TAKING STOCK

North American Pollutant Releases and Transfers 1994

COMMISSION FOR ENVIRONMENTAL COOPERATION

1997

DISCLAIMER

The National Pollutant Release Inventory (NPRI) and the Toxics Release Inventory (TRI) data sets are constantly evolving, as errors in reporting are noted and corrected. For this reason, both Canada and the United States "lock" their data sets on a specific date and use this "locked" set for annual summary reports. Both countries then correct errors and issue revised data sets for all reporting years in subsequent years.

The CEC follows a similar process. For the purposes of this report, the NPRI (with one exception noted below) and TRI data sets as of June 1996 were used. The CEC is aware that changes have occurred to both data sets for the reporting year 1994 since this time that are not reflected in this report. These changes will be reflected in the next report, which will summarize the 1995 data and make year-to-year comparisons with the revised 1994 data.

One exception in this year's report is an error in the NPRI data that was related to CEC by Environment Canada in time for inclusion in this report, but that is not reflected in the NPRI Summary Report for the 1994 data. This is an error in one facility's report which caused the over-reporting of air emissions by over 10 million kilograms. Other revisions will be reflected in the next CEC report.

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Chapter TAKING STOCK

Providing the public with information on pollutant sources and risks is recognized by all three countries of North America as an important tool for protecting human health and the environment. In 1995, the CEC's Council of Ministers decided to create a North American Pollutant Release Inventory to help the public better understand pollutant releases in North America as a whole. This report is the first in a series of annual reports on pollutant releases in North America based on information brought together from existing publicly available information in the three countries.

This report analyzes 1994 data from pollutant release and transfer registers in Canada and the United States, profiles the pilot pollutant release and transfer register (PRTR) project in Mexico and presents a chapter on environmental information in annual corporate reports. It follows the publication *Putting the Pieces Together: The Status of Pollutant Release and Transfer Registers in North America*, a background document published in 1996.

The CEC Secretariat would like to thank all who worked on this initiative, especially the excellent team of consultants who prepared this report: Hampshire Research Associates, Inc. (Alexandria, Virginia), Environmental Economics International (Toronto, Ontario) and Corporación Radian, S.A. de C.V. (Mexico City).

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Finally, this report would not have been possible were it not for the leadership and hard work of CEC Program Manager for Technical Cooperation Lisa Nichols and CEC Director Janine Ferretti.

Victor Lichtinger
Executive Director
Commission for Environmental Cooperation

Acronym	
ARET	Accelerated Reduction/Elimination of Toxics
CAS	A numerical classification of chemicals listed by the computerized Chemical Registry System and assigned by the Chemical Abstracts System (CAS), a branch of the American Chemical Society
CEC	Commission for Environmental Cooperation
CEFIC	European Chemical Industry Council
CERES	Coalition for Environmentally Responsible Economies
CMAP	*Clasificación Mexicana de Actividades y Productos* (Mexican Activities and Products Classification)
EPA	US Environmental Protection Agency
GNC	*Grupo Nacional Coordinador* (Mexican National Coordinating Group)
IJC	International Joint Commission
INE	*Instituto Nacional de Ecología* (Mexican National Institute of Ecology)
NAAEC	North American Agreement on Environmental Cooperation
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NAPRI	North American Pollutant Release Inventory (CEC Project)
NGO	Nongovernmental organization
NPRI	National Pollutant Release Inventory (PRTR for Canada)
OECD	Organization for Economic Cooperation and Development
OSHA	US Occupational Safety and Health Administration
PERI	Public Environmental Reporting Initiative
POTWs	US Publicly-owned Treatment Works
PRTR	Pollutant Release and Transfer Register
RETC	*Registro de Emisiones y Transferencia de Contaminantes (*PRTR for Mexico)
Semarnap	*Secretaría de Medio Ambiente, Recursos Naturales y Pesca* (Mexican Secretariat of the Environment, Natural Resources and Fisheries)
SIC	Standard Industrial Classification
TRI	Toxics Release Inventory (PRTR for US)
VOC	Volatile organic compound
UIJ	Underground Injection
UNEP	United Nations Environment Programme
UN-ISAR	United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting

33/50 Program
A voluntary program of the US EPA that has involved pollution prevention and other means to encourage reductions of TRI releases and transfers of 17 chemicals by 33 percent from 1988 to 1992 and by 50 percent from 1988 to 1995.

Chemical category
A group of closely related individual chemicals that are counted together for purposes of PRTR reporting thresholds and release and transfer calculations. The chemicals are reported to the PRTRs under a single name.

Destruction
A variety of processes that change the chemical in waste into another substance. Destruction also includes physical or mechanical processes that reduce the environmental impact of the waste. This is the term used in the NPRI report of 1993 data to summarize chemical, physical and biological treatment, and incineration. (See "treatment" as the term used to cover these activities in the TRI summary reports.)

Energy recovery
The combustion or burning of a wastestream to produce heat.

Environmental management hierarchy
The types of waste management plus source reduction prioritized as to environmental desirability. In order of preference, the one most beneficial to the environment is source reduction (pollution prevention at the source), followed by recycling, energy recovery, treatment, and disposal as the least desirable option.

Fugitive emissions
Air emissions that are not released through stacks, vents, ducts, pipes, or any other confined air stream. Examples are equipment leaks or evaporation from surface impoundments.

Incineration
A method of treating solid, liquid or gaseous wastes by burning.

Non-production-related waste
Waste that is generated as a one-time event, including large accidental spills, waste from a remedial action to clean up environmental contamination resulting from past disposal practices, or other wastes not occurring as a routine part of production operations. This does not include spills that occur in normal production operations that could be reduced or eliminated by improved handling, loading or unloading procedures.

Off-site transfers
Chemicals in waste that are moved off the grounds of the facility, including transfers of waste sent to other facilities or other locations, such as hazardous waste treatment facilities, municipal sewage treatment plants, or landfills.

On-site
Within the boundaries of the facility, including areas where wastes may be stored, treated or disposed of that are separate from the production processes, but still within the boundaries of the reporting facility.

Otherwise used
Any use of a chemical that is not manufacturing or processing, for instance as a chemical processing aid, a manufacturing aid or in an ancillary use during the production process.

Point source
The origin of known or deliberate environmental releases from fixed points such as smokestacks and wastewater discharge pipes.

Processing use
The use of a chemical as part of a chemical or physical process, including as a reactant, in processing a mixture or formulation, or as an article component.

Production ratio/activity index
The ratio of the production level associated with the chemical in the current reporting year to the previous year's level.

Production-related waste
A term used by the US EPA to denote chemical waste generated as a result of routine production that could potentially be reduced or eliminated by improved handling, more efficient processes, change of product or in product quality, or change in raw materials. This does not include spills resulting from large-scale accidents or waste from actions taken to clean up contamination. As used by the US EPA, it includes: chemicals released; sent off-site for disposal, recycling and energy recovery; and recycled or used for energy recovery on-site.

Recycling
Extraction of a chemical from a manufacturing process stream that would otherwise have been treated as waste, with the extracted chemical being reused in the original production process, in another production process, or sold as a separate product.

Releases
Quantities of a chemical in waste released on-site to air, water, underground injection or land.

Source reduction
A strategy for pollution reduction that involves preventing the generation of waste in the first place, rather than cleaning it up, treating it, or recycling it after it has been produced.

Source reduction activity
The types of activities undertaken to accomplish source reduction. The term includes equipment or technology modifications, process or procedure modifications, the reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control.

Tonne
A metric tonne, equaling 1,000 kilograms, 1.1023 short tons, or 0.9842 long tons.

Transfers
The term has a slightly different use in the United States than in Canada. Transfers in both countries include chemicals in waste that are sent from the reporting facility to one that treats or disposes of the chemical. Under the TRI definition, transfers also include chemicals sent off-site for recycling and energy recovery, but reporting of such transfers is optional under NPRI. Transfers of chemicals in products are currently not included in either country.

Treatment
A variety of processes that change the chemical in waste into another substance. Treatment also includes physical or mechanical processes that reduce the environmental impact of the waste. This is the term used in TRI reports to summarize chemical, physical and biological treatment, and incineration. (See “destruction” as the term used to cover these activities in NPRI.)

Waste
The amount of chemical that does not become a product and is not consumed or transformed during the production process. PRTRs differ as to whether material destined for recycling, reuse or energy recovery is included in their definition of waste.

North Americans are concerned about the effects of chemicals on their health and environment. Many companies have responded with programs to prevent or reduce chemical releases, often in response to government programs mandating their identification and reduction. One such program, the pollutant release and transfer register (PRTR), is a cornerstone of these efforts. PRTRs are designed to track the quantities of substances of concern that are released into the air, water or land. Results are fed into a national database, which allows information on these substances to be made available quickly to the public.

The Commission for Environmental Cooperation (CEC) recognizes the importance of these pollutant release and transfer registers, such as the Toxics Release Inventory (TRI) in the United States, the National Pollutant Release Inventory (NPRI) in Canada, and the proposed *Registro de Emisiones y Transferencia de Contaminantes* (RETC) in Mexico, for their potential to enhance the quality of the North American environment. The CEC, mandated under the terms of the North American Agreement on Environmental Cooperation, facilitates cooperation and public participation in fostering the conservation, protection and enhancement of the North American environment for the benefit of present and future generations, in the context of increasing economic, trade and social links between Canada, the United States and Mexico.

At the Second Annual Regular Session of the CEC in 1995, the environment ministers of the three North American countries (the Council) noted in the Communiqué:

> This past year, the NAFTA partners began to examine their common need for an inventory of polluting emissions. We have decided to create a North American Pollutant Release Inventory which will bring together, for the first time, existing national public information about emissions and long-range transportation of pollutants. This vital tool for improving the quality of the environment will be the result of harmonized methods of reporting on pollutant emissions of mutual concern.

At the Third Annual Regular Session of the CEC in Toronto, Canada (August 1996), the Council noted in the Communiqué:

> The Council announced that the first annual North American Pollutant Release Inventory (NAPRI) will be published...as part of an effort to provide the public with information on pollutant sources and risks. This inventory will bring together existing national public information from the three countries about emissions. In the long-run, the NAPRI will help improve the quality of the environment by providing the public with information to assess North American pollutant sources and risks. It also serves as a model for similar efforts in other parts of the world because North America represents the largest land mass ever to be subjected to compatible methods of reporting on pollutant emissions of mutual concern.

In addition, Article 10(2)(a) of the North American Agreement on Environmental Cooperation (NAAEC) states that the Council may consider and develop recommendations regarding the comparability of techniques and methodologies for data gathering and analysis, data management, and electronic data communications on matters covered by the NAAEC.

1.1 WHAT ARE POLLUTANT RELEASE AND TRANSFER REGISTERS?

Pollutant release and transfer registers, like TRI, NPRI and the proposed RETC, provide detailed data on the types, locations and amounts of substances of concern released on-site and transferred off-site by industrial facilities. The federal governments then provide annual reports that are released to the public; as well, the database is accessible to all. Many corporations also use the data to provide publicly available reports of their environmental performance. PRTRs are a new and innovative tool that can be used for a variety of purposes.

Tracking environmental substances of concern through pollutant release and transfer registers is essential to:

- enhance environmental quality,
- increase public and industry understanding of the types and quantities of substances of concern released into the environment and transferred off-site as waste,
- stimulate reduction of industrial waste,
- encourage industry to decrease release and transfer volumes, and assume responsibility for chemical use,
- track environmental progress, and
- assist governments in identifying the priorities.

Many companies have responded to PRTR results by conducting an internal environmental review and setting goals for waste reductions. For example, after reviewing some of its first TRI results, Monsanto committed itself to and achieved a 90 percent reduction in emissions to the air within five years.

PRTR data are also a useful aid in tracking overall environmental progress. US TRI data have shown a 44 percent reduction in releases reported from 1988 to 1994. Government priorities can shift, based on PRTR data. New programs or enforcement measures can be tailored to accomplish specific goals, such as reducing specific substances or targeting releases in a particular region. For example, in 1991 the US EPA launched the 33/50 Program seeking voluntary reductions in the releases and transfers of 17 chemicals on the TRI list. The result is that industry surpassed the national goal of a 33 percent reduction by 1992 (from 1988 levels) and achieved the 50 percent reduction goal for 1995 by 1994 (one year early). TRI data are also being used to set enforcement priorities and target industries for technical assistance.

The CEC wishes to assist citizens by integrating the existing data from North America. Helpful information can be found in pollutant release and transfer reports from Canada and the United States. But these systems have important differences between them, so superficial comparisons can be very deceptive. This report attempts to increase the value of the national inventories by presenting an analysis of the types and amounts of releases and transfers of substances of concern. This marks the first time that such an analysis of the North American data has been presented.

2.1 INTRODUCTION

North Americans are in the unique position of having electronic access to databases on releases and transfers in Canada and the United States. By consulting one of these databases, information on a given facility's releases and transfers can be quickly obtained. Assisting citizens in understanding what the information means, achieving accurate comparisons and making full use of the available possibilities are among the CEC's goals in producing this report. This chapter provides an overview of the existing PRTRs in North America, discusses the context of the data and provides contacts for additional information.

2.2 DESCRIPTION OF THE THREE NORTH AMERICAN PRTRs

As they all stem from the same primary rationale (to provide publicly available information on a facility's releases and transfers of substances of concern) the three inventories have many basic similarities. Each inventory also has its unique aspects, which result from its historical development or conceptual design. Understanding how and when comparisons among the databases can accurately be made is the goal of the later chapters in this report. For a more detailed comparison of the three databases please see *Putting the Pieces Together: The Status of Pollutant Release and Transfer Registers in North America*, published by the CEC in October 1996.

The grandparent of all the North American databases is the Toxics Release Inventory (TRI) in the United States, which first collected information in 1987. In 1993, Canadian facilities first reported their releases and transfers to the new National Pollutant Release Inventory (NPRI). Mexico, in 1996, completed a successful case study demonstrating its proposed national inventory. This inventory, the *Registro de Emisiones y Transferencia de Contaminantes* (RETC), is currently under development. Forty-five industrial participants in a pilot project in the Mexican state of Querétaro reported for 1995; full implementation is expected in 1997.

2.3 BASIC SIMILARITIES OF PRTRs

The three North American PRTRs have the following basic similarities. They all report on:

- individual chemicals,
- individual facilities,
- releases and transfers,
- an annual basis,
- using computerized data management,
- allowing for limited trade secrecy, and
- are intended for regular and active public discussion.

2.3.1 Individual Chemicals

Each country in North America has developed its own list of substances, reflecting local conditions, scientific assessments and chemicals commonly in commerce. The TRI list for 1994 reporting consists of 346 chemicals, compared to 178 on the NPRI list and 132 for the Mexican case study. For a detailed comparison of the chemical lists in the three countries, see **Appendix A**.

TRI includes separate reporting for certain chemicals and their compounds, while NPRI has one category for a chemical and its compounds. For example, TRI lists both lead and lead compounds, counting them as two separate substances on the list, while NPRI has the single category, lead and its compounds, on its list. All the analyses in this report add the TRI amount reported for a given chemical to that reported for its compounds in order to correspond with NPRI practice.

2.3.2 Individual Facilities

Each country has different requirements for reporting. In the United States, all manufacturing and federal facilities that meet the threshold (see **section 2.4.1**) must report. In Canada, any facility that meets the threshold must report. However, Canada exempts certain facilities, such as those involved with the distribution, storage or retail sale of fuels. Mexico is presently considering which facilities will be required to report.

2.3.3 Releases and Transfers

In their reports, facilities provide estimates of their releases of the listed chemicals to the air, land and water, and also by underground injection. Facilities also provide estimates on the amounts of listed chemicals that they transfer off-site. A transfer is the shipment of the chemical to a municipal sewage treatment plant or to another site for treatment, disposal or recycling. Tracking both releases and transfers is necessary in order to provide a full picture of the movements of chemicals.

Each country has slightly different categories for releases and transfers; these are outlined in **Table 2–1** (in **section 2.4.4**, below).

2.3.4 Trade Secrecy

The purpose of the databases is precisely to provide the public with data about chemicals in the environment, so in general all three databases limit the type of information that industries can claim as secret and not be forced to report. In the United States, the only claim of trade secrecy that can be made concerns the identity of the chemical. All data on release and transfer amounts are part of the database. Claiming trade secrecy is not widespread: only 19 forms, submitted by 17 TRI facilities, out of the 75,332 submitted for 1994, contained such claims. In Canada, all information in the report may be held confidential if it conforms to the criteria under the Federal Access to Information Act. Like TRI, claims for trade secrecy are a small percentage of the information filed. Mexico is currently considering criteria for trade secrecy.

2.3.5 Public Discussion

As the purpose of the databases is to provide publicly available information, both the TRI and NPRI are available in a variety of formats: annual summary reports, background data in hard copy and electronic form, and over the Internet. The level and detail of the information to be made public under the Mexican RETC has not yet been decided.

2.4 DIFFERENCES IN THE PRTR DATABASES

The two PRTR databases and the proposed Mexican RETC also have important differences. They differ in:

- chemicals reported,
- types of facilities covered,
- release and transfer categories,
- reporting thresholds,
- industrial classification system,
- classification of small releases, and
- requirements for reporting on source reduction.

The list of chemicals in each PRTR can be found in **Appendix A**, and the major differences in the types of facilities required to report and in the category of releases and transfers are indicated in **Table 2–1**. These differences are reflected in the data presentation. Further details about the other differences are also provided since they are less amenable to simply taking a subset of the data to account for differences, and must be kept in mind when interpreting the data presented in this report.

2.4.1 Thresholds

One of the major differences between the databases is the reporting threshold: the amount of chemical that can be manufactured or used in the facility before reporting is required. If the threshold is met or exceeded, then all releases and transfers must be reported. In the United States, if more than 25,000 pounds (11.34 tonnes) of a chemical is manufactured or processed, or if more than 10,000 pounds (4.54 tonnes) is "otherwise used," then releases and transfers must be reported. In Canada, if 10 tonnes (22,050 pounds) or more of the substance is manufactured, processed or "otherwise used," then releases and transfers must be reported. Both systems require reporting for facilities that employ the equivalent of 10 or more full-time employees.

The other major difference in threshold requirements between TRI and NPRI is the amount of chemical in a mixture. Both countries require reporting if the amount of chemical in a mixture is equal to or greater than 1 percent by weight. However, the United States has an additional, lower threshold for carcinogenic chemicals: chemicals meeting the OSHA carcinogen standard must be reported at levels of 0.1 percent. The net effect of these differences in threshold is that, in general, US facilities will reach the threshold at lower levels of chemical activity/use than Canadian ones.

In the Mexican case study, no reporting threshold was used and about half of the chemicals on the list were reported. These data will be used to develop an appropriate threshold.

2.4.2 Industrial Classification System

Industries are often classified into categories to allow comparisons. All three countries require that facilities report using a type of industrial classification system, but these systems are different in each of

the countries. The United States uses the Standard Industrial Classification System (SIC code), Canada uses its own Standard Industrial Classification System, which has the same name as the US system but is actually a different system. Mexico uses the *Clasificación Mexicana de Actividades y Productos* (Mexican Classification of Activities and Products, CMAP code), which is different yet.

Fortunately for comparison purposes, Canadian facilities are provided with a table that correlates Canadian SIC codes to the equivalent US SIC codes. The NPRI requires a facility to report both a Canadian and a US SIC code that represents the majority of their operations. This is essential for comparing NPRI and TRI data because otherwise there is no direct correspondence between the two SIC code systems.

The United States, Canada and Mexico are working together to develop a common North American Industry Classification System (NAICS) that, if used, will allow a compatible comparison of the data in the future. Information is available from Statistics Canada on the Internet at:
http://www.statcan.ca/english/Subjects/Standard/ind_e.htm

2.4.3 Reporting Small Releases

For releases that total less than one tonne of a chemical, NPRI allows the facility to report just the total amount without separating it into individual release categories. Therefore, in summary tables in this report, the total releases may be greater than the sum of the separate release categories. The amounts of the individual releases are reported under TRI, and the amounts for each of the individual type of transfers are reported for both NPRI and TRI. For both NPRI and TRI, there is also the option to report a range for the smallest releases. In this report, the midpoint of the range is used as the estimate for the release amount in these cases.

2.4.4 Source Reduction

The United States requires facilities to report the types of source reduction activities they have undertaken during the year, and Mexico also requested this information during the case study. The Canadian NPRI does not ask for any such information.

Table 2–1 provides a detailed comparison of the three North American PRTRs. As will be seen throughout this report, in spite of the numerous similarities between the three North American PRTR databases that permit comparison, any analyses must allow for important differences.

2.5 CONTEXT OF DATA AND DATA LIMITATIONS

In addition to the differences between the North American PRTRs, when assembling data to obtain a North American picture, their context must also be considered. Most PRTR systems do not provide estimates of:

- amounts released from a full range of industrial facilities,
- amounts released from small sources,
- all releases and transfers from a facility,
- amounts released from non-point sources such as transportation,
- factors responsible for changes in releases and transfers,
- releases and transfers of all substances of concern,
- releases from natural sources,
- exposure or risk of exposure to substances of concern, or
- normalized comparisons.

2.5.1 Accounting for Sources of Releases and Transfers

The North American PRTRs require reporting from industrial facilities, with the Canadian NPRI having a broader base than the US TRI. The latter requires reports only from manufacturing facilities, though the Phase II proposal for its expansion would lengthen the list of types of facilities required to report to include some non-manufacturing facilities. Approximately 25 percent of the total releases and transfers reported to NPRI are from facilities not required to report under TRI. With the proposed expansion of TRI now under consideration, this difference could be reduced to closer to 10 percent.

PRTRs do not always account for all releases and transfers. For example, NPRI does not require the reporting of chemical transfers offsite for recycling and energy recovery. In addition, the threshold levels are such that only the largest users of chemicals are required to report to TRI and NPRI. Smaller users, such as dry cleaning establishments, which often do not meet the threshold requirements, may be large sources of substances of concern in a particular locale or if taken as a

whole. The Canadian NPRI summary report for 1994 provided release estimates for six chemicals on the NPRI list emitted by glycol dehydrators, dry cleaners and solvent degreasers (*Summary Report 1994: National Pollutant Release Inventory*, Environment Canada, Hull, Quebec, Canada, 1996). If factored in, it is estimated that these releases would increase the respective NPRI totals by 59 percent.

PRTRs deal with releases and transfers from point or stationary sources, such as industrial facilities. Another significant source of chemical releases to the environment is non-point sources, particularly motor vehicles. Information on these non-point releases is not included in TRI or the proposed RETC. The Canadian NPRI summary report for 1994 included estimates of releases for 22 NPRI substances from mobile sources, such as automobiles, trucks, aircraft, boats, and from fuel distribution. These amounts are nearly seven times greater than the actual amounts reported to NPRI.

2.5.2 Tracking Reductions in Releases and Transfers

PRTR data can track reductions in the releases and transfers from year to year. However, reductions can be a combination of source reduction, production level changes, pollution control and changes in estimation methods. Several methods can be used to investigate changes, but current PRTR reporting does not indicate how much of the change was due to which factor.

Changes in the methods of estimating releases and transfers can result in changes in the quantities reported. To reduce the cost to industry of reporting, the data reported are estimates; facilities are not required to make precise measurements of their releases or transfers. The estimates can be based on monitoring data, materials balance calculations, or best engineering judgment. The type of estimation method used may change from year to year, which may cause variation in the amounts reported without any change in actual releases.

NPRI requires the facility to report, using general categories, the reasons for the change, while TRI requires the facility to report what kind of estimation method was used, and provides facilities with an index of changes in production. This information can indicate the general types of changes that occurred, but does not provide the amount of change due to a particular reason.

Table 2–1 COMPARISON OF PRTRs IN NORTH AMERICA

Major Data Elements	US Toxics Release Inventory (TRI)	Canadian National Pollutants Release Inventory (NPRI)	Mexican Registro de Emisiones y Transferencia de Contaminantes (RETC) (proposed)
Identification			
Type of facilities reporting	Manufacturing facilities; federal facilities	Any facility manufacturing or using a listed chemicals, with a few exceptions	Not yet decided
Industry classification	All US SIC codes applicable to facility operations	Canadian and US SIC code, one primary SIC code only per facility	Mexican CMAP code, one CMAP code only per facility
List of chemicals	Chemicals used in manufacturing (346 plus 22 categories for 1994)	Chemicals used or manufactured in sufficient quantities (178 for 1994)	Chemicals meeting proposed toxicity, and bioaccumulation and persistence criteria (132 plus 17 categories)
Reporting Threshold			
Number of employees	10 or more	10 or more	Not yet decided
Activity/use of chemical	Manufacture/process more than 25,000 pounds (11,338 kg) or use more than 10,000 pounds (4,535 kg)	Manufacture, process or use 10 tonnes (10,000 kg) or more	Not yet decided
Concentration of chemical in mixtures	Concentrations equal to or greater than 1 percent (0.1 percent for carcinogens)	Concentrations equal to or greater than 1 percent	Not yet decided
Type of Data Reported			
Units	Based on estimates: small amounts reported by range code; pounds reported	Based on estimates: small amounts reported for totals only or by range code; tonnes reported	Based on estimates: kilograms reported
Releases			
Air emissions	Fugitive and point source emissions; includes leaks and spills not separately	Fugitive and point source emissions; leaks and spills separately identified	Air emissions from production processes, including fugitives; spills identified separately

Major Data Elements	US Toxics Release Inventory (TRI)	Canadian National Pollutants Release Inventory (NPRI)	Mexican Registro de Emisiones y Transferencia de Contaminantes (RETC) (proposed)
Releases (continued)			
Surface water discharges	Includes leaks and spills not separately identified	Discharges, leaks, spills identified separately	Discharges; spills identified separately
On-site land releases	Landfills, land application, surface impoundments	Landfill, land application, spills, leaks	Landfill, land treatment, surface impoundments, land disposal; spills identified separately
Underground injection	Amount reported	Amount reported	Not reported since no such wells employed in Mexico
Accidental spills	Reported as single number for all media; also included in release and transfer amounts	Reported for separate media	Reported as single number for all media; not included in release and transfer amounts
Transfers			
Transfers to public sewage	Total amount reported	Total amount reported	Total amount reported
Other off-site transfers	Reported by method of treatment/disposal; reported for each transfer location	Reported by method of treatment/disposal; total only reported, not for each transfer location	Reported by method of treatment/disposal; reported for each transfer location
Chemicals in waste			
Management by treatment, disposal	On-site and off-site by type of management	Off-site transfers only	Off-site transfers only
Recycling/reuse/ rcovery	On-site and off-site reported	Reporting of off-site voluntary	Off-site reported
Other data elements			
Type of on-site waste treatment	Type for each method used	Not reported	Type for each method used
Projections	Two years following for on-site and off-site waste	Three years following for total releases and total transfers	One year following for total releases
Source reduction	Type of source reduction activities	Not reported	Type of source reduction activities

2.5.3 Data on Exposure and Risk

PRTRs do not collect data on either exposure to or risk associated with chemical releases. Such analyses are dependent on site-specific geographic and population characteristics, but PRTRs can provide some of the data needed to perform them. For example, public health authorities can use the data on releases from local facilities as one piece of the information needed to compile a profile of local exposure.

2.5.4 Normalized Comparisons

A number of factors need to be considered when reviewing the total amounts of chemicals released and transferred: size and type of industrial base, use of pollution-control equipment, and production levels. Some experts have suggested that normalizing the data, as total amounts of chemicals per unit of production, per job or by energy use, would increase understanding. For example, the United States may have high total releases and transfers simply by virtue of its large manufacturing sector. Expressing the releases as chemicals per unit of production or per job would allow a comparison adjusted for the size of the industry. Others have suggested that such a normalizing process builds in assumptions that may not be valid. The US, Canadian and proposed Mexican systems are not currently normalized, although the US TRI contains a production index. Normalized data have not been used in this report, but may be considered for future reports.

2.6 CONTACTS FOR FURTHER INFORMATION

PRTR data and summaries are available free of charge. The following boxes give contact telephone numbers and Internet sites for procuring PRTR information in the three countries:

Public Access to NPRI Data and Information

• Information on the NPRI, the annual report and the databases can be obtained from Environment Canada's regional and national offices:

New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador:
1-902-426-4482 1-902-426-3897 (fax)
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• NPRI data is accessible on the Internet at:
http://www.doe.ca/pdb/npri.html

Public Access to TRI Data and Information

• TRI Telephone Support

The EPA's TRI User Support (TRI-US) (1-800-535-0202 within the United States or 1-202-260-1531) provides TRI technical support in the form of general information, reporting assistance, and data requests.

• On-line Data Access

1) RTK NET (1-202-234-8494 for information on free access to TRI data or on-line 1-202-234-8570)
Web site: www.rtk.net Telnet: rtk.net

2) National Library of Medicine's Toxnet computer system (1-301-496-6531 to register).

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Key findings

- Releases and transfers of toxic chemicals in North America, as indicated in reports to Pollutant Release and Transfer Registers (PRTRs) in 1994, are dominated by releases and transfers from facilities in the United States. This is true not only generally, but for all types of releases and transfers reported except discharges to surface water, which are dominated by discharges from facilities in Canada.
- Releases account for a significantly greater fraction of total releases and transfers than do transfers. Releases account for nearly three-quarters of the total.
- Mandatory PRTR data provide a limited perspective on the generation of toxic chemical wastes. The releases and transfers that must be reported (releases to air, surface water, underground injection, and on-site land; transfers to treatment/destruction, sewage/POTWs, and disposal/containment) to both US and Canadian PRTRs tell less than half the story. They are equaled by transfers to recycling/reuse/recovery and transfers to energy recovery, for which reporting is not required by all PRTRs. NPRI, for example, does not require these transfers to be reported because they are not considered waste.
- Releases and transfers vary widely across US states and Canadian provinces in a manner not explained by differences in physical area or by differences in population. Seven US states are among the top 20 states and provinces on the basis of total releases and transfers, releases and transfers per capita, and releases and transfers per square kilometer.
- Of the facilities reporting the largest total volumes in each category in North America, a different facility is dominant for each type of release or transfer. Each of the top four facilities was so ranked because of a release to a single medium that represented 99 percent of that facility's releases and transfers. Similarly, for facilities that ranked highest in transfers, virtually all total releases and transfers reflected a single type of transfer.
- The chemical industry (US SIC code 28) is the dominant industry for releases, transfers, and total releases and transfers. Further, 28 of the 50 facilities with the largest total releases and transfers report in this SIC code, as do 6 of the 10 facilities with the largest reported releases and transfers.

3.1 INTRODUCTION

This chapter provides an overall summary of PRTR data for North America, using publicly available data collected by Canada and the United States for 1994, and analyzes the data for industries and chemicals that must be reported in both countries. **Chapter 4** presents separate analyses of the two countries' data, and **Chapter 5** presents a detailed comparison of the data collected by the two PRTRs for the common set of chemicals and industries.

The data for Canada are based on the data as released to the public in October 1996, in *Summary Report 1994: National Pollutant Release Inventory*, Environment Canada, Hull, Quebec. The data are as presented in this report with one exception: a form for isopropyl alcohol from a non-manufacturing facility of releases of 10 million kilograms and recycling of 20 million kilograms was in error and was corrected to releases of 10 thousand kilograms and recycling of 20 thousand kilograms. The data for the United States are based on the data as released to the public in June 1996, in *1994 Toxics Release Inventory: Public Data Release*, US Environmental Protection Agency, Washington, DC.

Table 3–1

NORTH AMERICAN RELEASES AND TRANSFERS, NPRI AND TRI, 1994
(MATCHED CHEMICALS/INDUSTRIES)

	North America		Canadian NPRI		US TRI		NPRI as % of Total	TRI as % of Total
	Number		Number		Number			
Total Facilities	22,815		1,351		21,464		5.9	94.1
Total Forms	72,903		4,598		68,305		6.3	93.7
	kg	**%**	**kg**	**%**	**kg**	**%**		
Total Air Emissions	723,749,251	48.1	89,195,059	48.1	634,554,192	48.1	12.3	87.7
Surface Water Discharges	62,765,857	4.2	33,256,285	17.9	29,509,572	2.2	53.0	47.0
Underground Injection	160,040,579	10.6	7,742,206	4.2	152,298,373	11.5	4.8	95.2
On-site Land Releases	138,790,584	9.2	10,528,273	5.7	128,262,311	9.7	7.6	92.4
Matched Releases	**1,085,530,799**	**72.1**	**140,906,351**	**76.0**	**944,624,448**	**71.5**	**13.0**	**87.0**
Treatment/Destruction	151,919,715	10.1	15,011,219	8.1	136,908,496	10.4	9.9	90.1
Sewage/POTWs	110,508,977	7.3	1,479,110	0.8	109,029,867	8.3	1.3	98.7
Disposal/Containment	158,096,736	10.5	28,114,247	15.2	129,982,489	9.8	17.8	82.2
Matched Transfers	**420,525,428**	**27.9**	**44,604,576**	**24.0**	**375,920,852**	**28.5**	**10.6**	**89.4**
Total Releases and Transfers	**1,506,056,227**	**100.0**	**185,510,927**	**100.0**	**1,320,545,300**	**100.0**	**12.3**	**87.7**

NOTE: Canada and US data only, Mexico data not collected for 1994

3.2 NORTH AMERICAN RELEASES AND TRANSFERS OVERALL

While similar, the two current North American PRTRs also exhibit significant differences in the industries and chemicals they cover. As noted in **Chapter 2**, the 1994 TRI required reporting from a list that numbered 346 chemicals, while that of NPRI ran to 178 chemicals. TRI is applicable to only manufacturing facilities and federal facilities, while, with a few exceptions, NPRI covers facilities in any industry. Data in this analysis are limited to those chemicals and industries covered by both PRTRs. Industries are defined by their US Standard Industrial Classification (SIC) code, which both countries collect.

The data covered in this chapter reflect the submission of 72,903 forms by 22,815 industrial facilities. (Note: Facilities report one chemical per form; therefore a facility that reports releases for and/or transfers of 10 chemicals submits 10 forms.) These forms reported releases and transfers of 1.5 billion kilograms of toxic chemicals in North America (see **Table 3–1**). In this common database, the Canadian NPRI represents 12 percent and the US TRI 88 percent of total releases and transfers.

3.2 NORTH AMERICAN RELEASES AND TRANSFERS OVERALL

Table 3–1
NORTH AMERICAN RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Table 3–2
NORTH AMERICAN RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (ALL CHEMICALS/INDUSTRIES)

Table 3–2 NORTH AMERICAN TOTAL RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (ALL CHEMICALS/INDUSTRIES)

	NPRI + TRI	Canadian NPRI		US TRI	
	Number	Number	% of North American Total	Number	% of North American Total
Total Facilities	24,451	1,707	7.0	22,744	93.0
Total Forms	81,260	5,928	7.3	75,332	92.7
Releases	**kg**	**kg**		**kg**	
Total Air Emissions	801,835,911	96,163,310	12.0	705,672,601	88.0
Surface Water Discharges	85,439,465	55,469,720	64.9	29,969,745	35.1
Underground Injection	172,527,104	14,264,870	8.3	158,262,234	91.7
On-site Land Releases	145,221,958	14,087,660	9.7	131,134,298	90.3
Total Releases	**1,205,280,853**	**180,241,975**	**15.0**	**1,025,038,878**	**85.0**
Transfers					
Treatment/Destruction	168,978,727	24,393,542	14.4	144,585,185	85.6
Sewage/POTWs	117,521,363	2,016,222	1.7	115,505,141	98.3
Disposal/Containment	174,469,897	37,869,948	21.7	136,599,949	78.3
Total Transfers	**460,969,987**	**64,279,712**	**13.9**	**396,690,275**	**86.1**
Subtotal Releases and Transfers	**1,666,250,840**	**244,521,687**	**14.7**	**1,421,729,153**	**85.3**
Recycling/Reuse/Recovery*	1,380,014,260	266,127,209	19.3	1,113,887,051	80.7
Energy Recovery*	215,553,647	5,029,165	2.3	210,524,482	97.7
Total Releases and Transfers	**3,064,018,747**	**515,678,061**	**16.8**	**2,746,140,686**	**89.6**

* Optional reporting for NPRI, required for TRI

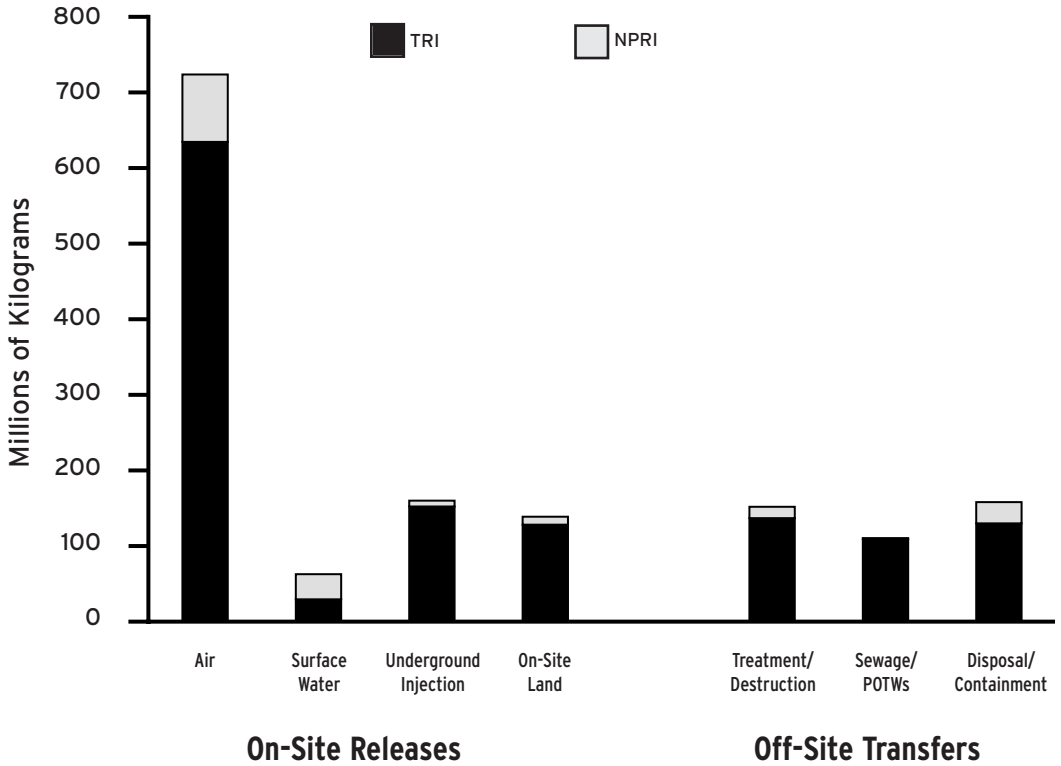
NOTE: Canada and US data only, Mexico data not collected for 1994

These results were taken from a larger pool of data reported to either PRTR, and they summarize 93 percent of the 24,451 reporting facilities and 90 percent of the 81,260 forms. **Chapter 5** discusses the exclusion of chemicals and industries from each PRTR's data as a result of this selection. More significant for the present analysis is the exclusion of reporting on transfers to recycling, reuse or recovery and on transfers to energy recovery. The submission of data on these transfers is mandatory for TRI, but optional for NPRI. These types of transfers account for 1.4 billion kilograms of chemicals, an amount that represents nearly half of the total 3.1 billion kilograms of reported releases and transfers of toxic chemicals (see **Table 3–2**).

In future years, reporting for the two PRTRs may become more similar, increasing the fraction of data held in common. An expansion of industrial coverage has been proposed for TRI. A proposal, whose comment period closed on 15 October 1996, would increase the number of chemicals subject to NPRI reporting and make the reporting of transfers to recycling/reuse/recovery or to energy recovery mandatory.

Figure 3–1

NORTH AMERICAN RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)



For the common North American data set, releases (to air, surface waters, on-site land and underground injection) represented 72 percent of total releases and transfers reported. Emissions to the air accounted for two-thirds of all releases, and nearly one-half of total releases and transfers. On-site underground injection was the next largest type of release, dominated by the amounts reported by US facilities. Discharges into surface waters were relatively small (4 percent of total releases and transfers), but in Canada especially, the proportion is significant (18 percent of Canadian releases and transfers and 2 percent of those in the United States; see **Figure 3–1**, graphically representing data from **Table 3–1**).

Facilities reported slightly greater off-site transfers to treatment or disposal than to sewage/POTWs (10 percent, 10 percent and 7 percent, respectively, of total North American releases and transfers). Off-site transfers differed markedly, however, in the two countries. For Canada, transfers to municipal sewage treatment plants were quite small—only 1 percent of the NPRI total—and amounts transferred to disposal were almost twice those sent to treatment. In contrast, in the United States TRI transfers to sewage treatment plants—although still the smallest reported transfer type—represented 8 percent of the total, and transfers to disposal were only somewhat smaller than those to treatment (9.8 percent and 10.4 percent, respectively, of total releases and transfers; see **Figure 3–1**, graphically representing data from **Table 3–1**).

3.2 NORTH AMERICAN RELEASES AND TRANSFERS OVERALL
(continued)

Figure 3–1
NORTH AMERICAN RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Table 3–3
NORTH AMERICAN RELEASES AND TRANSFERS BY STATE AND PROVINCE, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Table 3–3

NORTH AMERICAN RELEASES AND TRANSFERS BY STATE AND PROVINCE, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Province/State	1994 Population	Land Area (km²)	Number of Facilities	Total Releases and Transfers (kg)	Rank	Total Releases and Transfers Per Capita (kg)	Per Capita Rank	Total Releases and Transfers Per km² (kg)	Per km² Rank
Texas	18,378,000	691,031	1,136	134,570,175	1	7.3	12	194.74	24
Tennessee	5,175,000	109,153	638	79,366,746	2	15.3	7	727.11	5
Ontario	10,928,000	1,068,586	767	78,803,309	3	7.2	15	73.75	35*
Ohio	11,102,000	107,045	1,626	73,481,781	4	6.6	20	686.46	6
Louisiana	4,315,000	123,675	312	70,018,775	5	16.2	5	566.15	10
Illinois	11,752,000	145,934	1,308	69,769,517	6	5.9	24	478.09	13
Alabama	4,219,000	133,916	500	65,189,966	7	15.5	6	486.80	12
Pennsylvania	12,052,000	117,348	1,184	59,436,588	8	4.9	29	506.50	11
Michigan	9,496,000	151,585	912	56,855,878	9	6.0	23	375.08	16
Mississippi	2,669,000	123,515	309	55,278,082	10	20.7	3	447.54	14
Indiana	5,752,000	93,719	1,004	53,444,669	11	9.3	9	570.26	8
Quebec	7,281,000	1,540,689	315	52,809,233	12	7.3	13	34.28	48*
North Carolina	7,070,000	136,413	859	46,657,443	13	6.6	21	342.03	18
Florida	13,953,000	151,940	474	44,176,441	14	3.2	42	290.75	19
Missouri	5,278,000	180,515	558	37,802,904	15	7.2	16	209.42	22
Utah	1,908,000	219,889	152	32,874,088	16	17.2	4	149.50	29
Alberta	2,716,000	661,194	87	30,314,399	17	11.2	8	45.85	45*
Virginia	6,552,000	105,587	435	29,684,034	18	4.5	33	281.13	21
South Carolina	3,664,000	80,583	468	28,247,644	19	7.7	11	350.54	17
Georgia	7,055,000	152,577	685	27,159,615	20	3.8	37	178.01	26
California	31,431,000	411,049	1,415	25,923,660	21	0.8	57	63.07	37
New Jersey	7,904,000	20,168	631	25,838,247	22	3.3	41	1,281.13	2
Wisconsin	5,082,000	145,436	829	24,279,746	23	4.8	31	166.94	28
New York	18,169,000	127,190	722	23,718,221	24	1.3	53	186.48	25
Montana	856,000	380,850	22	21,434,891	25	25.0	1	56.28	42
Iowa	2,829,000	145,752	398	19,567,018	26	6.9	18	134.25	31
Arkansas	2,453,000	137,754	379	19,189,429	27	7.8	10	139.30	30
Kentucky	3,827,000	104,659	403	18,144,010	28	4.7	32	173.36	27
Kansas	2,554,000	213,098	271	16,130,232	29	6.3	22	75.69	33
Arizona	4,075,000	295,260	161	15,223,355	30	3.7	38	51.56	44
Minnesota	4,567,000	218,601	481	13,158,833	31	2.9	44	60.20	40
Oregon	3,086,000	251,419	243	13,004,290	32	4.2	34	51.72	43
West Virginia	1,822,000	62,758	146	12,509,786	33	6.9	19	199.33	23
Oklahoma	3,258,000	181,186	265	11,044,928	34	3.4	40	60.96	39
Washington	5,343,000	176,478	282	11,007,504	35	2.1	47	62.37	38
Wyoming	476,000	253,326	24	10,252,159	36	21.5	2	40.47	47
Nebraska	1,623,000	200,350	156	8,667,358	37	5.3	26	43.26	46
Massachusetts	6,041,000	21,456	506	8,388,149	38	1.4	51	390.95	15
New Mexico	1,654,000	314,926	38	8,351,831	39	5.0	28	26.52	50
Puerto Rico	3,622,000	9,104	162	8,136,728	40	2.2	46	893.77	4
Maryland	5,006,000	27,091	183	7,646,511	41	1.5	49	282.25	20
Connecticut	3,275,000	12,997	339	7,382,147	42	2.3	45	568.00	9
British Columbia	3,668,000	947,806	85	7,369,917	43	2.0	48	7.78	55*
New Brunswick	759,000	73,440	20	5,499,023	44	7.2	14	74.88	34*
Nova Scotia	937,000	55,491	18	5,396,854	45	5.8	25	97.26	32*
Maine	1,240,000	86,156	98	4,909,420	46	4.0	35	56.98	41
Manitoba	1,131,000	649,953	37	4,006,097	47	3.5	39	6.16	57*
Rhode Island	997,000	3,139	141	3,839,466	48	3.9	36	1,223.12	3
Delaware	706,000	5,294	69	3,620,521	49	5.1	27	683.90	7
Idaho	1,133,000	216,431	63	3,417,870	50	3.0	43	15.79	53
Alaska	606,000	1,530,702	8	2,947,678	51	4.9	30	1.93	62
Colorado	3,656,000	269,596	174	2,488,288	52	0.7	59	9.23	54
New Hampshire	1,137,000	24,033	102	1,545,277	53	1.4	52	64.30	36
Nevada	1,457,000	286,353	39	1,507,838	54	1.0	56	5.27	58
Saskatchewan	1,016,000	652,334	17	1,258,184	55	1.2	54	1.93	61*
South Dakota	721,000	199,731	64	1,044,250	56	1.4	50	5.23	59
North Dakota	638,000	183,121	33	747,368	57	1.2	55	4.08	60
Virgin Islands	102,000	342	3	712,828	58	7.0	17	2,085.02	1
Vermont	580,000	24,900	36	436,259	59	0.8	58	17.52	52
Hawaii	1,179,000	16,760	15	309,298	60	0.3	61	18.45	51
Prince Edward Island	134,000	5,659	2	38,789	61	0.3	60	6.85	56*
Newfoundland	582,000	405,721	3	15,122	62	0	63	0.04	63*
American Samoa	47,000	199	2	5,558	63	0.1	62	27.87	49
District of Columbia	570,000	163	1	2	64	0	64	0.01	64
Total	**293,264,000**	**15,443,126**	**22,815**	**1,506,056,227**		**5.1**		**97.52**	

* in final column = Canadian Province

NOTE: Canada and US data only, Mexico data not collected for 1994

Map 3–1 LARGEST SOURCES OF RELEASES AND TRANSFERS: TOP 20 STATES AND PROVINCES

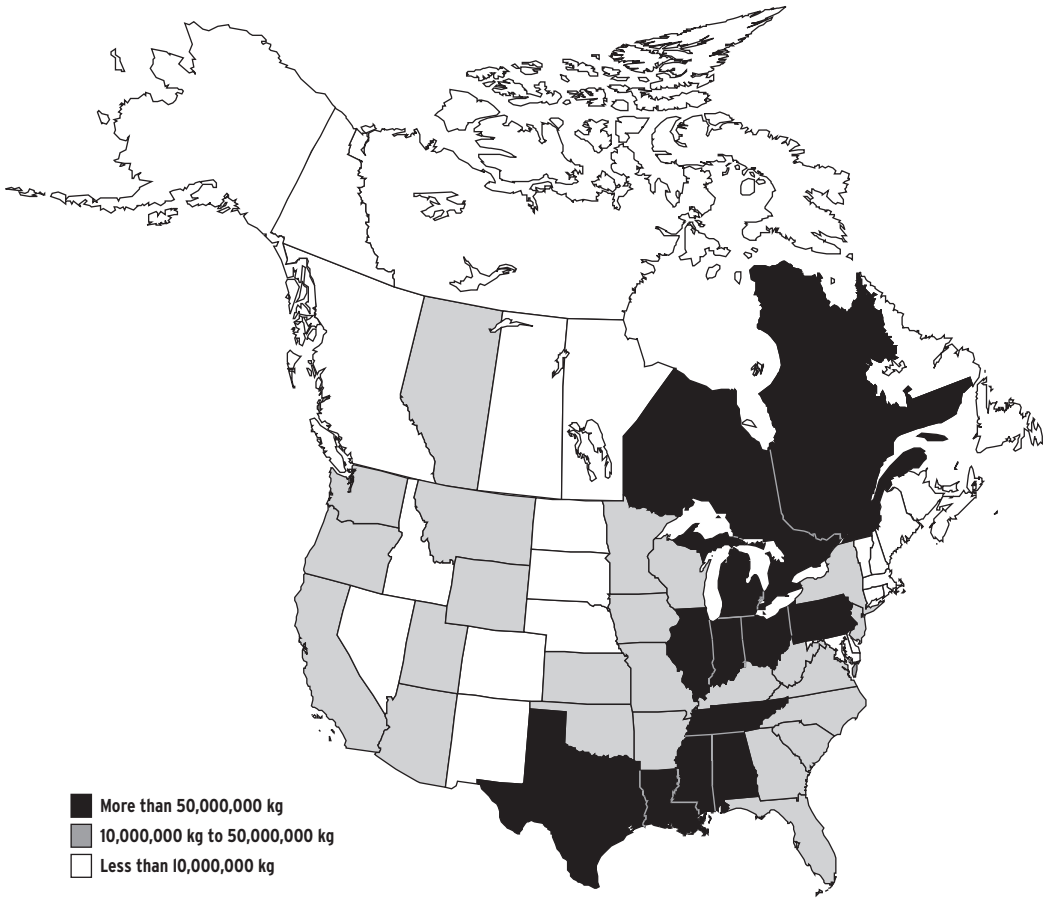
3.3 GEOGRAPHY OF NORTH AMERICAN RELEASES AND TRANSFERS

3.3.1 State and Provincial Data

Table 3–3 ranks US states and Canadian provinces according to the total releases and transfers reported by facilities located within their borders. The 1,136 TRI facilities in Texas reported almost 135 million kilograms of total releases and transfers, more than any other state or province. Texas contains almost twice as many facilities and reported twice the quantity of releases and transfers as Tennessee or Ontario, ranked second and third, which produced similar PRTR reported amounts (number of facilities and total releases and transfers). The 20 states and provinces with the largest total releases and transfers appear on **Map 3–1**; this group comprises 17 US states and 3 Canadian provinces.

In each of the top 12 states and provinces, total releases and transfers exceeded 50 million kilograms. Another 24 states and provinces reported more than 10 million kilograms. **Map 3–2** illustrates how

Map 3–2
RELEASES AND TRANSFERS BY STATES AND PROVINCES



releases and transfers are concentrated in the southeastern United States and around the Great Lakes area in the United States and Canada. **Chapter 7** of this report examines this region in more detail, as well as the others along the Canada-US border.

Neither population nor physical area fully explains this distribution of releases and transfers. As can be seen from **Table 3–3**, 13 of the top 20 states/provinces are also in the top 20 when ranked on the basis of releases per capita, and 12 are in the top 20 when ranked on the basis of releases per square kilometer. Seven (Tennessee, Louisiana, Alabama, Mississippi, South Carolina, Indiana and Ohio) are in the top 20 for total releases and transfers, releases and transfers per capita, and releases and transfers per square kilometer. With the exception of Indiana and Ohio in the Great Lakes region, these are located in the southeastern United States.

3.3.2 Facilities with the Largest Total Releases and Transfers

Some of the geographical pattern of releases and transfers can be attributed to a few facilities. Of the 24,451 facilities in the combined North American database, 32 facilities reported releases and transfers totaling more than 5 million kilograms—4 from NPRI and 28 from TRI. **Table 3–4** lists the 50 facilities with the largest total releases and transfers reported in the combined North American data for 1994. However, any evaluation of the relative health and environmental impacts of these facilities must also take into account the toxicity of the chemicals released, local climatic conditions, and the proximity of people and/or ecologically sensitive areas to the released waste streams.

These 50 facilities, which constitute far less than 1 percent of the total number of reporting facilities and which submitted fewer than 1 percent of all forms, nonetheless reported 27 percent of total releases and transfers (these data are graphed

Table 3–4

THE 50 NORTH AMERICAN FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	Facility	City, State/Province	SIC Codes		Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
			Canada	US						
1	DuPont	Pass Christian, MS		28	5	338,316	0	25,850,340	73	26,188,729
2	Magnesium Corp. of America	Rowley, UT		33	7	25,295,351	0	0	0	25,295,351
3	DuPont	New Johnsonville, TN		28	6	172,211	1,587	24,943,311	0	25,117,109
4	ASARCO Inc.	East Helena, MT		33	10	60,459	0	0	19,719,827	19,780,286
5	*Kronos Canada, Inc.	Varennes, QC	37	28	8	39,623	15,102,000	0	0	15,141,623
6	Zinc Corp. of America	Monaca, PA		33	10	267,524	243	0	0	267,767
7	Courtaulds Fibers Inc.	Axis, AL		28	7	14,931,295	28,345	0	205,215	15,164,855
8	DuPont	Beaumont, TX		28	30	386,846	10,279	14,490,141	0	14,887,266
9	Sloss Industries Corp.	Ariton, AL		28	3	1,883	0	0	0	1,883
10	IMC-Agrico Co.	Mulberry, FL		Mult.	4	312,517	0	0	11,383,220	11,695,737
11	Lenzing Fibers Corp.	Lowland, TN		28	7	9,705,562	8,889	0	0	9,714,451
12	Coastal Chem Inc.	Cheyenne, WY		28	14	644,214	0	9,103,401	0	9,747,615
13	*Samuel Bingham Company	Montreal, QC	15	30	1	0	0	0	0	0
14	Cytec Ind. Inc.	Westwego, LA		28	20	231,680	18,353	8,781,293	0	9,031,326
15	ASARCO Inc.	Hayden, AZ		33	9	375,293	0	0	7,746,682	8,121,975
16	DuPont	Victoria, TX		28	30	254,903	839	7,681,489	10,923	7,948,154
17	National Processing Co.	East Chicago, IN		33	1	113	0	0	0	113
18	Monsanto Co.	Sauget, IL		28	17	422,768	0	0	0	422,768
19	Elkem Metals Co.	Marietta, OH		33	8	2,315,953	246,712	0	4,901,587	7,464,252
20	Columbian Chemicals Co.	Saint Louis, MO		28	3	12,630	0	0	0	012,630
21	Northwestern Steel & Wire Co.	Sterling, IL		33	8	63,791	685	0	6,621,315	6,685,791
22	International Paper	Redwood, MS		26	10	6,469,773	1,220	0	0	6,470,993
23	PCS Phosphate Co. Inc.	Aurora, NC		28	7	1,617,179	0	0	4,613,469	6,230,648
24	National Steel Corp.	Ecorse, MI		33	22	147,729	116,900	0	0	264,629
25	Arcadian Fertilizer L.P.	Geismar, LA		28	14	697,191	5,153,707	0	200,859	6,051,757
26	*Sherritt Inc.	Fort Saskatchewan, AB	37	28	17	5,166,325	802,330	0	6,060	5,974,985
27	IMC-Agrico Co.	Saint James, LA		28	8	2,709,764	2,904,751	0	240,858	5,855,373
28	DuPont	Leland, NC		28	21	1,716,624	21,915	0	32,189	1,770,728
29	Cabot Corp.	Tuscola, IL		28	2	1,677,444	0	3,745,615	0	5,423,058
30	BP Chemicals Inc.	Port Lavaca, TX		28	16	56,298	385	5,050,431	13,298	5,120,411
31	*Samuel Bingham Company	Toronto, ON	15	30	1	0	0	0	0	0
32	Simpson Pasadena Paper Co.	Pasadena, TX		26	12	759,365	0	0	0	759,365
33	Kennecott Utah Copper	Magna, UT		33	13	193,653	2,063	0	4,197,197	4,392,914
34	Upjohn Co.	Portage, MI		28	27	1,168,651	182,066	1,722,336	0	3,073,053
35	Rouge Steel Co.	Dearborn, MI		33	12	20,149	5,587	0	0	25,736
36	Consolidated Papers Inc.	Wisconsin Rapids, WI		26	15	1,319,685	340	0	0	1,320,025
37	American Chrome & Chemicals	Corpus Christi, TX		28	5	41,324	9,932	0	4,489,796	4,541,052
38	Phelps Dodge Hidalgo Inc.	Playas, NM		33	3	240,674	0	0	4,114,181	4,354,856
39	Doe Run Co.	Herculaneum, MO		33	9	116,261	502	0	4,073,429	4,190,192
40	Boise Cascade Corp.	Saint Helens, OR		26	10	281,635	0	0	0	281,635
41	*Methanex Corporation	Medicine Hat, AB	37	28	5	4,132,490	0	0	0	4,132,490
42	BP Chemicals Inc.	Lima, OH		28	23	182,188	0	3,953,923	0	4,136,111
43	Eastman Kodak Co.	Rochester, NY		38	57	3,398,624	134,365	0	296	3,533,284
44	*Sherritt Inc.	Redwater, AB	37	28	11	1,797,810	96,200	1,853,020	6,680	3,753,840
45	Monsanto Co.	Alvin, TX		28	23	109,109	0	3,577,506	63,039	3,749,654
46	Sterling Chemicals Inc.	Texas City, TX		28	34	586,150	7,909	2,999,315	0	3,593,374
47	*Cartons St-Laurent Inc.	La Tuque, QC	27	26	4	382,307	3,175,116	0	3,845	3,561,268
48	Cyprus Miami Mining Corp.	Claypool, AZ		33	6	60,181	0	0	3,457,596	3,517,778
49	Monsanto Co.	Cantonment, FL		28	22	42,236	362	3,449,045	0	3,491,643
50	Hoechst Celanese Chemical	Pasadena, TX		28	31	1,319,247	0	2,024,195	0	3,343,442
	Subtotal				**648**	**92,243,000**	**28,033,583**	**119,225,359**	**76,101,634**	**315,603,977**
	% of Total				**0.9**	**12.7**	**44.7**	**74.5**	**54.8**	**29.1**
	Total				**72,903**	**723,749,299**	**62,765,875**	**160,040,583**	**138,790,590**	**1,085,530,875**

* = NPRI facility, all others TRI facilities

NOTE: Canada and US data only, Mexico data not collected for 1994

3.3 GEOGRAPHY OF NORTH AMERICAN RELEASES AND TRANSFERS (continued)

Table 3–4
THE 50 NORTH AMERICAN FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Figure 3–2 (following page)
NORTH AMERICAN TOP 50 FACILITIES FOR TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Map 3–3 (following page)
LARGEST SOURCES OF RELEASES AND TRANSFERS: FACILITIES WITH RELEASES AND TRANSFERS OF MORE THAN 5,000,000 kg

	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)**
1	10,431	0	0	10,431	26,199,160	Hydrochloric acid (UIJ)
2	0	0	0	0	25,295,351	Chlorine (air)
3	0	0	0	0	25,117,109	Hydrochloric acid (UIJ)
4	0	36	0	36	19,780,322	Zinc and compounds (land)
5	0	0	430,000	430,000	15,571,623	Sulfuric acid (water)
6	0	0	15,125,066	15,125,066	15,392,833	Zinc/copper compounds (transfers to disposal)
7	0	0	0	0	15,164,855	Carbon disulfide (air)
8	192,379	0	2,054	194,433	15,081,699	Ammonium nitrate (UIJ)
9	13,177,902	0	0	13,177,902	13,179,785	1,2,4–Trichlorobenzene (transfers to treatment)
10	0	0	0	0	11,695,737	Phosphoric acid (land)
11	0	0	497,234	497,234	10,211,685	Carbon disulfide (air)
12	0	0	694	694	9,748,309	Ammonium nitrate (UIJ)
13	0	0	9,697,820	9,697,820	9,697,820	Di(2-ethylhexyl) phthalate (transfers to disposal)
14	8,426	0	6,482	14,908	9,046,234	Acetonitrile, acrylic acid, ammonia (UIJ)
15	642,550	129	0	642,679	8,764,654	Zinc/copper/lead and compounds (land)
16	358,232	0	0	358,232	8,306,386	Nitric acid (UIJ)
17	7,824,886	0	0	7,824,886	7,824,999	Hydrochloric acid (transfers to treatment)
18	450,517	6,651,074	4,702	7,106,294	7,529,062	Hydrochloric acid (transfers to sewage)
19	0	0	33,923	33,923	7,498,175	Manganese and compounds (land), ammonia (air)
20	0	7,256,825	25,397	7,282,222	7,294,853	Ammonia (transfers to sewage)
21	163,361	0	15	163,375	6,849,166	Zinc/manganese and compounds (land)
22	0	0	0	0	6,470,993	Methanol (air)
23	0	0	0	0	6,230,648	Phosphoric acid (land)
24	55,853	38,362	5,795,634	5,889,849	6,154,478	Zinc and compounds (transfers to disposal)
25	0	0	61,678	61,678	6,113,435	Phosphoric acid (water)
26	0	0	13,280	13,280	5,988,265	Ammonia, methanol (air)
27	0	0	0	0	5,855,373	Phosphoric acid (water), ammonia (air)
28	3,879,479	0	22,241	3,901,720	5,672,448	Ethylene glycol (transfers to treatment)
29	0	0	0	0	5,423,058	Hydrochloric acid (UIJ)
30	13,766	0	0	13,766	5,134,177	Acetonitrile, ammonia, acrylamide (UIJ)
31	0	0	5,081,000	5,081,000	5,081,000	Di(2-ethylhexyl) phthalate (transfers to disposal)
32	0	4,255,732	0	4,255,732	5,015,097	Methanol (transfers to sewage)
33	0	0	413,202	413,202	4,806,116	Copper/zinc/lead and compounds (land)
34	872,399	743,673	112,299	1,728,372	4,801,424	Methanol (UIJ), dichloromethane (air)
35	6,803	0	4,625,720	4,632,522	4,658,259	Zinc and compounds (transfers to disposal)
36	3,278,642	0	0	3,278,642	4,598,667	Methanol (transfers to treatment)
37	9,524	0	726	10,249	4,551,302	Chromium and compounds (land)
38	0	0	0	0	4,354,856	Copper and compounds (land)
39	0	454	0	454	4,190,646	Zinc and compounds (land)
40	0	3,873,492	2,055	3,875,547	4,157,182	Methanol (transfers to sewage)
41	800	23,050	0	23,850	4,156,340	Methanol (air)
42	13,531	0	744	14,274	4,150,385	Acetronitrile, ammonia, acrylamide (UIJ)
43	265,976	847	5,530	272,352	3,805,637	Dichloromethane, hydrochloric acid, methanol (air)
44	0	0	0	0	3,753,840	Ammonia, ammonium nitrate (UIJ, air)
45	0	0	0	0	3,749,654	Ammonia, acrylonitrile, methanol (UIJ)
46	16,641	8,420	4,185	29,246	3,622,620	Ammonia, methanol, acrylamide (UIJ)
47	0	0	3,845	3,845	3,565,113	Methanol (water)
48	0	0	0	0	3,517,778	Copper and compounds (land)
49	0	0	4,970	4,970	3,496,613	Ammonium nitrate (UIJ)
50	2,812	104,943	14,789	122,544	3,465,986	Ethylene glycol (UIJ, air)
	31,244,907	**22,957,038**	**41,985,283**	**96,187,228**	**411,791,205**	
	20.6	**20.8**	**26.6**	**22.9**	**27.3**	
	151,919,723	**110,508,978**	**158,096,751**	**420,525,452**	**1,506,056,327**	

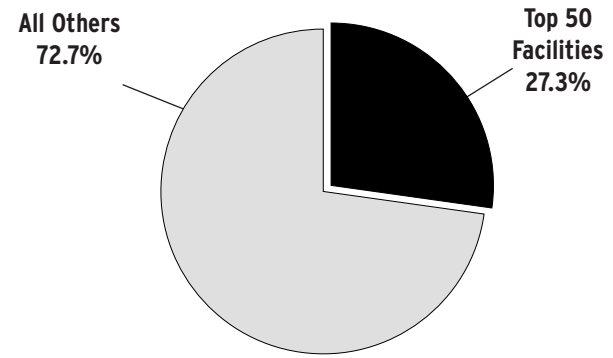
** Chemicals accounting for more than 70% of total releases and transfers from facility
UIJ= underground injection

in **Figure 3–2**). Seven are Canadian facilities, while 43 are in the United States. **Map 3–3** locates the facilities that reported more than 5 million kilograms of total releases and transfers in 1994.

As **Table 3–4** shows, each facility reported large amounts for relatively few chemicals and primarily released the chemical to one medium or transferred it off-site; they did not manage the chemical by a variety of methods. For example, for each of the top five facilities listed, just one chemical and one method of release or transfer accounted for more than 70 percent of the total reported by the facility.

While these 50 facilities reported 27 percent of total releases and transfers, they—mainly the US facil-

Figure 3–2 NORTH AMERICAN TOP 50 FACILITIES FOR TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)



Total 1,506,056,227 kg

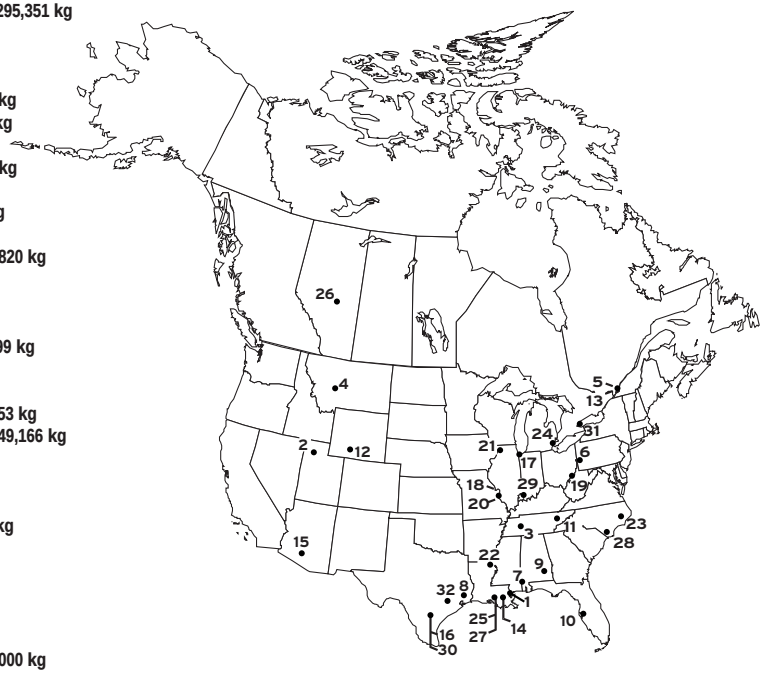
ities—accounted for 75 percent of all underground injection. They also reported 55 percent of on-site land releases and 45 percent of surface water discharges. These patterns suggest that releases to these media—underground, on-site land and surface water—were more concentrated in North America than air emissions. (Overall, air emissions accounted for nearly half of all releases and transfers in the two countries.) In contrast to their dominance over other media, this subgroup of facilities originated 13 percent of reported releases to air. While this is still disproportionate to the number of firms involved, these emissions represent a smaller fraction of total releases and transfers for this population than was found in the data for the full set of facilities. The role of these 50 facilities in off-site transfers—generating 23 percent of all such transfers—is more evenly distributed among transfer types, the largest share being 27 percent of transfers to disposal.

Among the 50 facilities, one finds the largest single sources for each distinct type of release and transfer. In some cases, one or two facilities account for a sizable portion of the total quantity of a particular release or transfer type. Two DuPont facilities in the United States, ranking first and third for total releases and transfers, together reported 30 percent of all underground injection reported. Similarly, a Kronos Canada facility accounted for nearly one-quarter of all reported surface water discharges in the country.

Moreover, releases and transfers from these facilities were to a striking extent limited to a single type of one or the other. Each of the five facilities with the largest totals in these categories was so ranked because of a release to a single medium that represented 99 percent of that facility's releases and transfers. Similarly, for facilities ranking highest for total releases and transfers on the basis of transfers, virtually all of the total was due to a single type of transfer. More generally, for 32 of the top 50 facilities, a single type of release or transfer accounted for more than 90 percent of total releases and transfers, and for 41 of 50, a single type accounted for more than 80 percent of the total.

Map 3–3 LARGEST SOURCES OF RELEASES AND TRANSFERS: FACILITIES WITH RELEASES AND TRANSFERS OF MORE THAN 5,000,000 kg

1 DuPont - 26,199,160 kg
2 Magnesium Corp. of America - 25,295,351 kg
3 DuPont - 25,117,109 kg
4 ASARCO Inc. - 19,780,322 kg
5 Kronos Canada Inc. - 15,571,623 kg
6 Zinc Corp. of America - 15,392,833 kg
7 Courtaulds Fibers Inc.- 15,164,855 kg
8 DuPont - 15,081,699 kg
9 Sloss Industries Corp. - 13,179,785 kg
10 IMC - Agrico Co. - 11,695,737 kg
11 Lenzing Fibers Corp. - 10,211,685 kg
12 Costal Chem Inc. - 9,748,309 kg
13 Samuel Bingham Company - 9,697,820 kg
14 Cytec Ind. Inc. - 9,046, 234 kg
15 ASARCO Inc. - 8,764,654 kg
16 DuPont - 8,306,386 kg
17 National Processing Co. - 7,824,0999 kg
18 Monsanto Co. - 7,529,062 kg
19 Elkem Metals - 7,498,175 kg
20 Columbian Chemicals Co. - 7,292,853 kg
21 Northwestern Steel and Wire - 6,849,166 kg
22 International Paper - 6,470,993 kg
23 PCS Phosphate Co. - 6,230,648 kg
24 National Steel Corp. - 6,154,478 kg
25 Arcadian Fertilizer L.P. - 6,113,435 kg
26 Sherritt Inc. - 5,988,265 kg
27 IMC-Agrico Co. - 5,855,373 kg
28 DuPont - 5,672,448 kg
29 Cabot Corp. - 5,423,058 kg
30 BP Chemicals Inc. - 5,134,177 kg
31 Samuel Bingham Company - 5,081,000 kg
32 Simpson Pasadena Paper - 5,015,097 kg



3.4 PRINCIPAL CHEMICALS REPORTED

The top six chemicals for total releases and transfers represent half of all releases and transfers reported in North America. **Table 3–5** shows the 25 chemicals with the largest total releases and transfers. Seventeen of these chemicals rank both among the top 25 for releases and among the top 25 for transfers, as shown in **Tables 3–6** and **3–7**. Another three are present in the list of the top 25 for releases, while five are on the list of the top 25 for transfers.

More methanol was reported as released to the environment and transferred off-site by North American facilities in 1994 than any other chemical covered by the two PRTRs, as is shown in **Figure 3–3**, based on data from **Table 3–5**. Although less than four percent of all forms submitted were for methanol, this chemical accounted for nearly 14 percent of total releases

Table 3–5

THE 25 CHEMICALS WITH THE LARGEST TOTAL RELEASES AND TRANSFERS IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Forms		Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers		NPRI as % of Total			
		Number	(%)			(kg)	(%)	Forms (%)	Total Releases (%)	Total Transfers (%)	Total Releases and Transfers (%)
67-56-1	Methanol	2,630	3.6	145,485,544	61,080,946	206,566,490	13.7	7.9	20.4	5.6	16.1
7664-41-7	Ammonia	3,070	4.2	117,230,143	29,317,771	146,547,914	9.7	4.2	20.9	1.3	17.0
7647-01-0	Hydrochloric acid	3,452	4.7	98,416,560	35,066,365	133,482,925	8.9	5.1	1.4	2.6	1.7
—	Zinc (and its compounds)	3,142	4.3	47,528,393	55,106,900	102,635,293	6.8	8.9	12.3	11.6	11.9
108-88-3	Toluene	3,739	5.1	83,627,346	12,432,626	96,059,972	6.4	6.3	8.8	15.1	9.6
1330-20-7	Xylene (mixed isomers)	3,487	4.8	57,571,837	5,942,326	63,514,163	4.2	5.8	14.7	22.9	15.5
—	Manganese (and its compounds)	2,549	3.5	26,139,167	23,101,459	49,240,626	3.3	7.2	11.8	16.0	13.7
7664-93-9	Sulfuric acid	4,158	5.7	33,004,506	15,053,990	48,058,496	3.2	7.4	64.3	13.4	48.3
78-93-3	Methyl ethyl ketone	2,468	3.4	40,042,132	3,661,847	43,703,979	2.9	4.9	10.9	16.6	11.4
7664-38-2	Phosphoric acid	2,859	3.9	35,766,193	4,352,447	40,118,640	2.7	5.8	0.1	12.9	1.5
75-15-0	Carbon disulfide	87	0.1	37,841,923	178,539	38,020,462	2.5	5.7	0.1	0.4	0.1
75-09-2	Dichloromethane	1,051	1.4	30,242,191	5,669,321	35,911,512	2.4	4.3	7.2	0.6	6.1
—	Copper (and its compounds)	4,127	5.7	20,421,699	12,853,564	33,275,263	2.2	4.7	7.6	4.0	6.2
6484-52-2	Ammonium nitrate (solution)	243	0.3	29,321,305	3,933,557	33,254,862	2.2	7.4	6.5	0.8	5.8
7782-50-5	Chlorine	1,516	2.1	29,341,094	528,463	29,869,557	2.0	7.8	6.9	0.0	6.8
100-42-5	Styrene	1,548	2.1	19,977,221	4,186,932	24,164,153	1.6	4.6	8.9	7.4	8.6
—	Lead (and its compounds)	1,777	2.4	9,515,618	14,190,209	23,705,827	1.6	7.1	19	8.8	12.9
107-21-1	Ethylene glycol	1,408	1.9	7,487,887	15,528,226	23,016,113	1.5	8.9	5.1	1.5	2.7
—	Chromium (and its compounds)	3,347	4.6	11,291,561	10,747,901	22,039,462	1.5	5.5	7.1	9.3	8.2
74-85-1	Ethylene	315	0.4	18,483,540	12,148	18,495,688	1.2	13.0	13.6	1.3	13.6
7697-37-2	Nitric acid	1,894	2.6	9,741,638	8,129,928	17,871,566	1.2	4.4	0.6	2.8	1.6
71-36-3	n-Butyl alcohol	1,199	1.6	14,824,581	2,138,638	16,963,219	1.1	5.7	8.4	10.4	8.7
117-81-7	Di(2-ethylhexyl) phthalate	338	0.5	346,919	15,948,558	16,295,477	1.1	9.2	26.8	93.4	92.0
79-01-6	Trichloroethylene	818	1.1	14,338,350	1,306,838	15,645,188	1.0	4.6	6.0	2.1	5.7
120-82-1	1,2,4-Trichlorobenzene	33	0.0	83,573	13,422,131	13,505,704	0.9	0.0	0.0	0.0	0.0
	Subtotal	**51,255**	**70.3**	**938,070,921**	**353,891,630**	**1,291,962,551**	**85.8**	**6.2**	**13.1**	**11.3**	**12.6**
	as % of Total	**70.3**		**86.4**	**84.2**	**85.8**					
	Total	**72,903**	**100.0**	**1,085,530,799**	**420,525,428**	**1,506,056,227**	**100.0**	**6.3**	**13.0**	**10.6**	**12.3**

NOTE: Canada and US data only, Mexico data not collected for 1994

Table 3–6

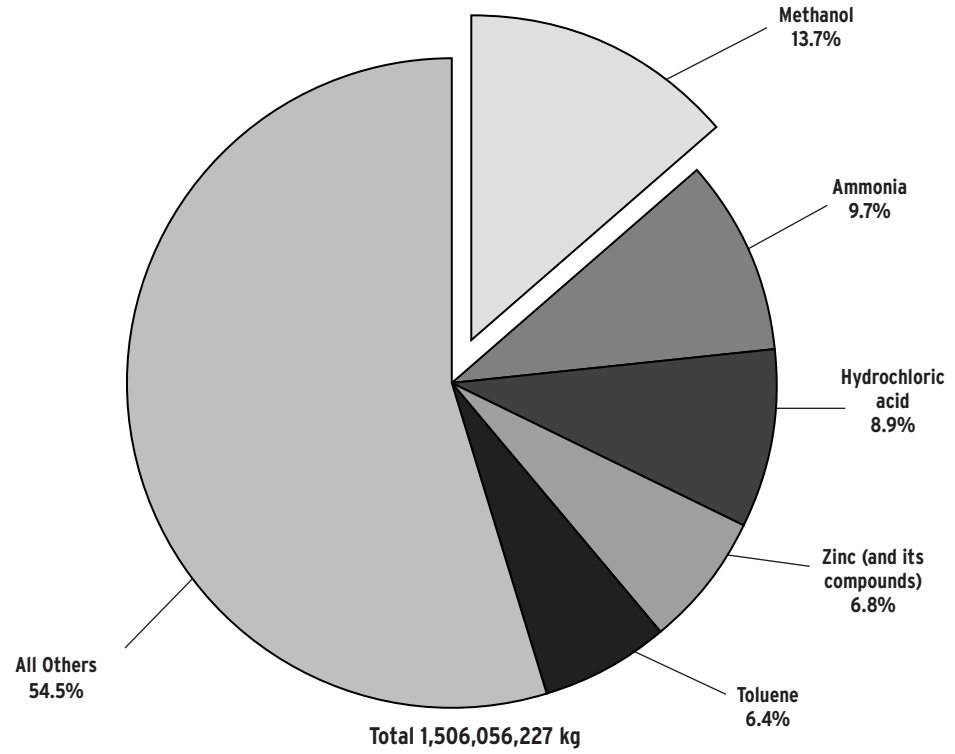
THE 25 CHEMICALS WITH THE LARGEST RELEASES IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)	NPRI as % of Total: Total Air Emissions (%)	Surface Water Discharges (%)	Underground Injection (%)	On-site Land Releases (%)	Total Releases (%)
67-56-1	Methanol	115,846,041	17,023,076	11,300,424	1,309,114	145,485,544	14.8	70.7	3.5	9.8	20.4
7664-41-7	Ammonia	87,902,153	7,697,119	19,198,220	2,426,979	117,230,143	19.6	15.5	31.4	0.1	20.9
7647-01-0	Hydrochloric acid	33,777,665	91,863	64,359,801	182,671	98,416,560	3.5	87.2	0.0	34.5	1.4
108-88-3	Toluene	83,252,986	43,851	244,612	78,121	83,627,346	8.8	14.4	8.0	6.7	8.8
1330-20-7	Xylene (mixed isomers)	57,274,786	21,874	152,903	109,791	57,571,837	14.7	8.9	8.9	1.4	14.7
—	Zinc (and its compounds)	4,293,949	760,360	89,324	42,372,117	47,528,393	30.1	12.7	0.2	10.5	12.3
78-93-3	Methyl ethyl ketone	39,422,855	49,159	541,156	23,337	40,042,132	10.4	0.0	51.7	0.6	10.9
75-15-0	Carbon disulfide	37,799,292	38,763	1,952	36	37,841,923	0.0	26.8	0.0	0.0	0.1
7664-38-2	Phosphoric acid	479,124	9,505,844	20,688	25,756,296	35,766,193	2.3	0.3	0.0	0.0	0.1
7664-93-9	Sulfuric acid	14,188,596	17,878,637	690,180	239,859	33,004,506	23.7	99.8	0.0	2.6	64.3
75-09-2	Dichloromethane	29,757,151	23,589	435,801	23,098	30,242,191	7.3	0.0	0.0	0.2	7.2
7782-50-5	Chlorine	29,123,828	149,588	33,701	27,173	29,341,094	6.9	3.4	0.0	0.0	6.9
6484-52-2	Ammonium nitrate (solution)	700,773	3,854,596	24,043,809	722,000	29,321,305	47.7	17.9	3.4	6.5	6.5
—	Manganese (and its compounds)	1,903,250	471,546	2,694	23,757,050	26,139,167	10.7	20.9	0.0	11.6	11.8
—	Copper (and its compounds)	1,794,637	76,513	106,237	18,439,094	20,421,699	31.7	18.4	0.0	5.3	7.6
100-42-5	Styrene	19,602,435	34,680	113,954	218,274	19,977,221	9.0	1.2	0.2	0.1	8.9
74-85-1	Ethylene	18,468,988	12,444	0	0	18,483,540	13.6	0.0	–	–	13.6
71-36-3	n-Butyl alcohol	13,969,888	41,665	805,994	1,080	14,824,581	8.8	44.8	0.0	9.3	8.4
79-01-6	Trichloroethylene	14,334,474	780	131	2,003	14,338,350	6.0	2.8	0.0	0.0	6.0
108-10-1	Methyl isobutyl ketone	12,278,691	36,361	59,683	6,017	12,382,690	7.1	0.0	0.0	2.6	7.0
—	Chromium (and its compounds)	528,691	110,277	17,283	10,625,990	11,291,561	2.6	26.4	0.0	7.0	7.1
115-07-1	Propylene	10,337,033	2,079	0	0	10,339,372	10.7	0.0	–	–	10.7
50-00-0	Formaldehyde	5,899,204	487,094	3,579,902	68,386	10,038,779	12.2	63.8	2.0	1.1	11.0
7697-37-2	Nitric acid	1,161,064	112,163	8,285,560	180,761	9,741,638	1.2	32.3	0.0	0.9	0.6
—	Lead (and its compounds)	1,743,285	35,051	573	7,730,589	9,515,618	53.6	15.3	0.0	11.2	19.0
	Subtotal	**635,840,839**	**58,558,972**	**134,084,582**	**134,299,836**	**962,913,383**	**11.9**	**55.5**	**5.7**	**7.5**	**13.1**
	as % of Total	**87.9**	**93.3**	**83.8**	**96.8**	**88.7**					
	Total	**723,749,251**	**62,765,857**	**160,040,579**	**138,790,584**	**1,085,530,799**	**12.3**	**53.0**	**4.8**	**7.6**	**13.0**

NOTE: Canada and US data only, Mexico data not collected for 1994

Figure 3–3

NORTH AMERICAN TOP FIVE CHEMICALS FOR TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)



and transfers. More than one-half (56 percent) was released to the air; another 9 percent and 8 percent were transferred to treatment and discharged to surface waters, respectively. Ammonia was second for total releases and transfers, with 10 percent, and hydrochloric acid ranked third with 9 percent.

Methanol, ammonia, and hydrochloric acid are the top three chemicals for releases (see **Table 3–6**), as well as for total releases and transfers. For transfers (see **Table 3–7**), methanol is still first, but zinc (and its compounds) and ammonia exchange their rankings, with ammonia displaced to fourth place. Zinc is one of only five chemicals in the list of the top 25 for releases and transfers for which transfers exceed releases.

Overall, Canadian and US releases and transfers represented 12 percent and 88 percent, respectively, of the North American total for releases (13 percent and 87 percent for the top 25 chemicals), although this proportion varies widely for individual chemicals. Total releases and transfers of methanol and ammonia, for example, are proportionately higher in NPRI, while 98 percent of releases and transfers of the third-ranked chemical, hydrochloric acid, are from US facilities.

3.4 PRINCIPAL CHEMICALS REPORTED

Table 3–5 (previous page)
THE 25 CHEMICALS WITH THE LARGEST RELEASES AND TRANSFERS IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Table 3–6
THE 25 CHEMICALS WITH THE LARGEST RELEASES IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Figure 3–3
NORTH AMERICAN TOP FIVE CHEMICALS FOR TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Table 3–7 (following page)
THE 25 CHEMICALS WITH THE LARGEST TRANSFERS IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Table 3–7

THE 25 CHEMICALS WITH THE LARGEST TRANSFERS IN NORTH AMERICA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	NPRI as % of Total: Treatment/ Destruction (%)	NPRI as % of Total: Sewage/ POTWs (%)	NPRI as % of Total: Disposal/ Containment (%)	NPRI as % of Total: Total Transfers (%)
67-56-1	Methanol	17,891,575	42,050,482	1,138,889	61,080,946	18.3	0.1	9.9	5.6
—	Zinc (and its compounds)	6,118,096	246,515	48,742,289	55,106,900	18.9	6.0	10.8	11.6
7647-01-0	Hydrochloric acid	20,064,063	9,385,940	5,616,362	35,066,365	0.8	7.3	0.9	2.6
7664-41-7	Ammonia	3,735,707	24,847,905	734,159	29,317,771	6.2	0.6	0.2	1.3
—	Manganese (and its compounds)	3,185,756	209,971	19,705,732	23,101,459	37.1	1.9	12.7	16.0
117-81-7	Di(2-ethylhexyl) phthalate	134,666	13,661	15,800,231	15,948,558	28.9	0.0	94.0	93.4
107-21-1	Ethylene glycol	7,357,994	7,437,863	732,369	15,528,226	2.0	0.8	3.5	1.5
7664-93-9	Sulfuric acid	6,835,456	3,029,806	5,188,728	15,053,990	7.2	3.3	27.3	13.4
—	Lead (and its compounds)	3,305,120	43,002	10,842,087	14,190,209	16.7	5.4	6.5	8.8
120-82-1	1,2,4-Trichlorobenzene	13,352,194	45,942	23,995	13,422,131	0.0	0.0	0.0	0.0
—	Copper (and its compounds)	1,681,028	129,861	11,042,675	12,853,564	13.6	4.1	2.5	4.0
108-88-3	Toluene	11,580,046	426,504	426,076	12,432,626	15.9	0.2	5.8	15.1
—	Chromium (and its compounds)	2,947,691	200,792	7,599,418	10,747,901	16.9	4.0	6.5	9.3
7697-37-2	Nitric acid	4,898,777	1,605,811	1,625,340	8,129,928	2.8	4.1	1.6	2.8
7783-20-2	Ammonium sulfate (solution)	1,450,871	4,960,959	19,662	6,431,492	0.0	1.0	0.0	0.8
7429-90-5	Aluminum (fume or dust)	76,852	4,157	5,871,139	5,952,148	12.9	0.0	4.3	4.4
1330-20-7	Xylene (mixed isomers)	4,993,732	349,418	599,176	5,942,326	24.8	16.2	11.1	22.9
75-09-2	Dichloromethane	5,157,232	378,733	133,356	5,669,321	0.6	0.0	0.0	0.6
—	Nickel (and its compounds)	1,400,679	101,654	3,948,171	5,450,504	13.4	3.5	7.7	9.1
7664-38-2	Phosphoric acid	990,720	1,781,472	1,580,255	4,352,447	5.8	3.5	27.8	12.9
100-42-5	Styrene	2,060,282	53,988	2,072,662	4,186,932	12.4	1.0	2.6	7.4
6484-52-2	Ammonium nitrate (solution)	44,904	2,062,018	1,826,635	3,933,557	0.0	0.0	1.6	0.8
108-95-2	Phenol	1,640,792	1,324,331	748,104	3,713,227	19.5	3.8	3.0	10.5
78-93-3	Methyl ethyl ketone	3,335,223	185,291	141,333	3,661,847	18.1	0.1	2.3	16.6
1332-21-4	Asbestos (friable)	118	1	2,450,747	2,450,866	0.0	0.0	26.4	26.3
	Subtotal	**124,239,574**	**100,876,077**	**148,609,590**	**373,725,241**	**10.2**	**1.4**	**18.5**	**11.1**
	as Percent of Total	**81.8**	**91.3**	**94.0**	**88.9**				
	Total	**151,919,715**	**110,508,977**	**158,096,736**	**420,525,428**	**9.9**	**1.3**	**17.8**	**10.6**

NOTE: Canada and US data only, Mexico data not collected for 1994

Table 3–8

TOTAL RELEASES AND TRANSFERS IN NORTH AMERICA, BY INDUSTRY, 1994
(MATCHED CHEMICALS/INDUSTRIES)

SIC Code	Industry	Forms		Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers		NPRI as % of Total			
		Number	(%)			(kg)	(%)	Forms (%)	Total Releases (%)	Total Transfers (%)	Total Releases and Transfers (%)
28	Chemicals	20,464	28.1	420,469,444	158,246,808	578,716,252	38.4	7.6	13.1	4.4	10.7
33	Primary Metal Industries	7,070	9.7	159,010,890	111,841,472	270,852,362	18.0	8.6	13.0	10.1	11.8
26	Paper Products	2,625	3.6	143,428,893	27,109,881	170,538,774	11.3	12.9	22.6	12.2	20.9
	Multiple codes 20-39	4,964	6.8	67,319,944	22,850,454	90,170,398	6.0	–	–	–	–
30	Rubber and Plastics Products	3,781	5.2	53,614,452	23,885,101	77,499,553	5.1	8.0	11.9	67.0	28.9
37	Transportation Equipment	4,332	5.9	52,432,515	10,315,530	62,748,045	4.2	6.6	13.1	15.1	13.5
34	Fabricated Metal Products	8,440	11.6	29,622,445	20,155,067	49,777,512	3.3	5.0	6.3	14.1	9.5
29	Petroleum and Coal Products	3,350	4.6	35,745,273	4,970,625	40,715,898	2.7	12.2	30.3	12.6	28.1
20	Food Products	3,794	5.2	14,561,816	13,495,004	28,056,820	1.9	3.9	0.4	3.7	2.0
25	Furniture and Fixtures	1,523	2.1	22,440,316	1,001,753	23,442,069	1.6	1.6	2.4	6.5	2.5
36	Electronic/Electrical Equipment	3,427	4.7	11,898,517	11,001,517	22,900,034	1.5	3.1	3.9	6.8	5.3
27	Printing and Publishing	508	0.7	16,051,446	502,311	16,553,757	1.1	9.1	8.5	43.4	9.5
24	Lumber and Wood Products	1,934	2.7	15,321,892	398,083	15,719,975	1.0	6.2	5.2	21.4	5.6
32	Stone/Clay/Glass Products	1,492	2.0	11,134,399	3,756,781	14,891,180	1.0	6.9	22.8	9.0	19.3
35	Industrial Machinery	2,684	3.7	9,513,263	2,516,537	12,029,800	0.8	2.6	2.3	4.5	2.8
22	Textile Mill Products	776	1.1	8,221,743	2,901,662	11,123,405	0.7	3.0	6.7	0.4	5.1
38	Measurement/Photographic Instruments	661	0.9	6,350,041	2,545,343	8,895,384	0.6	0.3	0.2	0.0	0.1
39	Misc. Manufacturing Industries	769	1.1	6,010,364	1,201,667	7,212,031	0.5	3.9	2.3	0.3	2.0
31	Leather Products	229	0.3	1,255,291	1,700,905	2,956,196	0.2	2.6	4.0	1.3	2.4
21	Tobacco Products	24	0.0	641,979	32,673	674,652	0.0	0.0	0.0	0.0	0.0
23	Apparel and Other Textile Products	56	0.1	485,876	96,254	582,130	0.0	3.6	0.0	0.0	0.0
	Total	**72,903**	**100**	**1,085,530,799**	**420,525,428**	**1,506,056,227**	**100.0**	**6.3**	**13.0**	**10.6**	**12.3**

NOTE: Canada and US data only, Mexico data not collected for 1994

3.5 REPORTING INDUSTRIES

Three industries—chemicals, primary metals, and paper products—account for two-thirds of the total releases and transfers reported in 1994, as shown in **Figure 3–4**. Each of these industries contributed a greater proportion of total releases and transfers than would be expected, based on the proportion of forms submitted, indicating higher levels in these categories per facility than average. The chemical industry submitted the most forms (28 percent of the total) and reported the greatest amount of total releases and transfers (38 percent); primary metals (10 percent of all forms) accounted for 18 percent of total releases and transfers; while paper products (4 percent of all forms) accounted for 11 percent of total releases and transfers (see **Table 3–8**).

Releases and transfers from the paper products industry in Canada reflect a contribution from Canadian facilities that is disproportionately higher than that of the chemicals or primary metal products industries or, for that matter, than in the complete data set. In the Canadian NPRI, each facility reports only the one SIC code that best represents its dominant opera-

Figure 3–4

NORTH AMERICAN TOP THREE INDUSTRIES FOR TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

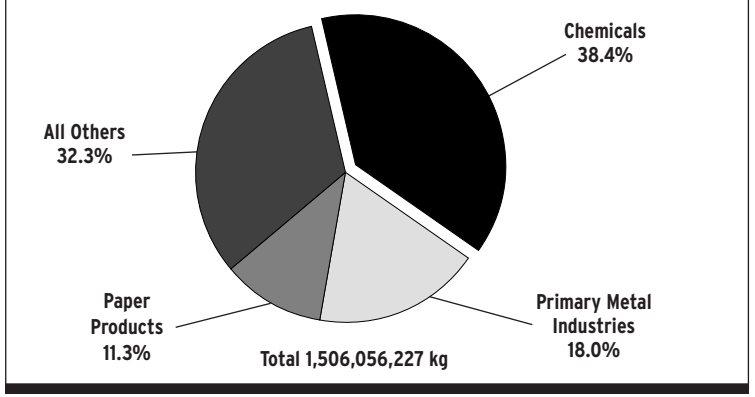


Table 3–9

RELEASES IN NORTH AMERICA, BY INDUSTRY, 1994
(MATCHED CHEMICALS/INDUSTRIES)

SIC Code	Industry	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)	NPRI as % of Total: Total Air Emissions (%)	Surface Water Discharges (%)	Underground Injection (%)	On-site Land Releases (%)	Total Releases (%)
28	Chemicals	206,765,810	34,993,827	148,778,570	29,826,098	420,469,444	17.1	48.0	1.8	0.7	13.1
33	Primary Metal Industries	63,962,001	2,593,726	4,853,091	87,576,300	159,010,890	15.6	32.4	0.0	11.2	13.0
26	Paper Products	120,699,887	20,482,136	0	2,243,159	143,428,893	14.1	74.2	–	5.9	22.6
	Multiple codes 20-39	49,930,089	2,381,692	271,089	14,737,074	67,319,944	–	–	–	–	–
30	Rubber and Plastics Products	53,225,152	173,043	2	202,435	53,614,452	11.6	76.1	0.0	49.0	11.9
37	Transportation Equipment	52,169,483	34,369	0	222,744	52,432,515	13.0	6.4	–	50.1	13.1
29	Petroleum and Coal Products	28,403,093	925,686	6,023,702	385,496	35,745,273	19.4	18.5	84.7	9.3	30.3
34	Fabricated Metal Products	29,192,785	33,955	1,249	383,429	29,622,445	6.1	1.2	0.0	19.1	6.3
25	Furniture and Fixtures	22,402,014	4,806	0.0	33,496	22,440,316	2.4	0.0	–	0.0	2.4
27	Printing and Publishing	16,044,759	6,075	0.0	612	16,051,446	8.4	97.5	–	0.0	8.5
24	Lumber and Wood Products	15,267,745	44,760	0	8,936	15,321,892	5.2	1.9	–	49.2	5.2
20	Food Products	11,644,988	558,079	86,325	2,270,285	14,561,816	0.3	3.0	0.0	0.0	0.4
36	Electronic/Electrical Equipment	11,754,587	65,921	245	75,006	11,898,517	3.8	17.2	0.0	8.3	3.9
32	Stone/Clay/Glass Products	10,291,697	119,586	26,304	693,282	11,134,399	24.0	43.0	0.0	2.2	22.8
35	Industrial Machinery	9,329,241	77,731	0	104,734	9,513,263	1.8	28.0	–	32.7	2.3
22	Textile Mill Products	8,149,574	63,815	2	7,459	8,221,743	6.7	0.0	0.0	0.0	6.7
38	Measurement/Photographic Instruments	6,207,229	139,355	0	3,327	6,350,041	0.2	0.0	–	0.0	0.2
39	Misc. Manufacturing Industries	6,000,109	620	0	9,249	6,010,364	2.2	0.0	–	65.5	2.3
31	Leather Products	1,185,803	62,036	0	7,452	1,255,291	4.2	0.0	–	0.0	4.0
21	Tobacco Products	637,341	4,638	0	0	641,979	0.0	0.0	–	–	0.0
23	Apparel and Other Textile Products	485,864	1	0	11	485,876	0.0	0.0	–	0.0	0.0
	Total	**723,749,251**	**62,765,857**	**160,040,579**	**13,8790,584**	**1,085,530,799**	**12.3**	**53.0**	**4.8**	**7.6**	**13.0**

NOTE: Canada and US data only, Mexico data not collected for 1994

tions. In the US TRI, however, a facility reports all SIC codes that apply to operations there. Therefore, only US facilities appear in the "multiple codes" category, which ranks fourth for total releases and transfers.

These same three industries rank highest for total releases and for total off-site transfers (see **Tables 3–9** and **3–10**). The chemical industry leads in all types of releases and transfers except on-site releases to land and transfers to disposal, both of which are dominated by the primary metal products industry. US facilities reporting multiple SIC codes rank fourth for total releases. For total transfers, however, rubber and plastics manufacturing is fourth, reflecting transfers reported to NPRI.

Just as with chemicals, release and transfer data for some industries reflect a disproportionate amount of NPRI data. Industries with proportionately higher releases from Canadian facilities are: petroleum and coal products; stone, clay and

Table 3–10

TRANSFERS IN NORTH AMERICA, BY INDUSTRY, 1994 (MATCHED CHEMICALS/INDUSTRIES)

SIC Code	Industry	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	NPRI as % of Total: Treatment/ Destruction (%)	Sewage/ POTWs (%)	Disposal/ Containment (%)	Total Transfers (%)
28	Chemicals	80,923,364	60,958,148	16,365,296	158,246,808	5.6	0.4	13.1	4.4
33	Primary Metal Industries	24,465,692	3,472,267	83,903,513	111,841,472	12.9	27.3	8.6	10.1
26	Paper Products	7,010,293	18,643,855	1,455,733	27,109,881	43.4	0.4	12.4	12.2
30	Rubber and Plastics Products	2,208,447	883,224	20,793,430	23,885,101	31.8	0.2	73.5	67.0
	Multiple codes 20-39	10,870,744	4,614,821	7,364,889	22,850,454	–	–	–	–
34	Fabricated Metal Products	9,017,943	960,531	10,176,593	20,155,067	13.8	1.9	15.5	14.1
20	Food Products	1,719,296	11,154,404	621,304	13,495,004	17.0	0.9	17.8	3.7
36	Electronic/Electrical Equipment	5,136,468	2,363,952	3,501,097	11,001,517	9.2	0.4	7.5	6.8
37	Transportation Equipment	4,112,561	433,181	5,769,788	10,315,530	21.6	3.3	11.3	15.1
29	Petroleum and Coal Products	721,467	2,228,102	2,021,056	4,970,625	21.7	1.6	21.4	12.6
32	Stone/Clay/Glass Products	1,047,873	356,198	2,352,710	3,756,781	15.6	0.0	7.4	9.0
22	Textile Mill Products	275,790	2,290,962	334,910	2,901,662	3.0	0.0	0.9	0.4
38	Measurement/ Photographic Instruments	1,908,188	315,673	321,482	2,545,343	0.0	0.0	0.0	0.0
35	Industrial Machinery	696,456	425,152	1,394,929	2,516,537	8.6	0.0	3.9	4.5
31	Leather Products	14,339	1,031,170	655,396	1,700,905	42.4	1.5	0.0	1.3
39	Misc. Manufacturing Industries	365,578	228,040	608,049	1,201,667	0.8	0.0	0.0	0.3
25	Furniture and Fixtures	843,339	36,160	122,254	1,001,753	7.7	0.9	0.0	6.5
27	Printing and Publishing	415,297	51,962	35,052	502,311	52.5	0.0	0.0	43.4
24	Lumber and Wood Products	111,499	19,536	267,048	398,083	27.1	0.0	20.5	21.4
23	Apparel and Other Textile Products	55,079	9,858	31,317	96,254	0.0	0.0	0.0	0.0
21	Tobacco Products	2	31,781	890	32,673	0.0	0.0	0.0	0.0
	Total	**151,919,715**	**110,508,977**	**158,096,736**	**420,525,428**	**9.9**	**1.3**	**17.8**	**10.6**

NOTE: Canada and US data only, Mexico data not collected for 1994

glass products; and paper products. Proportionately higher transfers are seen from the rubber and plastics, printing and publishing, and lumber and wood products industries.

3.6 PROJECTIONS FOR FUTURE RELEASES AND TRANSFERS

Both Canada and the United States require facilities to estimate PRTR releases and transfers for future years. Canadian facilities project total releases and total transfers, but US facilities make more detailed projections for on-site and off-site waste management. TRI includes one overall category for on-site releases and off-site disposal and another for off-site transfers to treatment. These two categories—releases/off-site disposal plus off-site treatment—give projections for total releases and transfers. As **Table 3–11** shows, North American facilities overall expect to reduce their total releases and transfers by 8 percent over the next two years, with Canadian facilities projecting a much greater percentage decrease (25 percent) than US facilities (6 percent). **Chapter 4** explores in greater detail the possible reasons for these differences.

Table 3–11

NORTH AMERICAN PROJECTIONS OF TOTAL RELEASES AND TRANSFERS, NPRI AND TRI, 1994-1996 (MATCHED CHEMICALS/INDUSTRIES)

	1994 (kg)	Projections for 1995 (kg)	Change 1994–1995 (%)	Projections for 1996 (kg)	Change 1994–1996 (%)
NPRI	185,510,927	161,546,189	-12.9	139,963,686	-24.6
TRI*	1,292,950,017	1,248,281,556	-3.5	1,216,681,389**	-5.9
Total	**1,478,460,944**	**1,409,827,745**	**-4.6**	**1,356,645,075**	**-8.2**

* Section 8.1 plus 8.7 on TRI Form R
** One TRI form erroneously projecting 93 million kilograms for 1996 was not included.

Table 3–12

NORTH AMERICAN PROJECTIONS OF TOTAL RELEASES AND TRANSFERS, NPRI AND TRI, BY INDUSTRY, 1994–1996
(MATCHED CHEMICALS/INDUSTRIES)

		NPRI Total Releases and Transfers					TRI Total Releases and Transfers				
US SIC Code	Industry	NPRI Number of Forms	1994 (kg)	Projections for 1995 (kg)	Projections for 1996 (kg)	Change 1994–1996 (%)	TRI Number of Forms	1994 (kg)	Projections for 1995 (kg)	Projections for 1996 (kg)	Change 1994–1996 (%)
20	Food Products	147	556,876	783,915	761,479	36.7	3,647	26,796,973	26,124,175	24,556,488	-8.4
21	Tobacco Products	0	0	0	0	–	24	674,672	669,182	676,557	0.3
22	Textile Mill Products	23	562,221	517,651	445,201	-20.8	753	19,173,179	10,192,766	9,882,751	-48.5
23	Apparel and Other Textile Products	2	0	0	0	–	54	589,577	474,727	344,249	-41.6
24	Lumber and Wood Products	119	879,749	961,036	981,743	11.6	1,815	14,566,279	13,656,365	13,607,394	-6.6
25	Furniture and Fixtures	25	595,291	663,227	663,117	11.4	1,498	23,145,237	21,623,390	21,649,662	-6.5
26	Paper Products	339	35,682,048	32,093,605	21,399,582	-40.0	2,286	133,598,816	134,646,529	127,746,802	-4.4
27	Printing and Publishing	46	1,577,690	1,394,581	1,331,056	-15.6	462	13,582,525	13,274,235	13,023,031	-4.1
28	Chemicals	1,559	62,042,975	49,419,954	44,904,152	-27.6	18,905	497,589,782	478,450,495	463,570,081	-6.8
29	Petroleum and Coal Products	410	11,451,006	10,918,651	10,589,063	-7.5	2,940	28,854,200	27,650,172	27,251,081	-5.6
30	Rubber and Plastics Products	303	22,386,983	14,273,215	14,297,261	-36.1	3,478	57,229,133	51,157,482	54,961,673	-4.0
31	Leather Products	6	72,276	35,500	33,000	-54.3	223	2,702,352	2,806,900	10,911,899	303.8
32	Stone/Clay/Glass Products	103	2,879,186	1,765,239	1,386,683	-51.8	1,389	11,854,430	11,115,527	10,651,980	-10.1
33	Primary Metal Industries*	605	31,969,803	33,253,658	28,065,380	-12.2	6,464	233,669,684	244,001,949	233,759,145	0.0
34	Fabricated Metal Products	419	4,705,766	5,223,787	5,209,866	10.7	8,021	46,090,375	40,207,907	39,150,030	-15.1
35	Industrial Machinery	69	336,958	316,869	313,526	-7.0	2,615	11,623,270	10,584,614	9,671,269	-16.8
36	Electronic/Electrical Equipment	106	1,207,989	955,323	806,911	-33.2	3,321	21,615,945	19,350,316	17,956,148	-16.9
37	Transportation Equipment	285	8,448,824	8,837,733	8,664,566	2.6	4,047	52,162,754	50,249,871	48,556,915	-6.9
38	Measurement/Photographic Instruments	2	12,020	10,130	130	-98.9	659	8,963,688	7,991,149	7,419,268	-17.2
39	Misc. Manufacturing Industries	30	143,266	122,115	110,970	-22.5	739	7,230,672	6,268,869	6,225,424	-13.9
	Multiple codes 20-39	0	0	0	0	–	4,964	81,236,471	77,784,936	75,109,542	-7.5
	Total	**4,598**	**185,510,927**	**161,546,189**	**139,963,686**	**-24.6**	**68,304**	**1,292,950,017**	**1,248,281,556**	**1,216,681,389**	**-5.9**

NOTE: Canada and US data only, Mexico data not collected for 1994
*One US TRI form erroneously projecting 93 million kilograms of zinc compounds for 1996 was not included.

3.6 PROJECTIONS FOR FUTURE RELEASES AND TRANSFERS (continued)

Table 3–12

NORTH AMERICAN PROJECTIONS OF TOTAL RELEASES AND TRANSFERS, NPRI AND TRI, BY INDUSTRY, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

		Total Releases and Transfers			
US SIC Code	Number of Forms	1994 (kg)	Projections for 1995 (kg)	Projections for 1996 (kg)	Change 1994–1996 (%)
20	3,794	27,353,849	26,908,090	25,317,967	-7.4
21	24	674,672	669,182	676,557	0.3
22	776	19,735,400	10,710,417	10,327,952	-47.7
23	56	589,577	474,727	344,249	-41.6
24	1,934	15,446,028	14,617,401	14,589,137	-5.5
25	1,523	23,740,528	22,286,617	22,312,779	-6.0
26	2,625	169,280,864	166,740,134	149,146,384	-11.9
27	508	15,160,215	14,668,816	14,354,087	-5.3
28	20,464	559,632,757	527,870,449	508,474,233	-9.1
29	3,350	40,305,206	38,568,823	37,840,144	-6.1
30	3,781	79,616,116	65,430,697	69,258,934	-13.0
31	229	2,774,628	2,842,400	10,944,899	294.5
32	1,492	14,733,616	12,880,766	12,038,663	-18.3
33	7,069	265,639,487	277,255,607	261,824,525	-1.4
34	8,440	50,796,142	45,431,694	44,359,895	-12.7
35	2,684	11,960,228	10,901,483	9,984,795	-16.5
36	3,427	22,823,934	20,305,639	18,763,059	-17.8
37	4,332	60,611,578	59,087,604	57,221,481	-5.6
38	661	8,975,708	8,001,279	7,419,398	-17.3
39	769	7,373,938	6,390,984	6,336,394	-14.1
	4,964	81,236,471	77,784,936	75,109,542	-7.5
	72,902	**1,478,460,944**	**1,409,827,745**	**1,356,645,075**	**-8.2**

Projected changes are not obviously correlated with the release and transfer amounts reported for particular chemicals in 1994, either for the data set as a whole or for the top 25 chemicals. These projected changes in releases and transfers for different chemicals range from a reduction of 84 percent for styrene oxide to an increase of 111 percent for peracetic acid. For the 25 chemicals with the greatest releases and transfers in 1994, projections range from a decrease of 45 percent (for di(2-ethylhexyl) phthalate) to an increase of 19 percent (for styrene).

Changes in release and transfer reductions vary markedly across industries, from industries that expect to cut releases and transfers by more than 40 percent (textile mill products, apparel) to an industry that projects a three-fold increase in releases and transfers (leather products) (see **Table 3–12**). The extreme projections for these industries primarily reflect the influence of TRI data. For other industries, large projected reductions by Canadian industries (e.g., food products, paper products, stone/clay/glass products, and measurement/photographic equipment) are masked in the North American data by smaller projected changes in the United States.

There appears to be no correlation between the size of releases and transfers by an industry in 1994 and its projected reductions (in percentage terms) between 1994 and 1996. Industries with comparatively small overall releases will not be reducing releases and transfers by any smaller fraction than will those with large releases and transfers.

Key findings

- Despite the large difference in chemical coverage between NPRI and TRI, NPRI facilities report the same number of forms (individual chemicals) per facility as do TRI facilities. In general, facilities report an average of nearly 3.5 forms each.
- The overall proportion of releases to transfers is the same in NPRI as in TRI. Releases account for 74 percent of total releases and transfers in NPRI and 72 percent in TRI.
- The pattern of releases differs markedly between NPRI and TRI. Much greater discharges to surface water are reported to NPRI than to TRI, not only relative to the number of reporting facilities, but also in absolute terms. In contrast, underground injection plays a much smaller role in NPRI than in TRI.
- The pattern of transfers also differs markedly. NPRI data reflect relatively larger transfers to disposal and fewer transfers to sewage/POTWs than TRI data.
- Average releases per facility for NPRI facilities are far larger than those in TRI (approximately 2.3 times as large). Likewise, average transfers per NPRI facility are twice as large as those in TRI. Some factors contributing to this difference, such as industry or chemical mix, or the number of facilities in the two countries, are explored later in this report. However, other factors (varying environmental regulations, for instance) cannot be explored through PRTR data alone.
- The largest releases include such chemicals as methanol and ammonia, which rank among the top 10 for each type of environmental release in both countries. Transfers are more varied, but methanol again figures among the top five chemicals transferred in both countries.
- The chemical, paper, and primary metal products industries reported the largest releases and transfers in both countries; however, the metal mining industry, a non-manufacturing industry not required to report to TRI, ranked third in NPRI data.

4.1 INTRODUCTION

This chapter summarizes data from the complete PRTR databases of Canada and the United States and notes significant similarities and differences. (**Chapter 5** compares the subset of common industries and chemicals reported in both PRTRs.) Data for transfers to recycling and energy recovery are not included because they are optional under the Canadian NPRI. As noted in **Chapter 3**, this excludes a significant portion of total releases and transfers. Also excluded is information concerning on-site waste-management activities because these are reported only under the US TRI.

Table 4–1

RELEASES AND TRANSFERS, NPRI AND TRI, 1994
(ALL CHEMICALS/INDUSTRIES)

	NPRI		TRI	
	Number		Number	
Total Facilities	1,707		22,744	
Total Forms	5,928		75,332	
Releases	**kg**	**%**	**kg**	**%**
Total Air Emissions	96,163,310	39.3	705,672,601	49.6
Surface Water Discharges	55,469,720	22.7	29,969,745	2.1
Underground Injection	14,264,870	5.8	158,262,234	11.1
On-site Land Releases	14,087,660	5.8	131,134,298	9.2
Total Releases	**180,241,975**	**73.7**	**1,025,038,878**	**72.1**
Transfers				
Treatment/Destruction	24,393,542	10.0	144,585,185	10.2
Sewage/POTWs	2,016,222	0.8	115,505,141	8.1
Disposal/Containment	37,869,948	15.5	136,599,949	9.6
Total Transfers	**64,279,712**	**26.3**	**396,690,275**	**27.9**
Total Releases and Transfers	**244,521,687**	**100.0**	**1,421,729,153**	**100.0**
Average per Facility	**Number**		**Number**	
Average Forms per Facility	3.5		3.3	
	kg		**kg**	
Average Releases per Facility	105,590		45,069	
Average Transfers per Facility	37,657		17,442	
Average Releases and Transfers per Facility	143,246		62,510	

4.2 OVERALL SCOPE OF NPRI AND TRI REPORTING

In 1994, a total of 1,707 Canadian facilities submitted 5,928 chemical forms to NPRI, while 22,744 US facilities reported on 75,332 forms to the TRI (see **Table 4–1**). Even though TRI lists almost twice as many chemicals as NPRI, in 1994, facilities reported about the same average number of forms in the two countries (3.5 forms per facility in Canada and 3.3 in the United States). The proportion of releases to total releases and transfers is also similar in the two countries: 74 percent of the total for NPRI and 72 percent for TRI.

4.3 RELEASE AND TRANSFER DATA IN NPRI

4.3.1 NPRI Release and Transfer Distributions

Emissions to the air constitute the largest type of release reported to NPRI (39 percent of total releases and transfers), followed by surface water discharges (23 percent). Underground injection and on-site land releases each account for approximately 6 percent of releases and transfers. For transfers, disposal/containment accounts for the largest fraction (15.5 percent of total releases and transfers), with most of the rest representing treatment/destruction. Transfers to sewage/POTWs account for less than one percent of total releases and transfers (see **Figure 4–1**, graphically representing NPRI data from **Table 4–1**).

Figure 4–1

NPRI RELEASES AND TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

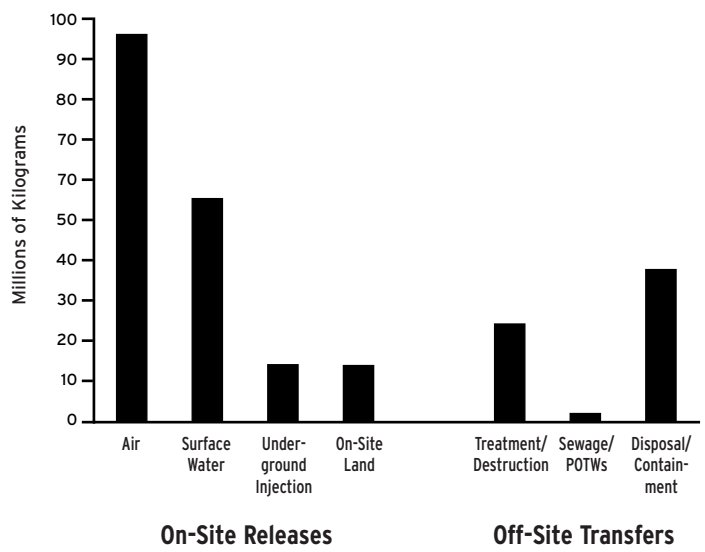


Table 4–2
NPRI RELEASES AND TRANSFERS BY INDUSTRY (CANADIAN SIC CODE), 1994
(ALL CHEMICALS/INDUSTRIES)

SIC Code	Industry	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	% of Total	Rank
02	Agricultural Services	10	0	0	0	0.0	–
03	Fishing/Trapping	1	0	0	0	0.0	–
04	Logging Industry	6	101,269	0	101,269	0.0	29
06	Mining	235	27,195,362	6,518,514	33,713,876	13.8	3
07	Oil/Gas Extraction	437	3,943,965	1,456,364	5,400,329	2.2	9
09	Mining Services	13	7,930	570	8,500	0.0	36
10	Food	95	38,095	246,632	284,727	0.1	23
11	Beverage	43	13,865	35,469	49,334	0.0	33
15	Rubber Products	88	2,253,929	15,168,518	17,422,447	7.1	5
16	Plastic Products	207	4,344,179	926,954	5,271,133	2.2	10
17	Leather	12	61,535	36,011	97,546	0.0	30
18	Primary Textiles	15	176,912	6,534	183,446	0.1	26
19	Textile Products	9	295,797	1,008	296,805	0.1	22
25	Wood	114	703,419	77,694	781,113	0.3	19
26	Furniture/Fixtures	23	558,926	51,091	610,017	0.2	21
27	Paper	331	32,321,573	3,195,280	35,516,853	14.5	2
28	Printing/Publishing	48	1,396,565	236,693	1,633,258	0.7	14
29	Primary Metal Products	534	20,608,427	10,503,728	31,112,155	12.7	4
30	Fabricated Metals	411	1,914,685	2,548,346	4,463,031	1.8	11
31	Machinery	21	130,801	38,453	169,254	0.1	28
32	Transportation Equipment	452	8,112,956	3,012,412	11,125,368	4.5	7
33	Electrical/Electronic	126	482,964	747,788	1,230,752	0.5	15
35	Non-metal Mineral Products	101	2,498,097	337,059	2,835,156	1.2	13
36	Refined Oil/Coal Products	412	10,851,091	624,706	11,475,797	4.7	6
37	Chemicals	1,609	57,207,901	7,114,659	64,322,560	26.3	1
39	Other Manufacturing	82	501,654	285,908	787,562	0.3	18
41	Industrial Construction	101	909,753	7,713,399	8,623,152	3.5	8
42	Trade Contracting	4	72,222	250	72,472	0.0	32
44	Construction Service Industries	2	0	12,000	12,000	0.0	34
45	Transportation Services	36	2,236,378	1,335,720	3,572,098	1.5	12
46	Pipeline Transport Industries	8	75,200	8,400	83,600	0.0	31
47	Storage/Warehousing	10	3,110	242,160	245,270	0.1	25
48	Communication Industries	1	10,030	269	10,299	0.0	35
49	Other Utilities	45	348,851	346,631	695,482	0.3	20
52	Food/Drug/Tobacco, Wholesale	1	0	0	0	0.0	–
55	Motor Vehicle Parts, Wholesale	15	260,210	3,030	263,240	0.1	24
56	Building Materials, Wholesale	8	4,901	859,700	864,601	0.4	17
59	Other Products, Wholesale	247	415,009	587,762	1,002,771	0.4	16
77	Business Services	1	0	0	0	0.0	–
81	Federal Government Services	11	182,125	0	182,125	0.1	27
97	Personal/Household Services	1	0	0	0	0.0	–
99	Other Services	2	2,289	0	2,289	0.0	37
	Total	**5,928**	**180,241,975**	**64,279,712**	**244,521,687**	**100.0**	

Table 4–3

NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994
(ALL CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	% of Total	Rank
07	Agricultural Services	11	0	0	0	0.0	–
09	Fishing, Hunting, Trapping	1	0	0	0	0.0	–
10	Metal Mining	214	27,167,783	6,515,905	33,683,688	13.8	3
12	Coal Mining	1	0	0	0	0.0	–
13	Oil and Gas Extraction	449	3,951,167	1,456,934	5,408,101	2.2	9
14	Nonmetallic Minerals, except Fuels	20	31,237	360	31,597	0.0	29
16	Heavy Construction, except Building	100	909,453	7,710,899	8,620,352	3.5	8
17	Special Trade Contractors	4	72,222	250	72,472	0.0	27
20	Food Products	150	56,141	500,737	556,878	0.2	20
22	Textile Mill Products	26	662,423	44,460	706,883	0.3	17
23	Apparel and Other Textile Products	2	0	0	0	0.0	–
24	Lumber and Wood Products	121	807,388	84,994	892,382	0.4	16
25	Furniture and Fixtures	25	530,200	65,091	595,291	0.2	19
26	Paper Products	344	32,593,534	3,301,688	35,895,222	14.7	2
27	Printing and Publishing	48	1,396,565	236,693	1,633,258	0.7	14
28	Chemicals	1,634	57,311,714	7,122,720	64,434,434	26.4	1
29	Petroleum and Coal Products	412	10,851,091	624,706	11,475,797	4.7	6
30	Rubber and Plastics Products	329	6,693,125	16,042,503	22,735,628	9.3	5
31	Leather Products	6	50,065	22,211	72,276	0.0	28
32	Stone/Clay/Glass Products	104	2,546,775	337,911	2,884,686	1.2	12
33	Primary Metal Industries	608	20,707,159	11,286,055	31,993,214	13.1	4
34	Fabricated Metal Products	422	1,894,288	2,857,553	4,751,841	1.9	10
35	Industrial Machinery	69	223,113	113,845	336,958	0.1	22
36	Electronic/Electrical Equipment	107	467,166	743,673	1,210,839	0.5	15
37	Transportation Equipment	303	7,600,640	1,811,463	9,412,103	3.8	7
38	Measurement/Photographic Instruments	2	12,020	0	12,020	0.0	32
39	Misc. Manufacturing Industries	30	139,877	3,389	143,266	0.1	25
42	Trucking/Warehousing	10	3,110	242,160	245,270	0.1	23
44	Water Transportation	2	12,180	0	12,180	0.0	31
45	Air Transportation	34	2,224,198	1,335,720	3,559,918	1.5	11
46	Pipelines, except Natural Gas	8	75,200	8,400	83,600	0.0	26
48	Communications	1	10,030	269	10,299	0.0	34
49	Electric/Gas/Sanitary Services	45	348,851	346,631	695,482	0.3	18
50	Wholesale Trade Durable Goods	39	447,781	1,206,686	1,654,467	0.7	13
51	Wholesale Trade Nondurable Goods	230	232,339	243,806	476,145	0.2	21
57	Furniture Stores	1	28,726	0	28,726	0.0	30
72	Personal Services	1	0	0	0	0.0	–
73	Business Services	2	0	12,000	12,000	0.0	33
87	Engineering/Management Services	1	0	0	0	0.0	–
89	Other Services	1	2,289	0	2,289	0.0	35
95	Environmental Quality and Housing	8	155	0	155	0.0	36
97	National Security	3	181,970	0	181,970	0.1	24
	Total	**5,928**	**180,241,975**	**64,279,712**	**244,521,687**	**100.0**	

4.3 RELEASE AND TRANSFER DATA IN NPRI (continued)

Table 4–3

NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994 (ALL CHEMICALS/INDUSTRIES)

4.3.2 NPRI Industries

NPRI requires facilities to report both a Canadian Standard Industrial Classification (SIC) code and a US SIC code. **Tables 4–2** and **4–3** present the NPRI data for the two classification schemes at the two-digit level. In the rest of this analysis, Canadian data are given according to US SIC codes to facilitate comparison.

Any Canadian facility using a listed chemical in quantities above the threshold must report to NPRI, regardless of its industrial classification. For 1994, facilities in 42 SIC categories reported. The chemical industry submitted the most forms and also reported the greatest amount of total releases and transfers (26 percent). Four industries—chemicals, paper, metal mining, and primary metal products—accounted for more than 68 percent of total releases and transfers. Metal mining (an industry that does not currently report to the US TRI) accounted for the third largest total in NPRI releases and transfers (14 percent of the NPRI total). Facilities in five industries (or six, based on the US SIC code) reported no releases or transfers of the chemicals used.

The Canadian chemical industry did not dominate transfer reporting to the extent that it did the reporting of releases. Rather, the rubber products industry reported the largest transfers, again because two facilities reported transfers of more than 5 million kilograms each of di(2-ethylhexyl) phthalate. Transfers by the primary metal products industry placed it second among the 42 reporting industries.

Facilities in industries other than manufacturing accounted for more than 22 percent of the NPRI total in 1994. Several non-manufacturing industries ranked among the top 10 for Canadian releases and transfers: metal mining, heavy construction, and oil and gas extraction.

4.3.3 NPRI Major Facilities

Table 4–4 gives data from the 50 NPRI facilities with the largest total releases and transfers, and for which chemicals account for more than 70 percent of total releases and transfers. (As mentioned above, any evaluation of the relative health and environmental impacts of these facilities must also take into account the toxicity of the chemicals released, local climatic conditions, and the proximity of people and/or ecologically sensitive areas to the released waste streams.) While representing only three percent (50 out of 1,707) of all NPRI facilities, these 50 facilities accounted for 66 percent of total releases and 64 percent of total transfers. The installations are located throughout the country in seven of the 10 provinces. **Table 4–4** also shows which chemicals were reported by the facility in the largest amounts. In most cases, just one or two chemicals are listed, and one type of release or transfer method is used for the bulk of the chemical waste. The particular chemical and type of release or transfer is presented to show how different the profile is for each of these top 50 facilities. As was noted in **section 2.4.3**, NPRI allows facilities to report total releases without separating them into individual release categories. Therefore, on **Table 4–4** and similar presentations of NPRI release data in this report, amounts given in the "total releases" column may be greater than would be suggested by addition of individual release amounts.

Exceptionally large releases or transfers were reported by just a few facilities for single chemicals. The top two facilities both have substantial discharges to surface water (28 million kilograms together) representing the bulk of their releases and transfers, and the next largest release reported in the database is a release of four million kilograms. Similarly, four forms report transfers of more than five million kilograms each (and the next largest transfer is less than three million kilograms). Three of the largest transfers are to disposal/containment (totaling 23 million kilograms), and one is to treatment (seven million kilograms). **Table 4–5** presents additional data on these facilities.

Removing these six forms with the largest releases and transfers from the NPRI data, however, does not dramatically alter the relative distribution of release types. Surface water discharges continue to represent a significant proportion (approximately 14 percent) of total NPRI releases and transfers. On the other hand, removing these large reports lowers the proportion of transfers to disposal/containment in NPRI to 8 percent. **Table 4–6** displays these results.

Table 4–4

THE 50 NPRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	Facility	City, Province	SIC Codes		Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
			Canada	US						
1	Kronos Canada, Inc.	Varennes, QC	37	28	8	39,623	15,102,000	0	0	15,141,623
2	BHP Minerals Canada Ltd.	Port Hardy, BC	06	10	2	0	13,439,526	0	0	13,439,526
3	Samuel Bingham Company	Montreal, QC	15	30	1	0	0	0	0	0
4	Cominco Ltd.	Trail, BC	06	10	14	792,230	8,012,660	0	0	8,804,890
5	Belledune Thermal Generating Station	Belledune, NB	41	16	2	0	0	0	0	0
6	Les Mines Agnico-Eagle Div. Laronde	Cadillac, QC	06	10	6	0	1,770	0	0	2,030
7	Sherritt Inc.	Fort Saskatchewan, AB	37	28	17	5,166,325	802,330	0	6,060	5,974,985
8	Samuel Bingham Company	Toronto, ON	15	30	1	0	0	0	0	0
9	Methanex Corporation	Medicine Hat, AB	37	28	6	4,132,490	0	0	0	4,132,490
10	Royal Oak Mines Inc.	Yellowknife, NT	06	10	2	3,000	630	3,800,000	0	3,803,760
11	Sherritt Inc.	Redwater, AB	37	28	11	1,797,810	96,200	1,853,020	6,680	3,753,840
12	Cartons St-Laurent Inc.	La Tuque, QC	27	26	4	382,307	3,175,116	0	3,845	3,561,268
13	Irving Pulp and Paper/Irving Tissue Co.	Saint John, NB	27	26	5	257,147	3,135,481	0	0	3,392,628
14	Dofasco Inc.	Hamilton, ON	29	33	22	660,431	48,657	0	17	709,105
15	Inco Limited Copper Cliff Smelter	Copper Cliff, ON	29	33	7	3,152,970	0	0	0	3,152,970
16	Scott Maritimes Limited	New Glasgow, NS	27	26	5	473,110	0	0	0	473,110
17	Polysar Rubber Corporation	Sarnia, ON	37	28	17	2,669,750	6,083	0	0	2,675,933
18	Acierie, Sidbec-Dosco (ISPAT) Inc.	Contrecoeur, QC	29	33	5	187,050	3,402	0	2,731,280	2,921,732
19	Canadian Fertilizers Limited	Medicine Hat, AB	37	28	5	2,873,784	23,650	0	175	2,898,147
20	CO-Steel Lasco	Whitby, ON	29	33	5	15,617	65	0	1,858,000	1,873,682
21	Tembec Inc.	Temiscaming, QC	27	26	5	0	2,577,900	0	0	2,577,900
22	Shell Scotford Refinery	Fort Saskatchewan, AB	36	29	12	64,139	207	2,430,000	20	2,494,366
23	James River-Marathon, Ltd.	Marathon, ON	27	26	3	141,600	2,271,000	0	0	2,412,600
24	Algoma Steel Inc.	Sault Ste. Marie, ON	29	33	17	385,637	451,392	0	1,398,960	2,236,870
25	Carseland Nitrogen Operations	Calgary, AB	37	28	5	2,266,000	0	0	3,000	2,269,012
26	Slater Steels, H.S.B. Division	Hamilton, ON	29	33	6	9,405	0	0	390	10,613
27	Novacor Chemicals - S.C.R.S.	Corunna, ON	37	28	9	2,075,260	520	0	0	2,075,780
28	Petro-Canada Edmonton Refinery	Edmonton, AB	36	29	17	197,440	700	1,705,700	2,100	1,905,940
29	Celanese Canada Inc.	Edmonton, AB	37	28	12	998,944	0	865,800	4,542	1,869,816
30	Western Pulp Limited Partnership	Port Alice, BC	27	26	4	130,118	1,600,000	0	0	1,730,118
31	General Chemical Canada Ltd.	Amherstburg, ON	37	28	2	1,475,130	158,500	0	0	1,633,630
32	Ivaco Rolling Mills	L'Orignal, ON	29	33	5	16,100	0	0	0	17,089
33	Terra Lambton Works	Courtright, ON	37	28	5	1,392,630	62,300	0	0	1,454,930
34	Essex Aluminum Plant, Ford Motor Co.	Windsor, ON	29	33	12	1,147,551	0	0	0	1,147,551
35	St. Anne Nackawic Pulp Co. Ltd.	Nackawic, NB	27	26	7	1,314,830	51,360	0	0	1,366,190
36	Hudson Bay Mining & Smelting Co.	Flin Flon, MB	29	33	5	1,356,367	0	0	0	1,356,367
37	Stora Forest Industries Ltd.	Port Hawkesbury, NS	27	26	5	207,088	1,035,839	0	0	1,242,927
38	Les Papiers Perkins Ltee.	Candiac, QC	27	26	2	1,152,050	0	0	0	1,152,050
39	Strathcona Refinery, Imperial Oil	Edmonton, AB	36	29	24	213,186	3,612	964,021	1,510	1,182,606
40	Simplot Canada Ltd.	Brandon, MB	37	28	10	1,089,130	9,300	0	52,800	1,151,616
41	General Motors of Canada, Car Plant	Oshawa, ON	32	37	15	1,139,094	0	0	0	1,139,094
42	Avenor Inc.	Thunder Bay, ON	27	26	8	1,108,052	3,822	0	0	1,111,874
43	Standard Products (Canada) Ltd.	Stratford, ON	15	30	2	1,027,998	0	0	0	1,027,998
44	Sunworthy Wallcoverings, Borden Co.	Brampton, ON	27	26	5	756,700	0	0	0	756,700
45	Windsor Assembly Plant, Chrysler Canada	Windsor, ON	32	37	13	1,017,901	313	0	0	1,018,214
46	Ethyl Canada Inc.	Corunna, ON	37	28	10	144,531	821	0	0	145,482
47	General Motors of Canada, Truck Plant	Oshawa, ON	32	37	13	917,877	0	0	0	918,323
48	Stelco Lake Erie Works	Nanticoke, ON	29	33	18	203,859	17,015	0	702,000	922,885
49	Amoco Canada - Wolf Lake Plant	Bonnyville, AB	07	13	1	0	0	900,000	0	900,000
50	Celanese Canada Inc.	Drummondville, QC	37	28	4	807,000	2,000	0	45,000	854,000
	Subtotal				**401**	**45,359,261**	**52,094,171**	**12,518,541**	**6,816,379**	**116,794,260**
	% of Total				**6.8**	**47.2**	**93.9**	**87.8**	**48.4**	**64.8**
	Total				**5,928**	**96,163,310**	**55,469,720**	**14,264,870**	**14,087,660**	**180,241,975**

4.3 RELEASE AND TRANSFER DATA IN NPRI (continued)

Table 4–4

THE 50 NPRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

Rank	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
1	0	0	430,000	430,000	15,571,623	Sulfuric acid (water)
2	0	0	0	0	13,439,526	Copper and compounds (water)
3	0	0	9,697,820	9,697,820	9,697,820	Di(2-ethylhexyl) phthalate (transfers to disposal)
4	0	0	0	0	8,804,890	Zinc/copper and compounds, ammonia (water)
5	0	0	7,470,320	7,470,320	7,470,320	Aluminum (transfers to disposal)
6	6,515,000	0	0	6,515,000	6,517,030	Copper and compounds (transfers to treatment)
7	0	0	13,280	13,280	5,988,265	Ammonia, methanol (air)
8	0	0	5,081,000	5,081,000	5,081,000	Di(2-ethylhexyl) phthalate (transfers to disposal)
9	800	23,050	0	23,850	4,156,340	Methanol (air)
10	0	0	0	0	3,803,760	Arsenic and compounds (UIJ)
11	0	0	0	0	3,753,840	Ammonia, ammonium nitrate (air,UIJ)
12	0	0	3,845	3,845	3,565,113	Methanol (water)
13	0	0	0	0	3,392,628	Methanol (water)
14	0	3,428	2,665,584	2,669,012	3,378,117	Zinc/manganese and compounds (transfers to disposal)
15	0	0	0	0	3,152,970	Sulfuric acid (air)
16	2,613,660	0	53,340	2,667,000	3,140,110	Methanol (transfers to treatment)
17	184,900	0	98,800	283,700	2,959,633	Chloromethane, benzene, hydrochloric acid, cyclohexane (air)
18	0	0	0	0	2,921,732	Zinc and compounds (land)
19	0	0	0	0	2,898,147	Ammonia (air)
20	0	0	841,300	841,300	2,714,982	Zinc/copper and compounds (land, transfers to disposal)
21	0	0	0	0	2,577,900	Sulfuric acid (water)
22	0	0	150	150	2,494,516	Ammonia (UIJ)
23	0	0	650	650	2,413,250	Methanol (water)
24	0	163,800	0	163,800	2,400,670	Manganese and compounds (land), ammonia (water)
25	0	0	0	0	2,269,012	Ammonia (air)
26	2,246,864	900	0	2,247,764	2,258,377	Manganese/zinc and compounds (transfers to treatment)
27	28,700	0	12,200	40,900	2,116,680	Cyclohexane (air)
28	0	0	76,960	76,960	1,982,900	Ammonia (uIJ)
29	0	0	39,217	39,217	1,909,033	Acetone (air), methanol, methyl ethyl ketone (UIJ)
30	0	0	0	0	1,730,118	Methanol (water)
31	0	0	0	0	1,633,630	Ammonia (air))
32	0	0	1,467,760	1,467,760	1,484,849	Zinc and compounds (transfers to disposal)
33	0	0	3,000	3,000	1,457,930	Ammonia (air)
34	180	20	257,120	257,320	1,404,871	Styrene (air)
35	0	0	0	0	1,366,190	Chlorine, chlorine dioxide, methanol (air)
36	0	0	0	0	1,356,367	Zinc/lead and compounds (air)
37	0	0	0	0	1,242,927	Methanol (air, water)
38	0	57,575	0	57,575	1,209,625	Xylenes (air)
39	0	0	13,930	13,930	1,196,536	Ammonia (UIJ)
40	0	0	0	0	1,151,616	Ammonia (air)
41	0	151	6,953	7,104	1,146,198	Xylenes, toluene, acetone (air)
42	0	0	0	0	1,111,874	Methanol (air)
43	5,480	0	11,224	16,704	1,044,702	Xylenes (air)
44	271,400	11,700	0	283,100	1,039,800	Methyl ethyl ketone, toluene (air)
45	0	0	10,958	10,958	1,029,172	Xylenes, methyl ethyl ketone (air)
46	0	0	859,600	859,600	1,005,082	Sulfuric acid (transfers to disposal)
47	0	105	4,569	4,674	922,997	Xylenes, n-butyl alcohol, acetone (air)
48	0	0	0	0	922,885	Manganese and compounds (land)
49	0	0	0	0	900,000	Hydrochloric acid (UIJ)
50	0	0	45,000	45,000	899,000	Acetone (air)
	11,866,984	**260,729**	**29,164,580**	**41,292,293**	**158,086,553**	
	48.6	**12.9**	**77.0**	**64.2**	**64.7**	
	24,393,542	**2,016,222**	**37,869,948**	**64,279,712**	**244,521,687**	

* Chemicals accounting for more than 70% of total releases and transfers from the facility
UIJ = underground injection

Table 4–5

NPRI FACILITIES WITH LARGE RELEASES OR TRANSFERS, 1994

Facility	SIC Code	Chemical	Release/Transfer	kg
Kronos Canada, Inc., Varennes, QC	37, US 28	Sulfuric acid	Surface water	15,000,000
BHP Minerals Canada, Ltd., Port Hardy, BC	06, US 10	Copper	Surface water	13,439,526
Samuel Bingham Co., Montreal, QC	15, US 30	Di(2-ethylhexyl) phthalate	Transfers to disposal	9,697,820
Belledune Thermal Generating Station, Belledune, NB	41, US 16	Aluminum (fume or dust)	Transfers to disposal	7,470,320
Les Mines Agnico-Eagle, Cadillac, QC	06, US 10	Copper (and its compounds)	Transfers to treatment	6,500,000
Samuel Bingham Co., Toronto, ON	15, US 30	Di(2-ethylhexyl) phthalate	Transfers to disposal	5,081,000

4.3 RELEASE AND TRANSFER DATA IN NPRI (continued)

Table 4–5
NPRI FACILITIES WITH LARGE RELEASES OR TRANSFERS, 1994

Table 4–6
NPRI RELEASES AND TRANSFERS, EXCLUDING LARGEST RELEASES/TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

4.3.4 NPRI Chemicals

Table 4–7 shows the 25 chemicals released in the largest amounts according to the NPRI database. These chemicals account for 93 percent of the total reported releases. Methanol ranks first, followed by ammonia and sulfuric acid. Methanol releases reported in Canada occur both to air and surface water in significant amounts; emissions to the air account for 57 percent of all methanol releases and surface water discharges for 40 percent. Emissions to the air also dominate for ammonia, although underground injection plays a notable role. Ammonia is one of two chemicals in the NPRI top 25 (the other is arsenic) that are released in substantial amounts to underground injection.

Table 4–8 shows the 25 chemicals with the largest transfers in NPRI. Again, the top 25 chemicals account for a large share (96 percent) of all transfers. Di(2-ethylhexyl) phthalate leads NPRI chemicals for transfers. Two facilities belonging to one parent company reported a total transfer to land disposal of 14 million kilograms (see **Table 4–5**, above).

NPRI data show that both release and transfer distribution is concentrated in a few chemicals. Four chemicals comprise more than half of the NPRI total for both these categories. Again, the few exceptionally large release and transfer reports discussed above (**Table 4–5**) explain this difference.

Table 4–9 presents the top 10 chemicals in each release and transfer category for NPRI. This table shows that methanol and ammonia rank first because their release amounts place them in the top 10 in all NPRI release categories. Moreover, methanol is one of the top 10 chemicals in each transfer category. In general, a striking degree of clustering is seen among chemicals receiving high rankings for releases or transfers. While theoretically 70 chemicals (seven categories of releases/transfers with 10 top chemicals each) could be represented, in fact only 28 are. Moreover, 19 of these 28 are in the top 10 for at least two categories.

4.3.5 NPRI Projections

Table 4–10 shows the projections of total releases and transfers in NPRI for 1995, 1996 and 1997. Canadian facilities have projected that total releases and transfers will decrease by 11 percent from 1994 to 1995, 26 percent in two years, 1994 to 1996, and 28 percent in three years, 1994 to 1997.

Table 4–6 NPRI RELEASES AND TRANSFERS, EXCLUDING LARGEST RELEASES/TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

	All NPRI		NPRI Without Large Releases/Transfers	
	kg	%	kg	%
Releases				
Total Air Emissions	96,163,310	39.3	96,163,310	51.3
Surface Water Discharges	55,469,720	22.7	27,030,194	14.4
Underground Injection	14,264,870	5.8	14,264,870	7.6
On-site Land Releases	14,087,660	5.8	14,087,660	7.5
Total Releases	**180,241,975**	**73.7**	**151,802,449**	**81.0**
Transfers				
Treatment/Destruction	24,393,542	10.0	17,893,542	9.6
Sewage/POTWs	2,016,222	0.8	2,016,222	1.1
Disposal/Containment	37,869,948	15.5	15,620,808	8.3
Total Transfers	**64,279,712**	**26.3**	**35,530,572**	**19.0**
Total Releases and Transfers	**244,521,687**	**100.0**	**187,333,021**	**100.0**

Table 4–7

THE 25 CHEMICALS WITH THE LARGEST NPRI RELEASES, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
1	67-56-1	Methanol	17,292,026	12,031,135	896,854	170,375	30,403,335
2	7664-41-7	Ammonia	17,976,465	1,826,353	6,068,000	588,695	26,465,316
3	7664-93-9	Sulfuric acid	3,454,559	18,800,026	0	31,346	22,294,515
4	—	Copper (and its compounds)	648,709	14,446,086	0	968,609	16,069,629
5	—	Zinc (and its compounds)	1,437,822	4,586,285	207	4,623,576	10,662,624
6	1330-20-7	Xylene (mixed isomers)	8,839,487	1,951	14,633	2,280	8,878,386
7	108-88-3	Toluene	7,659,355	6,335	35,330	5,581	7,723,317
8	78-93-3	Methyl ethyl ketone	4,160,329	10	280,190	129	4,448,431
9	—	Arsenic (and its compounds)	132,930	47,204	3,800,000	290	3,980,656
10	67-64-1	Acetone	3,663,732	38,946	84,000	49,400	3,841,890
11	107-21-1	Ethylene glycol	377,194	90,933	390,132	2,466,232	3,333,492
12	—	Manganese (and its compounds)	204,104	110,411	0	2,768,224	3,087,366
13	110-82-7	Cyclohexane	2,721,399	687	50	1,551	2,730,773
14	71-43-2	Benzene	2,590,727	1,052	73,890	2,911	2,675,468
15	74-85-1	Ethylene	2,556,303	0	0	0	2,558,541
16	7647-01-0	Hydrochloric acid	1,178,870	80,078	953,680	76,112	2,293,897
17	75-09-2	Dichloromethane	2,219,368	0	0	39	2,222,089
18	—	Lead (and its compounds)	1,109,650	159,621	0	866,162	2,142,220
19	67-63-0	Isopropyl alcohol (manufacturing)	2,050,829	46,529	2,702	130	2,110,347
20	7782-50-5	Chlorine	2,026,262	41,102	11,670	0	2,086,098
21	6484-52-2	Ammonium nitrate (solution)	335,148	689,800	828,000	47,023	1,900,121
22	100-42-5	Styrene	1,773,802	10,404	185	196	1,792,518
23	10049-04-4	Chlorine dioxide	1,730,264	5,273	0	0	1,735,537
24	71-36-3	n-Butyl alcohol	1,223,788	18,680	0	100	1,248,821
25	7783-20-2	Ammonium sulfate (solution)	142,798	1,031,300	0	18,264	1,193,082
		Subtotal	**87,505,920**	**54,070,201**	**13,439,523**	**12,687,225**	**167,878,469**
		% of Total NPRI Releases	**91.0**	**97.5**	**94.2**	**90.1**	**93.1**
		Total NPRI Releases	**96,163,310**	**55,469,720**	**14,264,870**	**14,087,660**	**180,241,975**

4.3 RELEASE AND TRANSFER DATA IN NPRI (continued)

Table 4–7
THE 25 CHEMICALS WITH THE LARGEST NPRI RELEASES, 1994
(ALL CHEMICALS/INDUSTRIES)

Table 4–8
THE 25 CHEMICALS WITH THE LARGEST NPRI TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Table 4–8
THE 25 CHEMICALS WITH THE LARGEST NPRI TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
1	117-81-7	Di(2-ethylhexyl) phthalate	38,931	0	14,852,208	14,891,139
2	7429-90-5	Aluminum (fume or dust)	9,940	0	7,756,462	7,766,402
3	—	Copper (and its compounds)	6,728,622	5,376	304,421	7,038,419
4	—	Zinc (and its compounds)	1,198,913	14,791	5,505,431	6,719,135
5	67-56-1	Methanol	3,317,664	58,175	1,020,026	4,395,865
6	—	Manganese (and its compounds)	1,182,729	4,023	2,605,022	3,791,774
7	7664-93-9	Sulfuric acid	1,203,820	100,785	1,418,569	2,723,174
8	108-88-3	Toluene	1,884,782	1,047	31,921	1,917,750
9	107-21-1	Ethylene glycol	1,010,996	550,353	98,073	1,659,422
10	1330-20-7	Xylene (mixed isomers)	1,313,180	56,705	69,437	1,439,322
11	—	Lead (and its compounds)	566,019	2,314	733,317	1,301,650
12	7647-01-0	Hydrochloric acid	278,839	681,770	48,737	1,009,346
13	—	Chromium (and its compounds)	498,778	8,094	495,775	1,002,647
14	1332-21-4	Asbestos (friable)	0	0	935,063	935,063
15	67-63-0	Isopropyl alcohol (manufacturing)	551,425	64,898	210,859	827,182
16	78-93-3	Methyl ethyl ketone	689,134	181	3,218	692,533
17	7664-38-2	Phosphoric acid	57,956	63,089	438,755	559,800
18	67-64-1	Acetone	447,695	43,611	48,861	540,167
19	—	Nickel (and its compounds)	187,971	3,529	315,419	506,919
20	108-05-4	Vinyl acetate	464,347	678	1	465,026
21	111-42-2	Diethanolamine	3,984	20,337	386,886	411,207
22	7664-41-7	Ammonia	253,071	138,607	1,376	393,054
23	108-95-2	Phenol	319,714	49,785	22,091	391,590
24	100-42-5	Styrene	256,017	528	54,149	310,694
25	80-62-6	Methyl methacrylate	258,100	6	5,200	263,306
		Subtotal	**22,722,627**	**1,868,682**	**37,361,277**	**61,952,586**
		% of Total NPRI Transfers	**93.2**	**92.7**	**98.7**	**96.4**
		Total NPRI Transfers	**24,393,542**	**2,016,222**	**37,869,948**	**64,279,712**

Table 4–9

TOP 10 NPRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES
(ALL CHEMICALS/INDUSTRIES)

		Rankings by Release/Transfer Category						
CAS Number	Chemical	Air Emissions	Surface Water	Underground Injection	On-site Land	Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment
67-56-1	Methanol	2	3	4	9	2	8	6
7664-41-7	Ammonia	1	5	1	7	–	3	–
7664-93-9	Sulfuric acid	7	1	–	–	5	4	5
—	Copper (and its compounds)	–	2	–	4	1	–	–
107-21-1	Ethylene glycol	–	–	7	3	8	2	–
—	Zinc (and its compounds)	–	4	–	1	6	–	3
—	Manganese (and its compounds)	–	–	–	2	7	–	4
7647-01-0	Hydrochloric acid	–	–	3	10	–	1	–
1330-20-7	Xylene (mixed isomers)	3	–	–	–	4	9	–
67-63-0	Isopropyl alcohol (manufacturing)	–	–	–	–	–	6	–
108-88-3	Toluene	4	–	–	–	3	–	–
78-93-3	Methyl ethyl ketone	5	–	8	–	9	–	–
—	Lead (and its compounds)	–	10	–	5	10	–	8
117-81-7	Di(2-ethylhexyl) phthalate	–	–	–	–	–	–	1
7664-38-2	Phosphoric acid	–	7	–	–	–	7	10
6484-52-2	Ammonium nitrate (solution)	–	8	5	–	–	–	–
7429-90-5	Aluminum (fume or dust)	–	–	–	–	–	–	2
—	Arsenic (and its compounds)	–	–	2	–	–	–	–
—	Chromium (and its compounds)	–	–	–	6	–	–	9
1332-21-4	Asbestos (friable)	–	–	–	8	–	–	7
67-64-1	Acetone	6	–	9	–	–	–	–
7697-37-2	Nitric acid	–	–	–	–	–	5	–
7783-20-2	Ammonium sulfate (solution)	–	6	–	–	–	10	–
111-42-2	Diethanolamine	–	–	6	–	–	–	–
110-82-7	Cyclohexane	8	–	–	–	–	–	–
71-43-2	Benzene	9	–	10	–	–	–	–
50-00-0	Formaldehyde	–	9	–	–	–	–	–
74-43-2	Ethylene	10	–	–	–	–	–	–

Table 4–10
NPRI PROJECTIONS OF TOTAL RELEASES AND TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

		Projections		
	1994	1995	1996	1997
Release/Transfer Category	(kg)	(kg)	(kg)	(kg)
Releases	180,241,975	156,832,839	122,199,560	116,070,486
Transfers	64,279,712	60,759,228	59,226,234	59,093,405
Total Releases and Transfers	**244,521,687**	**217,592,067**	**181,425,794**	**175,163,891**
% Change from 1994		-11.0	-25.8	-28.4

4.4 RELEASE AND TRANSFER DATA IN TRI

4.4.1 TRI Release and Transfer Distributions

The majority of releases reported to TRI represent emissions to the air (50 percent of total releases and transfers), followed by roughly equivalent releases to underground injection and to on-site land (11 and 9 percent, respectively). Discharges to surface water account for only 2 percent of total releases and transfers. Transfers, much smaller than releases, are roughly evenly apportioned between treatment/destruction and disposal/containment (10 percent each), with a somewhat smaller amount to sewage/POTWs (8 percent; see **Table 4–1** above, and **Figure 4–2**).

4.4.2 Major Facilities in TRI

Table 4–11 presents the 50 facilities with the largest total releases and transfers reported to TRI. As in the case of NPRI, several facilities make substantial contributions to some types of releases or transfers. Again, total releases and transfers for each of these facilities reflect a single predominant release or transfer type. For each of the top five facilities, a single type of release or transfer accounts for at least 95 percent of the total for that facility.

No small set of facilities, however, accounts for a dominant fraction of releases or transfers. Only for underground injection and on-site releases to land do the releases or transfers of the top 50 facilities amount to more than one-third of overall releases or transfers of that category: for underground injection, the three facilities with the largest releases account for 41 percent of total releases of this type (and 5 percent of total releases and transfers); for on-site land releases, the top three facilities account for 30 percent of this type (3 percent of total releases and transfers).

4.4.3 TRI Chemicals

Table 4–12 shows the 25 chemicals with the largest releases in TRI; they account for 85 percent of total releases. Methanol, hydrochloric acid and ammonia are the three chemicals with the greatest releases, representing 30 percent of the total. The data in **Table 4–12** show that 85 percent of all methanol releases are air emissions, while 66 percent of reported releases of second-ranked hydrochloric acid are to underground injection. Releases of ammonia are also predominantly (76 percent) represented by emissions to the air.

Table 4–13 shows the 25 chemicals with the largest transfers reported to TRI, accounting for 86 percent of total transfers. Methanol and hydrochloric acid are among the top three chemicals in this category, as they were for releases, but the transfer to disposal of very substantial amounts of zinc (and its compounds) results in this chemical displacing ammonia from the top three.

For both releases and transfers, a small set of chemicals plays a major role. Seven chemicals comprise one-half of all releases, and six chemicals account for one-half of all transfers.

Table 4–14 lists the top 10 chemicals in each release and transfer category for TRI. Methanol and ammonia are released in the top 10 amounts in all TRI release categories. Furthermore, methanol ranks first and second in two of three transfer categories, while ammonia ranks second in one transfer category. Again, the clustering seen among chemicals ranked highly for releases or transfers is quite striking. While theoretically 70 chemicals (seven categories of releases/transfers with 10 top chemicals each) could be represented, only 30 are. Twenty of these 30 are in the top 10 list for at least two categories.

Table 4–11

THE 50 TRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	Facility	City, State	SIC Code	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
1	DuPont	Pass Christian, MS	28	7	1,326,978	0	25,850,340	73	27,177,391
2	DuPont	New Johnsonville, TN	28	7	915,476	1,587	24,943,311	0	25,860,374
3	Magnesium Corp. of America	Rowley, UT	33	7	25,295,351	0	0	0	25,295,351
4	ASARCO Inc.	East Helena, MT	33	10	60,459	0	0	19,719,827	19,780,286
5	Zinc Corp. of America	Monaca, PA	33	10	267,524	243	0	0	267,767
6	Courtaulds Fibers Inc.	Axis, AL	28	7	14,931,295	28,345	0	205,215	15,164,855
7	DuPont	Beaumont, TX	28	36	389,767	10,294	14,506,875	0	14,906,937
8	Sloss Industries Inc.	Ariton, AL	28	3	1,883	0	0	0	1,883
9	IMC-Agrico Co.	Mulberry, FL	Mult.	4	312,517	0	0	11,383,220	11,695,737
10	Lenzing Fibers Corp.	Lowland, TN	28	7	9,705,562	8,889	0	0	9,714,451
11	DuPont	Victoria, TX	28	33	254,945	839	9,303,693	10,923	9,570,399
12	Coastal Chem Inc.	Cheyenne, WY	28	14	644,214	0	9,103,401	0	9,747,615
13	Cytec Ind. Inc.	Westwego, LA	28	23	231,693	18,353	9,053,401	0	9,303,447
14	ASARCO Inc.	Hayden, AZ	33	9	375,293	0	0	7,746,682	8,121,975
15	Monsanto Co.	Sauget, IL	28	20	448,283	0	0	0	448,283
16	National Processing Co.	East Chicago, IN	33	1	113	0	0	0	113
17	Elkem Metals Co.	Marietta, OH	33	8	2,315,953	246,712	0	4,901,587	7,464,252
18	Columbian Chemicals Co.	Saint Louis, MO	28	3	12,630	0	0	0	12,630
19	Northwestern Steel & Wire Co.	Sterling, IL	33	8	63,791	685	0	6,621,315	6,685,791
20	International Paper	Redwood, MS	26	10	6,469,773	1,220	0	0	6,470,993
21	PCS Phosphate Co. Inc.	Aurora, NC	28	7	1,617,179	0	0	4,613,469	6,230,648
22	National Steel Corp.	Ecorse, MI	33	23	147,788	116,900	0	0	264,688
23	Arcadian Fertilizer L.P.	Geismar, LA	28	14	697,191	5,153,707	0	200,859	6,051,757
24	IMC-Agrico Co.	Saint James, LA	28	8	2,709,764	2,904,751	0	240,858	5,855,373
25	DuPont	Leland, NC	28	23	1,722,064	21,915	0	32,189	1,776,168
26	Cabot Corp.	Tuscola, IL	28	2	1,677,444	0	3,745,615	0	5,423,058
27	Simpson Pasadena Paper Co.	Pasadena, TX	26	13	759,365	0	0	0	759,365
28	BP Chemicals Inc.	Port Lavaca, TX	28	19	56,344	385	5,100,971	13,298	5,170,997
29	Kennecott Utah Copper	Magna, UT	33	13	193,653	2,063	0	4,197,197	4,392,914
30	Upjohn Co.	Portage, MI	28	27	1,168,651	182,066	1,722,336	0	3,073,053
31	Rouge Steel Co.	Dearborn, MI	33	13	20,151	5,587	0	0	25,738
32	Consolidated Papers Inc.	Wisconsin Rapids, WI	26	16	1,319,685	340	0	0	1,320,025
33	Monsanto Co.	Cantonment, FL	28	24	42,236	362	4,545,190	0	4,587,788
34	American Chrome & Chemicals	Corpus Christi, TX	28	5	41,324	9,932	0	4,489,796	4,541,052
35	BP Chemicals Inc.	Lima, OH	28	26	182,195	0	4,167,846	0	4,350,041
36	Phelps Dodge Hidalgo Inc.	Playas, NM	33	3	240,674	0	0	4,114,181	4,354,856
37	Boise Cascade Corp.	Saint Helens, OR	26	11	281,635	0	0	0	281,635
38	Doe Run Co.	Herculaneum, MO	33	9	116,261	502	0	4,073,429	4,190,192
39	Eastman Kodak Co.	Rochester, NY	38	65	3,427,406	141,713	0	296	3,569,415
40	Monsanto Co.	Alvin, TX	28	25	109,109	0	3,598,383	63,039	3,770,531
41	Sterling Chemicals Inc.	Texas City, TX	28	39	590,274	7,909	3,133,250	0	3,731,434
42	Copper Range Co.	White Pine, MI	10	3	1,749,660	0	0	1,787,755	3,537,415
43	Cyprus Miami Mining Corp.	Claypool, AZ	33	6	60,181	0	0	3,457,596	3,517,778
44	Hoechst Celanese Chemical	Pasadena, TX	28	35	1,352,785	0	2,024,195	0	3,376,980
45	Allied-Signal Inc.	Hopewell, VA	28	17	890,214	583,837	0	0	1,474,051
46	Cerrowire & Cable Co. Inc.	Hartselle, AL	33	5	23	11	0	11	45
47	Metal Resources Inc.	Loudon, TN	33	1	1,778	0	0	0	1,778
48	Chino Mines Co.	Hurley, NM	33	2	238,247	0	0	3,110,660	3,348,907
49	ASARCO Inc.	Annapolis, MO	33	6	105,599	154	0	3,205,856	3,311,609
50	Occidental Chemical Corp.	Castle Hayne, NC	28	4	2,198	14	0	3,129,528	3,131,740
	Subtotal			**691**	**85,544,580**	**9,449,316**	**120,798,806**	**87,318,859**	**303,111,561**
	% of Total			**0.9**	**12.1**	**31.5**	**76.3**	**66.6**	**29.6**
	Total			**75,332**	**705,672,601**	**29,969,745**	**158,262,234**	**131,134,298**	**1,025,038,878**

4.4 RELEASE AND TRANSFER DATA IN TRI (continued)

Table 4–11

THE 50 TRI FACILITIES WITH LARGEST RELEASES AND TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Total Transfers (kg)	Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
10,431	0	0	10,431	27,187,822	Hydrochloric acid (UIJ)
0	0	0	0	25,860,374	Hydrochloric acid (UIJ)
0	0	0	0	25,295,351	Chlorine (air)
0	36	0	36	19,780,322	Zinc anc compounds (land)
0	0	15,125,066	15,125,066	15,392,833	Zinc/copper and compounds (transfers to disposal)
0	0	0	0	15,164,855	Carbon disulfide (air)
247,988	0	2,054	250,042	15,156,979	Ammonium nitrate (UIJ)
13,177,902	0	0	13,177,902	13,179,785	1,2,4-Trichlorobenzene (transfers to treatment)
0	0	0	0	11,695,737	Phosphoric acid (land)
0	0	497,234	497,234	10,211,685	Carbon disulfide (air)
358,232	0	0	358,232	9,928,631	Nitric acid, formic acid (UIJ)
0	0	694	694	9,748,309	Ammonium nitrate (UIJ)
8,426	0	6,482	14,908	9,318,355	Acetronitrile, acrylic acid, ammonia (UIJ)
642,550	129	0	642,679	8,764,654	Zinc/copper and compounds (land)
459,247	7,041,179	4,702	7,505,128	7,953,411	Hydrochloric acid (transfers to sewage)
7,824,886	0	0	7,824,886	7,824,999	Hydrochloric acid (transfers to treatment)
0	0	33,923	33,923	7,498,175	Manganese and compounds (land), ammonia (air)
0	7,256,825	25,397	7,282,222	7,294,853	Ammonia (transfers to sewage)
163,361	0	15	163,375	6,849,166	Zinc/manganese and compounds (land)
0	0	0	0	6,470,993	Methanol (air)
0	0	0	0	6,230,648	Phosphoric acid (land)
55,853	38,362	5,795,634	5,889,849	6,154,537	Zinc and compounds (transfers to disposal)
0	0	61,678	61,678	6,113,435	Phosphoric acid (water)
0	0	0	0	5,855,373	Phosphoric acid (water), ammonia (air)
3,879,479	0	22,241	3,901,720	5,677,888	Ethylene glycol (transfers to treatment)
0	0	0	0	5,423,058	Hydrochloric acid (UIJ)
0	4,464,349	0	4,464,349	5,223,714	Methanol (transfers to sewage)
13,785	0	0	13,785	5,184,782	Acetonitrile, ammonia, acrylamide (UIJ)
0	0	413,202	413,202	4,806,116	Copper/zinc/lead and compounds (land)
872,399	743,673	112,299	1,728,372	4,801,424	Methanol (UIJ), dichloromethane (air, transfers to treatment)
6,803	0	4,626,313	4,633,116	4,658,854	Zinc and compounds (transfers to disposal)
3,278,642	0	0	3,278,642	4,598,667	Methanol (transfers to treatment)
0	0	4,970	4,970	4,592,758	Ammonium nitrate, formic acid (UIJ)
9,524	0	726	10,249	4,551,302	Chromium and compounds (land)
13,649	0	744	14,392	4,464,433	Acetonitrile, ammonia, acrylamide (UIJ)
0	0	0	0	4,354,856	Copper and compounds (land)
0	3,977,800	2,109	3,979,910	4,261,545	Methanol (transfers to sewage)
0	454	0	454	4,190,646	Zinc and compounds (land)
266,059	1,119	11,017	278,195	3,847,610	Dichloromethane (air)
0	0	0	0	3,770,531	Ammonia, acrylonitrile, methanol (UIJ)
16,641	8,420	4,185	29,246	3,760,679	Ammonia, methanol, acrylamide (UIJ)
0	0	0	0	3,537,415	Copper and compounds (air, land)
0	0	0	0	3,517,778	Copper and compounds (land)
2,812	104,943	14,789	122,544	3,499,524	Ethylene glycol (UIJ)
163	2,000,493	0	2,000,656	3,474,707	Ammonia (air, water), ammonium nitrate (transfers to sewage)
452	0	3,451,246	3,451,698	3,451,743	Copper and compounds (transfers to disposal)
0	0	3,410,431	3,410,431	3,412,209	Aluminum (transfers to disposal)
0	0	0	0	3,348,907	Copper and compounds (land)
0	0	0	0	3,311,609	Zinc/lead and compounds (land)
6,667	0	3,628	10,295	3,142,035	Chromium and compounds (land)
31,315,950	**25,637,783**	**33,630,777**	**90,584,510**	**393,696,070**	
21.7	**22.2**	**24.6**	**22.8**	**27.7**	
144,585,185	**115,505,141**	**136,599,949**	**396,690,275**	**1,421,729,153**	

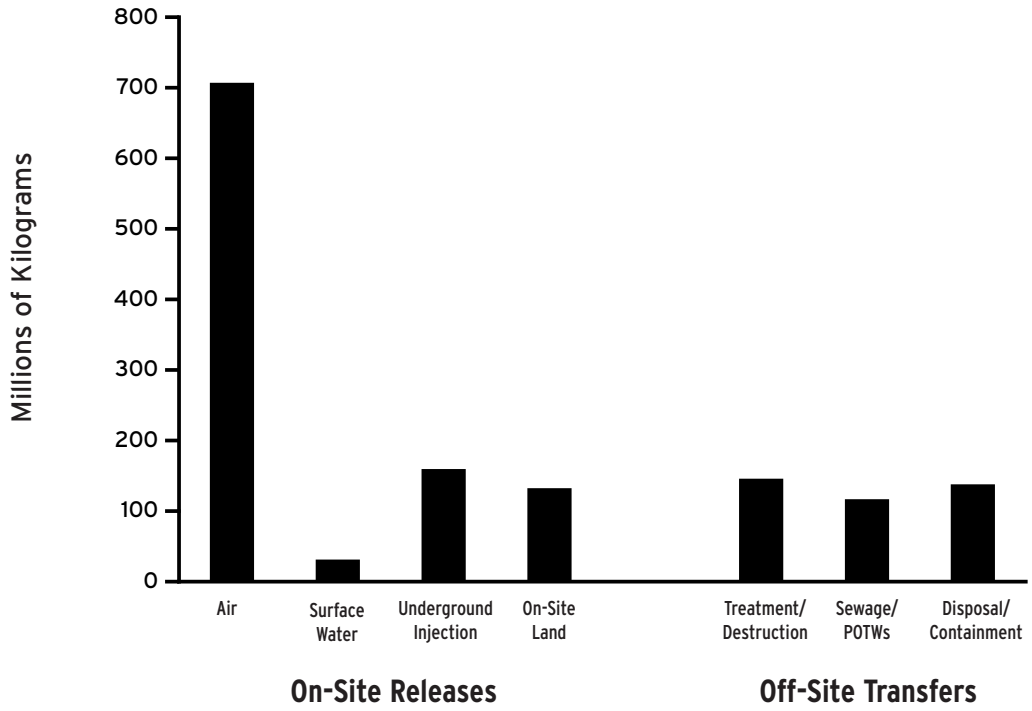
*Chemicals accounting for more than 70% of total releases and transfers from the facility
UIJ = underground injection

Table 4–12

THE 25 CHEMICALS WITH THE LARGEST TRI RELEASES, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
1	67-56-1	Methanol	98,781,410	4,992,235	11,040,068	1,180,361	115,994,074
2	7647-01-0	Hydrochloric acid	32,957,637	11,787	64,394,814	119,609	97,483,847
3	7664-41-7	Ammonia	70,742,068	6,627,426	13,178,820	2,785,506	93,333,821
4	108-88-3	Toluene	76,289,472	37,529	225,143	73,109	76,625,252
5	1330-20-7	Xylene (mixed isomers)	49,130,902	19,937	142,273	110,987	49,404,098
6	—	Zinc (and its compounds)	3,001,986	665,112	89,117	37,930,936	41,687,151
7	75-15-0	Carbon disulfide	37,785,857	28,358	1,952	36	37,816,204
8	78-93-3	Methyl ethyl ketone	35,657,569	49,154	261,156	23,489	35,991,368
9	7664-38-2	Phosphoric acid	469,226	9,478,632	20,688	25,753,166	35,721,712
10	75-09-2	Dichloromethane	28,440,132	23,714	435,801	23,059	28,922,706
11	6484-52-2	Ammonium nitrate (solution)	366,673	3,164,796	23,215,809	711,177	27,458,454
12	7782-50-5	Chlorine	27,110,571	234,016	33,701	28,616	27,406,904
13	—	Manganese (and its compounds)	1,700,325	372,985	2,694	20,989,456	23,065,460
14	—	Copper (and its compounds)	2,950,001	63,335	106,237	19,247,511	22,367,084
15	—	Glycol ethers	22,004,795	132,640	58,093	23,032	22,218,561
16	100-42-5	Styrene	17,845,599	34,276	113,769	218,078	18,211,722
17	71-55-6	1,1,1-Trichloroethane	17,257,178	898	46	1,239	17,259,361
18	74-85-1	Ethylene	15,995,617	12,444	0	0	16,008,061
19	71-36-3	n-Butyl alcohol	12,812,285	22,985	805,994	980	13,642,243
20	79-01-6	Trichloroethylene	13,547,335	758	131	2,003	13,550,226
21	7664-93-9	Sulfuric acid	10,865,682	96,208	690,182	233,627	11,885,698
22	108-10-1	Methyl isobutyl ketone	11,463,433	36,361	59,683	5,862	11,565,338
23	—	Chromium (and its compounds)	518,347	81,307	17,283	9,879,636	10,496,573
24	7697-37-2	Nitric acid	1,148,883	75,963	8,285,560	179,161	9,689,568
25	115-07-1	Propylene	9,275,215	2,079	0	0	9,277,293
		Subtotal	**598,118,197**	**26,264,936**	**123,179,013**	**119,520,635**	**867,082,781**
		% of Total TRI Releases	**84.8**	**87.6**	**77.8**	**91.1**	**84.6**
		Total TRI Releases	**705,672,601**	**29,969,745**	**158,262,234**	**131,134,298**	**1,025,038,878**

Figure 4–2
TRI RELEASES AND TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)



4.4.4 TRI Industries

Table 4–15 summarizes TRI data on releases and transfers according to the industrial classification of the reporting facilities. Only facilities in the 20 manufacturing SIC codes must report, plus federal facilities, which may fall outside these categories. The chemical industry submitted the most forms (28 percent of the total) and reported the greatest amount of total releases and transfers (38 percent). The top three industries (primary metal products and paper were ranked second and third, respectively) accounted for 65 percent of total releases and transfers. Each of these industries was ranked first, second or third, not only for total releases and transfers, but also for releases and transfers separately.

4.4.5 TRI Projections

US facilities projected a decrease in total releases and transfers of four percent from 1994 to 1995 and seven percent from 1994 to 1996. Projected reductions in the first year primarily reflect releases and transfers to disposal (five percent versus one percent for transfers), while for the two-year projection, slightly greater percentage reductions are predicted for transfers to treatment (eight percent versus seven percent; see **Table 4–16**).

4.5 COMPARISONS BETWEEN NPRI AND TRI

The data from NPRI and TRI are not strictly comparable, due to the differences in required reporting described in **Chapter 2**. In particular, NPRI requires reporting from a far broader range of industries than does TRI, while TRI requires reporting for a substantially larger set of chemicals. While care is thus required in comparing data from the two PRTRs, the data presented in this chapter do present some striking contrasts.

4.5.1 Distribution of Releases and Transfer Types

The most striking feature of the two countries' patterns of releases and transfers is found in NPRI: the comparatively large role played by surface water discharges and the comparatively small role played by transfers to sewage/POTWs. In fact, despite the much greater overall releases reported to TRI than to NPRI, surface water discharges reported by NPRI facilities (55 million kilograms; see **Table 4–1**, above) are greater in absolute amount than those reported by TRI facilities (30 million kilograms; see **Table 4–1**, above). Emissions to air play a somewhat greater role in TRI than in NPRI releases. **Figure 4–3** shows these relative levels of release and transfer types for NPRI and TRI.

Table 4–13

THE 25 CHEMICALS WITH THE LARGEST TRI TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
1	67-56-1	Methanol	14,630,490	41,992,416	1,026,040	57,648,946
2	—	Zinc (and its compounds)	4,982,323	231,851	43,500,958	48,715,133
3	7647-01-0	Hydrochloric acid	19,895,684	8,726,313	5,577,367	34,199,364
4	7664-41-7	Ammonia	3,503,036	24,750,056	732,785	28,985,878
5	—	Manganese (and its compounds)	2,003,689	205,951	17,200,130	19,409,770
6	107-21-1	Ethylene glycol	7,276,313	7,404,188	751,777	15,432,278
7	120-82-1	1,2,4-Trichlorobenzene	13,352,194	45,942	23,995	13,422,131
8	7664-93-9	Sulfuric acid	6,353,721	2,954,354	3,771,828	13,079,902
9	—	Lead (and its compounds)	2,754,809	40,688	10,154,176	12,949,673
10	—	Copper (and its compounds)	1,456,744	126,533	10,848,357	12,431,634
11	108-88-3	Toluene	9,877,804	426,431	426,693	10,730,929
12	—	Chromium (and its compounds)	2,452,300	194,003	7,181,083	9,827,385
13	7697-37-2	Nitric acid	4,759,431	1,552,740	1,604,133	7,916,304
14	—	Glycol ethers	1,914,819	5,052,490	325,683	7,292,992
15	7783-20-2	Ammonium sulfate (solution)	1,450,871	4,908,901	19,662	6,379,433
16	75-09-2	Dichloromethane	5,196,709	378,738	138,800	5,714,246
17	7429-90-5	Aluminum (fume or dust)	66,912	4,157	5,621,027	5,692,097
18	—	Nickel (and its compounds)	1,213,171	98,354	3,646,670	4,958,195
19	1330-20-7	Xylene (mixed isomers)	3,889,571	292,887	545,669	4,728,127
20	7664-38-2	Phosphoric acid	990,076	1,754,663	1,180,849	3,925,588
21	6484-52-2	Ammonium nitrate (solution)	44,904	2,061,988	1,801,782	3,908,674
22	100-42-5	Styrene	1,833,182	53,460	2,020,785	3,907,427
23	108-95-2	Phenol	1,321,078	1,275,043	727,857	3,323,978
24	—	Barium (and its compounds)	687,829	95,660	2,413,672	3,197,161
25	78-93-3	Methyl ethyl ketone	2,787,832	186,279	189,816	3,163,928
		Subtotal	**114,695,494**	**104,814,087**	**121,431,593**	**340,941,174**
		% of Total TRI Transfers	**79.3**	**90.7**	**88.9**	**85.9**
		Total TRI Transfers	**144,585,185**	**115,505,141**	**136,599,949**	**396,690,275**

Table 4–14
TOP 10 TRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES (ALL CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Rankings by Release/Transfer Category: Air Emissions	Surface Water	Underground Injection	On-site Land	Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment
67-56-1	Methanol	1	3	4	8	2	1	–
7664-41-7	Ammonia	3	2	3	7	–	2	–
7647-01-0	Hydrochloric acid	7	–	1	–	1	3	7
—	Zinc (and its compounds)	–	6	–	1	8	–	1
7664-38-2	Phosphoric acid	–	1	–	2	–	9	–
—	Manganese (and its compounds)	–	7	–	3	–	–	2
6484-52-2	Ammonium nitrate (solution)	–	4	2	10	–	8	–
107-21-1	Ethylene glycol	–	8	–	–	5	4	–
108-88-3	Toluene	2	–	–	–	4	–	–
—	Copper (and its compounds)	–	–	–	4	–	–	3
7664-93-9	Sulfuric acid	–	–	–	–	6	7	8
—	Chromium (and its compounds)	–	–	–	5	–	–	5
—	Lead (and its compounds)	–	–	–	6	–	–	4
7783-20-2	Ammonium sulfate (solution)	–	5	–	–	–	6	–
7697-37-2	Nitric acid	–	–	5	–	9	10	–
120-82-1	1,2,4-Trichlorobenzene	–	–	–	–	3	–	–
1330-20-7	Xylene (mixed isomers)	4	–	–	–	10	–	–
75-09-2	Dichloromethane	8	–	–	–	7	–	–
—	Glycol ethers	10	–	–	–	–	5	–
75-15-0	Carbon disulfide	5	–	–	–	–	–	–
75-05-8	Acetonitrile	–	–	6	–	–	–	–
7429-90-5	Aluminum (fume or dust)	–	–	–	–	–	–	6
78-93-3	Methyl ethyl ketone	6	–	–	–	–	–	–
7782-50-5	Chlorine	9	9	–	–	–	–	–
50-00-0	Formaldehyde	–	10	8	–	–	–	–
64-18-6	Formic acid	–	–	7	–	–	–	–
—	Nickel (and its compounds)	–	–	–	9	–	–	9
79-10-7	Acrylic acid	–	–	9	–	–	–	–
79-06-1	Acrylamide	–	–	10	–	–	–	–
—	Barium (and its compounds)	–	–	–	–	–	–	10

4.5 COMPARISONS BETWEEN NPRI AND TRI (continued)

Table 4–13 THE 25 CHEMICALS WITH THE LARGEST TRI TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

Table 4–14 TOP 10 TRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES (ALL CHEMICALS/INDUSTRIES)

Table 4–15

TRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994

US SIC Code	Industry	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	% of Total	Rank
20	Food Products	3,676	14,691,677	12,999,564	27,691,241	1.9	9
21	Tobacco Products	27	652,252	32,674	684,926	0.0	22
22	Textile Mill Products	834	8,003,083	3,098,775	11,101,858	0.8	16
23	Apparel and Other Textile Products	64	626,093	96,648	722,741	0.1	21
24	Lumber and Wood Products	1,953	15,406,862	2,499,766	17,906,628	1.3	12
25	Furniture and Fixtures	1,595	22,946,696	989,910	23,936,606	1.7	11
26	Paper Products	2,421	111,615,301	24,397,153	136,012,454	9.6	3
27	Printing and Publishing	570	15,548,059	384,142	15,932,201	1.1	13
28	Chemicals	21,200	385,873,629	159,133,402	545,007,030	38.3	1
29	Petroleum and Coal Products	3,087	25,216,288	4,381,294	29,597,582	2.1	8
30	Rubber and Plastics Products	3,881	53,748,447	8,079,536	61,827,982	4.3	6
31	Leather Products	279	1,822,920	1,779,541	3,602,461	0.3	20
32	Stone/Clay/Glass Products	1,538	8,839,396	4,142,292	12,981,688	0.9	15
33	Primary Metal Industries	6,694	142,084,497	101,308,349	243,392,845	17.1	2
34	Fabricated Metal Products	8,574	39,875,182	18,072,502	57,947,684	4.1	7
35	Industrial Machinery	2,854	11,550,333	2,980,375	14,530,707	1.0	14
36	Electronic/Electrical Equipment	3,641	15,468,796	11,857,045	27,325,841	1.9	10
37	Transportation Equipment	4,498	55,106,724	10,323,592	65,430,316	4.6	5
38	Measurement/Photographic Instruments	812	8,132,094	2,676,524	10,808,618	0.8	17
39	Misc. Manufacturing Industries	801	6,339,243	1,255,590	7,594,833	0.5	19
	Multiple codes 20-39	5,429	73,042,983	24,086,960	97,129,943	6.8	4
	No codes 20-39	904	8,448,323	2,114,644	10,562,967	0.7	18
	Total	**75,332**	**1,025,038,878**	**396,690,275**	**1,421,729,153**	**100.0**	

4.5 COMPARISONS BETWEEN NPRI AND TRI (continued)

Table 4–16 TRI PROJECTIONS OF RELEASES AND TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

Waste Management Activity	1994 (kg)	Projections 1995 (kg)	1996 (kg)
Treated Off-site	252,756,091	250,255,549	232,842,770
Quantity Released/Disposed of*	1,140,391,768	1,082,227,120	1,057,565,843
Total Releases and Transfers	**1,393,147,859**	**1,332,482,668**	**1,290,408,613**
% Change from 1994		**-4.4**	**-7.4**

* One form erroneously projecting 93 million kilograms for 1996 was not included.
NOTE: As found in Sections 8.1 and 8.7 of the TRI Form R
1994 amount does not include releases/transfers due to accidents, spills, etc.

4.5.2 Individual Facility Reporting

As shown in **Table 4–1** above, NPRI and TRI facilities, on average, report approximately the same number of forms for individual chemicals. That is, each facility reports releases and/or transfers of a comparable number of chemicals. In marked contrast, though, are the quantities of releases and transfers reported. Average releases per NPRI facility are almost two and one-half times those of TRI facilities, and NPRI transfers per facility are twice those for TRI facilities (see **Figure 4–4** for a graphical comparison of the data presented in **Table 4–1**, above). **Chapter 5** examines the source of these differences in greater detail.

Figure 4–3 DISTRIBUTION OF RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (ALL CHEMICALS/INDUSTRIES)

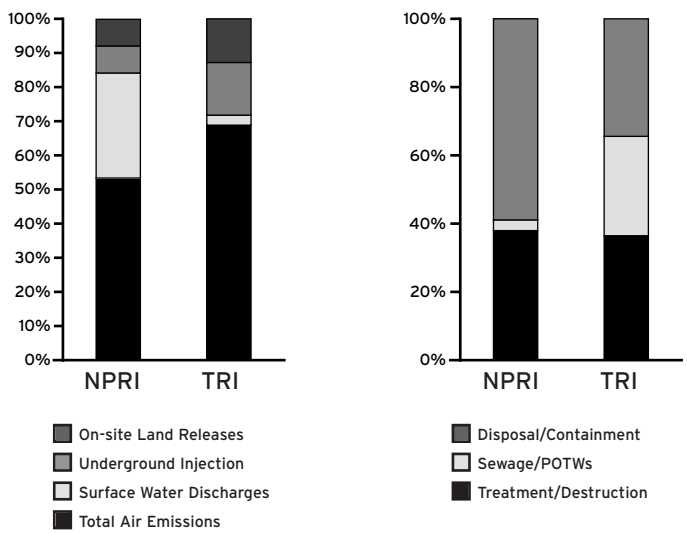


Figure 4–4 RELEASES AND TRANSFERS PER FACILITY, NPRI AND TRI, 1994 (ALL CHEMICALS/INDUSTRIES)

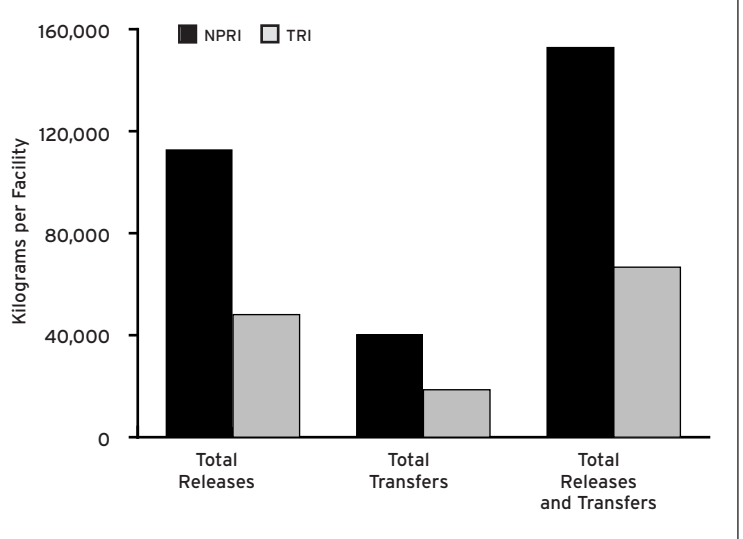
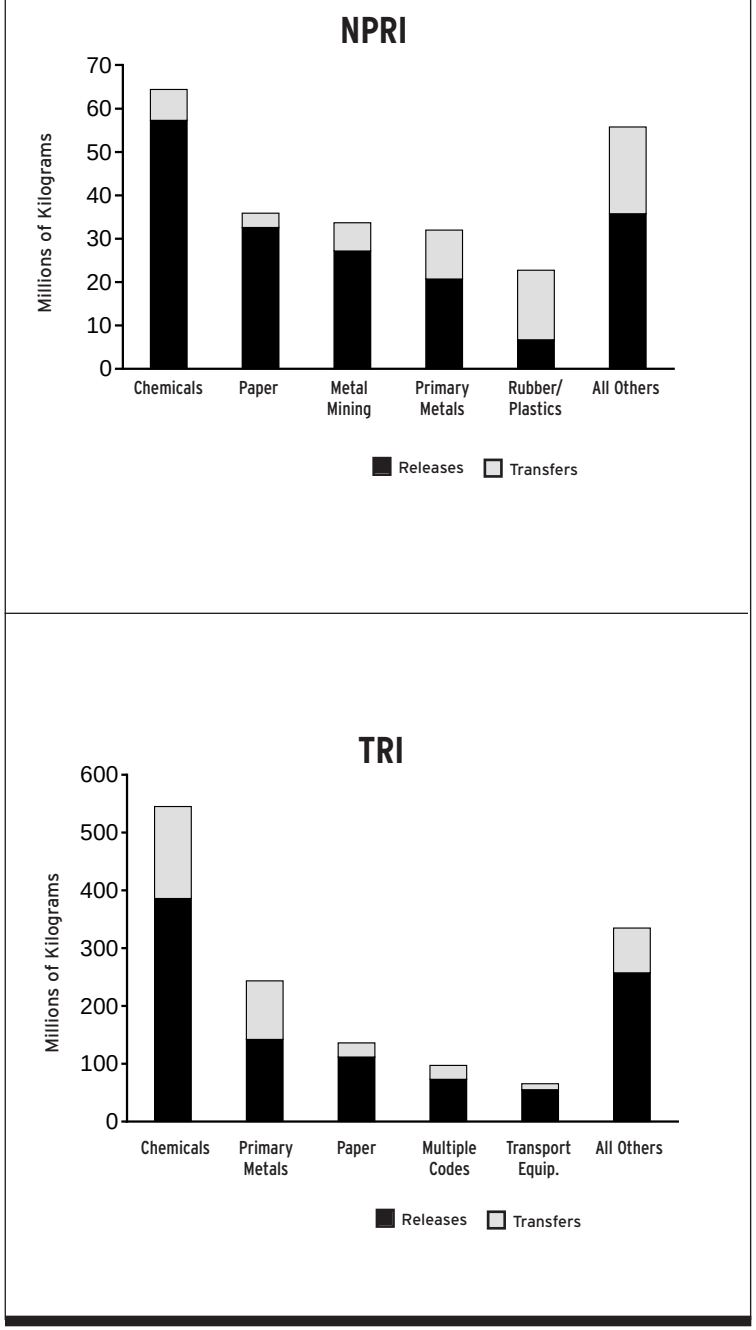


Figure 4–5 TOP FIVE INDUSTRIES FOR TOTAL RELEASES AND TRANSFERS, 1994 (US SIC CODE) (ALL CHEMICALS/INDUSTRIES)



4.5.3 Chemical Distribution

The lists of chemicals with the largest releases overlap substantially in the two PRTRs. For both countries, methanol and ammonia are among the three chemicals released in the greatest amounts, accounting for a substantial fraction of total releases. The five chemicals with the greatest transfer volumes have only two chemicals in common: zinc (and its compounds) and methanol. As noted above, the top transfer ranking in NPRI for di(2-ethylhexyl) phthalate reflects contributions from two facilities. On the other hand, the two NPRI facilities that transferred significant quantities of copper (and its compounds), based upon their SIC codes, would not have reported to the US TRI.

Only three among the 25 highest-ranking chemicals released or transferred in the two countries are not required to be reported to their respective PRTRs. Acetone, ranking eleventh among the NPRI top chemicals for releases and eighteenth for transfers, was deleted from the TRI list for 1994. For its part, NPRI does not list glycol ethers, which rank fifteenth among the top TRI chemicals for releases and fourteenth for transfers. Barium, ranked twenty-fourth for TRI transfers, is also not listed by NPRI.

4.5.4 Industrial Distribution

Figure 4–5 compares the top five industries for total releases and transfers for NPRI and TRI. In both cases, the top five industries represent a significant portion of total reported releases and transfers (to a somewhat greater degree for TRI than for NPRI). Releases are relatively more important than transfers for all but one of the top five industries in each PRTR (to a greater extent for NPRI than for TRI).

Certain industries common to both PRTRs (chemicals, paper, and primary metal products) play a key role in each PRTR. However, as noted above, metal mining, an industry not covered by TRI reporting, is among the top three industries for total releases and transfers in NPRI. Multiple SIC codes, a category not found in NPRI reporting, ranks among the top five industrial codes for TRI.

The US EPA has proposed adding various non-manufacturing industries (including metal mining facilities, coal processors, oil- and coal-fired power plants, hazardous waste treatment facilities, chemical distributors, petroleum bulk storage, and solvent recyclers) to TRI. NPRI, because it includes these industries, offers some perspective on the value of the information that would be gained by this. **Table 4–17** shows releases and transfers—totaling nearly 34 million kilograms—for the 93 non-manufacturing facilities that reported to NPRI in 1994. The NPRI facilities in the industries covered by the TRI expansion proposal add seven percent in terms of facilities and 18 percent in terms of kilograms of releases and transfers to the NPRI totals for the manufacturing industries. Currently, almost 25 percent of NPRI total releases and transfers are excluded from consideration here because of the non-manufacturing industry reports. Including these industries on the expanded TRI list would result in excluding just 10 percent of the NPRI totals, substantially increasing the match between the two databases.

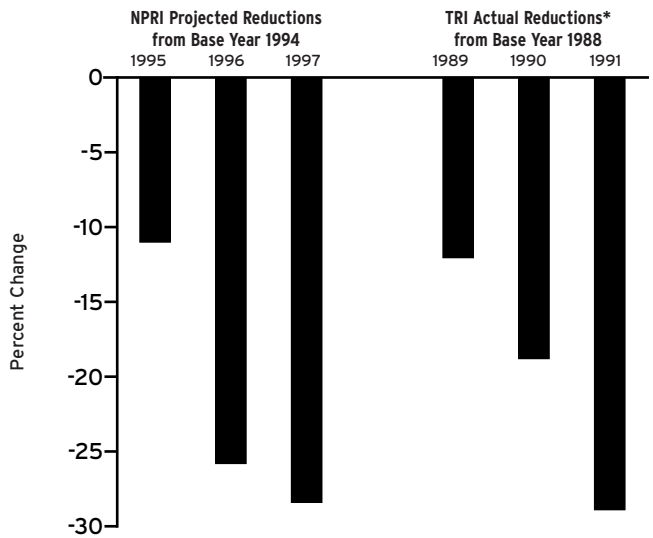
4.5 COMPARISONS BETWEEN NPRI AND TRI (continued)

4.5.5 Projections

Projected reductions in releases and transfers for 1995 and 1996 are far greater in NPRI than in TRI (11 percent and 26 percent, versus 4 percent and 7 percent). In fact, NPRI projections are comparable, not to current TRI projections, but to actual reductions in releases and transfers reported in TRI's first years of reporting. As 1994 is NPRI's second reporting year, so was 1988 for TRI.

Figure 4–6 compares projected NPRI reductions in the third through fifth years of reporting to actual TRI reductions for comparable years (the latter values were calculated for a subset of TRI chemicals whose reporting status did not change in 1988–1994 and do not include transfers to recycling or energy recovery). Reported releases and transfers in TRI decreased 12 percent from 1988 to 1989 and 29 percent from 1988 to 1991. These values are quite comparable to NPRI projections.

Figure 4–6 PROJECTED NPRI AND ACTUAL TRI PERCENTAGE DECREASES IN TOTAL RELEASES AND TRANSFERS IN FIRST YEARS FOR PRTR REPORTING



* TRI amounts are for subset of chemicals with no change in reporting status; transfers to recycling and energy recovery not included

Table 4–17

1994 NPRI REPORTS FROM INDUSTRIES PROPOSED FOR ADDITION TO TRI REPORTING (MATCHED CHEMICALS)

US SIC Code	Industry	Number of Facilities	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
10	Metal Mining	61	212	1,248,567	21,666,414	3,800,000	69,790	26,789,805
1011	Iron Ores	1	1	21,970	0	0	0	21,970
1021	Copper Ores	15	60	389,469	13,528,974	0	25,965	13,945,393
1031	Lead and Zinc Ores	5	32	796,131	8,037,828	0	0	8,834,095
1041	Gold Ores	28	80	11,531	96,880	3,800,000	25	3,910,416
1044	Silver Ores	1	5	5,100	0	0	6,400	12,582
1061	Ferroalloy Ores, except Vanadium	3	9	3,669	2,536	0	0	6,205
1094	Uranium-Radium-Vanadium Ores	6	17	20,697	196	0	37,400	59,144
1099	Metal Ores, not elsewhere classified	2	8	0	0	0	0	0
12	Coal Mining							
1221	Bituminous Coal/Lignite Surface Mining	1	1	0	0	0	0	0
4911	Electric Generation, Transmission	19	28	0	136,241	0	0	137,138
4931	Electric and Other Services Combined	1	3	0	58,683	0	0	58,683
5169	Wholesale Trade of Chemicals	10	69	5,403	0	0	130	10,300
7389	Business Services (Solvent Recovery)	1	2	0	0	0	0	0
	Total for TRI Expansion Industries	**93**	**315**	**1,253,970**	**21,861,338**	**3,800,000**	**69,920**	**26,995,926**
	Total for Current TRI Industries/ Matched Chemicals	**1,351**	**4,598**	**89,195,059**	**33,256,285**	**7,742,206**	**10,528,273**	**140,906,351**
	TRI Expansion Industries as % of Current TRI Industries	**6.9**	**6.9**	**1.4**	**65.7**	**49.1**	**0.7**	**19.2**

NOTE: Others on TRI expansion list but with no NPRI reports:
4939 Combination Utilities (Electric, Gas, Other)
4953 Refuse/Waste Disposal Systems
5171 Petroleum Bulk Stations and Terminals

4.5 COMPARISONS BETWEEN NPRI AND TRI
(continued)

Table 4–17
1994 NPRI REPORTS FROM INDUSTRIES PROPOSED FOR ADDITION TO TRI REPORTING (MATCHED CHEMICALS)

US SIC Code	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Releases and Transfers (kg)	Total Transfers to Recycling* (kg)	Transfers to Energy Recovery* (kg)
10	6,515,880	0	25	6,515,905	33,305,710	934,802	0
1011	0	0	0	0	21,970	0	0
1021	0	0	0	0	13,945,393	0	0
1031	0	0	0	0	8,834,095	0	0
1041	6,515,880	0	25	6,515,905	10,426,321	15,000	0
1044	0	0	0	0	12,582	0	0
1061	0	0	0	0	6,205	0	0
1094	0	0	0	0	59,144	919,802	0
1099	0	0	0	0	0	0	0
1221	0	0	0	0	0	0	0
4911	3,000	0	320,925	323,925	461,063	0	0
4931	0	0	1,100	1,100	59,783	0	0
5169	4,989	0	3,133	8,122	18,422	8,290	51,939
7389	12,000	0	0	12,000	12,000	0	0
	6,535,869	**0**	**325,183**	**6,861,052**	**33,856,978**	**943,092**	**51,939**
	15,011,219	**1,479,110**	**28,114,247**	**44,604,576**	**185,510,927**	**241,404,706**	**1,919,404**
	43.5	**0.0**	**1.2**	**15.4**	**18.3**	**0.4**	**2.7**

* Transfers to recyling and energy recovery are voluntary under NPRI and may not represent all such transfers.

Key findings

- The data reported for chemicals and industrial categories common to both NPRI and TRI represent 73 percent of the total releases and transfers in the NPRI database and 93 percent of those in the TRI database. Distribution of the types of releases and transfers in the matched NPRI/TRI data set is similar to that in the individual databases.
- The significant differences in average releases and transfers per facility (NPRI release and transfer amounts per facility are more than twice those in TRI) that were documented for the overall individual data sets persist in a matched data set that includes only common chemicals and industries. This difference does not appear to be significantly affected by the average number of forms (chemicals) reported by each facility, the differences in the predominant use of chemicals at various facilities, or the differences in reporting thresholds for the two PRTRs.
- To some extent, differences in average releases and transfers between NPRI and TRI facilities may reflect the distribution of industries in the two countries. While average releases and transfers per NPRI facility are greater for 13 of 20 matched industrial categories (using the two-digit US SIC code), including the industries with the largest total releases and transfers in each PRTR, these differences are not consistent within industrial sectors. For some three-digit US SIC codes, NPRI releases and transfers are massively greater than TRI releases and transfers, while for others, they are substantially smaller. The distribution of industries among three-digit SIC codes within a two-digit SIC code is quite different for the two countries.
- The most significant underlying difference in average releases and transfers may be each country's experience with PRTR reporting. Per-facility releases and transfers for this second year of NPRI reporting (1994) are quite consistent with values seen in the second year of TRI (1988), as opposed to current TRI reporting.

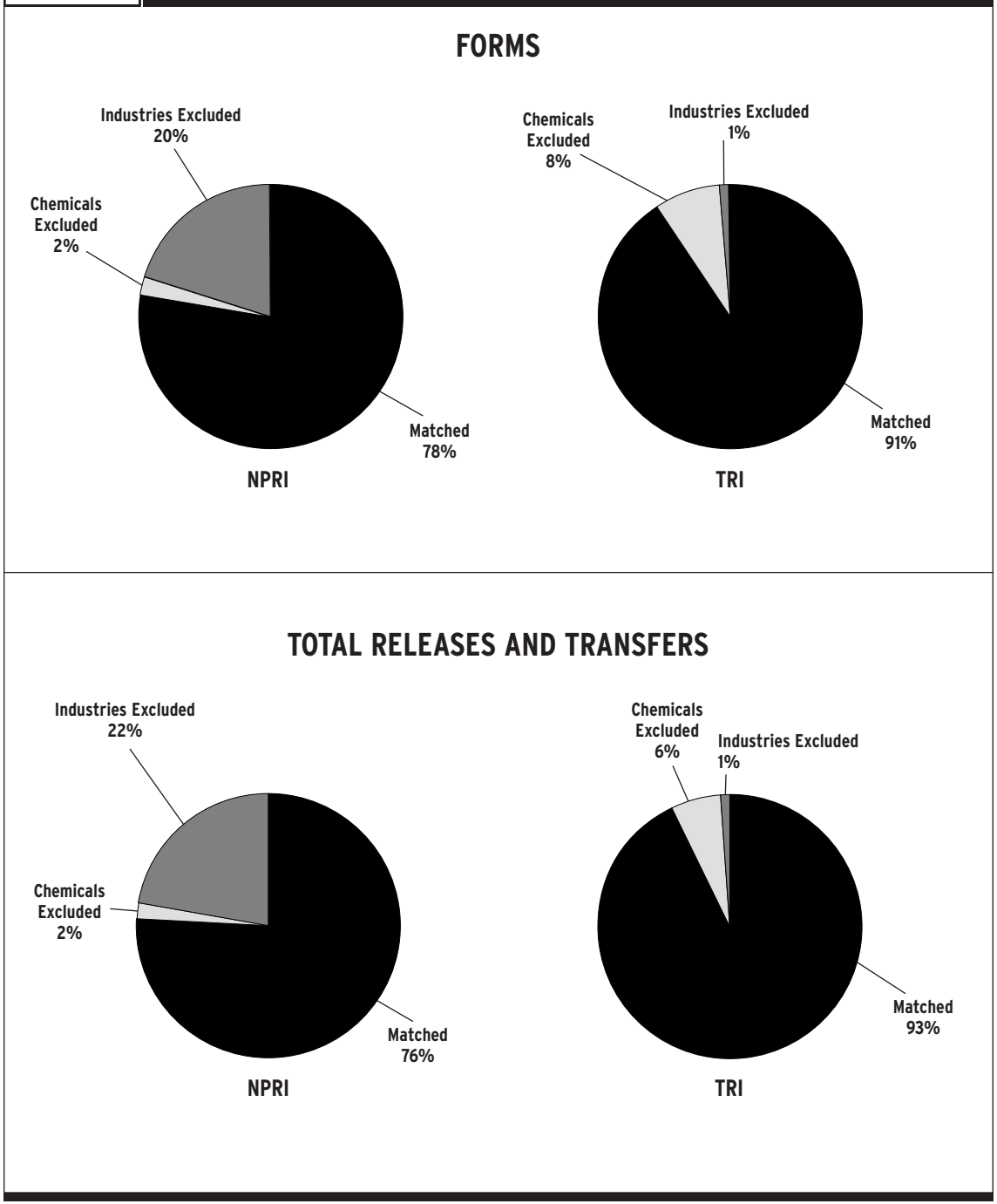
5.1 INTRODUCTION

Canada's NPRI and the US TRI cover different selections of chemicals and industrial categories. To obtain a better comparison between these databases, the chemicals and industrial groups that appear only in one or the other, but not both, were removed from the analysis. This meant omitting all forms from non-manufacturing facilities (those that report in US SIC codes outside the range of 20 to 39) from the NPRI database, because TRI covers only manufacturing. In contrast, NPRI requires any facility that handles an NPRI chemical (with a few exceptions) to report. In 1994, TRI required federal facilities to report, but no other non-manufacturing facilities have yet been added.

In addition, some chemicals on the NPRI list are not on the TRI list and vice versa. For this analysis, all forms for these chemicals were also removed, leaving a total of 174 chemicals that are represented on both lists.

To some extent, the differences between NPRI reporting and TRI reporting for 1994 described in the previous chapter may reflect these differences in chemical and industrial coverage. This chapter reconsiders those comparisons, using the data set of matched chemicals and industries.

Figure 5–1 MATCHING NPRI AND TRI FOR CHEMICALS AND INDUSTRIES, 1994 (US SIC CODES)



5.2 EFFECTS OF MATCHING

Figure 5–1 illustrates the effect of removing these non-comparable forms. For NPRI, 20 percent of all forms were excluded because the SIC code did not match TRI criteria. Fewer than two percent of NPRI forms were removed because of the chemical reported. For total releases and transfers, the effect was somewhat greater: 22 percent were excluded because the facility did not engage primarily in manufacturing. For TRI, the effects were smaller and reversed: more forms were removed because of the chemicals reported (eight percent) than because of industrial group (one percent), and the overall result was the exclusion of just seven percent of total releases and transfers. The resulting data set of matched industries and chemicals, therefore, represents 76 percent of the total NPRI releases and transfers and 93 percent of the total TRI releases and transfers.

5.3 PATTERNS OF RELEASE AND TRANSFER

Table 5–1 presents summary NPRI and TRI data for this matched data set, comparing releases and transfers from it with those of the two individual databases (**Table 4–1** in **Chapter 4**). A comparison of those two tables shows that the distribution within the overall categories (see the percentages for each release and transfer subcategory) also remains approximately the same for both Canada and the United States even though the absolute amounts are, of course, reduced in the matched data set. Air emissions remain the largest release type, at 48 percent of total releases and transfers for both inventories (see **Table 5–1**). In the unmatched data, 39 percent of NPRI releases

Table 5–1 RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

	NPRI Number		TRI Number	
Total Facilities	1,351		21,464	
Total Forms	4,598		68,305	
	kg	**%**	**kg**	**%**
Total Air Emissions	89,195,059	48.1	634,554,192	48.1
Surface Water Discharges	33,256,285	17.9	29,509,572	2.2
Underground Injection	7,742,206	4.2	152,298,373	11.5
On-site Land Releases	10,528,273	5.7	128,262,311	9.7
Matched Releases	**140,906,351**	**76.0**	**944,624,448**	**71.5**
Treatment/Destruction	15,011,219	8.1	136,908,496	10.4
Sewage/POTWs	1,479,110	0.8	109,029,867	8.3
Disposal/Containment	28,114,247	15.2	129,982,489	9.8
Matched Transfers	**44,604,576**	**24.0**	**375,920,852**	**28.5**
Total Releases and Transfers	**185,510,927**	**100.0**	**1,320,545,300**	**100.0**

Figure 5–2 DISTRIBUTION OF RELEASES AND TRANSFERS, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

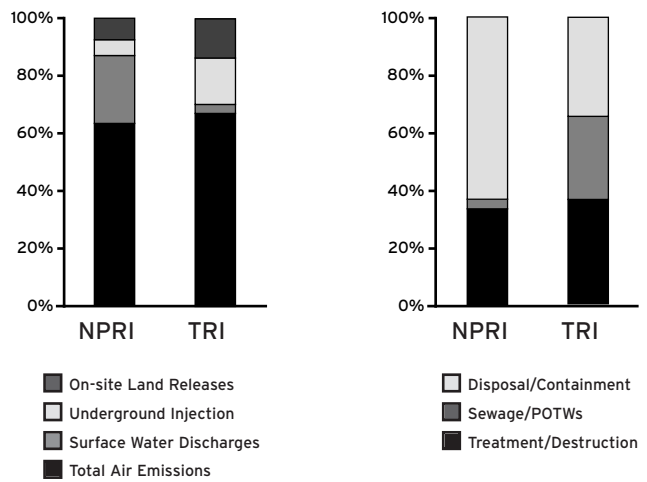


Table 5–2 AVERAGE RELEASES AND TRANSFERS PER FACILITY, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

	NPRI Number	TRI Number
Total Facilities	1,351	21,464
Total Forms	4,598	68,305
Average Forms per Facility	3.4	3.2
	kg	**kg**
Average Releases per Facility	104,298	44,010
Average Transfers per Facility	33,016	17,514
Average Releases and Transfers per Facility	137,314	61,524

and 50 percent of those reported to TRI were air emissions. In the matched data set, these subcategories are equal (48 percent). For both the matched data set and the individual databases, NPRI surface water discharges and TRI underground injection are the next largest types of releases; disposal/containment is the largest transfer destination for NPRI, as treatment/destruction is for TRI. **Figure 5–2** shows the relative distribution of releases and transfers for both NPRI and TRI in the matched data sets.

The relative proportion of total releases to total transfers in the two PRTRs is similar; releases are nearly three times as large as transfers. This distribution for the full set of chemicals and industries reported to each individual database (**Table 4–1**, above) is also reflected in the matched data set (compare the total releases versus transfers in **Table 5–1**). Also, the average releases and transfers per facility remain approximately twice as large for NPRI facilities as for TRI facilities (see **Table 5–2**).

5.3.1 Surface Water Discharges and Transfers to Sewage/POTWs

Canadian facilities report greater discharges to surface water, in absolute amounts, than US facilities, as mentioned in **Chapter 4**. In the matched data set, direct releases to water total more than 33 million kilograms reported to NPRI and slightly less than 30 million reported to TRI (see totals in **Tables 5–3a** and **5–4a**, respectively). The difference, while less extreme than in the unmatched data (where NPRI surface water discharges exceeded 55 million kilograms), remains striking in the matched data set. Of total releases and transfers (**Table 5–1**), Canadian facilities report releases of 18 percent to surface water, versus 2 percent for US facilities. This preponderance of surface water discharges in NPRI contrasts with TRI facilities' transfers of the chemicals to sewage/POTWs. Canadian facilities report transfers of less than one percent to sewage/POTWs, versus eight percent for US facilities.

Table 5–3a

NPRI SURFACE WATER DISCHARGES AND TRANSFERS TO SEWAGE/POTWs, BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Forms		Surface Water Discharges			Transfers to Sewage/POTWs			Total		
		Number	%	kg	%	kg/form	kg	%	kg/form	kg	%	kg/form
20	Food	10	1.5	16,900	0.1	1,690	98,006	6.6	9,801	114,906	0.3	11,491
21	Tobacco	0	–	–	–	–	–	–	–	–	–	–
22	Textiles	2	0.3	0	0.0	0	1,000	0.1	500	1,000	0.0	500
23	Apparel	0	–	–	–	–	–	–	–	–	–	–
24	Lumber	4	0.6	866	0.0	217	0	0.0	0	866	0.0	217
25	Furniture	1	0.1	0	0.0	0	325	0.0	325	325	0.0	325
26	Paper	60	8.8	15,189,476	45.7	253,158	77,475	5.2	1,291	15,266,951	44.0	254,449
27	Printing	4	0.6	5,922	0.0	1,481	0	0.0	0	5,922	0.0	1,481
28	Chemicals	200	29.3	16,813,205	50.6	84,066	259,973	17.6	1,300	17,073,178	49.2	85,366
29	Petroleum	71	10.4	170,975	0.5	2,408	35,511	2.4	500	206,486	0.6	2,908
30	Plastics	20	2.9	131,658	0.4	6,583	1,364	0.1	68	133,022	0.4	6,651
31	Leather	2	0.3	0	0.0	0	15,909	1.1	7,955	15,909	0.0	7,955
32	Stone/Clay	11	1.6	51,420	0.2	4,675	169	0.0	15	51,589	0.1	4,690
33	Primary Metals	170	24.9	840,193	2.5	4,942	947,917	64.1	5,576	1,788,110	5.1	10,518
34	Fabr. Metals	63	9.2	400	0.0	6	18,369	1.2	292	18,769	0.1	298
35	Machinery	7	1.0	21,726	0.1	3,104	58	0.0	8	21,784	0.1	3,112
36	Electrical	21	3.1	11,346	0.0	540	8,549	0.6	407	19,895	0.1	947
37	Transportation	33	4.8	2,198	0.0	67	14,386	1.0	436	16,584	0.0	503
38	Measure./Photo.	0	–	–	–	–	–	–	–	–	–	–
39	Miscellaneous	3	0.4	0	0.0	0	99	0.0	33	99	0.0	33
	Total	**682**	**100.0**	**33,256,285**	**100.0**	**48,763**	**1,479,110**	**100.0**	**2,169**	**34,735,395**	**100.0**	**50,932**

Even in the matched data set, much of the difference in surface water discharges reflects the influence of a few facilities in only two industries with unusually large discharges. **Tables 5–3a** and **b** explore NPRI reports of surface water discharges and transfers to sewage/POTWs by industrial group. Paper products manufacturers contribute more than five times the quantity of surface water discharges per chemical form submitted than the average for all industries. Forms from the chemical industry generally report surface water discharges of about twice the national average. Among the 60 forms submitted by the paper products facilities are five that report more than one million kilograms each in surface water discharges; the 200 forms from the chemical industry also include one such large release to water. Excluding these six forms from the analysis reduces overall NPRI surface water discharges from 33 million kilograms to less than 6 million. Excluding comparable forms from TRI as well also lowers surface water discharges (from 30 million kilograms to 16 million kilograms; see **Tables 5–4a** and **b**). The average surface water discharges plus transfers to sewage/POTWs per form from NPRI facilities is still, however, almost two and one-half times that per form from TRI facilities, so the difference between the two PRTRs is not solely attributable to a few facilities with large discharges.

Table 5–3b NPRI SURFACE WATER DISCHARGES AND TRANSFERS TO SEWAGE/POTWs, BY INDUSTRY (US SIC CODE), 1994, WITHOUT SURFACE WATER DISCHARGES GREATER THAN 1,000,000 kg* (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Forms		Surface Water Discharges			Transfers to Sewage/POTWs			Total		
		Number	%	kg	%	kg/form	kg	%	kg/form	kg	%	kg/form
20	Food	10	1.5	16,900	0.3	1,690	98,006	6.6	9,801	114,906	1.6	11,491
21	Tobacco	0	–	–	–	–	–	–	–	–	–	–
22	Textiles	2	0.3	0	0.0	0	1,000	0.1	500	1,000	0.0	500
23	Apparel	0	–	–	–	–	–	–	–	–	–	–
24	Lumber	4	0.6	866	0.0	217	0	0.0	0	866	0.0	217
25	Furniture	1	0.1	0	0.0	0	325	0.0	325	325	0.0	325
26	Paper	55	8.1	2,514,637	45.1	45,721	77,475	5.2	1,409	2,592,112	36.7	47,129
27	Printing	4	0.6	5,922	0.1	1,481	0	0.0	0	5,922	0.1	1,481
28	Chemicals	199	29.4	1,813,205	32.5	9,112	259,973	17.6	1,306	2,073,178	29.4	10,418
29	Petroleum	71	10.5	170,975	3.1	2,408	35,511	2.4	500	206,486	2.9	2,908
30	Plastics	20	3.0	131,658	2.4	6,583	1,364	0.1	68	133,022	1.9	6,651
31	Leather	2	0.3	0	0.0	0	15,909	1.1	7,955	15,909	0.2	7,955
32	Stone/Clay	11	1.6	51,420	0.9	4,675	169	0.0	15	51,589	0.7	4,690
33	Primary Metals	170	25.1	840,193	15.1	4,942	947,917	64.1	5,576	1,788,110	25.3	10,518
34	Fabr. Metals	63	9.3	400	0.0	6	18,369	1.2	292	18,769	0.3	298
35	Machinery	7	1.0	21,726	0.4	3,104	58	0.0	8	21,784	0.3	3,112
36	Electrical	21	3.1	11,346	0.2	540	8,549	0.6	407	19,895	0.3	947
37	Transportation	33	4.9	2,198	0.0	67	14,386	1.0	436	16,584	0.2	503
38	Measure./Photo.	0	–	–	–	–	–	–	–	–	–	–
39	Miscellaneous	3	0.4	0	0.0	0	99	0.0	33	99	0.0	33
	Total	**676**	**100.0**	**5,581,446**	**100.0**	**8,257**	**1,479,110**	**100.0**	**2,188**	**7,060,556**	**100.0**	**10,445**

* There were no forms with transfers to sewage greater than 1,000,000 kg in 1994.

Table 5–4a

TRI SURFACE WATER DISCHARGES AND TRANSFERS TO SEWAGE/POTWs, BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Forms		Surface Water Discharges			Transfers to Sewage/POTWs			Total		
		Number	%	kg	%	kg/form	kg	%	kg/form	kg	%	kg/form
20	Food	873	4.8	541,179	1.8	620	11,056,398	10.1	12,665	11,597,577	8.4	13,285
21	Tobacco	6	0.0	4,638	0.0	773	31,781	0.0	5,297	36,420	0.0	6,070
22	Textiles	353	1.9	63,815	0.2	181	2,289,962	2.1	6,487	2,353,777	1.7	6,668
23	Apparel	8	0.0	1	0.0	0	9,858	0.0	1,232	9,859	0.0	1,232
24	Lumber	299	1.6	43,894	0.1	147	19,536	0.0	65	63,429	0.0	212
25	Furniture	75	0.4	4,806	0.0	64	35,835	0.0	478	40,641	0.0	542
26	Paper	893	4.9	5,292,660	17.9	5,927	18,566,380	17.0	20,791	23,859,040	17.2	26,718
27	Printing	101	0.5	153	0.0	2	51,962	0.0	514	52,116	0.0	516
28	Chemicals	5,546	30.2	18,180,621	61.6	3,278	60,698,175	55.7	10,944	78,878,796	56.9	14,223
29	Petroleum	980	5.3	754,711	2.6	770	2,192,591	2.0	2,237	2,947,302	2.1	3,007
30	Plastics	488	2.7	41,385	0.1	85	881,860	0.8	1,807	923,245	0.7	1,892
31	Leather	99	0.5	62,036	0.2	627	1,015,261	0.9	10,255	1,077,297	0.8	10,882
32	Stone/Clay	241	1.3	68,166	0.2	283	356,029	0.3	1,477	424,195	0.3	1,760
33	Primary Metals	1,912	10.4	1,753,533	5.9	917	2,524,350	2.3	1,320	4,277,883	3.1	2,237
34	Fabr. Metals	1,978	10.8	33,555	0.1	17	942,162	0.9	476	975,717	0.7	493
35	Machinery	533	2.9	56,005	0.2	105	425,094	0.4	798	481,099	0.3	903
36	Electrical	1,063	5.8	54,575	0.2	51	2,355,403	2.2	2,216	2,409,978	1.7	2,267
37	Transportation	972	5.3	32,171	0.1	33	418,795	0.4	431	450,965	0.3	464
38	Measure./Photo.	237	1.3	139,355	0.5	588	315,673	0.3	1,332	455,028	0.3	1,920
39	Miscellaneous	139	0.8	620	0.0	4	227,941	0.2	1,640	228,561	0.2	1,644
	Multiple codes 20–39	1,579	8.6	2,381,692	8.1	1,508	4,614,821	4.2	2,923	6,996,513	5.1	4,431
	Total	**18,375**	**100.0**	**29,509,571**	**100.0**	**1,606**	**109,029,867**	**100.0**	**5,934**	**138,539,438**	**100.0**	**7,540**

Table 5–4b TRI SURFACE WATER DISCHARGES AND TRANSFERS TO SEWAGE/POTWs, BY INDUSTRY (US SIC CODE), 1994, WITHOUT SURFACE WATER DISCHARGE AND/OR TRANSFER TO SEWAGE/POTWs GREATER THAN 1,000,000 kg (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Forms		Surface Water Discharges			Transfers to Sewage/POTWs			Total		
		Number	%	kg	%	kg/form	kg	%	kg/form	kg	%	kg/form
20	Food	873	4.8	541,179	3.4	620	7,497,682	11.8	8,588	8,038,861	10.1	9,208
21	Tobacco	6	0.0	4,638	0.0	773	31,781	0.0	5,297	36,420	0.0	6,070
22	Textiles	353	1.9	63,815	0.4	181	2,289,962	3.6	6,487	2,353,777	3.0	6,668
23	Apparel	8	0.0	1	0.0	0	9,858	0.0	1,232	9,859	0.0	1,232
24	Lumber	299	1.6	43,894	0.3	147	19,536	0.0	65	63,429	0.1	212
25	Furniture	75	0.4	4,806	0.0	64	35,835	0.1	478	40,641	0.1	542
26	Paper	891	4.9	3,161,141	19.8	3,548	733,344	1.2	823	3,894,484	4.9	4,371
27	Printing	101	0.5	153	0.0	2	51,962	0.1	514	52,116	0.1	516
28	Chemicals	5,541	30.2	7,654,136	47.9	1,381	36,651,797	57.6	6,615	44,305,932	55.7	7,996
29	Petroleum	980	5.3	754,711	4.7	770	2,192,591	3.4	2,237	2,947,302	3.7	3,007
30	Plastics	488	2.7	41,385	0.3	85	881,860	1.4	1,807	923,245	1.2	1,892
31	Leather	99	0.5	62,036	0.4	627	1,015,261	1.6	10,255	1,077,297	1.4	10,882
32	Stone/Clay	241	1.3	68,166	0.4	283	356,029	0.6	1,477	424,195	0.5	1,760
33	Primary Metals	1,912	10.4	1,753,533	11.0	917	2,524,350	4.0	1,320	4,277,883	5.4	2,237
34	Fabr. Metals	1,978	10.8	33,555	0.2	17	942,162	1.5	476	975,717	1.2	493
35	Machinery	533	2.9	56,005	0.4	105	425,094	0.7	798	481,099	0.6	903
36	Electrical	1,063	5.8	54,575	0.3	51	2,355,403	3.7	2,216	2,409,978	3.0	2,267
37	Transportation	972	5.3	32,171	0.2	33	418,795	0.7	431	450,965	0.6	464
38	Measure./Photo.	237	1.3	139,355	0.9	588	315,673	0.5	1,332	455,028	0.6	1,920
39	Miscellaneous	139	0.8	620	0.0	4	227,941	0.4	1,640	228,561	0.3	1,644
	Multiple codes 20–39	1,578	8.6	1,520,014	9.5	963	4,614,821	7.3	2,924	6,134,835	7.7	3,888
	Total	**18,367**	**100.0**	**15,989,888**	**100.0**	**871**	**63,591,737**	**100.0**	**3,462**	**79,581,624**	**100.0**	**4,333**

5.4 FACILITY REPORTING

Tables 5–5 and **5–6** list the 50 facilities in each country that reported the largest total releases and transfers of the matched chemical/industrial data set in 1994. These tables also identify the chemicals and type of media or transfer that accounted for at least 70 percent of each facility's total releases and transfers. (The top 10 facilities in each country also appear on **Maps 5–1** and **5–2**.) The top 50 NPRI facilities account for 65 percent of total NPRI releases and transfers—a much greater proportion than in TRI, where the top 50 facilities made up 29 percent of total releases and transfers. (As stated earlier, it is important to note that any evaluation of the relative health and environmental impacts of these facilities must also take into account the toxicity of the chemicals released, local

Table 5–5

THE 50 NPRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	Facility	City, Province	SIC Codes		Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
			Canada	US						
1	Kronos Canada, Inc.	Varennes, QC	37	28	8	39,623	15,102,000	0	0	15,141,623
2	Samuel Bingham Company	Montreal, QC	15	30	1	0	0	0	0	0
3	Sherritt Inc.	Fort Saskatchewan, AB	37	28	17	5,166,325	802,330	0	6,060	5,974,985
4	Samuel Bingham Company	Toronto, ON	15	30	1	0	0	0	0	0
5	Methanex Corporation	Medicine Hat, AB	37	28	5	4,132,490	0	0	0	4,132,490
6	Sherritt Inc.	Redwater, AB	37	28	11	1,797,810	96,200	1,853,020	6,680	3,753,840
7	Cartons St-Laurent Inc.	La Tuque, QC	27	26	4	382,307	3,175,116	0	3,845	3,561,268
8	Irving Pulp and Paper/Irving Tissue Co.	Saint John, NB	27	26	5	257,147	3,135,481	0	0	3,392,628
9	Dofasco Inc.	Hamilton, ON	29	33	22	660,431	48,657	0	17	709,105
10	Inco Limited Copper Cliff Smelter	Copper Cliff, ON	29	33	7	3,152,970	0	0	0	3,152,970
11	Scott Maritimes Limited	New Glasgow, NS	27	26	5	473,110	0	0	0	473,110
12	Polysar Rubber Corporation	Sarnia, ON	37	28	17	2,669,750	6,083	0	0	2,675,933
13	Acierie, Sidbec–Dosco (ISPAT) Inc.	Contrecoeur, QC	29	33	5	187,050	3,402	0	2,731,280	2,921,732
14	Canadian Fertilizers Limited	Medicine Hat, AB	37	28	5	2,873,784	23,650	0	175	2,898,147
15	CO-Steel Lasco	Whitby, ON	29	33	5	15,617	65	0	1,858,000	1,873,682
16	Tembec Inc.	Temiscaming, QC	27	26	5	0	2,577,900	0	0	2,577,900
17	Shell Scotford Refinery	Fort Saskatchewan, AB	36	29	12	64,139	207	2,430,000	20	2,494,366
18	James River-Marathon, Ltd.	Marathon, ON	27	26	3	141,600	2,271,000	0	0	2,412,600
19	Algoma Steel Inc.	Sault Ste. Marie, ON	29	33	17	385,637	451,392	0	1,398,960	2,236,870
20	Carseland Nitrogen Operations	Calgary, AB	37	28	5	2,266,000	0	0	3,000	2,269,012
21	Slater Steels, H.S.B. Division	Hamilton, ON	29	33	6	9,405	0	0	390	10,613
22	Novacor Chemicals - S.C.R.S.	Corunna, ON	37	28	9	2,075,260	520	0	0	2,075,780
23	Petro-Canada Edmonton Refinery	Edmonton, AB	36	29	17	197,440	700	1,705,700	2,100	1,905,940
24	Western Pulp Limited Partnership	Port Alice, BC	27	26	4	130,118	1,600,000	0	0	1,730,118
25	General Chemical Canada Ltd.	Amherstburg, ON	37	28	2	1,475,130	158,500	0	0	1,633,630
26	Ivaco Rolling Mills	L'Orignal, ON	29	33	5	16,100	0	0	0	17,089
27	Terra Lambton Works	Courtright, ON	37	28	5	1,392,630	62,300	0	0	1,454,930
28	Essex Aluminum Plant, Ford Motor Co.	Windsor, ON	29	33	12	1,147,551	0	0	0	1,147,551
29	Hudson Bay Mining & Smelting Co.	Flin Flon, MB	29	33	5	1,356,367	0	0	0	1,356,367
30	Stora Forest Industries Ltd.	Port Hawkesbury, NS	27	26	5	207,088	1,035,839	0	0	1,242,927
31	Les Papiers Perkins Ltée	Candiac, QC	27	26	2	1,152,050	0	0	0	1,152,050
32	Strathcona Refinery, Imperial Oil	Edmonton, AB	36	29	23	213,186	3,612	964,021	1,510	1,182,606
33	St. Anne Nackawic Pulp Co. Ltd.	Nackawic, NB	27	26	6	1,114,620	51,360	0	0	1,165,980
34	Simplot Canada Ltd.	Brandon, MB	37	28	10	1,089,130	9,300	0	52,800	1,151,616
35	Celanese Canada Inc.	Edmonton, AB	37	28	11	300,338	0	781,800	142	1,082,810
36	Avenor Inc.	Thunder Bay, ON	27	26	8	1,108,052	3,822	0	0	1,111,874
37	Standard Products (Canada) Ltd.	Stratford, ON	15	30	2	1,027,998	0	0	0	1,027,998
38	Sunworthy Wallcoverings, Borden Co.	Brampton, ON	27	26	5	756,700	0	0	0	756,700
39	Windsor Assembly Plant, Chrysler Canada	Windsor, ON	32	37	12	1,017,901	313	0	0	1,018,214
40	General Motors of Canada Limited	Oshawa, ON	32	37	14	1,010,482	0	0	0	1,010,482
41	Ethyl Canada Inc.	Corunna, ON	37	28	10	144,531	821	0	0	145,482
42	Stelco Lake Erie Works	Nanticoke, ON	29	33	18	203,859	17,015	0	702,000	922,885
43	AltaSteel Ltd.	Edmonton, AB	29	33	7	5,083	2,822	0	745,323	753,228
44	Canadian General-Tower Ltd.	Cambridge, ON	16	30	7	795,510	0	0	0	795,763
45	Nutrite Inc. - Nitrogen Division	Maitland, ON	37	28	7	767,430	39,388	0	2,130	808,948
46	3M Perth, Ontario Plant Site	Perth, ON	35	32	6	839,758	0	0	0	839,758
47	Stelco Hilton Works	Hamilton, ON	29	33	19	420,426	56,610	0	7,000	484,916
48	CAMVAC Canada, Div. of Rexham Canada	Brantford, ON	27	26	5	814,000	0	0	0	814,000
49	3M London, Ontario Plant Site	London, ON	35	32	8	679,901	45,483	0	0	725,384
50	West Hill Plant, Witco Corporation	Scarborough, ON	36	29	3	779,000	0	0	0	779,000
	Subtotal				**413**	**46,912,834**	**30,781,888**	**7,734,541**	**7,521,432**	**92,956,900**
	% of Total				**9.0**	**52.6**	**92.6**	**99.9**	**71.4**	**66.0**
	Total				**4,598**	**89,195,059**	**33,256,285**	**7,742,206**	**10,528,273**	**140,906,351**

5.4 FACILITY REPORTING
(continued)

Table 5–5
THE 50 NPRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
1	0	0	430,000	430,000	15,571,623	Sulfuric acid (water)
2	0	0	9,697,820	9,697,820	9,697,820	Di(2-ethylhexyl) phthalate (transfers to disposal)
3	0	0	13,280	13,280	5,988,265	Ammonia, methanol (air)
4	0	0	5,081,000	5,081,000	5,081,000	Di(2-ethylhexyl) phthalate (transfers to disposal)
5	800	23,050	0	23,850	4,156,340	Methanol (air)
6	0	0	0	0	3,753,840	Ammonia, ammonium nitrate (air, UIJ)
7	0	0	3,845	3,845	3,565,113	Methanol (water)
8	0	0	0	0	3,392,628	Methanol (water)
9	0	3,428	2,665,584	2,669,012	3,378,117	Zinc/manganese and compounds (transfers to disposal)
10	0	0	0	0	3,152,970	Sulfuric acid (air)
11	2,613,660	0	53,340	2,667,000	3,140,110	Methanol (transfers to treatment)
12	184,900	0	98,800	283,700	2,959,633	Chloromethane, benzene, hydrochloric acid, cyclohexane (air)
13	0	0	0	0	2,921,732	Zinc and compounds (land)
14	0	0	0	0	2,898,147	Ammonia (air)
15	0	0	841,300	841,300	2,714,982	Zinc/copper and compounds (land, transfers to disposal)
16	0	0	0	0	2,577,900	Sulfuric acid (water)
17	0	0	150	150	2,494,516	Ammonia (UIJ)
18	0	0	650	650	2,413,250	Methanol (water)
19	0	163,800	0	163,800	2,400,670	Manganese and compounds (land), ammonia (water)
20	0	0	0	0	2,269,012	Ammonia (air)
21	2,246,864	900	0	2,247,764	2,258,377	Manganese/zinc and compounds (transfers to treatment)
22	28,700	0	12,200	40,900	2,116,680	Cyclohexane (air)
23	0	0	76,960	76,960	1,982,900	Ammonia (UIJ)
24	0	0	0	0	1,730,118	Methanol (water)
25	0	0	0	0	1,633,630	Ammonia (air)
26	0	0	1,467,760	1,467,760	1,484,849	Zinc and compounds (transfers to disposal)
27	0	0	3,000	3,000	1,457,930	Ammonia (air)
28	180	20	257,120	257,320	1,404,871	Styrene (air)
29	0	0	0	0	1,356,367	Zinc/lead and compounds (air)
30	0	0	0	0	1,242,927	Methanol (air, water)
31	0	57,575	0	57,575	1,209,625	Xylenes (air)
32	0	0	13,930	13,930	1,196,536	Ammonia (UIJ)
33	0	0	0	0	1,165,980	Chlorine, chlorine dioxide (air)
34	0	0	0	0	1,151,616	Ammonia (air)
35	0	0	39,183	39,183	1,121,993	Methanol, methyl ethyl ketone, formaldehyde (UIJ)
36	0	0	0	0	1,111,874	Methanol (air)
37	5,480	0	11,224	16,704	1,044,702	Xylenes (air)
38	271,400	11,700	0	283,100	1,039,800	Methyl ethyl ketone, toluene (air)
39	0	0	10,498	10,498	1,028,712	Xylenes, methyl ethyl ketone (air)
40	0	151	6,953	7,104	1,017,586	Xylenes, toluene (air)
41	0	0	859,600	859,600	1,005,082	Sulfuric acid (transfers to disposal)
42	0	0	0	0	922,885	Manganese and compounds (land)
43	0	0	125,122	125,122	878,350	Zinc/manganese and compounds (land)
44	60,304	0	5,066	65,370	861,133	Methyl ethyl ketone (air)
45	0	0	41,600	41,600	850,548	Ammonia (air)
46	66	0	209	275	840,033	Xylenes, toluene (air)
47	59,000	184,600	93,200	336,800	821,716	Benzene, ammonia (air), hydrochloric acid (transfers to sewage)
48	0	0	0	0	814,000	Methyl ethyl ketone, isopropyl alcohol (air)
49	85,507	0	714	86,221	811,605	Toluene, isopropyl alcohol, xylenes (air)
50	0	14,000	0	14,000	793,000	Methanol (air)
	5,556,861	**459,224**	**21,910,108**	**27,926,193**	**120,883,093**	
	37.0	**31.0**	**77.9**	**62.6**	**65.2**	
	15,011,219	**1,479,110**	**28,114,247**	**44,604,576**	**185,510,927**	

* Chemicals accounting for more than 70% of total releases and transfers from the facility
UIJ=underground injection

climatic conditions, and the proximity of people and/or ecologically sensitive areas to the released waste streams.) The list of the top 50 NPRI facilities in the matched dataset is quite different from that presented in **Chapter 4**. Six of those facilities, including five of the top 10, were in industries that were excluded when the data are matched. Nevertheless, the proportion of matched total NPRI releases and transfers accounted for is nearly identical. The top 50 facilities in the matched TRI data are generally the same as in the overall data set; the ordering has changed somewhat, though, due to the exclusion of certain chemicals from the matched data set.

Table 5–6

THE 50 TRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	Facility	City, State	SIC Code	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
1	DuPont	Pass Christian, MS	28	5	338,316	0	25,850,340	73	26,188,729
2	Magnesium Corp. of America	Rowley, UT	33	7	25,295,352	0	0	0	25,295,352
3	DuPont	New Johnsonville, TN	28	6	172,211	1,587	24,943,311	0	25,117,109
4	ASARCO Inc.	East Helena, MT	33	10	60,459	0	0	19,719,827	19,780,286
5	Zinc Corp. of America	Monaca, PA	33	10	267,524	243	0	0	267,767
6	Courtaulds Fibers Inc.	Axis, AL	28	7	14,931,295	28,345	0	205,215	15,164,855
7	DuPont	Beaumont, TX	28	30	386,846	10,279	14,490,141	0	14,887,266
8	Sloss Industries Corp.	Ariton, AL	28	3	1,883	0	0	0	1,883
9	IMC-Agrico Co.	Mulberry, FL	Mult.	4	312,517	0	0	11,383,220	11,695,737
10	Lenzing Fibers Corp.	Lowland, TN	28	7	9,705,562	8,889	0	0	9,714,451
11	Coastal Chem Inc.	Cheyenne, WY	28	14	644,214	0	9,103,401	0	9,747,615
12	Cytec Ind. Inc.	Westwego, LA	28	20	231,680	18,353	8,781,293	0	9,031,326
13	ASARCO Inc.	Hayden, AZ	33	9	375,293	0	0	7,746,682	8,121,975
14	DuPont	Victoria, TX	28	30	254,903	839	7,681,489	10,923	7,948,154
15	National Processing Co.	East Chicago, IN	33	1	113	0	0	0	113
16	Monsanto Co.	Sauget, IL	28	17	422,768	0	0	0	422,768
17	Elkem Metals Co.	Marietta, OH	33	8	2,315,953	246,712	0	4,901,587	7,464,252
18	Columbian Chemicals Co.	Saint Louis, MO	28	3	12,630	0	0	0	12,630
19	Northwestern Steel & Wire Co.	Sterling, IL	33	8	63,791	685	0	6,621,315	6,685,791
20	International Paper	Redwood, MS	26	10	6,469,773	1,220	0	0	6,470,993
21	PCS Phosphate Co. Inc.	Aurora, NC	28	7	1,617,179	0	0	4,613,469	6,230,648
22	National Steel Corp.	Ecorse, MI	33	22	147,729	116,900	0	0	264,629
23	Arcadian Fertilizer L.P.	Geismar, LA	28	14	697,191	5,153,707	0	200,859	6,051,757
24	IMC-Agrico Co.	Saint James, LA	28	8	2,709,764	2,904,751	0	240,858	5,855,373
25	DuPont	Leland, NC	28	21	1,716,624	21,915	0	32,189	1,770,728
26	Cabot Corp.	Tuscola, IL	28	2	1,677,444	0	3,745,615	0	5,423,058
27	BP Chemicals Inc.	Port Lavaca, TX	28	16	56,298	385	5,050,431	13,298	5,120,411
28	Simpson Pasadena Paper Co.	Pasadena, TX	26	12	759,365	0	0	0	759,365
29	Kennecott Utah Copper	Magna, UT	33	13	193,653	2,063	0	4,197,197	4,392,914
30	Upjohn Co.	Portage, MI	28	27	1,168,651	182,066	1,722,336	0	3,073,053
31	Rouge Steel Co.	Dearborn, MI	33	12	20,149	5,587	0	0	25,736
32	Consolidated Papers Inc.	Wisconsin Rapids, WI	26	15	1,319,685	340	0	0	1,320,025
33	American Chrome & Chemicals	Corpus Christi, TX	28	5	41,324	9,932	0	4,489,796	4,541,052
34	Phelps Dodge Hidalgo Inc.	Playas, NM	33	3	240,674	0	0	4,114,181	4,354,856
35	Doe Run Co.	Herculaneum, MO	33	9	116,261	502	0	4,073,429	4,190,192
36	Boise Cascade Corp.	Saint Helens, OR	26	10	281,635	0	0	0	281,635
37	BP Chemicals Inc.	Lima, OH	28	23	182,188	0	3,953,921	0	4,136,111
38	Eastman Kodak Co.	Rochester, NY	38	57	3,398,624	134,365	0	296	3,533,284
39	Monsanto Co.	Alvin, TX	28	23	109,109	0	3,577,506	63,039	3,749,654
40	Sterling Chemicals Inc.	Texas City, TX	28	34	586,150	7,909	2,999,315	0	3,593,374
41	Cyprus Miami Mining Corp.	Claypool, AZ	33	6	60,181	0	0	3,457,597	3,517,778
42	Monsanto Co.	Cantonment, FL	28	22	42,236	362	3,449,045	0	3,491,643
43	Hoechst Celanese Chemical	Pasadena, TX	28	31	1,319,247	0	2,024,195	0	3,343,442
44	Cerrowire & Cable Co. Inc.	Hartselle, AL	33	5	23	11	0	11	45
45	Allied-Signal Inc.	Hopewell, VA	28	16	863,856	583,837	0	0	1,447,693
46	Metal Resources Inc.	Loudon, TN	33	1	1,778	0	0	0	1,778
47	Chino Mines Co.	Hurley, NM	33	2	238,247	0	0	3,110,660	3,348,907
48	ASARCO Inc.	Annapolis, MO	33	6	105,599	154	0	3,205,856	3,311,609
49	Occidental Chemical Corp.	Castle Hayne, NC	28	4	2,198	14	0	3,129,528	3,131,740
50	Mallinckrodt Chemical Inc.	Saint Louis, MO	28	20	167,964	0	0	0	167,964
	Subtotal			**655**	**82,104,109**	**9,441,953**	**117,372,339**	**85,531,104**	**294,449,505**
	% of Total			**1.0**	**12.9**	**32.0**	**77.1**	**66.7**	**31.2**
	Total			**68,305**	**634,554,192**	**29,509,572**	**152,298,373**	**128,262,311**	**944,624,448**

5.4 FACILITY REPORTING (continued)

Table 5–6
THE 50 TRI FACILITIES WITH LARGEST TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Rank	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
1	10,431	0	0	10,431	26,199,160	Hydrochloric acid (UIJ)
2	0	0	0	0	25,295,351	Chlorine (air)
3	0	0	0	0	25,117,109	Hydrochloric acid (UIJ)
4	0	36	0	36	19,780,322	Zinc and compounds (land)
5	0	0	15,125,066	15,125,066	15,392,833	Zinc/copper compounds (transfers to disposal)
6	0	0	0	0	15,164,855	Carbon disulfide (air)
7	192,379	0	2,054	194,433	15,081,699	Ammonium nitrate (UIJ)
8	13,177,902	0	0	13,177,902	13,179,785	1,2,4-Trichlorobenzene (transfers to treatment)
9	0	0	0	0	11,695,737	Phosphoric acid (land)
10	0	0	497,234	497,234	10,211,685	Carbon disulfide (air)
11	0	0	694	694	9,748,309	Ammonium nitrate (UIJ)
12	8,426	0	6,482	14,908	9,046,234	Acetronitrile, acrylic acid, ammonia (UIJ)
13	642,550	129	0	642,679	8,764,654	Zinc/copper/lead and compounds (land)
14	358,232	0	0	358,232	8,306,386	Nitric acid (UIJ)
15	7,824,886	0	0	7,824,886	7,824,999	Hydrochloric acid (transfers to treatment)
16	450,517	6,651,074	4,702	7,106,294	7,529,062	Hydrochloric acid (transfers to sewage)
17	0	0	33,923	33,923	7,498,175	Manganese and compounds (land), ammonia (air)
18	0	7,256,825	25,397	7,282,222	7,294,853	Ammonia (transfers to sewage)
19	163,361	0	15	163,375	6,849,166	Zinc/manganese and compounds (land)
20	0	0	0	0	6,470,993	Methanol (air)
21	0	0	0	0	6,230,648	Phosphoric acid (land)
22	55,853	38,362	5,795,634	5,889,849	6,154,478	Zinc and compounds (transfers to disposal)
23	0	0	61,678	61,678	6,113,435	Phosphoric acid (water)
24	0	0	0	0	5,855,373	Phosphoric acid (water), ammonia (air)
25	3,879,479	0	22,241	3,901,720	5,672,448	Ethylene glycol (transfers to treatment)
26	0	0	0	0	5,423,058	Hydrochloric acid (UIJ)
27	13,766	0	0	13,766	5,134,177	Acetonitrile, ammonia, acrylamide (UIJ)
28	0	4,255,732	0	4,255,732	5,015,097	Methanol (transfers to sewage)
29	0	0	413,202	413,202	4,806,116	Copper/zinc/lead and compounds (land)
30	872,399	743,673	112,299	1,728,372	4,801,424	Methanol (UIJ), dichloromethane (air)
31	6,803	0	4,625,720	4,632,522	4,658,259	Zinc and compounds (transfers to disposal)
32	3,278,642	0	0	3,278,642	4,598,667	Methanol (transfers to treatment)
33	9,524	0	726	10,249	4,551,302	Chromium and compounds (land)
34	0	0	0	0	4,354,856	Copper and compounds (land)
35	0	454	0	454	4,190,646	Zinc and compounds (land)
36	0	3,873,492	2,055	3,875,547	4,157,182	Methanol (transfers to sewage)
37	13,531	0	744	14,274	4,150,385	Acetronitrile, ammonia, acrylamide (UIJ)
38	265,976	847	5,530	272,352	3,805,637	Dichloromethane, hydrochloric acid, methanol (air)
39	0	0	0	0	3,749,654	Ammonia, acrylonitrile, methanol (UIJ)
40	16,641	8,420	4,185	29,246	3,622,620	Ammonia, methanol, acrylamide (UIJ)
41	0	0	0	0	3,517,778	Copper and compounds (land)
42	0	0	4,970	4,970	3,496,613	Ammonium nitrate (UIJ)
43	2,812	104,943	14,789	122,544	3,465,986	Ethylene glycol (UIJ, air)
44	452	0	3,451,246	3,451,698	3,451,743	Copper and compounds (transfers to disposal)
45	163	2,000,493	0	2,000,656	3,448,349	Ammonia, ammonium nitrate (transfers to sewage)
46	0	0	3,410,431	3,410,431	3,412,209	Aluminum (transfers to disposal)
47	0	0	0	0	3,348,907	Copper and compounds (land)
48	0	0	0	0	3,311,609	Zinc/lead and compounds (land)
49	6,667	0	3,628	10,295	3,142,035	Chromium and compounds (land)
50	2,407,228	518,356	6,209	2,931,792	3,099,756	1,1,2-Trichloroethane (transfers to treatment)
	33,658,617	**25,452,837**	**33,630,851**	**92,742,305**	**387,191,810**	
	24.6	**23.3**	**25.9**	**24.7**	**29.3**	
	136,908,496	**109,029,867**	**129,982,489**	**374,920,852**	**1,320,545,300**	

* Chemicals accounting for more than 70% of total releases and transfers from the facility
UIJ=underground injection

Table 5–7 (following page)
DISTRIBUTION OF NPRI AND TRI TOTAL RELEASES AND TRANSFERS AND FACILITIES BY SIZE, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Figure 5–3 (following pages)
DISTRIBUTION OF FACILITIES BY SIZE OF TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Figure 5–4 (following pages)
DISTRIBUTION OF TOTAL RELEASES AND TRANSFERS BY SIZE OF FACILITY, 1994 (MATCHED CHEMICALS/INDUSTRIES)

5.4.1 The Impact of Facilities with Very Large or Very Small Releases

One reason for the difference in the proportion of total releases and transfers accounted for by the top 50 facilities in the adjusted list is the relative numbers of facilities reporting large releases and transfers. On one hand, in NPRI, three percent of facilities report total releases and transfers greater than one million kilograms, while one percent of TRI facilities do. Further, 14 percent of NPRI facilities report total releases and transfers between one hundred thousand and one million kilograms, which is twice the proportion of TRI facilities (7 percent) in this range. (See **Table 5–7** and **Figures 5–3** and **5–4.**)

Table 5–7

DISTRIBUTION OF NPRI AND TRI TOTAL RELEASES AND TRANSFERS AND FACILITIES BY SIZE, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Quantity per Facility	NPRI Number of Facilities	NPRI Total Releases and Transfers (kg)	TRI Number of Facilities	TRI Total Releases and Transfers (kg)
Greater than 5,000,000 kg	4	36,338,708	28	302,050,081
From 1,000,000 kg to 5,000,000 kg	37	76,951,115	187	351,305,755
From 100,000 kg to 1,000,000 kg	190	59,204,416	1,529	454,177,641
From 10,000 kg to 100,000 kg	344	11,998,934	5,515	186,103,326
From 1,000 kg to 10,000 kg	242	948,466	5,563	25,237,609
From 1 kg to 1,000 kg	258	69,288	6,396	1,670,888
0 kg	276	0	2,249	0
Total	**1,351**	**185,510,927**	**21,464**	**1,320,545,300**
	% of Total	**%**	**%**	**%**
Greater than 5,000,000 kg	0.3	19.6	0.1	22.9
From 1,000,000 kg to 5,000,000 kg	2.7	41.5	0.9	26.6
From 100,000 kg to 1,000,000 kg	14.1	31.9	7.1	34.4
From 10,000 kg to 100,000 kg	25.5	6.5	25.7	14.1
From 1,000 kg to 10,000 kg	17.9	0.5	25.9	1.9
From 1 kg to 1,000 kg	19.1	0.0	29.8	0.1
0 kg	20.4	0.0	10.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Figure 5–3 DISTRIBUTION OF FACILITIES BY SIZE OF TOTAL RELEASES AND TRANSFERS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

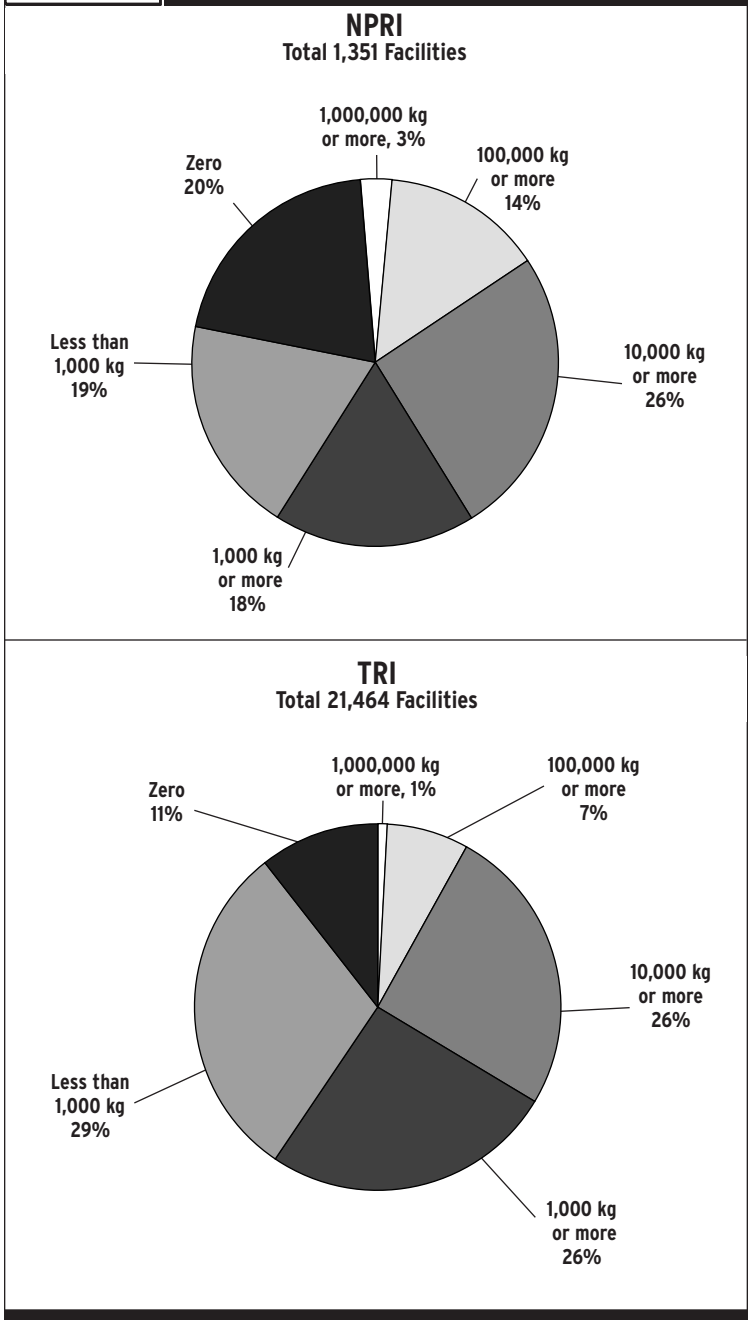
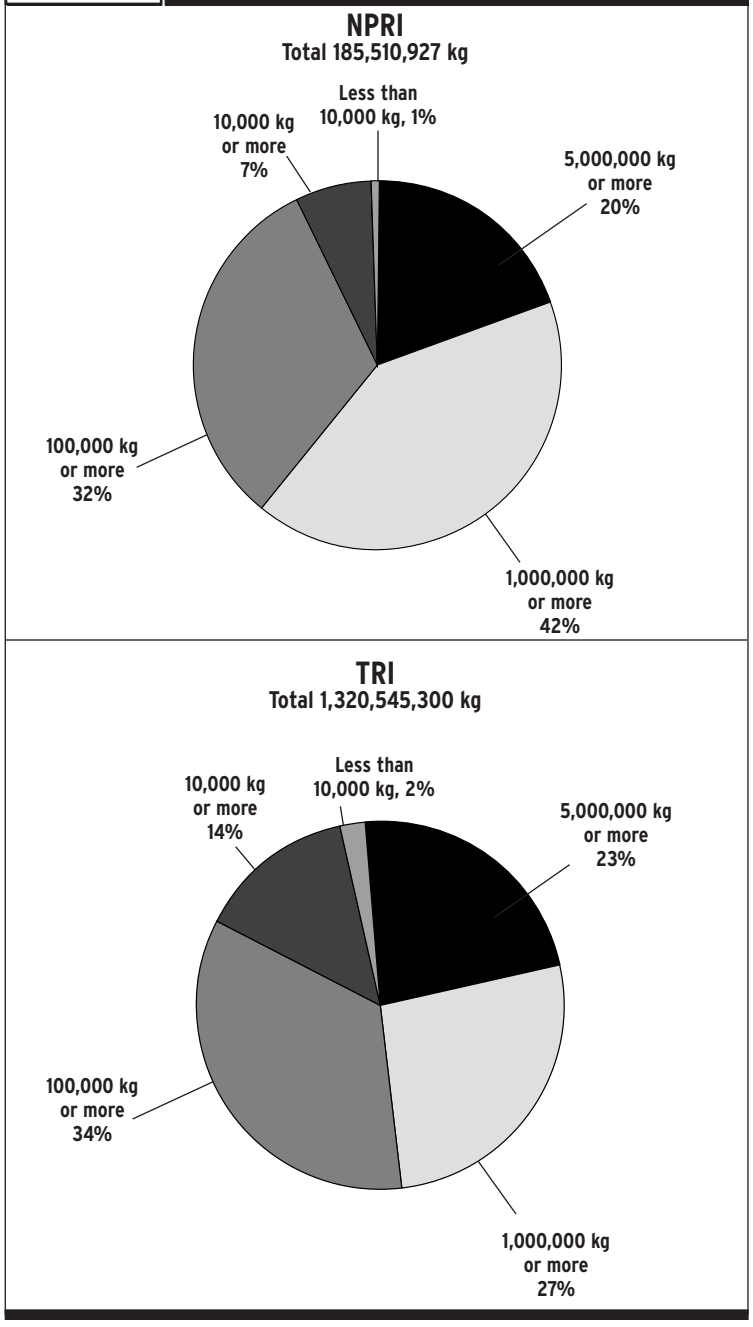


Figure 5–4 DISTRIBUTION OF TOTAL RELEASES AND TRANSFERS BY SIZE OF FACILITY, 1994 (MATCHED CHEMICALS/INDUSTRIES)



Map 5–1

LARGEST SOURCES OF RELEASES AND TRANSFERS: TOP 10 FACILITIES IN CANADA

Map 5–2

LARGEST SOURCES OF RELEASES AND TRANSFERS: TOP 10 FACILITIES IN THE UNITED STATES

On the other hand, a larger percentage of NPRI facilities in the matched data set report zero releases and transfers. In NPRI, one of every five facilities reports no releases or transfers, while in TRI, one of every 10 does so. Thus, releases and transfers in NPRI are more concentrated in fewer facilities.

5.5 RELEASES AND TRANSFERS PER FACILITY

As shown above in **Table 5–2**, facilities in the two countries submit roughly the same average number of forms for the matched data set: 3.4 forms per facility in Canada and 3.2 forms per facility in the United States. Also, as was the case in the unmatched data, on average, releases and transfers from NPRI facilities are slightly more than twice those of TRI facilities (137,314 kilograms in NPRI versus 61,524 kilograms in TRI).

Because the number of forms per facility is similar in the two PRTRs, releases and transfers per form show essentially the same differential as the average for facilities: 40,346 kilograms per form submitted to NPRI versus 19,333 kilograms per form in TRI—twice as large, on average, for NPRI as for TRI. Data in the matched data set can be analyzed for possible explanations of this significant difference between the two systems. There are several possible reasons for it, some of which are examined in the following sections. These reasons include differing industrial and/or chemical mixes, or the presence of individual facilities with extremely large releases or transfers. Other possible reasons, such as differing regulatory environments in the two countries, cannot be examined with the PRTR data.

5.5.1 Industrial Mix

Differences in the mix of industrial facilities within the matched set of industries reporting to the two PRTRs might account for some of the greater releases and transfers per facility in Canada. Relatively more paper products manufacturers, for instance, report to NPRI than to TRI. If paper manufacture tended to produce greater releases and transfers—in both countries—than other industries, then the greater relative prevalence of the paper industry in Canada could contribute to Canada's larger average releases and transfers per facility. Unfortunately, the data summarized in **Table 5–8** fail to support this hypothesis (and see **Figure 5–5**). In 13 industrial groups, NPRI data indicate higher releases and transfers per facility than one sees for TRI facilities in the same industries. Thus, differences in the average releases and transfers per form for NPRI and TRI within industries outweigh the influence of overall industrial groups in the two databases.

Canadian paper products manufacturers averaged 105,257 kilograms per form in total releases and transfers, while their US counterparts averaged 58,992 kilograms per form. The greatest difference appears in the rubber and plastics industry, where the average of total release and transfer amounts per NPRI form is 4.7 times that of the TRI. In this category, two forms with large transfers are responsible for this difference; without them, the ratio drops to 1.6, which is below the average ratio for all industries. The stone/clay/glass, petroleum and coal products, and transportation equipment industries exhibit release and transfer amounts per form that are higher than the NPRI average. Other industries reporting to the NPRI with lower averages than to the TRI include apparel, measurement/photographic instruments, miscellaneous manufacturing, food products, lumber and wood products, and leather.

It might be argued that differences in releases and transfers per form within industries reflect different activity patterns within the broad industrial categories represented by two-digit SIC codes. Some activities within those SIC codes might have different release and transfer patterns than others, and differences between Canada and the United States in the number of different

Table 5–8 AVERAGE TOTAL RELEASES AND TRANSFERS PER FORM BY INDUSTRY, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Average Total Releases and Transfers per Form: NPRI (kg)	Average Total Releases and Transfers per Form: TRI (kg)	Ratio of Average per Form NPRI/TRI
20	Food Products	3,788	7,540	0.5
21	Tobacco Products	0	28,111	0.0
22	Textile Mill Products	24,444	14,025	1.7
23	Apparel and Other Textile Products	0	10,780	0.0
24	Lumber and Wood Products	7,393	8,176	0.9
25	Furniture and Fixtures	23,812	15,252	1.6
26	Paper Products	105,257	58,992	1.8
27	Printing and Publishing	34,298	32,416	1.1
28	Chemicals	39,797	27,330	1.5
29	Petroleum and Coal Products	27,929	9,954	2.8
30	Rubber and Plastics Products	73,884	15,846	4.7
31	Leather Products	12,046	12,932	0.9
32	Stone/Clay/Glass Products	27,953	8,648	3.2
33	Primary Metal Industries	52,843	36,950	1.4
34	Fabricated Metal Products	11,231	5,619	2.0
35	Industrial Machinery	4,883	4,471	1.1
36	Electronic/Electrical Equipment	11,396	6,532	1.7
37	Transportation Equipment	29,645	13,417	2.2
38	Measurement/Photographic Instruments	6,010	13,480	0.4
39	Misc. Manufacturing Industries	4,776	9,565	0.5
	Multiple codes 20–39	–	18,165	0.0
	Total	**40,346**	**19,333**	**2.1**

Table 5–9

RELEASES AND TRANSFERS FOR CHEMICAL INDUSTRY (US SIC CODE 28), 1994
(MATCHED CHEMICALS/INDUSTRIES)

NPRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
281	Industrial inorganic chemicals	451	28.9	35,454,185	57.1	78,612
282	Plastic materials and synthetics	219	14.0	6,893,034	11.1	31,475
283	Pharmaceuticals	41	2.6	1,507,010	2.4	36,756
284	Soap, cleaners and toilet goods	200	12.8	328,104	0.5	1,641
285	Paints and allied products	346	22.2	2,146,797	3.5	6,205
286	Industrial organic chemicals	138	8.9	5,411,941	8.7	39,217
287	Agricultural chemicals	42	2.7	9,425,559	15.2	224,418
289	Miscellaneous chemical products	122	7.8	876,345	1.4	7,183
	Total	**1,559**	**100.0**	**62,042,975**	**100.0**	**39,797**

TRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
281	Industrial inorganic chemicals	1,425	7.5	95,609,108	18.5	67,094
282	Plastic materials and synthetics	1,995	10.6	38,114,174	7.4	19,105
283	Pharmaceuticals	690	3.6	27,906,060	5.4	40,444
284	Soap, cleaners and toilet goods	1,071	5.7	3,698,611	0.7	3,453
285	Paints and allied products	2,789	14.8	7,290,838	1.4	2,614
286	Industrial organic chemicals	2,992	15.8	94,946,902	18.4	31,734
287	Agricultural chemicals	965	5.1	40,775,019	7.9	42,254
289	Miscellaneous chemical products	1,949	10.3	12,900,398	2.5	6,619
	Multiple within SIC 28	5,020	26.5	195,414,039	37.8	38,927
	Not valid SIC within 28	12	0.1	19,400	0.0	1,617
	Total	**18,908**	**100.0**	**516,674,548**	**100.0**	**27,326**

types of facilities within a SIC code might then lead to differences in releases and transfers for the SIC code as a whole.

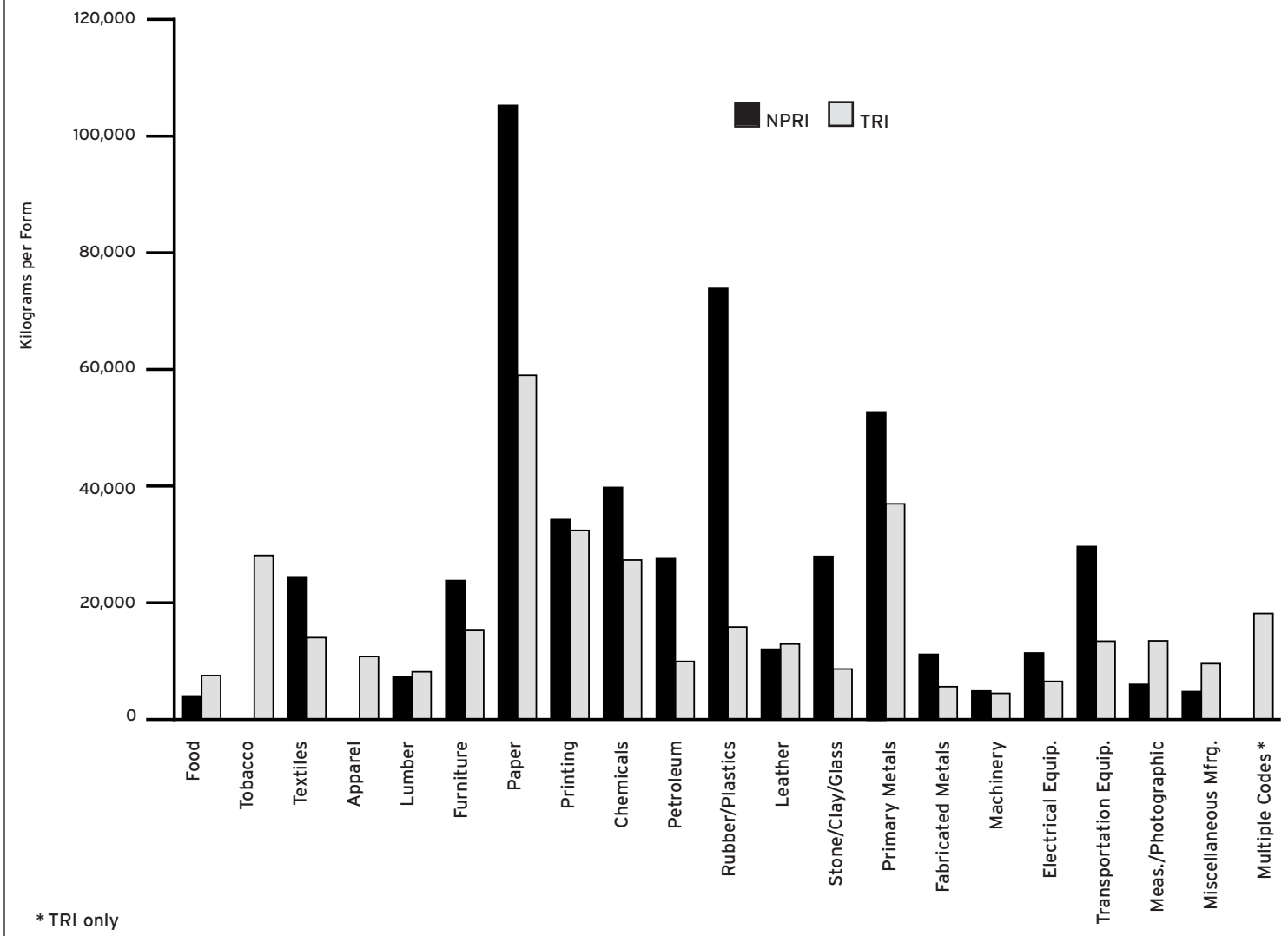
To study this hypothesis, **Tables 5–9** through **5–11** were compiled, presenting breakdowns by three-digit SIC code for the chemical, paper and primary metal products industries, which are the three industries with the largest release and transfer amounts for each PRTR. These tables do support the observation that the distribution of specific industrial activities varies considerably between the two countries. They also clearly illustrate, however, that NPRI and TRI facilities within the same three-digit SIC code vary markedly and inconsistently in their releases and transfers.

For example, in the chemical industry, NPRI releases and transfers per form are, on average, 33 percent higher than those reported to TRI. For agricultural chemicals (SIC 287), however, NPRI releases and transfers per form are more than five times as high as in TRI. In contrast, NPRI releases and transfers per form are lower than those reported by TRI for the pharmaceutical (SIC 283) and soap, cleaners and toilet goods (SIC 284) industries. For paints and allied products (SIC 285), which represent 22 percent of NPRI forms in SIC 28 and 15 percent of those in that classification in TRI, NPRI releases and transfers per form are more than twice as high as the amounts reported to TRI.

In the paper industry (SIC 26), release and transfer amounts per form from pulp mills (SIC 261) reporting to NPRI are nearly double those reported to TRI. There are about the same number of forms from pulp mills in each country (218 in NPRI versus 209 in TRI); however, pulp mills account for 64 percent of forms in SIC 26 for NPRI, but only 9 percent in this category

Figure 5–5

TOTAL RELEASES AND TRANSFERS PER FORM BY INDUSTRY, NPRI AND TRI, 1994
(MATCHED CHEMICALS/INDUSTRIES) (US SIC CODE)



5.5 RELEASES AND TRANSFERS PER FACILITY (continued)

Table 5–10

RELEASES AND TRANSFERS FOR PAPER INDUSTRY (US SIC CODE 26), 1994 (MATCHED CHEMICALS/INDUSTRIES)

NPRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
261	Pulp mills	218	64.3	28,627,469	80.2	131,319
262	Paper mills	52	15.3	1,298,669	3.6	24,974
263	Paperboard mills	6	1.8	470,822	1.3	78,470
265	Paperboard boxes	9	2.7	100,969	0.3	11,219
267	Misc. converted paper products	54	15.9	5,184,119	14.5	96,002
	Total	**339**	**100.0**	**35,682,048**	**100.0**	**105,257**

TRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
261	Pulp mills	209	9.1	14,269,467	10.6	68,275
262	Paper mills	540	23.6	21,158,860	15.7	39,183
263	Paperboard mills	302	13.2	24,826,413	18.4	82,207
265	Paperboard boxes	45	2.0	818,493	0.6	18,189
267*	Misc. converted paper products	372	16.3	13,373,848	9.9	35,951
	Multiple within SIC 26	818	35.8	60,409,647	44.8	73,850
	Total	**2,286**	**100.0**	**134,856,727**	**100.0**	**58,992**

* Includes 264 which was changed to 267 in 1987

under TRI. Miscellaneous converted paper products facilities (SIC 267) have releases and transfers per form that are 63 percent greater in NPRI than in TRI. Together with pulp mills, this accounts for 80 percent of NPRI forms in SIC 26, but only 25 percent of TRI forms. Paperboard mills (SIC 263) have similar releases and transfers per form reported to the two PRTRs, while releases and transfers per form for paper mills (SIC 262) and paperboard box manufacturers (SIC 265) are lower under NPRI than TRI.

For primary metal products (SIC 33), releases and transfers per form in NPRI are 43 percent higher than those in TRI. NPRI releases and transfers per form are also substantially higher for blast furnaces (SIC 331), iron and steel foundries (SIC 332), and nonferrous rolling and drawing (SIC 335) (from two to four times higher). These industries account for 63 percent of both NPRI and TRI forms in SIC 33. Average releases and transfers per form are substantially lower in NPRI for primary and secondary nonferrous metals (SIC codes 333 and 334), which represent 32 percent and 12 percent of NPRI and TRI forms, respectively. TRI releases and transfers from the primary nonferrous metals industry are almost eight times higher than those from similar NPRI facilities.

Accordingly, the fact that industrial activities within a two-digit SIC code vary between Canada and the United States seems unlikely to explain the greater average releases per facility and per form in NPRI, relative to TRI. Even within more narrowly defined industrial categories, NPRI releases and transfers per form may differ significantly from those reported to TRI.

Table 5–11

RELEASES AND TRANSFERS FOR PRIMARY METAL PRODUCTS INDUSTRY (US SIC CODE 33), 1994 (MATCHED CHEMICALS/INDUSTRIES)

NPRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
331	Blast furnace and basic steel products	197	32.6	16,937,382	53.0	85,977
332	Iron and steel foundries	97	16.0	6,009,285	18.8	61,951
333	Primary nonferrous metals	151	25.0	6,646,832	20.8	44,019
334	Secondary nonferrous metals	41	6.8	454,708	1.4	11,090
335	Nonferrous rolling and drawing	88	14.5	1,846,985	5.8	20,988
336	Nonferrous foundries	23	3.8	72,948	0.2	3,172
339	Miscellaneous primary metal products	8	1.3	1,663	0.0	208
	Total	**605**	**100.0**	**31,969,803**	**100.0**	**52,843**

TRI Facilities

US SIC Code	Industry	Number of Forms	% of All Forms	Total Releases and Transfers (kg)	% of Total	Average per Form (kg)
331	Blast furnace and basic steel products	1,770	27.4	82,957,774	34.7	46,869
332	Iron and steel foundries	1,170	18.1	17,464,081	7.3	14,927
333	Primary nonferrous metals	233	3.6	79,714,090	33.4	342,121
334	Secondary nonferrous metals	530	8.2	14,558,152	6.1	27,468
335	Nonferrous rolling and drawing	1,121	17.3	10,354,756	4.3	9,237
336	Nonferrous foundries	638	9.9	2,094,058	0.9	3,282
339	Miscellaneous primary metal products	411	6.4	2,290,705	1.0	5,573
	Multiple within SIC 33	565	8.7	29,417,686	12.3	52,067
	Not valid within SIC 33	27	0.4	31,257	0.0	1,158
	Total	**6,465**	**100.0**	**238,882,558**	**100.0**	**36,950**

5.5.2 Chemical Use/Production

Another potential reason for Canadian facilities' higher releases and transfers per form lies in data indicating how facilities use the chemicals they report. Facilities that only manufacture the reported chemical (that is, they do not process or otherwise use the chemical) are more predominant in NPRI than in TRI. They report, however, approximately the same average of releases and transfers. In contrast, forms indicating only processing reported four times the average amount of total releases and transfers in NPRI as in TRI (see **Table 5–12** and **Figure 5–6**).

5.5.3 Threshold Differences

The matched data set compiled for this analysis does not take into account two other differences between the two reporting systems: for the "otherwise used" category, TRI applies a lower threshold, and for carcinogens, the TRI de minimus level for reporting is 0.1 percent rather than the 1.0 percent level applied to all other TRI and NPRI chemicals.

Eliminating from the matched data set all **TRI** forms that report only in the "otherwise used" category and all forms from both PRTRs that report carcinogens controls for these differences. In the result (**Table 5–13**), NPRI forms still average twice the total release and transfer volumes reported to TRI.

Table 5–12 NPRI AND TRI AVERAGE RELEASES AND TRANSFERS BY ACTIVITY/USE TYPE, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Type of Activity/Use	Average Total Releases and Transfers per Form: NPRI (kg)	Average Total Releases and Transfers per Form: TRI (kg)	Ratio of Average per Form NPRI/TRI
Manufacture only	57,376	59,417	1.0
Process only	28,067	7,082	4.0
Other Uses only	31,499	13,274	2.4
Manufacture and Process	69,379	56,625	1.2
Manufacture and Other Uses	44,424	69,299	0.6
Process and Other Uses	31,330	20,246	1.5
All Three Activities/Uses	105,695	71,225	1.5
Total	**40,346**	**19,333**	**2.1**

Figure 5–6 AVERAGE RELEASES AND TRANSFERS PER FORM, BY ACTIVITY, NPRI AND TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

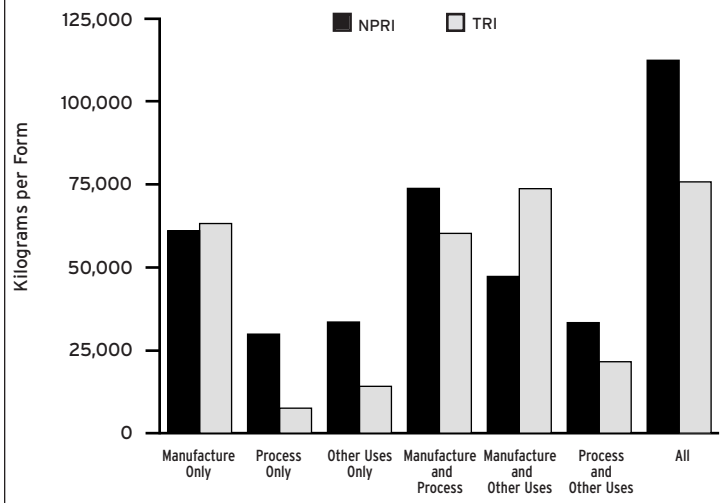


Table 5–13 MATCHING NPRI AND TRI FORMS ON THRESHOLDS, 1994

	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Average per Form (kg)
NPRI Matched Chemicals/Industries	4,598	140,906,351	44,604,576	185,510,927	40,346
minus only otherwise used	1,066	27,146,694	6,431,644	33,578,338	31,499
minus carcinogens	561	9,237,745	16,942,109	26,179,854	46,666
plus carcinogens/other use only	86	2,851,632	994,633	3,846,266	44,724
NPRI Matched Thresholds	**3,057**	**107,373,544**	**22,225,457**	**129,599,001**	**42,394**
TRI Matched Chemicals/Industries	68,305	944,624,448	375,920,852	1,320,545,300	19,333
minus only otherwise used	23,773	223,159,470	92,400,697	315,560,167	13,274
minus carcinogens	12,091	88,721,381	33,096,663	121,818,045	10,075
plus carcinogens/other use only	1,941	25,255,812	9,624,244	34,880,056	17,970
TRI Matched Thresholds	**34,382**	**657,999,409**	**260,047,736**	**918,047,144**	**26,701**

5.5.4 Year of PRTR Reporting

Data collected by PRTRs for 1994 do not, in fact, answer the question of why Canadian facilities report releases and transfers at a much higher average amount per facility than is the case in the United States. The available data suggest only that reporting by NPRI facilities, now early in their PRTR experience, compare more closely to reporting by TRI facilities in the early years of that register.

As with facilities' projections for future releases and transfers, the most significant factor may be that NPRI is in its first years. **Table 5–14** compares current NPRI reporting with early TRI results, using data for the second year of each PRTR: 1988 for TRI and 1994 for NPRI. Average releases and transfers for NPRI facilities in 1994 are slightly below those that were reported to TRI in 1988 (33,359 versus 33,475 kilograms per form, respectively).

5.6 CHEMICALS REPORTED

Tables 5–15 and **5–16** provide the amounts of the 25 chemicals from the matched data set with the largest reported releases in NPRI and TRI databases. There are 16 chemicals that appear on both tables. Both sets also report methanol, ammonia, xylene (mixed isomers), toluene and zinc (and its compounds) among the six chemicals released in greatest volume, with sulfuric acid for NPRI and hydrochloric acid for TRI completing the group. **Figure 5–7** shows releases of these top six chemicals in NPRI and/or TRI.

The TRI chemicals with the largest release volumes in the matched data set are the same as those that had appeared in the full TRI database, except for the exclusion of 1,1,1-trichloroethane and glycol ethers, which are not NPRI chemicals (see **Table 4–12**, above). In NPRI, ethylene glycol, ammonium sulfate and arsenic have dropped in rank below twenty-fifth because the large releases of these substances come from non-manufacturing facilities and their reports were thus omitted when deriving the matched data set (see **Table 4–7** for comparison). Acetone, ranked tenth in the full NPRI database, does not appear on the TRI list and is therefore also excluded here.

Table 5–14

COMPARISON OF RELEASES AND TRANSFERS IN FIRST YEARS OF NPRI AND TRI

	NPRI 1994		TRI 1988	
	Number		Number	
Forms	4,100		57,193	
	kg	kg/form	kg	kg/form
Total Releases	94,662,086	23,088	1,439,459,194	25,168
Total Transfers	42,111,285	10,271	475,090,867	8,307
Total Releases and Transfers	136,773,371	33,359	1,914,550,061	33,475

Only chemicals on NPRI list and no added, deleted or redefined TRI chemicals

Table 5–15

THE 25 CHEMICALS WITH THE LARGEST NPRI RELEASES, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
1	67-56-1	Methanol	17,166,020	12,031,135	400,000	128,753	29,732,797
2	7664-41-7	Ammonia	17,249,932	1,192,067	6,019,400	3,495	24,470,566
3	7664-93-9	Sulfuric acid	3,367,112	17,837,003	0	6,346	21,217,695
4	1330-20-7	Xylene (mixed isomers)	8,435,826	1,942	13,590	1,523	8,465,364
5	108-88-3	Toluene	7,301,850	6,327	19,470	5,216	7,340,639
6	—	Zinc (and its compounds)	1,292,972	96,732	207	4,441,294	5,843,848
7	78-93-3	Methyl ethyl ketone	4,083,442	10	280,000	129	4,369,206
8	—	Manganese (and its compounds)	203,732	98,599	0	2,767,594	3,074,552
9	110-82-7	Cyclohexane	2,674,482	687	50	1,467	2,677,441
10	74-85-1	Ethylene	2,505,643	0	0	0	2,507,751
11	71-43-2	Benzene	2,415,119	1,044	27,990	2,452	2,446,955
12	75-09-2	Dichloromethane	2,163,888	0	0	39	2,166,479
13	67-63-0	Isopropyl alcohol (manufacturing)	1,992,132	46,529	0	0	2,046,143
14	7782-50-5	Chlorine	2,019,224	5,018	0	0	2,031,046
15	6484-52-2	Ammonium nitrate (solution)	334,100	689,800	828,000	47,023	1,899,050
16	—	Lead (and its compounds)	934,996	5,373	0	866,137	1,812,626
17	100-42-5	Styrene	1,770,785	404	185	196	1,779,448
18	10049-04-4	Chlorine dioxide	1,730,264	5,273	0	0	1,735,537
19	—	Copper (and its compounds)	569,526	14,099	0	968,136	1,556,979
20	7647-01-0	Hydrochloric acid	1,178,850	80,078	22,680	63,062	1,349,230
21	71-36-3	n-Butyl alcohol	1,223,655	18,680	0	100	1,248,389
22	74-87-3	Chloromethane	1,176,020	880	0	0	1,176,900
23	115-07-1	Propylene	1,109,153	0	0	0	1,109,413
24	50-00-0	Formaldehyde	717,398	310,790	69,920	760	1,103,061
25	108-10-1	Methyl isobutyl ketone	868,319	0	0	155	870,412
		Subtotal	**84,484,440**	**32,442,470**	**7,681,492**	**9,303,877**	**134,031,527**
		% of Total NPRI Releases	**94.7**	**97.6**	**99.2**	**88.4**	**95.1**
		Total NPRI Releases	**89,195,059**	**33,256,285**	**7,742,206**	**10,528,273**	**140,906,351**

Table 5–16
THE 25 CHEMICALS WITH THE LARGEST TRI RELEASES, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
1	67-56-1	Methanol	98,680,021	4,991,941	10,900,424	1,180,361	115,752,746
2	7647-01-0	Hydrochloric acid	32,598,815	11,785	64,337,121	119,609	97,067,329
3	7664-41-7	Ammonia	70,652,221	6,505,052	13,178,820	2,423,484	92,759,577
4	108-88-3	Toluene	75,951,136	37,524	225,142	72,905	76,286,707
5	1330-20-7	Xylene (mixed isomers)	48,838,960	19,932	139,313	108,268	49,106,473
6	—	Zinc (and its compounds)	3,000,977	663,628	89,117	37,930,823	41,684,545
7	75-15-0	Carbon disulfide	37,785,857	28,358	1,952	36	37,816,204
8	7664-38-2	Phosphoric acid	468,156	9,478,632	20,688	25,753,166	35,720,642
9	78-93-3	Methyl ethyl ketone	35,339,413	49,149	261,156	23,208	35,672,926
10	75-09-2	Dichloromethane	27,593,263	23,589	435,801	23,059	28,075,712
11	6484-52-2	Ammonium nitrate (solution)	366,673	3,164,796	23,215,809	674,977	27,422,255
12	7782-50-5	Chlorine	27,104,604	144,570	33,701	27,173	27,310,048
13	—	Manganese (and its compounds)	1,699,518	372,947	2,694	20,989,456	23,064,615
14	—	Copper (and its compounds)	1,225,111	62,414	106,237	17,470,958	18,864,720
15	100-42-5	Styrene	17,831,650	34,276	113,769	218,078	18,197,774
16	74-85-1	Ethylene	15,963,345	12,444	0	0	15,975,788
17	71-36-3	n-Butyl alcohol	12,746,233	22,985	805,994	980	13,576,191
18	79-01-6	Trichloroethylene	13,476,312	758	131	2,003	13,479,203
19	7664-93-9	Sulfuric acid	10,821,484	41,634	690,180	233,513	11,786,810
20	108-10-1	Methyl isobutyl ketone	11,410,372	36,361	59,683	5,862	11,512,278
21	—	Chromium (and its compounds)	514,884	81,199	17,283	9,879,636	10,493,002
22	7697-37-2	Nitric acid	1,147,031	75,963	8,285,560	179,161	9,687,715
23	115-07-1	Propylene	9,227,880	2,079	0	0	9,229,959
24	50-00-0	Formaldehyde	5,181,806	176,304	3,509,982	67,626	8,935,718
25	75-05-8	Acetonitrile	513,125	6,612	7,757,678	1,464	8,278,879
		Subtotal	**560,138,845**	**26,044,933**	**134,188,233**	**117,385,807**	**837,757,818**
		% of Total TRI Releases	**88.3**	**88.3**	**88.1**	**91.5**	**88.7**
		Total TRI Releases	**634,554,192**	**29,509,572**	**152,298,373**	**128,262,311**	**944,624,448**

Figure 5–7 TOP SIX CHEMICALS FOR TOTAL RELEASES IN NPRI AND/OR TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)

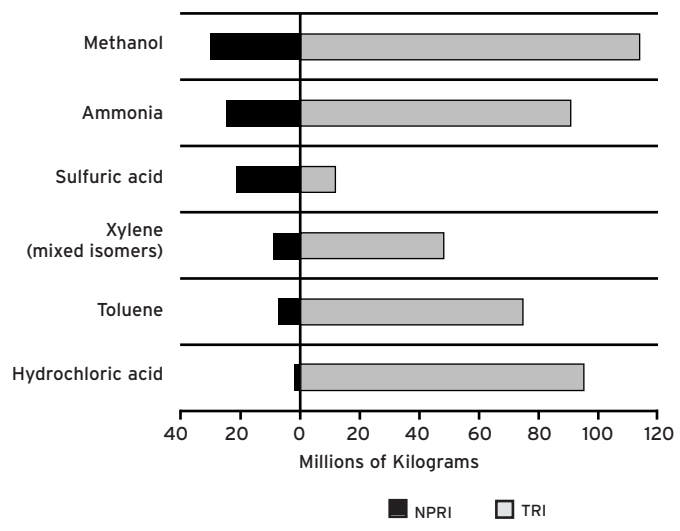
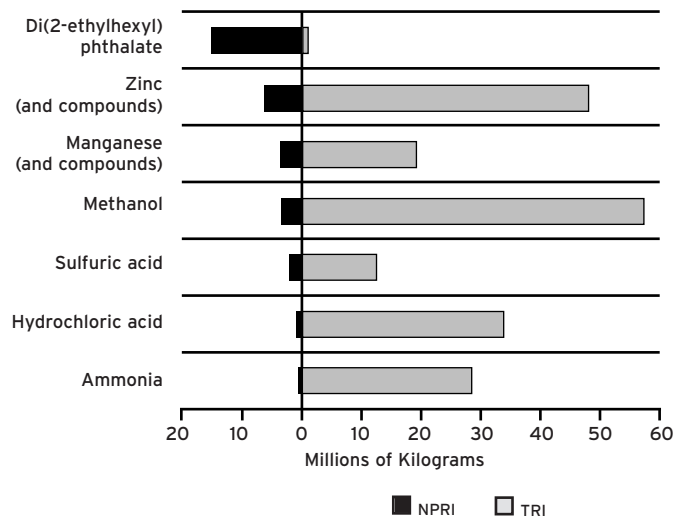


Figure 5–8 TOP SEVEN CHEMICALS FOR TOTAL TRANSFERS IN NPRI AND/OR TRI, 1994 (MATCHED CHEMICALS/INDUSTRIES)



Tables 5–17 and **5–18** present the 25 chemicals from the matched data set with the largest reported transfers in NPRI and TRI, respectively. Eighteen chemicals appear on both tables, but among the top six, only three are the same: zinc (and its compounds), manganese, and methanol. **Figure 5–8** graphically compares transfers of chemicals selected from the top seven in either NPRI or TRI [i.e., zinc, manganese and methanol are common to the top seven of both data sets; toluene and xylene from NPRI are omitted from this consideration; ethylene glycol and 1,2,4-trichlorobenzene from TRI are similarly omitted; and di(2-ethylhexyl) phthalate from the NPRI data is featured even though its TRI amounts place it below the top seven in that database].

As with releases, the top chemicals for transfers in the matched data set are much the same as in the full TRI database. The exceptions, not appearing in the matched data set, are glycol ethers and barium and its compounds, which are not NPRI chemicals (see **Table 5-19**). In comparison with NPRI data, diethanolamine no longer ranks in the top 25 because the large releases of it come from non-manufacturers, and acetone is missing because it was deleted from the TRI chemical list for 1994 (see **Table 4-6**, in comparison). Two NPRI chemicals have dropped in rank—aluminum (fume or dust) from second to twenty-second, and copper (and its compounds) from third to fifteenth—each because of a large transfer reported by a single non-manufacturing facility.

Table 5-20 presents the top 10 chemicals in each release and transfer category for NPRI. This table shows that methanol ranks first because it is released in sufficient amounts to place it in the top 10 in all NPRI release categories. Furthermore, methanol is one of the top 10 chemicals in two transfer categories. Similarly, ammonia is ranked second because it falls in the top 10 for two release categories and for all transfer categories. While the pattern differs slightly from that seen in the unmatched data, the clustering among chemicals ranked highly in the matched data set for releases or transfers is still quite striking. While theoretically 70 chemicals (seven release/transfer categories with 10 top chemicals in each) could be represented, only 28 are (one more than in the unmatched data). Twenty-one of these 28 are in the top 10 list for at least two categories.

Table 5-21 presents the top 10 chemicals in each release and transfer category for TRI. This table shows that methanol and ammonia rank highest because they are released in sufficient amounts to place them in the top 10 for all TRI release categories. Methanol also ranks first and second in two of three transfer categories, while ammonia ranks second in one transfer category (the same as in the unmatched data set). Again, the clustering seen among chemicals ranked highly for releases or transfers is quite striking. While theoretically 70 chemicals (seven release/transfer categories with 10 top chemicals each) could be represented, only 31 are, and 20 of these 31 are in the top 10 list for at least two categories.

5.6 CHEMICALS REPORTED (continued)

Table 5–17

THE 25 CHEMICALS WITH THE LARGEST NPRI TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
1	117-81-7	Di(2-ethylhexyl) phthalate	38,931	0	14,852,208	14,891,139
2	—	Zinc (and its compounds)	1,155,613	14,791	5,242,285	6,412,689
3	—	Manganese (and its compounds)	1,182,729	4,023	2,505,702	3,692,454
4	67-56-1	Methanol	3,271,197	58,125	113,076	3,442,398
5	7664-93-9	Sulfuric acid	490,920	100,785	1,418,569	2,010,274
6	108-88-3	Toluene	1,846,670	1,047	24,507	1,872,224
7	1330-20-7	Xylene (mixed isomers)	1,238,708	56,705	66,242	1,361,655
8	—	Lead (and its compounds)	550,319	2,314	700,502	1,253,135
9	—	Chromium (and its compounds)	498,778	8,094	495,435	1,002,307
10	7647-01-0	Hydrochloric acid	169,839	681,770	48,737	900,346
11	67-63-0	Isopropyl alcohol (manufacturing)	440,462	64,898	210,845	716,205
12	1332-21-4	Asbestos (friable)	0	0	645,780	645,780
13	78-93-3	Methyl ethyl ketone	603,338	181	3,218	606,737
14	7664-38-2	Phosphoric acid	57,956	63,089	438,645	559,690
15	—	Copper (and its compounds)	228,622	5,376	278,397	512,395
16	—	Nickel (and its compounds)	187,971	3,529	304,969	496,469
17	108-05-4	Vinyl acetate	464,347	628	1	464,976
18	108-95-2	Phenol	319,714	49,785	22,091	391,590
19	7664-41-7	Ammonia	232,671	137,401	1,376	371,448
20	100-42-5	Styrene	255,541	528	54,149	310,218
21	80-62-6	Methyl methacrylate	258,100	6	5,200	263,306
22	7429-90-5	Aluminum (fume or dust)	9,940	0	250,112	260,052
23	7697-37-2	Nitric acid	139,445	65,870	26,125	231,440
24	107-21-1	Ethylene glycol	145,291	58,270	25,423	228,984
25	71-36-3	n-Butyl alcohol	202,265	13,530	7,677	223,472
		Subtotal	**13,989,367**	**1,390,745**	**27,741,271**	**43,121,383**
		% of Total NPRI Transfers	**93.2**	**94.0**	**98.7**	**96.7**
		Total NPRI Transfers	**15,011,219**	**1,479,110**	**28,114,247**	**44,604,576**

Table 5–18

THE 25 CHEMICALS WITH THE LARGEST TRI TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
1	67-56-1	Methanol	14,620,378	41,992,357	1,025,813	57,638,548
2	—	Zinc (and its compounds)	4,962,483	231,724	43,500,004	48,694,212
3	7647-01-0	Hydrochloric acid	19,894,224	8,704,170	5,567,625	34,166,020
4	7664-41-7	Ammonia	3,503,036	24,710,504	732,783	28,946,323
5	—	Manganese (and its compounds)	2,003,027	205,948	17,200,030	19,409,006
6	107-21-1	Ethylene glycol	7,212,703	7,379,593	706,946	15,299,243
7	120-82-1	1,2,4-Trichlorobenzene	13,352,194	45,942	23,995	13,422,131
8	7664-93-9	Sulfuric acid	6,344,536	2,929,021	3,770,159	13,043,715
9	—	Lead (and its compounds)	2,754,801	40,688	10,141,585	12,937,075
10	—	Copper (and its compounds)	1,452,406	124,485	10,764,278	12,341,170
11	108-88-3	Toluene	9,733,376	425,457	401,569	10,560,402
12	—	Chromium (and its compounds)	2,448,913	192,698	7,103,983	9,745,594
13	7697-37-2	Nitric acid	4,759,332	1,539,941	1,599,215	7,898,488
14	7783-20-2	Ammonium sulfate (solution)	1,450,871	4,908,901	19,662	6,379,433
15	7429-90-5	Aluminum (fume or dust)	66,912	4,157	5,621,027	5,692,097
16	75-09-2	Dichloromethane	5,123,861	378,731	133,354	5,635,946
17	—	Nickel (and its compounds)	1,212,708	98,125	3,643,202	4,954,035
18	1330-20-7	Xylene (mixed isomers)	3,755,024	292,713	532,934	4,580,671
19	6484-52-2	Ammonium nitrate (solution)	44,904	2,061,988	1,796,635	3,903,528
20	100-42-5	Styrene	1,804,741	53,460	2,018,513	3,876,714
21	7664-38-2	Phosphoric acid	932,764	1,718,383	1,141,610	3,792,757
22	108-95-2	Phenol	1,321,078	1,274,546	726,013	3,321,637
23	78-93-3	Methyl ethyl ketone	2,731,885	185,110	138,115	3,055,110
24	—	Antimony (and its compounds)	261,022	62,421	1,984,492	2,307,935
25	75-05-8	Acetonitrile	1,726,975	463,349	30,336	2,220,659
		Subtotal	**113,474,156**	**100,024,413**	**120,323,878**	**333,822,446**
		% of Total TRI Transfers	**82.9**	**91.7**	**92.6**	**88.8**
		Total TRI Transfers	**136,908,496**	**109,029,867**	**129,982,489**	**375,920,852**

5.6 CHEMICALS REPORTED (continued)

Table 5–19

THE 25 CHEMICALS WITH THE LARGEST TRI TRANSFERS, 1994 (ALL CHEMICALS/INDUSTRIES)

Rank	CAS Number	Chemical	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
1	67-56-1	Methanol	14,630,490	41,992,416	1,026,040	57,648,946
2	—	Zinc (and its compounds)	4,982,323	231,851	43,500,958	48,715,133
3	7647-01-0	Hydrochloric acid	19,895,684	8,726,313	5,577,367	34,199,364
4	7664-41-7	Ammonia	3,503,036	24,750,056	732,785	28,985,878
5	—	Manganese (and its compounds)	2,003,689	205,951	17,200,130	19,409,770
6	107-21-1	Ethylene glycol	7,276,313	7,404,188	751,777	15,432,278
7	120-82-1	1,2,4-Trichlorobenzene	13,352,194	45,942	23,995	13,422,131
8	7664-93-9	Sulfuric acid	6,353,721	2,954,354	3,771,828	13,079,902
9	—	Lead (and its compounds)	2,754,809	40,688	10,154,176	12,949,673
10	—	Copper (and its compounds)	1,456,744	126,533	10,848,357	12,431,634
11	108-88-3	Toluene	9,877,804	426,431	426,693	10,730,929
12	—	Chromium (and its compounds)	2,452,300	194,003	7,181,083	9,827,385
13	7697-37-2	Nitric acid	4,759,431	1,552,740	1,604,133	7,916,304
14	—	Glycol ethers	1,914,819	5,052,490	325,683	7,292,992
15	7783-20-2	Ammonium sulfate (solution)	1,450,871	4,908,901	19,662	6,379,433
16	75-09-2	Dichloromethane	5,196,709	378,738	138,800	5,714,246
17	7429-90-5	Aluminum (fume or dust)	66,912	4,157	5,621,027	5,692,097
18	—	Nickel (and its compounds)	1,213,171	98,354	3,646,670	4,958,195
19	1330-20-7	Xylene (mixed isomers)	3,889,571	292,887	545,669	4,728,127
20	7664-38-2	Phosphoric acid	990,076	1,754,663	1,180,849	3,925,588
21	6484-52-2	Ammonium nitrate (solution)	44,904	2,061,988	1,801,782	3,908,674
22	100-42-5	Styrene	1,833,182	53,460	2,020,785	3,907,427
23	108-95-2	Phenol	1,321,078	1,275,043	727,857	3,323,978
24	—	Barium (and its compounds)	687,829	95,660	2,413,672	3,197,161
25	78-93-3	Methyl ethyl ketone	2,787,832	186,279	189,816	3,163,928
		Subtotal	**114,695,494**	**104,814,087**	**121,431,593**	**340,941,174**
		% of Total TRI Transfers	**79.3**	**90.7**	**88.9**	**85.9**
		Total TRI Transfers	**144,585,185**	**115,505,141**	**136,599,949**	**396,690,275**

Table 5–20

TOP 10 NPRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES
(MATCHED CHEMICALS/INDUSTRIES)

		Rankings by Release/Transfer Category						
CAS Number	Chemical	Air Emissions	Surface Water	Underground Injection	On-site Land	Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment
67-56-1	Methanol	2	2	3	7	1	8	–
7664-41-7	Ammonia	1	3	1	–	–	2	–
7664-93-9	Sulfuric acid	6	1	–	–	9	3	4
—	Manganese (and its compounds)	–	7	–	2	4	–	3
—	Zinc (and its compounds)	–	8	–	1	5	–	2
1330-20-7	Xylene (mixed isomers)	3	–	10	–	3	9	–
78-93-3	Methyl ethyl ketone	5	–	4	–	6	–	–
108-88-3	Toluene	4	–	9	–	2	–	–
—	Lead (and its compounds)	–	–	–	4	7	–	5
6484-52-2	Ammonium nitrate (solution)	–	4	2	–	–	–	–
7647-01-0	Hydrochloric acid	–	10	8	9	–	1	–
—	Chromium (and its compounds)	–	–	–	5	8	–	7
117-81-7	Di(2-ethylhexyl) phthalate	–	–	–	8	–	–	1
50-00-0	Formaldehyde	–	6	5	–	–	–	–
1332-21-4	Asbestos (friable)	–	–	–	6	–	–	6
—	Copper (and its compounds)	–	–	–	3	–	–	10
7664-38-2	Phosphoric acid	–	–	–	–	–	6	8
7783-20-2	Ammonium sulfate (solution)	–	5	–	–	–	10	–
7697-37-2	Nitric acid	–	–	–	–	–	4	–
107-21-1	Ethylene glycol	–	9	–	–	–	7	–
71-43-2	Benzene	9	–	7	–	–	–	–
67-63-0	Isopropyl alcohol (manufacturing)	–	–	–	–	–	5	–
75-65-0	tert-Butyl alcohol	–	–	6	–	–	–	–
110-82-7	Cyclohexane	7	–	–	–	–	–	–
—	Nickel (and its compounds)	–	–	–	10	–	–	9
74-85-1	Ethylene	8	–	–	–	–	–	–
108-05-4	Vinyl acetate	–	–	–	–	10	–	–
75-09-2	Dichloromethane	10	–	–	–	–	–	–

5.6 CHEMICALS REPORTED (continued)

Table 5–20
TOP 10 NPRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES (MATCHED CHEMICALS/INDUSTRIES)

Table 5–21
TOP 10 TRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES (MATCHED CHEMICALS/INDUSTRIES)

Table 5–21
TOP 10 TRI CHEMICALS FOR RELEASE/TRANSFER CATEGORIES (MATCHED CHEMICALS/INDUSTRIES)

		Rankings by Release/Transfer Category						
CAS Number	Chemical	Air Emissions	Surface Water	Underground Injection	On-site Land	Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment
67-56-1	Methanol	1	3	4	8	2	1	–
7664-41-7	Ammonia	3	2	3	7	–	2	–
7647–01-0	Hydrochloric acid	7	–	1	–	1	3	7
—	Zinc (and its compounds)	–	6	–	1	8	–	1
7664-38-2	Phosphoric acid	–	1	–	2	–	8	–
—	Manganese (and its compounds)	–	7	–	3	–	–	2
6484-52-2	Ammonium nitrate (solution)	–	4	2	–	–	7	–
107-21-1	Ethylene glycol	–	8	10	–	5	4	–
108-88-3	Toluene	2	–	–	–	4	–	–
—	Copper (and its compounds)	–	–	–	4	–	–	3
7664-93-9	Sulfuric acid	–	–	–	–	6	6	8
—	Chromium (and its compounds)	–	–	–	5	–	–	5
—	Lead (and its compounds)	–	–	–	6	–	–	4
7783-20-2	Ammonium sulfate (solution)	–	5	–	–	–	5	–
7697-37-2	Nitric acid	–	–	5	–	9	9	–
1330-20-7	Xylene (mixed isomers)	4	–	–	–	10	–	–
120-82-1	1,2,4-Trichlorobenzene	–	–	–	–	3	–	–
75-09-2	Dichloromethane	8	–	–	–	7	–	–
50-00-0	Formaldehyde	–	9	7	–	–	–	–
75-15-0	Carbon disulfide	5	–	–	–	–	–	–
75-05-8	Acetonitrile	–	–	6	–	–	–	–
7429-90-5	Aluminum (fume or dust)	–	–	–	–	–	–	6
78-93-3	Methyl ethyl ketone	6	–	–	–	–	–	–
—	Nickel (and its compounds)	–	–	–	9	–	–	9
79-10-7	Acrylic acid	–	–	8	–	–	–	–
79-06-1	Acrylamide	–	–	9	–	–	–	–
100-42-5	Styrene	10	–	–	–	–	–	10
7782-50-5	Chlorine	9	–	–	–	–	–	–
67-66-3	Chloroform	–	10	–	–	–	–	–
108-95-2	Phenol	–	–	–	–	–	10	–
—	Arsenic (and its compounds)	–	–	–	10	–	–	–

5.7 INDUSTRY REPORTING

In both countries, the largest reported total releases and transfers in the matched data set come from the chemical, paper products, and primary metal products industries (see **Tables 5-22** and **5-23**). Chemical manufacturers report the largest releases in both countries, while the largest transfers are reported by the chemical industry in TRI, but the rubber and plastics industry did so in NPRI. Two Canadian facilities in the rubber and plastics industry report transfers to disposal totaling 15 million kilograms; without those two forms, the primary metal products industry would rank first for transfers in NPRI. These data substantially agree with those in the unmatched data set.

The paper products industry ranks second for total releases and transfers in NPRI and third in TRI, while the primary metal products industry is second in TRI and third in NPRI. (Metal mining, the third-highest industry in the unmatched NPRI data, is a non-manufacturing industry and, therefore, is not included in the matched data set.) Two factors help explain this reversal: the primary metal products industry submits more forms, proportionately, than the paper products industry to TRI (6,465 versus 2,286) than to NPRI (605 versus 339), and, as described above, the reported average total releases and transfers per form from Canadian paper products facilities are almost exactly double those of US paper products manufacturers (105,257 kg/form versus 58,992 kg/form). For comparison, we might note that Canadian chemical facilities and primary metal products manufacturers each report average total releases and transfers

Table 5–22

NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994
(MATCHED CHEMICALS/INDUSTRIES)

Rank	US SIC Code	Industry	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	% of Total
14	20	Food Products	147	56,139	500,737	556,876	0.3
13	22	Textile Mill Products	23	549,937	12,284	562,221	0.3
19	23	Apparel and Other Textile Products	2	0	0	0	0.0
11	24	Lumber and Wood Products	119	794,755	84,994	879,749	0.5
12	25	Furniture and Fixtures	25	530,200	65,091	595,291	0.3
2	26	Paper Products	339	32,380,362	3,301,686	35,682,048	19.2
9	27	Printing and Publishing	46	1,359,797	217,893	1,577,690	0.9
1	28	Chemicals	1,559	55,144,851	6,898,124	62,042,975	33.4
5	29	Petroleum and Coal Products	410	10,826,300	624,706	11,451,006	6.2
4	30	Rubber and Plastics Products	303	6,394,135	15,992,848	22,386,983	12.1
17	31	Leather Products	6	50,065	22,211	72,276	0.0
8	32	Stone/Clay/Glass Products	103	2,541,641	337,545	2,879,186	1.6
3	33	Primary Metal Industries	605	20,686,353	11,283,450	31,969,803	17.2
7	34	Fabricated Metal Products	419	1,860,304	2,845,462	4,705,766	2.5
15	35	Industrial Machinery	69	223,113	113,845	336,958	0.2
10	36	Electronic/Electrical Equipment	106	464,316	743,673	1,207,989	0.7
6	37	Transportation Equipment	285	6,892,186	1,556,638	8,448,824	4.6
18	38	Measurement/Photographic Instruments	2	12,020	0	12,020	0.0
16	39	Misc. Manufacturing Industries	30	139,877	3,389	143,266	0.1
		Total NPRI Releases and Transfers	**4,598**	**140,906,351**	**44,604,576**	**185,510,927**	**100.0**

5.7 INDUSTRY REPORTING

Table 5–22
NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

Table 5–23
TRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

Table 5–23
TRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

Rank	SIC Code	Industry	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	% of Total
9	20	Food Products	3,647	14,505,678	12,994,267	27,499,945	2.1
20	21	Tobacco Products	24	641,980	32,674	674,654	0.1
16	22	Textile Mill Products	753	7,671,805	2,889,379	10,561,184	0.8
21	23	Apparel and Other Textile Products	54	485,877	96,253	582,130	0.0
13	24	Lumber and Wood Products	1,815	14,527,137	313,089	14,840,226	1.1
10	25	Furniture and Fixtures	1,498	21,910,116	936,662	22,846,778	1.7
3	26	Paper Products	2,286	111,048,531	23,808,195	134,856,727	10.2
12	27	Printing and Publishing	462	14,691,650	284,418	14,976,068	1.1
1	28	Chemicals	18,905	365,324,590	151,348,682	516,673,272	39.1
8	29	Petroleum and Coal Products	2,940	24,918,973	4,345,919	29,264,893	2.2
5	30	Rubber and Plastics Products	3,478	47,220,318	7,892,252	55,112,570	4.2
19	31	Leather Products	223	1,205,225	1,678,694	2,883,919	0.2
14	32	Stone/Clay/Glass Products	1,389	8,592,759	3,419,237	12,011,996	0.9
2	33	Primary Metal Industries	6,465	138,324,536	100,558,022	238,882,558	18.1
7	34	Fabricated Metal Products	8,021	27,762,141	17,309,605	45,071,746	3.4
15	35	Industrial Machinery	2,615	9,290,150	2,402,692	11,692,842	0.9
11	36	Electronic/Electrical Equipment	3,321	11,434,201	10,257,844	21,692,046	1.6
6	37	Transportation Equipment	4,047	45,540,328	8,758,892	54,299,220	4.1
17	38	Measurement/Photographic Instruments	659	6,338,021	2,545,342	8,883,363	0.7
18	39	Misc. Manufacturing Industries	739	5,870,488	1,198,277	7,068,765	0.5
4		Multiple codes 20–39	4,964	67,319,944	22,850,455	90,170,399	6.8
		Total TRI Releases and Transfers	**68,305**	**944,624,448**	**375,920,852**	**1,320,545,300**	**100.0**

per form somewhat more than 40 percent higher than their US counterparts (39,797 kg/form and 52,843 kg/form versus 27,330 kg/form and 36,950 kg/form).

Facilities reporting "multiple codes" — more than one SIC code—rank fourth for total releases and transfers in the United States. Canadian facilities report only the SIC code that best categorizes their operations, so this group does not appear in NPRI data. Rubber and plastics products manufacturing, because of its transfers described above, ranks fourth for total releases and transfers in Canada (it ranked fifth in the unmatched data, which did include metal mining).

Table 5–24

NPRI RELEASES AND TRANSFERS BY ACTIVITY/USE TYPE, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Type of Activity/Use	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
Manufacture Only	534	27,085,041	3,553,948	30,638,989
Process Only	1,899	27,785,801	25,512,698	53,298,499
Other Uses Only	1,066	27,146,694	6,431,644	33,578,338
Manufacture and Process	555	33,221,063	5,284,289	38,505,352
Manufacture and Other Uses	110	4,622,141	264,455	4,886,596
Process and Other Uses	286	7,172,067	1,788,224	8,960,291
All Three Activity/Uses	148	13,873,544	1,769,318	15,642,862
Total	**4,598**	**140,906,351**	**44,604,576**	**185,510,927**
	%	**%**	**%**	**%**
Manufacture Only	11.6	19.2	8.0	16.5
Process Only	41.3	19.7	57.2	28.7
Other Uses Only	23.2	19.3	14.4	18.1
Manufacture and Process	12.1	23.6	11.8	20.8
Manufacture and Other Uses	2.4	3.3	0.6	2.6
Process and Other Uses	6.2	5.1	4.0	4.8
All Three Activity/Uses	3.2	9.8	4.0	8.4
Total	**100.0**	**100.0**	**100.0**	**100.0**

5.8 CHEMICAL USE CATEGORIES

NPRI and TRI data forms indicate how the reporting facility uses the chemical concerned. There are three major use categories—chemicals are manufactured, processed, and/or "otherwise used"—with subcategories in each. **Tables 5–24** and **5–25** break down releases and transfers for each of the three major categories. For NPRI facilities, 12 percent of the forms indicate that the chemical is only manufactured, while fewer than 6 percent of TRI forms show manufacturing as the sole activity. The largest percentage of both NPRI and TRI forms indicate that the chemical is processed only (41 percent in each PRTR). NPRI facilities also indicate that the chemical is used in some combination of the three major activities in 24 percent of the cases; manufacture and processing is the combination most often reported. For TRI facilities, combinations of activities are reported on 18 percent of the forms, with manufacture and processing as well as processing and other uses reported on about the same number of forms, almost 7 percent for each of these combinations.

Table 5–25
TRI RELEASES AND TRANSFERS BY ACTIVITY/USE TYPE, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Type of Activity/Use	Number of Forms	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
Manufacture Only	3,735	157,263,905	64,659,207	221,923,112
Process Only	28,161	113,000,271	86,426,327	199,426,598
Other Uses Only	23,773	223,159,470	92,400,697	315,560,166
Manufacture and Process	4,529	208,286,896	48,166,563	256,453,458
Manufacture and Other Uses	2,012	98,757,811	40,672,200	139,430,011
Process and Other Uses	4,724	66,172,178	29,468,277	95,640,455
All Three Activity/Uses	1,276	77,069,693	13,813,253	90,882,946
None Given	95	914,225	314,328	1,228,553
Total	**68,305**	**944,624,448**	**375,920,852**	**1,320,545,300**
	%	**%**	**%**	**%**
Manufacture Only	5.5	16.6	17.2	16.8
Process Only	41.2	12.0	23.0	15.1
Other Uses Only	34.8	23.6	24.6	23.9
Manufacture and Process	6.6	22.0	12.8	19.4
Manufacture and Other Uses	2.9	10.5	10.8	10.6
Process and Other Uses	6.9	7.0	7.8	7.2
All Three Activity/Uses	1.9	8.2	3.7	6.9
None Given	0.1	0.1	0.1	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 5–26
PROJECTIONS OF TOTAL RELEASES AND TRANSFERS, NPRI AND TRI, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

	1994 (kg)	Projections 1995 (kg)	% Change 1994–1995	Projections 1996 (kg)	% Change 1994–1996
NPRI	185,510,927	161,546,189	-12.9	139,963,686	-24.6
TRI*	1,292,950,017	1,248,281,556	-3.5	1,216,681,389**	-5.9

* Section 8.1 plus 8.7 on TRI Form R
**One US TRI form erroneously projecting 93 million kilograms for 1996 was not included.

5.9 PROJECTIONS FOR FUTURE RELEASES AND TRANSFERS

NPRI facilities project their total releases and total transfers three years into the future, while TRI facilities report projections in seven waste-management categories two years ahead. To compare projections then, one need consider the data only for the next two years and in the two TRI categories (quantity released/disposed of and quantity treated off-site) that correspond to releases and transfers for the matched subset of chemicals and industries, as was done for the full databases in **section 3.6** above. **Table 5–26** shows these projections for NPRI and TRI. NPRI facilities in the set of matched data projected a decrease in total releases and transfers of 13 percent from 1994 to 1995 and 25 percent from 1994 to 1996. Matched TRI facilities projected much smaller decreases: less than four percent from 1994 to 1995 and six percent from 1994 to 1996. These values are quite similar to what was seen in the unmatched data set.

As was concluded in earlier chapters, comparisons between percentage decreases projected by NPRI facilities in 1994 and actual percentage decreases reported to TRI in its first years are not so disparate.

Table 5–27

DISTRIBUTION OF FORMS WITH PROJECTED CHANGES IN TOTAL RELEASES AND TRANSFERS, 1994–1996

NPRI

Change 1994–1995	Number of Forms	% of Total	1994 (kg)	Projections 1995 (kg)	% Change 1994–1995
Decrease	1,396	30.4	89,602,927	52,788,615	-41.1
Increase	1,048	22.8	64,290,305	77,139,879	20.0
Stay Same	2,154	46.8	31,617,695	31,617,695	0.0
Total	**4,598**	**100.0**	**185,510,927**	**161,546,189**	**-12.9**

Change 1994–1996	Number of Forms	% of Total	1994 (kg)	Projections 1996 (kg)	% Change 1994–1996
Decrease	1,527	33.2	104,158,311	46,051,947	-55.8
Increase	1,014	22.1	51,527,662	64,086,785	24.4
Stay Same	2,057	44.7	29,824,954	29,824,954	0.0
Total	**4,598**	**100.0**	**185,510,927**	**139,963,686**	**-24.6**

TRI*

Change 1994–1995	Number of Forms	% of Total	1994 (kg)	Projections 1995 (kg)	% Change 1994–1995
Decrease	19,976	29.2	507,440,939	363,376,732	-28.4
Increase	20,883	30.6	507,713,653	607,109,396	19.6
Stay Same	27,448	40.2	277,796,698	277,796,698	0.0
Total	**68,307**	**100.0**	**1,292,951,290**	**1,248,282,826**	**-3.5**

Change 1994–1996	Number of Forms	% of Total	1994 (kg)	Projections 1996 (kg)	% Change 1994–1996
Decrease	20,976	30.7	563,202,762	360,953,022	-35.9
Increase	20,909	30.6	492,458,711	618,439,821	25.6
Stay Same	26,422	38.7	237,289,816	237,289,816	0.0
Total	**68,307**	**100.0**	**1,292,951,290**	**1,216,682,659**	**-5.9**

* One form erroneously projecting 93 million kilograms for 1996 was not included.

TRI facilities reported a 19 percent decrease from 1988 to 1990, compared to the 25 percent decrease projected by NPRI facilities for 1994 to 1996 (see **Figure 4–6**).

Table 5–27 divides NPRI and TRI forms, and the data on total releases and transfers that they contain, into those that project decreases, increases, or no change in the quantities. About the same proportion of forms, 30 percent, projected decreases in total releases and transfers from 1994 to 1995 for both the NPRI and TRI databases. A lower percentage of NPRI forms (22 percent) projected increases, compared to 31 percent for TRI. Thus, the greater projected reductions in NPRI do not represent a higher proportion of chemicals and facilities projecting reductions, but rather a quantitatively larger reduction projected on the average NPRI form.

Projected changes from 1994 to 1996 for individual chemicals varied widely from the average for both countries and between the countries. In NPRI, among the 25 chemicals with the largest total releases and transfers, styrene had the second greatest projected change, a decrease of 60 percent, while the same chemical in the TRI data reported a projected increase of 27 percent (see **Tables 5–28** and **5–29**). Sulfuric acid in NPRI had the greatest projected change because of one form projecting a decrease from 15 million kilograms to 14,000 kilograms. The facility reporting this chemical has investigated selling its excess sulfuric acid rather than discharging it into surface waters.

5.9 PROJECTIONS FOR FUTURE RELEASES AND TRANSFERS (continued)

Table 5–27
DISTRIBUTION OF FORMS WITH PROJECTED CHANGES IN TOTAL RELEASES AND TRANSFERS, 1994–1996

Table 5–28
PROJECTED CHANGE FOR THE 25 CHEMICALS WITH LARGEST NPRI TOTAL RELEASES AND TRANSFERS, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

Tables 5–30 and **5–31** present the projected changes by industry. In both NPRI and TRI, the chemical industry, which has the largest total releases and transfers, projected the greatest change from 1994 to 1996, and this represented a larger-than-average percentage decrease. Again, the NPRI reduction was proportionally larger than that for TRI (28 percent versus 7 percent). In NPRI, the paper-products industry reported the second largest total release and transfer amounts and projected a 40 percent decrease from 1994 to 1996, while in TRI this same industry projected a 4 percent decrease. In TRI, the primary metal products industry reported the second-largest total release and transfer amounts and projected essentially no change from 1994 to 1996, while in NPRI this industry projected a 12 percent decrease, about half the Canadian national average.

Table 5–28 PROJECTED CHANGE FOR THE 25 CHEMICALS WITH LARGEST NPRI TOTAL RELEASES AND TRANSFERS, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Number of Forms	1994 Total Releases and Transfers (kg)	Projected Change 1994–1995 kg	Projected Change 1994–1995 %	Projected Change 1994–1996 kg	Projected Change 1994–1996 %
67-56-1	Methanol	209	33,175,195	-989,378	-3.0	-10,151,655	-30.6
7664-41-7	Ammonia	130	24,842,014	245,331	1.0	-1,589,542	-6.4
7664-93-9	Sulfuric acid	307	23,227,969	-12,237,714	-52.7	-17,404,562	-74.9
117-81-7	Di(2-ethylhexyl) phthalate	31	14,983,943	-7,549,075	-50.4	-7,189,306	-48.0
—	Zinc (and its compounds)	280	12,256,537	2,060,049	16.8	1,758,734	14.3
1330-20-7	Xylene (mixed isomers)	203	9,827,019	-1,049,933	-10.7	-2,169,139	-22.1
108-88-3	Toluene	236	9,212,863	-577,476	-6.3	-1,021,312	-11.1
—	Manganese (and its compounds)	184	6,767,006	-985,254	-14.6	-988,585	-14.6
78-93-3	Methyl ethyl ketone	121	4,975,943	-197,968	-4.0	-408,486	-8.2
—	Lead (and its compounds)	127	3,065,761	213,024	6.9	119,960	3.9
110-82-7	Cyclohexane	35	2,794,383	94,691	3.4	174,734	6.3
67-63-0	Isopropyl alcohol (manufacturing)	167	2,762,348	-275,879	-10.0	-389,424	-14.1
71-43-2	Benzene	49	2,572,207	-318,877	-12.4	-540,626	-21.0
74-85-1	Ethylene	41	2,507,911	37,816	1.5	-91,417	-3.6
7647-01-0	Hydrochloric acid	177	2,249,576	-42,845	-1.9	-177,894	-7.9
75-09-2	Dichloromethane	45	2,199,854	-112,925	-5.1	-202,703	-9.2
100-42-5	Styrene	71	2,089,666	-580,303	-27.8	-1,248,090	-59.7
—	Copper (and its compounds)	195	2,069,374	80,670	3.9	-24,202	-1.2
7782-50-5	Chlorine	119	2,031,046	-431,774	-21.3	-770,108	-37.9
6484-52-2	Ammonium nitrate (solution)	18	1,929,080	-44,948	-2.3	-131,948	-6.8
—	Chromium (and its compounds)	183	1,800,866	94,346	5.2	55,272	3.1
10049-04-4	Chlorine dioxide	42	1,735,537	-462,972	-26.7	-730,132	-42.1
71-36-3	n-Butyl alcohol	68	1,471,861	-76,320	-5.2	-49,421	-3.4
50-00-0	Formaldehyde	70	1,313,713	-176,448	-13.4	-247,358	-18.8
74-87-3	Chloromethane	2	1,176,900	-146,900	-12.5	-146,900	-12.5
	Subtotal	**3,110**	**173,038,572**	**-23,431,062**	**-13.5**	**-43,564,110**	**-25.2**
	% of Total	**67.6**	**93.3**				
	Total	**4,598**	**185,510,927**	**-23,964,738**	**-12.9**	**-45,547,241**	**-24.6**

Table 5–29

PROJECTED CHANGE FOR THE 25 CHEMICALS WITH LARGEST TRI TOTAL RELEASES AND TRANSFERS, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Number of Forms	1994 Total Releases and Transfers (kg)	Projected Change 1994–1995		Projected Change 1994–1996	
				kg	%	kg	%
67-56-1	Methanol	2,421	175,272,227	-8,161,844	-4.7	-18,228,922	-10.4
7647-01-0	Hydrochloric acid	3,275	134,874,242	-1,984,067	-1.5	-1,770,426	-1.3
7664-41-7	Ammonia	2,940	119,127,002	-4,733,200	-4.0	1,832,872	1.5
108-88-3	Toluene	3,503	82,335,663	-6,469,422	-7.9	-9,157,295	-11.1
—	Zinc (and its compounds)*	2,861	81,239,919	5,394,777	6.6	4,308,955	5.3
1330-20-7	Xylene (mixed isomers)	3,284	53,560,457	-4,159,473	-7.8	-6,075,207	-11.3
—	Manganese (and its compounds)	2,365	40,704,492	289,326	0.7	2,252,688	5.5
78-93-3	Methyl ethyl ketone	2,347	38,916,498	-4,092,816	-10.5	-6,101,370	-15.7
75-15-0	Carbon disulfide	82	38,500,933	2,332,982	6.1	-2,781,462	-7.2
75-09-2	Dichloromethane	1,006	35,994,553	-5,862,003	-16.3	-8,097,897	-22.5
—	Copper (and its compounds)	3,932	33,688,341	-6,702,959	-19.9	-6,416,028	-19.0
6484-52-2	Ammonium nitrate (solution)	225	29,559,863	-4,316,937	-14.6	-4,450,204	-15.1
7664-38-2	Phosphoric acid	2,694	29,139,300	-608,234	-2.1	-3,480,972	-11.9
7782-50-5	Chlorine	1,397	27,816,157	3,721,489	13.4	3,719,380	13.4
7664-93-9	Sulfuric acid	3,851	27,005,068	7,488,286	27.7	-4,414,026	-16.3
107-21-1	Ethylene glycol	1,283	22,379,150	571,743	2.6	-1,826,820	-8.2
100-42-5	Styrene	1,477	21,763,304	62,366	0.3	5,833,532	26.8
—	Chromium (and its compounds)	3,164	19,361,633	761,978	3.9	685,319	3.5
—	Lead (and its compounds)	1,650	17,780,303	-1,247,935	-7.0	-1,004,766	-5.7
7697-37-2	Nitric acid	1,811	17,359,114	1,049,660	6.0	-153,230	-0.9
7783-20-2	Ammonium sulfate (solution)	171	16,981,863	-8,479,265	-49.9	-281,756	-1.7
74-85-1	Ethylene	274	16,072,805	-414,541	-2.6	-1,164,152	-7.2
71-36-3	n-Butyl alcohol	1,131	15,501,615	-710,589	-4.6	-1,020,639	-6.6
79-01-6	Trichloroethylene	780	14,766,498	-2,877,399	-19.5	-5,089,298	-34.5
108-10-1	Methyl isobutyl ketone	1,020	12,493,397	-1,186,765	-9.5	-2,070,684	-16.6
	Subtotal	**48,944**	**1,122,194,399**	**-40,334,841**	**-3.6**	**-64,952,407**	**-5.8**
	% of Total	**71.7**	**86.8**				
	Total	**68,304**	**1,292,950,017**	**-44,668,461**	**-3.5**	**-76,268,628**	**-5.9**

* One form erroneously projecting 93 million kilograms for 1996 was not included.

5.9 PROJECTIONS FOR FUTURE RELEASES AND TRANSFERS (continued)

Table 5–29
PROJECTED CHANGE FOR THE 25 CHEMICALS WITH LARGEST TRI TOTAL RELEASES AND TRANSFERS, 1994–1996
(MATCHED CHEMICALS/INDUSTRIES)

Table 5–30
PROJECTED CHANGE IN NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994
(MATCHED CHEMICALS/INDUSTRIES)

Table 5–31 (following page)
PROJECTED CHANGE IN TRI TOTAL RELEASES AND TRANSFERS BY INDUSTRY, 1994–1996
(MATCHED CHEMICALS/INDUSTRIES)

Table 5–30
PROJECTED CHANGE IN NPRI RELEASES AND TRANSFERS BY INDUSTRY (US SIC CODE), 1994 (MATCHED CHEMICALS/INDUSTRIES)

US SIC Code	Industry	Number of Forms	1994 Total Releases and Transfers (kg)	Projected Change 1994–1995 kg	Projected Change 1994–1995 %	Projected Change 1994–1996 kg	Projected Change 1994–1996 %
20	Food Products	147	556,876	227,039	40.8	204,603	36.7
22	Textile Mill Products	23	562,221	-44,570	-7.9	-117,020	-20.8
23	Apparel and Other Textile Products	2	0	0	–	0	–
24	Lumber and Wood Products	119	879,749	81,287	9.2	101,994	11.6
25	Furniture and Fixtures	25	595,291	67,936	11.4	67,826	11.4
26	Paper Products	339	35,682,048	-3,588,443	-10.1	-14,282,466	-40.0
27	Printing and Publishing	46	1,577,690	-183,109	-11.6	-246,634	-15.6
28	Chemicals	1,559	62,042,975	-12,623,021	-20.3	-17,138,823	-27.6
29	Petroleum and Coal Products	410	11,451,006	-532,355	-4.6	-861,943	-7.5
30	Rubber and Plastics Products	303	22,386,983	-8,113,768	-36.2	-8,089,722	-36.1
31	Leather Products	6	72,276	-36,776	-50.9	-39,276	-54.3
32	Stone/Clay/Glass Products	103	2,879,186	-1,113,947	-38.7	-1,492,503	-51.8
33	Primary Metal Industries	605	31,969,803	1,283,855	4.0	-3,904,423	-12.2
34	Fabricated Metal Products	419	4,705,766	518,021	11.0	504,100	10.7
35	Industrial Machinery	69	336,958	-20,089	-6.0	-23,432	-7.0
36	Electronic/Electrical Equipment	106	1,207,989	-252,666	-20.9	-401,078	-33.2
37	Transportation Equipment	285	8,448,824	388,909	4.6	215,742	2.6
38	Measurement/Photographic Instruments	2	12,020	-1,890	-15.7	-11,890	-98.9
39	Misc. Manufacturing Industries	30	143,266	-21,151	-14.8	-32,296	-22.5
	Total	**4,598**	**185,510,927**	**-23,964,738**	**-12.9**	**-45,547,241**	**-24.6**

Table 5–31

PROJECTED CHANGE IN TRI TOTAL RELEASES AND TRANSFERS BY INDUSTRY, 1994–1996 (MATCHED CHEMICALS/INDUSTRIES)

SIC Code	Industry	Number of Forms	1994 Total Releases and Transfers (kg)	Projected Change 1994–1995		Projected Change 1994–1996	
				kg	%	kg	%
20	Food Products	3,647	26,796,973	-672,798	-2.5	-2,240,485	-8.4
21	Tobacco Products	24	674,672	-5,489	-0.8	1,885	0.3
22	Textile Mill Products	753	19,173,179	-8,980,413	-46.8	-9,290,428	-48.5
23	Apparel and Other Textile Products	54	589,577	-114,850	-19.5	-245,328	-41.6
24	Lumber and Wood Products	1,815	14,566,279	-909,915	-6.2	-958,886	-6.6
25	Furniture and Fixtures	1,498	23,145,237	-1,521,847	-6.6	-1,495,575	-6.5
26	Paper Products	2,286	133,598,816	1,047,712	0.8	-5,852,015	-4.4
27	Printing and Publishing	462	13,582,525	-308,290	-2.3	-559,494	-4.1
28	Chemicals	18,905	497,589,782	-19,139,287	-3.8	-34,019,700	-6.8
29	Petroleum and Coal Products	2,940	28,854,200	-1,204,028	-4.2	-1,603,120	-5.6
30	Rubber and Plastics Products	3,478	57,229,133	-6,071,652	-10.6	-2,267,460	-4.0
31	Leather Products	223	2,702,352	104,548	3.9	8,209,547	303.8
32	Stone/Clay/Glass Products	1,389	11,854,430	-738,903	-6.2	-1,202,451	-10.1
33	Primary Metal Industries*	6,464	233,669,684	10,332,265	4.4	89,461	0.0
34	Fabricated Metal Products	8,021	46,090,376	-5,882,468	-12.8	-6,940,346	-15.1
35	Industrial Machinery	2,615	11,623,270	-1,038,656	-8.9	-1,952,001	-16.8
36	Electronic/Electrical Equipment	3,321	21,615,945	-2,265,629	-10.5	-3,659,797	-16.9
37	Transportation Equipment	4,047	52,162,754	-1,912,883	-3.7	-3,605,839	-6.9
38	Measurement/Photographic Instruments	659	8,963,688	-972,539	-10.8	-1,544,420	-17.2
39	Misc. Manufacturing Industries	739	7,230,672	-961,803	-13.3	-1,005,248	-13.9
	Multiple codes 20–39	4,964	81,236,471	-3,451,535	-4.2	-6,126,929	-7.5
	Total	**68,304**	**1,292,950,017**	**-44,668,461**	**-3.5**	**-76,268,628**	**-5.9**

* One form erroneously projecting 93 million kilograms for 1996 was not included.

Key findings

- Parent companies whose Canadian facilities reported the largest releases and transfers are not the same companies as those whose US facilities reported the largest releases and transfers.
- In both NPRI and TRI, releases and transfers of OSHA carcinogens represented about 10 percent of total releases and transfers.
- Canadian facilities reported the reason for year-to-year changes in total releases and transfers. Firms whose combined reporting totaled more than 40 percent of both releases and transfers cited changes in production levels from 1993 to 1994 as the reason.
- US facilities reported the amount of year-to-year change and projections of future changes for separate categories of total production-related waste. Total production-related waste increased in 1994 and is projected to continue to increase.
- US facilities also reported on source reduction activity. The TRI data show that production-related waste is expected to increase less, and releases and transfers to decrease more, for facilities that reported source reduction activity during 1994.

6.1 INTRODUCTION

Some data common to both PRTRs can be refined for further comparisons. Parent company reporting and analyses of chemical groups of particular interest are two examples. In addition, differences in the particular data that must be reported in each country support analyses specific to one country or the other. This chapter presents these types of analyses.

Table 6–1

THE 10 PARENT COMPANIES WITH LARGEST NPRI RELEASES AND TRANSFERS, 1994
(ALL CHEMICALS/INDUSTRIES)

Parent Company	Number of Facilities	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
Kronos Canada Inc.	1	8	39,623	15,102,000	0	0	15,141,623
Samuel Bingham Company	2	2	0	0	0	0	0
BHP Minerals International	1	2	0	13,439,526	0	0	13,439,526
Sherritt Inc.	3	29	6,964,135	898,530	1,853,020	12,740	9,729,825
Cominco Ltd.	4	30	823,390	8,016,515	0	6,810	8,847,933
New Brunswick Power	6	12	0	0	0	0	0
Les Mines Agnico-Eagle	1	6	0	1,770	0	0	2,030
Methanex Corporation	2	15	4,486,690	18,300	0	0	4,504,990
Shell Canada	12	113	1,253,570	25,099	2,491,543	17,559	3,792,639
Royal Oak Mines	2	3	3,000	630	3,800,000	0	3,803,766
Subtotal	**34**	**220**	**13,570,408**	**37,502,370**	**8,144,563**	**37,109**	**59,262,332**
% of Total	**2.1**	**3.7**	**14.1**	**67.6**	**57.1**	**0.3**	**34.4**
Total	**1,707**	**5,928**	**96,163,310**	**55,469,720**	**14,264,870**	**14,087,660**	**180,241,975**

Parent Company	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
Kronos Canada Inc.	0	0	430,000	430,000	15,571,623	Sulfuric acid (water)
Samuel Bingham Company	0	0	14,778,820	14,778,820	14,778,820	Di(2-ethylhexyl) phthalate (transfers to disposal)
BHP Minerals International	0	0	0	0	13,439,526	Copper and compounds (water)
Sherritt Inc.	0	0	13,510	13,510	9,743,335	Ammonia, methanol (air)
Cominco Ltd.	0	0	0	0	8,847,933	Zinc/copper and compounds (water), ammonia (air)
New Brunswick Power	183,320	0	7,504,682	7,688,002	7,688,002	Aluminum (transfers to disposal)
Les Mines Agnico-Eagle	6,515,000	0	0	6,515,000	6,517,030	Copper and compounds (transfers to treatment)
Methanex Corporation	800	23,050	0	23,850	4,528,840	Methanol (air)
Shell Canada	163,925	0	87,209	251,134	4,043,773	Ammonia (UIJ), toluene, propylene (air)
Royal Oak Mines	0	0	0	0	3,803,766	Arsenic and compounds (UIJ)
Subtotal	**6,863,045**	**23,050**	**22,814,221**	**29,700,316**	**88,962,648**	
% of Total	**28.7**	**1.1**	**60.2**	**46.4**	**37.5**	
Total	**24,393,542**	**2,016,222**	**37,869,948**	**64,279,712**	**244,521,687**	

* Chemicals accounting for more than 70% of the total releases and transfers from the facilities belonging to the parent company
UIJ=underground injection

6.2 PARENT COMPANY REPORTING

Both NPRI and TRI require a facility to report the name of its parent company. In addition, NPRI collects the parent company address. More than one parent company can be listed, if needed, with the percentage of ownership given. TRI collects the parent company name and its Dun and Bradstreet number (an identification number supplied by this corporate information service). Compiling chemical reports by parent company requires the direct inspection of names, addresses and identification numbers. Complicating this is the fact that company nomenclature is not standardized in the databases. In TRI, for example, facilities belonging to the General Motors Corporation may identify their parent company by half a dozen or more variations, such as GMC or GM Corporation or Delco Div., GMC.

6.2 PARENT COMPANY REPORTING

Table 6–2

THE 10 PARENT COMPANIES WITH LARGEST TRI RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Parent Company	Number of Facilities	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
DuPont	70	751	14,703,280	420,723	77,046,571	151,151	92,321,725
ASARCO Inc.	11	91	696,451	5,337	72,503	30,679,570	31,453,861
Renco Group Inc.	12	52	25,630,677	3,623	0	4,335,914	29,970,214
Monsanto Company	27	264	1,787,724	206,676	10,328,743	99,120	12,422,263
International Paper Company	71	351	19,352,723	163,081	0	36,072	19,551,876
IMC Global Inc.	13	60	3,558,280	4,207,584	0	13,888,017	21,653,880
General Motors Corporation	112	874	11,716,618	16,046	0	4,975,611	16,708,275
Phelps Dodge Corporation	18	71	2,744,957	822	0	7,225,181	9,970,960
Courtaulds United States Inc.	9	53	15,422,641	28,345	0	205,215	15,656,201
Horsehead Industries Inc.	1	10	267,524	243	0	0	267,767
Subtotal	**344**	**2,577**	**95,880,874**	**5,052,479**	**87,447,817**	**61,595,852**	**249,977,023**
% of Total	**1.5**	**3.4**	**13.6**	**16.9**	**55.3**	**47.0**	**24.4**
Total	**22,744**	**75,332**	**705,672,601**	**29,969,745**	**158,262,234**	**131,134,298**	**1,025,038,878**

Parent Company	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
DuPont	10,284,317	509,820	193,464	10,987,601	103,309,326	Hydrochloric acid, ammonium nitrate, nitric acid (UIJ)
ASARCO Inc.	754,815	2,709	2,396,526	3,154,050	34,607,912	Zinc/lead and compounds (land)
Renco Group Inc.	28,345	17,473	809,364	855,182	30,825,396	Chlorine (air)
Monsanto, Company	1,690,716	9,321,971	57,351	11,070,038	23,492,301	Hydrochloric acid (transfers to sewage), ammonia, ammonium nitrate, formaldehyde, methanol, formic acid (UIJ)
International Paper Company	429,756	1,742,780	52,586	2,225,122	21,776,999	Methanol (air)
IMC Global Inc.	0	0	914	914	21,654,794	Phosphoric acid (land)
General Motors Corporation	626,358	676,796	1,361,969	2,665,123	19,373,398	Xylenes, glycol ethers, methyl isobutyl ketone, n-butyl alcohol (air), zinc/manganese and compounds (land)
Phelps Dodge Corporation	68,220	7,257,281	43,788	7,369,289	17,340,249	Copper and compounds (land), ammonia (transfers to sewage)
Courtaulds United States Inc.	24,018	10,335	2,824	37,178	15,693,379	Carbon disulfide (air)
Horsehead Industries Inc.	0	0	15,125,066	15,125,066	15,392,833	Zinc/copper and compounds (transfers to disposal)
Subtotal	**13,906,545**	**19,539,166**	**20,043,853**	**53,489,564**	**303,466,586**	
% of Total	**9.6**	**16.9**	**14.7**	**13.5**	**21.3**	
Total	**144,585,185**	**115,505,141**	**136,599,949**	**396,690,275**	**1,421,729,153**	

* Chemicals accounting for more than 70% of total releases and transfers from the facilities belonging to the parent company
UIJ=underground injection

In 1994, the top 10 parent companies in NPRI accounted for more than one-third of total releases and transfers reported in Canada. In the United States, the top 10 in TRI reported about one-fifth of total releases and transfers. **Tables 6–1** and **6–2** list the top 10 parent companies in each country, for all data reported to that country. As mentioned previously, any evaluation of the relative health and environmental impacts of these facilities must also take into account the toxicity of the chemicals released, local climatic conditions, and the proximity of people and/or ecologically sensitive areas to the released waste streams. These data also include the chemicals and type of release or transfer that account for the majority of the total releases and transfers reported by subsidiary facilities in the respective countries. Thus for Canada, the parent company with the largest releases and transfers, Kronos, owns one reporting facility that discharged sulfuric acid, primarily to surface waters. For the United States, DuPont has

Table 6–3

THE 10 PARENT COMPANIES WITH LARGEST NPRI RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Parent Company	Number of Facilities	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
Kronos Canada Inc.	1	8	39,623	15,102,000	0	0	15,141,623
Samuel Bingham Company	2	2	0	0	0	0	0
Sherritt Inc.	3	29	6,964,135	898,530	1,853,020	12,740	9,729,825
Methanex Corporation	2	13	4,486,690	18,300	0	0	4,504,990
Shell Canada	7	81	1,199,772	18,209	2,430,000	1,289	3,653,302
Inco Limited	6	38	3,668,724	51,194	0	50,912	3,770,830
Ford Motor Company	7	64	2,618,764	70,210	0	0	2,689,832
Sidbec-Dosco	6	19	231,275	3,584	0	3,177,380	3,413,129
Novacor Chemicals	6	57	3,216,331	520	4,995	28,917	3,250,820
Cartons St-Laurent Inc.	1	4	382,307	3,175,116	0	3,845	3,561,268
Subtotal	**41**	**315**	**22,807,621**	**19,337,663**	**4,288,015**	**3,275,083**	**49,715,619**
% of Total	**3.0**	**6.9**	**25.6**	**58.1**	**55.4**	**31.1**	**35.3**
Total	**1,351**	**4,598**	**89,195,059**	**33,256,285**	**7,742,206**	**10,528,273**	**140,906,351**

Parent Company	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
Kronos Canada Inc.	0	0	430,000	430,000	15,571,623	Sulfuric acid (water)
Samuel Bingham Company	0	0	14,778,820	14,778,820	14,778,820	Di(2-ethylhexyl) phthalate (transfers to disposal)
Sherritt Inc.	0	0	13,510	13,510	9,743,335	Ammonia, methanol (air)
Methanex Corporation	800	23,050	0	23,850	4,528,840	Methanol (air)
Shell Canada	163,925	0	69,479	233,404	3,886,706	Ammonia (UIJ), propylene, toluene (air)
Inco Limited	0	75	0	75	3,770,905	Sulfuric acid (air)
Ford Motor Company	464,319	2,030	582,690	1,049,039	3,738,871	Styrene, xylenes, methyl isobutyl ketone (air), toluene (air, transfers to treatment)
Sidbec-Dosco	0	1,970	287,850	289,820	3,702,949	Zinc/lead and compounds (land)
Novacor Chemicals	114,986	0	243,503	358,489	3,609,309	Cyclohexane, ethylene, benzene (air)
Cartons St-Laurent Inc.	0	0	3,845	3,845	3,565,113	Methanol (water)
Subtotal	**744,030**	**27,125**	**16,409,697**	**17,180,852**	**66,896,471**	
% of Total	**5.0**	**1.8**	**58.4**	**38.5**	**36.1**	
Total	**15,011,219**	**1,479,110**	**28,114,247**	**44,604,576**	**185,510,927**	

* Chemicals accounting for more than 70% of total releases and transfers from facilities belonging to the parent company
UIJ=underground injection

70 reporting facilities located throughout the country. It, too, has one major chemical, hydrochloric acid, accounting for more than 70 percent of its releases and transfers, which is disposed of through underground injection wells.

Tables 6–3 and **6–4** list the 10 parent companies in each country with the greatest total releases and transfers from the common set of chemicals and industries reported in both databases. While the leading firms in the United States do not change because all are manufacturing companies, the number of facilities and forms counted is smaller in the matched data set because some facilities report only chemicals not on the NPRI

Table 6–4

THE 10 PARENT COMPANIES WITH LARGEST TRI RELEASES AND TRANSFERS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Parent Company	Number of Facilities	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
DuPont	70	655	9,617,469	411,242	75,322,393	107,984	85,459,088
ASARCO Inc.	11	87	694,800	5,337	72,503	30,679,228	31,451,868
Renco Group Inc.	12	51	25,626,732	3,623	0	4,335,914	29,966,268
IMC Global Inc.	13	60	3,558,280	4,207,584	0	13,888,017	21,653,880
Monsanto Company	27	248	1,758,306	203,048	8,844,374	99,120	10,904,847
International Paper Company	64	327	19,228,516	137,008	0	36,061	19,401,585
General Motors Corporation	107	798	10,208,951	14,907	0	4,958,377	15,182,236
Phelps Dodge Corporation	18	66	2,316,106	822	0	7,225,181	9,542,109
Courtaulds United States Inc.	9	48	15,421,571	28,345	0	205,215	15,655,132
Horsehead Industries Inc.	1	10	267,524	243	0	0	267,767
Subtotal	**332**	**2,350**	**88,698,255**	**5,012,158**	**84,239,270**	**61,535,098**	**239,484,780**
% of Total	**1.5**	**3.4**	**14.0**	**17.0**	**55.3**	**48.0**	**25.4**
Total	**21,464**	**68,305**	**634,554,192**	**29,509,572**	**152,298,373**	**128,262,311**	**944,624,448**

Parent Company	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers)*
DuPont	9,655,584	481,919	193,195	10,330,698	95,789,787	Hydrochloric acid, ammonium nitrate, nitric acid (UIJ)
ASARCO Inc.	739,649	2,705	2,396,526	3,138,880	34,590,748	Zinc/lead and compounds (land)
Renco Group Inc.	28,345	16,096	809,364	853,805	30,820,073	Chlorine (air)
IMC Global Inc.	0	0	914	914	21,654,794	Phosphoric acid (land)
Monsanto Company	1,676,721	8,931,867	56,416	10,665,004	21,569,851	Hydrochloric acid (transfers to sewage), ammonia, ammonium nitrate, formaldehyde (UIJ)
International Paper Company	391,659	1,738,776	27,371	2,157,805	21,559,390	Methanol (air)
General Motors Corporation	520,234	205,136	1,301,133	2,026,502	17,208,738	Xylenes, methyl isobutyl ketone, n-butyl alcohol, methanol (air), zinc/manganese and compounds (land)
Phelps Dodge Corporation	68,220	7,257,281	43,788	7,369,289	16,911,398	Copper and compounds (land), ammonia (transfers to sewage)
Courtaulds United States Inc.	24,018	10,156	2,570	36,744	15,691,876	Carbon disulfide (air)
Horsehead Industries Inc.	0	0	15,125,066	15,125,066	15,392,833	Zinc/copper and compounds (transfers to disposal)
Subtotal	**13,104,429**	**18,643,936**	**19,956,343**	**51,704,707**	**291,189,488**	
% of Total	**9.6**	**17.1**	**15.4**	**13.8**	**22.1**	
Total	**136,908,496**	**109,029,867**	**129,982,489**	**375,920,852**	**1,320,545,300**	

* Chemicals accounting for more than 70% of total releases and transfers of the facilities belonging to the parent company
UIJ=underground injection

list (see explanation in **Chapter 5**). The major chemicals reported are also primarily the same since they are on both lists. For NPRI, however, half of the top parent companies in the full database are not manufacturers. Four are mining companies—BHP Minerals, Cominco, Les Mines Agrico-Eagle, and Royal Oak Mines—that would not report to TRI if located in the United States. One other—New Brunswick Power—is a utility and also would not have reported under TRI in 1994. There is no overlap of the top parent companies in Canada and the United States.

Table 6–5

NPRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS DESIGNATED ON TRI LIST, 1994
(ALL CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
117-81-7	Di(2-ethylhexyl) phthalate	33	24,131	0	0	68,632	92,804
71-43-2	Benzene	95	2,590,727	1,052	73,890	2,911	2,675,468
75-09-2	Dichloromethane	50	2,219,368	0	0	39	2,222,089
100-42-5	Styrene	78	1,773,802	10,404	185	196	1,792,518
50-00-0	Formaldehyde	80	729,854	310,790	69,920	760	1,116,417
1332-21-4	Asbestos (friable)	37	577	0	0	351,020	352,184
—	Nickel (and its compounds)	114	553,695	72,349	0	75,203	704,496
106-99-0	1,3-Butadiene	13	310,031	58	0	2	310,180
127-18-4	Tetrachloroethylene	29	160,642	74	0	0	163,335
75-07-0	Acetaldehyde	5	114,057	13,200	6,000	30	133,287
75-21-8	Ethylene oxide	12	50,842	0	0	0	51,067
107-13-1	Acrylonitrile	8	18,269	162	0	0	19,556
56-23-5	Carbon tetrachloride	6	12,773	4,732	0	0	18,135
75-01-4	Vinyl chloride	10	23,146	164	0	0	23,725
75-56-9	Propylene oxide	4	10,941	0	0	0	11,071
106-46-7	1,4-Dichlorobenzene	5	9,900	0	0	500	10,400
123-91-1	1,4-Dioxane	4	4,421	4,643	0	0	9,144
79-06-1	Acrylamide	10	897	926	0	2,845	5,878
107-06-2	1,2-Dichloroethane	4	6,886	523	0	40	7,579
26471-62-5	Toluenediisocyanate (mixed isomers)	31	245	0	0	0	1,033
584-84-9	Toluene-2,4-diisocyanate	3	0	0	0	0	148
139-13-9	Nitrilotriacetic acid	11	0	0	0	0	1,001
302-01-2	Hydrazine	11	0	0	0	0	1,242
140-88-5	Ethyl acrylate	7	130	0	0	0	1,120
67-66-3	Chloroform	3	39	2	0	1	172
106-89-8	Epichlorohydrin	3	0	0	0	0	133
96-09-3	Styrene oxide	1	0	0	0	0	130
79-46-9	2-Nitropropane	1	0	0	0	0	125
77-78-1	Dimethyl sulfate	1	11	0	0	0	11
101-14-4	4,4'-Methylenebis(2-chloroaniline)	1	0	0	0	0	5
62-56-6	Thiourea	1	0	0	0	0	0
	Subtotal	**671**	**8,615,384**	**419,079**	**149,995**	**502,179**	**9,724,453**
	% of Total for All NPRI Chemicals	**11.3**	**9.0**	**0.8**	**1.1**	**3.6**	**5.4**
	Total for All NPRI Chemicals	**5,928**	**96,163,310**	**55,469,720**	**14,264,870**	**14,087,660**	**180,241,975**

NOTE: 31 of the 78 OSHA carcinogens on the NPRI list had forms in 1994.

6.3 CARCINOGENS

Table 6–5
NPRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS DESIGNATED ON TRI LIST, 1994
(ALL CHEMICALS/INDUSTRIES)

Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
38,931	0	14,852,208	14,891,139	14,983,943
124,285	78	27,226	151,589	2,827,057
35,305	2	2	35,309	2,257,398
256,017	528	54,149	310,694	2,103,212
165,565	4,893	41,993	212,451	1,328,868
0	0	935,063	935,063	1,287,247
187,971	3,529	315,419	506,918	1,211,414
128,687	524	2,100	131,311	441,491
54,927	2	39,000	93,929	257,264
0	0	1	1	133,288
877	0	0	877	51,944
18,930	0	0	18,930	38,486
11,107	0	0	11,107	29,242
130	0	827	957	24,682
2,906	0	0	2,906	13,977
0	0	500	500	10,900
0	0	0	0	9,144
0	0	2,845	2,845	8,723
220	0	0	220	7,799
2,484	0	207	2,691	3,724
1,590	0	0	1,590	1,738
4	495	50	549	1,550
0	0	0	0	1,242
0	0	0	0	1,120
8	0	0	8	180
0	0	0	0	133
0	0	0	0	130
0	0	0	0	125
0	0	0	0	11
0	0	0	0	5
0	0	0	0	0
1,029,944	**10,051**	**16,271,590**	**17,311,584**	**27,036,037**
4.2	**0.5**	**43.0**	**26.9**	**11.1**
24,393,542	**2,016,222**	**37,869,948**	**64,279,712**	**244,521,687**

6.3 CARCINOGENS

The TRI list includes chemicals that are designated as carcinogenic under the US Occupational Safety and Health Administration (OSHA) regulations [OSHA Hazard Communication Standards (29 CFR 1910.122)]. There are 121 such carcinogens on the TRI list, and facilities submitted (non-zero) reports on 75 of them in 1994. NPRI covers 78 of the 121 OSHA carcinogens on the TRI list, receiving (non-zero) reports on 31. Considering the complete NPRI database, these chemicals represent 11 percent of total releases and transfers, with 27 million kilograms, and for TRI, they represent 9 percent, with 123 million kilograms (see **Tables 6–5** and **6–6**).

In the case of NPRI data, the two carcinogens with the largest releases and transfers are di(2-ethylhexyl) phthalate and benzene, which rank sixteenth and seventh, respectively, in TRI. These are followed in the NPRI data by dichloromethane, styrene and formaldehyde, which are the three top carcinogens in TRI. Altogether, 16 facilities in the two countries report total releases and transfers of more than two million kilograms of OSHA carcinogens: 4 in Canada and 12 in the United States. As noted in **Chapter 4**, two facilities in Canada, owned by the same parent company, report large transfers of di(2-ethylhexyl) phthalate off-site to land disposal (totaling 14 million kilograms). Without these forms, di(2-ethylhexyl) phthalate would drop to tenth among NPRI carcinogens for total releases and transfers.

Table 6–6

TRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS, 1994
(ALL CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
75-09-2	Dichloromethane	1,030	28,440,132	23,714	435,801	23,059	28,922,706
100-42-5	Styrene	1,489	17,845,599	34,276	113,769	218,078	18,211,722
50-00-0	Formaldehyde	781	5,205,679	176,304	3,509,982	67,626	8,959,591
75-07-0	Acetaldehyde	227	5,508,798	128,231	273,092	9,230	5,919,351
67-66-3	Chloroform	167	4,953,758	164,541	36,282	5,291	5,159,872
—	Nickel (and its compounds)	2,573	366,239	44,591	28,545	764,382	1,203,756
127-18-4	Tetrachloroethylene	459	4,626,816	1,756	1,837	1,972	4,632,381
71-43-2	Benzene	491	4,304,932	10,093	101,180	11,506	4,427,712
107-13-1	Acrylonitrile	114	664,272	9,241	2,219,722	126	2,893,361
7440-47-3	Chromium	1,766	288,255	9,291	22	520,858	818,425
8001-58-9	Creosote	89	612,337	2,469	0	299	615,105
79-06-1	Acrylamide	76	7,247	1,214	2,357,739	70	2,366,270
1332-21-4	Asbestos (friable)	85	2,704	118	0	130,678	133,500
7439-92-1	Lead	817	188,288	5,564	0	227,773	421,624
107-06-2	1,2-Dichloroethane	79	848,483	3,377	15,554	7	867,421
106-99-0	1,3-Butadiene	177	1,226,201	3,228	0	180	1,229,609
117-81-7	Di(2-ethylhexyl) phthalate	307	206,624	436	0	47,055	254,116
56-23-5	Carbon tetrachloride	69	280,693	555	5,739	0	286,986
75-56-9	Propylene oxide	118	469,768	5,757	10,066	2,790	488,380
106-89-8	Epichlorohydrin	68	220,738	1,581	0	342	222,661
75-01-4	Vinyl chloride	43	483,553	171	0	3	483,727
1336-36-3	Polychlorinated biphenyls (PCBs)	13	0	0	0	0	0
118-74-1	Hexachlorobenzene	9	197	122	93	0	412
123-91-1	1,4-Dioxane	55	104,713	138,672	0	1,028	244,412
75-21-8	Ethylene oxide	155	324,243	947	3,673	356	329,219
25376-45-8	Diaminotoluene (mixed isomers)	11	9,847	1,663	3,492	26	15,028
106-46-7	1,4-Dichlorobenzene	23	116,639	723	907	499	118,768
60-35-5	Acetamide	4	12	0	211,338	0	211,351
26471-62-5	Toluenediisocyanate (mixed isomers)	181	22,878	0	0	113	22,991
140-88-5	Ethyl acrylate	107	78,496	115	0	8	78,619
101-77-9	4,4'-Methylenedianiline	27	4,418	329	11,820	0	16,567
10034-93-2	Hydrazine sulfate	3	1	0	104,308	0	104,309
95-53-4	o-Toluidine	23	5,503	242	13,741	3	19,490
—	Chlorophenols	10	3,910	18	42,737	0	46,665
106-93-4	1,2-Dibromoethane	16	6,990	1,264	5	147	8,407
7440-43-9	Cadmium	45	4,564	573	0	1,880	7,017
7440-38-2	Arsenic	89	7,805	404	0	2,215	10,423
584-84-9	Toluene-2,4-diisocyanate	76	16,073	0	0	0	16,073
95-80-7	2,4-Diaminotoluene	4	915	0	0	0	915
79-46-9	2-Nitropropane	7	16,881	1,497	0	0	18,378
542-75-6	1,3-Dichloropropylene	11	11,188	39	0	0	11,227
120-71-8	p-Cresidine	5	459	37	0	23	518
7440-41-7	Beryllium	10	408	16	0	10,367	10,791

6.3 CARCINOGENS (continued)

Table 6–6
TRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS, 1994
(ALL CHEMICALS/INDUSTRIES)

Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
5,196,709	378,738	138,800	5,714,246	34,636,952
1,833,182	53,460	2,020,785	3,907,427	22,119,149
321,016	1,223,837	120,828	1,665,681	10,625,273
196,165	201,418	450	398,032	6,317,383
892,986	198,603	31,153	1,122,743	6,282,615
1,213,171	98,354	3,646,670	4,958,195	6,161,952
937,061	28,142	33,453	998,656	5,631,037
971,496	95,562	92,603	1,159,660	5,587,372
378,699	76,936	3,963	459,598	3,352,959
228,126	32,328	2,219,963	2,480,417	3,298,842
41,494	4,910	2,142,271	2,188,675	2,803,780
22,957	37,227	1,765	61,949	2,428,219
118	1	1,804,967	1,805,086	1,938,586
319,786	12,938	837,885	1,170,610	1,592,234
534,677	5,376	34,191	574,244	1,441,664
181,560	244	3,105	184,908	1,414,517
95,735	13,661	948,023	1,057,419	1,311,535
531,849	260	22,998	555,107	842,093
2,788	169,987	22,134	194,909	683,289
399,451	17,512	83	417,046	639,707
71,898	148	9,406	81,452	565,180
423,793	0	43,067	466,860	466,860
29,283	113	426,521	455,917	456,328
34,094	141,338	7,308	182,740	427,152
3,007	47,040	2,459	52,505	381,724
230,364	72,853	4,408	307,624	322,652
123,668	1,498	0	125,166	243,934
384	0	0	384	211,734
111,754	0	7,756	119,510	142,501
22,628	12,226	9,096	43,950	122,569
78,939	857	11,281	91,076	107,644
0	1,043	0	1,043	105,352
22,570	59,626	137	82,333	101,823
12,206	678	174	13,057	59,722
33,441	0	114	33,555	41,961
4,366	272	26,875	31,513	38,530
4,870	82	21,609	26,561	36,983
13,688	0	1,598	15,285	31,358
29,184	0	0	29,184	30,098
13	0	0	13	18,391
5,412	0	0	5,412	16,639
998	13,105	1,361	15,463	15,981
9	0	4,361	4,370	15,161

Table 6–6 (continued)

TRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS, 1994
(ALL CHEMICALS/INDUSTRIES)

CAS Number	Chemical	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	Releases to Land (kg)	Total Releases (kg)
92-87-5	Benzidine	1	14,334	0	0	0	14,334
302-01-2	Hydrazine	46	7,431	132	113	13	7,690
51-79-6	Urethane	4	5,011	0	0	0	5,011
62-56-6	Thiourea	27	1,439	1,605	2,268	113	5,424
91-94-1	3,3'-Dichlorobenzidine	5	5	0	0	0	5
64-67-5	Diethyl sulfate	33	3,142	5	0	2	3,148
96-45-7	Ethylene thiourea	10	240	0	0	0	240
101-80-4	4,4'-Diaminodiphenyl ether	5	53	750	0	5	808
91-08-7	Toluene-2,6-diisocyanate	47	3,856	0	0	0	3,856
77-78-1	Dimethyl sulfate	37	3,069	136	0	0	3,205
139-13-9	Nitrilotriacetic acid	8	6	1,246	227	0	1,479
25321-22-6	Dichlorobenzene (mixed isomers)	7	1,833	0	0	0	1,833
57-14-7	1,1-Dimethyl hydrazine	3	339	0	0	0	339
90-04-0	o-Anisidine	7	433	36	0	14	483
58-89-9	Lindane	8	263	2	0	2	267
98-07-7	Benzoic trichloride	5	1,301	0	0	0	1,301
107-30-2	Chloromethyl methyl ether	3	1,242	2	0	0	1,244
593-60-2	Vinyl bromide	1	1,188	0	0	0	1,188
101-14-4	4,4'-Methylenebis(2-chloroaniline)	20	9	0	0	0	9
81-07-2	Saccharin (manufacturing)	2	36	0	0	0	36
90-94-8	Michler's ketone	1	369	0	0	0	369
94-58-6	Dihydrosafrole	1	250	0	0	0	250
75-55-8	Propyleneimine	7	218	0	0	0	218
60-09-3	4-Aminoazobenzene	1	0	0	159	0	159
88-06-2	2,4,6-Trichlorophenol	1	90	29	0	0	120
542-88-1	Bis(chloromethyl) ether	2	116	0	0	0	116
—	Polybrominated biphenyls	2	0	0	0	0	0
135-20-6	Cupferron	2	5	0	0	0	5
96-09-3	Styrene oxide	5	28	0	0	0	28
119-90-4	3,3'-Dimethoxybenzidine	3	1	2	0	0	4
134-32-7	alpha-Naphthylamine	2	5	0	0	0	5
92-67-1	4-Aminobiphenyl	1	0	0	2	0	2
151-56-4	Ethyleneimine	1	0	0	0	0	0
1120-71-4	Propane sultone	1	0	0	0	0	0
	Subtotal	**12,218**	**77,533,561**	**777,115**	**9,504,215**	**2,048,141**	**89,863,032**
	% of Total for All TRI Chemicals	**16.2**	**11.0**	**2.6**	**6.0**	**1.6**	**8.8**
	Total for All TRI Chemicals	**75,332**	**705,672,601**	**29,969,745**	**158,262,234**	**131,134,298**	**1,025,038,878**

NOTE: 77 of the 121 OSHA carcinogens on the TRI list had forms in 1994.

6.3 CARCINOGENS (continued)

Table 6–6 (continued)
TRI RELEASES AND TRANSFERS OF OSHA CARCINOGENS, 1994
(ALL CHEMICALS/INDUSTRIES)

Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
0	0	0	0	14,334
1,660	2,249	2,086	5,996	13,686
0	3,147	1,938	5,085	10,097
826	844	1,166	2,836	8,260
6,576	118	569	7,263	7,268
858	2,070	0	2,928	6,077
3,737	2	1,278	5,018	5,258
4,342	5	55	4,402	5,210
675	0	424	1,099	4,956
0	5	0	5	3,210
943	0	0	943	2,422
96	0	4	100	1,933
1,500	0	2	1,502	1,841
0	985	0	985	1,468
1,117	2	19	1,138	1,405
0	0	0	0	1,301
0	0	32	32	1,276
0	0	0	0	1,188
485	2	590	1,077	1,086
0	5	635	639	676
0	0	0	0	369
0	0	0	0	250
0	0	0	0	218
0	0	0	0	159
0	0	0	0	120
0	0	2	2	118
0	0	113	113	113
0	35	0	35	40
0	0	0	0	28
0	15	0	15	19
0	0	0	0	5
0	0	0	0	2
0	0	0	0	0
0	0	0	0	0
15,578,407	**3,009,854**	**14,712,533**	**33,300,795**	**123,163,826**
10.8	**2.6**	**10.8**	**8.4**	**8.7**
144,585,185	**115,505,141**	**136,599,949**	**396,690,275**	**1,421,729,153**

6.4 DATA SPECIFIC TO EACH PRTR

The specific data that must be reported to each PRTR differ in several respects. In its additional data collection, NPRI concentrates on releases and transfers. This database requires an estimate of the percentage of annual releases by quarter; it breaks down the major release categories into routine releases, storage or handling releases, and spills, leaks and other non-routine releases. It also asks the reasons for changes in releases and transfers from the previous year. NPRI is also more thorough than TRI in identifying the facility by asking for the address of the parent company and the number of employees in the reporting facility.

For its part, TRI expanded reporting in 1991 to include on-site waste management and the types of source reduction activity undertaken at the facility. TRI also requires that facilities report transfer amounts for each off-site destination. In contrast, NPRI asks only for a total amount for each off-site transfer type, but does not inquire where the specific amounts are sent. The effects of this difference will become evident in **Chapter 7**: Border and Transborder Analyses.

Table 6–7 NPRI QUARTERLY BREAKDOWN OF RELEASES, 1994

Type of Quarterly Breakdown	Number of Forms	% of Total Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)	% of Total Releases
25% each quarter	3,193	81.5	77,759,431	38,020,838	13,989,870	10,364,996	140,347,770	77.9
Q1 ➡ 75%	22	0.6	158,988	26,870	0	806,323	992,311	0.6
Q2 ➡ 75%	8	0.2	8,370	13,930	0	44,974	68,177	0.0
Q3 ➡ 75%	12	0.3	14,575	0	0	7,819	22,428	0.0
Q4 ➡ 75%	23	0.6	44,453	25,668	0	4,000	75,159	0.0
At least one Qtr ➡ 50%	98	2.5	375,005	16,590,655	265,500	1,605,578	18,841,288	10.5
Other	560	14.3	17,703,372	791,759	9,000	1,253,970	19,794,906	11.0
Total	**3,916**	**100.0**	**96,064,194**	**55,469,720**	**14,264,370**	**14,087,660**	**180,142,039**	**100.0**

Does not include forms with zero releases or forms with no quarterly breakdown

Table 6–8 NPRI QUARTERLY BREAKDOWN OF TOTAL RELEASES, 1994*

	Quarterly Breakdown				
Type of Release	First Quarter (kg)	Second Quarter (kg)	Third Quarter (kg)	Fourth Quarter (kg)	Total (kg)
Total Releases	49,114,125	49,098,151	40,811,701	41,118,062	180,142,039
% of Total	27.3	27.3	22.7	22.8	100.0
Total Air Emissions of VOCs**	12,171,788	13,127,552	12,550,834	13,038,880	50,889,055
% of Total	23.9	25.8	24.7	25.6	100.0
Surface Water Discharges***	5,372,519	4,953,712	4,481,514	4,659,172	19,466,917
% of Total	27.6	25.4	23.0	23.9	100.0
Surface Water Discharges Without Two Forms with Largest Amounts***	4,476,719	4,505,812	4,481,514	4,509,872	17,973,917
% of Total	24.9	25.1	24.9	25.1	100.0

* Does not include forms with zero releases or forms with no quarterly breakdown
** Includes forms with releases to air for volatile organic chemicals only
***Includes forms with releases of surface water discharges only

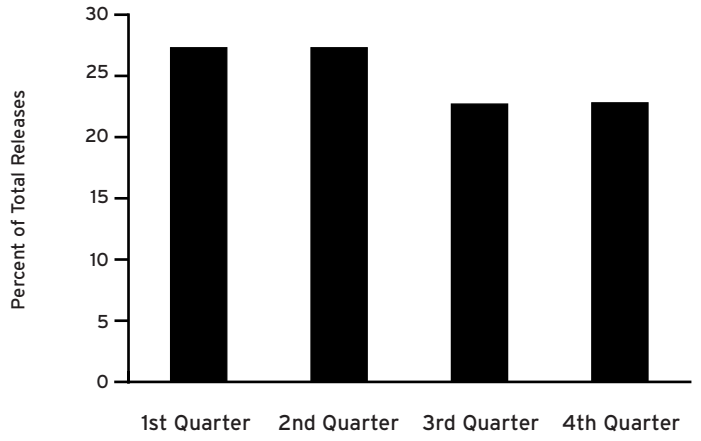
6.4.1 Additional Data in NPRI

Seasonal Reporting

Table 6–7 shows the seasonal distribution of NPRI releases according to facilities' quarterly estimates. More than 80 percent of the forms contain data for releases evenly distributed throughout the year; very few forms indicate major releases in only one quarter.

For those forms that do report seasonal fluctuations, more releases occurred in the first half of the year (see **Table 6–8** and **Figure 6–1**). Data for volatile organic compounds (VOCs), which could contribute to atmospheric inversions that trap air pollution at ground level in the summer months, show little fluctuation across the seasons. Discharges of toxic chemicals to surface waters may do more damage in periods of low flow during winter than at other times. Such releases, as reported to NPRI, tend to occur in the first quarter (January–March). However, this fluctuation is due to reporting by one facility for two chemicals (phosphoric acid and sulfuric acid). When these forms are deleted from the analysis, the amounts by quarter are fairly evenly divided.

Figure 6–1 DISTRIBUTION OF NPRI TOTAL RELEASES BY QUARTER, 1994 (ALL CHEMICALS/INDUSTRIES)



Does not include forms with zero releases or forms with no quarterly breakdown

Table 6–9 DISTRIBUTION OF REASONS FOR CHANGE IN NPRI RELEASES, 1994

Reason for Change in Releases

	Forms		Total Air Emissions	Surface Water Discharges	Underground Injection	On-site Land Releases	Total Releases	
	Number	%	(kg)	(kg)	(kg)	(kg)	kg	%
Production level	730	12.3	20,009,984	5,781,056	172,106	819,791	26,818,604	14.9
Production, estimate	249	4.2	7,267,804	3,765,355	1,026,944	4,180,336	16,244,093	9.0
Production, estimate, other	16	0.3	5,205,368	47,887	0	0	5,254,135	2.9
Production, other	82	1.4	2,881,930	15,140,487	48,656	447	18,072,256	10.0
Production, other, NA	1	0.0	0	0	0	0	0	0.0
Production level and NA	4	0.1	9,560	0	0	0	9,560	0.0
Estimate	345	5.8	5,777,382	957,510	313,080	63,963	7,138,646	4.0
Estimate and other	38	0.6	3,399,559	14,847	400,898	21,073	3,837,522	2.1
Estimate and NA	1	0.0	17,779	0	0	0	17,779	0.0
Other	489	8.2	15,430,928	3,927,565	2,282,129	2,260,147	23,908,625	13.3
No significant change	3,291	55.5	31,466,260	25,731,942	9,803,640	5,327,715	72,477,907	40.2
Not applicable (NA)	682	11.5	4,696,756	103,071	217,417	1,414,188	6,462,848	3.6
Total	**5,928**	**100.0**	**96,163,310**	**55,469,720**	**14,264,870**	**14,087,660**	**180,241,975**	**100.0**

Reasons for Change Reported at Least Once

	Forms		Total Air Emissions	Surface Water Discharges	Underground Injection	On-site Land Releases	Total Releases	
	Number	%	(kg)	(kg)	(kg)	(kg)	kg	%
Production level change	1,082	18.3	35,374,646	24,734,785	1,247,706	5,000,574	66,398,648	36.8
Estimation method change	649	10.9	21,667,892	4,785,599	1,740,922	4,265,372	32,492,175	18.0
Other change	626	10.6	26,917,785	19,130,786	2,731,683	2,281,667	51,072,538	28.3
Total for Forms Counted	**1,955**	**33.0**	**60,000,294**	**29,634,707**	**4,243,813**	**7,345,757**	**101,301,220**	**56.2**

No Change Reported

No significant change	3,291	55.5	31,466,260	25,731,942	9,803,640	5,327,715	72,477,907	40.2
Not applicable (NA)	682	11.5	4,696,756	103,071	217,417	1,414,188	6,462,848	3.6
Total for Forms Counted	**3,973**	**67.0**	**36,163,016**	**25,835,013**	**10,021,057**	**6,741,903**	**78,940,755**	**43.8**

Reasons for Changes from Previous Year's Releases and Transfers

The NPRI form requires the facility to indicate generally why the amount of releases and transfers changed from the previous year. As **Table 6–9** shows, 56 percent of the forms indicated no significant change in releases. But these forms only represented 40 percent of total releases. The 18 percent of forms citing production-level changes (often in conjunction with other types of change) as the reason for changes in release volumes represented 37 percent of total releases.

For transfers, this distribution was even more pronounced (see **Table 6–10**). No significant change was reported on 68 percent of the forms, representing just 25 percent of total transfers, while the 11 percent of the forms that listed production-level changes as the reason (again, often in conjunction with other types of change) represented 43 percent of total transfers.

Table 6–10

DISTRIBUTION OF REASONS FOR CHANGE IN NPRI TRANSFERS, 1994

Reason for Change in Transfers

	Forms		Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment	Total Transfers	
	Number	%	(kg)	(kg)	(kg)	kg	%
Production level	463	7.8	13,567,555	151,942	11,459,733	25,179,230	39.2
Production, estimate	111	1.9	759,992	165,379	1,113,620	2,038,991	3.2
Production, estimate, other	9	0.2	292,493	105	1,693	294,291	0.5
Production, other	46	0.8	211,311	843	176,394	388,548	0.6
Production, not significant	3	0.1	2,800	0	1,000	3,800	0.0
Estimate	198	3.3	754,272	20,145	1,747,795	2,522,212	3.9
Estimate, other	10	0.2	2,722	0	57,801	60,523	0.1
Other	365	6.2	1,528,991	800,961	2,651,234	4,981,186	7.7
Other and NA	3	0.1	7,000	0	0	7,000	0.0
No significant change	4,050	68.3	5,670,549	546,098	9,985,913	16,202,560	25.2
Not applicable (NA)	670	11.3	1,595,857	330,749	10,674,765	12,601,371	19.6
Total	**5,928**	**100.0**	**24,393,542**	**2,016,222**	**37,869,948**	**64,279,712**	**100.0**

Reason for Change Reported at Least Once

	Forms		Treatment/ Destruction	Sewage/ POTWs	Disposal/ Containment	Total Transfers	
	Number	%	(kg)	(kg)	(kg)	kg	%
Production level change	632	10.7	14,834,151	318,269	12,752,440	27,904,860	43.4
Estimation method change	328	5.5	1,809,479	185,629	2,920,909	4,916,017	7.6
Other change	433	7.3	2,042,517	801,909	2,887,122	5,731,548	8.9
Total for Forms Counted	**1,208**	**20.4**	**17,127,136**	**1,139,375**	**17,209,270**	**35,475,781**	**55.2**

No Change Reported

No significant change	4,050	68.3	5,670,549	546,098	9,985,913	16,202,557	25.2
Not applicable (NA)	670	11.3	1,595,857	330,749	10,674,765	12,601,371	19.6
Total for Forms Counted	**4,720**	**79.6**	**7,266,406**	**876,847**	**20,660,678**	**28,803,928**	**44.8**

6.4.2 Additional Data in TRI

Waste Management Categories

Beginning in 1991, TRI facilities must report the amounts of toxic chemicals in waste, on- and off-site, by waste management category: release/disposal (this includes not only releases and land disposal on-site, but also transfers off-site to disposal), recycling, energy recovery, and treatment. Only production-related waste is reported in these categories; any waste of the chemicals resulting from accidents or from a facility's remedial actions is reported separately. NPRI invites, but does not require, facilities to report transfers off-site for energy recovery and recycling.

The quantity of waste that was released/disposed of plus the quantity treated off-site comprise the amount of total releases and transfers, as discussed in earlier chapters of this report, except that releases or off-site transfers from accidents or remedial actions are not included. **Table 6–11** shows that releases and transfers—as covered in other parts of the TRI form and reported in similar categories to NPRI—represent only 12 percent of all production-related waste reported to TRI in 1994. The largest portions of production-related waste are the amounts of TRI chemicals in waste treated and recycled on-site, neither of which are categories reported to NPRI. Each of these accounts for nearly one-third (32.6 percent and 31.7 percent, respectively) of the total waste reported to TRI in 1994.

6.4 DATA SPECIFIC TO EACH PRTR
(continued)

Table 6–11 ACTUAL AND PROJECTED QUANTITIES OF TRI CHEMICALS IN WASTE, 1993–1996

					Projected			
Management Activity	1993 kg	% of Total	1994 kg	% of Total	1995 kg	% of Total	1996 kg	% of Total
Recycled On-site	3,740,623,977	31.5	3,812,621,180	31.7	3,923,129,289	31.9	3,958,989,391	32.2
Recycled Off-site	1,084,878,761	9.1	1,141,493,594	9.5	1,139,470,044	9.3	1,142,749,590	9.3
Energy Recovery On-site	1,333,511,731	11.2	1,552,179,668	12.9	1,601,292,971	13.0	1,577,420,875	12.8
Energy Recovery Off-site	207,646,322	1.8	212,792,568	1.8	200,268,508	1.6	195,988,439	1.6
Treated On-site	3,973,698,179	33.5	3,927,010,123	32.6	4,102,889,393	33.4	4,120,335,653	33.5
Total Releases and Transfers	1,517,669,702	12.8	1,393,147,859	11.6	1,332,482,668	10.8	1,290,417,932	10.5
Treated Off-site	254,689,440	2.1	252,756,091	2.1	250,255,549	2.0	232,842,770	1.9
Quantity Released/ Disposed of	1,262,980,262	10.7	1,140,391,768	9.5	1,082,227,120	8.8	1,057,575,162	8.6
Total Production-related Waste	11,858,028,673	100.0	12,039,244,992	100.0	12,299,532,873	100.0	12,285,901,881	100.0

NOTE: One form erroneously projecting 93 million kilograms for 1996 was not included.

Table 6–12 FACILITIES AND FORMS REPORTING SOURCE REDUCTION ACTIVITY, BY CATEGORY, 1994

	Facilities Reporting Source Reduction Activity		Forms Reporting Source Reduction Activity	
Source Reduction Activity Categories	Number	As % of All TRI Facilities	Number	As % of All TRI Forms
Good Operating Practices	3,427	15.1	9,100	12.1
Inventory Control	834	3.7	2,332	3.1
Spill and Leak Prevention	1,647	7.2	4,921	6.5
Raw Material Modifications	1,852	8.1	3,173	4.2
Process Modifications	2,637	11.6	6,167	8.2
Cleaning and Degreasing	1,015	4.5	1,676	2.2
Surface Preparation/Finishing	813	3.6	2,135	2.8
Product Modification	767	3.4	1,543	2.0
Any Source Reduction Activity*	**7,355**	**32.3**	**17,557**	**23.3**

*The numerical totals do not equal the sum of the above categories because facilities and forms may report more than one type of source reduction activity.

Year-to-Year Change and Source Reduction Activity

With these data, TRI also takes a different approach from NPRI to year-to-year change. TRI facilities must report waste management data for the previous as well as the current year, plus projections for the following two years, while NPRI requires that projections of releases and transfers be supplied for the next three years (with optional fourth and fifth years).

The goal of the Pollution Prevention Act of 1990 that added these reporting elements to TRI was to stress the importance of pollution prevention by making source reduction the first priority and focusing waste management on doing the least harm to the environment. After source reduction, the waste management categories are prioritized from recycling on-site as the most desirable option, followed by energy recovery, treatment, and ending with releases and disposal as least desirable. Indeed, the projected change from 1993 to 1996 shows that while production-related waste is projected to increase (from 11.9 to 12.3 billion kilograms), the quantity released or disposed of has decreased (from 1.26 billion kilograms in 1993 to 1.14 billion kilograms in 1994) and is projected to decline further (to 1.06 billion kilograms in 1996; see **Table 6–11**).

In this way, TRI captures actual and projected changes, but the reasons underlying them are not reported. One aspect, however, is reflected in TRI data. Each facility, for each TRI-listed chemical, reports what type of source reduction activity (if any) was undertaken during the year. Facilities select specific activities, in eight major categories, from a list of 43. Nearly one-third of all TRI facilities reported some source reduction activity undertaken during 1994, although less than one-quarter of all forms indicate such activity. The most commonly reported activities are improvements in operating practices and process modifications (see **Table 6–12**).

Table 6–13 SOURCE REDUCTION ACTIVITY REPORTING, 1994

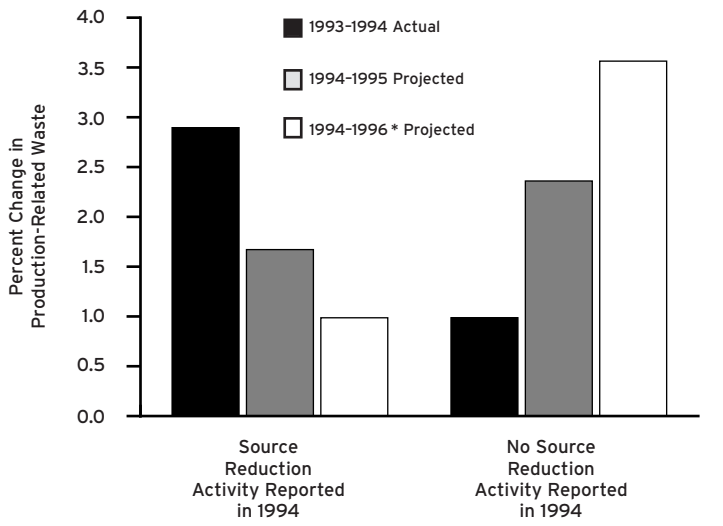
Source Reduction Activity Categories	Number of Occurrences* Number	As % of All Occurrences
Good Operating Practices	15,381	29.3
Inventory Control	4,027	7.7
Spill and Leak Prevention	8,301	15.8
Raw Material Modifications	5,278	10.1
Process Modifications	10,271	19.6
Cleaning and Degreasing	2,155	4.1
Surface Preparation/Finishing	4,595	8.8
Product Modification	2,486	4.7
Total Occurrences	**52,494**	**100.0**
Methods Used to Identify Source Reduction		
Pollution Prevention Opportunity Audit		
Internal	11,535	22.0
External	1,248	2.4
Materials Balance Audit	3,774	7.2
Participative Team Management	14,710	28.0
Employee Recommendation		
Informal	4,964	9.5
Formal Program	3,139	6.0
State Program	295	0.6
Federal Program	132	0.3
Trade/Industry Program	1,875	3.6
Vendor Assistance	5,850	11.1
Other	4,972	9.5
Total Occurrences	**52,494**	**100.0**

* Each TRI form can specify any number of the 43 activity types or 11 methods listed on the form. Each time an activity or a method is reported counts as an occurrence.

In addition, facilities indicate the methods used to identify each source reduction activity, choosing from a list of 11. Participative team management and internal pollution-prevention audits are the methods most often used to identify source reduction opportunities (see **Table 6–13**). Facilities do not report the results of their source reduction activities, that is, the amounts of waste reduced. Despite this, data on total production-related waste for 1993 and 1994 and projections for 1995 and 1996 can be collected for forms that indicate source reduction activity. These data can then be compared with those for which no source reduction activity was reported. In this way, not only can changes in total production-related waste be examined, but differences in the various waste-management options can also be evaluated.

Although the total of production-related waste reported on forms indicating source reduction activity increased by three percent from 1993 to 1994, these forms project much smaller rates of increase in the two years following the source reduction activity, as shown in **Figure 6–2**. By contrast, forms indicating no source reduction activity during 1994 reported a one percent increase in total production-related waste, and they project successively larger increases for the following two years.

Figure 6–2 ACTUAL AND PROJECTED QUANTITIES OF TRI WASTE WITH AND WITHOUT SOURCE REDUCTION ACTIVITY, 1994 (ALL CHEMICALS/INDUSTRIES)



* One TRI form erroneously projecting 93 million kilograms for 1996 was not included.

Table 6–14 ACTUAL AND PROJECTED QUANTITIES OF TRI CHEMICALS IN WASTE FOR FORMS WITH AND WITHOUT SOURCE REDUCTION REPORTED, 1994

	1993 kg	1994 kg	Projected 1995 kg	Projected 1996 kg	Actual Change 1993–1994 (%)	Projected Change 1994–1995 (%)	Projected Change 1994–1996 (%)
Forms Indicating Source Reduction Activity in 1994							
Recycled On-site	1,296,828,840	1,412,564,633	1,396,560,871	1,381,713,623	8.9	-1.1	-2.2
Recycled Off-site	311,717,411	311,908,459	314,138,357	313,060,284	0.1	0.7	0.4
Energy Recovery On-site	360,944,237	367,930,090	374,849,052	384,025,768	1.9	1.9	4.4
Energy Recovery Off-site	83,931,550	92,738,019	88,850,063	86,916,206	10.5	-4.2	-6.3
Treated On-site	843,738,090	850,148,811	943,263,621	950,023,852	0.8	11.0	11.7
Treated Off-site	73,477,905	72,987,622	75,307,223	70,527,959	-0.7	3.2	-3.4
Quantity Released/Disposed of	392,242,637	351,971,497	325,106,500	308,120,258	-10.3	-7.6	-12.5
Total Production-related Waste	**3,362,880,671**	**3,460,249,131**	**3,518,075,688**	**3,494,387,951**	**2.9**	**1.7**	**1.0**
Forms Indicating No Source Reduction Activity in 1994							
Recycled On-site	2,443,795,137	2,400,056,548	2,526,568,418	2,577,275,768	-1.8	5.3	7.4
Recycled Off-site	773,161,350	829,585,135	825,331,687	829,689,306	7.3	-0.5	0.0
Energy Recovery On-site	972,567,493	1,184,249,578	1,226,443,920	1,193,395,107	21.8	3.6	0.8
Energy Recovery Off-site	123,714,771	120,054,549	111,418,445	109,072,233	-3.0	-7.2	-9.1
Treated On-site	3,129,960,089	3,076,861,312	3,159,625,771	3,170,311,801	-1.7	2.7	3.0
Treated Off-site	181,211,535	179,768,468	174,948,326	162,314,811	-0.8	-2.7	-9.7
Quantity Released/Disposed of	870,737,625	788,420,271	757,120,620	749,445,585	-9.5	-4.0	-4.9
Total Production-related Waste	**8,495,152,198**	**8,579,004,346**	**8,781,466,256**	**8,884,706,179**	**1.0**	**2.4**	**3.6**

NOTE: One form erroneously projecting 93 million kilograms for 1996 was not included.

While it appears that a waste-management approach that attempts to reduce production-related waste reflects an overall movement away from releases and disposal, it also seems likely that facilities reporting source reduction activity will move in this direction to a greater degree than those that do not report such activities. **Table 6–14** shows that facilities that indicate source reduction activity on their forms also report reductions in the quantity of TRI chemicals released or disposed of by 10 percent from 1993 to 1994 and project further reductions of 12.5 percent from 1994 to 1996. For those indicating no source reduction activity, however, reductions in the quantities released or disposed of were smaller from 1993 to 1994 (9.5 percent) and smaller still in the projections for 1994 to 1996 (5 percent).

Key findings

- By far, more cross-border transfers are sent for recycling than for any other waste-management option: 98 percent of US transfers sent outside the country and 95 percent of transfers sent from Canada to the United States were for recycling.
- Off-site transfers in NPRI cannot be completely analyzed according to their geographic destinations. Although NPRI requires that off-site transfers be reported, many reporting forms show transfers to more than one receiving site (e.g., two landfills) and the total, but the specific amount to each site is not reported. Thus, the actual amount that Canadian facilities transport to other provinces or to individual US states cannot be known precisely, only in a range of values.
- Transfers from Canadian facilities to sites in the United States were greater than transfers in the other direction. Canadian facilities transferred from 36 million to 43 million kilograms to US sites; US facilities transferred 29 million kilograms to Canadian sites in 1994.
- Releases and transfers by facilities along the Canadian-US border are smaller than the number of such facilities would suggest. While 82 percent of NPRI facilities and 20 percent of TRI facilities are located within 100 kilometers of the border, their total releases and transfers represent, respectively, 69 percent and 13 percent of Canadian and US totals for 1994.
- Most regions of the border area host relatively equal numbers of NPRI and TRI facilities. In the Great Lakes region, however, TRI facilities outnumber NPRI facilities by almost six to one. This region also overwhelmingly dominates any border analysis, containing 90 percent of all facilities that are located within 100 kilometers of the Canadian-US border.

7.1 INTRODUCTION

Cross-boundary issues that can be examined with PRTR data include transfers of chemicals from facilities in one country to sites located in another and releases and transfers reported by facilities located near borders. US TRI data supply information on transfers across the US-Mexican and US-Canadian borders, while Canadian NPRI data give an indication of chemical waste transferred into the United States. In addition, this chapter examines data for facilities located within 100 kilometers of the boundary between the United States and Canada.

7.2 OFF-SITE TRANSFERS ACROSS BORDERS

The amount of chemicals in waste transferred from reporting facilities to off-site locations is reported to both NPRI and TRI, along with the address of the site to which the waste stream is shipped. Most reported transfers are to sites within a nation's borders, but can also be shipped to the northern/southern neighbor or to other countries as well. Transfers to sewage/POTWs are not included in this analysis because they would rarely cross national or even state/provincial boundaries.

It is not possible to know how much chemical waste was transferred to individual provinces within Canada or from Canada to individual US states. Both PRTRs require facilities to report the amount of transfer by type of waste-management activity undertaken at the off-site location. Under TRI, each transfer is identified by off-site location, but in NPRI, the transfer amount is not uniquely associated with the receiving site. For example, if transfers are sent to two landfills, NPRI lists the *total* amount sent to landfills and the names and addresses of the destinations, but not the amount directed to *each* landfill. Because there are reports where recipient locations, such as the landfills, are located in different provinces or in different countries, an analysis of what is being transported between the countries is not possible. For this analysis, therefore, data are presented as a range of values, the low end of which is calculated by attributing to a given destination *none* of the amount reported to multiple destinations, and the high end by attributing *all* of the amount reported to individual sites.

Table 7–1 TRI OFF-SITE TRANSFERS TO OTHER COUNTRIES FROM THE US, 1994

Country	Transfers to Recycling (kg)	Transfers to Energy Recovery (kg)	Treatment/ Destruction (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	% of Transfers Outside US
Austria	12,120	0	0	0	12,120	0.0
Australia	10,522	0	0	0	10,522	0.0
Belgium	53,504	0	20	0	53,524	0.1
Canada	27,889,698	2,359	1,034,081	54,312	28,980,450	46.5
Alberta	50,023	0	0	0	50,023	0.1
British Columbia	128,627	2,336	1,406	0	132,368	0.2
Manitoba	25,705	0	0	0	25,705	0.0
Ontario	21,768,665	24	703,368	14,792	22,486,848	36.1
Quebec	5,916,678	0	329,307	39,520	6,285,505	10.1
Finland	202,129	0	0	5,481	207,610	0.3
France	165,449	0	0	0	165,449	0.3
Germany	823,010	0	0	0	823,010	1.3
India	123,512	0	0	0	123,512	0.2
Japan	370,062	0	0	0	370,062	0.6
Mexico	31,143,498	0	242,725	0	31,386,223	50.3
Monterrey	30,314,203	0	242,725	0	30,556,928	49.0
Other Cities	829,295	0	0	0	829,295	1.3
Singapore	10,928	0	0	0	10,928	0.0
Sweden	33,639	0	0	0	33,639	0.1
United Arab Emirates	97,596	0	0	0	97,596	0.2
United Kingdom	98,816	0	9	0	98,825	0.2
Total Transferred outside the US	**61,034,483**	**2,359**	**1,276,835**	**59,793**	**62,373,470**	**100.0**

7.2.1 Off-Site Transfers from TRI Facilities

In 1994, TRI facilities reported transferring 62 million kilograms of chemicals out of the country (see **Table 7–1**); these represent 4 percent of all US transfers. The majority of these transfers were sent for recycling to sites in Mexico (50 percent) and Canada (47 percent). Indeed, 98 percent of all transfers sent by US facilities outside the country were for recycling, compared to 68 per cent of transfers that took place within US borders (see **Table 7–2** and **Figure 7–1**).

Almost all transfers to Mexico are directed to several sites in the city of Monterrey, which receives more US transfers than all destinations in Canada combined. Facilities in nine states sent TRI chemical waste to Monterrey, with facilities located in Arkansas and Texas originating the most. All these transfers were for recycling except for 243,000 kilograms that went to treatment from one Oklahoma facility that sends metal compounds to Monterrey for both recycling and treatment. To the north, facilities in 31 states sent transfers to five Canadian provinces. Sites in Ontario and Quebec received most of these transfers; facilities located in Indiana, Nebraska and Michigan sent the most (see **Tables 7–3** and **7–4**).

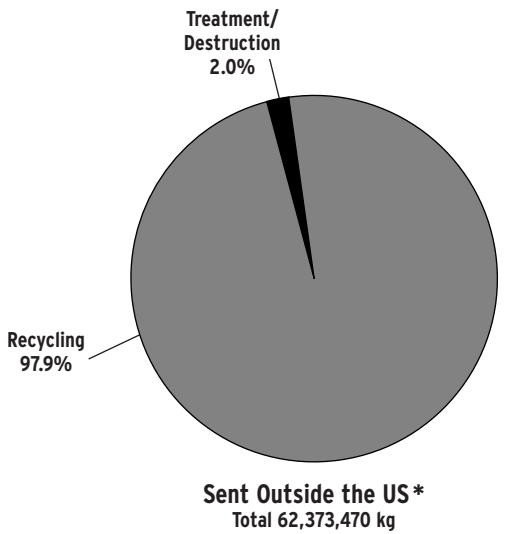
7.2 OFF-SITE TRANSFERS ACROSS BORDERS

Table 7–2 TRI OFF-SITE TRANSFERS WITHIN THE US AND TO OTHER COUNTRIES, 1994

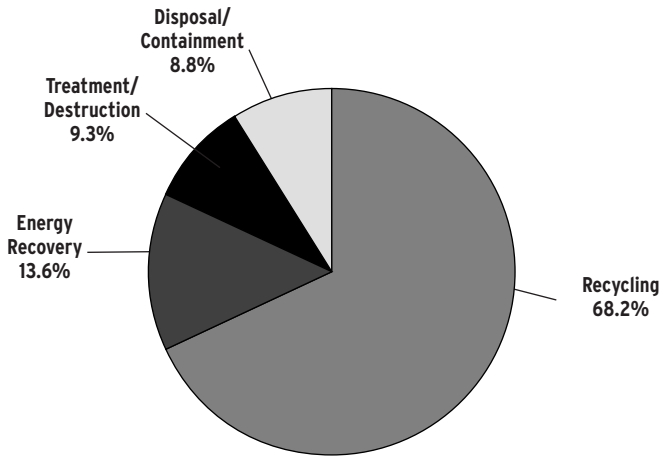
	Location of Receiving Sites					
	Outside the US		Within the US		Total Off-site Transfers	
	kg	%	kg	%	kg	%
Transfers to						
Recycling	61,034,483	97.9	1,052,852,568	68.2	1,113,887,051	69.4
Energy Recovery	2,359	0.0	210,522,123	13.6	210,524,482	13.1
Treatment/Destruction	1,276,835	2.0	143,308,350	9.3	144,585,185	9.0
Disposal/Containment	59,793	0.1	136,540,156	8.8	136,599,949	8.5
Total Transfers	**62,373,470**	**100.0**	**1,543,223,197**	**100.0**	**1,605,596,667**	**100.0**

NOTE: Does not include transfers to sewage/POTWs

Figure 7–1 DISTRIBUTION OF TRI OFF-SITE TRANSFERS OUTSIDE AND WITHIN THE US, 1994 (ALL CHEMICALS/INDUSTRIES)



Sent Outside the US*
Total 62,373,470 kg



Sent Within the US
Total 1,543,223,197 kg

*Energy Recovery and Disposal/Containment less than 1% each
Does not include transfers to sewage/POTWs

Table 7–3 TRI OFF-SITE TRANSFERS TO MEXICO FROM THE US, 1994

To Mexican City/ From US State	Transfers to Recycling (kg)	Transfers to Energy Recovery (kg)	Treatment/ Destruction (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	% of Transfers to Mexico
Monterrey, Nuevo Léon						
Arkansas	8,630,863	0	0	0	8,630,863	27.5
Texas	7,394,266	0	0	0	7,394,266	23.6
Illinois	3,842,953	0	0	0	3,842,953	12.2
Washington	3,173,883	0	0	0	3,173,883	10.1
Alabama	2,670,266	0	0	0	2,670,266	8.5
Mississippi	2,137,057	0	0	0	2,137,057	6.8
Oklahoma	1,554,760	0	242,725	0	1,797,485	5.7
Oregon	906,389	0	0	0	906,389	2.9
Virginia	3,767	0	0	0	3,767	0.0
Other Cities						
Texas	781,398	0	0	0	781,398	2.5
California	47,897	0	0	0	47,897	0.2
Total	**31,143,498**	**0**	**242,725**	**0**	**31,386,223**	**100.0**

7.2.2 Off-site Transfers from NPRI Facilities

The majority of NPRI off-site transfers reported were to sites within Canada. **Table 7–5** shows that 86 percent of off-site transfers were to sites within Canada and approximately 11 percent to the United States. Reporting off-site transfers to recycling and energy recovery is voluntary under NPRI, so these numbers represent a conservative estimate of off-site transfers.

Although the actual transfer amounts that Canadian facilities ship across borders cannot be determined, recycling appears to play a larger role in out-of-country transfers in Canada, as it does in the United States. Because the NPRI reporting of off-site transfers for recycling and energy recovery is voluntary, the actual proportions of waste sent to various management options may well differ from the reported data. These data show, however, that off-site recycling sites receive 95 percent of NPRI transfers sent to the United States, 82 percent of NPRI transfers sent to both US and Canadian destinations, and 78 percent of transfers that remain within Canada (see **Table 7–5,** graphed in **Figure 7–2**).

Table 7–4 TRI OFF-SITE TRANSFERS TO CANADA FROM THE US, 1994

To Canadian Province/ From US State	Transfers to Recycling (kg)	Transfers to Energy Recovery (kg)	Treatment/ Destruction (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	% of Transfers to Canada
Alberta						
Alaska	49,569	0	0	0	49,569	0.2
Ohio	454	0	0	0	454	0.0
British Columbia						
Alaska	85,215	0	0	0	85,215	0.3
Washington	21,869	2,336	1,306	0	25,511	0.1
California	21,542	0	0	0	21,542	0.1
Montana	0	0	100	0	100	0.0
Manitoba						
Alaska	25,705	0	0	0	25,705	0.1
Ontario						
Indiana	4,643,709	0	170	34	4,643,913	16.0
Nebraska	4,318,826	0	0	0	4,318,826	14.9
Michigan	3,196,111	0	578,466	2,512	3,777,089	13.0
Kentucky	1,957,241	0	0	100	1,957,341	6.8
New York	1,414,211	0	124,230	139	1,538,580	5.3
Wisconsin	1,230,890	0	0	0	1,230,890	4.2
Texas	987,771	0	0	0	987,771	3.4
Arizona	711,082	0	0	0	711,082	2.5
Illinois	679,674	0	0	0	679,674	2.3
California	631,123	0	0	0	631,123	2.2
West Virginia	616,327	0	12	499	616,837	2.1
Ohio	315,067	0	0	2,860	317,927	1.1
Pennsylvania	172,914	24	0	4,485	177,423	0.6
Mississippi	166,757	0	0	0	166,757	0.6
Arkansas	161,652	0	0	272	161,924	0.6
Connecticut	108,086	0	0	0	108,086	0.4
Massachusetts	102,731	0	490	0	103,221	0.4
Georgia	102,494	0	0	0	102,494	0.4
Washington	75,986	0	0	0	75,986	0.3
Alabama	71,655	0	0	0	71,655	0.2
Virginia	64,669	0	0	0	64,669	0.2
North Carolina	15,080	0	0	3,890	18,970	0.1
New Hampshire	16,190	0	0	0	16,190	0.1
Maine	4,740	0	0	0	4,740	0.0
Rhode Island	2,810	0	0	0	2,810	0.0
New Jersey	454	0	0	0	454	0.0
Kansas	415	0	0	0	415	0.0

7.2 OFF-SITE TRANSFERS ACROSS BORDERS (continued)

Table 7–4 (continued) TRI OFF-SITE TRANSFERS TO CANADA FROM THE US, 1994

To Canadian Province/ From US State	Transfers to Recycling (kg)	Transfers to Energy Recovery (kg)	Treatment/ Destruction (kg)	Disposal/ Containment (kg)	Total Transfers (kg)	% of Transfers to Canada
Quebec						
Pennsylvania	1,461,324	0	8,295	51	1,469,670	5.1
New York	980,503	0	131,528	8,227	1,120,259	3.9
New Jersey	777,793	0	0	966	778,759	2.7
Illinois	618,629	0	418	0	619,047	2.1
Arkansas	581,238	0	0	0	581,238	2.0
Kentucky	359,513	0	0	1,542	361,055	1.2
Delaware	302,287	0	0	0	302,287	1.0
Connecticut	209,184	0	66,951	7,372	283,507	1.0
Georgia	189,660	0	0	0	189,660	0.7
Ohio	178,422	0	1,646	0	180,068	0.6
Massachusetts	6,346	0	88,261	16,571	111,178	0.4
Indiana	93,775	0	0	0	93,775	0.3
California	90,050	0	0	0	90,050	0.3
Maine	0	0	31,814	1,263	33,077	0.1
Wisconsin	32,375	0	0	0	32,375	0.1
Michigan	31,973	0	0	0	31,973	0.1
Minnesota	3,608	0	0	0	3,608	0.0
Rhode Island	0	0	6	2,859	2,864	0.0
Alabama	0	0	0	340	340	0.0
Washington	0	0	0	329	329	0.0
New Hampshire	0	0	317	0	317	0.0
North Carolina	0	0	69	0	69	0.0
Total	**27,889,698**	**2,359**	**1,034,081**	**54,312**	**28,980,450**	**100.0**

7.2.3 Off-site Transfers between Canada and the United States

Taking the subset of reports concerning chemicals for which data are required under both NPRI and TRI, **Table 7–6** shows the overall amounts transported across the border to and from US states and Canadian provinces. US facilities reported a total of 29 million kilograms of transfers to sites in Canada, and Canadian facilities reported from 36 million to 43 million kilograms of transfers to US sites. Some NPRI forms report shipments to multiple states, but because they do not specify the quantity for each, amounts reported on these forms can only be assigned to the Canada-to-United States total; they cannot be allocated to any one state.

As indicated above, 31 US states reported sending off-site transfers to five Canadian provinces, led by shipments from Indiana, Nebraska and Michigan to sites in Ontario. The province of Quebec received the second largest amount of transfers, primarily from facilities in the states of Pennsylvania, New York, and New Jersey. Eight Canadian provinces sent transfers to 24 US states. Facilities located in Ontario and Quebec sent the largest amounts of transfers. Ontario facilities directed transfers primarily to sites in Michigan, Ohio, New York, Illinois and Indiana. Facilities in Quebec

Table 7–5 OFF-SITE TRANSFERS FROM NPRI FACILITIES, 1994

	Location of Receiving Sites									
	Canada Only		Both US and Canada		US Only		Unknown		Total NPRI Transfers	
	kg	%	kg	%	kg	%	kg	%	kg	%
Transfers to:										
Recycling*	224,928,701	78.1	5,554,634	81.5	35,613,274	94.8	30,600	2.8	266,127,209	79.8
Energy Recovery*	4,345,535	1.5	98,300	1.4	585,322	1.6	8	0.0	5,029,165	1.5
Treatment/Destruction	23,047,970	8.0	449,398	6.6	357,657	1.0	538,517	49.1	24,393,542	7.3
Disposal/Containment	35,613,551	12.4	715,380	10.5	1,013,937	2.7	527,081	48.1	37,869,948	11.4
Total Transfers	**287,935,757**	**100.0**	**6,817,712**	**100.0**	**37,570,190**	**100.0**	**1,096,197**	**100.0**	**333,419,855**	**100.0**
% of Total	**86.4**		**2.0**		**11.3**		**0.3**		**100.0**	

* Reporting in these categories is voluntary so totals may not represent all such transfers. NOTE: Does not include transfers to sewage/POTWs

Table 7–6

OFF-SITE TRANSFERS ACROSS NATIONAL BOUNDARIES, BETWEEN THE UNITED STATES AND CANADA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

	Canadian Province									
	Alberta		British Columbia		Manitoba		Nova Scotia		Ontario	
US State	To Alberta (kg)	From Alberta (kg)	To B.C. (kg)	From B.C. (kg)	To Manitoba (kg)	From Manitoba (kg)	To N.S. (kg)	From N.S. (kg)	To Ontario (kg)	From Ontario (kg)
Alabama	0	0	0	0	0	0	0	0	71,655	0
Alaska	49,569	0	85,215	0	25,705	0	0	0	0	0
Arizona	0	0	0	0	0	0	0	0	711,082	0
Arkansas	0	0	0	0	0	0	0	0	161,924	0
California	0	111,700	21,542	36,300	0	0	0	0	631,123	2,800–4,300
Connecticut	0	0	0	0	0	0	0	0	108,086	0–2,800
Delaware	0	0	0	0	0	0	0	0	0	0
Georgia	0	0	0	0	0	0	0	0	102,494	0–71,370
Illinois	0	0	0	0	0	0	0	0	679,674	1,595,211–4,510,565
Indiana	0	0	0	0	0	0	0	0	4,642,942	0–5,279,288
Kansas	0	0	0	0	0	0	0	0	415	0
Kentucky	0	0	0	0	0	0	0	0	1,957,341	0–2,300
Maine	0	0	0	0	0	0	0	0	4,740	0
Maryland	0	0	0	0	0	0	0	0	0	0–24,783
Massachusetts	0	0	0	0	0	0	0	0	102,547	0–9,156
Michigan	0	0	0	0	0	0	0	0	3,776,612	3,143,622–11,503,467
Minnesota	0	0	0	0	0	0	0	0	0	66
Mississippi	0	0	0	0	0	0	0	0	166,757	0
Missouri	0	96,500	0	0	0	0	0	0	0	0
Montana	0	0	100	0	0	0	0	0	0	0
Nebraska	0	0	0	0	0	0	0	0	4,318,767	0
New Hampshire	0	0	0	0	0	0	0	0	16,190	0
New Jersey	0	442	0	0	0	0	0	0	454	50,000–87,910
New York	0	0	0	0	0	0	0	0	1,538,353	32,445–5,306,026
North Carolina	0	0	0	0	0	35,000	0	0	18,970	0–2,490,000
Ohio	340	51,200–53,323	0	0	0	0	0	14,250	317,927	689,170–7,008,871
Oklahoma	0	0	0	268	0	0	0	0	0	0
Oregon	0	0	0	82,634–83,389	0	0	0	0	0	0
Pennsylvania	0	0	0	0	0	0	0	0	177,423	41,344–2,902,155
Rhode Island	0	0	0	0	0	0	0	0	2,810	0
South Carolina	0	0	0	0	0	0	0	0	0	0–2,490,000
Tennessee	0	0	0	0	0	0	0	0	0	1,064,165–1,135,535
Texas	0	0	0	0	0	0	0	0	987,771	0
Virginia	0	0	0	0	0	0	0	0	64,669	0
Washington	0	0	25,395	41,500	0	0	0	0	75,986	0
West Virginia	0	0	0	0	0	0	0	0	616,811	0
Wisconsin	0	0	0	0	0	0	0	0	1,230,890	0
All US States	**49,909**	**259,842–261,965**	**132,253**	**160,702–161,457**	**25,705**	**35,000**	**0**	**14,250**	**22,484,415**	**17,195,670–22,082,664**

NOTE: Transfers to recyling and energy recovery are voluntary under NPRI so these numbers may not represent all transfers from Canada. Rows and columns of Canadian data do not add to the totals presented because data from NPRI forms that report transfers to multiple states cannot be allocated to any one state. See explanation in text.

7.2 OFF-SITE TRANSFERS ACROSS BORDERS (continued)

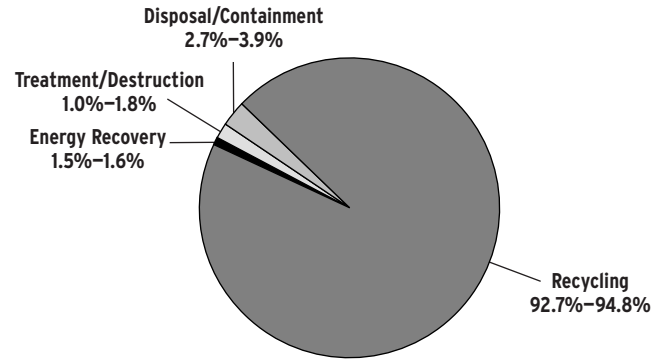
Table 7–6

OFF-SITE TRANSFERS ACROSS NATIONAL BOUNDARIES, BETWEEN THE UNITED STATES AND CANADA, 1994
(MATCHED CHEMICALS/INDUSTRIES)

Canadian Province							
Prince Edward Island		Quebec		Saskatchewan		Total Cross-Boundary Transfers	
To P.E.I. (kg)	From P.E.I. (kg)	To Quebec (kg)	From Quebec (kg)	To Sask. (kg)	From Sask. (kg)	To Canada (kg)	From Canada (kg)
0	0	340	0	0	0	71,995	0
0	0	0	0	0	0	160,490	0
0	0	0	0	0	0	711,082	0
0	0	581,238	0	0	0	743,161	0
0	0	90,050	0	0	0	890,715	150,800–152,300
0	0	280,648	0	0	0	388,734	0–2,800
0	0	302,287	0	0	0	302,287	0
0	0	189,660	0	0	0	292,154	0–71,370
0	0	619,047	750,000–804,000	0	0	1,298,721	2,345,211–5,314,565
0	0	93,775	0	0	0	4,736,717	0–5,279,288
0	0	0	0	0	0	415	0
0	0	361,055	0	0	0	2,318,396	0–2,300
0	0	33,077	0	0	0	37,817	0
0	0	0	0	0	0	0	0–24,783
0	0	110,905	0	0	0	213,453	0–19,156
0	0	31,973	1,500–138,655	0	0	3,808,585	3,145,122–11,642,122
0	0	3,608	0	0	0	3,674	66
0	0	0	840	0	0	166,757	840
0	0	0	0	0	0	0	96,500
0	0	0	0	0	0	100	0
0	0	0	0	0	0	4,318,767	0
0	0	317	0	0	0	16,508	0
0	7,200	778,419	335,075	0	0	786,514	392,717–430,627
0	0	1,104,399	0	0	0	2,642,752	32,445–5,306,026
0	0	69	0	0	0	54,039	35,000–2,525,000
0	0	180,068	324,000–373,810	0	32,800	512,586	1,111,420–7,483,054
0	0	0	0	0	0	0	268
0	0	0	0	0	0	0	82,634–83,389
0	0	1,469,670	23,000–1,657,140	0	0	1,647,092	64,344–4,559,295
0	0	2,864	0	0	0	5,675	0
0	0	0	0	0	0	0	0–2,490,000
0	0	0	0	0	0	0	1,064,165–1,135,535
0	0	0	0	0	205,330	987,771	205,330
0	0	0	17,000,000	0	0	64,669	17,000,000
0	0	329	0	0	0	143,211	41,500
0	0	0	0	0	0	616,811	0
0	0	32,375	0	0	0	1,263,264	0
0	**7,200**	**6,266,173**	**18,434,415–20,205,710**	**0**	**238,130**	**28,958,455**	**36,352,331–43,006,369**

Figure 7–2

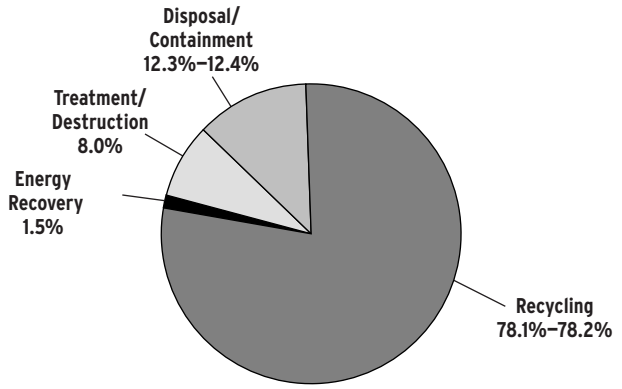
DISTRIBUTION OF NPRI OFF-SITE TRANSFERS OUTSIDE AND WITHIN CANADA, 1994
(ALL CHEMICALS/INDUSTRIES)



Sent Outside Canada
Total 38 million to 44 million kg

Low number = transfers to US only
High number = transfers to US only, plus transfers to both US and Canada

Reporting of transfers to recycling and to energy recovery is voluntary and figures given may not represent all such transfers. Does not include transfers to sewage/POTWs.



Sent Within Canada
Total 288 million to 295 million kg

Low number = transfers to Canada only
High number = transfers to Canada only, plus transfers to both US and Canada

sent the majority of their cross-border transfers to sites in Virginia and Pennsylvania. Notably, a few states that originate or receive a substantial portion of these cross-border transfers (Nebraska, New Jersey and Virginia) do not themselves lie along the border.

Of the 783 Canadian facilities and 212 US facilities that report transfers across the Canadian-US border, only 16 report sending these transfers to sites owned by their own parent company. Of these, 10 are TRI facilities, and their transfers to Canadian facilities under the same parent companies total 904,385 kilograms. Six are NPRI facilities, and the total of their cross-border shipments to related US facilities range from 27,688 to 116,171 kilograms.

7.3 CANADIAN-US BORDER REGIONS

The border area in this analysis is taken as the 100 kilometers on either side of the border (see **Map 7–1**) and is divided in five regions from west to east: the *Northwestern* region, comprising the Alaskan panhandle and northern British Columbia; the *Western* region, extending from the Pacific coast to the continental divide; the *Plains* and northern Mississippi basin; the *Great Lakes* and Lake of the Woods area; and the *Eastern* region, encompassing the Saint Lawrence River to the Atlantic. Facilities report their latitude and longitude to TRI and either their latitude and longitude or their Universal Transverse Mercator (UTM) coordinates to NPRI. These data are used to determine if they are located within 100 kilometers of the border. In cases where geographic coordinates were not given, the city where the facility is located was used.

Eighty-two percent of NPRI facilities and 20 percent of TRI facilities are located within 100 kilometers of the Canadian-US border (see **Table 7–7**). Their total releases and transfers, however, represent a smaller percentage of the whole: 69 percent for NPRI and 13 percent for TRI. Thus, although NPRI facilities generally cluster near the border, for both NPRI and TRI, those facilities reporting the largest amounts of releases and transfers are not necessarily located in the border region.

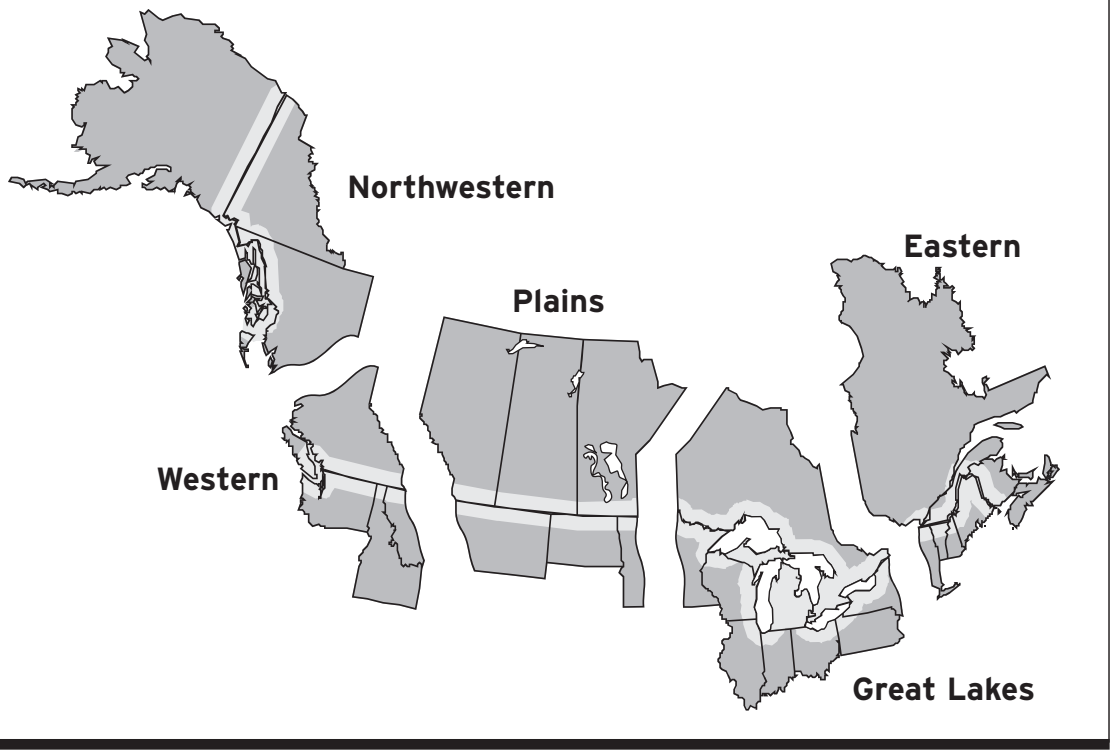
7.3.1 Releases and Transfers in the Border Regions

The five border regions vary substantially (see **Map 7–2**). Ninety percent of all border facilities are located in the area surrounding the Great Lakes, and this region contains almost six times as many TRI as NPRI facilities (4,053 TRI and 714 NPRI). In the Eastern region, nearly the opposite condition prevails: more than five times as many NPRI as TRI facilities are located there (303 NPRI and 57 TRI). The other three regions host nearly equal numbers of NPRI and TRI facilities (see **Figure 7–3**).

Total releases and transfers from NPRI and TRI facilities within each border region show roughly similar patterns. TRI facilities account for 166 million kilograms or 70 percent

Map 7–1

THE 100-KILOMETER BAND AND THE FIVE GEOGRAPHICAL REGIONS OF THE CANADIAN-US BORDER AREA



of the total for the Great Lakes region (versus 85 percent of the facilities). However, for the Eastern region, the NPRI facilities reported 53 million kilograms or 96 percent of that region's total (again, with about 85 percent of the facilities). For the Plains region, the NPRI facilities account for the majority of releases and transfers, having reported 1.5 million kilograms or 83 percent of the total (with 71 percent of the facilities, see **Figure 7–4**).

Emissions to the air tend to be more prominent in the border regions than for the national databases as a whole (see **Table 7–8** and **Figure 7–5**). This is particularly true in the Great Lakes, Western and Plains regions, where both NPRI and TRI facilities reported air emissions to be more than 80 percent of total releases. Underground injection is not widely practiced in the border regions. The Eastern region's releases are primarily surface water discharges, all other data being far outweighed by the magnitude of the sulfuric acid discharges from the Kronos Canada facility in Quebec. The TRI facilities in the Eastern region report air emissions almost exclusively.

Transfer patterns vary by border region, and except for the Great Lakes, are not similar to national patterns (see **Table 7–9** and **Figure 7–6**). In the Eastern region, transfers to disposal/containment account for almost 85 percent of the total for NPRI facilities, while for TRI facilities, transfers to treatment represent over 50 percent of all transfers. In the Great Lakes region, both NPRI and TRI transfers to treatment represent over 35 percent of all transfers, and transfers to sewage/POTWs from TRI facilities there are greater than for NPRI facilities, as is true for all facilities in their respective countries. In the Plains region, NPRI and TRI facilities predominantly reported transfers to treatment/destruction. In the Western region, while transfers

Table 7–7

RELEASES AND TRANSFERS FOR BORDER REGIONS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

NPRI–Canadian Facilities

Border Region	Facilities		Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers	
	Number	%			kg	%
Eastern	303	22.4	36,708,501	16,139,830	52,848,331	28.5
Great Lakes	714	52.8	48,985,094	23,316,052	72,301,146	39.0
Plains	29	2.1	1,329,642	145,999	1,475,641	0.8
Western	57	4.2	1,295,408	177,347	1,472,755	0.8
Northwestern	1	0.1	616,600	0	616,600	0.3
Subtotal	**1,104**	**81.7**	**88,935,245**	**39,779,228**	**128,714,473**	**69.4**
Total	**1,351**	**100.0**	**140,906,351**	**44,604,576**	**185,510,927**	**100.0**

TRI–US Facilities

Border Region	Facilities		Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers	
	Number	%			kg	%
Eastern	57	0.3	1,827,520	276,185	2,103,705	0.2
Great Lakes	4,053	18.9	92,695,805	72,918,309	165,614,113	12.5
Plains	12	0.1	252,415	41,413	293,828	0.0
Western	55	0.3	2,976,687	53,699	3,030,387	0.2
Northwestern	1	0.0	712,507	0	712,507	0.1
Subtotal	**4,178**	**19.5**	**98,464,934**	**73,289,606**	**171,754,540**	**13.0**
Total	**21,464**	**100.0**	**944,624,448**	**375,920,852**	**1,320,545,300**	**100.0**

Totals for US and Canadian Facilities

Border Region	Facilities		Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers	
	Number	%			kg	%
Eastern	360	1.6	38,536,021	16,416,015	54,952,036	3.6
Great Lakes	4,767	20.9	141,680,899	96,234,361	237,915,259	15.8
Plains	41	0.2	1,582,057	187,412	1,769,469	0.1
Western	112	0.5	4,272,095	231,046	4,503,142	0.3
Northwestern	2	0.0	1,329,107	0	1,329,107	0.1
Subtotal	**5,282**	**23.2**	**187,400,179**	**113,068,834**	**300,469,013**	**20.0**
Total	**22,815**	**100.0**	**1,085,530,799**	**420,525,428**	**1,506,056,227**	**100.0**

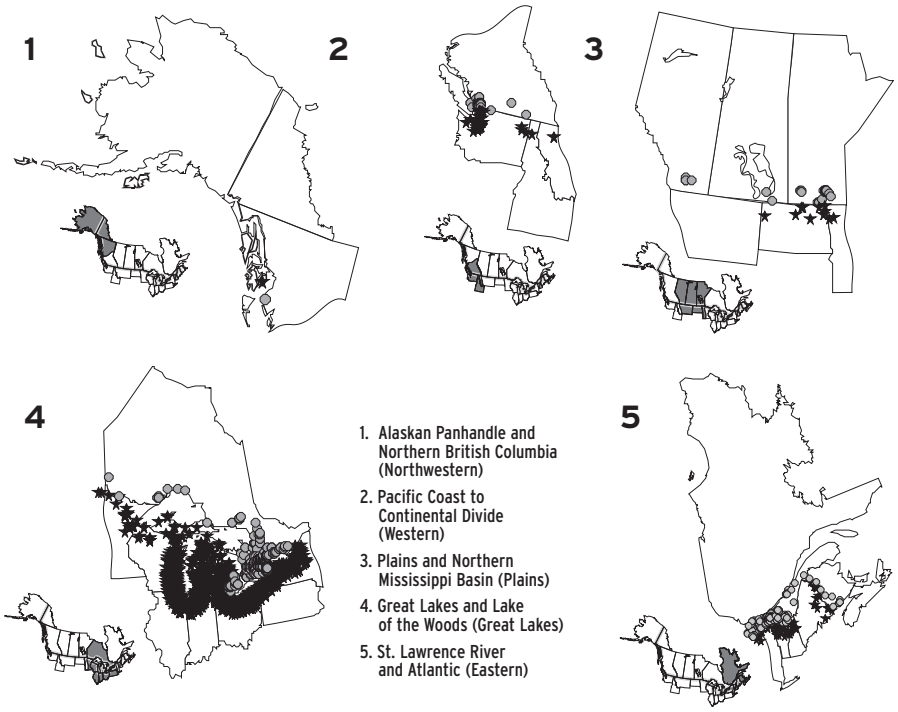
7.3 CANADIAN-US BORDER REGIONS (continued)

Table 7–7
RELEASES AND TRANSFERS FOR BORDER REGIONS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

Map 7–2
CANADIAN-US BORDER REGIONS, NPRI AND TRI FACILITIES

Map 7–2

CANADIAN-US BORDER REGIONS, NPRI AND TRI FACILITIES



to treatment/destruction amounted to more than half of all transfers reported by TRI facilities, disposal/containment represented more than 75 percent of all transfers from NPRI facilities.

7.3.2 Bioaccumulating Chemicals in the Great Lakes Region

The Great Lakes region has more facilities than any other border region and, as noted in **Chapter 3**, total releases and transfers from facilities in the states and provinces surrounding the Great Lakes are among the largest found anywhere. In addition, bioaccumulating chemicals in this area have been identified as a special class of substances of concern by the International Joint Commission (IJC). The IJC is an independent agency established by the Boundary Waters Treaty of 1909 for the prevention and resolution of disputes between Canada and the United States, primarily those involving water quantity and quality. Although all waterbodies along the US-Canada boundary fall within the IJC mandate, the Great Lakes programs are the largest and most comprehensive. Bioaccumulating chemicals considered by the IJC include 13 persistent and toxic substances that are of immediate concern in the Great Lakes system and another 26 substances having a demonstrated potential to impair the Great Lakes basin ecosystem (see the Environment Canada web page on the Canada-Ontario Agreement: http://www.cciw.ca/glimr/data/canada-ontario-agreement). Five of these 39 substances are on the NPRI list and 12 appear on the TRI list, as shown on **Table 7–10**. The other substances on the IJC list include dioxins, furans, polycyclic aromatic hydrocarbons (which are combustion byproducts and not manufactured) and DDT and related compounds (which are no longer manufactured in the United States or Canada).

Figure 7–3 DISTRIBUTION OF NPRI AND TRI FACILITIES IN THE FIVE BORDER REGIONS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

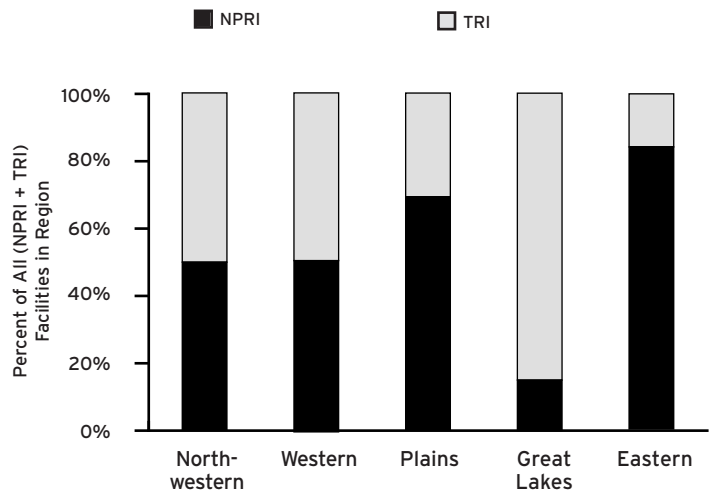
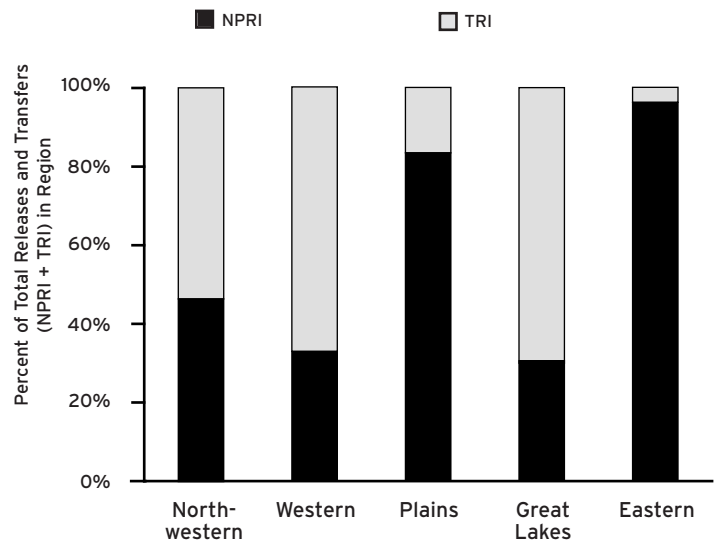


Figure 7–4 DISTRIBUTION OF NPRI AND TRI TOTAL RELEASES AND TRANSFERS IN THE FIVE BORDER REGIONS, 1994 (MATCHED CHEMICALS/INDUSTRIES)



While few direct discharges of these substances to water were reported in the PRTR data, releases from the other environmental media can end up in the Great Lakes through air deposition or via groundwater. Data on current releases also do not measure existing concentrations of these persistent substances, and for some, such as metals, local releases may be less important than major sources located outside and upwind from the immediate area. Furthermore, PRTR data do not include non-manufacturing uses of these chemicals in the United States, and pesticides are not listed on Canada's NPRI.

7.3.3 Industries in the Border Regions

As for the PRTRs as a whole, two industrial sectors accounted for the majority of total releases and transfers in each region (see **Table 7–11**). In most regions, the same industries led the totals on both sides of the border. In the East, however, the chemical and plastics industries contributed 60 percent of NPRI releases and transfers, but the paper and stone/clay/glass industries reported 73 percent of those in the TRI. In the Plains, the chemical industry had the largest releases and transfers reported from NPRI facilities, while the food industry dominated TRI releases and transfers.

The primary metal products and chemical industries led both NPRI and TRI facilities in the Great Lakes, as did paper and petroleum refining in the Western region. The only two facilities reporting in the Northwestern region were both paper facilities. Of all these industries, only stone/clay/glass (second among TRI facilities in the Eastern region) fell outside the top eight in the combined rankings for Canada and the United States.

Table 7–8
RELEASES FOR BORDER REGIONS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

NPRI–Canadian Facilities

Border Region	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
Eastern	13,294,541	19,494,741	380	3,885,026	3,6708,501
Great Lakes	40,807,459	3,532,726	0	4,535,700	4,8985,094
Plains	1,257,618	9,300	0	58,552	1,329,642
Western	1,177,605	34,724	0	77,200	1,295,408
Northwestern	616,600	0	0	0	616,600
Subtotal	**57,153,823**	**23,071,491**	**380**	**8,556,478**	**88,935,245**
% of Subtotal	**64.3**	**25.9**	**0**	**9.6**	**100.0**
Total	**89,195,059**	**33,256,285**	**7,742,206**	**10,528,273**	**140,906,351**
% of Total	**63.3**	**23.6**	**5.5**	**7.5**	**100.0**

TRI–US Facilities

Border Region	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
Eastern	1,804,290	19,178	0	4,052	1,827,520
Great Lakes	78,778,727	1,174,262	5,222,917	7,519,899	92,695,805
Plains	237,556	14,519	0	340	252,415
Western	2,562,379	378,408	0	35,901	2,976,687
Northwestern	341,757	370,636	0	113	712,507
Subtotal	**83,724,708**	**1,957,003**	**5,222,917**	**7,560,306**	**98,464,934**
% of Subtotal	**85.0**	**2.0**	**5.3**	**7.7**	**100.0**
Total	**634,554,192**	**29,509,572**	**152,298,373**	**128,262,311**	**944,624,448**
% of Total	**67.2**	**3.1**	**16.1**	**13.6**	**100.0**

Totals for Canadian and US Facilities

Border Region	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
Eastern	15,098,831	19,513,919	380	3,889,078	38,536,021
Great Lakes	119,586,186	4,706,988	5,222,917	12,055,599	141,680,899
Plains	1,495,174	23,819	0	58,892	1,582,057
Western	3,739,984	413,132	0	113,101	4,272,095
Northwestern	958,357	370,636	0	113	1,329,107
Subtotal	**140,878,531**	**25,028,494**	**5,223,297**	**16,116,784**	**187,400,179**
% of Subtotal	**75.2**	**13.4**	**2.8**	**8.6**	**100.0**
Total	**723,749,251**	**62,765,857**	**160,040,579**	**138,790,584**	**1,085,530,799**
% of Total	**66.7**	**5.8**	**14.7**	**12.8**	**100.0**

7.3 CANADIAN-US BORDER REGIONS
(continued)

Figure 7–5
NPRI AND TRI RELEASES IN THE FIVE BORDER REGIONS, 1994
(MATCHED CHEMICALS/INDUSTRIES)

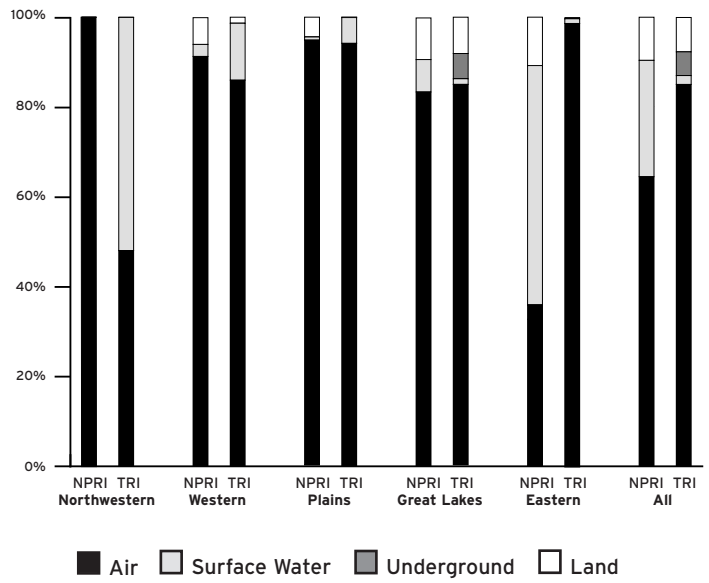


Table 7–9 TRANSFERS FOR BORDER REGIONS, 1994 (MATCHED CHEMICALS/INDUSTRIES)

NPRI–Canadian Facilities

Border Region	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
Eastern	2,467,652	210,543	13,461,635	16,139,830
Great Lakes	8,479,808	1,215,224	13,621,020	23,316,052
Plains	132,600	50	13,349	145,999
Western	32,368	5,270	139,709	177,347
Northwestern	0	0	0	0
Subtotal	**11,112,428**	**1,431,087**	**27,235,713**	**39,779,228**
% of Subtotal	**27.9**	**3.6**	**68.5**	**100.0**
Total	**15,011,219**	**1,479,110**	**28,114,247**	**44,604,576**
% of Total	**33.7**	**3.3**	**63.0**	**100.0**

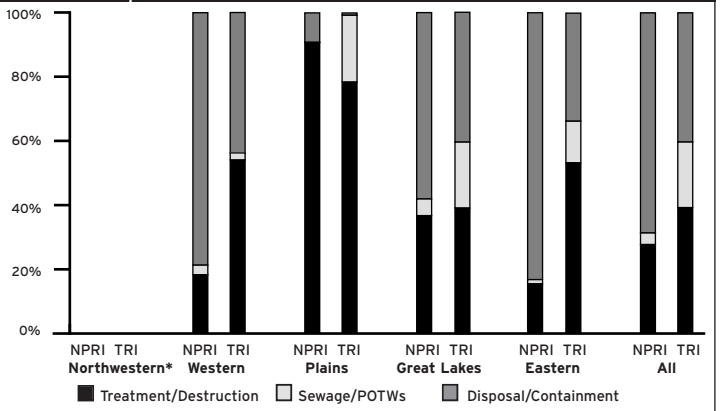
TRI–US Facilities

Border Region	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
Eastern	148,390	35,537	92,259	276,185
Great Lakes	28,519,657	14,949,224	29,449,429	72,918,309
Plains	32,379	8,694	340	41,413
Western	28,859	1,158	23,683	53,699
Northwestern	0	0	0	0
Subtotal	**28,729,284**	**14,994,612**	**29,565,710**	**73,289,606**
% of Subtotal	**39.2**	**20.5**	**40.3**	**100.0**
Total	**136,908,496**	**109,029,867**	**129,982,489**	**375,920,852**
% of Total	**36.4**	**29.0**	**34.6**	**100.0**

Totals for Canadian and US Facilities

Border Region	Treatment/ Destruction (kg)	Sewage/ POTWs (kg)	Disposal/ Containment (kg)	Total Transfers (kg)
Eastern	2,616,042	246,080	13,553,894	16,416,015
Great Lakes	36,999,465	16,164,448	43,070,449	96,234,361
Plains	164,979	8,744	13,689	187,412
Western	61,227	6,428	163,392	231,046
Northwestern	0	0	0	0
Subtotal	**39,841,712**	**16,425,699**	**56,801,423**	**113,068,834**
% of Subtotal	**35.2**	**14.5**	**50.2**	**100.0**
Total	**151,919,715**	**110,508,977**	**158,096,736**	**420,525,428**
% of Total	**36.1**	**26.3**	**37.6**	**100.0**

Figure 7–6 NPRI AND TRI TRANSFERS IN THE FIVE BORDER REGIONS, 1994 (MATCHED CHEMICALS/INDUSTRIES)



* No transfers were reported for this region.

Table 7–10 REPORTS ON BIOACCUMULATORS FROM GREAT LAKES REGION FACILITIES, 1994

CAS Number	Chemical	Number of Forms	Total Air Emissions (kg)	Surface Water Discharges (kg)	Underground Injection (kg)	On-site Land Releases (kg)	Total Releases (kg)
120-12-7	Anthracene	5	1,071	37	0	3	1,241
—	Cadmium (and its compounds)	6	1,281	1	0	0	1,310
106-46-7	1,4-Dichlorobenzene	1	0	0	0	0	0
—	Mercury (and its compounds)	1	0	0	0	11	11
101-14-4	4,4'-Methylenebis (2-chloroaniline)	1	0	0	0	0	5
	Total for NPRI Chemicals	**14**	**2,352**	**38**	**0**	**14**	**2,567**
120-12-7	Anthracene	10	14,985	0	0	4	14,989
309-00-2	Aldrin	0	0	0	0	0	0
—	Cadmium (and its compounds)	30	2,796	3	0	1,140	3,939
57-74-9	Chlordane	0	0	0	0	0	0
106-46-7	1,4-Dichlorobenzene	1	3,220	0	0	0	3,220
91-94-1	3,3'-Dichlorobenzidine	4	5	0	0	0	5
118-74-1	Hexachlorobenzene	0	0	0	0	0	0
—	Mercury (and its compounds)	6	965	3	0	546	1,514
101-14-4	4,4'-Methylenebis (2-chloroaniline)	8	7	0	0	0	7
87-86-5	Pentachlorophenol	1	2	0	0	0	2
1336-36-3	Polychlorinated biphenyls (PCBs)	5	0	0	0	0	0
8001-35-2	Toxaphene	0	0	0	0	0	0
	Total for TRI Chemicals	**65**	**21,980**	**5**	**0**	**1,690**	**23,675**

Table 7–11

NPRI AND TRI RELEASES AND TRANSFERS FOR BORDER REGIONS, FOR TOP INDUSTRIES, 1994 (MATCHED CHEMICALS/INDUSTRIES)

NPRI

US SIC Code	Industry	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
	Eastern			
28	Chemicals	18,347,598	1,552,811	19,900,409
30	Plastics	1,433,990	10,331,404	11,765,394
	Subtotal	19,781,588	11,884,215	31,665,803
	% of Total	53.9	73.6	59.9
	Total for Region	36,708,501	16,139,830	52,848,331
	Great Lakes			
33	Primary Metals	11,837,365	8,312,196	20,149,561
28	Chemicals	11,835,945	4,290,684	16,126,629
	Subtotal	23,673,310	12,602,880	36,276,190
	% of Total	48.3	54.1	50.2
	Total for Region	48,985,094	23,316,052	72,301,146
	Plains			
28	Chemicals	1,187,055	97,597	1,284,652
37	Transportation	58,466	16,181	74,647
	Subtotal	1,245,521	113,778	1,359,299
	% of Total	93.7	77.9	92.1
	Total for Region	1,329,642	145,999	1,475,641
	Western			
26	Paper	753,882	0	753,882
29	Petroleum	283,949	89,700	373,649
	Subtotal	1,037,831	89,700	1,127,531
	% of Total	80.1	50.6	76.6
	Total for Region	1,295,408	177,347	1,472,755
	Northwestern			
26	Paper	616,600	0	616,600
	Total			
28	Chemicals	55,144,851	6,898,124	62,042,975
26	Paper	32,380,362	3,301,686	35,682,048
	Subtotal	87,525,213	10,199,810	97,725,023
	% of Total	62.1	22.9	52.7
	Total	140,906,351	44,604,576	185,510,927

TRI

US SIC Code	Industry	Total Releases (kg)	Total Transfers (kg)	Total Releases and Transfers (kg)
	Eastern			
26	Paper	964,805	68,548	1,033,353
32	Stone/Clay	504,354	0	504,354
	Subtotal	1,469,158	68,548	1,537,707
	% of Total	80.4	24.8	73.1
	Total for Region	1,827,520	276,185	2,103,705
	Great Lakes			
33	Primary Metals	16,355,882	28,080,939	44,436,821
28	Chemicals	12,834,798	17,818,439	30,653,237
	Subtotal	29,190,680	45,899,378	75,090,058
	% of Total	31.5	62.9	45.3
	Total for Region	92,695,805	72,918,309	165,614,113
	Plains			
20	Food	112,249	8,354	120,603
37	Transportation	66,562	907	67,469
	Subtotal	178,812	9,261	18,807
	% of Total	70.8	22.4	64.0
	Total for Region	252,415	41,413	293,828
	Western			
26	Paper	1,375,213	2	1,375,215
29	Petroleum	405,596	764	406,360
	Subtotal	1,780,809	766	1,781,576
	% of Total	59.8	1.4	58.8
	Total for Region	2,976,687	53,699	3,030,387
	Northwestern			
26	Paper	712,507	0	712,507
	Total			
28	Chemicals	365,324,590	151,348,682	516,674,548
33	Primary Metals	138,324,536	100,558,022	238,882,558
	Subtotal	503,649,126	251,906,704	755,557,106
	% of Total	53.3	67.0	57.2
	Total	944,624,448	375,920,852	1,320,545,300

Key findings

- A Mexican PRTR is under development. A case study, with 45 facilities from the state of Querétaro voluntarily participating, was completed in mid-1996. This study was undertaken to test plans for the future implementation, format and management of a PRTR and, although it did not exactly reflect the structure of the overall Mexican industrial sector or the release and transfer of PRTR substances country-wide, these facts are not seen as serious deficiencies.
- Combustion and greenhouse gases were included in the case study, and carbon dioxide releases accounted for 98 percent of the 191 million kilograms of total releases and transfers reported.
- Seventy chemicals in the Mexican case study matched chemicals also listed by NPRI and TRI. For these substances, releases totaled 1.1 million kilograms and transfers just under 51,500 kilograms. There was poor response regarding data on transfers, however, so these may be underestimated. Also, reporting transfers to recycling was voluntary, and energy recovery was reported as transfers off-site for treatment.
- The case study showed that the electronic medium for submissions was well accepted and easy to use, although the smaller facilities in particular needed technical assistance in identifying sources of releases and transfers and for the calculation of emissions using indirect estimation methods.

8.1 INTRODUCTION

As described in **Chapters 1** and **2**, industrial facilities in Canada and the United States report to their governments information on releases (to the environment) and transfers (to other locations) of certain chemicals. These data are made public as a Pollutant Release and Transfer Register (PRTR). In the United States, the Toxics Release Inventory (TRI) was established in 1987. In Canada, the first reporting year for the National Pollutant Release Inventory (NPRI) was 1993. Mexico's *Registro de Emisiones y Transferencia de Contaminantes* (RETC) is under development. Forty-five industrial participants in a pilot project in the Mexican state of Querétaro reported for 1995; full implementation is expected in 1997.

8.2 CASE STUDY BACKGROUND

In 1994, Mexico began to develop a national PRTR (hereafter referred to as RETC—*Registro de Emisiones y Transferencia de Contaminantes*) with the participation of government, industry, academic institutions and NGOs in the National Coordinating Group (*Grupo Nacional Coordinador*—GNC). The final product of this group, headed by the General Direction of Management and Environmental Information of INE (*Instituto Nacional de Ecología*), is an executive proposal for the implementation of the RETC to be presented to the Secretariat of the Environment, Natural Resources and Fisheries (*Secretaría de Medio Ambiente, Recursos Naturales y Pesca*—Semarnap) and the Federal Congress. This proposal seeks to include the elements and strategies necessary for national annual reporting, which will begin in 1997 with 1996 release and transfer data.

In mid-1995, the GNC initiated a case study to plan and carry out a complete data collection cycle with a representative sample of facilities. The general objectives of the case study, as described in the report presented to the GNC (INE's final case study report, July 1996) were:

- To commence, through a concerted approach with industry, a pollutant-release register that allows the quantitative assessment of specified chemicals released to the different media (air, water and land) by each industrial plant involved in the study.
- To accumulate concrete experience in the management and operation of a pilot-scale RETC data-collection cycle, testing the reporting format, the availability of the information required, the clarity of the instructions, the communications strategy with the reporting industries and their desire for participation, among others.
- To consider the possible development of an RETC on the national level, based on the case study results.
- To determine the investment that would be required for the authorities and the affected industries to operate the program permanently and to assess its economic feasibility from a cost-benefit perspective.

The specific objectives for the case study included training governmental personnel in the tasks required for the management and operation of the RETC, analyzing input data at the state level, testing the environmental management applications and policies, and evaluating the level of technical assistance and support that would be needed for the facilities to report their pollutant releases and transfers accurately. In the case study, the following technical, administrative and operational elements for RETC implementation were tested:

- training programs for industry and governmental personnel,
- participation of the target industries,
- consulting system for industry and guidance materials for release estimation,
- format of the report and instructions for its completion,
- list of chemical substances to be reported,
- software application and use,
- usefulness of the information generated, and
- operating costs for the government and industry.

The state of Querétaro was selected for the case study because its industrial sector is representative of the national situation in number and type of industries; there is a well-developed level of cooperation between the federal government, state authorities and industry; and it had the necessary resources—human, financial and infrastructure—to support the development of the study. Also, Querétaro is located near Mexico City, facilitating coordination with the INE and GNC.

The state has an area of 11,769 square kilometers, which is 0.5 percent of the area of Mexico, and contains 18 municipalities. In 1995, its population was 1,248,844, amounting to 1.37 percent of the national total. In the 1960s, Querétaro began to develop industrially. Today, it is the fourth most-industrialized state in Mexico. The manufacturing sector is especially important and within this sector there is a great diversity of industrial activities. The most important industries are: metal products and auto parts; food and beverages; paper and printing; textiles; and chemicals. The manufacturing sector contributes 52 percent of the gross domestic product and employs 40 percent of the economically active population of the state (information provided by *Dirección de Ecología* of Querétaro, May 1996). The state government, through the *Dirección de Ecología*, agreed to participate in the case study as part of its environmental program, which seeks to balance economic activity and environmental protection.

8.3 METHODOLOGY USED IN THE CASE STUDY

The case study was carried out over a 10-month period, from September 1995 through June 1996, divided into four principal phases: planning, preparation, implementation and analysis/evaluation. Since Mexico does not have specific regulations requiring the reporting of releases, and given the study characteristics, industry participation was by invitation and voluntary.

Facilities were selected for their representativeness of Mexican industry, taking into account certain characteristics such as type and size. Three further characteristics of specific importance to the database were considered for each candidate: the firm's use or release of at least one of the substances listed for reporting on the RETC; a high probability that the firm would agree to participate voluntarily in the study; and the likelihood that the information furnished would be of the necessary accuracy. A list of 2,100 facilities was analyzed and narrowed down to the 80 facilities that were finally invited to participate in the study.

Table 8–1 COMPARISON OF THE INDUSTRIAL DISTRIBUTION BY SUBSECTOR

CMAP Code	Industrial Activity	Mexico (%)	Querétaro (%)	Case Study (%)
31	Food, beverages and tobacco	36	29	15
32	Textiles, garment and leather industry	12	23	2
33	Wood and wood products, including furniture	11	10	0
34	Paper and paper products, printing and publishing	6	9	15
35	Chemical substances, products derived from petroleum and coal, rubber and plastic	4	7	37
36	Non-metal mineral products, excluding those derived from petroleum and coal	10	6	2
37	Basic metal industries	1	5	2
38	Metal products, machinery and equipment, including surgical and precision instruments	19	2	27
39	Other manufacturing industries	1	9	0
	Total number of facilities	**138,719**	**3,329**	**80**

The industrial classification number used in Mexico is the Mexican Classification of Activities and Products (*Clasificación Mexicana de Actividades y Productos*—CMAP), a six-digit code. The first two digits refer to the productive subsector, the following two to the category of the activity, and the last two to the specific activity class. **Table 8–1** breaks down the relative industrial population distribution by productive subsector (the first two digits of the CMAP code) for Mexico as a whole, for the State of Querétaro and for the facilities that were invited to participate in the case study.

As is evident from the table, the textile, wood, and non-metal minerals (CMAP 32, 33, 36) had little or no representation in the case study relative to their actual numbers at the state and national levels, especially in contrast to the paper and chemical subsectors (CMAP 34 and 35), which had a marked over-representation. This seemed justifiable, however, because these latter subsectors use potentially greater numbers and quantities of the substances included in the RETC.

It is worth noting that, with the exception of one state-owned facility, all of the facilities invited to participate in the case study were manufacturers (CMAP codes 31–39), not commercial or service establishments. The facilities were required to report the use, releases and transfers of the substances included in RETC in any quantity because neither thresholds nor exemptions had been defined for RETC reporting; one of the aims of the case study was to determine them.

8.4 CASE STUDY RESULTS

There are two aspects to the results obtained from the case study: those relative to the release and transfer data reported by the facilities and those relative to the RETC implementation. For the case study, GNC and industry participants agreed that release and transfer information for the reported substances would be made available without identifying specific facilities.

The final list of substances used in the case study contained 132 individual chemicals and 17 categories. The selection of substances on the list was based on identifications from similar registers in other countries, such as the Canadian NPRI, the US TRI, the Swedish KEMI, and the chemicals covered by the Mexican Official Norms, as well as on criteria of toxicity, persistence and bioaccumulation.

8.4.1 Releases and Transfers of RETC Chemicals

Of the 80 facilities invited to participate in the RETC case study, 45 facilities provided the information requested. These facilities reported the release of almost 191 million kilograms of RETC chemicals into the air, water or land and 0.15 million kilograms of RETC chemicals transferred off-site for treatment or disposal in 1995. The 45 facilities submitted 223 individual chemical reports, or an average of almost five RETC chemicals per facility. **Table 8–2** summarizes releases and transfers from the 1995 RETC case study data.

Table 8–2 RELEASES AND TRANSFERS FROM RETC CASE STUDY

FACILITIES	
Number of participating facilities	45
Total number of forms presented	223
RELEASES (kg)	
Total air emissions	190,796,753
Surface water discharges	2,411
Underground injection	—
On-site land releases	10,382
Total Releases	**190,809,818**
TRANSFERS (kg)	
Treatment/Destruction	3,300
Sewage/POTWs	24,695
Disposal/Containment	101,110
Recycling/Reuse/Recovery	5,860
Energy Recovery	14,588
Total Transfers	**149,553**

The total average releases per facility in the RETC case study were greater than 4.2 million kilograms, whereas average transfers per facility equaled 3,300 kilograms. In Mexico, waste disposal by underground injection is not allowed; this kind of transfer was therefore not reported by RETC. Information concerning chemicals recycled was not required in the case study (under NPRI this information is optional but it is required by TRI). Energy recovery was reported as transfers off-site for treatment. In addition, some facilities declared releases but did not specify to which medium.

The final RETC case study report shows that 50.3 percent of air releases were generated by production processes and 49.7 percent from other sources. However, these data may not be accurate because many facilities reported combustion gaseous releases as “process” releases, though they should have been placed in the “others” category (INE’s final case study report, July 1996, pages 50 and 54).

The RETC data did not allow the segregation of fugitive air emissions data from those for point sources, which is possible in the NPRI and TRI reporting systems. As fugitive emissions frequently represent a major part of the total releases of an industrial facility, it would be important to consider the inclusion of this information in a national RETC report for comparison against the other North American databases.

Almost all of the releases and more than one-half of the transfers reported in the RETC case study belonged to chemicals considered as combustion and greenhouse gases, most of them a single chemical, carbon dioxide. Since these substances were reported in high amounts, they biased the RETC results away from other reported substances.

The main industrial subsectors to which the 45 reporting industries belong are the chemical (37 percent), machinery and equipment (27 percent), food, beverage and tobacco (15 percent) and paper (15 percent). The chemical industry was the industrial subsector with the largest number of chemicals reported in the case study (44), and in the largest quantities, a conclusion that accords with NPRI and TRI.

The report on the results of the case study, submitted by INE, notes that, “regarding transfers, not so much information was reported as for releases. This can be due either to the current absence of these

COMBUSTION AND GREENHOUSE GASES

The list of chemicals subject to data collection under RETC includes six chemicals (four individual chemicals and two categories of substances) considered as combustion and greenhouse gases. The releases and transfers of these gases accounted for 99.4 percent of the total and heavily outweighed the reported release amounts of other RETC chemicals. For instance, only 0.6 percent of releases by weight belonged to the remaining chemicals. Carbon dioxide releases accounted for 97.8 percent of the total.

The reporting of combustion and greenhouse gases in the RETC was because industry has been requested elsewhere to provide such information to show compliance with international obligations on climatic change issues. Such gases are not included on the NPRI or on the TRI.

The inclusion of these chemicals increased the information load to be processed. Since other registers do not consider them, they must be excluded from the matched subset prior to comparison with other registers. Additionally, such substances differ from the remaining RETC chemicals in their toxicity, persistence and bioaccumulation properties.

practices in many facilities, or to the voluntary omission of this information" (INE's final case study report, July 1996, page 51). This poor response from the participating industries might also have been due to a lack of clarity in the type of information required or because of doubts as to how to derive the estimates. The concept of pollutant transfer, as well as the estimation by substance, is new to most facilities in Mexico.

The chemicals most frequently reported in the case study were also those released in the largest amounts: the combustion and greenhouse gases, mainly carbon dioxide, carbon monoxide, and sulfur and nitrogen oxides. About one-third of the RETC forms sent by facilities pertained to releases of these chemicals. Fourteen substances were reported as having releases higher than one tonne (1,000 kilograms), as shown in **Table 8–3**.

After the combustion and greenhouse gases, six of the eight chemicals with the largest reported releases to the environment were non-halogenated organic compounds, a metallic compound and a chlorinated organic compound. According to the TRI classification of chemicals, four of these substances are considered carcinogenic (acetaldehyde, 1,4-dioxane, tetrachloroethylene and formaldehyde). No releases were reported for 23 chemicals; that is, their use did not generate releases. Releases of less than one kilogram were reported for 7 substances, and of less than ten kilograms for 17 others.

Transfers were less abundant, being reported for only 28 of the 149 chemicals and categories included in the RETC list. Of these, only 10 were reported as having transfer amounts higher than one tonne (1,000 kilograms), as shown in **Table 8–4**. On the other end of the spectrum, 12 chemicals were reported with transfer amounts of less than one kilogram.

Table 8–3

RELEASES OF RETC SUBSTANCES REPORTED AS GREATER THAN 1,000 kg

CAS Number	Chemical	Amount Released (kg)
124-38-9	Carbon dioxide	186,478,926
CGC 01	Sulfur oxides	1,967,175
75-07-0	Acetaldehyde	927,050
CGC 02	Nitrogen oxides	923,120
630-08-0	Carbon monoxide	306,500
123-91-1	1,4-Dioxane	99,107
10024-97-2	Nitrous oxide	42,001
127-18-4	Tetrachloroethylene	30,392
74-82-8	Methane	18,599
50-00-0	Formaldehyde	3,354
CCM 10	Zinc (inorganic, breathable, soluble)	3,330
64-17-5	Ethanol	2,778
1300-71-6	Dimethylphenol (isomeric mixture)	2,698
108-10-1	Methyl isobutyl ketone	1,184

Of the chemicals with the largest reported transfer amounts, one belonged to the category of combustion and greenhouse gases (this was considered an error since it corresponds to transfers of carbon dioxide to landfill), four were non-halogenated organic compounds and five were chlorinated organic compounds. According to the TRI classification of chemicals, five of these substances are considered carcinogenic (1,4-dioxane, benzyl chloride, tetrachloroethylene, dichloromethane and epichlorohydrin).

Table 8–4
RETC SUBSTANCES WITH REPORTED TRANSFERS GREATER THAN 1,000 kg

CAS Number	Chemical	Amount Transferred (kg)
124-38-9	Carbon dioxide	91,800
123-91-1	1,4-Dioxane	26,901
108-10-1	Methyl isobutyl ketone	11,500
00-44-7	Benzyl chloride	4,950
127-18-4	Tetrachloroethylene	4,292
	1,1,2-Trichloroethane *	2,500
1300-71-6	Dimethylphenol (isomeric mixture)	2,248
75-09-2	Dichloromethane	1,400
64-17-5	Ethanol	1,357
106-89-8	Epichlorohydrin	1,243

* In the case study, the chemical 1,1,2-trichloroethane was listed. This was a nomenclature error for 1,1,2-trichloroethylene (CAS 79-01-6).

8.4.2 Releases and Transfers of Chemicals Matched between RETC, NPRI and TRI

A comparison of pollutant release and transfer information by industrial sector between RETC, TRI and NPRI would be difficult since the industrial classification codes differ between the three countries. For example, code 31 of the Mexican CMAP (food products, beverage and tobacco) could correspond to two different US SIC codes: 20 (food) or 21 (tobacco). Thus the only way to compare the three databases is to examine their reporting on the individual chemicals that they have in common.

In the case study, data on only 74 (50 percent) of the 132 chemicals and 17 categories in the RETC list were reported. **Table 8–5** shows the number of substances reported and not-reported in the RETC case study. For comparison, the numbers of NPRI and TRI substances are also given, along with those common to all three databases. [Note: A comparison was made with the list of 346 chemicals and 22 reporting categories required by TRI and the 178 chemicals and categories required by NPRI in 1994. The final report on the case study, submitted to the GNC by the INE, notes that, of the reported chemicals, 56 are also on the TRI list, and 26 on the NPRI list. However, the years of the lists used for the analysis were not specified, which perhaps explains the discrepancy with the "Matched Chemical" totals shown in **Table 8–5**.] The above results show that in the RETC case study, 50 percent of the total chemicals listed were reported, while for NPRI this amounted to 73 percent, and for TRI it came to 82 percent.

Table 8–5
NUMBER OF SUBSTANCES IN RETC CASE STUDY, NPRI AND TRI

	Total Number of Chemicals and Categories			Matched Chemicals		
	RETC (1995)	NPRI (1994)	TRI (1994)	RETC	NPRI	TRI
Total on list	149	178	368	70	70	70
Reported	74	130	300	46	56	70
Not reported	75	48	68	24	14	0

RETC, NPRI AND TRI SUBSTANCES

Of the 149 RETC substances and categories listed, 70 are also found on the Canadian and US lists. This means that there are 70 common substances that can be compared in a pan-North American releases and transfers report. This number accounts for 47 percent of the total chemicals in RETC, 39 percent in NPRI and 19 percent in TRI.

Table 8–6 TOTAL RELEASES AND TRANSFERS FOR RETC CASE STUDY (CONSIDERING NPRI- AND TRI-MATCHED CHEMICALS)

Total facilities	45
Total forms	97
Releases (kg)	1,067,330
Transfers (kg)	51,531
Total Releases and Transfers (kg)	1,118,861

Table 8–6 shows the releases and transfers from the 1995 case study data among NPRI- and TRI-matched chemicals.

Of the 70 chemicals common to the three North American registers, 95 percent by volume were reported in the case study as releases and the remaining 5 percent were reported as transfers.

Table 8–7 shows release volumes by medium for the 70 matched chemicals reported in the RETC case study.

Table 8–7 RELEASES BY MEDIUM IN THE RETC CASE STUDY (CONSIDERING NPRI- AND TRI-MATCHED CHEMICALS)

	kg
Total air emissions	1,057,154
Surface water discharges	2,235
Underground injection	—
On-site land releases	7,940

The medium receiving the most releases is the air, followed by land and, in a lower proportion, surface water. The RETC does not consider underground injection releases because the technique is not permitted in Mexico, although it is included in both NPRI and TRI. **Table 8–8** shows the transfer amounts reported in the RETC case study among the 70 matched chemicals.

Table 8–8 TRANSFERS IN THE RETC CASE STUDY (CONSIDERING NPRI- AND TRI-MATCHED CHEMICALS)

	kg
Treatment/Destruction	3,300
Sewage/POTWs	24,429
Disposal/Containment	6,694
Recycling/Reuse/Recovery	4,780
Energy Recovery	12,328

Transfers to sewage accounted for 47 percent of the total, transfers for energy recovery, 24 percent, and transfers for disposal and containment, 13 percent. Transfers for recycling accounted for 9 percent and the remaining 7 percent went for treatment and destruction.

TRANSBOUNDARY TRANSFERS

A very important consideration for the future analysis of North American PRTRs, but for which no data were obtained during the case study, is the transboundary transfer of pollutants. None of the facilities participating in the case study declared a pollutant transfer to another country. However, once the RETC is applied nationally, the results of the releases from the border areas will be of particular interest in the context of a North America-wide analysis.

8.4.3 Facilities that must report to RETC

The case study did not include reporting thresholds since there was no baseline information on the handling and release of substances by Mexican industry. Therefore, all quantities of listed substances handled or released were required to be reported.

TRI provides thresholds that allow reporting exemptions for certain facilities manufacturing or processing less than 25,000 pounds (11,388 kilograms) annually, or that otherwise use less than 10,000 pounds (4,535 kilograms) of a substance per year. Similarly, NPRI thresholds exempt facilities that manufacture, process or otherwise use less than 10 tonnes. Had these criteria been in force during the RETC case study, only about 58 forms would have been presented, reporting on 14 chemicals. And if these thresholds were applied to just the chemicals RETC has in common with NPRI and TRI, then only 21 forms would have been presented, reporting on 8 chemicals. This represents 9 percent of the forms and 11 percent of all the chemicals actually reported.

REPORTING REQUIREMENTS

Exemptions, based on the criteria for minimum amounts of a given chemical, facility size or industrial type, could be considered for adoption after several reporting cycles and an exhaustive analysis. However, the actual capacity for information management could be an important criterion for consideration in establishing reporting thresholds or deciding to require reporting from only those facilities handling larger amounts of RETC-designated chemicals.

8.4.4 Other RETC Information

The amount of substances handled by a facility during the previous year of operation is required in the RETC report. This information can serve as a basis for pollution- or disaster-prevention measures, risk evaluation and the development of environmental management policies. Knowledge of this information might also be important for people who live in the vicinity of the facility, and would permit the authorities to define administrative or enforcement priorities.

The 45 RETC case study facilities reported using or handling 197 million kilograms of listed chemicals. However, for only 20 of the 74 chemicals were amounts greater than 1,000 kilograms handled. Additionally, for 23 chemicals the amount reported was zero kilograms; for 7 others the amount handled was less than one kilogram.

For 24 of the RETC-designated chemicals, the amount reported as being handled in the facility was less than the released amount reported. According to the INE, this was due to the fact that in many of the reports, the field specifying the amount used was left blank. This was the area of data collection in the case study where the most inconsistencies and doubts emerged.

8.4.5 RETC Elements Tested in the Case Study

The case study was primarily intended to test the feasibility of implementing a PRTR at the national level. Aspects of the data collection process—such as format clarity and the adequacy of available information-assistance systems—had a direct influence on the results reported. Some of the RETC elements tested in the case study are briefly presented below.

Report Format and Instructions

The facilities were requested to submit the information in both hard copy and electronic formats. Canadian software was modified to Mexican specifications for the electronic format. From the total population of 45 facilities that furnished information, 6 did so in electronic form, 18 in hard copy only, and 21 in both formats.

The introduction of the electronic format in the case study was intended to test its acceptance by the facilities. Comments received during the case study revealed that the use of an electronic reporting format was well accepted and highly recommended for its ease of completion. In addition, a majority of the facilities were able to use it if the hardware requirements were not excessive.

Industrial Participation

Of the 80 facilities invited to participate, 45 provided their data within the timeframe established to allow for their inclusion in the database. One facility returned the form without having completed it, five sent the forms too late for their data to be used in the database, five more did not send any information because they had closed down or had changed their line of business, six clearly stated that they did not want to participate in the study, and the remaining 18 did not have the information. Thus, 51 facilities presented the form, yielding a 64 percent success rate for the case study, which is considered reasonably good since, in this instance, participation was voluntary.

In the state of Querétaro, more than 80 percent of the industries are small or micro-sized, which is similar to the situation at the national level. In the case study, only 33 percent of the 45 facilities in the data set were small or micro-sized. INE has not indicated the percentage relative to the total number of facilities originally invited to participate, and for this reason it is not possible to know whether the ultimate population of participating small or micro-sized facilities was not representative of the originally invited population, or if such firms simply lacked interest in participating. It was evident, though, from the standpoint of infrastructure and resources, that these facilities will require the most assistance in preparing the information required by RETC in order to assure good data quality in the future.

Participants in the case study agreed that reporting releases of individual chemicals was an exercise that helped them identify inefficient processes or practices in their operations. A representative of a manufacturing facility said that the most expensive part of the RETC report was not the completion and delivery of the information form, but the subsequent investment needed to correct all the deficiencies detected at the facility during data collection.

Training Programs

During implementation of the case study, several training workshops for industrial participants and governmental personnel were held to present the objectives, scope, benefits and implementation programs, as well as to describe the technical aspects of identifying and supplying the information required in the RETC format. The interest shown by industrial and governmental representatives, and the comments and results of the evaluations obtained during the workshop, indicate that it will be necessary to consider broader training and dissemination mechanisms for the RETC prior to national implementation.

To best aid industry, emphasis must be placed on methodologies for identifying and estimating releases, evaluating fugitive discharges, and including in-situ and off-site transfers. Governmental personnel must be trained in data input, management and evaluation.

Assistance to Participants

Two consulting centers, one in Querétaro and the other one in Mexico City, were established with informational materials and personnel with expertise in the area of pollutant releases and transfers. Given that 95 percent of the facilities communicated with the consulting system via telephone or fax, it seems clear that this was an efficient and necessary means to respond to questions about the RETC processes. Similar consulting systems will be implemented for the national RETC.

Costs for Government and Industry

The cost incurred by the Mexican federal and state authorities for the completion of the case study was US $103,296, whereas the facilities incurred an average cost per facility of US $134 to prepare the information and fill out the form. These data provide a basis for estimating the probable cost impact for a national RETC implementation, and they help in estimating possible costs for similar studies in other countries.

Key findings

- Some corporations are preparing environmental reports, many in response to public requests for data, that can range from a short statement of principles to a detailed presentation of environmental performance data.
- Corporate environmental reports are mainly available from Canadian and US companies, although some also cover their Mexican facilities.
- The use of PRTR data in corporate environmental reports is widespread. Such data are used to show historical trends and track progress against reduction goals voluntarily set by the corporations.
- While the corporate environmental reports do not provide all of the data required in PRTR reporting, they complement PRTR databases by providing information on a company's environmental policies and insights into its management practices.

9.1 INTRODUCTION

Responding to increasing environmental awareness in the last few decades, many corporations have created separate annual environmental reports. They describe environmental policies, management and performance, and some report release and transfer data. Employees, shareholders, community groups, the news media and governmental officials are the audiences for these environmental reports.

9.2 WHAT IS CORPORATE ENVIRONMENTAL REPORTING?

A company may develop an environmental report for a variety of reasons:

- to track and profile environmental progress,
- to communicate environmental activities to communities, goverment and media,
- to recognize outstanding employee efforts or projects,
- to highlight a company's environmental activities for employees or shareholders, and
- to provide an up-to-date source of environmental information in one report.

Corporate environmental reporting is a newly emerging field: some companies are now producing their eighth annual environmental report, others have just released their first. The number of environmental reports has grown steadily and now stands in the hundreds.

Preparing a corporate environmental report focuses energy and attention on environmental policies, practices and performance. It allows for the evaluation of past performance, can prompt plans to improve performance, and can form an important part of a company's environmental management system. Reporting can assist in the accurate assessment of corporate environmental programs by employees, shareholders, public, media and government. It can also assist corporations in similar fields to gain ideas for environmental improvements, and inspire an industrial sector to set common environmental standards.

The Rio Declaration on the Environment and Development and its action plan, Agenda 21, provide support for environmental reporting. Agenda 21 encourages corporations to adopt voluntary programs recognizing the community's right to environmental information, including reports on annual releases of toxic chemicals into the environment. Industry is encouraged to recognize its responsibility for providing information on potential risks and on waste-management practices associated with the trade in chemical products.

The scope and content of environmental reports varies with the company, the audience and the industrial sector. In an international review of corporate reporting, five stages of disclosure were identified, as shown in the following box.

EVOLUTION TOWARDS SUSTAINABLE DEVELOPMENT REPORTING

Stage 1: Short statements in annual report. Can feature green glossies, newsletters, videos.

Stage 2: One-time reporting, often linked to first formal environmental policy statement.

Stage 3: Annual reporting to environmental management system. More text than figures.

Stage 4: Provision of full performance data (NPRI/TRI style). Often a separate environmental report; referred to in the annual report.

Stage 5: Sustainable development reporting. Linking environmental, economic and social aspects of performance. Supported by indicators of sustainability.

Adapted from: *Coming Clean*, 1993

While a standardized format does not exist for environmental reporting, seven guidance documents have been produced to help companies prepare their reports. These various guidelines for environmental reporting have been developed by:

- the Coalition for Environmentally Responsible Economies (CERES),
- the Public Environmental Reporting Initiative (PERI),
- the European Chemical Industry Council (CEFIC),
- the International Chamber of Commerce,
- the United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (UN-ISAR),
- the United Nations Environmental Program (UNEP), and
- the World Wildlife Fund and Hampshire Research Institute.

First developed in 1989 as the Valdez Principles, the CERES Principles are a comprehensive 10-point environmental code for corporations, developed to "encourage...positive programs...to prevent environmental degradation; to assist corporations in setting policy and enable investors to make informed decisions regarding environmental issues."

CERES is a non-profit membership organization of environmental groups, religious organizations, public pension trustees and social investors. CERES organizations represent more than ten million people and over $150 billion in invested assets. In 1996, approximately 50 companies endorse the CERES principles, including General Motors, the United States Trust Company of Boston, and Polaroid. The Coalition also encourages members to discuss and work together on environmental issues. Each year, these endorsing companies complete a CERES form, providing information on releases, energy use and corporate policies to CERES. CERES has asked endorsing companies to participate in a pilot project during 1996-1997 to assess the benefits and resource requirements of collecting materials' accounting data. Specific CERES questions relating to materials' accounting and environmental releases can be found in **Appendix 9–1**.

The drive to provide more specific guidance for environmental reports resulted in the Public Environmental Reporting Initiative (PERI) *Guidelines* (see **Appendix 9–2**). Developed by a number of companies in 1992-1993, these voluntary guidelines are intended to be used by all types of organizations to create a credible and balanced framework for environmental reporting. The revised 1994 PERI guidelines outline ten components for reporting, from which corporations choose applicable components for their activities. Unlike CERES, there is no formal organization, standard format or frequency of reporting required. The guidelines are built upon two principles: the "merits of continuous improvement" and the belief that "what gets measured, gets managed." Developed by corporations such as AMOCO, Dow, DuPont and Rockwell, PERI guidelines have been used by a number of organizations in the preparation of environmental reports.

The European Chemical Industry Council (CEFIC), headquartered in Brussels, has developed guidelines for environmental reporting for its members. The 1993 voluntary guidelines propose a common structure for corporate and site environmental reports, proposals for a standard emissions inventory, and do's and don'ts of environmental reporting. The guidelines suggest the discussion of pollution data and promote reporting on a core list of substances of concern for all members. This standard table emphasizes traditional pollutants, groups chemicals into families such as Volatile Organic Compounds, and proposes thresholds (see **Appendix 9–3**).

The International Chamber of Commerce in Paris developed a Business Charter for Sustainable Development Principles. With over 1,200 signatories, these general principles recognize the need to measure environmental performance and to provide appropriate information to the Board of Directors, shareholders, employees, the authorities and the public. In 1992, the Canadian Chamber of Commerce issued a more specific guideline on environmental reporting based on these principles.

The United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (UN-ISAR) issued recommendations to be used for environmental reporting in company reports to directors, managers and shareholders.

In 1994, UNEP suggested a list of 50 elements that could be included in environmental reporting. In 1995, the World Wildlife Fund and Hampshire Research Institute proposed a benchmark of key characteristics and core data elements needed to understand trends in the use of chemicals and their presence in product and waste streams.

9.3 HOW ARE RELEASE AND TRANSFER DATA REFLECTED IN CORPORATE ENVIRONMENTAL REPORTS?

For this chapter, a total of 51 annual and environmental reports from Canada, United States and Mexico were reviewed. These reports were drawn from companies that:

- followed CERES, PERI or other guidelines,
- reported significant releases to the NPRI or TRI inventories,
- won awards in the Canadian Financial Post's environmental reporting category,
- participated in Mexico's case study, or
- were known to have facilities across North America.

The set of corporate reports was reviewed for general trends and interesting examples of reporting PRTR results rather than for providing a comprehensive quantitative analysis of all corporate environmental reports.

This review of corporate environmental reports was designed to answer the following questions:

- What data on releases and transfers in Canada, United States and Mexico are available from corporate environmental reports?
- How are TRI and NPRI data reflected in corporate environmental reports?
- What environmental policies or programs have companies initiated based on results from the TRI and NPRI programs?

The following subsections address these questions.

9.3.1 What data on releases and transfers in Canada, the United States and Mexico are available from corporate environmental reports?

Most of the environmental reports reviewed from the United States and Canada mention releases and transfers of substances of concern from their facilities, although the extent and detail of the data presented vary widely. Reports span the range from a purely descriptive format emphasizing people and projects with no specific data on releases and transfers, to a data-intensive format detailing and quantifying releases and transfers.

For example, AMOCO's *1995 Environment, Health and Safety Report* describes projects that reduced releases in a specific process or facility. Some reports, such as Monsanto's *Environmental Annual Review 1995* and Dow Canada's *Eighth Annual Environmental Progress Report,* present detailed charts on a per-chemical or per-facility basis. Others, such as Phillips Petroleum's *1995 Health, Environmental and Safety Report,* give aggregate national data.

Many reports note that they are responding to requests for the presentation of more data and have thus included additional charts and tables. Several reports invite inquiries to the facility for specific data.

Very few companies in Mexico publish environmental information. In fact, during our search, we could not locate a single publicly available corporate environmental report for a Mexican facility. The absence of environmental corporate reporting in Mexico could be a result of the tradition of non-disclosure of information or simply due to the lack of release data. The results from the recent case study in Mexico (described in **Chapter 8** above) and the proposed national RETC may increase the public disclosure and discussion of PRTR information.

Some limited information on the releases and transfers of substances of concern from Mexican facilities could be gathered from a few companies' head office reports. Only two of the 51 reports reviewed—DuPont's *Safety, Health and the Environment 1995 Progress Report* and Hoechst Celanese's *1994 Environmental, Health and Safety Performance Report*—clearly presented Mexican data, together with historical trends in releases and transfers.

DuPont's 1995 report clearly listed quantities of air carcinogens and hazardous waste emitted from Mexican facilities. DuPont's releases of air carcinogens had not changed from 1990 to 1994—300,000 kilograms/year (300 tonnes)—and hazardous waste volumes were similar in 1994 (79 million kilograms or 79,000 tonnes) to what they had been in 1990 (73 million kilograms or 73,000 tonnes).

Hoechst Celanese posted a significant reduction in the releases from its Mexican facilities (Grupo Celanese). The chemicals reported were not based on TRI lists, but those required to be reported under the Mexican Air Pollutants Rule and Celanese's Company Policy Waste Reduction Program. Over 155,000 tonnes were released in 1991; this was reduced to approximately 62,000 tonnes in 1994.

Other companies, such as General Motors in its *1995 Environmental Report*, note that the collection of release data on a per-facility basis in Mexico is beginning, adding that a comprehensive report supplying this information will be available in the future. With the onset of the proposed RETC program, more companies may be able to report on historical trends.

Eleven companies presented release data by geographic region, and Mexican data were included in some of these aggregate reports. IBM's *1995 Environmental Report* presented 1994 data for hazardous waste quantities from its worldwide facilities (approximately 91,000 tonnes) and described how these quantities are managed. IBM also reported specifically on the TRI chemical list for its worldwide operations,

releasing approximately 16 million kilograms (16,000 tonnes) from non-US sources and 8 million kilograms (8,000 tonnes) from US facilities in 1994. Mexican data are subsumed in these global aggregates.

Union Carbide's *1995 Progress Report* presented data for releases and transfers from international facilities using TRI data from 1990-1994, but it is not clear which sites were included. Monsanto has one of the most comprehensive company reports covering releases from worldwide facilities, with detailed facility-specific information on its operations in the United States, Canada, Brazil and Japan.

Rockwell's *Environmental Report for the Year 1994* and Rohm and Haas's *1996 Report on Safety, Health and Environment*, both use the TRI list of chemicals to report on global facilities, including installations in Canada, the United Kingdom and Italy, but not Mexico. Both companies give facility-specific worldwide information. Dow Chemical's *1996 Progress Report on Environment, Health and Safety* has adapted the 33/50 Program into its global releases reduction program. [Under this program, approximately 1,200 industries voluntarily committed themselves to reduce releases and transfers of 17 TRI chemicals 33 percent by 1992 and 50 percent by 1995 from 1988 levels.] The environmental report breaks down global releases of the 17 priority substances of the 33/50 Program and TRI chemicals by region and by substance. In addition, in each geographic area the 33/50 list has been expanded to reflect specific local reporting needs.

In some reports the data were presented too broadly to permit understanding. For example, PPG Industries' *1995 Environment, Health and Safety Annual Report* presents data on global hazardous waste without defining the nature of either the hazardous waste or the facilities included in the analysis.

While the public reporting of data on releases and transfers from Mexican facilities is scarce, five environmental reports do describe such company environmental activities in Mexico as:

- Ford's tree-planting efforts,
- Eastman Kodak's commitment to zero wastewater discharge to municipal sewers,
- the conversion of Hoescht Celanese installations to natural gas to reduce air pollution,
- the commitment by Monsanto to Mexico's Responsible Care program (Responsabilidad Integral), and
- General Motor's agreement with Mexico's environmental agency to conduct environmental audits.

The importance of stand-alone environmental reports becomes obvious when searching for environmental information in annual reports. While most of the latter have a standard section describing contingent liabilities and commitments, including current and anticipated costs resulting from past practices at sites, they provide little information on environmental policies, practices and management.

Some exceptions to the general dearth of environmental information in annual reports do exist: annual reports such as that of DuPont Canada provide an outline of policies and performance, and then reference the environmental report for more information. Shell Oil's *1995 Annual Report* also provides a comprehensive review of environmental information, including TRI release and transfer data. Northern Telecom's *1995 Annual Report* also provides a description of environmental targets and the company's progress towards these targets.

In conclusion, the review of corporate reports confirms the importance of a stand-alone environmental report in providing relevant, reliable, understandable and comparable information for a broad range of audiences. The corporate environmental reports range from descriptive, text-based reports to detailed, chemical- and facility-specific productions. Most information on releases in Mexico appears in global environmental reports rather than Mexican environmental reports. Only 2 of the 51 reports presented Mexico-specific data on releases, while 11 presented aggregate Mexican data and 5 presented descriptions of environmental activities there. Several companies are expanding the monitoring of releases to their global facilities, using either a TRI-based list of chemicals or a company list.

9.3.2 How are TRI and NPRI data reflected in corporate environmental reports?

Of the 12 Canadian environmental reports reviewed, 8 presented NPRI results. While some reports discussed the NPRI results in detail and presented facility- and chemical-specific information, others covered the topic with a paragraph or two of text. Some of the environmental reports with a global focus presented more NPRI results than those with a purely Canadian focus. As the NPRI

matures, environmental reports may devote more space and discussion to NPRI results.

Twenty-eight of the 30 US environmental reports reviewed presented TRI data, and the 2 reports that chose not to present TRI data used their own company index of releases. The US reports also commonly listed progress under the EPA's 33/50 Program. Perhaps because of the greater experience with TRI data, US reports generally gave a fuller explanation and presentation of TRI results than was seen with NPRI results.

Most Canadian environmental reports contained the first year of NPRI data, so year-to-year comparisons are not yet possible. A few companies presented 1993 and 1994 NPRI data, but noted that program changes made comparisons invalid.

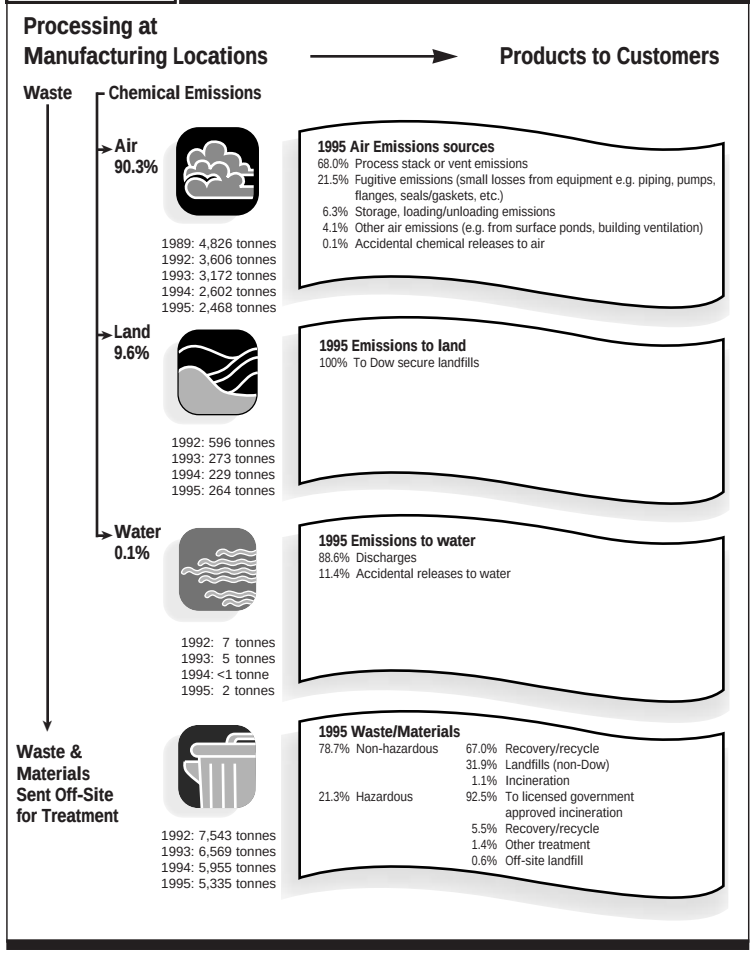
TRI data provide a baseline for the historical comparison of performance in the majority of US environmental reports. Companies compared their performance in reducing releases and transfers from year-to-year and provided explanations for increases or decreases in releases and transfers. Many companies had clear, detailed discussions on trends in TRI releases and transfers over the years. IBM detailed the effect of changes in TRI reporting on the 1994 and 1995 data. General Motors explained the increase in land-disposal figures under TRI.

Many companies have innovative ways of presenting TRI or NPRI data. Notable examples of clear presentation include:

- Monsanto, which pictorially represents TRI data and historical trends;
- Dow Canada, which pictorially represents NPRI data and historical trends (see **Figure 9–1**);
- Union Carbide, which presents separate graphs for known or suspected carcinogens;
- General Motors, which normalizes releases and transfers (expressed as amount per vehicle produced) and adjusts for the addition and deletion of chemicals to and from the TRI list;
- Rockwell, which breaks down TRI data by business sector; and
- Phillips, which pictorially represents TRI data (see **Figure 9–2**).

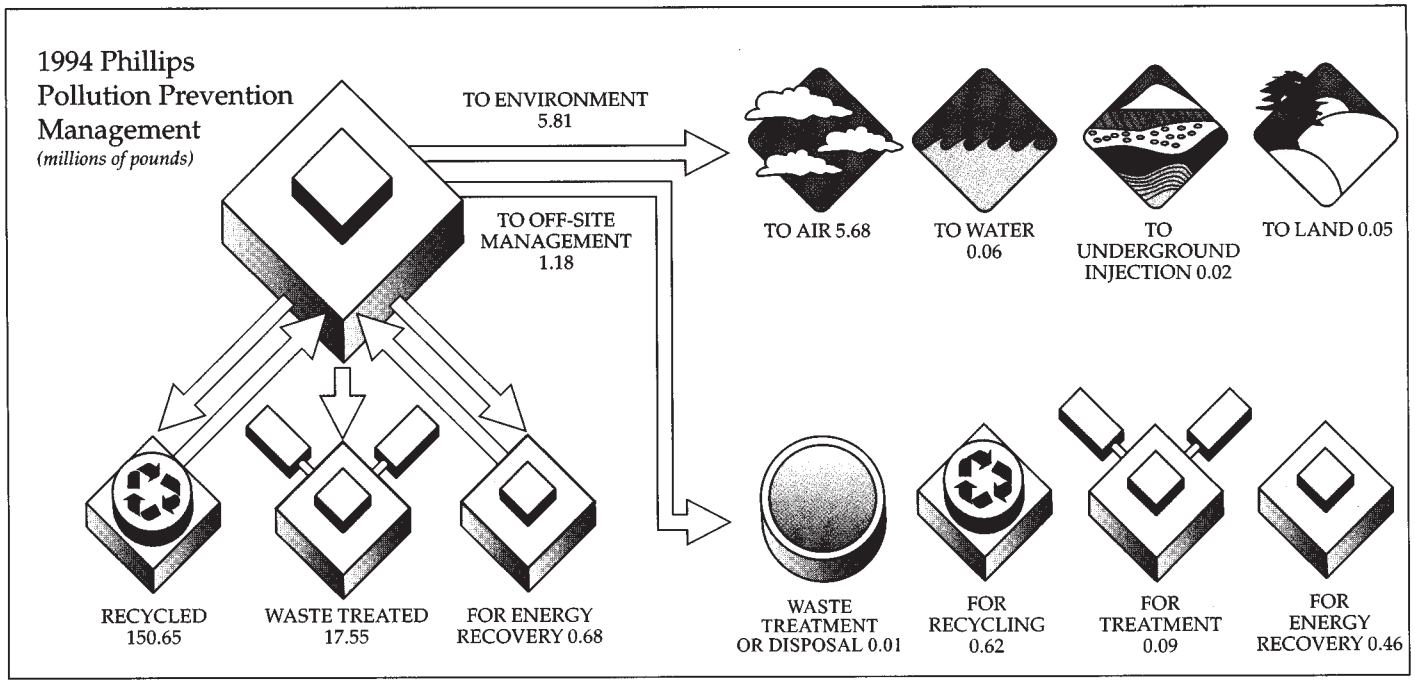
Figure 9-1

DOW CANADA PRESENTATION OF NPRI DATA AND TRENDS



Four reports used a variety of different methods to "normalize" the TRI or NPRI data. Normalization is a technique used to express release and transfer information as a function of a company's activity level. Normalization can be used to distinguish the probable cause of a drop in releases: either from a drop in production activity or as the result of a pollution-prevention program. For example, General Motors' *1995 Environmental Report* presents TRI data as a function of vehicle production, with releases and transfers of approximately seven kilograms per vehicle in 1988 compared to approximately four

Figure 9–2 TRI DATA AS PRESENTED BY PHILLIPS PETROLEUM



kilograms per vehicle in 1994. Dow Canada presents an emissions/production ratio, which was set at 1 in 1990 and has now been reduced to approximately 0.5. For its part, PPG measures waste generation rates per unit of production, stating that the waste generation rate "is a more realistic representation of progress as product manufacturing volumes fluctuate from year to year." BP's *1994 Health, Safety and Environment Report* expresses releases as a percentage of crude throughput (0.59 percent in 1990 versus 0.44 percent in 1994) and total releases as a percentage of chemical production (approximately 3 percent in 1990 and 2.3 percent in 1994).

Two companies created new indices built on release data to measure environmental progress. Rhone-Poulenc's *1994 Environmental Report* measures its environmental progress with air, water and waste indices, based on releases of suspended solids, nitrogen oxides and special wastes. The indices have been designed to rank releases based on potential hazard. While this may have meaning within the company, it is difficult for the public to translate these numbers into chemical- or facility-specific information.

Nortel has taken a different approach with its environmental performance index. Twenty-five factors are weighted according to environmental impact and degree of risk, and normalized against the annual cost of sales. This single number measures the rate at which Nortel is making progress. In 1995, Nortel's environmental performance index was 140, below the maximum optimal score of 175. Low scores in the generation of hazardous waste and air pollutants decreased the 1995 score. Thus, PRTR data are directly incorporated into the evaluation of the environmental performance of the company.

Environmental reports are also appearing on the Internet, as complete copies, more detailed data sets, or tied to additional corporate information. Nortel's environmental report even has key words highlighted in the print version; they serve as links leading to additional information in the company's Internet web site. A user can retrieve the PERI guidelines or the detailed company environmental policy. In the future, detailed facility- and chemical-specific information may be commonly found on the Internet, complementing hard copy versions of the environmental report.

In conclusion, most companies are using TRI data in their environmental reports to establish baselines, measure historical trends and document progress in meeting targets. Perhaps because NPRI is a more recent introduction, its data are currently not as extensively reported in environmental reports as TRI data. In general, though, PRTR data do form the backbone for most companies' assessments of environmental releases and transfers in their environmental reports.

9.3.3 What environmental policies or programs have companies initiated based on results from the TRI and NPRI programs?

Environmental reports often contain statements of a company's environmental policies. With regard to the releases and transfers of substances of concern, these environmental policy statements usually take one of three forms:

- general statements,
- specific numerical targets for reduction, and
- specific numerical targets for reduction tied to TRI or NPRI chemicals.

The Canadian Chemical Producers' Association provides a good example of the first of these policies. Its general environmental statement encourages member companies: "to continuously reduce emissions with a goal to prevent unacceptable risk to the environment and human health."

Some companies have more specific goals that set a numerical target for reduction. Often these numerical targets are set using either a company-generated or a government-sponsored list of chemicals, such as the 33/50 Program or the ARET program. Examples of statements containing these specific numerical targets for reduction include: "ICI will reduce wastes by 50 percent by 1995, using 1990 as the base year" and "Dow Chemical Company will further reduce air and water emissions of priority compounds by 75 percent by 2005."

A third type of environmental policy statement sets a specific numerical target based on a PRTR list of chemicals. For example, DuPont has a goal to reduce releases of airborne carcinogenic compounds 90 percent by 2000, as measured by TRI, and Union Carbide pledges to reduce releases and transfers (less off-site energy recovery) of TRI compounds by at least 55 percent between 1987 and 1995.

In most environmental reports from US companies, TRI provided the data needed to demonstrate continuous reductions in releases and transfers over time. TRI data are instrumental in assisting companies with setting environmental reduction goals, providing a measurement tool, and monitoring year-to-year progress.

In addition to providing information on a company's environmental policies, environmental reports also provide insight into a company's environmental management practices. The descriptions of guidelines, supervision, feedback and audit procedures assist in assessing a company's environmental performance. Sound environmental management practices are essential to reducing releases and transfers over time. Some industrial sectors have created their own system of environmental management practices. Perhaps the most recognized is the chemical industry's initiative known as Responsible Care, a voluntary program designed to "improve the performance of the chemical industry in environment, health, safety, product safety, distribution, emergency response and relations with the public." While the detailed implementation of the Responsible Care Program varies from country to country, participating companies evaluate themselves annually against established objectives. Responsible Care started in Canada in 1984 and has been adopted in a number of countries, including the United States in 1988 and Mexico *(Responsabilidad Integral)* in 1991.

One interesting trend noticed in the environmental reports is the growing number of global environmental reports. Companies such as DuPont, Monsanto and IBM are moving towards reporting environmental data from all their facilities around the globe. This requires a common measuring stick, and many companies have chosen to use the TRI list of chemicals and reporting system, which may assist in reducing pollution and providing a common baseline for measurement and improving environmental policies and prac-

tices worldwide. For example, during the past two years, Rockwell has reported air releases from its international facilities using the list of TRI chemicals. Rockwell also reports on the air releases of chemicals targeted for reduction under the 33/50 Program from its US and international facilities.

Rohm and Haas uses the TRI list of chemicals to track environmental releases and transfers from its global facilities. Rohm and Haas has set as its goal reducing TRI chemicals by 75 percent from the 1987 baseline by 1996. This goal also applies to the company's operations outside the United States. IBM made its internal reporting requirements consistent with TRI in 1993 and started reporting TRI releases internationally in 1993. Applications like these, using TRI for setting reduction goals, tracking releases and transfers and reporting on progress internationally, illustrates the importance of the database.

Some companies have developed their own list of priority chemicals for global application. For example, in Ciba's *1995 Corporate Environmental Report*, the company has refined its internal reporting system to allow it "to measure and report on more than 90 percent of [its] emissions worldwide." AMOCO's International Standard of Care provides guidance on environmental, health and safety measures worldwide. Monsanto's Pollution Prevention program measures releases of TRI, European Community-designated priority pollutants and other chemicals from its worldwide operations.

This trend towards the globalization of environmental data is also reflected in some companies' new commitment to applying their corporate environmental policies and practices worldwide. Several companies have formally committed to following corporate environmental guidelines worldwide and are taking concrete steps towards making this happen. United Technologies Corporation's *1994 Environment, Health and Safety Report* set new environmental and safety goals and expanded these globally. Its waste and emission reduction goals are more modest for international facilities than for those in the United States because they are at an "earlier stage of pollution prevention internationally." Falconbridge states that "the policy and codes of practice are the foundation of our environmental program and apply to all our operations worldwide." The adoption of environmental practices, policies and particular pollution reduction goals may assist in reducing pollution globally.

One of the other interesting trends noted in the environmental reports was company pride in and commitment to achieving the goals of the US EPA 33/50 Program. In their environmental reports, many companies noted that they had achieved the goals three years early, or surpassed their reduction goals, or received awards for their efforts. While the reporting on TRI chemicals has served as a focal point for reduction efforts in most company reports, the additional challenge created by a program like 33/50 has increased the drive to reduce pollution. As reflected in most company environmental reports, the pairing of the TRI and 33/50 programs has resulted in significant reductions in releases of priority substances of concern.

The strength of industry commitment to voluntary reduction programs, in addition to TRI reporting, was emphasized by the relatively small number of companies that had made formal commitments specifically to reduce TRI chemicals compared with those that had committed under the 33/50 Program. The two programs complement each other in achieving pollution reduction: TRI measures and focuses attention on releases and transfers of the substances and 33/50 harnesses industrial competitiveness.

In Canada, some companies have made a commitment to reducing releases under the voluntary ARET program. Approximately 49 substances are common to ARET and the NPRI database. Many companies have made formal commitments to reductions based on their own list of substances of concern, and some of these commitments include NPRI chemicals. Companies may choose to commit to formal goals to reduce substances on the NPRI list as the program matures.

Two observations derive from this analysis. The first concerns the importance of a voluntary challenge program to help stimulate further reductions, and the need for such a program to link easily to PRTR data to track reductions. Mexico may wish to assess whether a voluntary industrial challenge program could complement the establishment of its RETC program.

The other observation arising from the review of environmental PRTR data underlines the importance of the public disclosure of release and transfer data. While company reports provide data on releases and transfers, they do not provide all or the same information available in the TRI or NPRI databases. Given the limited data presented in some

environmental reports, and the limited number of corporations issuing them, corporate environmental reports can provide a valuable addition to—but not replace—PRTR programs. Rather, the utility of corporate environmental reports is to explain the PRTR results from the company's perspective, to recognize exceptional projects or people, and to begin to put the information into national and global perspectives.

This review of corporate environmental reports also underlines the need for the sort of comprehensive data analysis presented in this report. Companies have been the first to recognize the need to have a common measuring system for reporting on their global facilities. The PRTR systems in North America could be designed to enhance their common elements and thus assist in providing compatible measuring systems.

Corporate environmental reports will continue to be useful sources of information, but a picture of releases and transfers of substances of concern in North America compiled from corporate environmental reports would not account for the majority of releases and transfers or provide other detailed information. The detailed data analysis presented in this report is intended to help citizens obtain a comprehensive picture of such releases and transfers across North America.

APPENDIX 9–1 CERES QUESTIONS RELATING TO PRTRs

These selected questions relating to PRTRs are part of the most recent 1995 CERES reporting form used by companies endorsing the CERES Principles.

Section III: Materials Policy

35. Does your company routinely, or in specific circumstances track chemical use through materials accounting or mass balance methods (as distinct from tracking environmental releases)?

Explain if yes, provide details of the following:

(1) What chemicals (e.g., all types, specific clusters, TRI)
(2) At what stages in the production cycle (e.g., brought on-site, in inventory, embodied in product)
(3) At what level (e.g., process, product, facility, division, corporate)
(4) For what purpose (e.g., targeting use reduction opportunities, charge-backs for pollution control services, product pricing) is such information tracked?
(5) What benefits have these efforts provided (e.g., lower cost, better safety record, lower energy use)?

If no, have you made progress during the past year towards the development of such a system? Please describe the efforts. Please describe the obstacles to such progress.

Section IV: Releases to the Environment

36. Does your company have goals to phase out the use and emissions of ozone-depleting chemicals targeted by the Montreal Protocol?

37. If your company has a goal, does it apply to all company operations worldwide?

38. Describe the progress your company has made in reducing (1) use and (2) emissions of ozone-depleting chemicals. Show year to year comparison, beginning with an appropriate base year. Indicate measurement units. Please also provide the following projections, using the same measurement units.

39. Does your company normalize TRI (Toxic Release Inventory) releases? If yes, what activity unit (e.g., per unit of product output, per employee, per dollar of revenue) is used?

40. As an indication of your company's chemical reduction progress, indicate in the format below the quantities of each chemical released, used for energy recovery, recycled and treated reported under Section 313 of EPCRA (i.e., TRI Form R) for 1994 and 1995. Please comment on significant trends.

41. Has your company accepted, in the United States, EPA's 33/50 voluntary challenge to industry to reduce the emissions of 17 targeted chemicals from the SARA Title III list?

42. If the 33/50 challenge has been accepted, what progress has your company made in meeting the goals?

43. Does your company monitor and reduce SARA Title III emissions in its overseas operations?

44. Does your company plan to reduce emissions of greenhouses gases and have you set a goal for carbon dioxide, methane, nitrogen oxides, CFCs and other?

APPENDIX 9-2 PERI GUIDELINES RELATING TO PRTRs

These selected guidelines relating to PRTRs form part of the 1994 PERI Guidelines.

Environmental releases are one indicator of an organization's impact on the environment. Provide information that quantifies the amount of emissions, effluents or wastes released to the environment.

Information should be based on the global activity of the organization, with detail provided for the smaller geographic regions, if desired.

Provide the baseline data against which the organization measures itself each year to determine its progress, and quantify, to the extent possible, the following including historical information (e.g., last three years, where available) to illustrate trends:

- Emissions to the atmosphere, with specific reference to

  - chemical-based emissions (include those listed in any national reportable inventory, e.g., TRI in the United States, NPRI in Canada, Sedesol's (now Semarnap's) Emissions Inventory in Mexico)
  - use and emissions of ozone-depleting substances
  - greenhouse gas emissions, e.g., carbon dioxide, methane, nitrous oxide and halocarbons.

- Discharges to water (include those considered to be a priority for your organization).

- Hazardous waste, as defined by national legislation. Indicate the percentage of hazardous waste that was recycled, treated, incinerated, deep well injected or otherwise handled, either on- or off-site. Comment on how hazardous waste disposal contractors (storers, transporters, recyclers or handlers of waste) are monitored and investigated by the organization.

- Waste discharge to land. Include information on toxic/hazardous wastes, as well as soiled wastes discharges from facilities, manufacturing processes or operations.

- Objectives, targets and other progress made regarding the above listed items, including any information on other voluntary program activity (e.g., US EPA 33/50 Program).

- Identify the extent to which your organization uses recommended practices or voluntary standards developed by other organizations, such as the International Chamber of Commerce, international standards organizations, CMA, API, CEFIC, US EPA, Environment Canada, MITI Guidelines, etc.

Table 9–1 CEFIC STANDARD EMISSIONS TABLE

Substances	Reporting Common to all Countries	Reporting Optional (According to Local Situation)
Released into Water		
Suspended Solids		X
COD or TOC	X	
N	X	
P	X	
Soluble Salts		X
Acute Toxicity		X
Metals: Hg, Cd, Pb, Cr, As	X	
Metals: Zn, Cu, Ni		X
AOX or EOX		X
Company Priority List	X	
Released into Air		
Solid Particulates	X	
SO_2	X	
NO_x	X	
CO		X
Volatile Organic Compounds	X	
Volatile Inorganic Compounds	X	
Heavy Metals	X	
Waste		
Hazardous Waste		
Landfilled outside the site	X	
Landfilled inside the site	X	
Other Disposal Practices outside the site	X	
Other Disposal Practices inside the site		X
Non-Hazardous Waste	X	

APPENDIX 9–3 CEFIC GUIDELINES RELATING TO PRTRs

These selected guidelines relating to PRTRs form part of the 1993 *CEFIC Guidelines on Environmental Reporting for the European Chemical Industry*.

Both the Proposed Common Structure for Corporate Environmental Reports and that for Site Environmental Reports recommend inclusion of emissions data based on a standard release table (**Table 9–1**). CEFIC also has proposed thresholds for reporting on these substances.

References For Chapter 9

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10.1 INTRODUCTION

The CEC has analyzed data on releases and transfers from industrial facilities in Canada, the United States and Mexico, as reported to PRTRs in each country. This first in a series of annual reports attempts to increase the understanding of the type of data on releases and transfers currently collected by the governments and currently reported by companies in North America in their environmental reports.

The PRTR systems in each country are evolving and stand at different stages in their development. The US TRI was begun in 1987 and reported on-site releases and off-site transfers. It was expanded in 1991 to include the on-site waste management of chemicals, including recycling and energy recovery. The Canadian NPRI first collected reports on releases and transfers for the year 1993. Currently, reporting in Canada on off-site transfers to recycling and energy recovery is voluntary. Development of the Mexican RETC has just begun; plans for its implementation were tested with a case study in the state of Querétaro during 1995. The proposed national RETC would collect reports on releases, transfers, recycling and energy recovery from a population, to be specified, of industries throughout the country.

10.2 CANADIAN AND US PRTR DATA

The bulk of this report has focused on 1994 data from Canadian and US facilities, first combining them into a pan-North American matched data set and then comparing the individual data from the two countries. The NPRI and TRI are similarly structured so that such comparisons are possible.

10.2.1 Releases and Transfers

In 1994, on-site releases and off-site transfers of chemicals to treatment, sewage and disposal were reported from every state and province in the United States and Canada. Total releases and transfers of chemicals by industries required to report in both countries (but excluding transfers to recycling and energy recovery) amounted to 1.5 billion kilograms. On-site releases—including air emissions, surface water discharges, land disposal and releases to underground injection wells—represented three-fourths of this total. Releases and transfers from US facilities constituted 85 percent of it.

Releases of substances of concern in North America were dominated by air emissions, representing 48 percent of the total releases and transfers. The second-largest type of release was underground injection, mainly from US facilities. Canadian facilities, though fewer in numbers, reported larger absolute amounts of discharges to surface waters.

North American transfers were fairly evenly divided between transfers to treatment, disposal and sewage in 1994. However, Canadian facilities reported transfers to sewage infrequently; they represented less than one percent of NPRI total releases and transfers for that year.

In 1994, almost 16 times as many US facilities reported to TRI as Canadian facilities did to NPRI. However, the average releases from Canadian facilities were approximately 2.5 times greater than those reported in the United States, and the average transfer in Canada was about twice that in the United States. Canadian facilities projected larger percentage decreases in releases and transfers than did TRI facilities—a decrease of 25 percent from 1994 to 1996—while TRI facilities projected a decline of 8 percent.

10.2.2 Data on Releases and Transfers for Common Chemicals and Industries

While the basic structures of the two PRTRs are similar, the lists of chemicals, the industries required to submit data and the categories of transfers reported all differ somewhat, necessitating the selection of a subset of comparable data from each PRTR if comparisons transcending national boundaries are to be made. Data sets comprised only of forms reporting chemicals from industrial categories common to both NPRI and TRI account for 76 percent of the total releases and transfers in NPRI and 93 percent of those in TRI. While TRI lists twice as many chemicals as NPRI, the latter includes all industrial sectors where TRI addresses only manufacturing. Also, in the matched data sets, transfers to recycling and energy recovery are excluded because reporting in these categories is not required under NPRI.

The significant differences in average releases and transfers per facility persist in the matched data sets and do not appear to be accounted for by a difference in reporting thresholds or the number of chemicals reported in the two countries. To some extent, a difference in industrial mix in the two countries may be reflected in the data, though at a more refined level than the major industry codes that divide manufacturing into 20 generalized categories (two-digit US SIC codes).

The most significant factor underlying the difference in average releases and transfers that could be investigated through the use of PRTR data may be each country's history with PRTR reporting. Average releases and transfers from TRI facilities in their second year of reporting (1988) are quite similar to those submitted by facilities for 1994, NPRI's second year.

PRTRs provide only limited data for analyzing the disparity in discharges to surface waters and transfers to sewage between the two countries. Two NPRI facilities report surface water discharges of over 13 million kilograms, but even when these forms are removed from consideration, surface water discharges in Canada remain relatively large. These direct discharges to water are to some extent offset by the lower transfers to sewage, which might otherwise result in some indirect discharges. Forms from the paper products industry in Canada also show unusually large surface water discharges. On average, paper-industry facilities report five times the amount per form to NPRI than any other industry.

10.2.3 Cross-border Issues

Two cross-border issues were examined in this report: transfers from the United States to Canada or Mexico, and data from facilities located within 100 kilometers of the Canada-US border. These analyses are constrained by the limitations of the data reported to the PRTRs, but do yield some interesting results.

Off-site transfers of chemicals in waste can be shipped to nearby sites, to other states or provinces, or outside the country. Cross-border transfers shipped to another North American country are predominantly transfers to recycling. More than 95 percent of cross-border transfers are for recycling. From US facilities, half of all those transfers shipped outside the country are to Mexico, with another 46 percent of the transfers sent to Canadian sites. Transfers from the United States to Mexico were predominantly to one city (Monterrey), but transfers to Canadian sites were to all provinces, but not the territories.

Transfers from Canadian NPRI facilities to US sites, however, are for greater amounts than those sent from the United States to Canada. Individual transfer amounts from Canadian facilities to US sites cannot be determined exactly because only the total amount is reported for a particular type of transfer, and not the amount to each transfer site. However, the possible range of Canadian to US transfers is from 36 to 43 million kilograms (based on matched chemicals/industries), with materials originating in eight provinces and sent to 24 US states. Even the low-end estimate is, in total, more than the amount transferred from US facilities to Canadian sites (29 million kilograms).

The border between Canada and the United States runs south from the Arctic circle and across from the Pacific to the Atlantic Ocean. Eighty-two percent of all NPRI facilities are located within 100 kilometers of this border, while only 20 percent of TRI facilities are. The analysis of this area was divided into five regions from west to east: the Northwestern, the Western, the Plains, the Great Lakes and the Eastern region. Both NPRI and TRI border facilities are concentrated in the Great Lakes region, with TRI facilities outnumbering NPRI facilities there almost six to one. However, in the Eastern region there are five times as many NPRI facilities as TRI. In the other regions, there are about equalnumbers of NPRI and TRI facilities.

The distribution of releases and transfers varies more between the regions than between the countries within the regions. Air emissions tend to be more prominent in the Great Lakes, Western and Plains regions than they are in the national databases as a whole. The exception is the Eastern region, where NPRI facilities report surface water discharges and TRI facilities report almost exclusively air emissions.

10.3 PRTR STATUS IN MEXICO

In 1994, Mexico began developing a PRTR; in 1995, it conducted a case study in the state of Querétaro to test several aspects of PRTR reporting. Querétaro was selected as being representative of the national distribution of numbers and types of industries. The objectives of this study were to train governmental personnel in the administration and maintenance of a PRTR, to evaluate the level of technical support needed for facilities to report their releases and transfers accurately, and to test several elements of the PRTR itself, such as appropriate threshold levels, the list of chemicals, and the reporting format. Participation in the case study was by invitation and voluntary.

Case study PRTR reporting forms could be submitted electronically or on paper. The electronic medium was well accepted and recommended for its ease of use. The facilities that agreed to participate were found to require some assistance in the preparation of the PRTR reports. The one-third of the facilities that were small or micro-sized

required the most assistance. Some said the exercise of reporting allowed them to become more familiar with the details of their releases and transfers and to identify pollution prevention and control measures.

The training and assistance undertaken for both industrial and governmental representatives during the case study indicate that it will be necessary to establish broad training and dissemination programs for the PRTR prior to its full implementation. For industry, technical assistance would include methods for identifying and estimating releases from the distinct media, as well as information about the importance and benefits of knowing how chemicals in waste are generated at their facilities. For governmental personnel, such training would cover techniques for data input and management as well as data evaluation.

10.4 TRACKING ENVIRONMENTAL PROGRESS

PRTRs can be used as a tool to track environmental progress in reducing pollution. The above discussion has assessed this progress and presented projected decreases in the releases and transfers reported. PRTRs and this report can also be used to encourage and recognize companies' efforts to reduce pollution, particularly by reducing waste generation.

Those releases and off-site transfers that must be reported to both Canadian and US PRTRs are equaled by transfers to recycling, reuse and recovery, for which reporting is not currently required by all PRTRs. Additional amounts of chemicals treated, recycled or recovered on-site are only reported under the US system, so that current mandatory PRTR data provide a limited perspective on the total amount of chemical wastes generated. Therefore, at this stage of development of North American PRTRs, little can be said about the reduction of waste generation at the source.

Canadian facilities report the reason for year-to-year fluctuations in transfer/release levels. Changes in production levels were cited most often as the reason for such variations. US facilities report qualitatively on whether they undertook source reduction activities during the year. TRI data show that production-related waste is expected to increase less, and releases and transfers to treatment and disposal to decrease more, for those facilities reporting source reduction activity during 1994.

Companies have responded in recent years to increasing environmental awareness beyond the required governmental reporting. Many companies have created annual environmental reports that describe their environmental policies, management and performance. These can range from a short statement of principles in an annual report, through more detailed delineations of environmental management in the corporation, to the reporting of environmental performance data. No standardized reporting mechanism exists, but several industrial and nongovernmental organizations have developed guidelines.

Most of the environmental reports reviewed from the United States and Canada mentioned releases from their facilities, though the extent of the details varied widely. Very few companies in Mexico publish environmental information, although 11 of the 51 US company reports reviewed included some aggregated data on their Mexican facilities and five described corporate environmental activities in Mexico.

Many company reports presenting such data indicated that they were responding to public requests for more data. The absence of environmental corporate reporting in Mexico could be the result of a tradition of relatively less disclosure of information or simply the lack of release data because the Mexican PRTR is still in the developmental stage.

The use of US PRTR data in corporate environmental reporting was widespread; 28 of the 30 US reports reviewed presented TRI data. Frequently, with the aid of TRI data, companies tracked their progress back to 1987 or 1988. Also, 8 of the 12 Canadian reports reviewed presented NPRI results. PRTR data have also been used to set quantitative goals for pollution reduction and then the annual environmental report tracks progress in achieving them. Some companies additionally use the TRI list of chemicals as a basis for global reporting or note their participation in governmental voluntary reduction programs, such as the 33/50 Program in the United States or the ARET program in Canada.

This use of PRTR data in corporate environmental reports points to the importance of such data as a credible baseline, as a measure of progress towards internal corporate goals, and as a basis for responding voluntarily to the challenge from governments to reduce pollution.

Appendix A

A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
50-00-0	Formaldehyde	Formaldéhyde	Formaldehído	X	X	X
50-29-3	DDT	DDT	DDT			X
51-28-5	2,4-Dinitrophenol	2,4-Dinitrophénol	2,4-Dinitrofenol	X		X
51-75-2	Nitrogen mustard	Moutarde azotée	Mostaza de nitrógeno	X		
51-79-6	Urethane	Uréthane	Uretano	X		
52-68-6	Trichlorfon	Trichlorfon	Triclorfón	X		
53-96-3	2-Acetylaminofluorene	2-Acétylaminofluorène	2-Acetilaminofluoreno	X		
55-18-5	N-Nitrosodiethylamine	N-Nitrosodiéthylamine	N-Nitrosodietilamina	X		
55-21-0	Benzamide	Benzamide	Benzamida	X		
55-63-0	Nitroglycerin	Nitroglycérine	Nitroglicerina	X	X	
56-23-5	Carbon tetrachloride	Tétrachlorure de carbone	Tetracloruro de carbono	X	X	X
56-38-2	Parathion	Parathion	Paratión	X		
57-14-7	1,1-Dimethylhydrazine	1,1-Diméthylhydrazine	1,1-Dimetilhidracina	X		
57-57-8	beta-Propiolactone	bêta-Propiolactone	beta-Propiolactona	X		
57-74-9	Chlordane	Chlordane	Clordano	X		
58-89-9	Lindane	Lindane	Lindano	X		X
58-90-2	2,3,4,6-Tetrachlorophenol	2,3,4,6-Tétrachlorophénol	2,3,4,6-Tetraclorofenol			X
59-89-2	N-Nitrosomorpholine	N-Nitrosomorpholine	N-Nitrosomorfolina	X		X
60-09-3	4-Aminoazobenzene	4-Aminoazobenzène	4-Aminoazobenceno	X		X
60-11-7	4-Dimethylaminoazobenzene	4-Diméthylaminoazobenzène	4-Dimetilaminoazobenceno	X		
60-34-4	Methylhydrazine	Méthylhydrazine	Metilhidracina	X		
60-35-5	Acetamide	Acétamide	Acetamida	X		X
61-82-5	Amitrole	Amitrole	Amitrol	X		
62-53-3	Aniline	Aniline	Anilina	X	X	X
62-55-5	Thioacetamide	Thioacétamide	Tioacetamida	X		
62-56-6	Thiourea	Thio-urée	Tiourea	X	X	X
62-73-7	Dichlorvos	Dichlorvos	Diclorvos	X		
62-75-9	N-Nitrosodimethylamine	N-Nitrosodiméthylamine	N-Nitrosodimetilamina	X		X
63-25-2	Carbaryl	Carbaryl	Carbaril	X		
64-17-5	Ethanol	Éthanol	Etanol			X
64-18-6	Formic acid	Acide formique	Ácido fórmico	X		
64-67-5	Diethyl sulfate	Sulfate de diéthyle	Sulfato de dietilo	X	X	
67-56-1	Methanol	Méthanol	Metanol	X	X	
67-63-0	Isopropyl alcohol	Alcool iso-propylique	Alcohol isopropílico	X	X	
67-64-1	Acetone	Acétone	Acetona		X	
67-66-3	Chloroform	Chloroforme	Cloroformo	X	X	X
67-72-1	Hexachloroethane	Hexachloroéthane	Hexacloroetano	X	X	X
68-76-8	Triaziquone	Triaziquone	Triaziquone	X		
70-30-4	Hexachlorophene	Hexachlorophène	Hexaclorofeno	X		

Appendix A

A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
71-36-3	n-Butyl alcohol	Butan-1-ol	Alcohol n-butílico	X	X	
71-43-2	Benzene	Benzène	Benceno	X	X	X
71-55-6	1,1,1-Trichloroethane	1,1,1-Trichloroéthane	1,1,1-Tricloroetano	X		
72-20-8	Endrin	Endrine	Endrín			X
72-43-5	Methoxychlor	Méthoxychlore	Metoxicloro	X		
72-57-1	Trypan blue	Bleu trypan	Azultripán	X		
74-82-8	Methane	Méthane	Metano			X
74-83-9	Bromomethane	Bromométhane	Bromometano	X	X	X
74-85-1	Ethylene	Éthylène	Etileno	X	X	
74-87-3	Chloromethane	Chlorométhane	Clorometano	X	X	X
74-88-4	Methyl iodide	Iodométhane	Yoduro de metilo	X	X	
74-90-8	Hydrogen cyanide	Cyanure d'hydrogène	Ácido cianhídrico	X	X	
74-95-3	Methylene bromide	Bromure de méthyle	Bromuro de metilo	X		
75-00-3	Chloroethane	Chloroéthane	Cloroetano	X	X	
75-01-4	Vinyl chloride	Chlorure de vinyle	Cloruro de vinilo	X	X	
75-05-8	Acetonitrile	Acétonitrile	Acetonitrilo	X	X	
75-07-0	Acetaldehyde	Acétaldéhyde	Acetaldehído	X	X	X
75-09-2	Dichloromethane	Dichlorométhane	Diclorometano	X	X	X
75-15-0	Carbon disulfide	Disulfure de carbone	Disulfuro de carbono	X	X	X
75-21-8	Ethylene oxide	Oxyde d'éthylène	Óxido de etileno	X	X	X
75-25-2	Bromoform	Bromoforme	Bromoformo	X		X
75-27-4	Dichlorobromomethane	Dichlorobromométhane	Diclorobromometano	X		X
75-34-3	1,1-Dichloroethane	1,1-Dichloroéthane	1,1-Dicloroetano	X		
75-35-4	Vinylidene chloride	Chlorure de vinylidène	Cloruro de vinilideno	X	X	X
75-44-5	Phosgene	Phosgène	Fosgeno	X	X	
75-45-6	Chlorodifluoromethane (HCFC-22)	Chlorodifluorométhane (HCFC-22)	Clorodifluorometano (HCFC-22)	X		
75-55-8	Propylenimine	Propylènimine	Propilenimina	X		
75-56-9	Propylene oxide	Oxyde de propylène	Óxido de propileno	X	X	
75-63-8	Bromotrifluoromethane (Halon 1301)	Bromotrifluorométhane (halon 1301)	Bromotrifluorometano (halon 1301)	X		
75-65-0	tert-Butyl alcohol	2-Méthylpropan-2-ol	Alcohol terbutílico	X	X	
75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	1-Chloro-1,1-difluoroéthane (HCFC-142b)	1-Cloro-1,1-difluoroetano (HCFC-142b)	X		
75-69-4	Trichlorofluoromethane (CFC-11)	Trichlorofluorométhane (CFC-11)	Triclorofluorometano (CFC-11)	X		
75-71-8	Dichlorodifluoromethane (CFC-12)	Dichlorodifluorométhane (CFC-12)	Diclorodifluorometano (CFC-12)	X		
76-01-7	Pentachloroethane	Pentachloroéthane	Pentacloroetano	X		X
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)	1,1,2-Trichloro-1,2,2-trifluoroéthane (CFC-113)	1,1,2-Tricloro-1,2,2-trifluoroetano (CFC-113)	X		
76-14-2	Dichlorotetrafluoroethane (CFC-114)	Dichlorotétrafluoroéthane (CFC-114)	Diclorotetrafluoroetano (CFC-114)	X		
76-15-3	Monochloropentafluoroethane (CFC-115)	Chloropentafluoroéthane (CFC-115)	Cloropentafluoroetano (CFC-115)	X		
76-44-8	Heptachlor	Heptachlore	Heptacloro	X		X
77-47-4	Hexachlorocyclopentadiene	Hexachlorocyclopentadiène	Hexaclorciclopentadieno	X	X	X

Appendix A

A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
77-78-1	Dimethyl sulfate	Sulfate de diméthyle	Sulfato de dimetilo	X	X	
78-00-2	Tetraethyl lead	Plomb tétraéthyle	Tetraetilo de plomo			X
78-83-1	i-Butyl alcohol	2-Méthylpropan-1-ol	Alcohol i-butílico		X	
78-84-2	Isobutyraldehyde	Isobutyraldéhyde	Isobutiraldehído	X	X	
78-87-5	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dicloropropano	X	X	X
78-88-6	2,3-Dichloropropene	2,3-Dichloropropène	2,3-Dicloropropeno	X		
78-92-2	sec-Butyl alcohol	Butan-2-ol	Alcohol sec-butílico	X	X	
78-93-3	Methyl ethyl ketone	Méthyléthylcétone	Metil etil cetona	X	X	
79-00-5	1,1,2-Trichloroethane	1,1,2-Trichloroéthane	1,1,2-Tricloroetano	X	X	
79-01-6	Trichloroethylene	Trichloroéthylène	Tricloroetileno	X	X	X
79-06-1	Acrylamide	Acrylamide	Acrilamida	X	X	X
79-10-7	Acrylic acid	Acide acrylique	Ácido acrílico	X	X	
79-11-8	Chloroacetic acid	Acide chloroacétique	Ácido cloroacético	X	X	
79-21-0	Peracetic acid	Acide peracétique	Ácido peracético	X	X	
79-22-1	Methyl chlorocarbonate	Chlorocarbonate de méthyle	Clorocarbonato de metilo	X		
79-34-5	1,1,2,2-Tetrachloroethane	1,1,2,2-Tétrachloroéthane	1,1,2,2-Tetracloroetano	X	X	X
79-44-7	Dimethylcarbamyl chloride	Chlorure de diméthylcarbamyle	Cloruro de dimetilcarbamil	X		
79-46-9	2-Nitropropane	2-Nitropropane	2-Nitropropano	X	X	X
80-05-7	4,4'-Isopropylidenediphenol	p,p'-Isopropylidènediphénol	4,4'-Isopropilindenodifenol	X	X	
80-15-9	Cumene hydroperoxide	Hydroperoxyde de cumène	Cumeno hidroperóxido	X	X	
80-62-6	Methyl methacrylate	Méthacrylate de méthyle	Metacrilato de metilo	X	X	X
81-07-2	Saccharin	Saccharine	Sacarina	X		
81-88-9	C.I. Food Red 15	Indice de couleur rouge alimentaire 15	Rojo 15 alimenticio	X	X	
82-28-0	1-Amino-2-methylanthraquinone	1-Amino-2-méthylanthraquinone	1-Amino-2-metilantraquinona	X		
82-68-8	Quintozene	Quintozène	Quintoceno	X		
84-66-2	Diethyl phthalate	Phtalate de diéthyle	Dietil ftalato	X	X	
84-74-2	Dibutyl phthalate	Phtalate de dibutyle	Dibutil ftalato	X	X	X
85-01-8	Phenanthrene	Phénanthrène	Fenantreno			X
85-44-9	Phthalic anhydride	Anhydride phtalique	Anhídrido ftálico	X	X	
85-68-7	Butyl benzyl phthalate	Phtalate de benzyle et de butyle	Butil bencil ftalato		X	
86-30-6	N-Nitrosodiphenylamine	N-Nitrosodiphénylamine	N-Nitrosodifenilamina	X	X	X
87-62-7	2,6-Xylidine	2,6-Xylidine	2,6-Xilidina	X		
87-68-3	1,1,2,3,4,4-Hexachloro-1,3-butadiene	1,1,2,3,4,4-Hexachloro-1,3-butadiène	1,1,2,3,4,4-Hexacloro-1,3-butadieno	X		X
87-86-5	Pentachlorophenol	Pentachlorophène	Pentaclorofenol	X		X
88-06-2	2,4,6-Trichlorophenol	Trichloro-2,4,6-phénol	2,4,6-Triclorofenol	X		X
88-75-5	2-Nitrophenol	2-Nitrophénol	2-Nitrofenol	X		
88-89-1	Picric acid	Acide picrique	Ácido pícrico	X		
90-04-0	o-Anisidine	o-Anisidine	o-Anisidina	X		X
90-43-7	2-Phenylphenol	o-Phénylphénol	2-Fenilfenol	X	X	X

Appendix A

A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
90-94-8	Michler's ketone	Cétone de Michler	Cetona Michler	X	X	
91-08-7	Toluene-2,6-diisocyanate	Toluène-2,6-diisocyanate	Toluen-2,6-diisocianato	X	X	
91-20-3	Naphthalene	Naphtalène	Naftaleno	X	X	X
91-22-5	Quinoline	Quinoléine	Quinoleína	X	X	X
91-59-8	beta-Naphthylamine	bêta-Naphtylamine	beta-Naftilamina	X		X
91-94-1	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Diclorobencidina	X		X
92-52-4	Biphenyl	Biphényle	Bifenilo	X	X	X
92-67-1	4-Aminobiphenyl	4-Aminobiphényle	4-Aminobifenilo	X		X
92-87-5	Benzidine	Benzidine	Bencidina	X		X
92-93-3	4-Nitrobiphenyl	4-Nitrobiphényle	4-Nitrobifenilo	X		X
93-72-1	Silvex	Silvex	Silvex			X
94-36-0	Benzoyl peroxide	Peroxyde de benzoyle	Peróxido de benzoilo	X	X	
94-58-6	Dihydrosafrole	Dihydrosafrole	Dinitrosafrol	X		
94-59-7	Safrole	Safrole	Safrol	X	X	
94-75-7	2,4-D (acetic acid)	Acide dichloro-2,4-phénoxyacétique	Ácido 2,4-diclorofenoxiacético	X		X
95-47-6	o-Xylene	o-Xylène	o-Xileno	X	X	
95-48-7	o-Cresol	o-Crésol	o-Cresol	X	X	
95-50-1	1,2-Dichlorobenzene	o-Dichlorobenzène	1,2-Diclorobenceno	X	X	X
95-53-4	o-Toluidine	o-Toluidine	o-Toluidina	X		
95-63-6	1,2,4-Trimethylbenzene	1,2,4-Triméthylbenzène	1,2,4-Trimetilbenceno	X	X	X
95-80-7	2,4-Diaminotoluene	2,4-Diaminotoluène	2,4-Diaminotolueno	X	X	
95-95-4	2,4,5-Trichlorophenol	Trichloro-2,4,5-phénol	2,4,5-Triclorofenol	X		X
96-09-3	Styrene oxide	Oxyde de styrène	Óxido de estireno	X	X	
96-12-8	1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-cloropropano	X		X
96-33-3	Methyl acrylate	Acrylate de méthyle	Acrilato de metilo	X	X	
96-45-7	Ethylene thiourea	Imidazolidine-2-thione	Etilén tiourea	X	X	X
97-56-3	C.I. Solvent Yellow 3	Indice de couleur jaune de solvant 3	Solvente de amarillo 3	X		
98-07-7	Benzoic trichloride	Trichlorure de benzylidyne	Benzotricloruro	X		
98-82-8	Cumene	Cumène	Cumeno	X	X	
98-86-2	Acetophenone	Acétophénone	Acetofenona	X		
98-87-3	Benzal chloride	Chlorure de benzale	Cloruro de benzal	X		
98-88-4	Benzoyl chloride	Chlorure de benzoyle	Cloruro de benzoilo	X	X	
98-95-3	Nitrobenzene	Nitrobenzène	Nitrobenceno	X	X	
99-55-8	5-Nitro-o-toluidine	5-Nitro-o-toluidine	5-Nitro-o-toluidina	X		
99-59-2	5-Nitro-o-anisidine	5-Nitro-o-anisidine	5-Nitro-o-anisidina	X		
99-65-0	m-Dinitrobenzene	m-Dinitrobenzène	M-Dinitrobenceno	X		
100-00-5	1-Chloro-4-nitrobenzene	1-Chloro-4-nitrobenzène	1-Cloro-4-nitrobenceno			X
100-02-7	4-Nitrophenol	p-Nitrophénol	4-Nitrofenol	X	X	X
100-25-4	p-Dinitrobenzene	p-Dinitrobenzène	p-Dinitrobenceno	X		

Appendix A — A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
100-41-4	Ethylbenzene	Éthylbenzène	Etilbenceno	X	X	X
100-42-5	Styrene	Styrène	Estireno	X	X	X
100-44-7	Benzyl chloride	Chlorure de benzyle	Cloruro de bencilo	X	X	X
100-75-4	N-Nitrosopiperidine	N-Nitrosopipéridine	N-Nitrosopiperidina	X		
101-14-4	4,4'-Methylenebis(2-chloroaniline)	p,p'-Méthylènebis(2-chloroaniline)	4,4'-Metilenobis(2-cloroanilina)	X	X	X
101-61-1	4,4'-Methylenebis(N,N-dimethyl)benzeneamine	4,4'-Méthylènebis(N,N-diméthyl)benzèneamine	4,4'-Metilenobis(N,N-dimetil)bencenamina	X		X
101-68-8	Methylenebis (phenylisocyanate)	Méthylènebis(phénylisocyanate)	Metilenobis(fenilisocianato)	X	X	
101-77-9	4,4'-Methylenedianiline	p,p'-Méthylènedianiline	4,4'-Metilenodianilina	X	X	
101-80-4	4,4'-Diaminodiphenyl ether	Éther 4,4'-diaminodiphényle	Éter 4,4'-diaminodifenílico	X		
103-23-1	Bis(2-ethylhexyl) adipate	Adipate de bis(2-éthylhexyle)	Bis(2-etilhexil) adipato	X	X	
104-94-9	p-Anisidine	p-Anisidine	p-Anisidina	X		
105-67-9	2,4-Dimethylphenol	2,4-Diméthylphénol	2,4-Dimetilfenol	X		
106-42-3	p-Xylene	p-Xylène	p-Xileno	X	X	
106-44-5	p-Cresol	p-Crésol	p-Cresol	X	X	
106-46-7	1,4-Dichlorobenzene	p-Dichlorobenzène	1,4-Diclorobenceno	X	X	X
106-50-3	p-Phenylenediamine	p-Phénylènediamine	p-Fenilenodiamina	X	X	
106-51-4	Quinone	p-Quinone	Quinona	X	X	
106-88-7	1,2-Butylene oxide	1,2-Époxybutane	Óxido de 1,2-butileno	X	X	
106-89-8	Epichlorohydrin	Épichlorohydrine	Epiclorohidrina	X	X	X
106-93-4	1,2-Dibromoethane	1,2-Dibromoéthane	1,2-Dibromoetano	X		X
106-99-0	1,3-Butadiene	Buta-1,3-diène	1,3-Butadieno	X	X	X
107-02-8	Acrolein	Acroléine	Acroleína	X		X
107-04-0	1-Bromo-2-chloroethane	1-Bromo-2-chloroéthane	1-Bromo-2-cloroetano			X
107-05-1	Allyl chloride	Chlorure d'allyle	Cloruro de alilo	X	X	
107-06-2	1,2-Dichloroethane	1,2-Dichloroéthane	1,2-Dicloroetano	X	X	X
107-13-1	Acrylonitrile	Acrylonitrile	Acrilonitrilo	X	X	X
107-18-6	Allyl alcohol	Alcool allylique	Alcohol alílico	X	X	
107-21-1	Ethylene glycol	Éthylèneglycol	Etilén glicol	X	X	
107-30-2	Chloromethyl methyl ether	Éther de méthyle et de chlorométhyle	Éter clorometil metílico	X		
108-05-4	Vinyl acetate	Acétate de vinyle	Acetato de vinilo	X	X	
108-10-1	Methyl isobutyl ketone	Méthylisobutylcétone	Metil isobutil cetona	X	X	X
108-31-6	Maleic anhydride	Anhydride maléique	Anhídrido maleico	X	X	
108-38-3	m-Xylene	m-Xylène	m-Xileno	X	X	
108-39-4	m-Cresol	m-Crésol	m-Cresol	X	X	
108-60-1	Bis(2-chloro-1-methylethyl) ether	Éther di(2-chloro-1-méthyléthyle)	Éter bis(2-cloro-1-metil etil)	X		X
108-88-3	Toluene	Toluène	Tolueno	X	X	
108-90-7	Chlorobenzene	Chlorobenzène	Clorobenceno	X	X	
108-95-2	Phenol	Phénol	Fenol	X	X	X
109-06-8	2-Methylpyridine	2-Méthylpyridine	2-Metilpiridina	X		X

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CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
109-77-3	Malononitrile	Malononitrile	Malononitrilo	X		
109-86-4	2-Methoxyethanol	2-Méthoxyéthanol	2-Metoxietanol	X	X	
110-49-6	2-Methoxyethyl acetate	Acétate de 2-méthoxyéthyle	2-Metoxietil acetato		X	
110-80-5	2-Ethoxyethanol	2-Éthoxyéthanol	2-Etoxietanol	X	X	X
110-82-7	Cyclohexane	Cyclohexane	Ciclohexano	X	X	
110-86-1	Pyridine	Pyridine	Piridina	X	X	X
111-15-9	2-Ethoxyethyl acetate	Acétate de 2-éthoxyéthyle	2-Etoxietil acetato		X	
111-42-2	Diethanolamine	Diéthanolamine	Dietanolamina	X	X	
111-44-4	Bis(2-chloroethyl) ether	Éther di(2-chloroéthyle)	Éter bis(2-cloroetil)	X		X
111-91-1	Bis(2-chloroethoxy) methane	Méthane di(2-chloroéthoxy)	Bis(2-cloroetoxi) metano	X		
112-40-3	n-Dodecane	n-Dodécane	n-Dodecano			X
114-26-1	Propoxur	Propoxur	Propoxur	X		
115-07-1	Propylene	Propylène	Propileno	X	X	
115-32-2	Dicofol	Dicofol	Dicofol	X		
117-79-3	2-Aminoanthraquinone	2-Aminoanthraquinone	2-Aminoantraquinona	X		
117-81-7	Di(2-ethylhexyl) phthalate	Phtalate de bis(2-éthylhexyle)	Di(2-etilhexil) ftalato	X	X	X
117-84-0	n-Dioctyl phthalate	Phtalate de di-n-octyle	N-Dioctil ftalato		X	
118-74-1	Hexachlorobenzene	Hexachlorobenzène	Hexaclorobenceno	X		X
119-90-4	3,3'-Dimethoxybenzidine	3,3'-Diméthoxybenzidine	3,3'-Dimetoxibencidina	X		
119-93-7	3,3'-Dimethylbenzidine	3,3'-Diméthylbenzidine	3,3'-Dimetilbencidina	X		
120-12-7	Anthracene	Anthracène	Antraceno	X	X	X
120-58-1	Isosafrole	Isosafrole	Isosafrol	X	X	
120-71-8	p-Cresidine	p-Crésidine	p-Cresidina	X		
120-80-9	Catechol	Catéchol	Catecol	X	X	
120-82-1	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzène	1,2,4-Triclorobenceno	X	X	X
120-83-2	2,4-Dichlorophenol	2,4-Dichlorophénol	2,4-Diclorofenol	X	X	X
121-14-2	2,4-Dinitrotoluene	2,4-Dinitrotoluène	2,4-Dinitrotolueno	X	X	X
121-69-7	N,N-Dimethylaniline	N,N-Diméthylaniline	N,N-Dimetilanilina	X	X	
122-66-7	1,2-Diphenylhydrazine	1,2-Diphénylhydrazine	1,2-Difenilhidracina	X		X
123-31-9	Hydroquinone	Hydroquinone	Hidroquinona	X	X	
123-38-6	Propionaldehyde	Propionaldéhyde	Propionaldehído	X	X	
123-63-7	Paraldehyde	Paraldéhyde	Paraldehído	X		
123-72-8	Butyraldehyde	Butyraldéhyde	Butiraldehído	X	X	
123-91-1	1,4-Dioxane	1,4-Dioxane	1,4-Dioxano	X	X	X
124-38-9	Carbon dioxide	Dioxyde de carbone	Bióxido de carbono			X
124-48-1	Chlorodibromomethane	Chlorodibromométhane	Clorodibromometano			X
124-73-2	Dibromotetrafluoroethane (Halon 2402)	Dibromotétrafluoroéthane	Dibromotetrafluoroetano	X		
126-72-7	Tris(2,3-dibromopropyl) phosphate	Phosphate de tris(2,3-dibromopropyle)	Tris(2,3-dibromopropil) fosfato	X		
126-98-7	Methacrylonitrile	Méthacrylonitrile	Metacrilonitrilo	X		

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CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
126-99-8	Chloroprene	Chloroprène	Cloropreno	X		
127-18-4	Tetrachloroethylene	Tétrachloroéthylène	Tetracloroetileno	X	X	X
128-66-5	C.I. Vat Yellow 4	Indice de couleur jaune 4	Amarillo 4	X		
131-11-3	Dimethyl phthalate	Phtalate de diméthyle	Dimetil ftalato	X	X	
132-64-9	Dibenzofuran	Dibenzofurane	Dibenzofurano	X		
133-06-2	Captan	Captan	Captan	X		X
133-90-4	Chloramben	Chlorambène	Cloramben	X		
134-29-2	o-Anisidine hydrochloride	Chlorhydrate d'o-anisidine	o-Anisidina hidrocloruro	X		
134-32-7	alpha-Naphthylamine	alpha-Naphtylamine	alfa-Naftilamina	X		
135-20-6	Cupferron	Cupferron	Cupferron	X		
137-26-8	Thiram	Thirame	Tiram	X		X
139-13-9	Nitrilotriacetic acid	Acide nitrilotriacétique	Ácido nitrilotriacético	X	X	
139-65-1	4,4'-Thiodianiline	4,4'-Thiodianiline	4,4'-Tiodianilina	X		
140-88-5	Ethyl acrylate	Acrylate d'éthyle	Acrilato de etilo	X	X	
141-32-2	Butyl acrylate	Acrylate de butyle	Acrilato de butilo	X	X	
151-56-4	Ethyleneimine	Éthylène imine	Etilenimina	X		
156-10-5	p-Nitrosodiphenylamine	p-Nitrosodiphénylamine	p-Nitrosodifeniamina	X		
156-62-7	Calcium cyanamide	Cyanamide calcique	Cianamida de calcio	X	X	
302-01-2	Hydrazine	Hydrazine	Hidracina	X	X	X
306-83-2	2,2-Dichloro-1,1,1-trifluoroethane (HCFC-123)	Dichloro-2,2-trifluoro-1,1,1-éthane (HCFC-123)	2,2-Dicloro-1,1,1-trifluoroetano (HCFC-123)	X		
309-00-2	Aldrin	Aldrine	Aldrín	X		X
319-84-6	alpha-Hexachlorocyclohexane	alpha-Hexachlorocyclohexane	alfa-Hexaclorociclohexano			X
333-41-5	Diazinon	Diazinon	Diazinón			X
334-88-3	Diazomethane	Diazométhane	Diazometano	X		
353-59-3	Bromochlorodifluoromethane (Halon 1211)	Bromochlorodifluorométhane (halon 1211)	Bromoclorodifluorometano (halon 1211)	X		
354-23-4	1,2-Dichloro-1,1,2-trifluoroethane (HCFC-123a)	1,2-Dichloro-1,1,2-trifluoroéthane (HCFC-123a)	1,2-Dicloro-1,1,2-trifluoroetano (HCFC-123a)	X		
354-25-6	1-Chloro-1,1,2,2-tetrafluoroethane (HCFC-124a)	1-Chloro-1,1,2,2-tétrafluoroéthane (HCFC-124a)	1-Cloro-1,1,2,2-tetrafluoroetano (HCFC-124a)	X		
463-58-1	Carbonyl sulfide	Sulfure de carbonyle	Sulfuro de carbonilo	X		
492-80-8	C.I. Solvent Yellow 34	Indice de couleur jaune de solvant 34	Solvente amarillo 34	X		
505-60-2	Mustard gas	Gaz moutarde	Gas mostaza	X		
510-15-6	Chlorobenzilate	Chlorobenzilate	Clorobencilato	X		
528-29-0	o-Dinitrobenzene	o-Dinitrobenzène	O-Dinitrobenceno	X		
532-27-4	2-Chloroacetophenone	2-Chloroacétophénone	2-Cloroacetofenona	X		
534-52-1	4,6-Dinitro-o-cresol	4,6-Dinitro-o-crésol	4,6-Dinitro-o-cresol	X	X	X
540-59-0	1,2-Dichloroethylene	Dichloroéthylène-1-2	1,2-Dicloroetileno	X		
541-41-3	Ethyl chloroformate	Chloroformiate d'éthyle	Etilcloroformo	X	X	
541-73-1	1,3-Dichlorobenzene	Dichloro-1-3-benzène	1,3-Diclorobenceno	X		X
542-75-6	1,3-Dichloropropylene	Dichloro-1-3-propylène	1,3-Dicloropropileno	X		X
542-88-1	Bis(chloromethyl) ether	Éther di(chlorométhylique)	Bis(clorometil) éter	X		X

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CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
569-64-2	C.I. Basic Green 4	Indice de couleur vert de base 4	Verde 4 básico	X	X	
576-26-1	2,6-Dimethylphenol	Diméthyl-2-6-phénol	2,6-Dimetilfenol			X
584-84-9	Toluene-2,4-diisocyanate	Toluène-2,4-diisocyanate	Toluen-2,4-diisocianato	X	X	X
593-60-2	Vinyl bromide	Bromure de vinyle	Bromuro de vinilo	X		X
606-20-2	2,6-Dinitrotoluene	2,6-Dinitrotoluène	2,6-Dinitrotolueno	X	X	X
615-05-4	2,4-Diaminoanisole	2,4-Diaminoanisole	2,4-Diaminoanisol	X		
621-64-7	N-Nitrosodin-propylamine	N-Nitrosodi-n-propylamine	N-Nitrosodi-n-propilamina	X		X
624-83-9	Methyl isocyanate	Isocyanate de méthyle	Isocianato de metilo	X		
630-08-0	Carbon monoxide	Monoxyde de carbone	Monóxido de carbono			X
630-20-6	1,1,1,2-Tetrachloroethane	1,1,1,2-Tétrachloroéthane	1,1,1,2-Tetracloroetano	X		
636-21-5	o-Toluidine hydrochloride	Chlorydrate de o-toluidine	o-Toluidina hidrocloruro	X		
680-31-9	Hexamethylphosphoramide	Hexaméthylphosphoramide	Hexametilfosforamida	X		
684-93-5	N-Nitroso-N-methylurea	N-Nitroso-N-méthylurée	N-Nitroso-N-metilurea	X		
688-73-3	Tributyltin hydride	Hydride de tributylétain	Tributil-estaño			X
759-73-9	N-Nitroso-N-ethylurea	N-Nitroso-N-éthylurée	N-Nitroso-N-etilurea	X		
760-23-8	1,2-Dichloro-3-butane	1,2-Dichloro-3-butane	1,2-Dicloro-3-butano			X
764-41-0	1,4-Dichloro-2-butene	1,4-Dichloro-2-butène	1,4-Dicloro-2-buteno	X		X
812-04-4	1,1-Dichloro-1,2,2-trifluoroethane (HCFC-123b)	1,1-Dichloro-1,2,2-trifluoroéthane (HCFC-123b)	1,1,-Dicloro-1,2,2-trifluoroetano (HCFC-123b)	X		
842-07-9	C.I. Solvent Yellow 14	Indice de couleur jaune de solvant 14	Amarillo 14 solvente	X	X	
924-16-3	N-Nitrosodin-butylamine	N-Nitrosodi-n-butylamine	N-Nitroso-N-butilamina	X		
959-98-8	Endosulfan	Endosulfan	Endosulfán I			X
961-11-5	Tetrachlorvinphos	Tétrachlorvinphos	Tetraclorvinfos	X		
989-38-8	C.I. Basic Red 1	Indice de couleur rouge de base 1	Rojo 1 básico	X	X	
1120-71-4	Propane sultone	Propanesultone	Propano sultona	X		
1163-19-5	Decabromodiphenyl oxide	Oxyde de décabromodiphényle	Óxido de decabromodifenilo	X	X	
1300-71-6	Dimethylphenol (mixed isomers)	Diméthylphénol (mélange d'isomères)	Dimetilfenol (mezcla de isómeros)			X
1313-27-5	Molybdenum trioxide	Trioxide de molybdène	Trióxido de molibdeno	X	X	
1314-20-1	Thorium dioxide	Dioxyde de thorium	Dióxido de torio	X	X	
1319-77-3	Cresol (mixed isomers)	Crésol (mélange d'isomères)	Cresol (mezcla de isómeros)	X	X	
1330-20-7	Xylene (mixed isomers)	Xylène (mélange d'isomères)	Xileno (mezcla de isómeros)	X	X	
1332-21-4	Asbestos (friable form)	Amiante (forme friable)	Asbestos (friables)	X	X	X
1335-87-1	Hexachloronaphthalene	Hexachloronaphtalène	Hexacloronaftaleno	X		
1336-36-3	Polychlorinated biphenyls (PCBs)	Biphényles polychlorés (BPC)	Bifenilos policlorados (BPC)	X		
1344-28-1	Aluminum oxide (fibrous forms)	Oxyde d'aluminium (formes fibreuses)	Óxido de aluminio (formas fibrosas)	X	X	
1464-53-5	Diepoxybutane	Diépoxybutane	Diepoxibutano	X		
1582-09-8	Trifluralin	Trifluraline	Trifluralín	X		X
1634-04-4	Methyl tert-butyl ether	Oxyde de tert-butyle et de méthyle	Éter metil terbutílico	X	X	
1717-00-6	1,1-Dichloro-1-fluoroethane (HCFC-141b)	1,1-Dichloro-1-fluoroéthane (HCFC-141b)	1,1-Dicloro-1-fluoroetano (HCFC-141b)	X		
1836-75-5	Nitrofen	Nitrofène	Nitrofén	X		

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1897-45-6	Chlorothalonil	Chlorthalonil	Clorotalonil	X		
1937-37-7	C.I. Direct Black 38	Indice de couleur noir direct 38	Negro 38	X		
2164-17-2	Fluometuron	Fluométuron	Fluometurón	X		
2234-13-1	Octochloronaphthalene	Octochloronaphtalène	Octacloronaftaleno	X		
2303-16-4	Diallate	Diallate	Diallate	X		
2602-46-2	C.I. Direct Blue 6	Indice de couleur bleu direct 6	Azul 6	X		
2832-40-8	C.I. Disperse Yellow 3	Indice de couleur jaune de dispersion 3	Amarillo 3 disperso	X	X	
2837-89-0	2-Chloro-1,1,1,2-tetrafluoroethane (HCFC-124)	2-Chloro-1,1,1,2-tétrafluoroéthane (HCFC-124)	2-Cloro-1,1,1,2-tetrafluoroetano (HCFC-124)	X		
2921-88-2	Chlorpyrifos	Chlorpyrifos	Clorpirifos			X
3118-97-6	C.I. Solvent Orange 7	Indice de couleur orange de solvant 7	Naranja 7 solvente	X	X	
3761-53-3	C.I. Food Red 5	Indice de couleur rouge alimentaire 5	Rojo 5 alimenticio	X		
4549-40-0	N-Nitrosomethylvinylamine	N-Nitrosométhylvinylamine	N-Nitrosometilvinilamina	X		
4680-78-8	C.I. Acid Green 3	Indice de couleur vert acide 3	Verde 3 ácido	X	X	
6484-52-2	Ammonium nitrate (solution)	Nitrate d'ammonium (en solution)	Nitrato de amonio (solución)	X	X	
7429-90-5	Aluminum (fume or dust)	Aluminium (fumée ou poussière)	Aluminio (humo o polvo)	X	X	
7439-92-1	Lead	Plomb	Plomo	X		
7439-96-5	Manganese	Manganèse	Manganeso	X		X
7439-97-6	Mercury	Mercure	Mercurio	X		
7440-02-0	Nickel	Nickel	Níquel	X		
7440-22-4	Silver	Argent	Plata	X		
7440-28-0	Thallium	Thallium	Talio	X		
7440-36-0	Antimony	Antimoine	Antimonio	X		
7440-38-2	Arsenic	Arsenic	Arsénico	X		
7440-39-3	Barium	Baryum	Bario	X		
7440-41-7	Beryllium	Béryllium	Berilio	X		X
7440-42-8	Boron	Bore	Boro			X
7440-43-9	Cadmium	Cadmium	Cadmio	X		
7440-47-3	Chromium	Chrome	Cromo	X		
7440-48-4	Cobalt	Cobalt	Cobalto	X		
7440-50-8	Copper	Cuivre	Cobre	X		
7440-62-2	Vanadium (fume or dust)	Vanadium (fumée ou poussière)	Vanadio (humo o polvo)	X	X	
7440-66-6	Zinc (fume or dust)	Zinc (fumée ou poussière)	Zinc	X	X	
7550-45-0	Titanium tetrachloride	Tétrachlorure de titane	Tetracloruro de titanio	X	X	
7647-01-0	Hydrochloric acid	Acide chlorhydrique	Ácido clorhídrico	X	X	
7664-38-2	Phosphoric acid	Acide phosphorique	Ácido fosfórico	X	X	
7664-39-3	Hydrogen fluoride	Fluorure d'hydrogène	Ácido fluorhídrico	X	X	
7664-41-7	Ammonia	Ammoniac	Amoniaco	X	X	
7664-93-9	Sulfuric acid	Acide sulfurique	Ácido sulfúrico	X	X	
7697-37-2	Nitric acid	Acide nitrique	Ácido nítrico	X	X	

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7723-14-0	Phosphorus (yellow or white)	Phosphore (jaune ou blanc)	Fósforo (amarillo o blanco)	X	X	
7782-49-2	Selenium	Sélénium	Selenio	X		
7782-50-5	Chlorine	Chlore	Cloro	X	X	
7783-06-4	Hydrogen sulfide	Hydrogène sulfuré	Ácido sulfhídrico			X
7783-20-2	Ammonium sulfate (solution)	Sulfate d'ammonium (en solution)	Sulfato de amonio (solución)	X	X	
8001-35-2	Toxaphene	Toxaphène	Toxafeno	X		X
8001-58-9	Creosote	Créosote	Creosota	X		
10024-97-2	Nitrous oxide	Oxyde nitreux	Óxido nitroso			X
10034-93-2	Hydrazine sulfate	Sulfate d'hydrazine	Sulfato de hidracina	X		
10049-04-4	Chlorine dioxide	Dioxyde de chlore	Dióxido de cloro	X	X	X
12122-67-7	Zineb	Zinèbe	Zineb	X		
12427-38-2	Maneb	Manèbe	Maneb	X		
16071-86-6	C.I. Direct Brown 95	Indice de couleur brun direct 95	Café 95	X		
16543-55-8	N-Nitrosonornicotine	N-Nitrosonornicotine	N-Nitrosonornicotina	X		
20816-12-0	Osmium tetroxide	Tétroxyde d'osmium	Tetróxido de osmio	X		
22967-92-6	Methylmercury	Méthylmercure	Metil mercurio			X
23950-58-5	Pronamide	Pronamide	Pronamida	X		
25321-14-6	Dinitrotoluene (mixed isomers)	Dinitrotoluène (mélange d'isomères)	Dinitrotolueno (mezcla de isómeros)	X	X	X
25321-22-6	Dichlorobenzene (mixed isomers)	Dichlorobenzène (mélange d'isomères)	Diclorobenceno (mezcla de isómeros)	X		
25376-45-8	Diaminotoluene (mixed isomers)	Diaminotoluène (mélange d'isomères)	Diaminotolueno (mezcla de isómeros)	X		
26471-62-5	Toluenediisocyanate (mixed isomers)	Toluène diisocyanate (mélange d'isomères)	Toluendiisocianatos (mezcla de isómeros)	X	X	X
29082-74-4	Octachlorostyrene	Octachlorostyrène	Percloroestireno			X
30402-15-4	Pentachlorodibenzofurans	Pentachlorodibenzofuranes	Pentaclorodibenzofuranos			X
34077-87-7	Dichlorotrifluoroethane	Dichlorotrifluoroéthane	Diclorotrifluoroetano	X		
36088-22-9	Pentachloro-p-dioxin	Pentachloro-p-dioxine	Pentaclorodibenzo-p-dioxina			X
39156-41-7	2,4-Diaminoanisole sulfate	Sulfate de 2,4-diaminoanisole	Sulfato de 2,4-diaminoanisol	X		
63938-10-3	Chlorotetrafluoroethane	Chlorotétrafluoroéthane	Clorotetrafluoroetano	X		
90454-18-5	Dichloro-1,1,2-trifluoroethane	Dichloro-1,1,2-trifluoroéthane	Dicloro-1,1,2-trifluoroetano	X		
	Antimony compounds*	Antimoine (et ses composés)*	Antimonio (y sus compuestos)*	X	X	
	Arsenic compounds	Arsenic (et ses composés)	Arsénico (y sus compuestos)	X	X	X
	Barium compounds	Baryum (et ses composés)	Bario (y sus compuestos)	X		
	Beryllium compounds	Béryllium (et ses composés)	Berilio (y sus compuestos)	X		
	Cadmium compounds	Cadmium (et ses composés)	Cadmio (y sus compuestos)	X	X	X
	Chlorophenols	Chlorophénols	Clorofenoles	X		
	Chromium compounds	Chrome (et ses composés)	Cromo (y sus compuestos)	X	X	X
	Cobalt compounds	Cobalt (et ses composés)	Cobalto (y sus compuestos)	X	X	X
	Copper compounds	Cuivre (et ses composés)	Cobre (y sus compuestos)	X	X	X
	Cyanide compounds	Cyanure (et ses composés)	Cianuro (y sus compuestos)	X	X	X
	Ethylenebisdithiocarbamic acid, salts, esters	Acide, sels et éthers éthylènebisdithiocarbamiques	Ácido etilenobisditiocarbámico, sales y ésteres	X		

*Elemental compounds are reported separately from their respective element in TRI and RETC and aggregated with it in NPRI.

Appendix A — A COMPARISON OF CHEMICALS LISTED UNDER 1994 TRI, NPRI AND RETC

CAS Number	Chemical Name	Nom chimique	Sustancia	TRI	NPRI	RETC
	Glycol ethers	Éthers glycoliques	Éteres glicólicos	X		
	Lead compounds	Plomb (et ses composés)	Plomo (y sus compuestos)	X	X	X
	Manganese compounds	Manganèse (et ses composés)	Manganeso (y sus compuestos)	X	X	
	Mercury compounds	Mercure (et ses composés)	Mercurio (y sus compuestos)	X	X	X
	Nickel compounds	Nickel (et ses composés)	Niquel (y sus compuestos)	X	X	X
	Nitrogen oxides (NO_X)	Oxydes d'azote (NO_X)	Óxidos de nitrógeno (NO_X)			X
	Polybrominated biphenyls	Biphényles polybromés	Bifenilos polibromados	X		
	Polycyclic aromatic amines	Amines aromatiques polycycliques	Nitro-hidrocarburos aromáticos policíclicos			X
	Polycyclic aromatic hydrocarbons (PAHs)	Hydrocarbures aromatiques polycycliques (HAP)	Hidrocarburos aromáticos policíclicos (HAP)			X
	Selenium compounds	Sélénium (et ses composés)	Selenio (y sus compuestos)	X	X	X
	Silver compounds	Argent (et ses composés)	Plata (y sus compuestos)	X	X	X
	Sulfur oxides (SOx)	Oxydes de soufre (SO_X)	Óxidos de azufre (SO_X)			X
	Thallium compounds	Thallium (et ses composés)	Talio (y sus compuestos)	X		
	Uranium	Uranium	Uranio			X
	Warfarin and salts	Warfarin et sels	Warfarina y sales	X		X
	Zinc compounds	Zinc (et ses composés)	Zinc (y sus compuestos)	X	X	X