United States
Environmental Protection
Agency

Office of Pollution
Prevention and Toxics
(TS-799)

EPA 745-R-93-003
May 1993

P01064

EPA

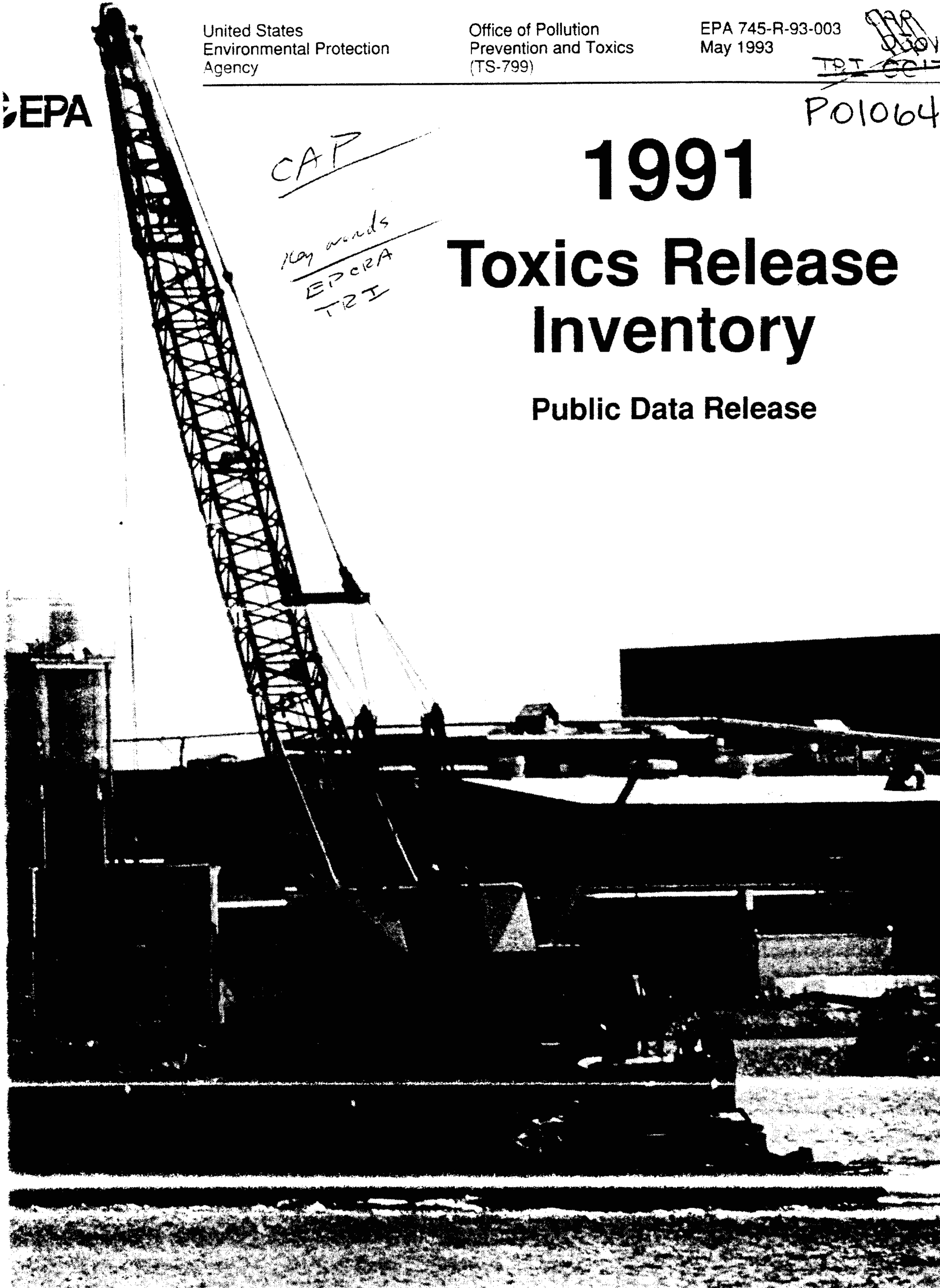
CAP

Key words
EPCRA
TRI

1991

Toxics Release Inventory

Public Data Release



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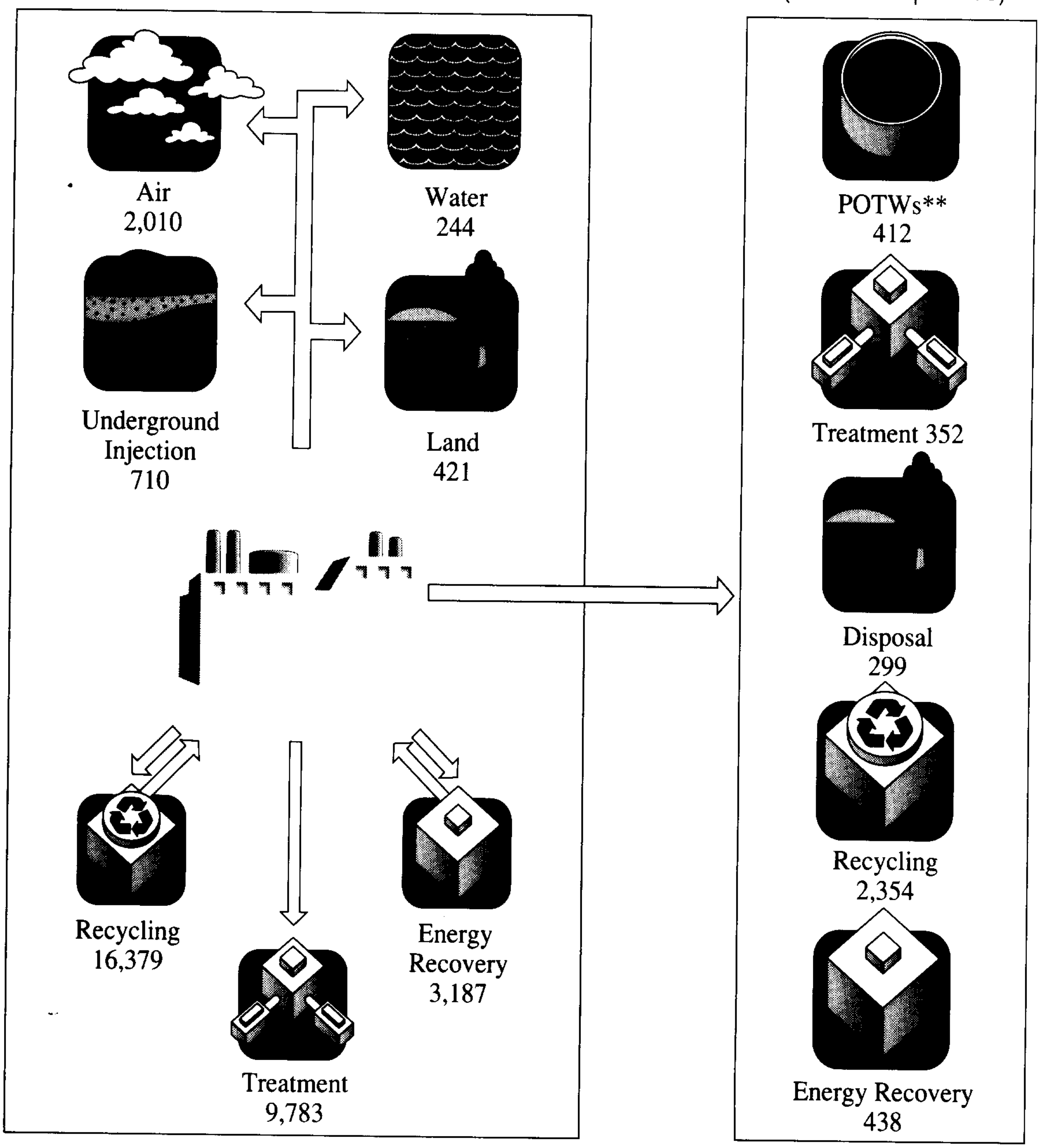
1991 Toxics Release Inventory Public Data Release Executive Summary

On-site Releases
and Waste Management
(millions of pounds)

Off-site
Waste Management*
(millions of pounds)



* 10 million pounds were reported with no off-site waste management code or an invalid code

** Publicly Owned Treatment Works

1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE EXECUTIVE SUMMARY

The 1991 reporting year marks the fifth year of the Toxics Release Inventory (TRI) program. According to the data, reported releases and transfers of listed toxic chemicals have declined for the fourth straight year.

Included in the 1991 data for the first time is extensive additional waste management and pollution prevention data required by the Pollution Prevention Act of 1990. The new data provide a much more complete picture of waste generation and management than has ever before been available in TRI, covering not just releases and off-site treatment and disposal, but also recycling, energy recovery, on-site treatment, and source reduction activities.

Because so many additional types of waste management activities are now reportable under TRI, the amount of toxic chemicals reported to TRI has increased greatly. The new TRI reports contain information about nearly 38 billion pounds of toxic chemicals managed or released by industry in 1991.

This additional data will be an exciting new tool for tracking facility progress in improving waste management and preventing pollution before it is ever generated.

1991 TRI Data

1991 releases:	3,385 million pounds
Air releases:	2,010 million
Water releases:	244 million
Underground injection:	710 million
Land releases:	421 million
1991 transfers:	3,865 million pounds
POTWs*:	412 million
Treatment/disposal/other:	661 million
Recycling:	2,354 million
Energy recovery:	438 million
Number of facilities reporting:	23,719
Number of forms filed:	82,293

* Publicly Owned Treatment Works

Top states for total release
(air, water, land, and underground injection):

Louisiana:	459 million pounds
Texas:	411 million pounds
Tennessee:	215 million pounds
Ohio:	171 million pounds
Indiana:	136 million pounds

Top industries for total release:

Chemicals:	1,550 million pounds
Primary metals:	433 million pounds
Paper:	242 million pounds
Plastics:	152 million pounds
Transportation Equip.:	149 million pounds

Top chemicals for total release:

Ammonia:	485 million pounds
Hydrochloric acid:	288 million pounds
Methanol:	252 million pounds
Toluene:	200 million pounds
Acetone:	165 million pounds

Releases and transfers of metal compounds:

Land releases:	315 million pounds
Transfers for disposal:	159 million pounds
Transfers to recycling:	1,012 million pounds

Releases of carcinogens:

Air releases:	202 million pounds
Water releases:	2 million pounds
Land releases:	8 million pounds

Releases to air of ozone depleters: 207 million pounds

Releases of bioaccumulators
(air, water, and land): 3 million pounds

Pollution Prevention Act Data

The following are aggregate reported quantities of TRI chemicals in waste. This new reporting distinguishes between production-related quantities and those releases that are the result of one-time or catastrophic events (non-production related quantities). Separating these quantities gives a clearer picture of what amounts may be amenable to source reduction efforts.

		Percent of Total
Total production-related quantities in waste:	37.8 billion pounds	
Recycled on-site:	16.4 billion pounds	43%
Recycled off-site:	3.3 billion pounds	9%
Energy Recovery on-site:	3.2 billion pounds	8%
Energy Recovery off-site:	0.5 billion pounds	1%
Treatment on-site:	9.8 billion pounds	26%
Treatment off-site:	0.9 billion pounds	2%
Quantity Released:	3.8 billion pounds	10%
Top 5 chemicals for total production-related quantities in wastes:		
Sulfuric acid:	7.4 billion pounds	
Hydrochloric acid:	2.5 billion pounds	
Acetonitrile:	2.5 billion pounds	
Methanol:	2.5 billion pounds	
Toluene:	1.8 billion pounds	
Non-production related quantities in waste:	0.031 billion pounds	

		Percent of Total
Facilities reporting source reduction:	8,821	37%
Forms indicating source reduction:	21,381	26%
Most commonly reported source reduction activities:		
Good operating practices:	9,966 forms	
Process modifications:	8,030 forms	
Spill/leak prevention:	6,071 forms	
Raw material modifications:	4,094 forms	
Cleaning and degreasing:	3,093 forms	
Most commonly reported methods to identify source reduction activities:		
Participative team management:	16,692 occurrences	
Internal pollution prevention opportunity audit:	13,782 occurrences	
Informal employee recommendations:	6,911 occurrences	
Vendor assistance:	6,910 occurrences	

The chemical for which source reduction was reported most frequently was 1,1,1-trichloroethane.

1988 - 1991 Comparison Data

Comparisons between 1990 and 1991 are made using a normalized data set of all chemicals reportable in both years. Comparisons between 1988 and 1991 are made using a normalized data set of only those chemicals reportable in all years 1988-1991. Although 1987 was the first year for TRI reporting, 1988 has been selected as the baseline year for comparisons because of concerns about data quality of industry's first-year submissions. Transfer comparisons do not include transfers for energy recovery and recycling, because these were first reportable for 1991.

	Percent Change 1990-1991	Percent Change 1988-1991
Total releases:	- 9	- 31
Air releases:	- 13	- 26
Water releases:	+ 24	- 22
Underground injection:	- 5	- 47
Land releases:	- 9	- 20
Transfers for treatment/disposal:	- 19	- 34
POTWs:	- 12	- 28
Treatment:	- 6	- 28
Disposal:	- 32	- 39
Number of facilities:	- 3	+ 6
Number of forms:	- 5	+ 5

The net increase in water releases from 1990 to 1991 is largely attributable to increased runoff from four fertilizer facilities in Louisiana. Excluding those increases, reported water releases would have decreased about 7% from 1990 to 1991.

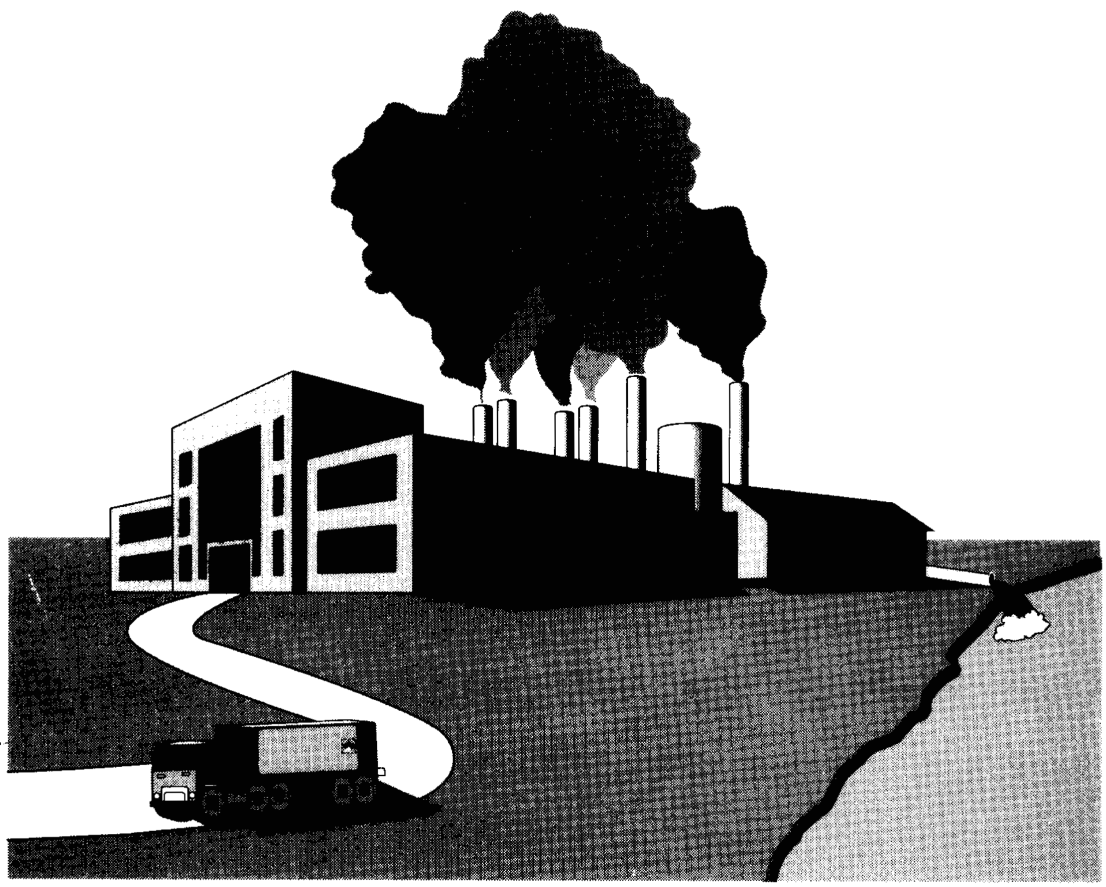
33/50 Program Information

The 33/50 Program is a voluntary Government/Industry/Community partnership program of toxics release reduction. The program targets 17 high-priority chemicals for reductions in releases and transfers of 33% by the 1992 TRI reporting year and 50% by the 1995 reporting year, using the 1988 TRI reports as a baseline. Many states, industry associations, and individual companies include 33/50 program chemicals within the scope of their own reduction programs.

Releases and transfers of the 17 targeted chemicals declined by 22% between 1990 and 1991, more than twice the rate of reduction for all other TRI chemicals.

1991 TRI data indicate that the 33/50 Program has reached its 1992 interim reduction goal of 33% a full year early. Releases and transfers of the targeted chemicals have declined 34% since 1988.

1991 Toxics Release Inventory Public Data Release Introduction



1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE: INTRODUCTION

WHAT IS THE TOXICS RELEASE INVENTORY?

The Toxics Release Inventory, or TRI, is a publicly available database that contains specific toxic chemical release and transfer information from manufacturing facilities throughout the United States. This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), which Congress passed to promote planning for chemical emergencies and to provide information to the public about the presence and release of toxic and hazardous chemicals in their communities. Following passage of the Pollution Prevention Act of 1990, the TRI was expanded to include mandatory reporting of additional waste management and pollution prevention activities.

Each year, manufacturing facilities meeting certain activity thresholds must report their estimated releases and transfers of listed toxic chemicals to the U.S. Environmental Protection Agency and to the state or tribal entity in whose jurisdiction the facility is located. The TRI list includes more than 300 chemicals and 20 chemical categories. A separate report, called a Form R, is required for each chemical the facility has manufactured, processed, or otherwise used in amounts exceeding the thresholds.

Reports for each calendar year are due by July 1 of the following year. After data entry and data quality assurance activities are completed, EPA makes the data available to the public in a printed report, in a computer database, and through a variety of other information products. States also make available to the public copies of the forms filed by facilities in their jurisdiction.

This document summarizes data collected for calendar year 1991 and provides basic data from 1988-1990 for comparison purposes. Although the first data were collected for calendar year 1987, 1988 has been selected as the baseline year because of concerns about the data quality of industry's first-year submissions.

WHO MUST REPORT?

Manufacturing facilities that have 10 or more full-time employees and meet the established thresholds for manufacturing, processing, or otherwise using listed chemicals must report their releases and transfers. Thresholds for manufacturing and processing are currently 25,000 pounds for each listed chemical, while the threshold for otherwise use is 10,000 pounds per chemical. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20-39, which include, among others: chemicals, petroleum refining, primary metals, fabricated metals, paper, rubber and plastics, and transportation equipment.

What Must be Reported?

TRI contains a great deal of information in addition to release and transfer estimates. Facilities must provide identifying information, such as name, location, type of business, contact names, name of parent company, and environmental permit numbers; information about the manufacture, process, and use of the listed chemical and the maximum amount on-site during the year; release and transfer estimates for each environmental medium and type of transfer; locations of off-site transfers; and waste treatment methods and efficiencies.

Beginning with the 1991 reports, facilities are required to provide additional information about waste management and source reduction activities. New data elements include quantities of the listed chemical treated, recycled, and combusted for energy recovery on-site, quantities transferred off-site for recycling and energy recovery, source reduction activities, and methods used to identify those activities. Availability of these data will provide a more complete picture of total waste generation and management by facilities, and will increase the ability to track progress in moving towards less waste generation and safer management alternatives. Companies must also provide a production index that will help relate changes in reported quantities of toxic chemicals in waste to changes in production.

What are the Benefits and Uses of the Data?

The TRI program gives the public unprecedented direct access to toxic chemical release and transfer data at the local, regional, and national level. The public can use this information to identify potential concerns, gain a better understanding of potential risks, and work with industry and government to reduce toxic chemical releases and the risks associated with them.

Federal, state, and local governments can use the data to compare facilities or geographic areas, to identify hotspots, to evaluate existing environmental programs, to more effectively set regulatory priorities, and to track pollution control and waste reduction progress.

Industry can use the data to obtain an overview of use and release of toxic chemicals, to identify and reduce costs associated with toxic waste, to identify promising areas of pollution prevention, to establish reduction targets, and to measure and document progress toward reduction goals. The public availability of the data has prompted many facilities to work with their communities to develop effective strategies for reducing environmental and human health risks posed by toxic chemical releases.

WHAT ARE THE LIMITATIONS OF THE DATA?

Although the TRI includes over 82,000 reports from approximately 23,000 facilities each year, it captures only a portion of all toxic chemical releases nationwide. Facilities with fewer than 10 employees and facilities that do not meet chemical thresholds are not required to file TRI reports. Although non-manufacturing facilities currently are not required to report, EPA is working to add to the TRI requirement certain non-manufacturing industries, such as mining and electric utilities, that are sources of significant releases of toxic chemicals. Many toxic chemicals, including some chemicals regulated under other environmental statutes, currently are not listed under EPCRA section 313, but are being identified and evaluated for addition to the list.

Some facilities that are required to report their releases and transfers to TRI do not file any reports, and some facilities may file reports for some, but not all, of the chemicals for which they were required to report. Accuracy of release and transfer data may vary from facility to facility and from year to year. Facilities are not required to perform any monitoring to develop TRI estimates, and may use a variety of estimation techniques if actual measurements are not available. EPA's active enforcement efforts have focused to date on facilities that have failed to file. EPA also is initiating more data quality inspections each year.

TRI reports reflect releases of chemicals, not exposures of the public to those chemicals. Release estimates alone are not sufficient to determine exposure or to calculate potential adverse effects on human health and the environment. Although additional information is necessary to assess exposure and risk, TRI data can be used to identify areas of potential concern.

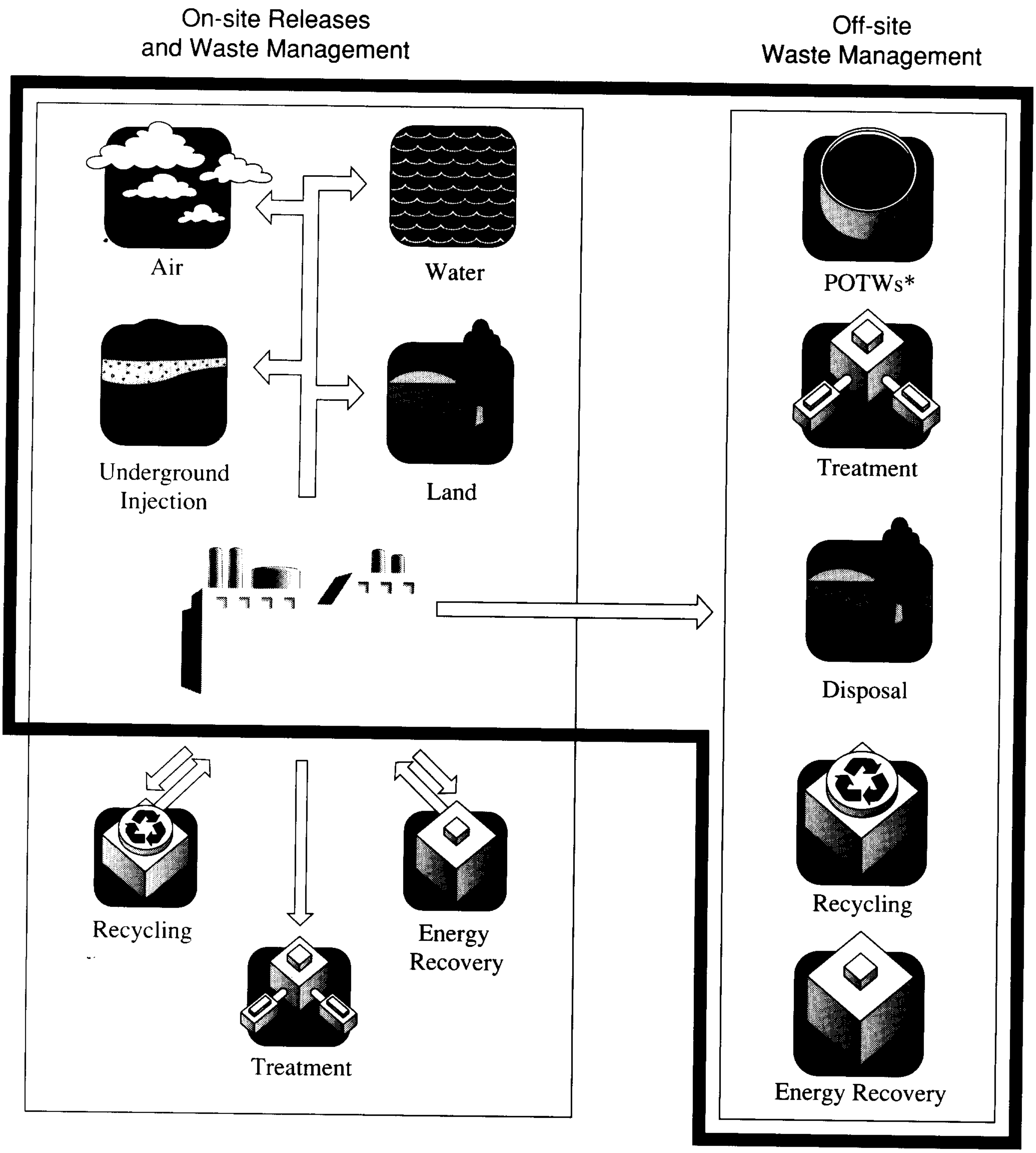
HOW CAN I OBTAIN ADDITIONAL TRI INFORMATION?

This report contains 1991 TRI data and limited comparison data for 1988-1990. The TRI database is accessible to the public via on-line telecommunications through the National Library of Medicine's TOXNET system; 1991 data should be available through this system in early June. Information about accessing the TRI database through TOXNET is provided in the Appendix.

Copies of TRI data submitted by facilities can be obtained from the EPA's TRI Reporting Center. Other potential sources of TRI information include the EPA Regional office, the State Section 313 contact, the Local Emergency Planning Committee, the State Emergency Response Commission, or the facility itself. Details about contacting some of these sources are provided in the Appendix.

EPA has prepared a number of documents to assist citizens, the news media, local and state governmental officials and others in using the TRI and other EPCRA data. These materials describe where the information can be obtained, its strengths and limitations, and how the data can be used in programs to protect public health and enhance environmental quality. To request copies of TRI and EPCRA documents or to obtain further information about the program, citizens should call their State Section 313 contact or the toll-free Emergency Planning and Community Right-to-Know Information Hotline at 1-800-535-0202.

Chapter 1
1991 TRI Releases and Transfers



* Publicly Owned Treatment Works

1991 TRI RELEASES AND TRANSFERS

This chapter provides information reported by facilities for calendar year 1991 on releases of toxic chemicals at the facility and transfers of chemicals off-site by the facility for the purposes of treatment, disposal, energy recovery, or recycling. These data are presented in three ways: by chemical; by state; and by industry. A separate section provides data on chemicals that may be of special interest to the public.

In 1991, there were 3.39 billion pounds of toxic chemicals released to the environment, including 2.01 billion pounds emitted to the air, 244 million pounds released to water, 421 million pounds released to land, and 710 million pounds injected underground.

Facilities also sent a total of 3.87 billion pounds of toxic chemicals to off-site facilities for treatment, disposal, energy recovery, and recycling. The bulk of these off-site transfers, 2.35 billion pounds, were sent off-site to be recycled. In addition, 438 million pounds of toxic chemicals were sent off-site for energy recovery, 352 million pounds of toxic chemicals were transferred off-site for treatment, 299 million pounds of toxic chemicals were transferred off-site for disposal, and 412 million pounds were sent to publicly-owned-treatment works.

Under TRI, facilities have been required to report off-site transfers of toxic chemicals for treatment or disposal. The 1991 reporting year was the first year in which facilities subject to TRI reporting were also required to report on the amounts of toxic chemicals that were sent off-site for the purposes of energy recovery or recycling. This new information, required by the Pollution Prevention Act, provides a more complete picture of toxic chemicals in wastes that are sent off-site by facilities subject to TRI. Although the total reported transfers in this chapter are significantly larger than total transfers reported in previous years, this does not represent an increase in the amounts of toxic chemicals in wastes sent off-site for treatment or disposal, but rather the inclusion of the new off-site transfer data.

In addition to the new information on off-site transfers, the Pollution Prevention Act also required information on the on-site management of toxic chemicals in wastes and efforts to prevent or reduce the amounts of toxic chemicals entering wastes. This new information is discussed in the next chapter.

TRI Chemicals Newly Listed For 1991

This chapter contains release information on all chemicals currently listed on EPCRA section 313, including the following chemicals that were first reportable in the 1991 reporting year:

Bromochlorodifluoromethane (Halon 1211)
Bromotrifluoromethane (Halon 1301)
Dibromotetrafluoroethane (Halon 2402)
Dichlorodifluoromethane (CFC-12)
Dichlorotetrafluoroethane (CFC-114)
Monochloropentafluoroethane (CFC-115)
Trichlorofluoromethane (CFC-11)

Data on releases and transfers of these ozone depleters are highlighted in Tables 1-27 and 1-28.

An Explanation of Releases and Transfers

Releases

A release is an on-site discharge of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, and releases at the facility to land and underground injection wells.

Releases to Air

Releases to air are reported either as fugitive or stack emissions. Stack emissions are releases to air that occur through confined air streams, such as stacks, vents, ducts, or pipes. Fugitive emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

Releases to Water

Releases to water include discharges to streams, rivers, lakes, oceans, and other bodies of water. This includes releases from contained sources, such as industrial process outflow pipes or open trenches. Releases due to runoff, including stormwater runoff, are also reported to TRI.

Releases to Land

Releases to land occur within the boundaries of the reporting facility. Releases to land include disposal of toxic chemicals in wastes in a landfill (in which waste is buried), land treatment/application farming (in which a waste containing a listed chemical is applied to or incorporated into soil), and surface impoundment (which is an uncovered holding area used to volatilize and/or settle waste materials).

Underground Injection

Underground injection is the disposal of fluids by the subsurface placement of the fluids in a well. Wastes containing EPCRA section 313 chemicals are either injected into Class I wells or Class V wells. Class I wells are used to inject liquid hazardous wastes or dispose of industrial and municipal waste waters beneath the lowermost underground source of drinking water. Class V wells are generally used to inject non-hazardous fluid into or above an underground source of drinking water. Wastes containing EPCRA section 313 chemicals are not disposed of in other classes of wells (i.e., Class II-IV).

Off-site Transfers

An off-site transfer is a transfer of the toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported under TRI as transferred off-site are sent to off-site facilities for the purposes of either recycling, energy recovery, treatment, or disposal. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, these quantities do not represent entry of the chemical into the environment.

Transfers to Publicly Owned Treatment Works (POTW)

A POTW is a wastewater treatment facility that is owned by a state or local municipality. Wastewaters from facilities reporting under TRI are transferred through pipes or sewers to the POTW. Treatment or removal of a chemical from the wastewater depends upon the nature of the chemical and treatment methods present at the POTW. In general, chemicals that are easily utilized as nutrients by microorganisms, are volatile, or have a low solubility in water are likely to be removed to some extent. Not all chemicals on EPCRA section 313 can be treated by a POTW. Those that are not removed by treatment are released by the POTW to surface waters.

Transfers Off-site for Treatment

Toxic chemicals in wastes that are transferred off-site may be treated through a variety of methods, including biological treatment, neutralization, incineration, and physical separation. These methods typically result in varying degrees of destruction of the toxic chemical. In some cases, the chemical is not destroyed but is prepared for further waste management, such as disposal.

Transfers Off-site for Disposal

Toxic chemicals in wastes that are transferred to a facility for disposal generally are either released to land (see above) at the off-site facility or injected underground.

Transfers Off-site for Recycling [This is a new TRI data element]

Toxic chemicals in wastes that are sent off-site for the purposes of recycling are generally recovered or regenerated by a variety of recycling methods, including solvent recovery, metals recovery, and acid regeneration. The choice of the recycling method depends on the toxic chemical being sent for recycling. Once they have been recycled, these chemicals may be returned to the originating facility for further processing or made available for use in commerce.

Transfers Off-site for Energy Recovery [This is a new TRI data element]

Toxic chemicals in waste sent off-site for purposes of energy recovery are combusted off-site in industrial furnaces (including kilns) or boilers that generate energy for use at that location. Chemicals that are not combustible, such as metals, metal compounds, CFCs and halons, should not be reported as transferred off-site for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Other Off-site Transfers

In this report, toxic chemicals in wastes that were reported as transferred off-site but for which the off-site activity (i.e., treatment, disposal, energy recovery, or recycing) was not specified have been classified as "other off-site transfers."

WHAT TO CONSIDER WHEN USING TRI DATA

Users of the TRI information should be aware that the TRI data reflect releases and transfers of chemicals, not exposures of the public to those chemicals. The TRI data can be used to determine the potential risks that may result from releases and transfers of toxic chemicals. The determination of potential risk depends upon many factors. Following are some of these factors:

- **Toxicity of the chemical**

  The TRI list consists of chemicals that vary widely in their ability to produce toxic effects.

  - Some high-volume releases of not-significantly toxic chemicals may appear to be a more serious problem than lower-volume releases of highly toxic chemicals, when just the opposite may be true.

- **Potential degradation or persistence of the chemical in the environment.**

  Sunlight, heat, or microorganisms may or may not decompose the chemical. Exposure to a chemical is also dependent upon how long the chemical remains unchanged in the environment.

  - For example, microorganisms readily degrade some chemicals, such as methanol into less toxic chemicals; volatile organic chemicals, such as ethylene and propylene, react in the atmosphere, contributing to smog; metals are persistent and will not be degraded upon release to the environment.

  - As a result, small releases of a persistent highly toxic chemical may create a more serious problem than large releases of a chemical that is rapidly transformed in the environment.

- **Bioconcentration of the chemical in the food chain.**

  The chemical may concentrate or may disperse as it moves up the food chain.

  - Some chemicals, such as benzoic trichloride or mercury, will accumulate as they move up the food chain; other chemicals, such as di-n-octyl phthalate, will disperse rather than bioconcentrate in higher organisms.

- **The environmental medium (air, water, land or underground injection) to which the toxic chemical has been released.**

  Chemical exposure of a population will depend on the environmental medium to which a chemical is released. The medium also affects the type of exposure (such as inhalation, dermal exposure, or ingestion).

- Releases of a chemical to the air can result in exposures to organisms living near and downwind from facilities releasing toxic chemicals to the atmosphere. Persistent chemicals may fall or be rained out of air onto land or into water bodies, resulting in exposures via these environmental media.

- Exposure that results from releases to water bodies (streams, lakes, etc.) depends on the downstream uses of the water, including drinking, cooking, and bathing.

- Releases to publicly owned treatment works (POTWs) may result in exposure if chemicals are not removed through treatment processes and are released by the POTW to water bodies used by downstream communities.

- Toxic chemicals released to land may be transported to other environmental media as a result of run-off or migration of the chemical through the soil into underlying water sources. Specially designed facilities such as permanent landfills and underground wells in which toxic chemicals in wastes are injected into rock below underground sources of drinking water may reduce the potential exposure from land disposal.

- Chemicals may enter the food chain through the presence of the toxic chemical in soil or water.

- **The location of the off-site facility receiving the chemical and the type and efficiency of its waste management practices.**

  The amount of the chemical that ultimately enters the environment depends upon how the toxic chemical was handled during disposal, treatment, energy recovery, or recycling, as is illustrated in the following examples.

  - The efficiency of recycling operations varies depending upon the method of recycling and the chemical being recycled.

  - Use of a combustible toxic chemical for energy recovery typically results in the destruction of 95 to 99% or more of the toxic chemical. The remaining quantity is either released to the air or is disposed in ash to land.

  - The efficiency of the treatment of toxic chemicals in wastes sent to sewage treatment plants varies depending on the chemical and the sewage plant. High volume pollutants such as methanol are readily degraded by most sewage treatment plants. Other high volume chemicals such as ammonia are not readily treated by most sewage treatment plants and will pass through the plant into the aquatic environment. The efficiency of other treatment methods, such as incineration, also depends upon the type of treatment method and the nature of the chemical.

- Toxic chemicals in wastes sent off-site for disposal are typically released to land or injected underground.

Further information on the use of TRI data in determining potential risks can be found in "Toxic Chemical Risk Screening Guide" (EPA 560/2-89-002), July 1989.

Table 1-1. TRI Releases, 1991.

1991 Releases	Pounds
Total Releases	3,385,873,118
Air Emissions	2,010,554,065
Surface Water Discharges	243,513,772
Underground Injection	710,377,137
Releases to Land	421,428,144

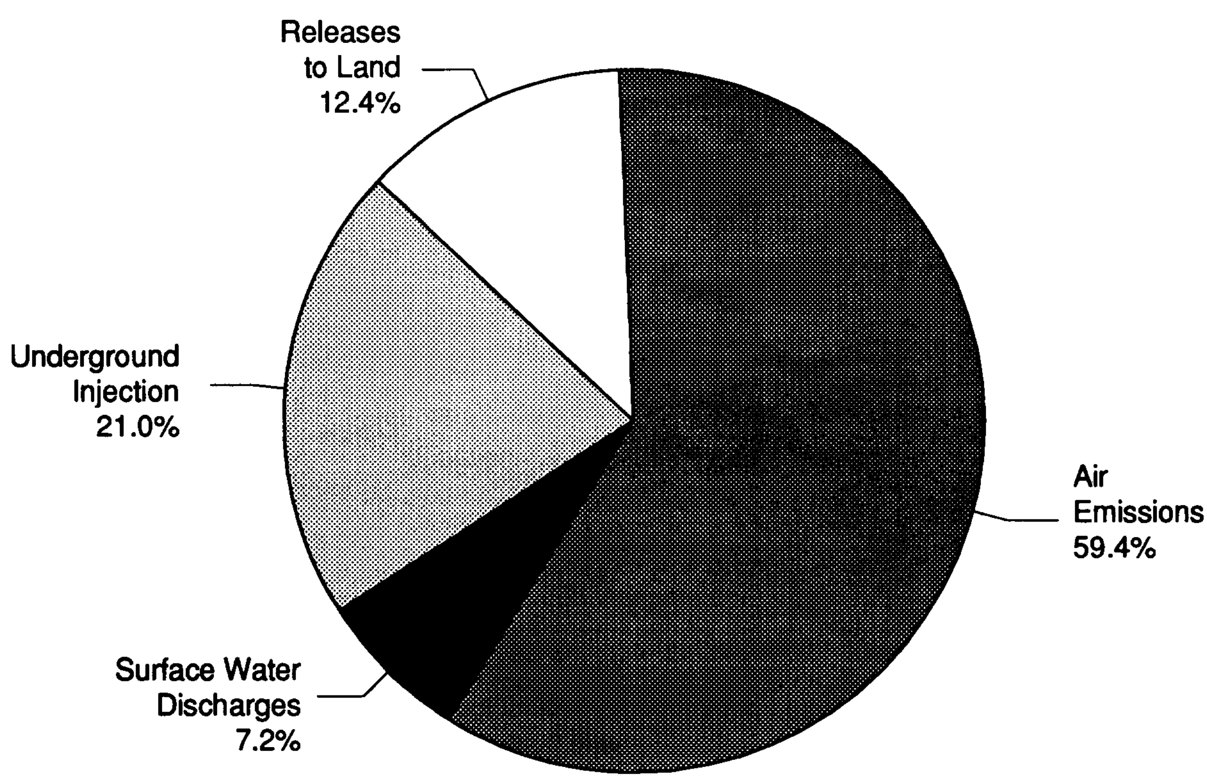


Figure 1-1. TRI Releases, 1991.

Table 1-2. TRI Transfers, 1991.

1991 Transfers	Pounds
Total Transfers	3,865,281,524
Transfers to POTWs	411,907,098
Transfers to Treatment	352,433,168
Transfers to Disposal	299,042,451
Transfers to Energy Recovery	438,225,342
Transfers to Recycling	2,354,123,586
Other Off-site Transfers	9,549,879

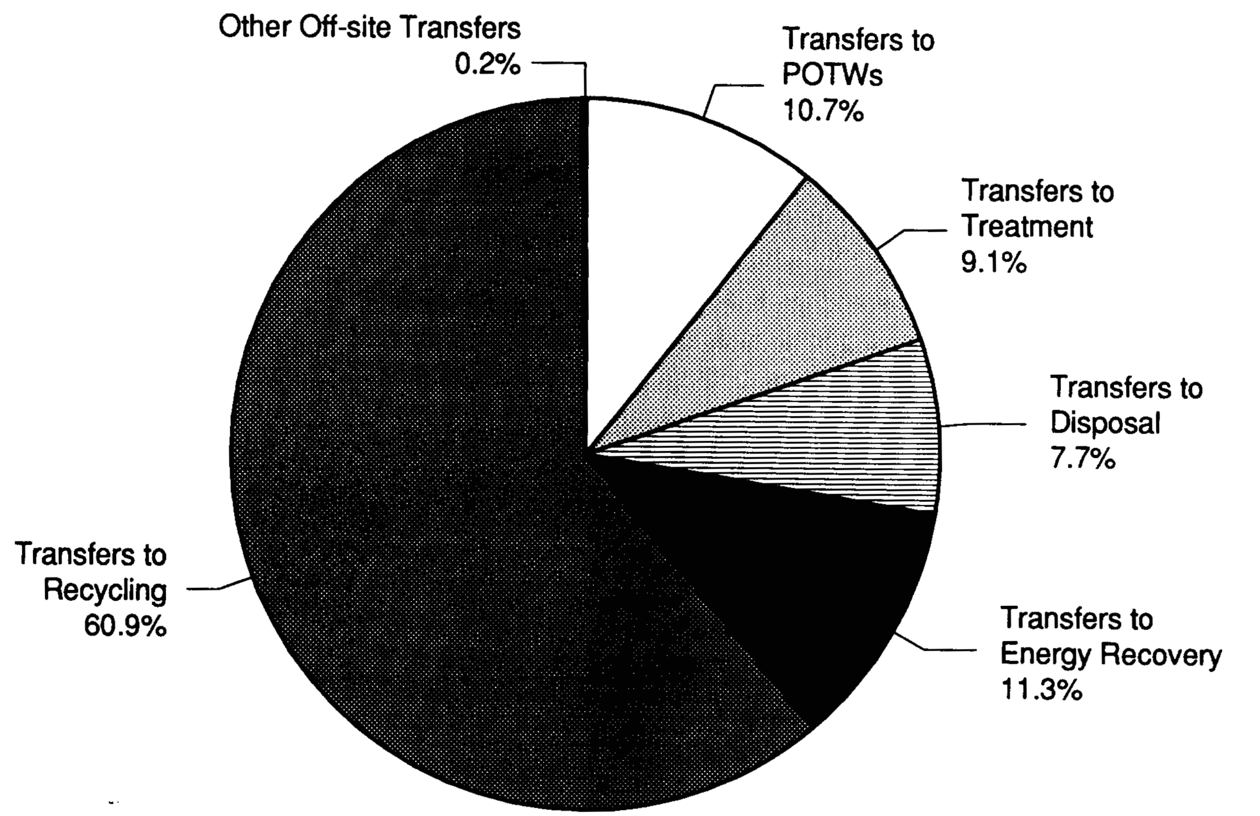


Figure 1-2. TRI Transfers, 1991.

THE 1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE

1991 Releases and Transfers by State

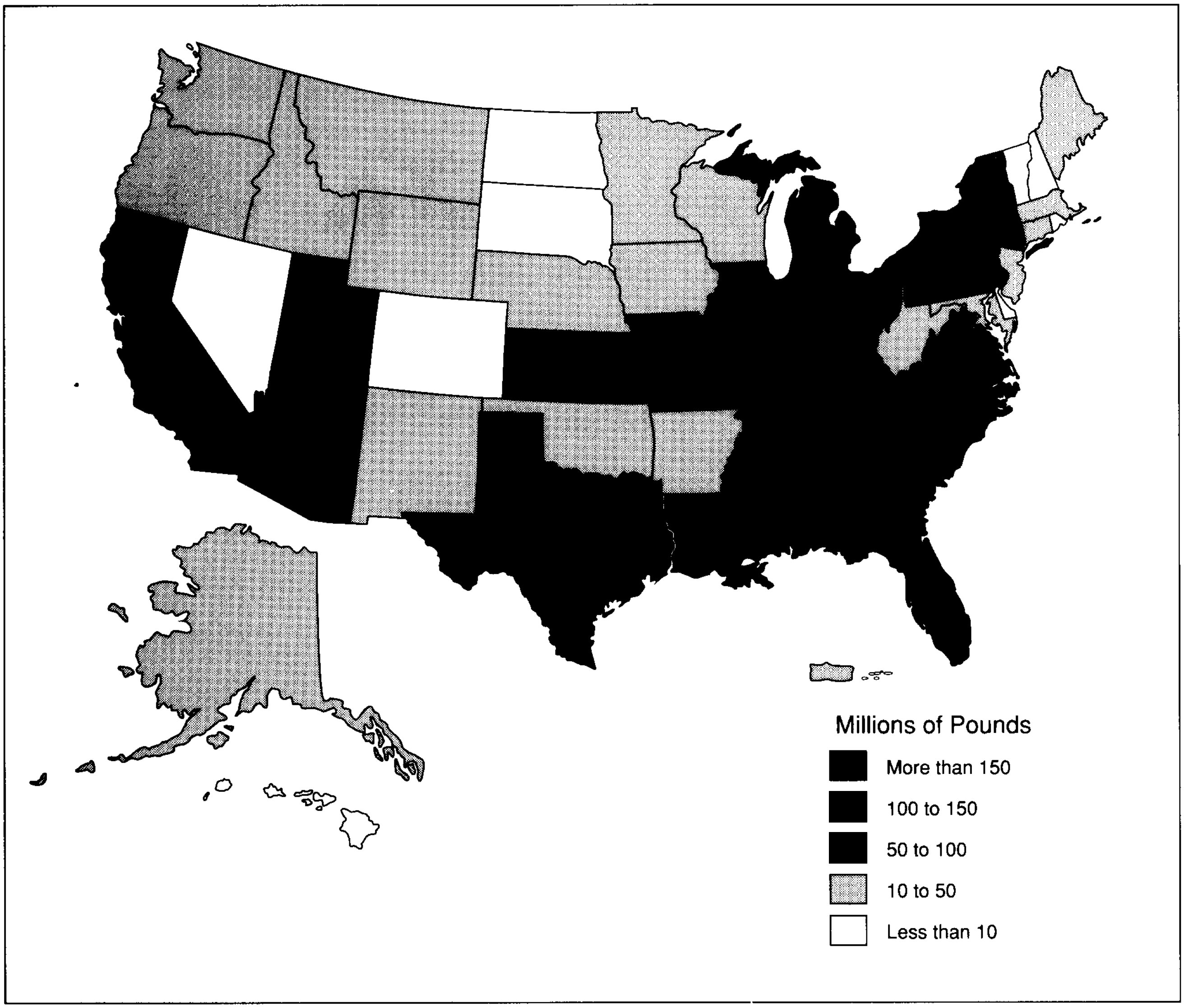


Figure 1-3. TRI Releases by State, 1991.

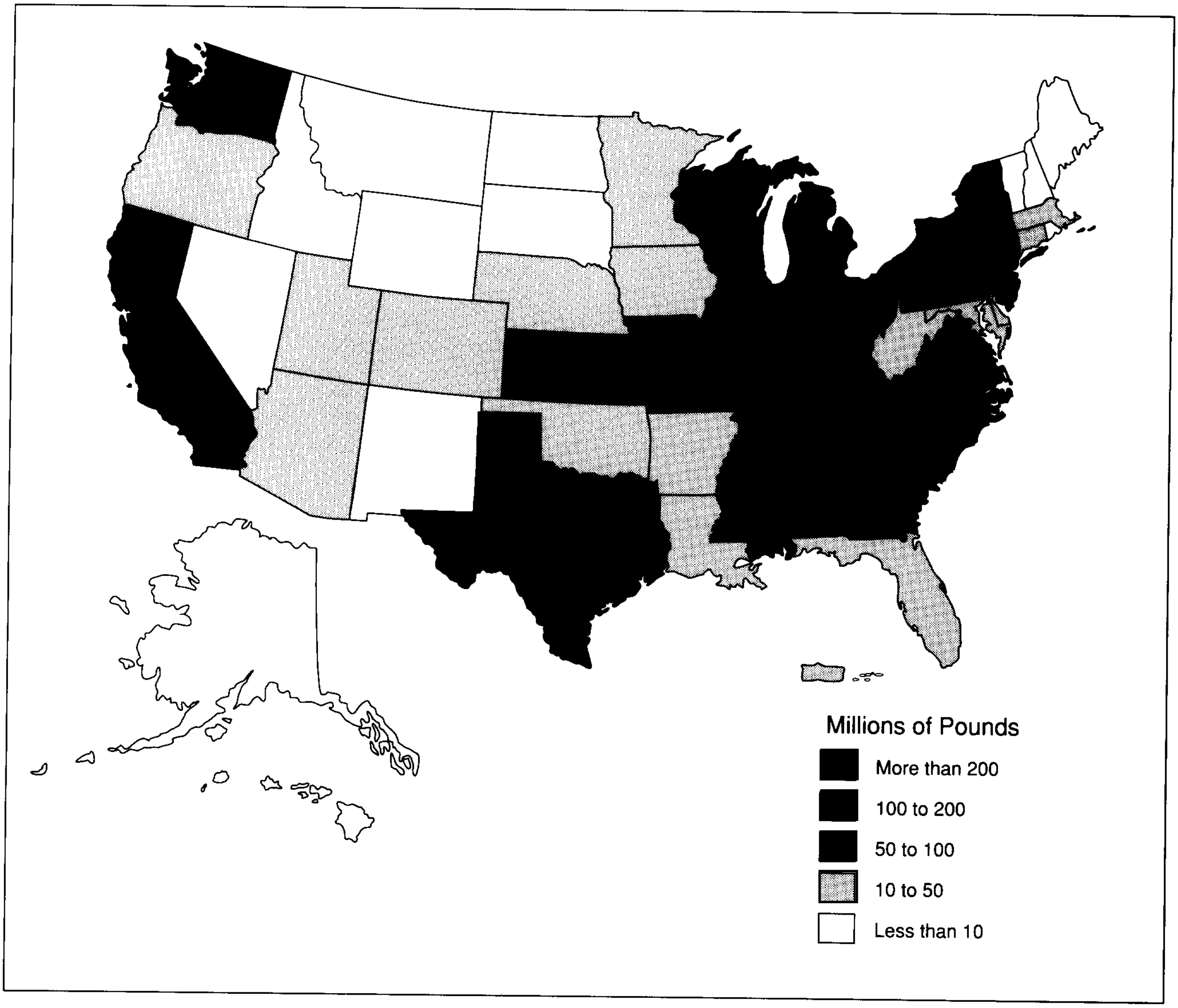


Figure 1-4. TRI Transfers by State, 1991.

Table 1-3. TRI Releases by State, 1991 (Alphabetically Ordered).

State	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Alabama	16,580,199	82,578,637	4,264,358	7,988,920	6,662,537	118,074,651
Alaska	582,728	12,643,715	4,795,953	150	4,132	18,026,678
American Samoa	22,000	0	0	0	0	22,000
Arizona	4,487,344	5,022,927	32,960	0	53,310,818	62,854,049
Arkansas	9,072,344	22,347,516	2,424,306	14,031,499	1,692,933	49,568,598
California	31,444,873	35,856,384	10,232,335	1,944,661	8,722,943	88,201,196
Colorado	2,754,475	3,318,751	195,424	500	514,465	6,783,615
Connecticut	6,870,076	9,388,954	3,902,429	50	3,345	20,164,854
Delaware	1,496,345	4,380,793	349,040	0	155,180	6,381,358
Florida	14,797,254	23,444,346	3,147,409	13,728,636	32,737,051	87,854,696
Georgia	13,526,226	44,514,716	4,728,313	0	1,155,194	63,924,449
Hawaii	438,180	141,478	17,029	235,199	81,200	913,086
Idaho	974,270	5,151,603	119,934	0	3,880,780	10,126,587
Illinois	27,542,663	54,164,438	6,438,552	16,199,676	18,591,746	122,937,075
Indiana	38,159,600	58,165,907	1,723,434	2,360,830	36,009,003	136,418,774
Iowa	6,407,397	28,701,215	2,001,525	0	1,789,953	38,900,090
Kansas	8,485,733	19,372,658	921,578	44,938,711	1,235,203	74,953,883
Kentucky	11,385,737	27,200,204	682,699	22,000,000	1,645,414	62,914,054
Louisiana	21,845,216	76,977,192	161,287,666	196,607,237	1,850,432	458,567,743
Maine	2,451,528	11,541,829	813,197	0	876,354	15,682,908
Maryland	4,478,187	7,078,279	682,953	0	1,293,351	13,532,770
Massachusetts	6,412,932	10,020,869	396,842	0	167,019	16,997,662
Michigan	18,598,896	51,851,274	944,817	6,699,997	13,943,692	92,038,676
Minnesota	7,350,164	32,030,987	838,399	0	1,432,241	41,651,791
Mississippi	13,746,569	42,198,692	2,173,830	48,371,556	5,607,356	112,098,003
Missouri	10,605,454	24,431,418	1,230,337	0	23,823,821	60,091,030
Montana	1,552,443	808,406	147,484	0	38,533,803	41,042,136
Nebraska	3,769,064	11,008,508	385,629	0	395,026	15,558,227
Nevada	447,056	543,444	250	0	2,435,160	3,425,910
New Hampshire	1,861,622	3,442,431	44,361	0	38,328	5,386,742
New Jersey	8,239,096	13,822,245	493,623	1	547,802	23,102,767
New Mexico	601,965	1,697,575	9,992	750	37,670,985	39,981,267
New York	21,158,898	43,526,898	1,656,018	38	1,742,285	68,084,137
North Carolina	20,133,754	63,499,937	781,249	0	23,599,855	108,014,795
North Dakota	582,348	1,214,279	79,557	0	22,750	1,898,934
Ohio	33,214,660	66,996,655	6,055,535	29,417,995	35,462,806	171,147,651
Oklahoma	5,398,061	18,428,487	509,137	2,597,370	8,366,323	35,299,378
Oregon	4,937,250	12,557,412	386,156	0	1,331,309	19,212,127
Pennsylvania	28,452,750	38,363,869	1,225,774	0	7,832,148	75,874,541
Puerto Rico	8,690,832	7,981,641	119,408	250	130,650	16,922,781
Rhode Island	2,668,383	1,682,723	121,277	0	24,147	4,496,530
South Carolina	17,463,068	44,452,404	1,210,766	0	1,069,601	64,195,839
South Dakota	377,674	2,261,739	9,038	0	32,790	2,681,241
Tennessee	53,306,877	86,310,304	3,622,533	69,568,902	2,417,820	215,226,436
Texas	79,402,956	89,520,877	2,889,837	225,032,087	13,767,951	410,613,708
Utah	5,000,623	69,550,357	120,656	0	23,722,951	98,394,587
Vermont	298,726	611,615	44,250	0	57,189	1,011,780
Virgin Islands	794,692	315,396	394,318	0	15,610	1,520,016
Virginia	17,716,400	49,592,240	2,251,200	0	2,022,165	71,582,005
Washington	10,392,763	15,738,122	4,355,925	5	156,331	30,643,146
West Virginia	10,359,757	16,758,644	1,436,226	0	354,546	28,909,173
Wisconsin	8,114,196	29,012,764	712,079	25	2,324,940	40,164,004
Wyoming	927,092	1,950,915	106,175	8,652,092	166,710	11,802,984
Total	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Table 1-4. TRI Transfers by State, 1991 (Alphabetically Ordered).

State	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
Alabama	945,395	9,456,286	5,841,317	45,325,310	39,335,023	148,902	101,052,233
Alaska	0	1,036	20	0	0	0	1,056
American Samoa	0	0	0	0	0	0	0
Arizona	475,907	1,138,509	80,969	815,522	23,873,872	42,191	26,426,970
Arkansas	576,892	2,246,527	2,292,016	3,520,143	30,854,407	4,124	39,494,109
California	28,349,693	6,329,931	8,906,422	13,625,824	131,519,474	312,378	189,043,722
Colorado	460,138	1,805,943	1,059,679	1,323,698	6,895,802	165,500	11,710,760
Connecticut	1,566,744	6,324,365	1,041,153	3,586,484	22,581,871	191,209	35,291,826
Delaware	2,344,905	806,462	28,741	1,186,088	7,045,571	0	11,411,767
Florida	13,860,357	7,112,699	2,590,989	4,855,937	15,097,568	18,154	43,535,704
Georgia	8,353,426	3,361,216	8,762,511	6,874,235	53,318,134	258,138	80,927,660
Hawaii	26,253	20	12,388	185	42,781	0	81,627
Idaho	1,246,330	61,501	5,065	283,187	475,283	0	2,071,366
Illinois	59,457,320	15,510,816	20,810,237	26,383,842	75,500,327	346,944	198,009,486
Indiana	5,761,241	35,159,725	10,435,579	19,408,585	294,438,283	1,378,073	366,581,486
Iowa	8,313,212	2,525,595	1,832,804	4,163,659	16,115,605	43,392	32,994,267
Kansas	1,951,405	3,017,996	43,694,705	1,548,678	32,746,921	1,660	82,961,365
Kentucky	1,942,905	6,698,250	7,184,087	5,351,092	59,278,568	807,733	81,262,635
Louisiana	112,305	9,381,126	4,317,925	5,127,982	28,730,868	9,627	47,679,833
Maine	794,917	474,453	1,081,428	298,665	2,589,437	9,600	5,248,500
Maryland	4,589,080	2,058,549	725,963	1,624,448	24,973,328	4,483	33,975,851
Massachusetts	5,708,676	4,993,072	2,358,484	6,707,841	15,797,249	199,355	35,764,677
Michigan	14,692,799	22,427,390	22,974,160	60,116,674	75,910,180	659,742	196,780,945
Minnesota	4,834,431	2,120,595	966,720	3,566,433	19,361,828	24,730	30,874,737
Mississippi	1,200,612	1,921,390	709,018	3,724,518	44,557,507	93,194	52,206,239
Missouri	26,111,983	6,317,491	2,110,458	9,753,464	31,805,124	134,441	76,232,961
Montana	10,650	156,360	78,681	184,211	2,874,853	0	3,304,755
Nebraska	1,295,342	3,875,356	4,098,986	1,004,157	13,640,100	6,866	23,920,807
Nevada	8,612	16,234	40,583	8,274	387,776	800	462,279
New Hampshire	451,079	1,601,771	391,659	329,446	3,633,242	38,650	6,445,847
New Jersey	44,204,143	17,653,135	2,458,127	22,512,174	93,159,759	176,797	180,164,135
New Mexico	90,891	60,776	31,920	147,996	198,644	25,444	555,671
New York	11,311,332	8,928,910	5,900,633	9,847,093	41,997,009	157,452	78,142,429
North Carolina	5,465,648	7,586,054	3,960,381	8,311,606	109,326,810	195,628	134,846,127
North Dakota	108,820	38,860	5,070	36,120	31,750	399	221,019
Ohio	45,038,807	44,941,803	22,650,421	26,439,909	319,626,185	189,512	458,886,637
Oklahoma	156,243	1,929,808	13,090,567	1,303,266	16,986,379	250	33,466,513
Oregon	4,133,808	949,589	4,059,878	457,922	8,109,370	56,016	17,766,583
Pennsylvania	15,505,272	33,660,701	17,192,967	16,703,984	210,783,647	231,317	294,077,888
Puerto Rico	6,206,477	7,977,747	461,490	6,400,370	11,914,110	250	32,960,444
Rhode Island	678,929	734,009	336,988	462,785	6,877,389	16,602	9,106,702
South Carolina	3,646,939	7,075,642	3,006,742	6,774,721	82,274,965	355,874	103,134,883
South Dakota	199,789	32,626	41,771	207,533	216,054	21,150	718,923
Tennessee	17,489,150	5,011,931	17,851,458	8,522,817	30,097,377	1,753,189	80,725,922
Texas	30,863,548	42,273,079	35,621,960	71,008,321	165,505,214	1,287,370	346,559,492
Utah	572,366	929,934	2,305,443	379,910	28,835,045	12,000	33,034,698
Vermont	35,707	673,321	29,477	73,460	2,158,192	4,400	2,974,557
Virgin Islands	0	173	0	0	376,488	0	376,661
Virginia	20,831,067	3,097,201	2,028,579	10,341,187	25,320,804	45,845	61,664,683
Washington	383,361	1,745,436	843,120	804,281	67,675,647	4,311	71,456,156
West Virginia	1,840,770	2,416,754	2,951,693	7,404,858	25,564,125	3,684	40,181,884
Wisconsin	7,528,307	7,813,947	9,778,535	9,382,150	33,707,641	112,503	68,323,083
Wyoming	173,115	1,068	2,484	4,297	0	0	180,964
Total	411,907,098	352,433,168	299,042,451	438,225,342	2,354,123,586	9,549,879	3,865,281,524

Table 1-5. TRI Releases by State, 1991 (Ordered by Total Release).

State	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Louisiana	21,845,216	76,977,192	161,287,666	196,607,237	1,850,432	458,567,743
Texas	79,402,956	89,520,877	2,889,837	225,032,087	13,767,951	410,613,708
Tennessee	53,306,877	86,310,304	3,622,533	69,568,902	2,417,820	215,226,436
Ohio	33,214,660	66,996,655	6,055,535	29,417,995	35,462,806	171,147,651
Indiana	38,159,600	58,165,907	1,723,434	2,360,830	36,009,003	136,418,774
Illinois	27,542,663	54,164,438	6,438,552	16,199,676	18,591,746	122,937,075
Alabama	16,580,199	82,578,637	4,264,358	7,988,920	6,662,537	118,074,651
Mississippi	13,746,569	42,198,692	2,173,830	48,371,556	5,607,356	112,098,003
North Carolina	20,133,754	63,499,937	781,249	0	23,599,855	108,014,795
Utah	5,000,623	69,550,357	120,656	0	23,722,951	98,394,587
Michigan	18,598,896	51,851,274	944,817	6,699,997	13,943,692	92,038,676
California	31,444,873	35,856,384	10,232,335	1,944,661	8,722,943	88,201,196
Florida	14,797,254	23,444,346	3,147,409	13,728,636	32,737,051	87,854,696
Pennsylvania	28,452,750	38,363,869	1,225,774	0	7,832,148	75,874,541
Kansas	8,485,733	19,372,658	921,578	44,938,711	1,235,203	74,953,883
Virginia	17,716,400	49,592,240	2,251,200	0	2,022,165	71,582,005
New York	21,158,898	43,526,898	1,656,018	38	1,742,285	68,084,137
South Carolina	17,463,068	44,452,404	1,210,766	0	1,069,601	64,195,839
Georgia	13,526,226	44,514,716	4,728,313	0	1,155,194	63,924,449
Kentucky	11,385,737	27,200,204	682,699	22,000,000	1,645,414	62,914,054
Arizona	4,487,344	5,022,927	32,960	0	53,310,818	62,854,049
Missouri	10,605,454	24,431,418	1,230,337	0	23,823,821	60,091,030
Arkansas	9,072,344	22,347,516	2,424,306	14,031,499	1,692,933	49,568,598
Minnesota	7,350,164	32,030,987	838,399	0	1,432,241	41,651,791
Montana	1,552,443	808,406	147,484	0	38,533,803	41,042,136
Wisconsin	8,114,196	29,012,764	712,079	25	2,324,940	40,164,004
New Mexico	601,965	1,697,575	9,992	750	37,670,985	39,981,267
Iowa	6,407,397	28,701,215	2,001,525	0	1,789,953	38,900,090
Oklahoma	5,398,061	18,428,487	509,137	2,597,370	8,366,323	35,299,378
Washington	10,392,763	15,738,122	4,355,925	5	156,331	30,643,146
West Virginia	10,359,757	16,758,644	1,436,226	0	354,546	28,909,173
New Jersey	8,239,096	13,822,245	493,623	1	547,802	23,102,767
Connecticut	6,870,076	9,388,954	3,902,429	50	3,345	20,164,854
Oregon	4,937,250	12,557,412	386,156	0	1,331,309	19,212,127
Alaska	582,728	12,643,715	4,795,953	150	4,132	18,026,678
Massachusetts	6,412,932	10,020,869	396,842	0	167,019	16,997,662
Puerto Rico	8,690,832	7,981,641	119,408	250	130,650	16,922,781
Maine	2,451,528	11,541,829	813,197	0	876,354	15,682,908
Nebraska	3,769,064	11,008,508	385,629	0	395,026	15,558,227
Maryland	4,478,187	7,078,279	682,953	0	1,293,351	13,532,770
Wyoming	927,092	1,950,915	106,175	8,652,092	166,710	11,802,984
Idaho	974,270	5,151,603	119,934	0	3,880,780	10,126,587
Colorado	2,754,475	3,318,751	195,424	500	514,465	6,783,615
Delaware	1,496,345	4,380,793	349,040	0	155,180	6,381,358
New Hampshire	1,861,622	3,442,431	44,361	0	38,328	5,386,742
Rhode Island	2,668,383	1,682,723	121,277	0	24,147	4,496,530
Nevada	447,056	543,444	250	0	2,435,160	3,425,910
South Dakota	377,674	2,261,739	9,038	0	32,790	2,681,241
North Dakota	582,348	1,214,279	79,557	0	22,750	1,898,934
Virgin Islands	794,692	315,396	394,318	0	15,610	1,520,016
Vermont	298,726	611,615	44,250	0	57,189	1,011,780
Hawaii	438,180	141,478	17,029	235,199	81,200	913,086
American Samoa	22,000	0	0	0	0	22,000
Total	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Table 1-6. TRI Releases to Air, Water, and Land by State, 1991 (Ordered by Total Air/Water/Land Release).

State	Air Emissions Pounds	Surface Water Discharges Pounds	Releases to Land Pounds	Total Air/Water/Land Releases Pounds
Louisiana	98,822,408	161,287,666	1,850,432	261,960,506
Texas	168,923,833	2,889,837	13,767,951	185,581,621
Tennessee	139,617,181	3,622,533	2,417,820	145,657,534
Ohio	100,211,315	6,055,535	35,462,806	141,729,656
Indiana	96,325,507	1,723,434	36,009,003	134,057,944
Alabama	99,158,836	4,264,358	6,662,537	110,085,731
North Carolina	83,633,691	781,249	23,599,855	108,014,795
Illinois	81,707,101	6,438,552	18,591,746	106,737,399
Utah	74,550,980	120,656	23,722,951	98,394,587
California	67,301,257	10,232,335	8,722,943	86,256,535
Michigan	70,450,170	944,817	13,943,692	85,338,679
Pennsylvania	66,816,619	1,225,774	7,832,148	75,874,541
Florida	38,241,600	3,147,409	32,737,051	74,126,060
Virginia	67,308,640	2,251,200	2,022,165	71,582,005
New York	64,685,796	1,656,018	1,742,285	68,084,099
South Carolina	61,915,472	1,210,766	1,069,601	64,195,839
Georgia	58,040,942	4,728,313	1,155,194	63,924,449
Mississippi	55,945,261	2,173,830	5,607,356	63,726,447
Arizona	9,510,271	32,960	53,310,818	62,854,049
Missouri	35,036,872	1,230,337	23,823,821	60,091,030
Minnesota	39,381,151	838,399	1,432,241	41,651,791
Montana	2,360,849	147,484	38,533,803	41,042,136
Kentucky	38,585,941	682,699	1,645,414	40,914,054
Wisconsin	37,126,960	712,079	2,324,940	40,163,979
New Mexico	2,299,540	9,992	37,670,985	39,980,517
Iowa	35,108,612	2,001,525	1,789,953	38,900,090
Arkansas	31,419,860	2,424,306	1,692,933	35,537,099
Oklahoma	23,826,548	509,137	8,366,323	32,702,008
Washington	26,130,885	4,355,925	156,331	30,643,141
Kansas	27,858,391	921,578	1,235,203	30,015,172
West Virginia	27,118,401	1,436,226	354,546	28,909,173
New Jersey	22,061,341	493,623	547,802	23,102,766
Connecticut	16,259,030	3,902,429	3,345	20,164,804
Oregon	17,494,662	386,156	1,331,309	19,212,127
Alaska	13,226,443	4,795,953	4,132	18,026,528
Massachusetts	16,433,801	396,842	167,019	16,997,662
Puerto Rico	16,672,473	119,408	130,650	16,922,531
Maine	13,993,357	813,197	876,354	15,682,908
Nebraska	14,777,572	385,629	395,026	15,558,227
Maryland	11,556,466	682,953	1,293,351	13,532,770
Idaho	6,125,873	119,934	3,880,780	10,126,587
Colorado	6,073,226	195,424	514,465	6,783,115
Delaware	5,877,138	349,040	155,180	6,381,358
New Hampshire	5,304,053	44,361	38,328	5,386,742
Rhode Island	4,351,106	121,277	24,147	4,496,530
Nevada	990,500	250	2,435,160	3,425,910
Wyoming	2,878,007	106,175	166,710	3,150,892
South Dakota	2,639,413	9,038	32,790	2,681,241
North Dakota	1,796,627	79,557	22,750	1,898,934
Virgin Islands	1,110,088	394,318	15,610	1,520,016
Vermont	910,341	44,250	57,189	1,011,780
Hawaii	579,658	17,029	81,200	677,887
American Samoa	22,000	0	0	22,000
Total	2,010,554,065	243,513,772	421,428,144	2,675,495,981

Table 1-7. Receipt of TRI Chemicals in Wastes from Out of State, 1991 (by Total Received).

Receiving State	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Received Pounds
Delaware	136,308	52,475	0	144,700,126	0	144,888,909
Ohio	18,212,652	11,077,225	30,324,252	80,322,005	319,057	140,255,191
Louisiana	18,551,952	4,348,207	16,198,492	85,987,787	5,750	125,092,188
Pennsylvania	7,026,647	1,390,015	2,426,874	103,013,666	1,741,435	115,598,637
Indiana	10,788,130	6,961,100	26,782,074	55,294,128	146,870	99,972,302
Illinois	6,310,519	5,940,239	13,331,114	68,361,036	260,114	94,203,022
Alabama	5,758,037	3,061,969	13,776,623	59,081,523	118,640	81,796,792
Michigan	14,137,069	2,884,016	9,047,802	43,541,431	106,109	69,716,427
Texas	7,645,417	12,125,205	3,817,202	45,597,068	106,961	69,291,853
South Carolina	10,046,851	3,203,325	27,988,928	27,196,259	19,086	68,454,449
California	599,344	135,157	663,850	66,124,215	47,079	67,569,645
New Jersey	12,855,002	426,260	15,187,333	24,626,194	101,096	53,195,885
Tennessee	3,256,719	777,089	5,931,493	34,710,440	377,788	45,053,529
New York	2,523,667	1,014,780	2,144,196	37,173,914	74,262	42,930,819
Wisconsin	1,298,581	208,119	7,626,672	25,531,873	61,362	34,726,607
Missouri	2,188,812	35,492	7,526,378	22,246,373	89,295	32,086,350
Kentucky	3,354,596	475,873	17,807,968	7,365,143	40,369	29,043,949
Georgia	515,506	156,654	2,493,049	24,370,324	182,895	27,718,428
West Virginia	360,579	174,687	0	25,187,037	0	25,722,303
Virginia	957,760	16,630	8,002,980	11,656,015	484,750	21,118,135
Florida	1,980,074	14,602	3,472,303	13,549,944	54,000	19,070,923
North Carolina	593,646	155,766	7,343,038	9,970,432	2,684	18,065,566
Connecticut	595,000	377,283	264,372	14,089,614	48,385	15,374,654
Minnesota	1,888,797	256	3,493,367	9,497,256	164	14,879,840
Arkansas	6,011,719	362,364	4,795,290	1,147,920	57,995	12,375,288
Montana	0	0	0	9,863,953	0	9,863,953
District of Columbia	0	360	0	9,790,000	0	9,790,360
Kansas	194,639	116,681	4,493,366	4,520,945	2,420	9,328,051
Massachusetts	1,467,399	723,770	626,333	5,981,232	162,533	8,961,267
Oklahoma	1,059,434	2,832,426	1,359,079	3,423,582	25,948	8,700,469
Washington	295,000	3,099,640	85,710	2,176,604	0	5,656,954
Wyoming	0	0	0	5,000,000	0	5,000,000
Arizona	171,999	30,228	23,022	4,682,579	12	4,907,840
Utah	336,301	2,952,025	46,690	136,318	25,518	3,496,852
Rhode Island	125,166	99,533	17,046	2,946,712	1,495	3,189,952
Colorado	214,527	2,484	542,956	2,026,526	0	2,786,493
Maryland	201,596	192,729	57,118	1,907,225	30,000	2,388,668
Iowa	36,229	347,947	0	1,608,152	0	1,992,328
Idaho	233,735	150,714	0	1,105,057	0	1,489,506
Oregon	78,490	501,434	3,784	857,288	32,290	1,473,286
Nevada	162,321	871,507	0	184,859	14	1,218,701
Nebraska	4,524	6,250	16,348	622,428	0	649,550
New Mexico	509,890	24,250	0	0	0	534,140
Mississippi	727	26,407	195,379	238,579	8,055	469,147
New Hampshire	29	78,495	500	25,279	0	104,303
Alaska	24,797	8	16,930	0	0	41,735
Vermont	9,694	600	25,800	2,915	250	39,259
South Dakota	17,761	0	0	3,319	0	21,080
North Dakota	0	18,322	0	0	0	18,322
American Samoa	0	0	0	7,600	0	7,600
Maine	0	3,199	6	1,103	0	4,308
Hawaii	0	0	0	0	0	0
Virgin Islands	0	0	0	0	0	0
Puerto Rico	0	0	0	0	0	0
Other (a)	3,878,863	871,487	1,337,117	72,529,170	23,835	78,640,472
Total	146,616,505	68,325,284	239,292,834	1,169,983,148	4,758,516	1,628,976,287

Table 1-8. Transfers of TRI Chemicals in Wastes Out of State, 1991 (by Total Transferred).

Transferring State	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Out of State Pounds
Pennsylvania	15,083,909	8,815,922	15,499,379	145,227,957	141,170	184,768,337
Texas	5,018,345	5,699,381	7,992,233	106,751,612	228,475	125,690,046
Ohio	22,361,832	2,531,743	8,494,441	80,027,445	53,707	113,469,168
New Jersey	6,110,616	1,333,140	8,091,283	75,512,127	108,268	91,155,434
North Carolina	4,901,436	932,904	6,004,698	75,301,627	71,985	87,212,650
Alabama	6,248,643	170,845	39,540,821	32,715,255	53,125	78,728,689
Illinois	6,584,699	2,450,363	21,116,584	47,710,345	44,637	77,906,628
Michigan	8,924,133	3,100,658	30,936,158	29,203,512	126,960	72,291,421
Kentucky	3,733,319	573,673	3,839,844	50,429,486	805,488	59,381,810
Indiana	2,522,535	1,931,476	6,258,453	44,302,565	377,515	55,392,544
Georgia	2,811,539	1,691,824	6,335,695	36,520,236	8,309	47,367,603
Mississippi	1,874,504	291,927	3,528,672	40,888,462	93,194	46,676,759
New York	7,280,133	1,483,643	7,862,772	28,410,772	29,388	45,066,708
South Carolina	3,322,896	621,998	3,398,000	37,712,774	138	45,055,806
Missouri	4,773,241	687,280	7,422,005	22,283,775	117,949	35,284,250
Virginia	2,806,246	856,530	6,687,569	22,970,144	38,839	33,359,328
Arkansas	1,955,689	1,729,521	3,310,570	25,339,805	750	32,336,335
Utah	467,863	47,693	374,233	28,310,265	0	29,200,054
Tennessee	2,102,345	5,501,793	5,604,416	13,130,218	1,751,180	28,089,952
Maryland	1,992,627	396,759	1,604,898	19,981,553	4,442	23,980,279
Florida	6,757,075	1,070,070	4,249,126	11,546,256	1,550	23,624,077
Wisconsin	1,284,137	1,557,786	7,999,293	12,347,948	934	23,190,098
Connecticut	5,074,121	455,495	3,410,852	13,682,230	191,209	22,813,907
California	1,839,241	4,119,162	1,676,336	13,732,638	48,090	21,415,467
Kansas	1,118,355	337,252	709,260	19,147,526	255	21,312,648
Oklahoma	1,332,887	7,194,028	893,498	11,610,185	0	21,030,598
Iowa	933,334	472,525	4,142,412	15,171,545	23,660	20,743,476
Louisiana	4,529,408	2,742,184	1,874,369	11,431,874	9,322	20,587,157
Arizona	389,497	34,433	342,454	17,141,535	42,176	17,950,095
West Virginia	2,416,647	681,252	7,210,118	7,144,513	3,684	17,456,214
Minnesota	911,727	518,101	3,093,945	12,198,984	23,730	16,746,487
Massachusetts	2,425,978	807,953	4,578,033	8,338,365	77,714	16,228,043
Nebraska	565,735	2,029,859	958,598	11,756,929	0	15,311,121
Oregon	374,110	3,098,728	422,094	6,109,389	0	10,004,321
Rhode Island	664,712	200,077	455,105	6,500,811	16,602	7,837,307
Colorado	1,146,443	687,303	106,853	5,599,662	159,800	7,700,061
Washington	131,598	586,944	509,487	6,351,657	3,828	7,583,514
Delaware	709,519	23,350	1,186,088	5,402,473	0	7,321,430
New Hampshire	1,561,351	294,886	329,446	3,077,238	38,650	5,301,571
Montana	156,360	69,300	184,211	2,811,853	0	3,221,724
Vermont	669,217	28,019	73,460	2,141,892	4,400	2,916,988
Maine	457,053	72,514	297,915	1,460,711	9,600	2,297,793
Puerto Rico	155,607	377,332	0	1,026,339	0	1,559,278
Idaho	21,666	13	282,937	475,283	0	779,899
South Dakota	32,626	0	207,533	216,049	21,150	477,358
New Mexico	26,006	9,300	147,996	197,144	25,444	405,890
Virgin Islands	173	0	0	376,488	0	376,661
Nevada	14,388	5	8,274	181,165	800	204,632
North Dakota	38,860	4,037	36,120	31,750	399	111,166
Hawaii	20	2,250	0	42,781	0	45,051
Wyoming	1,068	2,033	4,297	0	0	7,398
Alaska	1,036	20	0	0	0	1,056
American Samoa	0	0	0	0	0	0
Total	146,616,505	68,325,284	239,292,834	1,169,983,148	4,758,516	1,628,976,287

Table 1-9. Transfers of TRI Chemicals in Wastes Within a State, 1991 (by Total Transferred).

State	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Within State Pounds
Indiana	32,637,190	8,504,103	13,150,132	250,135,718	1,000,558	305,427,701
Ohio	22,579,971	20,118,678	17,945,468	239,598,740	135,805	300,378,662
Texas	37,254,734	29,922,579	63,016,088	58,753,602	1,058,895	190,005,898
California	4,490,690	4,787,260	11,949,488	117,786,836	264,288	139,278,562
Michigan	13,503,257	19,873,502	29,180,516	46,706,668	532,782	109,796,725
Pennsylvania	18,576,792	8,377,045	1,204,605	65,555,690	90,147	93,804,279
Washington	1,613,838	256,176	294,794	61,323,990	483	63,489,281
Illinois	8,926,117	18,359,874	5,267,258	27,789,982	302,307	60,645,538
Kansas	1,899,641	43,357,453	839,418	13,599,395	1,405	59,697,312
South Carolina	3,752,746	2,384,744	3,376,721	44,562,191	355,736	54,432,138
New Jersey	11,542,519	1,124,987	14,420,891	17,647,632	68,529	44,804,558
North Carolina	2,684,618	3,027,477	2,306,908	34,025,183	123,643	42,167,829
Wisconsin	6,529,810	8,220,749	1,382,857	21,359,693	111,569	37,604,678
Tennessee	2,909,586	12,349,665	2,918,401	16,967,159	2,009	35,146,820
Louisiana	4,851,718	1,575,741	3,253,613	17,298,994	305	26,980,371
Georgia	549,677	7,070,687	538,540	16,797,898	249,829	25,206,631
Puerto Rico	7,822,140	84,158	6,400,370	10,887,771	250	25,194,689
New York	1,648,777	4,416,990	1,984,321	13,586,237	128,064	21,764,389
Alabama	3,207,643	5,670,472	5,784,489	6,619,768	95,777	21,378,149
West Virginia	107	2,270,441	194,740	18,419,612	0	20,884,900
Kentucky	2,964,931	6,610,414	1,511,248	8,849,082	2,245	19,937,920
Missouri	1,544,250	1,423,178	2,331,459	9,521,349	16,492	14,836,728
Massachusetts	2,567,094	1,550,531	2,129,808	7,458,884	121,641	13,827,958
Oklahoma	596,921	5,896,539	409,768	5,376,194	250	12,279,672
Connecticut	1,250,244	585,658	175,632	8,899,641	0	10,911,175
Minnesota	1,208,868	448,619	472,488	7,162,844	1,000	9,293,819
Arizona	749,012	46,536	473,068	6,732,337	15	8,000,968
Virginia	290,955	1,172,049	3,653,618	2,350,660	7,006	7,474,288
Nebraska	3,309,621	2,069,127	45,559	1,883,171	6,866	7,314,344
Arkansas	290,838	562,495	209,573	5,514,602	3,374	6,580,882
Florida	355,624	1,520,919	606,811	3,551,312	16,604	6,051,270
Maryland	65,922	329,204	19,550	4,991,775	41	5,406,492
Mississippi	46,886	417,091	195,846	3,669,045	0	4,328,868
Iowa	1,592,261	1,360,279	21,247	944,060	19,732	3,937,579
Oregon	575,479	961,150	35,828	1,999,981	56,016	3,628,454
Colorado	659,500	372,376	1,216,845	1,296,140	5,700	3,550,561
Utah	462,071	2,257,750	5,677	524,780	12,000	3,262,278
Maine	17,400	1,008,914	750	1,128,726	0	2,155,790
Delaware	96,943	5,391	0	1,643,098	0	1,745,432
New Hampshire	40,420	96,773	0	556,004	0	693,197
Rhode Island	69,297	136,911	7,680	376,578	0	590,466
Nevada	1,846	40,578	0	206,611	0	249,035
Montana	0	9,381	0	63,000	0	72,381
New Mexico	34,770	22,620	0	1,500	0	58,890
Idaho	39,835	5,052	250	0	0	45,137
South Dakota	0	41,771	0	5	0	41,776
Vermont	4,104	1,458	0	16,300	0	21,862
Hawaii	0	10,138	185	0	0	10,323
North Dakota	0	1,033	0	0	0	1,033
Wyoming	0	451	0	0	0	451
Virgin Islands	0	0	0	0	0	0
American Samoa	0	0	0	0	0	0
Alaska	0	0	0	0	0	0
Total	205,816,663	230,717,167	198,932,508	1,184,140,438	4,791,363	1,824,398,139

THE 1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE

1991 Releases and Transfers by Chemical

Table 1-10. Top 50 Chemicals for Largest Releases, 1991.

CAS Number	Chemical	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
7664-41-7	Ammonia	46,929,186	141,696,062	41,137,132	240,682,883	14,763,305	485,208,568
7647-01-0	Hydrochloric acid	4,634,850	78,286,624	2,143,954	190,422,615	12,193,916	287,681,959
67-56-1	Methanol	35,913,043	163,769,926	20,064,023	28,877,462	3,634,255	252,258,709
108-88-3	Toluene	73,620,294	124,944,414	104,645	1,373,207	185,012	200,227,572
67-64-1	Acetone	84,674,684	75,522,340	1,206,217	3,463,348	466,862	165,333,451
7664-38-2	Phosphoric acid	314,776	1,002,123	114,363,613	26,545	47,311,554	163,018,611
7664-93-9	Sulfuric acid	1,577,640	20,099,089	37,243,237	94,720,218	7,678,646	161,318,830
71-55-6	1,1,1-Trichloroethane	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
	Zinc compounds	1,517,384	2,710,343	1,325,812	228,007	114,062,672	119,844,218
1330-20-7	Xylene (mixed isomers)	27,683,616	87,869,367	50,801	139,948	335,613	116,079,345
78-93-3	Methyl ethyl ketone	33,149,766	70,271,889	141,354	355,736	180,492	104,099,237
75-15-0	Carbon disulfide	2,626,842	86,712,281	58,634	2,835	260	89,400,852
75-09-2	Dichloromethane	31,726,830	47,611,641	98,877	1,317,706	117,788	80,872,842
7782-50-5	Chlorine	1,715,251	75,894,219	696,282	72,552	119,630	78,497,934
	Manganese compounds	490,885	755,529	698,968	15,327	68,528,067	70,488,776
6484-52-2	Ammonium nitrate (solution)	55,453	1,978,009	7,808,136	32,736,428	8,426,270	51,004,296
	Copper compounds	2,378,725	1,870,707	158,621	225,310	42,424,235	47,057,598
•	Glycol ethers	10,235,089	33,678,910	507,487	176,033	711,313	45,308,832
74-85-1	Ethylene	16,137,889	22,133,970	17,015	0	0	38,288,874
76-13-1	Freon 113	23,983,423	11,874,228	3,264	558	89,780	35,951,253
79-01-6	Trichloroethylene	16,642,065	18,416,403	12,750	800	62,991	35,135,009
71-36-3	n-Butyl alcohol	6,977,261	22,741,844	257,497	4,382,276	107,321	34,466,199
100-42-5	Styrene	10,161,049	18,315,297	25,609	22,080	389,929	28,913,964
108-10-1	Methyl isobutyl ketone	8,411,877	18,786,642	167,405	161,600	177,939	27,705,463
	Chromium compounds	134,838	427,257	335,233	34,619	24,761,345	25,693,292
7697-37-2	Nitric acid	685,940	2,594,202	167,773	21,128,099	585,053	25,161,067
115-07-1	Propylene	13,422,010	9,418,860	4,685	0	114,000	22,959,555
75-05-8	Acetonitrile	743,749	623,983	20,396	19,090,831	5,620	20,484,579
67-66-3	Chloroform	7,660,997	11,421,891	769,569	65,089	22,150	19,939,696
79-10-7	Acrylic acid	232,485	178,113	712	18,923,000	94	19,334,404
71-43-2	Benzene	9,971,308	7,503,182	26,896	834,242	111,928	18,447,556
110-82-7	Cyclohexane	6,605,946	10,577,659	12,606	591,703	27,757	17,815,671
107-21-1	Ethylene glycol	4,467,944	6,192,193	2,299,613	3,654,273	908,167	17,522,190
7783-20-2	Ammonium sulfate (solution)	19,639	265,457	7,592,647	7,523,816	2,106,747	17,508,306
7440-50-8	Copper	408,618	864,627	56,040	14,011	15,439,598	16,782,894
127-18-4	Tetrachloroethylene	6,482,575	10,204,876	7,448	14,000	23,302	16,732,201
463-58-1	Carbonyl sulfide	5,627	16,719,541	0	0	0	16,725,168
50-00-0	Formaldehyde	1,780,780	8,437,687	616,001	5,220,067	242,466	16,297,001
	Lead compounds	348,258	1,059,351	117,976	928	13,699,094	15,225,607
75-71-8	Dichlorodifluoromethane (CFC-12)	8,506,516	6,545,211	89	16,008	32,805	15,100,629
75-69-4	Trichlorofluoromethane (CFC-11)	5,339,896	6,382,210	5,156	1,428	10,203	11,738,893
7440-66-6	Zinc (fume or dust)	765,614	1,168,410	28,080	115	9,216,574	11,178,793
7439-96-5	Manganese	687,932	409,038	144,676	522	9,848,116	11,090,284
108-95-2	Phenol	2,498,507	3,832,788	163,915	3,192,210	324,921	10,012,341
75-07-0	Acetaldehyde	2,323,247	4,757,670	75,314	2,328,187	37,904	9,522,322
7664-39-3	Hydrogen fluoride	3,565,926	5,615,266	5,464	1	25,259	9,211,916
100-41-4	Ethylbenzene	2,876,381	5,764,613	16,608	94,637	53,124	8,805,363
108-05-4	Vinyl acetate	1,102,871	4,383,624	9,900	3,088,362	7,237	8,591,994
107-13-1	Acrylonitrile	520,853	1,668,036	1,959	4,732,983	13,293	6,937,124
7429-90-5	Aluminum (fume or dust)	523,990	4,210,547	56,841	0	1,420,310	6,211,688
	Subtotal	592,471,087	1,326,442,950	240,848,733	689,955,410	401,176,724	3,250,894,904
--	Total for All TRI Chemicals	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Table 1-11. The 15 Chemicals with the Largest Emissions to Air, 1991.

CAS Number	Chemical	Total Air Emissions Pounds
67-56-1	Methanol	199,682,969
108-88-3	Toluene	198,564,708
7664-41-7	Ammonia	188,625,248
67-64-1	Acetone	160,197,024
71-55-6	1,1,1-Trichloroethane	137,505,563
1330-20-7	Xylene (mixed isomers)	115,552,983
78-93-3	Methyl ethyl ketone	103,421,655
75-15-0	Carbon disulfide	89,339,123
7647-01-0	Hydrochloric acid	82,921,474
75-09-2	Dichloromethane	79,338,471
7782-50-5	Chlorine	77,609,470
	Glycol ethers	43,913,999
74-85-1	Ethylene	38,271,859
76-13-1	Freon 113	35,857,651
79-01-6	Trichloroethylene	35,058,468
	Subtotal	1,585,860,665
	Total for All TRI Chemicals	2,010,554,065

Table 1-12. The 15 Chemicals with the Largest Discharges to Surface Water, 1991.

CAS Number	Chemical	Surface Water Discharges Pounds
7664-38-2	Phosphoric acid	114,363,613
7664-41-7	Ammonia	41,137,132
7664-93-9	Sulfuric acid	37,243,237
67-56-1	Methanol	20,064,023
6484-52-2	Ammonium nitrate (solution)	7,808,136
7783-20-2	Ammonium sulfate (solution)	7,592,647
107-21-1	Ethylene glycol	2,299,613
7647-01-0	Hydrochloric acid	2,143,954
	Zinc compounds	1,325,812
67-64-1	Acetone	1,206,217
67-66-3	Chloroform	769,569
	Manganese compounds	698,968
7782-50-5	Chlorine	696,282
50-00-0	Formaldehyde	616,001
	Glycol ethers	507,487
	Subtotal	238,472,691
	Total for All TRI Chemicals	243,513,772

Table 1-13. The 15 Chemicals with the Largest Underground Injection, 1991.

CAS Number	Chemical	Underground Injection Pounds
7664-41-7	Ammonia	240,682,883
7647-01-0	Hydrochloric acid	190,422,615
7664-93-9	Sulfuric acid	94,720,218
6484-52-2	Ammonium nitrate (solution)	32,736,428
67-56-1	Methanol	28,877,462
7697-37-2	Nitric acid	21,128,099
75-05-8	Acetonitrile	19,090,831
79-10-7	Acrylic acid	18,923,000
7783-20-2	Ammonium sulfate (solution)	7,523,816
50-00-0	Formaldehyde	5,220,067
107-13-1	Acrylonitrile	4,732,983
79-06-1	Acrylamide	4,594,900
71-36-3	n-Butyl alcohol	4,382,276
	Cyanide compounds	3,781,837
107-21-1	Ethylene glycol	3,654,273
	Subtotal	680,471,688
	Total for All TRI Chemicals	710,377,137

Table 1-14. The 15 Chemicals with the Largest Releases to Land, 1991.

CAS Number	Chemical	Releases to Land Pounds
	Zinc compounds	114,062,672
	Manganese compounds	68,528,067
7664-38-2	Phosphoric acid	47,311,554
	Copper compounds	42,424,235
	Chromium compounds	24,761,345
7440-50-8	Copper	15,439,598
7664-41-7	Ammonia	14,763,305
	Lead compounds	13,699,094
7647-01-0	Hydrochloric acid	12,193,916
7439-96-5	Manganese	9,848,116
7440-66-6	Zinc (fume or dust)	9,216,574
6484-52-2	Ammonium nitrate (solution)	8,426,270
7664-93-9	Sulfuric acid	7,678,646
	Barium compounds	4,005,169
67-56-1	Methanol	3,634,255
	Subtotal	395,992,816
	Total for All TRI Chemicals	421,428,144

Table 1-15. The 15 Chemicals with the Largest Transfers to Publicly Owned Treatment Works, 1991.

CAS Number	Chemical	Transfers to POTWs Pounds
67-56-1	Methanol	113,854,683
7664-41-7	Ammonia	96,492,357
7783-20-2	Ammonium sulfate (solution)	42,154,207
7664-93-9	Sulfuric acid	34,175,276
107-21-1	Ethylene glycol	18,602,841
7647-01-0	Hydrochloric acid	16,566,697
67-64-1	Acetone	14,475,090
	Glycol ethers	9,286,863
7697-37-2	Nitric acid	8,648,779
6484-52-2	Ammonium nitrate (solution)	5,984,399
7664-38-2	Phosphoric acid	5,498,173
50-00-0	Formaldehyde	5,482,598
108-95-2	Phenol	5,401,118
	Manganese compounds	3,341,541
71-36-3	n-Butyl alcohol	2,208,281
	Subtotal	382,172,903
	Total for All TRI Chemicals	411,907,098

Table 1-16. The 15 Chemicals with the Largest Off-site Transfers for Treatment, 1991.

CAS Number	Chemical	Transfers to Treatment Pounds
7664-93-9	Sulfuric acid	44,343,292
67-56-1	Methanol	37,951,338
7647-01-0	Hydrochloric acid	35,103,614
108-88-3	Toluene	20,171,434
1330-20-7	Xylene (mixed isomers)	19,031,424
7697-37-2	Nitric acid	14,022,809
67-64-1	Acetone	13,328,807
75-09-2	Dichloromethane	11,956,118
78-93-3	Methyl ethyl ketone	9,365,077
	Zinc compounds	9,336,028
7664-41-7	Ammonia	6,964,023
71-55-6	1,1,1-Trichloroethane	6,743,974
7783-20-2	Ammonium sulfate (solution)	6,588,517
107-21-1	Ethylene glycol	5,948,273
107-06-2	1,2-Dichloroethane	5,722,194
	Subtotal	246,576,922
	Total for All TRI Chemicals	352,433,168

Table 1-17. The 15 Chemicals with the Largest Off-site Transfers for Disposal, 1991.

CAS Number	Chemical	Transfers to Disposal Pounds
	Zinc compounds	40,753,446
6484-52-2	Ammonium nitrate (solution)	39,237,767
7664-93-9	Sulfuric acid	31,353,990
	Manganese compounds	20,715,032
	Barium compounds	16,639,604
7439-96-5	Manganese	12,738,621
7647-01-0	Hydrochloric acid	12,733,345
7440-50-8	Copper	12,273,545
	Chromium compounds	10,472,628
	Lead compounds	9,981,379
	Copper compounds	6,693,964
7429-90-5	Aluminum (fume or dust)	5,836,393
1332-21-4	Asbestos (friable)	5,534,023
7439-92-1	Lead	5,512,965
7440-47-3	Chromium	5,500,165
	Subtotal	235,976,867
	Total for All TRI Chemicals	299,042,451

Table 1-18. The 15 Chemicals with the Largest Off-site Transfers for Energy Recovery, 1991.

CAS Number	Chemical	Transfers to Energy Recovery Pounds
108-88-3	Toluene	80,207,715
1330-20-7	Xylene (mixed isomers)	66,547,878
67-56-1	Methanol	63,132,911
67-64-1	Acetone	40,265,509
78-93-3	Methyl ethyl ketone	35,111,556
75-65-0	tert-Butyl alcohol	26,160,445
108-10-1	Methyl isobutyl ketone	18,801,198
	Glycol ethers	11,663,373
100-41-4	Ethylbenzene	8,664,046
100-42-5	Styrene	8,502,579
71-36-3	n-Butyl alcohol	6,750,269
79-10-7	Acrylic acid	5,010,030
85-44-9	Phthalic anhydride	4,684,778
7647-01-0	Hydrochloric acid	4,415,525
110-82-7	Cyclohexane	4,114,655
	Subtotal	384,032,467
	Total for All TRI Chemicals	438,225,342

Table 1-19. The 15 Chemicals with the Largest Off-site Transfers for Recycling, 1991.

CAS Number	Chemical	Transfers to Recycling Pounds
7664-93-9	Sulfuric acid	883,134,485
7440-50-8	Copper	289,976,983
	Lead compounds	166,608,749
	Zinc compounds	141,091,759
	Copper compounds	93,403,884
107-21-1	Ethylene glycol	91,411,758
7440-66-6	Zinc (fume or dust)	67,787,514
7440-47-3	Chromium	50,766,527
7647-01-0	Hydrochloric acid	42,004,594
7439-96-5	Manganese	41,442,691
1330-20-7	Xylene (mixed isomers)	38,885,924
7440-02-0	Nickel	38,882,197
7439-92-1	Lead	38,232,373
75-09-2	Dichloromethane	29,163,629
	Manganese compounds	28,667,700
	Subtotal	2,041,460,767
	Total for All TRI Chemicals	2,354,123,586

Table 1-20. Releases and Transfers of All TRI Chemicals, 1991 (Alphabetically Ordered).

CAS Number	Chemical	Rank by Total Releases	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
75-07-0	Acetaldehyde	45	2,323,247	4,757,670	75,314	2,328,187	37,904	9,522,322
60-35-5	Acetamide	259	10	25	5	0	0	40
67-64-1	Acetone	5	84,674,684	75,522,340	1,206,217	3,463,348	466,862	165,333,451
75-05-8	Acetonitrile	28	743,749	623,983	20,396	19,090,831	5,620	20,484,579
107-02-8	Acrolein	137	8,179	20,321	7	205,898	0	234,405
79-06-1	Acrylamide	56	60,668	3,496	4,635	4,594,900	1,500	4,665,199
79-10-7	Acrylic acid	30	232,485	178,113	712	18,923,000	94	19,334,404
107-13-1	Acrylonitrile	49	520,853	1,668,036	1,959	4,732,983	13,293	6,937,124
107-18-6	Allyl alcohol	144	27,628	47,624	5,555	44,560	100	125,467
107-05-1	Allyl chloride	140	155,176	24,977	5	145	0	180,303
7429-90-5	Aluminum (fume or dust)	50	523,990	4,210,547	56,841	0	1,420,310	6,211,688
1344-28-1	Aluminum oxide (fibrous forms)	130	23,646	41,268	1,571	0	213,286	279,771
60-09-3	4-Aminoazobenzene	244	0	1	0	440	0	441
92-67-1	4-Aminobiphenyl	276	0	0	0	4	0	4
7664-41-7	Ammonia	1	46,929,186	141,696,062	41,137,132	240,682,883	14,763,305	485,208,568
6484-52-2	Ammonium nitrate (solution)	16	55,453	1,978,009	7,808,136	32,736,428	8,426,270	51,004,296
7783-20-2	Ammonium sulfate (solution)	34	19,639	265,457	7,592,647	7,523,816	2,106,747	17,508,306
62-53-3	Aniline	69	130,452	496,579	26,801	1,603,259	1,068	2,258,159
90-04-0	o-Anisidine	206	765	260	187	0	3,800	5,012
104-94-9	p-Anisidine	264	5	8	5	0	0	18
120-12-7	Anthracene	157	25,778	29,716	1,158	0	2,433	59,085
7440-36-0	Antimony	177	3,964	17,300	1,223	120	5,745	28,352
7440-38-2	Arsenic	77	3,836	3,734	940	0	1,734,513	1,743,023
1332-21-4	Asbestos (friable)	106	5,610	6,952	252	0	585,676	598,490
7440-39-3	Barium	118	94,605	21,806	5,093	0	261,262	382,766
98-87-3	Benzal chloride	226	1,550	11	0	0	0	1,561
71-43-2	Benzene	31	9,971,308	7,503,182	26,896	834,242	111,928	18,447,556
98-07-7	Benzoic trichloride	201	7,686	261	0	0	0	7,947
98-88-4	Benzoyl chloride	180	23,446	3,420	5	0	250	27,121
94-36-0	Benzoyl peroxide	187	648	1,656	5	0	13,205	15,514
100-44-7	Benzyl chloride	179	18,189	8,934	15	20	0	27,158
7440-41-7	Beryllium	174	6	1,372	101	0	29,023	30,502
92-52-4	Biphenyl	94	677,182	183,323	18,700	47,318	30,162	956,685
111-44-4	Bis(2-chloroethyl) ether	215	2,950	594	0	0	0	3,544
542-88-1	Bis(chloromethyl) ether	239	2	572	0	0	0	574
108-60-1	Bis(2-chloro-1-methyl-ethyl)ether	205	2,090	1,520	1,800	0	0	5,410
103-23-1	Bis(2-ethylhexyl) adipate	139	69,541	73,183	50	0	81,715	224,489
353-59-3	Bromochlorodifluoromethane (Halon 1211)	191	8,388	3,570	0	0	0	11,958
75-25-2	Bromoform	222	150	0	0	1,900	0	2,050
74-83-9	Bromomethane	68	404,146	2,041,449	0	1,000	0	2,446,595
75-63-8	Bromotrifluoromethane (Halon 1301)	141	171,287	8,820	0	0	0	180,107
106-99-0	1,3-Butadiene	59	2,050,374	1,900,003	5,049	0	8,881	3,964,307
141-32-2	Butyl acrylate	128	151,355	141,386	1,273	0	55	294,069
71-36-3	n-Butyl alcohol	22	6,977,261	22,741,844	257,497	4,382,276	107,321	34,466,199
78-92-2	sec-Butyl alcohol	97	228,025	409,563	4,486	170,000	14	812,088
75-65-0	tert-Butyl alcohol	72	760,910	424,781	129,510	827,562	497	2,143,260
85-68-7	Butyl benzyl phthalate	119	109,517	192,762	1,177	0	75,866	379,322
106-88-7	1,2-Butylene oxide	156	48,928	10,836	3,490	0	5	63,259
123-72-8	Butyraldehyde	107	165,671	267,829	575	144,427	28	578,530
569-64-2	C.I. Basic Green 4	262	6	6	14	0	0	26
989-38-8	C.I. Basic Red 1	246	0	0	0	0	375	375
2832-40-8	C.I. Disperse Yellow 3	231	336	0	26	0	782	1,144
81-88-9	C.I. Food Red 15	278	0	1	0	0	0	1
97-56-3	C.I. Solvent Yellow 3	272	0	5	0	0	0	5
7440-43-9	Cadmium	197	1,857	3,091	661	0	2,753	8,362
156-62-7	Calcium cyanamide	158	12,000	625	0	0	40,005	52,630
133-06-2	Captan	190	1,883	5,233	260	4,500	260	12,136

Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
Acetaldehyde	153,583	250,717	1,043	128,185	12,300	0	545,828
Acetamide	29,000	2,638	0	0	0	0	31,638
Acetone	14,475,090	13,328,807	515,726	40,265,509	17,524,793	102,116	86,212,041
Acetonitrile	581,095	2,540,160	150,672	2,434,262	5,224,305	0	10,930,494
Acrolein	0	13	3	10,681	0	0	10,697
Acrylamide	95,578	35,230	9,175	1,019	138	0	141,140
Acrylic acid	47,439	349,226	63,956	5,010,030	6,690	0	5,477,341
Acrylonitrile	297,197	2,034,833	21,244	81,902	16,540	0	2,451,716
Allyl alcohol	119,183	376,143	107,580	370,214	0	0	973,120
Allyl chloride	11,754	302,388	240	33,000	0	0	347,382
Aluminum (fume or dust)	13,271	341,976	5,836,393	310	9,476,329	3,933	15,672,212
Aluminum oxide (fibrous forms)	269,012	87,339	2,087,546	21,800	1,176,337	13,736	3,655,770
4-Aminoazobenzene	0	0	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0	0	0
Ammonia	96,492,357	6,964,023	4,945,536	100,788	7,177,077	102,961	115,782,742
Ammonium nitrate (solution)	5,984,399	557,468	39,237,767	0	767,770	0	46,547,404
Ammonium sulfate (solution)	42,154,207	6,588,517	487,522	0	400,000	33,971	49,664,217
Aniline	1,306,755	383,469	71,241	1,632,669	0	2,442	3,396,576
o-Anisidine	3,395	10	71	0	0	0	3,476
p-Anisidine	8	0	0	0	0	0	8
Anthracene	597	25,279	124,353	399,543	100	0	549,872
Antimony	3,228	10,097	509,533	1,997	881,923	12,350	1,419,128
Arsenic	566	160,462	464,151	18	150,723	0	775,920
Asbestos (friable)	1,707	33,790	5,534,023	0	0	0	5,569,520
Barium	84,381	70,137	556,032	4,423	35,941	2,400	753,314
Benzal chloride	0	0	0	35,000	0	0	35,000
Benzene	613,449	1,656,194	142,460	3,675,466	353,205	385	6,441,159
Benzoic trichloride	0	0	0	0	0	0	0
Benzoyl chloride	230	493,270	0	18,421	0	0	511,921
Benzoyl peroxide	17,192	62,192	5,860	911	11,000	0	97,155
Benzyl chloride	28,749	73,051	205	200,005	0	0	302,010
Beryllium	0	245	117,582	10	77,731	0	195,568
Biphenyl	782,600	183,296	40,601	315,254	194,826	300	1,516,877
Bis(2-chloroethyl) ether	15,841	447,600	0	350	0	0	463,791
Bis(chloromethyl) ether	0	0	2	0	0	0	2
Bis(2-chloro-1-methyl-ethyl)ether	0	0	0	0	0	0	0
Bis(2-ethylhexyl) adipate	20,155	34,491	213,194	106,868	16,709	0	391,417
Bromochlorodifluoromethane (Halon 1211)	0	0	0	0	0	0	0
Bromoform	0	250	99,300	0	0	0	99,550
Bromomethane	0	320	15	420	121,000	0	121,755
Bromotrifluoromethane (Halon 1301)	0	0	0	0	0	0	0
1,3-Butadiene	11,650	124,385	13,362	377,354	5,537,690	0	6,064,441
Butyl acrylate	138,351	38,736	15,098	124,590	114,618	0	431,393
n-Butyl alcohol	2,208,281	3,349,795	293,657	6,750,269	2,813,102	30,083	15,445,187
sec-Butyl alcohol	14,464	27,216	1,723	3,904,139	25,317	0	3,972,859
tert-Butyl alcohol	1,339,777	324,704	788,854	26,160,445	0	0	28,613,780
Butyl benzyl phthalate	40,364	149,535	308,212	117,271	98,043	0	713,425
1,2-Butylene oxide	5	907	0	326,019	10	0	326,941
Butyraldehyde	260,475	2,083	388	911	0	0	263,857
C.I. Basic Green 4	18,132	0	1,995	0	0	499	20,626
C.I. Basic Red 1	0	0	375	271	0	0	646
C.I. Disperse Yellow 3	0	0	125	0	0	0	125
C.I. Food Red 15	1,400	0	0	5	0	0	1,405
C.I. Solvent Yellow 3	0	10	0	0	0	0	10
Cadmium	260,309	68,200	665,482	813	135,266	4,804	1,134,874
Calcium cyanamide	0	0	0	0	0	0	0
Captan	255	3,755	12,748	0	0	0	16,758

Table 1-20. Releases and Transfers of All TRI Chemicals, 1991 (Ordered Alphabetically), Continued.

CAS Number	Chemical	Rank by Total Releases	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
63-25-2	Carbaryl	199	2,022	4,825	260	0	1,170	8,277
75-15-0	Carbon disulfide	12	2,626,842	86,712,281	58,634	2,835	260	89,400,852
56-23-5	Carbon tetrachloride	83	528,100	1,018,701	2,844	42,470	2,152	1,594,267
463-58-1	Carbonyl sulfide	37	5,627	16,719,541	0	0	0	16,725,168
120-80-9	Catechol	122	4,035	1,751	254,267	0	86,600	346,653
57-74-9	Chlordane	228	1,248	179	1	0	0	1,428
7782-50-5	Chlorine	14	1,715,251	75,894,219	696,282	72,552	119,630	78,497,934
10049-04-4	Chlorine dioxide	58	146,153	3,816,182	13,760	0	120	3,976,215
79-11-8	Chloroacetic acid	103	66,762	446,920	1,696	0	123,675	639,053
532-27-4	2-Chloroacetophenone	277	1	1	0	0	0	2
108-90-7	Chlorobenzene	67	1,228,868	1,167,233	5,165	177,032	1,534	2,579,832
75-00-3	Chloroethane	64	1,397,212	1,466,057	16,078	300	10	2,879,657
67-66-3	Chloroform	29	7,660,997	11,421,891	769,569	65,089	22,150	19,939,696
74-87-3	Chloromethane	51	1,431,983	4,266,748	101,838	192,600	0	5,993,169
107-30-2	Chloromethyl methyl ether	216	30	3,305	0	0	0	3,335
126-99-8	Chloroprene	80	103,489	1,367,033	2	71,000	137,011	1,678,535
1897-45-6	Chlorothalonil	217	1,921	1,330	13	0	0	3,264
7440-47-3	Chromium	79	450,919	105,487	17,289	531	1,155,527	1,729,753
7440-48-4	Cobalt	148	29,787	42,134	4,289	0	13,706	89,916
7440-50-8	Copper	35	408,618	864,627	56,040	14,011	15,439,598	16,782,894
8001-58-9	Creosote	76	622,554	1,139,297	3,862	0	10,780	1,776,493
120-71-8	p-Cresidine	243	160	68	5	0	250	483
1319-77-3	Cresol (mixed isomers)	84	349,690	391,758	3,661	749,531	2,528	1,497,168
108-39-4	m-Cresol	104	66,736	11,098	445	560,000	10	638,289
95-48-7	o-Cresol	105	29,463	31,802	11	550,000	4,860	616,136
106-44-5	p-Cresol	117	45,348	90,329	2,046	252,200	3,259	393,182
98-82-8	Cumene	61	1,080,084	2,197,610	2,011	9,189	21,757	3,310,651
80-15-9	Cumene hydroperoxide	110	83,935	13,922	242	422,600	240	520,939
135-20-6	Cupferron	230	0	1,200	0	0	0	1,200
110-82-7	Cyclohexane	32	6,605,946	10,577,659	12,606	591,703	27,757	17,815,671
94-75-7	2,4-D (acetic acid)	173	10,049	6,161	262	1,291	13,260	31,023
1163-19-5	Decabromodiphenyl oxide	132	21,697	26,043	3,817	38	220,075	271,670
615-05-4	2,4-Diaminoanisole	280	0	0	0	0	0	0
39156-41-7	2,4-Diaminoanisole sulfate	281	0	0	0	0	0	0
101-80-4	4,4'-Diaminodiphenyl ether	233	7	697	337	0	0	1,041
25376-45-8	Diaminotoluene (mixed isomers)	163	17,963	2,620	1,110	24,000	10	45,703
95-80-7	2,4-Diaminotoluene	210	3,800	10	250	0	0	4,060
132-64-9	Dibenzofuran	167	18,439	21,608	505	0	1,882	42,434
96-12-8	1,2-Dibromo-3-chloropropane	249	290	0	0	0	0	290
106-93-4	1,2-Dibromoethane	169	8,642	29,560	73	240	2	38,517
124-73-2	Dibromotetrafluoroethane (Halon 2402)	203	250	6,300	0	0	0	6,550
84-74-2	Dibutyl phthalate	126	58,761	91,271	8,907	160,000	5,069	324,008
25321-22-6	Dichlorobenzene (mixed isomers)	150	4,446	73,649	2	0	9	78,106
95-50-1	1,2-Dichlorobenzene	113	175,806	242,646	3,962	19,000	21,153	462,567
541-73-1	1,3-Dichlorobenzene	204	878	3,941	779	0	0	5,598
106-46-7	1,4-Dichlorobenzene	123	47,159	289,005	2,146	2,000	420	340,730
91-94-1	3,3'-Dichlorobenzidine	268	5	5	0	0	0	10
75-27-4	Dichlorobromomethane	253	200	0	0	0	0	200
75-71-8	Dichlorodifluoromethane (CFC-12)	40	8,506,516	6,545,211	89	16,008	32,805	15,100,629
107-06-2	1,2-Dichloroethane	57	812,464	3,182,959	23,564	6,334	7,051	4,032,372
540-59-0	1,2-Dichloroethylene	164	14,925	29,857	12	0	0	44,794
75-09-2	Dichloromethane	13	31,726,830	47,611,641	98,877	1,317,706	117,788	80,872,842
120-83-2	2,4-Dichlorophenol	165	885	547	1	42,800	1	44,234
78-87-5	1,2-Dichloropropane	98	227,847	545,596	6,570	0	0	780,013
78-88-6	2,3-Dichloropropene	189	4,600	486	47	7,132	0	12,265
542-75-6	1,3-Dichloropropylene	185	11,895	8,510	0	0	0	20,405

Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
Carbaryl	0	9,937	6,032	0	0	0	15,969
Carbon disulfide	193,658	331,628	3,746	174,690	33,804	0	737,526
Carbon tetrachloride	621	939,774	39,111	11,061	390,625	1,684	1,382,876
Carbonyl sulfide	0	0	0	0	0	0	0
Catechol	237,081	39,630	74,667	35,305	50	0	386,733
Chlordane	69	292	0	0	0	0	361
Chlorine	964,055	402,410	57,594	5	621,626	39,020	2,084,710
Chlorine dioxide	14,783	0	0	0	0	0	14,783
Chloroacetic acid	3,279	4,427	1,954	0	0	0	9,660
2-Chloroacetophenone	0	0	0	0	0	0	0
Chlorobenzene	15,346	3,769,332	105,184	869,603	854,720	0	5,614,185
Chloroethane	5	310,731	0	24,440	140,250	0	475,426
Chloroform	809,427	1,755,778	71,518	255,288	2,077,870	3	4,969,884
Chloromethane	73,961	2,807,970	3,061	14,910	52,663	0	2,952,565
Chloromethyl methyl ether	0	0	35	0	0	0	35
Chloroprene	35,000	168,345	3,241	3,700	130,000	0	340,286
Chlorothalonil	293	6,412	204,538	653	0	0	211,896
Chromium	396,151	913,036	5,500,165	6,576	50,766,527	174,775	57,757,230
Cobalt	9,878	29,542	566,662	4	5,273,087	12	5,879,185
Copper	414,699	2,487,264	12,273,545	3,518	289,976,983	834,018	305,990,027
Creosote	17,024	586,725	1,995,572	663,755	471,700	13,680	3,748,456
p-Cresidine	18,368	1	2,680	0	0	0	21,049
Cresol (mixed isomers)	18,356	252,873	6,563	256,262	635,081	0	1,169,135
m-Cresol	11,918	39,458	23,451	9,622	490	0	84,939
o-Cresol	55,341	18,922	11,759	4,342	258	0	90,622
p-Cresol	1,062,305	24,251	16,104	28,829	0	0	1,131,489
Cumene	163,552	55,282	16,392	744,749	80,857	0	1,060,832
Cumene hydroperoxide	265	7,423	25,465	2,101	0	0	35,254
Cupferron	1,200	0	0	0	0	0	1,200
Cyclohexane	26,599	1,087,208	24,184	4,114,655	579,083	119,416	5,951,145
2,4-D (acetic acid)	350	105,891	13,326	0	0	0	119,567
Decabromodiphenyl oxide	43,538	43,567	743,947	8,551	49,163	0	888,766
2,4-Diaminoanisole	85	0	0	0	0	0	85
2,4-Diaminoanisole sulfate	250	0	0	0	0	0	250
4,4'-Diaminodiphenyl ether	5	3,962	120	0	0	0	4,087
Diaminotoluene (mixed isomers)	54,369	544,862	21,702	578,455	0	0	1,199,388
2,4-Diaminotoluene	620	5,710	6,060	8,396	0	0	20,786
Dibenzofuran	500	16,943	108,602	4,346	0	0	130,391
1,2-Dibromo-3-chloropropane	0	0	0	0	0	0	0
1,2-Dibromoethane	2	838	750	842	0	0	2,432
Dibromotetrafluoroethane (Halon 2402)	0	0	0	0	0	0	0
Dibutyl phthalate	14,535	109,797	70,751	176,958	4,660	10,063	386,764
Dichlorobenzene (mixed isomers)	7,410	111,339	9	325,693	0	0	444,451
1,2-Dichlorobenzene	84,218	2,413,025	427,032	1,079,191	1,490,896	0	5,494,362
1,3-Dichlorobenzene	160	3,966	22	0	800	0	4,948
1,4-Dichlorobenzene	11,068	111,019	770	36,530	4	0	159,391
3,3'-Dichlorobenzidine	15	19,116	4,650	0	0	0	23,781
Dichlorobromomethane	0	0	0	0	0	0	0
Dichlorodifluoromethane (CFC-12)	4,484	93,114	34,275	1,841	91,660	0	225,374
1,2-Dichloroethane	26,294	5,722,194	6,479	51,917	19,363,730	0	25,170,614
1,2-Dichloroethylene	0	359	0	0	2,000	0	2,359
Dichloromethane	1,308,202	11,956,118	495,762	3,717,385	29,163,629	153,456	46,794,552
2,4-Dichlorophenol	0	0	0	750	0	0	750
1,2-Dichloropropane	7,100	2	2,073	0	0	0	9,175
2,3-Dichloropropene	0	454,340	0	0	0	0	454,340
1,3-Dichloropropylene	0	920	0	0	0	0	920

Table 1-20. Releases and Transfers of All TRI Chemicals, 1991 (Ordered Alphabetically), Continued.

CAS Number	Chemical	Rank by Total Releases	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
76-14-2	Dichlorotetrafluoroethane (CFC-114)	74	1,694,535	207,258	35	5	5	1,901,838
62-73-7	Dichlorvos	236	326	318	0	0	0	644
115-32-2	Dicofol	271	5	1	0	0	0	6
1464-53-5	Diepoxybutane	282	0	0	0	0	0	0
111-42-2	Diethanolamine	96	187,534	83,573	434,060	60,000	132,585	897,752
117-81-7	Di-(2-ethylhexyl) phthalate	89	95,409	948,011	3,842	370	155,773	1,203,405
84-66-2	Diethyl phthalate	146	11,032	99,649	678	0	2,977	114,336
64-67-5	Diethyl sulfate	211	3,610	408	5	0	10	4,033
119-90-4	3,3'-Dimethoxybenzidine	275	0	0	4	0	0	4
57-14-7	1,1-Dimethyl hydrazine	242	111	378	0	0	0	489
105-67-9	2,4-Dimethylphenol	143	18,008	15,686	8	101,000	26	134,728
131-11-3	Dimethyl phthalate	153	14,147	51,690	1,198	865	811	68,711
77-78-1	Dimethyl sulfate	193	9,670	427	293	0	0	10,390
99-65-0	m-Dinitrobenzene	224	502	899	0	0	309	1,710
528-29-0	o-Dinitrobenzene	235	51	116	0	0	509	676
100-25-4	p-Dinitrobenzene	254	50	88	0	0	24	162
534-52-1	4,6-Dinitro-o-cresol	256	7	43	33	0	0	83
51-28-5	2,4-Dinitrophenol	155	16,585	7,557	3,888	35,532	10	63,572
121-14-2	2,4-Dinitrotoluene	196	5,103	312	2,682	0	1,424	9,521
606-20-2	2,6-Dinitrotoluene	219	1,197	751	702	0	0	2,650
25321-14-6	Dinitrotoluene (mixed isomers)	151	4,593	10,386	135	60,000	0	75,114
117-84-0	n-Dioctyl phthalate	172	16,139	15,691	557	0	255	32,642
123-91-1	1,4-Dioxane	91	365,544	352,960	318,133	0	15,952	1,052,589
106-89-8	Epichlorohydrin	112	277,040	182,110	5,456	0	3,675	468,281
110-80-5	2-Ethoxyethanol	101	224,795	447,143	5,022	0	0	676,960
140-88-5	Ethyl acrylate	138	108,970	122,991	423	947	939	234,270
100-41-4	Ethylbenzene	47	2,876,381	5,764,613	16,608	94,637	53,124	8,805,363
541-41-3	Ethyl chloroformate	223	1,254	576	0	0	0	1,830
74-85-1	Ethylene	19	16,137,889	22,133,970	17,015	0	0	38,288,874
107-21-1	Ethylene glycol	33	4,467,944	6,192,193	2,299,613	3,654,273	908,167	17,522,190
75-21-8	Ethylene oxide	75	805,152	987,896	2,260	25,416	50,336	1,871,060
96-45-7	Ethylene thiourea	237	24	558	0	0	0	582
2164-17-2	Fluometuron	252	104	113	10	0	5	232
50-00-0	Formaldehyde	38	1,780,780	8,437,687	616,001	5,220,067	242,466	16,297,001
76-13-1	Freon 113	20	23,983,423	11,874,228	3,264	558	89,780	35,951,253
76-44-8	Heptachlor	273	5	0	0	0	0	5
118-74-1	Hexachlorobenzene	234	549	292	111	60	1	1,013
87-68-3	Hexachloro-1,3-butadiene	209	2,420	990	681	200	2	4,293
77-47-4	Hexachlorocyclopentadiene	182	24,744	717	23	5	0	25,489
67-72-1	Hexachloroethane	183	1,783	20,926	0	160	2	22,871
302-01-2	Hydrazine	176	22,354	6,079	1,520	0	5	29,958
10034-93-2	Hydrazine sulfate	142	0	2	0	150,000	0	150,002
7647-01-0	Hydrochloric acid	2	4,634,850	78,286,624	2,143,954	190,422,615	12,193,916	287,681,959
74-90-8	Hydrogen cyanide	70	64,031	1,190,762	8,839	945,926	17	2,209,575
7664-39-3	Hydrogen fluoride	46	3,565,926	5,615,266	5,464	1	25,259	9,211,916
123-31-9	Hydroquinone	133	6,434	4,367	4,388	255,705	6	270,900
78-84-2	Isobutyraldehyde	116	118,100	272,124	91	6,810	262	397,387
67-63-0	Isopropyl alcohol (manufacturing)	85	471,421	977,470	21,735	200	2,077	1,472,903
80-05-7	4,4'-Isopropylidenediphenol	100	116,488	191,370	4,492	43,000	374,926	730,276
120-58-1	Isosafrole	270	5	5	0	0	0	10
7439-92-1	Lead	60	205,524	226,253	20,457	0	3,323,695	3,775,929
58-89-9	Lindane	240	271	291	0	0	5	567
108-31-6	Maleic anhydride	114	77,182	381,807	460	255	1,155	460,859
12427-38-2	Maneb	261	10	19	0	0	0	29
7439-96-5	Manganese	43	687,932	409,038	144,676	522	9,848,116	11,090,284
7439-97-6	Mercury	184	10,557	6,355	624	0	5,287	22,823
67-56-1	Methanol	3	35,913,043	163,769,926	20,064,023	28,877,462	3,634,255	252,258,709
72-43-5	Methoxychlor	238	251	314	10	0	5	580

Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
Dichlorotetrafluoroethane (CFC-114)	250	17,400	7	0	0	0	17,657
Dichlorvos	0	2,000	1,610	500	0	0	4,110
Dicofol	0	7,899	10	0	0	0	7,909
Diepoxybutane	0	0	0	0	0	0	0
Diethanolamine	1,311,723	367,573	220,993	171,046	173,587	434	2,245,356
Di-(2-ethylhexyl) phthalate	50,531	184,000	969,654	304,179	1,102,094	440	2,610,898
Diethyl phthalate	313,332	77,678	48,747	12,927	183,064	281	636,029
Diethyl sulfate	633	805	0	50	7,137,400	0	7,138,888
3,3'-Dimethoxybenzidine	0	0	0	0	0	0	0
1,1-Dimethyl hydrazine	0	6,360	26	0	3	0	6,389
2,4-Dimethylphenol	2,675	3,364	1,595	22,069	0	0	29,703
Dimethyl phthalate	82,565	58,623	17,434	16,102	250	0	174,974
Dimethyl sulfate	260	0	0	0	0	0	260
m-Dinitrobenzene	0	26,700	0	0	0	0	26,700
o-Dinitrobenzene	0	340	0	0	0	0	340
p-Dinitrobenzene	0	0	0	0	0	0	0
4,6-Dinitro-o-cresol	26,255	5,915	11,455	100	0	0	43,725
2,4-Dinitrophenol	255	5	1,200	2,600	0	0	4,060
2,4-Dinitrotoluene	0	53,250	57	110,750	0	0	164,057
2,6-Dinitrotoluene	0	250	0	250	0	0	500
Dinitrotoluene (mixed isomers)	890,000	14,720	55	0	0	0	904,775
n-Dioctyl phthalate	3,175	45,825	108,523	21,693	73,352	0	252,568
1,4-Dioxane	254,304	526,359	76,537	232,949	44,222	1	1,134,372
Epichlorohydrin	12,703	919,235	594	7,800	4,669	0	945,001
2-Ethoxyethanol	217,923	139,537	20,451	201,806	36,186	2	615,905
Ethyl acrylate	19,855	167,145	24,621	783,299	200	440	995,560
Ethylbenzene	101,944	1,316,257	181,096	8,664,046	2,704,241	11,677	12,979,261
Ethyl chloroformate	0	390	0	1,200	0	0	1,590
Ethylene	17	897,754	504	40,096	0	0	938,371
Ethylene glycol	18,602,841	5,948,273	1,300,080	4,082,995	91,411,758	3,450	121,349,397
Ethylene oxide	114,004	1,015	1,604	0	0	0	116,623
Ethylene thiourea	15	11,367	7,750	250	0	0	19,382
Fluometuron	1,012	11,625	17,010	0	0	0	29,647
Formaldehyde	5,482,598	928,275	497,947	102,312	62,290	8,433	7,081,855
Freon 113	38,402	1,181,848	114,338	454,663	7,784,450	98,217	9,671,918
Heptachlor	0	5	0	0	0	0	5
Hexachlorobenzene	5	127,143	1,064,793	0	1	0	1,191,942
Hexachloro-1,3-butadiene	4	1,709,379	4,263	0	0	0	1,713,646
Hexachlorocyclopentadiene	624	27,803	3,000	4,000	0	0	35,427
Hexachloroethane	0	166,013	5,011	39,000	0	0	210,024
Hydrazine	6,368	13,515	2,434	38,000	3	29	60,349
Hydrazine sulfate	0	0	0	0	0	0	0
Hydrochloric acid	16,566,697	35,103,614	12,733,345	4,415,525	42,004,594	616,043	111,439,818
Hydrogen cyanide	271	315	120	250	0	0	956
Hydrogen fluoride	356,983	2,513,853	1,080,205	750	46,814	250	3,998,855
Hydroquinone	168,069	22,736	214,630	4,132	10	440	410,017
Isobutyraldehyde	37,444	47,587	0	553,000	0	0	638,031
Isopropyl alcohol (manufacturing)	141,364	127,264	29,555	412,827	42,173	440	753,623
4,4'-Isopropylidenediphenol	32,776	21,064	231,212	67,980	4,707	1,214	358,953
Isosafrole	0	0	0	5	0	0	5
Lead	306,444	1,702,811	5,512,965	9,082	38,232,373	39,308	45,802,983
Lindane	5	7,258	66	0	0	0	7,329
Maleic anhydride	6,073	700,645	18,370	36,342	47	1	761,478
Maneb	0	255	2,370	0	0	0	2,625
Manganese	161,114	694,623	12,738,621	24,538	41,442,691	177,609	55,239,196
Mercury	42	43,401	114,550	0	444,961	0	602,954
Methanol	113,854,683	37,951,338	4,666,333	63,132,911	12,179,529	1,456,494	233,241,288
Methoxychlor	0	159	5	0	0	0	164

Table 1-20. Releases and Transfers of All TRI Chemicals, 1991 (Ordered Alphabetically), Continued.

CAS Number	Chemical	Rank by Total Releases	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
109-86-4	2-Methoxyethanol	71	1,105,988	712,351	364,059	0	20	2,182,418
96-33-3	Methyl acrylate	135	65,781	169,686	919	161	0	236,547
1634-04-4	Methyl tert-butyl ether	62	788,244	2,249,807	30,901	81,690	2,903	3,153,545
101-14-4	4,4'-Methylenebis (2-chloroaniline)	229	1,015	347	0	0	0	1,362
101-68-8	Methylenebis(phenyl-isocyanate)	99	391,550	234,784	10	0	125,989	752,333
74-95-3	Methylene bromide	159	38,277	13,010	0	0	0	51,287
101-77-9	4,4'-Methylenedianiline	170	9,013	4,155	1,486	22,062	3	36,719
78-93-3	Methyl ethyl ketone	11	33,149,766	70,271,889	141,354	355,736	180,492	104,099,237
60-34-4	Methyl hydrazine	279	0	0	0	0	0	0
74-88-4	Methyl iodide	181	22,544	2,870	13	740	0	26,167
108-10-1	Methyl isobutyl ketone	24	8,411,877	18,786,642	167,405	161,600	177,939	27,705,463
624-83-9	Methyl isocyanate	202	6,987	798	0	0	0	7,785
80-62-6	Methyl methacrylate	65	587,732	1,969,763	6,373	270,000	4,305	2,838,173
90-94-8	Michler's ketone	283	0	0	0	0	0	0
1313-27-5	Molybdenum trioxide	125	46,026	47,911	78,785	134,965	23,415	331,102
76-15-3	Monochloropenta-fluoroethane (CFC-115)	121	190,872	171,291	5	0	0	362,168
91-20-3	Naphthalene	66	1,391,603	1,280,285	31,484	39,112	54,343	2,796,827
134-32-7	alpha-Naphthylamine	269	5	5	0	0	0	10
7440-02-0	Nickel	93	408,694	140,609	53,883	4,418	393,775	1,001,379
7697-37-2	Nitric acid	26	685,940	2,594,202	167,773	21,128,099	585,053	25,161,067
139-13-9	Nitrilotriacetic acid	192	5	0	4,100	7,800	0	11,905
99-59-2	5-Nitro-o-anisidine	266	5	10	0	0	0	15
98-95-3	Nitrobenzene	109	34,483	18,125	850	468,404	365	522,227
55-63-0	Nitroglycerin	160	1,790	26,657	12,399	0	9,550	50,396
88-75-5	2-Nitrophenol	258	0	2	40	0	0	42
100-02-7	4-Nitrophenol	194	9,406	127	600	0	0	10,133
79-46-9	2-Nitropropane	134	31,052	74,695	380	139,342	0	245,469
156-10-5	p-Nitrosodiphenylamine	207	24	0	0	4,700	0	4,724
121-69-7	N,N-Dimethylaniline	149	24,751	26,605	30,430	0	0	81,786
86-30-6	N-Nitrosodiphenylamine	284	0	0	0	0	0	0
56-38-2	Parathion	232	267	280	255	0	255	1,057
87-86-5	Pentachlorophenol	186	6,991	5,517	2,278	0	1,510	16,296
79-21-0	Peracetic acid	198	1,110	3,982	10	5	3,220	8,327
108-95-2	Phenol	44	2,498,507	3,832,788	163,915	3,192,210	324,921	10,012,341
106-50-3	p-Phenylenediamine	214	1,054	2,497	0	0	2	3,553
90-43-7	2-Phenylphenol	195	8,403	1,054	224	0	5	9,686
75-44-5	Phosgene	208	2,279	2,109	5	5	0	4,398
7664-38-2	Phosphoric acid	6	314,776	1,002,123	114,363,613	26,545	47,311,554	163,018,611
7723-14-0	Phosphorus (yellow or white)	120	19,662	3,847	2,273	0	339,229	365,011
85-44-9	Phthalic anhydride	102	112,154	519,670	13,164	0	944	645,932
88-89-1	Picric acid	82	2	1	2	1,634,494	19	1,634,518
1336-36-3	Polychlorinated biphenyls (PCBs)	267	0	0	0	0	10	10
123-38-6	Propionaldehyde	86	598,008	790,001	63	66,741	0	1,454,813
114-26-1	Propoxur	265	10	5	0	0	0	15
115-07-1	Propylene	27	13,422,010	9,418,860	4,685	0	114,000	22,959,555
75-55-8	Propyleneimine	245	50	350	0	0	0	400
75-56-9	Propylene oxide	90	450,934	615,690	10,181	20,710	2,450	1,099,965
110-86-1	Pyridine	111	58,405	51,587	4,930	370,750	13	485,685
91-22-5	Quinoline	152	20,133	24,958	2,660	23,000	286	71,037
106-51-4	Quinone	212	2,205	1,807	0	5	0	4,017
82-68-8	Quintozene	248	20	286	0	0	0	306
81-07-2	Saccharin (manufacturing)	247	63	251	0	0	0	314
7782-49-2	Selenium	227	525	511	188	0	260	1,484
7440-22-4	Silver	188	5,555	7,849	119	28	250	13,801
100-42-5	Styrene	23	10,161,049	18,315,297	25,609	22,080	389,929	28,913,964
96-09-3	Styrene oxide	225	1,628	47	0	0	0	1,675
7664-93-9	Sulfuric acid	7	1,577,640	20,099,089	37,243,237	94,720,218	7,678,646	161,318,830

Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
2-Methoxyethanol	399,241	393,034	702	542,690	26,025	0	1,361,692
Methyl acrylate	5,311	38,476	1,025	221,846	5,000	0	271,658
Methyl tert-butyl ether	129,131	20,321	6,060	522,457	6,618	0	684,587
4,4'-Methylenebis (2-chloroaniline)	5	4,228	0	1,000	0	0	5,233
Methylenebis(phenyl-isocyanate)	911	529,923	1,004,233	49,445	375,246	83,036	2,042,794
Methylene bromide	5,417	0	0	0	0	0	5,417
4,4'-Methylenedianiline	1,759	44,218	16,913	28,000	0	0	90,890
Methyl ethyl ketone	772,861	9,365,077	512,746	35,111,556	26,033,673	121,043	71,916,956
Methyl hydrazine	1	0	0	0	0	2	3
Methyl iodide	0	5	0	0	0	0	5
Methyl isobutyl ketone	816,066	2,112,745	155,643	18,801,198	20,346,186	5,907	42,237,745
Methyl isocyanate	0	0	15,067	0	0	0	15,067
Methyl methacrylate	131,991	525,679	187,596	1,255,989	458,907	9	2,560,171
Michler's ketone	3	0	0	703	0	0	706
Molybdenum trioxide	80,682	48,998	534,959	0	2,424,255	86,736	3,175,630
Monochloropenta-fluoroethane (CFC-115)	0	0	0	0	0	0	0
Naphthalene	63,546	488,867	1,378,524	1,522,280	206,040	16,406	3,675,663
alpha-Naphthylamine	0	0	0	0	0	0	0
Nickel	506,495	588,824	3,548,970	7,812	38,882,197	343,261	43,877,559
Nitric acid	8,648,779	14,022,809	3,889,873	750	2,224,835	10,455	28,797,501
Nitrilotriacetic acid	0	0	0	0	0	0	0
5-Nitro-o-anisidine	255	0	250	0	0	0	505
Nitrobenzene	100	326,969	8,403	243,550	35,606	4,048	618,676
Nitroglycerin	86	87,122	0	8	2,683	0	89,899
2-Nitrophenol	140	11,441	221	0	0	0	11,802
4-Nitrophenol	21,067	561,290	0	0	0	0	582,357
2-Nitropropane	0	2,837	33,650	0	39,204	0	75,691
p-Nitrosodiphenylamine	0	0	0	2,200	0	0	2,200
N,N-Dimethylaniline	206,399	84,654	0	489,869	0	0	780,922
N-Nitrosodiphenylamine	0	470,000	0	0	0	0	470,000
Parathion	0	361	505	0	0	2,307	3,173
Pentachlorophenol	834	65,491	187,231	10,613	1,755	90	266,014
Peracetic acid	1,672	0	0	0	0	0	1,672
Phenol	5,401,118	2,375,455	901,912	1,573,947	1,047,096	25,892	11,325,420
p-Phenylenediamine	3,239	1,200	13,000	0	0	0	17,439
2-Phenylphenol	4,858	5	510	260	0	0	5,633
Phosgene	0	2,425	5	0	0	0	2,430
Phosphoric acid	5,498,173	2,319,204	1,657,538	17,353	8,325,508	552,865	18,370,641
Phosphorus (yellow or white)	266	3,652	506	0	141,598	0	146,022
Phthalic anhydride	3,281	436,077	279,776	4,684,778	0	1	5,403,913
Picric acid	0	12,465	0	25,000	0	0	37,465
Polychlorinated biphenyls (PCBs)	0	2,319,927	112,850	0	14	0	2,432,791
Propionaldehyde	12,922	250	4,975	5,100	0	0	23,247
Propoxur	255	455	5	0	0	0	715
Propylene	5	724,173	6,039	288,300	0	0	1,018,517
Propyleneimine	0	0	0	0	0	0	0
Propylene oxide	49,854	6,887	40,392	1,361,220	5	0	1,458,358
Pyridine	264,235	202,765	4,560	177,321	33,804	0	682,685
Quinoline	255	4,248	3,702	0	0	0	8,205
Quinone	0	0	0	0	0	0	0
Quintozene	11	61,470	1,480	105	0	0	63,066
Saccharin (manufacturing)	260	350	1,400	0	0	0	2,010
Selenium	265	965	5,407	0	43,378	0	50,015
Silver	259,353	9,105	116,004	0	995,281	337	1,380,080
Styrene	243,118	2,858,300	1,998,082	8,502,579	67,095	8,385	13,677,559
Styrene oxide	0	0	0	0	0	0	0
Sulfuric acid	34,175,276	44,343,292	31,353,990	94,151	883,134,485	566,510	993,667,704

Table 1-20. Releases and Transfers of All TRI Chemicals, 1991 (Ordered Alphabetically), Continued.

CAS Number	Chemical	Rank by Total Releases	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
79-34-5	1,1,2,2-Tetrachloroethane	154	40,927	23,324	2,102	0	0	66,353
127-18-4	Tetrachloroethylene	36	6,482,575	10,204,876	7,448	14,000	23,302	16,732,201
961-11-5	Tetrachlorvinphos	255	1	129	2	0	0	132
7440-28-0	Thallium	260	1	29	1	0	0	31
62-55-5	Thioacetamide	285	0	0	0	0	0	0
62-56-6	Thiourea	200	873	555	717	5,400	505	8,050
1314-20-1	Thorium dioxide	251	0	250	0	0	0	250
7550-45-0	Titanium tetrachloride	171	27,370	6,236	0	0	0	33,606
108-88-3	Toluene	4	73,620,294	124,944,414	104,645	1,373,207	185,012	200,227,572
584-84-9	Toluene-2,4-diisocyanate	88	12,148	1,311,804	0	0	250	1,324,202
91-08-7	Toluene-2,6-diisocyanate	124	303,581	28,507	0	0	250	332,338
26471-62-5	Toluenediisocyanate (mixed isomers)	162	18,359	29,526	0	0	10	47,895
95-53-4	o-Toluidine	168	8,904	1,925	260	21,100	8,111	40,300
52-68-6	Trichlorfon	250	5	254	9	0	0	268
120-82-1	1,2,4-Trichlorobenzene	115	127,598	282,051	1,669	3,134	4,573	419,025
71-55-6	1,1,1-Trichloroethane	8	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
79-00-5	1,1,2-Trichloroethane	108	94,329	433,437	1,382	2	256	529,406
79-01-6	Trichloroethylene	21	16,642,065	18,416,403	12,750	800	62,991	35,135,009
75-69-4	Trichlorofluoromethane (CFC-11)	41	5,339,896	6,382,210	5,156	1,428	10,203	11,738,893
95-95-4	2,4,5-Trichlorophenol	178	0	0	0	28,000	0	28,000
88-06-2	2,4,6-Trichlorophenol	257	1	79	1	0	1	82
1582-09-8	Trifluralin	166	8,449	2,711	80	0	31,835	43,075
95-63-6	1,2,4-Trimethylbenzene	52	2,723,947	2,618,627	15,756	16,898	17,732	5,392,960
51-79-6	Urethane	221	0	2,050	0	0	0	2,050
7440-62-2	Vanadium (fume or dust)	147	1,739	14,664	685	0	74,730	91,818
108-05-4	Vinyl acetate	48	1,102,871	4,383,624	9,900	3,088,362	7,237	8,591,994
593-60-2	Vinyl bromide	213	260	3,300	0	0	0	3,560
75-01-4	Vinyl chloride	92	390,119	657,366	4,625	4	251	1,052,365
75-35-4	Vinylidene chloride	129	71,772	213,418	832	0	15	286,037
1330-20-7	Xylene (mixed isomers)	10	27,683,616	87,869,367	50,801	139,948	335,613	116,079,345
108-38-3	m-Xylene	87	926,807	509,426	2,260	5	3,186	1,441,684
95-47-6	o-Xylene	78	1,153,483	576,448	6,507	5	1,618	1,738,061
106-42-3	p-Xylene	53	1,343,694	3,934,677	1,076	5	3,635	5,283,087
87-62-7	2,6-Xylidine	263	5	16	0	0	0	21
7440-66-6	Zinc (fume or dust)	42	765,614	1,168,410	28,080	115	9,216,574	11,178,793
12122-67-7	Zineb	274	5	0	0	0	0	5
	Antimony compounds	81	30,395	55,746	45,593	6,509	1,522,871	1,661,114
	Arsenic compounds	63	25,007	165,308	4,496	23,000	2,738,853	2,956,664
	Barium compounds	54	248,569	614,578	100,702	408	4,005,169	4,969,426
	Beryllium compounds	175	1	241	9	0	30,000	30,251
	Cadmium compounds	127	17,066	52,427	3,580	1,540	248,374	322,987
	Chlorophenols	136	3,368	968	782	229,798	56	234,972
	Chromium compounds	25	134,838	427,257	335,233	34,619	24,761,345	25,693,292
	Cobalt compounds	131	7,857	25,946	78,593	19,949	142,152	274,497
	Copper compounds	17	2,378,725	1,870,707	158,621	225,310	42,424,235	47,057,598
	Cyanide compounds	55	61,839	708,282	111,021	3,781,837	26,768	4,689,747
	Glycol ethers	18	10,235,089	33,678,910	507,487	176,033	711,313	45,308,832
	Lead compounds	39	348,258	1,059,351	117,976	928	13,699,094	15,225,607
	Manganese compounds	15	490,885	755,529	698,968	15,327	68,528,067	70,488,776
	Mercury compounds	218	1,355	1,475	47	9	28	2,914
	Nickel compounds	73	60,804	182,380	73,071	366,530	1,278,693	1,961,478
	Selenium compounds	145	2,381	34,679	722	4,100	80,295	122,177
	Silver compounds	161	6,590	18,238	8,309	25	16,993	50,155
	Thallium compounds	241	5	250	0	0	255	510
	Zinc compounds	9	1,517,384	2,710,343	1,325,812	228,007	114,062,672	119,844,218
	Mixtures and other trade names	95	189,755	680,261	6,063	1,540	50,384	928,003
	Trade Secrets	220	56	893	1,400	0	0	2,349
	Total		626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
1,1,2,2-Tetrachloroethane	2,005	214,173	262	17,800	852,908	1	1,087,149
Tetrachloroethylene	234,637	3,580,303	112,237	1,232,887	10,694,611	138,019	15,992,694
Tetrachlorvinphos	9	5,300	27,969	0	0	0	33,278
Thallium	0	1	953	0	0	0	954
Thioacetamide	0	0	0	0	0	0	0
Thiourea	15,906	4,107	1,661	750	335	0	22,759
Thorium dioxide	250	0	102,249	0	0	0	102,499
Titanium tetrachloride	5	2,367,140	958	2,688	0	0	2,370,791
Toluene	1,266,355	20,171,434	1,636,162	80,207,715	24,882,493	198,649	128,362,808
Toluene-2,4-diisocyanate	0	35,711	14,098	12,911	10,900	0	73,620
Toluene-2,6-diisocyanate	0	14,423	0	10	1,950	0	16,383
Toluenediisocyanate (mixed isomers)	6	200,231	15,387	22,289	11,129	0	249,042
o-Toluidine	8,250	101,931	85	62,900	0	1,300	174,466
Trichlorfon	0	1,145	47	0	0	0	1,192
1,2,4-Trichlorobenzene	136,769	315,761	59,051	68,617	85,165	0	665,363
1,1,1-Trichloroethane	293,508	6,743,974	969,200	3,212,938	27,237,545	287,441	38,744,606
1,1,2-Trichloroethane	819	4,995,437	8,580	0	8,179,318	0	13,184,154
Trichloroethylene	72,845	2,577,754	115,974	802,290	6,785,517	99,640	10,454,020
Trichlorofluoromethane (CFC-11)	10,252	175,662	410,963	32,314	175,082	0	804,273
2,4,5-Trichlorophenol	0	0	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0	0	0
Trifluralin	141	26,604	50,013	0	250	0	77,008
1,2,4-Trimethylbenzene	238,993	216,540	143,827	1,535,784	469,483	8,600	2,613,227
Urethane	0	15,300	4,500	0	0	0	19,800
Vanadium (fume or dust)	270	1,646	426,571	61	154,749	0	583,297
Vinyl acetate	153,451	124,913	49,834	3,648,193	1,136	0	3,977,527
Vinyl bromide	0	0	0	0	0	0	0
Vinyl chloride	252	69,540	6,549	59	236,549	0	312,949
Vinylidene chloride	94	74,520	7	0	0	0	74,621
Xylene (mixed isomers)	1,437,628	19,031,424	914,695	66,547,878	38,885,924	195,932	127,013,481
m-Xylene	19,178	102,008	49,329	47,829	15,968	0	234,312
o-Xylene	117,628	101,894	23,242	2,614,447	10,249	61,354	2,928,814
p-Xylene	18,748	48,171	14,076	10,020	1,365	296	92,676
2,6-Xylidine	0	0	0	0	0	0	0
Zinc (fume or dust)	40,658	1,061,859	4,144,417	50,022	67,787,514	147,137	73,231,607
Zineb	0	5	0	0	0	0	5
Antimony compounds	88,027	185,845	1,759,024	76,010	1,899,230	1,621	4,009,757
Arsenic compounds	1,384	416,169	1,148,904	250	949,197	157	2,516,061
Barium compounds	2,045,102	2,451,281	16,639,604	218,923	915,600	37,134	22,307,644
Beryllium compounds	0	1,081	1,800	0	7,135	0	10,016
Cadmium compounds	5,462	320,357	354,219	6,647	2,131,646	36,801	2,855,132
Chlorophenols	1,330	104,388	0	4,493	0	0	110,211
Chromium compounds	791,952	3,056,902	10,472,628	62,847	17,670,973	148,391	32,203,693
Cobalt compounds	15,242	117,768	214,330	2,802	1,188,055	25	1,538,222
Copper compounds	197,460	1,886,082	6,693,964	42,822	93,403,884	195,011	102,419,223
Cyanide compounds	121,457	446,980	365,189	250	82,660	12,390	1,028,926
Glycol ethers	9,286,863	3,409,543	719,838	11,663,373	3,928,476	36,430	29,044,523
Lead compounds	286,082	2,856,308	9,981,379	59,751	166,608,749	63,910	179,856,179
Manganese compounds	3,341,541	4,861,868	20,715,032	3,644	28,667,700	195,061	57,784,846
Mercury compounds	22	22,130	13,892	5	490	0	36,539
Nickel compounds	132,553	1,729,940	3,099,304	4,541	21,348,692	29,354	26,344,384
Selenium compounds	160	10,461	42,825	0	22,485	0	75,931
Silver compounds	3,308	1,328	2,901	0	1,138,708	500	1,146,745
Thallium compounds	5	0	0	0	1,500	0	1,505
Zinc compounds	623,374	9,336,028	40,753,446	475,859	141,091,759	1,750,175	194,030,641
Mixtures and other trade names	19,463	187,447	307,729	130,554	1,982,645	5,950	2,633,788
Trade Secrets	0	25,054	8,499	2,000	30,000	0	65,553
Total	411,907,098	352,433,168	299,042,451	438,225,342	2,354,123,586	9,549,879	3,865,281,524

THE 1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE

1991 Releases and Transfers by Industry

Table 1-21. TRI Releases by Industry, 1991.

SIC Code	Industry	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
20	Food	13,872,902	14,580,590	2,402,141	210,595	8,962,351	40,028,579
21	Tobacco	377,909	3,119,723	14,583	0	0	3,512,215
22	Textiles	6,075,182	18,345,243	261,118	0	67,407	24,748,950
23	Apparel	420,788	953,006	182	0	14,710	1,388,686
24	Lumber	6,855,829	24,977,497	115,236	0	92,238	32,040,800
25	Furniture	7,861,553	46,931,358	625	0	261,748	55,055,284
26	Paper	28,926,646	179,322,026	29,662,182	5	4,102,113	242,012,972
27	Printing	26,016,422	18,803,301	406	1	23,486	44,843,616
28	Chemicals	190,321,556	425,379,355	187,984,295	656,159,121	89,877,402	1,549,721,729
29	Petroleum	34,558,058	22,083,995	3,330,517	14,271,606	981,862	75,226,038
30	Plastics	48,148,253	102,987,646	579,551	15,795	500,666	152,231,911
31	Leather	3,584,688	5,991,335	118,645	0	83,399	9,778,067
32	Stone/Clay	4,039,495	17,111,235	155,812	7,464,305	2,343,515	31,114,362
33	Primary Metals	41,864,730	114,271,776	8,503,659	13,536,557	254,917,719	433,094,441
34	Fabr. Metals	43,463,283	64,524,080	278,576	824	1,515,802	109,782,565
35	Machinery	15,326,157	23,677,309	50,739	35	443,717	39,497,957
36	Electrical	21,780,652	43,923,295	389,091	2,224	1,545,301	67,640,563
37	Transportation	49,100,172	97,738,993	139,004	1,000	1,916,444	148,895,613
38	Measure./Photo.	12,184,456	29,273,856	736,288	0	55,622	42,250,222
39	Miscellaneous	6,217,387	12,261,825	5,613	0	51,074	18,535,899
Multiple codes 20-39(b)		61,204,127	107,881,781	8,416,223	9,614,319	49,548,271	236,664,721
No codes 20-39		4,179,151	10,035,444	369,286	9,100,750	4,123,297	27,807,928
	Total	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Table 1-22. TRI Transfers by Industry, 1991.

SIC Code	Industry	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
20	Food	38,232,701	3,584,204	1,261,865	126,600	1,180,705	211,115	44,597,190
21	Tobacco	14,644	0	20,295	7,681	4,732	0	47,352
22	Textiles	6,765,966	885,007	1,783,099	2,341,897	534,193	12,255	12,322,417
23	Apparel	186,721	198,598	58,271	58,278	3,013	11,635	516,516
24	Lumber	146,930	1,029,083	2,540,007	3,471,695	1,539,102	31,849	8,758,666
25	Furniture	142,883	1,894,187	800,824	5,855,106	3,320,643	102,731	12,116,374
26	Paper	44,908,367	7,383,049	3,993,620	6,550,477	2,921,456	94,919	65,851,888
27	Printing	329,875	1,722,515	261,170	4,301,514	5,108,510	9,517	11,733,101
28	Chemicals	237,266,136	187,871,839	87,227,928	320,448,696	388,042,082	3,026,559	1,223,883,240
29	Petroleum	7,218,566	610,142	2,897,394	1,618,330	627,692,089	47,387	640,083,908
30	Plastics	5,046,559	5,001,346	9,548,832	10,341,672	15,028,481	67,572	45,034,462
31	Leather	5,685,248	626,013	1,144,836	1,124,862	945,845	87,043	9,613,847
32	Stone/Clay	1,690,689	6,919,937	6,002,924	4,718,116	4,152,753	16,547	23,500,966
33	Primary Metals	21,555,153	52,949,912	85,603,553	7,846,104	620,328,782	1,999,447	790,282,951
34	Fabr. Metals	6,708,095	19,690,394	22,289,027	11,680,648	168,280,668	601,054	229,249,886
35	Machinery	2,429,666	3,260,536	5,142,199	3,011,108	37,473,362	393,964	51,710,835
36	Electrical	7,438,842	17,737,659	14,932,319	10,945,175	226,877,243	806,900	278,738,138
37	Transportation	7,422,111	13,374,330	12,016,582	22,586,611	109,427,642	717,453	165,544,729
38	Measure./Photo.	1,595,450	4,471,104	1,373,717	3,849,881	17,429,978	23,591	28,743,721
39	Miscellaneous	797,358	1,358,840	1,611,146	2,648,979	7,335,683	205,554	13,957,560
Multiple codes 20-39(b)		15,302,267	21,418,869	33,990,233	13,926,445	112,805,694	831,993	198,275,501
No codes 20-39		1,022,871	445,604	4,542,610	765,467	3,690,930	250,794	10,718,276
	Total	411,907,098	352,433,168	299,042,451	438,225,342	2,354,123,586	9,549,879	3,865,281,524

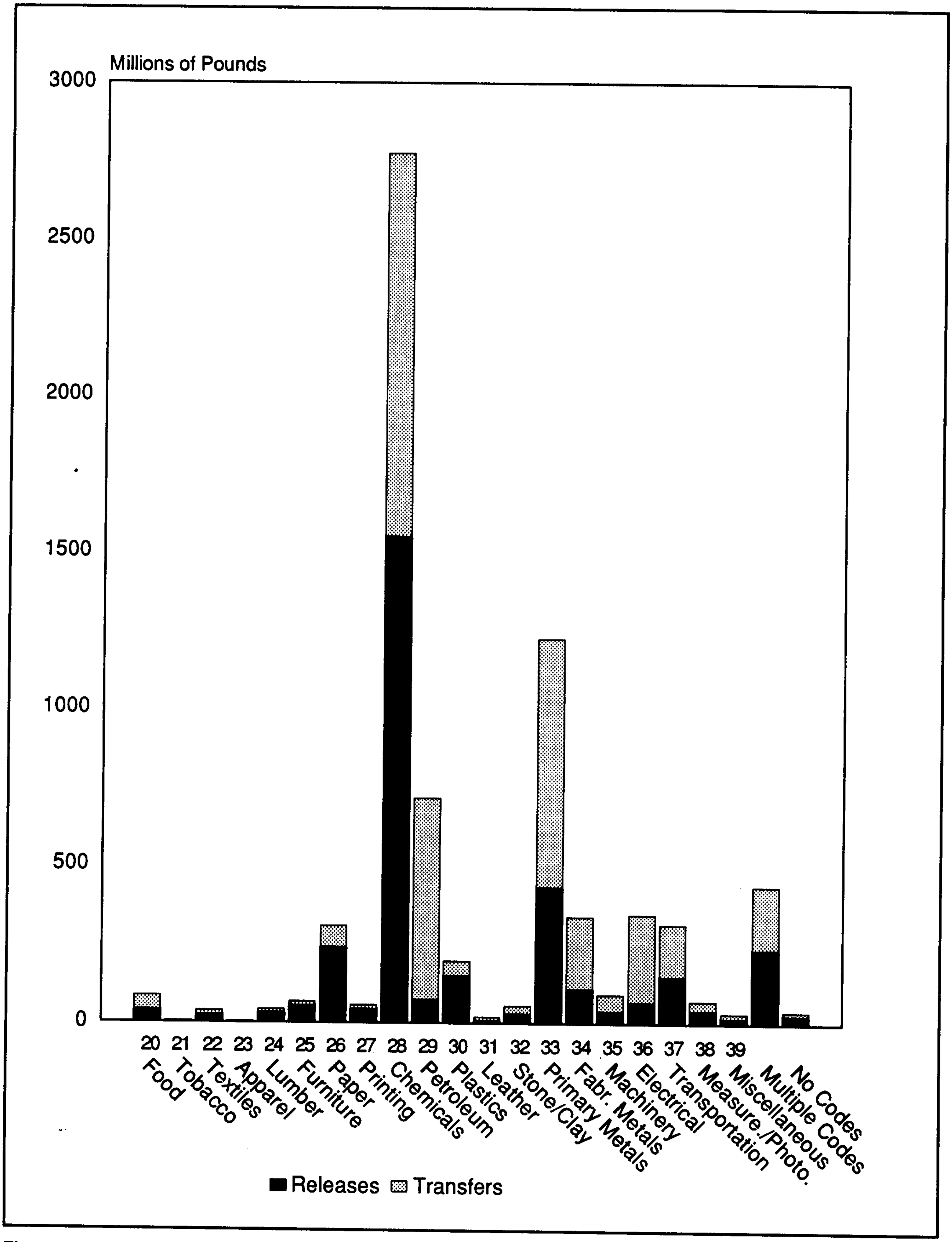


Figure 1-5. TRI Releases and Transfers by Industry, 1991.

Table 1-23. Top 50 TRI Facilities with Largest Releases, 1991.

Facility Name	City	State	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
American Cyanamid Co.	Westwego	LA	82,324	291,212	305,090	141,330,450	0	142,009,076
Agrico Chemical Co.	Saint James	LA	245,260	11,788,350	81,464,800	0	345,250	93,843,660
Magnesium Corp. of America	Rowley	UT	333,555	64,603,400	0	0	250	64,937,205
Du Pont Johnsonville Plant	New Johnsonville	TN	46,250	7,170,400	0	52,000,000	1,250	59,217,900
Monsanto Co.	Alvin	TX	71,120	109,169	0	54,019,610	44,000	54,243,899
Agrico Chemical Co.	Uncle Sam	LA	37,999	738,310	48,161,000	0	250,219	49,187,528
Du Pcnt Delisle	Pass Christian	MS	198,213	5,960,100	0	41,000,000	520	47,158,833
Vulcan Chemicals	Wichita	KS	133,032	637,051	0	44,860,820	0	45,630,903
Courtaulds Fibers Inc.	Axis	AL	452,005	42,002,515	43,105	0	430,000	42,927,625
Eastman Kodak Co.	Kingsport	TN	32,248,944	7,725,117	382,606	0	82,113	40,438,780
Asarco Inc.	East Helena	MT	36,770	84,560	0	0	38,502,100	38,623,430
Sterling Chemicals Inc.	Texas City	TX	392,030	963,680	10,560	35,383,465	0	36,749,735
Du Pont Beaumont Plant	Beaumont	TX	259,059	2,369,065	56,196	33,187,515	9,795	35,881,630
Inland Steel Co.	East Chicago	IN	553,480	258,370	658,100	0	31,079,455	32,549,405
BP Chemicals Inc.	Port Lavaca	TX	27,976	59,733	840	28,963,776	0	29,052,325
BP Chemicals Inc.	Lima	OH	342,545	2,649,855	60,455	24,508,895	0	27,561,750
Du Pont Victoria Site	Victoria	TX	32,459	1,580,972	2,267	25,602,557	13,125	27,231,380
Asarco Inc.	Hayden	AZ	591,540	146,006	0	0	25,746,045	26,483,591
Magma Copper Co.	San Manuel	AZ	32,563	168,200	0	0	23,877,136	24,077,899
Phelps Dodge Mining Co.	Playas	NM	750	676,643	0	0	23,170,254	23,847,647
Arcadian Fertilizer L.P.	Geismar	LA	127,256	1,501,965	21,592,465	0	341,655	23,563,341
Du Pont	Louisville	KY	222,579	945,947	0	22,000,000	0	23,168,526
BASF Corp.	Lowland	TN	1,578,310	18,048,250	30,960	0	1,532,600	21,190,120
Cabot Corp.	Tuscola	IL	750	4,552,406	0	14,217,020	0	18,770,176
ICI Americas Inc.	Mount Pleasant	TN	106,731	105,079	0	17,528,207	0	17,740,017
Elkem Metals Co.	Marietta	OH	3,385,250	124,200	3,136,200	0	10,837,624	17,483,274
Herculaneum Smelter	Herculaneum	MO	29,590	366,592	525	0	16,124,772	16,521,479
Texasgulf Inc.	Aurora	NC	200,310	1,623,950	63,550	0	13,953,650	15,841,460
Eastman Kodak Co.	Rochester	NY	1,806,214	11,919,308	633,003	0	396	14,358,921
Kennecott Utah Copper	Magna	UT	42,355	394,300	5,400	0	13,792,175	14,234,230
3M	Hutchinson	MN	744,244	12,640,224	0	0	0	13,384,468
BASF Corp.	Geismar	LA	493,350	489,695	15,017	12,000,036	0	12,998,098
Northwestern Steel & Wire Co	Sterling	IL	73,670	309,350	2,620	0	11,590,000	11,975,640
Mississippi Chemical Corp.	Yazoo City	MS	707,800	10,486,291	613,324	0	0	11,807,415
Unocal Corp.	Kenai	AK	148,610	11,067,060	235,075	150	4,000	11,454,895
Uniroyal Chemical Co. Inc.	Geismar	LA	350,409	748,838	210	9,769,920	0	10,869,377
Citgo Petroleum Corp.	Lake Charles	LA	1,130,960	341,842	67,712	9,284,726	6,116	10,831,356
American Chrome & Chemicals	Corpus Christi	TX	5,110	154,250	18,150	0	10,000,000	10,177,510
IMC Fertilizer Inc.	Mulberry	FL	9,120	965,000	0	0	9,100,000	10,074,120
Coastal Chem Inc.	Cheyenne	WY	204,350	842,200	0	8,570,642	0	9,617,192
Dow Chemical Co.	Freeport	TX	3,858,658	5,097,756	464,378	0	21,664	9,442,456
Monsanto Co.	Cantonment	FL	56,100	537,655	870	8,644,827	0	9,239,452
Occidental Chemical Corp.	Castle Hayne	NC	607	31,002	36	0	9,200,255	9,231,900
Hoechst Celanese	Narrows	VA	4,900,700	4,166,700	497	0	6,700	9,074,597
Amoco Oil Co.	Texas City	TX	618,670	129,089	144,900	7,937,000	244,471	9,074,130
General Motors Corporation	Saginaw	MI	87,565	388,242	0	0	8,532,606	9,008,413
Occidental Chemical Corp.	White Springs	FL	260,020	310,000	3,490	0	8,400,000	8,973,510
Du Pont La Porte Plant	La Porte	TX	181,279	497,917	1,349	7,681,000	486	8,362,031
Climax Chemical Co.	Monument	NM	75,632	122,693	0	0	7,921,032	8,119,357
ICI Americas Inc.	Bucks	AL	10,295	46,135	74	7,982,277	0	8,038,781
Subtotal			57,534,368	238,936,644	158,174,824	606,472,893	265,161,714	1,326,280,443
Total for All Facilities			626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Table 1-24. Top 10 Parent Companies With Largest Releases, 1991.

Parent Company	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
DuPont	7,940,322	46,705,185	1,539,939	186,868,334	273,619	243,327,399
Freeport-McMoran Inc.	445,769	12,865,330	130,207,800	0	6,103,469	149,622,368
American Cyanamid Company	1,042,081	1,976,155	964,985	141,636,035	23,039	145,642,295
Asarco Inc.	881,233	671,807	11,563	5,881,195	70,945,957	78,391,755
Monsanto Company	1,398,303	6,289,913	2,102,608	66,150,237	84,558	76,025,619
Eastman Kodak Company	40,700,920	24,880,680	1,218,893	0	164,533	66,965,026
Renco Group Inc.	418,745	64,784,673	3,620	0	1,240,020	66,447,058
BP America	2,432,568	4,232,797	282,142	53,472,671	19,883	60,440,061
General Motors Corporation	8,599,571	26,452,717	148,742	0	16,022,918	51,223,948
Vulcan Materials Company	226,390	1,098,755	28,953	44,860,820	5	46,214,923
Subtotal	64,085,902	189,958,012	136,509,245	498,869,292	94,878,001	984,300,452
Total for All TRI Facilities	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

Parent Company (Continued)	Facilities Number	Forms Number	Total Releases Pounds
DuPont	83	855	243,327,399
Freeport-McMoran Inc.	4	19	149,622,368
American Cyanamid Company	28	259	145,642,295
Asarco Inc.	12	94	78,391,755
Monsanto Company	34	303	76,025,619
Eastman Kodak Company	23	309	66,965,026
Renco Group Inc.	6	35	66,447,058
BP America	61	286	60,440,061
General Motors Corporation	133	1,209	51,223,948
Vulcan Materials Company	3	59	46,214,923
Subtotal	387	3,428	984,300,452
Total for All TRI Facilities	23,719	82,293	3,385,873,118

THE 1991 TOXICS RELEASE INVENTORY
PUBLIC DATA RELEASE

1991 Releases and Transfers of Highlighted Chemicals

Metals and Metal Compounds

Under EPCRA section 313, facilities that manufacture, process, or otherwise use metal compounds report releases and/or transfers of only the metal portion of the metal compound. For example, a facility that releases a copper compound, such as copper sulfate, would report as a release only the weight of the copper not the weight of the entire copper compound. This is done to capture information on the targeted portion of each member of the category, so that releases and transfers of metal compounds can be traced through the environment and can be compared from facility to facility.

Metals (including the metal portion of metal compounds) are different from other toxic substances listed on EPCRA section 313 because they do not degrade and are not destroyed. Other listed chemicals on EPCRA section 313 can be destroyed by sunlight, heat, microorganisms, or other chemicals. Although metals cannot be destroyed, they may be converted to a less toxic form. For example, many facilities convert hexavalent chromium (which is a known carcinogen) to the less toxic trivalent form before release or transfer off-site. Other metal wastes may be treated before disposal so that the metal will be less likely to be transported through soils. Although such treatment may limit the availability of the metal to the environment, it does not destroy it.

As a result of the inherent persistence of metals, metals can either be recycled or (ultimately) disposed. This is clearly reflected in the reported releases and off-site transfers of metals. The majority (65%) of the toxic metals released or transferred off-site was recycled. Release (including disposal), either on-site or off-site, accounted for 32% of all releases and transfers.

Facilities also reported transfers off-site for treatment and to publicly owned treatment works (public sewage treatment plants). Treatment may remove the metal from a waste stream or convert the metal into a less toxic form, but it does not destroy the metal. For example, public sewage treatment plants will remove some fraction of the metals during treatment of the waste stream to remove solid matter. The metal wastes that remain in the treated wastewater will pass through the treatment plant and into the aquatic environment. The removed metals are then generally sent to a landfill for disposal.

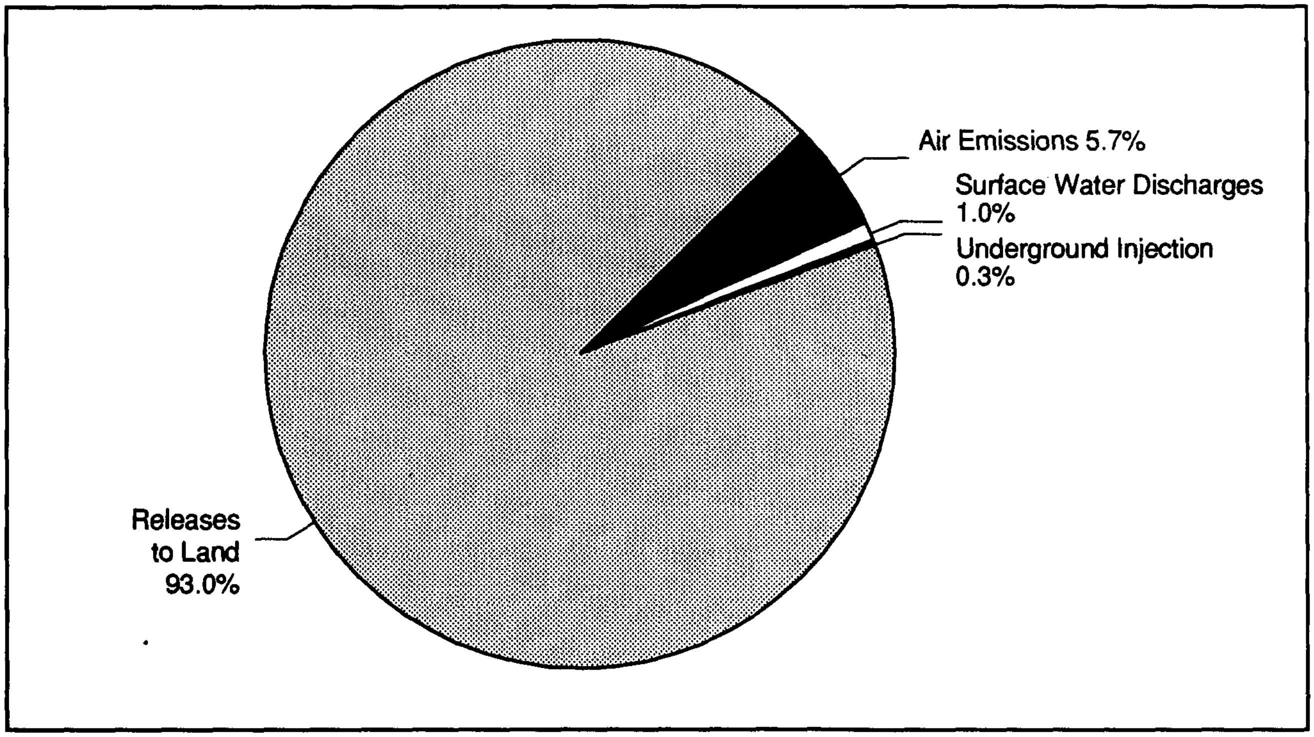


Figure 1-6. Releases of TRI Metals and Metal Compounds, 1991.

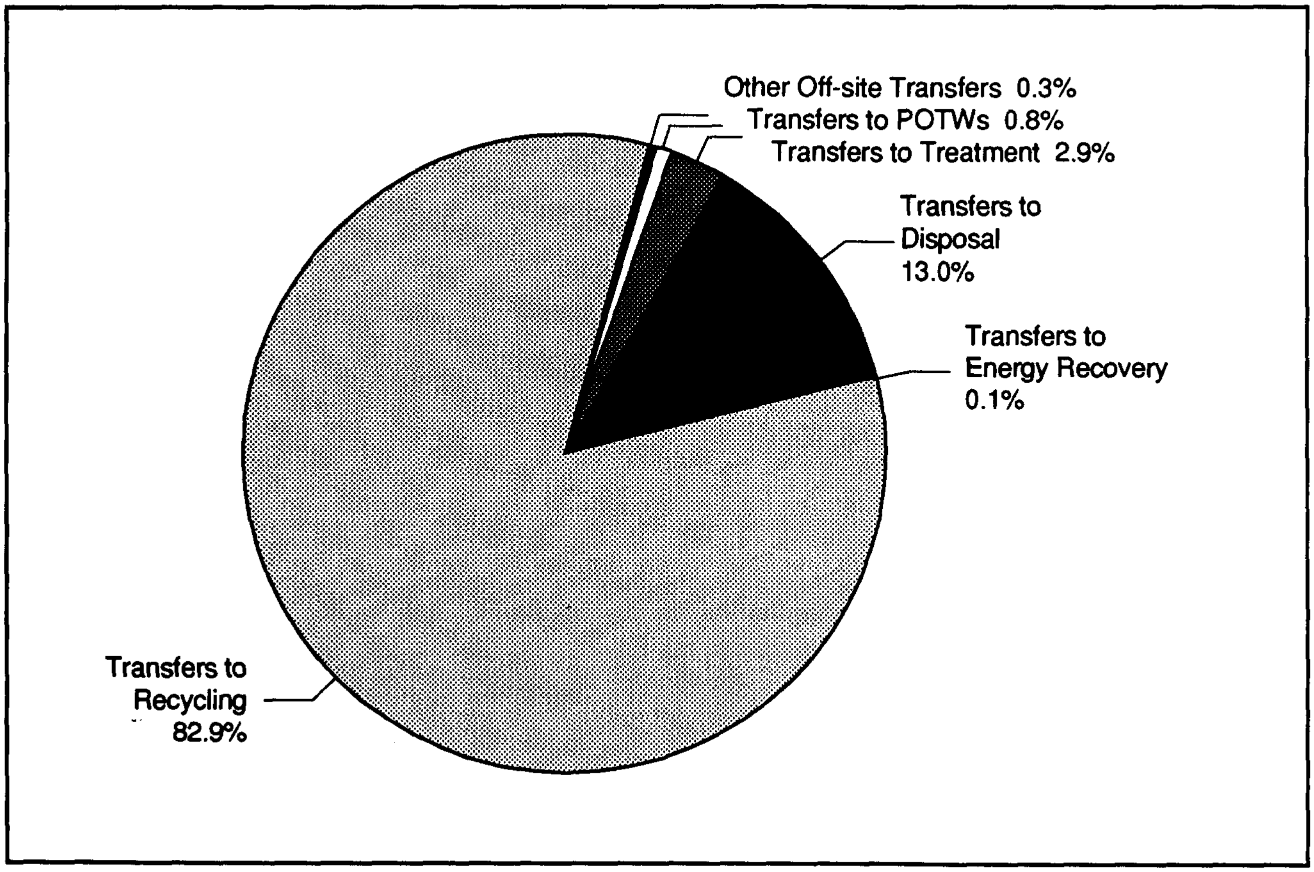


Figure 1-7. Transfers of TRI Metals and Metal Compounds, 1991.

Table 1-25. Releases of TRI Metals and Metal Compounds, 1991.

Metal Category	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Antimony and antimony compounds	34,359	73,046	46,816	6,629	1,528,616	1,689,466
Arsenic and arsenic compounds	28,843	169,042	5,436	23,000	4,473,366	4,699,687
Barium and barium compounds	343,174	636,384	105,795	408	4,266,431	5,352,192
Beryllium and beryllium compounds	7	1,613	110	0	59,023	60,753
Cadmium and cadmium compounds	18,923	55,518	4,241	1,540	251,127	331,349
Chromium and chromium compounds	585,757	532,744	352,522	35,150	25,916,872	27,423,045
Cobalt and cobalt compounds	37,644	68,080	82,882	19,949	155,858	364,413
Copper and copper compounds	2,787,343	2,735,334	214,661	239,321	57,863,833	63,840,492
Lead and lead compounds	553,782	1,285,604	138,433	928	17,022,789	19,001,536
Manganese and manganese compounds	1,178,817	1,164,567	843,644	15,849	78,376,183	81,579,060
Mercury and mercury compounds	11,912	7,830	671	9	5,315	25,737
Nickel and nickel compounds	469,498	322,989	126,954	370,948	1,672,468	2,962,857
Selenium and selenium compounds	2,906	35,190	910	4,100	80,555	123,661
Silver and silver compounds	12,145	26,087	8,428	53	17,243	63,956
Thallium and thallium compounds	6	279	1	0	255	541
Zinc and zinc compounds(c)	2,282,998	3,878,753	1,353,892	228,122	123,279,246	131,023,011
Total	8,348,114	10,993,060	3,285,396	946,006	314,969,180	338,541,756

Table 1-26. Transfers of TRI Metals and Metal Compounds, 1991.

Metal Category	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
Antimony and antimony compounds	91,255	195,942	2,268,557	78,007	2,781,153	13,971	5,428,885
Arsenic and arsenic compounds	1,950	576,631	1,613,055	268	1,099,920	157	3,291,981
Barium and barium compounds	2,129,483	2,521,418	17,195,636	223,346	951,541	39,534	23,060,958
Beryllium and beryllium compounds	0	1,326	119,382	10	84,866	0	205,584
Cadmium and cadmium compounds	265,771	388,557	1,019,701	7,460	2,266,912	41,605	3,990,006
Chromium and chromium compounds	1,188,103	3,969,938	15,972,793	69,423	68,437,500	323,166	89,960,923
Cobalt and cobalt compounds	25,120	147,310	780,992	2,806	6,461,142	37	7,417,407
Copper and copper compounds	612,159	4,373,346	18,967,509	46,340	383,380,867	1,029,029	408,409,250
Lead and lead compounds	592,526	4,559,119	15,494,344	68,833	204,841,122	103,218	225,659,162
Manganese and manganese compounds	3,502,655	5,556,491	33,453,653	28,182	70,110,391	372,670	113,024,042
Mercury and mercury compounds	64	65,531	128,442	5	445,451	0	639,493
Nickel and nickel compounds	639,048	2,318,764	6,648,274	12,353	60,230,889	372,615	70,221,943
Selenium and selenium compounds	425	11426	48232	0	65863	0	125,946
Silver and silver compounds	262,661	10,433	118,905	0	2,133,989	837	2,526,825
Thallium and thallium compounds	5	1	953	0	1,500	0	2,459
Zinc and zinc compounds(c)	664,032	10,397,887	44,897,863	525,881	208,879,273	1,897,312	267,262,248
Total	9,975,257	35,094,120	158,728,291	1,062,914	1,012,172,379	4,194,151	1,221,227,112

Ozone Depleters

Ozone depleters, such as chlorofluorocarbons (CFCs), halons, methyl chloroform, carbon tetrachloride, and methyl bromide, are known to release chlorine or bromine in the stratosphere (earth's upper atmosphere). Chlorine and bromine act as catalysts in the conversion of ozone to oxygen, thus reducing the amount of stratospheric ozone. Stratospheric ozone is important because it shields the earth from ultraviolet-B radiation. As the ozone layer diminishes, the amount of this harmful radiation reaching the earth's surface increases. These ozone depleters remain in the stratosphere for many decades; thus, emissions today will influence ozone levels far into the future.

Ultraviolet-B radiation has been shown to cause various adverse human health and environmental effects, including increased incidence of skin cancer and suppression of the immune system in animals, and possibly in humans. (See Potential Health and Environmental Effects in the Appendix for a more detailed description of the adverse effects associated with ultraviolet-B radiation.)

On September 16, 1987, the United States, along with 23 other nations and the European Economic Community, signed the "Montreal Protocol on Substances that Deplete the Ozone Layer." As a result of this protocol and newer scientific evidence, Congress mandated in the Clean Air Act Amendments that the production of CFCs and halons be phased out by the year 2000. EPA has proposed that the production phase-out be accelerated, resulting in a phase-out by January 1, 1996.

Interim substitutes, such as hydrochlorofluorocarbons (HCFCs), also decrease ozone in the stratosphere. HCFCs have much lower ozone depletion potentials. The HCFCs will serve as first generation substitutes, but will themselves be phased out. On June 24, 1992, EPA proposed the addition of HCFCs to TRI list because HCFCs decrease stratospheric ozone resulting in adverse health and environmental effects. EPA plans to finalize the addition by late 1993.

The following ozone depleters are currently listed on TRI:

Bromochlorodifluoromethane (Halon 1211)
Bromomethane (methyl bromide)
Bromotrifluoromethane (Halon 1301)
Carbon tetrachloride
Dibromotetrafluoroethane (Halon 2402)
Dichlorodifluoromethane (CFC-12)
Dichlorotetrafluoroethane (CFC-114)
Freon-113
Monochloropentafluoroethane (CFC-115)
1,1,1-Trichloroethane (methyl chloroform)
Trichlorofluoromethane (CFC-11)

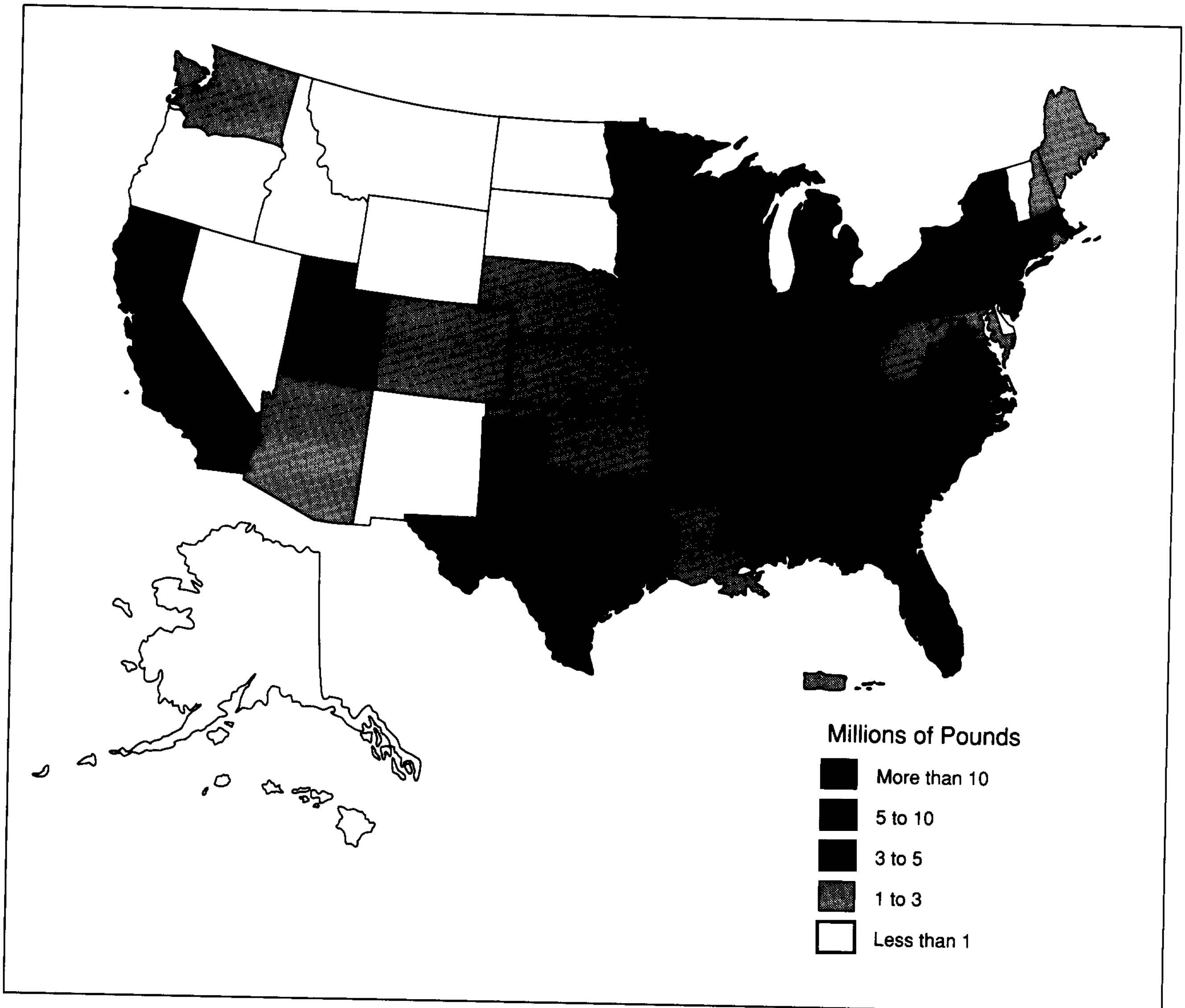


Figure 1-8. TRI Releases of Ozone Depleters to Air, 1991

Table 1-27. TRI Releases of Ozone Depleters, 1991.

CAS Number	Chemical	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
353-59-3	Bromochlorodifluoromethane (Halon 1211)	8,388	3,570	0	0	0	11,958
74-83-9	Bromomethane (methyl bromide)	404,146	2,041,449	0	1,000	0	2,446,595
75-63-8	Bromotrifluoromethane (Halon 1301)	171,287	8,820	0	0	0	180,107
56-23-5	Carbon tetrachloride	528,100	1,018,701	2,844	42,470	2,152	1,594,267
124-73-2	Dibromotetrafluoroethane (Halon 2402)	250	6,300	0	0	0	6,550
75-71-8	Dichlorodifluoromethane (CFC-12)	8,506,516	6,545,211	89	16,008	32,805	15,100,629
76-14-2	Dichlorotetrafluoroethane (CFC-114)	1,694,535	207,258	35	5	5	1,901,838
76-13-1	Freon 113	23,983,423	11,874,228	3,264	558	89,780	35,951,253
76-15-3	Monochloropentafluoroethane (CFC-115)	190,872	171,291	5	0	0	362,168
71-55-6	1,1,1-Trichloroethane (methyl chloroform)	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
75-69-4	Trichlorofluoromethane (CFC-11)	5,339,896	6,382,210	5,156	1,428	10,203	11,738,893
	Total	110,058,175	96,533,839	33,196	64,274	306,752	206,996,236

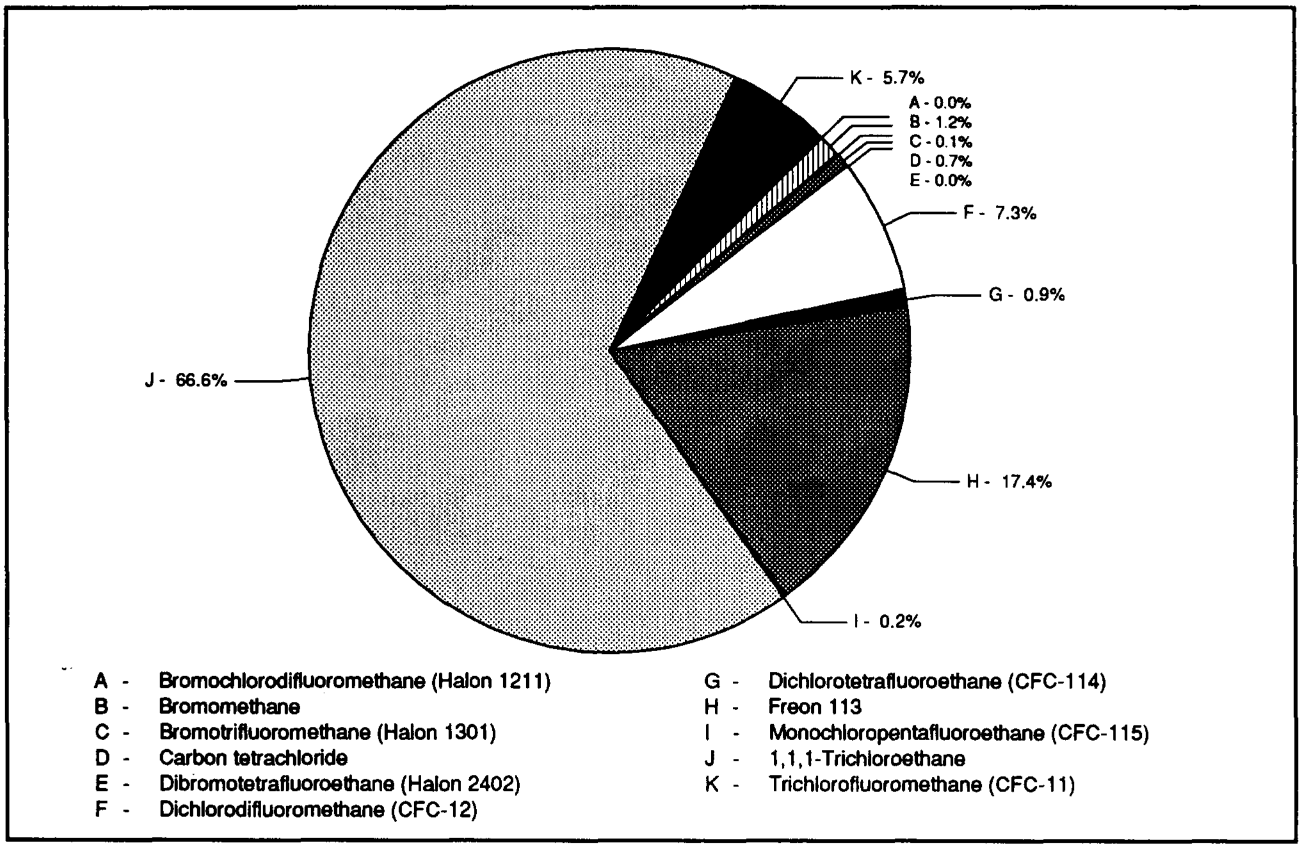


Figure 1-9. TRI Releases of Ozone Depleters to Air, by Chemical, 1991.

Table 1-28. TRI Transfers of Ozone Depleters, 1991.

CAS Number	Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
353-59-3	Bromochlorodifluoromethane (Halon 1211)	0	0	0	0	0	0	0
74-83-9	Bromomethane (methyl bromide)	0	320	15	420	121,000	0	121,755
75-63-8	Bromotrifluoromethane (Halon 1301)0	0	0	0	0	0	0	
56-23-5	Carbon tetrachloride	621	939,774	39,111	11,061	390,625	1,684	1,382,876
124-73-2	Dibromotetrafluoroethane (Halon 2402)	0	0	0	0	0	0	0
75-71-8	Dichlorodifluoromethane (CFC-12)	4,484	93,114	34,275	1,841	91,660	0	225,374
76-14-2	Dichlorotetrafluoroethane (CFC-114)	250	17,400	7	0	0	0	17,657
76-13-1	Freon 113	38,402	1,181,848	114,338	454,663	7,784,450	98,217	9,671,918
76-15-3	Monochloropentafluoroethane (CFC-115)	0	0	0	0	0	0	0
71-55-6	1,1,1-Trichloroethane (methyl chloroform)	293,508	6,743,974	969,200	3,212,938	27,237,545	287,441	38,744,606
75-69-4	Trichlorofluoromethane (CFC-11)	10,252	175,662	410,963	32,314	175,082	0	804,273
	Total	347,517	9,152,092	1,567,909	3,713,237	35,800,362	387,342	50,968,459

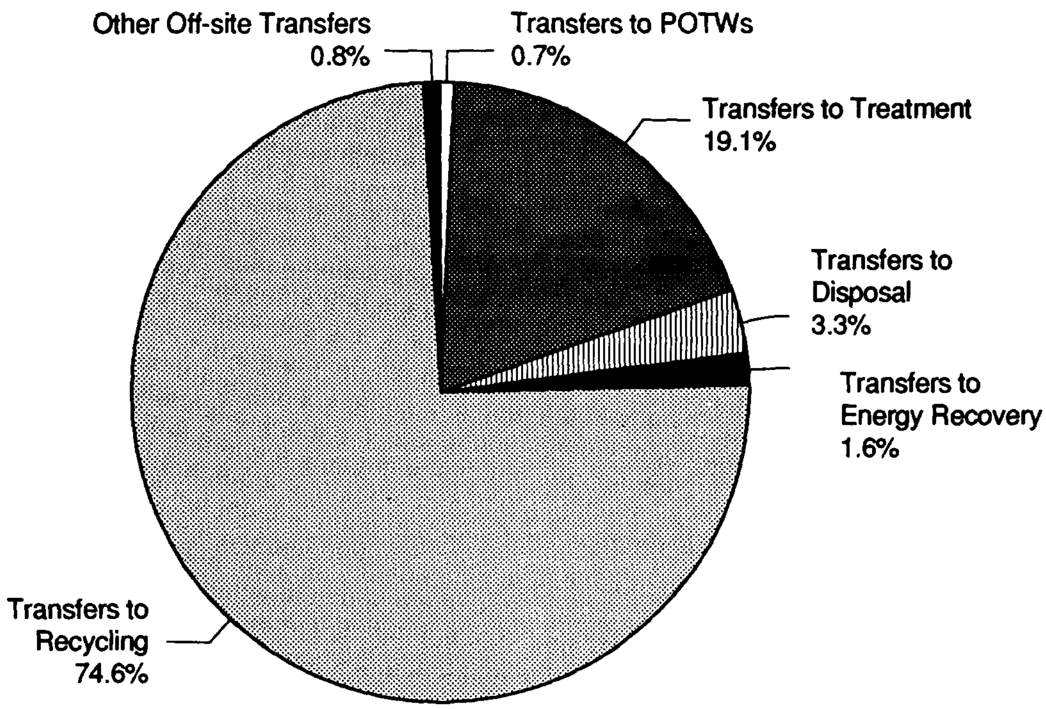


Figure 1-10. TRI Transfers of Ozone Depleters, 1991.

BIOACCUMULATORS

Bioaccumulation is the accumulation of a chemical by an organism, in concentrations greater than are present in the environment. Bioaccumulation of chemicals can have significant adverse effects on both human health and the environment.

Bioaccumulation includes both uptake from dissolved chemicals in water and from ingestion by aquatic organisms of food and sediments. Bioaccumulators enter the food chain primarily through their introduction into water bodies (such as streams, lakes, rivers, etc.), which may be the result of releases of these chemicals to air and land, as well as discharges to water bodies. Air emissions may be atmospherically transported and subsequently deposited on the land or bodies of water (for example, atmospheric transport is believed to be the only source for some toxic chemicals in the Upper Great Lakes). Releases to land are also important for two reasons. First, there may be uptake and accumulation of these chemicals in plants which may then be consumed by other organisms. Second, there may be run-off from the soil which can reach a water body. This is also important when considering the magnitude of the releases to each media: in 1991, releases of the bioaccumulators listed on TRI to water were 29,276 pounds; while releases to air and land were 2,556,928 pounds and 416,341 pounds, respectively.

While exposure to certain chemical concentrations may not be toxic for the organism, the process of bioaccumulation may result in harmful concentrations for consumers of the organism. For example, in aquatic environments, phytoplankton take up not only nutrients but also toxic bioaccumulators that may be present in minute quantities. Small fish and zooplankton consume large quantities of phytoplankton, bioaccumulating the chemicals from the phytoplankton. These chemicals will continue to biomagnify as organisms consume organisms in the food chain. Predators at the end of the food chain, such as lake trout, salmon, and water fowl, including herring gulls may accumulate levels of toxic chemicals that are hundreds or thousands of times greater than that present in the phytoplankton. These levels of toxic bioaccumulating chemicals may be high enough to cause adverse effects such as egg shell thinning and other serious deformities resulting in reduced survival of off-spring.

The following TRI chemicals have been identified as chemicals which will bioaccumulate:

- Aldrin
- Anthracene
- Benzoic trichloride
- Chlordane
- Decabromodiphenyl oxide
- Dibutyl phthalate
- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- Di-(2-ethylhexyl) phthalate
- Heptachlor
- Hexachlorobenzene
- Hexachloro-1,3-butadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Mercury
- Mercury compounds
- Methoxychlor
- 4,4'-Methylenebis (2-chloroaniline)
- Pentachlorophenol
- Polychlorinated biphenyls (PCBs)
- Toxaphene
- 1,2,4-Trichlorobenzene

Table 1-29. TRI Releases of Bioaccumulators to Air, Water, and Land, 1991.

CAS Number	Chemical	Total Air Emissions Pounds	Surface Water Discharges Pounds	Releases to Land Pounds	Total Air/ Water/Land Releases Pounds
309-00-2	Aldrin	0	0	0	0
120-12-7	Anthracene	55,494	1,158	2,433	59,085
98-07-7	Benzoic trichloride	7,947	0	0	7,947
57-74-9	Chlordane	1,427	1	0	1,428
1163-19-5	Decabromodiphenyl oxide	47,740	3,817	220,075	271,632
84-74-2	Dibutyl phthalate	150,032	8,907	5,069	164,008
95-50-1	1,2-Dichlorobenzene	418,452	3,962	21,153	443,567
106-46-7	1,4-Dichlorobenzene	336,164	2,146	420	338,730
117-81-7	Di-(2-ethylhexyl) phthalate	1,043,420	3,842	155,773	1,203,035
76-44-8	Heptachlor	5	0	0	5
118-74-1	Hexachlorobenzene	841	111	1	953
87-68-3	Hexachloro-1,3-butadiene	3,410 0	681	2	4,093
77-47-4	Hexachlorocyclo-pentadiene	25,461	23	0	25,484
67-72-1	Hexachloroethane	22,709	0	2	22,711
7439-97-6	Mercury	16,912	624	5,287	22,823
	Mercury compounds	2,830	47	28	2,905
72-43-5	Methoxychlor	565	10	5	580
101-14-4	4,4'-Methylenebis (2-chloroaniline)	1,362	0	0	1,362
87-86-5	Pentachlorophenol	12,508	2,278	1,510	16,296
1336-36-3	Polychlorinated biphenyls (PCBs)	0 0	0	10	10
8001-35-2	Toxaphene	0	0	0	0
120-82-1	1,2,4-Trichlorobenzene	409,649	1,669	4,573	415,891
	Total	2,556,928	29,276	416,341	3,002,545

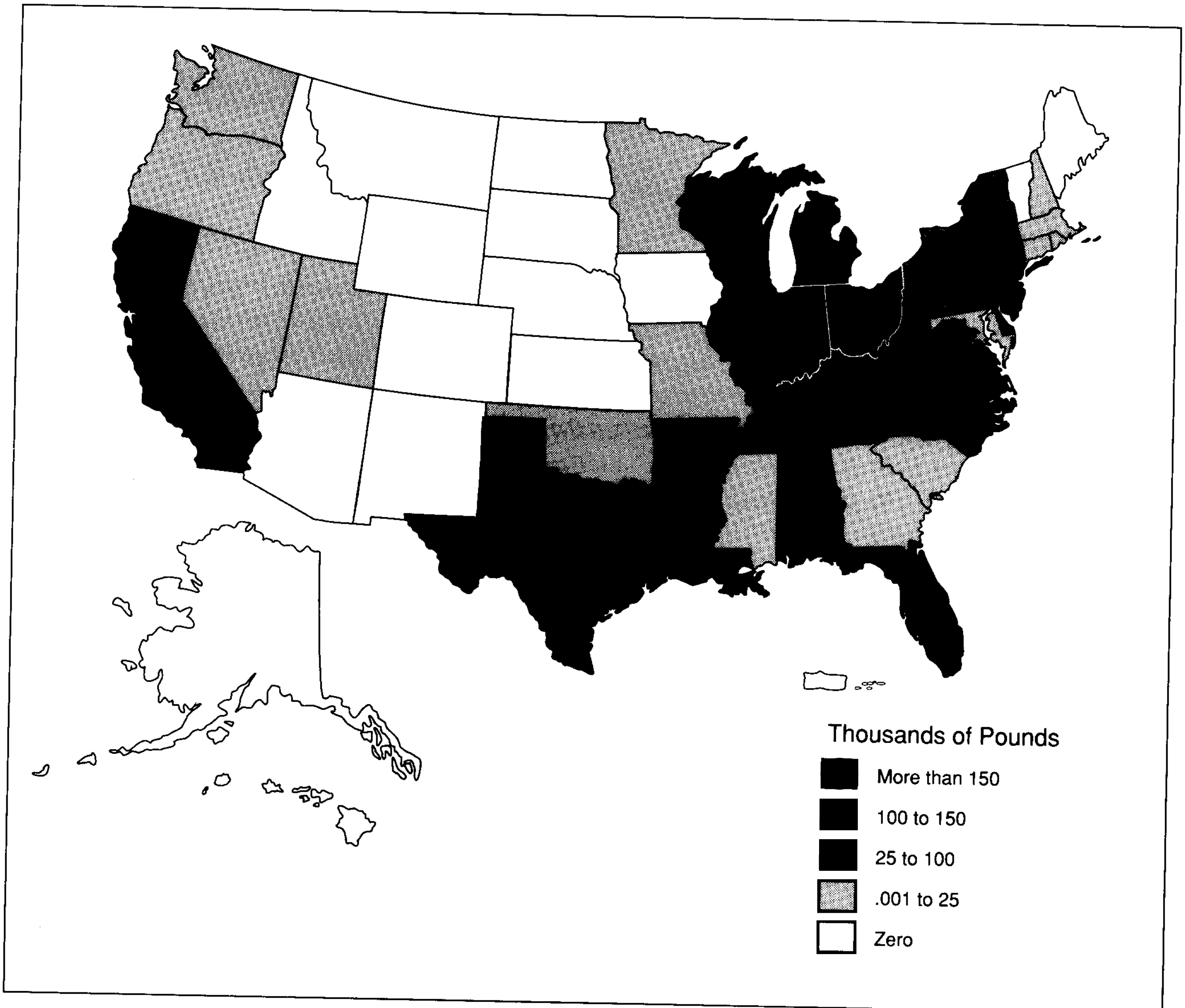


Figure 1-11. TRI Releases of Bioaccumulators to Air, Water, and Land, 1991.

CARCINOGENS

Some chemicals on the TRI are listed because they are either known human carcinogens or suspect carcinogens. (Known human carcinogens are those that have been shown to cause cancer in humans. Suspect carcinogens are those chemicals that have been shown to cause cancer in animals.) Known and suspect carcinogens are highlighted on the TRI list because reportable *de minimis* concentration values are based on whether the chemical is considered to be an "OSHA Carcinogen" (see below). These known or suspect carcinogens are featured in this data public release package because these chemicals are specifically identified in EPCRA section 313.

Clarification of the Basis for Carcinogen Listings on the EPCRA Section 313 List of Toxic Chemicals

The section 313 reporting rule contains a "*de minimis*" concentration in mixture limitation (a chemical does not have to be accounted for if it is present in a mixture below a certain concentration). When the rule was developed, EPA adopted the *de minimis* percentages from the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standards (29 CFR 1910.1200), because much of the information the industry would have relating to mixtures would most likely be from the material safety data sheet (MSDS) on that mixture. The OSHA *de minimis* limitation is 0.1% 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 minimis* limitation is 1.0% for chemicals that do not meet the above OSHA carcinogen criteria.

The carcinogen designations in the list of chemicals relate to any chemical that the Agency determined met the above OSHA criteria for the 0.1% *de minimis* limitation.

Following are the releases of chemicals on the EPCRA section 313 list that meet this definition of a carcinogen or suspect carcinogen.

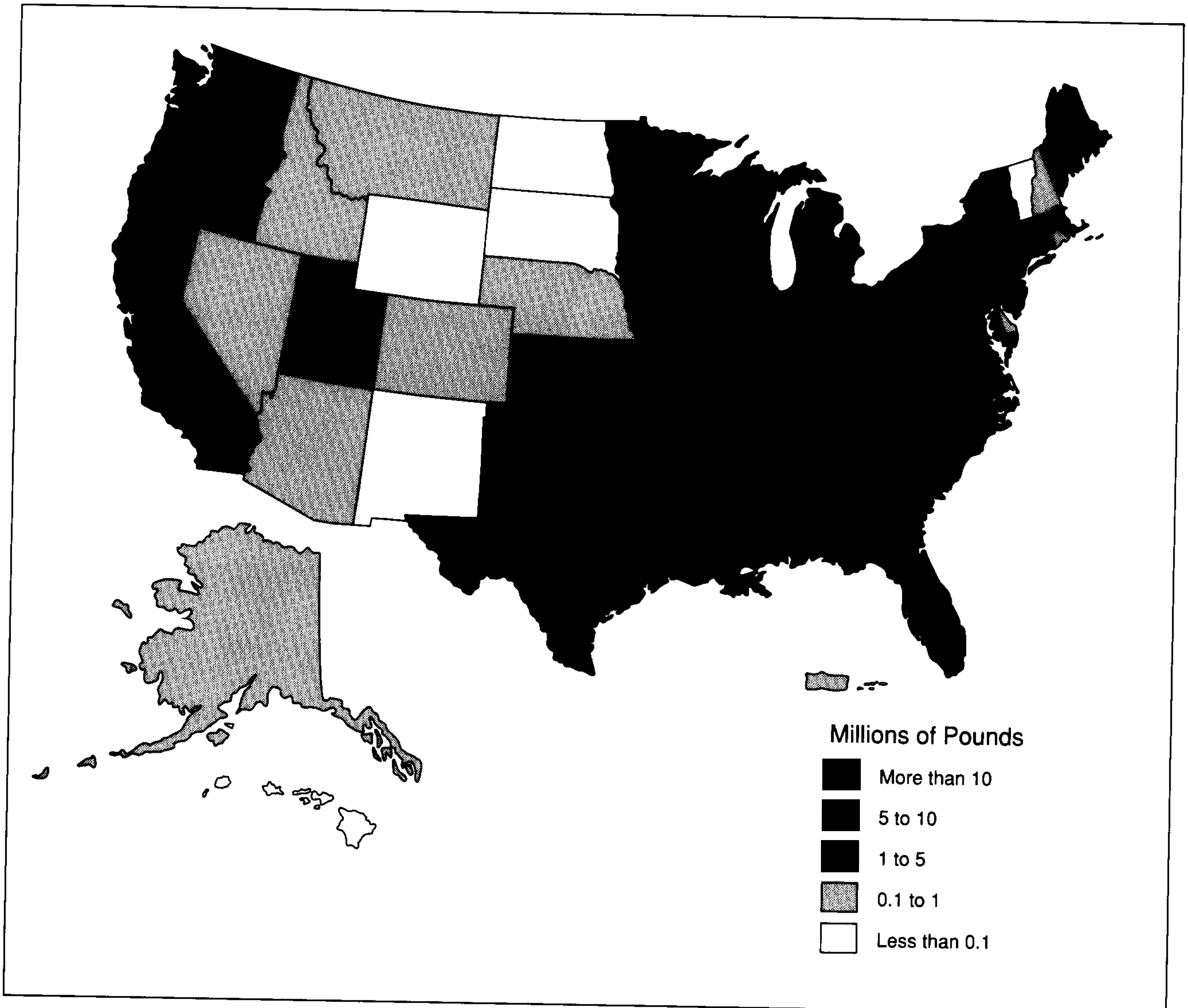


Figure 1-12. TRI Releases of Carcinogens to Air, 1991.

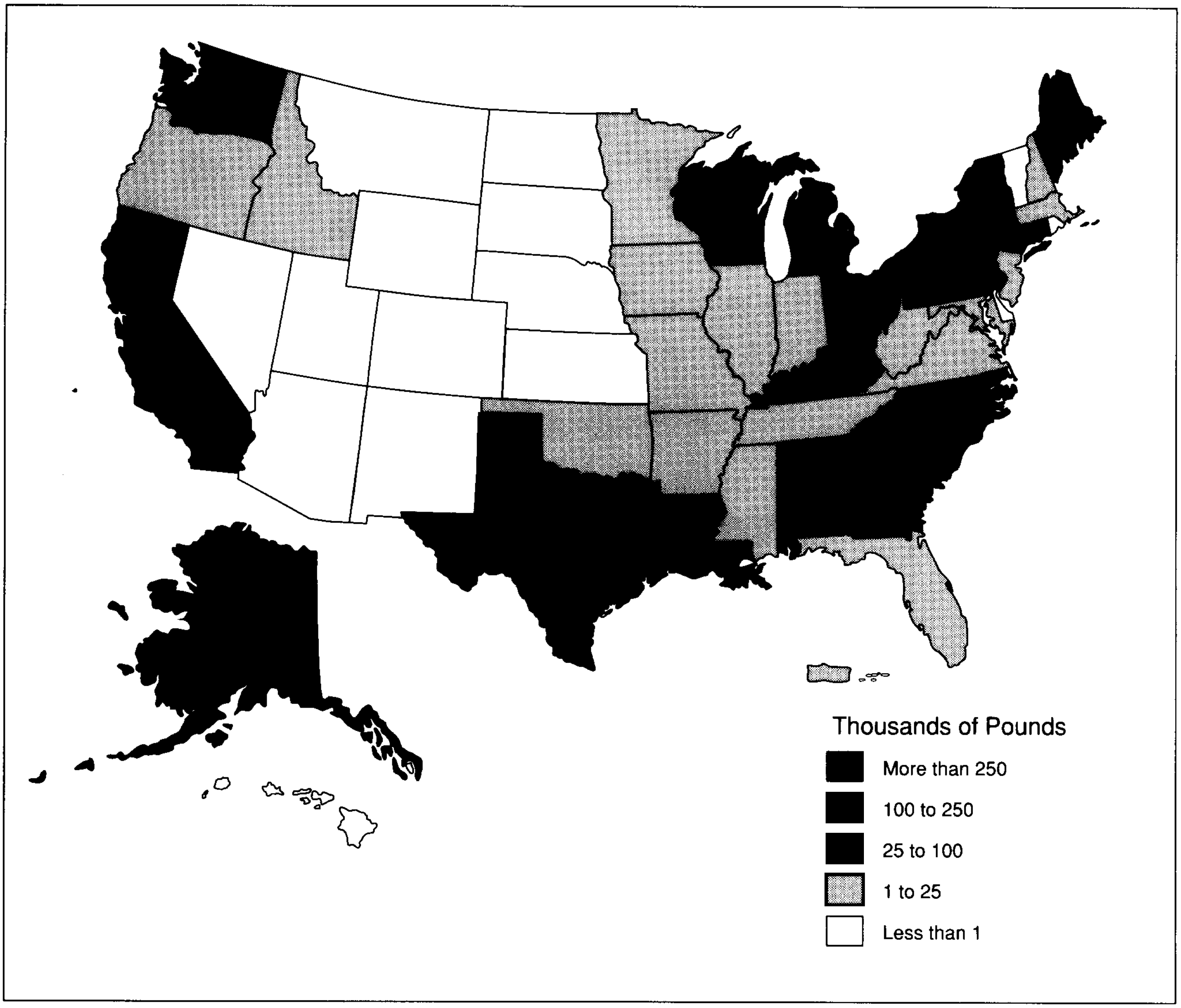


Figure 1-13. TRI Releases of Carcinogens to Surface Water, 1991.

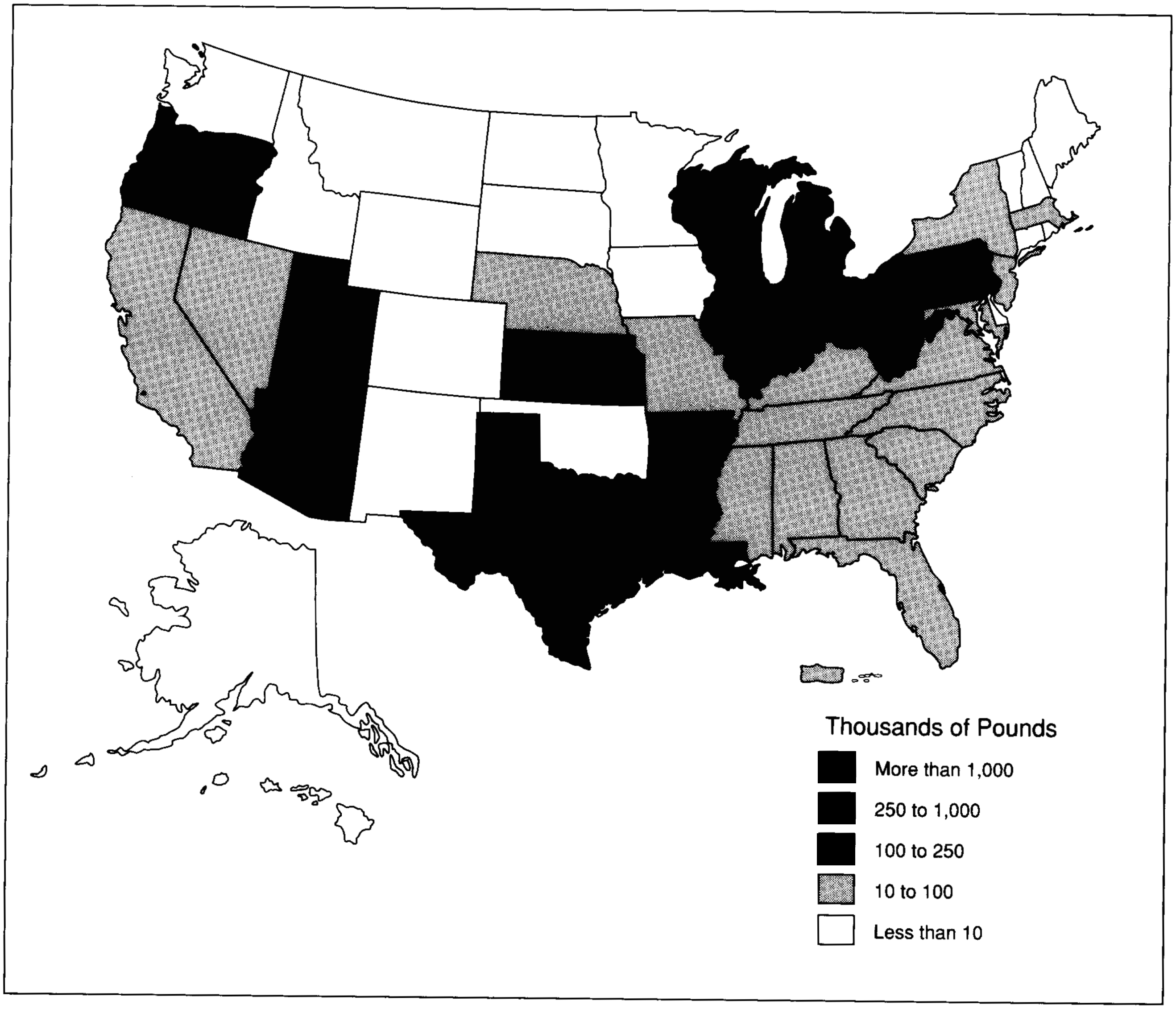


Figure 1-14. TRI Releases of Carcinogens to Land, 1991.

Table 1-30. TRI Releases of Known or Suspect Carcinogens to Air, Surface Water, and Land, 1991 (Alphabetically Ordered).

CAS Number	Chemical	Total Air Emissions Pounds	Surface Water Discharges Pounds	Releases to Land Pounds	Total Air/ Water/Land Releases Pounds
75-07-0	Acetaldehyde	7,080,917	75,314	37,904	7,194,135
60-35-5	Acetamide	35	5	0	40
79-06-1	Acrylamide	64,164	4,635	1,500	70,299
107-13-1	Acrylonitrile	2,188,889	1,959	13,293	2,204,141
60-09-3	4-Aminoazobenzene	1	0	0	1
92-67-1	4-Aminobiphenyl	0	0	0	0
90-04-0	o-Anisidine	1,025	187	3,800	5,012
7440-38-2	Arsenic	7,570	940	1,734,513	1,743,023
1332-21-4	Asbestos (friable)	12,562	252	585,676	598,490
71-43-2	Benzene	17,474,490	26,896	111,928	17,613,314
98-07-7	Benzoic trichloride	7,947	0	0	7,947
7440-41-7	Beryllium	1,378	101	29,023	30,502
542-88-1	Bis(chloromethyl) ether	574	0	0	574
106-99-0	1,3-Butadiene	3,950,377	5,049	8,881	3,964,307
81-88-9	C.I. Food Red 15	1	0	0	1
97-56-3	C.I. Solvent Yellow 3	5	0	0	5
7440-43-9	Cadmium	4,948	661	2,753	8,362
56-23-5	Carbon tetrachloride	1,546,801	2,844	2,152	1,551,797
67-66-3	Chloroform	19,082,888	769,569	22,150	19,874,607
107-30-2	Chloromethyl methyl ether	3,335	0	0	3,335
7440-47-3	Chromium	556,406	17,289	1,155,527	1,729,222
8001-58-9	Creosote	1,761,851	3,862	10,780	1,776,493
120-71-8	p-Cresidine	228	5	250	483
135-20-6	Cupferron	1,200	0	0	1,200
615-05-4	2,4-Diaminoanisole	0	0	0	0
39156-41-7	2,4-Diaminoanisole sulfate	0	0	0	0
101-80-4	4,4'-Diaminodiphenyl ether	704	337	0	1,041
25376-45-8	Diaminotoluene (mixed isomers)	20,583	1,110	10	21,703
95-80-7	2,4-Diaminotoluene	3,810	250	0	4,060
96-12-8	1,2-Dibromo-3-chloropropane	290	0	0	290
106-93-4	1,2-Dibromoethane	38,202	73	2	38,277
25321-22-6	Dichlorobenzene (mixed isomers)	78,095	2	9	78,106
106-46-7	1,4-Dichlorobenzene	336,164	2,146	420	338,730
91-94-1	3,3'-Dichlorobenzidine	10	0	0	10
107-06-2	1,2-Dichloroethane	3,995,423	23,564	7,051	4,026,038
75-09-2	Dichloromethane	79,338,471	98,877	117,788	79,555,136
542-75-6	1,3-Dichloropropylene	20,405	0	0	20,405
1464-53-5	Diepoxybutane	0	0	0	0
117-81-7	Di-(2-ethylhexyl) phthalate	1,043,420	3,842	155,773	1,203,035
64-67-5	Diethyl sulfate	4,018	5	10	4,033
119-90-4	3,3'-Dimethoxybenzidine	0	4	0	4
57-14-7	1,1-Dimethyl hydrazine	489	0	0	489
77-78-1	Dimethyl sulfate	10,097	293	0	10,390

Table 1-30. TRI Releases of Known or Suspect Carcinogens to Air, Surface Water, and Land, 1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Total Air Emissions Pounds	Surface Water Discharges Pounds	Releases to Land Pounds	Total Air/ Water/Land Releases Pounds
123-91-1	1,4-Dioxane	718,504	318,133	15,952	1,052,589
106-89-8	Epichlorohydrin	459,150	5,456	3,675	468,281
140-88-5	Ethyl acrylate	231,961	423	939	233,323
75-21-8	Ethylene oxide	1,793,048	2,260	50,336	1,845,644
96-45-7	Ethylene thiourea	582	0	0	582
50-00-0	Formaldehyde	10,218,467	616,001	242,466	11,076,934
118-74-1	Hexachlorobenzene	841	111	1	953
302-01-2	Hydrazine	28,433	1,520	5	29,958
10034-93-2	Hydrazine sulfate	2	0	0	2
7439-92-1	Lead	431,777	20,457	3,323,695	3,775,929
58-89-9	Lindane	562	0	5	567
101-14-4	4,4'-Methylenebis-(2-chloroaniline)	1,362	0	0	1,362
101-77-9	4,4'-Methylenedianiline	13,168	1,486	3	14,657
74-88-4	Methyl iodide	25,414	13	0	25,427
90-94-8	Michler's ketone	0	0	0	0
134-32-7	alpha-Naphthylamine	10	0	0	10
7440-02-0	Nickel	549,303	53,883	393,775	996,961
139-13-9	Nitrilotriacetic acid	5	4,100	0	4,105
99-59-2	5-Nitro-o-anisidine	15	0	0	15
79-46-9	2-Nitropropane	105,747	380	0	106,127
156-10-5	p-Nitrosodiphenylamine	24	0	0	24
1336-36-3	Polychlorinated biphenyls (PCBs)	0	0	10	10
75-55-8	Propyleneimine	400	0	0	400
75-56-9	Propylene oxide	1,066,624	10,181	2,450	1,079,255
81-07-2	Saccharin (manufacturing)	314	0	0	314
100-42-5	Styrene	28,476,346	25,609	389,929	28,891,884
96-09-3	Styrene oxide	1,675	0	0	1,675
79-34-5	1,1,2,2-Tetrachloroethane	64,251	2,102	0	66,353
127-18-4	Tetrachloroethylene	16,687,451	7,448	23,302	16,718,201
62-55-5	Thioacetamide	0	0	0	0
62-56-6	Thiourea	1,428	717	505	2,650
584-84-9	Toluene-2,4-diisocyanate	1,323,952	0	250	1,324,202
91-08-7	Toluene-2,6-diisocyanate	332,088	0	250	332,338
26471-62-5	Toluenediisocyanate (mixed isomers)	47,885	0	10	47,895
95-53-4	o-Toluidine	10,829	260	8,111	19,200
88-06-2	2,4,6-Trichlorophenol	80	1	1	82
51-79-6	Urethane	2,050	0	0	2,050
593-60-2	Vinyl bromide	3,560	0	0	3,560
75-01-4	Vinyl chloride	1,047,485	4,625	251	1,052,361
	Subtotal	202,282,566	2,115,237	8,457,114	212,854,917
	Total for All TRI Chemicals	2,010,554,065	243,513,772	421,428,144	2,675,495,981

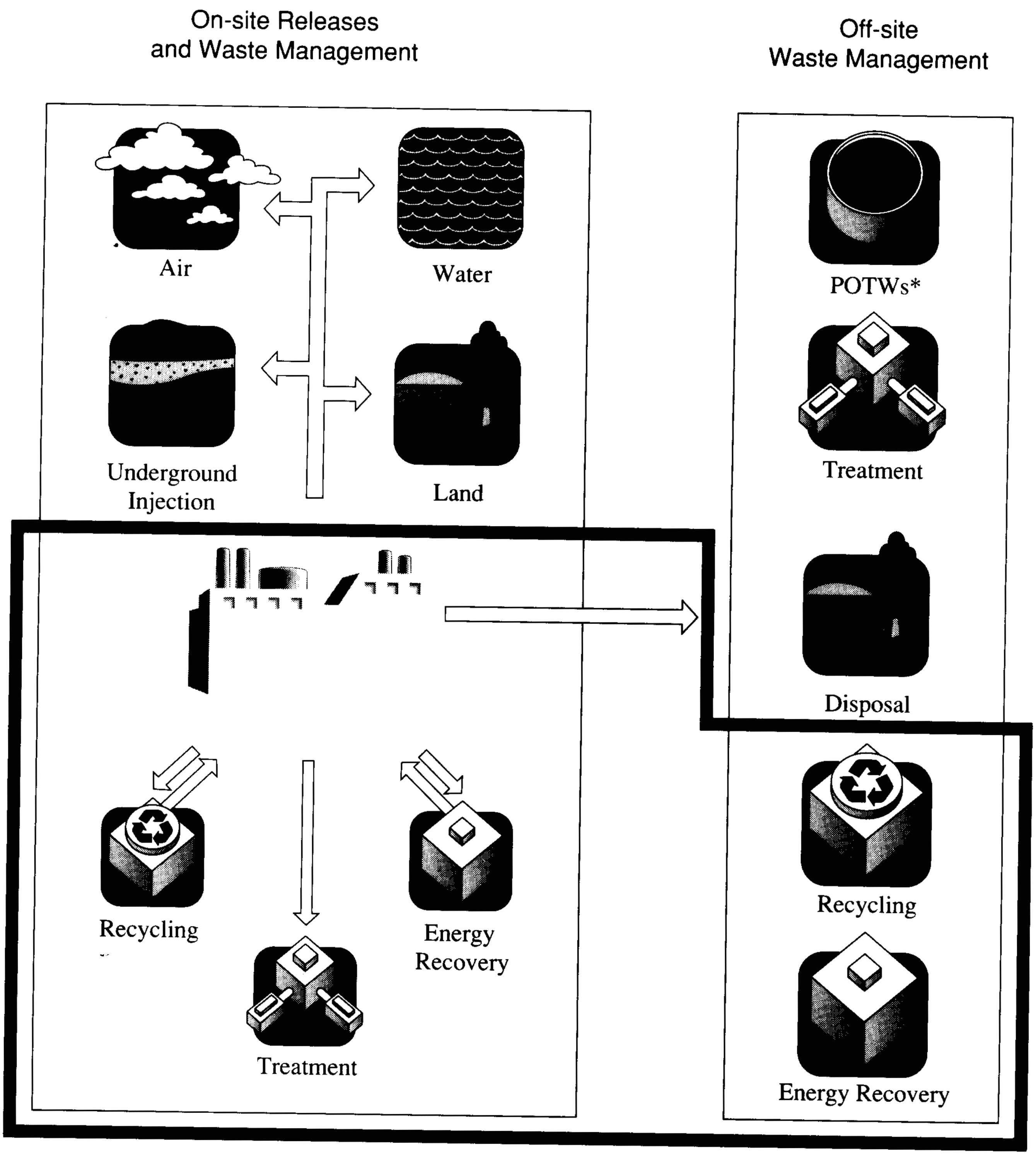
Notes

(a) Other includes wastes sent to other countries and sites not identified by state (Table 1-7).

(b) Facilities that reported more than one two-digit SIC code within the range of 20 to 39 [e.g., paper (26) and chemicals (28)] (Tables 1-21 and 1-22).

(c) For purposes of EPCRA section 313, only fume or dust forms of zinc metal are reportable (Tables 1-25 and 1-26).

Chapter 2
Pollution Prevention Act Data



* Publicly Owned Treatment Works

INFORMATION ON THE PREVENTION AND MANAGEMENT OF TOXIC CHEMICALS IN WASTE

New to Form R, beginning with the 1991 reporting year, is information required by the Pollution Prevention Act of 1990 (PPA). This new information gives, for the first time, a comprehensive look at the quantities of TRI chemicals in wastes, an indication of how those quantities are managed, and an indication of what efforts are being made to reduce or eliminate those quantities. As shown in the graphic on the previous page and in Figures 2-1 and 2-2, this information expands the data collected under TRI, beyond on-site releases and transfers off-site for treatment and disposal, to include transfers off-site for recycling and energy recovery as well as on-site recycling, energy recovery, and treatment. This new information provides a baseline for assessing progress in the prevention of quantities of toxic chemicals from entering wastes as well as assessing the management of toxic chemicals that are not prevented from entering wastes.

In learning what this new information is, what it means, and how it relates to the information that has been collected on Form R in the past, it may be helpful to look at the Form R in the Appendix of this document. Some of this information is completely new, while some, such as the quantities released and the quantities sent off-site for treatment, has been reported prior to 1991, but is now aggregated and reported in a new and additional way on Form R. A comparison of the information collected prior to 1991 and the information collected beginning with 1991 is shown in Figures 2-1 and 2-2. The following quantities of toxic chemicals in wastes are now required on EPA's Form R (in Section 8) to meet the requirements of section 6607(b) of the PPA:

- quantity released at the facility and disposed off-site;
- quantity used for energy recovery at the facility;
- quantity used for energy recovery off-site;
- quantity recycled at the facility;
- quantity recycled off-site;
- quantity treated at the facility;
- quantity treated off-site; and
- quantity released or transferred off-site due to catastrophic events or remedial actions.

Facilities also provide an indication of changes in production or activity at the facility to help assess changes in the quantities of toxic chemicals in wastes relative to changes in production. Facilities also indicate what, if any, source reduction activities have been implemented to reduce or eliminate quantities of the reported toxic chemical in wastes.

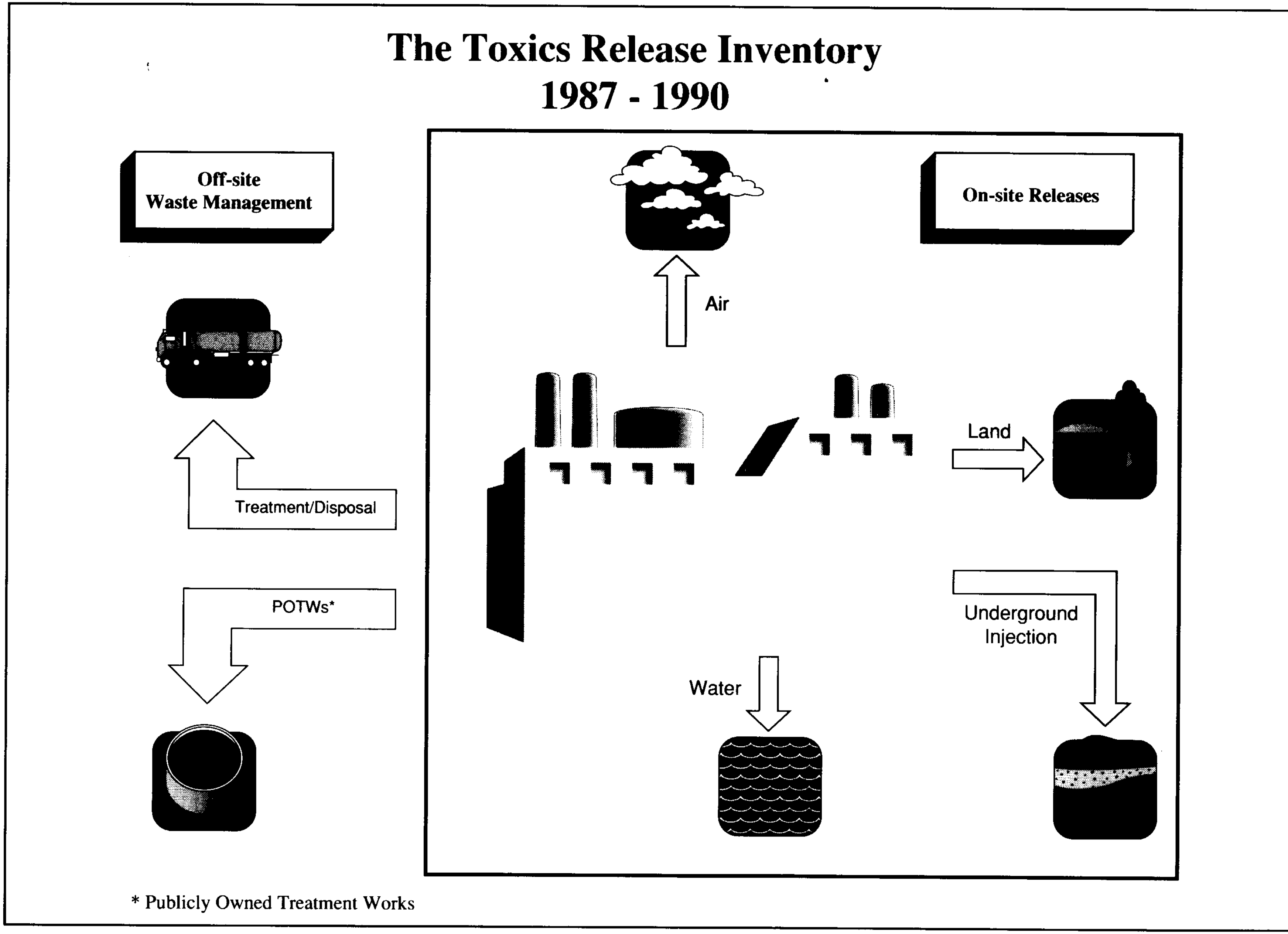


Figure 2-1. Toxics Release Inventory, 1987 - 1990.

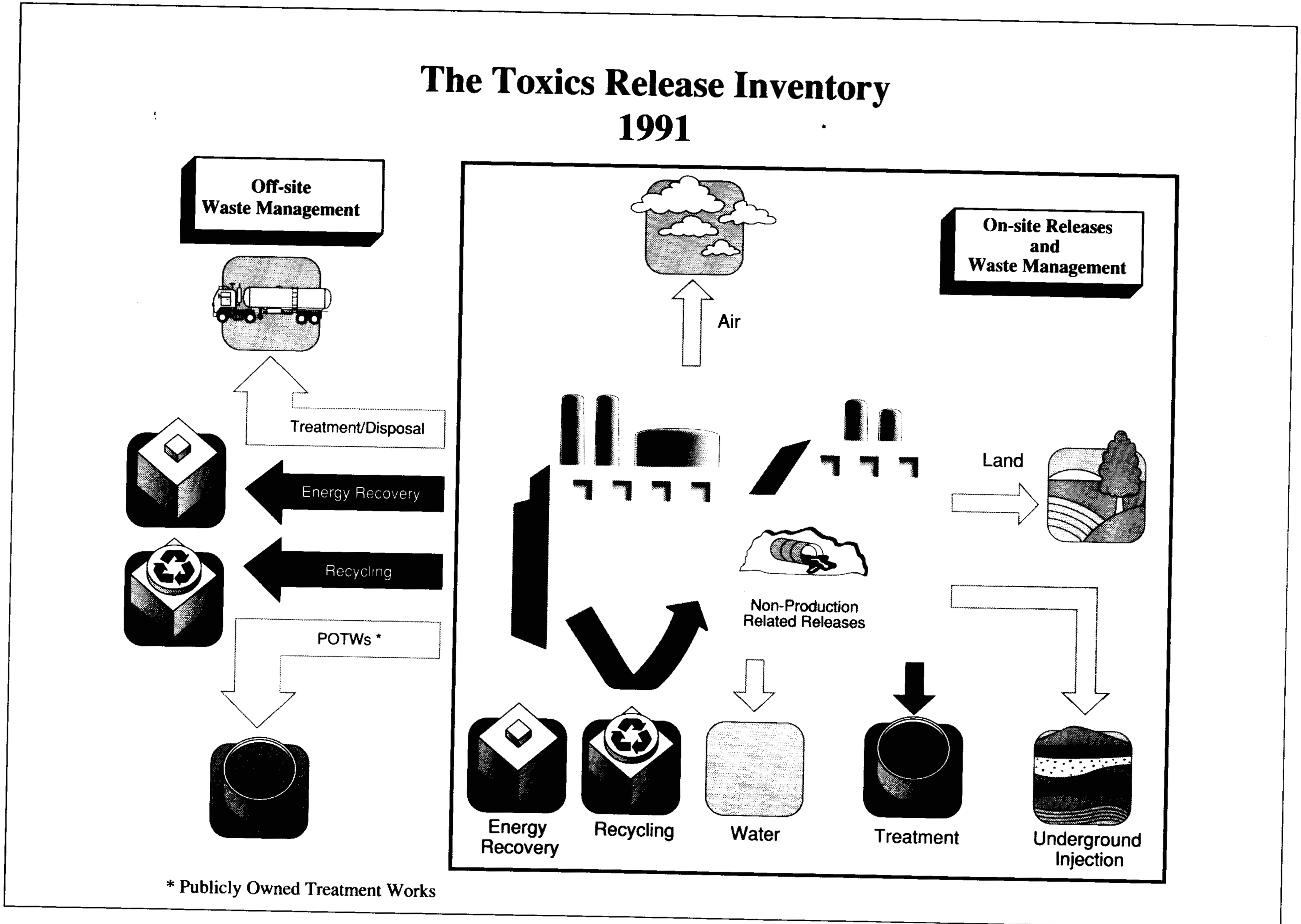


Figure 2-2. **Toxics Release Inventory, 1991.**

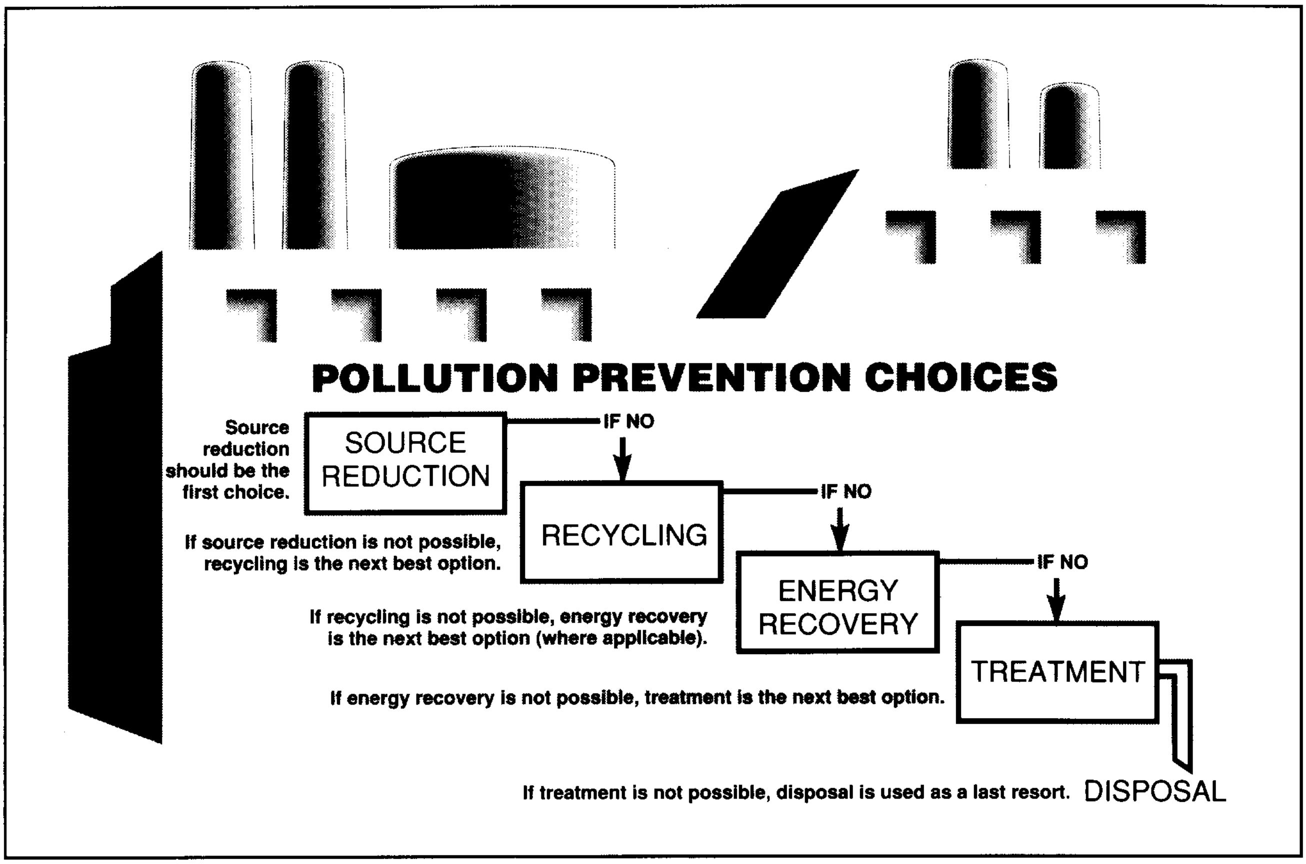


Figure 2-3. Waste Management Hierarchy.

This new information can help assess movement in the waste management hierarchy, established in the PPA as national policy:

- pollution should be prevented at the source whenever feasible;
- pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible;
- pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and
- disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

The decision-making that should be used when determining how to prevent and manage toxic chemicals in wastes is illustrated in Figure 2-3.

For 1991, a total of approximately 37.8 billion pounds of toxic chemicals in production-related wastes were reported managed as follows:

Recycled on-site:	16.379 billion pounds
Recycled off-site:	3.262 billion pounds

Used for energy recovery on-site:	3.187 billion pounds
Used for energy recovery off-site:	0.498 billion pounds
Treated on-site:	9.783 billion pounds
Treated off-site:	0.874 billion pounds
Released on-site and disposed off-site:	3.771 billion pounds
Total:	37.754 billion pounds

Looking at the hierarchy of waste management, approximately 52% of the toxic chemicals in wastes, 19.641 billion pounds, were reported as recycled; 10%, 3.685 billion pounds, were reported as combusted for energy recovery; 28%, 10.657 billion pounds, were reported as treated; and 10%, 3.771 billion pounds, were reported as released or disposed into the environment. This indicates that 62% of the toxic chemicals in waste were reported as recycled or used beneficially, while the remaining 38% were reported as either treated with some subsequent releases to the environment or released directly to the environment. In addition to these production-related wastes, a total of approximately 31.4 million pounds of toxic chemicals in wastes not associated with production (from catastrophic or remedial actions) were reported.

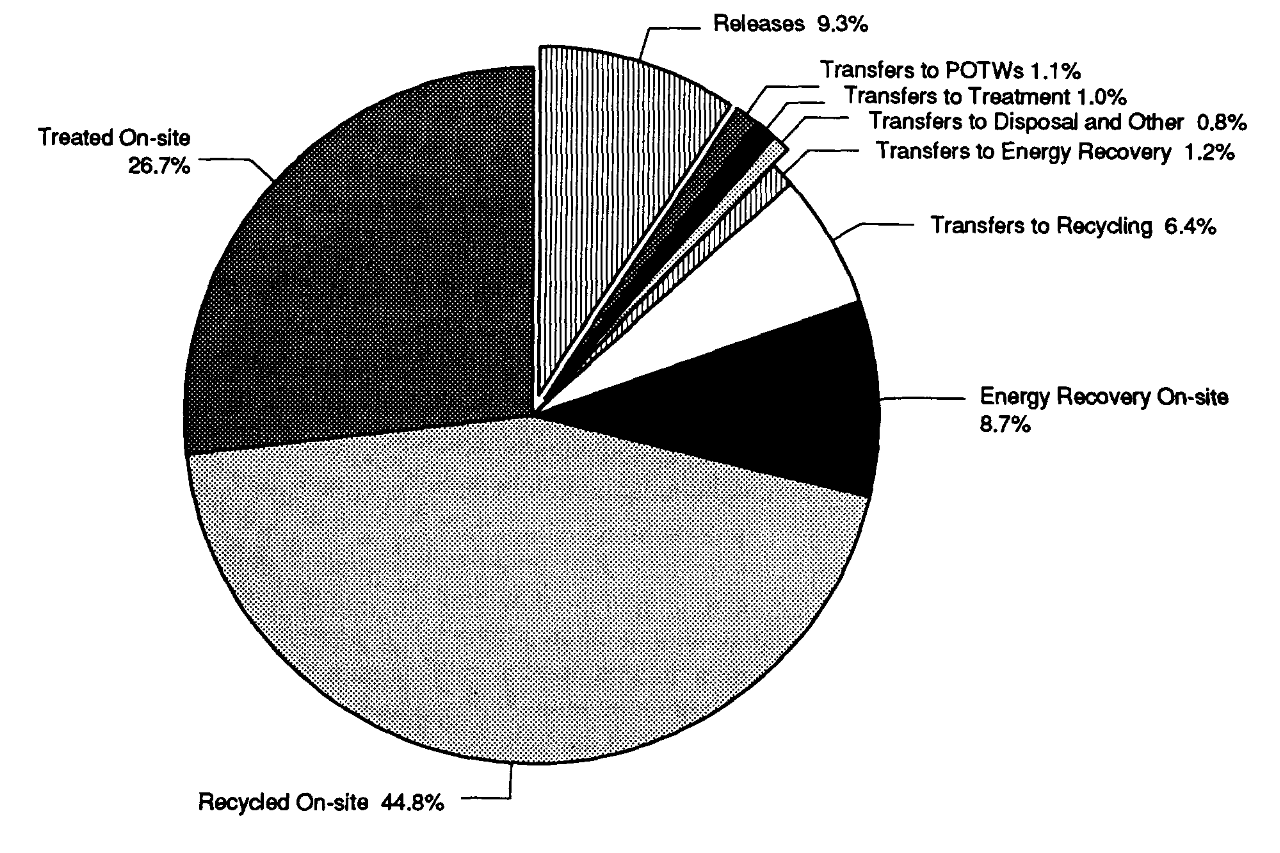


Figure 2-4. Quantities Reported by Management Technique, 1991.

The management of the 37.8 billion pounds of toxic chemicals in production-related wastes reported for 1991 is further illustrated in Figure 2-4. The extended pieces of the pie chart show those quantities reported in 1991 that have been reported since the inception of the TRI program:

releases to air, land, water, and underground wells; transfers to POTWs; transfers to other off-site locations for the purposes of treatment or disposal; and "other" transfers. These quantities (about 4.4 billion pounds) comprise approximately 12% of the total quantities of toxic chemicals in wastes now collected under TRI.

Data Required by the Pollution Prevention Act (PPA)

Quantity released (Section 8.1 of Form R). This is the total quantity that was released to the environment at the facility (directly discharged to air, land, and water, and injected underground), and sent off-site for the purposes of disposal. Because this quantity includes amounts disposed off-site, it differs from the total releases to the environment that facilities report in Section 5 of Form R (those releases are presented in Chapter 1).

Quantity used for energy recovery on-site (Section 8.2 of Form R). This is the quantity that was actually combusted for the purposes of energy recovery on-site. The reported toxic chemical has to have a heating value that is high enough to sustain combustion in some form of energy recovery device, such as a furnace, including kilns, or a boiler. For example, metals or metal compounds should not be reported as combusted for energy recovery because the parent metals do not contribute any heating value to the wastes being combusted. The parent metals would be discharged to air or remain in the ash, which is usually disposed. The amount reported should represent the amount actually destroyed in the combustion process, not the amount that entered the energy recovery unit. For example, 100,000 pounds of toluene entered a boiler which, on average, combusted 98% of the toluene. The remaining toluene was discharged to air. A total of 98,000 pounds is reported as combusted for energy recovery, and the remaining 2,000 pounds is reported as released to air.

Quantity used for energy recovery off-site (Section 8.3 of Form R). This is the quantity that was sent off-site for the purposes of energy recovery. It is the quantity that left the facility boundary, not the amount actually combusted at the off-site location. The toxic chemical must have a significant heating value and the off-site location must have some form of energy recovery unit in place. These quantities should also have been reported in Section 6 of Form R as off-site transfers, along with the receiving facility's name and location (these quantities are also presented in Chapter 1).

Quantity recycled on-site (Section 8.4 of Form R). This is the quantity that was recovered and made available for further use at the facility. It is not the quantity that entered a recycling or recovery operation. This quantity may be greater than the actual amount of the toxic chemical managed at the facility, depending on how the facility reported. For example, a facility used a total of 15,000 pounds of 1,1,1-trichloroethane for cleaning and other purposes during the reporting year. The toxic chemical was recycled in batches for a total of 15 batches, resulting in 225,000 pounds of 1,1,1-trichloroethane recycled during that year. This quantity is much greater than the amount of the toxic chemical that was actually used at the facility, but reflects the amounts of 1,1,1-trichloroethane in wastes that were managed at the facility during the reporting year. However, not all facilities have reported in this manner.

Quantity recycled off-site (Section 8.5 of Form R). This is the quantity that was sent off-site for the purposes of recycling. It is the quantity that left the facility boundary, not the amount actually recovered at the off-site location. These quantities should also have been reported in Section 6 of Form R as off-site transfers, along with the receiving facility's name and location (these quantities are also presented in Chapter 1).

Quantity treated on-site (Section 8.6 of Form R). This is the quantity that was destroyed in on-site waste treatment operations, not the amount that entered any treatment operation. If 100,000 pounds of benzene were combusted in an incinerator that destroyed 99% of the benzene, the facility would have reported 99,000 pounds as treated on-site. If the remaining 1,000 pounds were released through a stack, the 1,000 pounds would have been reported as a quantity released (Section 8.1). For this data element, destroyed means that the chemical no longer exists in its reportable form. For example, reduction of a certain quantity of hexavalent chromium to trivalent chromium would not be reported as a quantity treated because the chromium was not destroyed and was still in its reportable form.

Quantity treated off-site (Section 8.7 of Form R). This is the quantity that was sent to POTWs and other off-site locations for the purposes of treatment. It is the quantity that left the facility boundary, not the amount that was actually treated at the off-site location. Quantities included here should also have been reported in Section 6 of Form R (these quantities are also presented in Chapter 1). Data users should be aware that off-site locations can have varying levels of treatment capabilities, which means that a toxic chemical sent to a POTW or other off-site location may or may not have been treated in the sense that the chemical was destroyed and not released to the environment. For example, metals and certain organic chemicals may have been "passed through" a POTW, meaning that they were discharged directly from the POTW. Metals may also have been contained in the sludges from POTWs, which were disposed on land. As a result, quantities may have been reported as treated when they were ultimately released to the environment. This could also have occurred at other off-site locations in that the toxic chemical in wastes may have been treated and then disposed. In situations where the toxic chemical was stabilized and/or solidified, this is almost always a treatment step prior to disposal, usually to a landfill.

Quantity released to the environment due to one-time events (Section 8.8 of Form R). This is the quantity that was released to the environment or sent off-site for recycling, energy recovery, treatment, or disposal due to one-time events not associated with routine production practices. Such events include catastrophic events, such as accidental releases, and remedial actions. This quantity is separated from the quantities recycled, used for energy recovery, treated, and released to allow for distinctions to be made between those quantities that are routinely associated with production operations and are more amenable to source reduction and those quantities that are not routinely associated with production processes and are not as amenable to source reduction because they are not readily anticipated. This separation of quantities is important in assessing progress in source reduction at facilities. While the aggregation of these quantities in one place is new to reporting under TRI, some of the quantities due to accidental or non-routine events have been reported since 1987. Releases to the environment, as reported in Section 5 of Form R, have included accidental as well as routine discharges, and wastes transferred off-site for treatment or disposal have included quantities from accidental events or remedial actions since 1987.

An important consideration when looking at and using these data is that the individual quantities are intended to be mutually exclusive of each other in order to avoid double-counting. This is important because the sum of the quantities reported as recycled (on- and off-site), used for energy recovery (on- and off-site), treated (on- and off-site), and released provides the total production-related quantity of the toxic chemical in wastes that a facility must manage in that year.

As required under the PPA, the quantities of the toxic chemical in production-related wastes are to be reported not only for the reporting year, but for the year prior to and the two years following the reporting year. Because 1991 was the first year for which this new information was required, the PPA did not require facilities to report quantities for 1990 when they did not have sufficient information to make a reasonable estimate. For example, if a facility recycled the chemical on-site during both 1990 and 1991, but felt that it did not have sufficient records to estimate the quantity recycled in 1990, the facility could have entered "NA" (Not Applicable) for the quantity recycled on-site during 1990. As a result, information for 1990 may not be available for comparisons across the four years reported.

The quantities reported for 1992 and 1993, the two years following the reporting year, are projections only. The intent of this information is to encourage facilities to plan to implement source reduction and move up the waste management hierarchy in the future. Future year estimates are not commitments that facilities reporting under TRI are required to meet.

Tables 2-1 and 2-2 show the quantities of toxic chemicals in production-related wastes reported for 1990 through 1993, aggregated at the national level. In addition to the production-related quantities reported for 1991, a total of 31,451,032 pounds of toxic chemicals in non-production-related wastes were reported for that year. All of the quantities reported for 1990 through 1993 are shown in Table 2-1, which includes forms that did not have information for all four years. Table 2-1 indicates an increase from 1990 to 1991, but it should be noted that this apparent increase is due in part to facilities which did not report quantities for 1990. Table 2-2 shows the quantities for only those forms that provided quantities consistently for all four years. This allows for a consistent comparison to see potential trends in the quantities recycled, combusted for energy recovery, treated, and disposed. While both tables indicate that the quantities of toxic chemicals in wastes projected for future years are relatively stable, the stability in the quantities is more pronounced when looking at Table 2-2. Table 2-2 shows a slight decrease in the quantities of toxic chemicals in wastes between 1990 and 1991. Looking beyond the national aggregates, the distributions of toxic chemicals in wastes by state, by industry, and by individual toxic chemical are shown in Tables 2-3 through 2-5.

Table 2-1. TRI Data Collected under the Pollution Prevention Act, National Summary, 1991.(a)

Category of Waste Generated	1990		1991		Projected Data 1992		Projected Data 1993	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Recycled On-site	14,452,166,728	42.7	16,379,108,682	43.4	15,899,500,419	42.6	16,001,626,071	42.9
Recycled Off-site	2,534,357,669	7.5	3,261,980,931	8.6	3,216,228,147	8.6	3,216,883,647	8.6
Energy Recovery On-site	2,761,172,935	8.2	3,186,795,733	8.4	3,223,687,332	8.6	3,594,430,633	9.6
Energy Recovery Off-site	426,955,395	1.3	497,757,471	1.3	485,893,116	1.3	472,764,385	1.3
Treated On-site	9,047,390,554	26.7	9,783,374,620	25.9	10,157,362,541	27.2	10,156,260,220	27.2
Treated Off-site	853,899,904	2.5	874,285,432	2.3	772,735,826	2.1	736,192,317	2.0
Quantity Released(b)	3,796,689,036	11.2	3,771,194,892	10.0	3,558,849,540	9.5	3,107,462,103	8.3
Total	33,872,632,221	100.0	37,754,497,761	100.0	37,314,256,921	100.0	37,285,619,376	100.0

Table 2-2. TRI Data Collected under the Pollution Prevention Act, Forms Reporting Consistent Data, National Summary, 1991.(a)

Category of Waste Generated	1990		1991		Projected Data 1992		Projected Data 1993	
	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Recycled On-site	10,942,012,010	43.4	10,434,507,021	42.8	10,590,327,883	42.5	10,656,117,053	42.9
Recycled Off-site	1,880,406,286	7.5	1,813,514,462	7.4	1,870,204,744	7.5	1,912,326,015	7.7
Energy Recovery On-site	1,944,233,283	7.7	1,942,194,161	8.0	1,944,233,283	7.8	1,986,069,691	8.0
Energy Recovery Off-site	193,861,662	0.8	195,733,170	0.8	197,552,762	0.8	198,429,939	0.8
Treated On-site	7,314,412,863	29.0	7,210,331,737	29.6	7,633,642,658	30.6	7,590,338,237	30.5
Treated Off-site	585,608,267	2.3	536,578,610	2.2	537,777,233	2.2	539,167,232	2.2
Quantity Released(b)	2,354,083,854	9.3	2,260,187,150	9.3	2,133,506,424	8.6	1,981,233,694	8.0
Total	25,214,618,225	100.0	24,393,046,311	100.0	24,907,244,987	100.0	24,863,681,861	100.0

Table 2-3. TRI Data Collected under the Pollution Prevention Act, by State, 1991 (Alphabetically Ordered).

State	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
Alabama	311,325,143	64,461,431	66,131,883	48,413,773
Alaska	889	0	2,922,000	0
American Samoa	0	0	0	0
Arizona	463,325,079	25,466,219	348,615	925,883
Arkansas	90,346,644	34,731,355	34,303,642	4,943,795
California	127,036,992	135,220,535	210,343,553	14,182,009
Colorado	38,750,612	7,190,858	11,378,000	1,509,052
Connecticut	189,870,407	25,628,435	6,726,315	4,530,769
Delaware	54,572,494	7,389,305	138,544	1,228,685
Florida	325,916,896	26,145,360	40,607,150	7,495,397
Georgia	658,552,343	64,942,806	57,384,878	7,298,247
Hawaii	6,567	225,879	1,430,000	0
Idaho	937,485	500,367	180	285,045
Illinois	235,615,511	476,165,014	145,774,540	47,334,880
Indiana	461,628,922	331,482,347	73,750,452	20,109,496
Iowa	24,601,949	21,224,191	1,168,055	4,575,001
Kansas	251,236,642	33,043,722	425,389,721	2,338,234
Kentucky	154,979,666	65,674,839	71,998,890	6,109,170
Louisiana	980,424,001	126,591,721	314,051,351	5,105,804
Maine	7,714,020	5,403,527	10,653,914	437,639
Maryland	86,969,675	23,124,382	10,137,459	1,832,923
Massachusetts	62,202,595	19,818,516	8,682,927	7,207,035
Michigan	227,060,950	148,165,063	65,826,271	56,909,494
Minnesota	79,471,452	19,778,105	6,100,350	3,597,326
Mississippi	162,721,869	48,146,529	14,581,845	4,788,371
Missouri	220,450,142	59,958,407	263,912,077	10,627,732
Montana	36,506,236	2,874,103	688,684	214,541
Nebraska	31,265,938	13,195,491	4,631,666	1,082,015
Nevada	3,014,564	736,070	0	9,274
New Hampshire	21,600,409	3,634,548	1,300,388	458,520
New Jersey	266,375,224	93,779,433	16,910,321	25,189,563
New Mexico	28,264,528	200,809	18,603,230	161,324
New York	484,131,284	47,251,890	21,824,990	9,981,795
North Carolina	184,644,800	123,157,215	33,961,227	8,846,979
North Dakota	66,259	32,850	0	48,339
Ohio	1,364,248,014	263,262,046	108,000,391	38,282,153
Oklahoma	48,568,021	16,586,941	19,550,290	1,529,997
Oregon	42,823,959	9,883,149	14,100,716	567,050
Pennsylvania	1,714,115,597	180,714,964	84,012,599	18,670,088
Puerto Rico	77,569,711	9,583,868	48,677	7,985,302
Rhode Island	10,372,313	9,027,390	248,700	456,354
South Carolina	590,031,785	81,022,016	102,172,038	6,810,666
South Dakota	548,406	261,106	0	210,649
Tennessee	442,206,527	39,175,518	32,496,372	8,651,307
Texas	5,233,989,351	364,755,948	717,185,391	77,125,983
Utah	10,751,166	33,065,891	11,941	388,194
Vermont	6,044,118	2,243,810	0	504,710
Virgin Islands	0	374,000	0	0
Virginia	133,115,463	26,507,497	81,463,418	10,775,685
Washington	91,974,319	64,778,277	9,860,028	816,268
West Virginia	267,557,607	26,124,281	10,069,064	7,493,124
Wisconsin	70,391,861	43,839,497	11,768,990	9,707,534
Wyoming	3,212,277	35,433,410	54,144,000	4,297
Total	16,379,108,682	3,261,980,931	3,186,795,733	497,757,471

State	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
Alabama	569,911,217	10,356,612	122,071,787	1,192,671,846	205,504
Alaska	2,803,916	0	17,809,574	23,536,379	84,980
American Samoa	0	0	22,000	22,000	0
Arizona	56,090,961	2,616,214	62,833,659	611,606,630	53,962
Arkansas	144,228,962	1,622,297	49,771,907	359,948,602	127,308
California	259,043,619	29,340,063	106,355,580	881,522,351	3,043,336
Colorado	20,034,890	2,533,060	6,918,328	88,314,800	117,397
Connecticut	33,570,688	7,587,799	22,002,683	289,917,096	137,572
Delaware	66,332,739	3,208,077	6,367,067	139,236,911	23,091
Florida	190,382,598	15,876,087	194,899,454	801,322,942	632,161
Georgia	279,567,337	8,790,838	77,972,956	1,154,509,405	236,641
Hawaii	5,647,742	6,294	1,005,748	8,322,230	725
Idaho	24,997,862	196,938	10,803,876	37,721,753	25,520
Illinois	588,767,617	72,395,140	159,762,885	1,725,815,587	1,158,325
Indiana	274,951,835	30,020,336	146,770,188	1,338,713,576	136,093
Iowa	206,877,605	8,791,589	41,919,256	309,157,646	136,746
Kansas	53,325,891	4,404,012	83,099,964	852,838,186	340,091
Kentucky	152,058,977	8,392,449	68,811,469	528,025,460	279,786
Louisiana	1,263,538,442	11,065,017	499,672,063	3,200,448,399	1,584,867
Maine	66,320,150	1,026,632	16,840,109	108,395,991	48,005
Maryland	285,787,567	7,086,274	15,554,909	430,493,189	73,217
Massachusetts	34,055,511	10,807,623	19,338,616	162,112,823	57,042
Michigan	310,628,049	32,209,345	108,295,694	949,094,866	393,796
Minnesota	204,350,506	3,756,074	45,680,567	362,734,380	53,181
Mississippi	210,656,737	3,221,398	103,465,389	547,582,138	865,657
Missouri	94,912,814	24,578,332	66,111,866	740,551,370	365,155
Montana	22,400,860	183,046	41,010,116	103,877,586	508
Nebraska	15,585,092	1,515,710	19,427,564	86,703,476	1,672,940
Nevada	15,444,605	25,477	3,345,568	22,575,558	123,917
New Hampshire	10,031,201	862,647	5,859,019	43,746,732	3,194
New Jersey	256,251,003	45,123,408	41,833,267	745,462,219	953,262
New Mexico	10,607,433	99,881	25,732,011	83,669,216	93
New York	198,456,069	16,242,855	75,719,045	853,607,928	205,629
North Carolina	388,317,967	11,537,044	108,306,377	858,771,609	187,369
North Dakota	1,991,325	37,636	1,789,945	3,966,354	0
Ohio	357,401,073	137,106,567	192,878,592	2,461,178,836	889,677
Oklahoma	65,724,386	3,934,313	40,650,847	196,544,795	217,514
Oregon	84,736,723	7,270,361	20,537,476	179,919,434	9,124
Pennsylvania	273,535,191	156,313,011	89,781,649	2,517,143,099	500,636
Puerto Rico	41,670,034	12,003,961	17,903,333	166,764,886	21,857
Rhode Island	23,456,450	988,968	6,351,719	50,901,894	12,682
South Carolina	222,080,470	8,403,343	66,784,507	1,077,304,825	166,916
South Dakota	25,912,652	174,067	2,602,268	29,709,148	5,250
Tennessee	236,429,369	12,529,646	237,453,044	1,008,941,783	4,780,707
Texas	1,367,635,103	68,339,099	424,156,792	8,253,187,667	4,810,049
Utah	121,236,094	1,078,761	91,448,031	257,980,078	6,043,775
Vermont	7,478,873	202,861	1,036,053	17,510,425	43,991
Virgin Islands	835,100	0	1,517,422	2,726,522	303
Virginia	101,256,953	68,532,927	76,350,461	498,002,404	195,966
Washington	249,372,017	5,467,505	30,922,992	453,191,406	55,425
West Virginia	162,884,113	4,058,339	31,289,070	509,475,598	228,903
Wisconsin	120,918,126	12,236,998	50,793,328	319,656,334	137,237
Wyoming	2,882,106	128,501	11,556,802	107,361,393	3,950
Total	9,783,374,620	874,285,432	3,771,194,892	37,754,497,761	31,451,032

Table 2-4. TRI Data Collected under the Pollution Prevention Act, by Industry, 1991.

SIC Code	Industry	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
20	Food	28,693,388	15,823,776	225,511	126,764
21	Tobacco	49,901,029	4,732	0	7,283
22	Textiles	14,245,415	639,028	3,441,643	2,642,001
23	Apparel	285,402	4,196	0	73,159
24	Lumber	17,404,088	980,201	10,087,285	4,632,305
25	Furniture	3,194,367	2,913,755	349,338	6,396,713
26	Paper	235,840,123	4,840,527	232,574,942	7,639,416
27	Printing	173,444,146	6,654,051	154,500	5,028,466
28	Chemicals	9,617,201,024	743,213,473	1,160,651,996	347,019,942
29	Petroleum	1,516,923,524	823,887,184	790,294,549	16,516,376
30	Plastics	1,165,402,111	15,523,700	21,784,734	11,329,814
31	Leather	5,461,257	971,966	0	1,202,374
32	Stone/Clay	66,278,038	3,324,181	842,977,323	7,883,184
33	Primary Metals	1,802,597,905	769,973,476	44,963,133	9,365,924
34	Fabr. Metals	247,230,727	188,764,193	10,133,825	13,031,073
35	Machinery	114,064,107	41,035,299	146,205	3,550,023
36	Electrical	290,714,374	297,482,768	2,042,583	12,935,178
37	Transportation	69,460,436	114,809,540	2,612,763	25,822,932
38	Measure./Photo.	26,487,748	17,474,423	282,691	4,183,214
39	Miscellaneous	13,617,541	10,186,252	17,056	2,869,950
	Multiple codes 20-39	910,956,070	199,538,960	57,897,942	14,795,522
	No codes 20-39	9,705,862	3,935,250	6,157,714	705,858
	Total	16,379,108,682	3,261,980,931	3,186,795,733	497,757,471

Industry	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
Food	255,529,684	27,561,655	58,885,967	386,846,745	606,096
Tobacco	1,320,937	2,330	3,520,704	54,757,015	14,118
Textiles	44,886,119	5,584,573	27,857,671	99,296,450	70,902
Apparel	1,956,308	233,055	1,519,593	4,071,713	6,066
Lumber	3,487,884	966,863	32,370,947	69,929,573	591,971
Furniture	1,525,621	981,565	49,347,778	64,709,137	379,201
Paper	1,747,788,583	46,011,387	249,705,333	2,524,400,311	363,551
Printing	33,210,972	1,700,039	44,127,911	264,320,085	37,074
Chemicals	4,673,882,659	377,758,962	1,649,540,049	18,569,268,105	15,018,438
Petroleum	492,329,288	116,730,107	72,677,419	3,829,358,447	215,422
Plastics	65,237,965	4,781,250	159,751,796	1,443,811,370	372,822
Leather	21,328,100	4,140,528	11,822,116	44,926,341	14,981
Stone/Clay	204,076,346	3,585,464	136,830,664	1,264,955,200	59,300
Primary Metals	580,623,199	165,331,868	524,347,728	3,897,203,233	6,546,840
Fabr. Metals	405,104,166	26,653,510	122,889,476	1,013,806,970	924,636
Machinery	19,138,999	5,266,934	43,473,581	226,675,148	494,526
Electrical	248,092,358	23,140,036	87,114,711	961,522,008	2,176,760
Transportation	58,123,925	18,236,933	151,807,154	440,873,683	651,559
Measur./Photo.	44,974,483	5,782,295	42,788,091	141,972,945	82,199
Miscellaneous	6,410,458	1,685,689	19,391,842	54,178,788	36,709
Multiple Codes	735,256,006	37,349,310	249,123,284	2,204,917,094	2,597,879
No codes	139,090,560	801,079	32,301,077	192,697,400	189,982
Total	9,783,374,620	874,285,432	3,771,194,892	37,754,497,761	31,451,032

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991 (Alphabetically Ordered).

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
75-07-0	Acetaldehyde	114,695	300	7,620,347	127,935
60-35-5	Acetamide	0	0	82,200	2,138
67-64-1	Acetone	268,728,692	18,262,490	134,433,568	42,758,635
75-05-8	Acetonitrile	2,421,520,190	5,153,900	27,510,882	2,776,771
107-02-8	Acrolein	6,400	0	1,692,831	10,681
79-06-1	Acrylamide	2,286	0	0	1,154
79-10-7	Acrylic acid	147,220	17,727	16,406,396	4,977,741
107-13-1	Acrylonitrile	159,893,164	16,540	1,923,569	234,312
107-18-6	Allyl alcohol	203,764	0	46,880	370,224
107-05-1	Allyl chloride	1,466,000	0	1,750,600	33,000
7429-90-5	Aluminum (fume or dust)	13,185,989	46,204,582	0	64,989
1344-28-1	Aluminum oxide (fibrous forms)	31,235	333,653	0	1,400
60-09-3	4-Aminoazobenzene	0	0	0	0
92-67-1	4-Aminobiphenyl	0	0	0	0
7664-41-7	Ammonia	258,127,545	7,697,327	40,686,457	337,774
6484-52-2	Ammonium nitrate (solution)	71,981,665	7,966,410	0	0
7783-20-2	Ammonium sulfate (solution)	708,087	936,937	0	0
62-53-3	Aniline	11,628,476	1	4,623,996	2,166,273
90-04-0	o-Anisidine	0	0	290	0
104-94-9	p-Anisidine	0	0	0	0
120-12-7	Anthracene	604,718	36,870	2,642,616	406,996
7440-36-0	Antimony	3,218,036	1,300,881	0	2,997
7440-38-2	Arsenic	470,019	41,707	0	4
1332-21-4	Asbestos (friable)	1,864,544	0	0	0
7440-39-3	Barium	30,976	53,008	0	3,973
98-87-3	Benzal chloride	0	0	0	24,000
71-43-2	Benzene	196,393,605	1,414,752	33,714,288	4,932,365
98-07-7	Benzoic trichloride	0	0	0	0
98-88-4	Benzoyl chloride	0	0	0	0
94-36-0	Benzoyl peroxide	6,355	11,150	343	914
100-44-7	Benzyl chloride	1,049	0	0	200,581
7440-41-7	Beryllium	0	77,621	0	0
92-52-4	Biphenyl	24,179,485	356,720	1,322,257	318,516
111-44-4	Bis(2-chloroethyl) ether	0	0	441,148	350
542-88-1	Bis(chloromethyl) ether	0	0	0	0
108-60-1	Bis(2-chloro-1-methylethyl)ether	0	0	11,130,000	0
103-23-1	Bis(2-ethylhexyl) adipate	6,439,053	198,369	29,899	108,210
353-59-3	Bromochlorodifluoromethane (Halon 1211)	0	0	0	0
75-25-2	Bromoform	0	0	0	0
74-83-9	Bromomethane	9,370	0	0	250
75-63-8	Bromotrifluoromethane (Halon 1301)	29,100	0	0	0
106-99-0	1,3-Butadiene	250,467,140	18,124,104	77,705,621	47,154
141-32-2	Butyl acrylate	210	95,190	713,563	233,635
71-36-3	n-Butyl alcohol	70,407,582	2,472,385	27,563,365	8,139,497
78-92-2	sec-Butyl alcohol	226,306	27,492	8,299,980	3,921,952
75-65-0	tert-Butyl alcohol	33,478	13,497	43,721,233	26,858,983
85-68-7	Butyl benzyl phthalate	1,444,692	95,448	30,024	119,080
106-88-7	1,2-Butylene oxide	26,300	7	564,180	330,019
123-72-8	Butyraldehyde	111,280	0	2,152,960	911
569-64-2	C.I. Basic Green 4	338	0	0	0
989-38-8	C.I. Basic Red 1	0	0	0	270
2832-40-8	C.I. Disperse Yellow 3	0	0	0	0
81-88-9	C.I. Food Red 15	0	0	0	3

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
Acetaldehyde	6,847,653	414,309	9,584,996	24,710,235	1,808
Acetamide	1	29,708	36	114,083	0
Acetone	117,452,577	23,052,335	161,632,499	766,320,796	254,475
Acetonitrile	11,732,428	2,272,173	20,958,975	2,491,925,319	12,102
Acrolein	1,614,888	13	233,909	3,558,722	4
Acrylamide	311,373	114,684	4,675,782	5,105,279	96
Acrylic acid	29,698,686	387,851	56,335,783	107,971,404	37,671
Acrylonitrile	15,634,889	2,277,301	7,003,311	186,983,086	181,299
Allyl alcohol	406,545	494,292	229,711	1,751,416	330
Allyl chloride	589,504	311,600	179,248	4,329,952	704
Aluminum (fume or dust)	18,274,473	1,801,400	12,484,791	92,016,224	3,665
Aluminum oxide (fibrous forms)	210,306	1,363,953	2,786,394	4,726,941	0
4-Aminoazobenzene	130	0	440	570	0
4-Aminobiphenyl	100,000	0	4	100,004	0
Ammonia	306,924,511	65,253,002	499,483,105	1,178,509,721	759,303
Ammonium nitrate (solution)	31,137,428	4,168,908	52,594,025	167,848,436	40,361
Ammonium sulfate (solution)	8,780,248	27,119,422	39,871,936	77,416,630	5,401
Aniline	2,989,882	1,228,518	2,452,780	25,089,926	11,837
o-Anisidine	4,598	10	8,494	13,392	0
p-Anisidine	764	13	36	813	0
Anthracene	7,643,176	27,077	191,626	11,553,079	6,251
Antimony	1,114,708	36,679	489,457	6,162,758	865
Arsenic	14,058	701,767	1,727,668	2,955,223	1,187
Asbestos (friable)	1,242,202	319,020	4,710,975	8,136,741	121,709
Barium	22,354	109,319	853,974	1,073,604	18,975
Benzal chloride	2,500	0	1,556	28,056	12,000
Benzene	31,256,769	2,163,924	18,760,658	288,636,361	108,722
Benzoic trichloride	280,001	0	7,937	287,938	0
Benzoyl chloride	514,218	511,861	27,073	1,053,152	0
Benzoyl peroxide	31,389	69,690	29,867	149,708	280
Benzyl chloride	315,645	89,302	106,840	713,417	4,400
Beryllium	610	0	146,835	225,066	710
Biphenyl	1,602,163	644,626	1,365,731	29,789,498	18,979
Bis(2-chloroethyl) ether	690,569	379,664	19,049	1,530,780	15
Bis(chloromethyl) ether	177	0	582	759	0
Bis(2-chloro-1-methylethyl)ether	1,106,300	0	5,400	12,241,700	0
Bis(2-ethylhexyl) adipate	415,076	36,036	434,978	7,661,621	26
Bromochlorodifluoromethane (Halon 1211)	0	0	11,948	11,948	9
Bromoform	0	190	101,000	101,190	0
Bromomethane	545,521	240	2,512,116	3,067,497	0
Bromotrifluoromethane (Halon 1301)	213	0	168,302	197,615	12,005
1,3-Butadiene	51,069,422	1,364,892	3,926,193	402,704,526	228,991
Butyl acrylate	1,495,681	175,987	299,794	3,014,060	5
n-Butyl alcohol	18,996,616	4,104,959	33,949,277	165,633,681	56,149
sec-Butyl alcohol	2,557,628	46,554	778,507	15,858,419	2,810
tert-Butyl alcohol	3,074,168	1,543,628	2,217,688	77,462,675	10,137
Butyl benzyl phthalate	1,443,936	198,683	621,176	3,953,039	234
1,2-Butylene oxide	223,214	910	62,645	1,207,275	19
Butyraldehyde	1,413,382	261,213	579,317	4,519,063	38
C.I. Basic Green 4	3,520	504	20,158	24,520	0
C.I. Basic Red 1	0	0	370	640	0
C.I. Disperse Yellow 3	933	125	1,144	2,202	0
C.I. Food Red 15	0	1,400	1	1,404	0

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991, Continued.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
97-56-3	C.I. Solvent Yellow 3	0	0	0	2
7440-43-9	Cadmium	73,823	249,260	0	813
156-62-7	Calcium cyanamide	0	0	0	0
133-06-2	Captan	1,277	0	0	0
63-25-2	Carbaryl	30,517	0	0	0
75-15-0	Carbon disulfide	17,506,225	1	5,446,169	187,804
56-23-5	Carbon tetrachloride	10,238,966	390,538	5,964,156	10,849
463-58-1	Carbonyl sulfide	0	0	2,396,121	0
120-80-9	Catechol	270,000	1,000,065	31,816,947	308,304
57-74-9	Chlordane	500	0	0	0
7782-50-5	Chlorine	102,076,338	647,823	6	0
10049-04-4	Chlorine dioxide	1,842,355	0	0	0
79-11-8	Chloroacetic acid	27,298	0	0	0
532-27-4	2-Chloroacetophenone	0	0	240,000	0
108-90-7	Chlorobenzene	72,196,590	892,902	2,676,212	793,470
75-00-3	Chloroethane	36,811,490	140,339	15,751,315	24,448
67-66-3	Chloroform	4,125,901	2,078,744	5,499,527	720,671
74-87-3	Chloromethane	3,187,122	52,813	3,031,087	20,932
107-30-2	Chloromethyl methyl ether	0	0	0	0
126-99-8	Chloroprene	0	130,000	454,294	3,700
1897-45-6	Chlorothalonil	2,614	670	0	3
7440-47-3	Chromium	39,566,674	78,576,055	0	215
7440-48-4	Cobalt	2,171,203	8,015,392	0	4
7440-50-8	Copper	584,266,533	350,356,528	0	306,951
8001-58-9	Creosote	14,878,637	43,000	73,000	581,029
120-71-8	p-Cresidine	0	0	0	0
1319-77-3	Cresol (mixed isomers)	321,037	615,657	3,081,999	256,346
108-39-4	m-Cresol	886,822	200,520	619,002	10,275
95-48-7	o-Cresol	78,150	278	432,000	4,560
106-44-5	p-Cresol	65,859	120,020	345,685	29,600
98-82-8	Cumene	4,077,543	84,792	8,227,728	802,715
80-15-9	Cumene hydroperoxide	25,000	0	277	1,741
135-20-6	Cupferron	0	0	0	0
110-82-7	Cyclohexane	160,571,531	918,113	11,936,571	4,213,423
94-75-7	2,4-D (acetic acid)	39,546	0	0	0
1163-19-5	Decabromodiphenyl oxide	1,282,881	49,617	0	8,550
615-05-4	2,4-Diaminoanisole	0	0	0	0
39156-41-7	2,4-Diaminoanisole sulfate	0	0	0	0
101-80-4	4,4'-Diaminodiphenyl ether	0	0	0	0
25376-45-8	Diaminotoluene (mixed isomers)	0	0	5,527,057	547,000
95-80-7	2,4-Diaminotoluene	0	0	0	8,400
132-64-9	Dibenzofuran	192,924	24,373	0	8,492
96-12-8	1,2-Dibromo-3-chloropropane	0	0	0	0
106-93-4	1,2-Dibromoethane	3,550	2	1,200	2
124-73-2	Dibromotetrafluoroethane (Halon 2402)	0	0	0	0
84-74-2	Dibutyl phthalate	87,500	11,230	658,230	166,163
25321-22-6	Dichlorobenzene (mixed isomers)	769,000	0	460,380	325,362
95-50-1	1,2-Dichlorobenzene	5,498,705	1,618,813	1,041,134	1,101,491
541-73-1	1,3-Dichlorobenzene	360	800	117,000	0
106-46-7	1,4-Dichlorobenzene	1,044,855	4	292,145	18,525
91-94-1	3,3'-Dichlorobenzidine	0	0	0	0
75-27-4	Dichlorobromomethane	0	0	0	0
75-71-8	Dichlorodifluoromethane (CFC-12)	1,155,150	118,984	0	2,836
107-06-2	1,2-Dichloroethane	63,246,628	20,100,792	33,544,750	342,418

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
C.I. Solvent Yellow 3	0	0	0	2	0
Cadmium	301,920	56,070	597,394	1,279,280	1,100
Calcium cyanamide	0	0	53,005	53,005	0
Captan	12,000	3,603	19,403	36,283	200
Carbaryl	994,705	10,972	6,892	1,043,086	0
Carbon disulfide	8,287,633	349,984	89,223,077	121,000,893	5,406
Carbon tetrachloride	15,074,894	840,933	1,649,063	34,169,399	101,757
Carbonyl sulfide	6,949,151	0	16,719,646	26,064,918	0
Catechol	28,591,989	329,154	458,499	62,774,958	441
Chlordane	7,000	130	1,410	9,040	0
Chlorine	298,236,718	1,186,637	78,875,756	481,023,278	115,533
Chlorine dioxide	31,827,326	75	3,978,197	37,647,953	1,362
Chloroacetic acid	906,317	4,779	27,302	965,696	0
2-Chloroacetophenone	0	0	2	240,002	0
Chlorobenzene	2,343,144	3,783,313	2,694,828	85,380,459	29,728
Chloroethane	18,553,147	310,486	2,884,899	74,476,124	4,310
Chloroform	26,581,978	2,007,797	19,739,220	60,753,838	124,714
Chloromethane	9,807,000	2,880,895	5,962,158	24,942,007	12,944
Chloromethyl methyl ether	39,600	0	3,333	42,933	0
Chloroprene	8,095,215	201,550	1,545,363	10,430,122	12,140
Chlorothalonil	1,979	3,515	209,773	218,554	6
Chromium	1,672,436	1,971,783	5,312,357	127,099,520	83,117
Cobalt	104,911	44,063	575,993	10,911,566	1,744
Copper	3,718,997	4,296,749	39,995,968	982,941,726	196,626
Creosote	158,282	494,037	3,557,867	19,785,852	722,369
p-Cresidine	697	18,380	3,037	22,114	0
Cresol (mixed isomers)	5,819,640	241,048	2,144,262	12,479,989	46,905
m-Cresol	184,313	50,943	707,786	2,659,661	66
o-Cresol	21,215	74,184	101,756	712,143	4,813
p-Cresol	133,758	1,087,453	410,223	2,192,598	1,050
Cumene	4,055,098	193,667	3,396,129	20,837,672	7,892
Cumene hydroperoxide	553,898	7,809	545,286	1,134,011	0
Cupferron	0	1,200	1,200	2,400	0
Cyclohexane	29,137,068	1,098,588	17,840,283	225,715,577	27,946
2,4-D (acetic acid)	101,271	104,940	21,225	266,982	8
Decabromodiphenyl oxide	32,350	333,841	699,488	2,406,727	40,002
2,4-Diaminoanisole	0	0	84	84	0
2,4-Diaminoanisole sulfate	0	0	60	60	0
4,4'-Diaminodiphenyl ether	126	3,964	1,158	5,248	2
Diaminotoluene (mixed isomers)	307,055	649,193	45,902	7,076,207	12
2,4-Diaminotoluene	0	620	4,905	13,925	12,000
Dibenzofuran	5,000,415	16,969	140,304	5,383,477	3,192
1,2-Dibromo-3-chloropropane	0	0	290	290	0
1,2-Dibromoethane	2,362	1,557	39,290	47,963	0
Dibromotetrafluoroethane (Halon 2402)	0	0	141	141	6,300
Dibutyl phthalate	196,688	90,180	374,257	1,584,248	4,400
Dichlorobenzene (mixed isomers)	225,964	118,619	77,890	1,977,215	5,977
1,2-Dichlorobenzene	1,022,472	2,484,569	479,928	13,247,112	49,174
1,3-Dichlorobenzene	25	3,816	5,566	127,567	100
1,4-Dichlorobenzene	2,796	91,972	340,448	1,790,745	19,527
3,3'-Dichlorobenzidine	2,666	19,014	4,900	26,580	0
Dichlorobromomethane	1	0	200	201	0
Dichlorodifluoromethane (CFC-12)	538,074	135,841	15,121,234	17,072,119	288,242
1,2-Dichloroethane	79,445,841	5,479,660	4,003,821	206,163,910	65,194

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991, Continued.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
540-59-0	1,2-Dichloroethylene	166,000	2,000	1,990,182	0
75-09-2	Dichloromethane	182,108,296	26,224,925	14,270,049	6,066,234
120-83-2	2,4-Dichlorophenol	1,695,856	0	0	750
78-87-5	1,2-Dichloropropane	23,971,016	0	18,100,000	0
78-88-6	2,3-Dichloropropene	1,400,000	0	290,000	0
542-75-6	1,3-Dichloropropylene	2,139,000	0	17,410,000	0
76-14-2	Dichlorotetrafluoroethane (CFC-114)	2,439,175	0	0	0
62-73-7	Dichlorvos	15	0	0	0
115-32-2	Dicofol	34	0	0	0
1464-53-5	Diepoxybutane	0	0	68,000	0
111-42-2	Diethanolamine	129,475	290,162,457	23,159	168,704
117-81-7	Di-(2-ethylhexyl) phthalate	632,549	960,722	555,060	305,846
84-66-2	Diethyl phthalate	330,527	218,770	120,930	12,866
64-67-5	Diethyl sulfate	0	7,100,000	0	50
119-90-4	3,3'-Dimethoxybenzidine	0	0	0	0
57-14-7	1,1-Dimethyl hydrazine	0	3	0	0
105-67-9	2,4-Dimethylphenol	233,175	0	1,021,097	21,737
131-11-3	Dimethyl phthalate	5,100	0	638,300	23,000
77-78-1	Dimethyl sulfate	0	0	0	0
99-65-0	m-Dinitrobenzene	0	0	0	0
528-29-0	o-Dinitrobenzene	0	0	0	0
100-25-4	p-Dinitrobenzene	0	0	0	0
534-52-1	4,6-Dinitro-o-cresol	7	0	322,831	100
51-28-5	2,4-Dinitrophenol	0	0	40,003	0
121-14-2	2,4-Dinitrotoluene	0	0	191,000	150,000
606-20-2	2,6-Dinitrotoluene	0	0	0	0
25321-14-6	Dinitrotoluene (mixed isomers)	0	0	140,000	0
117-84-0	n-Dioctyl phthalate	113,506	64,964	0	21,982
123-91-1	1,4-Dioxane	243,685	41,427	242,907	281,040
106-89-8	Epichlorohydrin	7,085,172	0	321,963	12,469
110-80-5	2-Ethoxyethanol	787,572	22,136	1,443,183	250,869
140-88-5	Ethyl acrylate	170,760	8,470	5,683,198	782,437
100-41-4	Ethylbenzene	13,411,266	3,891,948	64,124,373	8,890,416
541-41-3	Ethyl chloroformate	0	0	0	1,200
74-85-1	Ethylene	373,576,147	0	413,351,136	18,039,963
107-21-1	Ethylene glycol	304,686,059	89,881,367	4,840,047	4,315,400
75-21-8	Ethylene oxide	409,742	276	300,669	0
96-45-7	Ethylene thiourea	0	0	0	834
2164-17-2	Fluometuron	0	0	0	0
50-00-0	Formaldehyde	151,962,186	84,020	15,022,870	162,522
76-13-1	Freon 113	38,428,078	8,150,576	404,431	556,864
76-44-8	Heptachlor	0	0	0	0
118-74-1	Hexachlorobenzene	350,000	1	340,000	0
87-68-3	Hexachloro-1,3-butadiene	566,000	0	0	0
77-47-4	Hexachlorocyclopentadiene	0	0	0	3,800
67-72-1	Hexachloroethane	1,670,000	0	508,000	39,000
302-01-2	Hydrazine	30,300	3	0	38,000
10034-93-2	Hydrazine sulfate	0	0	0	0
7647-01-0	Hydrochloric acid	115,138,071	69,481,240	3,600	1,738
74-90-8	Hydrogen cyanide	59,247	0	22,589,396	18
7664-39-3	Hydrogen fluoride	90,063,658	338,535	6,250	640
123-31-9	Hydroquinone	103,615	0	109,953	4,132
78-84-2	Isobutyraldehyde	900,000	0	2,057,865	563,277
67-63-0	Isopropyl alcohol (manufacturing)	142,915	40,661	6,971,566	266,982

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
1,2-Dichloroethylene	4,685,579	149	41,971	6,885,881	2,830
Dichloromethane	34,185,873	10,528,620	80,189,944	353,573,941	490,093
2,4-Dichlorophenol	198,451	0	34,198	1,929,255	581
1,2-Dichloropropane	4,512,537	6,852	789,405	47,379,810	4
2,3-Dichloropropene	338,000	450,000	12,206	2,490,206	0
1,3-Dichloropropylene	250,577	920	20,521	19,821,018	96
Dichlorotetrafluoroethane (CFC-114)	35,000	14,000	1,914,392	4,402,567	7,007
Dichlorvos	18	2,215	1,530	3,778	0
Dicofol	0	12	5	51	0
Diepoxybutane	0	0	0	68,000	0
Diethanolamine	3,587,721	1,544,975	1,291,566	296,908,057	2,005
Di-(2-ethylhexyl) phthalate	474,892	178,949	2,110,679	5,218,697	11,777
Diethyl phthalate	365,207	490,833	196,670	1,735,803	2,400
Diethyl sulfate	7,498	1,139	4,322	7,113,009	0
3,3'-Dimethoxybenzidine	40	0	4	44	0
1,1-Dimethyl hydrazine	3,097	6,338	489	9,927	1
2,4-Dimethylphenol	142,070	3,221	112,759	1,534,059	213
Dimethyl phthalate	231,068	90,983	119,519	1,107,970	450
Dimethyl sulfate	1,185,665	12	9,599	1,195,276	0
m-Dinitrobenzene	756,855	0	1,628	758,483	25,522
o-Dinitrobenzene	203,312	0	693	204,005	3
p-Dinitrobenzene	26,713	0	162	26,875	2
4,6-Dinitro-o-cresol	30,080	26,500	11,549	391,067	10
2,4-Dinitrophenol	239,323	30	64,710	344,066	0
2,4-Dinitrotoluene	181,970	700	8,641	532,311	0
2,6-Dinitrotoluene	90,500	178	2,200	92,878	0
Dinitrotoluene (mixed isomers)	239,804	901,789	75,248	1,356,841	4
n-Dioctyl phthalate	22,104	22,888	132,373	377,817	330
1,4-Dioxane	1,532,321	792,119	1,103,776	4,237,275	57
Epichlorohydrin	12,451,808	926,506	478,344	21,276,262	1,747
2-Ethoxyethanol	1,194,976	231,883	664,408	4,595,027	79,509
Ethyl acrylate	711,507	177,569	252,163	7,786,104	6,400
Ethylbenzene	9,448,914	1,051,964	9,565,158	110,384,039	54,164
Ethyl chloroformate	78,075	390	1,801	81,466	0
Ethylene	408,736,057	897,766	37,235,717	1,251,836,786	967,102
Ethylene glycol	151,084,348	72,211,672	23,950,078	650,968,971	429,786
Ethylene oxide	5,588,024	66,365	1,899,453	8,264,529	19,926
Ethylene thiourea	10	1,862	16,053	18,759	0
Fluometuron	0	12,450	1,950	14,400	15,000
Formaldehyde	95,071,775	4,268,664	17,446,887	284,018,924	701,388
Freon 113	12,454,301	1,034,760	33,589,244	94,618,254	51,871
Heptachlor	0	4	1	5	0
Hexachlorobenzene	3,376,840	342,241	1,138,670	5,547,752	2,219
Hexachloro-1,3-butadiene	9,995,723	1,709,381	8,607	12,279,711	450,005
Hexachlorocyclopentadiene	178,000	28,718	28,415	238,933	50
Hexachloroethane	4,554,946	165,944	37,403	6,975,293	45,034
Hydrazine	98,075	18,925	32,146	217,449	0
Hydrazine sulfate	0	0	150,002	150,002	0
Hydrochloric acid	1,987,515,900	56,241,684	285,888,060	2,514,270,293	554,365
Hydrogen cyanide	7,404,268	176	2,202,588	32,255,693	807
Hydrogen fluoride	124,400,903	2,482,376	9,839,263	227,131,625	5,009
Hydroquinone	396,182	398,008	285,742	1,297,632	115
Isobutyraldehyde	285,896	71,754	189,000	4,067,792	8
Isopropyl alcohol (manufacturing)	6,224,655	105,524	1,487,258	15,239,561	34,768

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991, Continued.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
80-05-7	4,4'-Isopropylidenediphenol	3,424	18,337	12,260,865	85,974
120-58-1	Isosafrole	0	0	0	0
7439-92-1	Lead	107,175,655	48,534,922	0	14,746
58-89-9	Lindane	518	0	0	0
108-31-6	Maleic anhydride	130,130	47	2,370,836	36,390
12427-38-2	Maneb	326	0	0	0
7439-96-5	Manganese	17,237,590	68,197,746	0	3,004
7439-97-6	Mercury	1,236,162	210,434	0	0
67-56-1	Methanol	755,239,883	15,026,446	346,497,993	71,372,795
72-43-5	Methoxychlor	0	0	0	0
109-86-4	2-Methoxyethanol	3,858,560	8,289	1,411,613	725,921
96-33-3	Methyl acrylate	0	13,000	260,324	180,737
1634-04-4	Methyl tert-butyl ether	448,194	10,918	230,000	990,370
101-14-4	4,4'-Methylenebis(2-chloroaniline)	0	0	0	2,965
101-68-8	Methylenebis(phenylisocyanate)	26,556	422,735	112,824	72,373
74-95-3	Methylene bromide	2,000,000	0	0	0
101-77-9	4,4'-Methylenedianiline	2,000	0	33,024	28,000
78-93-3	Methyl ethyl ketone	864,307,237	24,888,298	94,341,416	38,424,594
60-34-4	Methyl hydrazine	0	0	0	0
74-88-4	Methyl iodide	30	0	2,500	0
108-10-1	Methyl isobutyl ketone	184,837,606	17,952,566	36,906,508	19,306,703
624-83-9	Methyl isocyanate	0	0	0	0
80-62-6	Methyl methacrylate	56,882,336	518,077	3,570,890	1,496,143
90-94-8	Michler's ketone	0	0	0	703
1313-27-5	Molybdenum trioxide	5,503,205	2,707,629	0	12
76-15-3	Monochloropentafluoroethane (CFC-115)	28,300	0	0	0
91-20-3	Naphthalene	10,909,619	334,569	3,920,377	1,496,297
134-32-7	alpha-Naphthylamine	0	0	0	0
7440-02-0	Nickel	25,335,425	54,080,127	0	5,382
7697-37-2	Nitric acid	273,024,584	2,510,301	0	620
139-13-9	Nitrilotriacetic acid	0	0	0	0
99-59-2	5-Nitro-o-anisidine	0	0	0	0
98-95-3	Nitrobenzene	2,878,230	0	4,507,114	424,004
55-63-0	Nitroglycerin	24,711	0	0	8
88-75-5	2-Nitrophenol	0	0	0	0
100-02-7	4-Nitrophenol	0	0	2,000	0
79-46-9	2-Nitropropane	0	5,400	2,213,299	12,804
156-10-5	p-Nitrosodiphenylamine	0	0	18,000	2,200
121-69-7	N,N-Dimethylaniline	43,692	0	0	489,869
86-30-6	N-Nitrosodiphenylamine	0	0	0	0
56-38-2	Parathion	130	0	0	0
87-86-5	Pentachlorophenol	52,221	2,001	7,800	1,189,577
79-21-0	Peracetic acid	21,060	0	0	0
108-95-2	Phenol	66,093,239	992,279	23,114,311	1,490,413
106-50-3	p-Phenylenediamine	0	0	0	0
90-43-7	2-Phenylphenol	0	0	27	31
75-44-5	Phosgene	0	0	100,128	0
7664-38-2	Phosphoric acid	42,654,131	10,463,531	7,463	14,472
7723-14-0	Phosphorus (yellow or white)	793,608	194,690	0	0
85-44-9	Phthalic anhydride	1,804,546	0	3,396,807	4,561,112
88-89-1	Picric acid	0	0	43,003	35,000
1336-36-3	Polychlorinated biphenyls (PCBs)	0	0	0	0
123-38-6	Propionaldehyde	68,517	0	2,577,021	0
114-26-1	Propoxur	0	0	0	0

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
4,4'-Isopropylidenediphenol	2,187,911	91,425	1,075,149	15,723,085	13,300
Isosafrole	0	2	2	4	0
Lead	2,193,348	1,509,856	9,393,695	168,822,222	154,451
Lindane	1,500	213	393	2,624	100
Maleic anhydride	28,501,365	699,649	463,004	32,201,421	5,541
Maneb	3,600	0	413	4,339	0
Manganese	1,568,413	989,270	22,633,135	110,629,158	7,342
Mercury	28,356	46,079	83,333	1,604,364	5,279
Methanol	908,629,441	113,696,524	274,052,271	2,484,515,353	460,732
Methoxychlor	133	161	105	399	0
2-Methoxyethanol	5,596,958	788,769	2,189,282	14,579,392	717
Methyl acrylate	1,289,503	42,452	242,592	2,028,608	42,054
Methyl tert-butyl ether	843,536	143,168	2,906,134	5,572,320	11,435
4,4'-Methylenebis(2-chloroaniline)	10	386	1,113	4,474	0
Methylenebis(phenylisocyanate)	255,941	613,229	1,958,277	3,461,935	5,814
Methylene bromide	285,224	5,417	51,207	2,341,848	0
4,4'-Methylenedianiline	356,543	33,088	57,976	510,631	33
Methyl ethyl ketone	45,423,894	7,757,468	102,309,424	1,177,452,331	164,607
Methyl hydrazine	16	0	0	16	0
Methyl iodide	43,630	5	25,765	71,930	0
Methyl isobutyl ketone	11,765,185	2,532,919	28,194,835	301,496,322	57,244
Methyl isocyanate	167,410	0	22,641	190,051	1
Methyl methacrylate	3,457,755	764,346	3,108,407	69,797,954	12,248
Michler's ketone	0	0	3	706	0
Molybdenum trioxide	1,229,356	282,842	755,171	10,478,215	0
Monochloropentafluoroethane (CFC-115)	61,000	0	362,770	452,070	7
Naphthalene	20,313,626	636,042	5,110,251	42,720,781	403,721
alpha-Naphthylamine	0	0	2	2	0
Nickel	1,769,176	1,252,338	3,498,010	85,940,458	4,127
Nitric acid	193,661,500	26,691,465	29,235,035	525,123,505	51,652
Nitrilotriacetic acid	804,340	0	12,000	816,340	1
5-Nitro-o-anisidine	48	3	52	103	0
Nitrobenzene	328,302	40,147	523,517	8,701,314	61,146
Nitroglycerin	357,420	92,807	40,809	515,755	0
2-Nitrophenol	41,616	11,340	263	53,219	99
4-Nitrophenol	114,000	581,307	10,130	707,437	0
2-Nitropropane	29,921	2,837	276,365	2,540,626	0
p-Nitrosodiphenylamine	0	0	4,724	24,924	0
N,N-Dimethylaniline	202,500	271,018	100,848	1,107,927	1
N-Nitrosodiphenylamine	0	470,000	0	470,000	0
Parathion	24	100	2,097	2,351	10
Pentachlorophenol	14,799	66,021	23,540	1,355,959	148
Peracetic acid	16,478	49	6,148	43,735	0
Phenol	23,424,780	5,939,412	13,151,029	134,205,463	64,523
p-Phenylenediamine	233,372	2,989	20,402	256,763	0
2-Phenylphenol	9,786	2,944	11,740	24,528	0
Phosgene	7,277,282	1,695	4,988	7,384,093	376
Phosphoric acid	388,737,290	5,591,044	166,538,605	614,006,536	93,946
Phosphorus (yellow or white)	35,671	3,339	364,462	1,391,770	248
Phthalic anhydride	14,084,952	375,666	740,274	24,963,357	254,523
Picric acid	1,500	465	1,634,501	1,714,469	0
Polychlorinated biphenyls (PCBs)	2,422,736	412,339	12,949	2,848,024	801
Propionaldehyde	973,343	13,172	1,456,534	5,088,587	3,125
Propoxur	30	41	120	191	0

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991, Continued.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
115-07-1	Propylene	423,397,754	400	710,551,553	2,888,300
75-55-8	Propyleneimine	0	0	0	0
75-56-9	Propylene oxide	66,250	490	11,839,820	1,356,901
110-86-1	Pyridine	4,853,632	0	764,655	198,462
91-22-5	Quinoline	8,292	0	236,001	1,307
106-51-4	Quinone	0	0	73,530	0
82-68-8	Quintozene	1,399	0	0	0
81-07-2	Saccharin (manufacturing)	0	0	0	0
7782-49-2	Selenium	275	46,378	0	0
7440-22-4	Silver	961,016	1,061,670	0	0
100-42-5	Styrene	175,897,839	2,051,733	28,800,292	8,343,383
96-09-3	Styrene oxide	2,210	0	75,000	0
7664-93-9	Sulfuric acid	2,971,421,150	1,168,804,572	63,405	27,466
79-34-5	1,1,2,2-Tetrachloroethane	7,000,896	852,909	1,000,000	32,000
127-18-4	Tetrachloroethylene	118,584,078	9,035,196	4,013,084	1,504,622
961-11-5	Tetrachlorvinphos	0	0	0	0
7440-28-0	Thallium	109	0	0	0
62-55-5	Thioacetamide	0	0	0	0
62-56-6	Thiourea	0	335	0	0
1314-20-1	Thorium dioxide	0	0	0	0
7550-45-0	Titanium tetrachloride	0	0	0	3,688
108-88-3	Toluene	1,118,482,253	24,557,245	254,980,246	86,805,609
584-84-9	Toluene-2,4-diisocyanate	855	10,948	35,394	26,931
91-08-7	Toluene-2,6-diisocyanate	68	1,800	8,849	10
26471-62-5	Toluenediisocyanate (mixed isomers)	9,710	11,129	7,000,396	17,949
95-53-4	o-Toluidine	1,130,001	0	193,880	161,600
52-68-6	Trichlorfon	90	0	0	0
120-82-1	1,2,4-Trichlorobenzene	48,567	153,144	2,115,121	84,043
71-55-6	1,1,1-Trichloroethane	204,077,933	28,751,600	14,001,816	3,913,519
79-00-5	1,1,2-Trichloroethane	12,500,000	7,917,850	12,897,170	0
79-01-6	Trichloroethylene	253,517,471	7,446,327	6,188,130	1,045,752
75-69-4	Trichlorofluoromethane (CFC-11)	51,196,415	169,952	0	135,077
95-95-4	2,4,5-Trichlorophenol	0	0	0	0
88-06-2	2,4,6-Trichlorophenol	0	0	0	0
1582-09-8	Trifluralin	1,320	0	0	0
95-63-6	1,2,4-Trimethylbenzene	10,579,279	517,663	2,872,790	1,840,129
51-79-6	Urethane	0	0	0	0
7440-62-2	Vanadium (fume or dust)	204,000	149,573	0	0
108-05-4	Vinyl acetate	268,332	22	18,299,865	3,662,152
593-60-2	Vinyl bromide	0	0	0	0
75-01-4	Vinyl chloride	158,902,260	236,549	26,360,193	0
75-35-4	Vinylidene chloride	583,500	0	177,709	0
1330-20-7	Xylene (mixed isomers)	203,232,878	33,656,703	176,910,275	75,074,433
108-38-3	m-Xylene	1,317,099	32,989	515,889	66,612
95-47-6	o-Xylene	1,590,087	10,350	39,605,761	2,803,861
106-42-3	p-Xylene	940,964	1,265	104,776	111,936
87-62-7	2,6-Xylidine	0	0	0	0
7440-66-6	Zinc (fume or dust)	14,301,992	63,661,338	0	108,822
12122-67-7	Zineb	0	0	0	0
	Antimony compounds	4,190,189	2,114,000	0	75,602
	Arsenic compounds	3,376,528	949,028	0	141
	Barium compounds	18,378,282	999,880	6,102	253,297
	Beryllium compounds	22,000	7,210	0	0
	Cadmium compounds	3,791,460	1,790,381	0	7,504

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
Propylene	464,419,038	724,123	21,564,865	1,623,546,033	1,805,211
Propyleneimine	95	0	413	508	0
Propylene oxide	6,728,657	21,831	1,086,594	21,100,543	17,954
Pyridine	2,007,022	366,441	576,810	8,767,022	353
Quinoline	31,065	4,310	71,570	352,545	73
Quinone	151,600	0	4,004	229,134	0
Quintozene	0	61,410	1,361	64,170	0
Saccharin (manufacturing)	10,000	370	1,400	11,770	0
Selenium	4,074	810	5,221	56,758	0
Silver	724,317	1,719	126,314	2,875,036	0
Styrene	9,494,938	3,122,162	28,884,115	256,594,462	442,670
Styrene oxide	43,932	0	1,571	122,713	0
Sulfuric acid	2,733,731,874	261,105,871	283,483,678	7,418,638,016	9,903,100
1,1,2,2-Tetrachloroethane	17,463,961	180,608	65,768	26,596,142	10
Tetrachloroethylene	15,284,084	3,305,286	16,407,683	168,134,033	221,631
Tetrachlorvinphos	0	26,300	6,882	33,182	0
Thallium	5,298	0	985	6,392	0
Thioacetamide	31,000	0	0	31,000	0
Thiourea	756	12,666	18,798	32,555	0
Thorium dioxide	0	0	102,749	102,749	0
Titanium tetrachloride	24,931,111	2,133,598	243,074	27,311,471	3,607
Toluene	128,268,450	13,865,706	196,784,903	1,823,744,412	666,612
Toluene-2,4-diisocyanate	13,606	37,526	1,467,006	1,592,266	894
Toluene-2,6-diisocyanate	1,291	6,085	364,476	382,579	223
Toluenediisocyanate (mixed isomers)	12,676	207,730	38,400	7,297,990	10,673
o-Toluidine	116,413	12,086	39,916	1,653,896	1,328
Trichlorfon	219	1,145	141	1,595	13
1,2,4-Trichlorobenzene	592,603	424,563	486,669	3,904,710	1,515
1,1,1-Trichloroethane	3,047,769	5,253,041	132,160,136	391,205,814	293,081
1,1,2-Trichloroethane	30,737,565	5,358,381	538,029	69,948,995	3,629
Trichloroethylene	4,886,629	2,630,021	34,532,204	310,246,534	161,449
Trichlorofluoromethane (CFC-11)	158,292	180,035	11,935,150	63,774,921	60,800
2,4,5-Trichlorophenol	28,000	0	0	28,000	0
2,4,6-Trichlorophenol	742,684	0	82	742,766	0
Trifluralin	1,950	25,265	64,959	93,494	224
1,2,4-Trimethylbenzene	8,418,511	342,982	5,379,986	29,951,340	17,810
Urethane	0	15,300	5,300	20,600	2,500
Vanadium (fume or dust)	198,589	860	488,049	1,041,071	0
Vinyl acetate	8,987,168	283,756	8,743,998	40,245,293	23,884
Vinyl bromide	330,000	0	3,600	333,600	0
Vinyl chloride	34,888,514	130,526	1,017,049	221,535,091	51,456
Vinylidene chloride	4,374,008	74,619	270,541	5,480,377	1,327
Xylene (mixed isomers)	32,953,777	11,623,545	114,334,033	647,785,644	615,512
m-Xylene	503,442	107,184	1,533,942	4,077,157	3,779
o-Xylene	15,579,611	205,507	1,728,058	61,523,235	11,842
p-Xylene	143,558	58,749	5,368,692	6,729,940	2,029
2,6-Xylidine	1,384	0	12	1,396	0
Zinc (fume or dust)	1,078,882	2,600,684	14,974,953	96,726,671	50,838
Zineb	0	2	10	12	0
Antimony compounds	12,841,148	246,743	3,227,554	22,695,236	124,398
Arsenic compounds	391,058	500,470	4,149,954	9,367,179	16,200
Barium compounds	2,669,418	3,749,327	20,086,332	46,142,638	73,471
Beryllium compounds	0	611	31,801	61,622	0
Cadmium compounds	410,413	301,489	637,968	6,939,215	114,033

Table 2-5. TRI Data Collected under the Pollution Prevention Act, by Chemical, 1991, Continued.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds
	Chlorophenols	2,007,786	0	21,000	4,273
	Chromium compounds	52,384,427	28,022,971	0	74,778
	Cobalt compounds	539,577	1,296,538	2	2,630
	Copper compounds	62,522,745	114,991,063	40	225,860
	Cyanide compounds	3,756,207	38,280	260,040	6
	Glycol ethers	17,576,034	3,978,151	21,932,134	12,472,029
	Lead compounds	666,910,750	224,964,761	116,475	55,085
	Manganese compounds	34,748,470	29,413,152	0	36,002
	Mercury compounds	46,763	63,813	0	3,241
	Nickel compounds	23,266,310	24,657,694	0	4,247
	Selenium compounds	146,320	22,910	0	0
	Silver compounds	1,711,699	1,195,554	0	0
	Thallium compounds	1,000	1,500	0	0
	Zinc compounds	218,519,583	155,616,570	260,584	558,574
	Mixtures and other trade names	32,801	1,573,309	126,272,110	768
	Trade Secrets(e)	900,000,000	30,000	390,000	2,000
	Total	16,379,108,682	3,261,980,931	3,186,795,733	497,757,471

Chemical	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released(b) Pounds	Total Production Related Wastes(c) Pounds	Non-Production Related Wastes(d) Pounds
Chlorophenols	1,407	105,675	235,854	2,375,995	1
Chromium compounds	34,025,419	3,000,271	34,767,990	152,275,856	287,078
Cobalt compounds	1,210,890	115,275	482,193	3,647,105	5,337
Copper compounds	101,927,104	1,961,933	46,287,976	327,916,721	389,649
Cyanide compounds	43,123,280	418,798	4,852,857	52,449,468	2,701
Glycol ethers	19,168,317	9,276,458	46,952,235	131,355,358	441,221
Lead compounds	40,049,865	4,209,180	26,062,277	962,368,393	676,323
Manganese compounds	572,185	8,544,482	85,599,347	158,913,638	4,302,300
Mercury compounds	7,497	18,718	15,453	155,485	20
Nickel compounds	17,776,097	1,340,727	5,210,092	72,255,167	141,331
Selenium compounds	65,000	48,943	126,351	409,524	34
Silver compounds	587,032	1,784	612,297	4,108,366	292
Thallium compounds	0	0	1,000	3,500	0
Zinc compounds	124,287,132	21,298,188	153,846,469	674,387,100	648,431
Mixtures and other trade names	173,799	480,353	529,678	129,062,818	100,304
Trade Secrets	600,000	25,054	10,848	901,057,902	0
Total	9,783,374,620	874,285,432	3,771,194,892	37,754,497,761	31,451,032

Tables 2-6 through 2-9 show the top 25 toxic chemicals (by quantity) in each category of the waste management hierarchy: recycle; energy recovery; treatment; and release (including disposal). Sulfuric acid was reported as recycled in the greatest quantity, both on-site and off-site. Propylene was reported as combusted in the greatest quantity for the purposes of energy recovery in total as well as on-site. Toluene (#4 overall) was reported as transferred off-site for the purposes of energy recovery in the greatest quantity. Sulfuric acid was reported as the greatest quantity treated, both on-site and off-site. The top 25 chemicals released (including off-site disposal) are listed in Table 2-9. Comparing this group of chemicals to the top 50 chemicals released on-site shows that these 25 include the top 22 released on-site (presented in Table 1-10 in Chapter 1). The relative rankings are different due to the inclusion of off-site disposal in the quantities released as presented in this chapter.

Table 2-6. Top 25 TRI Chemicals Reported as Recycled, 1991.

CAS Number	Chemical	Recycled On-site Pounds	Recycled Off-site Pounds	Total Recycled Pounds
7664-93-9	Sulfuric acid	2,971,421,150	1,168,804,572	4,140,225,722
75-05-8	Acetonitrile	2,421,520,190	5,153,900	2,426,674,090
108-88-3	Toluene	1,118,482,253	24,557,245	1,143,039,498
7440-50-8	Copper	584,266,533	350,356,528	934,623,061
	Trade Secrets(e)	900,000,000	30,000	900,030,000
	Lead compounds	666,910,750	224,964,761	891,875,511
78-93-3	Methyl ethyl ketone	864,307,237	24,888,298	889,195,535
67-56-1	Methanol	755,239,883	15,026,446	770,266,329
115-07-1	Propylene	423,397,754	400	423,398,154
107-21-1	Ethylene glycol	304,686,059	89,881,367	394,567,426
	Zinc compounds	218,519,583	155,616,570	374,136,153
74-85-1	Ethylene	373,576,147	0	373,576,147
111-42-2	Diethanolamine	129,475	290,162,457	290,291,932
67-64-1	Acetone	268,728,692	18,262,490	286,991,182
7697-37-2	Nitric acid	273,024,584	2,510,301	275,534,885
106-99-0	1,3-Butadiene	250,467,140	18,124,104	268,591,244
7664-41-7	Ammonia	258,127,545	7,697,327	265,824,872
79-01-6	Trichloroethylene	253,517,471	7,446,327	260,963,798
1330-20-7	Xylene (mixed isomers)	203,232,878	33,656,703	236,889,581
71-55-6	1,1,1-Trichloroethane	204,077,933	28,751,600	232,829,533
75-09-2	Dichloromethane	182,108,296	26,224,925	208,333,221
108-10-1	Methyl isobutyl ketone	184,837,606	17,952,566	202,790,172
71-43-2	Benzene	196,393,605	1,414,752	197,808,357
7647-01-0	Hydrochloric acid	115,138,071	69,481,240	184,619,311
100-42-5	Styrene	175,897,839	2,051,733	177,949,572
	Subtotal	14,168,008,674	2,583,016,612	16,751,025,286
	Total for All TRI Chemicals	16,379,108,682	3,261,980,931	19,641,089,613

Table 2-7. Top 25 TRI Chemicals Reported as Combusted for Energy Recovery, 1991.

CAS Number	Chemical	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds	Total Energy Recovery Pounds
115-07-1	Propylene	710,551,553	2,888,300	713,439,853
74-85-1	Ethylene	413,351,136	18,039,963	431,391,099
67-56-1	Methanol	346,497,993	71,372,795	417,870,788
108-88-3	Toluene	254,980,246	86,805,609	341,785,855
1330-20-7	Xylene (mixed isomers)	176,910,275	75,074,433	251,984,708
67-64-1	Acetone	134,433,568	42,758,635	177,192,203
78-93-3	Methyl ethyl ketone	94,341,416	38,424,594	132,766,010
	Mixtures and other trade names	126,272,110	768	126,272,878
106-99-0	1,3-Butadiene	77,705,621	47,154	77,752,775
100-41-4	Ethylbenzene	64,124,373	8,890,416	73,014,789
75-65-0	tert-Butyl alcohol	43,721,233	26,858,983	70,580,216
108-10-1	Methyl isobutyl ketone	36,906,508	19,306,703	56,213,211
95-47-6	o-Xylene	39,605,761	2,803,861	42,409,622
7664-41-7	Ammonia	40,686,457	337,774	41,024,231
71-43-2	Benzene	33,714,288	4,932,365	38,646,653
100-42-5	Styrene	28,800,292	8,343,383	37,143,675
71-36-3	n-Butyl alcohol	27,563,365	8,139,497	35,702,862
	Glycol ethers	21,932,134	12,472,029	34,404,163
107-06-2	1,2-Dichloroethane	33,544,750	342,418	33,887,168
120-80-9	Catechol	31,816,947	308,304	32,125,251
75-05-8	Acetonitrile	27,510,882	2,776,771	30,287,653
75-01-4	Vinyl chloride	26,360,193	0	26,360,193
108-95-2	Phenol	23,114,311	1,490,413	24,604,724
74-90-8	Hydrogen cyanide	22,589,396	18	22,589,414
108-05-4	Vinyl acetate	18,299,865	3,662,152	21,962,017
	Subtotal	2,855,334,673	436,077,338	3,291,412,011
	Total for All TRI Chemicals	3,186,795,733	497,757,471	3,684,553,204

Table 2-8. Top 25 TRI Chemicals Reported as Treated, 1991.

CAS Number	Chemical	Treated On-site Pounds	Treated Off-site Pounds	Total Treated Pounds
7664-93-9	Sulfuric acid	2,733,731,874	261,105,871	2,994,837,745
7647-01-0	Hydrochloric acid	1,987,515,900	56,241,684	2,043,757,584
67-56-1	Methanol	908,629,441	113,696,524	1,022,325,965
115-07-1	Propylene	464,419,038	724,123	465,143,161
74-85-1	Ethylene	408,736,057	897,766	409,633,823
7664-38-2	Phosphoric acid	388,737,290	5,591,044	394,328,334
7664-41-7	Ammonia	306,924,511	65,253,002	372,177,513
7782-50-5	Chlorine	298,236,718	1,186,637	299,423,355
107-21-1	Ethylene glycol	151,084,348	72,211,672	223,296,020
7697-37-2	Nitric acid	193,661,500	26,691,465	220,352,965
	Zinc compounds	124,287,132	21,298,188	145,585,320
108-88-3	Toluene	128,268,450	13,865,706	142,134,156
67-64-1	Acetone	117,452,577	23,052,335	140,504,912
7664-39-3	Hydrogen fluoride	124,400,903	2,482,376	126,883,279
	Copper compounds	101,927,104	1,961,933	103,889,037
50-00-0	Formaldehyde	95,071,775	4,268,664	99,340,439
107-06-2	1,2-Dichloroethane	79,445,841	5,479,660	84,925,501
78-93-3	Methyl ethyl ketone	45,423,894	7,757,468	53,181,362
106-99-0	1,3-Butadiene	51,069,422	1,364,892	52,434,314
75-09-2	Dichloromethane	34,185,873	10,528,620	44,714,493
1330-20-7	Xylene (mixed isomers)	32,953,777	11,623,545	44,577,322
	Lead compounds	40,049,865	4,209,180	44,259,045
	Cyanide compounds	43,123,280	418,798	43,542,078
	Chromium compounds	34,025,419	3,000,271	37,025,690
79-00-5	1,1,2-Trichloroethane	30,737,565	5,358,381	36,095,946
	Subtotal	8,924,099,554	720,269,805	9,644,369,359
	Total for All TRI Chemicals	9,783,374,620	874,285,432	10,657,660,052

Table 2-9. Top 25 Chemicals Reported as Released (Includes Off-site Disposal), 1991.

CAS Number	Chemical	Quantity Released(b) Pounds
7664-41-7	Ammonia	499,483,105
7647-01-0	Hydrochloric acid	285,888,060
7664-93-9	Sulfuric acid	283,483,678
67-56-1	Methanol	274,052,271
108-88-3	Toluene	196,784,903
7664-38-2	Phosphoric acid	166,538,605
67-64-1	Acetone	161,632,499
	Zinc compounds	153,846,469
71-55-6	1,1,1-Trichloroethane	132,160,136
1330-20-7	Xylene (mixed isomers)	114,334,033
78-93-3	Methyl ethyl ketone	102,309,424
75-15-0	Carbon disulfide	89,223,077
	Manganese compounds	85,599,347
75-09-2	Dichloromethane	80,189,944
7782-50-5	Chlorine	78,875,756
79-10-7	Acrylic acid	56,335,783
6484-52-2	Ammonium nitrate (solution)	52,594,025
	Glycol ethers	46,952,235
	Copper compounds	46,287,976
7440-50-8	Copper	39,995,968
7783-20-2	Ammonium sulfate (solution)	39,871,936
74-85-1	Ethylene	37,235,717
	Chromium compounds	34,767,990
79-01-6	Trichloroethylene	34,532,204
71-36-3	n-Butyl alcohol	33,949,277
	Subtotal	3,126,924,418
	Total for All TRI Chemicals	3,771,194,892

Issues Associated with the New Information Required on Form R

As with the first year of data collection under TRI (1987), EPA recognizes that the quality of the data required by the PPA and reported for the first time under TRI in 1991 is questionable. Just as the TRI program developed over time since 1987, the issues and problems associated with the collection of these additional data will be resolved with the help of the public. EPA is currently providing as much guidance as possible through training courses and workshops held across the country.

There are two main issues associated with these new data: (1) how the new data are to be reported and what they mean or do not mean; and (2) how these new data relate to the data collected under TRI prior to 1991. Table 2-8, the top 25 chemicals reported as treated, reveals one of the issues of how the new data are reported. Four of the top 25 chemicals reported as treated are metal compounds: zinc compounds, #11; copper compounds, #15; lead compounds, #22; and chromium compounds, #24. Because the amounts reported should reflect only the parent metal portion of the metal compound, and because the parent metals are not destroyed in on-site treatment, these metal compounds should not be reported as treated on-site. If a facility interprets the quantity treated on-site to represent the amount of the toxic chemical removed from wastes and not the amount of the toxic chemical in wastes destroyed, the facility may double-count the amount of the toxic chemical in wastes and incorrectly categorize the ultimate disposition of the toxic chemical in wastes. Quantities of metals undergoing on-site treatment are not destroyed, but are either released on-site or transferred off-site, and should be reported as such in Section 8 of Form R. If a facility reports a metal both as treated on-site and as released or disposed, this results in the double-counting of the quantity of the metal in waste. Because of this problem, metals should not be reported as treated on-site. Metals can, however, be reported as sent off-site for treatment. This is acceptable, because facilities are only required to report the ultimate known disposition of toxic chemicals transferred off-site and because quantities reported as treated off-site represent the quantities leaving the facility for the purposes of treatment, not the amount actually destroyed off-site. However, it should be realized that parent metals sent off-site for treatment will not be destroyed and will ultimately be released or disposed to the environment.

Further complicating this is the issue of how to report a quantity that is treated and subsequently disposed. In reporting transfers off-site, facilities should report the ultimate known disposition of the toxic chemical. In a situation where a metal is sent off-site and stabilized prior to disposal in a landfill, the quantity of the metal sent off-site should be reported as disposed, not treated, off-site in both Sections 6 and 8 of Form R. There may, however, be situations where the facility transfers the toxic chemical off-site and does not know that it is being landfilled or where it is being landfilled, and the only information available to the facility is the treatment prior to disposal. While the quantity can be reported as a quantity treated off-site, this makes it difficult to clearly categorize or assess the difference between the treatment and release/disposal categories of the waste management hierarchy.

The second issue associated with the new data, how they relate to the data that have been collected under TRI prior to 1991, is evident through comparisons of the information presented in this chapter and the information provided in Chapter 1. The new information reported on Form R

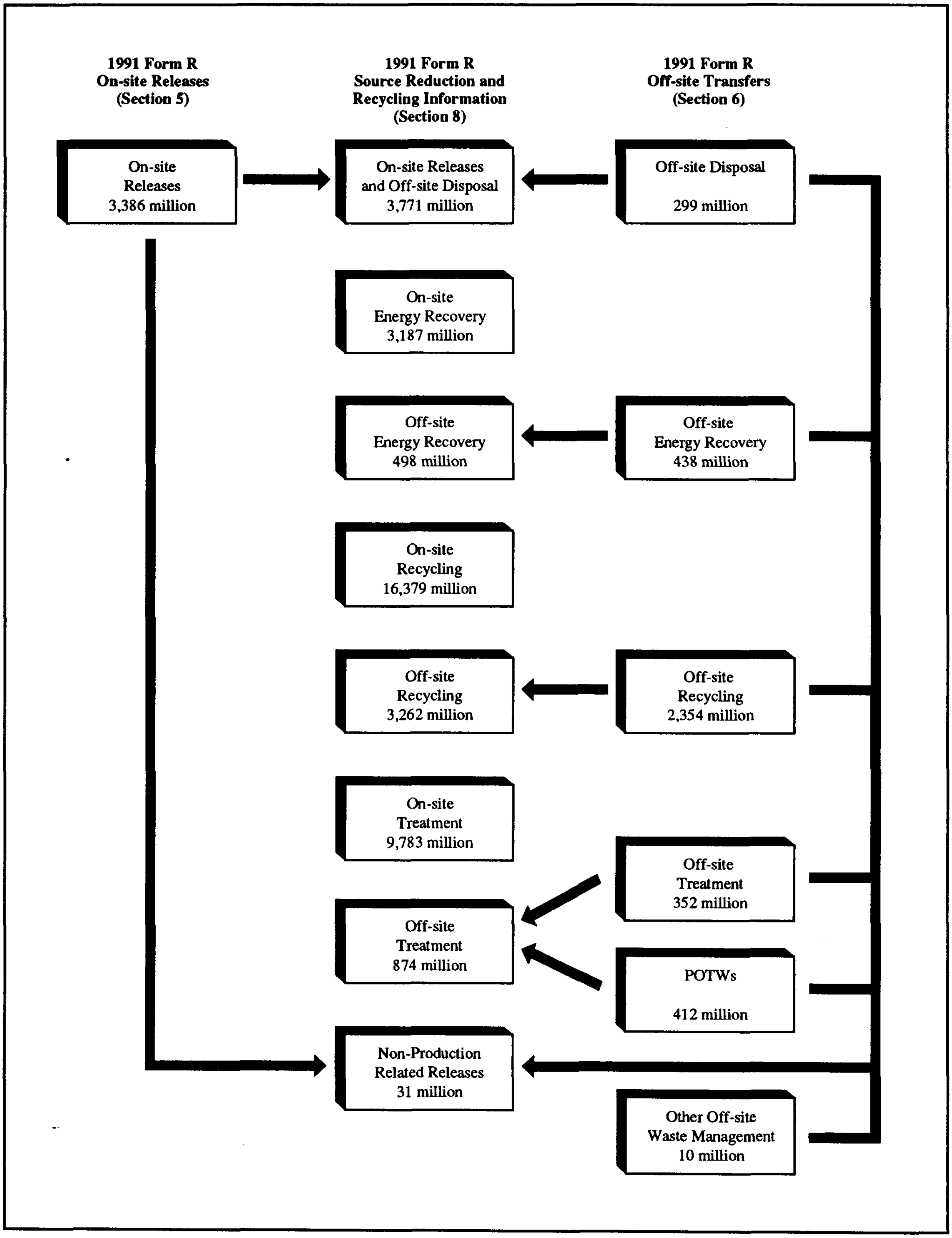


Figure 2-5. Relationship of Data from Various Form R Sections (amounts in pounds).

may not match exactly with the release and transfer information that has been collected since the inception of the TRI program. Figure 2-5 shows how quantities released on-site, quantities transferred off-site, and the new information relate, and the magnitudes of the differences between the reported quantities.

In some cases, information on quantities of the toxic chemicals transferred off-site (reported in Section 6) does not match with the new information (reported in Section 8). Some facilities have reported quantities as sent off-site, but did not provide a code indicating the waste management activity to which the quantity was subject (recycle, energy recovery, treatment, or disposal). Some facilities reported quantities sent off-site, but provided codes that are not in the instructions for Form R; these codes cannot be assigned to any particular off-site activity and, along with the quantities that have no codes, are identified as "other" off-site activities.

Even with the use of valid codes, however, there still may exist some discrepancies. For example, the quantity released (including disposal) as reported in Section 8 of Form R may not equal the sum of the quantities reported as released on-site and the amounts reported as sent off-site for disposal (reported in Sections 5 and 6, respectively). EPA believes that this is a problem in relating the data that should be reported in different sections of Form R that will be reduced over time.

The largest discrepancy in the information reported is the difference between what is reported as recycled off-site in Section 8 of Form R and what is reported as sent off-site for recycling in the "Off-Site Transfers" section of Form R (Section 6). This discrepancy, which is greater than 1 billion pounds, may be due to factors beyond just relating the data reported in different sections of Form R. Facilities may have interpreted what was to be reported as recycled off-site for the new information (Section 8) differently from what was to be reported as sent off-site as a transfer in wastes (Section 6.2).

To resolve these and other complex outstanding issues, EPA has initiated a public dialogue process, in which members of environmental groups, industry, States, and academia are being brought together. The representatives of these groups will discuss the issues associated with reporting this new information and provide EPA with advice and recommendations as to how to resolve them. This process will insure that the intent of the PPA is met and that the users of TRI data are provided with meaningful information on the management of toxic chemicals in wastes.

WHAT IS BEING DONE TO REDUCE THESE WASTES?

Facilities are required to provide information on any source reduction activity implemented during the reporting (calendar) year. Source reduction activities are those that reduced or prevented a quantity of the reported toxic chemical from being recycled, combusted for energy recovery, treated, or released (including disposal). Of the 23,719 facilities that submitted Form Rs for 1991, 8,821 (37%) indicated that they implemented source reduction. Of the total 82,293 Form Rs submitted, 21,381 (26%) indicated that source reduction had been implemented.

The categories or types of source reduction actions that can be reported are:

- Good operating practices
- Inventory control
- Spill and leak prevention
- Raw material modifications
- Process modifications
- Cleaning and degreasing
- Surface preparation and finishing
- Product modifications

Under these categories are more specific activities that are reported on Form R using specific codes. For example, raw material modifications include increasing the purity of raw materials, substitution of raw materials, and "other" raw material modifications. The most frequently reported source reduction activities were good operating practices, process modifications, and spill and leak prevention activities.

A reported source reduction activity could have been implemented at any time during the reporting year. This is important to consider when analyzing the source reduction activities reported and the impact that those activities might have had on the total quantity of wastes that had to be managed. The implementation of a source reduction activity late in the reporting year would have had a smaller impact on the amount of wastes that was managed than the implementation of the same activity earlier in the reporting year.

What is Pollution Prevention?

Through pollution prevention, risks to people and the environment can be reduced, financial and natural resources can be saved that would otherwise have to be expended on environmental clean-up or pollution control, and industrial processes can become more efficient. Pollution prevention is source reduction, which is defined in the PPA as any practice that:

- reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions); and

- reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

Pollution prevention practices can include equipment, process, procedure, or technology modifications, reformulation or redesign of products, substitution of raw materials, and improvements in maintenance and inventory controls. Under this definition, waste management activities, including recycling, treatment, and disposal, are not considered forms of pollution prevention.

Box 2-1. What is Pollution Prevention?

Facilities are also required to report the method(s) used to identify the reported source reduction activity. The methods are as follows:

- Internal pollution prevention opportunity audit(s)
- External pollution prevention opportunity audit(s)
- Materials balance audits
- Participative team management
- Employee recommendation (independent of a formal company program)
- Employee recommendation (under a formal company program)
- State government technical assistance program
- Federal government technical assistance program
- Trade association/industry technical assistance program
- Vendor assistance
- Other

The most frequently reported methods of identifying opportunities for source reduction measures were internal pollution prevention opportunity audits and participative team management. The frequency for these methods and the association between reported source reduction activities and the methods used to identify the opportunities for them are shown in Table 2-10.

The states of California, Illinois, Indiana, Ohio, Pennsylvania, and Texas had the greatest number of forms reporting source reduction activities. Good operating practices and process modifications were reported most frequently as the types of source reduction activities implemented (see Table 2-11). Consistent with the national picture, the most frequent method of identifying opportunities for source reduction for facilities in these states were internal pollution prevention opportunity audits and participative team management (see Table 2-12).

Among industries, the greatest number of forms submitted indicating source reduction were from the chemical industry and fabricated metals sector. Of the total forms submitted by each sector, the greatest percentage of forms indicating source reduction were those from the furniture, measurements/photographic equipment, and printing sectors. Of the total facilities in each industry submitting Form Rs, the greatest percentage of facilities reporting source reduction activities are in the measurements/photographic equipment, electrical, and printing sectors. Looking at the distribution of activities, good operating practices, process modifications, and spill and leak prevention, were most frequently reported (see Tables 2-13 and 2-14).

The top 50 chemicals for which source reduction was reported are listed in Tables 2-15 and 2-16. The chemical for which source reduction was reported most frequently was 1,1,1-trichloroethane. The activities most frequently reported to reduce the amount of 1,1,1-trichloroethane entering wastes included cleaning and degreasing process modifications and good operating practices. The most frequent methods of identifying opportunities for source reduction for 1,1,1-trichloroethane were internal pollution prevention opportunity audits and participative team management.

Table 2-10. Methods Used to Identify Source Reduction Activity for Each Source Reduction Activity, 1991 (number of occurrences of each method).

Source Reduction Activity(f)	Number of Occurrences	Percent of Total Occurrences	Pollution Prevention Opportunity Audit: Internal	Pollution Prevention Opportunity Audit: External	Materials Balance Audit	Participative Team Management
Good Operating Practices	**16,672**	**27.0**	**3,797**	**359**	**1,429**	**5,296**
W13	7,212	11.7	1,826	215	740	2,169
W14	3,379	5.5	648	42	292	1,269
W19	6,081	9.8	1,323	102	397	1,858
Inventory Control	**4,115**	**6.7**	**733**	**86**	**383**	**1,202**
W21	1,240	2.0	237	7	105	322
W22	564	0.9	121	7	54	165
W23	31	0.1	5	0	5	10
W24	433	0.7	73	16	5	170
W25	392	0.6	50	7	27	104
W29	1,455	2.4	247	49	187	431
Spill and Leak Prevention	**9,467**	**15.3**	**2,792**	**347**	**530**	**2,254**
W31	937	1.5	216	23	50	261
W32	2,108	3.4	664	66	120	547
W33	751	1.2	190	37	34	201
W35	913	1.5	264	24	78	156
W36	2,939	4.8	855	127	158	679
W39	1,819	2.9	603	70	90	410
Raw Material Modifications	**6,678**	**10.8**	**1,222**	**138**	**301**	**1,636**
W41	842	1.4	65	5	31	319
W42	4,967	8.0	1,014	124	221	1,143
W49	869	1.4	143	9	49	174
Process Modifications	**12,774**	**20.7**	**2,887**	**346**	**928**	**3,405**
W51	2,498	4.0	657	63	269	717
W52	4,686	7.6	1,146	164	342	1,154
W53	275	0.4	50	4	13	53
W54	395	0.6	63	4	22	119
W55	812	1.3	162	17	43	237
W58	4,108	6.7	809	94	239	1,125
Cleaning and Degreasing	**5,206**	**8.4**	**1,258**	**89**	**286**	**1,332**
W59	486	0.8	121	5	48	124
W60	186	0.3	47	3	10	49
W61	2,008	3.3	511	53	85	498
W63	264	0.4	66	6	14	67
W64	375	0.6	98	3	23	92
W65	202	0.3	43	2	10	50
W66	195	0.3	45	0	5	57
W67	140	0.2	34	1	7	29
W68	280	0.5	77	2	28	81
W71	1,070	1.7	216	14	56	285
Surface Preparation/Finishing	**4,116**	**6.7**	**661**	**99**	**214**	**888**
W72	1,380	2.2	211	25	84	262
W73	1,275	2.1	221	37	61	259
W74	947	1.5	134	18	47	243
W75	155	0.3	27	8	12	39
W78	359	0.6	68	11	10	85
Product Modifications	**2,745**	**4.4**	**432**	**54**	**116**	**679**
W81	855	1.4	160	20	53	189
W82	1,409	2.3	186	31	46	388
W83	58	0.1	6	1	0	10
W89	423	0.7	80	2	17	92
Total	61,773	100.0	13,782	1,518	4,187	16,692
Percent of Total	100.0		22.3	2.5	6.8	27.0

Source Reduction Activity	Employee Recommendation Informal	Employee Recommendation Formal Program	State Program	Federal Program	Trade/ Industry Program	Vendor Assistance	Other
Good Operating Practices	**2,159**	**1,036**	**103**	**18**	**420**	**887**	**1,168**
W13	842	453	45	11	154	401	356
W14	640	153	11	3	53	109	159
W19	677	430	47	4	213	377	653
Inventory Control	**470**	**258**	**20**	**11**	**187**	**388**	**377**
W21	156	92	6	5	56	144	110
W22	91	27	0	0	1	58	40
W23	1	4	1	1	1	2	1
W24	37	28	3	5	27	25	44
W25	78	11	9	0	4	37	65
W29	107	96	1	0	98	122	117
Spill and Leak Prevention	**1,025**	**558**	**63**	**31**	**242**	**562**	**1,063**
W31	109	53	11	5	15	58	136
W32	296	109	6	2	49	121	128
W33	78	62	6	4	20	57	62
W35	59	39	7	2	34	87	163
W36	261	203	19	8	82	139	408
W39	222	92	14	10	42	100	166
Raw Material Modifications	**726**	**317**	**23**	**22**	**284**	**1,461**	**548**
W41	277	9	0	0	11	98	27
W42	381	271	21	17	221	1,103	451
W49	68	37	2	5	52	260	70
Process Modifications	**1,408**	**785**	**47**	**12**	**436**	**1,263**	**1,257**
W51	296	157	12	1	51	177	98
W52	530	277	19	4	162	481	407
W53	44	7	1	0	15	52	36
W54	55	31	4	0	14	51	32
W55	104	43	1	0	8	134	63
W58	379	270	10	7	186	368	621
Cleaning and Degreasing	**605**	**349**	**48**	**17**	**190**	**758**	**274**
W59	57	43	3	1	7	59	18
W60	10	10	1	1	11	29	15
W61	134	133	21	9	94	367	103
W63	49	7	5	1	7	36	6
W64	78	17	4	0	17	37	6
W65	35	13	6	1	3	27	12
W66	35	4	3	1	8	28	9
W67	33	9	1	0	5	13	8
W68	35	28	1	0	4	18	6
W71	139	85	3	3	34	144	91
Surface Preparation/Finishing	**279**	**152**	**26**	**11**	**344**	**1,151**	**291**
W72	99	49	10	1	141	431	67
W73	58	29	2	2	92	424	90
W74	99	35	9	1	79	201	81
W75	7	2	0	0	10	36	14
W78	16	37	5	7	22	59	39
Product Modifications	**239**	**156**	**7**	**4**	**158**	**440**	**460**
W81	77	45	2	0	33	144	132
W82	115	86	5	4	111	231	206
W83	9	2	0	0	1	13	16
W89	38	23	0	0	13	52	106
Total	6,911	3,611	337	126	2,261	6,910	5,438
Percent of Total	11.2	5.8	0.5	0.2	3.7	11.2	8.8

Table 2-11. Number of TRI Facilities and Forms Reporting Source Reduction, by Source Reduction Category, by State, 1991.

		Facilities Reporting Source Reduction Activities			Forms Reporting Source Reduction Activities	
State	Number of TRI Facilities	Number	Percent of All Facilities in the State	Number of TRI Forms	Number	Percent of All Forms from the State
Alabama	480	154	32.1	1,840	430	23.4
Alaska	7	4	57.1	48	10	20.8
American Samoa	2	1	50.0	2	1	50.0
Arizona	186	95	51.1	576	220	38.2
Arkansas	394	148	37.6	1,221	314	25.7
California	1,891	815	43.1	5,788	1974	34.1
Colorado	208	75	36.1	597	152	25.5
Connecticut	441	178	40.4	1,295	331	25.6
Delaware	70	26	37.1	293	51	17.4
Florida	520	206	39.6	1,497	390	26.1
Georgia	741	267	36.0	2,400	608	25.3
Hawaii	27	6	22.2	87	32	36.8
Idaho	55	18	32.7	183	34	18.6
Illinois	1,425	490	34.4	5,062	1234	24.4
Indiana	1,000	414	41.4	3,520	1082	30.7
Iowa	442	148	33.5	1,330	316	23.8
Kansas	268	99	36.9	941	284	30.2
Kentucky	427	161	37.7	1,640	345	21.0
Louisiana	320	109	34.1	2,008	372	18.5
Maine	109	46	42.2	368	88	23.9
Maryland	230	66	28.7	757	136	18.0
Massachusetts	633	285	45.0	1,789	593	33.1
Michigan	982	342	34.8	3,818	994	26.0
Minnesota	560	259	46.3	1,617	577	35.7
Mississippi	315	116	36.8	1,083	271	25.0
Missouri	600	203	33.8	2,125	576	27.1
Montana	24	7	29.2	137	11	8.0
Nebraska	183	59	32.2	526	127	24.1
Nevada	40	14	35.0	105	35	33.3
New Hampshire	129	50	38.8	357	94	26.3
New Jersey	782	258	33.0	2,846	572	20.1
New Mexico	43	18	41.9	154	48	31.2
New York	894	356	39.8	2,809	889	31.6
North Carolina	971	354	36.5	3,033	843	27.8
North Dakota	38	13	34.2	102	22	21.6
Ohio	1,653	555	33.6	6,048	1404	23.2
Oklahoma	264	79	29.9	870	167	19.2
Oregon	250	109	43.6	787	256	32.5
Pennsylvania	1,241	421	33.9	4,264	1044	24.5
Puerto Rico	182	51	28.0	572	104	18.2
Rhode Island	179	78	43.6	477	157	32.9
South Carolina	477	183	38.4	1,880	463	24.6
South Dakota	56	20	35.7	110	34	30.9
Tennessee	671	282	42.0	2,242	622	27.7
Texas	1,254	442	35.2	6,084	1358	22.3
Utah	137	52	38.0	498	132	26.5
Vermont	53	23	43.4	125	48	38.4
Virgin Islands	3	1	33.3	29	9	31.0
Virginia	485	170	35.1	1,680	425	25.3
Washington	354	144	40.7	1,119	312	27.9
West Virginia	145	55	37.9	723	146	20.2
Wisconsin	852	291	34.2	2,703	616	22.8
Wyoming	26	5	19.2	128	28	21.9
Total	23,719	8,821	37.2	82,293	21,381	26.0

State	Good Operating Practices	Inventory Control	Spill and Leak Prevention	Raw Material Modifications	Process Modifications	Cleaning and Degreasing	Surface Preparation and Finishing	Product Modifications
	Category of Source Reduction Activity (number of forms reporting)							
Alabama	245	53	129	74	135	41	36	21
Alaska	6	0	7	1	16	0	0	0
American Samoa	0	0	1	0	0	0	0	0
Arizona	111	18	93	42	92	65	12	11
Arkansas	105	41	110	57	114	35	71	45
California	1139	253	673	266	718	376	114	153
Colorado	72	12	44	20	60	18	27	7
Connecticut	177	35	55	49	109	107	15	32
Delaware	16	3	15	6	28	5	3	0
Florida	177	31	136	69	146	83	38	42
Georgia	331	49	245	116	223	68	31	46
Hawaii	0	17	32	0	5	0	0	0
Idaho	13	1	4	6	22	3	2	1
Illinois	605	140	360	316	455	177	90	133
Indiana	402	142	254	247	407	188	158	80
Iowa	150	13	72	71	105	37	56	21
Kansas	152	33	80	51	98	52	17	20
Kentucky	137	21	95	58	130	49	36	25
Louisiana	184	29	156	39	213	31	10	6
Maine	39	2	3	30	24	20	16	4
Maryland	73	8	24	51	42	21	10	15
Massachusetts	367	87	61	122	192	106	32	48
Michigan	492	210	225	186	443	153	173	143
Minnesota	256	78	130	118	211	113	78	36
Mississippi	124	27	123	54	66	25	42	10
Missouri	246	106	304	152	172	96	44	47
Montana	3	0	2	2	5	0	0	1
Nebraska	52	6	25	33	37	16	28	7
Nevada	12	5	13	5	10	2	0	1
New Hampshire	38	14	22	11	38	20	10	3
New Jersey	230	70	164	112	234	48	18	33
New Mexico	34	4	3	3	19	9	3	5
New York	396	117	201	147	348	125	108	91
North Carolina	303	190	215	173	259	84	215	67
North Dakota	8	0	1	7	11	4	8	3
Ohio	662	165	296	288	521	157	139	184
Oklahoma	70	39	60	37	47	16	31	29
Oregon	118	27	49	62	111	29	42	34
Pennsylvania	495	132	223	206	440	175	146	73
Puerto Rico	24	27	31	24	35	22	4	9
Rhode Island	82	17	67	25	47	42	18	5
South Carolina	204	32	132	63	190	47	39	47
South Dakota	22	6	21	2	6	7	3	1
Tennessee	260	51	145	135	204	52	84	47
Texas	536	129	550	204	566	140	82	82
Utah	45	11	30	18	72	9	10	6
Vermont	25	0	2	10	13	8	6	5
Virgin Islands	0	0	0	0	9	0	0	0
Virginia	190	64	92	92	138	55	72	24
Washington	155	30	104	70	137	56	34	24
West Virginia	61	11	33	20	95	5	7	7
Wisconsin	298	54	126	140	208	94	93	64
Wyoming	24	0	33	4	4	2	0	0
Total	9,966	2,610	6,071	4,094	8,030	3,093	2,311	1,798

Table 2-12. Methods Used to Identify Reported Source Reduction Activities, by State, 1991.

State	Pollution Prevention Opportunity Audit		Materials Balance Audit	Participative Team Management	Employee Recommendation	
	Internal	External			Informal	Formal Program
Alabama	180	29	74	230	71	74
Alaska	7	0	1	1	7	0
American Samoa	0	0	0	0	1	0
Arizona	97	10	44	144	45	14
Arkansas	122	10	33	111	62	34
California	888	165	280	857	312	140
Colorado	66	8	15	65	39	20
Connecticut	143	14	42	171	77	44
Delaware	17	1	6	23	11	8
Florida	154	9	59	164	95	28
Georgia	247	25	90	243	87	42
Hawaii	27	0	0	5	0	0
Idaho	9	2	2	16	3	9
Illinois	408	47	95	551	306	129
Indiana	373	48	109	490	208	128
Iowa	105	20	53	142	65	26
Kansas	73	2	55	153	54	54
Kentucky	122	14	47	140	64	28
Louisiana	178	9	62	160	44	79
Maine	30	1	12	47	16	10
Maryland	39	3	12	68	37	15
Massachusetts	200	24	71	272	109	52
Michigan	360	41	134	440	184	96
Minnesota	263	18	47	268	129	53
Mississippi	112	5	42	124	57	19
Missouri	250	11	31	216	93	81
Montana	1	0	0	4	4	0
Nebraska	51	4	8	55	26	26
Nevada	9	0	7	12	12	0
New Hampshire	26	1	16	33	34	11
New Jersey	165	37	66	226	116	37
New Mexico	24	0	4	25	6	2
New York	332	38	89	361	140	116
North Carolina	321	32	55	352	178	68
North Dakota	1	0	2	13	2	4
Ohio	498	71	173	682	339	119
Oklahoma	60	9	37	79	45	27
Oregon	105	0	47	126	78	36
Pennsylvania	373	84	129	497	238	120
Puerto Rico	42	14	8	43	15	13
Rhode Island	64	15	16	59	29	17
South Carolina	228	13	93	249	79	27
South Dakota	2	0	4	17	8	3
Tennessee	209	28	70	238	147	42
Texas	549	46	171	609	275	158
Utah	42	13	16	52	37	8
Vermont	17	0	12	26	5	8
Virgin Islands	0	0	0	0	9	0
Virginia	158	8	59	182	65	17
Washington	169	26	17	163	68	47
West Virginia	63	4	27	71	26	9
Wisconsin	219	25	79	302	150	61
Wyoming	10	0	12	3	13	13
Total	8,208	984	2,633	9,580	4,320	2,172
Percent of Total	21.4	2.6	6.9	24.9	11.2	5.7

State	State Program	Federal Program	Trade/ Industry Program	Vendor Assistance	Other	Number of Forms	Percent of Total Forms
Alabama	1	3	35	109	54	860	2.2
Alaska	0	0	1	1	1	19	0.0
American Samoa	0	0	0	0	0	1	0.0
Arizona	0	2	16	41	18	431	1.1
Arkansas	0	0	17	83	58	530	1.4
California	18	2	144	335	376	3517	9.2
Colorado	4	1	2	24	23	267	0.7
Connecticut	1	2	17	72	36	619	1.6
Delaware	1	0	2	6	7	82	0.2
Florida	8	3	19	70	52	661	1.7
Georgia	11	4	47	130	122	1048	2.7
Hawaii	0	0	0	0	16	48	0.1
Idaho	0	0	6	5	6	58	0.2
Illinois	8	0	87	249	275	2155	5.6
Indiana	6	10	84	322	248	2026	5.3
Iowa	7	0	19	112	36	585	1.5
Kansas	1	1	7	64	62	526	1.4
Kentucky	4	1	14	62	67	563	1.5
Louisiana	1	0	19	42	62	656	1.7
Maine	0	1	3	31	16	167	0.4
Maryland	5	0	12	41	29	261	0.7
Massachusetts	14	1	29	90	124	986	2.6
Michigan	2	8	61	294	201	1821	4.7
Minnesota	30	1	25	149	58	1041	2.7
Mississippi	4	0	16	81	48	508	1.3
Missouri	0	1	14	90	115	902	2.3
Montana	0	0	0	2	3	14	0.0
Nebraska	0	1	9	47	17	244	0.6
Nevada	2	0	1	3	5	51	0.1
New Hampshire	1	1	1	22	16	162	0.4
New Jersey	10	0	46	79	140	922	2.4
New Mexico	0	0	2	8	5	76	0.2
New York	3	6	59	243	159	1546	4.0
North Carolina	15	1	128	338	107	1595	4.2
North Dakota	0	0	0	12	2	36	0.1
Ohio	9	2	60	308	262	2523	6.6
Oklahoma	2	0	7	40	35	341	0.9
Oregon	5	3	38	44	27	509	1.3
Pennsylvania	7	14	71	242	161	1936	5.0
Puerto Rico	1	0	2	21	34	193	0.5
Rhode Island	3	0	6	34	23	266	0.7
South Carolina	5	1	15	97	35	842	2.2
South Dakota	1	0	9	10	7	61	0.2
Tennessee	13	5	64	148	100	1064	2.8
Texas	16	5	38	233	321	2421	6.3
Utah	0	0	5	24	37	234	0.6
Vermont	0	0	2	17	0	87	0.2
Virgin Islands	0	0	0	0	0	9	0.0
Virginia	10	3	34	104	94	734	1.9
Washington	16	5	41	83	59	694	1.8
West Virginia	0	0	5	47	21	273	0.7
Wisconsin	5	2	51	189	82	1165	3.0
Wyoming	0	0	1	13	13	78	0.2
Total	250	90	1,391	4,911	3,875	38,414	100.0
Percent of Total	0.7	0.2	3.6	12.8	10.1	100.0	

Table 2-13. Number of Forms Reporting Source Reduction, by Source Reduction Category, by Industry, 1991.

			Facilities Reporting Source Reduction Activities			Forms Reporting Source Reduction Activities	
SIC Code	Industry	Number of TRI Facilities	Number	Percent of All Facilities in the Industry	Number of TRI Forms	Number	Percent of All Forms from the Industry
20	Food	2,021	420	20.8	3,742	597	16.0
21	Tobacco	23	7	30.4	47	9	19.1
22	Textiles	448	147	32.8	985	256	26.0
23	Apparel	42	12	28.6	78	22	28.2
24	Lumber	728	234	32.1	1,946	532	27.3
25	Furniture	537	226	42.1	1,722	674	39.1
26	Paper	619	277	44.7	2,498	577	23.1
27	Printing	385	180	46.8	796	286	35.9
28	Chemicals	4,262	1741	40.8	23,093	6163	26.7
29	Petroleum	426	154	36.2	3,344	789	23.6
30	Plastics	1,832	730	39.8	4,470	1278	28.6
31	Leather	153	64	41.8	382	125	32.7
32	Stone/Clay	659	194	29.4	1,665	453	27.2
33	Primary Metals	1,858	496	26.7	6,796	1308	19.2
34	Fabr. Metals	3,153	1084	34.4	8,995	2067	23.0
35	Machinery	1,091	397	36.4	3,012	703	23.3
36	Electrical	1,635	772	47.2	4,938	1561	31.6
37	Transportation	1,256	545	43.4	4,928	1437	29.2
38	Measure./Photo.	438	224	51.1	1,141	432	37.9
39	Miscellaneous	387	155	40.1	981	305	31.1
	Multiple codes 20-39	1,545	706	45.7	5,946	1692	28.5
	No codes 20-39	221	56	25.3	788	115	14.6
	Total	23,719	8,821	37.2	82,293	21,381	26.0

Industry	Good Operating Practices	Inventory Control	Spill and Leak Prevention	Raw Material Modifi-cations	Process Modifi-cations	Cleaning and Degreasing	Surface Preparation and Finishing	Product Modifi-cations
	Category of Source Reduction Activity (number of forms reporting)							
Food	357	36	340	25	198	38	6	18
Tobacco	5	0	1	1	6	0	0	0
Textiles	72	26	74	89	88	21	17	24
Apparel	5	2	7	5	8	3	5	0
Lumber	320	68	158	78	186	24	166	29
Furniture	163	218	98	131	137	48	551	61
Paper	232	40	48	227	204	36	14	61
Printing	86	10	25	136	52	57	16	12
Chemicals	3227	963	2480	1141	2781	430	28	719
Petroleum	312	65	479	99	374	17	0	43
Plastics	475	141	230	410	407	203	171	131
Leather	35	6	10	61	29	22	61	8
Stone/Clay	196	55	340	90	108	12	9	35
Primary Metals	587	66	398	193	626	133	68	53
Fabr. Metals	962	206	338	344	696	536	358	93
Machinery	306	55	67	138	172	197	136	55
Electrical	708	156	265	209	704	403	89	101
Transportation	680	171	175	259	401	334	319	138
Measure./Photo.	238	51	65	67	111	154	25	49
Miscellaneous	158	59	22	56	95	68	72	33
Multiple codes 20-39	796	194	419	305	618	322	176	122
No codes 20-39	46	22	32	30	29	35	24	13
Total	9,966	2,610	6,071	4,094	8,030	3,093	2,311	1,798

Table 2-14. Methods Used to Identify Source Reduction Activity, by Industry, 1991.

SIC Code	Industry	Pollution Prevention Opportunity Audit		Materials Balance Audit	Participative Team Management	Employee Recommendation	
		Internal	External			Informal	Formal Program
20	Food	235	25	87	245	92	36
21	Tobacco	9	2	4	1	1	0
22	Textiles	79	4	27	123	39	22
23	Apparel	9	2	1	13	2	0
24	Lumber	183	11	18	221	107	22
25	Furniture	181	35	53	235	154	35
26	Paper	199	17	37	251	110	51
27	Printing	102	9	37	81	42	37
28	Chemicals	2,388	312	816	3,176	1,536	752
29	Petroleum	345	48	37	219	105	67
30	Plastics	469	68	153	519	244	100
31	Leather	45	7	19	67	20	5
32	Stone/Clay	161	11	30	146	47	64
33	Primary Metals	523	80	169	504	216	86
34	Fabr. Metals	750	106	282	835	411	188
35	Machinery	282	45	79	285	153	82
36	Electrical	665	52	185	768	310	171
37	Transportation	629	55	183	715	207	189
38	Measure./Photo.	158	11	57	226	74	50
39	Miscellaneous	107	16	47	115	68	24
	Multiple codes 20-39	638	59	295	775	356	176
	No codes 20-39	51	9	17	60	26	15
	Total	8,208	984	2,633	9,580	4,320	2,172
	Percent of Total	21.4	2.6	6.8	24.9	11.2	5.6

Industry	State Program	Federal Program	Trade/ Industry Program	Vendor Assistance	Other	Number of Forms	Percent of Total Forms
Food	6	2	46	165	57	996	2.6
Tobacco	0	0	0	1	0	18	0.0
Textiles	1	2	20	110	35	462	1.2
Apparel	0	0	1	10	1	39	0.1
Lumber	23	12	66	197	71	931	2.4
Furniture	9	0	165	437	82	1,386	3.6
Paper	1	1	42	141	136	986	2.6
Printing	4	4	12	115	38	481	1.3
Chemicals	41	15	257	623	1,210	11,126	29.0
Petroleum	12	0	29	61	232	1,155	3.0
Plastics	9	8	132	430	211	2,343	6.1
Leather	1	1	19	63	21	268	0.7
Stone/Clay	0	0	19	64	172	714	1.9
Primary Metals	28	3	91	285	328	2,313	6.0
Fabr. Metals	43	21	163	642	312	3,753	9.8
Machinery	14	1	43	247	89	1,320	3.4
Electrical	17	0	71	345	238	2,822	7.3
Transportation	8	8	92	384	205	2,675	7.0
Measure./Photo.	8	2	11	85	79	761	2.0
Miscellaneous *	2	0	20	114	46	559	1.5
Multiple codes 20-39	23	9	88	361	297	3,077	8.0
No codes 20-39	0	1	4	31	15	229	0.6
Total	250	90	1,391	4,911	3,875	38,414	100.0
Percent of Total	0.6	0.2	3.7	12.8	10.1	100.0	

Table 2-15. Number of Forms Reporting Source Reduction, by Source Reduction Category, for the Top 50 TRI Chemicals by Number of Forms Reporting Source Reduction Activities, 1991.

CAS Number	Chemical	Number of TRI Forms	Forms Reporting Source Reduction Activities: Number	Forms Reporting Source Reduction Activities: Percent of All Forms for the Chemical
71-55-6	1,1,1-Trichloroethane	3,563	1,590	44.6
108-88-3	Toluene	3,794	1,475	38.9
1330-20-7	Xylene (mixed isomers)	3,440	1,274	37.0
67-64-1	Acetone	2,634	961	36.5
78-93-3	Methyl ethyl ketone	2,499	958	38.3
7664-93-9	Sulfuric acid	5,600	911	16.3
7664-41-7	Ammonia	3,219	689	21.4
67-56-1	Methanol	2,478	640	25.8
	Glycol ethers	2,037	607	29.8
76-13-1	Freon 113	1,061	591	55.7
7647-01-0	Hydrochloric acid	3,290	560	17.0
75-09-2	Dichloromethane	1,258	517	41.1
	Zinc compounds	2,281	497	21.8
7664-38-2	Phosphoric acid	2,640	414	15.7
108-10-1	Methyl isobutyl ketone	1,015	382	37.6
71-36-3	n-Butyl alcohol	1,144	379	33.1
•	Chromium compounds	1,454	377	25.9
100-42-5	Styrene	1,381	373	27.0
7697-37-2	Nitric acid	1,848	340	18.4
7440-50-8	Copper	2,237	320	14.3
	Lead compounds	912	307	33.7
107-21-1	Ethylene glycol	1,346	299	22.2
100-41-4	Ethylbenzene	833	299	35.9
79-01-6	Trichloroethylene	697	290	41.6
	Copper compounds	1,392	257	18.5
7782-50-5	Chlorine	1,614	249	15.4
	Barium compounds	987	243	24.6
127-18-4	Tetrachloroethylene	558	210	37.6
7440-02-0	Nickel	1,453	204	14.0
7440-47-3	Chromium	1,413	201	14.2
7439-92-1	Lead	827	173	20.9
50-00-0	Formaldehyde	804	172	21.4
95-63-6	1,2,4-Trimethylbenzene	536	171	31.9
	Nickel compounds	765	160	20.9
71-43-2	Benzene	480	155	32.3
108-95-2	Phenol	655	147	22.4
91-20-3	Naphthalene	448	136	30.4
7664-39-3	Hydrogen fluoride	518	126	24.3
	Manganese compounds	880	122	13.9
75-69-4	Trichlorofluoromethane (CFC-11)	297	116	39.1
101-68-8	Methylenebis(phenylisocyanate)	710	110	15.5
75-71-8	Dichlorodifluoromethane (CFC-12)	372	108	29.0
7439-96-5	Manganese	1,109	104	9.4
	Antimony compounds	463	100	21.6
110-82-7	Cyclohexane	348	99	28.4
7440-66-6	Zinc (fume or dust)	472	84	17.8
	Cyanide compounds	271	79	29.2
111-42-2	Diethanolamine	353	75	21.2
117-81-7	Di-(2-ethylhexyl) phthalate	332	73	22.0
115-07-1	Propylene	335	70	20.9
	Subtotal	71,053	18,794	26.5
	Total for All TRI Chemicals	82,293	21,381	26.0

Chemical	Good Operating Practices	Inventory Control	Spill and Leak Prevention	Raw Material Modifi-cations	Process Modifi-cations	Cleaning and Degreasing	Surface Preparation and Finishing	Product Modifi-cations
	Category of Source Reduction Activity (number of forms reporting)							
1,1,1-Trichloroethane	678	106	192	304	302	812	119	138
Toluene	620	243	328	420	463	157	401	173
Xylene (mixed isomers)	542	212	299	297	415	110	481	138
Acetone	428	152	210	197	275	231	129	84
Methyl ethyl ketone	433	184	187	265	267	134	296	106
Sulfuric acid	467	86	289	95	416	95	16	31
Ammonia	348	31	303	64	328	17	6	23
Methanol	281	95	203	138	244	54	108	54
Glycol ethers	274	123	114	179	201	46	100	73
Freon 113	289	39	91	115	152	365	22	38
Hydrochloric acid	271	57	200	44	247	64	15	16
Dichloromethane	202	31	109	138	153	152	22	51
Zinc compounds	266	77	132	81	215	30	16	47
Phosphoric acid	212	67	161	41	146	42	11	22
Methyl isobutyl ketone	189	64	101	90	141	42	125	53
n-Butyl alcohol	181	85	97	75	147	25	136	25
Chromium compounds	155	39	90	105	169	27	27	42
Styrene	137	68	132	76	153	28	43	43
Nitric acid	165	54	102	31	162	43	13	6
Copper	214	35	59	32	150	22	7	30
Lead compounds	145	35	62	107	135	5	11	48
Ethylene glycol	152	43	104	'63	101	10	5	25
Ethylbenzene	148	46	144	60	140	24	24	22
Trichloroethylene	132	18	44	16	71	168	6	9
Copper compounds	163	27	103	26	141	14	6	12
Chlorine	72	10	54	57	141	8	3	7
Barium compounds	118	37	58	68	89	7	18	28
Tetrachloroethylene	117	17	61	25	45	88	4	7
Nickel	108	29	43	28	100	22	4	16
Chromium	108	25	22	28	83	22	11	18
Lead	77	6	29	49	64	7	5	31
Formaldehyde	70	16	60	43	75	8	3	17
1,2,4-Trimethylbenzene	81	24	78	37	73	11	12	12
Nickel compounds	84	10	43	20	95	20	5	14
Benzene	47	5	121	10	98	1	0	4
Phenol	72	22	55	25	74	6	2	7
Naphthalene	59	10	88	21	54	5	7	6
Hydrogen fluoride	61	17	32	11	72	12	2	3
Manganese compounds	77	6	34	16	58	2	3	8
Trichlorofluoromethane (CFC-11)	40	7	28	39	34	3	8	15
Methylenebis(phenylisocyanate)	61	15	25	13	42	6	7	12
Dichlorodifluoromethane (CFC-12)	40	2	45	21	49	0	0	13
Manganese	68	21	18	17	38	4	4	12
Antimony compounds	58	12	26	13	47	4	0	11
Cyclohexane	38	10	62	9	46	4	1	6
Zinc (fume or dust)	51	9	30	20	37	6	3	7
Cyanide compounds	26	10	20	16	44	13	2	2
Diethanolamine	34	8	26	12	29	1	0	13
Di-(2-ethylhexyl) phthalate	26	3	12	34	19	0	1	11
Propylene	23	2	44	1	30	0	0	0
Subtotal	8,708	2,350	4,970	3,692	6,870	2,977	2,250	1,589
Total for All TRI Chemicals	9,966	2,610	6,071	4,094	8,030	3,093	2,311	1,798

Table 2-16. Methods Used to Identify Source Reduction Activities for the Top 50 Chemicals by Number of Forms Reporting Source Reduction Activities, 1991.

CAS Number	Chemical	Number of Forms Reporting Source Reduction Activities	Pollution Prevention Opportunity Audit Internal	Pollution Prevention Opportunity Audit External	Materials Balance Audit	Participative Team Management	Employee Recommendation Informal	Employee Recommendation Formal Program
71-55-6	1,1,1-Trichloroethane	1,590	680	87	197	690	306	212
108-88-3	Toluene	1,475	512	76	178	650	289	143
1330-20-7	Xylene (mixed isomers)	1,274	494	60	142	550	276	111
67-64-1	Acetone	961	362	47	118	423	183	97
78-93-3	Methyl ethyl ketone	958	350	45	131	456	206	98
7664-93-9	Sulfuric acid	911	331	30	94	418	218	76
7664-41-7	Ammonia	689	249	25	89	285	151	63
67-56-1	Methanol	640	226	14	86	270	146	71
	Glycol ethers	607	206	19	73	293	122	63
76-13-1	Freon 113	591	278	22	85	316	111	82
7647-01-0	Hydrochloric acid	560	209	23	77	237	141	53
75-09-2	Dichloromethane	517	194	20	82	214	96	50
	Zinc compounds	497	200	25	57	229	111	55
7664-38-2	Phosphoric acid	414	123	13	63	192	75	32
108-10-1	Methyl isobutyl ketone	382	149	19	53	183	76	45
71-36-3	n-Butyl alcohol	379	133	19	47	169	91	51
	Chromium compounds	377	156	20	38	163	70	29
100-42-5	Styrene	373	134	23	41	138	63	34
7697-37-2	Nitric acid	340	121	9	44	175	75	30
7440-50-8	Copper	320	117	25	56	145	53	40
	Lead compounds	307	120	16	32	150	68	36
107-21-1	Ethylene glycol	299	118	8	38	134	55	28
100-41-4	Ethylbenzene	299	128	20	23	130	65	44
79-01-6	Trichloroethylene	290	120	9	37	120	68	28
	Copper compounds	257	114	9	22	113	72	20
7782-50-5	Chlorine	249	100	10	18	91	41	21
	Barium compounds	243	89	9	34	116	55	27
127-18-4	Tetrachloroethylene	210	93	14	23	96	39	19
7440-02-0	Nickel	204	61	9	35	93	43	19
7440-47-3	Chromium	201	56	4	37	90	40	18
7439-92-1	Lead	173	63	15	22	73	33	14
50-00-0	Formaldehyde	172	73	7	21	76	42	18
95-63-6	1,2,4-Trimethylbenzene	171	66	8	11	71	33	18
	Nickel compounds	160	77	4	22	76	42	11
71-43-2	Benzene	155	71	16	14	37	19	14
108-95-2	Phenol	147	61	10	22	69	18	14
91-20-3	Naphthalene	136	57	10	6	45	28	10
7664-39-3	Hydrogen fluoride	126	44	3	20	57	27	15
	Manganese compounds	122	57	3	10	51	26	11
75-69-4	Trichlorofluoromethane (CFC-11)	116	29	1	17	41	19	7
101-68-8	Methylenebis(phenylisocyanate)	110	35	5	9	58	21	6
75-71-8	Dichlorodifluoromethane (CFC-12)	108	40	11	16	40	17	9
7439-96-5	Manganese	104	33	6	21	41	17	6
	Antimony compounds	100	39	1	21	53	28	16
110-82-7	Cyclohexane	99	44	6	7	33	13	13
7440-66-6	Zinc (fume or dust)	84	33	6	10	38	16	4
	Cyanide compounds	79	32	6	9	35	10	6
111-42-2	Diethanolamine	75	25	1	7	34	10	4
117-81-7	Di-(2-ethylhexyl) phthalate	73	25	3	9	32	16	8
115-07-1	Propylene	70	27	5	3	21	6	5
	Subtotal	18,794	7,154	856	2,327	8,310	3,846	1,904
	Total for All TRI Chemicals	21,381	8,208	984	2,633	9,580	4,320	2,172

Chemical	State Program	Federal Program	Trade/ Industry Program	Vendor Assistance	Other	Number of Forms	Percent of Total Forms
1,1,1-Trichloroethane	21	13	111	443	197	2,957	7.7
Toluene	23	8	110	466	271	2,726	7.1
Xylene (mixed isomers)	20	4	98	454	222	2,431	6.3
Acetone	17	4	97	273	148	1,769	4.6
Methyl ethyl ketone	11	5	81	299	145	1,827	4.8
Sulfuric acid	3	2	39	168	162	1,541	4.0
Ammonia	4	1	42	113	117	1,139	3.0
Methanol	2	2	53	152	118	1,140	3.0
Glycol ethers	4	3	38	167	111	1,099	2.9
Freon 113	7	2	31	140	88	1,162	3.0
Hydrochloric acid	5	2	23	82	108	960	2.5
Dichloromethane	6	4	26	117	104	913	2.4
Zinc compounds	3	1	22	81	87	871	2.3
Phosphoric acid	3	4	21	95	63	684	1.8
Methyl isobutyl ketone	11	3	35	107	68	749	1.9
n-Butyl alcohol	5	2	42	109	61	729	1.9
Chromium compounds	6	3	31	94	75	685	1.8
Styrene	5	6	53	114	86	697	1.8
Nitric acid	2	2	15	71	47	591	1.5
Copper	6	0	25	60	58	585	1.5
Lead compounds	5	0	13	64	74	578	1.5
Ethylene glycol	1	0	12	48	52	494	1.3
Ethylbenzene	3	0	11	48	73	545	1.4
Trichloroethylene	6	1	11	76	51	527	1.4
Copper compounds	7	4	22	55	26	464	1.2
Chlorine	1	0	16	52	52	402	1.0
Barium compounds	1	0	5	40	56	432	1.1
Tetrachloroethylene	2	1	21	49	37	394	1.0
Nickel	1	0	14	41	33	349	0.9
Chromium	1	1	14	38	35	334	0.9
Lead	3	0	18	26	50	317	0.8
Formaldehyde	1	0	6	29	27	300	0.8
1,2,4-Trimethylbenzene	6	1	16	23	41	294	0.8
Nickel compounds	4	0	7	36	29	308	0.8
Benzene	3	1	7	17	57	256	0.7
Phenol	2	0	6	23	33	258	0.7
Naphthalene	0	0	5	18	41	220	0.6
Hydrogen fluoride	0	0	3	20	35	224	0.6
Manganese compounds	0	0	3	17	18	196	0.5
Trichlorofluoro-methane (CFC-11)	1	0	16	55	20	206	0.5
Methylenebis(phenyl-isocyanate)	0	0	7	45	15	201	0.5
Dichlorodifluoromethane (CFC-12)	0	0	6	20	30	189	0.5
Manganese	2	0	8	25	20	179	0.5
Antimony compounds	1	0	2	14	11	186	0.5
Cyclohexane	2	0	4	10	25	157	0.4
Zinc (fume or dust)	4	0	8	23	11	153	0.4
Cyanide compounds	1	1	4	19	17	140	0.4
Diethanolamine	1	0	5	11	14	112	0.3
Di-(2-ethylhexyl) phthalate	0	0	7	18	8	126	0.3
Propylene	0	0	2	9	28	106	0.3
Subtotal	223	81	1,272	4,574	3,355	33,902	88.3
Total for All TRI Chemicals	250	90	1,391	4,911	3,875	38,414	100.0

Assessment of Progress in Source Reduction

The reporting of source reduction activities and the methods used to identify those activities yield an indication of what is being done to prevent the generation of pollution at the source. Quantifying progress in reducing wastes is a complex question that cannot be answered by simply comparing quantities over time. Many factors affect the quantity of toxic chemicals in wastes. One such factor is changes in production or activity at a facility. For this reason, the Pollution Prevention Act requires facilities to provide on Form R a production ratio or activity index as an indicator of whether production or activity involving the reported toxic chemical has increased, decreased, or remained steady from the prior year to the reporting year. For the 1991 reporting year, the ratio is calculated by dividing the production or activity involving the reported toxic chemical in 1991 by the production or activity involving the reported toxic chemical in 1990. A ratio that is less than 1.0 indicates that production or activity is down in 1991 as compared to 1990. A ratio of 1.0 indicates that production or activity has remained steady. A ratio greater than 1.0 indicates that production or activity has increased. Table 2-17 shows the distribution of the ratios reported for 1991.

Calculating an Indicator of Changes in Quantities of Toxic Chemicals in Wastes

Because of the complexity of quantifying progress in reducing toxic chemicals in wastes at the source, there is not any one clear method for measuring progress. Comparing changes in quantities of toxic chemicals in wastes when source reduction has been implemented is one, but this does not take production into account. There is also a method for using the new information reported under TRI to assess changes in the quantities of toxic chemicals in wastes relative to changes in production or activity at a facility. This method has an implicit assumption that there is a direct relationship between the level of production or activity at a facility and the amount of toxic chemicals in wastes, including releases, generated by that production or activity. Thus, if production increases, wastes are assumed to increase by a direct proportion. Similarly, if production decreases, wastes are assumed to decrease proportionally. This assumption may hold for some, but not all, processes or facilities. There may be many instances where processes do not have a directly proportional relationship between the level of activity and wastes generated.

A thorough and accurate assessment of source reduction progress would require more detailed information than is currently included in Form R. Nonetheless, the data collected under TRI can be used to provide an indication of whether toxic chemicals in wastes are increasing or decreasing. To perform the following analysis, those forms that have complete data for both 1990 and 1991 must be selected. Data for those years must be comparable, meaning that a facility has to have reported quantities for the same activity, for example, on-site recycling, for both years. The following method shows how the information reported on Form R can be used to assess changes in the quantities of toxic chemicals in wastes relative to changes in production or activity.

Table 2-17. Distribution of Production Index

Index	Number of Forms Reporting Number	Percent of Forms Reporting Percent	Cumulative Percent of Forms Reporting Percent	Production Related Wastes 1991 Pounds	Cumulative Percent of 1991 Waste Percent	Percent of 1991 Waste Percent
0.1	387	0.5	0.5	99,844,277	0.3	0.3
0.2	319	0.4	1.0	23,003,097	0.1	0.3
0.3	538	0.7	1.7	42,828,818	0.1	0.4
0.4	664	0.9	2.6	112,231,094	0.3	0.7
0.5	1,165	1.6	4.2	304,143,844	0.8	1.6
0.6	1,929	2.6	6.9	251,348,459	0.7	2.2
0.7	3,402	4.7	11.5	1,249,794,006	3.4	5.6
0.8	6,482	8.9	20.4	1,891,423,137	5.1	10.7
0.9	11,928	16.3	36.7	5,000,228,330	13.5	24.2
1.0	19,901	27.3	64.0	17,645,545,829	47.5	71.7
1.1	10,236	14.0	78.0	5,165,680,745	13.9	85.6
1.2	5,154	7.1	85.1	1,329,404,937	3.6	89.2
1.3	2,966	4.1	89.1	810,013,352	2.2	91.4
1.4	1,518	2.1	91.2	704,114,957	1.9	93.3
1.5	1,188	1.6	92.8	250,509,085	0.7	94.0
1.6	651	0.9	93.7	363,009,377	1.0	95.0
1.7	540	0.7	94.5	119,523,807	0.3	95.3
1.8	364	0.5	95.0	44,817,386	0.1	95.4
1.9	350	0.5	95.5	211,063,288	0.6	96.0
2.0 - 2.9	1,337	1.8	97.3	495,322,653	1.3	97.3
3.0 - 3.9	416	0.6	97.9	135,318,940	0.4	97.7
4.0 - 4.9	217	0.3	98.2	122,436,848	0.3	98.0
5.0 - 9.9	381	0.5	98.7	211,425,605	0.6	98.6
10.0-24.9	224	0.3	99.0	22,708,453	0.1	98.6
25.0-49.9	89	0.1	99.1	43,041,558	0.1	98.7
50.0-99.9	426	0.6	99.7	433,011,949	1.2	99.9
> 100	228	0.3	100.0	33,401,158	0.1	100.0
Total	73,000	100.0		37,115,194,989	100.0	
Zero or Blank or NA for Index						
Zero	604			10,878,392		
Blank	4,537			263,939,613		
NA	4,116			360,623,549		
Total	9,257			635,441,554		
Negative Number for Index						
Total	36			3,861,218		

1) Sum Sections 8.1 through 8.7 for the prior year (1990)
2) Sum Sections 8.1 through 8.7 for the current year (1991)
3) Multiply the sum for the prior year as calculated in step 1 by the production ratio or activity index (which is reported in Section 8.9 of Form R). This yields a quantity that would have been generated in the current year (call it the expected quantity).
4) Take the sum for the current year as calculated in step 2 and subtract from it the result of step 3 (the expected quantity).

If the result of step 4 is a negative number, this means that the total quantity of the toxic chemical in wastes the facility reported for the current year (1991) was less than that expected, given the reported level of production or activity. This could be an indication that reduction of the toxic chemical in wastes is occurring. If the result of step 4 is a positive number, this means that the amount of toxic chemical in wastes the facility reported for the current year (1991) was greater than that expected, given the reported level of production or activity. This could be an indication that reduction of the toxic chemical in wastes is not occurring.

Because production may not be directly and linearly related to the quantity of chemical in waste, analysis of progress should also include simple comparison of current and prior year data. A decrease could be an indication of progress while an increase could indicate that progress is not happening. An increase could also indicate that source reduction in the form of chemical substitution has been implemented.

As this is the first year of PPA data, it is not yet clear how best to interpret the data that have been submitted. Thus, this data release will provide some basic analyses to stimulate debate and input from the public on how best to measure progress. The following examples illustrate how the above method can be used to assess changes in the quantities of toxic chemicals in wastes relative to changes in production or activity. These examples also show some situations that can arise when performing these analyses. In all of the following examples, the facility has indicated that at least one source reduction activity has been implemented for the reported toxic chemical.

CASE 1 Facility A reports on methanol

Facility A reports the following:
Total quantity of toxic chemical (methanol) in wastes, 1990 (pounds): 1,100,750
Total quantity of toxic chemical (methanol) in wastes, 1991 (pounds): 740,750
Production ratio: 1.00

The total quantity of methanol in wastes decreased by 33% between 1990 and 1991 ([740,750 - 1,100,750]/1,100,750 = -0.33). Since production is constant (i.e., the production ratio = 1.0), there is no difference between the quantity reported for 1990 and the quantity expected for 1991 (1,100,750 x 1 = 1,100,750). Thus, the relative (adjusted for production) and absolute changes in the quantity of methanol in wastes are the same, a decrease of 360,000 pounds. Given the assumption of a direct relationship between production and the generation of wastes which must subsequently be managed, this situation indicates that reduction of the toxic chemical in wastes may be occurring, as the quantity methanol in waste is decreasing while production remains constant.

CASE 2 Facility B reports on xylenes

Facility B reports the following:
Total quantity of toxic chemical (xylenes) in wastes, 1990 (pounds): 2,317,000
Total quantity of toxic chemical (xylenes) in wastes, 1991 (pounds): 2,269,700
Production ratio: 0.98

The total quantity of xylenes in wastes decreased between 1990 and 1991 by approximately 2% ([2,269,700 - 2,317,000]/2,317,000 = -0.02), and production fell by 2% (0.98 - 1.00 = -0.02). Adjusting for production, the quantity of xylenes in wastes expected for 1991 is 2,270,660 pounds (2,317,000 x 0.98 = 2,270,660). The quantity reported for 1991 is 960 pounds less than what was expected for 1991 (2,269,700 - 2,270,660 = -960). In this instance, adjusting for production shows a slight decrease in the quantity of the toxic chemical in wastes from what could be expected. This decrease relative to changes in production (960 pounds) is smaller than the absolute decrease (47,300 pounds) in the amount of xylenes in wastes between the two years. Given the assumption of a direct relationship between production activities and the generation of wastes, this indicates that there could have been a small decrease in the amount of xylenes in waste generated per unit of production.

CASE 3 Facility C reports on 1,3-butadiene

Facility C reports the following:
Total quantity of toxic chemical (1,3-butadiene) in wastes, 1990 (pounds): 3,320,000
Total quantity of toxic chemical (1,3-butadiene) in wastes, 1991 (pounds): 2,701,000
Production ratio: 1.10

The total quantity of 1,3-butadiene in wastes between 1990 and 1991 decreased by 19% ([2,701,000 - 3,320,000]/3,320,000 = -0.19), while production increased by 10% (1.10 - 1.00 = 0.10). Adjusting for production, the expected quantity of 1,3-butadiene in wastes for 1991 would be 3,652,000 pounds (3,320,000 x 1.10 = 3,652,000). The quantity reported for 1991 is 951,000 pounds (2,701,000 - 3,652,000 = 951,000) less than the quantity expected for that year. This indicates a relative decrease in 1,3-butadiene in wastes even greater than the absolute decrease of 619,000 pounds, and indicates that there could have been a substantial decrease in the amount of 1,3-butadiene in wastes generated per unit of production.

CASE 4 Facility D reports on dichloromethane

Facility D reports the following:
Total quantity of toxic chemical (dichloromethane) in wastes, 1990 (pounds): 390,000
Total quantity of toxic chemical (dichloromethane) in wastes, 1991 (pounds): 730,000
Production ratio: 2.40

The total quantity of dichloromethane in wastes between 1990 and 1991 increased by 87% ([730,000 - 390,000]/390,000 = 0.87), while production increased by 140% (2.40 - 1.00 = 1.40). Adjusting for production, the expected quantity of dichloromethane in wastes for 1991 would be 936,000 pounds (390,000 x 2.40 = 936,000). The quantity reported for 1991 is 206,000 pounds (730,000 - 936,000 = -206,000) less than the quantity expected for that year. Given the assumption of a direct relationship between production activities and the generation of wastes, this indicates a decrease in dichloromethane in wastes relative to the large increase in production, and even though there was an absolute increase in the amount of dichloromethane in wastes, there could have been a substantial decrease in the amount of dichloromethane in wastes generated per unit of production.

CHANGES IN QUANTITIES OF TOXIC CHEMICALS IN WASTES AT THE NATIONAL LEVEL

EPA performed a preliminary analysis of the data received for 1991 using the technique outlined above. Of the 82,293 Form Rs submitted for 1991, 50,957 forms had sufficient information for both 1990 and 1991 to perform an analysis of the changes of the quantity of toxic chemicals in wastes for those two years. Of those 50,957 forms, 13,679 (approximately 27%, or 17% of the total 82,293 forms submitted) indicated the implementation of a source reduction activity. For this subset of facilities that reported source reduction and provided sufficient information for both 1990 and 1991, the quantity of toxic chemicals in wastes reported on those forms decreased by 7% between 1990 and 1991 in absolute terms (see Table 2-18). Adjusting for production changes indicates a slightly greater decrease of almost 10%.

As shown in Table 2-19, forms that did not indicate the implementation of source reduction showed a slight increase in the total quantity of toxic chemicals entering wastes. This increase was 0.6% in absolute terms and 0.1% adjusted for production.

EPA has further analyzed this subset of the 1991 data further and has found that not all facilities reporting a source reduction activity have indicated a decrease in the total quantity of toxic chemicals in wastes. Some facilities that have reported the implementation of a source reduction activity have also indicated an increase in the total quantity of toxic chemicals in wastes. In addition, many facilities that did not indicate the implementation of a source reduction activity on Form R have indicated decreases in the total quantity of toxic chemicals in wastes. EPA is continuing to analyze this data in order to more fully understand why increases and decreases in quantities in quantities of toxic chemicals in wastes are occurring. EPA will also be further developing methods for analyzing this new data and will be seeking public input on such analyses and what conclusions can be drawn from them.

Table 2-18. Change in Quantities of Toxic Chemicals in Wastes from 1990 to 1991 for Facilities Reporting Source Reduction Activities.(g)

Category of Waste Generated	1990 Reported Quantity Pounds	1990 Reported Percent of Total	1991 Reported Quantity Pounds	1991 Reported Percent of Total	Amount Expected for 1991 Quantity Pounds	Amount Expected for 1991 Percent of Total
Recycled On-site	4,288,934,120	44.1	4,142,850,655	45.9	4,221,103,018	42.3
Recycled Off-site	531,795,145	5.5	463,835,017	5.1	530,172,516	5.3
Energy Recovery On-site	802,755,967	8.3	795,579,596	8.8	860,121,878	8.6
Energy Recovery Off-site	154,851,112	1.6	148,940,697	1.6	166,264,791	1.7
Treated On-site	2,503,434,947	25.7	2,255,785,438	25.0	2,684,299,601	26.9
Treated Off-site	191,688,210	2.0	151,075,322	1.7	185,264,814	1.9
Quantity Released(b)	1,251,761,547	12.9	1,077,462,015	11.9	1,329,116,688	13.3
Total	9,725,221,048	100.0	9,035,528,740	100.0	9,976,343,306	100.0

Category of Waste Generated	Absolute Change 1991-1990 Quantity Pounds	Absolute Change 1991-1990 Percent Change	Relative Change 1991 Rep. - 1991 Exp. Quantity Pounds	Relative Change 1991 Rep. - 1991 Exp. Percent Change
Recycled On-site	-146,083,465	-3.4	-78,252,363	-1.8
Recycled Off-site	-67,960,128	-12.8	-66,337,499	-12.5
Energy Recovery On-site	-7,176,371	-0.9	-64,542,282	-8.0
Energy Recovery Off-site	-5,910,415	-3.8	-17,324,094	-11.2
Treated On-site	-247,649,509	-9.9	-428,514,163	-17.1
Treated Off-site	-40,612,888	-21.2	-34,189,492	-17.8
Quantity Released(b)	-174,299,532	-13.9	-251,654,673	-20.1
Total	-689,692,308	-7.1	-940,814,566	-9.7

Table 2-19. Change in Quantities of Toxic Chemicals in Wastes from 1990 to 1991 for Facilities Not Reporting Source Reduction Activities.(h)

Category of Waste Generated	1990 Reported Quantity Pounds	1990 Reported Percent of Total	1991 Reported Quantity Pounds	1991 Reported Percent of Total	Amount Expected for 1991 Quantity Pounds	Amount Expected for 1991 Percent of Total
Recycled On-site	8,377,872,770	44.5	8,404,984,183	44.4	8,246,932,874	43.6
Recycled Off-site	1,719,965,885	9.1	1,681,409,450	8.9	1,699,825,896	9.0
Energy Recovery On-site	1,306,776,700	6.9	1,359,061,268	7.2	1,376,186,334	7.3
Energy Recovery Off-site	114,743,884	0.6	116,702,877	0.6	121,598,004	0.6
Treated On-site	5,293,106,366	28.1	5,349,008,719	28.2	5,406,464,292	28.6
Treated Off-site	493,196,042	2.6	474,545,889	2.5	480,944,499	2.5
Quantity Released(b)	1,527,059,904	8.1	1,557,913,296	8.2	1,585,227,169	8.4
Total	18,832,721,551	100.0	18,943,625,682	100.0	18,917,179,068	100.0

Category of Waste Generated	Absolute Change 1991-1990 Quantity Pounds	Absolute Change 1991-1990 Percent Change	Relative Change 1991 Rep. - 1991 Exp. Quantity Pounds	Relative Change 1991 Rep. - 1991 Exp. Percent Change
Recycled On-site	27,111,413	0.3	158,051,309	1.9
Recycled Off-site	-38,556,435	-2.2	-18,416,446	-1.1
Energy Recovery On-site	52,284,568	4.0	-17,125,066	-1.3
Energy Recovery Off-site	1,958,993	1.7	-4,895,127	-4.2
Treated On-site	55,902,353	1.1	-57,455,573	-1.1
Treated Off-site	-18,650,153	-3.8	-6,398,610	-1.3
Quantity Released(b)	30,853,392	2.0	-27,313,873	-1.8
Total	110,904,131	0.6	26,446,614	0.1

Notes

(a) Submission of prior year (1990) data was optional in this first year of reporting. Data for 1992 and 1993 were estimated projections by the facilities submitting Form Rs for the 1991 reporting year. They do not represent reported totals for the 1992 or 1993 reporting years (Tables 2-1 and 2-2).

(b) "Quantity Released" includes amounts released on-site and amounts sent off-site for disposal (Tables 2-1 through 2-5, 2-9, 2-18, and 2-19).

(c) "Total Production Related Wastes" refers to wastes associated with routine production processes and is the sum of the amounts in the preceding seven columns (i.e., amounts recycled on- and off-site, used for energy recovery on- and off-site, treated on- and off-site, and released) (Tables 2-3, 2-4, and 2-5).

(d) "Non-Production Related Wastes" refers to the quantity released to the environment as a result of remedial actions, catastrophic events, or one-time events not associated with production processes (Tables 2-3, 2-4, and 2-5).

(e) The trade secret claim for 900,000,000 pounds recycled on-site and 360,000 pounds treated on-site has been withdrawn. The chemical has been identified as diethyl phthalate (Table 2-5).

(f) **Source Reduction Activity Codes (Table 2-10):**

Good Operating Practices
- W13 Improved maintenance scheduling, recordkeeping, or procedures
- W14 Changed production schedule to minimize equipment and feedstock changeovers
- W19 Other changes in operating practices

Inventory Control
- W21 Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
- W22 Began to test outdated material -- continue to use if still effective
- W23 Eliminated shelf-life requirements for stable materials
- W24 Instituted better labelling procedures
- W25 Instituted clearinghouse to exchange materials that would otherwise be discarded
- W29 Other changes in inventory control

Spill and Leak Prevention
- W31 Improved storage or stacking procedures
- W32 Improved procedures for loading, unloading, and transfer operations
- W33 Installed overflow alarms or automatic shut-off valves
- W35 Installed vapor recovery systems
- W36 Implemented inspection or monitoring program of potential spill or leak sources
- W39 Other spill and leak prevention

Raw Material Modifications
- W41 Increased purity of raw materials
- W42 Substituted raw materials
- W49 Other raw material modifications

Process Modifications
- W51 Instituted recirculation within a process
- W52 Modified equipment, layout, or piping
- W53 Use of a different process catalyst
- W54 Instituted better controls on operating bulk containers to minimize discarding of empty containers
- W55 Changed from small volume containers to bulk containers to minimize discarding of empty containers
- W58 Other process modifications

Cleaning and Degreasing

W59 Modified stripping/cleaning equipment
W60 Changed to mechanical stripping/cleaning devices (from solvents or other materials)
W61 Changed to aqueous cleaners (from solvents or other materials)
W63 Modified containment procedures for cleaning units
W64 Improved draining procedures
W65 Redesigned parts racks to reduce dragout
W66 Modified or installed rinse systems
W67 Improved rinse equipment design
W68 Improved rinse equipment operation
W71 Other cleaning and degreasing modifications

Surface Preparation and Finishing

W72 Modified spray systems or equipment
W73 Substituted coating materials used
W74 Improved application techniques
W75 Changed from spray to other system
W78 Other surface preparation and finishing modifications

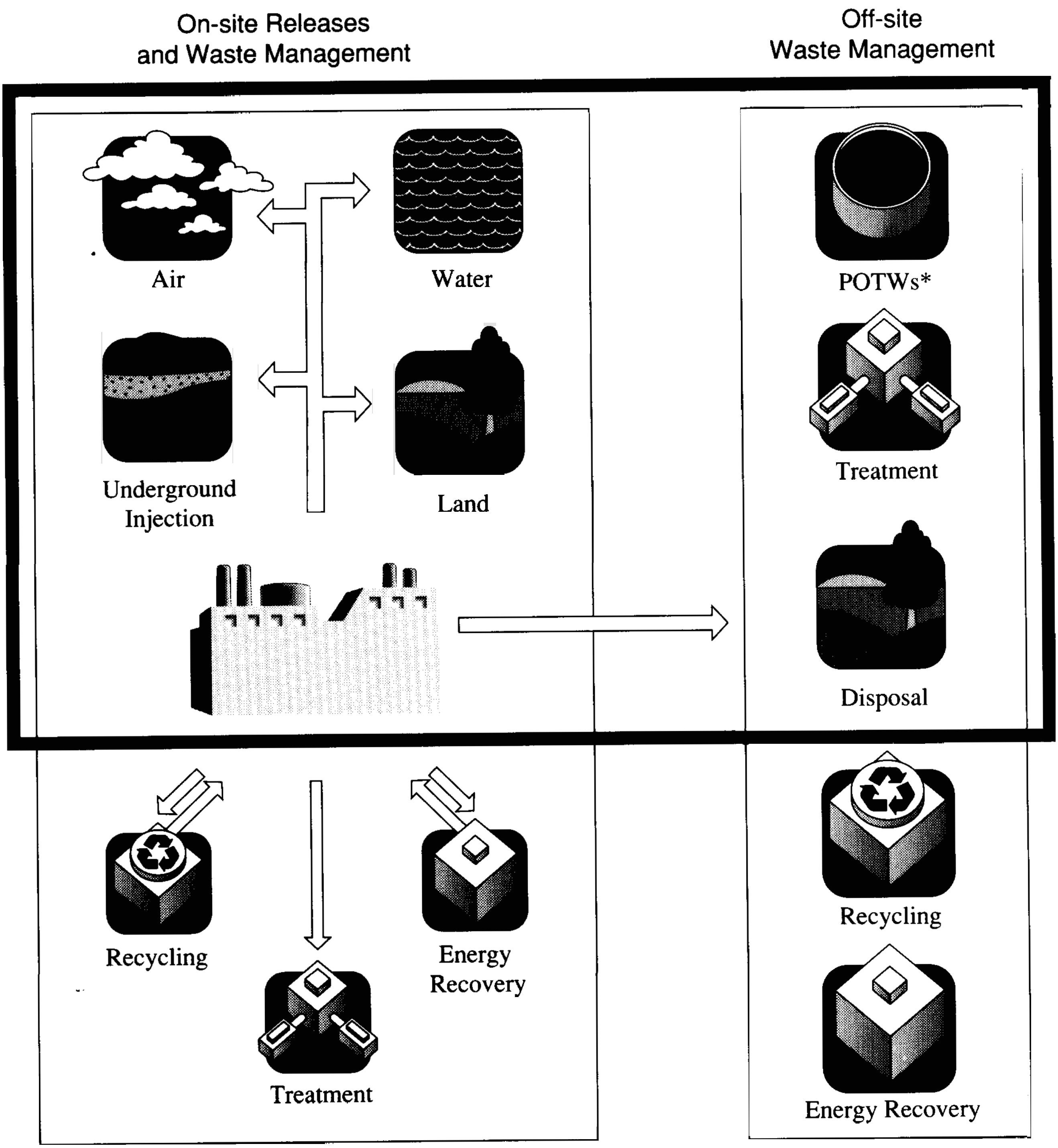
Product Modifications

W81 Changed product specifications
W82 Modified design or composition
W83 Modified packaging
W89 Other product modifications

(g) 13,679 of the 50,957 Form Rs met these criteria (Table 2-18).

(h) 37,278 of the 50,957 Form Rs met these criteria (Table 2-19).

Chapter 3
1988 to 1991
Comparison Year Data



* Publicly Owned Treatment Works

1988 TO 1991 COMPARISON YEAR DATA

INTRODUCTION

Baseline Year

1991 marks the fifth reporting year for the TRI program. This section of the report summarizes the TRI data for 1988 through 1991 to allow comparisons across years to help identify changes and trends. Although 1987 was the first year for TRI reporting, 1988 has been chosen as the baseline year because of concerns about the data quality of industry's submissions in the first year.

Chemical List Changes

Certain TRI reporting requirements have changed since the inception of the program. EPA has the authority to add chemicals to the reporting list if they meet the statutory criteria for toxicity, and to delete chemicals from the list if they are determined not to meet the toxicity criteria. Since 1987, in response to petitions, EPA has removed from the list seven individually listed chemicals and three members of the copper compounds category that did not meet the toxicity criteria. Also in response to a petition, EPA deleted non-fibrous aluminum oxide, but retained fibrous forms of aluminum oxide on the list. EPA has added 16 chemicals to the list, nine of which were reportable beginning with the 1990 reporting year, and seven of which were reportable beginning with the 1991 reporting year. More complete information about chemical list changes is included in Chapter 1 and the Question and Answer section of the Appendix.

In order to control for changes to the chemical list over time, year-to-year comparisons presented in this chapter are based on a consistent list of chemicals that have been reportable for all years being compared. This use of a consistent set of chemicals ensures that any year-to-year changes in release or transfer totals seen here cannot be attributed to changes in the list of reportable chemicals. Because of this normalization process, release and transfer totals presented in the 1988-1991 comparison section may differ slightly from totals seen in the 1990-1991 comparison section and from the totals presented in Chapter 1 of this report.

Threshold Changes

Facilities are only required to report for a particular chemical if they meet the manufacturing, processing or otherwise use thresholds for that chemical. The otherwise use threshold has remained 10,000 pounds since the inception of the program. However, the manufacturing and process thresholds dropped from 75,000 pounds for 1987, to 50,000 pounds for 1988, and again to 25,000 pounds for 1989 and later. Declining thresholds until 1989 probably increased the number of facilities required to report to TRI each year, as well as the number of forms filed. However, thresholds did not change for the 1990 or 1991 reporting years, so threshold changes should not be a factor in comparing 1991 data to 1990 or 1989 data. Threshold changes would be a factor to consider when comparing 1991 data to 1988 data.

1988 TO 1991 DATA COMPARISONS

This section compares summary release and transfer data for the 1988 through 1991 reporting years in order to highlight and help explain changes and possible trends.

Tables and text in this section include only those chemicals listed for all reporting years from 1988 through 1991; any chemicals added or deleted during that time are not included. This section includes releases to all media, as well as transfers to POTWs and to other off-site locations for treatment and disposal. Off-site transfers reported without waste management codes or with invalid codes are included in a category called "other off-site transfers." Transfers for recycling and energy recovery for 1991 are not included in this chapter, because they were first required to be reported for the 1991 reporting year.

1988 to 1991 Releases and Transfers

Since 1988, TRI reported releases have declined nearly 31%, from 4.85 billion pounds in 1988 to 3.35 billion pounds in 1991. Reported transfers have declined 33.5%, from 1.6 billion pounds in 1988 to 1.06 billion pounds in 1991.

Table 3-1. Comparison of TRI Releases and Transfers, 1988 - 1991.

	1988	1989	88-89 Percent Change	1990	89-90 Percent Change	1991	90-91 Percent Change	88-91 Percent Change
	Number	Number	Percent	Number	Percent	Number	Percent	Percent
Total Facilities	22,189	24,074	8.5	24,332	1.1	23,608	-3.0	6.4
Total Forms	77,515	85,927	10.9	85,180	-0.9	81,157	-4.7	4.7
	Pounds	Pounds	Percent	Pounds	Percent	Pounds	Percent	Percent
Total Air Emissions	2,666,109,198	2,562,194,620	-3.9	2,282,703,155	-10.9	1,979,345,978	-13.3	-25.8
Fugitive Air	823,738,542	793,597,781	-3.7	706,748,307	-10.9	609,765,664	-13.7	-26.0
Point source Air	1,842,370,656	1,768,596,839	-4.0	1,575,954,848	-10.9	1,369,580,314	-13.1	-25.7
Surface Water Discharges	311,070,591	188,025,233	-39.6	196,832,760	4.7	243,497,317	23.7	-21.7
Underground Injection	1,343,633,468	1,175,583,836	-12.5	745,413,562	-36.6	710,248,004	-4.7	-47.1
On-site Land Releases	527,546,722	455,029,001	-13.7	462,679,392	1.7	421,160,113	-9.0	-20.2
Total Releases	4,848,359,979	4,380,832,690	-9.6	3,687,628,869	-15.8	3,354,251,412	-9.0	-30.8
Transfers to POTWs	574,045,380	558,575,158	-2.7	466,123,084	-16.6	410,596,887	-11.9	-28.5
Transfers to Treatment	489,219,375	464,928,284	-5.0	373,479,495	-19.7	350,400,454	-6.2	-28.4
Transfers to Disposal	485,346,782	397,690,166	-18.1	431,994,463	8.6	294,391,066	-31.9	-39.3
Other Off-site Transfers(a)	53,545,448	27,737,608	-48.2	36,977,876	33.3	9,522,463	—	—
Total Transfers	1,602,156,985	1,448,931,216	-9.6	1,308,574,918	-9.7	1,064,910,870	-18.6	-33.5
Total Releases and Transfers	6,450,516,964	5,829,763,906	-9.6	4,996,203,787	-14.3	4,419,162,282	-11.5	-31.5

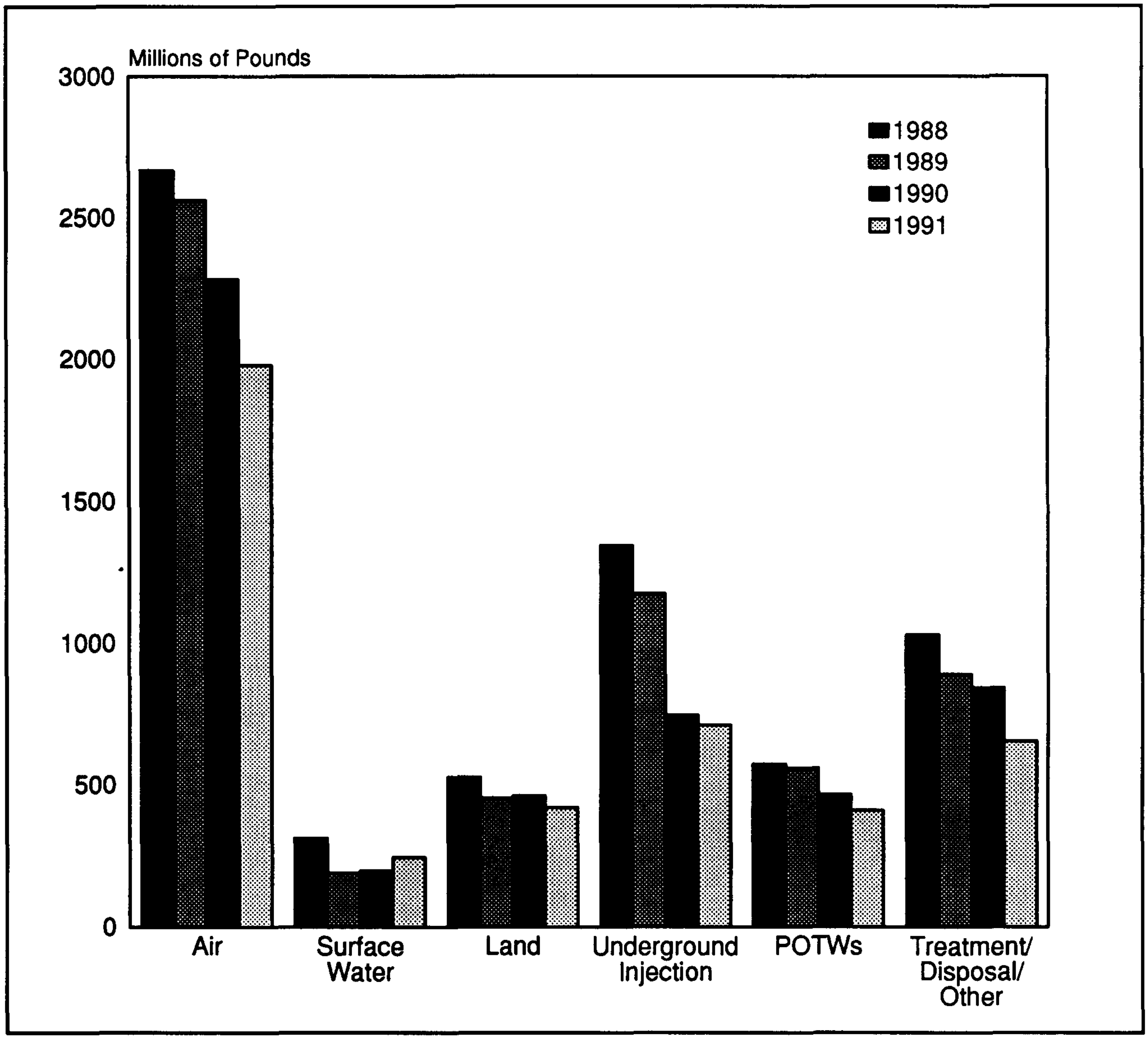


Figure 3-1. TRI Releases and Transfers, 1988-1991.

Air emissions have declined about 26%, from 2.67 billion pounds in 1988 to 1.98 billion pounds in 1991. Surface water discharges have declined nearly 22%, from 311 million pounds in 1988 to nearly 244 million pounds in 1991. Reported water releases decreased nearly 40% from 1988 to 1989, largely because facilities incorrectly reported mineral acid releases in the early years of the TRI program. Water releases have increased in each of the last two reporting years.

Reported underground injection of waste has decreased about 47%, from 1.34 billion pounds in 1988 to 710 million pounds in 1991. Reported land releases have declined about 20%, from 528 million pounds in 1988 to 421 million pounds in 1991. Transfers to POTWs decreased from 574 million pounds in 1988 to 411 million pounds in 1991, a decrease of over 28%. Transfers to off-site locations for treatment also declined more than 28%, from 489 million pounds in 1988 to 350 million pounds in 1991. Transfers to disposal declined more than 39%, from 485 million pounds in 1988 to 294 million pounds in 1991.

The greatest total net change from one year to the next occurred between 1989 and 1990, when reported releases decreased nearly 16% and reported transfers decreased nearly 10%. A significant portion of the reported decrease for total releases, as well as for transfers to POTWs, is attributable to a new reporting option for ammonium sulfate. Beginning with the 1990 reporting year, facilities were given the option of reporting their releases and transfers of ammonium sulfate either as ammonium sulfate or as ammonia. Sulfate accounts for 73%, by weight, of ammonium sulfate. Thus, facilities that chose to report ammonium sulfate as ammonia would have reported releases and transfers of ammonia that were approximately one-quarter of their 1989 ammonium sulfate numbers. EPA estimates roughly that, without this guidance change, total releases would have declined about 7% between 1989 and 1990 instead of the 16% reported. Transfers to POTWs would have increased about 1.6% instead of the 16.6% decrease reported. Reported air releases and transfers for treatment and disposal probably were not significantly affected by this optional reporting.

1988 to 1991 Number of Facilities and Forms

In general, the number of reporting facilities and the number of forms filed increased initially and then declined somewhat. Below are the total numbers of reporting facilities and submitted forms for each reporting year 1988-1991 (including only those forms for chemicals which were reportable in all years 1988-1991):

	1988	1989	1990	1991
Number of forms	77,515	85,927	85,180	81,157
Number of facilities	22,189	24,074	24,332	23,608

The number of facilities submitting at least one Form R increased between 1988 and 1989 and again from 1989 to 1990. However, between 1990 and 1991, the number of reporting facilities declined for the first time. This decline is examined in the 1990-1991 data comparison section of this chapter.

The total number of forms filed increased by more than 8,400 between 1988 and 1989; at least some of this increase was due to the lowered manufacturing and processing thresholds. Between 1989 and 1990, the total number of forms filed dropped slightly, even though the number of reporting facilities increased. Between 1990 and 1991, the total number of forms filed dropped by more than 4,000; this decline is explored in the 1990-1991 data comparison section of this chapter.

Between 1988 and 1989, the number of forms filed **per chemical** increased for most chemicals; again, this would be expected since the manufacturing and processing thresholds dropped for 1989. Between 1989 and 1990, the number of forms filed per chemical increased for some chemicals and decreased for others. Between 1990 and 1991, there was a noticeable drop in the number of forms submitted per chemical (see 1990-1991 data comparison section).

1990 to 1991 Data Comparisons

This section compares summary release and transfer data for the 1990 and 1991 reporting years in order to highlight and help explain some of the reported changes. Because only two years of data are examined here, any identified changes should not be considered to be indicative of trends.

Tables and text in this section include only those chemicals listed for both reporting years 1990 and 1991. The nine chemicals added to the list for reporting year 1990 are included here, as is aluminum oxide (fibrous forms). The seven CFCs and Halons added to the list for reporting year 1991 are not included here. All delisted chemicals are excluded from this analysis. (See Questions and Answers in the Appendix for details about list changes.) This section includes releases to all media, as well as off-site transfers to POTWs and to other off-site locations for treatment and disposal. Off-site transfers reported without waste management codes or with invalid codes are included in a category called "other.off-site transfers." Transfers for recycling and energy recovery for 1991 are not included in this chapter, because they were first required to be reported for the 1991 reporting year.

Table 3-2. Comparison of TRI Releases and Transfers, 1990 - 1991.

	1990	1991	Change in Amount	Percent Change
	Number	Number	Number	Percent
Total Facilities	24,422	23,680	-742	-3.0
Total Forms	85,624	81,545	-4,079	-4.8
	Pounds	Pounds	Pounds	Percent
Total Air	2,285,710,798	1,981,317,661	-304,393,137	-13.3
Fugitive Air	707,617,279	610,467,652	-97,149,627	-13.7
Point Source Air	1,578,093,519	1,370,850,009	-207,243,510	-13.1
Surface Water Discharges	196,854,583	243,508,487	46,653,904	23.7
Underground Injection	745,450,747	710,359,696	-35,091,051	-4.7
Releases to Land	463,469,501	421,385,131	-42,084,370	-9.1
Total Releases	3,691,485,629	3,356,570,975	-334,914,654	-9.1
Transfers to POTWs	466,981,947	411,892,112	-55,089,835	-11.8
Transfers to Treatment	374,890,789	352,146,992	-22,743,797	-6.1
Transfers to Disposal	442,441,330	298,597,206	-143,844,124	-32.5
Other Off-site Transfers(b)	37,319,629	9,549,879	-27,769,750	-74.4
Total Transfers	1,321,633,695	1,072,186,189	-249,447,506	-18.9
Total Releases and Transfers	5,013,119,324	4,428,757,164	-584,362,160	-11.7

1990 to 1991 Releases and Transfers

Total TRI reported releases declined 9% from 1990 to 1991, from 3.69 billion pounds to 3.36 billion pounds. Total reported transfers declined nearly 19%, from 1.32 billion pounds in 1990 to 1.07 billion pounds in 1991.

Releases

Air releases declined more than 13%, from 2.29 billion pounds in 1990 to 1.98 billion pounds in 1991. Much of this decline was attributable to decreased emissions of a variety of solvents, including toluene, acetone, 1,1,1-trichloroethane, methyl ethyl ketone, dichloromethane, and xylene. Toluene alone accounted for more than 43 million pounds of the decrease. Many of these solvents have been targeted by EPA, states, and industry for pollution prevention efforts, including EPA's 33/50 program of voluntary industrial toxics reduction. Chlorine releases declined by more than 27 million pounds; most of this decrease appears to be due to reductions in chlorine emissions from Magnesium Corporation of America in Rowley, UT. Ammonia emissions declined by more than 21 million pounds, primarily due to large reductions from several facilities. Emissions of Freon 113, one of the ozone-depleting chemicals whose production is being phased out under Clean Air Act requirements, declined by more than 11 million pounds.

Surface water discharges increased nearly 24%, from 197 million pounds in 1990 to nearly 244 million pounds in 1991, a net increase of nearly 47 million pounds. This increase can be attributed largely to increased runoff from phosphogypsum stacks at four fertilizer manufacturing facilities in Louisiana. Releases of phosphoric and sulfuric acid from these facilities increased about 60 million pounds from 1990 to 1991, more than the total net increase for all surface water

Looking at individual facilities' reductions for two commonly used solvents, toluene and methyl ethyl ketone, it appears that many facilities are reporting large reductions in air emissions from 1990 to 1991.

Of the top 25 emitters of toluene to air in 1990, 20 reported reductions. Among these were five 3M facilities that reported reductions ranging from 23% to 56%. Seven others reported reductions ranging from 10% to 23%. These 20 facilities' reductions accounted for about 14.6 million pounds of decrease of toluene air emissions, or about 34% of this chemical's net decrease to this environmental medium.

Of the top 25 emitters of methyl ethyl ketone to air in 1990, 22 reported reductions. Among these were four 3M facilities that reported reductions ranging from 2.3% to 65%. Eleven others reported reductions ranging from 32% to 94%. These 22 facilities' reductions accounted for about 14 million pounds of decrease, or about 56% of the net decrease of methyl ethyl ketone emissions to air.

Box 3-1. Reductions in Air Emissions.

discharges. (Similar releases from some of these same facilities contributed to a net increase of releases to surface water between 1989 and 1990, and to large net decreases from 1987-1988 and 1988-1989.) Eliminating these 1991 increases from the data, surface water discharges would have declined by about 7% overall. (See discussion of 1991 TRI Top Increasers, below.)

Releases to land decreased 9%, from 463 million pounds in 1990 to 421 million pounds in 1991. Most of this reported reduction appears to be due to reduced releases of phosphoric acid and several types of metal compounds, including copper, manganese, chromium, and barium compounds. The decrease for copper compounds, about 13 million pounds, was not a real decrease, but resulted from a change in reporting due to a change in SIC code determination by Copper Range in White Pine, MI. (Prior to 1991, this facility reported releases and transfers from all its operations. For the 1991 reporting year, the facility determined, using EPA guidance, that it was primarily a mining facility and therefore was not obligated to report under TRI.) Releases of copper increased by about 4 million pounds, largely due to an increased release from Magma Copper of San Manuel, AZ (see discussion of 1991 TRI Top Increasers, below).

Underground injection of waste declined by nearly 5%, from 745 million pounds in 1990 to 710 million pounds in 1991. This net decrease of 35 million pounds is the result of large increases and decreases for specific chemicals from a few facilities. Ammonia releases decreased by 25 million pounds, with four facilities accounting for 24.5 million pounds of decrease. For sulfuric acid, there was a net decrease of 17.4 million pounds, with three facilities responsible for 24.5 million pounds of decrease. However, on-site underground injection of hydrochloric acid increased by 32 million pounds, with five facilities having increases totalling about 50 million pounds.

Transfers

Transfers to POTWs decreased nearly 12%, from 467 million pounds in 1990 to 412 million pounds in 1991. Ammonium sulfate accounts for about 20.5 million pounds of decrease; the ammonia portion of this decrease is about 5.5 million pounds. Transfers of ammonia to POTWs increased by almost 14 million pounds. Thus, it seems likely that the decrease in ammonium sulfate is due in part to reporting the ammonia portion under the ammonia listing. This would indicate that the changes are attributable to the optional reporting for ammonium sulfate, rather than a real reduction in transfers. Methanol, hydrochloric acid, and nitric acid together accounted for another 41 million pounds of decrease, while sulfuric acid increased almost 5 million pounds.

Transfers to treatment decreased more than 6%, from 375 million pounds in 1990 to 352 million pounds in 1991.

Transfers for disposal decreased more than 32%, from 442 million pounds in 1990 to 299 million pounds in 1991. Most of this decrease is attributable to decreased disposal of several metal compounds, aluminum, and hydrochloric acid. One facility, Kennecott Utah Copper in Magna, UT, accounted for more than 83 million pounds of decrease in transfers for disposal, and probably accounts for most of the decrease in transfers for disposal of copper compounds, lead compounds, arsenic compounds, and zinc compounds. This facility had a one-time transfer in 1990 of 81 million pounds of stockpiled flue dust; the facility's 1991 totals represent a decrease from this abnormally high level caused by the one-time transfer. Without this one facility's change, transfers off-site for disposal would have decreased by about 18% instead of 32%.

Transfers of the "other" type decreased by about 28 million pounds from 1990 to 1991; however, a valid comparison cannot be made between the two years for this category. EPA believes that the "other" category for 1990 includes about 24 million pounds of transfers for recycling and energy recovery that were incorrectly reported. EPA believes this because these transfers were reported along with RCRA codes for recycling and energy recovery that were not included in the Form R instructions and therefore were not valid TRI codes for 1990 and prior years. For the 1991 reporting year, the "other" category should contain few, if any, transfers for recycling and energy recovery, since those now must be reported under separate categories, and codes for them have been provided in the Form R instructions. Because the "other" category appears to contain this inconsistency between years, the amounts included in it should not be considered comparable.

1990 to 1991 Number of Forms

From 1990 to 1991, the total number of forms filed dropped by 4,079. There was also a noticeable drop in the number of forms submitted per individual chemical. For example, of the 85 chemicals having more than 100 forms per chemical submitted in 1991, 56 (67%) showed some decrease in the number of forms from 1990 to 1991. However, some chemicals had a more significant decline than others in the number of reports submitted from 1990 to 1991. Many of the commonly used solvents, such as toluene, 1,1,1-trichloroethane, dichloromethane, trichloroethylene, tetrachloroethylene, and 1,2-dichloroethane, had decreases in number of forms filed ranging from 8.6% to 16.4%. Freon 113 reports decreased by 21.4%. Submissions of 2-ethoxyethanol dropped by 28.7%. The number of forms filed for some metals, such as lead, zinc (fume or dust), antimony, barium, and aluminum (fume or dust), declined by 7.1% to 18.7%. The number of reports for cadmium decreased by 37.1%, and those for cyanide compounds decreased by 16.9%.

Some of the decreases may be due to less usage of the chemical, so that a report is no longer required because thresholds are not met. Less usage could be due to either changes in production, or to increased source reduction or recycling of the chemical. It is also possible that the chemical use may have been phased out. Many facilities are reducing the use of solvents to meet Clean Air Act requirements or pollution reduction goals, either triggered by industry or by state or federal agencies. Some of the other reasons listed below for changes in number of facilities can also explain why a single chemical report was submitted in one year, but not another.

1990 to 1991 Number of Facilities

The total number of reporting facilities declined by 742 between 1990 and 1991, representing a 3% net decrease. 2,995 facilities that reported in 1990 did not report in 1991, while 2,277 facilities that reported in 1991 did not report in 1990. The difference between these two numbers, 718 facilities, is approximately equal to the 742 facility net decrease apparent in the data. (The slight difference between the two numbers is due to difficulties cross-referencing facilities between the two reporting years.)

EPA examined the number of forms filed by facilities that reported only in 1990 or only in 1991 to determine how much of the decline in number of forms filed in 1991 was due to the decline in number of facilities reporting. 5,774 of the forms filed for 1990 were filed by facilities that reported in 1990 but not 1991. 4,335 of the forms filed in 1991 came from facilities that reported in 1991 but not 1990. This net decline of 1,439 forms accounts for 36% of the total net decrease in forms filed by all facilities in 1991.

Some facilities may not have reported in 1991 because they went out of business. Of the 2,995 facilities reporting in 1990 but not in 1991, EPA has identified at least 281 (9.4%) that have since closed down. Others may not have reported because they did not exceed the thresholds for any of the chemicals in 1991, no longer have ten full-time employees, have changed their business activity to a non-covered SIC code, have filed late submissions, or are out of compliance for some reason. After reporting, some facilities discover that they were not required to report because they were not in a covered SIC code or they qualified for an exemption. If they do not withdraw their previous submissions, or if EPA has not yet processed their withdrawals, they appear as part of the net decrease in facilities, because they filed in the previous year, but not the current one.

EPA attempted to determine how much of the change in reported release and transfer amounts between 1990 and 1991 was due to the decline in the number of facilities reporting. To do this, EPA excluded the release and transfer amounts reported by facilities that filed for only one of the two years, 1990 or 1991, but not both. The results of this analysis indicate that the decline in the number of facilities reporting had little overall impact on the release and transfer totals. After adjusting for the change in the universe of reporting facilities, the decrease in releases between 1990 and 1991 is about 8.5% instead of 9%, while the decrease in transfers is about 18% instead of 18.9%.

1991 TRI Top Decreasers in Total Releases

Table 3-3 lists the 50 TRI facilities with the greatest decreases in total releases from 1990 to 1991, ranked by the magnitude of their decrease. Together, these facilities accounted for reductions totalling 285 million pounds. EPA contacted some of these facilities to better understand how and why the decreases occurred and whether they were due to production changes, pollution prevention efforts, estimation method change, or reporting errors. Some of the reasons for change were found or supplemented by other published information on the TRI and are referenced at the end of this chapter.

Magnesium Corporation of America *Rowley, UT*

Releases of chlorine to air decreased from 88 to 61 million pounds due to the installation of new chlorine reduction burners. The chlorine is a byproduct from the electrolytic reduction of magnesium chloride to magnesium. Also, releases of hydrochloric acid to air decreased from 6.7 to 3.6 million pounds due to the installation of a neutralizer for this acid.

Inland Steel Co. *East Chicago, IN*

Releases of manganese compounds to landfill decreased from 39 to 28 million pounds and releases of zinc compounds to landfill decreased from 2.6 to 1.8 million pounds. The decrease was partly due to increased selling of slag containing these compounds as a product and partly due to a decrease in production.

Vulcan Chemical *Wichita, KS*

Underground injection of hydrochloric acid decreased from 45 to 35 million pounds. Some of the acid is now converted to commercial grade calcium chloride for road deicing and dust control uses.

Monsanto Co. *Alvin, TX*

Releases of ammonia to underground injection decreased from 58 to 49 million pounds due to a source reduction activity, characterized as an operating process change at the facility.

TexasGulf Inc. *Aurora, NC*

Releases of phosphoric acid to land from phosphate fertilizer production decreased from 24 to 14 million pounds. This was due in part to better estimates from improved monitoring capabilities and in part to improved operating procedures within the plant that have resulted in lower concentrations of phosphoric acid in their wastewater.

Monsanto Co. *Cantonment, FL*

Releases of ammonium nitrate (solution) to underground injection decreased from 14 to 5.6 million pounds. Ammonium nitrate is produced by neutralizing nitric acid (a byproduct of nylon production) with ammonia. The decrease is due to use of a different alkaline waste stream to neutralize some of the nitric acid.

Star Enterprise *Convent, LA*

Releases of ammonia to underground injection decreased from 8.7 million to zero pounds. This was due to the installation of a new sour water stripping unit at the petroleum refinery. Ammonia vapors stripped from the sour water are then burned with oxygen to convert the ammonia to nitrogen and water. The facility's underground injection wells have now been permanently closed.

Weyerhaeuser Paper Co. *Cosmopolis, WA*

Releases of sulfuric acid to water decreased from 8.1 million to 0.5 million pounds. In 1990, the state of Washington required a slightly acidic water discharge from the facility, a pulp mill, to control a fecal coliform contamination in oyster beds.

3M Tape Mfg. CV & AP Plant *Hutchinson, MN*

Releases of toluene and methyl ethyl ketone to air decreased from 19.2 to 12.9 million pounds. Increased amounts of these solvents, used to apply the magnetic layer to videotape, are now recovered and reused.

Table 3-3. Top 50 TRI Facilities with Greatest Decrease in Releases from 1990 to 1991 (by Total Decrease).(c)

Facility	City	State	Net Change from 1990 to 1991: Fugitive Nonpoint Air Emissions Pounds	Stack Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds
Magnesium Corp. of America	Rowley	UT	-31,076	-30,101,100	0	0	30
American Cyanamid Co.	Westwego	LA	-107,588	-101,365	42,597	-19,855,550	0
Inland Steel Co.	East Chicago	IN	-1,283,825	-62,030	-284,205	-4,406,600	-12,139,595
Cyprus Miami Mining Corp.	Claypool	AZ	57,000	11,300	2,600	0	-16,022,060
Vulcan Chemicals	Wichita	KS	30,951	-104,857	0	-13,763,200	0
Monsanto Co.	Alvin	TX	-68,210	-101,530	0	-10,384,690	-25,400
Texasgulf Inc.	Aurora	NC	14,810	484,300	-16,450	0	-10,371,300
Monsanto Co.	Cantonment	FL	-23,600	-739,148	-1,160	-8,485,045	0
Star Enterprise Inc.	Convent	LA	-2,762	-859	2,583	-8,740,905	-468
Du Pont Victoria Site	Victoria	TX	0	102,371	-2,507	-7,758,124	-220,603
Weyerhaeuser Paper Co.	Cosmopolis	WA	-36,100	3,250	-7,655,905	0	0
Wheeling-Pittsburgh Steel Co.	Follansbee	WV	-1,949,260	1,542,730	23,220	0	-7,237,280
USS Fairless Works	Fairless Hills	PA	-45,158	-38,802	-497	0	-7,240,000
Piney Point Phosphates Inc.	Palmetto	FL	-3,681,000	86,091	324	0	-3,346,000
Union Camp Corp.	Savannah	GA	77,352	-7,091,890	199,520	0	0
3M Co.	Hutchinson	MN	193,033	-6,914,573	0	0	0
Triad Chemical	Donaldsonville	LA	375	-6,017,856	-101,639	0	0
3M Co.*	Brownwood	TX	-1,583	-5,307,520	0	0	-387
Holliston Mills Inc.	Church Hill	TN	-21,873	-4,382,409	-199	0	-234
Angus Chemical Co.	Sterlington	LA	-61,465	-240,511	-49,490	-4,007,000	0
CF Industries Inc.	Donaldsonville	LA	15,195	-4,455,884	435,070	0	0
BASF Corp.	Lowland	TN	-406,995	-2,613,000	14,810	0	-865,700
BP Chemicals Inc.	Port Lavaca	TX	-57,836	-39,718	-370	-3,467,111	-14
Great Lakes Chemical Corp.	El Dorado	AR	12,585	45,131	-5	-3,250,327	-3,501
Eastman Kodak Co.	Kingsport	TN	589,943	-1,104,762	-2,204,405	0	-363,646
General Electric Co. Plastics	Mount Vernon	IN	-507,013	-2,477,579	-37,121	0	0
Courtaulds Fibers Inc.	Axis	AL	-41,900	-3,000,000	7,245	0	29,250
Agricultural Minerals Corp.	Verdigris	OK	-159	-1,280,000	-23,222	-1,522,000	250
Jersey Miniere Zinc	Clarksville	TN	1,952	-43,607	-9,664	0	-2,751,278
Borden Chemicals & Plastics	Geismar	LA	-114,102	-32,526	26,461	-2,645,740	0
Shell Oil Co.	Norco	LA	-219,331	-219,501	38,570	-2,205,400	-1,672
Hoechst Celanese	Narrows	VA	-1,215,000	-1,383,503	-163	0	1,137
Reynolds Metals Co.	Muscle Shoals	AL	-280,360	-2,301,968	2	0	0
U.S. Vanadium Corp.	Hot Springs	AR	-250	301,400	-597,750	0	-2,237,000
Unocal Corp.	Kenai	AK	-7,494	-2,439,664	-20,440	150	-22,905
3M Co.	Nevada	MO	-95,703	-2,374,440	0	0	-2,870
Glenbrook Nickel Co.	Riddle	OR	-250	-31,184	-15	0	-2,406,000
3M Co.	Knoxville	IA	-109	-2,313,169	0	0	0
Westinghouse Electric Corp.	Hampton	SC	14,170	-2,303,450	31	0	0
Chemetals Inc.	New Johnsonville	TN	-88,768	-89,933	-336	0	-2,063,647
Union Carbide Chemicals	Texas City	TX	-2,310,197	70,190	0	0	0
Hexcel Corp.	Casa Grande	AZ	327,032	-2,537,988	0	0	0
Amoco Oil Co.	Texas City	TX	-159,680	20,884	56,205	-1,229,000	-880,198
Georgia-Pacific	Woodland	ME	-133,352	-1,938,400	-28,820	0	0
Amoco Chemical Co.	Alvin	TX	-1,943,556	-149,873	-3,362	0	2,010
Macon Kraft Inc.	Macon	GA	10,100	-2,046,740	-1,230	0	0
Johnstown Corp.	Johnstown	PA	0	0	0	0	-2,014,730
Eagle Ottawa Leather Co.	Grand Haven	MI	-1,779	-1,981,375	0	0	0
FMC Corp.	Pocatello	ID	-1,337	-509	0	0	-1,932,591
O'Sullivan Corp.	Winchester	VA	-1,545,433	-371,361	0	0	0
Total			-15,099,606	-96,066,937	-10,189,717	-91,720,542	-72,116,402

Facility	City	State	1990 Total Releases Pounds	1991 Total Releases Pounds	1990 to 1991 Changes in Total Releases Pounds
Magnesium Corp. of America	Rowley	UT	95,049,351	64,917,205	-30,132,146
American Cyanamid Co.	Westwego	LA	162,030,982	142,009,076	-20,021,906
Inland Steel Co.	East Chicago	IN	50,682,660	32,506,405	-18,176,255
Cyprus Miami Mining Corp.	Claypool	AZ	19,712,060	3,760,900	-15,951,160
Vulcan Chemicals	Wichita	KS	59,386,409	45,549,303	-13,837,106
Monsanto Co.	Alvin	TX	64,823,729	54,243,899	-10,579,830
Texasgulf Inc.	Aurora	NC	25,730,100	15,841,460	-9,888,640
Monsanto Co.	Cantonment	FL	18,488,405	9,239,452	-9,248,953
Star Enterprise Inc.	Convent	LA	8,910,554	168,143	-8,742,411
Du Pont Victoria Site	Victoria	TX	35,097,213	27,218,350	-7,878,863
Weyerhaeuser Paper Co.	Cosmopolis	WA	8,533,955	845,200	-7,688,755
Wheeling-Pittsburgh Steel Co.	Follansbee	WV	10,325,464	2,704,874	-7,620,590
USS Fairless Works	Fairless Hills	PA	7,927,782	603,325	-7,324,457
Piney Point Phosphates Inc.	Palmetto	FL	7,773,300	832,715	-6,940,585
Union Camp Corp.	Savannah	GA	10,659,854	3,844,836	-6,815,018
3M Co.	Hutchinson	MN	20,106,008	13,384,468	-6,721,540
Triad Chemical	Donaldsonville	LA	11,777,898	5,658,778	-6,119,120
3M Co.	Brownwood	TX	7,145,945	1,836,455	-5,309,490
Holliston Mills Inc.	Church Hill	TN	4,404,715	0	-4,404,715
Angus Chemical Co.	Sterlington	LA	6,498,879	2,140,413	-4,358,466
CF Industries Inc.	Donaldsonville	LA	11,430,589	7,424,970	-4,005,619
BASF Corp.	Lowland	TN	25,061,005	21,190,120	-3,870,885
BP Chemicals Inc.	Port Lavaca	TX	32,617,374	29,052,325	-3,565,049
Great Lakes Chemical Corp.	El Dorado	AR	7,637,872	4,441,755	-3,196,117
Eastman Kodak Co.	Kingsport	TN	43,497,650	40,414,780	-3,082,870
General Electric Co. Plastics	Mount Vernon	IN	7,986,937	4,965,224	-3,021,713
Courtaulds Fibers Inc.	Axis	AL	45,933,030	42,927,625	-3,005,405
Agricultural Minerals Corp.	Verdigris	OK	7,067,729	4,242,598	-2,825,131
Jersey Miniere Zinc	Clarksville	TN	3,026,541	223,944	-2,802,597
Borden Chemicals & Plastics	Geismar	LA	5,791,347	3,025,440	-2,765,907
Shell Oil Co.	Norco	LA	3,859,415	1,252,081	-2,607,334
Hoechst Celanese	Narrows	VA	11,614,226	9,016,697	-2,597,529
Reynolds Metals Co.	Muscle Shoals	AL	5,412,623	2,830,297	-2,582,326
U.S. Vanadium Corp.	Hot Springs	AR	4,552,100	2,018,500	-2,533,600
Unocal Corp.	Kenai	AK	13,945,248	11,454,895	-2,490,353
3M Co.	Nevada	MO	2,916,190	443,177	-2,473,013
Glenbrook Nickel Co.	Riddle	OR	2,437,449	0	-2,437,449
3M Co.	Knoxville	IA	4,230,530	1,917,252	-2,313,278
Westinghouse Electric Corp.	Hampton	SC	7,488,110	5,198,861	-2,289,249
Chemetals Inc.	New Johnsonville	TN	2,242,684	0	-2,242,684
Union Carbide Chemicals	Texas City	TX	7,011,225	4,771,218	-2,240,007
Hexcel Corp.	Casa Grande	AZ	3,048,411	837,455	-2,210,956
Amoco Oil Co.	Texas City	TX	11,265,919	9,074,130	-2,191,789
Georgia-Pacific	Woodland	ME	2,107,522	6,950	-2,100,572
Amoco Chemical Co.	Alvin	TX	4,040,289	1,945,508	-2,094,781
Macon Kraft Inc.	Macon	GA	3,070,070	1,032,200	-2,037,870
Johnstown Corp.	Johnstown	PA	2,014,730	0	-2,014,730
Eagle Ottawa Leather Co.	Grand Haven	MI	2,164,629	181,475	-1,983,154
FMC Corp.	Pocatello	ID	2,383,965	449,528	-1,934,437
O'Sullivan Corp.	Winchester	VA	4,054,664	2,137,870	-1,916,794
Total			924,975,336	639,782,132	-285,193,204

1991 TRI Top Increasers in Total Releases

Table 3-4 lists the top 50 TRI facilities with the greatest increases in total releases from 1990 to 1991, ranked by the magnitude of their increase. Together, these facilities accounted for a total increase of 222 million pounds. EPA contacted some of these facilities to better understand how and why the increases occurred and whether they were due to production changes, estimation method change, reporting errors, or other factors. A few of the reasons for change were found or supplemented by other published information on the TRI. These reports are referenced at the end of this chapter.

Agrico Chemical *Saint James, LA*

Releases to the Mississippi River of sulfuric acid increased from 5.1 to 14.2 million pounds and releases of phosphoric acid increased from 36.6 to 67.3 million pounds. The increases are due to the inability of the facility to recycle all the rainwater runoff from its gypsum storage piles, due to intense rainfalls over short periods of time or sustained moderate rainfall. Gypsum is a byproduct from the manufacturing of phosphoric acid.

Agricò Chemical *Uncle Sam, LA*

Releases to the Mississippi River of sulfuric acid increased from 5.3 to 14.7 million pounds and of phosphoric acid increased from 29.9 to 33.5 million pounds due to increased stormwater runoff from gypsum storage piles.

Du Pont *Louisville, KY*

Releases of hydrochloric acid to underground injection increased from 9.4 to 22 million pounds. Due to seasonal fluctuations in market conditions, Du Pont was unable to sell all of its byproduct hydrochloric acid, which is produced during the manufacture of Freon 22 and other CFCs. After developing additional storage for the acid so it can be sold when the market is more favorable, Du Pont was able to shut down its Louisville Deepwell in September 1992.

BASF Corp. *Geismar, LA*

Releases of hydrochloric acid to underground injection increased from 0.5 to 12 million pounds. Unfavorable market conditions prevented BASF from selling the hydrochloric acid as a product in 1991.

Magma Copper Co. *San Manuel, AZ*

Releases to land of copper increased from 10.1 to 14.6 million pounds; zinc went from zero to 4.7 million pounds; arsenic compounds went from zero to 1.7 million pounds; and lead went from 0.4 to 2.5 million pounds. These releases come from the copper smelting and refining process. The increases are due to increased production and to better estimates from new analysis and performing a mass balance within their process. Improved analysis of zinc compounds and arsenic in 1991 showed that these chemicals slightly exceeded the *de minimis* concentration limit in process streams, so their releases were reported in 1991.

Du Pont Johnsonville Plant *New Johnsonville, TN*

Underground injection of hydrochloric acid increased from 41 to 52 million pounds. The facility incorrectly reported their 1990 releases and has submitted a revision that will result in only a 0.2 million pounds increase in total reported releases.

Du Pont Delisle *Pass Christian, MS*

Releases of hydrochloric acid to underground injection increased from 33 to 41 million pounds. This was due in part to a 10% increase in production and, in large part, to increased stormwater collection and rainfall in 1991.

Wheeling-Pittsburgh Steel Corp. *Mingo Junction, OH*

Reported releases to land of zinc compounds increased from zero to 7 million pounds. This increase is due primarily to a 1990 reporting error. In 1990, the facility incorrectly reported 6.5 million pounds of zinc compounds as off-site transfers instead of as land releases. The reason the material should not have been reported as an off-site transfer is that the material was actually sent to another establishment at the same facility and not to a different facility. An actual increase of .5 million pounds of zinc compounds was due to the use of a higher proportion of galvanized scrap steel as a raw material.

Arcadian Fertilizer L.P. *Geismar, LA*

Releases to the Mississippi River of sulfuric acid increased from 5.8 to 7.3 million pounds and releases of phosphoric acid increased from 7.3 to 13 million pounds due to increased stormwater runoff from gypsum storage piles. Prior to 1991, Arcadian had had three years of substantial decreases due to projects undertaken as part of its initial voluntary reduction program.

Cabot Corp. *Tuscola, IL*

Release of hydrochloric acid (produced as a byproduct) to on-site deep well injection increased from 7 to 14 million pounds. The facility was unable to sell the waste hydrochloric acid due to a weak market, so they injected it underground.

Zinc Corp. of America *Bartlesville, OK*

Releases of metal compounds (zinc, copper, manganese, and cobalt) to land on-site increased from zero to 6.8 million pounds. This material is stored in piles at the facility and will later be removed or covered over as part of a remediation project. In 1991, the facility incorrectly reported it as land disposal under TRI because it was regulated under RCRA as a landfill. However, TRI guidance for this type of situation is to report the final disposal of the material. The facility has sent in revisions to correct their numbers.

General Motors Corp. Powertrain Div. *Defiance, OH*

Releases of manganese compounds and zinc compounds to land on-site increased from 1.6 to 6.2 million pounds. The facility is an iron foundry that produces a slag byproduct containing the compounds. The slag is stored in a settling basin and, periodically, the materials are dredged and removed to a landfill. Twenty percent of this increase was due to increased production. The remainder was due to a change in reporting. In previous years, the facility had only reported the

Table 3-4. Top 50 TRI Facilities with Greatest Increase in Releases from 1990 to 1991 (by Total Increase).

			Net Change from 1990 to 1991				
Facility	City	State	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds
Agrico Chemical Co.	Saint James	LA	42,000	-2,288,400	39,403,600	0	78,945
Agrico Chemical Co.	Uncle Sam	LA	-13,120	28,167	12,950,700	0	8,269
Du Pont	Louisville	KY	-18,749	139,626	0	12,552,181	0
BASF Corp.	Geismar	LA	87,496	-40,571	-18,667	11,521,226	0
Magma Copper Co.	San Manuel	AZ	27,410	-341,168	0	0	11,370,091
Du Pont Johnsonville Plant	New Johnsonville	TN	-34,065	-1,711,600	-40,400	11,000,000	0
Du Pont Delisle	Pass Christian	MS	3,213	264,400	-430	8,000,000	-1,480
Wheeling-Pittsburgh Steel Co.	Mingo Junction	OH	18,622	486	-19,056	0	7,646,600
Arcadian Fertilizer L.P.	Geismar	LA	-1,754	87,465	7,333,200	0	102,905
Cabot Corp.	Tuscola	IL	750	541,137	0	6,858,260	0
Zinc Corp. of America	Bartlesville	OK	2,516	-2,482	0	-2,164	6,806,039
General Motors Corporation	Defiance	OH	-1,154	-26,951	-13,265	0	4,964,411
Kennecott Utah Copper	Magna	UT	-2,560	-123,700	200	0	4,665,555
ICI Americas Inc.	Mount Pleasant	TN	5,893	63,371	-2,000	4,459,946	0
Glaval Corp.	Bremen	IN	4,465,128	0	0	0	0
Sterling Chemicals Inc.	Texas City	TX	-71,220	-102,205	-4,540	4,551,110	0
Climax Chemical Co.	Grantsville	UT	56,620	-21,775	0	0	3,629,914
Molycorp Inc.	Mountain Pass	CA	-30,273	-47,585	0	0	3,478,356
Marine Shale Processors Inc.	Amelia	LA	327	3,390,770	-178	0	0
BP Chemicals Inc.	Lima	OH	-46,850	-524,395	-17,900	3,868,880	0
Du Pont La Porte Plant	La Porte	TX	-240,273	-875	1,349	3,362,960	486
Alumax Inc. of South Carolina	Goose Creek	SC	7,545	2,570,373	0	0	0
Northwestern Steel & Wire Co.	Sterling	IL	7,270	-3,470	994	0	2,490,000
Herculaneum Smelter	Herculaneum	MO	470	175	105	0	2,429,597
Georgia-Pacific Corp.	Woodland	ME	131,511	1,952,961	202,060	0	139
Sid Richardson Carbon & Gasoline Co.	Big Spring	TX	-95	2,146,562	0	0	0
Elkem Metals Co.	Marietta	OH	319,878	14,200	-27,343	0	1,787,879
Du Pont	Memphis	TN	-94,962	2,031,219	-19,821	0	-8,300
Laroche Industries Inc.	Cherokee	AL	5,934	22,336	6,000	0	1,767,710
Occidental Chemical Corp.	Castle Hayne	NC	-200	-14,100	-28	0	1,795,454
ADM Corn Processing	Clinton	IA	-1,740	1,850,280	-89,390	0	0
Nitrogen Products Inc.	Helena	AR	25,000	1,477,280	213,768	0	0
Zinc Corp. of America	Monaca	PA	-83,551	-214,926	677	0	2,009,805
Phillips 66 Co.	Borger	TX	-973,285	3,252,981	-512,826	0	-56,380
Coastal Chem Inc.	Cheyenne	WY	-23,004	61,510	0	1,752,415	-82,390
ICI Americas Inc.	Bucks	AL	2,849	10,480	10	1,688,429	0
PPG Industries Inc.	Oak Creek	WI	-8,669	1,625,636	16	0	0
Mor-Flo Industries Inc.	Johnson City	TN	303,454	1,300,232	0	0	0
Inion Camp Corp.	Franklin	VA	-29,060	1,646,200	-29,865	0	0
Asarco Inc.	Hayden	AZ	58,614	-282,224	-103	0	1,768,907
Gaylord Container Corp.	Bogalusa	LA	-56,500	1,594,960	2,680	0	0
American Chrome & Chemicals	Corpus Christi	TX	-50	-26,000	-196,300	0	1,700,000
Ford Motor Co.	Louisville	KY	10,714	1,459,952	0	0	0
Procter & Gamble Co.	Perry	FL	-155,110	232,000	986,002	0	312,715
Starcraft Automotive Corp.	Goshen	IN	19,127	1,308,084	0	250	42,526
Scott Paper Co.	Mobile	AL	-54,750	633,000	788,100	0	0
Hoechst Celanese Chemical	Bay City	TX	-52,527	188,767	-915	1,176,932	15,580
Georgia-Pacific Corp.	Zachary	LA	32,050	1,288,200	2,000	0	1,355
Griffin Wheel Co.	Keokuk	IA	755	755	0	0	1,301,580
Bowater Carolina Co.	Catawba	SC	122,737	1,112,769	53,409	0	191
Total			3,764,362	26,523,907	60,951,843	70,790,425	60,026,459

Facility	City	State	1990 Total Releases Pounds	1991 Total Releases Pounds	1990 to 1991 Changes in Total Releases Pounds
Agrico Chemical Co.	Saint James	LA	56,607,515	93,843,660	37,236,145
Agrico Chemical Co.	Uncle Sam	LA	36,213,512	49,187,528	12,974,016
Du Pont	Louisville	KY	10,392,468	23,065,526	12,673,058
BASF Corp.	Geismar	LA	1,448,614	12,998,098	11,549,484
Magma Copper Co.	San Manuel	AZ	13,021,566	24,077,899	11,056,333
Du Pont Johnsonville Plant	New Johnsonville	TN	50,003,965	59,217,900	9,213,935
Du Pont Delisle	Pass Christian	MS	38,893,130	47,158,833	8,265,703
Wheeling-Pittsburgh Steel Co.	Mingo Junction	OH	123,482	7,770,134	7,646,652
Arcadian Fertilizer L.P.	Geismar	LA	16,041,525	23,563,341	7,521,816
Cabot Corp.	Tuscola	IL	11,370,029	18,770,176	7,400,147
Zinc Corp. of America	Bartlesville	OK	89,817	6,893,726	6,803,909
General Motors Corporation	Defiance	OH	2,352,874	7,275,915	4,923,041
Kennecott Utah Copper	Magna	UT	9,694,735	14,234,230	4,539,495
ICI Americas Inc.	Mount Pleasant	TN	13,212,807	17,740,017	4,527,210
Glaval Corp.	Bremen	IN	124,488	4,589,616	4,465,128
Sterling Chemicals Inc.	Texas City	TX	32,344,470	36,717,615	4,373,145
Climax Chemical Co.	Grantsville	UT	122,350	3,787,109	3,664,759
Molycorp Inc. *	Mountain Pass	CA	2,987,870	6,388,368	3,400,498
Marine Shale Processors Inc.	Amelia	LA	178,140	3,569,059	3,390,919
BP Chemicals Inc.	Lima	OH	24,282,015	27,561,750	3,279,735
Du Pont La Porte Plant	La Porte	TX	5,225,749	8,349,396	3,123,647
Alumax Inc. of South Carolina	Goose Creek	SC	79,967	2,657,885	2,577,918
Northwestern Steel & Wire Co.	Sterling	IL	9,480,846	11,975,640	2,494,794
Herculaneum Smelter	Herculaneum	MO	14,091,132	16,521,479	2,430,347
Georgia-Pacific Corp.	Woodland	ME	0	2,286,671	2,286,671
Sid Richardson Carbon & Gasoline Co.	Big Spring	TX	508,644	2,655,111	2,146,467
Elkem Metals Co.	Marietta	OH	15,388,660	17,483,274	2,094,614
Du Pont	Memphis	TN	4,172,833	6,080,969	1,908,136
Laroche Industries Inc.	Cherokee	AL	514,270	2,316,250	1,801,980
Occidental Chemical Corp.	Castle Hayne	NC	7,450,774	9,231,900	1,781,126
ADM Corn Processing	Clinton	IA	93,260	1,852,410	1,759,150
Nitrogen Products Inc.	Helena	AR	0	1,716,048	1,716,048
Zinc Corp. of America	Monaca	PA	1,586,000	3,298,005	1,712,005
Phillips 66 Co.	Borger	TX	2,465,209	4,175,699	1,710,490
Coastal Chem Inc.	Cheyenne	WY	7,908,661	9,617,192	1,708,531
ICI Americas Inc.	Bucks	AL	6,337,013	8,038,781	1,701,768
PPG Industries Inc.	Oak Creek	WI	127,439	1,744,422	1,616,983
Mor-Flo Industries Inc.	Johnson City	TN	233,000	1,836,686	1,603,686
Inion Camp Corp.	Franklin	VA	1,371,894	2,959,169	1,587,275
Asarco Inc.	Hayden	AZ	24,938,397	26,483,591	1,545,194
Gaylord Container Corp.	Bogalusa	LA	137,360	1,678,500	1,541,140
American Chrome & Chemicals	Corpus Christi	TX	8,699,860	10,177,510	1,477,650
Ford Motor Co.	Louisville	KY	374,324	1,844,990	1,470,666
Procter & Gamble Co.	Perry	FL	1,672,062	3,047,669	1,375,607
Starcraft Automotive Corp.	Goshen	IN	146,800	1,516,787	1,369,987
Scott Paper Co.	Mobile	AL	1,873,855	3,240,205	1,366,350
Hoechst Celanese Chemical	Bay City	TX	2,355,975	3,683,812	1,327,837
Georgia-Pacific Corp.	Zachary	LA	1,061,505	2,385,110	1,323,605
Griffin Wheel Co.	Keokuk	IA	2,925	1,306,015	1,303,090
Bowater Carolina Co.	Catawba	SC	1,172,777	2,461,883	1,289,106
Total			438,976,563	661,033,559	222,056,996

amount removed to the landfill, which, for the 1990 reporting year, happened to be none. In 1991, they reported both the quantity sent to the settling basin and sent to landfill (without double counting).

Reasons Facilities Report One Year but Not Another

The universe of facilities submitting reports changes somewhat each year. Each year, some facilities submit reports for the first time, and other facilities that have reported in previous years do not submit reports for the current year.

Sometimes this results from new facilities starting operations and other facilities shutting down either temporarily or permanently. Sometimes it is a matter of a facility meeting or failing to meet the reporting criteria for the first time. For example, a facility may meet the chemical manufacturing, processing or use thresholds one year but not another, or it may have ten or more employees one year and fewer than ten another year.

A facility may shift the majority of its industrial activities from a covered SIC code (e.g., primary metals) to a non-covered SIC code (e.g., mineral mining), eliminating its reporting obligation. In some cases, a change in a facility's SIC code determination reflects not a change in industrial activities, but a change in the facility's understanding or interpretation of the SIC code requirements.

In some cases, a facility that is not required by law to report, such as a facility with fewer than 10 employees or a facility outside the covered industry groups, may choose to report voluntarily. Because such facilities are not obligated to report, they may choose to file TRI reports some years but not others. There may also be Federal facilities (government owned and operated) that are reporting voluntarily for the first time.

Reasons Facility Release/Transfer Estimates Change

A number of factors affect the release and transfer estimates provided by facilities. Some reported increases and decreases are real—that is, changes in the amounts reported reflect changes in the amounts actually released and transferred. Other reported increases and decreases are accounting or "paper" changes that do not reflect an actual change in releases and transfers. Often, changes in amounts reported by facilities are due to a combination of several factors.

Real Changes

Real changes in TRI releases can result from a variety of factors. Source reduction activities, such as process changes, elimination of spills and leaks, inventory control, improved maintenance, and alternative methods of cleaning and degreasing can cause substantial real reductions in TRI releases. For example, Ashland Chemical of Plaquemine, LA, decreased air emissions of methanol by 65,000 pounds from 1990 to 1991 by replacing a methanol tank vent scrubber with internal floating roofs in two storage tanks and making some process modifications.

Another example of source reduction is Eastman Kodak Company's Kodak Park Division in Rochester, NY, reducing dichloromethane air releases by 1.06 million pounds from 1990 to 1991. Since 1988, their dichloromethane air releases have been reduced 48%, or by 4.25 million pounds. These reductions are due to process and procedure modifications in their cellulose triacetate film base manufacturing.

Chemical substitution—that is, replacing a listed TRI chemical with another, possibly less toxic, chemical—will cause a real decrease in the listed TRI chemical that is no longer being used by the facility or is being used in smaller quantities. For example, Borden Chemicals and Plastics (Geismar, LA) reduced air emissions of zinc and chromium compounds from 17,411 pounds in 1990 to zero by substituting a different cooling water tower treatment material. In another example, Grumman Corp. Allied Operations in Montgomery, PA, reduced their air emissions of 1,1,1-trichloroethane from 66,310 pounds in 1990 to 24,750 pounds in 1990. Like many facilities, this facility discontinued use of 1,1,1-trichloroethane in cleaning operations and replaced it with a lower VOC alternative.

However, it is important to look at what chemical or chemicals, if any, have replaced the listed TRI chemical. Sometimes a listed TRI chemical is replaced with another listed TRI chemical, resulting in decreased releases/transfers of one TRI chemical but possibly increased releases/transfers of the other. Sometimes listed TRI chemicals are replaced with chemicals that are also toxic, but are not yet included on the TRI list. In such cases, the substitution will cause a real decrease in releases/transfers of the listed chemical that is no longer being used, but these releases/transfers may be replaced by unreported releases/transfers of the unlisted substitute chemical.

Production increases and decreases can cause changes in reported facility releases/transfers. As an example, the decrease in the amount of TRI air emissions between 1990 and 1991 from Anitec Image Corporation in Binghamton, NY, was due primarily to the shutdown of the company's film base manufacturing operation. Its fugitive air releases of dichloromethane decreased from 1,800,000 to 640,000 pounds. Releases/transfers are likely to increase when production increases and decrease when production decreases, although the relationship is not necessarily linear. This year, for the first time, the TRI database includes production indices provided by facilities on each chemical reporting form to help relate reported releases/transfers to reported changes in production levels.

Releases/transfers may increase one year due to an abnormal event not related to normal production processes, such as an accidental release or a clean-up operation. For example, Occidental Chemical of Addis, LA, reported an 8,000 pound increase of vinyl chloride air emissions from 1990 to 1991 that was partly due to an emergency release of vinyl chloride. These one-time events can cause a real but anomalous increase in the reporting year in which they occur, and then a decrease from that abnormally high level the following year. The new TRI data for this year provide estimates for these one-time, non-production related releases/transfers.

Installation of pollution control equipment may also lead to real reductions in TRI releases/ transfers. As an example, Geneva Steel in Vineyard, UT, decreased ammonia releases to water from 239,302 pounds in 1990 to 27,023 pounds in 1991 due to installation of a treatment plant with micro-organisms that consume the ammonia. However, it is important to note that some types of pollution control merely shift waste from one type of release, treatment, or disposal to another.

Increased recycling and reuse of wastes instead of disposal will result in real decreases in TRI releases and/or in transfers for treatment and disposal. Sometimes facilities are able to sell waste materials as usable raw materials or products, which may also result in real decreases in TRI emissions. For example, Lake Erie Screw Corp. in Lakewood, OH, transferred 180,000 pounds of sulfuric acid off-site for disposal in 1990, but in 1991, the facility sold sulfuric acid to waste water treatment plants for reuse. The converse also occurs. In EPA's investigation of top release increasers, several facilities' increases in releases from 1990 to 1991 were due to market changes that prevented them from continuing to sell their acid waste for other uses.

"Paper" Changes

A common type of "paper" change occurs when a facility changes the way it estimates or calculates its releases for reporting purposes. Changing estimation techniques, or changing from estimation to monitoring of releases, can cause a change in the amount reported without a corresponding change in actual releases. For example, the General Motors Harrison Radiator Division's (Lockport, NY) discharge of 63,000 pounds of acetone to water in 1991, the result of a process reaction in the company's wastewater treatment plant, was discovered after the facility analyzed its 1991 waste water. Because such data were not available to make estimates for the previous year, the discharges had not been reported before.

Reported releases/transfers may change without actual releases/transfers changing when reporting guidance is clarified or a facility changes its interpretation of the reporting guidance. For example, EPA revised its guidance for 1991 concerning the *de minimis* exemption and beneficiation activities, such as ore processing. These activities are no longer excluded from this exemption, which could result in lower reported releases for some facilities.

Apparent increases or decreases can occur if a facility makes a reporting error one year and does not submit a revision. Examples of common reporting errors include misunderstanding the reporting requirements and exemptions, mathematical miscalculations, and typographical errors.

Prior to 1991, total amounts reported to TRI may have decreased in part because facilities shifted their transfers of TRI chemicals to energy recovery or recycling instead of disposal or treatment. Until 1991, transfers for energy recovery or recycling were not required to be reported to TRI. However, for the 1991 reporting year and beyond, these transfers must be reported as part of the new pollution prevention data.

ASSESSING THE COMPARATIVE IMPACT OF VARIOUS REASONS FOR CHANGE

In 1991, EPA surveyed a statistical sample of 1,206 facilities, 960 of which responded, to assess the comparative impact of various real and "paper" changes on the TRI data between 1989 and 1990. Specifically, the study focused on the comparative impact of measurement/estimation technique changes, production changes, and source reduction activities. The study estimated the number of forms and facilities associated with each reason for change and the quantity of change in pounds attributable to each reason for change. While similar data are not available for the 1991 reporting year, the findings of this study are expected to be generally relevant to the 1991 changes. Release and transfer quantities and percentages here will not match exactly amounts presented elsewhere in this chapter, because quantities calculated for this survey were based on a data set that is no longer current.

Production change was the most frequently cited reason for reported emissions changes between 1989 and 1990. Nearly 70% of facilities contacted cited production change as responsible for at least part of their reported release/transfer change. Production change was cited as a reason for change for about 45% of the forms. However, because production change was cited as a reason for almost as great a quantity of increase as of decrease, the net effect of production change on the change in TRI releases and transfers from 1989 to 1990 was only about 5%. Production change accounted for about 19% of the 1990 increase (by weight), 13% of the decrease, and 5% of the net decrease between 1989 and 1990 (about 41 million pounds).

Twenty-four percent of facilities cited estimation technique changes as a reason for at least part of their reported release/transfer changes. Estimation technique changes were cited as a reason for change for about 15% of forms. As with production changes, estimation technique changes largely cancelled each other out, causing little net effect. Estimation technique changes accounted for 7% of the 1990 increase, 5% of the decrease, and only about 3% of the net change (about 22 million pounds).

Source reduction was cited as a reason for change by 40% of facilities for about 18% of forms. Because source reduction accounted for about 20% of the decrease and only 2% of the increase, it had a large effect on the net change from 1989 to 1990. Source reduction accounted for about 45% of the net change, a decrease of about 387 million pounds.

The study found that the category of "other factors" accounted for more of the net change from 1989 to 1990 than any other reason assessed. In large part, this is probably because this category includes everything not included in the other categories, such as changes in reporting guidance, changes in facility interpretation and application of that guidance, reporting errors, accidental and one-time releases, increased recycling, and other unexplained reasons. The study found that "other factors" accounted for 73% of the 1990 increase, 62% of the decrease, and 48% of the net change (about 416 million pounds).

This study was able to develop estimates for only a few of the various reasons within this "other" category. Beginning with the 1990 reporting year, facilities were given the option of reporting ammonium sulfate as ammonia. The effect of facilities' exercising this option was estimated to have accounted for about 250 million pounds of decrease, a little less than half of the total decrease and more than half of the net decrease attributable to this category. Because by far the greatest effect of this optional reporting occurred in 1990, and change attributable to it will be much lower in the future, it seems likely that this "other" category would be substantially smaller in other years. It is important to note that a substantial portion of the change assigned to this category was so assigned because many facilities, although aware that the changes in their releases were due to source reduction, production variability, or measurement changes, were nevertheless unable to make quantitative allocations among these factors.

TRI Releases and Transfers Compared to Value of Shipments Data

One approach to understanding better how TRI releases and transfers have changed in relation to economic activity is to compute, and track over time, a ratio of the value of economic activity relative to releases and transfers for treatment and disposal. Changes in this ratio over time will indicate whether more or less value of economic activity is being obtained for each unit of TRI releases and transfers for treatment and disposal. This will give some indication of whether industry is improving its performance in managing TRI chemicals.

The specific measure used in the following analysis is the ratio of **real**—that is, inflation-adjusted—value of shipments to the sum of TRI releases and transfers. The ratio of real value of shipments to TRI releases and transfers is effectively an indicator of industry's productivity in the use and disposal of TRI chemicals as part of the manufacturing process.

Increases over time in the ratio would indicate that, for a given inflation-adjusted value of goods produced and shipped, manufacturers are releasing a lower quantity of TRI chemicals to the environment, and might thus be judged to be more productive in managing the use and disposal of TRI chemicals. Conversely, a declining ratio would suggest that a lower value of goods was being produced and shipped for each unit of TRI releases and transfers, and might be indicative of less effective management of the use and disposal of TRI chemicals in the manufacturing process.

The results of this analysis show that there has been an overall increase in the dollar value of shipments per ton of TRI releases and transfers in the period 1988 to 1991. The ratio of value of shipments to releases and transfers has increased from 0.87 to 1.19, representing an increase in value of shipments of more than $320,000 per ton of TRI releases and transfers. In other words, reported TRI releases and transfers have declined with respect to production as measured by value of shipments.

For the period 1988-1991, the ratio improved for 18 of 20 two-digit SIC code major groups. The chemical industry, which accounts for the largest share of TRI releases and transfers of any industry grouping, showed an improvement of about 50%. The two industry groups (food and apparel) that did not show an improvement together account for only about 2% of total TRI releases and transfers from all industries.

From 1990 to 1991, the ratio of value of shipments to releases and transfers increased from 1.09 to 1.19, an increase of 9.2%. The ratio of value of shipments to releases and transfers improved for 18 of the 20 SIC code groupings. Only apparel and stone/clay/glass showed declines between 1990 and 1991. The chemical industry, which showed a 30% improvement between 1989 and 1990, showed an improvement of 3% between 1990 and 1991.

Table 3-5 shows, for each year for each industry group, the value of shipments, tons of TRI releases and transfers, and the ratio of value of shipments to TRI releases and transfers. Table 3-6 shows growth rates for value of shipments, TRI releases and transfers, and their ratio. Rounding of numbers in the tables may cause the appearance of inconsistent results in a few cases.

It should be noted that, while value of shipments data constitute the best data readily available to represent production for this analysis, they are an imperfect measure of production. Value of shipments data do not cover all elements of production, such as unsold production or production of intermediates not sold. Also, while the value of shipments is adjusted for the rate of inflation in the economy, certain price changes that differ from the general rate of inflation may mean that changes in the value of shipments actually reflect changes in the price of products in addition to changes in production. Still, value of shipments is a reasonable proxy for production and constitutes the best data available to approximate production for this analysis.

Table 3-5. Ratio of Shipments to TRI Releases and Transfers for Manufacturing Industries, 1988 - 1991(d).

SIC Code	Industry	Value of Shipments $ Millions, 1987				TRI Releases and Transfers Tons			
		1988	1989	1990	1991	1988	1989	1990	1991
20	Food	328,212	324,780	330,472	332,705	34,793	38,977	41,766	41,272
21	Tobacco	16,807	15,987	16,333	15,437	1,468	904	1,264	1,160
22	Textiles	60,644	61,593	59,096	58,405	28,215	23,437	19,375	17,097
23	Apparel	60,664	57,530	56,852	56,332	857	1,030	823	922
24	Lumber	65,994	64,465	63,493	59,103	18,718	19,102	18,143	15,903
25	Furniture	35,212	35,599	34,997	32,917	36,445	35,053	32,919	28,997
26	Paper	107,789	108,747	107,830	106,378	168,955	164,862	157,442	149,156
27	Printing	121,749	120,218	120,352	114,871	34,739	31,198	27,337	23,578
28	Chemicals	229,822	232,512	238,168	234,989	1,504,035	1,363,668	1,070,615	1,025,717
29	Petroleum	194,113	189,831	188,828	190,224	55,409	56,669	47,617	42,830
30	Rubber/Plastics	88,285	89,307	91,104	88,538	99,319	105,789	101,423	83,100
31	Leather	8,522	8,349	8,065	7,325	14,061	12,889	11,609	8,660
32	Stone/Clay	59,602	58,903	57,698	53,082	30,255	26,239	20,908	22,671
33	Primary Metals	131,929	128,761	125,367	117,451	438,632	392,209	403,295	296,984
34	Fabr. Metals	147,890	144,033	141,662	134,715	115,337	109,474	98,436	79,030
35	Machinery	228,720	229,126	225,061	209,175	41,670	39,267	32,011	24,781
36	Electrical	178,729	179,545	178,924	179,727	94,043	75,661	63,833	52,956
37	Transportation	328,430	326,477	318,276	303,867	138,361	127,530	110,461	90,398
38	Measure./Photo.	107,036	106,937	108,008	108,870	40,228	33,448	27,471	23,336
39	Miscellaneous	32,437	32,059	32,381	31,601	20,262	21,409	15,842	11,166
	Total	2,532,586	2,514,760	2,502,966	2,435,711	2,915,800	2,678,816	2,302,590	2,039,715

SIC Code	Industry	Ratio of Shipments to Releases and Transfers $ Millions/Ton			
		1988	1989	1990	1991
20	Food	9.43	8.33	7.91	8.06
21	Tobacco	11.45	17.68	12.92	13.31
22	Textiles	2.15	2.63	3.05	3.42
23	Apparel	70.77	55.86	69.11	61.10
24	Lumber	3.53	3.37	3.50	3.72
25	Furniture	0.97	1.02	1.06	1.14
26	Paper	0.64	0.66	0.68	0.71
27	Printing	3.50	3.85	4.40	4.87
28	Chemicals	0.15	0.17	0.22	0.23
29	Petroleum	3.50	3.35	3.97	4.44
30	Rubber/Plastics	0.89	0.84	0.90	1.07
31	Leather	0.61	0.65	0.69	0.85
32	Stone/Clay	1.97	2.24	2.76	2.34
33	Primary Metals	0.30	0.33	0.31	0.40
34	Fabr. Metals	1.28	1.32	1.44	1.70
35	Machinery	5.49	5.84	7.03	8.44
36	Electrical	1.90	2.37	2.80	3.39
37	Transportation	2.37	2.56	2.88	3.36
38	Measure./Photo.	2.66	3.20	3.93	4.67
39	Miscellaneous	1.60	1.50	2.04	2.83
	Total	0.87	0.94	1.09	1.19

Table 3-6. Growth Rates in Ratio of Shipments to Releases and Transfers for Manufacturing Industries, 1988 - 1991(e).

SIC Code	Industry	Percent Change in Real Value of Shipments 1988-91 Percent	1988-89 Percent	1989-90 Percent	1990-91 Percent	Percent Change in TRI Releases and Transfers 1988-91 Percent	1988-89 Percent	1989-90 Percent	1990-91 Percent
20	Food	1.4	-1.0	1.8	0.7	18.6	12.0	7.2	-1.2
21	Tobacco	-8.1	-4.9	2.2	-5.5	-21.0	-38.4	39.8	-8.3
22	Textiles	-3.7	1.6	-4.1	-1.2	-39.4	-16.9	-17.3	-11.8
23	Apparel	-7.1	-5.2	-1.2	-0.9	7.5	20.1	-20.1	12.1
24	Lumber	-10.4	-2.3	-1.5	-6.9	-15.0	2.1	-5.0	-12.3
25	Furniture	-6.5	1.1	-1.7	-5.9	-20.4	-3.8	-6.1	-11.9
26	Paper	-1.3	0.9	-0.8	-1.3	-11.7	-2.4	-4.5	-5.3
27	Printing	-5.6	-1.3	0.1	-4.6	-32.1	-10.2	-12.4	-13.8
28	Chemicals	2.2	1.2	2.4	-1.3	-31.8	-9.3	-21.5	-4.2
29	Petroleum	-2.0	-2.2	-0.5	0.7	-22.7	2.3	-16.0	-10.1
30	Rubber/Plastics	0.3	1.2	2.0	-2.8	-16.3	6.5	-4.1	-18.1
31	Leather	-14.0	-2.0	-3.4	-9.2	-38.4	-8.3	-9.9	-25.4
32	Stone/Clay	-10.9	-1.2	-2.0	-8.0	-25.1	-13.3	-20.3	8.4
33	Primary Metals	-11.0	-2.4	-2.6	-6.3	-32.3	-10.6	2.8	-26.4
34	Fabr. Metals	-8.9	-2.6	-1.6	-4.9	-31.5	-5.1	-10.1	-19.7
35	Machinery	-8.5	0.2	-1.8	-7.1	-40.5	-5.8	-18.5	-22.6
36	Electrical	0.6	0.5	-0.3	0.4	-43.7	-19.5	-15.6	-17.0
37	Transportation	-7.5	-0.6	-2.5	-4.5	-34.7	-7.8	-13.4	-18.2
38	Measure./Photo.	1.7	-0.1	1.0	0.8	-42.0	-16.9	-17.9	-15.0
39	Miscellaneous	-2.6	-1.2	1.0	-2.4	-44.9	5.7	-26.0	-29.5
	Total	-3.8	-0.7	-0.5	-2.7	-30.0	-8.1	-14.0	-11.4

SIC Code	Industry	Percent Change in Ratio of Shipments to Releases and Transfers			
		1988-91 Percent	1988-89 Percent	1989-90 Percent	1990-91 Percent
20	Food	-14.5	-11.7	-5.0	1.9
21	Tobacco	16.3	54.4	-26.9	3.0
22	Textiles	58.9	22.3	16.1	12.0
23	Apparel	-13.7	-21.1	23.7	-11.6
24	Lumber	5.4	-4.3	3.7	6.2
25	Furniture	17.5	5.1	4.7	6.8
26	Paper	11.8	3.4	3.8	4.1
27	Printing	39.0	9.9	14.3	10.7
28	Chemicals	49.9	11.6	30.5	3.0
29	Petroleum	26.8	-4.4	18.4	12.0
30	Rubber/Plastics	19.9	-5.0	6.4	18.6
31	Leather	39.6	6.9	7.2	21.8
32	Stone/Clay	18.9	13.9	22.9	-15.2
33	Primary Metals	31.5	9.2	-5.3	27.2
34	Fabr. Metals	32.9	2.6	9.4	18.4
35	Machinery	53.8	6.3	20.5	20.1
36	Electrical	78.6	24.9	18.1	21.1
37	Transportation	41.6	7.8	12.6	16.7
38	Measure./Photo.	75.3	20.2	23.0	18.7
39	Miscellaneous	76.8	-6.5	36.5	38.5
	Total	37.5	8.1	15.8	9.9

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THE 1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE

1988 - 1991
Releases and Transfers
by State

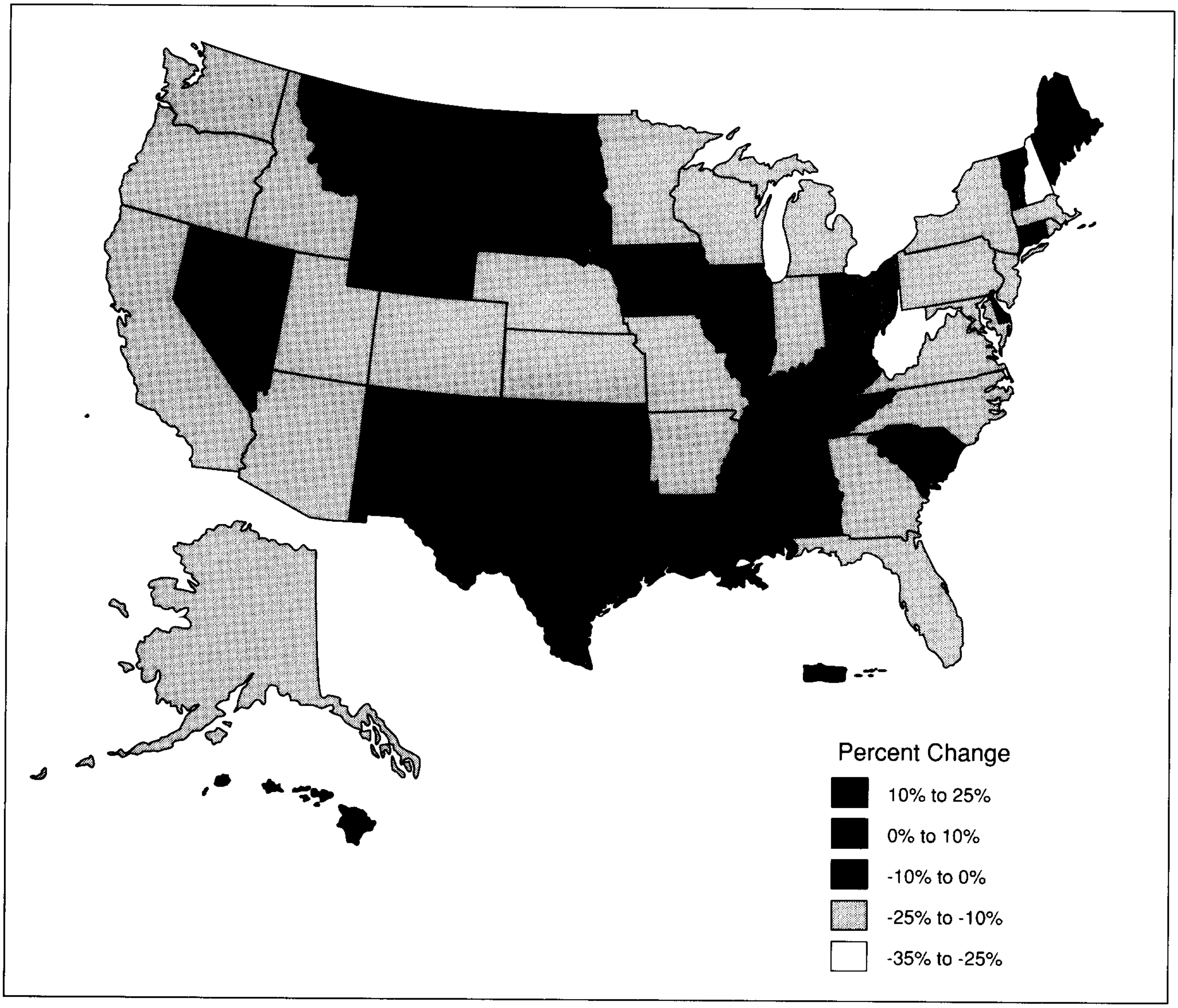

Figure 3-2. TRI Releases by State, Percent Change, 1990-1991.

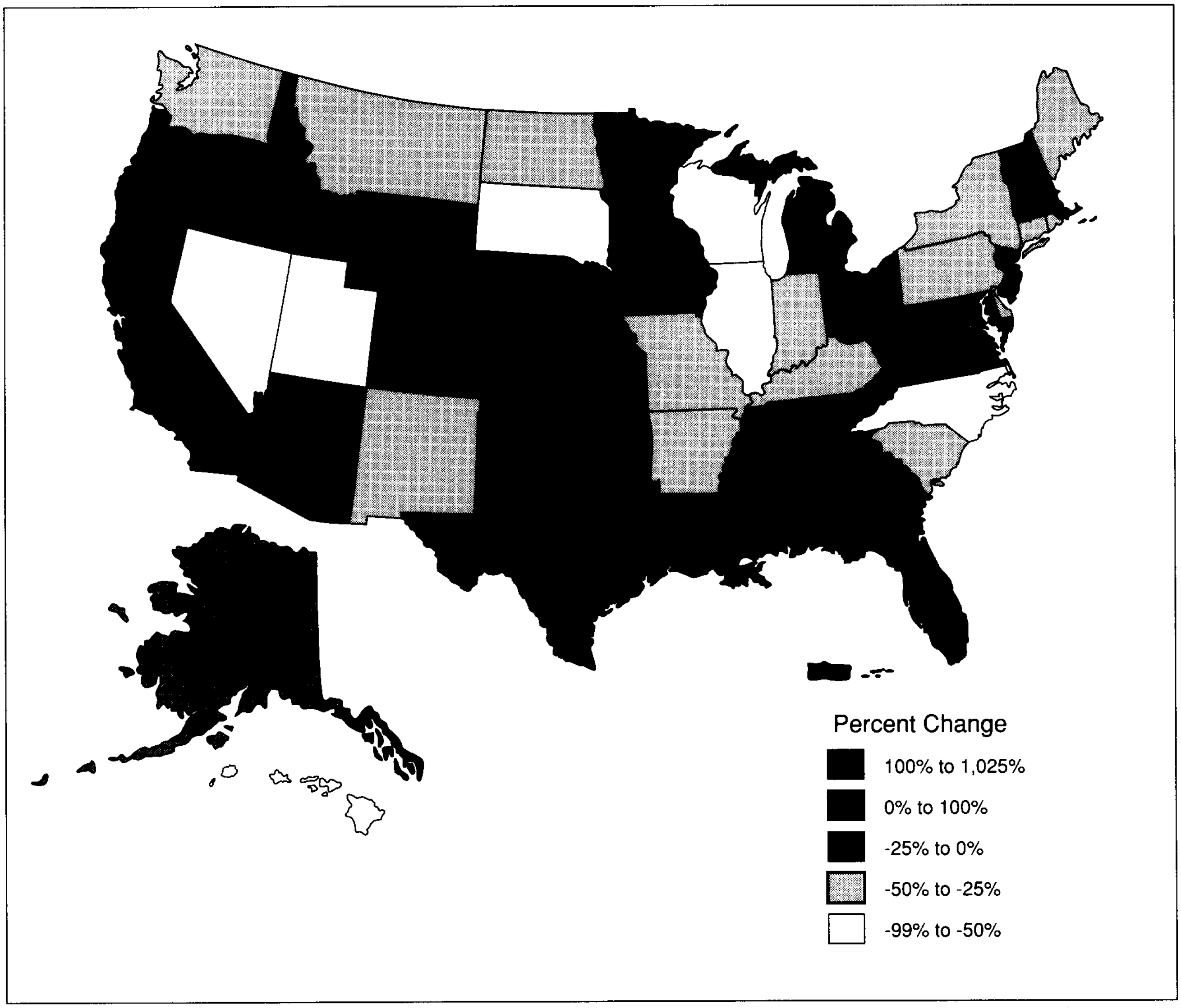

Figure 3-3. TRI Transfers by State, Percent Change, 1990-1991.

Table 3-7. TRI Releases and Transfers by State, 1988-1991 (Alphabetically Ordered).

State	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Alabama	91	16,368,289	82,103,616	4,264,093	7,988,920	6,661,627	117,386,545
	90	18,320,908	84,916,282	3,135,411	6,317,242	3,195,836	115,885,679
	89	18,079,034	87,787,672	7,525,742	7,602,901	5,180,111	126,175,460
	88	19,150,455	86,046,018	7,074,182	6,139,021	4,615,038	123,024,714
Alaska	91	582,728	12,643,715	4,795,953	150	4,132	18,026,678
	90	530,608	15,437,766	4,949,477	20	29,076	20,946,947
	89	490,074	20,459,326	4,662,650	1,000	10,415	25,623,465
	88	516,975	22,528,589	4,466,815	1,018	1,720	27,515,117
American Samoa	91	22,000	0	0	0	0	22,000
	90	19,300	0	5	0	0	19,305
	89	27,750	0	0	0	0	27,750
	88	29,500	0	0	0	0	29,500
Arizona	91	4,478,871	4,975,644	32,960	0	53,310,818	62,798,293
	90	4,230,486	8,472,811	158	30	58,044,481	70,747,966
	89	4,622,879	8,146,644	2,260	10	32,321,670	45,093,463
	88	7,086,609	9,211,534	9,855	505	53,667,725	69,976,228
Arkansas	91	8,741,793	22,151,811	2,420,296	14,031,499	1,692,683	49,038,082
	90	9,381,848	24,392,266	2,570,380	17,891,695	3,477,930	57,714,119
	89	9,858,564	33,927,044	9,088,006	21,926,895	2,308,944	77,109,453
	88	11,314,082	37,375,807	7,448,161	10,521,284	1,938,900	68,598,234
California	91	29,577,235	35,408,428	10,232,311	1,944,661	8,527,943	85,690,578
	90	33,375,380	48,173,601	10,096,012	1,763,292	5,123,011	98,531,296
	89	33,769,697	49,672,284	10,673,054	1,728,376	6,483,650	102,327,061
	88	36,553,122	54,672,976	10,861,727	1,586,653	8,412,685	112,087,163
Colorado	91	2,645,593	3,197,551	195,424	500	514,305	6,553,373
	90	3,181,250	4,049,975	209,072	280	533,776	7,974,353
	89	5,007,980	5,816,656	146,933	1,250	897,140	11,869,959
	88	5,807,053	6,212,209	115,968	1,750	2,802,039	14,939,019
Connecticut	91	6,862,043	8,890,669	3,902,424	50	3,345	19,658,531
	90	8,342,768	9,115,472	4,012,129	0	166,742	21,637,111
	89	10,929,971	10,637,369	4,753,850	0	337,525	26,658,715
	88	13,362,605	12,341,550	6,080,615	250	1,687,641	33,472,661
Delaware	91	1,494,629	4,338,630	349,040	0	155,180	6,337,479
	90	1,762,968	4,257,781	431,584	0	183,028	6,635,361
	89	2,229,156	6,410,239	649,993	0	152,911	9,442,299
	88	1,743,401	5,821,194	574,601	0	240,117	8,379,313
District of Columbia	89	0	0	250	0	0	250
	88	250	0	250	0	0	500
Florida	91	14,711,961	23,219,594	3,147,409	13,728,636	32,737,051	87,544,651
	90	23,455,869	23,637,128	2,782,382	21,536,061	41,317,990	112,729,430
	89	31,485,605	29,787,475	6,604,133	28,338,638	40,211,477	136,427,328
	88	22,607,530	28,907,269	6,955,412	34,651,616	36,890,073	130,011,900
Georgia	91	13,329,545	44,204,008	4,728,063	0	1,154,944	63,416,560
	90	17,028,772	57,790,626	4,311,630	810	1,169,663	80,301,501
	89	19,809,417	56,645,512	5,804,031	0	2,789,333	85,048,293
	88	19,680,258	64,548,977	3,018,325	59,467	9,284,086	96,591,113

State	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Alabama	91	945,010	15,280,508	16,225,518
	90	975,636	17,497,440	18,473,076
	89	1,367,341	19,110,587	20,477,928
	88	1,154,834	15,743,098	16,897,932
Alaska	91	0	1,056	1,056
	90	4	90	94
	89	750	5,750	6,500
	88	1,000	1,750	2,750
American Samoa	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Arizona	91	475,907	1,261,669	1,737,576
	90	1,196,735	1,195,125	2,391,860
	89	4,042,150	1,673,171	5,715,321
	88	4,535,978	1,803,608	6,339,586
Arkansas	91	576,886	4,422,417	4,999,303
	90	2,170,702	7,853,372	10,024,074
	89	1,021,930	11,145,689	12,167,619
	88	1,274,323	7,966,981	9,241,304
California	91	28,091,113	15,310,606	43,401,719
	90	31,844,973	23,013,359	54,858,332
	89	47,412,133	21,900,287	69,312,420
	88	49,942,234	41,447,725	91,389,959
Colorado	91	460,081	3,013,857	3,473,938
	90	684,808	3,271,664	3,956,472
	89	764,168	5,092,503	5,856,671
	88	631,601	5,260,474	5,892,075
Connecticut	91	1,566,744	7,530,337	9,097,081
	90	2,329,976	11,228,129	13,558,105
	89	2,569,369	15,183,276	17,752,645
	88	3,312,079	18,527,596	21,839,675
Delaware	91	2,344,905	834,453	3,179,358
	90	4,008,334	1,707,658	5,715,992
	89	3,278,847	2,698,570	5,977,417
	88	3,276,713	4,172,497	7,449,210
District of Columbia	89	250	500	750
	88	250	250	500
Florida	91	13,856,151	9,721,842	23,577,993
	90	18,831,240	7,367,793	26,199,033
	89	17,883,556	16,419,697	34,303,253
	88	16,229,362	13,163,767	29,393,129
Georgia	91	8,327,521	12,268,719	20,596,240
	90	7,894,619	14,991,015	22,885,634
	89	9,580,271	25,513,195	35,093,466
	88	8,329,234	28,874,897	37,204,131

Table 3-7. TRI Releases and Transfers by State, 1988-1991 (Alphabetically Ordered), Continued.

State	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Hawaii	91	438,180	141,478	17,029	235,199	81,200	913,086
	90	550,617	138,744	15,990	111,500	34,009	850,860
	89	514,209	170,804	9,500	1,196,672	211,372	2,102,557
	88	535,305	338,840	10,000	1,051,509	205,745	2,141,399
Idaho	91	964,270	5,151,603	119,934	0	3,880,780	10,116,587
	90	1,942,666	3,743,919	474,398	0	5,434,670	11,595,653
	89	2,463,603	2,892,084	308,667	0	11,775,840	17,440,194
	88	2,458,912	2,907,771	296,220	0	11,850,374	17,513,277
Illinois	91	26,843,981	53,255,672	6,438,278	16,199,440	18,582,646	121,320,017
	90	32,506,784	56,945,646	6,335,164	9,449,685	15,326,504	120,563,783
	89	38,276,286	64,696,498	16,762,680	10,712,556	11,689,068	142,137,088
	88	43,897,320	65,495,032	14,170,412	7,340,184	11,527,542	142,430,490
Indiana	91	37,548,747	57,524,688	1,722,928	2,360,830	36,009,003	135,166,196
	90	41,277,512	65,372,470	2,848,499	9,192,188	46,769,327	165,459,996
	89	46,023,670	68,383,679	5,418,401	32,703,116	50,467,727	202,996,593
	88	42,671,026	68,283,408	4,913,927	34,820,400	63,075,385	213,764,146
Iowa	91	6,319,613	28,604,960	2,001,525	0	1,789,203	38,715,301
	90	7,077,459	32,126,250	2,448,455	25	279,801	41,931,990
	89	9,313,610	35,903,349	1,223,605	250	188,843	46,629,657
	88	9,635,817	35,076,431	1,383,577	5	636,535	46,732,365
Kansas	91	7,828,061	19,130,166	920,768	44,921,511	1,235,203	74,035,709
	90	9,595,423	20,612,925	1,044,876	58,706,062	1,323,496	91,282,782
	89	10,522,936	22,392,654	652,181	91,160,915	374,262	125,102,948
	88	10,513,947	22,058,000	853,044	90,207,460	485,074	124,117,525
Kentucky	91	10,399,713	26,585,266	681,839	22,000,000	1,638,959	61,305,777
	90	11,478,193	30,223,048	683,815	9,447,874	1,422,105	53,255,035
	89	12,974,837	32,276,175	773,051	39,000,000	1,059,367	86,083,430
	88	15,413,368	33,102,252	1,700,777	30,000,250	5,765,095	85,981,742
Louisiana	91	20,401,044	76,122,777	161,282,510	196,547,237	1,850,432	456,204,000
	90	23,575,674	86,153,219	101,050,157	226,922,147	2,105,590	439,806,787
	89	27,759,629	107,084,486	46,355,307	291,435,814	2,552,318	475,187,554
	88	28,981,207	109,336,425	159,575,724	423,893,540	7,588,195	729,375,091
Maine	91	2,447,932	11,301,527	813,197	0	876,354	15,439,010
	90	2,348,615	11,313,002	899,866	0	504,946	15,066,429
	89	3,090,042	12,465,281	366,329	0	444,789	16,366,441
	88	3,338,266	13,737,850	437,488	0	960,950	18,474,554
Maryland	91	4,468,885	7,042,773	682,953	0	1,293,351	13,487,962
	90	5,742,869	7,394,884	1,282,351	55	1,868,993	16,289,152
	89	5,747,622	12,724,189	2,448,229	0	1,946,146	22,866,186
	88	5,290,205	12,723,448	3,955,551	2	2,668,375	24,637,581
Massachusetts	91	6,325,056	9,918,972	396,842	0	167,019	16,807,889
	90	8,750,286	12,442,558	264,196	45	53,000	21,510,085
	89	9,592,557	15,344,297	837,906	0	80,176	25,854,936
	88	10,329,152	17,502,015	674,490	4,000	918,766	29,428,423
Michigan	91	18,295,834	51,569,368	944,588	6,699,997	13,943,437	91,453,224
	90	23,419,837	62,722,736	818,783	8,323,247	25,655,939	120,940,542
	89	23,715,290	83,108,244	739,582	8,278,831	23,492,744	139,334,691
	88	27,603,509	72,085,327	1,153,087	6,326,978	18,532,668	125,701,569

State	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Hawaii	91	26,253	12,408	38,661
	90	388,060	8,459	396,519
	89	1,287,450	12,358	1,299,808
	88	835,250	13,682	848,932
Idaho	91	1,246,330	66,566	1,312,896
	90	2,863,797	209,897	3,073,694
	89	1,722,366	377,831	2,100,197
	88	484,374	122,215	606,589
Illinois	91	59,449,924	35,652,428	95,102,352
	90	76,200,740	54,014,520	130,215,260
	89	59,534,639	57,144,888	116,679,527
	88	60,061,811	54,853,179	114,914,990
Indiana	91	5,759,441	46,850,720	52,610,161
	90	7,116,838	51,480,443	58,597,281
	89	15,598,603	46,252,325	61,850,928
	88	14,015,833	58,255,280	72,271,113
Iowa	91	8,313,207	4,390,959	12,704,166
	90	7,293,705	3,921,405	11,215,110
	89	7,175,323	4,852,277	12,027,600
	88	6,569,558	7,297,474	13,867,032
Kansas	91	1,951,405	46,587,973	48,539,378
	90	2,767,122	11,246,276	14,013,398
	89	3,585,185	6,731,425	10,316,610
	88	3,114,358	4,285,528	7,399,886
Kentucky	91	1,942,900	14,496,038	16,438,938
	90	2,353,523	22,756,601	25,110,124
	89	2,147,974	25,271,554	27,419,528
	88	2,802,249	33,675,587	36,477,836
Louisiana	91	109,452	13,367,857	13,477,309
	90	49,964	15,008,696	15,058,660
	89	59,301	20,256,097	20,315,398
	88	3,533,503	13,708,868	17,242,371
Maine	91	794,917	1,565,481	2,360,398
	90	898,677	1,367,804	2,266,481
	89	1,449,600	1,479,325	2,928,925
	88	2,755,230	1,322,107	4,077,337
Maryland	91	4,589,080	2,787,870	7,376,950
	90	4,450,476	3,250,404	7,700,880
	89	3,291,391	3,964,388	7,255,779
	88	3,992,911	5,424,732	9,417,643
Massachusetts	91	5,702,276	7,505,270	13,207,546
	90	6,195,155	13,036,581	19,231,736
	89	11,116,773	17,599,739	28,716,512
	88	17,688,766	20,809,642	38,498,408
Michigan	91	14,691,959	45,734,338	60,426,297
	90	13,984,528	61,707,808	75,692,336
	89	15,342,787	78,067,382	93,410,169
	88	15,907,775	88,218,943	104,126,718

Table 3-7. TRI Releases and Transfers by State, 1988-1991 (Alphabetically Ordered), Continued.

State	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Minnesota	91	7,051,229	31,918,919	838,399	0	1,432,241	41,240,788
	90	7,905,188	42,943,495	852,479	147	1,685,250	53,386,559
	89	8,315,805	54,169,910	1,379,110	0	1,484,535	65,349,360
	88	9,387,548	45,528,058	2,735,819	0	3,138,268	60,789,693
Mississippi	91	12,735,123	41,855,523	2,173,830	48,371,556	5,607,296	110,743,328
	90	14,462,873	43,614,541	2,326,808	40,396,040	5,240,230	106,040,492
	89	18,828,885	41,713,504	3,159,711	43,303,000	8,555,481	115,560,581
	88	16,621,878	43,550,309	2,340,307	46,806,563	9,001,495	118,320,552
Missouri	91	10,316,288	24,375,043	1,230,337	0	23,819,521	59,741,189
	90	11,854,739	33,790,546	1,518,922	20	22,709,602	69,873,829
	89	12,009,212	36,630,432	1,262,363	0	27,561,492	77,463,499
	88	11,197,572	39,261,607	1,941,032	500	39,489,639	91,890,350
Montana	91	1,552,443	808,406	147,484	0	38,533,803	41,042,136
	90	1,694,587	757,644	105,448	0	40,095,720	42,653,399
	89	1,838,742	667,933	106,325	0	36,448,609	39,061,609
	88	1,808,908	591,749	125,124	0	32,910,857	35,436,638
Nebraska	91	3,744,287	11,008,508	385,629	0	395,026	15,533,450
	90	4,608,313	12,293,897	492,995	0	70,168	17,465,373
	89	4,504,996	12,167,973	265,960	0	131,070	17,069,999
	88	4,670,955	14,028,262	309,718	0	56,737	19,065,672
Nevada	91	404,931	536,444	250	0	2,435,160	3,376,785
	90	385,232	360,351	251	0	2,547,192	3,293,026
	89	332,916	353,870	1,150	0	2,284,722	2,972,658
	88	358,734	345,442	250	0	1,841,221	2,545,647
New Hampshire	91	1,861,617	3,406,944	44,361	0	38,328	5,351,250
	90	2,420,051	5,711,057	254,248	35	106,210	8,491,601
	89	2,511,430	8,479,423	153,016	0	61,882	11,205,751
	88	3,591,076	8,739,349	522,963	0	429,118	13,282,506
New Jersey	91	7,757,472	12,939,113	493,103	1	547,020	21,736,709
	90	9,210,146	15,870,002	468,982	105	1,008,967	26,558,202
	89	10,441,871	20,750,187	859,772	0	3,107,032	35,158,862
	88	13,752,749	25,312,116	1,417,400	2,950	2,871,740	43,356,955
New Mexico	91	577,264	1,575,004	9,992	750	37,670,985	39,833,995
	90	645,716	1,914,747	14	20	37,621,753	40,182,250
	89	933,707	1,888,845	5	5	31,011,089	33,833,651
	88	748,852	1,384,496	505	5	28,830,402	30,964,260
New York	91	20,603,109	43,244,474	1,656,018	38	1,742,280	67,245,919
	90	24,799,315	50,498,537	1,615,704	150	1,752,836	78,666,542
	89	30,169,571	56,627,563	1,775,014	250	2,137,908	90,710,306
	88	38,988,964	62,239,393	2,072,805	251	3,036,560	106,337,973
North Carolina	91	19,539,386	62,511,217	781,249	0	23,599,855	106,431,707
	90	23,961,815	65,771,123	1,358,581	75	33,049,152	124,140,746
	89	26,630,539	68,578,811	905,313	0	25,801,567	121,916,230
	88	27,210,198	71,976,237	700,561	0	16,838,821	116,725,817
North Dakota	91	582,348	1,214,279	79,557	0	22,750	1,898,934
	90	480,226	991,151	4,349	0	87,307	1,563,033
	89	498,782	843,185	6,006	0	77,395	1,425,368
	88	414,998	857,891	4,903	0	35,312	1,313,104

State	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Minnesota	91	4,834,426	3,106,783	7,941,209
	90	5,899,016	4,357,752	10,256,768
	89	4,974,000	13,694,748	18,668,748
	88	6,069,834	6,237,589	12,307,423
Mississippi	91	1,199,161	2,540,590	3,739,751
	90	1,325,737	3,735,222	5,060,959
	89	1,313,343	4,339,003	5,652,346
	88	1,504,135	8,205,384	9,709,519
Missouri	91	26,110,492	8,402,227	34,512,719
	90	30,335,005	9,503,171	39,838,176
	89	76,495,021	11,594,712	88,089,733
	88	67,045,211	14,444,283	81,489,494
Montana	91	10,650	235,041	245,691
	90	30,042	343,162	373,204
	89	29,646	18,456	48,102
	88	1,312	50,510	51,822
Nebraska	91	1,295,342	7,980,958	9,276,300
	90	1,366,041	7,116,088	8,482,129
	89	1,000,112	4,848,821	5,848,933
	88	901,304	4,342,939	5,244,243
Nevada	91	8,612	57,617	66,229
	90	15,417	141,776	157,193
	89	14,919	311,640	326,559
	88	20,611	639,906	660,517
New Hampshire	91	451,079	2,031,830	2,482,909
	90	398,540	1,356,748	1,755,288
	89	736,185	2,312,043	3,048,228
	88	496,102	2,205,161	2,701,263
New Jersey	91	44,198,915	19,887,817	64,086,732
	90	56,729,052	31,875,627	88,604,679
	89	61,603,003	30,376,618	91,979,621
	88	55,340,497	69,611,609	124,952,106
New Mexico	91	90,891	118,140	209,031
	90	69,185	271,641	340,826
	89	119,352	220,449	339,801
	88	35,871	262,045	297,916
New York	91	11,311,327	14,952,194	26,263,521
	90	12,912,681	24,315,020	37,227,701
	89	15,094,632	27,225,796	42,320,428
	88	23,071,486	49,336,133	72,407,619
North Carolina	91	5,460,747	11,631,278	17,092,025
	90	5,853,543	10,968,098	16,821,641
	89	5,629,794	13,438,470	19,068,264
	88	6,814,934	19,431,809	26,246,743
North Dakota	91	108,820	44,329	153,149
	90	308,242	43,027	351,269
	89	67,154	78,854	146,008
	88	52,832	157,287	210,119

Table 3-7. TRI Releases and Transfers by State, 1988-1991 (Alphabetically Ordered), Continued.

State	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Ohio	91	32,048,213	65,601,743	6,055,535	29,417,995	35,448,960	168,572,446
	90	37,360,146	78,449,441	5,945,668	25,426,030	22,710,761	169,892,046
	89	45,228,891	95,333,274	6,124,992	58,995,955	30,467,215	236,150,327
	88	43,610,363	99,024,143	5,822,706	56,920,298	30,478,708	235,856,218
Oklahoma	91	5,311,446	18,428,237	509,137	2,597,370	8,366,323	35,212,513
	90	6,295,032	22,145,030	543,298	4,171,682	1,256,911	34,411,953
	89	7,527,234	22,131,281	388,269	6,157,083	933,114	37,136,981
	88	9,621,157	26,695,946	367,955	6,354,214	1,794,414	44,833,686
Oregon	91	4,903,260	12,516,261	386,156	0	1,329,909	19,135,586
	90	5,040,206	13,623,171	561,591	40	3,714,610	22,939,618
	89	5,809,042	14,156,455	382,447	15	2,420,361	22,768,320
	88	7,411,661	14,265,749	349,446	1	1,360,882	23,387,739
Pennsylvania	91	27,962,670	37,664,471	1,225,774	0	7,832,148	74,685,063
	90	33,079,306	43,356,200	1,626,101	110	15,158,101	93,219,818
	89	34,292,931	47,515,796	2,192,697	269	19,264,278	103,265,971
	88	39,858,771	51,809,692	4,200,272	750	16,882,576	112,752,061
Puerto Rico	91	8,559,550	7,400,753	119,408	250	130,650	16,210,611
	90	8,430,074	8,148,574	118,089	738	25,457	16,722,932
	89	7,628,455	6,176,890	22,435	250	44,960	13,872,990
	88	8,426,837	5,819,108	123,110	0	110,825	14,479,880
Rhode Island	91	2,668,378	1,681,973	121,277	0	24,147	4,495,775
	90	2,962,669	2,256,827	61,683	0	1,272	5,282,451
	89	3,587,518	2,711,612	60,678	0	0	6,359,808
	88	4,084,786	3,695,659	586,245	0	115,048	8,481,738
South Carolina	91	17,174,418	44,345,732	1,210,671	0	1,036,801	63,767,622
	90	19,380,892	48,638,175	1,112,528	42	1,498,701	70,630,338
	89	23,538,701	48,875,207	1,204,616	0	1,388,459	75,006,983
	88	19,392,489	48,451,049	1,396,249	5	1,299,422	70,539,214
South Dakota	91	376,644	2,254,629	9,038	0	32,790	2,673,101
	90	491,662	2,417,558	44,867	0	5,350	2,959,437
	89	485,310	2,745,664	55,115	0	26	3,286,115
	88	699,139	1,830,288	2,400	0	1	2,531,828
Tennessee	91	53,077,465	85,429,953	3,622,533	69,568,902	2,417,820	214,116,673
	90	54,785,580	92,795,323	5,014,150	54,068,501	9,154,372	215,817,926
	89	57,108,168	102,962,628	5,964,926	54,996,665	10,711,528	231,743,915
	88	55,380,750	91,468,661	6,317,715	49,906,115	13,593,370	216,666,611
Texas	91	77,667,764	88,785,079	2,889,746	224,980,390	13,767,951	408,090,930
	90	84,727,274	90,970,588	4,528,451	244,868,295	18,371,129	443,465,737
	89	98,179,772	98,324,250	6,032,735	463,917,038	21,945,761	688,399,556
	88	98,751,942	108,570,165	5,551,496	509,920,742	35,425,065	758,219,410
Utah	91	4,930,336	69,417,654	120,656	0	23,722,951	98,191,597
	90	5,357,893	100,807,690	278,735	45	15,815,951	122,260,314
	89	5,283,385	125,118,661	255,590	0	16,088,398	146,746,034
	88	4,808,210	116,784,200	330,471	0	13,802,757	135,725,638
Vermont	91	287,770	611,615	44,250	0	57,189	1,000,824
	90	266,538	671,353	91,158	5	44,038	1,073,092
	89	335,440	854,656	136,713	0	40,203	1,367,012
	88	436,225	1,130,896	113,308	0	24,341	1,704,770

State	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Ohio	91	44,948,858	67,326,457	112,275,315
	90	24,759,146	78,539,531	103,298,677
	89	29,848,071	111,430,006	141,278,077
	88	25,040,364	121,368,194	146,408,558
Oklahoma	91	156,243	14,966,735	15,122,978
	90	142,875	14,000,529	14,143,404
	89	405,705	11,021,701	11,427,406
	88	503,489	11,831,845	12,335,334
Oregon	91	4,133,808	4,993,912	9,127,720
	90	7,606,210	2,615,141	10,221,351
	89	7,662,785	3,129,585	10,792,370
	88	7,106,157	5,457,647	12,563,804
Pennsylvania	91	15,504,584	50,945,109	66,449,693
	90	17,611,357	72,603,108	90,214,465
	89	16,322,242	68,748,987	85,071,229
	88	15,725,217	88,878,277	104,603,494
Puerto Rico	91	6,206,477	8,439,487	14,645,964
	90	9,130,814	6,255,357	15,386,171
	89	6,537,852	7,039,214	13,577,066
	88	8,025,455	5,119,728	13,145,183
Rhode Island	91	678,929	1,086,849	1,765,778
	90	1,222,579	1,823,709	3,046,288
	89	1,420,338	2,873,105	4,293,443
	88	1,938,667	4,582,828	6,521,495
South Carolina	91	3,646,646	10,139,585	13,786,231
	90	3,068,690	20,065,970	23,134,660
	89	3,440,173	21,964,554	25,404,727
	88	2,705,342	18,660,474	21,365,816
South Dakota	91	199,789	95,547	295,336
	90	211,813	403,526	615,339
	89	99,655	596,307	695,962
	88	156,884	402,034	558,918
Tennessee	91	17,489,150	24,587,394	42,076,544
	90	18,141,981	16,136,042	34,278,023
	89	21,138,111	22,248,318	43,386,429
	88	25,890,881	18,631,735	44,522,616
Texas	91	29,966,874	78,446,924	108,413,798
	90	38,953,083	78,475,263	117,428,346
	89	37,205,646	86,130,766	123,336,412
	88	40,404,206	82,437,497	122,841,703
Utah	91	572,267	3,243,279	3,815,546
	90	895,732	88,114,454	89,010,186
	89	785,013	2,030,474	2,815,487
	88	959,543	2,113,261	3,072,804
Vermont	91	35,707	707,198	742,905
	90	43,208	442,042	485,250
	89	77,588	576,764	654,352
	88	72,761	811,150	883,911

Table 3-7. TRI Releases and Transfers by State, 1988-1991 (Alphabetically Ordered), Continued.

State	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Virgin Islands	91	794,692	315,396	394,318	0	15,610	1,520,016
	90	831,913	380,552	195,751	0	75,224	1,483,440
	89	502,680	656,722	1,190	0	113,643	1,274,235
	88	748,330	742,462	2,500	0	140,342	1,633,634
Virginia	91	17,022,639	49,265,438	2,248,100	0	2,022,165	70,558,342
	90	22,182,500	55,634,531	2,156,157	854	2,542,483	82,516,525
	89	23,297,587	58,656,245	10,589,918	0	2,952,502	95,496,252
	88	23,035,001	102,160,981	19,991,274	1,373	6,280,413	151,469,042
Washington	91	10,280,094	15,642,749	4,355,670	5	155,576	30,434,094
	90	11,755,397	16,695,661	12,171,507	35	614,068	41,236,668
	89	12,563,087	16,049,022	15,652,467	0	420,913	44,685,489
	88	11,125,544	18,576,430	13,605,780	0	914,274	44,222,028
West Virginia	91	9,957,591	16,556,035	1,436,221	0	354,546	28,304,393
	90	12,017,866	18,774,469	2,103,173	5	7,922,628	40,818,141
	89	12,413,553	22,034,923	2,894,032	0	10,183,610	47,526,118
	88	15,028,571	21,911,772	3,860,049	0	895,363	41,695,755
Wisconsin	91	7,994,142	28,834,891	712,079	25	2,323,987	39,865,124
	90	10,529,127	32,481,623	496,185	103	3,445,949	46,952,987
	89	11,747,181	31,778,426	304,155	250	4,222,721	48,052,733
	88	12,901,793	33,559,227	505,970	250	6,919,656	53,886,896
Wyoming	91	927,092	1,950,915	106,175	8,652,092	166,710	11,802,984
	90	929,939	3,757,882	120,097	6,818,227	328,087	11,954,232
	89	747,972	2,911,530	82,173	14,125,832	192,699	18,060,206
	88	1,144,667	1,746,397	42,050	27,113,559	15,274,367	45,321,040
Total	91	609,765,664	1,369,580,314	243,497,317	710,248,004	421,160,113	3,354,251,412
	90	706,748,307	1,575,954,848	196,832,760	745,413,562	462,679,392	3,687,628,869
	89	793,597,781	1,768,596,839	188,025,233	1,175,583,836	455,029,001	4,380,832,690
	88	823,738,542	1,842,370,656	311,070,591	1,343,633,468	527,546,722	4,848,359,979

State	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Virgin Islands	91	0	173	173
	90	0	13,200	13,200
	89	0	0	0
	88	0	0	0
Virginia	91	20,831,063	4,815,575	25,646,638
	90	17,333,177	8,253,784	25,586,961
	89	35,089,054	11,413,171	46,502,225
	88	37,856,487	13,390,977	51,247,464
Washington	91	383,111	2,577,085	2,960,196
	90	1,386,880	3,656,990	5,043,870
	89	805,063	4,909,330	5,714,393
	88	978,070	7,497,559	8,475,629
West Virginia	91	1,840,047	5,297,316	7,137,363
	90	3,074,249	12,350,080	15,424,329
	89	3,423,255	11,660,135	15,083,390
	88	3,536,369	19,873,750	23,410,119
Wisconsin	91	7,528,295	16,989,630	24,517,925
	90	12,794,507	18,515,015	31,309,522
	89	17,005,039	35,353,799	52,358,838
	88	21,331,783	27,051,531	48,383,314
Wyoming	91	173,115	3,552	176,667
	90	4,670	26,222	30,892
	89	250	17,418	17,668
	88	10,350	128,583	138,933
Total	91	410,596,887	654,313,983	1,064,910,870
	90	466,123,084	842,451,834	1,308,574,918
	89	558,575,158	890,356,058	1,448,931,216
	88	574,045,380	1,028,111,605	1,602,156,985

THE 1991 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE

1988 - 1991
Releases and Transfers
by Chemical

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered).

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
75-07-0	Acetaldehyde	91	2,323,247	4,757,670	75,314	2,328,187	37,904	9,522,322
		90	2,389,070	4,801,983	83,040	1,963,498	29,665	9,267,256
		89	2,504,288	5,347,859	69,472	1,924,529	30,764	9,876,912
		88	2,530,858	4,119,010	84,236	2,219,105	194,951	9,148,160
60-35-5	Acetamide	91	10	25	5	0	0	40
		90	12	23	5	0	0	40
		89	0	0	250	0	0	250
		88	0	0	0	0	0	0
67-64-1	Acetone	91	84,674,684	75,522,340	1,206,217	3,463,348	466,862	165,333,451
		90	93,785,012	96,529,032	1,288,958	4,688,469	215,992	196,507,463
		89	103,989,300	103,499,813	1,021,694	4,526,483	264,044	213,301,334
		88	98,810,786	110,328,285	1,149,331	3,117,741	376,439	213,782,582
75-05-8	Acetonitrile	91	743,749	623,983	20,396	19,090,831	5,620	20,484,579
		90	866,270	868,372	10,726	19,445,260	248	21,190,876
		89	707,629	811,057	91,616	18,033,180	1,250	19,644,732
		88	1,340,588	786,151	42,223	16,739,010	1,790	18,909,762
107-02-8	Acrolein	91	8,179	20,321	7	205,898	0	234,405
		90	5,816	16,213	5	103,059	5	125,098
		89	7,582	12,743	0	67,637	80	88,042
		88	17,352	16,300	0	68,950	500	103,102
79-06-1	Acrylamide	91	60,668	3,496	4,635	4,594,900	1,500	4,665,199
		90	42,156	6,959	3,814	4,214,305	545	4,267,779
		89	18,685	6,811	7,379	4,430,980	992	4,464,847
		88	17,298	8,721	3,124	2,198,000	756	2,227,899
79-10-7	Acrylic acid	91	232,485	178,113	712	18,923,000	94	19,334,404
		90	228,335	203,144	43,888	21,525,000	94,334	22,094,701
		89	165,533	192,740	10,701	18,728,000	2,009	19,098,983
		88	585,041	215,005	16,646	22,262,010	15,950	23,094,652
107-13-1	Acrylonitrile	91	520,853	1,668,036	1,959	4,732,983	13,293	6,937,124
		90	642,530	2,507,222	3,892	4,925,276	268	8,079,188
		89	794,799	3,592,668	4,242	5,790,548	4,712	10,186,969
		88	995,505	3,200,760	5,874	4,562,713	2,150	8,767,002
107-05-1	Allyl chloride	91	155,176	24,977	5	145	0	180,303
		90	169,368	36,656	135	1,200	0	207,359
		89	98,802	76,801	364	1,250	250	177,467
		88	93,911	55,558	430	250	200	150,349
7429-90-5	Aluminum (fume or dust)	91	523,990	4,210,547	56,841	0	1,420,310	6,211,688
		90	613,958	1,700,290	56,805	10	1,314,181	3,685,244
		89	1,088,106	1,986,345	78,857	0	3,568,818	6,722,126
		88	1,225,523	2,454,256	91,518	250	3,177,625	6,949,172
60-09-3	4-Aminoazobenzene	91	0	1	0	440	0	441
		90	0	1	0	510	0	511
		89	0	0	0	353	0	353
		88	0	0	0	537	0	537
92-67-1	4-Aminobiphenyl	91	0	0	0	4	0	4
		90	0	0	0	11	0	11
		89	0	1	0	9	0	10
		88	0	10	0	4	0	14
7664-41-7	Ammonia	91	46,929,186	141,696,062	41,137,132	240,682,883	14,763,305	485,208,568
		90	53,879,029	156,281,750	44,053,651	265,671,125	17,868,381	537,753,936
		89	62,003,124	191,187,502	24,343,822	84,456,152	8,267,968	370,258,568
		88	54,089,229	199,433,416	24,769,396	55,697,844	14,204,960	348,194,845

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Acetaldehyde	91	153,583	251,760	405,343
	90	155,435	170,664	326,099
	89	323,000	204,884	527,884
	88	160,438	187,173	347,611
Acetamide	91	29,000	2,638	31,638
	90	0	0	0
	89	0	0	0
	88	0	250	250
Acetone	91	14,475,090	13,946,649	28,421,739
	90	12,625,027	22,690,149	35,315,176
	89	13,281,813	36,561,102	49,842,915
	88	14,103,287	34,135,494	48,238,781
Acetonitrile	91	581,095	2,690,832	3,271,927
	90	825,013	1,726,365	2,551,378
	89	950,278	4,859,899	5,810,177
	88	600,450	4,402,814	5,003,264
Acrolein	91	0	16	16
	90	5	108	113
	89	250	51	301
	88	250	250	500
Acrylamide	91	95,578	44,405	139,983
	90	37,105	67,306	104,411
	89	33,136	137,799	170,935
	88	13,540	112,040	125,580
Acrylic acid	91	47,439	413,182	460,621
	90	128,172	270,667	398,839
	89	31,441	214,619	246,060
	88	23,262	243,053	266,315
Acrylonitrile	91	297,197	2,056,077	2,353,274
	90	342,107	862,489	1,204,596
	89	787,803	1,310,242	2,098,045
	88	955,739	1,097,960	2,053,699
Allyl chloride	91	11,754	302,628	314,382
	90	6,459	234,000	240,459
	89	11,144	168,476	179,620
	88	14,900	209,075	223,975
Aluminum (fume or dust)	91	13,271	6,182,302	6,195,573
	90	28,531	14,814,721	14,843,252
	89	20,990	16,862,508	16,883,498
	88	15,424	22,516,087	22,531,511
4-Aminoazobenzene	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
4-Aminobiphenyl	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Ammonia	91	96,492,357	12,012,520	108,504,877
	90	82,739,725	10,361,731	93,101,456
	89	31,325,498	7,505,719	38,831,217
	88	25,729,688	6,272,720	32,002,408

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
6484-52-2	Ammonium nitrate (solution)	91	55,453	1,978,009	7,808,136	32,736,428	8,426,270	51,004,296
		90	381,632	2,352,022	7,625,032	39,757,210	4,168,730	54,284,626
		89	897,324	2,503,543	8,853,857	44,738,000	7,550,275	64,542,999
		88	419,038	2,527,869	8,436,598	67,941,000	15,902,204	95,226,709
7783-20-2	Ammonium sulfate (solution)	91	19,639	265,457	7,592,647	7,523,816	2,106,747	17,508,306
		90	18,868	355,717	9,186,613	5,221,976	2,939,819	17,722,993
		89	53,284	839,427	68,551,944	461,238,592	15,529,173	546,212,420
		88	313,237	482,350	71,838,665	520,144,631	13,422,824	606,201,707
62-53-3	Aniline	91	130,452	496,579	26,801	1,603,259	1,068	2,258,159
		90	214,274	266,511	36,008	2,471,752	3,099	2,991,644
		89	231,107	257,433	14,844	3,243,543	11,655	3,758,582
		88	323,900	388,869	16,105	3,582,975	12,822	4,324,671
90-04-0	o-Anisidine	91	765	260	187	0	3,800	5,012
		90	500	1,341	141	0	250	2,232
		89	750	1,298	4,949	0	2,570	9,567
		88	501	1,792	285	0	250	2,828
104-94-9	p-Anisidine	91	5	8	5	0	0	18
		90	5	10	5	0	0	20
		89	0	4	250	0	0	254
		88	0	10	250	0	250	510
120-12-7	Anthracene	91	25,778	29,716	1,158	0	2,433	59,085
		90	27,320	38,745	1,360	0	4,806	72,231
		89	41,501	53,449	2,316	0	17,342	114,608
		88	146,428	55,935	4,382	0	11,106	217,851
7440-36-0	Antimony	91	3,964	17,300	1,223	120	5,745	28,352
		90	6,819	45,242	5,219	165	182,272	239,717
		89	14,113	84,391	3,533	440	557,336	659,813
		88	11,039	59,377	11,178	2,100	903,916	987,610
7440-38-2	Arsenic	91	3,836	3,734	940	0	1,734,513	1,743,023
		90	1,969	3,877	1,640	10	50,530	58,026
		89	5,257	52,643	1,754	0	147,616	207,270
		88	2,858	5,329	1,282	0	181,267	190,736
1332-21-4	Asbestos (friable)	91	5,610	6,952	252	0	585,676	598,490
		90	6,626	12,645	515	5	437,282	457,073
		89	11,300	29,449	1,050	0	1,073,901	1,115,700
		88	11,038	38,422	10,699	0	2,111,880	2,172,039
7440-39-3	Barium	91	94,605	21,806	5,093	0	261,262	382,766
		90	49,824	32,008	54,102	10	362,509	498,453
		89	198,349	94,577	26,048	0	2,762,027	3,081,001
		88	174,401	92,410	18,650	0	6,721,686	7,007,147
98-87-3	Benzal chloride	91	1,550	11	0	0	0	1,561
		90	1,744	11	0	0	0	1,755
		89	5,450	6	0	0	0	5,456
		88	5,252	6	0	0	0	5,258
55-21-0	Benzamide	89	250	250	250	250	0	1,000
		88	250	250	250	250	0	1,000
71-43-2	Benzene	91	9,971,308	7,503,182	26,896	834,242	111,928	18,447,556
		90	14,516,266	10,686,871	24,524	689,066	722,486	26,639,213
		89	15,045,660	11,694,181	169,274	668,610	120,355	27,698,080
		88	20,235,191	11,027,298	46,998	825,035	127,920	32,262,442

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Ammonium nitrate (solution)	91	5,984,399	39,795,235	45,779,634
	90	7,441,267	1,582,930	9,024,197
	89	6,924,275	1,597,638	8,521,913
	88	7,678,062	2,211,859	9,889,921
Ammonium sulfate (solution)	91	42,154,207	7,110,010	49,264,217
	90	62,664,033	4,111,471	66,775,504
	89	201,593,642	3,400,733	204,994,375
	88	187,982,629	4,667,266	192,649,895
Aniline	91	1,306,755	457,152	1,763,907
	90	1,706,763	702,812	2,409,575
	89	1,811,082	1,381,047	3,192,129
	88	2,106,510	830,567	2,937,077
o-Anisidine	91	3,395	81	3,476
	90	5,610	99	5,709
	89	3,038	1,250	4,288
	88	768	3	771
p-Anisidine	91	8	0	8
	90	5	0	5
	89	0	0	0
	88	0	0	0
Anthracene	91	597	149,632	150,229
	90	18,427	860,733	879,160
	89	20,111	255,089	275,200
	88	20,419	279,187	299,606
Antimony	91	3,228	531,980	535,208
	90	10,587	397,133	407,720
	89	35,284	389,195	424,479
	88	40,228	551,858	592,086
Arsenic	91	566	624,613	625,179
	90	1,034	371,410	372,444
	89	2,051	237,091	239,142
	88	1,928	63,969	65,897
Asbestos (friable)	91	1,707	5,567,813	5,569,520
	90	4,652	9,035,967	9,040,619
	89	41,252	7,050,377	7,091,629
	88	68,148	13,186,642	13,254,790
Barium	91	84,381	628,569	712,950
	90	13,083	496,508	509,591
	89	26,301	1,356,109	1,382,410
	88	205,209	1,765,596	1,970,805
Benzal chloride	91	0	0	0
	90	5	37,000	37,005
	89	0	280,000	280,000
	88	0	103,186	103,186
Benzamide	89	0	750	750
	88	0	750	750
Benzene	91	613,449	1,799,039	2,412,488
	90	634,025	2,221,216	2,855,241
	89	1,107,975	1,839,858	2,947,833
	88	1,135,172	2,295,959	3,431,131

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
98-07-7	Benzoic trichloride	91	7,686	261	0	0	0	7,947
		90	8,310	25	0	0	0	8,335
		89	24,833	442	0	0	0	25,275
		88	24,542	421	0	0	0	24,963
98-88-4	Benzoyl chloride	91	23,446	3,420	5	0	250	27,121
		90	17,667	5,657	0	67,501	260	91,085
		89	31,243	3,830	0	168,200	550	203,823
		88	28,295	4,719	0	130,000	250	163,264
94-36-0	Benzoyl peroxide	91	648	1,656	5	0	13,205	15,514
		90	12,922	1,708	5	5	16,025	30,665
		89	3,277	1,547	1,000	0	19,500	25,324
		88	4,063	2,231	0	5,350	36,050	47,694
100-44-7	Benzyl chloride	91	18,189	8,934	15	20	0	27,158
		90	26,024	7,521	265	315	270	34,395
		89	18,777	8,841	251	400	500	28,769
		88	30,689	12,640	640	0	500	44,469
7440-41-7	Beryllium	91	6	1,372	101	0	29,023	30,502
		90	9	1,366	42	0	6,517	7,934
		89	253	1,642	122	0	31,522	33,539
		88	550	2,213	74	0	37,000	39,837
92-52-4	Biphenyl	91	677,182	183,323	18,700	47,318	30,162	956,685
		90	764,465	369,678	21,394	63,214	35,552	1,254,303
		89	763,227	330,168	42,685	72,993	44,115	1,253,188
		88	628,891	579,696	68,493	82,760	222,297	1,582,137
111-44-4	Bis(2-chloroethyl) ether	91	2,950	594	0	0	0	3,544
		90	3,206	573	83	0	0	3,862
		89	3,637	1,251	1,552	0	0	6,440
		88	4,322	600	1,351	0	0	6,273
542-88-1	Bis(chloromethyl) ether	91	2	572	0	0	0	574
		90	3	360	0	0	0	363
		89	1	2	0	0	0	3
		88	1	0	0	0	0	1
108-60-1	Bis(2-chloro-1-methyl-ethyl)ether	91	2,090	1,520	1,800	0	0	5,410
		90	3,800	2,430	12,000	0	0	18,230
		89	751	2,608	12,000	0	0	15,359
		88	340	809	30,000	0	0	31,149
103-23-1	Bis(2-ethylhexyl) adipate	91	69,541	73,183	50	0	81,715	224,489
		90	42,123	92,831	6,919	0	19,798	161,671
		89	36,862	50,034	2,453	0	65,765	155,114
		88	25,789	66,788	10,440	0	1,200	104,217
75-25-2	Bromoform	91	150	0	0	1,900	0	2,050
		90	48,205	0	0	0	72,000	120,205
		89	0	0	0	0	0	0
		88	0	0	8,600	0	0	8,600
74-83-9	Bromomethane	91	404,146	2,041,449	0	1,000	0	2,446,595
		90	404,981	2,093,262	0	28,000	0	2,526,243
		89	339,603	2,583,261	0	66,525	0	2,989,389
		88	513,244	1,726,918	0	1,546	0	2,241,708
106-99-0	1,3-Butadiene	91	2,050,374	1,900,003	5,049	0	8,881	3,964,307
		90	3,094,370	2,068,264	111,234	1,605	6,428	5,281,901
		89	3,553,473	2,277,299	143,434	1,500	14,823	5,990,529
		88	3,929,376	2,953,834	522,504	1,500	7,817	7,415,031

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Benzoic trichloride	91	0	0	0
	90	5	90	95
	89	0	4,117	4,117
	88	0	22,572	22,572
Benzoyl chloride	91	230	493,270	493,500
	90	1,353	640,743	642,096
	89	200	434,542	434,742
	88	180	360,969	361,149
Benzoyl peroxide	91	17,192	68,052	85,244
	90	48,028	16,527	64,555
	89	73,463	151,766	225,229
	88	69,946	62,554	132,500
Benzyl chloride	91	28,749	73,256	102,005
	90	45,550	280,212	325,762
	89	52,101	19,527	71,628
	88	41,553	98,847	140,400
Beryllium	91	0	117,827	117,827
	90	0	1,371	1,371
	89	0	1,209	1,209
	88	4	3,158	3,162
Biphenyl	91	782,600	224,197	1,006,797
	90	1,085,443	407,609	1,493,052
	89	890,702	366,521	1,257,223
	88	1,446,610	478,363	1,924,973
Bis(2-chloroethyl) ether	91	15,841	447,600	463,441
	90	31,791	20,697	52,488
	89	24,829	22,024	46,853
	88	9,621	27,265	36,886
Bis(chloromethyl) ether	91	0	2	2
	90	0	0	0
	89	0	0	0
	88	0	0	0
Bis(2-chloro-1-methyl-ethyl)ether	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Bis(2-ethylhexyl) adipate	91	20,155	247,685	267,840
	90	32,437	208,932	241,369
	89	58,338	269,107	327,445
	88	49,659	206,706	256,365
Bromoform	91	0	99,550	99,550
	90	0	0	0
	89	0	0	0
	88	0	0	0
Bromomethane	91	0	335	335
	90	552,160	2,821	554,981
	89	0	0	0
	88	0	0	0
1,3-Butadiene	91	11,650	137,747	149,397
	90	14,383	161,844	176,227
	89	29,072	410,419	439,491
	88	44,874	366,187	411,061

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
141-32-2	Butyl acrylate	91	151,355	141,386	1,273	0	55	294,069
		90	138,216	167,165	29,071	0	68	334,520
		89	121,041	191,540	6,400	2	462	319,445
		88	165,197	246,676	3,528	10	602	416,013
71-36-3	n-Butyl alcohol	91	6,977,261	22,741,844	257,497	4,382,276	107,321	34,466,199
		90	6,889,955	26,383,892	323,550	3,529,441	97,838	37,224,676
		89	7,912,542	28,995,065	943,657	1,414,104	109,200	39,374,568
		88	8,487,649	28,956,465	127,610	3,006,660	175,791	40,754,175
78-92-2	sec-Butyl alcohol	91	228,025	409,563	4,486	170,000	14	812,088
		90	206,618	492,363	4,315	171,484	51	874,831
		89	359,589	622,727	6,411	0	307	989,034
		88	394,501	695,295	122,291	0	2,600	1,214,687
75-65-0	tert-Butyl alcohol	91	760,910	424,781	129,510	827,562	497	2,143,260
		90	1,275,366	341,050	271,265	995,382	24,962	2,908,025
		89	1,030,715	428,456	221,906	724,537	23,110	2,428,724
		88	1,206,290	366,697	14,989	674,798	818	2,263,592
85-68-7	Butyl benzyl phthalate	91	109,517	192,762	1,177	0	75,866	379,322
		90	41,458	185,209	925	260	9,774	237,626
		89	54,204	219,732	1,028	250	8,324	283,538
		88	45,407	245,853	802	480	16,682	309,224
106-88-7	1,2-Butylene oxide	91	48,928	10,836	3,490	0	5	63,259
		90	54,696	24,769	4,625	0	5	84,095
		89	68,234	51,445	4,139	0	0	123,818
		88	34,973	64,958	3,500	0	250	103,681
123-72-8	Butyraldehyde	91	165,671	267,829	575	144,427	28	578,530
		90	211,784	350,687	3,423	1,937	371	568,202
		89	412,448	1,195,898	4,297	7,562	278	1,620,483
		88	767,404	2,241,388	3,812	1,997	31	3,014,632
569-64-2	C.I. Basic Green 4	91	6	6	14	0	0	26
		90	9	7	250	0	0	266
		89	500	250	250	0	250	1,250
		88	500	250	0	0	0	750
989-38-8	C.I. Basic Red 1	91	0	0	0	0	375	375
		90	0	0	0	0	0	0
		89	250	0	0	0	0	250
1937-37-7	C.I. Direct Black 38	89	250	250	0	0	0	500
2832-40-8	C.I. Disperse Yellow 3	91	336	0	26	0	782	1,144
		90	364	0	26	0	843	1,233
		89	359	0	24	0	846	1,229
		88	398	0	302	0	0	700
81-88-9	C.I. Food Red 15	91	0	1	0	0	0	1
		90	0	2	0	0	0	2
		89	250	0	0	0	0	250
		88	250	0	0	0	0	250
3118-97-6	C.I. Solvent Orange 7	89	0	0	0	0	0	0
97-56-3	C.I. Solvent Yellow 3	91	0	5	0	0	0	5
		90	0	0	5	0	0	5
		89	0	0	0	0	0	0
		88	250	0	0	0	0	250
842-07-9	C.I. Solvent Yellow 14	90	0	0	0	0	0	0
		89	250	250	0	0	0	500
		88	0	0	0	0	0	0

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Butyl acrylate	91	138,351	53,834	192,185
	90	127,398	130,325	257,723
	89	20,536	664,022	684,558
	88	34,604	604,685	639,289
n-Butyl alcohol	91	2,208,281	3,673,535	5,881,816
	90	4,239,917	6,070,691	10,310,608
	89	5,694,054	5,437,997	11,132,051
	88	4,524,863	8,180,445	12,705,308
sec-Butyl alcohol	91	14,464	28,939	43,403
	90	9,991	73,105	83,096
	89	14,563	129,700	144,263
	88	41,108	230,727	271,835
tert-Butyl alcohol	91	1,339,777	1,113,558	2,453,335
	90	1,792,590	472,509	2,265,099
	89	1,513,361	488,133	2,001,494
	88	1,539,726	495,275	2,035,001
Butyl benzyl phthalate	91	40,364	457,747	498,111
	90	87,592	876,604	964,196
	89	56,782	914,323	971,105
	88	44,235	1,066,747	1,110,982
1,2-Butylene oxide	91	5	907	912
	90	250	8,185	8,435
	89	250	585	835
	88	0	1,148	1,148
Butyraldehyde	91	260,475	2,471	262,946
	90	350,893	4,082	354,975
	89	392,052	220,498	612,550
	88	371,633	123,938	495,571
C.I. Basic Green 4	91	18,132	2,494	20,626
	90	1,006	500	1,506
	89	1,492	1	1,493
	88	1,320	250	1,570
C.I. Basic Red 1	91	0	375	375
	90	0	0	0
	89	0	0	0
C.I. Direct Black 38	89	0	250	250
C.I. Disperse Yellow 3	91	0	125	125
	90	250	219	469
	89	250	63	313
	88	0	899	899
C.I. Food Red 15	91	1,400	0	1,400
	90	270	0	270
	89	0	0	0
	88	0	0	0
C.I. Solvent Orange 7	89	0	0	0
C.I. Solvent Yellow 3	91	0	10	10
	90	5	0	5
	89	0	0	0
	88	0	0	0
C.I. Solvent Yellow 14	90	0	0	0
	89	750	250	1,000
	88	0	0	0

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
7440-43-9	Cadmium	91	1,857	3,091	661	0	2,753	8,362
		90	5,371	12,434	1,380	10	91,792	110,987
		89	12,336	23,436	2,746	0	103,163	141,681
		88	9,300	13,130	2,598	0	94,602	119,630
156-62-7	Calcium cyanamide	91	12,000	625	0	0	40,005	52,630
		90	12,000	620	0	0	40,000	52,620
		89	12,000	620	0	0	3,600	16,220
		88	12,000	600	0	0	66,000	78,600
133-06-2	Captan	91	1,883	5,233	260	4,500	260	12,136
		90	1,783	17,469	505	5,500	505	25,762
		89	3,762	21,460	500	5,000	500	31,222
		88	4,066	10,803	750	5,100	1,000	21,719
63-25-2	Carbaryl	91	2,022	4,825	260	0	1,170	8,277
		90	2,292	6,166	505	0	48,755	57,718
		89	3,303	6,778	750	0	33,952	44,783
		88	2,515	5,408	877	0	500	9,300
75-15-0	Carbon disulfide	91	2,626,842	86,712,281	58,634	2,835	260	89,400,852
		90	3,333,871	95,092,808	40,579	3,900	505	98,471,663
		89	3,233,664	96,955,438	33,105	16,600	508	100,239,315
		88	3,139,255	120,974,449	39,501	13,400	43,436	124,210,041
56-23-5	Carbon tetrachloride	91	528,100	1,018,701	2,844	42,470	2,152	1,594,267
		90	419,001	1,320,225	4,718	31,557	1,005	1,776,506
		89	943,133	2,507,116	15,656	122,043	1,616	3,589,564
		88	1,081,552	2,695,101	15,627	98,054	14,759	3,905,093
463-58-1	Carbonyl sulfide	91	5,627	16,719,541	0	0	0	16,725,168
		90	12,249	18,622,615	0	0	0	18,634,864
		89	9,023	18,417,583	772	0	0	18,427,378
		88	7,643	20,175,429	750	0	0	20,183,822
120-80-9	Catechol	91	4,035	1,751	254,267	0	86,600	346,653
		90	2,772	25,260	232,760	0	84,216	345,008
		89	2,748	1,214	312,295	0	84,538	400,795
		88	2,388	1,201	400,760	0	84,283	488,632
133-90-4	Chloramben	90	5	5	0	0	0	10
		89	0	0	0	0	0	0
		88	250	1,168	250	0	0	1,668
57-74-9	Chlordane	91	1,248	179	1	0	0	1,428
		90	4,244	178	1	0	0	4,423
		89	3,617	136	4	0	0	3,757
		88	2,695	3	4	4,262	0	6,964
7782-50-5	Chlorine	91	1,715,251	75,894,219	696,282	72,552	119,630	78,497,934
		90	2,064,481	102,786,953	1,272,770	73,894	250,591	106,448,689
		89	2,258,461	130,521,336	2,400,165	469,857	291,386	135,941,205
		88	4,706,728	129,402,266	6,615,485	107,624	428,097	141,260,200
10049-04-4	Chlorine dioxide	91	146,153	3,816,182	13,760	0	120	3,976,215
		90	134,215	5,136,299	785	15	20	5,271,334
		89	139,311	6,885,697	1,250	0	0	7,026,258
		88	1,277,546	12,076,241	2,350	0	41,000	13,397,137
79-11-8	Chloroacetic acid	91	66,762	446,920	1,696	0	123,675	639,053
		90	20,650	4,754	1,691	0	0	27,095
		89	20,616	4,229	1,524	10	0	26,379
		88	21,660	5,159	850	10	0	27,679
532-27-4	2-Chloroacetophenone	91	1	1	0	0	0	2

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Cadmium	91	260,309	738,486	998,795
	90	4,815	235,276	240,091
	89	8,489	279,274	287,763
	88	7,894	219,670	227,564
Calcium cyanamide	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Captan	91	255	16,503	16,758
	90	255	16,771	17,026
	89	350	16,695	17,045
	88	250	13,695	13,945
Carbaryl	91	0	15,969	15,969
	90	0	15,448	15,448
	89	14	14,610	14,624
	88	171	33,780	33,951
Carbon disulfide	91	193,658	335,374	529,032
	90	121,882	244,231	366,113
	89	132,535	173,493	306,028
	88	159,369	212,788	372,157
Carbon tetrachloride	91	621	980,569	981,190
	90	42,050	1,082,188	1,124,238
	89	3,841	1,716,813	1,720,654
	88	5,014	1,350,511	1,355,525
Carbonyl sulfide	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Catechol	91	237,081	114,297	351,378
	90	336,096	246,537	582,633
	89	270,614	238,233	508,847
	88	245,399	105,088	350,487
Chloramben	90	0	15,591	15,591
	89	0	0	0
	88	0	1,159	1,159
Chlordane	91	69	292	361
	90	99	523	622
	89	37	3,099	3,136
	88	23	80,809	80,832
Chlorine	91	964,055	499,024	1,463,079
	90	1,213,113	675,573	1,888,686
	89	2,713,363	3,147,885	5,861,248
	88	3,169,020	3,999,038	7,168,058
Chlorine dioxide	91	14,783	0	14,783
	90	1,586	5	1,591
	89	2,250	750	3,000
	88	2,650	41,750	44,400
Chloroacetic acid	91	3,279	6,381	9,660
	90	1,785	6,768	8,553
	89	9,717	4,096	13,813
	88	10,727	9,406	20,133
2-Chloroacetophenone	91	0	0	0

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
108-90-7	Chlorobenzene	91	1,228,868	1,167,233	5,165	177,032	1,534	2,579,832
		90	1,845,339	2,205,033	72,893	49,406	4,267	4,176,938
		89	1,523,319	2,523,230	62,551	82,969	6,609	4,198,678
		88	2,032,791	2,533,096	98,354	84,457	4,127	4,752,825
75-00-3	Chloroethane	91	1,397,212	1,466,057	16,078	300	10	2,879,657
		90	1,896,919	2,146,014	35,997	110	93	4,079,133
		89	2,196,786	2,693,306	71,749	150	0	4,961,991
		88	2,060,779	2,962,563	27,448	1,510	0	5,052,300
67-66-3	Chloroform	91	7,660,997	11,421,891	769,569	65,089	22,150	19,939,696
		90	8,388,150	14,138,445	1,005,860	89,560	57,924	23,679,939
		89	8,872,690	16,841,084	1,177,743	64,338	70,265	27,026,120
		88	7,566,776	17,469,790	1,126,484	36,002	68,546	26,267,598
74-87-3	Chloromethane	91	1,431,983	4,266,748	101,838	192,600	0	5,993,169
		90	1,992,361	5,847,270	144,397	199,605	92,260	8,275,893
		89	2,945,506	6,883,819	108,639	180,250	0	10,118,214
		88	3,431,488	8,904,962	115,985	165,250	0	12,617,685
107-30-2	Chloromethyl methyl ether	91	30	3,305	0	0	0	3,335
		90	35	3,300	0	0	0	3,335
		89	34	3,202	0	0	0	3,236
		88	33	3,000	0	0	0	3,033
126-99-8	Chloroprene	91	103,489	1,367,033	2	71,000	137,011	1,678,535
		90	159,397	1,401,702	756	140,000	750	1,702,605
		89	211,913	1,576,948	9	158,183	0	1,947,053
		88	234,228	1,713,780	287	68,792	0	2,017,087
1897-45-6	Chlorothalonil	91	1,921	1,330	13	0	0	3,264
		90	2,786	9,668	9	0	0	12,463
		89	19,715	9,782	252	0	1	29,750
		88	19,455	9,021	250	0	0	28,726
7440-47-3	Chromium	91	450,919	105,487	17,289	531	1,155,527	1,729,753
		90	255,076	166,519	40,249	85	2,726,042	3,187,971
		89	778,978	164,040	68,638	693	3,366,458	4,378,807
		88	357,706	201,802	74,810	2,249	9,295,079	9,931,646
7440-48-4	Cobalt	91	29,787	42,134	4,289	0	13,706	89,916
		90	16,823	21,113	8,858	0	35,008	81,802
		89	32,755	18,643	14,165	0	237,431	302,994
		88	18,776	17,552	16,743	0	213,204	266,275
7440-50-8	Copper	91	408,618	864,627	56,040	14,011	15,439,598	16,782,894
		90	444,458	830,345	56,907	22,351	11,421,385	12,775,446
		89	867,587	772,122	99,820	31,894	10,047,157	11,818,580
		88	317,559	1,197,902	115,509	15,651	10,468,235	12,114,856
120-71-8	p-Cresidine	91	160	68	5	0	250	483
		90	2,607	83	0	0	250	2,940
		89	977	1,233	250	0	250	2,710
		88	5,400	1,680	250	0	750	8,080
1319-77-3	Cresol (mixed isomers)	91	349,690	391,758	3,661	749,531	2,528	1,497,168
		90	388,918	354,051	2,390	1,724,529	3,946	2,473,834
		89	419,031	478,713	7,601	2,069,891	2,415	2,977,651
		88	400,427	378,672	6,500	1,804,060	4,762	2,594,421
108-39-4	m-Cresol	91	66,736	11,098	445	560,000	10	638,289
		90	4,193	3,915	0	0	0	8,108
		89	4,825	7,776	45	0	0	12,646
		88	5,860	12,572	283	0	455	19,170

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Chlorobenzene	91	15,346	3,874,516	3,889,862
	90	148,728	3,747,131	3,895,859
	89	312,398	4,074,606	4,387,004
	88	578,774	5,043,055	5,621,829
Chloroethane	91	5	310,731	310,736
	90	21,010	438,611	459,621
	89	250	397,113	397,363
	88	0	460,559	460,559
Chloroform	91	809,427	1,827,299	2,636,726
	90	802,260	1,321,726	2,123,986
	89	1,101,731	865,533	1,967,264
	88	1,226,573	1,369,922	2,596,495
Chloromethane	91	73,961	2,811,031	2,884,992
	90	47,316	130,668	177,984
	89	159,077	94,868	253,945
	88	54,223	104,432	158,655
Chloromethyl methyl ether	91	0	35	35
	90	0	0	0
	89	0	0	0
	88	0	0	0
Chloroprene	91	35,000	171,586	206,586
	90	60,194	177,765	237,959
	89	41,000	35,455	76,455
	88	62,000	18,749	80,749
Chlorothalonil	91	293	210,950	211,243
	90	755	204,127	204,882
	89	1,004	316,841	317,845
	88	541	399,934	400,475
Chromium	91	396,151	6,587,976	6,984,127
	90	163,429	19,735,291	19,898,720
	89	320,980	14,213,624	14,534,604
	88	417,722	17,250,258	17,667,980
Cobalt	91	9,878	596,216	606,094
	90	8,175	270,801	278,976
	89	12,106	273,439	285,545
	88	8,843	232,016	240,859
Copper	91	414,699	15,594,827	16,009,526
	90	156,443	14,514,304	14,670,747
	89	197,288	14,940,599	15,137,887
	88	311,247	19,351,474	19,662,721
p-Cresidine	91	18,368	2,681	21,049
	90	18,750	0	18,750
	89	25,750	10,300	36,050
	88	37,750	4,700	42,450
Cresol (mixed isomers)	91	18,356	259,436	277,792
	90	57,073	651,295	708,368
	89	78,305	728,393	806,698
	88	358,242	1,339,779	1,698,021
m-Cresol	91	11,918	62,909	74,827
	90	7,439	14,746	22,185
	89	15,588	55,715	71,303
	88	7,165	139,240	146,405

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
95-48-7	o-Cresol	91	29,463	31,802	11	550,000	4,860	616,136
		90	20,824	18,322	36	0	255	39,437
		89	38,015	21,653	311	2	3,345	63,326
		88	45,563	44,236	448	1	1,667	91,915
106-44-5	p-Cresol	91	45,348	90,329	2,046	252,200	3,259	393,182
		90	8,262	230,743	1,955	1,997	2,873	245,830
		89	8,969	246,515	3,421	1,800	10,000	270,705
		88	6,286	634,417	1,143	152,000	62,291	856,137
98-82-8	Cumene	91	1,080,084	2,197,610	2,011	9,189	21,757	3,310,651
		90	1,535,052	2,696,457	1,878	13,402	19,167	4,265,956
		89	1,333,580	3,066,836	10,085	27,620	3,784	4,441,905
		88	2,152,089	2,895,731	3,201	30,165	8,591	5,089,777
80-15-9	Cumene hydroperoxide	91	83,935	13,922	242	422,600	240	520,939
		90	97,285	12,886	427	45,518	6,665	162,781
		89	101,457	14,164	3,411	134,316	250	253,598
		88	178,787	13,736	1,784	371,000	250	565,557
135-20-6	Cupferron	91	0	1,200	0	0	0	1,200
		90	5	480	34	0	0	519
		89	0	1,500	34	0	0	1,534
		88	140	780	0	0	0	920
110-82-7	Cyclohexane	91	6,605,946	10,577,659	12,606	591,703	27,757	17,815,671
		90	6,220,010	11,283,985	26,062	327,259	33,376	17,890,692
		89	5,993,515	12,123,474	20,219	355,243	48,559	18,541,010
		88	4,988,813	8,820,135	20,273	334,471	38,190	14,201,882
94-75-7	2,4-D (acetic acid)	91	10,049	6,161	262	1,291	13,260	31,023
		90	4,030	4,212	259	2,100	10,662	21,263
		89	3,755	3,451	1,422	2,660	0	11,288
		88	3,539	3,981	549	3,789	38,000	49,858
1163-19-5	Decabromodiphenyl oxide	91	21,697	26,043	3,817	38	220,075	271,670
		90	15,608	48,495	2,577	43	24,844	91,567
		89	19,241	30,716	3,450	52	9,394	62,853
		88	7,500	22,104	500	292	21,450	51,846
615-05-4	2,4-Diaminoanisole	91	0	0	0	0	0	0
		90	21	5	0	0	0	26
		89	250	0	0	0	0	250
		88	0	0	0	0	0	0
39156-41-7	2,4-Diaminoanisole sulfate	91	0	0	0	0	0	0
		90	0	0	0	0	0	0
		89	0	0	0	0	0	0
		88	0	0	0	0	0	0
101-80-4	4,4'-Diaminodiphenyl ether	91	7	697	337	0	0	1,041
		90	5	900	413	0	0	1,318
		89	250	380	595	0	0	1,225
		88	0	216	585	0	0	801
25376-45-8	Diaminotoluene (mixed isomers)	91	17,963	2,620	1,110	24,000	10	45,703
		90	19,595	6,119	955	89,000	265	115,934
		89	15,707	4,016	2,068	95,000	480	117,271
		88	15,202	5,895	3,288	174,000	295	198,680
95-80-7	2,4-Diaminotoluene	91	3,800	10	250	0	0	4,060
		90	3,801	127	250	0	0	4,178
		89	4,050	376	250	0	0	4,676
		88	2,900	88	250	0	0	3,238

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
o-Cresol	91	55,341	30,681	86,022
	90	53,066	66,247	119,313
	89	123,923	73,192	197,115
	88	40,703	90,523	131,226
p-Cresol	91	1,062,305	40,355	1,102,660
	90	879,959	80,741	960,700
	89	1,507,037	745,156	2,252,193
	88	744,568	27,270	771,838
Cumene	91	163,552	71,674	235,226
	90	254,062	416,465	670,527
	89	185,473	197,808	383,281
	88	203,279	206,457	409,736
Cumene hydroperoxide	91	265	32,888	33,153
	90	3,755	190,086	193,841
	89	3,051	343,913	346,964
	88	5,250	25,516	30,766
Cupferron	91	1,200	0	1,200
	90	530	0	530
	89	1,600	0	1,600
	88	780	4,275	5,055
Cyclohexane	91	26,599	1,230,808	1,257,407
	90	33,146	1,331,377	1,364,523
	89	30,129	2,367,576	2,397,705
	88	145,067	2,940,861	3,085,928
2,4-D (acetic acid)	91	350	119,217	119,567
	90	5,581	59,214	64,795
	89	10,015	352,644	362,659
	88	27,952	283,232	311,184
Decabromodiphenyl oxide	91	43,538	787,514	831,052
	90	37,100	811,425	848,525
	89	48,868	834,242	883,110
	88	19,090	629,067	648,157
2,4-Diaminoanisole	91	85	0	85
	90	0	0	0
	89	250	0	250
	88	250	0	250
2,4-Diaminoanisole sulfate	91	250	0	250
	90	250	0	250
	89	250	0	250
	88	250	0	250
4,4'-Diaminodiphenyl ether	91	5	4,082	4,087
	90	250	5,857	6,107
	89	250	4,754	5,004
	88	179	142	321
Diaminotoluene (mixed isomers)	91	54,369	566,564	620,933
	90	80,350	1,168,065	1,248,415
	89	7,523	1,106,968	1,114,491
	88	2,951	745,955	748,906
2,4-Diaminotoluene	91	620	11,770	12,390
	90	1,501	0	1,501
	89	1,250	0	1,250
	88	1,200	0	1,200

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
132-64-9	Dibenzofuran	91	18,439	21,608	505	0	1,882	42,434
		90	21,207	9,018	532	0	897	31,654
		89	31,588	32,922	447	0	8,536	73,493
		88	46,648	24,406	1,510	0	9,929	82,493
96-12-8	1,2-Dibromo-3-chloropropane	91	290	0	0	0	0	290
106-93-4	1,2-Dibromoethane	91	8,642	29,560	73	240	2	38,517
		90	22,383	35,537	0	495	125	58,540
		89	22,880	36,287	250	4,914	322	64,653
		88	34,119	29,208	1,011	6,882	259	71,479
84-74-2	Dibutyl phthalate	91	58,761	91,271	8,907	160,000	5,069	324,008
		90	46,209	68,676	558	110,000	167	225,610
		89	114,975	117,408	2,400	310,000	13,022	557,805
		88	171,136	34,070	14,339	350,000	11,695	581,240
25321-22-6	Dichlorobenzene (mixed isomers)	91	4,446	73,649	2	0	9	78,106
		90	29,606	59,918	1	11	22	89,558
		89	11,564	126,348	185	0	0	138,097
		88	20,169	143,515	40	0	0	163,724
95-50-1	1,2-Dichlorobenzene	91	175,806	242,646	3,962	19,000	21,153	462,567
		90	167,220	275,524	12,395	15,313	32,588	503,040
		89	208,921	248,344	16,146	18,680	75,863	567,954
		88	206,238	324,463	11,624	20,115	13,354	575,794
541-73-1	1,3-Dichlorobenzene	91	878	3,941	779	0	0	5,598
		90	3,104	5,578	785	0	0	9,467
		89	3,554	7,844	22	0	0	11,420
		88	5,782	9,500	1,281	0	0	16,563
106-46-7	1,4-Dichlorobenzene	91	47,159	289,005	2,146	2,000	420	340,730
		90	96,238	721,895	3,912	255	38	822,338
		89	115,581	1,476,648	6,621	250	250	1,599,350
		88	103,870	1,787,549	6,153	4,000	1,300	1,902,872
91-94-1	3,3'-Dichlorobenzidine	91	5	5	0	0	0	10
		90	10	15	1	0	0	26
		89	250	4	241	0	0	495
		88	250	5	752	0	0	1,007
75-27-4	Dichlorobromomethane	91	200	0	0	0	0	200
		90	632	0	0	0	0	632
107-06-2	1,2-Dichloroethane	91	812,464	3,182,959	23,564	6,334	7,051	4,032,372
		90	1,167,609	4,436,475	48,763	826,672	7,351	6,486,870
		89	1,326,461	2,966,105	225,814	1,046,661	714	5,565,755
		88	1,572,325	2,963,854	40,527	1,452,084	2,166	6,030,956
540-59-0	1,2-Dichloroethylene	91	14,925	29,857	12	0	0	44,794
		90	81,311	46,588	54	360	118	128,431
		89	109,604	90,888	728	55	0	201,275
		88	16,552	108,896	95	0	1	125,544
75-09-2	Dichloromethane	91	31,726,830	47,611,641	98,877	1,317,706	117,788	80,872,842
		90	37,744,015	62,532,366	190,500	850,018	21,024	101,337,923
		89	42,295,554	81,864,100	226,823	1,937,469	15,894	126,339,840
		88	48,751,550	79,242,388	350,050	1,478,834	157,211	129,980,033
120-83-2	2,4-Dichlorophenol	91	885	547	1	42,800	1	44,234
		90	264	565	95	20,400	0	21,324
		89	554	999	78	6,589	0	8,220
		88	535	868	107	17,700	2	19,212

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Dibenzofuran	91	500	125,545	126,045
	90	40,052	90,125	130,177
	89	47,572	170,179	217,751
	88	47,726	234,034	281,760
1,2-Dibromo-3-chloropropane	91	0	0	0
1,2-Dibromoethane	91	2	1,588	1,590
	90	255	86,864	87,119
	89	310	122,348	122,658
	88	253	33,861	34,114
Dibutyl phthalate	91	14,535	190,611	205,146
	90	19,812	217,738	237,550
	89	25,994	283,549	309,543
	88	36,523	271,592	308,115
Dichlorobenzene (mixed isomers)	91	7,410	111,348	118,758
	90	26,769	212,700	239,469
	89	44,813	500,636	545,449
	88	182,663	124,378	307,041
1,2-Dichlorobenzene	91	84,218	2,840,057	2,924,275
	90	76,763	2,864,394	2,941,157
	89	208,084	2,519,915	2,727,999
	88	64,118	2,039,805	2,103,923
1,3-Dichlorobenzene	91	160	3,988	4,148
	90	30	1,464	1,494
	89	40	260	300
	88	40	540	580
1,4-Dichlorobenzene	91	11,068	111,789	122,857
	90	12,921	180,756	193,677
	89	33,941	104,091	138,032
	88	37,997	138,882	176,879
3,3'-Dichlorobenzidine	91	15	23,766	23,781
	90	505	16,751	17,256
	89	342	22,195	22,537
	88	617	224,205	224,822
Dichlorobromomethane	91	0	0	0
	90	0	0	0
1,2-Dichloroethane	91	26,294	5,728,673	5,754,967
	90	81,514	3,562,224	3,643,738
	89	1,399,826	2,623,097	4,022,923
	88	1,477,242	2,013,386	3,490,628
1,2-Dichloroethylene	91	0	359	359
	90	0	4,001	4,001
	89	0	22,210	22,210
	88	0	213,358	213,358
Dichloromethane	91	1,308,202	12,605,336	13,913,538
	90	1,281,832	9,163,437	10,445,269
	89	921,911	12,813,000	13,734,911
	88	1,830,832	22,688,907	24,519,739
2,4-Dichlorophenol	91	0	0	0
	90	0	60,800	60,800
	89	0	117,721	117,721
	88	6	12,909	12,915

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
78-87-5	1,2-Dichloropropane	91	227,847	545,596	6,570	0	0	780,013
		90	199,002	838,712	4,253	0	300	1,042,267
		89	311,906	1,064,664	14,977	0	5	1,391,552
		88	316,478	1,079,826	23,785	0	3,400	1,423,489
542-75-6	1,3-Dichloropropylene	91	11,895	8,510	0	0	0	20,405
		90	46,570	12,903	310	0	0	59,783
		89	35,469	15,448	340	0	0	51,257
		88	39,790	14,800	250	0	0	54,840
62-73-7	Dichlorvos	91	326	318	0	0	0	644
		90	800	510	0	0	0	1,310
		89	1,111	214	0	0	0	1,325
		88	1,050	0	0	0	0	1,050
115-32-2	Dicofol	91	5	1	0	0	0	6
		90	13	255	5	0	0	273
		89	829	500	250	0	0	1,579
		88	593	750	0	0	0	1,343
1464-53-5	Diepoxybutane	91	0	0	0	0	0	0
111-42-2	Diethanolamine	91	187,534	83,573	434,060	60,000	132,585	897,752
		90	289,889	99,448	360,137	157,015	120,866	1,027,355
		89	365,348	119,726	591,555	162,459	134,797	1,373,885
		88	440,057	198,081	438,213	238,317	133,456	1,448,124
117-81-7	Di-(2-ethylhexyl) phthalate	91	95,409	948,011	3,842	370	155,773	1,203,405
		90	125,451	1,172,663	2,393	265	19,551	1,320,323
		89	288,097	789,274	2,983	600	25,937	1,106,891
		88	175,342	948,104	2,792	3,091	20,778	1,150,107
84-66-2	Diethyl phthalate	91	11,032	99,649	678	0	2,977	114,336
		90	12,839	83,578	2,697	0	37	99,151
		89	10,742	81,868	9,163	0	250	102,023
		88	9,139	82,488	11,272	0	0	102,899
64-67-5	Diethyl sulfate	91	3,610	408	5	0	10	4,033
		90	5,058	435	10	5	280	5,788
		89	7,345	1,372	0	0	250	8,967
		88	8,436	2,191	0	0	250	10,877
119-90-4	3,3'-Dimethoxybenzidine	91	0	0	4	0	0	4
		90	3	1	4	0	0	8
		89	250	250	3	0	0	503
119-93-7	3,3'-Dimethylbenzidine	90	0	0	0	0	0	0
		89	0	0	0	0	0	0
57-14-7	1,1-Dimethyl hydrazine	91	111	378	0	0	0	489
		90	100	363	250	0	0	713
		89	467	337	250	0	0	1,054
		88	2,206	2,117	10	0	0	4,333
105-67-9	2,4-Dimethylphenol	91	18,008	15,686	8	101,000	26	134,728
		90	2,453	5,433	13	56,900	302	65,101
		89	1,336	1,164	219	55,869	85	58,673
		88	1,661	9,927	484	24,703	649	37,424
131-11-3	Dimethyl phthalate	91	14,147	51,690	1,198	865	811	68,711
		90	76,787	268,476	1,528	750	433	347,974
		89	101,739	263,181	1,260	500	415	367,095
		88	113,841	420,965	4,335	390	504	540,035

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
1,2-Dichloropropane	91	7,100	2,075	9,175
	90	8,596	6,209	14,805
	89	10,802	6,744	17,546
	88	136,775	4,913	141,688
1,3-Dichloropropylene	91	0	920	920
	90	0	1,268	1,268
	89	0	4,604	4,604
	88	0	2,738	2,738
Dichlorvos	91	0	3,610	3,610
	90	5	3,991	3,996
	89	1	4,441	4,442
	88	0	1,516	1,516
Dicofol	91	0	7,909	7,909
	90	0	286	286
	89	0	14,045	14,045
	88	0	25,166	25,166
Diepoxybutane	91	0	0	0
Diethanolamine	91	1,311,723	589,000	1,900,723
	90	3,474,117	611,164	4,085,281
	89	1,505,535	1,279,160	2,784,695
	88	1,927,247	1,328,142	3,255,389
Di-(2-ethylhexyl) phthalate	91	50,531	1,154,094	1,204,625
	90	93,541	1,560,679	1,654,220
	89	199,176	2,281,404	2,480,580
	88	168,891	2,340,803	2,509,694
Diethyl phthalate	91	313,332	126,706	440,038
	90	440,616	85,527	526,143
	89	276,553	102,354	378,907
	88	37,600	105,924	143,524
Diethyl sulfate	91	633	805	1,438
	90	1,170	2,826	3,996
	89	1,500	0	1,500
	88	890	0	890
3,3'-Dimethoxybenzidine	91	0	0	0
	90	37	0	37
	89	259	0	259
3,3'-Dimethylbenzidine	90	5	0	5
	89	0	0	0
1,1-Dimethyl hydrazine	91	0	6,386	6,386
	90	0	8,507	8,507
	89	0	8,997	8,997
	88	0	8,855	8,855
2,4-Dimethylphenol	91	2,675	4,959	7,634
	90	4,030	15,092	19,122
	89	5,190	10,780	15,970
	88	7,964	3,000	10,964
Dimethyl phthalate	91	82,565	76,057	158,622
	90	88,719	57,146	145,865
	89	339,024	114,413	453,437
	88	508,821	135,710	644,531

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
77-78-1	Dimethyl sulfate	91	9,670	427	293	0	0	10,390
		90	9,303	436	375	0	0	10,114
		89	11,912	1,905	500	0	50	14,367
		88	9,171	1,625	610	0	50	11,456
534-52-1	4,6-Dinitro-o-cresol	91	7	43	33	0	0	83
		90	8	39	131	0	0	178
		89	258	13	25	0	1	297
		88	259	15	266	0	2	542
51-28-5	2,4-Dinitrophenol	91	16,585	7,557	3,888	35,532	10	63,572
		90	17,111	7,586	89,074	111,500	3,307	228,578
		89	10,568	3,084	160,672	301,070	3,242	478,636
		88	12,386	8,439	98,692	86,200	257	205,974
121-14-2	2,4-Dinitrotoluene	91	5,103	312	2,682	0	1,424	9,521
		90	6,312	51,271	3,735	74,000	2,153	137,471
		89	9,500	77,793	12,657	69,000	341	169,291
		88	15,533	77,724	12,055	106,400	14,961	226,673
606-20-2	2,6-Dinitrotoluene	91	1,197	751	702	0	0	2,650
		90	1,486	16,251	416	19,000	0	37,153
		89	2,268	81,646	1,083	18,000	0	102,997
		88	6,074	81,523	957	27,000	0	115,554
117-84-0	n-Dioctyl phthalate	91	16,139	15,691	557	0	255	32,642
		90	17,556	13,282	1,843	5	261	32,947
		89	20,165	503,124	1,196	0	1,748	526,233
		88	25,946	43,565	1,523	0	1,000	72,034
123-91-1	1,4-Dioxane	91	365,544	352,960	318,133	0	15,952	1,052,589
		90	307,216	346,400	204,856	0	12,549	871,021
		89	418,688	412,672	273,523	0	33,723	1,138,606
		88	361,259	251,374	203,320	0	11,702	827,655
106-89-8	Epichlorohydrin	91	277,040	182,110	5,456	0	3,675	468,281
		90	254,946	171,714	11,029	79,220	7,648	524,557
		89	283,573	188,854	4,585	197,200	2,511	676,723
		88	264,142	200,965	4,917	68,750	2,524	541,298
110-80-5	2-Ethoxyethanol	91	224,795	447,143	5,022	0	0	676,960
		90	352,731	673,531	42,015	0	0	1,068,277
		89	290,296	1,453,368	96,042	0	78	1,839,784
		88	290,053	2,152,887	120,164	0	52	2,563,156
140-88-5	Ethyl acrylate	91	108,970	122,991	423	947	939	234,270
		90	121,530	92,682	1,161	10	498	215,881
		89	103,084	92,591	1,188	0	3,281	200,144
		88	125,227	119,276	1,211	0	265	245,979
100-41-4	Ethylbenzene	91	2,876,381	5,764,613	16,608	94,637	53,124	8,805,363
		90	3,057,578	6,095,906	13,037	213,620	61,934	9,442,075
		89	3,272,129	6,214,867	16,945	60,475	88,912	9,653,328
		88	3,046,169	4,359,431	15,775	72,914	202,364	7,696,653
541-41-3	Ethyl chloroformate	91	1,254	576	0	0	0	1,830
		90	1,307	525	0	0	0	1,832
		89	7,950	692	0	0	0	8,642
		88	11,880	2,023	0	0	0	13,903
74-85-1	Ethylene	91	16,137,889	22,133,970	17,015	0	0	38,288,874
		90	16,528,900	22,945,931	11,488	27,500	11,005	39,524,824
		89	18,966,417	25,250,027	14,902	18,618	16,200	44,266,164
		88	21,154,105	26,142,065	15,214	17,203	13,250	47,341,837

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Dimethyl sulfate	91	260	0	260
	90	30	33	63
	89	1,250	0	1,250
	88	1,000	0	1,000
4,6-Dinitro-o-cresol	91	26,255	17,370	43,625
	90	44,756	204,573	249,329
	89	61,206	87,809	149,015
	88	19	306,096	306,115
2,4-Dinitrophenol	91	255	1,205	1,460
	90	261	3,923	4,184
	89	0	2,385	2,385
	88	1,000	677,650	678,650
2,4-Dinitrotoluene	91	0	53,307	53,307
	90	12	37,020	37,032
	89	600,000	243,455	843,455
	88	700,000	126,336	826,336
2,6-Dinitrotoluene	91	0	250	250
	90	0	30,230	30,230
	89	140,000	70,630	210,630
	88	170,000	31,585	201,585
n-Dioctyl phthalate	91	3,175	154,348	157,523
	90	6,198	208,317	214,515
	89	12,810	176,791	189,601
	88	7,277	215,900	223,177
1,4-Dioxane	91	254,304	602,897	857,201
	90	210,938	104,580	315,518
	89	281,002	220,515	501,517
	88	203,103	211,281	414,384
Epichlorohydrin	91	12,703	919,829	932,532
	90	57,931	669,716	727,647
	89	30,742	784,801	815,543
	88	73,385	690,564	763,949
2-Ethoxyethanol	91	217,923	159,990	377,913
	90	111,872	198,211	310,083
	89	162,581	330,511	493,092
	88	196,286	438,371	634,657
Ethyl acrylate	91	19,855	192,206	212,061
	90	12,985	101,995	114,980
	89	9,219	121,040	130,259
	88	27,656	108,663	136,319
Ethylbenzene	91	101,944	1,509,030	1,610,974
	90	116,775	2,214,120	2,330,895
	89	538,180	3,974,198	4,512,378
	88	511,530	2,913,769	3,425,299
Ethyl chloroformate	91	0	390	390
	90	0	0	0
	89	0	0	0
	88	0	69,600	69,600
Ethylene	91	17	898,258	898,275
	90	11	194,412	194,423
	89	200	605	805
	88	250	41,319	41,569

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
107-21-1	Ethylene glycol	91	4,467,944	6,192,193	2,299,613	3,654,273	908,167	17,522,190
		90	4,103,701	6,952,871	2,741,607	5,809,302	987,630	20,595,111
		89	4,179,951	8,709,354	3,905,474	8,971,967	957,398	26,724,144
		88	4,055,642	9,217,264	3,727,220	7,927,570	736,344	25,664,040
151-56-4	Ethyleneimine	89	250	250	0	0	0	500
		88	250	250	0	0	0	500
75-21-8	Ethylene oxide	91	805,152	987,896	2,260	25,416	50,336	1,871,060
		90	784,241	1,663,975	8,911	49,280	24,042	2,530,449
		89	832,144	2,319,279	5,217	16,219	37,962	3,210,821
		88	975,532	3,717,979	44,851	11,125	54,700	4,804,187
96-45-7	Ethylene thiourea	91	24	558	0	0	0	582
		90	255	30	0	0	0	285
		89	1	763	0	0	0	764
		88	0	500	0	0	0	500
2164-17-2	Fluometuron	91	104	113	10	0	5	232
		90	26	19	0	0	0	45
		89	273	267	0	0	0	540
		88	250	250	0	0	0	500
50-00-0	Formaldehyde	91	1,780,780	8,437,687	616,001	5,220,067	242,466	16,297,001
		90	2,267,883	10,125,225	761,927	8,025,876	188,552	21,369,463
		89	2,687,565	10,324,007	807,163	8,215,905	240,248	22,274,888
		88	3,006,120	8,886,393	902,888	9,608,524	494,111	22,898,036
76-13-1	Freon 113	91	23,983,423	11,874,228	3,264	558	89,780	35,951,253
		90	31,802,084	15,508,786	12,170	1,820	35,477	47,360,337
		89	42,655,738	22,784,569	14,588	2,057	25,185	65,482,137
		88	46,684,519	23,283,604	32,894	5,965	27,799	70,034,781
76-44-8	Heptachlor	91	5	0	0	0	0	5
		90	3,797	0	1	0	0	3,798
		89	3,403	8	2	0	0	3,413
		88	54,292	3	2	0	0	54,297
118-74-1	Hexachlorobenzene	91	549	292	111	60	1	1,013
		90	1,258	210	124	220	0	1,812
		89	3,669	944	338	710	0	5,661
		88	3,602	497	4	410	0	4,513
87-68-3	Hexachloro-1,3-butadiene	91	2,420	990	681	200	2	4,293
		90	3,364	1,542	715	330	0	5,951
		89	3,919	709	622	330	1	5,581
		88	2,043	513	153	220	0	2,929
77-47-4	Hexachlorocyclo--pentadiene	91	24,744	717	23	5	0	25,489
		90	83,812	773	10	5	0	84,600
		89	88,061	1,185	6	250	0	89,502
		88	77,902	415	6	2,131	0	80,454
67-72-1	Hexachloroethane	91	1,783	20,926	0	160	2	22,871
		90	1,885	6,156	1	1,500	334	9,876
		89	3,413	19,245	421	770	1	23,850
		88	2,949	16,238	11	520	1	19,719
302-01-2	Hydrazine	91	22,354	6,079	1,520	0	5	29,958
		90	22,457	4,726	1,414	423	5	29,025
		89	20,627	11,042	2,291	0	71	34,031
		88	24,368	7,689	2,149	0	29	34,235

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Ethylene glycol	91	18,602,841	7,251,803	25,854,644
	90	15,968,632	11,671,041	27,639,673
	89	17,436,120	15,887,479	33,323,599
	88	17,259,152	17,588,484	34,847,636
Ethyleneimine	89	0	0	0
	88	0	0	0
Ethylene oxide	91	114,004	2,619	116,623
	90	266,214	2,729	268,943
	89	351,993	26,622	378,615
	88	363,065	21,913	384,978
Ethylene thiourea	91	15	19,117	19,132
	90	255	16,609	16,864
	89	261	22,451	22,712
	88	500	2,500	3,000
Fluometuron	91	1,012	28,635	29,647
	90	81,085	3,393	84,478
	89	126,214	15,569	141,783
	88	2,300	22,800	25,100
Formaldehyde	91	5,482,598	1,434,655	6,917,253
	90	6,290,198	1,920,921	8,211,119
	89	6,257,127	2,112,242	8,369,369
	88	4,382,254	2,724,992	7,107,246
Freon 113	91	38,402	1,394,403	1,432,805
	90	50,520	2,709,239	2,759,759
	89	60,288	4,589,922	4,650,210
	88	104,193	6,284,293	6,388,486
Heptachlor	91	0	5	5
	90	58	85,306	85,364
	89	51	73,292	73,343
	88	37	51,935	51,972
Hexachlorobenzene	91	5	1,191,936	1,191,941
	90	23	53,010	53,033
	89	30	1,453,803	1,453,833
	88	160	965,099	965,259
Hexachloro-1,3-butadiene	91	4	1,713,642	1,713,646
	90	958	84,345	85,303
	89	100	4,213,617	4,213,717
	88	300	3,532,641	3,532,941
Hexachlorocyclo--pentadiene	91	624	30,803	31,427
	90	904	44,109	45,013
	89	1,096	17,468	18,564
	88	852	619,315	620,167
Hexachloroethane	91	0	171,024	171,024
	90	0	128,241	128,241
	89	250	486,536	486,786
	88	260	660,856	661,116
Hydrazine	91	6,368	15,978	22,346
	90	11,367	25,474	36,841
	89	3,354	68,818	72,172
	88	1,468	43,123	44,591

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
10034-93-2	Hydrazine sulfate	91	0	2	0	150,000	0	150,002
		90	5	252	0	138,941	0	139,198
		89	0	1	0	76,957	0	76,958
		88	290	882	0	355,000	0	356,172
7647-01-0	Hydrochloric acid	91	4,634,850	78,286,624	2,143,954	190,422,615	12,193,916	287,681,959
		90	5,641,346	80,489,419	2,770,080	158,217,391	8,669,227	255,787,463
		89	5,287,364	76,089,642	3,052,768	273,272,293	5,710,354	363,412,421
		88	6,224,677	67,707,146	3,948,499	396,089,339	5,509,273	479,478,934
74-90-8	Hydrogen cyanide	91	64,031	1,190,762	8,839	945,926	17	2,209,575
		90	56,825	663,250	3,824	1,597,552	48	2,321,499
		89	92,667	678,920	5,610	3,534,070	328	4,311,595
		88	131,604	980,673	2,300	1,737,850	1,761	2,854,188
7664-39-3	Hydrogen fluoride	91	3,565,926	5,615,266	5,464	1	25,259	9,211,916
		90	3,401,719	5,903,243	13,868	20	8,309	9,327,159
		89	3,552,367	7,367,441	35,918	0	10,943	10,966,669
		88	3,784,342	9,181,080	189,928	250	13,002	13,168,602
123-31-9	Hydroquinone	91	6,434	4,367	4,388	255,705	6	270,900
		90	6,261	5,736	4,525	284,020	295	300,837
		89	6,774	6,286	4,884	353,022	504	371,470
		88	3,601	6,733	7,211	375,400	530	393,475
78-84-2	Isobutyraldehyde	91	118,100	272,124	91	6,810	262	397,387
		90	148,031	337,247	80	864	1	486,223
		89	178,072	406,035	751	1,042	1	585,901
		88	178,740	503,878	773	60	1	683,452
67-63-0	Isopropyl alcohol (manufacturing)	91	471,421	977,470	21,735	200	2,077	1,472,903
		90	1,124,772	1,551,306	11,131	15	50	2,687,274
		89	2,137,392	2,994,557	11,008	18,441	1,657	5,163,055
		88	790,232	1,196,100	1,900	0	14	1,988,246
80-05-7	4,4'-Isopropylidene--diphenol	91	116,488	191,370	4,492	43,000	374,926	730,276
		90	93,380	91,098	2,412	23,000	555,917	765,807
		89	114,927	113,322	6,879	0	779,533	1,014,661
		88	119,620	106,806	126,385	0	424,117	776,928
7439-92-1	Lead	91	205,524	226,253	20,457	0	3,323,695	3,775,929
		90	502,758	360,799	25,414	40	4,822,504	5,711,515
		89	306,465	554,011	33,329	5	5,846,148	6,739,958
		88	500,958	645,279	61,130	5	6,633,330	7,840,702
58-89-9	Lindane	91	271	291	0	0	5	567
		90	1,011	538	250	0	5	1,804
		89	751	36	0	0	250	1,037
		88	251	7	0	0	0	258
108-31-6	Maleic anhydride	91	77,182	381,807	460	255	1,155	460,859
		90	90,604	402,465	1,378	10	120,816	615,273
		89	94,114	357,450	2,824	0	750	455,138
		88	111,458	550,373	12,580	240,000	0	914,411
12427-38-2	Maneb	91	10	19	0	0	0	29
		90	270	521	5	0	0	796
		89	1,000	1,031	0	0	0	2,031
		88	1,000	1,265	250	0	0	2,515
7439-96-5	Manganese	91	687,932	409,038	144,676	522	9,848,116	11,090,284
		90	503,716	665,754	139,876	874	9,031,122	10,341,342
		89	2,115,142	479,588	150,322	556	7,985,972	10,731,580
		88	1,038,920	761,590	321,894	250	20,464,605	22,587,259

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Hydrazine sulfate	91	0	0	0
	90	250	250	500
	89	0	250	250
	88	0	0	0
Hydrochloric acid	91	16,566,697	48,453,002	65,019,699
	90	39,305,472	41,027,703	80,333,175
	89	28,420,423	44,200,651	72,621,074
	88	35,554,163	74,453,882	110,008,045
Hydrogen cyanide	91	271	435	706
	90	290	4,127	4,417
	89	294	24,282	24,576
	88	337	22,451	22,788
Hydrogen fluoride	91	356,983	3,594,308	3,951,291
	90	70,956	4,031,896	4,102,852
	89	196,554	3,877,404	4,073,958
	88	696,139	6,328,884	7,025,023
Hydroquinone*	91	168,069	237,806	405,875
	90	277,533	141,090	418,623
	89	595,068	170,387	765,455
	88	512,180	309,941	822,121
Isobutyraldehyde	91	37,444	47,587	85,031
	90	35,728	41,987	77,715
	89	36,055	37,130	73,185
	88	713	30,260	30,973
Isopropyl alcohol (manufacturing)	91	141,364	157,259	298,623
	90	88,399	784,598	872,997
	89	681,397	1,400,169	2,081,566
	88	154,651	688,989	843,640
4,4'-Isopropylidene- -diphenol	91	32,776	253,490	286,266
	90	42,334	477,272	519,606
	89	35,368	492,569	527,937
	88	31,135	1,434,170	1,465,305
Lead	91	306,444	7,255,084	7,561,528
	90	33,260	12,300,630	12,333,890
	89	50,052	14,656,648	14,706,700
	88	122,220	13,684,082	13,806,302
Lindane	91	5	7,324	7,329
	90	5	3,052	3,057
	89	250	1,053	1,303
	88	0	186	186
Maleic anhydride	91	6,073	719,016	725,089
	90	643,337	738,472	1,381,809
	89	578,073	882,229	1,460,302
	88	556,373	978,535	1,534,908
Maneb	91	0	2,625	2,625
	90	0	5,850	5,850
	89	250	16,489	16,739
	88	1,470	7,362	8,832
Manganese	91	161,114	13,610,853	13,771,967
	90	60,448	16,085,106	16,145,554
	89	84,604	26,208,163	26,292,767
	88	132,384	24,133,354	24,265,738

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
7439-97-6	Mercury	91	10,557	6,355	624	0	5,287	22,823
		90	14,015	8,384	751	0	4,184	27,334
		89	16,063	9,522	1,555	0	4,942	32,082
		88	16,036	7,359	1,397	0	13,279	38,071
67-56-1	Methanol	91	35,913,043	163,769,926	20,064,023	28,877,462	3,634,255	252,258,709
		90	39,312,330	162,089,503	17,810,136	27,970,817	5,527,527	252,710,313
		89	43,627,434	168,156,968	16,444,366	25,142,977	7,776,702	261,148,447
		88	46,761,506	181,504,818	16,833,614	26,555,436	11,674,236	283,329,610
72-43-5	Methoxychlor	91	251	314	10	0	5	580
		90	756	846	505	0	255	2,362
		89	250	286	250	0	250	1,036
		88	47,971	224,910	252	0	258	273,391
109-86-4	2-Methoxyethanol	91	1,105,988	712,351	364,059	0	20	2,182,418
		90	1,298,049	1,293,167	40,340	4,540	3,233	2,639,329
		89	988,479	1,710,422	46,428	4,000	112	2,749,441
		88	1,148,256	4,751,413	40,520	750	7	5,940,946
96-33-3	Methyl acrylate	91	65,781	169,686	919	161	0	236,547
		90	79,309	170,377	470	99	4	250,259
		89	77,236	116,965	1,167	200	250	195,818
		88	319,897	109,438	1,358	200	30,260	461,153
1634-04-4	Methyl tert-butyl ether	91	788,244	2,249,807	30,901	81,690	2,903	3,153,545
		90	652,252	2,244,097	42,667	112,400	1,501	3,052,917
		89	534,455	2,593,718	37,439	19,300	1,290	3,186,202
		88	617,340	1,882,897	21,499	14,400	370	2,536,506
101-14-4	4,4'-Methylenebis (2-chloroaniline)	91	1,015	347	0	0	0	1,362
		90	761	1,005	0	0	0	1,766
		89	501	511	0	0	0	1,012
		88	500	250	0	0	0	750
101-61-1	4,4'-Methylenebis-(N,N-dimethyl)	88	250	0	0	0	7,000	7,250
101-68-8	Methylenebis (phenylisocyanate)	91	391,550	234,784	10	0	125,989	752,333
		90	370,019	239,950	50	20	226,671	836,710
		89	205,704	118,218	506	0	149,262	473,690
		88	154,905	90,892	1,022	0	87,415	334,234
74-95-3	Methylene bromide	91	38,277	13,010	0	0	0	51,287
		90	51,164	13,630	0	0	0	64,794
		89	31,584	4,780	0	0	0	36,364
		88	34,468	23,255	0	0	0	57,723
101-77-9	4,4'-Methylenedianiline	91	9,013	4,155	1,486	22,062	3	36,719
		90	14,250	5,273	1,201	57,250	6	77,980
		89	33,140	14,620	1,305	96,000	0	145,065
		88	36,804	93,347	2,599	460,250	1,140	594,140
78-93-3	Methyl ethyl ketone	91	33,149,766	70,271,889	141,354	355,736	180,492	104,099,237
		90	42,863,784	85,627,333	77,514	146,199	50,423	128,765,253
		89	41,693,966	94,365,489	71,781	200,703	171,347	136,503,286
		88	38,687,923	97,348,615	91,344	253,762	166,458	136,548,102
60-34-4	Methyl hydrazine	91	0	0	0	0	0	0
		90	1	0	0	0	0	1
		89	0	73	0	0	0	73
		88	2,774	153	1	0	0	2,928

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Mercury	91	42	157,951	157,993
	90	42	177,279	177,321
	89	1,024	125,563	126,587
	88	1,613	257,378	258,991
Methanol	91	113,854,683	44,074,165	157,928,848
	90	127,561,836	48,879,725	176,441,561
	89	111,677,647	62,572,988	174,250,635
	88	112,776,950	58,537,919	171,314,869
Methoxychlor	91	0	164	164
	90	0	1,487	1,487
	89	0	440	440
	88	0	24,759	24,759
2-Methoxyethanol	91	399,241	393,736	792,977
	90	531,570	891,880	1,423,450
	89	480,845	1,306,586	1,787,431
	88	622,102	884,230	1,506,332
Methyl acrylate *	91	5,311	39,501	44,812
	90	9,377	743,953	753,330
	89	13,131	80,591	93,722
	88	14,886	18,784	33,670
Methyl tert-butyl ether	91	129,131	26,381	155,512
	90	123,291	55,580	178,871
	89	78,535	104,933	183,468
	88	7,713	98,177	105,890
4,4'-Methylenebis (2-chloroaniline)	91	5	4,228	4,233
	90	0	2,105	2,105
	89	0	4,541	4,541
	88	0	6,250	6,250
4,4'-Methylenebis-(N,N-dimethyl)	88	0	1,150	1,150
Methylenebis (phenylisocyanate)	91	911	1,617,192	1,618,103
	90	5,171	1,706,143	1,711,314
	89	1,875	2,320,548	2,322,423
	88	1,250	2,612,974	2,614,224
Methylene bromide	91	5,417	0	5,417
	90	8,579	49,085	57,664
	89	5,440	51,082	56,522
	88	6,097	0	6,097
4,4'-Methylenedianiline	91	1,759	61,131	62,890
	90	2,434	106,306	108,740
	89	3,088	306,171	309,259
	88	7,399	280,887	288,286
Methyl ethyl ketone	91	772,861	9,998,866	10,771,727
	90	867,891	20,323,777	21,191,668
	89	886,502	28,506,748	29,393,250
	88	962,868	28,620,683	29,583,551
Methyl hydrazine	91	1	2	3
	90	0	0	0
	89	0	500	500
	88	0	2,700	2,700

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
74-88-4	Methyl iodide	91	22,544	2,870	13	740	0	26,167
		90	29,443	373	1	5,085	0	34,902
		89	17,178	8,294	1	5,085	0	30,558
		88	5,691	3,253	5	250	0	9,199
108-10-1	Methyl isobutyl ketone	91	8,411,877	18,786,642	167,405	161,600	177,939	27,705,463
		90	9,688,471	18,021,527	53,798	52,221	24,733	27,840,750
		89	10,850,259	20,673,502	449,407	81,850	20,891	32,075,909
		88	13,015,362	18,610,414	762,108	116,650	31,770	32,536,304
624-83-9	Methyl isocyanate	91	6,987	798	0	0	0	7,785
		90	13,033	1,640	0	0	750	15,423
		89	13,702	1,246	0	0	314	15,262
		88	9,649	586	0	0	64	10,299
80-62-6	Methyl methacrylate	91	587,732	1,969,763	6,373	270,000	4,305	2,838,173
		90	672,236	1,963,918	27,181	210,015	593	2,873,943
		89	1,295,353	1,855,670	28,802	197,013	4,801	3,381,639
		88	1,178,598	2,259,240	28,084	327,221	8,119	3,801,262
90-94-8	Michler's ketone	91	0	0	0	0	0	0
		90	0	0	0	0	0	0
		89	78	66	0	0	0	144
		88	450	650	0	0	0	1,100
1313-27-5	Molybdenum trioxide	91	46,026	47,911	78,785	134,965	23,415	331,102
		90	21,846	42,671	102,840	170,650	49,120	387,127
		89	34,336	66,333	124,535	173,270	108,264	506,738
		88	37,272	72,589	139,021	197,115	97,238	543,235
91-20-3	Naphthalene	91	1,391,603	1,280,285	31,484	39,112	54,343	2,796,827
		90	2,050,725	1,724,919	36,113	28,135	143,191	3,983,083
		89	1,848,065	1,577,969	146,749	39,552	118,187	3,730,522
		88	3,370,519	1,704,275	22,568	50,946	123,706	5,272,014
134-32-7	alpha-Naphthylamine	91	5	5	0	0	0	10
		90	250	250	0	0	0	500
		89	336	336	0	0	0	672
		88	336	254	101	0	0	691
7440-02-0	Nickel	91	408,694	140,609	53,883	4,418	393,775	1,001,379
		90	224,811	211,532	57,322	9,136	3,007,213	3,510,014
		89	668,213	190,875	87,752	18,946	1,293,227	2,259,013
		88	260,551	176,000	89,206	14,295	1,225,677	1,765,729
7697-37-2	Nitric acid	91	685,940	2,594,202	167,773	21,128,099	585,053	25,161,067
		90	756,949	3,113,497	152,174	31,912,657	383,313	36,318,590
		89	873,122	4,154,846	737,142	31,017,845	489,065	37,272,020
		88	1,143,693	7,182,275	1,448,540	25,485,680	1,330,695	36,590,883
139-13-9	Nitrilotriacetic acid	91	5	0	4,100	7,800	0	11,905
		90	25	1,000	7,700	0	0	8,725
		89	1,250	1,250	5,100	0	5,100	12,700
		88	1,000	1,500	5,100	0	5,100	12,700
99-59-2	5-Nitro-o-anisidine	91	5	10	0	0	0	15
		90	5	5	0	0	0	10
		89	250	250	0	0	0	500
98-95-3	Nitrobenzene	91	34,483	18,125	850	468,404	365	522,227
		90	51,251	15,009	1,419	608,000	755	676,434
		89	22,394	16,397	1,287	554,025	2,814	596,917
		88	22,614	17,759	5,907	819,024	2,875	868,179

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Methyl iodide	91	0	5	5
	90	0	228	228
	89	250	251	501
	88	0	250	250
Methyl isobutyl ketone	91	816,066	2,274,295	3,090,361
	90	1,258,294	4,548,341	5,806,635
	89	1,286,727	6,468,802	7,755,529
	88	1,509,030	10,323,972	11,833,002
Methyl isocyanate	91	0	15,067	15,067
	90	0	0	0
	89	0	23,000	23,000
	88	0	8,714	8,714
Methyl methacrylate	91	131,991	713,284	845,275
	90	166,245	1,139,639	1,305,884
	89	152,680	3,878,765	4,031,445
	88	191,071	3,099,097	3,290,168
Michler's ketone	91	3	0	3
	90	0	27,591	27,591
	89	0	26,703	26,703
	88	0	33,519	33,519
Molybdenum trioxide	91	80,682	670,693	751,375
	90	39,534	581,414	620,948
	89	22,024	885,998	908,022
	88	34,044	600,960	635,004
Naphthalene	91	63,546	1,883,797	1,947,343
	90	210,542	1,904,111	2,114,653
	89	964,706	1,644,330	2,609,036
	88	800,215	1,926,327	2,726,542
alpha-Naphthylamine	91	0	0	0
	90	0	534	534
	89	0	0	0
	88	0	0	0
Nickel	91	506,495	4,481,055	4,987,550
	90	114,444	8,083,538	8,197,982
	89	190,326	9,402,650	9,592,976
	88	252,272	9,954,420	10,206,692
Nitric acid	91	8,648,779	17,923,137	26,571,916
	90	13,105,320	21,120,370	34,225,690
	89	13,662,821	23,828,396	37,491,217
	88	22,890,969	26,354,766	49,245,735
Nitrilotriacetic acid	91	0	0	0
	90	3,300	0	3,300
	89	2,750	34,105	36,855
	88	264,609	191,003	455,612
5-Nitro-o-anisidine	91	255	250	505
	90	5	0	5
	89	250	0	250
Nitrobenzene	91	100	339,420	339,520
	90	1,372	108,352	109,724
	89	4,750	108,436	113,186
	88	5,671	1,371,395	1,377,066

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
55-63-0	Nitroglycerin	91	1,790	26,657	12,399	0	9,550	50,396
		90	1,053	29,550	11,580	0	17,150	59,333
		89	8,638	27,169	9,198	0	21,500	66,505
		88	2,280	50,103	2,746	0	11,640	66,769
88-75-5	2-Nitrophenol	91	0	2	40	0	0	42
		90	0	4	29	0	0	33
		89	4,186	219	6	0	0	4,411
		88	32,152	1,537	1	0	2	33,692
100-02-7	4-Nitrophenol	91	9,406	127	600	0	0	10,133
		90	7,570	83	31	1,200	0	8,884
		89	7,614	140	0	1,800	0	9,554
		88	7,642	213	0	6,300	7	14,162
79-46-9	2-Nitropropane	91	31,052	74,695	380	139,342	0	245,469
		90	62,836	21,422	1,100	87,000	0	172,358
		89	111,947	63,675	2,700	237,000	0	415,322
		88	208,303	181,082	4,300	257,000	0	650,685
156-10-5	p-Nitrosodiphenylamine	91	24	0	0	4,700	0	4,724
		90	24	0	0	0	0	24
		89	24	0	0	2,500	0	2,524
		88	15	0	0	2,000	0	2,015
121-69-7	N,N-Dimethylaniline	91	24,751	26,605	30,430	0	0	81,786
		90	17,802	33,500	16,030	0	0	67,332
		89	6,957	84,802	14,437	0	0	106,196
		88	18,448	80,457	19,967	0	250	119,122
62-75-9	N-Nitrosodimethylamine	89	0	0	0	0	0	0
		88	0	0	0	0	0	0
86-30-6	N-Nitrosodiphenylamine	91	0	0	0	0	0	0
		90	0	0	0	0	0	0
		89	0	0	9	40,000	9	40,018
		88	0	0	27	34,000	0	34,027
56-38-2	Parathion	91	267	280	255	0	255	1,057
		90	296	317	10	0	10	633
		89	1,006	589	250	0	250	2,095
		88	2,258	1,007	750	0	250	4,265
87-86-5	Pentachlorophenol	91	6,991	5,517	2,278	0	1,510	16,296
		90	15,507	7,699	2,577	0	1,941	27,724
		89	6,066	5,057	2,559	0	6,906	20,588
		88	8,133	5,896	2,465	20,000	3,717	40,211
79-21-0	Peracetic acid	91	1,110	3,982	10	5	3,220	8,327
		90	2,066	3,766	113	0	1,826	7,771
		89	1,013	8,471	40	0	0	9,524
		88	766	4,687	55	0	0	5,508
108-95-2	Phenol	91	2,498,507	3,832,788	163,915	3,192,210	324,921	10,012,341
		90	3,154,808	4,498,361	271,865	4,421,439	293,643	12,640,116
		89	3,402,750	5,662,497	267,134	4,282,511	372,156	13,987,048
		88	4,521,892	5,893,524	258,950	4,659,319	1,882,255	17,215,940
106-50-3	p-Phenylenediamine	91	1,054	2,497	0	0	2	3,553
		90	768	350	0	4,500	0	5,618
		89	3,808	275	0	3,100	0	7,183
		88	2,210	111,680	826	4,716	0	119,432

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Nitroglycerin	91	86	87,122	87,208
	90	84	32,936	33,020
	89	211	24,501	24,712
	88	53	3,583	3,636
2-Nitrophenol	91	140	11,662	11,802
	90	4,600	35,894	40,494
	89	14,638	24,819	39,457
	88	149,000	14,700	163,700
4-Nitrophenol	91	21,067	561,290	582,357
	90	400,774	62,617	463,391
	89	630,059	36	630,095
	88	560,428	70	560,498
2-Nitropropane	91	0	36,487	36,487
	90	0	6,100	6,100
	89	1,753	581	2,334
	88	3,000	13,695	16,695
p-Nitrosodiphenylamine	91	0	0	0
	90	0	1,300	1,300
	89	0	180	180
	88	0	180	180
N,N-Dimethylaniline	91	206,399	84,654	291,053
	90	198,535	108,870	307,405
	89	237,226	442,117	679,343
	88	287,483	466,169	753,652
N-Nitrosodimethylamine	89	0	0	0
	88	0	0	0
N-Nitrosodiphenylamine	91	0	470,000	470,000
	90	0	1,853,445	1,853,445
	89	0	520,190	520,190
	88	0	300	300
Parathion	91	0	3,173	3,173
	90	0	26,566	26,566
	89	0	4,450	4,450
	88	0	5,280	5,280
Pentachlorophenol	91	834	252,812	253,646
	90	4,349	75,159	79,508
	89	8,013	87,417	95,430
	88	4,728	545,673	550,401
Peracetic acid	91	1,672	0	1,672
	90	2,000	1,821	3,821
	89	0	0	0
	88	0	0	0
Phenol	91	5,401,118	3,303,259	8,704,377
	90	5,061,347	6,295,548	11,356,895
	89	5,237,067	4,355,642	9,592,709
	88	6,041,090	6,308,966	12,350,056
p-Phenylenediamine	91	3,239	14,200	17,439
	90	23,509	41,586	65,095
	89	1,178	40,550	41,728
	88	6,277	117,923	124,200

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
90-43-7	2-Phenylphenol	91	8,403	1,054	224	0	5	9,686
		90	8,925	985	135	10	530	10,585
		89	7,225	827	134	0	500	8,686
		88	9,010	1,620	480	0	0	11,110
75-44-5	Phosgene	91	2,279	2,109	5	5	0	4,398
		90	2,423	2,431	15	10	20	4,899
		89	4,728	3,535	250	250	0	8,763
		88	3,839	17,764	500	250	0	22,353
7664-38-2	Phosphoric acid	91	314,776	1,002,123	114,363,613	26,545	47,311,554	163,018,611
		90	424,210	1,214,201	74,718,305	1,500,399	61,083,525	138,940,640
		89	584,331	1,362,194	26,961,424	93,016	49,799,924	78,800,889
		88	728,787	1,235,191	122,650,664	54,961	52,611,111	177,280,714
7723-14-0	Phosphorus (yellow or white)	91	19,662	3,847	2,273	0	339,229	365,011
		90	19,423	4,913	2,345	0	2,196,153	2,222,834
		89	10,435	5,489	3,033	0	3,291,402	3,310,359
		88	7,594	11,559	11,322	0	3,893,674	3,924,149
85-44-9	Phthalic anhydride	91	112,154	519,670	13,164	0	944	645,932
		90	147,799	541,789	374	0	9,605	699,567
		89	117,544	532,607	2,120	0	3,080	655,351
		88	126,406	422,573	1,040	0	1,015	551,034
88-89-1	Picric acid	91	2	1	2	1,634,494	19	1,634,518
		90	1	1	2	1,249,930	2	1,249,936
		89	251	1	250	1,265,460	250	1,266,212
		88	251	1	251	1,362,180	250	1,362,933
1336-36-3	Polychlorinated biphenyls (PCBs)	91	0	0	0	0	10	10
		90	5	0	0	0	71,366	71,371
		89	0	0	264	0	998	1,262
		88	0	0	10	0	752	762
1120-71-4	Propane sultone	88	0	0	0	0	0	0
123-38-6	Propionaldehyde	91	598,008	790,001	63	66,741	0	1,454,813
		90	340,631	648,355	491	34,394	0	1,023,871
		89	342,352	750,117	411	4,518	0	1,097,398
		88	399,253	868,586	1,156	930	0	1,269,925
114-26-1	Propoxur	91	10	5	0	0	0	15
		90	260	10	5	0	0	275
		89	250	254	0	0	0	504
		88	250	0	0	0	0	250
115-07-1	Propylene	91	13,422,010	9,418,860	4,685	0	114,000	22,959,555
		90	13,514,810	10,088,533	867	0	296	23,604,506
		89	15,123,782	11,539,074	953	0	250	26,664,059
		88	17,656,964	11,455,525	10,003	0	0	29,122,492
75-55-8	Propyleneimine	91	50	350	0	0	0	400
		90	293	318	0	0	0	611
		89	287	253	0	0	0	540
		88	250	250	0	0	0	500
75-56-9	Propylene oxide	91	450,934	615,690	10,181	20,710	2,450	1,099,965
		90	494,937	910,286	70,780	120,005	3,893	1,599,901
		89	413,155	1,674,804	83,091	270,000	4,727	2,445,777
		88	539,841	2,733,342	112,503	1,113,780	11,630	4,511,096
110-86-1	Pyridine	91	58,405	51,587	4,930	370,750	13	485,685
		90	66,527	56,163	7,336	514,955	25	645,006
		89	75,476	67,527	2,365	660,281	251	805,900
		88	142,281	72,918	2,158	491,775	1,125	710,257

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
2-Phenylphenol	91	4,858	515	5,373
	90	5,447	1,000	6,447
	89	6,416	1,250	7,666
	88	6,400	250	6,650
Phosgene	91	0	2,430	2,430
	90	0	1,713	1,713
	89	0	1,236	1,236
	88	0	1,520	1,520
Phosphoric acid	91	5,498,173	4,529,607	10,027,780
	90	6,450,006	5,096,637	11,546,643
	89	11,511,560	8,109,947	19,621,507
	88	14,040,990	8,499,932	22,540,922
Phosphorus (yellow or white)	91	266	4,158	4,424
	90	1,302	14,529	15,831
	89	4,495	85,591	90,086
	88	646	210,033	210,679
Phthalic anhydride	91	3,281	715,854	719,135
	90	42,719	2,311,303	2,354,022
	89	243,292	3,547,530	3,790,822
	88	53,441	5,981,309	6,034,750
Picric acid	91	0	12,465	12,465
	90	1	1,044	1,045
	89	0	25	25
	88	0	14,000	14,000
Polychlorinated biphenyls (PCBs)	91	0	2,432,777	2,432,777
	90	0	2,605,734	2,605,734
	89	1	4,414,102	4,414,103
	88	250	5,824,807	5,825,057
Propane sultone	88	0	0	0
Propionaldehyde	91	12,922	5,225	18,147
	90	69	1,457	1,526
	89	26,553	0	26,553
	88	761	1,600	2,361
Propoxur	91	255	460	715
	90	260	796	1,056
	89	753	2,267	3,020
	88	0	250	250
Propylene	91	5	730,212	730,217
	90	1,340	4,907,543	4,908,883
	89	6,103	683,410	689,513
	88	500	1,524,389	1,524,889
Propyleneimine	91	0	0	0
	90	250	0	250
	89	250	0	250
	88	250	0	250
Propylene oxide	91	49,854	47,279	97,133
	90	251,413	12,256	263,669
	89	309,915	9,714	319,629
	88	386,355	17,752	404,107
Pyridine	91	264,235	207,325	471,560
	90	264,948	175,479	440,427
	89	354,602	259,117	613,719
	88	275,083	97,428	372,511

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
91-22-5	Quinoline	91	20,133	24,958	2,660	23,000	286	71,037
		90	20,513	7,177	17	0	198	27,905
		89	27,365	36,859	5	0	3,093	67,322
		88	31,633	17,717	502	0	896	50,748
106-51-4	Quinone	91	2,205	1,807	0	5	0	4,017
		90	711	891	5	0	0	1,607
		89	860	900	12	0	0	1,772
		88	4,600	6,700	140	0	0	11,440
82-68-8	Quintozene	91	20	286	0	0	0	306
		90	260	21	0	0	0	281
		89	1,250	790	0	0	250	2,290
		88	750	314	0	0	0	1,064
81-07-2	Saccharin (manufacturing)	91	63	251	0	0	0	314
		90	68	258	0	0	0	326
		89	315	760	0	0	0	1,075
		88	250	500	0	0	0	750
94-59-7	Safrole	90	5	0	0	0	0	5
		89	0	0	0	0	0	0
		88	250	250	0	0	0	500
7782-49-2	Selenium	91	525	511	188	0	260	1,484
		90	1,260	799	452	0	171,283	173,794
		89	2,508	11,442	750	0	236,714	251,414
		88	2,251	14,031	1,168	0	127,508	144,958
7440-22-4	Silver	91	5,555	7,849	119	28	250	13,801
		90	4,662	7,514	297	5	3,725	16,203
		89	7,624	7,660	1,419	71	10,200	26,974
		88	11,482	36,519	1,654	0	39,510	89,165
100-42-5	Styrene	91	10,161,049	18,315,297	25,609	22,080	389,929	28,913,964
		90	12,774,403	18,305,231	37,376	29,040	161,048	31,307,098
		89	15,971,500	18,798,591	51,082	0	184,716	35,005,889
		88	12,411,252	20,211,285	59,069	165	242,941	32,924,712
96-09-3	Styrene oxide	91	1,628	47	0	0	0	1,675
		90	1,535	888	0	0	0	2,423
		89	511	1,514	0	0	0	2,025
		88	511	1,803	0	0	0	2,314
7664-93-9	Sulfuric acid	91	1,577,640	20,099,089	37,243,237	94,720,218	7,678,646	161,318,830
		90	1,615,390	22,523,306	25,804,925	112,116,427	2,213,250	164,273,298
		89	2,388,897	23,176,433	19,763,132	149,583,139	6,997,898	201,909,499
		88	2,260,222	15,535,829	36,534,517	138,707,333	4,930,211	197,968,112
79-34-5	1,1,2,2-Tetra- -chloroethane	91	40,927	23,324	2,102	0	0	66,353
		90	38,513	6,283	3,529	80	495	48,900
		89	26,259	9,352	5,429	283	18	41,341
		88	25,904	17,961	814	0	29	44,708
127-18-4	Tetrachloroethylene	91	6,482,575	10,204,876	7,448	14,000	23,302	16,732,201
		90	9,074,857	13,321,145	21,510	11,012	1,255	22,429,779
		89	11,966,038	15,512,638	53,940	50,005	10,791	27,593,412
		88	16,125,229	19,668,296	33,314	72,250	82,144	35,981,233
961-11-5	Tetrachlorvinphos	91	1	129	2	0	0	132
		90	500	254	0	0	0	754
		89	250	250	0	0	0	500
		88	250	1	0	0	0	251

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Quinoline	91	255	7,950	8,205
	90	4,893	16,533	21,426
	89	6,575	22,336	28,911
	88	6,406	11,187	17,593
Quinone	91	0	0	0
	90	0	0	0
	89	250	120	370
	88	250	280	530
Quintozene	91	11	62,950	62,961
	90	10	1,087	1,097
	89	250	1,883	2,133
	88	250	12,625	12,875
Saccharin (manufacturing)	91	260	1,750	2,010
	90	681	4,043	4,724
	89	500	4,340	4,840
	88	7,900	750	8,650
Safrole	90	12	0	12
	89	13	0	13
	88	250	0	250
Selenium	91	265	6,372	6,637
	90	520	23,146	23,666
	89	762	13,990	14,752
	88	1,250	6,262	7,512
Silver	91	259,353	125,446	384,799
	90	3,077	3,890	6,967
	89	4,243	53,573	57,816
	88	3,624	27,138	30,762
Styrene	91	243,118	4,864,767	5,107,885
	90	254,836	10,382,640	10,637,476
	89	415,027	7,554,518	7,969,545
	88	471,273	9,278,019	9,749,292
Styrene oxide	91	0	0	0
	90	0	0	0
	89	250	0	250
	88	250	750	1,000
Sulfuric acid	91	34,175,276	76,263,792	110,439,068
	90	29,443,189	73,465,888	102,909,077
	89	43,403,895	78,358,651	121,762,546
	88	55,970,375	108,840,212	164,810,587
1,1,2,2-Tetra- -chloroethane	91	2,005	214,436	216,441
	90	124	150,527	150,651
	89	663	201,051	201,714
	88	400	203,732	204,132
Tetrachloroethylene	91	234,637	3,830,559	4,065,196
	90	450,787	4,433,734	4,884,521
	89	467,081	4,279,472	4,746,553
	88	586,288	5,511,471	6,097,759
Tetrachlorvinphos	91	9	33,269	33,278
	90	28	98,128	98,156
	89	0	13,189	13,189
	88	2	49,480	49,482

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
7440-28-0	Thallium	91	1	29	1	0	0	31
		90	250	500	5	0	0	755
		89	500	500	0	0	500	1,500
62-55-5	Thioacetamide	91	0	0	0	0	0	0
		90	0	0	0	0	0	0
		88	250	250	0	0	0	500
62-56-6	Thiourea	91	873	555	717	5,400	505	8,050
		90	2,300	565	572	4,800	265	8,502
		89	2,253	1,500	971	5,900	752	11,376
		88	1,504	500	16,951	5,940	750	25,645
1314-20-1	Thorium dioxide	91	0	250	0	0	0	250
		90	250	610	0	0	0	860
		89	250	610	0	0	0	860
		88	230	1,350	0	0	0	1,580
7550-45-0	Titanium tetrachloride	91	27,370	6,236	0	0	0	33,606
		90	42,397	11,963	0	0	0	54,360
		89	44,785	12,502	0	0	0	57,287
		88	38,614	40,054	0	0	1,400	80,068
108-88-3	Toluene	91	73,620,294	124,944,414	104,645	1,373,207	185,012	200,227,572
		90	84,413,528	157,264,379	198,500	1,432,918	383,904	243,693,229
		89	93,193,936	176,358,467	182,297	620,403	427,055	270,782,158
		88	102,808,393	189,388,805	197,820	1,473,666	741,301	294,609,985
584-84-9	Toluene-2,4-diiso- -cyanate	91	12,148	1,311,804	0	0	250	1,324,202
		90	18,862	38,529	0	0	5	57,396
		89	45,110	48,710	0	0	3,570	97,390
		88	47,184	118,928	0	0	1,040	167,152
91-08-7	Toluene-2,6-diiso- -cyanate	91	303,581	28,507	0	0	250	332,338
		90	6,023	19,438	5	0	5	25,471
		89	24,664	26,693	0	0	12,180	63,537
		88	153,253	338,939	0	0	510	492,702
95-53-4	o-Toluidine	91	8,904	1,925	260	21,100	8,111	40,300
		90	5,367	2,075	252	250	8,486	16,430
		89	22,222	3,627	1,252	250	3,563	30,914
		88	19,196	27,726	1,902	250	5,024	54,098
8001-35-2	Toxaphene	90	0	0	0	0	0	0
52-68-6	Trichlorfon	91	5	254	9	0	0	268
		90	250	254	6	0	0	510
		89	500	347	1	0	0	848
		88	250	3	0	0	0	253
120-82-1	1,2,4-Trichlorobenzene	91	127,598	282,051	1,669	3,134	4,573	419,025
		90	106,656	270,210	7,417	3,479	725	388,487
		89	239,949	905,984	4,729	12,223	259	1,163,144
		88	438,009	1,094,904	31,628	7,408	3,073	1,575,022
71-55-6	1,1,1-Trichloroethane	91	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
		90	83,389,447	81,112,035	16,722	1,581	62,176	164,581,961
		89	91,649,649	84,215,221	27,309	2,318	70,630	175,965,127
		88	90,767,027	86,001,968	95,934	1,000	187,786	177,053,715
79-00-5	1,1,2-Trichloroethane	91	94,329	433,437	1,382	2	256	529,406
		90	107,637	497,437	1,351	1,091	265	607,781
		89	144,746	642,442	8,095	2,090	130	797,503
		88	618,608	1,122,734	5,303	0	89	1,746,734

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Thallium	91	0	954	954
	90	0	916	916
	89	250	250	500
Thioacetamide	91	0	0	0
	90	0	0	0
	88	0	250	250
Thiourea	91	15,906	5,768	21,674
	90	11,045	3,955	15,000
	89	9,263	7,586	16,849
	88	26,634	4,814	31,448
Thorium dioxide	91	250	102,249	102,499
	90	660	533,147	533,807
	89	1,277	447,030	448,307
	88	250	677,549	677,799
Titanium tetrachloride	91	5	2,368,098	2,368,103
	90	5	1,975,893	1,975,898
	89	0	2,354,006	2,354,006
	88	0	1,667,045	1,667,045
Toluene	91	1,266,355	22,006,245	23,272,600
	90	1,724,465	39,898,984	41,623,449
	89	3,001,993	63,484,088	66,486,081
	88	3,549,792	61,614,018	65,163,810
Toluene-2,4-diiso- -cyanate	91	0	49,809	49,809
	90	0	90,950	90,950
	89	501	270,921	271,422
	88	500	229,620	230,120
Toluene-2,6-diiso- -cyanate	91	0	14,423	14,423
	90	2,005	18,505	20,510
	89	250	105,440	105,690
	88	250	54,731	54,981
o-Toluidine	91	8,250	103,316	111,566
	90	28,312	12,391	40,703
	89	24,900	20,016	44,916
	88	15,172	32,170	47,342
Toxaphene	90	0	2,200	2,200
Trichlorfon	91	0	1,192	1,192
	90	125	1,007	1,132
	89	86	1,713	1,799
	88	215	1,566	1,781
1,2,4-Trichlorobenzene	91	136,769	374,812	511,581
	90	229,363	683,172	912,535
	89	248,011	1,121,514	1,369,525
	88	262,676	898,387	1,161,063
1,1,1-Trichloroethane	91	293,508	8,000,615	8,294,123
	90	169,540	12,472,740	12,642,280
	89	312,010	16,662,054	16,974,064
	88	304,103	19,513,105	19,817,208
1,1,2-Trichloroethane	91	819	5,004,017	5,004,836
	90	855	2,019,792	2,020,647
	89	780	494,719	495,499
	88	750	259,842	260,592

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
79-01-6	Trichloroethylene	91	16,642,065	18,416,403	12,750	800	62,991	35,135,009
		90	18,565,243	20,358,601	14,210	805	12,554	38,951,413
		89	22,579,951	26,769,836	15,849	390	8,686	49,374,712
		88	25,879,146	27,900,517	13,802	390	21,186	53,815,041
95-95-4	2,4,5-Trichlorophenol	91	0	0	0	28,000	0	28,000
		89	250	0	0	0	0	250
		88	1	90	0	0	0	91
88-06-2	2,4,6-Trichlorophenol	91	1	79	1	0	1	82
		90	0	78	79	0	0	157
		89	2	114	3,515	0	250	3,881
		88	0	250	50	12,000	0	12,300
1582-09-8	Trifluralin	91	8,449	2,711	80	0	31,835	43,075
		90	12,992	2,616	12	0	5	15,625
		89	2,079	1,853	322	0	970	5,224
		88	2,020	1,257	601	0	0	3,878
95-63-6	1,2,4-Trimethylbenzene	91	2,723,947	2,618,627	15,756	16,898	17,732	5,392,960
		90	3,217,095	2,319,873	5,905	28,574	12,862	5,584,309
		89	2,274,143	2,641,573	10,608	7,651	38,136	4,972,111
		88	1,960,642	2,293,501	10,353	7,964	62,083	4,334,543
51-79-6	Urethane	91	0	2,050	0	0	0	2,050
		90	760	3,310	0	5	270	4,345
		89	250	3,700	0	0	0	3,950
		88	140,500	4,873	0	0	0	145,373
7440-62-2	Vanadium (fume or dust)	91	1,739	14,664	685	0	74,730	91,818
		90	2,623	12,683	670	0	63,952	79,928
		89	3,377	5,970	1,004	0	10,702	21,053
		88	3,135	14,029	4,704	0	87,296	109,164
108-05-4	Vinyl acetate	91	1,102,871	4,383,624	9,900	3,088,362	7,237	8,591,994
		90	1,204,869	4,352,276	5,558	1,360,901	14,151	6,937,755
		89	1,438,370	4,066,033	5,339	1,296,265	22,599	6,828,606
		88	1,470,177	4,450,214	10,021	2,109,859	18,889	8,059,160
593-60-2	Vinyl bromide	91	260	3,300	0	0	0	3,560
		90	9,190	915	270	0	0	10,375
		89	150	620	270	0	0	1,040
		88	4,000	950	400	0	0	5,350
75-01-4	Vinyl chloride	91	390,119	657,366	4,625	4	251	1,052,365
		90	313,596	821,994	7,291	593	2,535	1,146,009
		89	399,883	869,149	2,969	391	3,899	1,276,291
		88	421,880	1,016,047	2,051	53	4,409	1,444,440
75-35-4	Vinylidene chloride	91	71,772	213,418	832	0	15	286,037
		90	69,583	234,130	251	155	483	304,602
		89	81,686	138,946	2,691	720	540	224,583
		88	104,552	191,801	3,462	170	429	300,414
1330-20-7	Xylene (mixed isomers)	91	27,683,616	87,869,367	50,801	139,948	335,613	116,079,345
		90	31,720,382	104,476,607	42,617	105,394	429,763	136,774,763
		89	36,211,016	119,500,710	185,702	70,161	474,831	156,442,420
		88	33,675,278	120,715,961	203,346	144,728	561,857	155,301,170
108-38-3	m-Xylene	91	926,807	509,426	2,260	5	3,186	1,441,684
		90	883,439	679,158	1,086	0	1,130	1,564,813
		89	912,956	565,350	2,643	0	5,730	1,486,679
		88	1,406,104	1,010,939	2,566	0	18,045	2,437,654

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Trichloroethylene	91	72,845	2,793,368	2,866,213
	90	11,353	3,690,232	3,701,585
	89	31,269	4,966,856	4,998,125
	88	79,252	6,401,817	6,481,069
2,4,5-Trichlorophenol	91	0	0	0
	89	0	250	250
	88	0	20	20
2,4,6-Trichlorophenol	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	10	10
Trifluralin	91	141	76,617	76,758
	90	93	82,201	82,294
	89	79	71,092	71,171
	88	371	190,546	190,917
1,2,4-Trimethylbenzene	91	238,993	368,967	607,960
	90	140,928	575,978	716,906
	89	701,180	607,889	1,309,069
	88	501,717	569,529	1,071,246
Urethane	91	0	19,800	19,800
	90	750	3,028	3,778
	89	758	12,128	12,886
	88	1,010	4,908	5,918
Vanadium (fume or dust)	91	270	428,217	428,487
	90	260	41,132	41,392
	89	751	38,924	39,675
	88	0	93,417	93,417
Vinyl acetate	91	153,451	174,747	328,198
	90	221,756	2,087,819	2,309,575
	89	178,538	244,501	423,039
	88	2,319,733	396,204	2,715,937
Vinyl bromide	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Vinyl chloride	91	252	76,089	76,341
	90	1,897	130,859	132,756
	89	7,925	105,396	113,321
	88	17,104	675,787	692,891
Vinylidene chloride	91	94	74,527	74,621
	90	1,000	134,773	135,773
	89	1,172	169,048	170,220
	88	3,303	405,239	408,542
Xylene (mixed isomers)	91	1,437,628	20,142,051	21,579,679
	90	1,892,057	23,744,311	25,636,368
	89	3,835,043	33,149,576	36,984,619
	88	4,159,721	37,416,803	41,576,524
m-Xylene	91	19,178	151,337	170,515
	90	1,013	174,020	175,033
	89	2,051	288,112	290,163
	88	19,708	221,172	240,880

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
95-47-6	o-Xylene	91	1,153,483	576,448	6,507	5	1,618	1,738,061
		90	1,551,323	584,787	2,541	0	1,842	2,140,493
		89	1,357,510	633,011	3,135	0	3,480	1,997,136
		88	1,548,792	641,522	2,786	250	22,461	2,215,811
106-42-3	p-Xylene	91	1,343,694	3,934,677	1,076	5	3,635	5,283,087
		90	1,333,708	3,517,838	676	0	1,510	4,853,732
		89	1,224,377	3,878,564	2,017	0	2,285	5,107,243
		88	1,672,827	4,352,922	3,200	0	49,226	6,078,175
87-62-7	2,6-Xylidine	91	5	16	0	0	0	21
		90	0	17	1,906	0	0	1,923
		89	0	44	1,906	0	0	1,950
		88	0	337	1,537	0	0	1,874
7440-66-6	Zinc (fume or dust)	91	765,614	1,168,410	28,080	115	9,216,574	11,178,793
		90	845,335	1,323,621	40,885	280	11,332,911	13,543,032
		89	1,942,398	1,458,370	134,950	2,720	20,523,162	24,061,600
		88	1,934,992	1,483,841	849,544	140,010	25,617,115	30,025,502
12122-67-7	Zineb	91	5	0	0	0	0	5
		90	10	250	0	0	0	260
		89	250	250	0	0	0	500
		88	250	1,000	0	0	0	1,250
	Antimony compounds	91	30,395	55,746	45,593	6,509	1,522,871	1,661,114
		90	42,567	105,850	32,488	6,868	1,818,526	2,006,299
		89	74,035	94,909	45,624	3,900	1,011,439	1,229,907
		88	58,941	106,587	31,178	9,200	1,935,018	2,140,924
	Arsenic compounds	91	25,007	165,308	4,496	23,000	2,738,853	2,956,664
		90	51,004	114,826	4,103	23,276	2,640,888	2,834,097
		89	34,286	141,572	14,237	33,865	4,005,229	4,229,189
		88	43,461	223,791	6,243	27,400	4,946,434	5,247,329
	Barium compounds	91	248,569	614,578	100,702	408	4,005,169	4,969,426
		90	290,134	916,865	70,929	298	8,151,047	9,429,273
		89	230,300	513,338	83,568	850	5,278,783	6,106,839
		88	152,646	848,120	99,428	2,773	5,651,655	6,754,622
	Beryllium compounds	91	1	241	9	0	30,000	30,251
		90	1	211	88	0	40,000	40,300
		89	501	461	25	0	36,000	36,987
		88	1	861	17	0	12,000	12,879
	Cadmium compounds	91	17,066	52,427	3,580	1,540	248,374	322,987
		90	25,878	66,386	1,959	1,565	312,631	408,419
		89	29,235	55,900	1,985	1,772	247,340	336,232
		88	23,349	77,163	1,799	2,409	295,127	399,847
	Chlorophenols	91	3,368	968	782	229,798	56	234,972
		90	3,909	1,022	551	174,100	2	179,584
		89	3,655	909	294	137,624	0	142,482
		88	2,154	419	272	71,554	0	74,399
	Chromium compounds	91	134,838	427,257	335,233	34,619	24,761,345	25,693,292
		90	327,000	430,382	407,827	83,137	25,531,086	26,779,432
		89	845,596	573,710	477,774	59,110	31,110,567	33,066,757
		88	258,132	511,508	326,027	52,653	30,933,660	32,081,980
	Cobalt compounds	91	7,857	25,946	78,593	19,949	142,152	274,497
		90	10,148	42,657	90,869	19,308	195,173	358,155
		89	14,334	65,103	70,468	15,562	92,902	258,369
		88	11,330	45,329	63,662	18,500	37,794	176,615

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
o-Xylene	91	117,628	186,490	304,118
	90	55,154	453,667	508,821
	89	132,761	304,269	437,030
	88	44,023	161,509	205,532
p-Xylene	91	18,748	62,543	81,291
	90	256	55,446	55,702
	89	500	86,462	86,962
	88	752	79,428	80,180
2,6-Xylidine	91	0	0	0
	90	0	0	0
	89	0	0	0
	88	0	0	0
Zinc (fume or dust)	91	40,658	5,353,413	5,394,071
	90	45,611	13,316,592	13,362,203
	89	131,830	37,486,804	37,618,634
	88	836,930	38,748,702	39,585,632
Zineb	91	0	5	5
	90	0	750	750
	89	0	500	500
	88	0	2,850	2,850
Antimony compounds	91	88,027	1,946,490	2,034,517
	90	37,606	2,708,419	2,746,025
	89	58,126	2,139,585	2,197,711
	88	66,858	2,304,110	2,370,968
Arsenic compounds	91	1,384	1,565,230	1,566,614
	90	1,961	16,751,074	16,753,035
	89	1,200	2,808,664	2,809,864
	88	3,126	1,424,000	1,427,126
Barium compounds	91	2,045,102	19,128,019	21,173,121
	90	3,009,291	20,084,029	23,093,320
	89	1,202,037	15,470,392	16,672,429
	88	823,073	17,141,635	17,964,708
Beryllium compounds	91	0	2,881	2,881
	90	1	1,121	1,122
	89	1	5,254	5,255
	88	3	8,541	8,544
Cadmium compounds	91	5,462	711,377	716,839
	90	9,463	1,090,524	1,099,987
	89	11,075	469,684	480,759
	88	13,719	1,069,452	1,083,171
Chlorophenols	91	1,330	104,388	105,718
	90	1,128	806,406	807,534
	89	2,350	1,610,640	1,612,990
	88	2,650	1,970,912	1,973,562
Chromium compounds	91	791,952	13,677,921	14,469,873
	90	949,648	15,887,785	16,837,433
	89	1,009,686	18,560,750	19,570,436
	88	1,707,344	14,414,623	16,121,967
Cobalt compounds	91	15,242	332,123	347,365
	90	16,748	427,846	444,594
	89	24,570	447,814	472,384
	88	28,364	331,546	359,910

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Copper compounds	91	2,378,725	1,870,707	158,621	225,310	42,424,235	47,057,598
	90	2,074,560	1,838,608	72,224	192,434	55,751,749	59,929,575
	89	2,179,085	1,637,721	141,114	167,982	40,749,934	44,875,836
	88	3,066,746	1,301,171	185,613	165,957	42,531,528	47,251,015
Cyanide compounds	91	61,839	708,282	111,021	3,781,837	26,768	4,689,747
	90	183,863	957,080	125,265	3,383,660	24,272	4,674,140
	89	220,927	806,968	154,576	4,491,053	29,171	5,702,695
	88	525,618	625,725	194,901	3,707,326	107,208	5,160,778
Glycol ethers	91	10,235,089	33,678,910	507,487	176,033	711,313	45,308,832
	90	10,010,915	38,847,154	433,969	207,037	273,732	49,772,807
	89	10,692,285	37,785,105	177,101	364,850	142,233	49,161,574
	88	10,330,586	38,081,876	292,686	362,198	105,185	49,172,531
Lead compounds	91	348,258	1,059,351	117,976	928	13,699,094	15,225,607
	90	414,831	1,208,632	107,242	1,608	14,246,771	15,979,084
	89	451,239	1,110,843	115,906	1,559	14,229,166	15,908,713
	88	357,677	1,176,104	180,113	2,755	20,329,467	22,046,116
Manganese compounds	91	490,885	755,529	698,968	15,327	68,528,067	70,488,776
	90	1,349,772	916,722	722,041	2,842	83,550,389	86,541,766
	89	905,441	938,440	908,046	1,006,301	85,186,132	88,944,360
	88	575,222	1,241,182	681,463	6,816,070	84,222,474	93,536,411
Mercury compounds	91	1,355	1,475	47	9	28	2,914
	90	783	375	58	21	15	1,252
	89	2,049	1,960	13	36	260	4,318
	88	1,001	1,365	259	27	500	3,152
Nickel compounds	91	60,804	182,380	73,071	366,530	1,278,693	1,961,478
	90	151,019	104,304	89,134	259,822	3,053,612	3,657,891
	89	151,087	129,084	119,061	269,266	3,119,841	3,788,339
	88	154,362	109,076	130,574	224,968	2,404,132	3,023,112
Polybrominated biphenyls	88	250	0	0	0	0	250
Selenium compounds	91	2,381	34,679	722	4,100	80,295	122,177
	90	5,287	28,925	1,145	5,000	148,861	189,218
	89	5,756	14,966	1,511	4,500	1,560	28,293
	88	2,251	12,255	250	3,400	46,000	64,156
Silver compounds	91	6,590	18,238	8,309	25	16,993	50,155
	90	7,584	13,537	1,635	265	21,406	44,427
	89	6,826	14,403	12,096	250	19,990	53,565
	88	5,991	9,415	8,934	250	11,550	36,140
Thallium compounds	91	5	250	0	0	255	510
	90	5	250	0	0	255	510
	89	2	254	0	0	250	506
	88	1	252	750	0	250	1,253
Zinc compounds	91	1,517,384	2,710,343	1,325,812	228,007	114,062,672	119,844,218
	90	1,908,640	2,856,360	1,139,374	312,151	110,520,809	116,737,334
	89	1,910,215	2,903,813	886,632	162,221	100,301,281	106,164,162
	88	3,253,805	3,995,798	1,196,059	110,555	114,065,328	122,621,545
Mixtures and other trade name products	91	189,755	680,261	6,063	1,540	50,384	928,003
	90	199,240	953,377	61,849	1,350,015	22,285	2,586,766
	89	800,542	5,141,289	2,001	750	178,230	6,122,812
	88	735,457	2,742,785	58,960	0	26,958	3,564,160

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Copper compounds	91	197,460	8,775,057	8,972,517
	90	204,072	45,183,143	45,387,215
	89	375,564	9,602,037	9,977,601
	88	431,978	14,478,353	14,910,331
Cyanide compounds	91	121,457	824,559	946,016
	90	119,001	1,585,823	1,704,824
	89	149,168	2,412,619	2,561,787
	88	1,152,244	2,696,674	3,848,918
Glycol ethers	91	9,286,863	4,165,811	13,452,674
	90	10,266,603	7,600,432	17,867,035
	89	9,417,876	8,967,219	18,385,095
	88	8,988,363	7,819,411	16,807,774
Lead compounds	91	286,082	12,901,597	13,187,679
	90	158,017	43,742,871	43,900,888
	89	102,264	16,384,625	16,486,889
	88	89,731	17,023,928	17,113,659
Manganese compounds	91	3,341,541	25,771,961	29,113,502
	90	6,550,187	30,724,316	37,274,503
	89	6,568,596	27,961,977	34,530,573
	88	1,842,909	21,326,757	23,169,666
Mercury compounds	91	22	36,022	36,044
	90	274	36,026	36,300
	89	1,034	62,581	63,615
	88	528	17,639	18,167
Nickel compounds	91	132,553	4,858,598	4,991,151
	90	200,277	6,437,522	6,637,799
	89	259,114	9,191,207	9,450,321
	88	650,232	5,881,547	6,531,779
Polybrominated biphenyls	88	0	0	0
Selenium compounds	91	160	53,286	53,446
	90	478	59,210	59,688
	89	1,618	40,637	42,255
	88	1,860	62,997	64,857
Silver compounds	91	3,308	4,729	8,037
	90	4,317	79,659	83,976
	89	6,009	7,367	13,376
	88	8,078	14,955	23,033
Thallium compounds	91	5	0	5
	90	5	0	5
	89	4	500	504
	88	6	1,250	1,256
Zinc compounds	91	623,374	51,839,649	52,463,023
	90	1,166,425	79,350,809	80,517,234
	89	2,049,705	59,864,014	61,913,719
	88	1,524,278	82,794,896	84,319,174
Mixtures and other trade name products	91	19,463	501,126	520,589
	90	196,253	1,543,545	1,739,798
	89	130,218	4,165,623	4,295,841
	88	186,938	11,611,254	11,798,192

Table 3-8. Releases and Transfers of All TRI Chemicals, 1988-1991 (Alphabetically Ordered), Continued.

Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
Trade Secrets	91	56	893	1,400	0	0	2,349
	90	0	0	530	0	0	530
	89	0	0	3,600	0	0	3,600
	88	0	0	19,700	0	0	19,700
Total	91	609,765,664	1,369,580,314	243,497,317	710,248,004	421,160,113	3,354,251,412
	90	706,748,307	1,575,954,848	196,832,760	745,413,562	462,679,392	3,687,628,869
	89	793,597,781	1,768,596,839	188,025,233	1,175,583,836	455,029,001	4,380,832,690
	88	823,738,542	1,842,370,656	311,070,591	1,343,633,468	527,546,722	4,848,359,979

Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment/ Disposal/Other Pounds	Total Transfers Pounds
Trade Secrets	91	0	33,553	33,553
	90	0	9,500	9,500
	89	0	30,500	30,500
	88	0	20,650	20,650
Total	91	410,596,887	654,313,983	1,064,910,870
	90	466,123,084	842,451,834	1,308,574,918
	89	558,575,158	890,356,058	1,448,931,216
	88	574,045,380	1,028,111,605	1,602,156,985

THE 1991 TOXICS RELEASE INVENTORY
PUBLIC DATA RELEASE

1988 - 1991
Releases and Transfers
by Industry

Table 3-9. TRI Releases and Transfers by Industry, 1988-1991.

SIC Code	Industry	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
20	Food	91	13,214,383	14,498,210	2,402,141	210,595	8,929,551	39,254,880
		90	15,095,422	11,131,425	3,835,523	35,258	8,488,084	38,585,712
		89	16,995,917	7,647,861	3,018,499	1,105,786	7,999,684	36,767,747
		88	13,522,683	4,387,037	3,649,698	1,026,719	5,507,009	28,093,146
21	Tobacco	91	73,809	2,200,965	14,583	0	0	2,289,357
		90	174,881	2,283,058	22,892	0	1,500	2,482,331
		89	49,752	1,656,796	45,092	0	1,511	1,753,151
		88	101,907	1,715,447	13,050	0	750	1,831,154
22	Textiles	91	6,074,982	18,344,996	261,118	0	67,407	24,748,503
		90	7,330,722	19,002,932	479,227	25	35,817	26,848,723
		89	10,024,229	20,832,884	997,389	0	46,754	31,901,256
		88	10,803,918	26,130,334	1,004,717	0	150,350	38,089,319
23	Apparel	91	420,788	953,006	182	0	14,710	1,388,686
		90	335,035	942,705	47,992	0	770	1,326,502
		89	521,777	833,584	250	0	500	1,356,111
		88	281,846	742,152	250	0	40,849	1,065,097
24	Lumber	91	6,213,015	24,074,845	111,379	0	81,458	30,480,697
		90	6,037,576	27,418,114	90,715	90	110,044	33,656,539
		89	5,594,397	29,169,660	188,331	20	111,695	35,064,103
		88	6,606,486	25,630,153	230,979	0	55,230	32,522,848
25	Furniture	91	7,861,528	46,930,697	625	0	261,748	55,054,598
		90	8,672,664	52,458,381	5,490	40	76,226	61,212,801
		89	10,653,478	54,039,309	2,780	0	19,621	64,715,188
		88	9,146,875	56,962,643	3,051	0	74,936	66,187,505
26	Paper	91	28,926,396	179,322,026	29,662,182	5	4,088,377	241,998,986
		90	35,512,561	169,284,794	35,660,467	138	7,476,193	247,934,153
		89	37,243,312	168,115,957	41,099,562	1	10,006,745	256,465,577
		88	40,748,057	180,181,522	38,150,146	0	10,524,971	269,604,696
27	Printing	91	26,016,422	18,792,301	406	1	23,486	44,832,616
		90	27,767,407	22,326,809	948	20	4,614	50,099,798
		89	31,235,969	25,768,255	4,716	0	1,064	57,010,004
		88	33,058,097	27,340,160	32,091	40,000	41,566	60,511,914
28	Chemicals	91	181,846,326	422,313,803	187,972,463	656,037,120	89,868,300	1,538,038,012
		90	203,276,518	487,205,087	131,996,266	678,786,904	101,921,164	1,603,185,939
		89	226,881,662	551,191,553	110,199,155	1,085,475,393	106,565,503	2,080,313,266
		88	235,698,366	614,911,416	231,695,040	1,100,601,499	135,943,723	2,318,850,044
29	Petroleum	91	34,355,051	21,946,740	3,330,517	14,271,606	981,862	74,885,776
		90	35,785,608	23,189,804	3,880,871	16,449,541	2,525,906	81,831,730
		89	38,410,870	25,942,665	3,823,642	25,116,365	2,553,649	95,847,191
		88	45,182,962	19,597,884	3,270,918	20,486,919	2,664,090	91,202,773
30	Plastics	91	45,900,417	99,925,930	579,551	15,795	499,916	146,921,609
		90	57,583,965	119,505,091	446,651	14,254	187,171	177,737,132
		89	51,806,290	130,776,911	700,587	8,250	239,802	183,531,840
		88	50,055,680	118,854,513	630,660	2,754	173,799	169,717,406
31	Leather	91	3,583,938	5,991,335	118,645	0	83,399	9,777,317
		90	3,633,858	8,556,494	409,397	0	20,603	12,620,352
		89	3,418,978	9,489,965	228,374	0	257,183	13,394,500
		88	3,889,304	10,882,876	680,755	0	353,215	15,806,150

Industry	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Food	91	38,232,701	5,057,184	43,289,885
	90	40,440,449	4,504,853	44,945,302
	89	37,728,023	3,457,333	41,185,356
	88	38,337,080	3,155,271	41,492,351
Tobacco	91	9,744	20,295	30,039
	90	8,841	36,881	45,722
	89	16,558	38,736	55,294
	88	791,940	312,982	1,104,922
Textiles	91	6,765,966	2,680,339	9,446,305
	90	7,862,298	4,038,495	11,900,793
	89	11,150,851	3,820,915	14,971,766
	88	14,633,468	3,707,196	18,340,664
Apparel	91	186,721	268,504	455,225
	90	149,494	169,267	318,761
	89	441,203	262,335	703,538
	88	471,546	177,859	649,405
Lumber	91	131,011	1,194,612	1,325,623
	90	83,770	2,546,353	2,630,123
	89	109,714	3,030,863	3,140,577
	88	213,016	4,700,189	4,913,205
Furniture	91	142,883	2,796,742	2,939,625
	90	329,322	4,295,876	4,625,198
	89	553,177	4,838,369	5,391,546
	88	435,981	6,266,674	6,702,655
Paper	91	44,900,773	11,412,552	56,313,325
	90	54,003,925	12,946,315	66,950,240
	89	48,056,487	25,201,019	73,257,506
	88	46,963,232	21,341,623	68,304,855
Printing	91	329,875	1,993,202	2,323,077
	90	344,849	4,229,713	4,574,562
	89	826,152	4,560,355	5,386,507
	88	3,512,661	5,452,679	8,965,340
Chemicals	91	236,340,097	277,056,688	513,396,785
	90	283,095,065	254,949,330	538,044,395
	89	351,580,824	295,441,941	647,022,765
	88	333,646,374	355,572,926	689,219,300
Petroleum	91	7,218,566	3,554,918	10,773,484
	90	6,948,800	6,454,420	13,403,220
	89	10,588,147	6,902,158	17,490,305
	88	10,827,012	8,788,815	19,615,827
Plastics	91	5,045,808	14,233,024	19,278,832
	90	4,538,025	20,569,948	25,107,973
	89	5,363,883	22,682,584	28,046,467
	88	4,837,035	24,083,550	28,920,585
Leather	91	5,685,248	1,857,892	7,543,140
	90	8,275,788	2,321,862	10,597,650
	89	9,545,379	2,839,019	12,384,398
	88	10,021,402	2,294,465	12,315,867

Table 3-9. TRI Releases and Transfers by Industry, 1988-1991, Continued.

SIC Code Industry	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
32 Stone/Clay	91	3,928,496	16,960,732	155,562	7,464,305	2,338,965	30,848,060
	90	6,502,675	14,400,594	166,221	7,488,065	2,588,247	31,145,802
	89	8,541,594	17,916,019	215,095	6,570,250	3,387,246	36,630,204
	88	8,371,510	18,959,852	1,178,292	6,580,250	4,084,908	39,174,812
33 Primary Metals	91	41,776,638	114,250,138	8,503,163	13,536,557	254,917,719	432,984,215
	90	55,673,464	154,185,968	10,760,069	15,644,290	272,284,055	508,547,846
	89	58,829,938	183,428,194	15,923,475	37,676,115	242,963,646	538,821,368
	88	65,906,531	174,278,428	17,681,379	41,607,936	279,733,162	579,207,436
34 Fabr. Metals	91	43;321,289	64,267,970	278,576	824	1,340,552	109,209,211
	90	48,038,372	77,269,847	513,521	822	828,070	126,650,632
	89	54,936,756	79,238,434	313,585	338,958	1,048,671	135,876,404
	88	50,899,108	79,371,676	1,517,127	386,120	4,204,779	136,378,810
35 Machinery	91	14,541,148	23,502,756	50,734	35	442,764	38,537,437
	90	20,008,688	28,633,617	206,719	518	94,825	48,944,367
	89	26,056,923	30,588,693	407,257	250	309,524	57,362,647
	88	25,293,240	34,393,125	375,682	0	215,868	60,277,915
36 Electrical	91	21,221,222	41,929,111	389,086	2,224	1,545,301	65,086,944
	90	25,643,102	52,740,196	405,894	18,398	2,732,973	81,540,563
	89	31,987,770	65,897,051	474,104	48,410	1,386,432	99,793,767
	88	36,734,597	86,211,364	686,680	43,720	1,443,596	125,119,957
37 Transportation	91	48,048,376	97,501,506	139,004	1,000	1,916,444	147,606,330
	90	63,121,403	109,531,950	193,621	320	1,694,619	174,541,913
	89	73,357,798	129,972,830	135,239	750	1,490,479	204,957,096
	88	76,252,942	135,212,887	370,208	81,850	2,454,763	214,372,650
38 Measure./Photo.	91	11,766,487	26,654,797	736,288	0	55,622	39,213,194
	90	13,606,771	30,141,932	66,506	20	29,975	43,845,204
	89	16,730,006	35,027,606	431,041	0	45,263	52,233,916
	88	17,210,427	38,838,102	688,569	250	372,793	57,110,141
39 Miscellaneous	91	6,188,764	12,113,431	5,608	0	51,074	18,358,877
	90	7,923,780	16,777,923	11,643	75	3,364	24,716,785
	89	9,391,214	19,144,204	34,603	0	55,694	28,625,715
	88	9,391,645	21,136,080	54,024	1	273,341	30,855,091
Multiple codes 20-39	91	60,403,288	107,319,680	8,416,218	9,607,187	49,528,171	235,274,544
	90	61,610,187	140,286,168	7,458,816	25,932,047	61,195,423	296,482,641
	89	77,790,026	174,685,087	9,615,997	19,228,107	76,395,098	357,714,315
	88	80,473,590	157,526,181	8,863,376	172,774,638	76,680,347	496,318,132
No codes 20-39	91	4,082,901	9,785,339	369,286	9,100,750	4,123,287	27,461,563
	90	3,413,648	8,681,959	173,311	1,042,737	379,749	13,691,404
	89	3,139,125	7,233,321	166,460	15,181	143,237	10,697,324
	88	4,108,771	9,106,824	293,899	812	2,552,677	16,062,983
Total	91	609,765,664	1,369,580,314	243,497,317	710,248,004	421,160,113	3,354,251,412
	90	706,748,307	1,575,954,848	196,832,760	745,413,562	462,679,392	3,687,628,869
	89	793,597,781	1,768,596,839	188,025,233	1,175,583,836	455,029,001	4,380,832,690
	88	823,738,542	1,842,370,656	311,070,591	1,343,633,468	527,546,722	4,848,359,979

Industry	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
Stone/Clay	91	1,687,253	12,806,930	14,494,183
	90	971,943	9,698,798	10,670,741
	89	1,116,905	14,731,796	15,848,701
	88	1,346,738	19,988,122	21,334,860
Primary Metals	91	21,554,649	139,428,651	160,983,300
	90	9,534,180	288,507,589	298,041,769
	89	17,117,474	228,479,368	245,596,842
	88	22,911,920	275,143,941	298,055,861
Fabr. Metals	91	6,450,876	42,399,952	48,850,828
	90	6,344,106	63,876,444	70,220,550
	89	8,427,744	74,644,264	83,072,008
	88	17,140,977	77,154,071	94,295,048
Machinery	91	2,429,416	8,595,284	11,024,700
	90	2,578,381	12,499,932	15,078,313
	89	2,877,472	18,294,772	21,172,244
	88	2,713,794	20,348,301	23,062,095
Electrical	91	7,438,837	33,385,972	40,824,809
	90	11,973,027	34,151,967	46,124,994
	89	14,621,694	36,905,657	51,527,351
	88	18,801,849	44,163,669	62,965,518
Transportation	91	7,422,111	25,768,023	33,190,134
	90	8,896,838	37,483,395	46,380,233
	89	7,975,439	42,126,874	50,102,313
	88	7,409,065	54,940,627	62,349,692
Measure./Photo.	91	1,591,070	5,868,391	7,459,461
	90	1,892,200	9,203,900	11,096,100
	89	2,410,607	12,252,110	14,662,717
	88	3,737,116	19,608,312	23,345,428
Miscellaneous	91	797,353	3,175,046	3,972,399
	90	625,502	6,342,221	6,967,723
	89	732,717	13,459,849	14,192,566
	88	454,054	9,213,991	9,668,045
Multiple Codes	91	15,214,158	55,655,718	70,869,876
	90	16,509,053	61,454,386	77,963,439
	89	25,709,651	69,367,626	95,077,277
	88	32,715,229	67,111,082	99,826,311
No Codes	91	1,021,771	5,104,064	6,125,835
	90	717,228	2,169,889	2,887,117
	89	1,625,057	7,018,115	8,643,172
	88	2,123,891	4,585,260	6,709,151
Total	91	410,596,887	654,313,983	1,064,910,870
	90	466,123,084	842,451,834	1,308,574,918
	89	558,575,158	890,356,058	1,448,931,216
	88	574,045,380	1,028,111,605	1,602,156,985

Notes

(a) "Other Off-site Transfers" consists of off-site transfers reported without waste management codes. For 1988-1990, this category is believed to include off-site transfers for energy recovery and recycling that should not have been reported. For 1991, this category should contain few, if any, transfers for recycling and energy recovery. Because of this inconsistency, amounts in this "other" category cannot be compared across years (Table 3-2).

(b) "Other Off-site Transfers" consists of off-site transfers reported without valid waste management codes. For 1990, this category is believed to include about 24 million pounds of off-site transfers for energy recovery and recycling that should not have been reported. For 1991, the "other" category should contain few, if any, transfers for recycling and energy recovery. Because of this inconsistency, amounts in this "other" category cannot be compared across years (Table 3-1).

(c) Copper Range Co. in White Pine, Michigan, was the sixth largest decreaser between 1990 and 1991 with a total decrease in releases of -12,102,600 pounds. However, the facility is not included in the top 50 list because it indicated that it is not a covered facility (currently, only manufacturing facilities are required to report under EPCRA section 313) (Table 3-3).

(d) Source: Environmental Protection Agency/Department of Commerce. Release and transfer data include values for releases and transfers from one 2-digit SIC industry. When a facility reported more than one SIC code, its releases and transfers were not included in this data (Table 3-5).

(e) Source: Department of Commerce/Environmental Protection Agency (Table 3-6).

Chapter 4
The 33/50 Program

Partnership in Prevention

Government-Industry-Community

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TRI REPORTING PROFILES FOR 33/50 PROGRAM CHEMICALS

INTRODUCTION

The 33/50 Program, an EPA voluntary pollution prevention initiative, derives its name from its overall goals -- an interim goal of a 33% reduction by 1992 and an ultimate goal of a 50% reduction by 1995 in emissions of 17 high-priority toxic chemicals (see Box 4-1), using 1988 TRI reporting as a baseline. 12,800 facilities reported that 1.474 billion pounds of 33/50 Program chemicals were either directly released to the environment or transferred off-site to waste management facilities during 1988. The aim of the 33/50 Program is to reduce this 1.474 billion pounds of pollution by at least 50% -- 737 million pounds -- by 1995, with an interim reduction target of more than 486 million pounds by 1992.

1992 Interim Goal of 33/50 Program Achieved One Year Early

One of the more noteworthy findings revealed in the 1991 TRI reporting data is that releases and transfers of 33/50 Program chemicals declined by 34% between 1988 and 1991, surpassing the Program's 1992 interim 33% national reduction goal a full year ahead of schedule (see Figure 4-1). Data reported by facilities to TRI for 1991 indicate that releases and transfers of 33/50 Program chemicals declined from 1.474 billion pounds in the Program's 1988 baseline year to 973 million pounds in 1991, when categories of reporting in 1991 that were not required for reporting in 1988 are excluded (see below). The 501 million pound reduction in reported emissions through 1991 exceeds by nearly 15 million pounds the amount required to achieve the Program's 1992 interim 33% reduction goal. The early achievement of the Program's 1992 reduction goal, together with an analysis of facilities' projected on-site releases and off-site transfers to treatment and disposal of the 17 target chemicals through 1993 (reported for the first time in 1991 and discussed later in this chapter), offers strong encouragement that the 33/50 Program's ultimate goal of a 50% reduction by 1995 will be achieved.

Many states, a number of industry associations, and numerous individual companies include 33/50 Program chemicals within the scope of their own reduction programs. Twenty-six states had established toxics use reduction and pollution prevention programs prior to establishment of the 33/50 Program, and these contributed to its design. Others have used the 33/50 Program as a model. EPA views the 33/50 Program as an umbrella under which the federal government, states, industry, and communities work in partnership to achieve common goals. Any progress in reducing emissions of 33/50 Program chemicals reflects the efforts of all these partners.

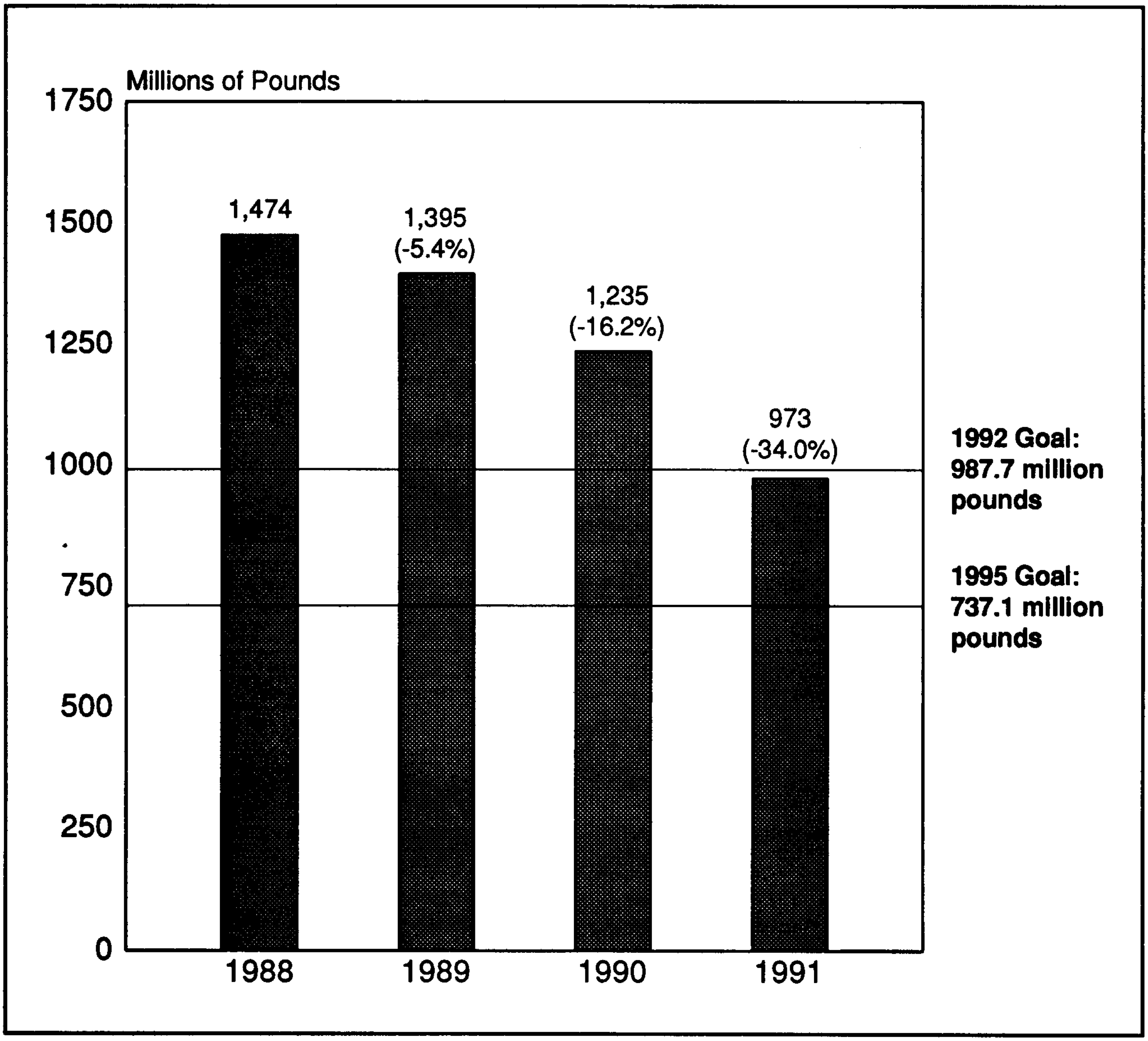

Figure 4-1. TRI Releases and Transfers of 33/50 Program Chemicals, 1988 - 1991.

Exclusions of New TRI Reporting Data

As discussed in Chapter 2, TRI reporting requirements were significantly expanded for 1991 as a result of Congress' passage of the Pollution Prevention Act of 1990. However, analyses of the progress of the 33/50 Program consider only environmental releases reported in Section 5 of Form R and those off-site transfers reported in Section 6 that facilities were required to report under 1988 TRI reporting requirements: transfers to POTWs and other transfers for treatment and disposal (as well as "other," which includes reports with missing or invalid off-site transfer codes).

Accordingly, the following quantities of the 17 33/50 Program chemicals that are reported by facilities in Sections 6 and 8 of Form R are excluded when comparing 1991 and future years' TRI data to the Program's 1988 baseline:

- Off-site Transfers to Energy Recovery (Form R Section 6.2);
- Off-site Transfers to Recycling (Form R Section 6.2);
- All Quantities Reported for Items in the new Mandatory Source Reduction and Recycling Activities Section (Form R Section 8.1 - 8.10).

These new reporting categories do, however, provide valuable information to EPA, the public, and the reporting facilities themselves, and are discussed later in this chapter. These data will be used by the 33/50 Program extensively in the future to determine how facilities achieve reductions in environmental releases.

Company Participation in the 33/50 Program

The 33/50 Program represents an innovative experiment aimed at demonstrating whether voluntary reduction programs can augment the Agency's traditional command-and-control approach by achieving targeted reductions more quickly than would regulations alone. The Program is part of a broad group of EPA activities designed to encourage pollution prevention as the best means of achieving reductions in toxic chemical emissions. The 33/50 Program seeks to instill a pollution prevention ethic throughout the highest echelons of American businesses.

Initial communications about the 33/50 Program are directed to the Chief Executive Officers of the parent companies of the more than 16,400 industrial facilities that have reported to EPA's Toxics Release Inventory (TRI) emitting any of the Program's 17 target chemicals between 1988

17 Priority Chemicals Targeted by the 33/50 Program

Benzene	Methyl Ethyl Ketone
Cadmium & Compounds	Methyl Isobutyl Ketone
Carbon Tetrachloride	Nickel & Compounds
Chloroform	Tetrachloroethylene
Chromium & Compounds	Toluene
Cyanides	Trichloroethane
Dichloromethane	Trichloroethylene
Lead & Compounds	Xylenes
Mercury & Compounds	

Box 4-1. 33/50 Program Chemicals.

and 1990. To date, more than 7,600 companies have been invited to participate. The Program achieved a major milestone in November, 1992, when the 1,000th company committed to reducing its releases of toxic chemicals into the environment. In its March, 1993, Third Progress Update, the 33/50 Program reported that a total of 1,135 companies have elected to participate, pledging to reduce voluntarily nearly 354 million pounds of pollution (see Figure 4-2). Company participation in the 33/50 Program has risen steadily from its inception in early 1991, increasing twofold from July, 1991 to February, 1992 (publication dates for the Program's first two Progress Reports), and again by more than 50% in the Program's second year.

Reduction pledges continue to approach the Program's national goals, their slower growth rate reflecting the fact that companies with the greatest amounts of releases and transfers (the "Top 600") were the first to be contacted. Commitment outreach in recent months has focussed more on the smaller companies. In addition, the 354 million pounds of reductions pledged to date represents a lower bound, as numeric reduction targets are still being set by about a third of the participating companies, and companies appear to be achieving greater reductions than they initially anticipated.

Facilities owned by companies that have elected to participate in the 33/50 Program are reporting greater reductions in emissions of the 17 target chemicals than are other facilities associated with non-participating companies. Between 1988 and 1991, participating companies reported a nearly 40% decrease in releases and transfers of Program chemicals, compared to a 27% decline reported by non-participants. The difference between participants and non-participants is somewhat greater for on-site environmental releases: a 36% reduction in releases for participants versus a 20% reduction for non-participants. Participating companies, representing only 15% of the companies invited to participate, were responsible for 60% of the total releases and transfers of Program chemicals in the 1988 baseline year and 56% in 1991.

Assessing the success of our efforts to encourage companies to commit to the 33/50 Program yields two conclusions. EPA's outreach to the larger companies has proven highly successful, with nearly 60% choosing to enroll. However, getting the message across to the more numerous smaller companies has been decidedly more difficult; only one in ten have elected to participate. Accordingly, EPA is initiating new outreach approaches to encourage smaller companies to participate, such as calling facilities directly to discuss the benefits of the Program and to identify and address any barriers that prevent them from participating.

33/50 Program Releases and Transfers, 1988-1991

Figure 4-3 and Table 4-1 present facilities' reports of on-site releases and off-site transfers to treatment and disposal for 1988 through 1991. The data are aggregated for all TRI chemicals that have been included in TRI reporting requirements for each of the four years. In addition, 33/50 Program chemicals are broken out in aggregate for comparison to that of all other TRI chemicals.

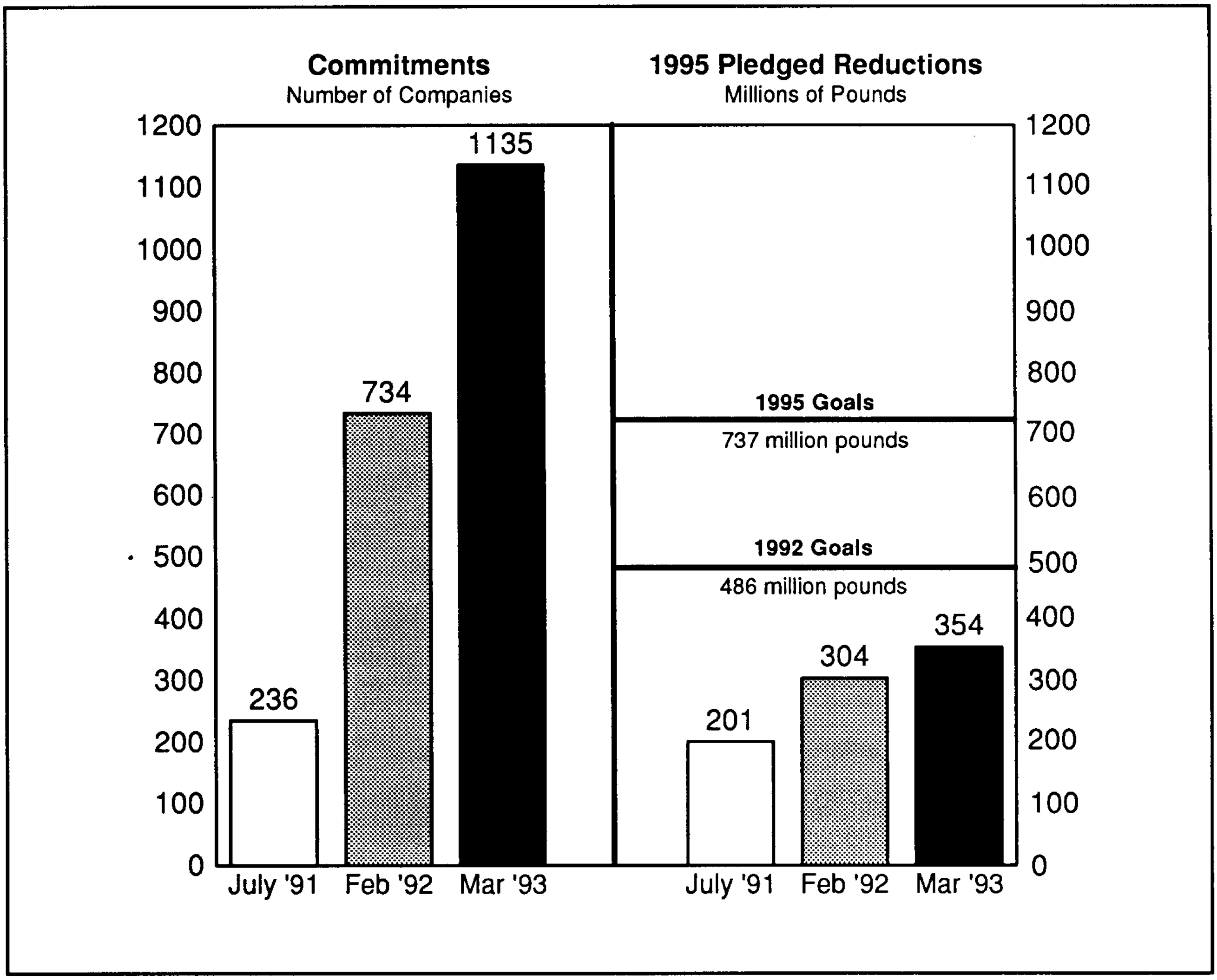

Figure 4-2. 33/50 Program Commitment Status, March 1993.

33/50 Program Chemical Reductions versus Reductions for Other TRI Chemicals

Facilities' 1991 TRI reports show that in the first year after formal announcement of the 33/50 Program, the 17 target chemicals experienced substantially greater proportional reductions (-21%) than all other TRI chemicals (-8%). (See Figure 4-3.) This represents a significant change in the reduction pattern from the two previous years. Prior to 1991, reductions in the releases and off-site transfers of the 17 33/50 Program chemicals lagged significantly behind reductions in other TRI chemicals. When the 17 33/50 Program chemicals are subtracted, remaining TRI releases and transfers declined by 23% from 1988 through 1990, from just under 5 billion pounds to 3.7 billion pounds. During that same period, emissions of the 17 targeted 33/50 Program chemicals were reduced by only 16%, from 1.47 billion pounds to 1.24 billion pounds (see Table 4-1).

At the time the 33/50 Program was being formulated, 1988 was the most recent year for which TRI data were available and the Program's baseline and goals were set accordingly. Reductions that companies achieved between 1988 and 1990 therefore contribute to the 33/50 Program's national reduction goals. However, these prior reductions should not be viewed as resulting from the 33/50 Program, as companies were first informed about the Program in February of 1991.

The 21.2% reduction in releases and transfers of the 17 target chemicals reported by facilities for 1990 - 1991 is nearly twice the amount of reductions reported in the previous year (11.5% between 1989 and 1990), and fully four times greater than the reductions observed between 1988 and 1989 (5.4%). 33/50 Program chemicals also contributed significantly to aggregate TRI release and transfer reductions observed between 1990 and 1991. While representing only 22% of the total volume of 1988-comparable TRI releases and transfers in 1991, 33/50 Program chemicals accounted for nearly half (45%) of the total TRI 1990 - 1991 reductions. Of the 577 million pounds in total TRI release/transfer reductions reported for 1991, 262 million are associated with the Program's 17 target chemicals.

Facilities' 1991 TRI reports on releases and off-site transfers of 33/50 Program chemicals, as well as updated reports for 1988 through 1990, are summarized by chemical and release medium/transfer management method in Table 4-2 (organics are listed first). Off-site transfers of 33/50 Program chemicals have declined at a much higher rate than have their on-site environmental releases. Transfers are down 50% from 1988, 39% in the last year alone. On-site releases, which accounted for 80% of the 33/50 Program 1988 release/transfer baseline, declined by 30% through 1991 and 17% in the last year (compared to 9% for all other TRI chemicals).

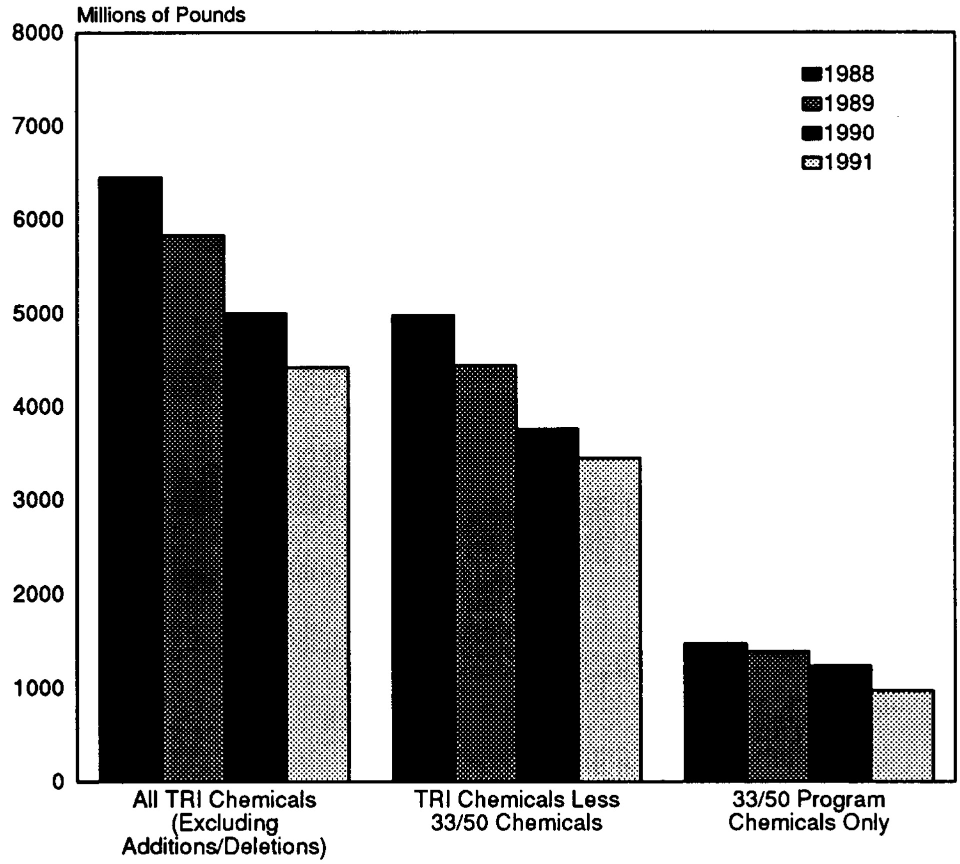

Figure 4-3. Releases and Transfers of 33/50 Program Chemicals compared to other TRI Chemicals, 1988-1991.

Table 4-1. Releases and Transfers of 33/50 Program Chemicals compared to other TRI Chemicals, 1988-1991.

Year	All TRI Chemicals (excluding Additions/ Deletions)	TRI Chemicals Less 33/50 Chemicals	33/50 Program Chemicals Only
	Pounds	Pounds	Pounds
1988	6,450,516,964	4,976,369,274	1,474,147,690
1989	5,829,763,906	4,434,701,979	1,395,061,927
1990	4,996,203,787	3,760,960,034	1,235,243,753
1991	4,419,162,282	3,446,042,372	973,119,910
	Percent Change	Percent Change	Percent Change
1988-1991	-31.4%	-30.7%	-33.9%
1988-1990	-22.5%	-24.4%	-16.2%
1990-1991	-11.5%	-8.3%	-21.2%

Table 4-2. TRI Releases and Transfers of 33/50 Chemicals, 1988-1991.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
71-43-2	Benzene	91	9,971,308	7,503,182	26,896	834,242	111,928	18,447,556
		90	14,516,266	10,686,871	24,524	689,066	722,486	26,639,213
		89	15,045,660	11,694,181	169,274	668,610	120,355	27,698,080
		88	20,235,191	11,027,298	46,998	825,035	127,920	32,262,442
56-23-5	Carbon tetrachloride	91	528,100	1,018,701	2,844	42,470	2,152	1,594,267
		90	419,001	1,320,225	4,718	31,557	1,005	1,776,506
		89	943,133	2,507,116	15,656	122,043	1,616	3,589,564
		88	1,081,552	2,695,101	15,627	98,054	14,759	3,905,093
67-66-3	Chloroform	91	7,660,997	11,421,891	769,569	65,089	22,150	19,939,696
		90	8,388,150	14,138,445	1,005,860	89,560	57,924	23,679,939
		89	8,872,690	16,841,084	1,177,743	64,338	70,265	27,026,120
		88	7,566,776	17,469,790	1,126,484	36,002	68,546	26,267,598
75-09-2	Dichloromethane	91	31,726,830	47,611,641	98,877	1,317,706	117,788	80,872,842
		90	37,744,015	62,532,366	190,500	850,018	21,024	101,337,923
		89	42,295,554	81,864,100	226,823	1,937,469	15,894	126,339,840
		88	48,751,550	79,242,388	350,050	1,478,834	157,211	129,980,033
78-93-3	Methyl ethyl ketone	91	33,149,766	70,271,889	141,354	355,736	180,492	104,099,237
		90	42,863,784	85,627,333	77,514	146,199	50,423	128,765,253
		89	41,693,966	94,365,489	71,781	200,703	171,347	136,503,286
		88	38,687,923	97,348,615	91,344	253,762	166,458	136,548,102
108-10-1	Methyl isobutyl ketone	91	8,411,877	18,786,642	167,405	161,600	177,939	27,705,463
		90	9,688,471	18,021,527	53,798	52,221	24,733	27,840,750
		89	10,850,259	20,673,502	449,407	81,850	20,891	32,075,909
		88	13,015,362	18,610,414	762,108	116,650	31,770	32,536,304
127-18-4	Tetrachloroethylene	91	6,482,575	10,204,876	7,448	14,000	23,302	16,732,201
		90	9,074,857	13,321,145	21,510	11,012	1,255	22,429,779
		89	11,966,038	15,512,638	53,940	50,005	10,791	27,593,412
		88	16,125,229	19,668,296	33,314	72,250	82,144	35,981,233
108-88-3	Toluene	91	73,620,294	124,944,414	104,645	1,373,207	185,012	200,227,572
		90	84,413,528	157,264,379	198,500	1,432,918	383,904	243,693,229
		89	93,193,936	176,358,467	182,297	620,403	427,055	270,782,158
		88	102,808,393	189,388,805	197,820	1,473,666	741,301	294,609,985
71-55-6	1,1,1-Trichloroethane	91	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
		90	83,389,447	81,112,035	16,722	1,581	62,176	164,581,961
		89	91,649,649	84,215,221	27,309	2,318	70,630	175,965,127
		88	90,767,027	86,001,968	95,934	1,000	187,786	177,053,715
79-01-6	Trichloroethylene	91	16,642,065	18,416,403	12,750	800	62,991	35,135,009
		90	18,565,243	20,358,601	14,210	805	12,554	38,951,413
		89	22,579,951	26,769,836	15,849	390	8,686	49,374,712
		88	25,879,146	27,900,517	13,802	390	21,186	53,815,041
	Xylenes	91	31,107,600	92,889,918	60,644	139,963	344,052	124,542,177
		90	35,488,852	109,258,390	46,920	105,394	434,245	145,333,801
		89	39,705,859	124,577,635	193,497	70,161	486,326	165,033,478
		88	38,303,001	126,721,344	211,898	144,978	651,589	166,032,810
	Cadmium and cadmium compounds	91	18,923	55,518	4,241	1,540	251,127	331,349
		90	31,249	78,820	3,339	1,575	404,423	519,406
		89	41,571	79,336	4,731	1,772	350,503	477,913
		88	32,649	90,293	4,397	2,409	389,729	519,477

CAS Number	Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
71-43-2	Benzene	91	613,449	1,799,039	2,412,488
		90	634,025	2,221,216	2,855,241
		89	1,107,975	1,839,858	2,947,833
		88	1,135,172	2,295,959	3,431,131
56-23-5	Carbon tetrachloride	91	621	980,569	981,190
		90	42,050	1,082,188	1,124,238
		89	3,841	1,716,813	1,720,654
		88	5,014	1,350,511	1,355,525
67-66-3	Chloroform	91	809,427	1,827,299	2,636,726
		90	802,260	1,321,726	2,123,986
		89	1,101,731	865,533	1,967,264
		88	1,226,573	1,369,922	2,596,495
75-09-2	Dichloromethane	91	1,308,202	12,605,336	13,913,538
		90	1,281,832	9,163,437	10,445,269
		89	921,911	12,813,000	13,734,911
		88	1,830,832	22,688,907	24,519,739
78-93-3	Methyl ethyl ketone	91	772,861	9,998,866	10,771,727
		90	867,891	20,323,777	21,191,668
		89	886,502	28,506,748	29,393,250
		88	962,868	28,620,683	29,583,551
108-10-1	Methyl isobutyl ketone	91	816,066	2,274,295	3,090,361
		90	1,258,294	4,548,341	5,806,635
		89	1,286,727	6,468,802	7,755,529
		88	1,509,030	10,323,972	11,833,002
127-18-4	Tetrachloroethylene	91	234,637	3,830,559	4,065,196
		90	450,787	4,433,734	4,884,521
		89	467,081	4,279,472	4,746,553
		88	586,288	5,511,471	6,097,759
108-88-3	Toluene	91	1,266,355	22,006,245	23,272,600
		90	1,724,465	39,898,984	41,623,449
		89	3,001,993	63,484,088	66,486,081
		88	3,549,792	61,614,018	65,163,810
71-55-6	1,1,1-Trichloroethane	91	293,508	8,000,615	8,294,123
		90	169,540	12,472,740	12,642,280
		89	312,010	16,662,054	16,974,064
		88	304,103	19,513,105	19,817,208
79-01-6	Trichloroethylene	91	72,845	2,793,368	2,866,213
		90	11,353	3,690,232	3,701,585
		89	31,269	4,966,856	4,998,125
		88	79,252	6,401,817	6,481,069
	Xylenes	91	1,593,182	20,542,421	22,135,603
		90	1,948,480	24,427,444	26,375,924
		89	3,970,355	33,828,419	37,798,774
		88	4,224,204	37,878,912	42,103,116
	Cadmium and cadmium compounds	91	265,771	1,449,863	1,715,634
		90	14,278	1,325,800	1,340,078
		89	19,564	748,958	768,522
		88	21,613	1,289,122	1,310,735

Table 4-2. TRI Releases and Transfers of 33/50 Chemicals, 1988-1991, Continued.

CAS Number	Chemical	Year	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
	Chromium and chromium compounds	91	585,757	532,744	352,522	35,150	25,916,872	27,423,045
		90	582,076	596,901	448,076	83,222	28,257,128	29,967,403
		89	1,624,574	737,750	546,412	59,803	34,477,025	37,445,564
		88	615,838	713,310	400,837	54,902	40,228,739	42,013,626
	Cyanide compounds	91	125,870	1,899,044	119,860	4,727,763	26,785	6,899,322
		90	240,688	1,620,330	129,089	4,981,212	24,320	6,995,639
		89	313,594	1,485,888	160,186	8,025,123	29,499	10,014,290
		88	657,222	1,606,398	197,201	5,445,176	108,969	8,014,966
	Lead and lead compounds	91	553,782	1,285,604	138,433	928	17,022,789	19,001,536
		90	917,589	1,569,431	132,656	1,648	19,069,275	21,690,599
		89	757,704	1,664,854	149,235	1,564	20,075,314	22,648,671
		88	858,635	1,821,383	241,243	2,760	26,962,797	29,886,818
	Mercury and mercury compounds	91	11,912	7,830	671	9	5,315	25,737
		90	14,798	8,759	809	21	4,199	28,586
		89	18,112	11,482	1,568	36	5,202	36,400
		88	17,037	8,724	1,656	27	13,779	41,223
	Nickel and nickel compounds	91	469,498	322,989	126,954	370,948	1,672,468	2,962,857
		90	375,830	315,836	146,456	268,958	6,060,825	7,167,905
		89	819,300	319,959	206,813	288,212	4,413,068	6,047,352
		88	414,913	285,076	219,780	239,263	3,629,809	4,788,841
	Total	91	290,297,916	475,448,087	2,156,916	9,443,956	46,294,969	823,641,844
		90	346,713,844	577,831,394	2,515,201	8,746,967	55,591,899	991,399,305
		89	382,371,550	659,678,538	3,652,521	12,194,800	60,754,467	1,118,651,876
		88	405,817,444	680,599,720	4,010,493	10,245,158	73,584,492	1,174,257,307
	Total less 33/50 Chemicals	91	319,467,748	894,132,227	241,340,401	700,804,048	374,865,144	2,530,609,568
		90	360,034,463	998,123,454	194,317,559	736,666,595	407,087,493	2,696,229,564
		89	411,226,231	1,108,918,301	184,372,712	1,163,389,036	394,274,534	3,262,180,814
		88	417,921,098	1,161,770,936	307,060,098	1,333,388,310	453,962,230	3,674,102,672
	Total for All TRI Chemicals	91	609,765,664	1,369,580,314	243,497,317	710,248,004	421,160,113	3,354,251,412
		90	706,748,307	1,575,954,848	196,832,760	745,413,562	462,679,392	3,687,628,869
		89	793,597,781	1,768,596,839	188,025,233	1,175,583,836	455,029,001	4,380,832,690
		88	823,738,542	1,842,370,656	311,070,591	1,343,633,468	527,546,722	4,848,359,979

CAS Number	Chemical	Year	Transfers to POTWs Pounds	Transfers Off-site for Treatment Disposal/Other Pounds	Total Transfers Pounds
	Chromium and chromium compounds	91	1,188,103	20,265,897	21,454,000
		90	1,113,077	35,623,076	36,736,153
		89	1,330,666	32,774,374	34,105,040
		88	2,125,066	31,664,881	33,789,947
	Cyanide compounds	91	121,728	824,994	946,722
		90	119,291	1,589,950	1,709,241
		89	149,462	2,436,901	2,586,363
		88	1,152,581	2,719,125	3,871,706
	Lead and lead compounds	91	592,526	20,156,681	20,749,207
		90	191,277	56,043,501	56,234,778
		89	152,316	31,041,273	31,193,589
		88	211,951	30,708,010	30,919,961
	Mercury and mercury compounds	91	64	193,973	194,037
		90	316	213,305	213,621
		89	2,058	188,144	190,202
		88	2,141	275,017	277,158
	Nickel and nickel compounds	91	639,048	9,339,653	9,978,701
		90	314,721	14,521,060	14,835,781
		89	449,440	18,593,857	19,043,297
		88	902,504	15,835,967	16,738,471
	Total	91	10,588,393	138,889,673	149,478,066
		90	10,943,937	232,900,511	243,844,448
		89	15,194,901	261,215,150	276,410,051
		88	19,828,984	280,061,399	299,890,383
	Total less 33/50 Chemicals	91	400,008,494	515,424,310	915,432,804
		90	455,179,147	609,551,323	1,064,730,470
		89	543,380,257	629,140,908	1,172,521,165
		88	554,216,396	748,050,206	1,302,266,602
	Total for All TRI Chemicals	91	410,596,887	654,313,983	1,064,910,870
		90	466,123,084	842,451,834	1,308,574,918
		89	558,575,158	890,356,058	1,448,931,216
		88	574,045,380	1,028,111,605	1,602,156,985

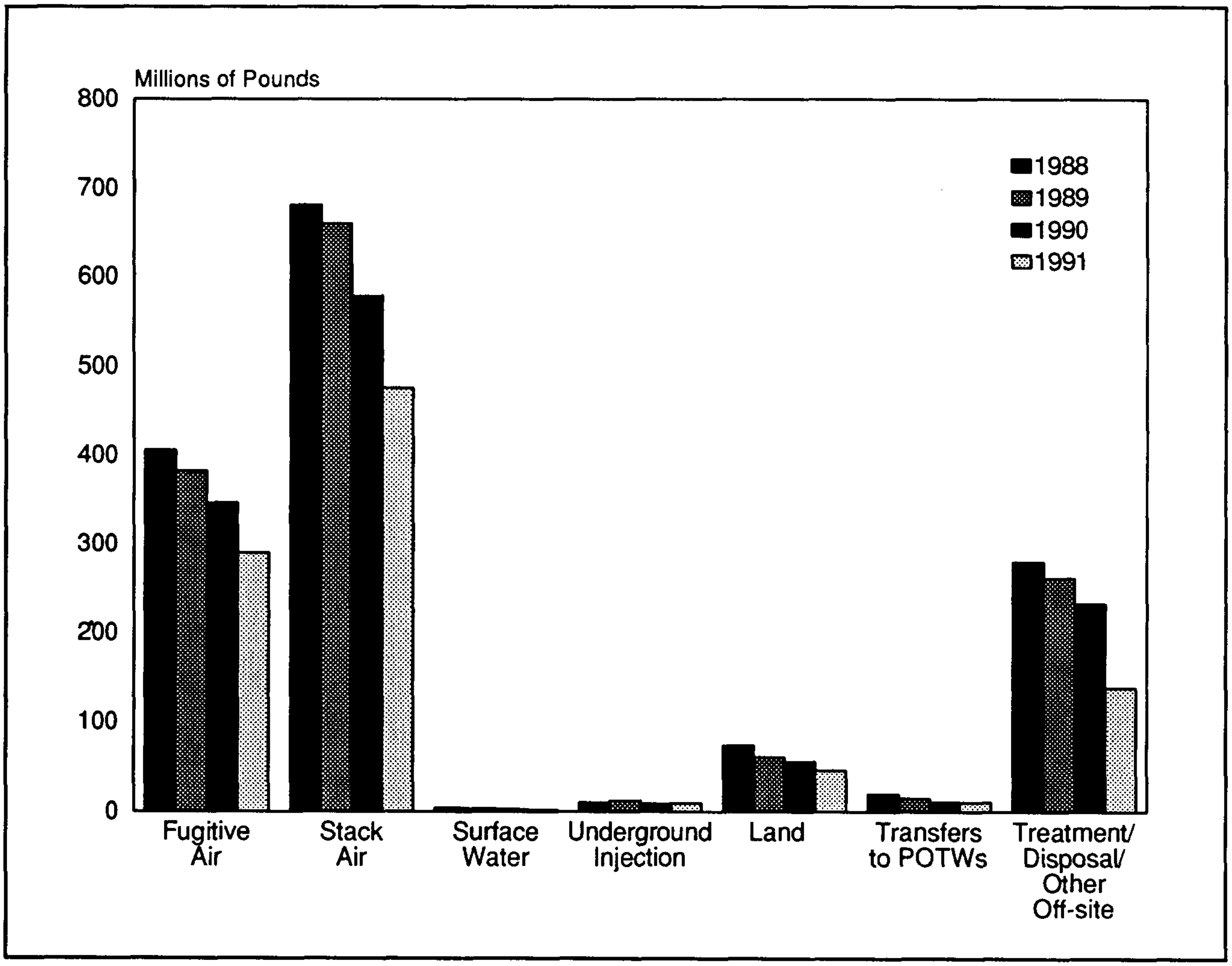

Figure 4-4. Total TRI Releases and Transfers of 33/50 Program Chemicals, by On-site Release Medium/Transfer Management Type, 1988 - 1991.

33/50 Program Chemical Releases and Transfers, by Medium and by Chemical

Figures 4-4 and 4-5 present reduction trends for 33/50 Program chemicals aggregated by on-site release medium/off-site transfer type, and by chemical, respectively. The figures are provided for illustrative purposes only. No attempt has been made at this time to extract conclusions or discern patterns in the 1991 reporting at these more detailed levels. These will be the subject of future 33/50 Program progress reports, in conjunction with updates on Program participation status.

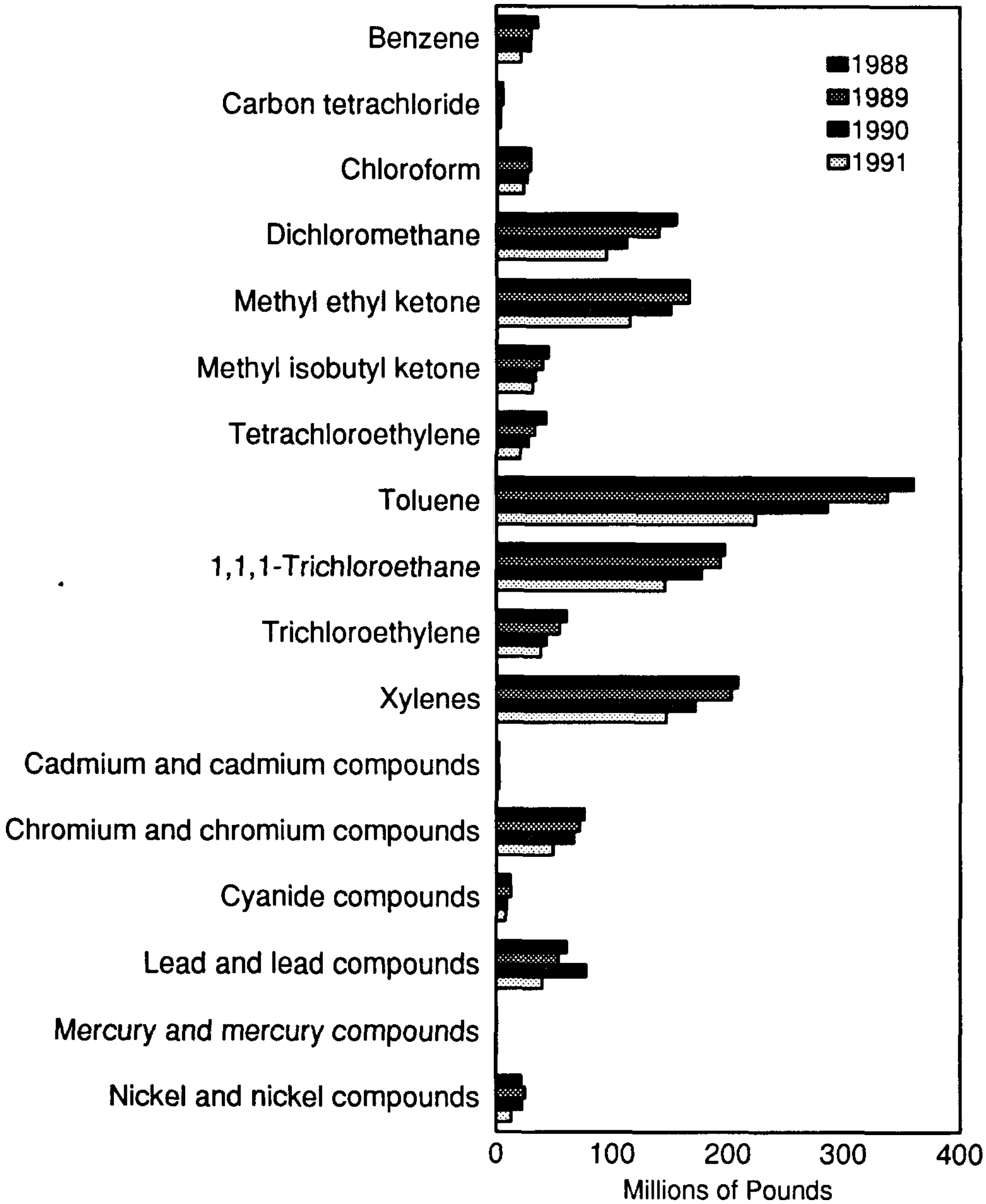

Figure 4-5. Total TRI Releases and Transfers of 33/50 Program Chemicals, by Chemical, 1988 - 1991.

Table 4-3. TRI Releases of 33/50 Chemicals, 1991.

CAS Number	Chemical	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total Releases Pounds
71-43-2	Benzene	9,971,308	7,503,182	26,896	834,242	111,928	18,447,556
56-23-5	Carbon tetrachloride	528,100	1,018,701	2,844	42,470	2,152	1,594,267
67-66-3	Chloroform	7,660,997	11,421,891	769,569	65,089	22,150	19,939,696
75-09-2	Dichloromethane	31,726,830	47,611,641	98,877	1,317,706	117,788	80,872,842
78-93-3	Methyl ethyl ketone	33,149,766	70,271,889	141,354	355,736	180,492	104,099,237
108-10-1	Methyl isobutyl ketone	8,411,877	18,786,642	167,405	161,600	177,939	27,705,463
127-18-4	Tetrachloroethylene	6,482,575	10,204,876	7,448	14,000	23,302	16,732,201
108-88-3	Toluene	73,620,294	124,944,414	104,645	1,373,207	185,012	200,227,572
71-55-6	1,1,1-Trichloroethane	69,230,762	68,274,801	21,803	2,805	171,807	137,701,978
79-01-6	Trichloroethylene	16,642,065	18,416,403	12,750	800	62,991	35,135,009
	Xylenes	31,107,600	92,889,918	60,644	139,963	344,052	124,542,177
	Cadmium and cadmium compounds	18,923	55,518	4,241	1,540	251,127	331,349
	Chromium and chromium compounds	585,757	532,744	352,522	35,150	25,916,872	27,423,045
	Cyanide compounds	125,870	1,899,044	119,860	4,727,763	26,785	6,899,322
	Lead and lead compounds	553,782	1,285,604	138,433	928	17,022,789	19,001,536
	Mercury and mercury compounds	11,912	7,830	671	9	5,315	25,737
	Nickel and nickel compounds	469,498	322,989	126,954	370,948	1,672,468	2,962,857
	Total	290,297,916	475,448,087	2,156,916	9,443,956	46,294,969	823,641,844
	Total less 33/50 Chemicals	336,081,480	908,726,582	241,356,856	700,933,181	375,133,175	2,562,231,274
	Total for All TRI Chemicals	626,379,396	1,384,174,669	243,513,772	710,377,137	421,428,144	3,385,873,118

TRI Pollution Prevention Act Data for 33/50 Program Chemicals

As described in Chapter 2, the Pollution Prevention Act of 1990 (PPA) substantially expanded the scope of TRI to include reporting on additional toxic chemical management activities. Off-site transfers to energy recovery and recycling processes are now reported in Section 6.2 of Form R in addition to the previously reported transfers to POTW's and other treatment and disposal facilities. Off-site transfers to energy recovery and recycling facilities are also reported in Section 8 of Form R, which was made mandatory under the PPA, in addition to amounts of toxic chemicals combusted for on-site energy recovery or recovered in on-site recycling processes. Section 8 also includes reporting on amounts of toxic chemicals destroyed in on-site treatment systems and amounts sent to off-site treatment facilities, as well as an aggregate of the amounts of each chemical the facility released to the environment as a result of on-site operations plus the amounts shipped off-site for disposal.

Table 4-4. TRI Transfers of 33/50 Chemicals, 1991.

CAS Number	Chemical	Transfers to POTWs Pounds	Transfers to Treatment Pounds	Transfers to Disposal Pounds	Transfers to Energy Recovery Pounds	Transfers to Recycling Pounds	Other Off-site Transfers Pounds	Total Transfers Pounds
71-43-2	Benzene	613,449	1,656,194	142,460	3,675,466	353,205	385	6,441,159
56-23-5	Carbon tetrachloride	621	939,774	39,111	11,061	390,625	1,684	1,382,876
67-66-3	Chloroform	809,427	1,755,778	71,518	255,288	2,077,870	3	4,969,884
75-09-2	Dichloromethane	1,308,202	11,956,118	495,762	3,717,385	29,163,629	153,456	46,794,552
78-93-3	Methyl ethyl ketone	772,861	9,365,077	512,746	35,111,556	26,033,673	121,043	71,916,956
108-10-1	Methyl isobutyl ketone	816,066	2,112,745	155,643	18,801,198	20,346,186	5,907	42,237,745
127-18-4	Tetrachloroethylene	234,637	3,580,303	112,237	1,232,887	10,694,611	138,019	15,992,694
108-88-3	Toluene	1,266,355	20,171,434	1,636,162	80,207,715	24,882,493	198,649	128,362,808
71-55-6	1,1,1-Trichloroethane	293,508	6,743,974	969,200	3,212,938	27,237,545	287,441	38,744,606
79-01-6	Trichloroethylene	72,845	2,577,754	115,974	802,290	6,785,517	99,640	10,454,020
	Xylenes	1,593,182	19,283,497	1,001,342	69,220,174	38,913,506	257,582	130,269,283
	Cadmium and cadmium compounds	265,771	388,557	1,019,701	7,460	2,266,912	41,605	3,990,006
	Chromium and chromium compounds	1,188,103	3,969,938	15,972,793	69,423	68,437,500	323,166	89,960,923
	Cyanide compounds	121,728	447,295	365,309	500	82,660	12,390	1,029,882
	Lead and lead compounds	592,526	4,559,119	15,494,344	68,833	204,841,122	103,218	225,659,162
	Mercury and mercury compounds	64	65,531	128,442	5	445,451	0	639,493
	Nickel and nickel compounds	639,048	2,318,764	6,648,274	12,353	60,230,889	372,615	70,221,943
	Total	10,588,393	91,891,852	44,881,018	216,406,532	523,183,394	2,116,803	889,067,992
	Total less 33/50 Chemicals	401,318,705	260,541,316	254,161,433	221,818,810	1,830,940,192	7,433,076	2,976,213,532
	Total for All TRI Chemicals	411,907,098	352,433,168	299,042,451	438,225,342	2,354,123,586	9,549,879	3,865,281,524

Section 8 reporting items described above pertain only to chemical quantities contained in wastes that are the result of regular production-related activities. Toxic chemical quantities contained in wastes that are generated at the facility through non-routine activities, such as spill clean-ups and other catastrophic events, are reported in a separate Section 8 reporting item. Each of the items reported for production-related wastes in Section 8 is reported in aggregate, by chemical, for the reporting year (1991), the prior year (1990), and forecasted by facilities for the two successive years (1992 and 1993).

33/50 Transfers to Energy Recovery and Recycling

Tables 4-3 and 4-4 present a complete summary of 1991 on-site releases and off-site transfers reported by facilities in Sections 5 and 6 of Form R for each 33/50 Program chemical, by on-site release medium and off-site transfer type. Release reporting in Section 5, summing to 823.6 million pounds, is identical in nature to reporting in prior years. Reporting on off-site transfers, however, has been significantly affected by the new PPA requirement to include transfers to energy recovery (216.4 million pounds) and transfers to recycling (523.2 million pounds). Each of these new reporting categories on its own exceeds the total for all off-site transfers that were previously required to be reported (149.5 million pounds).

These new data indicate that the bulk of 33/50 Program metals and their associated compounds were shipped off-site for recycling. Some quantities of metals erroneously have been reported as sent off-site for energy recovery as metals do not contribute to the heating value of the wastes in which they are contained and are not destroyed in energy recovery processes. Off-site recycling of lead and its compounds alone accounted for nearly 40% of all such transfers of 33/50 Program chemicals. Greater quantities of the organic chemicals were also recycled than were burned for energy. Energy recovery was a more prevalent off-site management method than recycling only for benzene, methyl ethyl ketone, toluene, and xylenes.

Management of 33/50 Program Chemicals in Wastes

Tables 4-5 through 4-9 present all four years of Section 8 reporting data for each 33/50 Program chemical, by waste management activity (non-production-related wastes are reported only for 1991). Again, the magnitude of the quantities associated with new reporting categories is overwhelming relative to the amounts for previously reported releases and transfers. On-site recycling (4.3 billion pounds) dominates the waste management picture for the 17 Program chemicals, more than quadrupling the 1988-comparable figures in 1991. As expected, quantities associated with on-site waste management activities are substantially greater than off-site transfers to similar management methods.

Analysts will note significant discrepancies between reported off-site transfers to energy recovery and recycling in Sections 6 and 8. Less significant discrepancies can also be observed in the reporting of off-site shipments to treatment. The causes and meaning of these discrepancies are discussed in Chapter 2. Figure 4-6 presents two profiles of 1991 reporting data for 33/50 Program chemicals to illustrate the impact of the expansions to TRI reporting brought about by the PPA. Two views are presented to accommodate the significant discrepancies in reporting for off-site energy recovery and recycling. In one profile (left), off-site energy recovery and recycling data are taken from Section 6. In the other profile (right), off-site energy recovery and recycling data are taken from Section 8. In both profiles, Section 8 data for off-site treatment (77 million pounds) are omitted, as their inclusion would duplicate off-site treatment quantities (102.5 million pounds) included in the 1988-comparable release/transfer amount reported in Section 6. Section 8.1 reporting for on-site releases and off-site transfers to disposal (846.3 million pounds) is also excluded in favor of their counterparts from Section 5 and 6 (823.6 million pounds of on-site releases plus 44.9 million pounds of transfers to disposal).

Table 4-5. TRI Data Collected under the Pollution Prevention Act for 33/50 Chemicals, 1990 - 1993: Quantity Recycled(a).

CAS Number	Chemical	1990 On-site Pounds	1991 On-site Pounds	Projected Data 1992 On-site Pounds	Projected Data 1993 On-site Pounds
71-43-2	Benzene	186,221,940	196,393,605	202,417,036	205,490,682
56-23-5	Carbon tetrachloride	13,809,422	10,238,966	14,299,143	14,824,425
67-66-3	Chloroform	4,120,879	4,125,901	4,149,851	4,189,401
75-09-2	Dichloromethane	153,704,577	182,108,296	171,887,424	175,443,735
78-93-3	Methyl ethyl ketone	860,316,285	864,307,237	873,842,445	877,203,944
108-10-1	Methyl isobutyl ketone	172,649,101	184,837,606	183,517,967	179,009,876
127-18-4	Tetrachloroethylene	141,398,774	118,584,078	100,085,824	100,707,105
108-88-3	Toluene	1,044,915,519	1,118,482,253	1,126,516,579	1,108,863,252
71-55-6	1,1,1-Trichloroethane	188,056,560	204,077,933	170,420,702	104,844,395
79-01-6	Trichloroethylene	223,411,546	253,517,471	253,726,305	250,591,479
	Xylenes	176,416,278	207,081,028	173,057,124	176,307,518
	Cadmium and cadmium compounds	3,680,759	3,865,283	3,800,234	3,765,578
	Chromium and chromium compounds	66,854,044	91,951,101	84,412,237	86,717,179
	Cyanides	4,826,689	3,815,454	5,370,332	4,666,497
	Lead and lead compounds	722,419,745	774,086,405	843,333,074	896,477,272
	Mercury and mercury compounds	1,544,836	1,282,925	946,870	951,870
	Nickel and nickel compounds	40,416,570	48,601,735	44,418,955	46,024,696
	Subtotal On-site for 33/50 Chemicals	4,004,763,524	4,267,357,277	4,256,202,102	4,236,078,904
	Subtotal On-site less 33/50 Chemicals	10,447,403,204	12,111,751,405	11,643,298,317	11,765,547,167
	Subtotal On-site for All TRI Chemicals	14,452,166,728	16,379,108,682	15,899,500,419	16,001,626,071

CAS Number	Chemical	1990 Off-site Pounds	1991 Off-site Pounds	Projected Data 1992 Off-site Pounds	Projected Data 1993 Off-site Pounds
71-43-2	Benzene	825,048	1,414,752	1,314,877	814,678
56-23-5	Carbon tetrachloride	9,901	390,538	367,312	366,722
67-66-3	Chloroform	301,029	2,078,744	2,041,306	2,041,313
75-09-2	Dichloromethane	27,349,922	26,224,925	23,995,107	19,742,164
78-93-3	Methyl ethyl ketone	26,615,454	24,888,298	25,029,100	24,040,995
108-10-1	Methyl isobutyl ketone	12,259,999	17,952,566	17,722,322	18,119,834
127-18-4	Tetrachloroethylene	8,587,970	9,035,196	7,963,251	7,924,658
108-88-3	Toluene	19,940,589	24,557,245	24,863,740	23,355,561
71-55-6	1,1,1-Trichloroethane	29,815,008	28,751,600	22,123,251	14,070,105
79-01-6	Trichloroethylene	7,142,607	7,446,327	6,052,720	4,984,824
	Xylenes	25,237,600	33,701,307	30,886,210	32,032,227
	Cadmium and cadmium compounds	2,536,773	2,039,641	2,060,981	2,081,824
	Chromium and chromium compounds	64,485,821	106,599,026	94,945,018	99,739,938
	Cyanides	62,415	38,280	44,074	8,465
	Lead and lead compounds	274,126,453	273,499,683	281,759,583	294,874,150
	Mercury and mercury compounds	111,001	274,247	336,080	336,334
	Nickel and nickel compounds	51,718,854	78,737,821	72,225,397	73,600,958
	Subtotal Off-site for 33/50 Chemicals	551,126,444	637,630,196	613,730,329	618,134,750
	Subtotal Off-site less 33/50 Chemicals	1,983,231,225	2,624,350,735	2,602,497,818	2,598,748,897
	Subtotal Off-site for All TRI Chemicals	2,534,357,669	3,261,980,931	3,216,228,147	3,216,883,647
	Total for 33/50 Chemicals	4,555,889,968	4,904,987,473	4,869,932,431	4,854,213,654
	Total less 33/50 Chemicals	12,430,634,429	14,736,102,140	14,245,796,135	14,364,296,064
	Total for All TRI Chemicals	16,986,524,397	19,641,089,613	19,115,728,566	19,218,509,718

Table 4-6. TRI Data Collected under the Pollution Prevention Act for 33/50 Chemicals, 1990 - 1993: Quantity Used for Energy Recovery(a).

CAS Number	Chemical	1990 On-site Pounds	1991 On-site Pounds	Projected Data 1992 On-site Pounds	Projected Data 1993 On-site Pounds
71-43-2	Benzene	21,176,508	33,714,288	28,812,538	26,158,418
56-23-5	Carbon tetrachloride	3,288,879	5,964,156	15,555,356	18,746,865
67-66-3	Chloroform	1,990,067	5,499,527	7,519,104	9,496,582
75-09-2	Dichloromethane	15,632,408	14,270,049	15,310,887	16,221,100
78-93-3	Methyl ethyl ketone	90,352,222	94,341,416	95,158,244	107,555,209
108-10-1	Methyl isobutyl ketone	42,654,440	36,906,508	37,823,204	42,955,740
127-18-4	Tetrachloroethylene	12,382,080	4,013,084	4,226,835	4,452,966
108-88-3	Toluene	250,558,252	254,980,246	262,443,091	288,619,559
71-55-6	1,1,1-Trichloroethane	7,363,780	14,001,816	14,637,770	15,354,150
79-01-6	Trichloroethylene	6,083,419	6,188,130	6,212,991	6,581,666
	Xylenes	197,292,824	217,136,701	223,801,420	239,747,588
	Cadmium and cadmium compounds	0	0	0	0
	Chromium and chromium compounds	0	0	1	0
	Cyanides	42,279,210	22,849,436	20,922,422	21,279,382
	Lead and lead compounds	83,604	116,475	118,500	119,200
	Mercury and mercury compounds	0	0	0	0
	Nickel and nickel compounds	0	0	10	10
	Subtotal On-site for 33/50 Chemicals	691,137,693	709,981,832	732,542,373	797,288,435
	Subtotal On-site less 33/50 Chemicals	2,070,035,242	2,476,813,901	2,491,144,959	3,157,142,198
	Subtotal On-site for All TRI Chemicals	2,761,172,935	3,186,795,733	3,223,687,332	3,954,430,633

CAS Number	Chemical	1990 Off-site Pounds	1991 Off-site Pounds	Projected Data 1992 Off-site Pounds	Projected Data 1993 Off-site Pounds
71-43-2	Benzene	3,372,068	4,932,365	4,529,408	4,943,593
56-23-5	Carbon tetrachloride	1,835	10,849	5,281	291
67-66-3	Chloroform	346,140	720,671	621,330	546,922
75-09-2	Dichloromethane	5,746,239	6,066,234	5,319,225	4,906,635
78-93-3	Methyl ethyl ketone	36,653,958	38,424,594	36,077,565	34,365,357
108-10-1	Methyl isobutyl ketone	12,022,235	19,306,703	18,676,693	19,096,258
127-18-4	Tetrachloroethylene	909,105	1,504,622	1,080,036	893,510
108-88-3	Toluene	72,799,299	86,805,609	86,510,188	84,352,277
71-55-6	1,1,1-Trichloroethane	3,493,538	3,913,519	3,033,116	2,131,378
79-01-6	Trichloroethylene	1,002,311	1,045,752	811,472	581,760
	Xylenes	64,803,135	78,056,842	75,318,262	71,066,260
	Cadmium and cadmium compounds	6,282	8,317	7,620	6,968
	Chromium and chromium compounds	53,683	74,993	74,344	66,578
	Cyanides	14	24	415	3,915
	Lead and lead compounds	32,312	69,831	66,704	64,264
	Mercury and mercury compounds	0	3,241	9,435	500
	Nickel and nickel compounds	13,875	9,629	4,701	4,694
	Subtotal Off-site for 33/50 Chemicals	201,256,029	240,953,795	232,145,795	223,031,160
	Subtotal Off-site less 33/50 Chemicals	225,699,366	256,803,676	253,747,321	249,733,225
	Subtotal Off-site for All TRI Chemicals	426,955,395	497,757,471	485,893,116	472,764,385
	Total for 33/50 Chemicals	892,393,722	950,935,627	964,688,168	1,020,319,595
	Total less 33/50 Chemicals	2,295,734,608	2,733,617,577	2,744,892,280	3,406,875,423
	Total for All TRI Chemicals	3,188,128,330	3,684,553,204	3,709,580,448	4,427,195,018

Table 4-7. TRI Data Collected under the Pollution Prevention Act for 33/50 Chemicals, 1990 - 1993: Quantity Treated(a).

CAS Number	Chemical	1990 On-site Pounds	1991 On-site Pounds	Projected Data 1992 On-site Pounds	Projected Data 1993 On-site Pounds
71-43-2	Benzene	21,865,259	31,256,769	30,799,920	31,517,292
56-23-5	Carbon tetrachloride	13,123,649	15,074,894	14,924,565	15,362,639
67-66-3	Chloroform	33,086,010	26,581,978	26,600,006	26,773,101
75-09-2	Dichloromethane	31,161,206	34,185,873	36,339,814	38,081,156
78-93-3	Methyl ethyl ketone	33,969,950	45,423,894	48,814,259	48,466,536
108-10-1	Methyl isobutyl ketone	9,079,196	11,765,185	11,945,634	12,198,975
127-18-4	Tetrachloroethylene	19,531,235	15,284,084	15,786,368	15,981,873
108-88-3	Toluene	99,851,002	128,268,450	142,527,931	163,838,919
71-55-6	1,1,1-Trichloroethane	3,620,168	3,047,769	2,439,239	2,850,333
79-01-6	Trichloroethylene	1,798,181	4,886,629	4,698,415	4,790,711
	Xylenes	32,087,790	49,180,388	52,651,046	55,059,974
	Cadmium and cadmium compounds	962,670	712,333	705,249	612,729
	Chromium and chromium compounds	25,996,738	35,697,855	40,377,635	42,648,217
	Cyanides	49,102,212	50,527,548	51,209,641	52,074,846
	Lead and lead compounds	44,258,209	42,243,213	42,763,966	42,621,846
	Mercury and mercury compounds	35,157	35,853	37,450	99,321
	Nickel and nickel compounds	18,885,365	19,545,273	18,863,329	18,847,258
	Subtotal On-site for 33/50 Chemicals	438,413,997	513,717,988	541,484,467	571,825,726
	Subtotal On-site less 33/50 Chemicals	8,608,976,557	9,269,656,632	9,615,878,074	9,584,434,494
	Subtotal On-site for All TRI Chemicals	9,047,390,554	9,783,374,620	10,157,362,541	10,156,260,220

CAS Number	Chemical	1990 Off-site Pounds	1991 Off-site Pounds	Projected Data 1992 Off-site Pounds	Projected Data 1993 Off-site Pounds
71-43-2	Benzene	2,662,027	2,163,924	1,956,285	1,819,685
56-23-5	Carbon tetrachloride	971,935	840,933	1,020,048	658,157
67-66-3	Chloroform	1,935,098	2,007,797	2,090,584	1,485,414
75-09-2	Dichloromethane	8,345,059	10,528,620	11,176,243	11,040,959
78-93-3	Methyl ethyl ketone	7,708,590	7,757,468	6,933,344	5,865,304
108-10-1	Methyl isobutyl ketone	3,207,654	2,532,919	2,304,960	2,050,784
127-18-4	Tetrachloroethylene	2,841,310	3,305,286	2,458,500	858,165
108-88-3	Toluene	16,850,242	13,865,706	15,388,873	13,451,138
71-55-6	1,1,1-Trichloroethane	4,633,476	5,253,041	4,008,457	2,752,287
79-01-6	Trichloroethylene	2,472,268	2,630,021	2,593,185	2,440,062
	Xylenes	11,536,274	11,994,985	8,251,526	7,538,476
	Cadmium and cadmium compounds	187,530	357,559	459,238	386,540
	Chromium and chromium compounds	5,481,567	4,972,054	3,903,276	3,205,968
	Cyanides	364,474	418,974	328,280	263,037
	Lead and lead compounds	6,759,380	5,719,036	5,763,383	5,232,153
	Mercury and mercury compounds	100,779	64,797	41,108	31,997
	Nickel and nickel compounds	4,391,217	2,593,065	1,625,926	1,555,650
	Subtotal Off-site for 33/50 Chemicals	80,448,880	77,006,185	70,303,216	60,635,776
	Subtotal Off-site less 33/50 Chemicals	773,451,024	797,279,247	702,432,610	675,556,541
	Subtotal Off-site for All TRI Chemicals	853,899,904	874,285,432	772,735,826	736,192,317
	Total for 33/50 Chemicals	518,862,877	590,724,173	611,787,683	632,461,502
	Total less 33/50 Chemicals	9,382,427,581	10,066,935,879	10,318,310,684	10,259,991,035
	Total for All TRI Chemicals	9,901,290,458	10,657,660,052	10,930,098,367	10,892,452,537

Table 4-8. TRI Data Collected under the Pollution Prevention Act for 33/50 Chemicals, 1990 - 1993: Quantity Released (Includes Off-site Disposal)(a).

CAS Number	Chemical	1990 Pounds	1991 Pounds	Projected Data 1992 Pounds	Projected Data 1993 Pounds
71-43-2	Benzene	22,777,071	18,760,658	14,341,727	12,669,477
56-23-5	Carbon tetrachloride	1,711,637	1,649,063	1,359,662	1,272,155
67-66-3	Chloroform	23,184,204	19,739,220	16,871,435	14,278,092
75-09-2	Dichloromethane	90,259,930	80,189,944	64,243,069	57,398,045
78-93-3	Methyl ethyl ketone	117,221,288	102,309,424	86,053,440	76,789,187
108-10-1	Methyl isobutyl ketone	26,480,175	28,194,835	27,164,097	25,506,386
127-18-4	Tetrachloroethylene	19,170,142	16,407,683	11,940,254	9,051,251
108-88-3	Toluene	215,032,891	196,784,903	171,886,924	156,803,806
71-55-6	1,1,1-Trichloroethane	141,349,697	132,160,136	104,897,302	72,454,478
79-01-6	Trichloroethylene	38,020,135	34,532,204	29,156,169	23,989,725
	Xylenes	123,317,694	122,964,725	111,356,550	107,104,561
	Cadmium and cadmium compounds	1,319,468	1,235,362	1,256,353	1,179,702
	Chromium and chromium compounds	38,085,219	40,080,347	38,551,411	37,435,248
	Cyanides	8,810,822	7,055,445	7,068,939	6,716,208
	Lead and lead compounds	42,676,945	35,455,972	32,792,185	30,778,099
	Mercury and mercury compounds	133,963	98,786	205,295	54,531
	Nickel and nickel compounds	13,215,548	8,708,102	7,797,482	7,470,241
	Total Released On-site/Disposed of Off-site for 33/50 Chemicals	922,766,829	846,326,809	726,942,294	640,951,192
	Total Released On-site/Disposed of Off-site less 33/50 Chemicals	2,873,922,207	2,924,868,083	2,831,907,246	2,466,510,911
	Total Released On-site/Disposed of Off-site for All TRI Chemicals	3,796,689,036	3,771,194,892	3,558,849,540	3,107,462,103

Table 4-9. TRI Data Collected under the Pollution Prevention Act for 33/50 Chemicals, 1990 - 1993: Total Wastes(a).

CAS Number	Chemical	1990 Total Production Related Wastes Pounds	1991 Total Production Related Wastes Pounds	Projected Data 1992 Total Production Related Wastes Pounds	Projected Data 1993 Total Production Related Wastes Pounds	1991 Non-Production Related Wastes Pounds
71-43-2	Benzene	258,899,921	288,636,361	284,171,791	283,413,825	108,722
56-23-5	Carbon tetrachloride	32,917,258	34,169,399	47,531,367	51,231,254	101,757
67-66-3	Chloroform	64,963,427	60,753,838	59,893,616	58,810,825	124,714
75-09-2	Dichloromethane	332,199,341	353,573,941	328,271,769	322,833,794	490,093
78-93-3	Methyl ethyl ketone	1,172,837,747	1,177,452,331	1,171,908,397	1,174,286,532	164,607
108-10-1	Methyl isobutyl ketone	278,352,800	301,496,322	299,154,877	298,937,853	57,244
127-18-4	Tetrachloroethylene	204,820,616	168,134,033	143,541,068	139,869,528	221,631
108-88-3	Toluene	1,719,947,794	1,823,744,412	1,830,137,326	1,839,284,512	666,612
71-55-6	1,1,1-Trichloroethane	378,332,227	391,205,814	321,559,837	214,457,126	293,081
79-01-6	Trichloroethylene	279,930,467	310,246,534	303,251,257	293,960,227	161,449
	Xylenes	630,691,595	720,115,976	675,322,138	688,856,604	633,162
	Cadmium and cadmium compounds	8,693,482	8,218,495	8,289,675	8,033,341	115,133
	Chromium and chromium compounds	200,957,072	279,375,376	262,263,922	269,813,128	370,195
	Cyanides	105,445,836	84,705,161	84,944,103	85,012,350	3,508
	Lead and lead compounds	1,090,356,648	1,131,190,615	1,206,597,395	1,270,166,984	830,774
	Mercury and mercury compounds	1,925,736	1,759,849	1,576,238	1,474,553	5,299
	Nickel and nickel compounds	128,641,429	158,195,625	144,935,800	147,503,507	145,458
	Total for 33/50 Chemicals	6,889,913,396	7,292,974,082	7,131,955,496	7,147,945,943	4,493,439
	Total less 33/50 Chemicals	26,982,718,825	30,461,523,679	30,182,301,425	30,137,673,433	26,957,593
	Total for All TRI Chemicals	33,872,632,221	37,754,497,761	37,314,256,921	37,285,619,376	31,451,032

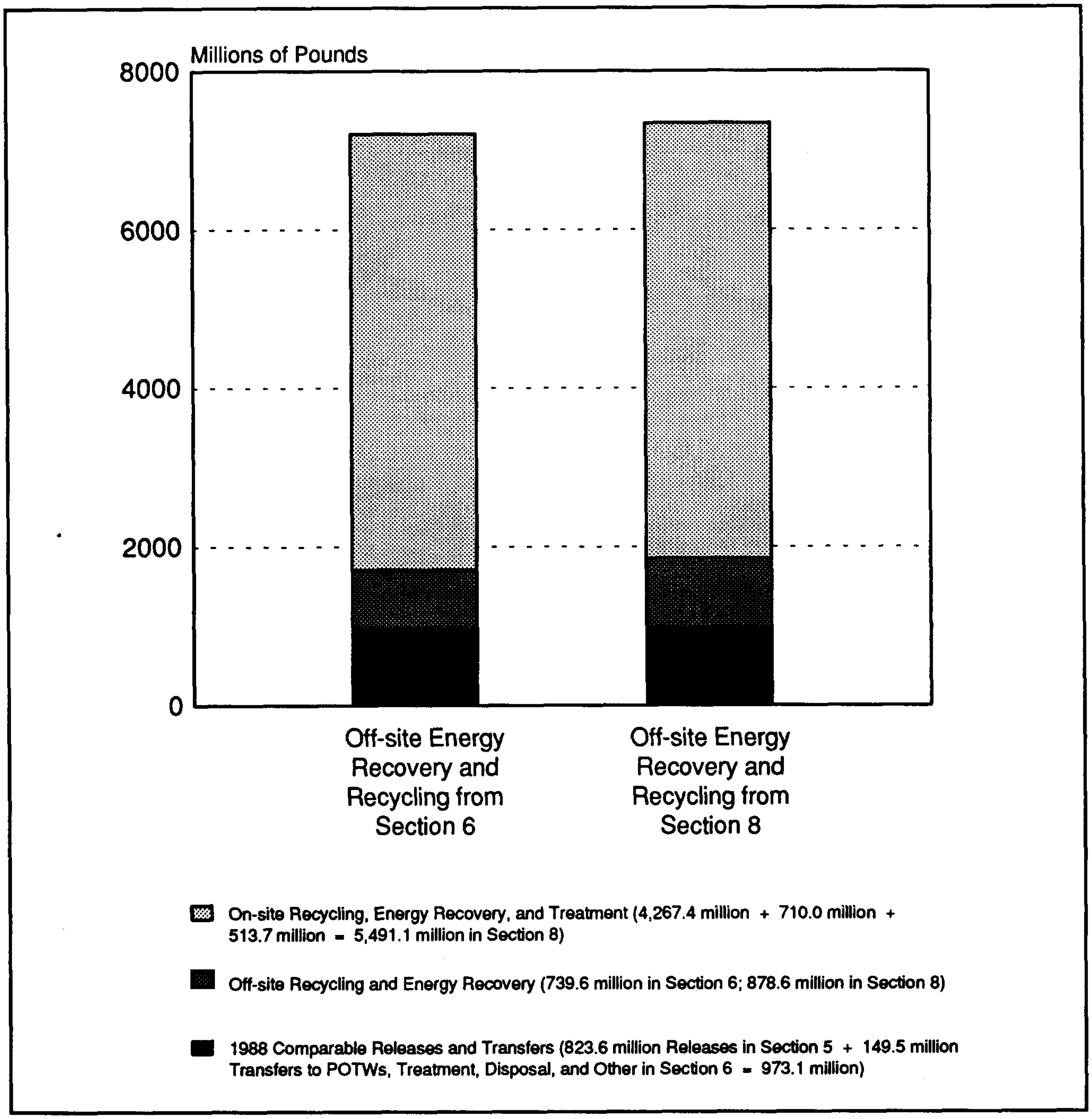

Figure 4-6. New Reporting under the Pollution Prevention Act in 1991 for 33/50 Program Chemicals.

As indicated in Figure 4-6, the 140 million pound discrepancy between Section 6 and Section 8 reporting for transfers to energy recovery and recycling, while nearly equal to the total for all other off-site transfers of 33/50 Program chemicals, is less significant in the context of total waste management for the 17 Program chemicals. More importantly, the figure illustrates that 1988-comparable releases and off-site transfers play a relatively small role in the management of 33/50 Program chemicals in wastes. When all quantities in Section 8.1 through 8.8 are summed, the total amount of 33/50 Program chemicals in wastes reported by facilities to TRI for 1991 is 7.3 billion pounds. (A similar total is developed, 50 million pounds greater, when summing the figures used from Sections 5, 6, and 8 in constructing the right bar of Figure 4-6.) The 973 million pounds of releases and transfers that are the focus of the 33/50 Program's reduction goals account for only 13% of this total.

Figures 4-7 and 4-8 present the data reported for 33/50 Program chemicals in Section 8 of Form R, aggregated by management method and chemical, respectively. The figures are provided for illustrative purposes only. No attempt has been made at this time to extract conclusions or discern patterns in the 1991 reporting at these more detailed levels. These will be the subject of future 33/50 Program progress reports, in conjunction with updates on Program participation status.

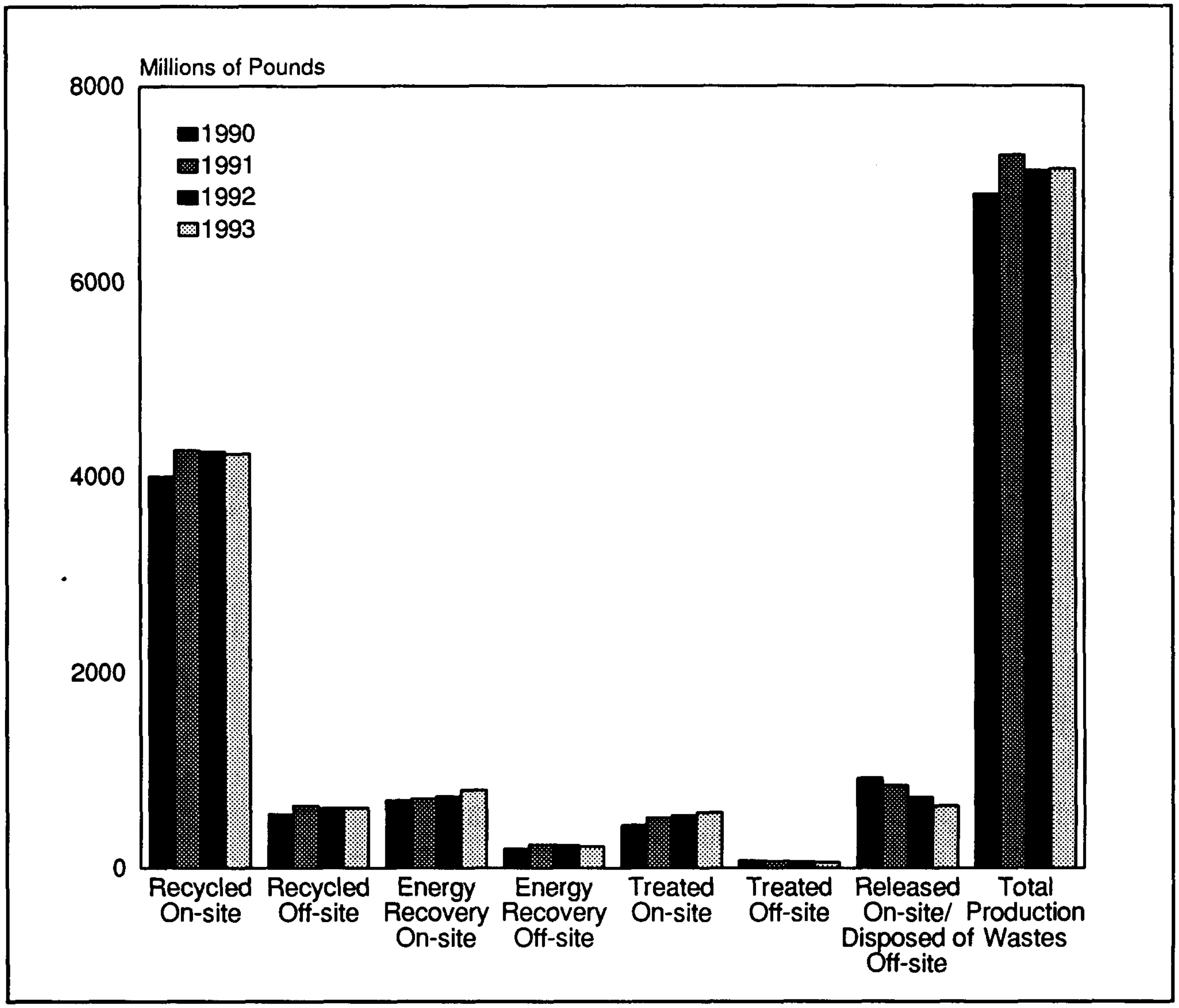

Figure 4-7. TRI Data Collected under the Pollution Prevention Act for 33/50 Program Chemicals, by Management Option, 1990 - 1993.

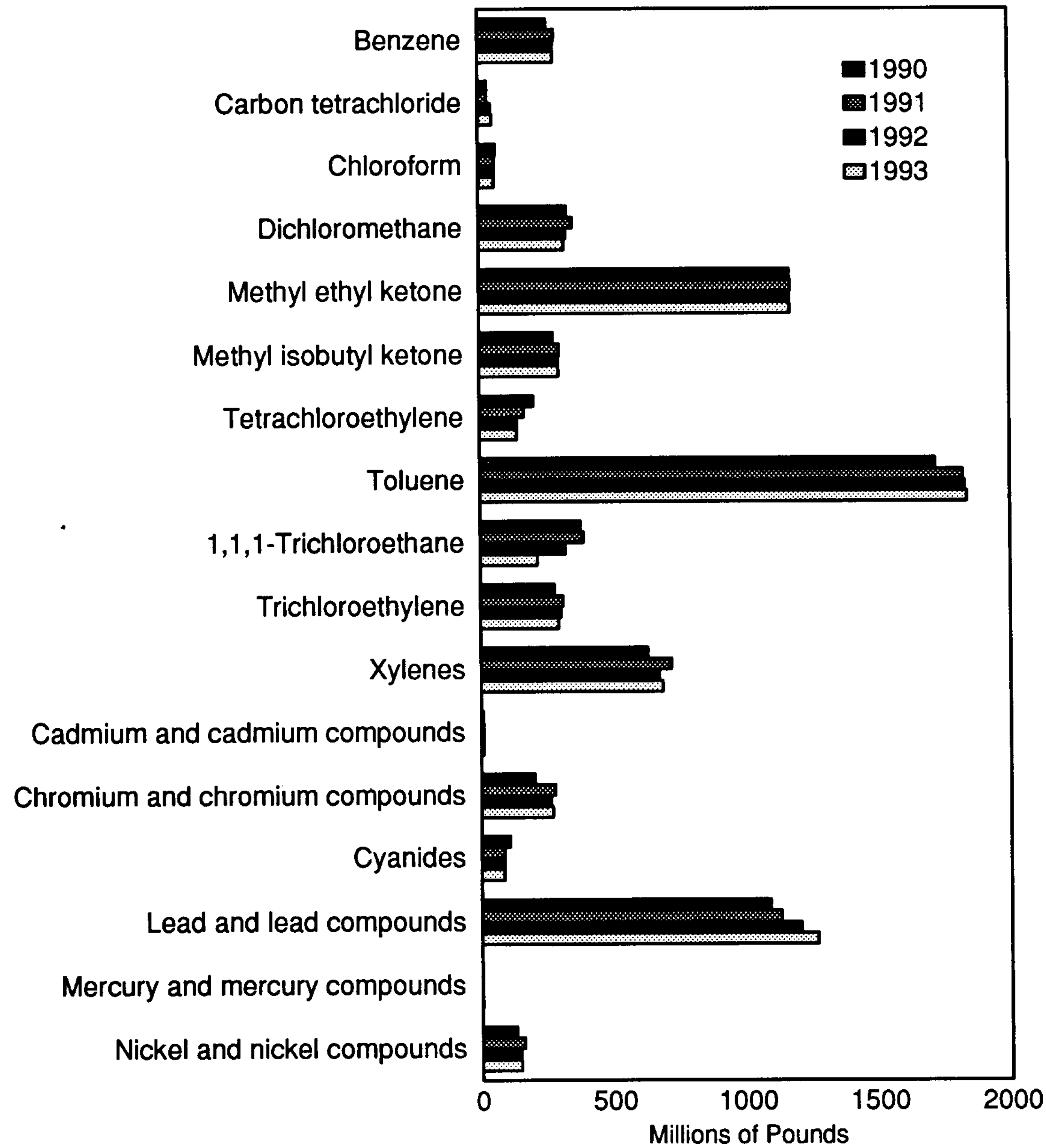

Figure 4-8. Total Production Wastes for 33/50 Program Chemicals, by Chemical, 1990-1993.

Table 4-10. Number of Forms Reporting Source Reduction, by Source Reduction Category, by Chemical, 1991.

CAS Number	Chemical	Number of TRI Forms	Forms Reporting Source Reduction Activities: Number	Forms Reporting Source Reduction Activities: Percent of All Forms
71-43-2	Benzene	480	155	32.3
56-23-5	Carbon tetrachloride	99	28	28.3
67-66-3	Chloroform	183	67	36.6
75-09-2	Dichloromethane	1,258	517	41.1
78-93-3	Methyl ethyl ketone	2,499	958	38.3
108-10-1	Methyl isobutyl ketone	1,015	382	37.6
127-18-4	Tetrachloroethylene	558	210	37.6
108-88-3	Toluene	3,794	1,475	38.9
71-55-6	1,1,1-Trichloroethane	3,563	1,590	44.6
79-01-6	Trichloroethylene	697	290	41.6
	Xylenes	3,639	1,341	36.9
	Cadmium and cadmium compounds	210	59	28.1
	Chromium and chromium compounds	2,867	578	20.2
	Cyanide compounds	308	91	29.5
	Lead and lead compounds	1,739	480	27.6
	Mercury and mercury compounds	54	12	22.2
	Nickel and nickel compounds	2,218	364	16.4
	Total for 33/50 Chemicals	25,181	8,597	34.1
	Total less 33/50 Chemicals	57,112	12,784	22.4
	Total for All TRI Chemicals	82,293	21,381	26.0

Source Reduction Reporting for 33/50 Program Chemicals

Facilities are also required to report in Section 8 of Form R any source reduction efforts that were directed toward TRI chemicals during the reporting year. Table 4-10 summarizes facilities' reporting of source reduction activities for each of the 17 33/50 Program chemicals. As a group and individually, 33/50 Program chemicals evidenced higher rates of source reduction reporting than other TRI chemicals. Of the more than 21,000 Form R's reporting that a source reduction activity was implemented during 1991, fully 40% (8,609) were for the seventeen 33/50 Program chemicals, even though Program chemicals account for only 30% of total TRI Form R's. More than a third of the Form R's for 33/50 Program chemicals reported the occurrence of source reduction, compared to slightly more than a fifth of the forms for other TRI chemicals.

Individual 33/50 Program chemicals had some of the highest rates of reporting on source reduction. The three TRI chemicals with the greatest number of Form R's reporting source reduction, and four of the top five, were 33/50 Program chemicals (1,1,1-trichloroethane, toluene, xylenes, and methyl ethyl ketone). The high ranking for 33/50 Program chemicals is partially due to the fact that they rank among the highest TRI chemicals in total number of Form R's submitted, but they also evidenced some of the highest percentages of Form R submissions indicating source reduction.

Chemical	Good Operating Practices	Inventory Control	Spill and Leak Prevention	Raw Material Modifications	Process Modifications	Cleaning and Degreasing	Surface Preparation and Finishing	Product Modifications
	Category of Source Reduction Activity (number of forms reporting)							
Benzene	47	5	121	10	98	1	0	4
Carbon tetrachloride	17	0	17	2	14	0	1	0
Chloroform	21	0	13	30	53	2	0	3
Dichloromethane	202	31	109	138	153	152	22	51
Methyl ethyl ketone	433	184	187	265	267	134	296	106
Methyl isobutyl ketone	189	64	101	90	141	42	125	53
Tetrachloroethylene	117	17	61	25	45	88	4	7
Toluene	620	243	328	420	463	157	401	173
1,1,1-Trichloroethane	678	106	192	304	302	812	119	138
Trichloroethylene	132	18	44	16	71	168	6	9
Xylenes	562	221	338	300	450	112	485	145
Cadmium and cadmium compounds	29	4	14	26	23	8	0	11
Chromium and chromium compounds	263	64	112	133	252	49	38	60
Cyanide compounds	30	11	21	16	51	14	2	2
Lead and lead compounds	222	41	91	156	199	12	16	79
Mercury and mercury compounds	3	0	1	2	7	0	0	2
Nickel and nickel compounds	192	39	86	48	195	42	9	30
Total for 33/50 Chemicals	3,757	1,048	1,836	1,981	2,784	1,793	1,524	873
Total less 33/50 Chemicals	6,209	1,562	4,235	2,113	5,246	1,300	787	925
Total for All TRI Chemicals	9,966	2,610	6,071	4,094	8,030	3,093	2,311	1,798

Sixteen 33/50 Program chemicals are among the top 35 TRI chemicals reporting source reduction. Of these, organic chemicals generally evidenced higher percentages of Form R's reporting source reduction than did the metals, ranging from 30% to 45% for the nine organic chemicals with the largest number of source reduction reports. Among the three 33/50 Program metals with large numbers of Form R's, lead came the closest to achieving a similarly high source reduction reporting rate (28%). Twenty percent of the reports for cadmium, the most frequently reported metal, indicated source reduction, as did 16.5% of the reports for nickel.

Facilities described the type of source reduction activity which they implemented for each chemical (see Table 4-10). 33/50 Program chemicals as a group did not differ significantly from other TRI chemicals in the types of activities employed. Improvement in facility operating practices is the most common approach. If, however, Form R source reduction activity categories for Cleaning and Degreasing and for Surface Preparation and Finishing are aggregated into another category, Process Modifications, Process Modifications would rank as the most frequently employed source reduction activity, particularly so for 33/50 Program chemicals.

Facilities also described the methods they employed in identifying source reduction opportunities. Table 4-11 summarizes facilities' reporting of source reduction activity identification methods for each of the 17 33/50 Program chemicals. Here again, facilities did not seem to treat Program chemicals differently than other TRI chemicals in their search for source reduction opportunities. For the most part, facilities are drawing on their own resources to investigate pollution

Table 4-11. Methods Used to Identify Source Reduction Activity, by Chemical, 1991.

CAS Number	Chemical	Number of Forms Reporting Source Reduction Activities	Pollution Prevention Opportunity Audit		Materials Balance Audit	Participative Team Management	Employee Recommendation	
			Internal	External			Informal	Formal Program
71-43-2	Benzene	155	71	16	14	37	19	14
56-23-5	Carbon tetrachloride	28	10	0	4	13	7	6
67-66-3	Chloroform	67	28	1	8	36	7	8
75-09-2	Dichloromethane	517	194	20	82	214	96	50
78-93-3	Methyl ethyl ketone	958	350	45	131	456	206	98
108-10-1	Methyl isobutyl ketone	382	149	19	53	183	76	45
127-18-4	Tetrachloroethylene	210	93	14	23	96	39	19
108-88-3	Toluene	1,475	512	76	178	650	289	143
71-55-6	1,1,1-Trichloroethane	1,590	680	87	197	690	306	212
79-01-6	Trichloroethylene	290	120	9	37	120	68	28
	Xylenes	1,341	529	62	149	573	290	115
	Cadmium and cadmium compounds	59	21	3	9	29	15	9
	Chromium and chromium compounds	578	212	24	75	253	110	47
	Cyanide compounds	79	35	6	12	41	14	7
	Lead and lead compounds	480	183	31	54	223	101	50
	Mercury and mercury compounds	12	5	2	1	4	2	3
	Nickel and nickel compounds	364	138	13	57	169	85	30
	Total for 33/50 Chemicals	8,585	3,330	428	1,084	3,787	1,730	884
	Total less 33/50 Chemicals	12,796	4,878	556	1,549	5,793	2,590	1,288
	Total for all TRI Chemicals	21,381	8,208	984	2,633	9,580	4,320	2,172

prevention options, either by conducting formal audits (Pollution Prevention Opportunity Audits or Materials Balance Audits) or by developing ideas from management teams and employees. The 33/50 Program is built on the premise and promise of forging partnerships to achieve pollution prevention, and companies appear to be relying heavily on partnerships with their employees and managers in seeking source reduction opportunities.

Where facilities have sought outside assistance in identifying prevention opportunities, material/product/process vendors are the dominant choice. Facilities report little reliance on state and Federal programs for assistance in their source reduction endeavors. This may be a consequence of the fact that most government pollution prevention assistance programs are in their infancies. But the heavy reliance on internal resources suggests that familiarity with facility-specific conditions is critical to successful identification of source reduction opportunities.

Chemical	State Program	Federal Program	Trade/ Industry Program	Vendor Assistance	Other	Number of Forms	Percent of Total Forms
Benzene	3	1	7	17	57	256	0.7
Carbon tetrachloride	0	0	0	3	5	48	0.1
Chloroform	0	0	10	7	18	123	0.3
Dichloromethane	6	4	26	117	104	913	2.4
Methyl ethyl ketone	11	5	81	299	145	1,827	4.8
Methyl isobutyl ketone	11	3	35	107	68	749	1.9
Tetrachloroethylene	2	1	21	49	37	394	1.0
Toluene	23	8	110	466	271	2,726	7.1
1,1,1-Trichloroethane	21	13	111	443	197	2,957	7.7
Trichloroethylene	6	1	11	76	51	527	1.4
Xylenes	21	4	99	458	243	2,543	6.6
Cadmium and cadmium compounds	1	0	3	17	10	117	0.3
Chromium and chromium compounds	7	4	45	132	110	1,019	2.7
Cyanide compounds	1	1	4	19	21	161	0.4
Lead and lead compounds	8	0	31	90	124	895	2.3
Mercury and mercury compounds	0	0	1	2	3	23	0.1
Nickel and nickel compounds	5	0	21	77	62	657	1.7
Total for 33/50 Chemicals	126	45	616	2,379	1,526	15,935	41.5
Total less 33/50 Chemicals	124	45	775	2,532	2,349	22,479	58.5
Total for all TRI Chemicals	250	90	1,391	4,911	3,875	38,414	100.0

Looking to the Future: An Agenda For Action

The 33/50 Program faces an ambitious agenda as it enters its third year. Despite the evidence that the Program's 1992 interim 33% reduction goal has been achieved a year early, efforts to expand company participation will continue. In addition to the reduction goals, the 33/50 Program strives to promote the benefits of pollution prevention as widely as possible throughout American industry. Accordingly, industry trade associations are being asked to assist EPA in convincing smaller companies to participate. The Program's communications with all companies include challenges to exceed their initial goals and stress the concept of continuous improvement.

Increasing attention is also being directed toward recognizing companies' environmental improvements. The Agency is examining options for following up on the Program's popular Certificates of Appreciation (sent to all Program participants) with a mechanism to recognize companies when they achieve their reduction goals. A 33/50 Awards Program is in development, which is intended to salute companies that excel in protecting the environment by preventing pollution at its source. EPA also is considering conducting a national 33/50 Program conference to show-case the accomplishments of the Program's company, state, and community partners.

Finally, preparations are underway to commence evaluating the Program's success formally by using the expanded pollution prevention data reported in facilities' 1991 and subsequent TRI reports. As detailed in the preceding pages, the 1991 TRI data suggest exciting developments to date. However, important issues remain that require in-depth analysis, including assessing the actual role played by 33/50 Program in bringing about reported reductions in facilities' releases and transfers of the target chemicals. The new TRI data provide profiles of facilities' waste management patterns that will be useful to government, the public, and the reporting industries themselves. They provide a mechanism to promote planning for reductions in pollution and bench marks against which to measure the success of prevention initiatives.

For More Information

The 33/50 Program has issued three public Progress Reports to date, the most recent having been released in March, 1993. Anyone interested in obtaining additional information about the 33/50 Program can do so by contacting EPA at (202) 260-6907 or directing letters to Mail Code TS-799, Office of Pollution Prevention and Toxics, U. S. EPA, 401 M Street SW, Washington, DC 20460. Written communications from companies are maintained in a publicly available 33/50 Program Administrative Record. Copies of company communications and computer generated lists of participating companies are available upon request.

Information about the 33/50 Program can also be obtained from 33/50 Program Coordinators in EPA's ten Regional Offices.

Note

(a) Submission of prior year (1990) data was optional in this first year of reporting. Data for 1992 and 1993 were estimated projections by the facilities submitting Form Rs for the 1991 reporting year. They do not represent reported totals for the 1992 or 1993 reporting years (Tables 4-5 through 4-9).

Appendices


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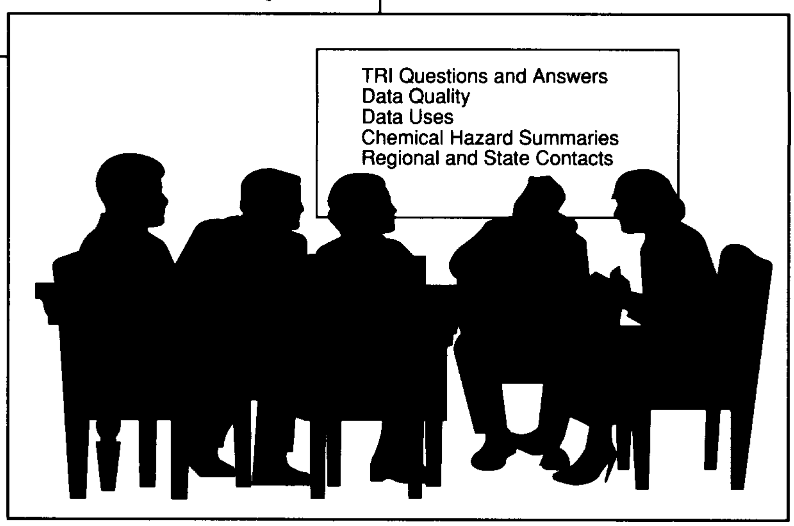
TRI Questions and Answers
Data Quality
Data Uses
Chemical Hazard Summaries
Regional and State Contacts

QUESTIONS AND ANSWERS ABOUT THE 1991 TOXICS RELEASE INVENTORY (TRI) DATA

GENERAL AND CROSS-MEDIA QUESTIONS AND ANSWERS

Q Why are these data collected?

A The Toxics Release Inventory is mandated by the "Emergency Planning and Community Right-to-Know Act" (EPCRA), signed by the President in October 1986. The law is based on the premise that citizens have a right to know about chemicals in their communities. It has two main purposes: to encourage planning for response to chemical accidents; and to provide the public and the government information about possible chemical hazards in their communities. The law requires the establishment of State Emergency Response Commissions and Local Emergency Planning Committees to collect detailed information from local facilities.

Section 313 of EPCRA requires certain manufacturers to report to the U.S. Environmental Protection Agency (EPA) and to the states the amounts of over 300 toxic chemicals and 20 chemical categories that they release directly to air, water, or land; or inject underground; or transfer to off-site facilities. In addition, the law specifies that the EPA must compile these reports into an annual inventory of releases and transfers—the Toxics Release Inventory (TRI) —and make the inventory available to the public by computer telecommunication and other means on a cost-reimbursable basis.

In October of 1990, the Pollution Prevention Act (PPA) was passed by Congress. Section 6607 of the PPA requires, beginning with the 1991 reporting year, that TRI facilities include their pollution prevention and waste management practices on their Toxic Chemical Release Inventory Reporting Form R submitted to EPA and the states. The collection of these data will help track facilities' progress in reducing not only releases of toxic chemicals to the environment, but also the quantities of the chemicals in other waste streams.

Q Are Federal facilities required to report under section 313 of EPCRA?

A Government-owned and contractor-operated facilities (known as GOCOs) are currently covered and do report. Government-owned and government-operated facilities (GOGOs) are not required to report by law, but some have reported voluntarily and others plan to report in the future. For example, the Department of Energy will voluntarily submit reports to EPA and the States for all their facilities starting on July 1, 1994.

On April 21, 1993, the President announced that he will issue an Executive Order requiring federal facilities (GOGOs) to comply with the federal Right-to-Know laws. He has also asked all federal facilities to set a voluntary goal of 50% reduction of their releases of toxic pollutants by 1999.

Q Who must report?

A Manufacturing facilities (those in Standard Industrial Classification codes 20-39) with ten or more employees are required to file toxic chemical release reports if they manufacture or process more than 25,000 pounds of any of the reportable chemicals or use more than 10,000 pounds of any reportable chemicals.

Q What is the compliance rate with this reporting requirement?

A EPA does not have any specific data on 1991 compliance with the law. However, a confidential survey of facilities conducted in the summer of 1989 estimated compliance for 1987 to be approximately 66%. That is, for every 100 facilities that should have filed a Form R, approximately 66 did file at least one report.

The survey estimated that there were approximately 148,000 facilities in SIC codes 20-39 with 10 or more employees in 1987. Of those facilities, an estimated 29,800 met the chemical thresholds and therefore were required to file at least one report in 1987. Of the 29,800 facilities that needed to report, only about 19,600 did file a report, leaving approximately 10,000 facilities out of compliance in 1987. This survey only identified facilities that failed to file any reports at all. Additional facilities may have been out of compliance because they filed for some but not all chemicals they needed to file for, or because their estimates were inaccurate.

Q How was the list of chemicals subject to section 313 reporting created?

A The list of chemicals subject to section 313 reporting was given to EPA by Congress. The Congressional list was derived from separate lists from the states of New Jersey and Maryland. The criteria for chemicals on the Maryland and New Jersey lists differ from the criteria established under section 313. For instance, the Maryland list is a survey list and consists of chemicals that are noted for toxicity and/or high volume activities in that state. As a result of these differences in listing criteria, a number of chemicals have been added to the section 313 list that were not on the original state lists. Also, a number of chemicals have been deleted from the section 313 list of toxic chemicals because EPA determined that they did not meet any of the criteria for listing.

Under EPCRA section 313, anyone can petition EPA to add a chemical(s) to, or delete a chemical(s) from the list of chemicals.

EPA has developed criteria and is currently refining the process for reviewing the section 313 list of chemicals. The result of this exercise will allow EPA to more effectively add chemicals to and delete chemicals from the list. This will result in reporting releases on chemicals that meet the intent of section 313.

Q What are the criteria for listing a chemical under section 313 of EPCRA?

A For a chemical or chemical category to be kept on or added to the section 313 list, it must be known to cause or can reasonably be anticipated to cause one of the following:

- significant adverse acute health effects at concentration levels that are reasonably likely to exist beyond facility boundaries as a result of continuous, or frequently recurring, releases.
- in humans - cancer; teratogenic effects; or serious or irreversible reproductive dysfunction, neurological disorders, heritable genetic mutations, or other chronic health effects.
- because of its toxicity, its toxicity and persistence in the environment, or its toxicity and tendency to bioaccumulate in the environment, a significant adverse effect on the environment of sufficient seriousness to warrant release reporting under EPCRA section 313.

Q What chemicals have been added to the section 313 list?

A EPA added to the list nine chemicals that were subject to reporting for the 1990 reporting year. These chemicals were added to the list for cancer and chronic toxicity concerns. These chemicals are:

Allyl alcohol
Creosote
2,3-Dichloropropene
m-Dinitrobenzene
o-Dinitrobenzene
p-Dinitrobenzene
Dinitrotoluene (mixed isomers)
Isosafrole
Toluene diisocyanate (mixed isomers)

As a result of a petition submitted by three governors and the Natural Resources Defense Council, EPA also added to the list seven chlorofluorocarbons (CFCs) and halons that are subject to reporting beginning with the 1991 reporting year. These chemicals were added because they are stratospheric ozone depleters. Depletion of the ozone can lead to adverse human health and environmental effects. These chemicals are:

- Bromochlorodifluoromethane (Halon 1211)
- Bromotrifluoromethane (Halon 1301)
- Dibromotetrafluoroethane (Halon 2402)
- Dichlorodifluoromethane (CFC-12)
- Dichlorotetrafluoroethane (CFC-114)
- Monochloropentafluoroethane (CFC-115)
- Trichlorofluoromethane (CFC-11)

Q What chemicals have been deleted from the EPCRA section 313 list?

A The following chemicals have been deleted from the EPCRA section 313 list of toxic substances:

Titanium dioxide	Melamine
Color Index (C.I.) Acid Blue 9 disodium salt	Sodium hydroxide (solution)
C.I. Acid Blue 9 diammonium salt	Sodium sulfate (solution)
Terephthalic acid	C.I. Pigment Green 7 (a copper compound)
C.I. Pigment Blue 15 (a copper compound)	C.I. Pigment Green 36 (a copper compound)

EPA modified the listing for aluminum oxide to cover only fibrous forms of the chemical.

Q Is EPA planning to expand the number of chemicals covered by EPCRA section 313?

A EPA is reviewing information on various chemicals for addition to EPCRA section 313. EPA plans to initiate rulemaking by the end of 1993 to expand the EPCRA section 313 chemical list.

Q What is the status of EPCRA section 313 petitions to date?

A EPA has responded to and is currently working on many petitions to modify the EPCRA section 313 list of toxic chemicals. The following is a summary of section 313 petition decisions to date.

EPCRA Section 313 Petitions

Status as of April 16, 1993

Chemical	Action Requested	Status
Acetone	Delist	Pending
Aluminum oxide (non-fibrous)	Delist	Granted
Ammonium sulfate (solution) (1)	Delist	Proposed
Antimony tris(iso-octyl)-mercaptoacetate	Delist	Denied
Barium sulfate	Delist	Proposed
Butyl benzyl phthalate	Delist	Proposed
Cadmium selenide	Delist	Denied
Cadmium sulfide	Delist	Denied
CFC-11 (2)	List	Granted
CFC-114	List	Granted
CFC-115	List	Granted
CFC-12	List	Granted
Chromium (III) compounds	Delist	Denied
C.I. Acid Blue 9 (3) disodium and diammonium salts	Delist	Granted
C.I. Pigment Blue 15	Delist	Granted
C.I. Pigment Green 36	Delist	Granted
C.I. Pigment Green 7	Delist	Granted
Cobalt and compounds	Delist	Denied
Copper mono-chlorophthalocyanine	Delist	Pending
Cyclohexane	Delist	Denied
Chromium antimony titanium buff rutile	Delist	Denied
Decabromodiphenyl ether	Delist	Denied
Di-n-Octyl phthalate	Delist	Proposed
Diethyl phthalate	Delist	Withdrawn
Ethylene	Delist	Denied
Halon 1211	List	Granted
Halon 1301	List	Granted
Halon 2402	List	Granted
Hydrochlorofluorocarbons	List	Proposed
Hydrochloric acid	Modify	Pending
Inorganic Fluorides	List	Denied
Iron Chromite	Delist	Withdrawn
Manganese and compounds	Delist	Denied
Melamine	Delist	Granted
Methyl ethyl ketone	Delist	Withdrawn
Methyl isobutyl ketone	Delist	Withdrawn
Molybdenum trioxide	Delist	Withdrawn
Nickel and compounds	Delist	Denied
ortho-Phenylphenol	Delist	Denied
Phosphoric acid	Delist	Withdrawn
Phosphoric acid	Delist	Pending
Phthalic anhydride	Delist	Withdrawn
Propylene	Delist	Denied
Sodium hydroxide (solution)	Delist	Granted
Sodium sulfate (solution)	Delist	Granted
Sulfuric acid	Delist	Denied
Sulfuric acid	Modify	Proposed
Terephthalic acid	Delist	Granted

Titanium dioxide	Delist	Granted
Trifluralin	Delist	Withdrawn
Zinc borate hydrate	Delist	Denied
Zinc sulfide	Delist	Denied
82 RCRA Chemicals (4)	List	Proposed

(1) The ammonium sulfate (solution) proposed deletion will not result in a loss of reporting, but rather in more focused reporting. The ammonium moiety will be reportable as (aqueous) ammonia, which is listed on EPCRA section 313.
(2) CFC = Chlorofluorocarbon
(3) C.I. = Color Index
(4) EPA is proposing to add either the 70 chemicals that meet the toxicity criteria or the 22 chemicals that meet the toxicity criteria and are produced in quantities greater than 25,000 pounds.

Q In the future, does EPA plan to widen the scope of sources required to report under EPCRA section 313?

A EPA is in the process of identifying non-manufacturing industries associated with significant chemical releases to determine their suitability for TRI reporting. At this time, a phased expansion is expected, with additions to the list of toxic chemicals to be proposed first and additional facilities to follow.

Q In addition to the Pollution Prevention Act (PPA) of 1990, has there been any other Congressional action taken regarding TRI?

A In addition to the PPA, Congress has sought to modify the TRI in other ways as well. For example, in the 102nd Congress, a number of bills were introduced connected with RCRA reauthorization that would have added industries not currently covered (including Federal facilities), added additional chemicals, and required facilities to develop toxics use reduction plans. While none of the bills became law, new TRI provisions could be introduced separately in the 103rd Congress or could be attached to any of a number of legislative vehicles.

Q Has the Agency received any petitions to modify the TRI in ways other than by adding or deleting chemicals?

A Yes. For example, the Small Business Administration has requested EPA to exempt small source reports (i.e., an exemption for facilities that have low release/transfer amounts). The petition and request for public comments were published in the Federal Register in October of 1992. The Agency is currently reviewing the petition and the comments received.

Q Can releases of these chemicals be prevented?

A Much can be done to prevent the EPCRA section 313 chemicals from entering wastes and, thus, to reduce the amount ultimately released to the environment. One effect of the national availability of data on releases of toxic chemicals has been increased scrutiny by facilities, local communities, and state and federal governments with an eye to reducing releases. Using the new TRI data as a tool, EPA will be tracking year-to-year trends in release and pollution prevention data. All reporting facilities must provide EPA with information on what, if any, source reduction activities they implemented. Also, many states have established Pollution Prevention and Toxics Use Reduction programs.

Currently, over 1,000 parent companies have signed on to the 33/50 Program, a voluntary program with a national goal of a 33% reduction in releases and transfers of 17 EPCRA section 313 chemicals and a 50% reduction in 1995. These facilities have already either committed to plans to reduce releases of toxic chemicals over the next few years or have implemented changes which will reduce their releases in future years.

EPA's Office of Pollution Prevention and Toxics is leading an Agency-wide effort to promote reduction in the quantity of wastes generated, not just by manufacturing industries, but by other sectors of the economy as well.

For more information on EPA's pollution prevention initiatives, see the "Pollution Prevention Act Data" and "33/50 Program" chapters in this document.

Q What caused the big decrease in ammonium sulfate (solution) releases to water and discharges to POTWs from the 1989 reporting year?

A Facilities that manufacture, process, or otherwise use ammonium sulfate (solution) were given the option of reporting their releases and transfers either as ammonium sulfate (solution) or as ammonia. Therefore many facilities filed reports for ammonia instead of ammonium sulfate in 1989. Every pound of ammonium sulfate decrease from these facilities is partially offset by an increase of 0.27 pounds of ammonia, since ammonium sulfate is 27% ammonia and 73% sulfate, by weight.

EPA believes that reporting releases of aqueous solutions of ammonium salts, such as ammonium sulfate, as ammonia more properly represents the substance of concern. Ammonium sulfate (solution) primarily affects water quality by the introduction of ammonia to a water body. EPA has low concern for sulfate as evidenced by its deletion of sodium sulfate (solution) from EPCRA section 313.

Q It has been said that making direct comparisons of the TRI releases and transfers across years is difficult to do. Why?

A There are many factors that may affect cross-year comparisons of releases and transfers at the state, local, chemical, or even facility-specific level. For example, the list of chemicals subject to reporting has changed and thresholds for reporting for manufacturers and processors has been lowered from 75,000 pounds in 1987 to 50,000 pounds in 1988 to 25,000 pounds for 1989 and beyond. These changes alter the number of facilities that are required to report as well as the number of forms submitted under section 313. In addition, many other facility-dependent factors make assessing releases and transfers across years difficult. Facilities may change their methods of making estimates of their releases and transfers of toxic chemicals (hopefully, towards more accurate estimates). Chemicals not subject to section 313 reporting may be substituted for covered chemicals. The amount of a chemical manufactured, processed, or used at a facility may be drastically different from year to year. Facilities may change products or processes that may affect which chemicals and how much of these chemicals are manufactured, processed, or used. Production of a covered chemical may be up or down for a given year. These factors and more make yearly comparisons difficult. This subject is discussed further in Chapter 3 of this document.

Q Are the 1991 release data compared to the current 1990 release data or to the 1990 data presented last spring?

A For purposes of comparison, EPA uses the current data for the 1990 reporting year, which differ from the data presented last spring because of late submissions, revisions, and withdrawals. Over time, the 1991 data will also change somewhat for the same reasons.

Q How much do changes in estimation techniques used by facilities affect facilities' release and transfer estimates?

A EPA conducted a study assessing the reasons for changes in estimates for approximately 1,200 facilities from 1989 to 1990. Fifteen percent of the reports evaluated had estimation method changes that accounted for at least part of the release estimate change. The study found that 7% of the total increased quantity and 5% of the total decreased quantity, and about 3% of net change in quantities were due to changes in measurement or estimation techniques.

Q Why is there such variability in release and transfer quantities? Facilities in the same business reported different numbers; are these differences real?

A There are many reasons for variability. For example, facilities in the same business may use very different processes (e.g. 5 or 6 major pulping/papermaking processes exist in the U.S.) and may have very different production levels or capacities (50 to 1,500 tons of paper per day). One facility may treat waste on site, while a similar facility may transfer the same waste off-site for treatment. Some facilities simply have more efficient production processes, resulting in fewer releases and reduced waste. Even if two facilities generated the same quantity of waste, their reported releases and transfers could be quite different. For example, differences in type of pollution treatment controls and recycle practices utilized by facilities can lead to differences in reported releases and transfers.

A large difference may come from the ability of individual facilities to accurately estimate releases and transfers, which depends on the data and expertise available.

Q What can I do to reduce TRI releases in my community?

A A first step in encouraging release reductions is developing a full picture of releases to your community from the reporting facilities. Contact the facility or facilities and ask them for more information on their TRI releases, pollution prevention, and worker safety programs. Because of the new PPA data collected for the 1991 year, Form R submissions can be used to see if facilities in your community are implementing source reduction programs and to determine what effect the programs are having. Establishing and continuing a positive dialogue with facilities on potential release reduction activities can promote risk reductions. Discuss your concerns with local, state, and EPA officials, and encourage them to pursue pollution prevention initiatives with these facilities. These officials have more information that they can make available to you so you can develop a better understanding of environmental situations where you live. Organize a neighborhood citizen organization, contact existing public interest groups, and work together as a coalition to seek pollution prevention and risk reduction.

These are just a few examples of some of the hundreds of ways the TRI could serve and has served as a pollution prevention and release reduction tool. For more information on how TRI has been used, see the TRI Data Use section contained in this information package.

Q Has EPA looked at TRI facilities and releases on Indian tribal lands?

A Yes. EPA cross-referenced tribal land boundaries with the 1989 TRI reports and found that there were 303 facilities who reported being on or with three kilometers of tribal lands. The total reported releases and transfers were 34.6 million pounds (0.6% of the total TRI releases and transfers reported for 1989).

POLLUTION PREVENTION QUESTIONS

Q When will EPA publish the final Form R including the new PPA data elements?

A The Form R data elements and reporting policy issues are currently under review by the Toxics Data Reporting Subcommittee of the National Advisory Council for Environmental Policy and Technology (NACEPT). NACEPT is an independent advisory council that provides advice to EPA on environmental issues. EPA does not expect to issue a final rule covering integration of the source reduction and recycling data until September 1994. Industry will continue to use the Form R that was approved May 14, 1992 until a new form is issued.

Q The Form R expiration date says 11/92. Is the Form R valid or will it be changed for reporting year 1992?

A November 1992 was the expiration date given by OMB when they approved the form on May 19, 1992. However, due to the passage of the Pollution Prevention Act Implementation provisions of the 1993 Appropriations Act, the Agency can continue to use this Form R until revisions are promulgated by law. Therefore, even though the expiration date shown on the Form R has passed, this Form R is still valid and should be used for all 1992 submissions.

Q Why don't the totals reported for off-site transfers for energy recovery, recycling, and treatment for one part of the Form R equal the quantities of chemicals reported for energy recovery off-site, recycling off-site, and treatment off-site in another part? Do these represent different quantities? Why are the data reported in two places on the Form R?

A Differences in the data may be due to different interpretations on the part of the reporting facilities, that are caused by unfamiliarity with the new data elements. One part of the Form R (section 8) contains the aggregate quantities undergoing each type of on-site or off-site waste management practice, as required by the PPA. Another part of Form R, Section 6.2, contains the same off-site quantity, but is reported by off-site location and listed by specific type of each waste management practice. EPA will build on the experience gained from the 1991 reports to develop final guidance for the facilities.

Q How will EPA use the future year's estimates? What if actual estimates differ from the projected estimates?

A EPA will use the future estimates data as an indicator of potential future trends in waste management. These projections are just that—projections. They do not represent a commitment or an enforceable quantity.

Q How are the releases reported in the "Source Reduction and Recycling Activities" section of the Form R different from those reported in the "Releases of the Toxic Chemical to the Environment On-Site" section?

A The first quantity can differ from the second release total in two basic ways. It includes any quantity sent off-site for disposal, whereas the second does not. The first should not include any quantity associated with catastrophic, remedial, or one-time events that are non-routine. Such quantities would be reported as part of the second if released into the environment at the facility.

Q Why are the off-site energy recovery, recycling, and treatment data characterized differently from these same activities on-site?

A The difference in how the data are characterized is due primarily to what the facility is likely to know. For example, a facility is likely to be able to estimate the amount of chemical recovered by on-site recycling processes because this is an activity under their control The facility is less likely to know this "recovered" amount for an activity occurring off-site and not under their control. What they will know, however, is how much of the chemical they sent off-site *for the purpose* of recycling. This same difference in knowledge and data characterization applies to on-site versus off-site treatment. The facility can estimate amounts destroyed by their treatment processes, but will only know the amount sent off-site for the purpose of treatment.

Q Why are the quantities reported in the "Source Reduction and Recycling Activities" section mutually exclusive of one another?

A These quantities are designed to be added up to a total amount of TRI chemical in wastes (exclusive of catastrophic, remedial, or one-time non-production related releases). To accomplish this, the individual quantities undergoing each type of waste management activity must be mutually exclusive. Any double or multiple counting of an amount of the reported TRI chemical in waste will inflate the actual total.

Q Why are catastrophic releases reported separately?

A The values reported in the "Source Reduction and Recycling Activities" section are intended to provide a window into what opportunities exist for the facility to apply pollution prevention. The catastrophic releases are reported separately because they cannot be predicted and are generally not amenable to pollution prevention efforts.

Q Why are the recycling numbers so large?

A The recycling numbers are certainly large in comparison with amounts of the toxic chemical reported on Form R reports prior to 1991. The size of these new amounts is not, however, unexpected. Quantities recycled are likely to be much larger than release quantities because the purpose of recycle is to recover/reuse the chemical for further economic benefit. Unlike the release amounts, which leave the process one time only, the recycled amounts may be estimated based on the total number of times an amount is recovered and put back into the process.

Q What is the purpose of the production index?

A The production index is intended to put the reported data in context so that the data user can better assess progress in pollution prevention. The index can help determine if decreases in reported releases are largely the result of changes in business activity or the result of source reduction efforts or other factors.

Q How is a chemical that is treated and then disposed of reported in the "Source Reduction and Recycling Activities" section of the Form R?

A The amount of a chemical treated on-site is reported as the amount destroyed by that treatment. Any amount not destroyed (the balance) is to be reported as an amount "released" (including transferred off-site for disposal).

Q Does EPA plan to review the quality of the new data reported on the Form R?

A EPA plans to institute computerized review of the new data, primarily to check potential data discrepancies between different sections of the form.

Q Almost a million pounds of various metals and metal compounds have been reported as transferred to energy recovery. Can metal compounds be used for energy recovery?

A No. These reports were made in error and will be the subject of future Notices of Technical Error to be issued by EPA. They may represent metal compounds in waste solvents that were sent to an energy recovery unit. EPA's instructions cite metals as an example of the type of chemicals that should not be reported as undergoing energy recovery.

Q About 80 million pounds of toluene were reported as burned off-site for energy recovery in 1991. Does any of the toluene get released to the environment as a result of this?

A Energy recovery processes are not 100% efficient. Therefore, some amount of the toluene is likely to be released, either as un-combusted material or as fugitive releases from the handling of the toluene-containing material prior to combustion.

Q What is the difference between energy recovery and incineration?

A Both incineration and energy recovery involve combustion of a toxic chemical in a waste. However, they have different purposes. Energy recovery is combustion occurring in a boiler, kiln, or industrial furnace in which the heat from the combustion is used to generate steam or heat other materials in a manufacturing process. Incineration is combustion whose primary purpose is destruction of the toxic chemical.

Q How are the 1991 data elements collected by EPA different from those stated in the PPA?

A Facilities do not report the "quantity entering any waste stream prior to recycling, treatment, or disposal" as stated in the PPA. This number will be derived by EPA by adding up the individual quantities that were reported as released, used for energy recovery, treated, and recycled. This total number will be available in the public database for each chemical reported by a facility. Energy recovery, not discussed in the PPA, has aspects of both recycling and waste treatment, and is reported separately rather than included as part of the treated or recycled quantity. Instead of reporting the percent changes of quantities from the prior year and for the next two years, the Form R collects the actual prior year quantity and the estimated two future years quantities in pounds per year. Quantities treated, recycled, or undergoing energy recovery are reported separately by whether they occur on-site or off-site.

Q Will 1992 TRI reporting be different from 1991 TRI?

A The 1992 TRI reporting will use essentially the same Form R and instructions as for the 1991 reporting.

Q What is the Office of Pollution Prevention and Toxics (OPPT) doing to reduce TRI releases?

A OPPT is using TRI data to help target activities, chemicals, facilities, and industry categories that are of high concern. The Pollution Prevention Policy Council's initiative, "Source Reduction Review Project," is one example where the TRI data were used as a screening tool to identify a group of industrial categories as long-term targets of opportunity. As a part of this project, OPPT is working with other program offices to incorporate prevention into their programs, through regulation where feasible and through guidance and voluntary efforts. OPPT is also working with industry (usually through trade associations) to raise awareness of the benefits of pollution prevention. OPPT also conducts training programs that help orient government and industry toward pollution prevention and incorporate prevention into what they do. A state grants program is available to help states develop pollution prevention programs. OPPT and the Office of Research and Development have developed a clearinghouse that provides information on pollution prevention for industry, government and public interest groups to use in encouraging and implementing prevention.

Q The quantity of certain chemicals released (at a particular facility or nationwide) is decreasing. What does this mean?

A The TRI database does not include a specific explanation of the reason for changes in quantity. The new TRI data can give some indication of whether changes are due to shifting of chemicals off-site for energy recovery or recycling, decrease in economic activity or production levels, or source reduction. However, other factors may also cause changes such as substitution of one chemical (that may or may not be in TRI) for another, changes in accounting or estimation techniques, and other reasons. A recently completed study by OPPT examined how some of the above factors contributed to changes in releases and transfers between 1989 and 1990. The study found that source reduction was a significant factor in explaining some of the changes. However, fluctuations in production were more frequently cited than changes due to source reduction for individual facilities' increases and decreases. This is an important consideration because measuring progress in source reduction must also take into account production changes. The results of this study will be used to further develop methods to assess changes over time using the source reduction and recycling data from the 1991 reporting year.

Source reduction is too complex to be captured by only one measure. These new data collected on Form R will help EPA better evaluate release trends and will also be critical in developing a comprehensive understanding of the effects of pollution prevention activities. The data provide EPA a more comprehensive view of waste management practices. They shift the focus from releases to movement up the waste management hierarchy.

Exposure and Health Effects Questions

Q Where can I find out more about the toxic properties of the EPCRA section 313 chemicals and their potential to cause adverse human health and environmental effects?

A EPA has prepared 319 fact sheets that will help the public understand the potential health and ecological effects of exposure to chemical releases identified in the Toxics Release Inventory. Fact Sheets for most of the section 313 chemicals are available from EPA Regional Offices, State Emergency Response Commissions, and state Section 313 Contacts. You should be aware that determining the health and ecological effects of chemicals is a very complicated process. Most chemicals have not been tested for toxicity in a comprehensive manner. As further scientific information is acquired, additional information will be made available. The fact sheets are also available on the National Library of Medicine's TOXNET system, CD-ROM, and computer diskette. PC TRIFACTS is available from USEPA, Cathy Cain, 26 W. Martin Luther King Drive, Cincinnati, OH 45242.

Q How much of these chemicals am I exposed to?

A Estimating exposure based on release quantities requires an analysis of chemical and site-specific characteristics. There is no simple conversion of release quantity to concentration in the environment or dose received by individuals.

Natural environmental processes can: transform the chemical (e.g., sunlight decomposes some chemicals); transfer it from one medium to another (e.g. water to air); or concentrate it (e.g. bioaccumulation of the chemical in fish). Concentration in the environment can depend on the volume of water in the receiving stream into which the chemical is released; dispersion of air releases as a function of local meteorological conditions; the height from which the release occurs; integrity of landfill liners or other containment of disposed materials; and many other factors. Finally, your exposure to the chemicals will depend on factors such as distance from the release, source and treatment of your drinking water supply, etc.

Q What are my chances of getting sick when I have been exposed to chemicals?

A The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time someone is exposed and the amount of chemical to which they are exposed, as well as the "inherent" toxicity of the chemical.

Q When are higher exposures more likely?

A Accidents can expose the facility's workers and surrounding community to higher concentrations of the chemicals. Other conditions that increase risk of exposure include dust-releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills, and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.). During process start-up and shutdown operations, there also is a greater likelihood of exposure. The closer one is to a release, the greater the risk of exposure.

Q Is the risk of getting sick higher for workers in the facilities than for community residents?

A Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of sensitive populations, such as children or people who are already ill, community exposures may cause health problems.

Q If I have acute (short-term) health effects, will these actually develop into chronic effects?

A Not always. Most chronic (long-term) effects result from repeated exposures to a chemical. Although many acute effects are reversible, some exposures may also cause chronic health effects.

Q Can I get long-term effects without ever having short-term effects?

A Yes, because long-term effects can occur from repeated or continuous exposures to a chemical at levels not high enough to make you immediately sick.

Q Don't all chemicals cause cancer?

A No. Most chemicals tested by scientists do not cause cancer.

Q Should I be concerned if a chemical causes cancer in animals?

A Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q Should I be concerned if a chemical is a teratogen (a substance which causes fetal malformations) in animals?

A Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that damage can occur in humans.

Q But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless the chemical is a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses, especially over long periods of time.

Q Can men as well as women be affected by chemicals that cause reproductive system damage?

A Yes. Some chemicals reduce potency or fertility in either men or women. Some damage sperm and eggs, possibly leading to birth defects.

Q Aren't pregnant women at the greatest risk from reproductive hazards?

A Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of child-bearing age are at higher risk.

Q What is the risk to public health resulting from toxic emissions to the air?

A While the EPCRA section 313 data represent a useful means of identifying potential air toxics sources, these data are not sufficient to accurately determine the magnitude of the public health risk posed by the emissions from a given facility. For example, section 313 provides no information concerning the potential exposure to these emissions. These data are most useful to point out the direction for further analyses of public health risk. In addition to identifying new regulatory projects, the data can be used to make priority decisions for the air toxics regulatory agenda.

Q Is there any difference between fugitive and stack air emissions when it comes to my health?

A Dispersion of the chemical and its concentration at various distances from the point of release are affected by whether, for example, the chemical is emitted from a tall stack at high temperatures or a pipe fitting near the ground at ambient temperature. Thus, your exposure could vary depending on the manner in which the release occurs. In general, a ground or near-ground release, such as through fugitive emissions, will more likely result in a higher exposure and, therefore, a greater possible health hazard for nearby residents than emissions from tall stacks.

Q Is my drinking water contaminated by this chemical?

A Again, this depends on the amount and concentration released, characteristics at the site, including the relationship of the release to the water supply, both surface and below ground, the distance to where the drinking water intake/well is located, and treatment, if any, the water receives before it is piped to your house.

Q Are the plants with highest releases always the most important in terms of public health?

A No. It is not possible to determine risks to public health strictly from knowing the amount of a chemical which is released by a facility over a year. A release total is an important first step in identifying a facility that may pose a public health hazard. Other factors that are necessary to the risk assessment process include specific information on: the environmental medium of the release, chemical toxicity and potency, local meteorological and topographical characteristics, where people live and work (potential population exposure), and when and how releases occur. Because some chemicals are more toxic than others, knowing only the quantity of chemicals released to the environment is not sufficient to determine its importance with respect to risk.

Compliance and Enforcement Questions

Q How many inspections have EPA's Regional offices conducted in support of the Office of Compliance Monitoring's (OCM) EPCRA section 313 program?

A Since October 1988, our field offices have conducted approximately 3,263 inspections of facilities subject to EPCRA section 313 reporting requirements.

Q How many civil complaints have been issued?

A EPA has issued approximately 683 civil complaints (almost all of which are against non-reporters) since October 1988.

Q What is the total amount of proposed penalties levied against EPCRA section 313 violators?

A EPA's Office of Compliance Monitoring has levied proposed penalties in excess of 34 million dollars in the EPCRA section 313 program since October 1988.

Q What is EPA doing about Supplemental Environmental Projects (SEPs)?

A Supplemental Environmental Projects are projects that facilities may undertake, as part of the settlement process, to protect or restore the environment through pollution prevention, waste minimization, and/or decrease in the amount of natural resources used. Since Fiscal Year 1991 (when we began to track cases with SEPs), EPA has closed 116 civil complaint cases containing one or more SEPs.

Q What is the EPCRA section 313 compliance and enforcement program doing about data quality?

A Data quality is emerging as a second important focus for the EPCRA section 313 compliance and enforcement programs, both at Headquarters and in the Regions. Now that the section 313 non-reporters compliance and enforcement program has matured, we are beginning to concentrate more on the quality of the TRI data submitted to EPA and the states. EPA and its regions are using a variety of tools, from compliance assistance to issuing cases, in order to ensure compliance with the regulations. During fiscal year 1992, EPA conducted approximately 600 EPCRA inspections; of these, over 100 focused on data quality in addition to non-reporting violations.

Q Without a final regulation in place, how is EPA enforcing the Pollution Prevention Act reporting requirements?

A Submission of the data to EPA and the states is required by the Pollution Prevention Act as mandated by Congress. In February of 1993, EPA issued Notices of Noncompliance (NON) to 86 facilities who did not use the revised Form R to submit their data. These facilities had previously been notified several times by EPA of the requirement to submit their information on the revised Form R. Each of the EPA regional offices will receive a complete listing of those facilities that have received a NON for not reporting on the revised Form R. In accordance with the EPCRA Enforcement Response Policy, EPA may issue civil penalties against those facilities that do not comply with the terms of the Notice of Noncompliance.

Q How many states have enforcement authority for section 313 of EPCRA under state laws?

A About sixteen state have TRI-like laws and thirteen states have enforcement authority for the TRI reports submitted to those states. For more information on TRI state activities, see the companion document to this document, entitled 1991 TRI Public Data Release, State Fact Sheets (EPA 745-F-93-002), May 1993.

33/50 Program Questions

Q How is the 33/50 Program related to the TRI program?

A In February 1991, the EPA Administrator announced the establishment of the 33/50 Program. It is a voluntary TRI release reduction program that asks industries to work with EPA, the environmental community, and the states to initiate or expand pollution prevention activities at individual facilities. EPA is seeking a 33% reduction in TRI releases and off-site transfers for treatment and disposal of 17 selected toxic chemicals and chemical categories by 1992, and a 50% or greater reduction by 1995. These reductions will be measured using the 1988 TRI data as a baseline. EPA expects the public accountability fostered by TRI and the Pollution Prevention Act to continue to play a vital role in persuading companies to take voluntary actions to prevent pollution from toxic chemicals.

The 17 chemicals and chemical categories targeted for reductions are: benzene, cadmium and compounds, carbon tetrachloride, chloroform, chromium and compounds, cyanide and compounds, dichloromethane, lead and compounds, mercury and compounds, methyl ethyl ketone, methyl isobutyl ketone, nickel and compounds, tetrachloroethylene, toluene, 1,1,1-trichloroethane, trichloroethylene, and xylenes. For further information, see Chapter 4, "33/50 Program" in this document.

AIR QUESTIONS

Q How much of the 2 billion pounds of toxic chemicals emitted to the air is addressed by the air toxics section of the Clean Air Act Amendments?

A The law addresses over 1.4 billion pounds of the 2.0 billion pounds of toxic chemicals reported to the TRI for 1991. The remaining 600 million pounds of toxic chemicals are subject to control as volatile organic compounds under the ambient air standard for ozone, or are subject to the particulate matter ambient air standard.

Q What legal tools are available to the Agency to reduce toxic air emissions?

A Title III of the amended Clean Air Act (CAA) is the primary regulatory tool by which EPA will control emissions of air toxics. Under section 112(d), EPA must issue regulations requiring the maximum degree of reduction in emissions that is achievable. After the application of the maximum achievable control technology (MACT) standards, section 112(f) states that EPA must issue additional standards within 8 years if they are required to further protect the public.

Also, EPA has authority to abate "imminent and substantial endangerment" to public health under several statutes. In particular, section 303 of the CAA and section 106 of Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) provide that EPA can issue administrative orders or seek injunctive relief in court to address such hazards. Any facility-specific enforcement action would typically be preceded by a detailed facility-specific analysis of emissions and risk. EPA would consider use of these authorities to reduce emissions from facilities that pose high risks due to toxic air pollutants.

Q When will the EPA promulgate regulations to reduce these emissions?

A In accordance with the CAA, EPA published on July 16, 1992 the final list of categories of sources to be regulated (57 FR 31576). The proposed schedule for regulation was published by EPA on September 24, 1992 in the Federal Register (57 FR 44147). A proposed regulation for Hazardous Organic National Emission Standards for Hazardous Air Pollutants (HON) for the synthetic organic chemical manufacturing industry was published on December 31, 1992 (57-FR 62608). The HON will have far-reaching effects because it will require reductions of up to 110 hazardous air pollutants. The requirement will result in substantial reductions in emissions from the affected facilities. In addition, a provision of the new CAA allows an incentive for sources that choose to reduce their emissions by 90 percent before EPA proposed the new standards. Those entering into this "early reductions program," can obtain extensions from the time required to comply with the new standards. The EPA has worked closely with industry representatives to promote widespread participation in this program. The program encourages industry to come up with innovative, cost-effective control technologies and pollution prevention methods.

Q Why are some of the 189 hazardous air pollutants listed in the amendments to the Clean Air Act not included in the TRI?

A The following 16 chemicals are listed as hazardous air pollutants in the new CAA, but are not on the EPCRA section 313 list. EPA is reviewing these chemicals for possible addition to EPCRA section 313 list.

Acetophenone
Caprolactam
Coke Oven Emissions
p,p'-Dichlorodiphenyldichloroethylene (DDE)
Dimethyl formamide
Ethylidene dichloride (1,1-Dichloroethane)
Hexamethylene-1,6-diisocyanate
Hexane
Isophorone
Mineral fibers
Phosphine
Polycyclic Organic Matter
Radionuclides (including radon)
2,3,7,8-Tetrachlorodibenzo-p-dioxin
Triethylamine
2,2,4-Trimethylpentane

There are different reasons why these chemicals are not found in the TRI data. The EPCRA section 313 and CAA amendments lists were developed for different purposes; thus, differences in these lists of chemicals are not unexpected. For example, the TRI list would focus on the individual constituents of coke oven emissions, rather than list a process source. Polycyclic organic matter (POM) is a mixture of chemicals originating from the combustion of fossil fuel. Since electric utilities are source categories that are not subject to reporting under EPCRA section 313, it may not be appropriate to list POM on the TRI list. Where appropriate, CAA chemicals may be added to the EPCRA section 313 reporting requirements after further review.

Q How will the TRI data be used in the future by the air office?

A The Office of Air and Radiation has used and plans to continue to use the TRI data for source identification and source category prioritization. The TRI data have been a valuable source of air emissions information and will continue to provide direction for further analyses of potential air toxics sources and associated public health risk. See the TRI Data Use section of this information package for more specific information on how the EPA program offices are using the TRI data.

Q How will EPA regulate TRI chemicals with large quantities of air emissions?

A Listed below are the 15 chemicals with the greatest total reported air emissions in TRI for 1991 (see Table 1-11), and the authority by which they will be regulated under the Clean Air Act Amendments.

Chemical	Regulated under Clean Air Act Amendment
Acetone	Title I
Ammonia	Title III, section 112(r)
Carbon disulfide	Title I and Title III, section 112(b)
Chlorine	Title III, section 112(b) and 112(r)
Dichloromethane	Title III, section 112(b)
Ethylene	Title I
Freon 113	Title VI
Glycol ethers	Title III, section 112(b)
Hydrochloric acid	Title III, section 112(b)
Methanol	Title I and Title III, section 112(b)
Methyl ethyl ketone	Title I and Title III, section 112(b)
Toluene	Title I and Title III, section 112(b)
1,1,1-Trichloroethane	Title VI and Title III, section 112(b)
Trichloroethylene	Title I and Title III, section 112(b)
Xylene	Title I and Title III, section 112(b)

Title I of the CAAA covers emission reduction programs for volatile organic compounds (VOCs) to meet ambient air quality standards. These programs are controlled to some extent by state and/or local governments. Eight of the fifteen TRI chemicals listed above are considered VOCs that participate in atmospheric photochemical reactions to produce ozone, a regulated ambient air pollutant.

Title III, section 112(b) of the CAAA, lists hazardous air pollutants (HAPs) that EPA is required to regulate by source categories. Eleven of the fifteen TRI chemicals listed above are considered to be CAA HAPs. EPA's approach will lead to the early regulation of source categories that emit one or more of the hazardous air pollutants. Therefore, significant reductions of all of the hazardous air pollutants emitted by an industrial plant will be achieved rather than reduction of just one specific pollutant. For example, the hazardous air pollutants (also referred to as air toxics) will be regulated under one of the first emission standards to be promulgated under the CAAA. The Hazardous Organic National Emissions Standards for Hazardous Air Pollutants will affect many sources of toxic emissions, such as process vents, equipment leaks, and storage tanks at chemical manufacturing plants, and will address the emissions of over 110 of the pollutants listed in section 112 of Title III. Chlorine and hydrochloric acid emissions will be regulated by Maximum Available Control Technology (MACT) standards covering other source categories.

Title III, section 112(r) of the CAAA, requires EPA to develop regulations to help prevent accidental releases of 100 substances. Facilities producing, handling, or storing extremely hazardous substances, including chlorine and ammonia, will be required to take precautions to protect against accidental releases of these toxic chemicals.

In addition to the other air pollutant regulations, section 604 of Title VI mandates restrictions of ozone-depleting chemicals. EPA has proposed a rule that would phase-out the production of ozone-depleting chemicals, including Freon 113 and 1,1,1-trichloroethane (methyl chloroform), by January 1, 1996, due to their ozone-depleting potential. The rule is expected to be finalized by the fall of 1993.

Water Questions

Q Why did water releases increase so much since 1990?

A Total releases of the EPCRA section 313 chemicals to water in 1991 increased by almost 47 million pounds, approximately 24%, compared to the 1990 releases. Almost all of the increase is attributable to increased sulfuric and phosphoric acid releases of 60 million pounds from four fertilizer plants in Louisiana. These releases were due to gypsum stack storm water runoff that could not be recycled by the facilities. If these particular increases are disregarded, then the total of all other TRI water releases dropped almost 7% from 1990 to 1991.

Q How do the water releases compare from 1990 to 1991 for specific chemicals?

A Among the top 15 chemicals released to water, which account for almost 98% of the total water releases, phosphoric acid, sulfuric acid, glycol ethers, zinc compounds, and methanol showed increases of 53%, 44%, 17%, 16%, and 13%, respectively. Increases of chemicals other than phosphoric acid and sulfuric acid could be due to a change in business activity (change in production) or more accurate discharge estimates by the reporting industries.

The following chemicals showed a decrease: chlorine (-45%), chloroform (-23%), hydrochloric acid (-23%), formaldehyde (-19%), ammonium sulfate (-17%), ethylene glycol (-16%), acetone (-6%), and ammonia (-7%). The decrease in ammonium sulfate releases to water may be primarily the result of facilities changing their reporting on this chemical and may not represent an actual decrease. Chromium compounds, listed as the chemical with the 15th largest total releases to water in 1990, decreased 18%. Chloroform and chromium compounds are both chemicals targeted for release reduction by EPA's 33/50 program.

Q What are the basic facts concerning the eight chemicals accounting for 95% (by weight) of direct water discharges?

A The Toxics Release Inventory reports 216 chemicals discharged directly into the water environment. Over 95% (by weight) of these discharges consist of eight chemicals.

Three of these chemicals (phosphoric acid, sulfuric acid, and hydrochloric acid) affect water quality primarily by altering the pH of the water body, a chemical parameter EPA already regulates for industrial and municipal discharges to water.

Three other chemicals (ammonium sulfate, ammonia, and ammonium nitrate) primarily affect water quality by the introduction of ammonia to the water body. EPA has issued water quality criteria for ammonia. For several years, EPA has required states to pay special attention to them when developing water quality standards and regulatory control strategies. EPA also regulates the oxygen demand from ammonia and the nutrient impact of all three ammonia chemicals.

For the two remaining chemicals, methanol and ethylene glycol:

> Methanol is a semi-volatile chemical that biodegrades readily and is only toxic at moderately high levels.
>
> Ethylene glycol is essentially antifreeze. Ethylene glycol is not a priority pollutant, and we do not have water quality criteria for this chemical. It is moderately toxic to aquatic organisms at high levels.

EPA will examine all of the information, including the remaining 208 chemicals to see if their toxicity or if the characteristics of the receiving waters require short-term or long-term attention. The environmental impact of these discharges is much more dependent on the toxicity of the chemicals and on the physical, chemical, and biological characteristics of the receiving waters than simply on the weight of these chemicals.

Q How does EPA (or the states) regulate EPCRA section 313 chemicals discharged to water?

A Under section 301 of the Clean Water Act (CWA), the discharge of any pollutant by any person is unlawful unless it is in compliance with the provision of 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 a National Pollutant Discharge Elimination System (NPDES) permit. Pursuant to Congressional directive, these programs have focused on a subset of toxic pollutants of greatest concern. There are 126 such toxic chemicals; they are known as "priority pollutants." This list includes 94 of the EPCRA section 313 chemicals. States are in the process of adopting water quality standards for these priority pollutants that could reasonably be expected to interfere with water quality. The states and EPA then use standards, together with best available treatment guidelines, 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.

While many of the top 10 EPCRA section 313 chemicals being discharged to water are controlled, a number of the small-volume chemicals with high toxicity levels are not fully regulated. EPA will continue to work with the states to ensure that all appropriate standards and permits are adopted. EPA is also preparing to issue Federal water quality standards if states do not adopt standards as Congress has directed. In addition, states and EPA regulate the overall toxicity of effluents with permit limits that rely upon biological toxicity tests; these limits serve, in part, to control the discharge of those EPCRA section 313 listed toxic chemicals for which there are no state water quality standards.

Q **Which of the EPCRA section 313 chemicals are covered by water quality criteria? What are your plans to develop water quality criteria for chemicals that are on the EPCRA section 313 list, but for which criteria have not been developed?**

A EPA has published aquatic life and/or human health protective ambient water quality criteria for 80 of the EPCRA section 313 chemicals. There is a current capability to develop four to six aquatic life protective water quality criteria a year. Obviously, at this level of effort, it would take us many years to complete criteria for all of the chemicals on the EPCRA section 313 list.

Because criteria and advisory development is a multi-year process, EPA is careful to set priorities before we begin work. First, EPA collects a variety of toxicology and exposure information on chemicals we are considering for criteria or advisories. Then, EPA ranks the pollutants using a ranking method. Finally, EPA meets with other affected offices to obtain their views before making a final selection of chemicals for criteria and advisory development. TRI data will play a major role in setting these priorities.

Once EPA issues a criteria document for a chemical, the next step is for states to adopt them as water quality standards under state law. Those standards are then used to derive enforceable NPDES permit limits for specific direct discharging facilities.

Q **Are the EPCRA section 313 chemicals covered by the state water quality standards? If not, why not?**

A A number of the EPCRA section 313 chemicals are covered by state water quality standards. Recently, under the CWA, our emphasis on adoption and revision of chemicals in state water quality standards has been on the subset of EPCRA section 313 chemicals appearing on the CWA section 307(a)(1) list. This is a list of 126 pollutants that Congress has identified for priority attention in EPA's water program. The emphasis on this list for state standards stems from the mandate in the 1987 CWA amendments that EPA ensures that these chemicals, in particular, are covered in state water quality standards.

The Agency is very concerned with any pollution sources causing problems with human health or with aquatic life. EPA will review the TRI data, particularly in the context of the pollutant ranking described above, and intends to move aggressively in the water quality standards area for unregulated pollutants.

Q EPA has completed its review of the state assessments under Section 304(1) of the CWA, which reported the names and locations of water bodies in the United States that are not in attainment with water quality standards. Separate lists have been prepared for waters impacted by any pollutants and for waters and point sources where water quality is entirely or substantially impacted due to priority pollutants from point sources.

1. Were the TRI data used in these assessments?

A States may have used similar types of information in generating their lists, but the actual TRI data submitted to EPA were not available to them at the time they did their assessments.

2. Were the TRI data used in EPA's review of the states' lists?

A Yes, to some degree. Under the Statutes, EPA had until June 4, 1990, to approve or disapprove the state lists. At a minimum, the list of facilities submitted by states and planned EPA additions to these lists were reviewed against the list of facilities identified in the Toxics Release Inventory as discharging significant amounts of priority pollutants.

3. Will future state assessments of waters use TRI data?

A Yes. EPA will continue to review updates to state lists against the current TRI submittals and against subsequent TRI submittals.

4. What are the difficulties in resolving any differences between the lists submitted by the states and the TRI data?

A Each facility on the EPCRA section 313 list that shows a significant release of toxics will need a separate review to determine if its receiving water should be included on future state lists of waters not meeting water quality standards. Although EPA expects the state lists to be generally consistent with the TRI data, in some cases, the TRI data include loadings from spills and other releases not regulated by permits. There are also some cases where states did not list waters on the Section 304(1) lists due to a lack of discharge or ambient data for some toxics. In such cases, EPA and the states will, over time, fill any data gaps by collecting (and/or having dischargers collect) additional effluent and ambient data. In some cases, this may also require permitting of previously unpermitted discharges.

Q The Office of Prevention, Pesticides and Toxics has prepared information on the industrial categories that are responsible for the majority of the discharges of the EPCRA section 313 chemicals. What is the process for deciding whether to revise effluent guidelines or to develop new effluent guidelines to reflect the TRI information?

A EPA is required to publish a biennial effluent guidelines plan under section 304(m) of the CWA. The purpose of the plan is to identify those industrial categories for which effluent limitations and standards should be developed or revised. Plans were published in 1990 and 1992. The choice of industries to be regulated is based on a number of factors, including TRI data. A Task Force is currently advising EPA on how to improve the process for selection of additional industries, and this may lead to a greater reliance on TRI data.

Q How will the EPA use TRI to implement the Public Water Supply Supervision Program of the Safe Drinking Water Act?

A The Office of Ground Water and Drinking Water will use the TRI data in a variety of ways to identify potential contaminants in specific geographic areas.

- In particular, these data could be source data for vulnerability assessments to determine frequency of monitoring by public water systems.
- The Office of Ground Water and Drinking Water could review chemicals reported in the TRI database for identifying candidates for future maximum contaminant level developments.
- The Office of Ground Water and Drinking Water will compare hazardous waste injection data with TRI data to identify and match those contaminants released.

Q What is EPA's ability to actually measure the EPCRA section 313 compounds in the environment?

A EPA has official methods for 146 of the 317 individually listed chemicals under EPCRA section 313.

Q Has EPA been developing methods for those compounds for which adequate methods are not yet available? If not, why not?

A EPA has considered developing analytical methods for the remaining 171 TRI chemicals. These would cost somewhere between $1.5 million and $2.0 million.

EPA is learning about new chemicals in the environment at a very rapid rate. Data reporting efforts like the TRI are a good mechanism for us to use in deciding which methods to develop next and which chemicals to regulate next.

Q Who should we see to get the analytical methods that EPA considers most appropriate? Who in EPA is responsible for developing these analytical methods?

A Three offices have responsibilities for developing analytical methods—the Office of Science and Technology, the Office of Solid Waste, and the Office of Research and Development. These analytical methods are available from:

Office of Science and Technology
Bill Telliard/Ben Honaker (202-260-5131)

Office of Solid Waste
Alec McBride (202-260-4761)

Office of Research and Development
Gary McGee (513-569-7303)

Q How will EPA use the TRI data to improve the management of the permit program?

A EPA will investigate the feasibility of EPA Headquarters and Regions, and states using TRI data to determine whether permits issued to some or all of these facilities control contaminants listed as releases in the TRI report.

The Office of Wastewater Enforcement and Compliance (OWEC) used TRI data to begin to identify new undetected significant industrial users discharging to POTWs, and to identify illegal unpermitted discharges.

OWEC used data to identify discharges by industrial users to POTW to determine whether additional NPDES permit limits are needed.

OWEC/regions/states will use the data for geographic and national planning and targeting of activities to high priority areas (i.e., near coastal areas, wetlands) and to target inspections to suspected violators that could lead to permit modification, new or revised limits when the permit is reissued, or an enforcement action.

Q How will EPA use the TRI data in its coastal protection programs?

A EPA will use the TRI data to develop management plans in the National Estuary Program and the Near Coastal Waters Program. The data will be used to identify sources of toxic discharges into nationally significant estuaries and coastal water in order to provide a basis upon which to prioritize problems and protection programs.

Q How will EPA use the TRI data in the dredging and disposal programs?

A EPA will use the TRI data to evaluate the potential contamination of dredged materials that are proposed for disposal in marine waters.

UNDERGROUND INJECTION QUESTIONS

Q **How are the TRI data used in the Underground Injection Control (UIC) program of the Safe Drinking Water Act?**

A EPA and the implementing states verify the accuracy of TRI-reported underground injection operations to determine if these operations are properly authorized and in compliance with the program's requirements.

Q **What do the TRI data show as underground injection operations?**

A Generally, the largest number of listed facilities are Class I wells, which are industrial or municipal disposal wells injecting below the lowermost underground sources of drinking water. When constructed and operated in compliance with program requirements, these wells are expressly designed to prevent the movement of formation and disposed fluids into protected aquifers. The next group of injection wells listed are Class V wells; these wells are important since they may be directly discharging into aquifers protected by the program and are a high priority for inspection and enforcement follow-up. EPA bans injection of hazardous waste at or above underground sources of drinking water.

Q **Does EPA have any estimation of what percentage of the TRI releases to underground injection wells are going to Class I (deep underground injection or industrial or municipal wastes) wells?**

A EPA receives TRI data attributable to underground injection in general as a release category. This is owing to the current structure of the reporting form, Form R, which does not differentiate between underground injection releases by well type. Other UIC volume data reported by the states and the Regions indicate that the major percentage of TRI releases are from Class I industrial (non-hazardous) and Class I hazardous injection wells.

Q **How are Class I injection wells monitored to ensure against any toxic releases to the environment?**

A All Class I wells are rigorously monitored to prevent any loss of injected fluids emplaced in the receiving geologic formations. Class I wells must be properly sited and adequately cased and cemented to protect underground sources of drinking water and isolate the injection zone; the well casing, tubing, and annular seal must be tested for mechanical integrity; a test for any fluid movement along the borehole must be run at least every five years, and the operator must identify all wells within a specified distance from the injection well bore to assure that all abandoned wells are properly plugged so that there is no potential for fluid movement by these paths.

Q Have any Class I wells released fluids to underground sources of drinking water (USDWs); and, if so, were these wells adequately repaired?

A Contamination of underground sources of drinking water by Class I wells have been rare. EPA and the states have identified only two cases where hazardous injected wastes contaminated underground sources of drinking water (USDWs), and one case where a Class I well was suspected of causing contamination. All three cases occurred prior to the implementation of a state or Federal UIC program. EPA also identified eight cases where leakage from Class I hazardous wells entered non-USDW formations. These leaks were minor in nature and immediately adjacent to the well bore. Current UIC monitoring regulations would have prevented these failures. All of these cases were properly addressed by either repairing the wells, or properly plugging and abandoning operations. Class I underground injection wells are safer than virtually all other waste disposal practices.

Q What does a TRI injection discharge listing mean to an area's ground water resources?

A A listing for any particular facility may, depending on well classification and operating status, pose a threat to underground sources of drinking water. For that reason, each underground injection listing in the TRI database is checked against authorized facilities. If not properly authorized, the operation would be subject to state or EPA enforcement action. If authorized, the operation would be subject to a compliance review on prescribed schedule.

Solid and Hazardous Waste Questions

Q How can a Local Emergency Planning Committee (LEPC) and the community use the TRI data?

A First, LEPCs can use the TRI data for emergency planning for response to chemical accidents. Specifically, they can use TRI data, along with reports on chemical accidents, as a risk screening tool around manufacturing facilities. The LEPCs receive notifications of accidental releases under EPCRA section 304. They can compare the data received under section 304 to the TRI data to help screen the risks posed by manufacturing facilities in their community. More broadly, reviewing this information along with chemical inventory information submitted by facilities under sections 311/12 of EPCRA can enable communities and LEPCs to obtain a "chemical profile" of their community for use in planning for response to chemical accidents.

Second, the chemical profile now possible with information from EPCRA can be used to examine community-wide risks and be used in a variety of strategies to reduce those risks.

Additionally, the LEPCs can use the TRI data in conjunction with the Material Safety Data Sheets available under EPCRA and other information to respond to community requests for information under the right-to-know provisions under EPCRA.

Q What role do TRI data play in chemical accident prevention?

A TRI data are used to support two activities related to chemical accident prevention:

- TRI data are used to identify chemical-handling facilities that could benefit from information on chemical process safety for preventing accidental chemical releases.

- TRI data are used as one source of background material in learning more about facility activities. For example, these data can assist a team in preparing for a chemical safety audit at a particular chemical-handling facility.

Q Are the toxic chemicals under EPCRA regulated under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)?

A Approximately 236 of the 317 individually listed toxic chemicals under EPCRA section 313 are also CERCLA hazardous substances. Toxic chemicals that are also CERCLA hazardous substances are subject to all of the requirements of CERCLA, as amended, such as reporting, liability, financial responsibility, cleanup, and penalties.

Q How are the EPCRA section 313 reporting requirements similar to CERCLA reporting requirements?

A There are few similarities between the reporting requirements of EPCRA section 313 and those of CERCLA section 103. Section 313 requires the owner or operator of a facility where a toxic chemical is manufactured, processed, or otherwise used to submit a toxic chemical release form to the EPA when the quantity of the toxic chemical exceeds the threshold quantity established by section 313(f) of EPCRA.

The reporting requirements of section 103 of CERCLA require any person in charge of a vessel or facility to report the release of a hazardous substance into the environment, in a quantity equal to or greater than its reportable quantity, to the National Response Center. The purpose of reporting under CERCLA section 103 is to allow the Federal government to assess each reported release to determine if a response action is warranted.

In addition, EPCRA section 304 requires reporting of these releases to state and local authorities.

Q How many EPCRA section 313 chemicals are regulated under the Resource Conservation and Recovery Act (RCRA)?

A Approximately two-thirds of the 317 individually listed EPCRA section 313 chemicals are regulated under RCRA. More detailed information is contained in the TRI Chemical Regulatory Matrix in the Appendix of this document.

The criteria used for listing wastes as hazardous does include the presence of hazardous constituents, many of which are toxic chemicals. As such, many of the EPCRA section 313 chemicals are regulated under RCRA when present in hazardous wastes.

Forty of the individually listed EPCRA section 313 chemicals are currently used to identify a waste as a characteristic hazardous waste. When such chemicals are found in the waste above specified levels, the waste is subject to RCRA regulation.

In addition, 153 of the individually listed EPCRA section 313 chemicals are also listed as hazardous wastes when they are unused, or discarded commercial chemical products.

Q Are all land releases reported under TRI regulated under RCRA?

A Some land releases may be accidental releases or chemicals in wastes that are not regulated by RCRA. Most of the land releases reported to the inventory fall under one of the following categories: on-site disposal of hazardous wastes which are regulated under RCRA or authorized state hazardous waste programs; and industrial solid waste or waste from mining and mineral processing activities that would be regulated under state solid waste management programs insofar as they do exist. Some mineral processing wastes are regulated as hazardous wastes.

Under the EPCRA section 313, facilities that manufactured or processed 25,000 pounds or used 10,000 pounds of a listed chemical must report. Under RCRA, only those facilities that generate more than 100 kilograms (220 pounds) of hazardous waste per month must report.

Q Can you make direct comparisons between TRI data and data in the RCRA program for amounts of hazardous waste generated, waste minimization, etc.?

A It is difficult to make comparisons for several reasons:

TRI reports individual chemical constituent data; RCRA requires reporting on a total waste stream that represents a substantially larger volume than any single chemical contained in the wastestream. A RCRA hazardous waste stream may or may not contain EPCRA section 313 chemicals.

TRI reports toxic chemicals released to air, land, water; data collected in the RCRA program report hazardous waste generation and management in regulated land disposal, incineration, storage, or treatment units.

RCRA also distinguishes between regulated and exempt wastes. A particular EPCRA section 313 chemical may occur in a waste that is exempt and need not be reported under RCRA. EPCRA section 313 does not make this distinction. (Example: Certain wastewater treatment activities are exempt from RCRA, as are small quantity generators who generate less than 100 kg/month of hazardous waste).

SIC code data in TRI are limited to categories 20 through 39; RCRA is not limited by SIC code.

Under RCRA, hazardous waste generators are required to report on existing or planned waste minimization activities at facilities on a biennial basis. The current reporting forms request information on reduction of the volume of waste generated. These data differ from TRI data in that they represent specific RCRA waste streams rather than individual chemical constituents. EPA's Office of Solid Waste is exploring approaches to refine the utility of the waste minimization data collected through the biennial reporting system and to coordinate the results with TRI data.

The biennial report does request the CAS number of EPCRA section 313 chemicals that are contained in RCRA wastestreams, to facilitate a link between the two data sources.

Q How many facilities are regulated by the RCRA program and what is the overlap with facilities that report for TRI?

A Under Subtitle C, RCRA regulates about 4800 Treatment, Storage, Incineration, and Land Disposal facilities, including: 1500 land disposal facilities; 350 incinerators; 3000 storage/treatment facilities; more than 200,000 large and small quantity generators; and about 18,000 transporters. These sites and facilities are listed in the Resource, Conservation and Recovery Information System (RCRIS) and may be cross-checked with EPCRA section 313 facilities by EPA ID number.

Of the 200,000 large and small quantity generators that are regulated under Subtitle C of RCRA, approximately 17,000 of the large quantity generators (LQGs) report to RCRA's biennial reporting system. Approximately 10,000 of these LQGs are listed in EPCRA section 313 SIC codes 20 - 39, and, of these, approximately 7,000 sites report for TRI.

Q How are TRI releases that are hazardous wastes regulated?

A Hazardous wastes must be stored, treated, or disposed in hazardous waste management units regulated under the RCRA or under authorized state laws. Hazardous waste land disposal units, including landfills, land treatment, surface impoundments, and waste piles, must meet applicable design and operating controls, such as liners and leak detection systems and ground water monitoring systems to detect releases out of the unit. All facilities that store, treat, or dispose of hazardous wastes are subject to corrective action requirements to clean up hazardous wastes or hazardous constituents that migrate from any waste management unit at the facility. Although the EPCRA section 313 counts placement of toxic chemicals in some of these management units as releases, they are not uncontrolled releases to the environment.

PUBLIC ACCESS TO THE TOXICS RELEASE INVENTORY

EPA is fully committed to making the Toxics Release Inventory publicly available and continues to expand avenues of access and technical assistance to the TRI user community. EPA believes that increased citizen and community awareness of environmental issues and their involvement in the decision-making process is important to developing successful environmental programs. Effective pollution prevention and control depend on the involvement of federal, state and local governments, industry, and the public.

Outreach continues to be an integral part of EPA's TRI agenda. The Agency has implemented an outreach program that identifies groups and organizations to assist the agency in making the various constituencies aware of the availability and potential uses of the TRI. These groups (also referred to as multiplier and intermediary groups) include librarians, journalists, trade associations, national public interest and environmental groups, states, and others. TRI is a valuable resource to the many who know about and use the information.

A concerted effort has been made to offer TRI in a variety of printed and electronic formats. It has been distributed to nearly 4,000 public and federal depository libraries (i.e., libraries designated to receive government publications) across the country. Online access is provided through an agreement with the National Library of Medicine (see below). Other formats include diskette, microfiche, magnetic tape, CD-ROM (Compact Disc-Read Only Memory), and printed reports. A description of these products is provided later in this section.

Each of the ten EPA Regional offices has established a TRI Coordinator. The TRI Coordinators are very knowledgeable about TRI and other EPCRA provisions (see listing of EPA Regional TRI Coordinators in this Appendix). Most states and the EPA Regional offices have outreach programs that include providing training to industry and other groups. Industry training focuses primarily on understanding reporting requirements and completing the form. Outreach to groups and organizations who have contact with the general public, such as grass roots organizations, the health community, labor, and many other groups, are vital to the success of the Agency's efforts to raise overall awareness of TRI and the other provisions of the Emergency Planning and Right-to-Know Act. The public outreach activities focus on helping others understand, access, and use the data. Concerned citizens, on their own or through organized groups, continue to use TRI to raise and answer questions about chemical releases in their communities.

States also receive TRI reports and make the information available to the public. Many states have their data available before EPA can compile the data for all the states. Some publish TRI annual reports, and many have computerized the data and provide the information to the public in a variety of formats. Each state has an individual designated by the governor for Emergency Planning and Community Right-to-Know Act (EPCRA) activities. For more information about your state's TRI program, contact the EPCRA Coordinator for your state. (See listing of state EPCRA contacts in this Appendix.)

EPA continues to evaluate and provide additional routes of access to TRI and related activities. A description of TRI products, services, and key guidance documents, along with access information for the National Library of Medicine (NLM), the Government Printing Office (GPO), the National Technical Information Service (NTIS), and other access points, is provided below.

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TRI Products, Services & Guidance Documents

<u>TRI and Related Products & Services</u>

TRI Online -- Accessible via the National Library of Medicine's (NLM) Toxicology Data Network (TOXNET).
Access: NLM
(See below)

Compact Disc -- Read Only Memory (CD-ROM) -- Contains the complete national TRI for 1987-1990 and the Hazardous Substances Fact Sheets for TRI chemicals. [CD-ROM for Reporting Year 1991 will be available by Summer 1993.)
Access: NTIS, GPO, Depository Libraries, and EPA Regional Offices

<u>Ordering Information</u>

National Library of Medicine (NLM)
Specialized Information Services
8600 Rockville Pike
For information call: 301-496-6531
Hours: 7 days/week; 24 hours/day
Bethesda, MD 20894

National Technical Information Service (NTIS)
U.S. Department of Commerce
5285 Port Royal Rd.
Springfield, VA 22161
Call: 703-487-4650
Fax: 703-321-8547
Rush order: 1-800-553-NTIS
Hours: 8:30 am -5:00 pm (Eastern Time)

(a) U.S. Government Printing Office (GPO)
Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250-7954
Call: 202-783-3238
Fax: 202-512-2250
Hours: 8:30 am - 4:00 pm (Eastern Time)
(To order CD-ROM, microfiche, and printed reports)

Public and Depository Libraries
Contact the EPCRA Information Hotline at 1-800-535-0202 or TRI-US at 202-260-1531.

Diskettes -- State-specific diskettes include selected data from the TRI reporting form. High density 5.25 and 3.50 inch diskettes are available in the Lotus 1-2-3 (version 2.0), dBASE III PLUS, and ASCII for DOS microcomputers and Excel (version 2.1) for Macintosh. (1991 data will be available to the public by Summer 1993.) Access: NTIS, GPO

(b) U.S. Government Printing Office (GPO)
Superintendent of Documents
Attn: Electronic Products Sales Coordinator
P.O. Box 37082
Washington, D.C. 20013-7082
Call: 202-512-1530
Fax: 202-512-1262
Hours: 8:30 am - 4:00 pm (Eastern Time)
(To order diskettes, magnetic tapes & to access the electronic bulletin board)

Magnetic Tapes -- Available for all reporting years. Contains the complete national data and is periodically updated. Tapes are standard 1600 or 6250 bpi, 9-track, ASCII or EBCDIC and come with tape documentation. (1991 date will be available by Spring 1993.) Access: NTIS, GPO

See NTIS, GPO(b) above.

Form R Facsimile -- Photocopies or computer-generated facsimiles of TRI reports.
Access: TRI Information Branch

TRI Information Branch
Call: 202-260-1609
Fax: 202-260-4655

Microfiche -- Contains the complete TRI for each reporting year along with indices to help locate specific facility reports. Contains listing of Section 313 chemicals, indices and user guide. (Data for 1989 & 1990 will be available from GPO and NTIS by May '93.) Microfiche will not be provided for the 1991 and subsequent reporting years. Access: Selected federal depository, state and county public libraries, GPO, NTIS

See GPO(a), NTIS above.

TRI National Report -- Covers 1987-1989 data, only. Provides a detailed summary, analysis and comparison of the TRI data. Focuses on reporting requirements, changes from previous year's requirements, state summaries, total releases and transfers of TRI chemical by media and other comparisons and analyses. Maps, charts and tables are presented. (No report available for 1990 or 1991 data.) Access: EPCRA Information Hotline

Emergency Planning and Community Right-to-Know Information (EPCRA) Hotline
Call: 1-800-535-0202
Fax: 703-412-3333 (To request documents, only.)
Hours: 8:30 AM - 7:30 PM (Eastern Time)

NESE-DB (National Economics, Social and Environmental Data Bank) CD-ROM -- 1990 TRI state release and transfer data. (Data for 1991 reporting year will be available during the summer of 1993.) Access: Department of Commerce, selected federal depository libraries

U.S. Department of Commerce
NESE-DB CD-ROM
Office of Business Analysis
Room 4885
Washington, D.C. 20277 - 2787
Call: 202-377-1986

TRI-US (TRI User Support Service) -- General TRI information, searches and search assistance, NLM online search training, CD-ROM training. Access: TRI-US
(See below)

Toxics Release Inventory User Support Service (TRI-US)
U.S. EPA
401 M Street, SW. (TS-793)
Washington, D.C. 20460
Call: 202-260-1531
Fax: 202-260-4659
Hours: 8:00 am - 4:30 pm (Eastern Time)

EPCRA Information Hotline -- TRI publications, information and assistance.

See EPCRA Information Hotline above.

Roadmap Database -- Provides assistance to TRI users for identifying regulations and risk assessment information for TRI chemicals (diskette). Access: NTIS

See NTIS above.

TRI-FACTS -- Supplements the environmental release data on TRI chemicals by providing information related to health, ecological effects, and safety and handling of these chemicals. Access: NLM, CD-ROM, software from EPA Public Clearinghouse (EPIC)

See NLM and CD-ROM above. A Free Copy of the software is available from EPIC by writing to:
Cathy Cain
26 West Martin Luther King Drive
Cincinnati, OH 45242

PC TRI-FACTS -- TRI-FACTS for the personal computer. Access: EPA

EPA National Center for Environmental and Public Information
Cathy Cain
26 Martin Luther King Drive
Cincinnati, OH 45268
Call: 513-891-6685
Fax: 513-891-6561

RTK Net (Right-to-Know Computer Network) -- Telecommunication computer service containing the 1987-1990 TRI data, chemical fact sheets, and other data bases. (1991 data will be available in summer 1993.) Access: RTK-Net (See below)

Right-to-Know Computer Network (RTK Net)
1731 Connecticut Ave., NW.
Washington, D.C. 20009-1146
Call: 202-797-7200
Fax: 202-234-8584
Modem: 202-234-8570
(Parameters 8,n,1. Login as "public.")

GPO Bulletin Board -- Electronic bulletin board with TRI state specific data. (1991 data will be available in summer 1993.) Access: GPO

See GPO(b) above.

(IRIS) Integrated Risk Information System Database -- Online access and training and materials for obtaining information on TRI chemicals. Access: NLM

See NLM above.

"Risk Screening Guide" -- Method for evaluating TRI data for environmental managers. Access: NTIS

See NTIS above.

"Chemicals, the Press and the Public" -- A journalists' guide to reporting on chemicals in the community. Access: National Safety Council

National Safety Council
Environmental Health Center
1050 17th Street, NW. Suite 770
Washington, D.C. 20036
Call: 202-293-2270

"Public Access to the Toxics Release Inventory"-- Comprehensive listing and ordering information for TRI products, services, and documents. Access: TRI-US, EPCRA Hotline

See TRI-US, EPCRA Information Hotline above.

National Library of Medicine (NLM): Online Access

The Toxics Release Inventory (TRI) is a component file of NLM's TOXNET system. Utilizing a free text search capability, boolean logic, a powerful and flexible command language, and a variety of online user assistance features, TOXNET offers state-of-the-art, user-friendly searching. On-line and off-line printing of entire or specific portions of records is available, as is a variety of customized print options. Special TRI features allow sorting and numerical manipulation of data. A menu-driven search package also allows novice users or individuals with limited computer skills to search TRI efficiently.

The TOXNET systems also contains TRIFACTS. TRIFACTS contains information on health effects, ecological effects, safety, and handling for TRI chemicals.

Cost: $18 - 20 per hour
Hours: 7 days/week; 24 hours/day

To apply for access, contact:

TRI Representative
National Library of Medicine
Specialized Information Services
8600 Rockville Pike
Bethesda, MD 20894
Phone: 301-496-6531

Access to TRI Online Searches

Many EPA, Federal Depository, county public, university, and medical libraries across the nation have online access to NLM. Contact a library directly to inquire about its policy of providing online search service to the public. The EPCRA or TRI-US Hotlines can refer you to your nearest library. The EPCRA Hotline number is 1-800-535-0202 (in Washington DC 703-920-9877) and 1-202-260-1531 for TRI-US.

Toxic Release Inventory User Support Service (TRI-US)

TRI-US provides general information about the Toxics Release Inventory and access to any of the data formats. Specialists can help determine the data product best suited for the individual user's needs. The service provides a limited amount of online searches and comprehensive search assistance for the TRI online and CD-ROM applications. TRI-US provides both NLM/TOXNET and CD-ROM training through individual sessions and workshops. Documentation for all TRI products is available from TRI-US. TRI-US provides referrals to EPA regional or state TRI contacts, libraries where TRI is available, or other TRI resource centers in local areas.

Cost: No Charge
Hours: 8:00 am - 4:30 pm (Eastern Time)

Contact:

US EPA
TRI-US
401 M Street, SW (TS-793)
Washington, DC 20460
Phone: 202-260-1531
FAX: 202-260-4659

RTK NET (Right-to-Know Computer Network)

RTK NET is an online computer telecommunications link to environmental databases. This service promotes pollution prevention strategies. It provides communication among individuals concerned about toxic use reduction, and seeks to increase use and analysis of TRI and related data. RTK NET links TRI with other environmental data, all civil cases brought by the U.S. EPA, and a portion of the 1990 Census.

TRI data for 1987-1990 are available on RTK NET, along with health facts for each TRI chemical. Data for reporting year 1991 will be available during the summer of 1993. The TRI data can be accessed by modem from any computer. (Set computer parameters to 2400, 8,N,1. Dial-in using the modem number listed below, and type "public" (lower case) at the prompt for user i.d.) Participants can communicate with one another through computer-generated mail, in addition to exchanging and reviewing documents electronically.

Both "live" and "computer" conferences are held. Conference subjects are selected by participants and have included such topics as health, activism, and environmental justice.

Training is available from the computer service on using telecommunications, using RTK NET, and searching the database.

For access, contact:

RTK NET
1731 Connecticut Ave., NW
Washington, DC 20009-1146
Phone: Unison Institute 202-797-7200
Fax: 202-234-8584
Modem: 202-234-8570

TOXICS RELEASE INVENTORY DATA QUALITY PROGRAM

The goals of the U.S. Environmental Protection Agency's (EPA's) data quality program for the Toxics Release Inventory (TRI) are to (1) identify and assist facilities that must report so that data submitted will be of the highest quality; (2) insure high quality data entry; (3) correct and normalize as much of the submitted data as possible in order to maximize the utility of the data; and (4) accurately assess the relative validity of release estimates and other data.

Identification and Assistance to Facilities

Through mass mailings to all facilities within the manufacturing sector of the economy, work with a wide variety of trade associations, hosting local and national seminars, and enforcement activities, EPA has endeavored to locate all facilities required to report under section 313 of the Emergency Planning and Community Right-to-Know act (EPCRA) and inform them of their obligations. In addition, EPA has prepared various materials to assist facilities in complying with the Act. These include detailed reporting instructions, a question-and-answer document, magnetic media reporting instructions, general technical guidance and 16 industry-specific guidance documents. In addition, EPA maintains a toll-free hotline to answer regulatory and technical questions to assist facilities.

Data Entry Quality Activities

EPA continues to place a high emphasis on data entry accuracy within the Toxics Release Inventory Database. EPA's internal review of 3% of the records showed a data entry accuracy rate of over 99%. This is up from a Reporting Year 1987 rate of 97.5%. EPA continued the computerized edit checks at the point of data entry, including a high percent of verification and formalization of data reconciliation activities. EPA mailed copies of the emission numbers to all reporting facilities to allow them to verify the entered data. EPA also received submissions from over 2,341 facilities reporting on magnetic media which ensures against data entry errors.

Normalization of Data

Because Congress has required that EPA make the TRI data available to the public through computer telecommunications, EPA has found it necessary to undertake a variety of activities to make the data more usable. This is due to the fact that computers only retrieve data in exactly the format as requested (e.g., if asked for "Los Angeles," the computer will not be able to identify facilities listed under "LA"), and facilities report their data in a wide variety of ways. As a result, EPA has taken steps to use a consistent name for all counties, used a variety of nomenclature standards for names within the database (to ensure, for example, that all filings for a particular company can readily be identified), inserted latitude and longitude for the center of the zip code area in which the facility is found, and has taken other steps to assist in the utilization of the data.

EPA generates a facility identification number at the time of data entry. Linkage between all years of reports has been made to the best of EPA's ability. This allows easy retrieval of cross-year data, even when a facility is sold or changes its name. The identification number has been sent to all facilities. Facilities are required to use this number on all future Form R reports submitted to the Agency. Use of this number facilitates data quality and cross-year analysis.

Correcting Form R Errors

Every year EPA issues Notices of Noncompliance (NONs) to facilities who use invalid forms, provide incomplete forms, incomplete facility identification, or incorrect/missing chemical identification. These facilities are also notified by telephone to make sure their follow-up revisions correct these errors. A facility that does not comply with a NON may be subject to civil penalties.

For the reporting years 1988 through 1990, EPA also issued Notices of Technical Error (NOTEs) for missing required data or providing incorrect information, such as facility identification numbers or invalid codes. The response rate to the NONs and NOTEs has been very good and has prevented errors from recurring in following years. To help facilities avoid these types of errors, a list of common errors was provided in the 1989 and 1990 reporting year instructions. Due to lack of a final regulation for the pollution prevention data elements and budget cuts for the TRI program, EPA did not issue NOTEs for the 1991 reporting year. However, based on limited evaluation of the 1991 Form Rs, a list of common errors to avoid involving the new required pollution prevention data has been developed and is available from the EPCRA Information Hotline at 1-800-535-0202.

Accuracy Evaluation

The accuracy of the release data can vary. Some releases can be estimated fairly easily, just by knowing how much of the chemical was used during the reporting year or by weighing drums of solid/liquid waste. Where monitoring of release streams or wastes has been done, release estimates may be within 20% of actual amount released, although infrequent, non-representative sampling may lead to much less accuracy. Estimates of fugitive air emissions and complex waste waters for which monitoring data are not available may be off by one or even two orders of magnitude, particularly when the release is a small percentage of the amount of the chemical actually processed.

For the 1987 and 1988 reporting years, EPA conducted audits at 248 facilities to determine how well facilities complied with the law and estimated release quantities. These audits did not "confirm" estimates through monitoring, but determined how well facilities used available data and estimation techniques to calculate releases.

Overall, based on the audit of 156 facilities, 1987 total annual releases appeared to have been underestimated by 2%, representing the net effect of overestimates and underestimates. For non-zero release estimates, more than three-quarters were within a factor of two of EPA's best estimate. About 15% were in error by an order of magnitude or more.

The survey of the 1988 data focused on facilities in Standard Industrial Classification (SIC) codes 28 (chemical manufacturing), 29 (petroleum refining), and 34 (metal finishing and fabrication). Ninety facilities were visited. The aggregate 1988 release estimates in these industries were more accurate than their 1987 estimates, since their aggregate 1988 estimates were found to be approximately equal to the estimates calculated by the EPA contractor.

For the 1987 and 1988 reporting years, in a different type of survey, EPA also identified approximately 1,800 forms with suspect release data and telephoned facilities to discuss how to improve and correct their estimates. The information from this survey was also used to improve the reporting instructions and technical guidance.

EPA has taken steps to make data quality a priority in its enforcement program. During fiscal year 1992, EPA conducted approximately 600 EPCRA inspections. Of these, over 100 focused on data quality in addition to nonreporting violations. To assist in this endeavor, EPA has developed a guidance manual for EPA Regional inspectors on what to look for when auditing an EPCRA reporting facility. The manual contains detailed guidance on how to determine if a facility has identified all reportable chemicals, made proper threshold determinations, and provided reasonable release estimates.

In fiscal year 1990, $1 million was awarded to 11 states to develop and implement TRI data quality assurance programs. These projects focused on one or more broad data quality assurance objectives: 1) verification of the accuracy of the estimates and other data submitted by the facilities; 2) identification of facilities that should have reported but did not; and 3) identification of discrepancies between TRI data reported to EPA and to the state. Quality assurance activities to be conducted include facility site visits and telephone audits, cross-checking TRI data against other state data, such as permit data, using computer algorithms to identify suspect estimates, and comparing TRI data across reporting years.

SUMMARY OF EPA PROGRAM OFFICE, REGIONAL OFFICE, AND STATE USES OF TOXICS RELEASE INVENTORY DATA

OFFICE OF AIR AND RADIATION (OAR)

OAR has used the Toxics Release Inventory data for a variety of tasks related to the implementation of the Clean Air Act Amendments of 1990 (CAAA), including the following:

- TRI data on the number of facilities emitting a chemical and amount emitted are used in setting research priorities for the 189 Hazardous Air Pollutants (HAPs) identified in the CAAA.

- TRI data were used to estimate the number of major sources of HAPs that might be affected by regulations under section 112(g), the modifications provision of the CAAA.

- TRI estimates of emissions from publicly owned treatment works (POTWs) were used in establishing maximum achievable control technology (MACT) standards required by Title III of the CAAA.

- TRI data are used to target potential sources for inclusion in the Early Reductions Program, which is a means of getting enforceable reductions of toxic emissions before a regulation is in place.

- TRI data are used in inventories of air toxics emissions, and in air toxics "Locating and Estimating" documents, which help state and local air agencies identify potential source categories of air toxics in their communities.

- TRI data are used to verify the quality and completeness of point source emission inventories in state implementation plans.

- TRI data are used to aid in identifying potential or actual violations of the National Ambient Air Quality Standards (NAAQS) for lead.

- TRI data were used to identify which of the 189 HAPs might be emitted as particulates and thus might be captured by control equipment used in response to the NAAQS for particulate matter.

- TRI data will be used as a measure of the progress of the CAAA in reducing air toxics.

Office of Pollution Prevention and Toxics (OPPT)

OPPT is using TRI data in a variety of ways to support EPA's Source Reduction Review Project (SRRP). The SRRP is an EPA-wide effort to use the regulatory development process to promote source reduction within the EPA programs. As an example, for the "Metal Products and Machinery" effluent guideline being developed under the Clean Water Act, OPPT has used TRI data to identify the types of source reduction techniques already adopted by some facilities. This information will help the Agency to identify candidate facilities for site visits, as well as technologies that might serve as the basis for the selection of a prevention-oriented "Best Available Technology" treatment standard for the effluent guideline ultimately developed.

OPPT is developing an "opportunities map" for targeting potential new projects and collaborators under the Design for the Environment (DfE) Program. One of DfE's primary objectives is to effect behavioral change in the private sector by removing structural impediments to pollution prevention, and by promoting the concept of "green design." The targeting effort under DfE will draw upon existing information, including TRI data, to identify: (a) key sources of environmental problems, (b) potential change agents, and (c) the necessary infrastructural and institutional changes to effect environmental improvement.

TRI data form the backbone of EPA's innovative 33/50 Program, which seeks to achieve voluntary national reductions of 33% by 1992 and 50% by 1995 in the releases and off-site transfers of 17 high priority TRI chemicals, using 1988 TRI reporting as a baseline. EPA has used TRI reporting data to identify more than 7,600 parent companies of the more than 16,400 facilities that have reported one or more of the target chemicals since 1988 (see Chapter 4). Each company has been contacted by EPA to solicit their participation in the Program. Participation in the 33/50 Program is easy, since companies' environmental releases and off-site transfers are already reported to TRI. Accordingly, no additional environmental data are required to be reported; companies merely inform us of their interest in participating and voluntary commitment to specific reduction targets.

Assessments of the 33/50 Program's progress in meeting its ambitious national goals, as well as the progress individual companies are making in achieving their own reduction targets, are made directly from environmental data already being reported annually to TRI. The Pollution Prevention Act's expansion of TRI reporting data for 1991 and beyond will greatly assist the Agency in determining the extent to which companies' pollution prevention initiatives contributed to observed reductions in releases and transfers. The new two-year forecasting data will also help by providing advance notice of any potential shortfalls in meeting the national goals, enabling EPA to attempt to determine if there are barriers inhibiting companies' reduction efforts. Finally, the Agency hopes that the requirement for companies to project future emissions will provide additional incentives to investigate source reduction opportunities and participate in the 33/50 Program.

The OPPT Existing Chemicals Program continues to use the TRI data for risk screening, testing, and pollution prevention activities in the Risk Management assessment processes. TRI data serve as a major input to exposure and risk assessments in OPPT. TRI data have also been useful in identifying target audiences for risk notification efforts following Risk Management assessment.

The TRI is especially important to the Existing Chemical Program's new initiatives on pollution prevention. TRI data are used for targeting chemicals/uses/facilities for pollution prevention assessment and for evaluating pollution prevention actions. TRI data are also used by the Chemical Assessment Desk and other OPPT outreach efforts to respond to inquiries from a variety of sources.

OPPT has developed software that contains health and ecotoxicity information on most of the section 313 chemicals. This software is called PC-TRIFACTS and enables the TRI data user to better understand the potential health and ecological effects of chemical releases identified in the TRI.

Office of Enforcement (OE) and Office of Compliance Monitoring (OCM)

OE, OCM, and EPA Regional offices continue to use TRI data as a tool in inspection targeting and enforcement. In addition, the TRI data are constantly evaluated with an eye towards sector-wide EPCRA initiatives. Finally, the data are included in an enforcement data base system that is used to develop multi-media/multi-statute cases and initiatives.

OCM and OE cross-check data collected under EPCRA and the Toxic Substances Control Act (TSCA) to identify those facilities or types of businesses that reported for some but not all of the reporting rules. By using TRI data and the Facility and Company Tracking System (FACTS), enforcement personnel are able to identify additional facilities owned by the same parent corporation or the same company that may be subject to liability.

OCM uses the TRI data in its EPCRA Targeting System (ETS), which provides local access to TRI and FACTS data for all facilities subject to EPCRA section 313 requirements. ETS supports creation of prioritized inspection targeting lists, generated from a wide array of selection criteria, and daily targeting activities, such as contact with facilities and tracking tips and complaints. Nine of the ten EPA Regional field offices have been introduced to this new system.

The Multi-media Coordination Team (MCT), which was established as an experimental unit in OE during the summer of 1991, is using TRI data through the Integrated Data for Enforcement Analysis (IDEA) system. IDEA provides integrated data on individual facilities' compliance records for most of the statutes administered by EPA through access to approximately ten separate data bases, including the Toxics Release Inventory System (TRIS). The TRI data aid OE in developing enforcement initiatives. EPA uses the data to distinguish between industrial sectors based on risk, in terms of types of chemicals reported, total pounds of toxic chemicals released, types of releases, and average pounds released per facility.

OE staff routinely access TRI data on facilities for which violations under other statutes have been identified, with an eye toward including EPCRA violations in the same case or using the information as leverage in negotiations.

TRI data continue to be extremely helpful in identifying pollution prevention projects. Enforcement staff use data on releases and transfers to identify (or evaluate) projects that will significantly reduce emissions, or those that will help prevent or minimize the release of extremely hazardous substances under EPCRA section 302.

OCM places a high priority on enhancing the use of TRI data among Regional field personnel. OCM has issued guidance to the field offices on the resources available to their inspectors in identifying non-reporters, late reporters, and data quality errors. These resources provide the inspectors with valuable information extrapolated from the Toxics Release Inventory, such as facility reporting rates, processes, and releases.

Office of Solid Waste and Emergency Response (OSWER)

TRI data, in combination with other information on waste minimization, are useful in analyzing long-term trends and identifying particular industry practices that warrant attention by the program.

With respect to enforcement, TRI data supplement other existing data sources and can be called on to assist in the development of OSWER enforcement priorities. TRI data also are valuable as a means of establishing liability under both the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Resource Conservation Recovery Act of 1976 (RCRA).

Another site-specific function of the TRI data base relates to its role in providing emission information that can be used when developing emission inventories for the Superfund site discovery program and when undertaking Superfund preliminary assessments of sites. In the reportable quantity (RQ) program, TRI data could be used to support future rulemaking under CERCLA (e.g., designation of additional hazardous substances). In addition, states use the TRI data in conjunction with other data obtained under EPCRA for accident prevention planning.

Office of Water (OW)

TRI is being used as a source of data regarding discharge/release of contaminants to groundwater and surface water. The TRI data are used with other pertinent exposure and toxicity-related factors (e.g., quantity produced, occurrence in water, human health effects) in identifying and prioritizing drinking water contaminants. The prioritized list will be used to identify candidates for regulatory consideration.

TRI data were used as a screening mechanism for possible sources of wellhead contamination. Using TRI and other relevant data in a Geographic Information System (GIS), potential contamination sources have been identified. These sources may affect community groundwater systems in the development and implementation of wellhead protection programs. EPA Regional offices continue to coordinate groundwater programs, using GIS as a cross-program tool.

OW has also identified the TRI data as one source EPA Regional offices should use to list a water body or facility under section 304(l) of the Clean Water Act. Section 304(l) requires listing of navigable waters that do not meet certain water quality standards and development of appropriate pollution control strategies for those water bodies.

OW's Gulf of Mexico Program uses the TRI data and other information to identify and quantify inputs of toxic chemicals to the Gulf. This information is then used to calculate a toxicity index for various Gulf estuaries.

The Office of Water Enforcement and Compliance (OWEC) has used TRI data to identify industrial users with the greatest combination of toxic pollutants to city sewer systems. Certain facilities are referred to EPA Regional offices for further evaluation.

OWEC also used TRI data to identify industrial users (IUs) subject to pretreatment standards that are located in cities that are not required to have pretreatment programs. Comparing location of users to cities without approved pretreatment programs may be a way of identifying IUs for which EPA is responsible. OW is also matching permitted facilities with reported TRI discharges to surface water to identify any unpermitted dischargers.

The TRI data were also used in compiling a report to Congress on the National Pretreatment Program, and in identifying the types and sources of pollutants discharged to publicly owned treatment works (POTWs).

OW is evaluating the types and volumes of TRI discharges reported by "minor" and "major" National Pollutant Discharge Elimination System (NPDES) facilities to assess the relative risk presented by minor as opposed to major facilities.

In developing effluent guidelines, OW needs to understand which pollutants are released from pesticide manufacturing facilities and the patterns of those releases. Some TRI data are useful for screening purposes; however, the OW effluent guidelines program also screens for a number of pollutants not reported under TRI.

EPA Regional Use of TRI Data

The Regions continue to use the data as an outreach tool, in enforcement targeting, and as an aid in risk screening. Multi-media inspections that include EPCRA, TSCA, Air, Water, and the RCRA programs have increased. This past year, pollution prevention initiatives, some of which rely on TRI as the yardstick of their success, were evident in all the Regions. A few examples of TRI data use in the Regions follow.

EPA's Region 5 (headquartered in Chicago) has used the TRI data extensively, particularly in their air and water programs. The Region 5 Air and Radiation Division has used the TRI data in four program areas: 1) identification of largest lead emissions sources in the Region, review of those sources for compliance with the Clean Air Act, and evaluation of their potential for voluntary emissions reductions; 2) support for enforcement cases, including identification of specific air toxics at a source and identification of Clean Air Act violations; 3) evaluation of company submittals seeking to receive compliance extensions through the Early Reduction Program; and 4) quantification of atmospheric deposition of heavy metals to the Great Lakes.

The Region 5 Water Division uses the TRI data as a baseline data set for a variety of purposes. In the permits program, TRI data provide a checklist for pollutants and their estimated loads that are used to ensure that reported pollutants are being addressed adequately through regulation or enforcement. In non-regulatory water programs, such as the Great Lakes Lakewide Management Plans and Remedial Action Plans and geographic initiatives in Northwest Indiana and Southeast Michigan, TRI data are used as a baseline data set for assessing and targeting the multi-media regulatory programs for existing effluent limitation and for pollution prevention activities. TRI data are also used in these geographic programs to identify potential sources of Critical Pollutants to individual Great Lake drainage basins and to specific sub-watersheds, allowing these areas to be ranked and prioritized based on relative watershed loadings.

EPA's Region 9 (headquartered in San Francisco) is using TRI data in a Government-Industry Pollution Prevention Project in Los Angeles County. This project is designed to extend EPA's 33/50 voluntary pollution prevention program to all TRI emitters in this geographic area, which has the highest TRI emissions in Region 9. In this project, the Region is working to form a partnership with industry and other governmental agencies in order to promote pollution prevention through community involvement, pilot pollution prevention projects, and incentives for industry participation.

State Use of TRI Data

State TRI programs vary greatly in resources and sophistication; some states are able to do little more than store TRI forms in filing cabinets and boxes, while other states have complex programs of TRI data availability, data analysis, and pollution prevention activities. A 1992 survey of states and territories found that 34 of 52 respondents had entered at least one year's TRI data into a computer database; 28 of these included 3 or more years of data in their database. Twenty-six states generate customized database reports, 20 states provide data runs for the public, and 6 states allow direct public access to the computerized database. A follow-up survey completed in March 1993 found that 16 of 46 states used TRI data in Geographical Information Systems or other mapping projects, and 14 help analyze the data for the public by providing health effects or risk analysis information. More complete information about these survey results can be found in the TRI State Fact-Sheet Book (EPA 745-F-93-002), May 1993.

The U.S. EPA has promoted state management, use, and quality assurance of the TRI data through a variety of grant programs, including two TRI-specific programs in 1990 and 1991. In 1990, the EPA awarded a total of $1.0 million to eleven states for data management and data quality projects under the TRI Data Quality Assurance program. In 1991, EPA awarded $800,000 to 10 states for a variety of start-up and advanced TRI program activities under the TRI Data Capabilities Program. Many of the products of these grant activities have been distributed to EPA Regions, other states, and State Emergency Response Commissions (SERCs) and Local Emergency Planning Committees (LEPCs). TRI-related grants have also been awarded to states through the EPA's compliance monitoring, pollution prevention, and other programs.

The Office of Pollution Prevention within the New Jersey Department of Environmental Protection and Energy is using the TRI database in conjunction with the department's Geographic Information System (GIS) and information collected through the state's own Right-to-Know program to conduct pollution prevention research. The objectives of this study are to identify facilities, processes, and geographic areas where pollution prevention measures are likely to be most effective, to prioritize facilities for emissions reductions actions, and to develop and document these identification and prioritization methods for use by other states.

Among the activities in this New Jersey project are 1) enhancement of facility locational data within the TRI database and generation of locational data for POTWs and off-site disposal facilities, 2) creation of chemical groups based on similar health and environmental effects to help determine patterns of impact, 3) using grid cells and minor watershed boundaries to aggregate releases and map their density and approximate areal extent, 4) developing comparison methods for prioritizing geographic areas or groups of facilities for targeting pollution prevention efforts, 5) analysis of throughput efficiency for facilities in two priority areas, and 6) designing a user interface to make the TRI data and modeling results more accessible, particularly to people who are not regular GIS users.

The state of Virginia maintains an up-to-date electronic database of TRI data, which is also integrated with reporting under other sections of EPCRA, including sections 302, 304, 311, and 312 (sections related to emergency planning, emergency release notification, and chemical inventory reporting). Virginia also publishes an annual TRI summary report that is made available as hard copy and on diskette. Virginia state and local government planners and policy-makers are using TRI data and reports in the areas of hazardous materials response, emergency planning, environmental enforcement, and minimization of hazardous waste. Partly as a result of the state's TRI annual report, state agencies responsible for environmental protection have increased their technical assistance to and regulatory compliance monitoring of Virginia facilities.

The state of Washington is using TRI release information in its pollution prevention legislation, both for determining which facilities must participate in pollution prevention planning and as part of the basis for planning fees.

POTENTIAL HEALTH AND ENVIRONMENTAL EFFECTS OF FIFTEEN HIGH RELEASE TRI CHEMICALS AND TRI OZONE-DEPLETING CHEMICALS

The fifteen Toxics Release Inventory (TRI) chemicals that were released to the environment in greatest quantity in 1991 are listed in Tables A-1 and A-2. Table A-1 provides a 'X-list' summary of potential adverse health and environmental effects of these high release TRI chemicals. Table A-2 lists available EPA drinking water levels and ambient air standards for the chemicals. The list contains thirteen discrete chemicals (assuming the three xylene isomers are considered one chemical) and two groups of unspecified metal (manganese and zinc) compounds. Included in the list of thirteen discrete chemicals are two inorganic gases (chlorine and ammonia), three inorganic acids (hydrochloric, sulfuric, and phosphoric), and eight volatile organic solvents (two ketones, two aromatic hydrocarbons, two chlorinated hydrocarbons, carbon disulfide, and methanol).

The following is a summary of potential adverse health and environmental effects of the 1991 top fifteen volume-released TRI chemicals/chemical categories.

Acetone (also known as dimethylketone) is a flammable liquid that is likely to evaporate when exposed to air. Acetone is irritating to the skin, eye, nose, throat, and upper respiratory tract. EPA has categorized acetone as a Group D carcinogen; EPA has concluded that acetone is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. For non-cancer effects, EPA has established an oral reference dose (RfD) of 0.1 mg/kg/day for acetone. The RfD is based on results from a 90-day rat gavage study showing no adverse kidney effects at a dose of 100 mg/kg/day. The RfD assumes that a 70 kg person could consume (by the oral route) up to 7 mg of acetone daily over a lifetime without appreciable risk of adverse non-cancer effects. An inhalation reference concentration (RfC) for potential non-cancer effects of acetone is currently pending Agency review.

Acetone is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed 1 mg/L. Acetone is not expected to persist in water or bioaccumulate in aquatic life. Because of its potential to volatilize and react in the lower atmosphere, acetone may contribute to formation of photochemical smog.

Ammonia is a corrosive and severely irritating gas with a pungent odor; ammonia can also exist in aqueous solutions. Ammonia is irritating to the skin, eyes, nose, throat, and upper respiratory system. EPA has established an inhalation reference concentration (RfC) of 0.1 mg/m^3 (approximately 0.14 ppm) for non-cancer effects for ammonia. The RfC is based on results showing no adverse effects on lung function in workers monitored during a chronic occupational exposure study. The RfC assumes that a person, breathing 20 cubic meters a day, can be exposed over a lifetime to daily atmospheric amounts of less than 2 mg of ammonia without appreciable risk for adverse non-cancer lung effects. EPA has not evaluated ammonia for its cancer-causing potential or established an oral reference dose (RfD) for its potential non-cancer effects.

Ammonia is expected to have moderate toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be between 0.1 mg/L and 1 mg/L. Ammonia is not expected to persist in water or bioaccumulate in aquatic life. Because it is a source of nitrogen, an essential element for aquatic plant growth, ammonia may contribute to eutrophication of standing or slow-moving surface water. Eutrophication may stimulate the overgrowth of algae whose death and decay may lead to depletion of dissolved oxygen in the water. Low levels of dissolved oxygen limit the type of aquatic organisms that can survive in the water.

Carbon disulfide is a flammable liquid that is likely to evaporate when exposed to air. For non-cancer effects, EPA has established an oral reference dose (RfD) of 0.1 mg/kg/day for carbon disulfide. The RfD is based on results from a inhalation developmental toxicity study in rats showing no adverse effects at a level of 20 ppm. (One ppm of carbon disulfide is equivalent to 3.1 mg per cubic meter of air). The RfD assumes that a 70 kg person could consume (by the oral route) up to 7 mg of carbon disulfide daily over a lifetime without appreciable risk of adverse non-cancer effects. An inhalation reference concentration (RfC) for potential non-cancer effects of carbon disulfide is currently pending Agency review. EPA has not evaluated carbon disulfide for its cancer-causing potential.

Carbon disulfide is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be greater than 1 mg/L. Carbon disulfide is not expected to persist in water or bioaccumulate in aquatic life.

Chlorine is a corrosive and severely irritating gas with a suffocating odor. Contact with moisture (e.g., the water present in mucous membranes in the nose and throat) results in the formation of hydrochloric acid. Chlorine can severely damage exposed tissue (the skin, eye, nose, throat, upper respiratory tract, and the lung). EPA has not evaluated chlorine for its cancer-causing potential or established an oral reference dose (RfD) or an inhalation reference concentration (RfC) for its potential non-cancer effects. A cancer assessment of chlorine and an inhalation reference concentration (RfC) for its non-cancer effects are currently pending Agency review.

Chlorine is expected to have high toxicity to aquatic organisms. Concentrations lethal to half the organisms in a test population are expected to be less than 0.1 mg/L. Chlorine is not expected to persist in water or bioaccumulate in aquatic life. Chlorine is expected to damage exposed portions of terrestrial plants.

Dichloromethane (also known as methylene chloride) is a non-flammable liquid that is likely to evaporate when exposed to air. EPA has classified dichloromethane as a Group B2 or a 'probable human' carcinogen. This determination is based on sufficient evidence of cancer from animal studies of dichloromethane; it has been shown to cause cancer in both oral and inhalation studies. Sufficient evidence of cancer is not available from human studies. Non-cancer effects of dichloromethane include its potential to cause adverse liver and kidney effects. For these effects, EPA has established an oral reference dose (RfD) of 0.06 mg/kg/day for dichloromethane. The RfD is based on results from a two-year rat drinking water study showing no adverse effects at a dose of 6 mg/kg/day . The RfD assumes that a 70 kg person could consume (by the oral route) up to 4.2 mg of dichloromethane daily for a lifetime without appreciable risk of adverse non-cancer effects. An inhalation reference concentration (RfC) for potential non-cancer effects of dichloromethane is currently pending Agency review.

Dichloromethane is expected to have moderate toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be between 0.1 mg/L and 1 mg/L. Dichloromethane is not expected to persist in water or bioaccumulate in aquatic life. Because of dichloromethane is expected to react in the lower atmosphere, it is unlikely to remain in air long enough to reach the upper layers of the atmosphere (the stratosphere) and be a source of ozone-destroying chlorine atoms.

Hydrochloric acid (HCl) is an aqueous solution of hydrogen chloride gas; its vapors have a pungent odor. Hydrochloric acid and hydrogen chloride gas are severely irritating to the skin, eyes, nose, throat, and upper respiratory tract. EPA has established an inhalation reference concentration (RfC) of 0.007 mg/m^3 (approximately 0.005 ppm) for HCl for non-cancer effects. The RfC is based on results showing abnormal increases in cell growth in the upper respiratory tract of animals exposed to HCl/air concentrations of 10 ppm over their lifetimes. The RfC assumes that a person, breathing 20 cubic meters a day, can be exposed over a lifetime to daily atmospheric amounts of less than 0.14 mg of hydrogen chloride without appreciable risk for adverse non-cancer upper respiratory effects. EPA has not evaluated HCl for its cancer-causing potential or established an oral reference dose (RfD) for its potential non-cancer effects. HCl has been shown to cause adverse effects in the developing fetus in animal studies.

Hydrochloric acid is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms in a test population are expected to be greater than 1 mg/L. HCl is not expected to persist in water or bioaccumulate in aquatic life. Depending on the capacity to resist changes in acidity and alkalinity (the buffering capacity) of receiving water, HCl can increase the water's acidity (as measured by decreases in pH). A pH lower than 6.5 is generally considered to be unsuitable for the reproduction of sensitive aquatic populations.

Manganese is an essential element in human growth and maintenance of health. Of the trace elements required for human health, manganese is probably one of the least toxic when it is ingested in the diet. Manganese appears to be more toxic when exposure occurs by drinking water or by inhalation. Manganese compounds are of particular concern for human health when they exist in air as dusts or as fumes. EPA has categorized manganese as a Group D carcinogen; EPA has concluded that manganese is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. For non-cancer effects, EPA has established two oral reference doses (RfDs) for manganese, one for dietary ingestion and one for ingestion by drinking water. These oral RfDs for manganese are 0.14 mg/kg/day for dietary intake and 0.005 mg/kg/day for drinking water intake. The RfD (derived for dietary ingestion) is based a composite level (0.14 mg/kg/day) for manganese thought to be acceptable in the human diet. This RfD assumes that a 70 kg person could consume (through the diet) up to 9.8 mg of manganese daily over a lifetime without appreciable risk of adverse non-cancer effects. The RfD (derived for drinking water ingestion) is based on results from an epidemiology study of potential adverse central nervous system effects in people consuming manganese-contaminated drinking water. Adverse effects were observed at a daily dose of manganese at 0.06 mg/kg but not at 0.005 mg/kg. This RfD assumes that a 70 kg person could ingest up to 0.35 mg of manganese in drinking water daily over a lifetime without appreciable risk of adverse non-cancer, central nervous system effects. For non-cancer effects, EPA has established an inhalation reference concentration (RfC) of 0.0004 mg/m^3 for manganese. The RfC is based on results from a chronic worker exposure study showing manganese-related, adverse central nervous system and respiratory effects at a level as low as 0.97 mg of manganese/m^3. The RfC assumes that a person, breathing 20 cubic meters a day, can be exposed over a lifetime to daily atmospheric amounts of less than 0.008 mg of manganese without appreciable risk for adverse non-cancer, central nervous system or upper respiratory effects. Manganese may also cause adverse reproductive effects in humans by the inhalation route.

Manganese and its compounds are expected to have moderate toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be between 0.1 mg/L and 1 mg/L. Manganese is likely to persist in water. Its concentration in aquatic tissue is not expected to be significantly higher than its concentration in surrounding water.

Methanol is a flammable liquid that is likely to evaporate when exposed to air. For non-cancer effects, EPA has established an oral reference dose (RfD) of 0.5 mg/kg/day for methanol. The RfD is based on results from a 90-day gavage study in rats showing no adverse changes in liver enzyme levels or in brain weight at a dose as high as 500 mg/kg/day. The RfD assumes that a 70 kg person could consume (by the oral route) up to 35 mg of methanol daily over a lifetime without appreciable risk of adverse non-cancer effects. An inhalation reference concentration (RfC) for potential non-cancer effects of methanol is currently pending Agency review. EPA has not evaluated methanol for its cancer-causing potential.

Methanol is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed 1 mg/L. Methanol is not expected to persist in water or bioaccumulate in aquatic life.

Methylchloroform (see 1,1,1-Trichloroethane)

Methyl ethyl ketone (MEK) is a flammable liquid that is likely to evaporate when exposed to air. MEK is irritating to the skin, eye, nose, throat, and upper respiratory tract. EPA has categorized MEK as a Group D carcinogen; EPA has concluded that MEK is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. For non-cancer effects, EPA has established an inhalation reference concentration (RfC) of 1 mg/m^3 for MEK. The RfC is based on results from an inhalation developmental toxicity study in rats showing no adverse effects at 100 ppm. (One ppm of MEK is equivalent to 2.9 mg per cubic meter of air). The RfC assumes that a person, breathing 20 cubic meters of air per day, can be exposed over a lifetime to daily atmospheric amounts of less than 20 mg of MEK without appreciable risk of adverse non-cancer effects. An oral reference dose (RfD) for potential non-cancer effects of methyl ethyl ketone has recently been withdrawn for further Agency review.

Methyl ethyl ketone is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed 1 mg/L. Methyl ethyl ketone is not expected to persist in water or bioaccumulate in aquatic life. Because of its potential to volatilize and react in the lower atmosphere, MEK may contribute to formation of photochemical smog.

Methylene Chloride (see Dichloromethane)

Phosphoric acid exists as either a solid or thick liquid. Aqueous solutions of phosphoric acid are corrosive and irritating to the skin, eye, and mucous membranes. EPA has not evaluated phosphoric acid for its cancer-causing potential or established an oral reference dose (RfD) or inhalation reference concentration (RfC) for its potential non-cancer effects.

Phosphoric acid is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms in a test population are expected to be greater than 1 mg/L. Phosphoric acid is not expected to persist in water or bioaccumulate in aquatic life. Depending on the capacity to resist changes in acidity and alkalinity (the buffering capacity) of receiving water, phosphoric acid can increase the water's acidity (as measured by decreases in pH). A pH lower than 6.5 is generally considered to be unsuitable for the reproduction of sensitive aquatic populations. Because it is a source of phosphorus, an essential element for aquatic plant growth, phosphoric acid may contribute to eutrophication of standing or slow moving surface water. Eutrophication may stimulate the overgrowth of algae whose death and decay may lead to depletion of the dissolved oxygen content of the water. Low levels of dissolved oxygen limit the type of aquatic organisms that can survive in the water.

Sulfuric acid is a corrosive liquid that is severely irritating to the skin, eye, nose, throat, and upper respiratory tract. EPA has not evaluated sulfuric acid for its cancer-causing potential or established an oral reference dose (RfD) or inhalation reference concentration (RfC) for its potential non-cancer effects.

Sulfuric acid is expected to have moderate toxicity to aquatic organisms. Concentrations lethal to half the organisms in a test population are expected to be between 0.1 mg/L and 1 mg/L.

Sulfuric acid is not expected to persist in water or bioaccumulate in aquatic life. Depending on the capacity to resist changes in acidity and alkalinity (the buffering capacity) of receiving water, sulfuric acid can increase the water's acidity (as measured by decreases in pH). A pH lower than 6.5 is generally considered to be unsuitable for the reproduction of sensitive aquatic populations.

Toluene is a flammable liquid that is likely to evaporate when exposed to air. EPA has categorized toluene as a Group D carcinogen; EPA has concluded that toluene is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. For non-cancer effects, EPA has established an oral reference dose (RfD) of 0.2 mg/kg/day for toluene. The RfD is based on results from a 90-day gavage study in rats showing no adverse liver and kidney effects at a dose as high as 312 mg/kg/day. The RfD assumes that a 70 kg person could consume (by the oral route) up to 14 mg of toluene daily for a lifetime without appreciable risk of adverse non-cancer effects. For non-cancer effects, EPA has established an inhalation reference concentration (RfC) of 0.4 mg/m^3 (approximately 0.1 ppm) for toluene. The RfC is based on results from a chronic occupational exposure study showing adverse central nervous system effects in workers exposed at a level as low as 88 ppm (approximately 330 mg/m^3). The RfC assumes that a person, breathing 20 cubic meters a day, can be exposed over a lifetime to daily atmospheric amounts of less than 8 mg of toluene without appreciable risk for adverse non-cancer effects. Toluene has been shown to damage the developing fetus in animal studies at high levels of exposure, as low as 420 mg/kg/day orally and 200 ppm (approximately 760 mg/m^3) by inhalation.

Toluene is expected to be moderately toxic to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be between 0.1 mg/L and 1 mg/L. Toluene is not expected to persist in water or bioaccumulate in aquatic life. Because of its potential to volatilize and react in the lower atmosphere, toluene may contribute to formation of photochemical smog.

1,1,1-Trichloroethane (also known as methylchloroform) is a non-flammable liquid that is likely to evaporate when exposed to air. EPA has categorized methylchloroform as a Group D carcinogen; EPA has concluded that methylchloroform is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. Available evidence from short-term assays suggests methylchloroform may be a mutagen. EPA has recently withdrawn an oral reference dose (RfD) for potential non-cancer effects of methylchloroform. An inhalation reference concentration (RfC) for potential non-cancer effects of methylchloroform is currently pending Agency review.

Methyl chloroform is expected to have low toxicity to aquatic organisms; concentrations lethal to half the organisms of a test population are expected to be greater than 1 mg/L. Methylchloroform is not expected to persist in water or bioaccumulate in aquatic life. Because of its expected low reactivity in the lower atmosphere, methylchloroform could stay in air long enough to reach the upper layers of the atmosphere. Methylchloroform could be a source of ozone-destroying chlorine atoms in the upper layer of the atmosphere known as the stratosphere.

Xylene is the name shared by three chemicals, each a dimethyl benzene isomer; the chemicals are flammable liquids that are likely to evaporate when exposed to air. EPA has categorized xylene as a Group D carcinogen; EPA has concluded that xylene is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. For non-cancer effects, EPA has established an oral reference dose (RfD) of 2 mg/kg/day for xylene. The RfD is based on results from a lifetime rat gavage study showing no adverse effects at a dose as high as 250 mg/kg/day. The RfD assumes a 70 kg person could consume (by the oral route) up to 140 mg of xylene daily over a lifetime without appreciable risk of adverse non-cancer effects. An inhalation reference concentration (RfC) for potential non-cancer effects of xylene is currently pending Agency review. Limited information suggests xylene may damage the developing fetus of animals at high levels of inhalation exposure.

Xylene is expected to have moderate toxicity to aquatic organisms. Concentrations lethal to one half the organisms of a test population are expected to be between 0.1 mg/L and 1 mg/L. Xylene is not expected to persist in water or bioaccumulate in aquatic life. Because of its potential to volatilize and react in the lower atmosphere, xylene may contribute to formation of photochemical smog.

Zinc is also an essential element in human growth and maintenance of health. EPA has categorized zinc as a Group D carcinogen; EPA has concluded that zinc is not classifiable as to its cancer-causing potential. Sufficient cancer evidence is not available in either human studies or animal studies to allow EPA to make a more definite determination. EPA has established an oral reference dose (RfD) of 0.3 mg/kg/day for soluble zinc salts. The RfD is based on results from a clinical study of potential effects in people consuming zinc supplements in their diet. Adverse effects indicative of imbalances of copper in the body were observed at a daily dose of supplemental zinc at 1 mg/kg. The RfD assumes that a 70 kg person could ingest up to 21 mg of soluble zinc salts daily over a lifetime without appreciable risk of adverse effects. EPA has not established an inhalation reference concentration (RfC) for zinc for its potential non-cancer effects. Zinc has been shown to damage the developing fetus at doses as low as 100 mg/kg/day in animal studies.

Zinc and its salts are expected to be highly toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to be less than 0.1 mg/L. Zinc is likely to persist in water. Its concentration in aquatic tissue is expected to be significantly higher than its concentration in surrounding water.

Table A-1. Potential Adverse Human Health and Environmental Effects of the Top Fifteen Released TRI Chemicals (1991).

CHEMICALS	POTENTIAL ADVERSE EFFECTS								
	Irr/ Corr	Cancer	Muta	Chronic	Develop	Repro	Aquatic	Ozone Deple- tion	Smog Forma- tion
Acetone	X								X
Ammonia	X						X		
Carbon Disulfide	X			X	X				
Chlorine	X						X		
Dichloromethane		X		X			X		
Hydrochloric Acid	X			X	X		?		
Manganese				X		X (inhal)	X		
Methanol				?					
Methyl Ethyl Ketone	X								X
Phosphoric Acid	X						X		
Sulfuric Acid	X						X		
Toluene				X	X		X		X
1,1,1-Trichloro-ethane								X	
Xylene					?		X		X
Zinc				X	X		X		

Table A-2. Drinking Water Health Advisories/Maximum Contaminant Levels and Air Standards for the Top Fifteen Released TRI Chemicals (1991).

CHEMICALS	HEALTH ADVISORIES	MAXIMUM CONTAMINANT (mg/L) Goal	MAXIMUM CONTAMINANT (mg/L) Level	AMBIENT AIR STANDARDS
Acetone	None	None		None
Ammonia	None	None		None
Carbon Disulfide	None	None		None
Chlorine	None	None		None
Dichloromethane	10-day (child): 2 mg/L longer term (child): 0.5 mg/L (adult): 2 mg/L	0	0.005	None
Hydrochloric Acid	None	None		None
Manganese	None	1.3 (proposed)		None
Methanol	None	None		None
Methyl Ethyl Ketone	10-day (child): 8 mg/L longer term (child): 3 mg/L lifetime (adult): 0.2 mg/L	None		None
Phosphoric Acid	None	None		None
Sulfuric Acid	None	None		None
Toluene	10-day (child): 3 mg/L longer term (child): 3 mg/L lifetime (adult): 2 mg/L	1	1	None
1,1,1-Trichloroethane	10-day (child): 40 mg/L longer term (child): 40 mg/L lifetime (adult): 0.2 mg/L	0.2	0.2	None
Xylene	10-day (child): 40 mg/L longer term (child): 40 mg/L lifetime (adult): 10 mg/L	10	10	None
Zinc	None	None		None

Ozone Depleters

The following chemicals are listed on the EPCRA section 313 toxic chemical list because of their contribution to the depletion of stratospheric ozone: Bromochlorodifluoromethane (Halon 1211), Bromomethane (methyl bromide), Bromotrifluoromethane (Halon 1301), Carbon tetrachloride, Dibromotetrafluoroethane (Halon 2402), Dichlorodifluoromethane (CFC-12), Dichlorotetrafluoroethane (CFC-114), Freon-113, Monochloropentafluoroethane (CFC-115), 1,1,1-Trichloroethane (methyl chloroform), and Trichlorofluoromethane (CFC-11).

As discussed in Chapter 1, the result of these ozone-depleting chemicals' being released into the atmosphere is a decrease in the earth's protective ozone layer, yielding an increase in the amount of ultraviolet-B radiation that reaches the earth's surface. Ultraviolet-B radiation is known to cause many adverse human health and environmental effects. The following are some of the effects associated with UV-B radiation exposure:

Health Effects

Skin Cancer

Exposure to ultraviolet-B radiation has been implicated with two types of nonmelanoma skin cancer: squamous cell cancer and basal cell cancer. In addition, experimental evidence suggests that ultraviolet-B radiation plays an important role in causing malignant melanoma skin cancer. Recent studies predict that for each 1 percent change in ultraviolet-B radiation intensity, the incidence of melanoma could increase from 0.5 to 1 percent.

Other Health Effects

Studies have demonstrated that ultraviolet-B radiation can suppress the immune response system in animals and possibly in humans.

The incidence of cataracts and adverse affects on the retina are likely to increase with ultraviolet-B radiation exposure.

Other studies have shown that increased penetration of ultraviolet-B radiation could increase the rate of tropospheric ozone formation. Data suggest that ozone exposure may lead to chronic health effects, including morphological changes to, and impaired functioning of, the lungs.

Environmental Effects

Aquatic organisms, particularly phytoplankton, zooplankton, and the larvae of many fishes, appear to be susceptible to harm from ultraviolet-B radiation because they spend at least part of their time at or near the surface of the waters they inhabit.

Plants have also been shown to be adversely affected by increased ultraviolet-B radiation. Possible effects include yield reductions and altering the balance of competition between plants.

TRI CHEMICALS IN OTHER FEDERAL PROGRAMS: REGULATORY MATRIX

Many of the chemicals covered under the ToxicS Release Inventory (TRI) are also subject to other environmental laws. The following matrix indicates whether the currently listed TRI chemicals are subject to any of the following selected environmental laws:

1. **EPCRA 302**: Under the Emergency Planning and Community Right-to-Know Act (EPCRA) section 302 (codified at 40 CFR Part 355), facilities with listed extremely hazardous substances (EHSs) in quantities greater than their Threshold Planning Quantities (TPQs) must report to the State Emergency Response Commission. TPQs are based on a combination of acute toxicity and ability of the substance to become airborne. The list of EHSs and their TPQs can be found at 40 CFR Part 355 Appendix A. For more information, contact the EPCRA Information Hotline: 1-800-535-0202.

2. **CAA 112**: The Clean Air Act (CAA) section 112, National Emission Standards for Hazardous Air Pollutants (NESHAPS; codified at 40 CFR Part 61), lists the Hazardous Air Pollutants and includes emissions standards and monitoring requirements for plants with listed chemicals.

3. **CERCLA**: Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; 42 USC 9601 et seq.), releases of listed substances at or above their Reportable Quantities (RQs) must be reported to the National Response Center (NRC). RQs are set on the basis of aquatic toxicity, acute mammalian toxicity, ignitability, reactivity, chronic toxicity, and carcinogenicity, with possible adjustment on the basis of biodegradation, hydrolysis, and photolysis. The list of CERCLA hazardous substances and their RQs can be found at 40 CFR 302.4. For more information, contact the RCRA/Superfund Hotline: 1-800-424-9346.

4. **FIFRA**: The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) creates a statutory framework under which EPA, through a registration process, regulates the development, sale, distribution, and use of pesticides.

5. **NPDWR**: The National Primary Drinking Water Regulations under the Safe Drinking Water Act, Subparts B and G (codified at 40 CFR Part 141) lists Maximum Contaminant Levels (MCLs) for certain chemicals. The MCL is the maximum permissible level of a contaminant in public drinking water systems. MCLs are based on health factors, but are also required by law to reflect the technological and economic feasibility of removing the contaminant from the water supply. Further information is available from the Safe Drinking Water Hotline: 1-800-424-4791.

6. **PPL**: The Clean Water Act (CWA) regulates the discharge of pollutants into waterways by industrial sources, municipal sources, and other sources. These sources of water pollution are subject to effluent limitations based on guidelines and water quality standards. Approximately 125 pollutants make up a "Priority Pollutants List." EPA has developed water quality criteria for all the priority pollutants.

7. **RCRA (P/U)**: Under the Resource Conservation and Recovery Act (RCRA), hazardous wastes are required to be managed "cradle to grave" (i.e., from the point of generation to the point of ultimate disposal). For a waste to be classified as hazardous, it can be an F, K, P, or U listed hazardous waste (40 CFR 261.30 - 261.33) or exhibit one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

   The chemicals on the P and U list are commercial chemical products, off-specification species, container residues, and spill residues. The chemicals on the P list have been identified as acute hazardous waste; those on the U list have been identified as toxic wastes. For more information, contact the RCRA/Superfund Hotline: 1-800-424-9346.

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
75-07-0	Acetaldehyde		X	X					X
60-35-5	Acetamide		X	X					
67-64-1	Acetone			X					X
75-05-8	Acetonitrile		X	X					X
53-96-3	2-Acetylaminofluorene		X	X					X
107-02-8	Acrolein	X	X	X	X		X	X	
79-06-1	Acrylamide	X	X	X		X			X
79-10-7	Acrylic acid		X	X					X
107-13-1	Acrylonitrile	X	X	X			X		X
309-00-2	Aldrin	X		X			X	X	
107-18-6	Allyl alcohol	X		X				X	
107-05-1	Allyl chloride		X	X					
7429-90-5	Aluminum (fume or dust)								
1344-28-1	Aluminum oxide (fibrous forms)								
117-79-3	2-Aminoanthraquinone								
60-09-3	4-Aminoazobenzene								
92-67-1	4-Aminobiphenyl		X	X					
82-28-0	1-Amino-2-methylanthraquinone								
7664-41-7	Ammonia	X		X					
6484-52-2	Ammonium nitrate (solution)								
7783-20-2	Ammonium sulfate (solution)								
62-53-3	Aniline	X	X	X					X
90-04-0	o-Anisidine		X	X					
104-94-9	p-Anisidine								
134-29-2	o-Anisidine hydrochloride								
120-12-7	Anthracene			X			X		
7440-36-0	Antimony			X		X	X		
7440-38-2	Arsenic			X			X		
1332-21-4	Asbestos (friable)		X	X		X	X		
7440-39-3	Barium								
98-87-3	Benzal chloride	X		X					X
55-21-0	Benzamide								
71-43-2	Benzene		X	X		X	X		X
92-87-5	Benzidine		X	X			X		X
98-07-7	Benzoic trichloride	X	X	X					X
98-88-4	Benzoyl chloride			X					
94-36-0	Benzoyl peroxide								
100-44-7	Benzyl chloride	X	X	X				X	
7440-41-7	Beryllium			X		X	X		
92-52-4	Biphenyl		X	X	X				
111-44-4	Bis(2-chloroethyl) ether	X	X	X			X		X
542-88-1	Bis(chloromethyl) ether	X	X	X				X	
108-60-1	Bis(2-chloro-1-methylethyl) ether			X			X		X
103-23-1	Bis(2-ethylhexyl) adipate					X			
353-59-3	Bromochlorodifluoromethane (Halon 1211)			X					
75-25-2	Bromoform		X	X			X		X
74-83-9	Bromomethane	X	X	X	X		X		X

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
75-63-8	Bromotrifluoromethane (Halon 1301)			X					
106-99-0	1,3-Butadiene		X	X					
141-32-2	Butyl acrylate								
71-36-3	n-Butyl alcohol			X					X
78-92-2	sec-Butyl alcohol								
75-65-0	tert-Butyl alcohol								
85-68-7	Butyl benzyl phthalate			X			X		
106-88-7	1,2-Butylene oxide		X	X					
123-72-8	Butyraldehyde								
4680-78-8	C.I. Acid Green 3								
569-64-2	C.I. Basic Green 4								
989-38-8	C.I. Basic Red 1								
1937-37-7	C.I. Direct Black 38								
2602-46-2	C.I. Direct Blue 6								
16071-86-6	C.I. Direct Brown 95								
2832-40-8	C.I. Disperse Yellow 3								
3761-53-3	C.I. Food Red 5								
81-88-9	C.I. Food Red 15								
3118-97-6	C.I. Solvent Orange 7								
97-56-3	C.I. Solvent Yellow 3								
842-07-9	C.I. Solvent Yellow 14								
492-80-8	C.I. Solvent Yellow 34			X					X
128-66-5	C.I. Vat Yellow 4								
7440-43-9	Cadmium			X			X		
156-62-7	Calcium cyanamide		X	X					
133-06-2	Captan		X	X	X				
63-25-2	Carbaryl		X	X	X				
75-15-0	Carbon disulfide	X	X	X				X	
56-23-5	Carbon tetrachloride		X	X		X	X		X
463-58-1	Carbonyl sulfide		X	X					
120-80-9	Catechol		X	X					
133-90-4	Chloramben		X	X					
57-74-9	Chlordane	X	X	X	X	X	X		X
7782-50-5	Chlorine	X	X	X	X				
10049-04-4	Chlorine dioxide				X				
79-11-8	Chloroacetic acid	X	X	X					
532-27-4	2-Chloroacetophenone		X	X					
108-90-7	Chlorobenzene		X	X		X	X		X
510-15-6	Chlorobenzilate		X	X					X
75-00-3	Chloroethane		X	X			X		
67-66-3	Chloroform	X	X	X			X		X
74-87-3	Chloromethane		X	X			X		X
107-30-2	Chloromethyl methyl ether	X	X	X					X
126-99-8	Chloroprene		X	X					
1897-45-6	Chlorothalonil				X				
7440-47-3	Chromium			X			X		
7440-48-4	Cobalt								
7440-50-8	Copper			X	X		X		
8001-58-9	Creosote			X	X				X

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
120-71-8	p-Cresidine								
1319-77-3	Cresol (mixed isomers)		X	X					X
108-39-4	m-Cresol		X	X	X				
95-48-7	o-Cresol	X	X	X					
106-44-5	p-Cresol		X	X					
98-82-8	Cumene		X	X					X
80-15-9	Cumene hydroperoxide			X					X
135-20-6	Cupferron								
110-82-7	Cyclohexane			X					X
94-75-7	2,4-D (acetic acid)		X	X	X	X			X
1163-19-5	Decabromodiphenyl oxide								
2303-16-4	Diallate			X					X
615-05-4	2,4-Diaminoanisole								
39156-41-7	2,4-Diaminoanisole sulfate								
101-80-4	4,4'-Diaminodiphenyl ether								
25376-45-8	Diaminotoluene (mixed isomers)			X					X
95-80-7	2,4-Diaminotoluene		X	X					X
334-88-3	Diazomethane		X	X					
132-64-9	Dibenzofuran		X	X					
96-12-8	1,2-Dibromo-3-chloropropane		X	X		X			X
106-93-4	1,2-Dibromoethane		X	X	X	X			X
124-73-2	Dibromotetrafluoroethane (Halon 2402)			X					
84-74-2	Dibutyl phthalate		X	X			X		X
25321-22-6	Dichlorobenzene (mixed isomers)			X					
95-50-1	1,2-Dichlorobenzene			X	X	X	X		X
541-73-1	1,3-Dichlorobenzene			X			X		X
106-46-7	1,4-Dichlorobenzene		X	X	X	X	X		X
91-94-1	3,3'-Dichlorobenzidine		X	X			X		X
75-27-4	Dichlorobromomethane			X			X		
75-71-8	Dichlorodifluoromethane (CFC-12)			X	X				X
107-06-2	1,2-Dichloroethane		X	X	X	X	X		X
540-59-0	1,2-Dichloroethylene								
75-09-2	Dichloromethane		X	X	X	X	X		X
120-83-2	2,4-Dichlorophenol			X			X		X
78-87-5	1,2-Dichloropropane		X	X		X	X		X
78-88-6	2,3-Dichloropropene			X					
542-75-6	1,3-Dichloropropylene		X	X	X				X
76-14-2	Dichlorotetrafluoroethane (CFC-114)			X					
62-73-7	Dichlorvos	X	X	X	X				
115-32-2	Dicofol			X	X				
1464-53-5	Diepoxybutane	X		X					X
111-42-2	Diethanolamine		X	X					
117-81-7	Di-(2-ethylhexyl) phthalate		X	X		X	X		X
84-66-2	Diethyl phthalate			X			X		X
64-67-5	Diethyl sulfate		X	X					
119-90-4	3,3'-Dimethoxybenzidine		X	X					X
60-11-7	4-Dimethylaminoazobenzene		X	X					X

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
119-93-7	3,3'-Dimethylbenzidine		X	X					X
79-44-7	Dimethylcarbamyl chloride		X	X					X
57-14-7	1,1-Dimethyl hydrazine	X	X	X					X
105-67-9	2,4-Dimethylphenol			X	X		X		X
131-11-3	Dimethyl phthalate		X	X			X		X
99-65-0	m-Dinitrobenzene			X					
528-29-0	o-Dinitrobenzene			X					
100-25-4	p-Dinitrobenzene			X					
534-52-1	4,6-Dinitro-o-cresol	X	X	X	X		X	X	
51-28-5	2,4-Dinitrophenol		X	X			X	X	
121-14-2	2,4-Dinitrotoluene		X	X			X		X
606-20-2	2,6-Dinitrotoluene			X			X		X
25321-14-6	Dinitrotoluene (mixed isomers)			X					
117-84-0	n-Dioctyl phthalate			X			X		X
123-91-1	1,4-Dioxane		X	X					X
122-66-7	1,2-Diphenylhydrazine		X	X			X		X
106-89-8	Epichlorohydrin	X	X	X		X			X
110-80-5	2-Ethoxyethanol			X					X
140-88-5	Ethyl acrylate		X	X					X
100-41-4	Ethylbenzene		X	X		X	X		
541-41-3	Ethyl chloroformate								
74-85-1	Ethylene				X				
107-21-1	Ethylene glycol		X	X	X				
151-56-4	Ethyleneimine	X	X	X				X	
75-21-8	Ethylene oxide	X	X	X	X				X
96-45-7	Ethylene thiourea		X	X					X
2164-17-2	Fluometuron				X				
50-00-0	Formaldehyde	X	X	X	X				X
76-13-1	Freon 113								
76-44-8	Heptachlor		X	X	X	X	X	X	
118-74-1	Hexachlorobenzene		X	X		X	X		X
87-68-3	Hexachloro-1,3-butadiene		X	X			X		X
77-47-4	Hexachlorocyclopentadiene	X	X	X		X	X		X
67-72-1	Hexachloroethane		X	X			X		X
1335-87-1	Hexachloronaphthalene								
680-31-9	Hexamethylphosphoramide		X	X					
302-01-2	Hydrazine	X	X	X					X
10034-93-2	Hydrazine sulfate								
7647-01-0	Hydrochloric acid	X	X	X	X				
74-90-8	Hydrogen cyanide	X		X		X		X	
7664-39-3	Hydrogen fluoride	X	X	X					X
123-31-9	Hydroquinone	X	X	X					
78-84-2	Isobutyraldehyde								
67-63-0	Isopropyl alcohol (manufacturing)				X				
80-05-7	4,4'-Isopropylidenediphenol								
120-58-1	Isosafrole			X					X
7439-92-1	Lead			X			X		
58-89-9	Lindane	X	X	X	X	X	X		X
108-31-6	Maleic anhydride		X	X					X
12427-38-2	Maneb				X				

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
7439-96-5	Manganese								
7439-97-6	Mercury			X			X		
67-56-1	Methanol		X	X	X				X
72-43-5	Methoxychlor		X	X	X	X			X
109-86-4	2-Methoxyethanol				X				
96-33-3	Methyl acrylate								
1634-04-4	Methyl tert-butyl ether		X	X					
101-14-4	4,4'-Methylenebis (2-chloroaniline)		X	X					X
101-61-1	4,4'-Methylenebis(N,N-dimethyl)								
101-68-8	Methylenebis(phenylisocyanate)		X	X					
74-95-3	Methylene bromide			X					X
101-77-9	4,4'-Methylenedianiline		X	X					
78-93-3	Methyl ethyl ketone		X	X					X
60-34-4	Methyl hydrazine	X	X	X				X	
74-88-4	Methyl iodide		X	X					X
108-10-1	Methyl isobutyl ketone		X	X					X
624-83-9	Methyl isocyanate	X	X	X				X	
80-62-6	Methyl methacrylate		X	X					X
90-94-8	Michler's ketone								
1313-27-5	Molybdenum trioxide								
76-15-3	Monochloropentafluoroethane (CFC-115)			X					
505-60-2	Mustard gas	X							
91-20-3	Naphthalene		X	X	X		X		X
134-32-7	alpha-Naphthylamine			X					X
91-59-8	beta-Naphthylamine			X					X
7440-02-0	Nickel			X		X	X		
7697-37-2	Nitric acid	X		X					
139-13-9	Nitrilotriacetic acid								
99-59-2	5-Nitro-o-anisidine								
98-95-3	Nitrobenzene	X	X	X			X		X
92-93-3	4-Nitrobiphenyl		X	X					
1836-75-5	Nitrofen								
51-75-2	Nitrogen mustard	X							
55-63-0	Nitroglycerin			X				X	
88-75-5	2-Nitrophenol			X			X		
100-02-7	4-Nitrophenol		X	X	X		X		X
79-46-9	2-Nitropropane		X	X					X
156-10-5	p-Nitrosodiphenylamine								
121-69-7	N,N-Dimethylaniline		X	X					
924-16-3	N-Nitrosodi-n-butylamine			X					X
55-18-5	N-Nitrosodiethylamine			X					X
62-75-9	N-Nitrosodimethylamine	X	X	X			X	X	
86-30-6	N-Nitrosodiphenylamine			X			X		
621-64-7	N-Nitrosodi-n-propylamine			X			X		X
4549-40-0	N-Nitrosomethylvinylamine			X				X	
59-89-2	N-Nitrosomorpholine		X	X					
759-73-9	N-Nitroso-N-ethylurea			X					X
684-93-5	N-Nitroso-N-methylurea		X	X					X

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
16543-55-8	N-Nitrosonornicotine								
100-75-4	N-Nitrosopiperidine			X					X
2234-13-1	Octochloronaphthalene								
20816-12-0	Osmium tetroxide			X				X	
56-38-2	Parathion	X	X	X	X			X	
87-86-5	Pentachlorophenol		X	X	X	X	X		X
79-21-0	Peracetic acid	X			X				
108-95-2	Phenol	X	X	X	X		X		X
106-50-3	p-Phenylenediamine		X	X					
90-43-7	2-Phenylphenol				X				
75-44-5	Phosgene	X	X	X				X	
7664-38-2	Phosphoric acid			X	X				
7723-14-0	Phosphorus (yellow or white)	X	X	X	X				
85-44-9	Phthalic anhydride		X	X					X
88-89-1	Picric acid								
1336-36-3	Polychlorinated biphenyls (PCBs)		X	X		X			
1120-71-4	Propane sultone		X	X					X
57-57-8	beta-Propiolactone	X	X	X					
123-38-6	Propionaldehyde		X	X					
114-26-1	Propoxur		X	X	X				
115-07-1	Propylene								
75-55-8	Propyleneimine	X	X	X				X	
75-56-9	Propylene oxide	X	X	X	X				
110-86-1	Pyridine			X					X
91-22-5	Quinoline		X	X					
106-51-4	Quinone		X	X					X
82-68-8	Quintozene		X	X	X				X
81-07-2	Saccharin (manufacturing)			X					X
94-59-7	Safrole			X					X
7782-49-2	Selenium			X			X		
7440-22-4	Silver			X	X		X		
7757-82-6	Sodium sulfate (solution)	X	X	X					X
100-42-5	Styrene		X	X		X			
96-09-3	Styrene oxide		X	X					
7664-93-9	Sulfuric acid	X		X	X				
79-34-5	1,1,2,2-Tetrachloroethane		X	X			X		X
127-18-4	Tetrachloroethylene		X	X	X	X	X		X
961-11-5	Tetrachlorvinphos				X				
7440-28-0	Thallium			X		X	X		
62-55-5	Thioacetamide			X					X
139-65-1	4,4'-Thiodianiline								
62-56-6	Thiourea			X					X
1314-20-1	Thorium dioxide								
7550-45-0	Titanium tetrachloride	X	X	X					
108-88-3	Toluene		X	X		X	X		X
584-84-9	Toluene-2,4-diisocyanate	X	X	X					X
7440-28-0	Thallium			X		X	X		
62-55-5	Thioacetamide			X					X
139-65-1	4,4'-Thiodianiline								
62-56-6	Thiourea			X					X

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
1314-20-1	Thorium dioxide								
7550-45-0	Titanium tetrachloride	X	X	X					
108-88-3	Toluene		X	X		X	X		X
584-84-9	Toluene-2,4-diisocyanate	X	X	X					X
91-08-7	Toluene-2,6-diisocyanate	X		X					X
26471-62-5	Toluenediisocyanate (mixed isomers)			X					X
95-53-4	o-Toluidine		X	X					X
636-21-5	o-Toluidine hydrochloride			X					X
8001-35-2	Toxaphene	X	X	X	X	X	X	X	
68-76-8	Triaziquone								
52-68-6	Trichlorfon			X	X				
120-82-1	1,2,4-Trichlorobenzene		X	X		X	X		
71-55-6	1,1,1-Trichloroethane		X	X	X	X	X		X
79-00-5	1,1,2-Trichloroethane		X	X		X	X		X
79-01-6	Trichloroethylene		X	X		X	X		X
75-69-4	Trichlorofluoromethane (CFC-11)			X	X				X
95-95-4	2,4,5-Trichlorophenol		X	X					X
88-06-2	2,4,6-Trichlorophenol		X	X			X		X
1582-09-8	Trifluralin		X	X	X				
95-63-6	1,2,4-Trimethylbenzene								
126-72-7	Tris(2,3-dibromopropyl) phosphate			X					X
51-79-6	Urethane		X	X					X
7440-62-2	Vanadium (fume or dust)								
108-05-4	Vinyl acetate	X	X	X					
593-60-2	Vinyl bromide		X	X					
75-01-4	Vinyl chloride		X	X		X	X		X
75-35-4	Vinylidene chloride		X	X		X	X		X
1330-20-7	Xylene (mixed isomers)		X	X	X	X			X
108-38-3	m-Xylene		X	X					X
95-47-6	o-Xylene		X	X					X
106-42-3	p-Xylene		X	X					X
87-62-7	2,6-Xylidine								
7440-66-6	Zinc (fume or dust)			X	X		X		
12122-67-7	Zineb								
	Antimony compounds		X	X					
	Arsenic compounds		X	X		X			
	Barium compounds					X			
	Beryllium compounds		X	X					
	Cadmium compounds		X	X		X			
	Chlorophenols			X					
	Chromium compounds		X	X		X			
	Cobalt compounds		X	X					
	Copper compounds			X	X	X			
	Cyanide compounds		X	X					
	Glycol ethers		X	X					
	Lead compounds		X	X		X			
	Manganese compounds		X	X					
	Mercury compounds		X	X		X			

CAS Number	Chemical	EPCRA 302	CAA 112	CERCLA	FIFRA	NPDWR	PPL	RCRA P	RCRA U
	Nickel compounds		X	X					
	Poly brominated biphenyls								
	Selenium compounds		X	X		X			
	Silver compounds			X	X				
	Thallium compounds			X					
	Zinc compounds			X	X				

TOXICS RELEASE INVENTORY FORM R FOR 1991

The Form R for 1991 modifies previous years' forms in both content and format. While several sections of the form were rearranged, the biggest change was the addition of a number of information elements mandated by the Pollution Prevention Act of 1990 in section 8 (see chapter 2 for a detailed discussion of the information collected under this Act). In past years, section 8 was optional; in the 1991 form, the section is mandatory.

The 1991 Form (a copy of which follows) is divided into two parts:

- **Part I (Facility Identification Information)** contains information on such matters as name, address, parent company information, and contact names and phone numbers for the facility.

- **Part II (Chemical-Specific Information)** contains information such as chemical identity, facility activities and uses of the chemical, on-site release and off-site transfer amounts, on-site waste treatment methods and efficiencies, and data on source reduction and recycling activities.

Readers who are interested in a more in-depth understanding of who is required to report to TRI and how to fill out the Form R are referred to the EPCRA Information Hotline at 1-800-535-0202.

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FORM R 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

TRI FACILITY ID NUMBER

Toxic Chemical, Category, or Generic

WHERE TO SEND COMPLETED FORMS:
1. EPCRA Reporting Center
P.O. Box 3348
Merrifield, VA 22116-3348
ATTN: TOXIC CHEMICAL RELEASE INVENTORY
2. APPROPRIATE STATE OFFICE
(See instructions in Appendix F)

Enter "X" here if this is a revision

For EPA use only

IMPORTANT: See instructions to determine when "Not Applicable (NA)" boxes should be checked.

PART I. FACILITY IDENTIFICATION INFORMATION

SECTION 1. REPORTING YEAR

19 ____

SECTION 2. TRADE SECRET INFORMATION

2.1 Are you claiming the toxic chemical identified on page 3 trade secret?

☐ Yes (Answer question 2.2; Attach substantiation forms) ☐ No (Do not answer 2.2; Go to Section 3)

2.2 If yes in 2.1, is this copy: ☐ Sanitized ☐ Unsanitized

SECTION 3. CERTIFICATION (Important: Read and sign after completing all form 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

SECTION 4. FACILITY IDENTIFICATION

4.1

Facility or Establishment Name

TRI Facility ID Number

Street Address

City

County

State

Zip Code

Mailing Address (if different from street address)

City

State

Zip Code

PUT LABEL HERE

United States Environmental Protection Agency

EPA FORM R

PART I. FACILITY IDENTIFICATION INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 4. FACILITY IDENTIFICATION (Continued)

4.2	This report contains information for: (Important: check only one)	a. ☐ An entire facility		b. ☐ Part of a facility		
4.3	Technical Contact	Name		Telephone Number (include area code)		
4.4	Public Contact	Name		Telephone Number (include area code)		
4.5	SIC Code (4-digit)	a.	b.	c.	d.	e.	f.

		Latitude			Longitude		
4.6	Latitude and Longitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

4.7	Dun & Bradstreet Number(s) (9 digits)	a.
		b.
4.8	EPA Identification Number(s) (RCRA I.D. No.) (12 characters)	a.
		b.
4.9	Facility NPDES Permit Number(s) (9 characters)	a.
		b.
4.10	Underground Injection Well Code (UIC) I.D. Number(s) (12 digits)	a.
		b.

SECTION 5. PARENT COMPANY INFORMATION

5.1	Name of Parent Company ☐ NA	
5.2	Parent Company's Dun & Bradstreet Number ☐ NA	(9 digits)

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EPA FORM R

PART II. CHEMICAL-SPECIFIC INFORMATION

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 1. TOXIC CHEMICAL IDENTITY

(Important: DO NOT complete this section if you complete Section 2 below.)

1.1	CAS Number (Important: Enter only one number exactly as it appears on the Section 313 list. Enter category code if reporting a chemical category.)
1.2	Toxic Chemical or Chemical Category Name (Important: Enter only one name exactly as it appears on the Section 313 list.)
1.3	Generic Chemical Name (Important: Complete only if Part I, Section 2.1 is checked "yes." Generic Name must be structurally descriptive.)

SECTION 2. MIXTURE COMPONENT IDENTITY

(Important: DO NOT complete this section if you complete Section 1 above.)

2.1	Generic Chemical Name Provided by Supplier (Important: Maximum of 70 characters, including numbers,letters, spaces, and punctuation.)

SECTION 3. ACTIVITIES AND USES OF THE TOXIC CHEMICAL AT THE FACILITY

(Important: Check all that apply.)

3.1	Manufacture the toxic chemical:	a. ☐ Produce b. ☐ Import	If produce or import: c. ☐ For on-site use/processing d. ☐ For sale/distribution e. ☐ As a byproduct f. ☐ As an impurity
3.2	Process the toxic chemical:	a. ☐ As a reactant b. ☐ As a formulation component	c. ☐ As an article component d. ☐ Repackaging
3.3	Otherwise use the toxic chemical:	a. ☐ As a chemical processing aid b. ☐ As a manufacturing aid	c. ☐ Ancillary or other use

SECTION 4. MAXIMUM AMOUNT OF THE TOXIC CHEMICAL ON-SITE AT ANY TIME DURING THE CALENDAR YEAR

4.1	☐ (Enter two-digit code from instruction package.)

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PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 5. RELEASES OF THE TOXIC CHEMICAL TO THE ENVIRONMENT ON-SITE

			A. Total Release (pounds/year) (enter range code from instructions or estimate)	B. Basis of Estimate (enter code)	C. % From Stormwater
5.1	Fugitive or non-point air emissions	☐ NA			
5.2	Stack or point air emissions	☐ NA			
5.3	Discharges to receiving streams or water bodies (enter one name per box)				
5.3.1	Stream or Water Body Name				
5.3.2	Stream or Water Body Name				
5.3.3	Stream or Water Body Name				
5.4	Underground injections on-site	☐ NA			
5.5	Releases to land on-site				
5.5.1	Landfill	☐ NA			
5.5.2	Land treatment/ application farming	☐ NA			
5.5.3	Surface impoundment	☐ NA			
5.5.4	Other disposal	☐ NA			

☐ Check here only if additional Section 5.3 information is provided on page 5 of this form.

Range Codes: A = 1 - 10 pounds; B = 11 - 499 pounds; C = 500 - 999 pounds.

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EPA FORM R

PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 5.3 ADDITIONAL INFORMATION ON RELEASES OF THE TOXIC CHEMICAL TO THE ENVIRONMENT ON-SITE

5.3	Discharges to receiving streams or water bodies (enter one name per box)	A. Total Release (pounds/year) (enter range code from instructions or estimate)	B. Basis of Estimate (enter code)	C. % From Stormwater
5.3.__	Stream or Water Body Name			
5.3.__	Stream or Water Body Name			
5.3.__	Stream or Water Body Name			

SECTION 6. TRANSFERS OF THE TOXIC CHEMICAL IN WASTES TO OFF-SITE LOCATIONS

6.1 DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS (POTW)

6.1.A Total Quantity Transferred to POTWs and Basis of Estimate

6.1.A.1 Total Transfers (pounds/year) (enter range code or estimate)	6.1.A.2 Basis of Estimate (enter code)

6.1.B POTW Name and Location Information

6.1.B.__ POTW Name		6.1.B.__ POTW Name	
Street Address		Street Address	
City	County	City	County
State	Zip Code	State	Zip Code

If additional pages of Part II, Sections 5.3 and/or 6.1 are attached, indicate the total number of pages in this box [ ] and indicate which Part II, Sections 5.3/6.1 page this is, here. [ ]
(example: 1, 2, 3, etc.)

Range Codes: A = 1 - 10 pounds; B = 11 - 499 pounds; C = 500 - 999 pounds.

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EPA FORM R

PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 6.2 TRANSFERS TO OTHER OFF-SITE LOCATIONS

6.2.___ Off-site EPA Identification Number (RCRA ID No.)			
Off-Site Location Name			
Street Address			
City		County	
State	Zip Code	Is location under control of reporting facility or parent company?	☐ Yes ☐ No

A. Total Transfers (pounds/year) (enter range code or estimate)	B. Basis of Estimate (enter code)	C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery (enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

SECTION 6.2 TRANSFERS TO OTHER OFF-SITE LOCATIONS

6.2.___ Off-site EPA Identification Number (RCRA ID No.)			
Off-Site Location Name			
Street Address			
City		County	
State	Zip Code	Is location under control of reporting facility or parent company?	☐ Yes ☐ No

A. Total Transfers (pounds/year) (enter range code or estimate)	B. Basis of Estimate (enter code)	C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery (enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

If additional pages of Part II, Section 6.2 are attached, indicate the total number of pages in this box ☐ and indicate which Part II, Section 6.2 page this is, here. ☐ (example: 1, 2, 3, etc.)

EPA Form 9350-1 (Rev. 12/4/92) - Previous editions are obsolete.

Range Codes: A = 1 - 10 pounds; B = 11 - 499 pounds; C = 500 - 999 pounds.

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PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 7A. ON-SITE WASTE TREATMENT METHODS AND EFFICIENCY

☐ **Not Applicable (NA) - Check here if no on-site waste treatment is applied to any waste stream containing the toxic chemical or chemical category.**

a. General Waste Stream (enter code)	b. Waste Treatment Method(s) Sequence [enter 3-character code(s)]	c. Range of Influent Concentration	d. Waste Treatment Efficiency Estimate	e. Based on Operating Data?
7A.1a	7A.1b 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	7A.1c	7A.1d %	7A.1e Yes ☐ No ☐
7A.2a	7A.2b 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	7A.2c	7A.2d %	7A.2e Yes ☐ No ☐
7A.3a	7A.3b 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	7A.3c	7A.3d %	7A.3e Yes ☐ No ☐
7A.4a	7A.4b 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	7A.4c	7A.4d %	7A.4e Yes ☐ No ☐
7A.5a	7A.5b 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	7A.5c	7A.5d %	7A.5e Yes ☐ No ☐

If additional copies of page 7 are attached, indicate the total number of pages in this box ☐ and indicate which page 7 this is, here. ☐ (example: 1, 2, 3, etc.)

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PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Toxic Chemical, Category, or Generic Name

SECTION 7B. ON-SITE ENERGY RECOVERY PROCESSES

☐ Not Applicable (NA) - Check here if no on-site energy recovery is applied to any waste stream containing the toxic chemical or chemical category.

Energy Recovery Methods [enter 3-character code(s)]

1 ☐ 2 ☐ 3 ☐ 4 ☐

SECTION 7C. ON-SITE RECYCLING PROCESSES

☐ Not Applicable (NA) - Check here if no on-site recycling is applied to any waste stream containing the toxic chemical or chemical category.

Recycling Methods [enter 3-character code(s)]

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐

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PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI FACILITY ID NUMBER
Chemical, Category, or Generic Name

SECTION 8. SOURCE REDUCTION AND RECYCLING ACTIVITIES

All quantity estimates can be reported using up to two significant figures.		Column A 1991 (pounds/year)	Column B 1992 (pounds/year)	Column C 1993 (pounds/year)	Column D 1994 (pounds/year)
8.1	Quantity released *				
8.2	Quantity used for energy recovery on-site				
8.3	Quantity used for energy recovery off-site				
8.4	Quantity recycled on-site				
8.5	Quantity recycled off-site				
8.6	Quantity treated on-site				
8.7	Quantity treated off-site				
8.8	Quantity released to the environment as a result of remedial actions, catastrophic events, or one-time events not associated with production processes (pounds/year)				
8.9	Production ratio or activity index				

8.10	Did your facility engage in any source reduction activities for this chemical during the reporting year? If not, enter "NA" in Section 8.10.1 and answer Section 8.11.			
	Source Reduction Activities [enter code(s)]	Methods to Identify Activity (enter codes)		
8.10.1		a.	b.	c.
8.10.2		a.	b.	c.
8.10.3		a.	b.	c.
8.10.4		a.	b.	c.

8.11	Is additional optional information on source reduction, recycling, or pollution control activities included with this report? (Check one box)	YES ☐	NO ☐

* Report releases pursuant to EPCRA Section 329(8) including "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment." Do not include any quantity treated on-site or off-site.

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Region 4

Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

Region 5

Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

Region 6

Arkansas, Louisiana, New Mexico, Oklahoma, Texas

Region 7

Iowa, Kansas, Missouri, Nebraska

Region 8

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

Region 9

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Region 10

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