
Chapter 1

Toxics Release Inventory Reporting and the 2001 Public Data Release



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INTRODUCTION

Following a fatal chemical-release accident in Bhopal, India, the Emergency Planning and Community Right-to-Know Act (EPCRA) provisions were enacted to promote emergency planning, to minimize the effects of an accident such as occurred at Bhopal, and to provide the public with information on releases of toxic chemicals in their communities.

Section 313 of EPCRA established the Toxics Release Inventory (TRI) Program, a national database that identifies facilities, chemicals manufactured, processed and used at the identified facilities, and the annual amounts of these chemicals released (in routine operations including spills and in catastrophic accidents and other one-time events) and otherwise managed on- and off-site in waste.

In 1990, Congress passed the Pollution Prevention Act (PPA). Among its requirements was a mandate to expand TRI to include additional information on toxic chemicals in waste and on source reduction methods. Beginning in 1991, covered facilities were required to report quantities of TRI chemicals treated on-site, recycled, and combusted for energy recovery. This waste management data has strengthened TRI as a tool for providing information on facilities' handling of TRI chemicals in waste as well as for analyzing progress in reducing releases.

The TRI Program has been a tremendously successful program. The industries that have reported to TRI since its inception have reduced their on- and off-site releases of TRI chemicals by 54.5 percent or 1.72 billion pounds (for chemicals reportable in all years). Governments—federal, state, and local—have used TRI to set priorities, measure progress,

and target areas of special and immediate concern. The public has used the TRI data to understand their local environment, to participate in local and national debates about the choices being made that may affect their health and the health of their children and, ultimately, to exert their influence on the outcome of these debates. The release estimates are an input to determine exposure or calculate potential risks to human health and the environment, but by themselves do not represent risk. Given the potential for using TRI data in these ways, it is important for the public to understand the limitations as well as the benefits of TRI data and factors that should be considered in drawing conclusions from the data about risks to human health or the environment. The determination of potential risk depends on many factors, including toxicity, chemical fate after release, release location, and population concentrations.

Since TRI began in 1987, the program has grown. For the reporting year 2000, TRI was expanded to include certain new persistent bioaccumulative toxic (PBT) chemicals. In addition, reporting thresholds were lowered for both the newly-added PBT chemicals and certain PBT chemicals already on the TRI list (see **Chapter 3** for the PBT Chemicals TRI data). The year 1998 marked the first reporting by seven additional industry sectors: metal mining, coal mining, electrical utilities that combust coal and/or oil, hazardous waste treatment and disposal facilities, chemical wholesale distributors, petroleum bulk stations and terminals, and solvent recovery services (see **Who Must Report?** in this chapter for specific industry identification). Since 1994, federal facilities have been added to TRI and the number of reportable chemicals has nearly doubled.



Now in the second decade of the TRI Program, many challenges in the Right-to-Know Program remain to be met. TRI was designed to be a program that would evolve, over time, to meet the changing needs of an informed and involved public. TRI is not a static program. As new chemicals of concern are identified, they will be added. Sectors that appear to contribute to environmental loadings will be added. Data collection will be modified to meet new information needs and access technologies will be developed over time to assure enhanced public access to the TRI data.

2001 PUBLIC DATA RELEASE

This *2001 Toxics Release Inventory Public Data Release Report* (EPA 260-R-03-001) provides a detailed view of the information collected through TRI. This volume summarizes data collected for calendar year 2001, along with changes since 1988. The companion volume, *2001 TRI Public Data Release: State Fact Sheets* (EPA 260-F-03-002), supplies TRI data in greater detail for each state and territory. The on-line TRI Explorer, a Web tool for searching TRI data, available at <http://www.epa.gov/triexplorer>, includes data collected for all years, including those not found in this report. In addition, the TRI data can be accessed through EPA's Envirofacts data warehouse at <http://www.epa.gov/enviro>.

The *2001 Toxics Release Inventory Public Data Release Report* contains three chapters plus an executive summary. This chapter provides background information, and important factors and assumptions that need to be considered when using TRI data. Chapter 2 examines TRI data as reported by industry sectors. It gives an overview of on- and off-site releases, management of TRI chemicals in waste, and transfers off-site for further waste management for 2001, 2000 and 2001, and 1998 through 2001. Chapter 3 presents TRI data for 2000 and 2001 for PBT chemicals. Federal Facility data are also examined in Chapters 2 and 3.

Appendix A provides data for all reportable chemicals. Appendix B provides data for metals and metal

category compounds. Appendix C provides information for those TRI chemicals that have been designated as OSHA carcinogens. Appendix D lists ways to access the TRI data and related information. Appendix E provides a list of TRI Program contacts in the EPA regional offices and state offices. Appendix F is the TRI reporting form: (Form R) and the Form A Certification Statement. Appendix G provides data on long-term trends by industry, including 1995 through 2001, 1991 through 2001, and 1988 through 2001.

TRI REPORTING

Each year, facilities that meet certain thresholds must report their releases and other waste management activities for listed toxic chemicals to EPA and to the state or tribal entity in whose jurisdiction the facility is located. The TRI list for 2001 included more than 600 chemicals and 30 chemical categories. Each facility submits a TRI reporting form for each TRI chemical it has manufactured, processed, or otherwise used during 2001 in amounts exceeding the thresholds (see **How Do Facilities Report?** later in this chapter).

Reports for each calendar year are due by July 1 of the following year. After completion of data entry and data quality assurance activities, the Agency makes the data available to the public in printed reports, in a computer database, and through a variety of other information products. States also make available to the public copies of the forms filed by facilities in their jurisdiction. In addition, some states independently produce a data release report.

Who Must Report?

Facilities with Standard Industrial Classification (SIC) primary codes 20 through 39 have been required to report to TRI since 1987 (see Box 1-1). Federal facilities have been required to report since 1994, regardless of their SIC code. In May 1997, EPA added seven new industry sectors who began reporting in 1998:

- Metal mining (SIC code 10, except 1011, 1081, and 1094),
- Coal mining (SIC code 12, except 1241),



- Electrical utilities that combust coal and/or oil for the purpose of generating power for distribution in commerce (SIC codes 4911, 4931, and 4939),
- RCRA Subtitle C hazardous waste treatment and disposal facilities (in SIC code 4953),
- Chemical wholesalers (SIC code 5169),
- Petroleum terminals and bulk stations (SIC code 5171), and
- Solvent recovery services (in SIC code 7389).

Facilities in the specified industries that have the equivalent of 10 or more full-time employees and meet the established thresholds for manufacturing, processing, or “otherwise use” of listed chemicals must report their releases and other waste management quantities (including quantities transferred off-site for further waste management).

For most chemicals, thresholds for manufacturing and processing are currently 25,000 pounds for each listed chemical, while the threshold for otherwise using is 10,000 pounds per chemical. For the group of PBT chemicals these thresholds have been lowered.

Box 1-1 summarizes the requirements that determine whether facilities must report.

What Must Be Reported?

Each year, facilities report to TRI the amounts of toxic chemicals released on-site to air, water, and land and injected underground (Section 5 of TRI Reporting Form R), and the amounts of chemicals transferred off-site for recycling, energy recovery, treatment, and disposal (Section 6 of Form R). They also report production-related waste management information on quantities recycled, combusted for energy recovery, treated, or released or otherwise disposed of, both on- and off-site, and catastrophic or other one-time releases (Section 8 of Form R).

Box 1-1: Who Must Report to TRI?

A facility must report to TRI if it:

- Conducts manufacturing operations within Standard Industrial Classification (SIC) codes 20 through 39 or, beginning in the 1998 reporting year, if it is in one of the following industries: metal mining, coal mining, electrical utilities that combusted coal and/or oil, RCRA Subtitle C hazardous waste treatment and disposal facilities, chemical distributors, petroleum terminals and bulk storage facilities, and solvent recovery services. Also, federal facilities must report to TRI regardless of their SIC code classification.
- Employs 10 or more full-time-equivalent employees; and
- Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year, except for PBT chemicals where the thresholds are 0.1 gram for dioxin and dioxin-like compounds, and 10 or 100 pounds for other PBT chemicals.

SIC codes are used throughout the federal government to classify economic activity by industry. Facilities in the manufacturing sectors—that is, SIC codes 20 through 39—have been required to report since the TRI program began. Federal facilities have been required to report to TRI since 1994 regardless of their SIC code. In 1998, seven additional industries began reporting.

On TRI Form Rs and on TRI Form A certification statements, facilities report the four-digit SIC codes that define their operations. A facility might report, for example, SIC code 2873, nitrogenous fertilizers. Industries are grouped into broader categories at the three-digit and two-digit SIC code levels. For example, at the two-digit level it falls into the chemicals and allied products major group, SIC code 28. Producers of nitrogenous fertilizers have been required to report to TRI since 1987. A facility that mines silver ore (SIC code 1044, in the coal and silver ores group SIC code 104, in the metal mining major group SIC code 10) was required to report to TRI beginning in 1998. A solvent recovery facility in SIC code 7389 was also required to report beginning in 1998, although other types of economic activity in that SIC code (miscellaneous business services) do not report to TRI.

Tables in this report present data by industry sector (two-digit SIC code). Industrial facilities often conduct interrelated operations that result in products or services which are classified in different SIC codes. Box 2-3 explains the classification of facilities reporting multiple codes.



To some extent, data in Sections 5, 6, and 7 of Form R and those in Section 8 represent a different view of essentially the same information.

Facilities provide specific identifying information, such as:

- Name
- Location
- Type of business
- Contact names
- Name of parent company
- Environmental permit numbers

They also provide information about the manufacture, process, and otherwise use of the listed chemical at the facility and the maximum amount of the chemical on-site during the year. Facilities provide information about methods used to treat waste streams containing the toxic chemicals at the site and the efficiencies of those treatment methods. In addition to information about the amount of toxic chemicals sent off-site for waste management, facilities also must specify the destination of these transfers. Beginning with the 1991 reports, facilities were required to provide information about source reduction and other pollution prevention activities, along with the quantities managed in waste by

activities such as recycling. Companies must provide a production index that can help relate changes in reported quantities of toxic chemicals in waste managed to changes in production.

These additional data elements facilitate tracking of industry progress in reducing waste generation and moving towards safer waste management alternatives. While current TRI data cannot provide an absolute measure of pollution prevention, the data can provide insights into the complete toxics cycle.

Box 1-2 summarizes what facilities must report to TRI. See **TRI Releases and Waste Management: Data Analyzed in the 2001 TRI Public Data Release Report** later in this chapter for more detail on the data that facilities report, as those data are presented and analyzed throughout this book.

How Do Facilities Report?

TRI facilities may file their TRI reports either electronically, using the TRI reporting software, or in hard copy. Each facility submits a Form R for each TRI chemical for which it meets the reporting requirements. Starting with the 1995 reporting year, facilities with lower levels of reportable amounts that do not manufacture, process, or otherwise use more than 1 million pounds of the chemical can certify that they are not required to report on the Form A certification statement.

Box 1-2: What Must Be Reported to TRI?

Information reported by facilities includes:

- Basic information identifying the facility,
- Name and telephone number of a contact person,
- Environmental permits held,
- Amounts of each listed chemical released to the environment at the facility,
- Amounts of each chemical sent from the facility to other locations for recycling, energy recovery, treatment, or disposal,
- Amounts of each chemical recycled, burned for energy recovery, or treated at the facility,
- Maximum amount of chemical present on-site at the facility during year,
- Types of activities conducted at the facility involving the toxic chemical, and
- Source reduction activities.



Form R

The Form R is the TRI reporting form that must be submitted annually by the owner or operator of a covered facility. The reports are submitted on or before July 1 and cover activities that occurred at the facility during the previous calendar year. With the TRI reporting form, EPA provides instructions and technical guidance on how to calculate toxic chemical releases from facilities. The *Toxic Chemical Release Inventory Reporting Forms and Instructions* are available on the Internet at <http://www.epa.gov/tri>.

Form A

While expanding chemical and industry coverage, EPA has also provided a burden-reducing option for facilities with relatively low quantities of listed toxic chemicals in waste. Beginning in 1995, as the expanded chemical list went into effect, facilities whose total annual reportable amount of a listed toxic chemical does not exceed 500 pounds can apply a higher activity threshold in determining their reporting obligations. The total annual reportable amount is defined as the sum of the waste management categories that would be reported to TRI: quantities released (including disposal), recovered as a result of on-site recycling operations, combusted on-site for energy recovery, and treated at the facility, plus amounts transferred off-site for recycling, energy recovery, treatment, and disposal. These amounts correspond to total production-related waste.

If the facility does not exceed the total production-related amount of 500 pounds, it is eligible for a manufacture, process, or otherwise use threshold of 1 million pounds of the listed chemical. If it does not exceed either the reported amount or the alternate one million pound threshold, the facility does not have to file a Form R. Instead of filing a Form R detailing its releases and other waste management activities, the facility can submit a certification statement (Form A). Form A certifies that the facility met the conditions outlined above and is not required to report the TRI data for that chemical.

What Are the Benefits and Limitations of the Data?

Benefits

The TRI Program has given the public unprecedented direct access to toxic chemical release and other waste management data at the local, state, regional, and national level. Use of this information can enable the public to identify potential concerns, gain a better understanding of potential risks, and work with industry and government to reduce toxic chemical releases and the risks associated with them. When combined with hazard and exposure data, this information can allow informed environmental priority-setting at the local level.

Federal, state, and local governments can use the data to compare facilities or geographic areas, to identify hot spots, to evaluate existing environmental programs, to more effectively set regulatory priorities, and to track pollution control and waste reduction progress. TRI data, in conjunction with demographic data, can help government agencies and the public identify potential environmental justice concerns.

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

Completion of three major efforts in EPA's strategy to enhance TRI's effectiveness has significantly increased the usefulness of TRI data. These actions were the TRI chemical expansion for the 1995 reporting year, facility expansion to include new industries for the 1998 reporting year, and expanded coverage of PBT chemicals through lower reporting thresholds and addition of PBT chemicals to the



TRI chemical list beginning with the 2000 reporting year.

EPA's expansion strategy has given TRI users a substantially greater range and depth of valuable information. EPA's action on chemical expansion nearly doubled the number of chemicals that TRI addresses. As a result of the addition of seven industries, nearly 2,000 additional facilities have submitted reports. Beginning with the data for reporting year 2000, communities have available additional information on releases and other waste management of PBT chemicals that may pose potential threats to human health and the environment.

Limitations

TRI reports reflect releases and other waste management activities of chemicals, not exposures of the public to those chemicals. Release estimates alone are not sufficient to determine exposure or to calculate potential adverse effects on human health and the environment. Although additional information is necessary to assess exposure and risk, TRI data can be used to identify areas of potential concern. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities of toxic chemicals. The determination of potential risk depends upon many factors, including the toxicity of the chemical, the fate of the chemical after it is released, the locality of the release, and the human and other populations that are exposed to the chemical after its release.

While TRI provides the public, industry, and state and local governments an invaluable source of key environmental data, it has some limitations that must be considered when using the data. **What to Consider When Using TRI Data**, later in this chapter, describes specific information to keep in mind when analyzing TRI data.

Even with the expanded industry coverage, TRI does not address all sources of releases and other waste management activities of TRI chemicals. Although the Agency has expanded the number of

industries that must report and has added PBT chemicals to the section 313 list of toxic chemicals, the program does not cover all sources of TRI chemicals. Although TRI is successful in capturing information on a significant portion of toxic chemicals currently being used by covered industry sectors, it does not cover all toxic chemicals or all industry sectors. In addition, facilities that do not meet the TRI threshold levels (those with fewer than 10 full-time employees or those not meeting TRI quantity thresholds) are not required to report. The new PBT chemicals reporting thresholds expand the information TRI will collect, but only for a subset of the TRI chemicals. Thus, while the TRI includes 95,513 reports from 24,896 facilities for 2001, the 6.16 billion pounds of on-and off-site releases reported represent only a portion of all toxic chemical releases nationwide.

The TRI does not include data on toxic emissions from cars and trucks, nor from the majority of sources of releases of pesticides, volatile organic compounds, fertilizers or from many other non-industrial sources.

While many facilities base their TRI data on monitoring data, others report estimated data to TRI as the program does not mandate additional release monitoring. Various estimation techniques are used when monitoring data are not available, and EPA has published estimation guidance for the regulated community. Variations between facilities can result from the use of different estimation methodologies. These factors should be taken into account when considering data accuracy and comparability.

As discussed above, the TRI data summarized in this report reflect chemical releases and other waste management activities that occur in a given calendar year. Patterns of releases and other waste management activities can change dramatically from one year to the next. Thus, it is important to recognize that current facility activities may be different from those reported for 2001 or prior years.



TRI IN PERSPECTIVE

In 1987, when the Congress passed EPCRA, more than 300 chemicals and chemical categories were included in the “TRI Chemical List” and the manufacturing sector in SIC codes 20–39 was required to report under EPCRA section 313. Further, data coverage was initially confined to information on releases and certain transfers off-site for further waste management.

Passage of the Pollution Prevention Act in 1990 expanded TRI to include additional information on toxic chemicals in waste and also on source reduction methods. Beginning in 1991, covered facilities were required to report quantities of TRI chemicals recycled, combusted for energy recovery, and treated on- and off-site. Over time, EPA has worked to expand TRI to cover other industrial sectors and chemicals. Towards that end, the Agency has pursued an expansion strategy that has enlarged the boundaries of TRI in several directions.

Chemical Expansion

The original TRI chemical list combined two existing lists: the New Jersey Environmental Hazardous Substance List and the Maryland Chemical Inventory Report List. Over time, through EPA's petition process, the original list has been modified as the Agency responded to petitions to add and delete chemicals, given the law's toxicity listing criteria. These criteria focus on both acute and chronic health effects as well as environmental effects, as outlined in section 313(d) of EPCRA.

The first chemical expansion occurred in 1993 with the addition of certain chemicals that appear on the Resource Conservation and Recovery Act (RCRA) (58 FR 63500) list of hazardous wastes and certain hydrochlorofluorocarbons (HCFCs) (58 FR 63496) to EPCRA section 313.

The second expansion was the addition of 286 chemicals and chemical categories on November 30, 1994 (59 FR 61432).¹ The additional chemicals can be characterized as high or moderately high in

toxicity, and they are currently manufactured, processed, or otherwise used in the U.S.. Many are high production volume (HPV) chemicals. This list expansion raised the number of chemicals and chemical categories reported to TRI to more than 600. Specifically, the rule added more than 150 pesticides, certain Clean Air Act chemicals, certain Clean Water Act Priority Pollutants, and certain Safe Drinking Water Act chemicals. Many of the chemicals are carcinogens, reproductive toxicants, or developmental toxicants. Of particular note is the addition of industrial chemicals such as diisocyanates, n-hexane, N-methyl-2-pyrrolidone, and chemicals such as polycyclic aromatic compounds that result from the combustion of fuels.

Facility Expansion

Since the enactment of EPCRA, the TRI Program has focused on the releases and other waste management activities of the manufacturing sector—facilities that classify themselves as being primarily in SIC codes 20–39. To provide the public with a more complete picture of the toxics in their community, EPA undertook a detailed examination of other, non-manufacturing industries to determine which may be significant generators of toxic chemical releases and other wastes. This effort focused particular attention on sectors linked to manufacturing—those providing energy, further managing products, or further managing waste from the manufacturing sector.

Factors used to evaluate industries for this expansion included other available data on toxic chemical releases and other waste management activities, the interrelationship of non-manufacturing operations to manufacturing operations, the degree to which reporting would be expected to occur, and the potential burden that TRI reporting might impose on these facilities.

On May 1, 1997, EPA published a final rule (62 FR 23833) adding seven industry sectors to TRI: metal mining, coal mining, electrical utilities that combust coal and/or oil, hazardous waste treatment and dis-

¹ Of the 286 chemicals, 20 were diisocyanates and 19 were polycyclic aromatic compounds. These are reported not as individual chemicals, but as two chemical compound categories. Not individually counting the members of these two categories converts 286 to 249. Furthermore, three other chemicals have been remanded and one chemical was not reportable because of an administrative stay. Thus, the number of chemicals added to TRI, beginning with the 1995 reporting year, was 245.



posal facilities, chemical wholesale distributors, petroleum bulk stations and terminals, and solvent recovery services (**Who Must Report?**, earlier in this chapter, identifies the SIC codes for the added industries). EPA has also conducted an aggressive outreach campaign, including guidance, training, and technical assistance to assist these new industries in understanding their reporting obligations. Final guidance documents for these industries are available from EPA's Web site at <http://www.epa.gov/tri>.

Persistent Bioaccumulative Toxic Chemicals (PBTs)

Beginning with the reporting year 2000, lower reporting thresholds apply to TRI facilities that manufacture, process, or otherwise use certain PBT chemicals. Also, additional PBT chemicals that TRI had not previously covered were added to the section 313 toxic chemical list. These new reporting requirements were issued in October 1999 (64 FR 58666) and on January 17, 2001 (66 FR 4500) for lead and lead compounds.²

PBT chemicals include substances such as mercury, lead, and polychlorinated biphenyls (PCBs), already on the TRI list, and dioxin and dioxin-like compounds, which were among the chemicals added for the 2000 reporting year. The PBT chemicals are of particular concern not only because they are toxic, but also because they remain in the environment for long periods of time and are not readily destroyed (i.e., they are persistent), and build up or accumulate in body tissue (i.e., they bioaccumulate). Relatively small releases of PBT chemicals can pose human and environmental health threats. Consequently, these chemicals warrant recognition by communities as potential health threats and information about their releases and other waste management activities need to be captured by the TRI.

In the October 1999 PBT chemical rulemaking, EPA created three separate thresholds for PBT chemicals: 10 pounds for certain highly persistent,

highly bioaccumulative toxic chemicals, 100 pounds for other PBT chemicals, and a special threshold of 0.1 grams for dioxin and dioxin-like chemicals. The threshold for a PBT chemical is the same for manufacturing, processing or otherwise use (i.e., either 100 pounds or 10 pounds or 0.1 grams for dioxin and dioxin-like compounds). Under the existing thresholds of 25,000 pounds for manufacture or processing of a listed chemical and 10,000 pounds for otherwise using a listed chemical, important information on the releases and other waste management activities of the PBT chemicals were not reported. In addition to the chemical category of dioxin and dioxin-like compounds (a total of 17 substances), six other PBT chemicals have been added to TRI: benzo(g,h,i)perylene, benzo(j,k)fluorene (fluoranthene) (as part of the PACs category), 3-methylcholanthrene (as part of the PACs category), octachlorostyrene, pentachlorobenzene, and tetrabromobisphenol A. New reporting thresholds apply to the following PBT chemicals already on the TRI list: aldrin, chlordane, heptachlor, hexachlorobenzene, isodrin, methoxychlor, pendimethalin, polycyclic aromatic compounds, polychlorinated biphenyls, toxaphene, trifluralin, lead and lead compounds, mercury and mercury compounds.

TRI RELEASES AND WASTE MANAGEMENT: DATA ANALYZED IN THE 2001 TRI PUBLIC DATA RELEASE REPORT

What to Consider When Using TRI Data

Users of TRI information should be aware that TRI data reflect releases and other waste management activities of chemicals, not whether (or to what degree) the public has been exposed to those chemicals. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities which involve toxic chemicals. The determination of potential risk depends upon many factors, including the toxicity

² The lower reporting threshold and requirements for lead and lead compounds are effective for the 2001 reporting year and applies to all lead and lead compounds except for lead when contained in stainless steel, brass, or bronze alloys.



of the chemical, the fate of the chemical, and the amount and duration of human or other exposure to the chemical after it is released. Listed below are some of the factors that should be considered when reviewing TRI data. Box 1-3 highlights some of these factors.

Toxicity of the Chemical

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

- ◆ Some high-volume releases of less toxic chemicals may appear to be a more serious problem than lower-volume releases of more toxic chemicals, when just the opposite may be true. For example, phosgene is toxic in smaller quantities than methanol. A comparison between these two chemicals for setting hazard priorities or estimating potential health concerns, solely on the basis of volumes released, may be misleading.

Exposure Considerations

- ◆ **Potential degradation or persistence of the chemical in the environment.** Exposure to a chemical is dependent upon the chemical being available. The longer the chemical remains unchanged in the environment, the greater the potential for exposure. Sunlight, heat, or microorganisms may or may not decompose the chemical.
 - For example, microorganisms readily degrade some chemicals, such as methanol, into less toxic chemicals; volatile organic compounds, such as ethylene and propy-

lene, react in the atmosphere and contribute to the formation of smog; metals are persistent and will not degrade upon release to the environment.

- As a result, smaller releases of a persistent, highly toxic chemical may create a more serious problem than larger releases of a chemical that is rapidly converted to a less toxic form.

- ◆ **Bioconcentration of the chemical in the food chain.** As a chemical becomes incorporated in the food chain, it may concentrate or disperse as it moves up the food chain.

- Some chemicals, such as mercury, accumulate as they move up the food chain.
- Small releases of a chemical that bioaccumulates may result in significant exposures to consumers.

- ◆ **The environmental medium (air, water, land, or underground injection) to which the toxic chemical has been released.** Chemical exposure of a population depends on the environmental medium to which a chemical is released. The medium also affects the types of exposures possible, such as inhalation, dermal exposure, or ingestion.

- Releases of a chemical to the air can result in exposures to organisms living near and downwind from facilities releasing toxic chemicals to the atmosphere. Persistent

Box 1-3: Factors to Consider in Using TRI Data

Toxicity of the Chemical: TRI chemicals vary in their ability to produce toxic effects. Some high-volume releases of less-toxic chemicals may appear to be a more serious problem than lower-volume releases of highly toxic chemicals, when just the opposite may be true.

Exposure Considerations: The potential for exposure may be greater the longer the chemical remains unchanged in the environment. Sunlight, heat, or microorganisms may or may not decompose the chemical. For example, microorganisms readily degrade some chemicals, such as methanol, into less-toxic chemicals, whereas metals are persistent and will not degrade when released to the environment. Chemical exposure of a population depends on the environmental medium (air, water, land, etc.) to which a chemical is released. The medium also affects the types of exposures possible, such as inhalation, dermal exposure, or ingestion.



chemicals may fall or precipitate from air onto land or into water bodies, resulting in exposures via these environmental media.

- Exposures that may result from releases to water bodies (streams, lakes, etc.) depend in part on the downstream uses of the water, including drinking, cooking, and bathing.
 - Releases to underground injection wells are regulated by EPA's Underground Injection Control Program to provide safeguards so that injection wells do not endanger current and future underground sources of drinking water. When wells are properly sited, constructed, and operated, underground injection is an effective and environmentally safe method to dispose of wastes.
 - Releases to RCRA subtitle C landfills are regulated by EPA's Land Disposal Restrictions (LDR) Program. Land disposal units, such as RCRA subtitle C landfills and surface impoundments, must comply with stringent requirements for liners, leak detection systems, and groundwater monitoring. LDR provides that a hazardous waste cannot be placed on the land until the waste is treated (or meets specific treatment standards) to reduce the mobility or toxicity of the hazardous waste constituents in the waste.
- ◆ **The type of off-site facility receiving the chemical and the efficiency of its waste management practices.** The amount of a toxic chemical that ultimately enters the environment depends on how the chemical was handled during treatment, energy recovery, or recycling activities. Several factors to keep in mind when considering amounts sent off-site are presented below.
- The efficiency of recycling operations varies depending on the method of recycling and the chemical being recycled.
 - Use of a combustible toxic chemical for energy recovery typically results in the destruction of 95% to 99% or more of the toxic chemical. The remaining quantity may be either released to air or disposed of in ash to land.
 - The efficiency of the treatment of toxic chemicals in waste sent to sewage treatment plants varies depending on the chemical and the sewage plant. Some high-volume pollutants, such as methanol, are readily degraded by most sewage treatment plants. Other chemicals, such as methyl ethyl ketone (MEK), may be partially treated and partially released. Other high-volume chemicals, such as ammonia, are not readily treated by most sewage treatment plants and will pass through the plant into the aquatic environment. In addition, metals sent to sewage treatment plants may be removed with solid wastes and sent to landfills, or they may pass through the plant and be discharged into surface waters; they are not, however, destroyed.
 - The efficiency of other treatment methods, such as incineration, also depends upon the specifications of the treatment facility and the nature of the chemical.
 - Toxic chemicals in waste sent off-site for disposal are typically released to land or injected underground.
- ◆ **On-site waste management of the toxic chemical.** As with off-site waste management, the amount of the toxic chemical released to the environment depends on how the chemical was handled during treatment, energy recovery, or recycling activities. However, since the waste management is on-site, any amount of the chemical that enters the environment after waste management is reported to TRI as part of that facility's releases.



On-site and Off-site Releases

Figure 1-1 (see page 1-12) illustrates on-site and off-site releases, other on-site waste management activities, and transfers off-site for other waste management, reportable to TRI. Box 1-4 describes reportable releases that may occur on-site at the facility and identifies types of activities that may contribute releases to various media. Box 1-5 describes releases that may ultimately result when a facility transfers chemicals off-site for disposal.

As noted in Box 1-5, off-site releases include additional details about off-site transfers of metals and metal category compounds, beginning with reporting year 1997. Box 1-6 explains how facilities should report metals and metal category compounds, and Box 1-7 describes EPA's methodology for using these data in analyses in this report.

Box 1-8 describes EPA's methodology for avoiding duplication of amounts analyzed in off-site releases (transfers to land and underground injection disposal) that are also reported as on-site releases by facilities that received such transfers. This potential for duplication arises now that RCRA subtitle C hazardous waste treatment and disposal facilities also report to TRI.

Waste Management

The PPA of 1990 requires facilities to report information about the quantities of TRI chemicals they manage in waste, both on- and off-site. The PPA established as national policy that source reduction is the preferred approach to managing waste. Source reduction is defined as an activity that prevents the generation of waste. The PPA also established as national policy a hierarchy of waste management options, illustrated in Figure 1-2, for situations where source reduction cannot be implemented feasibly.

Although source reduction is the preferred method of reducing risk, environmentally sound recycling shares many of its advantages. Like source reduction, recycling reduces the need for treatment or

disposal of waste and helps conserve energy and natural resources. Where source reduction and recycling are not feasible, toxic chemicals in waste can be treated. Release (including disposal) of a chemical is viewed as a last resort, to be employed only if the preferred methods of waste management cannot be implemented. The PPA did not specifically address the combustion of waste for energy recovery as a waste management option. However, because energy recovery shares aspects of recycling and treatment, EPA chose to list this activity separately in the waste management hierarchy.

Waste management data presented in this book appear in tables and figures in the order of the hierarchy: recycling, energy recovery, treatment, and release (including disposal).

Box 1-9 describes the waste management information facilities must report to TRI. The amount of TRI chemicals in waste reported includes both waste generated by the facility and waste received by the facility for the purpose of further waste management. Facilities report these data as estimates for the reporting year (2001) and the previous year (2000) and as projections for the two following years (2002 and 2003). The PPA requires this data projection to encourage facilities to consider their future waste generation, opportunities for source reduction, and potential improvement in waste man-

Figure 1-2: Waste Management Hierarchy

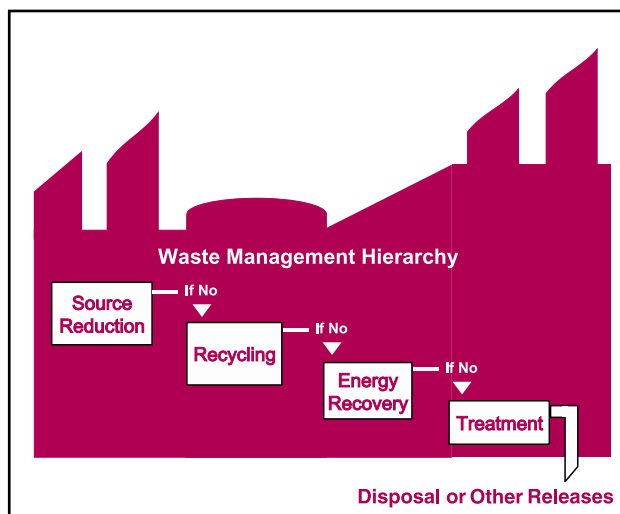
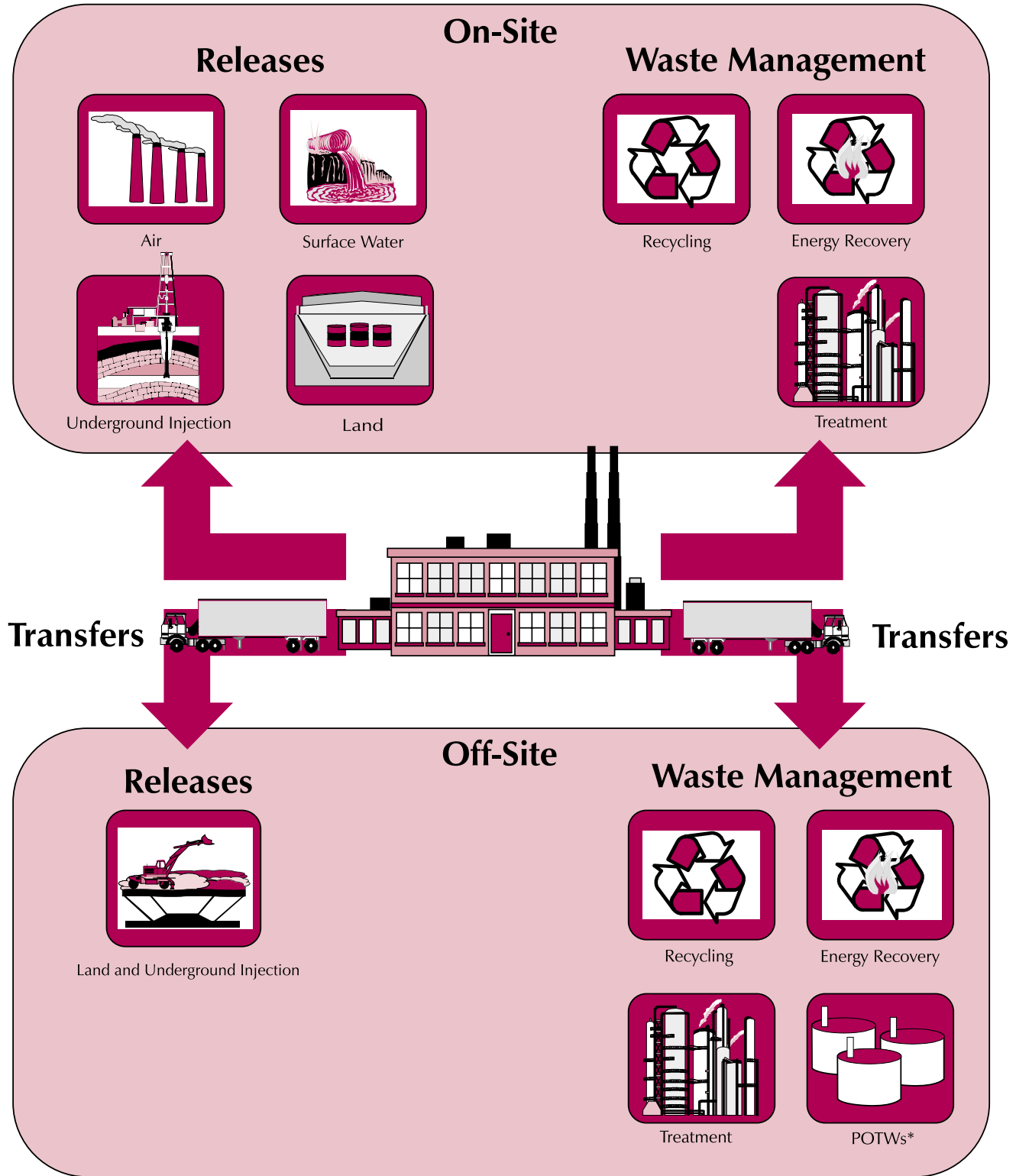




Figure 1-1: Information Collected under TRI



*Publicly Owned Treatment Works

**Box 1-4: An Explanation of On-site Releases**

A release is a discharge of a toxic chemical to the environment. On-site releases include emissions to the air, discharges to bodies of water, releases at the facility to land, as well as releases into underground injection wells. Releases are reported to TRI by media type. On-site releases are reported in Section 5 of Form R.

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

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

Underground Injection. Underground injection is the subsurface emplacement of fluids through wells. TRI chemicals associated with manufacturing, the petroleum industry, mining, commercial and service industries, and federal and municipal government-related activities may be injected into Class I, II, III, IV, or V wells, if they do not endanger underground sources of drinking water (USDW), public health, or the environment. The different types of authorized injection activities are as follows:

- Class I wells include the emplacement of hazardous and nonhazardous fluids (industrial and municipal wastes) into isolated formations beneath the lowermost underground source of drinking water (USDW). Because they may inject hazardous waste, Class I wells are the most strictly regulated and are further regulated under the Resource Conservation and Recovery Act.
- Class II includes injection of brines and other fluids associated with oil and gas production.
- Class III encompasses injection of fluids associated with solution mining of minerals.
- Class IV addresses injection of hazardous or radioactive wastes into or above a USDW and is banned unless authorized under other Statutes for ground water remediation.
- Class V wells inject nonhazardous fluids into or above a USDW and are typically shallow, on-site disposal systems, such as floor and sink drains which discharge directly or indirectly to ground water, dry wells, leach fields, and similar types of drainage wells.

Beginning with the 1996 reporting year, facilities separately report amounts injected into Class I wells and into all other wells. This change was made to recognize the difference in management and regulatory oversight provided by the Underground Injection Control Program for Class I wells as distinguished from other forms of injection reportable to TRI.

On-site Land Releases. On-site releases to land occur within the boundaries of the reporting facility. Releases to land include:

- Disposal of toxic chemicals in landfills in which wastes are buried,
 - ♦ RCRA subtitle C landfills, which are landfills that comply with stringent requirements for liners, leak detection systems, and groundwater monitoring,
 - ♦ Other landfills,
- Land treatment/application farming, which are management techniques in which a waste containing a listed chemical is applied to or incorporated into the soil,
- Surface impoundments that are uncovered holding areas used to volatilize and/or settle waste materials, and
- Other land disposal methods, which include waste piles, spills or leaks.

Beginning with the 1996 reporting year, facilities separately report amounts released to RCRA subtitle C landfills from amounts released to other on-site landfills. This change was made to recognize the difference in management and regulatory oversight provided for RCRA subtitle C landfills as distinguished from other landfills.



Box 1-5: An Explanation of Off-site Releases (Transfers Off-site to Disposal)

An off-site release is a discharge of a toxic chemical to the environment that occurs as a result of a facility's transferring a waste containing a TRI chemical off-site to disposal, as reported in Section 6 of Form R. Certain other types of transfers are also categorized as off-site releases because, except for location, the outcome of transferring the chemical off-site is the same as releasing it on-site.

Transfers to Disposal - Land. Toxic chemicals in waste may be transferred off-site for disposal in landfills or other types of land disposal. (See discussion of on-site releases to land for a description of these release types.)

Transfers to Disposal – Underground Injection. Toxic chemicals in waste may be transferred off-site to sites that inject the wastes underground. (See discussion of on-site underground injection for a description of these release types.)

Storage Only. Generally, a toxic chemical is sent off-site for storage because there is no known disposal method. One example is toxic chemicals in mixed hazardous and radioactive waste. EPA considers this an off-site release because this method is being used as a form of disposal and the toxic chemical will remain there indefinitely.

“Unknown.” The “unknown” category of disposal indicates that a facility is not aware of the type of waste management used for the toxic chemical that is sent off-site. Therefore, EPA has categorized this method as the lowest type of waste management (environmentally least desirable) and has included it as a type of disposal for reporting purposes. Thus, it is considered to be an off-site release.

Metals and Metal Category Compounds. Transfers of metals and metal category compounds to solidification/stabilization, to wastewater treatment (excluding POTWs), and to publicly owned treatment works (POTWs, or municipal sewage treatment) also result in releases and are classified as off-site releases (transfers to disposal) (see Box 1-6).

Box 1-6: How Metals and Metal Category Compounds Should be Reported to TRI

In Section 6.2 of Form R, facilities report the amounts sent to each off-site location to which the facility ships or transfers wastes containing the reported toxic chemical for the purposes of recycling, energy recovery, treatment, or disposal. Metals and metal category compounds are managed in waste either by being released (including disposal) or by being recycled. The metal has no heat value and thus cannot be combusted for energy recovery and cannot be treated because it cannot be destroyed regardless of whether the stream containing the metal is sent for energy recovery or treatment. Thus, transfers of metals and metal category compounds for further waste management should be reported as either a transfer for recycling or a transfer for disposal. The applicable waste management code for transfers of metals and metal category compounds for recycling is M24. Applicable codes for transfers for disposal include M10, M41, M62, M71, M72, M73, M79, M90, M94, and M99. Two codes, M41 and M62, were new for the 1997 reporting year. These codes are for transfers to waste management in which the wastestream may be treated but the metal contained in the wastestream is not treated and is ultimately released. For example, M41 would be used for a metal or metal category compound which is stabilized in preparation for disposal.

Prior to the 1997 reporting year, some facilities reported transfers of metals and metal category compounds for further waste management using two waste treatment codes, M40 and M61. Beginning in reporting year 1997, metals and metal category compounds must be reported using one of the 10 disposal codes or the applicable recycling code (M24 for metals recovery).

Off-site Transfers for Further Waste Management: Codes for Section 6.2 of Form R

Recycling

- M 20 Solvents/Organics Recovery
- M 24 Metals Recovery
- M 26 Other Reuse or Recovery
- M 28 Acid Regeneration
- M 93 Transfer to Waste Broker-Recycling

Energy Recovery

- M 56 Energy Recovery
- M 92 Transfer to Waste Broker-Energy Recovery

Treatment

- M 40 Solidification/Stabilization
- M 50 Incineration/Thermal Treatment
- M 54 Incineration/Insignificant Fuel Value
- M 61 Wastewater Treatment (Excluding POTWs)
- M 69 Other Waste Treatment
- M 95 Transfer to Waste Broker-Waste Treatment

Disposal

- M 10 Storage Only
- M 41 Solidification/Stabilization–Metals and Metal Compounds only
- M 62 Wastewater Treatment (Excluding POTWs)–Metals and Metal Compounds only
- M 71 Underground Injection
- M 72 Landfill/Disposal Surface Impoundment
- M 73 Land Treatment
- M 79 Other Land Disposal
- M 90 Other Off-site Management
- M 94 Transfers to Waste Broker–Disposal
- M 99 Unknown

**Box 1-6: How Metals and Metal Category Compounds Should be Reported to TRI (continued)**

In Section 6.1 of Form R, facilities report amounts of listed chemicals transferred to publicly owned treatment works (POTWs). Because metals are not destroyed by sewage treatment processes, amounts of metals and metal category compounds reported in Section 6.1 are considered transfers to disposal.

In Section 8.1 of Form R, facilities report quantities of listed chemicals released on- and off-site (excluding one-time catastrophic or remedial releases). Except for those quantities recycled, metals and metal category compounds should be reported in Section 8.1 of the Form R. This includes those quantities of metals and metal category compounds reported in:

- Section 5 as on-site releases
- Section 6.2 as sent off-site for stabilization/solidification (M41) or wastewater treatment (excluding POTWs) (M62) and/or,
- Section 6.1 as discharges to POTWs.

These quantities should not be reported in Section 8.7 of the Form R.

Box 1-7: Use of Data for Metals and Metal Category Compounds in This Report

Off-site releases (transfers to disposal) in tables in this report include the quantities of metals and metal category compounds that were reported using the incorrect waste management codes, M40 and M61, in Section 6.2 (e.g., waste treatment codes instead of recycling or disposal codes) along with the quantities of metals and metal category compounds that were reported correctly in Section 6.2. For the years prior to 1997, EPA has also included the quantities of metals and metal category compounds that were reported using the two waste management codes, M40 and M61, as off-site releases rather than off-site waste treatment. In addition, when discussing off-site releases of TRI chemicals, EPA has included those quantities of metals and metal category compounds reported as discharges to POTWs in Section 6.1 of the Form R.

Chemicals considered to be metals and metal category compounds in this report appear in the tables in Appendix B.

agement options as presented in the hierarchy. Future-year estimates are not commitments that facilities reporting to TRI must meet.

The individual waste management quantities reported are mutually exclusive to avoid double-counting. For example, an incinerator may destroy 99% of the chemical in the waste; in this case, the amount reported as treated on-site would be the amount destroyed by the incinerator, not the amount that entered the incinerator. The amount not destroyed in incineration (1%) would be reported as released. The sum of the individual quantities in a given year equals the total quantity of TRI chemicals in waste resulting from routine production operations at a facility during that year.

For the reporting year only, facilities must also report the quantity of waste released (including disposal) as a result of activities other than routine production operations. This quantity appears in data tables in this book as “non-production-related waste

managed.” It includes waste released to the environment at the facility or transferred off-site because of catastrophic events or remedial (clean-up) actions at the facility. Non-production-related waste is considered less amenable to source reduction because facilities cannot reasonably anticipate these quantities.

It is important to note that facilities may vary in how they interpret some of the reporting requirements under the PPA. EPA has not yet specifically defined in regulations the reporting requirements for these data elements, so some facilities may include in their reports amounts that other facilities do not believe they must include. Because of this, higher quantities of TRI chemicals in waste for a particular state or industry may reflect not only differences in actual quantities, but also different interpretations of the reporting requirements.

Box 1-10 explains the differences between “total on- and off-site releases” and “quantity released on- and off-site.”



Box 1-8: Duplication of Off-site Transfers to Disposal

TRI facilities transfer off-site chemicals in waste to other facilities for disposal. These recipient facilities can dispose of the wastes in on-site landfills, disposal surface impoundments, in land treatment facilities, or by using other types of land disposal methods. They may also dispose of wastes in underground injection wells or, if metals and metal category compounds are sent to a wastewater treatment facility, they may be discharged to surface waters. The recipient facilities generally are treatment, storage and disposal (TSD) facilities regulated under the federal Resources Conservation and Recovery Act (RCRA). Such facilities are one of the added industries that must, beginning with the 1998 reporting year, report their releases, transfers, and other waste management to TRI. Thus, the facility that sends these transfers would report to TRI the amounts as transfers to disposal (off-site releases) and the TSD facility that receives the material would report the amounts as on-site releases to land, surface waters, or underground injection.

To avoid counting the transfers to the TSD facilities that are also reported to TRI as on-site releases by the TSD facilities, off-site transfers to disposal to these TSD facilities must be omitted from tables that compare or summarize on-site and off-site releases for all industries, including the industries added in 1998. Only the on-site releases from the TSD facilities are included in such analyses. In the *2001 TRI Public Data Release*, this applies to tables presented in Chapters 2 and 3.

The RCRA ID number that facilities report was used to identify such transfers and match them to on-site releases reported by TSD facilities. A TRI facility must report its own RCRA ID number as well as the RCRA ID number of the TSD facility receiving the transfer. Each amount of off-site transfer to disposal should have the RCRA ID number of the receiving facility. If this RCRA ID number matches the RCRA ID number of a TRI facility and the TRI facility receiving the waste reported on-site releases of the same chemical (or the metal and its compounds in the case of metals) that were greater than or equal to the sum of the off-site transfers received, then the off-site transfer amount is omitted from the analysis.

If the TRI facility receiving the waste reported on-site releases of the chemical less than the total reported as transferred to the facility, then the amount omitted from the analysis is reduced proportionally. For example, if Facility A reported 20,000 pounds transferred to Facility C and Facility B reported 80,000 pounds transferred to Facility C, but Facility C only reported 90,000 pounds released on-site (which is 90 percent of the total amount of 100,000 pounds reported as transferred), then the amount of transfers omitted from the analysis for Facility A is 18,000 pounds (or 90 percent of 20,000 pounds) and for Facility B is 72,000 pounds (or 90 percent of 80,000 pounds).

In tables that present off-site transfers but not on-site releases, these amounts are not omitted in order to present complete data on off-site transfers for analysis. Also, tables that present data on waste managed do not omit any reported data in order to present complete data on how waste is being managed.

The following shows which types of off-site transfers to disposal are matched with which types of on-site releases to determine if the transfers should be omitted:

Off-site Transfer M Code	Section 5 Checked for Recipient TRI Facilities Based on Matching Chemical or, if Metal, Metal plus Metal Category Compounds
M10	5.5.4
M41*	5.5.1 A and B
M62*	5.5.1 A and B, 5.5.3 and 5.3
M71	5.4
M72	5.5.1 A and B, 5.5.3
M73	5.5.2
M79	5.5.4
M90	All Section 5
M99	All Section 5

*Includes metals and metal category compounds reported under codes M40 and M61.

**Box 1-9: An Explanation of Waste Management Information**

Information about facilities' management of TRI chemicals in waste is reported in Section 8 of Form R.

Recycled On-site. This is the quantity of the toxic chemical recovered at the facility and made available for further use. To avoid double-counting, the amount reported represents the amount exiting the recycling unit. It is not the quantity that entered an on-site recycling or recovery operation. For example, 3,000 pounds of a listed chemical enters a recycling operation. Of this, 500 pounds of the chemical are in residues from the recycling operation that are subsequently sent off-site for disposal. The quantity reported as recycled on-site would be 2,500 pounds.

Recycled Off-site. This is the quantity of the toxic chemical that left the facility boundary for recycling, not the amount recovered at the off-site location. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for recycling, less any amount(s) associated with non-routine events.

Used for Energy Recovery On-site. This is the quantity of the toxic chemical that was combusted in some form of energy recovery device, such as a furnace (including kilns) or boiler. The toxic chemical should have a heating value high enough to sustain combustion. To avoid double-counting, the amount reported represents the amount destroyed in the combustion process, not the amount that entered the energy recovery unit. For example, 100,000 pounds of toluene entered a boiler that, on average, combusted 98% of the toluene. Any remaining toluene was discharged to air. A total of 98,000 pounds is reported as combusted for energy recovery (the remaining 2,000 pounds is reported as released).

Used for Energy Recovery Off-site. This is the quantity of the toxic chemical that left the facility boundary for energy recovery, not the amount combusted at the off-site location. The toxic chemical must have a significant heating value, and the off-site location must have some form of energy recovery unit in place. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for energy recovery, less any amount(s) associated with non-routine events.

Treated On-site. This is the quantity of the toxic chemical destroyed in on-site waste treatment operations, not the amount that entered a treatment operation. For example, if 100,000 pounds of benzene were combusted in an incinerator that destroyed 99% of the benzene, the facility would report 99,000 pounds as treated on-site (the remaining 1,000 pounds would be reported as released).

Treated Off-site. This is the quantity of the toxic chemical that left the facility boundary and was sent to POTWs or other off-site locations for treatment, not the amount that was destroyed at the off-site location(s). This quantity includes the amount(s) reported in Section 6 of Form R as transferred to POTWs or other off-site locations for treatment, less any amount(s) associated with non-routine events and not including quantities of metals and metal category compounds (see Box 1-6).

Released On- and Off-site. This is the total quantity of the toxic chemical that was released to the environment or disposed of at the facility (directly discharged to air, land, and water, and injected underground) or sent off-site for disposal. This quantity is the sum of the amounts reported in Sections 5 and 6 of Form R (releases plus transfers to disposal and transfers to POTWs of metals and metal category compounds) less any amount(s) associated with non-routine events.

Released to the Environment Due to One-time Events. This amount is referred to as non-production-related waste and is the quantity released to the environment or sent off-site for recycling, energy recovery, treatment, or disposal due to one-time events not associated with routine production practices. Such events include catastrophic events, such as accidental releases, as well as remedial actions (clean up). This quantity is separated from the quantities recycled, used for energy recovery, treated, and released, to distinguish between quantities that are routinely associated with production operations and are more amenable to source reduction and those that are not routinely associated with production processes and are not so amenable to source reduction because they are not readily anticipated (e.g. releases due to damage from a tornado). This separation is important in assessing progress in source reduction at facilities.



Box 1-10: Differences between Amounts Reported in Sections 5 and 6 and in Section 8 of Form R

“Total on- and off-site releases” and “quantity released on- and off-site” are not the same. This difference arises primarily from the types of releases reported on different sections of the Form R. “Total on- and off-site releases” reflects all on-site releases as collected in Section 5 of the Form R and transfers off-site for disposal as reported in Section 6 (including metals and metal category compounds as described in Box 1-6). However, “quantity released on- and off-site” is limited to production-related on- and off-site releases as collected in Section 8.1 of the Form R. Although total amounts analyzed in these two categories are often the same, production-related releases reported in Section 8.1 do not include those releases associated with catastrophic events, remedial actions, or other one-time events not related to production. For the same reason, transfers for recycling, energy recovery, and treatment (including POTWs for non-metals) reported in Section 6 do not exactly correspond with similar quantities reported in Section 8. Once again, the relevant parts in Section 8 include only production-related wastes whereas Section 6 includes all off-site waste management amounts.

Other reasons also contribute to the different quantities reported in different sections of the Form R. For example, a release or transfer of less than 1,000 pounds may be reported in ranges in Section 5 and 6 whereas an exact amount must be included in Section 8. Furthermore, facilities may round off the quantities reported in Section 8 to two significant digits.

Transfers Off-site for Further Waste Management

Box 1-11 describes off-site transfers to recycling, energy recovery, treatment, and POTWs that TRI facilities must report.

Making Year-to-Year Comparisons of TRI Data

Year-to-year comparisons must be based on a consistent set of reporting requirements to assure that any changes in releases or waste management data do not simply reflect expansion of TRI's chemical and industry coverage or other modifications in reporting requirements over the course of the years. Therefore, trend analyses have been undertaken using various baseline years, as described below.

1998–2001

EPA has made changes during the 1998–2001 period to the list of chemicals that must be reported and to reporting thresholds for some chemicals. EPA has the authority both to add chemicals to the TRI reporting list if they meet the statutory toxicity criteria and to delete chemicals from the list if EPA determines that they do not meet the toxicity criteria. For the 2000 reporting year, PBT chemicals already on the list had the reporting thresholds lowered and other PBT chemicals were added to the list. The reporting threshold for the PBT lead and lead compounds (except when lead is contained in stainless steel, brass, or bronze alloys) was lowered

for the 2001 reporting year. The PBT chemicals are excluded from analyses of the 1998–2001 data.

In addition, vanadium compounds were added to the list and vanadium was changed to exclude vanadium when contained in alloys for the 2000 reporting year. Vanadium and vanadium compounds are excluded from analyses of the 1998–2001 data.

1988–2001

Analyses for the period 1988 to 2001 exclude chemicals added to TRI since 1988 and those for which reporting requirements have changed over that time. Also, reporting by industry sectors added in 1998 is excluded from the data for 1998–2001 for analyses covering the 1988–2001 period. Additional considerations also apply to analyses of TRI data for 1988 to 2001, including:

- In 1989, the reporting thresholds for manufacture and processing of TRI chemicals were reduced from 50,000 pounds to 25,000 pounds. This may affect data for 1988 and 1989, but not for subsequent years.
- Off-site transfers to recycling and energy recovery became reportable in 1991. Comparisons between 1988 and later years include only the transfer types that were reportable in 1988.
- Reporting of amounts injected underground into Class I wells separately from amounts injected



Box 1-11: An Explanation of Transfers Off-site for Further Waste Management

An off-site transfer, reported in Section 6 of Form R, is the transfer of toxic chemicals in waste to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported to TRI as transferred are sent to off-site facilities for the purposes of recycling, energy recovery, treatment, or disposal. The amounts reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers to disposal, these amounts do not necessarily represent entry of the chemical into the environment. Transfers to disposal represent an off-site release (see Box 1-5).

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

Transfers Off-site to Energy Recovery. Toxic chemicals in waste sent off-site for purposes of energy recovery are combusted off-site in industrial furnaces (including kilns) or boilers that generate heat or energy for use at that location. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers Off-site to Treatment. Toxic chemicals in waste that are transferred off-site may be treated through a variety of methods, including biological treatment, neutralization, incineration, and physical separation. These methods typically result in destruction of the toxic chemical.

Transfers to Publicly Owned Treatment Works (POTWs). A POTW is a wastewater treatment facility that is owned by a state or municipality. Wastewaters from facilities reporting under TRI are transferred through pipes or sewers to a POTW. Treatment or removal of a chemical from the wastewater depends upon the nature of the chemical, as well as the treatment methods present at the POTW. In general, chemicals that are easily utilized as nutrients by microorganisms, or have a low solubility in water, are likely to be removed to some extent. Chemicals that are volatile and have a low solubility in water may evaporate into the atmosphere. Not all TRI chemicals can be treated or removed by a POTW. Some chemicals, such as metals, may be removed, but are not destroyed and may be disposed of in landfills or discharged to receiving waters; transfers of metals and metal category compounds to POTWs are categorized as off-site releases, as explained in Boxes 1-5 and 1-6.

Other Off-site Transfers. In this report, toxic chemicals in waste that were reported as transferred off-site but for which the off-site activity (i.e., recycling, energy recovery, treatment, or disposal) was not specified or was not an accepted code have been classified as “other off-site transfers.”

into underground wells of other classes (II–V), and reporting of on-site land releases to RCRA subtitle C landfills separately from other types of on-site land releases began in 1996. These release types cannot be analyzed separately for 1988 and later years.

Appendix G presents total releases for 1988-2001 by industry sector.

Other Changes

Several other changes in the TRI reporting requirements over the years will affect comparisons of other groups of years. They include chemicals added in 1990, 1991, 1994, 1995 and 2000, industry sectors added in 1998, changes in reporting requirements for ammonia, hydrochloric acid and sulfuric acid in 1994 and 1995 and several chemicals that have been deleted over the years. These

chemicals and industry sectors are excluded from analyses that include years before the changes were made.

Other changes include the types of data reported. The PPA of 1990 required reporting of on- and off-site waste management data and off-site transfers to recycling and energy recovery beginning with the 1991 reporting year so this information can only be analyzed for years 1991 and later.

Appendix G presents total releases for 1988-2001 and 1995-2001 and waste management data for 1991-2001 and 1995-2001 by industry sector.

Reasons for Change

Box 1-12 provides reasons that a facility's reported amounts may change from one year to another. Explanations for changes in reported amounts



Box 1-12: Reasons Facility Estimates of Releases and Other Waste Management Change

Some reported increases and decreases are real—that is, they reflect changes in the amounts of TRI chemicals actually released or otherwise managed in waste. Other reported increases and decreases are accounting or "paper" changes that do not reflect change in releases or other waste management. Some examples follow.

Real Changes

Source reduction activities, such as process changes, elimination of spills and leaks, inventory control, improved maintenance, chemical substitution, and alternative methods of cleaning and degreasing can cause real reduction in the amount of waste generated and/or managed.

The installation of pollution control equipment does not reduce the amount of waste generated, but may lead to real reductions in TRI chemicals released. However, if the pollution control does not destroy the reported chemical, it may merely shift the chemical from one type of waste management to another.

Production changes can cause real changes in the quantities of TRI chemicals released or otherwise managed as waste by facilities. Production-related waste is likely to increase when production increases and decrease when production decreases, although the relationship is not necessarily linear.

One-time events unrelated to normal production processes, such as accidental releases or clean-up operations, can cause a real but anomalous increase in the reporting year in which they occur and then a decrease from that abnormally high level the following year.

“Paper” Changes

Changes in estimation or calculation techniques can cause a change in the amount reported without a corresponding change in actual quantities of the chemical released or otherwise managed as waste.

Clarifications of reporting instructions or changes in the way a facility interprets those instructions may cause a change in reported amounts without an actual change in quantities of the chemical released or otherwise managed as waste.

Changes in the reporting definition of a particular chemical may cause a change in the reported amounts without an actual change in quantities released or otherwise managed as waste. For example, revising the definitions of sulfuric acid and hydrochloric acid to include only aerosol forms, as occurred in reporting years 1994 and 1995, resulted in lower reports of releases, when non-aerosol forms were no longer reported.

Similarly, a facility's use of the alternate threshold may result in a reported decrease without an actual reduction in releases if the facility begins to take advantage of an alternate manufacture, process, or otherwise use threshold of more than 1 million pounds. Beginning in the 1995 reporting year, some facilities whose "total annual reportable amount" for a reportable chemical does not exceed 500 pounds may use an alternate manufacture, process, or otherwise use threshold of more than 1 million pounds of the chemical. If they do not exceed this alternate threshold, they no longer need to report amounts of releases or other waste management activities.

Apparent increases or decreases can occur if a facility makes a reporting error one year and does not submit a revision for that year, but does not repeat the error the following year.

Box 1-13: What Is Source Reduction?

Through source reduction, risks to people and the environment can be reduced, financial and natural resources can be saved that would otherwise have to be expended on environmental clean-up or pollution control, and industrial processes can become more efficient. Source reduction is defined in the Pollution Prevention Act of 1990 as any practice that:

- reduces the amount of any hazardous substance, pollutant, or contaminant entering any wastestream or otherwise released into the environment (including fugitive emissions); and
- reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

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



include actual source reduction projects undertaken to reduce a facility's generation of waste of a particular chemical, increases or decreases in production levels, changes in a facility's methods of estimating or calculating reportable amounts (which does not indicate a corresponding change in actual releases and waste management), reporting errors in previous years for which the facility has not filed a revised submission, and others.

Apparent increases and decreases among industries can also result when facilities change the SIC codes they report from one year to another, reflecting new or discontinued facility operations or indicating a different understanding of how SIC codes relate to the facility's business.

Source Reduction

As noted above, the PPA of 1990 requires facilities to report the quantities of TRI chemicals they manage in waste, both on- and off-site. The PPA also requires facilities to provide information about the efforts they have made to reduce or eliminate those quantities. With the 1991 reporting year, facilities began reporting to TRI information about any source reduction activities they implemented during the year.

Source reduction activities are undertaken to reduce the amount of a toxic chemical which enters a wastestream or is otherwise released to the environment. By reducing the generation of toxic chemicals in waste, source reduction activities reduce the need to recycle, treat, or dispose of toxic chemicals. Box 1-13 explains source reduction as defined by the PPA.

A reported source reduction activity could have been implemented at any time during the reporting year. This is important to consider when analyzing the impact that source reduction activities may have had on the total quantity of waste that a facility managed during the year. Undertaking a source reduction activity late in the reporting year would have a smaller impact on the amount of waste that was managed during the year than implementing the same activity earlier in the year.

HOW CAN I OBTAIN ADDITIONAL TRI INFORMATION?

The TRI data are available in on-line databases and in a variety of common computer and hard copy formats to ensure that everyone can easily use the information. Information about accessing the TRI database is provided on the inside front cover of this report. The TRI User Support Service (**202-566-0250**, <tri.us@epa.gov>) can provide assistance in accessing and using the TRI data. On-line services include the TRI Explorer, EPA's Envirofacts, the National Library of Medicine's TOXNET system, and the Right-to-Know Network (RTK NET).

To request copies of TRI and EPCRA documents or to obtain further information about the program, contact the toll-free EPCRA Call Center at **1-800-424-9346**. TRI information is also available on the TRI Web site at <http://www.epa.gov/tri>.

Other potential sources of TRI information include the state EPCRA section 313 contacts, the EPA Regional Offices, or the facilities themselves. EPA regional and state EPCRA section 313 contacts appear in Appendix E of this report, the *2001 TRI Public Data Release: State Fact Sheets* and on the TRI Web site.