichlorobromomethane				X	X
1,2-Dichloroethane		X		X	X
1,2-Dichloroethylene				X	X
Dichloromethane	X	X	X	X	X
2,4-Dichlorophenol	X			X	X
1,2-Dichloropropane	X	X		X	X
2,3-Dichloro-1-propene					X
1,3-Dichloropropylene					X
Dichlorvos		X	X		X
Dicofol		X	X		X
Diepoxybutane					X
Diethanolamine					X
Di-(2-ethylhexyl) phthalate	X	X	X	X	X
Diethyl phthalate	X	X	X	X	X
Diethyl sulfate					
3,3'-Dimethoxybenzidine					X
4-Dimethylaminoazobenzene					X
3,3'-Dimethylbenzidine					X
Dimethylcarbamyl chloride					X
1,1-Dimethyl hydrazine	X	X			
2,4-Dimethylphenol		X	X	X	X
Dimethyl phthalate	X	X	X	X	X
Dimethyl sulfate					X
4,6-Dinitro-o-cresol		X	X	X	
2,4-Dinitrophenol	X	X	X	X	
2,4-Dinitrotoluene				X	X
2,6-Dinitrotoluene				X	
Dinitrotoluene (mixed isomers)					X
n-Dioctyl phthalate		X	X	X	X
1,4-Dioxane					X
1,2-Diphenylhydrazine				X	X
Epichlorohydrin		X			X
2-Ethoxyethanol					X
Ethyl acrylate					X
Ethylbenzene				X	X
Ethyl chloroformate					
Ethylene					
Ethylene glycol		X	X	X	X
Ethyleneimine					
Ethylene oxide	X	X	X	X	X
Ethylene thiourea		X			X

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
Fluometuron		X	X		X
Formaldehyde		X	X	X	X
Freon 113					
Heptachlor		X	X	X	X
Hexachlorobenzene		X		X	X
Hexachloro-1,3-butadiene				X	X
Hexachlorocyclopentadiene		X		X	X
Hexachloroethane	X	X		X	X
Hexachloronaphthalene					
Hexamethylphosphoramide					X
Hydrazine	X	X		X	X
Hydrazine sulfate	X				X
Hydrochloric acid		X	X		
Hydrogen cyanide		X			
Hydrogen fluoride					
Hydroquinone	X				X
Isobutyraldehyde					
Isopropyl alcohol (manufacturing)	X	X	X		X
4,4'-Isopropylidenediphenol	X				X
Lead		X		X	X
Lindane		X	X		X
Maleic anhydride	X				
Maneb		X	X		
Manganese				X	
Melamine (DELISTED)					X
Mercury		X		X	X
Methanol		X	X	X	X
Methoxychlor		X	X	X	X
2-Methoxyethanol		X	X		X
Methyl acrylate					
Methyl tert-butyl ether	X				
4,4'-Methylenebis(2-chloro aniline)				X	X
4,4'-Methylenebis(N,N-dimethyl)					X
Methylenebis(phenylisocyanate)					
Methylene bromide	X				
4,4'-Methyenedianiline					X
Methyl ethyl ketone	X	X	X	X	X
Methyl hydrazine					
Methyl iodide					X
Methyl isobutyl ketone	X	X		X	X
Methyl isocyanate					
Methyl methacrylate				X	X
Michler's ketone					X
Mustard gas				X	
Naphthalene		X	X	X	X
alpha-Naphthylamine					
beta-Naphthylamine					X
Nickel				X	X
Nitric acid					
Nitrilotriacetic acid		X			X
5-Nitro-o-anisidine					X
Nitrobenzene	X	X		X	
4-Nitrobiphenyl					
Nitrofen		X			X
Nitrogen mustard				X	X

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
Nitroglycerin					
2-Nitrophenol				X	
4-Nitrophenol	X	X	X	X	X
2-Nitropropane		X			
p-Nitrosodiphenylamine					X
N,N-Dimethylaniline					X
N-Nitrosodi-n-butylamine					X
N-Nitrosodiethylamine					X
N-Nitrosodimethylamine				X	X
N-Nitrosodiphenylamine				X	X
N-Nitrosodi-n-propylamine				X	X
N-Nitrosomethylvinylamine					X
N-Nitrosomorpholine					X
N-Nitroso-N-ethylurea					X
N-Nitroso-N-methylurea					X
N-Nitrosonornicotine					X
N-Nitrosopiperidine					X
Octochloronaphthalene					
Osmium tetroxide					
Parathion		X	X	X	X
Pentachlorophenol		X	X	X	X
Peracetic acid		X			
Phenol	X	X	X	X	X
p-Phenylenediamine	X				
2-Phenylphenol		X	X		X
Phosgene	X			X	X
Phosphoric acid		X	X		
Phosphorus (yellow or white)		X	X		
Phthalic anhydride	X				X
Picric acid					
Polychlorinated biphenyls (PCBs)					X
Propane sultone					X
beta-Propiolactone		X			X
Propionaldehyde					
Propoxur		X	X		
Propylene					X
Propyleneimine					
Propylene oxide	X	X	X		X
Pyridine	X	X			X
Quinoline	X				
Quinone	X	X			
Quintozene		X	X		X
Saccharin (manufacturing)	X				X
Safrole		X			X
Selenium		X		X	
Silver		X	X	X	
Sodium hydroxide (solution)(DELISTED)		X	X		
Sodium sulfate (solution)(DELISTED)		X	X		
Styrene				X	X
Styrene oxide					X
Sulfuric acid		X	X	X	
Terephthalic acid (DELISTED)	X				
1,1,2,2-Tetrachloroethane	X	X		X	X
Tetrachloroethylene		X	X	X	X
Tetrachlorvinphos		X	X		X

CHEMICAL	TSCA SEC. 4 TESTING PROGRAM	PESTICIDE CHEMICAL	PESTICIDE IN FIFRA REREGIS-TRATION PROGRAM	ATSDR TOXICO-LOGICAL PROFILE	NATIONAL TOXICOLOGY PROGRAM TESTING PROGRAM
Thallium				X	
Thioacetamide					X
4,4'-Thiodianiline					X
Thiourea		X			X
Thorium dioxide					
Titanium tetrachloride					
Toluene	X	X		X	X
Toluene-2,4-diisocyanate					X
Toluene diisocyanate (mixed isomers)					X
Toluene-2,6-diisocyanate					X
o-Toluidine					X
o-Toluidine hydrochloride	X				X
Toxaphene		X	X	X	X
Triaziquone					
Trichlorfon		X	X		X
1,2,4-Trichlorobenzene	X	X		X	
1,1,1-Trichloroethane	X	X	X	X	X
1,1,2-Trichloroethane		X		X	X
Trichloroethylene		X		X	X
2,4,5-Trichlorophenol	X	X	X	X	
2,4,6-Trichlorophenol		X		X	X
Trifluralin		X	X		X
1,2,4-Trimethylbenzene					
Tris(2,3-dibromopropyl) phosphate					X
Urethane					X
Vanadium (fume or dust)				X	
Vinyl acetate				X	
Vinyl bromide					X
Vinyl chloride				X	X
Vinylidene chloride	X			X	X
Xylene (mixed isomers)	X	X		X	X
m-Xylene	X				
o-Xylene	X				
p-Xylene	X				
2,6-Xylidine					X
Zinc (fume or dust)				X	
Zineb		X	X		
Antimony compounds	X				
Arsenic compounds		X	X		
Barium compounds					
Beryllium compounds					
Cadmium compounds					
Chlorophenols					
Chromium compounds					
Cobalt compounds					
Copper compounds		X	X		
Cyanide compounds				X	
Glycol ethers					
Lead compounds					
Manganese compounds					
Mercury compounds					
Nickel compounds					
Poly brominated biphenyls					
Selenium compounds					
Silver compounds					
Thallium compounds					
Zinc compounds					

GLOSSARY

Absolute change: The change (in pounds) of TRI chemicals generated in wastes between two years without regard to changes in facility production levels.

Absorption: The taking up of a substance by its penetration into living or non-living material.

Acute toxicity: Toxic effects resulting from short term exposure at generally high concentrations.

Ambient Water Quality Criteria (AWQC): Estimates of concentrations of chemicals in surface waters (fresh or salt) that are not expected to harm the most sensitive aquatic organisms.

Aquatic toxicity: The degree of danger to a body of water and the organisms that inhabit it.

Bioaccumulation: The accumulation of a substance by an organism, in concentrations greater than are present in the external environment.

Carcinogen: Any substance that can cause or contribute to the production of cancer. See Chapter 3, Box 3-G for further discussion of carcinogens as they are defined for the purposes of this report.

Carcinogenesis: The process by which normal cells convert to cancerous cells.

Chemical Abstracts Service (CAS) number: A unique identifying number assigned to chemicals by the Chemical Abstracts Service.

Chemical category: A group of closely-related individual chemicals which are counted together for purposes of TRI reporting threshold and release calculations and which are reported to TRI under a single name. The TRI chemical list in effect at the time of 1989 reporting included 20 chemical categories, 15 of which were metal compound categories (such as lead compounds) and five of which were organic compound categories (such as glycol ethers).

Chlorofluorocarbons (CFCs): Chemical compounds containing carbon, chlorine, and fluorine. They are commonly used as refrigerants, propellants, and foam-blowing agents.

Chronic toxicity: Toxic effects resulting generally from long term exposure at low doses.

Degradation: The process by which a chemical is reduced to a less complex form.

Delisting: The deletion of a TRI chemical from the TRI chemical list after EPA has concluded that there is not sufficient evidence to establish any of the criteria for listing. Since the date of the original TRI chemical list, published in February, 1988, a total of 11 TRI chemicals have been delisted. See Chapter 2, Box 2-A, for further discussion of these chemical delistings.

Dun and Bradstreet number: A 9-digit number assigned by Dun and Bradstreet to a facility or establishment in order to code the facility or establishment for financial purposes.

Emissions factors: Published estimates based on the average measured emissions at several facilities in the same industry for the same general type of industrial process. Emission factors usually express releases as a ratio of amount released to process/equipment throughput.

Establishments: Defined for the purposes of TRI reporting as distinct and separate economic activities that are performed at a single physical location.

Facility: Defined for the purposes of TRI reporting as all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person.

Form R: The Toxic Chemical Release Inventory Reporting Form R, also referred to throughout this report as "form." Facilities required to report to EPA must complete a separate Form R for each chemical or chemical category reported.

Fugitive air emissions: Air emissions which are not released through stacks, vents, ducts, pipes, or any other confined air stream. Examples are equipment leaks or evaporation from surface impoundments.

Hazard Communication Standard: Regulation under the Occupational Safety and Health Administration (OSHA) requiring, among other things, the preparation and distribution of Material Safety Data Sheets.

Incineration: The destruction of solid, liquid, or gaseous wastes by burning.

Inhalation exposure: Exposure to a chemical via the respiratory tract.

Interstate commerce: In the context of TRI, the shipping of off-site transfers of wastes containing TRI chemicals across state borders for treatment, storage, and/or disposal.

Isomers: Two or more substances that have the same chemical composition, but a different structural arrangement.

Local Emergency Planning Committee (LEPC): A committee, formed in response to the requirements of the Emergency Planning and Community Right-to-Know Act of 1986, responsible for preparing and implementing emergency response plans for its jurisdiction and for collecting chemical data and making it publicly available. LEPCs are appointed by the State Emergency Response Commission.

Mass balance calculations: Emission calculations relating to an entire industrial process or piece of process equipment. If there were no wastestream, the amount of a chemical leaving a process or piece of equipment (output) would equal the amount entering (input). If the amount of chemical in the input and output streams for the process are known, the amount of chemical in a wastestream can be found by calculating the difference in the input and output amounts (taking into account any accumulation/depletion of the chemical in the equipment, e.g., by reaction).

Matched data: The subset of TRI data reported by the *same* facilities for the *same* chemicals for two or more reporting years (also referred to as "matched forms"). The matched 1987 and 1988 data were used in the second (1988) National Report in order to evaluate cross-year changes.

Material Safety Data Sheet (MSDS): A fact sheet containing technical information about hazardous chemicals, including physical and chemical characteristics, health hazards, and safety precautions.

Maximum Achievable Control Technology (MACT): Engineering-based emissions standards, whose establishment is mandated by the Clean Air Act Amendments of 1990, which must be set for 189 hazardous air pollutants over a ten-year period.

Maximum Contaminant Levels (MCLs): Enforceable standards established under the Safe Drinking Water Act in conjunction with the National Primary Drinking Water Regulations. They are the maximum permissible level of contaminants in water delivered to any user of a public water system. MCLs are to be set as close to the Maximum Contaminant Level Goal as is feasible with the use of the best technology, treatment techniques, and other means generally available, taking costs into consideration.

Maximum Contaminant Level Goals (MCLGs): Non-enforceable health goals for drinking water, established under the Safe Drinking Water Act in conjunction with the National Primary Drinking Water Regulations.

Mineral acid: A term loosely used to refer to inorganic acids such as sulfuric and hydrochloric acids.

Mutagenesis: The induction of a genetic change.

National Ambient Air Quality Standards (NAAQS): Standards (established by EPA under the Clean Air Act of 1970) for the concentrations allowable in the outdoor air for "criteria pollutants" such as ozone, carbon monoxide, sulfur dioxide, lead, total suspended particulates, and nitrogen oxide .

National Emission Standards for Hazardous Air Pollutants (NESHAPS): Emissions standards set by EPA for an air pollutant not covered by NAAQS that may cause an increase in deaths or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare.

National Pollutant Discharge Elimination System (NPDES): A program administered under the Clean Water Act which prohibits discharge of pollutants from point sources into waters of the United States except in compliance with a special permit issued by EPA or an approved state.

National Pretreatment Program: A program, developed as a part of the NPDES program, which regulates non-domestic wastewater discharges to publicly owned treatment works. See Chapter 4, Box 4-C for further discussion of the requirements of this program.

National Primary Drinking Water Regulations: Regulations established under the Safe Drinking Water Act and its amendments, designed to control contaminants in public drinking water supplies that EPA determines have adverse effects upon human health.

Neutralization: The reaction of an acid and a base to produce a salt and water. Mineral acids which have been neutralized prior to release or transfer are to be reported to TRI as zero release or transfer.

Off-site transfers: Annual quantities (in pounds) of a TRI chemical in wastes sent off-site for treatment, storage, or disposal. Transfers are reported in two categories: as transfers to publicly owned treatment works (POTWs) and as other off-site transfers (including transfers to incinerators, underground wells, landfills, and other treatment, storage or disposal sites not on the premises of the reporting facility).

On-site land releases: TRI releases to land on the premises of the reporting facility which fall into one or more of four categories: landfills, land treatment/application farming, surface impoundments, and other land disposal (such as spills or leaks to land and other types of disposal which cannot be classified in one of the three other categories).

Parent company: For the purposes of this report, a company that owns/operates one or more TRI facilities.

Parent metal: For the purposes of this report, the metal whose compounds comprise a TRI reporting category. For example, mercury is the "parent metal" for the category of mercury compounds.

Partial facility reports: Separate reports for each establishment (or for groups of establishments) located at a facility that has activities related to a TRI chemical being reported. Multiple partial reports may be filed for a TRI chemical as long as all releases and transfers of the TRI chemical from the entire facility are reported. Thresholds for the TRI chemical are based on the combined activities of all establishments at the facility (i.e. thresholds are not calculated separately by establishments or groups of establishments) .

Persistence: The amount of time that a chemical remains in the environment. A chemical may persist for less than a second or indefinitely.

Point source air emissions: Air emissions released from a stack, vent, duct, pipe, or other confined air stream, including storage tank emissions. Air releases from air pollution control equipment would generally fall in this category.

Pollution prevention: The combination of source reduction (see below) and toxic chemical use substitution, excluding any recycling or treatment of pollutants, and the substitution of a nontoxic product made with nontoxic chemicals for a nontoxic product made with toxic chemicals.

Production index: As applied to TRI reporting of waste minimization, a ratio of reporting-year production to the prior reporting-year production. The index is calculated to most closely reflect activities involving the chemical being reported on the Form R. Examples are : amount of paint produced in 1990/amount of paint produced in 1989, and number of appliances coated in 1990/number of appliances coated in 1989. Thus, if production has doubled, the production index is 2.0; if it has halved, the index is 0.5.

Projected change: The anticipated change in waste generation at a facility between years based solely upon the facility's change in productivity over those years. The projected change is used in the evaluation of waste minimization efforts (see relative change, below).

Publicly owned treatment works (POTW): A wastewater treatment works that is owned by a state or municipality including any devices used in the storage, treatment, recycling, and reclamation of domestic sewage or a combination of domestic sewage and industrial wastewaters. It also includes sewers, pipes, and other conveyances that convey wastewater to such a treatment works. The term also refers to the authority that has jurisdiction over discharges to and from such a treatment works.

Reference Dose (RfD): A threshold dose, based on estimates of exposure over a lifetime, below which no adverse effect is expected to occur.

Relative change: The cross-year change in amounts of TRI chemicals generated in wastes as a function of facility production levels, analyzed in the cross-year evaluation of waste minimization efforts.

Releases: Annual quantities (in pounds) of the TRI chemical in wastes released on site to air, water, underground injection, or land.

Reportable Quantity (RQ): The amount that triggers release notification reporting under CERCLA and EPCRA.

Revision: A facility-initiated correction of a previously-submitted Form R report.

Source reduction: Industrial source reduction is defined in the Pollution Prevention Act of 1990 as "any practice which 1) reduces the amount of any hazardous substance, pollutant, or contaminant entering any wastestream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and 2) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control."

Standard Industrial Classification (SIC) code: A number developed by the U.S. Office of Management and Budget to identify industrial sectors. The first two digits identify the broad industrial sector (such as SIC code 20, Food and Kindred Products) and the last two digits represent a facility's specialty within this broad sector (such as SIC code 2047, dog and cat food).

State Emergency Response Commission (SERC): Commission appointed by each state governor according to the requirements of the Emergency Planning and Community Right-to-Know Act. The SERCs designate emergency planning districts, appoint local emergency planning committees, and supervise and coordinate their activities. The SERCs also collect chemical information and make it publicly available.

Surface impoundment: A natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.

Threshold Planning Quantity (TPQ): The amount of each of the 360 Extremely Hazardous Substances (listed under Section 302 of the Emergency Planning and Community Right-to-Know Act) that, if present at the facility, trigger emergency planning notification requirements as well as participation by a facility representative in the local emergency planning process.

Total releases and transfers: The aggregate total in pounds of all TRI chemicals in wastes released on site to the air, water, underground injection, or land, combined with transfers, which are sent to POTWs and other off-site locations for treatment, storage, and/or disposal. This total may refer to overall nationwide TRI amounts or to a chemical, geographic area, industry, or facility.

Toxicity: The quality or degree of being poisonous or harmful to plant or animal life.

Trade secret: A claim of secrecy for the chemical identity when reporting its release and transfer to TRI. When making such a claim, the facility submits two reports to EPA, one identifying the chemical and the other providing a generic identity. The latter report is made available to the public. EPA may review and deny such claims.

Underground injection: A disposal method by which chemical wastes are injected into deep underground wells, requiring special geological conditions in order to prevent contamination of groundwater. See Chapter 4 for further discussion.

Underground Injection Well Code (UIC): Identification numbers assigned by EPA or the state under the authority of the Safe Drinking Water Act to facilities injecting TRI wastes into underground injection wells.

Waste generated: The pounds of a TRI chemical contained in a facility's wastestream *prior* to any on-site treatment or disposal.

Waste minimization: For the purpose of TRI reporting, facility activities including the reduction of waste generation and recycling. This can be accomplished by equipment changes, process modifications, product reformulation, chemical substitutions, or other techniques.

33/50-Intensive industry: An industry (as defined by two-digit SIC code) for which releases and transfers of 33/50 chemicals comprise over half of its total TRI releases and transfers.

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAS number	Chemical Abstracts Service registry number
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act of 1980
CFCs	The group of chemicals known as chlorofluorocarbons
CMA	Chemical Manufacturers Association
CWA	Clean Water Act
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FIPS code	Federal Information Processing Standard code
ITC	Interagency Testing Committee
LEPC	Local Emergency Planning Committee
MACT	Maximum Achievable Control Technology
MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
MSDS	Material Safety Data Sheet
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
POTWs	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
RED	Re-registration Eligibility Document
RfD	Reference Dose
RQ	Reportable Quantity
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
SIC Code	Standard Industrial Classification Code
TLV	Threshold Limit Value
TOXNET	The National Library of Medicine's Toxicology Data Network
TPQ	Threshold Planning Quantity
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
UIC program	Underground Injection Control program

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