Pollution Prevention Evaluation Report *2000*

Minnesota Office of Environmental Assistance

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POLLUTION PREVENTION
Right From The Start

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Executive Summary

In May 2000, the Minnesota Toxic Pollution Prevention Act (TPPA) was 10 years old. The TPPA declares that the policy of the state is to eliminate or reduce at the source the use, generation or release of toxic pollutants and hazardous wastes. The TPPA requires the Minnesota Office of Environmental Assistance (OEA) to report every two years to the Legislature on the state's progress in meeting this objective. Minn. Stat. §115D.10 (1998). This is the fifth *Pollution Prevention Evaluation Report*.

Preventing pollution requires a change in thinking so that toxic materials are not used and wastes are not generated in the first place. Rather than shifting pollution between environmental media (i.e., from land to water), pollution prevention is a multi-media approach that reduces the overall quantity of toxic pollution. Producing cost-effective goods and services using less-toxic or non-toxic materials, reducing waste and conserving resources are the best ways to build and sustain healthy communities throughout Minnesota.

Reducing waste and toxicity is also key to building healthy, sustainable businesses. Companies that make changes to reduce their use and generation of toxic chemicals often increase efficiency, improve the working environment, save money both in raw material costs and in waste disposal costs, and reduce their liability and regulatory burden.

Thriving communities and competitive businesses are two of the major goals outlined in Governor Ventura's *Big Plan*[1]. Pollution prevention can play a major role in helping to achieve both of those objectives.

Generation. *The sum of all toxic release inventory (TRI) chemical management methods used for a reported chemical. For each TRI chemical, facilities report a breakdown by management method, which is used to calculate the total quantity generated. The management methods are as follows:*

Releases. *Any direct emission to air, water or land, including disposal to landfill and surface impoundment, which is a type of land application such as a holding pond.*

Recycling. *Any processing of a waste chemical so that it can be used in the manufacture of new products.*

Treatment. *Any processing of a waste chemical for purposes of reducing volume or toxicity prior to disposal.*

Burn for energy recovery. *Any combustion of a waste chemical with significant fuel value that takes place in an industrial boiler, furnace or kiln.*

Minnesota businesses reaping benefits of pollution prevention

Under federal and state statutes, certain manufacturing companies are required to file annual Toxic Release Inventory (TRI) reports if they use any of the approximately 600 listed toxic chemicals in amounts above specified thresholds. Of the 600 listed toxic chemicals, as many as 200 are used above threshold levels by Minnesota companies. These companies file TRI reports with the Minnesota Emergency Response Commission, which provides the data to the OEA.

Facilities are required to report each chemical by total quantity generated and by management method. The OEA assesses this data to evaluate industry's progress in preventing pollution. Below is a list of ways that companies can manage a chemical after it has been used in the manufacturing process.

- Released to the environment.
- Recycled, on- or off-site.
- Treated, on- or off-site.
- Burned for energy recovery, on- or off-site.

Instead of generating toxic chemicals and then having to manage them, many Minnesota companies are taking a different approach. These innovative businesses are reaping multiple benefits by finding alternatives to toxic chemicals and manufacturing processes that use these chemicals. Furthermore, many businesses are realizing these benefits while maintaining or increasing their production levels. The following examples describe two companies that are helping to make the environment and their communities healthy and sustainable by preventing pollution, while at the same time improving their bottom line.

[1] Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*, 1999.

- **Marathon Ashland Petroleum**, an oil refinery in St. Paul Park, reduced its generation of TRI chemicals more than 50 percent from 1996 to 1998. Part of Ashland's reduction efforts involved finding substitutes for chlorinated and ignitable cleaning solvents. The Minnesota Technical Assistance Program (MnTAP) provided an intern to assist Ashland in making the change to water-based solvents, which will save the refinery almost $40,000 annually. The switch to water-based solvents also improves worker health and safety.
- **Plato Woodworking, Inc.**, (Plato), manufactures wood cabinets. Plato worked with its finishing supplier to find sealers and varnishes that comply with new federal emissions standards. When Plato made the switch to less toxic varnishes, the company found that they no longer needed to use heavy-duty toxic solvents for cleaning. Reducing the toxicity of its varnishes enabled Plato to reduce the toxicity of its cleaning solvents. As a result, Plato eliminated the use of 43,600 pounds of methanol, toluene and xylene annually. The company no longer has to file TRI reports or pay pollution prevention fees. Furthermore, Plato made these changes while increasing production by about 10 percent.

This report contains many other examples like these. Details on the accomplishments of other companies can be found in Chapter Nine, which summarizes the 1998 and 1999 Governor's Award Winners, and in Chapter Ten, which profiles 26 facilities.

The Ventura Administration's *Big Plan*[2] charges state agencies to continue to help Minnesota businesses access and use the latest research and technology. As discussed in Chapters Seven and Eight, the OEA and MnTAP are committed to helping businesses find and adopt the least polluting, most efficient materials and technologies available.

Assessing the progress of industry statewide

Chapter Two provides an analysis of industry's progress in preventing pollution over the last decade, with an emphasis on changes in the generation and release of TRI chemicals from 1997 to 1998. Chapter Two also provides some analysis of production trends in six major Minnesota industries.

New reporters

In 1998, the U.S. Environmental Protection Agency (EPA) added seven industry groups to the TRI reporting requirements. Of these, the addition of the electricity generating facilities had the greatest impact on the quantities of TRI data reported in Minnesota. The coal-fired electric generating facilities account for 97 percent of the 12-million-pound increase in chemical releases in the state from 1997 to 1998. The utilities account for about one-third of the increase in total TRI chemical generation from 1997 to 1998.

Number of reporters

The number of facilities required to file TRI reports has dropped from 608 in 1991 to 419 in 1998. There were 33 Minnesota companies that had to file a TRI report in 1997, but no longer had to report in 1998. Many of these facilities reduced their use of TRI chemicals to such an extent that they are below reporting requirements. Other facilities may no longer have to report due to changes in reporting requirements. Beginning in 1995, facilities that report less than 500 pounds of a chemical, and use less than one million pounds of that chemical, were given the option to file an alternate threshold certification instead of the TRI form.

Findings for TRI reporters excluding new reporters

The tables in Chapter Two show total quantities reported for 1998, broken down by management method. To provide a clearer picture of changes over time for recurrent reporters, results are analyzed without the addition of new reporters in 1998.

[2] Office of the Governor, *The Big Plan*, 1999.

- **Releases.** Minnesota facilities that file TRI reports have decreased their releases of TRI chemicals from 77 million pounds in 1988, the first year of TRI reporting, to 20.6 million pounds in 1998. TRI reporters have reached a plateau in reducing releases, staying around 20 million pounds for the last two years. These facilities project annual releases of about 20 million pounds for the next two reporting years (1999 and 2000)..
- **Generation.** Facilities reported generating 215 million pounds of TRI chemicals in 1991, the first year of reporting on total generation. In 1998, TRI reporters, excluding new reporters, generated about 280 million pounds of toxic chemicals. There are 215 fewer reporters in 1998 than there were in 1991. In should, however, be noted, as discussed in Chapter Two, that production increased at a greater rate than waste generation for six major Minnesota industries.

Findings for TRI reporters excluding recycling companies

Three Minnesota TRI reporters are recycling businesses that process wastes so that the materials can be reused by the manufacturing sector. Although the companies are not generating these materials as wastes themselves, they still have to file TRI reports on the materials they recycle. They also report on the chemicals generated as wastes from the recycling processes.

The OEA analyzed the TRI data excluding these three recycling companies: Gopher Resources Corp., North Star Recycling, and U.S. Filter Recovery Services. Of these three facilities, Gopher Resources Corp., which recycles lead batteries, accounted for about 168 million pounds of the 298 million pounds of total TRI chemicals reported in Minnesota for 1998. With the recycling companies excluded from the analysis, the trend in chemical generation looks very different.

- **Releases.** Chemical releases are about 19 million pounds when the recycling companies' TRI reports are excluded from the data. Chemical releases are down 21 percent from 1993 to 1998, both when the data includes the recyclers, and when it excludes them.
- **Generation.** When the three recyclers are excluded from the analysis of chemical generation, a significant change occurs. TRI chemical generation by the other recurrent reporters declined 40 percent from 1993 through 1998, compared to a 7.5-percent increase if recyclers are included.

Conclusion

Although TRI reporting facilities have reached a plateau in reducing releases, they have made significant progress in reducing the generation of toxic chemicals—in other words, they have successfully prevented pollution.

Changes in production

The OEA recognizes that Minnesota has a booming economy, and that production has increased over the years. Using sales dollars as a measure of production, the OEA's analysis shows that for six industry sectors, production has increased at a greater rate than toxic chemical waste generation. This means that companies in these industries are generating less waste per unit of production by producing goods more efficiently. The OEA will continue to seek ways to factor changes in production into its analysis.

New analysis incorporates hazard values

The OEA has traditionally used the TRI reports to determine the total quantities of toxic chemicals generated and released in the state, and to rank the facilities that generated the largest quantities of toxic chemicals. In the last two years, the OEA has improved and expanded its analysis to factor in the degree of hazard of the TRI chemicals relative to one another. While this new methodology represents an improvement over the past, ongoing efforts by MPCA, with assistance from OEA, will result in further improvements in prioritizing these chemicals.

Using models developed by the Minnesota Pollution Control Agency (MPCA) and the Clean Manufacturing Technical Institute in Indiana, the OEA is now able to assess the relative environmental risks of TRI chemicals generated and released in Minnesota. The OEA analyzed TRI data using these models to establish which chemicals, facilities and industries present the greatest opportunities to reduce threats to human health and the environment. Chapter Four explains the OEA's methodology and presents results of the analysis.

Other sources of toxic chemicals

The OEA assesses progress in preventing pollution by evaluating companies' reports on TRI chemicals generated as waste. However, there are many other users and sources of toxic chemicals that are not fully addressed by TRI reports. Some other potential sources include farms, households, commercial institutions, schools, and motor vehicles. In addition, TRI reporting does not capture any of the toxic chemicals that go into products.

In this report, the OEA provides information on some of the other sources of toxic pollution in the state. Chapter Five details current state initiatives in three areas to evaluate the quantities, effects and sources of toxic chemicals that are used in certain products, or are used and released largely by non-manufacturing sources. All of the chemicals in question are on the TRI list, but are not part of TRI reporting.

Identifying and overcoming barriers to further progress

The OEA reviewed drafts of this report with representatives of industry, environmental organizations and other government agencies. All recognize that Minnesota companies have made progress in reducing toxic pollution. The discussions with these groups focused on two areas: identifying barriers to further gains in preventing pollution and finding ways to overcome those barriers.

The OEA learned from both industry and environmental advocates that ranking chemicals according to potential hazard would help them target limited resources to reduce the toxic chemicals of greatest concern. However, there are questions as to how the OEA should rank TRI chemicals and how a ranking of TRI chemicals would relate to other federal and state lists of targeted chemicals. They noted that different ranking systems and results can make it difficult to ascertain common toxicity reduction goals.

Strategies

The following strategies seek to establish a more integrated and comprehensive approach to preventing pollution in Minnesota. The strategies rely on partnerships among government agencies, industry and environmental groups to determine policies and incentives that will help all users and generators of toxic chemicals to find safe alternatives.

- **Strategy one:** The OEA will work with key public and private stakeholders to develop recommendations for new or improved incentives and programs to prevent pollution. In Chapter Six, the OEA outlines a plan to first assess the potential for further pollution prevention opportunities in major Minnesota industries. The OEA will then share the results of this research with interested parties, including manufacturers, and jointly determine ways to develop policies and make incentives more effective.
- **Strategy two:** The OEA will work with the U.S. EPA, the MPCA, the Minnesota Department of Health and other state agencies that are developing priority chemical lists and initiatives to help facilitate development of a state priority chemical list. The OEA will use other state and federal findings on toxic chemicals, their sources and potential effects on human health and the environment to refine its own set of priorities. The OEA will work with other Minnesota state agencies to develop common reduction strategies.

- **Strategy three:** The OEA will continue to engage manufacturers, retailers and recyclers in crafting and implementing voluntary product stewardship programs that seek to reduce toxicity and waste for particular products that pose risks to the environment or waste management in Minnesota. Product stewardship requires a consideration of a product's life cycle, which includes design, manufacture, use and disposal, to find ways to minimize the use of toxic substances and increase recyclability. Using a product stewardship framework, the OEA has developed partnerships with manufacturers and retailers to share the costs and responsibility for getting products collected and recycled. When manufacturers share recycling costs, they have an incentive to use recycled materials in new products and design products to be less toxic and easier to recycle. The OEA is also working with Minnesota manufacturers to test and refine tools that help businesses undertake this life-cycle assessment.
- **Strategy four:** The OEA, with the Minnesota Department of Administration, will seek increased state commitments and implementation of environmentally preferable purchasing initiatives, using Executive Order 99-4 as a basis for encouraging more government leadership in reducing the use of products containing toxic materials. Government can provide strong signals to manufacturers to offer less toxic or non-toxic products and services by purchasing those products. In April 1999, Governor Ventura issued an executive order that calls for state agencies, in cooperation with the Department of Administration, to "encourage pollution prevention through their purchasing policies and specifications." The OEA will continue to work with the Department of Administration to develop tools and policies to help government agencies become leaders in environmental purchasing.

Research initiatives

Chapter Six also details two research initiatives that the OEA is undertaking as part of the first phase of strategy one. Discussions with manufacturers in 1999 and early 2000 identified the need to research new types of financial incentives to encourage pollution prevention. In 1999, the OEA also contracted with a research firm to conduct a survey of Minnesota manufacturers to determine what kinds of assistance they find most valuable. Financial assistance programs were among the incentives selected as having the greatest value to businesses.

- In spring and summer of 2000, the OEA will evaluate and determine whether to establish a revolving loan fund for pollution prevention. Loans may prove effective to help businesses implement proven, market-ready pollution prevention technology. Investment in pollution prevention technologies must compete with other projects at a facility to provide the best return on investment. Reduced-rate loans make investment in pollution prevention technologies more competitive with other investment opportunities. Once funded the programs are self-sustaining.
- The OEA will research tax and fee incentives that discourage pollution and environmentally damaging activities, and encourage toxicity reduction and environmentally positive activities. Taxes can play an important role in fostering the development of new technologies with positive environmental attributes. For example, Minnesota tax policy supports the development of the renewable energy industry through property tax exemptions for certain wind energy projects and a sales tax exemption for wind power equipment. *The Big Plan*[3] envisions a tax system that "aligns with our broader goals and doesn't undermine citizens and communities from doing the right things."

Existing incentive programs

Chapters Seven, Eight and Nine provide summaries of businesses' achievements in preventing pollution in the last three years with the help of existing programs that provide technical and financial assistance and recognition. Part of the research outlined under strategy one in Chapter Six will involve an evaluation of these existing incentives and programs to find ways to refine and/or expand them.

[3] Office of the Governor, *The Big Plan*, 1999.

In the OEA's 1999 survey of business needs, more than 60 percent of responding companies ranked best practices guides, on-site assistance, telephone assistance, tours of model facilities, reduced rate loans, and Internet sites as very valuable or valuable in helping them prevent pollution.

Facility profiles

The *Pollution Prevention Evaluation Report* concludes with profiles of the facilities that ranked the highest according to the toxicity and quantity of the TRI chemicals they generate and release. OEA staff met with environmental managers from each of these facilities to gain a better understanding of their TRI data and of the steps these companies have taken to prevent pollution. These meetings provide a foundation for working together to identify opportunities and incentives to help industry attain further reductions in the use and generation of toxic chemicals.

With these profiles, the OEA has taken steps to explain the TRI data more clearly through better use of graphs and charts. The OEA, with its partners in industry and government, will continue to find ways to help the public access, understand and use TRI data.

Chapter One

Preventing Pollution in Minnesota: An Overview

This chapter provides an historical overview of pollution prevention statutes, programs and progress in Minnesota during the last 10 years. The overview is followed by an explanation of the federal toxic release inventory (TRI) reporting requirements and the process used by the to analyze this data and make it publicly available. Chapter One concludes with an examination of the "public right to know" aspect of TRI reporting, and directs people to Web sites that provide TRI data and other information on toxic chemicals.

Ten years of pollution prevention

In May 2000, the Minnesota Toxic Pollution Prevention Act (TPPA) was 10 years old. It has been 20 years since the Minnesota Waste Management Act (WMA) was passed. Both of these acts make it a priority for businesses, government and other organizations to reduce waste and prevent pollution in Minnesota. What has happened in the years since these acts were passed? What pollution prevention and waste reduction accomplishments have occurred? Have programs been successful in reducing waste and pollution? This fifth *Pollution Prevention Evaluation Report* seeks to answer these questions by looking back to see how far we have come and how much farther we still need to go.

A key feature of the WMA was to develop a statewide Hazardous Waste Management Plan. The Waste Management Board (a predecessor agency to the OEA) completed the plan in 1984. Because of significant economic and environmental benefits, the plan stated that Minnesota's highest priority for waste management was to reduce the amount of hazardous waste generated. If enough waste was reduced, Minnesota generators could lessen the need to send hazardous waste outside of Minnesota for management and eliminate the need to develop similar hazardous waste facilities within the state.

The plan recommended that two programs be established to help generators reduce their waste. As a result, the Minnesota Technical Assistance Program (MnTAP) was created to help small and medium sized business reduce waste. In addition, a waste reduction grant program was established to support new technical developments in the waste reduction field.

Federal statutes

In 1986, Congress passed several amendments to the federal Superfund Amendments and Reauthorization Act (SARA). SARA included the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the Emergency Planning and Community Right-to-Know Act (42 U.S.C. §11001, et seq. [1986]). The Right-to-Know Act requires businesses to report on the types and quantities of approximately 600 toxic chemicals they release to the environment.

This information became publicly available in 1989 with the first toxic release inventory (TRI) forms submitted for reporting year 1988. The data on toxic chemical releases was quite startling. Much larger quantities of chemical releases were reported than originally estimated. This information spurred many companies and states to develop waste reduction and pollution prevention programs.

Another provision of SARA required states to develop "capacity assurance" plans for the hazardous waste generated in their states. This was required because several states complained that they were importing large quantities of hazardous waste from other states. Capacity assurance plans were also designed to ensure that states that did not have existing

facilities shared the responsibility for siting new hazardous waste management facilities. Completed in October 1989, a major goal of Minnesota's capacity assurance plan was to reduce hazardous waste by 40 percent by the year 2000 (factoring in economic growth). The plan states that waste reduction is the primary way to make sure Minnesota has enough hazardous waste capacity while minimizing the need for new facilities to be sited in the state.

Minnesota's Toxic Pollution Prevention Act

Minnesota passed the 1990 Toxic Pollution Prevention Act (TPPA) as a way to implement its waste reduction goals. (Minn.Stat.§115D.01, et. seq. [1998]). The act defines pollution prevention as "eliminating or reducing at the source the use, generation, or release of toxic pollutants, hazardous substances and hazardous wastes."

The TPPA increased spending on pollution prevention assistance, education, grants, and outreach programs. The new funding came from a pollution prevention fee on facilities that report releases and transfers of toxic chemicals, as reported on the TRI. The TPPA also required facilities that release toxic chemicals to prepare pollution prevention plans and submit annual progress reports. See Appendix A for the complete TPPA text.

In the fall of 1990, Congress passed the Federal Pollution Prevention Act using Minnesota's TPPA and other state's acts as models. (42 U.S.C. §13101 et. seq. [1990]). The federal act significantly expanded toxic chemical reporting to include all chemicals generated by facilities and required information about pollution prevention activities. The act also provided modest funding for state pollution prevention programs.

Pollution prevention accomplishments

We have come a long way since these acts were passed. Industry, government, environmental groups, and academic institutions should be recognized for their accomplishments. For example:

- Reported toxic chemical releases decreased 70 percent over the 10 years since the TPPA was passed.
- The number of Minnesota facilities required to report has decreased from nearly 600 to 418.
- Since 1990, hazardous waste shipments have remained relatively constant at approximately 72,000 tons per year.

These results correspond well with the OEA's 1989 projection that aggressive waste reduction efforts could offset growth in the waste stream resulting from continued economic growth. Generation of TRI chemicals is also relatively constant, averaging about 250 million pounds per year, adding more evidence that projections made in the 1989 capacity assurance plan were accurate.

According to state economic data, Minnesota industries that file TRI reports have grown 30 percent during the 10 years since the TPPA was passed. The amount of waste generated by these reporters has remained constant. Industry has become much more efficient in their processes and now generates significantly less waste per unit of product than 10 years ago. Had pollution prevention efforts not occurred, the OEA estimates that economic growth would have raised hazardous waste shipments to about 91,000 tons per year and annual toxic chemical generation to over 325 million pounds.

Reasons for success

Industry has been successful in achieving these reductions for several reasons. The primary reason is economic. Taking a preventive approach to many of society's problems, whether disease, crime or pollution, often turns out to be cheaper and more effective than attempts to treat, control and clean up problems after they are created.

To remain competitive, successful companies reduce wasteful practices and continually strive to be more efficient at making products. Pollution prevention plans and progress reports

require companies to evaluate their waste generating practices and determine the economic benefits of preventing pollution. The pollution prevention fee—based on the number and amount of toxic chemicals released—is a direct economic incentive to reduce waste.

The TPPA added other incentives such as technical assistance, recognition and grants to help companies prevent pollution. In the early to mid-1990s, the OEA held annual pollution prevention conferences and workshops to raise awareness of pollution prevention. Because industry programs have matured, the OEA and MnTAP now provide more one-on-one assistance and direct outreach to individual companies and industrial groups.

In addition, the TPPA provides a framework for providing the public with facts about the TRI chemicals generated and released. This framework helps citizens, government and businesses make informed decisions about the long-term economic and environmental needs of their communities.

The future of pollution prevention

Pollution prevention has occurred in Minnesota under a primarily voluntary program. It appears that economic growth will continue to offset pollution prevention efforts for the foreseeable future. Reductions in total reported quantities of toxic chemical and hazardous waste generation will not occur unless we bolster incentives for pollution prevention.

This past year, the OEA started working with the top ranking companies generating toxic chemicals to help identify opportunities to prevent pollution. The OEA ranked these companies applying a toxicity-weighted index to the quantity of toxic chemicals released. These top ranking facilities account for 85 percent of the toxic chemicals generated in the state. The OEA is dedicated to working one-on-one with these and other businesses. As described in Chapter Six, the OEA and MnTAP are also embarking on several initiatives to identify and implement new ways to provide incentives and recognition for pollution prevention.

Toxic release inventory reporting requirements

Each facility that meets the statutory criteria files a TRI report for each listed chemical that it generates above threshold levels. Annual reports are required for more than 600 listed chemicals. About 100 to 200 listed chemicals are generated above threshold levels by Minnesota businesses. The reporting criteria are as follows:

- Facilities in Standard Industrial Classification (SIC) codes 20 through 39 (See Chapter Two for a detailed discussion of new reporters for 1998.)
- Facilities with 10 or more full-time employees.
- Facilities that manufacture or process more than 25,000 pounds, or otherwise use more than 10,000 pounds of any listed chemical during a calendar year.

Facilities are required to report each chemical by quantity and management method. The management methods are:

- Chemicals released to the environment.
- Chemicals recycled, on- and off-site
- Chemicals treated, on- and off-site
- Chemicals burned for energy recovery, on- and off-site.

For example, a facility might indicate that in 1997, it generated 100,000 pounds of toluene as waste, of which 10,000 pounds were released to the air, 70,000 pounds were recycled, and 20,000 pounds were treated for disposal. For further reference, see Sections 8.1-8.7 of the TRI reporting form (Form R) in Appendix B.

The chemical waste data that each facility reports on the TRI Form R is all legally generated and managed, with the exception of accidental discharges. If a facility has an accidental discharge, such as a spill, it would be reported in Section 8.8 of the Form R.

Federal changes to TRI reporting thresholds

The U.S. Environmental Protection Agency (EPA) is lowering reporting thresholds for 18 TRI chemicals. The federal government is focusing on chemicals that stay in the environment for a long time, build up in the tissues of plants and animals, and pose health hazards even at low doses, including cancers and disorders of the reproductive, nervous and immune systems. These chemicals are called "PBTs"—persistent, bioaccumulative toxics.

Many of the 18 PBTs are not used above current threshold levels by Minnesota facilities, and have not been reported under TRI. Also, half of the 18 PBTs are pesticides, some of which have already been banned from use in the United States, although they continue to be detected in the environment.

The current reporting thresholds for all TRI chemicals are 25,000 pounds used in manufacturing or processing per year, or 10,000 pounds ancillary use per year. (Using a TRI chemical as a cleaning solvent is an example of ancillary use.)

The EPA is lowering TRI reporting thresholds to 100 pounds used per year for 6 of the 18 PBTs, and to 10 pounds used per year for 11 PBTs, including mercury.

- The EPA is lowering the reporting threshold for mercury to just 10 pounds used per year. Currently, none of the state's manufacturing facilities uses mercury in quantities that trigger reporting requirements. This new reporting threshold goes into effect for reports filed in 2001 for the 2000-reporting year.
- The EPA is adding dioxins to the TRI list and is setting the reporting threshold at 0.1 gram per year. This change goes into effect for reports filed in 2001 for the 2000-reporting year.
- The EPA has lowered the reporting threshold for lead to 100 pounds. Lead is one of the state's highest-ranking TRI chemicals. This new reporting threshold goes into effect for reports filed in 2002 for the 2001-reporting year.

As a result of the new reporting criteria, the OEA anticipates that some Minnesota facilities will file TRI reports showing generation of mercury and dioxins, and an increased number of facilities will file reports for lead. It is unknown whether any Minnesota facilities will file TRI reports on the pesticides listed among the 18 PBTs.

State agencies analyze TRI reports

Minnesota facilities file their TRI reports with the state's Emergency Response Commission (ERC). The ERC is a 22-member organization established as part of the Division of Emergency Management in the Minnesota Department of Public Safety. The ERC oversees and coordinates the state's emergency planning process. The ERC is responsible for collecting and maintaining information regarding chemical storage, management, releases and transfers.

Under Minnesota's Toxic Pollution Prevention Act, facilities that report toxic chemical releases under TRI Form R must also prepare pollution prevention plans that establish goals for reducing or eliminating the generation or release of the chemicals they report. These facilities must also submit annual progress reports to the ERC which list the company's reduction objectives, methods and progress toward achieving those objectives, and barriers to reducing a chemical on a chemical basis.

The ERC publishes an annual report summarizing the toxic release inventory and pollution prevention progress reports submitted by Minnesota manufacturers and select other industries. The report provides citizens with information on major toxic chemicals that are being used at many of the largest facilities located in their communities, how these facilities manage their toxic chemical wastes, and how many TRI reporters are located in a given county. The ERC also summarizes specific chemicals, such as a statewide ranking of

chemicals by quantity of air releases in pounds. The ERC provides the TRI data and copies of the progress reports to the OEA to develop programs, target technical assistance and help prepare the biennial *Pollution Prevention Evaluation Report*.

Changes to reporting

The OEA has followed up on recommendations contained in the *1998 Pollution Prevention Evaluation Report* by making substantive changes to the progress report format and to the *Minnesota Guide to Pollution Prevention Planning.*

The OEA worked with the ERC to make the progress report format consistent with the federal TRI Form R. In particular, the OEA and the ERC clarified that the progress report's numeric objectives section is the same as the section of the Form R where facilities report their projected generation of each chemical for the next two years. Also, the state now requires plans and progress reports to address all types of chemical generation described in Section 8 of the Form R, rather than just addressing chemical releases.

OEA and MnTAP staff updated the pollution prevention planning guide to make it much more concise, now comprising four chapters instead of nine. The guide's approach moves beyond compliance issues to explain why pollution prevention makes good business sense, and how to integrate pollution prevention into business plans.

Improving Community Right-to-Know information

One of the OEA's goals in writing this evaluation report is to make technical data about toxic chemicals user friendly and to help the public understand "Community Right-to-Know" information. For example, in this report we graphically illustrate TRI data in graphs and charts to help show facility-specific and statewide trends.

The OEA will continue to partner with the ERC and Minnesota Pollution Control Agency to further improve both the user-friendliness and accessibility of information on toxic chemicals generated and released in the state. The agencies will jointly explore opportunities to simplify the steps needed to access information about an individual facility's toxic chemical generation and improve the ease of understanding currently available data.

Where to go for Community Right-to-Know information

There are a growing number of projects underway to improve Community Right-to-Know data and information. The examples summarized below help to illustrate the future direction of Community Right-to-Know information in Minnesota.

- **Minnesota Emergency Response Commission (ERC)** | http://www.erc.state.mn.us

  In December 1999, the ERC completed the first phase of a new Web site that will make it easier for the public to access a wide variety of chemical release-related information. The site provides the entire 1998 Minnesota TRI report, which is the most recent data available. In the future, ERC plans to add features allowing visitors to their Web site to query reports on individual facilities (e.g., look-up facilities based on zip code or county). Copies of the ERC's *Right-to-Know Chemical Information Report* also can be downloaded from the ERC Web site or are available by calling 651-297-7372.

- **U.S. EPA Envirofacts** | http://www.epa.gov/enviro/index_lojs.html

  The EPA created the Envirofacts Warehouse to provide the public with direct access to the wealth of information contained in its databases. The Envirofacts Warehouse contains information from EPA databases on air, chemicals, facility information, grants/funding, hazardous waste, risk management plans, superfund, toxic releases, and water permits, drinking water, drinking water contaminant occurrence, and drinking water microbial and disinfection byproduct information. On-line queries allow you to retrieve data from these

sources and create reports, or you may generate maps of environmental information by selecting from mapping applications available through EPA's Maps On Demand. Data available on this site is one year older than that available to Minnesota state agencies.

- **Environmental Defense Scorecard** | http://www.scorecard.org/

  Environmental Defense, a non-profit environmental organization, developed its own "Scorecard" as a source of free and easily accessible environmental information on the Internet. The Web site allows users to type in a zip code to find out about local air pollution and explore interactive maps. Scorecard delivers information as supplied by TRI reporting facilities, as well as local information on the criteria air pollutants: ozone, sulfur dioxide, particulate matter, nitrogen oxides, carbon monoxide and lead. Scorecard profiles 6,800 chemicals, showing where they are used and the hazards and health risks associated with them. Data available on this site is one year older than that available to Minnesota state agencies.

- **Koch MCEA Web Page** | http://www.kochpinebend.com

  In 1999, the Minnesota Center for Environmental Advocacy (MCEA), a non-profit environmental group, and Koch Petroleum Group LP (Koch) announced that they will collaborate on a project to develop a comprehensive set of environmental performance measures for Koch's oil refining facility in Rosemount, Minnesota. As part of the project, a user-friendly Internet Web site will be developed to voluntarily report Koch's ongoing and annual performance to the public. The Web site will be publicly available in summer 2000.

  The Web site will provide information and data on Koch-Pine Bend's water use, wastewater discharges, air emissions, non-hazardous industrial wastes and wastes sent to hazardous waste treatment facilities, and will track Koch's progress on their commitment to reduce emissions by 50 percent over the next five years. The Web site will allow visitors to compare Koch's waste and emission levels to other refinery operations in the United States and to other Minnesota industries.

- **Massachusetts TURAData** | http://www.turi.org/turadata

  Massachusetts launched its new TURAData Web site in January 2000. The purpose of the site is to make information available to the public about toxin use in Massachusetts' communities. This information has been collected from companies as a result of Massachusetts' Toxics Use Reduction Act (TURA). The site allows users to create reports by community, company or specific toxic chemicals. Massachusetts is unique in that data on the use of toxic chemicals (as opposed to data only on quantities generated and released) is available. Users of the site have access to information on toxic chemicals used, by-products generated, and the amounts of toxic chemicals released to the environment.

Chapter Two

State Trends in Pollution Prevention

This chapter discusses statewide trends in the generation of toxic release inventory (TRI) chemicals from 1991 to 2000. It is divided into four sections. The first section shows how the state's industries are managing the TRI chemicals they generate, and changes in management methods over time. The second section provides another look at chemical generation and management trends by excluding the data on three recycling companies from the analysis of the remaining 415 product manufacturers. The third section highlights the companies that have made the greatest reductions in generating and releasing TRI chemicals, and the companies that have shown the greatest increases in generating and releasing TRI chemicals. The chapter concludes with an examination of production trends in six major Minnesota industries by comparing sales data with chemical generation data.

While the TRI data provides valuable information, it can be difficult to determine why there are changes in chemicals generated. For example, a decrease in the generation of a chemical may be due to changes in reporting requirements or production rather than pollution prevention. TRI reporting only captures the change in quantity, not the reason for the change. Comparing the TRI data with other data sources such as sales data can help determine if changes in reporting are due to pollution prevention or other factors.

Trend analysis for TRI chemical generation and releases for all reporters

Reporting of TRI chemical generation began in 1991 as a result of new reporting requirements mandated by the federal Pollution Prevention Act of 1990. These requirements obligated TRI reporters to detail all methods of waste management in their annual reporting. Statewide generation of TRI chemicals in 1991 was reported to be 215 million pounds, and generation ranged between 240 and 260 million pounds annually until 1998. When the 1998 federal expansion of industries required to report took effect, reported generation rose to 298 million pounds.

In addition, the U.S. Environmental Protection Agency (EPA) requires TRI facilities to estimate the quantities of TRI chemical generation for the next two years. Based on this information, projections for total generation were 317 million pounds (1999) and 332 million pounds (2000).

The reported quantities of TRI chemical releases to air, water and land have declined significantly since 1988, when release reporting began. At that time, statewide releases were reported to be approximately 77 million pounds. Reporting facilities realized significant reductions during the first years of TRI reporting until 1992 when statewide releases were 32.5 million pounds. This represents a reduction of nearly 60 percent from 1988 to 1992. In addition, there has been a 21-percent reduction in releases for recurring reporting industries from 1993 to 1998.

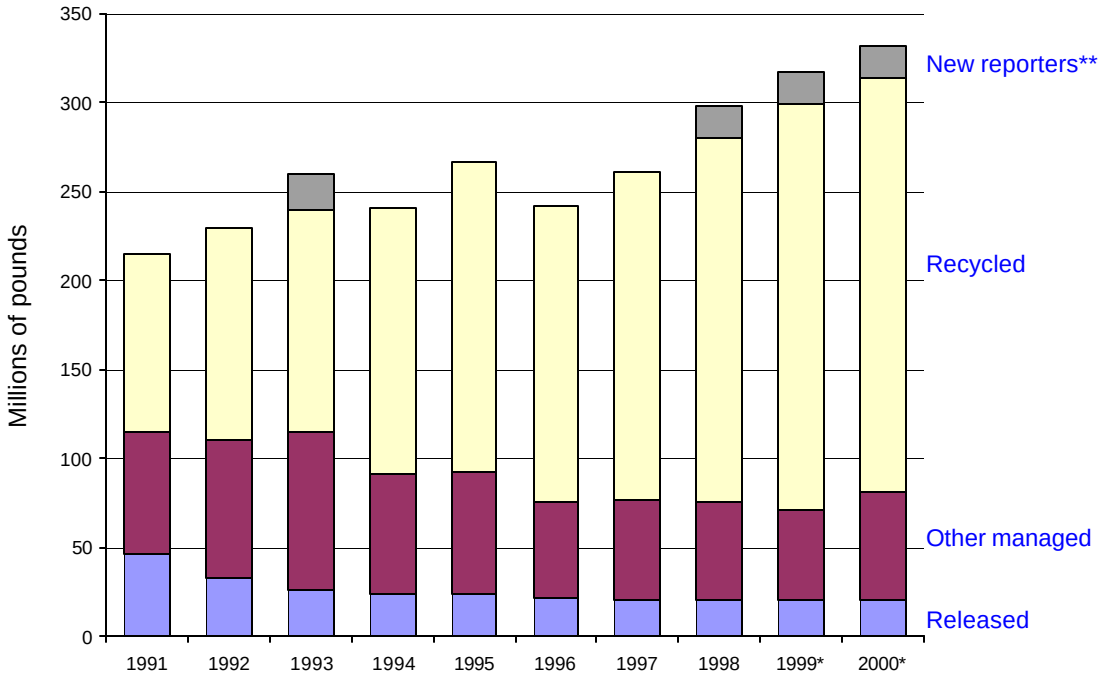
In 1998, the EPA's expansion of the number and types of industry sectors required to report on the TRI led to a significant increase in reported releases. The quantities of chemicals these new reporters contribute to the overall total are shown in Table 2-1. Without these new reporters, statewide releases would have been 20.6 million pounds, a slight increase from 1997.

Statewide TRI chemical releases for all reporters, both new and recurring, in 1998 were 32.2 million pounds. Electric generating facilities, which are new reporters, were responsible for much of the increase. Reporting facilities project their releases to remain fairly constant at 32.1 million pounds in 1999 and to increase to 33 million pounds in 2000.

Analysis of recurrent reporters

The OEA analyzed TRI data from recurring reporters to allow for a more consistent comparison. When the new reporters for 1998 are excluded from the analysis, generation of TRI chemicals has increased 28 percent from 1991 to 1998. In addition, 190 fewer facilities reported on the TRI in 1998 than in 1991. This decrease in the number of reporters is due to changes in reporting requirements that allowed some facilities to use alternative reporting methods. Additionally, many facilities dropped below reporting thresholds by preventing pollution.

Figure/Table 2-1: Statewide trends and projections for TRI chemicals — All reporters, 1991-2000



*Projections reported in 1998 TRI submittals.

**Total chemicals generated reported by Minnesota TRI expansion for 1993 and federal TRI expansion for 1998-2000.

TRI chemical figures shown in millions of pounds.

									Projections*	
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999***	**2000***
Number of Reporters	583	563	548	529	459	425	397	418	418	418
Released	46.5	32.5	26.3	24.0	24.4	22.1	20.3	20.6	20.1	20.1
Other Managed	68.7	78.0	88.7	67.0	68.5	53.6	56.0	55.3	51.6	61.2
Recycled	100.3	119.5	124.8	149.5	173.7	166.4	184.6	203.8	227.8	232.7
New Reporters **	0.0	0.0	20.5	0.0	0.0	0.0	0.0	18.5	17.9	18.1
Total Generated	215.4	230.0	260.3	240.5	266.6	242.1	260.9	298.2	317.3	332.1

As explained later in this chapter, the data also shows that during the same time frame, most industry sectors have increased sales and production. As production has increased, the number of TRI reporters has decreased. Since many facilities are producing more, yet are remaining below TRI reporting thresholds, this indicates that many facilities are preventing pollution.

The facilities that dropped below reporting thresholds were likely smaller versus larger generators. The average amount of waste generated per reporting facility increased by 90 percent, from 370,000 pounds per facility in 1991 to 704,000 pounds per facility in 1998.

Although there were 190 fewer recurrent reporters in 1998 versus 1991, TRI chemical generation for this group rose 64 million pounds, a 30-percent increase during that time period.

The majority of the recurrent reporters have become more efficient during this time period. It is likely that increased production has resulted in increased waste generation. The data shows that while TRI chemical releases declined significantly since 1991, there was no corresponding decline in chemical generation. This suggests that facilities made early reductions in releases by changing to other waste management practices such as treatment before disposal, incineration or increased recycling.

This trend can be seen most clearly in years from 1991 to 1993 when releases declined from 46.5 million pounds to 26.3 million pounds—a decrease of 43 percent. During this time, chemical generation rose 21 percent—from 215 million pounds to 260 million pounds. If facilities made these reductions through pollution prevention, a reduction in overall generation would be expected, especially since there were 35 fewer reporters between these years.

Statewide trends and projections for TRI chemicals 1991-2000: Excluding recyclers

There are compelling reasons to analyze TRI data excluding recyclers. Recycling, though a preferred waste management method, still produces waste that must be reported under TRI requirements. Since recyclers process waste resulting from the products manufactured by others, their options for preventing pollution do not include use of alternative chemicals or feedstock. Inputs are determined from the waste generated by others.

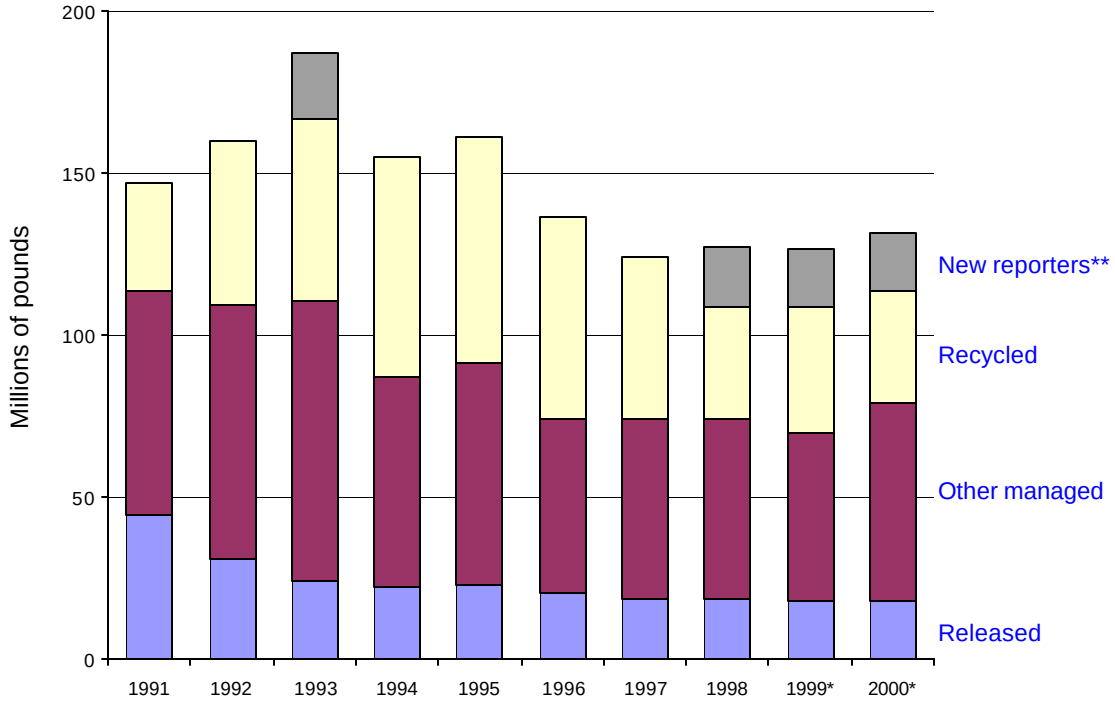
One of Minnesota's largest recyclers, Gopher Resource Corp., recycles lead batteries. Lead is a heavy metal. Since TRI chemicals are measured in pounds and Gopher Resources Corp. recycles large amounts of lead, the quantities reported by Gopher Resources Corp. significantly impact the analysis of TRI chemical data from other reporters.

In 1998, three out of the 418 reporters are recycling companies in the business of recycling waste into useable products. To understand more clearly pollution prevention progress in the manufacturing sector, the OEA analyzed the TRI data excluding these three businesses: Gopher Resources Corp., North Star Recycling, and U.S. Filter Recovery Services.

- **Chemical releases:** Though quantities of chemicals released are higher when recyclers are included in the analysis, there is no difference in the percentage change over time. Chemical releases are down 21 percent from 1993 to 1998, both when the data from recyclers is included and when it is excluded. This suggests that on average, both the manufacturing industries and recycling industries have reduced releases by about 20 percent. About two-thirds of this reduction occurred from 1993 through 1996. The rate at which reductions in releases occur has slowed over time, plateauing in the 1997-1998 reporting years. TRI reporters project no significant reductions in releases for the 1999-2000 reporting year.
- **Chemical generation:** When the three recyclers are excluded from the analysis of chemical generation, a significant change occurs: waste generated by recurring reporters declined 40 percent from 1993 through 1998, as compared to a 7.5-percent increase if the recyclers are included. This difference is predominantly due to the success of increased recycling. For example, Gopher Resources Corp. has increased lead recycling by 245 percent, from 67 to 164 million pounds from 1991 to 1998. Chemical generation from recurrent reporters (excluding recyclers) is down significantly, while all indications show that production is up. This suggests that industry has made progress in preventing pollution.

This analysis demonstrates the importance of carefully analyzing chemical generation trends and identifying significant impacts from particular facilities. These recycling industries can distort or "hide" progress being made by the majority of TRI reporters. Although recurrent reporters have reached a plateau in reducing releases, holding at approximately 19 million pounds, they have made significant progress in reducing toxic chemical generation.

Figure/Table 2-2: Statewide trends and projections for TRI chemicals — Excluding recyclers, 1991-2000



* Projections reported in 1998 TRI submittals.

**Total chemicals generated reported by Minnesota TRI expansion facilities for 1993 and Federal TRI expansion facilities for 1998-2000.

TRI chemical figures shown in millions of pounds.

									Projections*	
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999***	**2000***
Number of Reporters	581	561	545	526	456	422	394	415	415	415
Released	44.9	31.1	24.2	22.4	22.9	20.8	18.7	19.0	18.4	18.5
Other Managed	68.7	78.0	86.2	65.0	68.4	53.5	55.9	55.3	51.5	61.0
Recycled	33.7	50.9	56.4	67.5	69.6	61.9	49.7	34.6	38.9	34.0
New Reporters **	0.0	0.0	20.5	0.0	0.0	0.0	0.0	18.5	17.9	18.1
Total Generated	147.2	160.0	166.8	154.9	160.9	136.2	124.3	108.9	108.8	113.4

Impact of recycling activities on TRI chemical generation in Minnesota

The three TRI reporters that are in the recycling business in Minnesota are Gopher Resource Corp., a secondary lead smelter in Eagan; North Star Recycling, a scrap steel broker and processor in St. Paul; and U.S. Filter Recovery Services, a metals and chemicals recycler in Roseville. Each of these businesses has grown over the past several years, with Gopher Resource Corp. having the most significant impact on TRI reporting in Minnesota.

Recycling, though a preferred waste management method, still produces waste. For example, Gopher Resources Corporation's recovery of lead in their smelting process is very efficient, exceeding 99.5-percent recovery rates each year. However, because of the tremendous quantities they recycle, that half-percent of lead compound waste adds up to hundreds of thousands of pounds in releases.

Lead compound releases reported by Gopher Resources Corp. have increased from 180,000 pounds in 1991 to 290,000 pounds in 1998. They project releases to be 457,000 pounds in 2000

as increasing numbers of lead-acid batteries, their primary feedstock, are used and recycled. Gopher Resources Corp. recently became ISO 14001-certified. One of the company's goals is to continue to find ways to improve lead recovery and reduce releases.

The recyclers have reported tremendous growth in the quantity of chemicals recycled at their facilities, with an increase from 66.6 million pounds in 1991 to over 168 million pounds in 1998. Gopher Resources Corp. makes up 99 percent of this increase. The fraction of statewide TRI chemical generation attributed to these facilities has risen from 31 percent in 1991 to 56 percent in 1998. By 2000, the OEA projects that chemicals generated by these three recycling facilities will comprise nearly 60 percent of the total for all reporters.

Of the 298 million pounds of TRI chemicals generated in 1998, nearly 186 million pounds were reported as managed through on-site recycling or 62 percent of the total generated. However, when the recycling facilities are factored out, the total generation is reduced to 127 million pounds with only about 18 million pounds recycled on-site or 14 percent of the total generated.

This shows that on-site recycling by the manufacturing industries is not nearly as prevalent as first indicated. When recyclers are excluded from the analysis, the primary management method used by the remaining Minnesota TRI reporters is on-site treatment; on-site recycling falls to the fourth-most used option. The overall impact of recycling activities on 1998 TRI chemical generation is detailed in Table 2-3.

Table 2-3: Impact of recycling on TRI chemical generation, 1998

Management Method	1998 Statewide Total (pounds)		1998 Statewide Total, Excluding Recyclers (pounds)	
Releases	32,228,613	11%	30,608,440	24%
Energy Recovery, On-site	7,034,602	2%	7,034,602	6%
Energy Recovery, Off-Site	2,297,718	1%	2,297,718	2%
Recycling, On-Site	185,944,188	62%	17,823,199	14%
Recycling, Off-Site	23,041,958	8%	21,984,958	17%
Treatment, On-Site	37,316,963	13%	37,238,420	29%
Treatment, Off-Site	10,357,140	3%	10,345,442	8%
Total	298,221,182	100%	127,332,779	100%

New reporters in 1998

In 1998, the EPA added these seven industry groups to the list of facilities subject to the TRI reporting requirements.

- Metal mining.
- Coal mining.
- Electric generating facilities (limited to facilities that combust coal and/or oil).
- Wholesale petroleum bulk terminals and tanks.
- Wholesale chemical distributors.
- Solvent recovery services that operate on a fee or contract basis.
- Commercial hazardous waste treatment (limited to facilities regulated under Subtitle C of RCRA).

Facilities in these industry groups that meet the employee and chemical use threshold criteria must submit TRI reports to the EPA and Minnesota's Emergency Response Commission. Reports from these facilities were first received in July 1999, covering the 1998 reporting year.

Except for coal mining and wholesale petroleum bulk terminals and tanks, many of these industry groups had previously been required to report under the Minnesota Toxic Pollution Prevention Act when amended in 1993.

Impact of Minnesota electric generating facilities on TRI chemical generation

While Minnesota has required electric generating facilities to report TRI chemical generation and releases since 1993 under the Minnesota Hazardous Chemical Emergency, Planning and Response Act, reporting did not apply to chemicals that are associated with or incidental to the combustion of fossil fuels for the generation of electricity. Beginning in 1998, the EPA rule now requires electric generating facilities to file TRI reports for all chemicals that exceed the reporting thresholds, including chemicals that are associated with or incidental to the combustion of fossil fuels for the generation of electricity.

In 1998, there were 13 electric generating facilities in Minnesota reporting a total of 11.6 million pounds of chemical releases.

- **Increase in releases.** Electric generating facilities account for 97 percent of the 12 million-pound-increase in TRI-reported chemical releases in Minnesota from 1997 to 1998. Chemical releases rose from 20.2 million pounds in 1997 to 32.2 million pounds in 1998.
- **Increase in generation.** Electric generating facilities account for approximately one-third of the 37 million-pound-increase in TRI-reported chemicals generated in 1998. Chemical generation for all reporters went from 261 million pounds in 1997 to 298 million pounds in 1998, an increase of 37million pounds.

The 13 electric utility facilities reported 16 different TRI chemicals, which are generated primarily from combustion of coal in the production of electricity. Mercury and mercury compounds, although often present in coal, were not reported by any Minnesota electric generating facilities because none exceeded the 25,000-pound reporting threshold for this chemical. The OEA anticipates that some facilities may begin reporting mercury for reporting year 2000, when the reporting threshold drops to 10 pounds.

The electric generating companies reported generating and releasing nearly eight million pounds of barium compounds. In addition, they reported generating and releasing compounds containing manganese, zinc, copper, lead, nickel, chromium, molybdenum trioxide, antimony and vanadium (dust or fumes). Metal compounds are present in the combustion ash that is sent to ash landfills or managed through surface impoundment.

Acids, such as hydrofluoric acid, hydrochloric acid and sulfuric acid, are generated through the combustion of coal. Acids are generally treated on-site or released as air emissions. Caustics, such as ammonia are used for treating boiler water systems. Ammonia is primarily released as air emissions, although a small amount was reported as treated on-site. All of these chemicals were generated and/or used in amounts above reporting threshold, triggering reporting in 1998.

Based on 1998 data, electric generating facilities that burn coal make up six of the top 20 TRI chemical releasers in Minnesota. The top two releasers of TRI chemicals in the state in 1998 were Northern States Power's Sherburne County Generating Plant (6.7 million pounds) and Minnesota Power's Boswell Energy Center (1.7 million pounds).

Highlighting industrial progress in pollution prevention

TRI data shows which facilities accomplished the largest reductions in their releases of TRI chemicals, and which facilities accomplished the largest reductions in generation of TRI chemicals. However, the data does not indicate whether reductions were due to pollution prevention, improved waste management, decreases in production rates or changes in reporting requirements.

Likewise, TRI data shows which facilities reported the largest increases in their releases of TRI chemicals and in their generation of TRI chemicals. However, the data does not show whether the increases were due to declines in efficiency, increased production rates or changes in reporting practices.

Facilities with the largest reduction in quantity of releases

In 1998, 46.5 percent of TRI reporters reduced the quantities of chemicals they released compared to 1996 levels. There were 67 facilities that reduced releases by more than 10,000 pounds and nine reduced releases by more than 100,000 pounds. 3M's Hutchinson facility reduced releases by more than 1 million pounds. Table 2-4 shows the ten facilities that achieved the greatest reductions in quantities of TRI chemical releases.

Table 2-4: Facilities with the largest reduction in quantity of releases

Facility	1996 Releases	1998 Releases	Change in pounds and percent
3M - Hutchinson	2,153,759	579,836	-1,573,923 (-73.1%)
Southern Minnesota Beet Sugar Cooperative	634,472	136,790	-497,682 (-78.4%)
Potlatch Corp. - OSB	363,820	146,406	-217,414 (-59.8%)
Potlatch Corporation	223,674	33,677	-189,997 (-84.9%)
Archer Daniels Midland Co.	660,000	485,350	-174,650 (-26.5%)
3M - St. Paul	620,632	459,153	-161,479 (-26.0%)
Marathon Ashland Petroleum, LLC	295,405	141,526	-153,879 (-52.1%)
Silgan Containers Mfg. Corp.	214,000	91,999	-122,001 (-57.0%)
Boise Cascade Corp.	713,510	602,410	-111,100 (-15.6%)
Water Gremlin Co.	200,100	110,100	-90,000 (-45.0%)

Facilities with the largest reduction by percentage of releases

Though large facilities may reduce large *quantities* of waste, smaller facilities may reduce a larger *percentage* of their waste. The ten facilities listed in Table 2-5 had the largest percentage reduction in releases between 1996 and 1998. There were 54 facilities that reduced releases by 50 percent or more, 21 that reduced releases by 80 percent or more, and seven that reduced releases by 100 percent—reporting zero releases in 1998.

Table 2-5: Facilities with the largest reduction by percentage of releases

Facility	1996 Releases	1998 Releases	Change in pounds and percent	
Kurt Manufacturing Co.	18,000	0	-18,000	(-100.0%)
Kraft Foods, Inc. – Melrose	5,346	0	-5,346	(-100.0%)
Kraft Foods, Inc – New Ulm	2,000	0	-2,000	(-100.0%)
Twin City Die Casting, Inc.	600	0	-600	(-100.0%)
CMS Hartzell Mfg. Co.	600	0	-600	(-100.0%)
Dairy Farmers Of America – Winsted	28	0	-28	(-100.0%)
Dairy Farmers Of America – Fergus Falls	3	0	-3	(-100.0%)
Thermo King Corp.	52,900	3	-52,897	(-100.0%)
Aura Ceramics, Inc.	11,009	11	-10,998	(-99.9%)
Twin City Plating	9,022	10	-9,012	(-99.9%)

Facilities with the largest reduction in quantity of chemicals generated

Table 2-6 shows the 10 facilities that had the largest reduction in quantities of chemicals generated between 1996 and 1998. In 1998, 48.6 percent of TRI reporters reduced the quantities of chemicals they generated compared to 1996 levels. There were 104 facilities that reduced generation by more than 10,000 pounds; 24 reduced generation by more than 100,000 pounds, and five reduced generation by more than 1 million pounds.

Table 2-6: Facilities with the largest reduction in quantity of chemicals generated

Facility	1996 Generation	1998 Generation	Change in pounds and percent	
3M - Hutchinson	32,420,324	25,787,126	-6,633,198	(-20.5%)
Thermo King Corp.	5,444,340	50,003	-5,394,337	(-99.1%)
Boise Cascade Corp.	11,094,610	8,300,410	-2,794,200	(-25.2%)
Mixon, Inc.	1,960,112	887,112	-1,073,000	(-54.7%)
Champion International Corp.	1,424,734	390,521	-1,034,213	(-72.6%)
3M St. Paul	4,072,774	3,169,352	-903,422	(-22.2%)
Southern Minnesota Beet Sugar Cooperative	634,472	136,790	-497,682	(-78.4%)
Twin City Die Casting, Inc.	444,819	12,088	-432,731	(-97.3%)
Spicer Off-Highway Products Division	382,645	1,569	-381,076	(-99.6%)
Dairy Farmers Of America – Fergus Falls	606,013	251,931	-354,082	(-58.4%)

Facilities with the largest reduction by percentage of chemicals generated

Though large facilities may reduce large *quantities* of waste, smaller facilities may reduce a larger *percentage* of their waste. There were 45 facilities that reduced generation by 50 percent or more in 1998 compared to 1996 levels. Eight facilities reduced generation by 80 percent or more. Fremont Industries in Shakopee reduced generation by 100 percent—they generated no waste from the TRI chemicals used at their facility in 1998. Table 2-7 shows facilities that attained the greatest reductions by percentage in TRI chemical generation.

Table 2-7: Facilities with the largest reduction by percentage of chemicals generated

Facility	1996 Generation	1998 Generation	Change in pounds and percent	
Fremont Industries, Inc.	317	0	-317	(-100.0%)
Spicer Off-Highway Products Division	382,645	1,569	-381,076	(-99.6%)
Thermo King Corp.	5,444,340	50,003	-5,394,337	(-99.1%)
Twin City Die Casting, Inc.	444,819	12,088	-432,731	(-97.3%)
Tandem Products, Inc.	13,548	1,038	-12,510	(-92.3%)
Chemrex Inc.	91,095	10,200	-80,895	(-88.8%)
Twin City Plating	38,624	4,608	-34,016	(-88.1%)
QX, Inc.	36,608	7,104	-29,504	(-80.6%)
Stylmark, Inc.	360,858	72,919	-287,939	(-79.8%)
Southern Minnesota Beet Sugar Cooperative	634,472	136,790	-497,682	(-78.4%)

Facilities with the largest increase in quantity of releases

In 1998, 41 percent of TRI reporters increased the quantities of chemical releases from their facilities compared to 1996. There were 49 facilities that reported increases in releases of more than 10,000 pounds. Eleven reported increases of more than 100,000 pounds and NSP's Sherburne County (Sherco) Generating Plant reported increases of more than one million pounds. It should be noted that the increase for Sherco is primarily due to an expansion of the chemicals they are required to report. Table 2-8 shows the 10 facilities that reported the largest increases in quantities of TRI chemical releases.

Table 2-8: Facilities with the largest increase in quantity of releases

Facility	1996 Releases	1998 Releases	Change in pounds and percent	
NSP - Sherco Plant*	23,000	6,709,700	6,686,700	(+29072.6%)
Koch Petroleum Group	626,999	1,105,721	478,722	(+76.4%)
Frigidaire Home Products-Freezers	17,854	411,035	393,181	(+2202.2%)
Crystal Cabinet Works, Inc.	218,438	515,312	296,874	(+135.9%)
North Star Recycling-Minnesota	960,782	1,241,207	280,425	(+29.2%)
Ford - Twin Cities Assembly Plant	636,825	866,379	229,554	(+36.1%)
3M Cottage Grove Center	629,418	845,805	216,387	(+34.4%)
Gopher Resource Corp.	268,400	378,000	109,600	(+40.8%)
Blandin Paper	0	106,737	106,737	(NA)
Pearl Manufacturing, Inc.	44,651	149,531	104,880	(+234.9%)

* NSP-Sherco's TRI reporting requirements were expanded in 1998 to include chemicals generated from coal combustion

Facilities with the largest increase by percentage of releases

In 1998, there were 63 facilities that reported increases in chemical releases above 50 percent compared to 1996 levels. There were 48 facilities reporting increases above 80 percent and 36 facilities reported increases greater than 100 percent. Table 2-9 shows the 10 facilities that reported the largest increases by percentage in TRI chemical releases.

Table 2-9: Facilities with the largest increase by percentage of releases

Facility	1996 Releases	1998 Releases	Change in pounds and percent	
Cannon Equipment Company	15	22,569	22,554	(+150360%)
NSP - Sherco Plant*	23,000	6,709,700	6,686,700	(+29072%)
Frigidaire Home Products-Freezers	17,854	411,035	393,181	(+2202%)
Lake Superior Paper Ind.	11,000	76,000	65,000	(+590%)
Johnson Screens Inc.	57	366	309	(+542%)
Hawkins Chemical, Inc.	24	113	89	(+370%)
Foldcraft Company	5,201	20,377	15,176	(+291%)
Chemcentral/Minnesota	884	3,375	2,491	(+281%)
The Dotson Company, Inc.	959	3,515	2,556	(+266%)
Pearl Manufacturing, Inc.	44,651	149,531	104,880	(+234%)

* NSP-Sherco's TRI reporting requirements were expanded in 1998 to include chemicals generated from coal combustion

Facilities with the largest increase in quantity of chemicals generated

In 1998, 50 percent of TRI reporters increased the quantities of chemicals generated from their facilities compared to 1996. There were 101 facilities that reported increases in generation of more than 10,000 pounds. In addition, 30 facilities reported increases of more than 100,000 pounds and five reported increases of more than 1 million pounds. The increase for NSP's Sherco plant was primarily due to an expansion of the chemicals they are required to report. Table 2-10 shows the 10 facilities that reported the largest increases in quantities of TRI chemicals generated.

Table 2-10: Facilities with the largest increase in quantity of chemicals generated

Facility	1996 Generation	1998 Generation	Change in pounds and percent	
Gopher Resource Corp.	103,298,399	164,468,000	61,169,601	(+59.2%)
NSP - Sherco Plant*	23,660	7,298,800	7,275,140	(+30748.0%)
3M Cottage Grove Center	14,807,395	19,041,650	4,234,255	(+28.6%)
U.S. Filter Recovery Services Inc.	1,610,790	5,179,196	3,568,406	(+221.0%)
Koch Petroleum Group	1,106,881	2,653,401	1,546,520	(+139.0%)
International Business Machines Corp.	634,850	1,603,147	968,297	(+152.0%)
Potlatch Corp.	5,452,925	5,918,926	466,001	(+8.6%)
Ford - Twin Cities Assembly Plant	1,744,625	2,185,275	440,650	(+25.3%)
Filmtec Corp.	940,202	1,340,968	400,766	(+42.6%)
Frigidaire Home Products-Freezers	52,854	450,535	397,681	(+752.0%)

* NSP-Sherco's TRI reporting requirements were expanded in 1998 to include chemicals generated from coal combustion

Facilities with the largest increase by percentage of chemicals generated

In the same year, there were 66 facilities that reported increases in chemical generation above 50 percent compared to 1996 levels. There were 51 facilities reporting increases above 80 percent and 38 facilities reported increases greater than 100 percent. Table 2-11 shows the 10 facilities that reported the largest increases by percentage of TRI chemical generation.

Table 2-11: Facilities with the largest increase by percentage of chemicals generated

Facility	1996 Generation	1998 Generation	Change in pounds and percent	
NSP - Sherco Plant*	23,660	7,298,800	7,275,140	(+30748%)
The Dotson Company, Inc.	959	40,368	39,409	(+4109%)
Frigidaire Home Products-Freezers	52,854	450,535	397,681	(+752%)
Alliedsignal, Inc.	24,112	172,698	148,586	(+616%)
St. Paul Metalcraft, Inc.	3,614	23,659	20,045	(+554%)
Blandin Paper	28,072	129,533	101,461	(+361%)
Foldcraft Company	5,201	21,114	15,913	(+305%)
Viking Drill & Tool Inc.	35,510	137,226	101,716	(+286%)
Douglas Corp. - Plating Division	21,805	74,886	53,081	(+243%)
Interplastic Corp.	116,429	395,762	279,333	(+239%)

* NSP-Sherco's TRI reporting requirements were expanded in 1998 to include chemicals generated from coal combustion.

Linking industrial sales with waste generation to assess pollution prevention

One of the most effective ways to measure progress in pollution prevention is to track changes in the amount of waste generated from the creation of each product. The less waste generated per unit of product, the more efficient the process.

The OEA can obtain data regarding the amounts of waste generated from each TRI reporter, but does not have access to information regarding the number of products these reporters produce. To overcome this lack of information, the OEA is exploring methods to correlate economic activity with production rates. Economic activity, as measured by sales dollars, is currently tracked for each industrial sector.

For this analysis, specific industry sectors are identified using Standard Industrial Classification (SIC) codes. For each sector, sales data over an eight-year period are compared to TRI chemical generation during the same period. Dividing pounds of TRI chemicals generated by dollars of industry sales reported for each year creates an indicator that can be used to compare levels of efficiency (waste generated per sales dollar) from year to year.

The OEA recognizes that there are inherent, significant limitations of assuming that manufacturing efficiency trends for specific industries can be assessed based on correlating sales information with TRI chemical generation data. The OEA will work with industry to further refine reporting data to adequately measure the correlation between production and chemical generation.

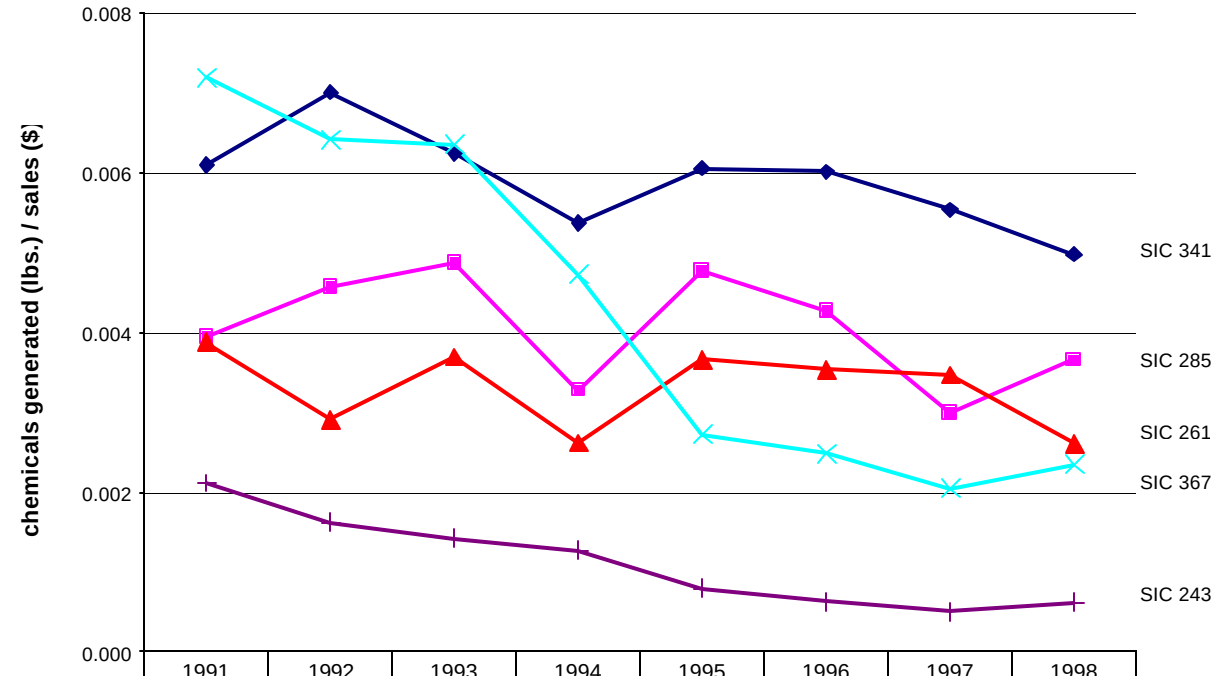
Applying the indicator to selected industry sectors

The following charts help illustrate trends when industrial sales data is linked with TRI chemical generation data; a downward-sloping chart indicates pollution prevention. The charts are based on data from six out of the 76 SIC codes required to report. These six were selected based solely on criteria regarding data integrity; nothing is implied about the performance of

industries within an individual SIC code. The OEA will continue to work with other government agencies to ensure that the best available sales indicator is being used as further analysis takes place.

- **X Axis.** Year for which data was collected.
- **Y Axis.** Total chemicals generated by an industry sector's TRI reporters divided by sales in dollars for the entire industry within the highlighted 3-digit SIC code, adjusted for inflation in 1992 real dollars.
- **Trend line.** Pounds of TRI chemicals generated per dollar of sales. The lower the line, the more efficient the process. For example, an industry sector may report constant sales over a period of time and TRI data may show decreasing waste generation in that same interval. This would indicate improved manufacturing efficiency for that industry sector.

Figure 2-3: Chemical waste generated per dollar of sales for selected SIC codes



	1991	1992	1993	1994	1995	1996	1997	1998
SIC 341	0.006	0.007	0.006	0.005	0.006	0.006	0.006	0.005
SIC 285	0.004	0.005	0.005	0.003	0.005	0.004	0.003	0.004
SIC 261	0.004	0.003	0.004	0.003	0.004	0.004	0.003	0.003
SIC 367	0.007	0.006	0.006	0.005	0.003	0.002	0.002	0.002
SIC 243	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001

- **SIC 341 — Metal Cans and Containers**
  Sales for the metal cans and containers industry have ranged between $400 and $450 million from 1991 to 1998. Based on the correlation of waste generation per dollar sales, manufacturing efficiency has improved for this industry, with chemical generation per sales dollar declining 18 percent. The slower rate of improvement as compared to other industries suggests that technological innovation may not be occurring as readily in this industrial sector or that competitive markets have limited funds available to implement waste reduction practices.
- **SIC 285 — Paints, Varnishes, Lacquers and Enamels**
  Sales for the paints and related coatings industry have ranged between $117 and $137 million from 1991 to 1998. Based on the correlation of waste generated per dollar sales, this industry has shown a slight improvement in manufacturing efficiency, cutting the quantity of chemical generation per sales dollar by about 7 percent, although it is unclear why performance has been uneven from year to year.

- **SIC 261 — Pulp Mills**

  Sales for the pulp mills industry have consistently ranged between $2.9 and $3.1 billion from 1991 to 1998. Based on the correlation of waste generation per dollar sales, this industry has improved manufacturing efficiency and has reduced chemical generation per sales dollar by 33 percent. It is unclear why data fluctuated for the years prior to 1995.

- **SIC 367 — Printed Circuit Boards and Electronic Components**

  Sales for the printed circuit boards and electronic components industry have increased steadily from $1.3 to $2.5 billion from 1991 to 1998. Since 1991, this industry has shown a dramatic improvement in manufacturing efficiency, cutting chemical generation per sales dollar by 67 percent. Improvements in efficiency have leveled off since 1995, indicating potential technical or financial barriers that limit additional pollution prevention progress.

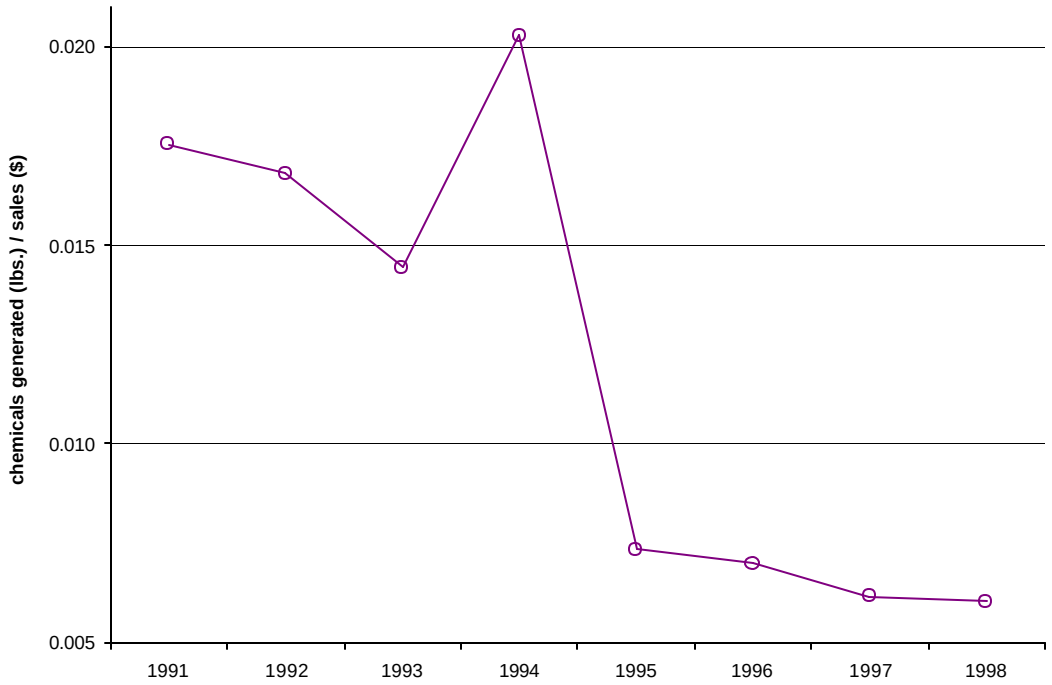
- **SIC 243 — Wood Products; plywood, veneer and cabinetry**

  Sales for the plywood, veneer and cabinetry industry have consistently ranged between $1.4 and $1.7 billion from 1991 to 1998. Based on the correlation of waste generation per dollar sales, this industry has shown a remarkable improvement in manufacturing efficiency, cutting chemical generation per sales dollar by 71 percent. Improvements in efficiency have slowed since 1996, indicating potential technical or financial barriers that limit additional pollution prevention progress.

- **SIC 347— Metal Plating and Finishing**

  Sales for the metal plating and finishing industry have increased fairly steadily from $319 to $463 million from 1991 to 1998. The correlation of waste generation per sales data show a marked improvement in manufacturing efficiency, cutting chemical generation per sales dollar 66 percent. Improvements in efficiency have slowed since 1995, potentially indicating either technical or financial barriers that limit additional pollution prevention progress.

Figure 2-4: Chemical waste generated per dollar of sales, SIC 347



Chapter Three

Economic Analysis of Minnesota's Industrial Pollution Prevention Activities

Pollution prevention makes a substantial contribution to the long-term economic and environmental health and viability of Minnesota manufacturers and their communities.

This chapter explores a new method for evaluating economic and environmental benefits of pollution prevention. This is the first time that the OEA has done this type of analysis to estimate the benefits of pollution prevention. The analysis uses a modeling tool that takes actual cost savings and environmental benefits from several companies and extrapolates the results across an entire industry. For this analysis, the OEA took the results of pollution prevention activities from 51 Minnesota companies in 17 industries and projected what the benefits would be if the activities were adopted throughout an industry.

When the results are extrapolated, the realized and potential environmental benefits are the elimination of 2.5 million pounds of solid waste, one billion pounds of toxic waste and 2.3 billion gallons of water. These environmental benefits occur each year that the pollution prevention activities are in place.

When documented results from specific facilities are extrapolated to similar facilities in the state, the realized and potential economic benefits are $132 million in savings from lowered production costs. This economic benefit occurs each year that the pollution prevention activities continue to be in place.

Using the numbers determined through cost savings and direct economic benefit, the model indicates the economic impact associated with those cost savings. This analysis shows that $116 million in additional economic benefit occurs through the additional activities resulting from lowered production costs. In future years, additional economic benefits accrue depending on how a particular industry invests their cost savings. The direct cost savings and modeled economic benefits due to pollution prevention total $250 million.

This economic analysis demonstrates what has been confirmed by individual facilities. Pollution prevention provides a substantial contribution to the long-term economic and environmental health and viability of Minnesota manufacturers and their communities.

REMI model analysis for pollution prevention

Learn more about the REMI system of economic modeling at www.remi.com.

Regional Economic Models Inc. (REMI), developed by George Treyz of Amherst, Massachusetts, builds economic forecasting and simulation models for national, state and county-based regions. The REMI model can simulate the economic and demographic effects of activities that influence an area's economy, such as construction and operation of new businesses, regulations, and public policies. It captures the detail of the economy, as well as key inter-relationships within it (such as the response of the economy to new capital investment and new jobs created). Major divisions of the economy addressed by the model are:

- Output by sector.
- Labor and capital demand.
- Population and labor supply.
- Wages, prices and profits.
- Market shares.

Case studies

The OEA used REMI to analyze pollution prevention data for specific facilities, including waste reduced, cost savings, and employment and then extrapolated environmental and economic benefits assuming these pollution prevention activities were implemented by other companies in that same sector. The OEA ran a total of 51 case studies that documented specific reductions at actual companies in solid/hazardous waste, air emissions, wastewater, and water use. OEA and MnTAP developed the pollution prevention case studies from the activities of its technical and financial assistance programs, which include site visits, written projects and grant awards. The case studies documented results that occurred between 1992 and 1998. The data was adjusted for inflation at 1998 levels.

The case studies covered 17 industries in SIC codes 20-39. Where data gaps existed for employment or sales, the OEA used data from the *1998 Minnesota Directory of Manufacturers* and the *1996 County Business Patterns for Minnesota*. The model calculated economic benefit per employee, then extrapolated across the industry SIC based on total number of employees in that industry.

Environmental and economic benefit analysis results

These case studies do not include data for all of the pollution prevention activities undertaken by the facilities. Only a sub-set of all activities implemented by a facility were measured by case studies and it is the data from this sub-set of activities that was used for this analysis. Therefore, the total projected environmental and economic benefits reported represent a conservative estimate of total benefits actually achieved.

- For solid waste reduction practices, the case studies documented annual reductions of 399,000 pounds of solid waste. If these practices were implemented in similar industries, projected reductions total nearly 2.5 million pounds per year, with an economic benefit projected at $22 million.
- Facilities implementing pollution prevention practices (P2) reduced toxic air emissions, wastewater discharges and hazardous waste generation by a combined 17 million pounds per year. If these P2 practices were extensively adopted by similar industries, their toxic waste generation could be reduced by up to 1 billion pounds per year, saving an estimated $69 million.
- Facilities implementing water conservation practices documented saving 27 million gallons per year. An estimated 2.3 billion gallons of water could be conserved annually, saving $40 million, if water conservation practices were broadly implemented by similar industries.

The total economic benefit if these specific pollution prevention activities were implemented in similar industries amounts to $132 million per year. This is not a one-time savings — cost savings accrue each year, continuing as long as the more efficient activities remain in place.

Table 3-1: Projected Benefits, Based on Case Studies

	Measured facility pollution prevention for targeted activities	Projected environmental benefits by industry for targeted P2 activities	Projected economic benefits from lowered production costs for targeted activities
Solid waste	399,000 lb./yr.	2,495,524 lb./yr.	$22,136,411
Toxic waste	16,931,539 lb./yr.	1 billion lb./yr.	$69,552,726
Water conserved	26,740,000 gal./yr.	2.3 billion gal./yr.	$40,098,026
			$131,787,163

Economic activity analysis

The OEA also used the REMI model to generate estimates of economic activity associated with pollution prevention projects. If pollution prevention activities from the case studies were fully implemented across an industry sector, the OEA estimates that 1,200 indirect and induced jobs

could be created. This is based on the impact on local suppliers and long-term effects from increased profits for industrial investment. From the 1,200 new jobs, additional wages generated could be $42 million. Estimated value-added activity could be $59 million, and gross economic activity at $116 million.

The data suggests that implementing pollution prevention in the industrial sector can have a significant impact on new job creation and generation of new wages. In addition, economic activity is generated from new product development and sale.

The value-added economic activity stems from increased efficiency (manufacturing improvements as a result of pollution prevention) which generates higher profits. These increased revenues are available to invest in new equipment, new technologies, expanding markets, and new product development. These new products in turn generate dollars on supplies to make the new products and sales of the new product itself. Job growth occurs as a result of product and facility expansions and new product sales.

Table 3-2: Estimated Economic Activity Associated with Pollution Prevention Projects

Economic activity indicator	Individual P2 case studies	Estimated industry-wide impact*
Total estimated job impact	**116**	**1200**
• Estimated indirect jobs: Impacts on local suppliers statewide, unadjusted for displacement effects	36	375
• Estimated induced jobs: Long term effects on personal income and consumer spending, localized and statewide	80	825
Estimated wages and salary disbursements The monetary remuneration of employees, including compensation of officers, commissions, tips, and bonus and receipts-in-kind that represent income to the recipient.	**$4.07 million**	**$42 million**
Estimated value-added activity Contribution to Gross State Product analogous to GDP (gross domestic product); output excluding the intermediate inputs (primarily compensation and profit)	**$5.88 million**	**$59 million**
Estimated gross economic activity Amount of production in total sales, includes intermediate goods purchased as well as value-added (compensation plus profit)	**$11.7 million**	**$116 million**

* Estimated impact when targeted activities are implemented in entire industry

Scenarios calculated by OEA using the Regional Economic Models, Inc. Minnesota Forecasting and Simulation Model, October 1999

Pollution prevention results in both direct and indirect monetary benefits. Direct benefits occur from increased efficiencies in production and savings on raw materials purchase and avoided disposal costs. Indirect benefits include resource conservation, reduced releases to the environment, improved worker health and safety, and decreased liability. These savings and increased efficiencies have a clear impact on industry's ability to pursue new product development and more efficient equipment, thus making them more environmentally and economically competitive.

The savings calculated by the OEA using the REMI economic model assume that all similar facilities implemented the same pollution prevention activities as identified through the individual case studies. Implementation of the documented activities is technologically feasible by similar facilities, though they may have a fiscal barrier to doing so. One way to determine the number of facilities that have implemented these pollution prevention activities would be to survey them. Without this data, it is difficult to establish the ratio of realized to potential benefits achieved through pollution prevention.

Chapter Four

Prioritizing TRI Generators Based on Potential Hazard to the Environment

TRI reports provide a detailed list of what chemicals are reported generated and released in Minnesota each year. Table 4-1 shows the top 10 chemicals generated, by weight, in the state.

Analysis of TRI data has historically focused on the quantity of chemicals, reported by weight.

It is recognized, however, that all toxic chemicals are not equal. Even in very small quantities, certain chemicals pose a greater risk to human health than greater quantities of other toxic substances.

Efforts are underway in the U.S. and around the world to analyze toxic substances based on their relative risk to human health and the environment.

Table 4-1: Top chemicals generated, 1998

Chemical Name	Total generated (pounds)
Lead Compounds	163,560,128
Methyl Ethyl Ketone	21,360,710
Methanol	17,048,932
Toluene	14,399,349
Copper Compounds	10,927,859
Xylene (mixed isomers)	8,657,984
Barium Compounds	8,282,251
Zinc Compounds	5,489,967
Nitric Acid	5,378,583

Source: 1998 TRI data

See Appendix D for the full list of the 102 TRI chemicals that were reported in Minnesota in 1998.

Targeting assistance in Minnesota

Traditionally, the OEA has used TRI data to identify industries and individual facilities for targeted assistance in pollution prevention. Through this approach, chemicals that were generated in the greatest quantity, by weight, were targeted for reduction.

The OEA is working to prioritize its assistance based in a new way, with analysis that combines the data on *quantity* of each TRI chemical with information on the *relative hazard* for that chemical. The OEA hopes that this effort will help Minnesota focus on the chemicals, industries and facilities that offer the biggest opportunity for reduction in relative toxicity — and provide the greatest benefit to human health and the environment.

Two hazard-ranking models

Analyzing chemicals based on their hazard or risk is a significant challenge. Individual models must make assumptions about the risk associated with chemicals and their toxic properties; for example, one model may stress the importance of worker safety and the dangers of chemical exposure, while another will give greater weight to a toxic chemical's persistence in the environment.

For risk analysis, the OEA felt it was important to include environmental as well as worker safety concerns. With assistance from the MPCA, the OEA used two different hazard-ranking models to evaluate the TRI data.

- The first model was developed by MPCA; it places a higher significance on metals because of their persistence in the environment and their ability to accumulate in living organisms. The MPCA chemical hazard indexing system is a steady-state fugacity model, which measures the movement and distribution of chemicals between different environmental media. The model was designed with an emphasis on chemical releases to the air and can assess and compare the environmental fate for each chemical of interest.

- The second model, developed by the Indiana Clean Manufacturing Technology and Safe Materials Institute (CMTI) at Purdue University, places greater emphasis on solvents and corrosive chemicals as having higher direct exposure and worker safety risks. The CMTI chemical hazard ranking formula contains elements that can be separated into two major subgroups: worker exposure hazard and environmental hazard. The average of these two subgroups represents the overall hazard associated with the chemical.
  - The **worker exposure** subgroup comprises elements for health effects, exposure pathways and safety concerns (flammability, reactivity and corrosivity).
  - The **environmental hazard** subgroup contains elements for air, water, land and global (or ozone-depletion potential) impacts.

Each model assigns individual chemicals a "hazard value" that takes into account factors such as a chemical's persistence in the environment, exposure pathways and degree of hazard. Each model has had thorough peer review.

Applying the models to Minnesota TRI data

The OEA worked with the MPCA to apply these hazard-ranking models to Minnesota TRI data from 1996 and 1998, using each model's *Hazard Value.*

Methodology

The following calculations were done using TRI data and the MPCA and CMTI models, producing 3 sets of data for each model.

1. *Quantity Generated* x *Hazard Value*
   (*Quantity Generated* represents total opportunity for pollution prevention.)
2. (*Quantity Generated – Quantity Recycled*) x *Hazard Value*
   (Subtracting out *Quantities Recycled* serves to credit recycling compared to other management techniques.)
3. *Quantity Released* x *Hazard Value*

A simple formula was then developed to combine the results of the two models.

Analyzing the results

The results of these efforts enable prioritization of TRI chemicals, industry sectors and individual facilities for evaluation, partnerships and assistance.

Appendix E provides a quick reference for many of the TRI chemicals and their health effects.

- **1996 TRI data.** The resulting data sets were analyzed to screen the top individual facilities and top industries as determined by both two- and three-digit SIC codes. For the purposes of this report, these are priorities for targeted pollution prevention assistance.
- **1998 TRI data.** Results were used in this report to evaluate the toxicity of Minnesota's reported TRI chemicals using 1998 TRI data.

These lists will change over time as new data becomes available and improvements to models are made, but they provide excellent starting points for both the state and industry to address relative risk as they target facilities and industries for chemical reduction efforts.

Minnesota's top-ranking facilities as indicated by hazard and quantity

To identify which facilities represent the greatest potential risk to the environment based on the toxicity and quantity of chemicals they release and generate, a two-step process was used.

- First, each chemical reported by a facility was multiplied by its corresponding hazard value for each model.
- The results for each reported chemical were added together to get a total for each facility.

The facilities profiled in Chapter Ten are those TRI reporters that represent the highest potential risk to the environment based on the toxicity and quantity of chemicals they released and generated according to 1996 TRI data.

These top facilities — just six percent of the total number of Minnesota facilities required to report under TRI — are responsible for about 85 percent of the total chemicals generated and 43 percent of the chemicals released in the state.

Analysis of Minnesota's TRI reporters using 1998 TRI data is underway.

Minnesota's top-ranking industry sectors as indicated by hazard and quantity

The OEA used the data sets from the hazard-ranking models to identify which industry sectors offer the greatest potential for reducing risks posed by TRI chemicals.

The results from the facility analysis (described above) were sorted and summed by both two-digit and three-digit SIC groups. This was done to identify which overall industry sectors should be prioritized for outreach, along with identifying specific manufacturing segments that stood out within the broader industry sectors. The OEA shared this information with the Minnesota Technical Assistance Program to help them develop their technical assistance workplan.

Table 4-2: Industry sector rankings for three-digit SICs

Two-digit SIC codes represent major industry sectors; three-digit SIC codes identify subsets of those sectors.

Rank	SIC	
1	334	Secondary smelting and refining of non-ferrous metals
2	289	Chemicals and chemical preparations
3	267	Coated and laminated paper and packaging
4	331	Steel works, blast furnaces and rolling mills
5	261	Pulp mills

Table 4-3: Industry sector rankings for two-digit SICs

Rank	SIC	
1	33	Primary metals industries
2	34	Fabricated metals products, except machinery and transportation equipment
3	26	Paper and allied products
4	28	Chemicals and allied products
5	35	Industrial and commercial machinery and computer equipment

Minnesota's reported TRI chemicals as indicated by hazard and quantity

TRI chemicals represent approximately 600 of the more than 70,000 chemicals registered for use in the nation. Of these 600 TRI chemicals, Minnesota facilities reported in 1998 on 102 chemicals that they use and generate at levels that trigger reporting requirements in a given year.

Appendix D lists all 102 TRI chemicals reported in Minnesota in 1998.

Lead is the highest-ranking priority chemical reported. It ranked highly in five of the six data sets, and was the first chemical listed in four of those five. Reporters of lead include primary electrical equipment manufacturers and the primary and fabricated metal industries.

Gopher Resources Corp. is a secondary lead smelting facility that recovers lead from used batteries and other products for recycling into new products. They generate (98 percent) and release (44 percent) a significant portion of the lead reported in Minnesota. The recycling process, though also waste-producing, produces much less pollution than the other methods available to manage toxic waste.

In addition to Gopher Resources Corp., there are 20 other facilities that generate lead. Nineteen of them also report releases. If Gopher Resources Corporation's contributions were excluded, lead would still be the second highest-ranking priority chemical, behind copper.

The federal government considers lead such a high risk that the U.S. EPA recently passed a final rule lowering the reporting threshold for lead from 25,000 pounds used in manufacturing or processing to just 100 pounds used per year. Starting in 2001, any facility using 100 pounds or more of lead annually will be required to inform the public by filing a TRI report.

Other lists of chemicals of concern

In discussions the OEA had with industry, environmental organizations and government, there were questions about how the 102 reported TRI chemicals relate to other groups or lists of chemicals. Specifically, how should OEA and MPCA make use of other lists of chemicals of concern as they pursue pollution prevention opportunities with facilities?

The OEA and MPCA continue to consult and review other chemical lists that may be useful. Some of these lists are relatively new and may change. Though other national and regional chemical lists address toxicity, they do not take into account the quantities of chemicals generated and released specifically in Minnesota. Following is a brief description of several national and international chemical lists that have been developed.

- **Canada-U.S. Binational Toxics Reduction Strategy** | http://www.epa.gov/grtlakes/bns/

  The Canada-U.S. Binational Toxics Reduction Strategy (1997) is an agreement between Environment Canada and the U.S. EPA that provides a framework for actions to reduce or eliminate persistent toxic substances, especially those which bioaccumulate, from the Great Lakes Basin.

  Under the strategy, initial action will be focused on the virtual elimination of "Level I" substances, which have been linked to or have the potential to cause harmful environmental impacts in the Great Lakes Basin. These are substances that occur in the water, sediment or aquatic biota of the Great Lakes ecosystem and are toxic to aquatic, animal or human life. They are an immediate priority for virtual elimination through pollution prevention and other actions that phase out the use, generation or release of these substances in a cost-effective manner.

See Appendix F for a list of Level I and Level II substances.

  Environment Canada and the U.S. EPA have identified "Level II" substances as having the potential to cause a significant impact on the Great Lakes ecosystem. The two nations have agreed to share information regarding the persistence, bioaccumulation potential, and toxicity of Level II substances. Appendix F lists both Level I and Level II substances.

- **CERCLA List of Priority Hazardous Substances** | http://www.atsdr.cdc.gov/99list.html

  Every two years, the U.S. EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate the hazardous substances that are most commonly found at facilities on the National Priorities List (NPL). From these, they publish the CERCLA List of Priority Hazardous Substances, a prioritized list of those that pose the most significant potential threat to human health due to their known or suspected toxicity and potential for human exposure at these NPL sites. (Facilities on the NPL are more commonly known as Superfund sites.)

  The CERCLA list takes into account the quantity and toxicity of the chemicals being reviewed. It is possible for substances with low toxicity but high NPL frequency of occurrence and exposure to be on the CERCLA list of priority hazardous substances. The objective of this priority list is to rank substances across all NPL hazardous waste sites and provide guidance to ATSDR in selecting substances subject to toxicological profiles.

Next steps

Improvements to models that assign relative risk to chemicals are ongoing. The Minnesota Pollution Control Agency (MPCA), in conjunction with the OEA, will continue to research the best available hazard-ranking models. The OEA and MPCA will continue to refine their analysis based on these recognized hazard-ranking models.

The agencies are also aware of other state, federal and international efforts to prioritize chemicals for reduction, and will evaluate those lists to develop common toxics reduction strategies.

Starting in 2000, facilities that use 10 pounds or more of mercury and generate 0.1 gram or more of dioxins will be required to file reports on those chemicals. The OEA will evaluate future TRI reports to determine the effect of this new data on our priority facilities and industries.

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Chapter Five

Other Sources and Types of Toxic Pollution

Toxic chemical pollution comes from a wide variety of sources—the cars we drive, the products we buy, the ways we grow our food, clean our homes and schools, and maintain our lawns all contribute to the toxic chemicals in our air, water and soil. Products and services that eliminate or reduce the use and generation of toxic chemicals include organic produce, chlorine-free paper, energy generated from wind power, cars that run on fuel cells or a combination of electricity and gasoline, and industrial cleaners that are water-based instead of solvent-based.

There is a range of policies, incentives and tools that government can employ to help people develop and use environmentally preferable products and practices. A first step in this effort is to share results and knowledge among government agencies, industries, and environmental and citizen groups. In this chapter of the *Pollution Prevention Evaluation Report*, the OEA worked with the Minnesota Department of Agriculture, the Minnesota Pollution Control Agency and the Minnesota Department of Health to provide information on sources of toxic pollution that are not covered by toxic release inventory (TRI) reporting requirements.

Limited data to assess pollution prevention

The policy statement in Minnesota's Toxic Pollution Prevention Act calls for comprehensive pollution prevention efforts that are implemented at the source and minimize the transfer of toxic pollutants from one environmental medium to another. The act further envisions greater cooperation and coordination among all elements of government, industry and the public to prevent pollution.

In practice, however, evaluation of pollution prevention has narrowly focused on generation and releases of TRI chemicals as reported by manufacturing industries, leaving many gaps in our understanding of what constitutes toxic chemical pollution, where it comes from, and how to prevent it.

- **TRI data covers only 600 of 70,000 chemicals.** There are more than 70,000 chemicals registered for use in the United States, but only about 600 of these chemicals are on the TRI list. For many of the chemicals not on the TRI list, there is little data available to assess possible health and environmental hazards. In 1999, the U.S. EPA, the national environmental organization Environmental Defense, and chemical manufacturers reached an agreement to begin testing more of these chemicals to determine their effects on human health and the environment.
- **TRI data does not cover toxic chemicals in products.** Another gap in Minnesota's data on toxic chemicals is that manufacturers report only the quantities of TRI chemicals that their facilities generate as wastes. Companies do not report the quantities of toxic chemicals that go into their products.
- **TRI data not available on other sources.** There are many unreported sources of toxic pollutants that threaten public health and the environment. These sources include motor vehicles, farms, commercial institutions, schools and homes. It is difficult to assess toxic chemical use and generation for many of these non-industrial sources.

A more comprehensive assessment

This chapter describes current state efforts to evaluate the use and release of chemicals that do not show up in TRI reports, even though most of the chemicals in question are on the toxic

release inventory. These TRI chemicals go unreported because they come mainly from non-manufacturing sources or because they are contained within products rather than left over from manufacturing processes as wastes.

The state initiatives that are described in this chapter address chemicals in three areas:

1. Use of heavy metals or "listed metals" in inks, dyes, paints, pigments and fungicides sold or used in Minnesota.
2. Emissions of 10 toxic chemicals of concern in Minnesota because of high concentrations in the air.
3. Use of pesticides and pollution prevention efforts for pesticides.

Reducing listed metals in certain products

The Minnesota Pollution Control Agency (MPCA) is directing an effort to reduce the use of four heavy metals—lead, mercury, hexavalent chromium and cadmium—from inks, dyes, paints, pigments and fungicides sold or used in Minnesota. All four of these heavy metals are TRI chemicals, although their use in the product categories listed above is not captured by TRI reporting requirements.

In 1991, the Minnesota Legislature passed a law requiring reduction of these four heavy metals in specific products. Minn. Stat. §115A.9651 (1990, 1991 supp.) These listed metals all have known adverse effects on public health and the environment. Release of these four metals into the environment may lead to bioaccumulation in plants, animals and humans. Children and fetuses are particularly vulnerable, as are the elderly and industrial workers. These toxic metals cannot be destroyed.

In 1997, the Legislature changed the law and timeline from prospective product bans to a deliberative process to be conducted by the Listed Metal Advisory Council (LMAC). The LMAC reviews whether the use of listed metals in specified products is appropriate and justified, and can make recommendations to the MPCA commissioner that individual specified products be banned.

Results to date

The LMAC was required by statute to select a list of specified products by product group to be reviewed by July 1, 2000. According to reports from regulated companies, 224 specified products containing more than 400,340 pounds of listed metals were distributed for sale or use in Minnesota during 1997. The LMAC selected four product groups: traffic markings, automotive refinishing paints, wood fungicides, and pigments. These product groups contain 111 specified products and approximately 90 percent of the listed metals in the program.

- By December 1999, the LMAC completed review and recommended a ban for the four specified products in the traffic marking paints group. This will remove 70,500 pounds of lead and 17,500 pounds of hexavalent chromium from Minnesota's environment.
- The LMAC has completed review for 71of 72 paints in the automotive refinish paints group and recommended that two of the paints be banned.
- The LMAC completed the review of the copper chromium arsenate (CCA) wood fungicide group and decided to not recommend a ban. However, the LMAC was concerned about the environmental impact of arsenic in CCA treated wood and sent a special memorandum to the MPCA commissioner calling for more study by the MPCA.
- The LMAC began review of the last product group—pigments—in January 2000.

Given the current pace, the LMAC will satisfy the statutory requirement to complete their review and make recommendations to the MPCA commissioner for all 111 specified products by July 1, 2000. Following conclusion of the review, the MPCA will initiate rulemaking for LMAC product ban recommendations that the MPCA commissioner agrees should be pursued.

"Air toxics" and their sources

In November 1999, the MPCA released a "Staff Paper on Air Toxics," which illustrates risks posed by a class of air pollutants known as "air toxics." The analysis uses a variety of data sources including air monitoring data, emissions inventory data, modeling studies conducted by EPA, and research on health impacts to characterize issues related to these chemicals.

More information on the MPCA's outdoor toxic air chemical findings is online at www.pca.state.mn.us/air/airtoxics.html#summary.

This analysis identified a set of ten chemicals that are pollutants of concern because their ambient air concentrations exceed health benchmarks in some or all regions of Minnesota. Health benchmarks for air toxics are levels above which health risks to the general public may occur and below which it is unlikely that adverse health effects will occur with long-term exposure. These 10 chemicals have been divided into two groups:

- **Chemicals for which current information warrants action.** The chemicals in this group are benzene, carbon tetrachloride, chloroform and formaldehyde. The MPCA has determined that enough information now exists to say that they are concerned about ambient air concentrations of these chemicals as well as their potential health effects.
- **Chemicals for which current information highlights need for more study.** The chemicals in this group are 1,3-butadiene, acrolein, arsenic, chromium, ethylene dibromide (1,2-dibromoethane) and nickel. The MPCA has determined that current data suggests that these chemicals are pollutants of concern, however, additional information is needed to confirm their significance.

Sources of the ten air toxics

All ten of the toxic chemicals analyzed in the MPCA's air toxics paper are on the TRI list. Overall, the majority of the excess cancer risk from breathing these toxic chemicals in the *outdoor* air is not coming from manufacturing companies that file TRI reports. Many of the ten toxic chemicals of concern evaporate from gasoline or are byproducts of combustion, primarily from vehicles.

The MPCA's staff paper discusses primary sources of the ten pollutants, which can be grouped into three major categories:

- **Point sources.** Permitted sources such as manufacturing facilities, utilities, waste incinerators and refineries.
- **Area sources.** Examples include home furnaces, wood stoves, fireplaces, gas stations, dry cleaners, and solvent and paint users.
- **Mobile sources.** Vehicles and equipment, such as cars, trucks, planes, construction equipment, off-road vehicles, and lawn and garden equipment.

According to the MPCA report and modeling done by EPA using 1990 emissions data, the majority of the potential cancer risk (61 percent) from breathing outdoor air containing the pollutants studied comes from mobile sources. Area sources make up 25 percent of the cancer risk and point sources are responsible for 14 percent of the cancer risk. TRI reporters fall into the point source category.

The primary source of any individual's exposure to these pollutants in the outdoor air will vary depending on where they live, work and play. For example, a person living or working in close proximity to a point source or an area source of pollution may have a higher risk from those point or area sources than from mobile sources. Although outdoor air concentrations may be highest in the urban core, a specific individual's exposure will be more dependent upon lifestyle choices and home and workplace conditions than upon home location.

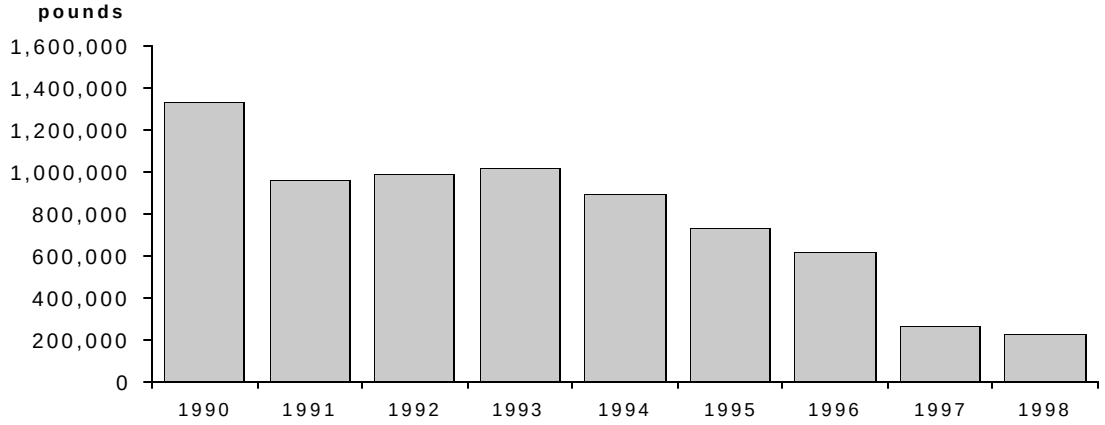
More information on the MPCA's outdoor toxic air chemical findings is online at http://www.pca.state.mn.us/air/airtoxics.html#summary.

OEA's analysis of TRI data on these ten air toxics

The OEA conducted a review of TRI data from 1990 to 1998 to identify trends for these ten chemicals with regard to their reported releases as air emissions from manufacturing facilities. The review shows that nine of the ten chemicals of concern have been reported as released to air in Minnesota; acrolein has never been reported in Minnesota. Two of the ten chemicals were initially reported in Minnesota, but have since stopped. Ethylene dibromide has not been reported in Minnesota since 1990 and carbon tetrachloride has not been reported in Minnesota since 1995.

Overall, TRI-reported air releases of these chemicals have decreased dramatically since 1990, the year used in U.S. EPA's modeling study. At that time, total air releases for these chemicals reported to TRI were 1,334,552 pounds. In 1998, total air releases for these chemicals were 225,612 pounds, a decrease of over 80 percent (See Figure 5-1).

Figure 5-1: Annual TRI Air Releases of MPCA Air Toxics of Concern



Source: Minnesota Emergency Response Commission

TRI reporting trends for specific chemicals

- **1,3-butadiene:** Air releases declined from 17,046 pounds in 1992 to 666 pounds in 1998.
- **Acrolein:** Listed reportable TRI chemical, however never reported in Minnesota.
- **Arsenic:** Air releases declined from 163 pounds in 1990 to 90 pounds in 1998.
- **Benzene:** Air releases declined from 221,010 pounds in 1990 to 24,746 pounds in 1998.
- **Carbon tetrachloride:** Not reported since 1995. Air releases declined from 10,255 pounds in 1991 to 992 in 1995, when it was last reported.
- **Chloroform:** Air releases declined from 199,964 pounds in 1990 to 8,600 pounds in 1998.
- **Chromium:** Air releases declined from 27,818 pounds in 1990 to 8,130 pounds in 1998.
- **Ethylene dibromide:** Not reported since 1990. Reported air releases were never more than six pounds annually.
- **Formaldehyde:** Air releases declined from 842,288 pounds in 1990 to 162,368 pounds in 1998.
- **Nickel:** Air releases declined from 22,450 pounds in 1990 to 21,012 pounds in 1998. Air releases were 6,192 pounds in 1997. The increase from 1997 to 1998 is largely due to new reporters, specifically the electric utilities, which reported a collective total of 11,395 pounds of nickel air releases in 1998.

Conclusion

The OEA's analysis of the TRI data on the ten targeted toxic air chemicals does not mean that the risks associated with these chemicals has decreased. Data for area and mobile sources are not reported under TRI requirements and have not been taken into account in this review. More

study is needed to further refine knowledge of issues associated with toxic air chemicals. It should also be noted that health effects vary among the individual pollutants of concern.

This review does indicate that contributions from TRI-reporting facilities for these chemicals have declined significantly in the last decade. Consequently, as MPCA and various stakeholders work to develop emission-reduction strategies, it will be necessary to frame dialogues so as to include all sources—area, mobile and point sources—of air toxics.

Use of pesticides

Pesticides are used in most sectors of the United States economy. A pesticide is any agent used to control undesired insects, weeds, rodents, fungi, bacteria or other organisms. The term "pesticide" includes insecticides, herbicides, rodenticides, fungicides, nematicides, and acracides, as well as disinfectants, fumigants, wood preservatives, and plant growth regulators.

Pesticides play a vital role in controlling agricultural, industrial, home/garden, and public health pests. Without effective control of pests, the U.S. would not have an economically viable supply of many crops, commodities and services. Pesticides also help control disease-bearing and invasive pests and serve an important public health and environmental protection role. The benefits from pesticide use are not achieved, however, without potential risk to human health and the environment because of the toxicity of pesticide chemicals. For this reason, the chemicals are regulated under the pesticide laws to avoid unacceptable risks.

Pesticides and TRI reporting

Many pesticides are listed on the TRI. Their use often goes unreported, primarily because most users of pesticides are not required to file TRI reports.

According to the EPA's *1999 Pesticide Industry Sales and Usage Report*, the United States accounts for nearly one-third ($11.9 billion) of pesticide expenditures and one-fourth of pesticide use worldwide. Agricultural use accounts for 77 percent (958 million pounds) of the total of 1,230 million pounds of conventional pesticides used in 1997 in the United States. Professional applications in non-agriculture sectors accounted for 12 percent (150 million pounds) and applications by homeowners accounted for 11 percent (135 million pounds) of pounds used. Most facilities that file TRI reports and use pesticides fall into the category of professional applications in non-agriculture sectors.

When companies that file TRI reports do use pesticides that are on the TRI list, the quantities used are often too small to trigger reporting requirements, or the pesticides are used in non-manufacturing activities, which are not covered by TRI reporting. As discussed in Chapter Two, the EPA is lowering the reporting thresholds for 18 TRI chemicals, including nine pesticides. The lower reporting threshold (100 or 10 pounds used annually), may result in some Minnesota facilities filing TRI reports for some of the listed pesticides. The tables at the end of this chapter list the most commonly used pesticides in the U.S. that are also on the TRI list.

U.S. EPA review

Approximately 20,000 pesticide products are currently registered or licensed for use in the United States. Before the U.S. EPA will register a pesticide product, the agency must evaluate test data on all of its ingredients. Depending on the type of pesticide, a registrant may be required to generate data from as many as 100 different tests in order for the U.S. EPA to determine the product's safety.

The 1996 Food Quality Protection Act requires the U.S. EPA to conduct an extensive scientific review of pesticides, with a particular emphasis on protecting children's health. U.S. EPA is reviewing the allowable limits (tolerances) for pesticide residues in food to determine whether existing tolerances meet stringent new safety standards required by the Food Quality Protection Act. By August 2006, U.S. EPA will complete the review of all tolerances that were in effect in August 1996 when the Food Quality Protection Act was passed.

Minnesota Department of Health study

The Minnesota Department of Health (MDH), in collaboration with the U.S. EPA and national researchers, is conducting a study to evaluate children's health risks from exposures to multiple chemicals including pesticides, metals, polyaromatic hydrocarbons and volatile organic chemicals. The MDH will release its results in August 2000.

Minnesota Department of Agriculture

The Minnesota Department of Agriculture (MDA) is the lead state agency for all aspects of pesticide regulation. The MDA administers the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Minnesota Pesticide Control Law. The Agronomy and Plant Protection Division manages the programs that include registration of products, licensing of private and commercial applicators, dealer licensing, ground and surface water monitoring, collection of waste pesticides, promotion of best management practices, emergency response to spills, site remediation, superfund, and enforcement. The Groundwater Protection Act of 1989 reinvented pesticide regulation in Minnesota and provided the MDA with new and innovative responsibilities, programs and funding. A number of the programs that were developed by MDA in 1989 were first of their kind in the United States and have since been adopted by other states.

Pollution prevention efforts for pesticides

Several of the MDA's programs focus on pollution prevention activities. In addition, the MDA currently has many special projects to prevent pollution.

- **Innovative technology: Precision farming techniques.** An increasing number of farmers are adopting precision farming techniques to manage their land. The purpose of precision farming is to farm as efficiently as possible by using a computer to adjust the inputs such as fertilizer, pesticides, seed and tillage. Precision farming, also known as farming by the foot or site-specific farming, involves detailed mapping of soils, nutrient levels, organic matter, and crop history of a field using the field GIS format. Computers integrate all the information to control crop inputs as the equipment moves across the fields. Since 1995, the MDA has been helping to evaluate the environmental impacts of precision farming techniques on ground and surface water on the Red Top Farm site near St. Peter.

  In cooperation with the Red Top Farm site landowner, the MDA is comparing precision and conventional farming techniques. Fields on this farm site are being farmed with both precision and conventional methods. The MDA is collecting and comparing water samples from each of these fields. The MDA wants to determine if precision-farming technology can reduce nitrogen-leaching losses while maintaining or improving yields. In addition, the MDA is studying pesticide movement through soils.

- **Integrated pest management (IPM).** The Integrated Pest Management Program develops and implements statewide strategies for the increased use of IPM on private and state managed lands. IPM is a balanced approach to pest management, which incorporates many aspects of plant health care/crop protection in ways that mitigate harmful environmental impacts and protect human health. The MDA funds IPM research and provides information on IPM through newsletters to growers, producers and land managers to help them make alternative choices in their pest management decisions.

- **IPM in schools.** There are initiatives at the national level and in other states to evaluate and reduce the use of pesticides in schools. Minnesota legislators, state agencies, environmental organizations, schools, and citizens are also investigating the use of pesticides in schools. The IPM approach involves regularly inspecting buildings and grounds for conditions that might attract pests and then recommending ways to create inhospitable surroundings to deter pests. When pests are found, vendors that practice IPM typically use pesticides as a last resort, and then use the least hazardous pesticides possible that will effectively control or reduce the number of pests.

  MDA survey of Minnesota schools. The MDA, with funding from the U.S. EPA, has conducted a survey of pest management practices in Minnesota schools. The survey provides data on indoor and outdoor pesticide use, and pest management practices in both public and

private schools. The MDA is developing an IPM in schools program to educate school districts on IPM and how to implement its use. The survey results and further information on IPM in schools are available on the MDA Web site: http://www.mda.state.mn.us/IPM/

Survey of St. Paul schools. The St. Paul Neighborhood Energy Consortium, (NEC), with funding from the OEA, is evaluating IPM practices in four St. Paul schools. The NEC will work with school staff, IPM experts, and professional trainers to survey current pesticide use and practices, develop IPM plans, and educate school staff and parents.

- **Urban initiative.** The MDA, funded by a grant from the U.S. EPA, is conducting an urban initiative to work with pesticides users in urban areas who are not part of MDA's traditional education and training programs. The goal of the program is to establish a regulatory presence in urban and residential communities, provide educational materials and training on pest prevention and control, and ensure the safe and proper use of all pesticides. Program activities include identifying communities at risk, training local personnel to monitor pesticide use, and establishing cooperative relationships with other state, federal and local agencies, community organizations, environmental organizations, dealers, and educational institutions.
- **Facility pollution prevention project |** http://www.mda.state.mn.us

  The MDA, funded in part by a grant from EPA, is completing an agricultural chemical facility pollution prevention project. MDA staff collected and assessed data on the effectiveness of current management practices at retail facilities that store and distribute agricultural chemicals (pesticides and fertilizers). The goal of the project is to reduce and/or eliminate pollution from storage facilities. The MDA staff developed recommendations for environmentally protective storage and handling practices at retail facilities. They then conducted an educational outreach and regulatory effort to promote proper management practices. MDA staff made presentations at pesticide applicator training sessions and organized a series of workshops for facility managers at actual retail facilities to discuss and demonstrate proper storage and handling practices.

Other environmental pesticide programs

- **Pesticide and fertilizer clean-up fund** | http://www.mda.state.mn.us

  One of the most innovative programs that the MDA administers is the Agricultural Chemical Response and Reimbursement Account (ACRRA). This program was established primarily to reimburse costs incurred in cleaning up agricultural chemical (pesticides and fertilizers) incidents. The account is funded by annual surcharges on pesticide and fertilizer manufacturers, distributors, applicators and dealers. ACRRA funds can be used for reimbursements for sudden incidents and long-term cleanups up to $200,000, with the responsible person paying the first $1,000 and ten percent of the first $100,000. The ACRRA fund pays the costs from $100,000 to $200,000.

  Since 1990, when the ACRRA program went into effect, almost $10.5 million has been reimbursed on a total of 424 clean-ups. This program has encouraged many individuals to report agricultural chemical incidents. These incidents are cleaned up immediately to prevent them from becoming larger problems in the future.

- **Ground water monitoring.** The MDA monitors surface water and groundwater to help determine adverse impacts on the environment and develop best management practices. Since 1985, the MDA has found a number of pesticides in the groundwater.

  Based on data collected from the monitoring program, the herbicide atrazine has been placed in "common detection status." An advisory committee has determined that detection of atrazine is not due to misuse, or unusual or unique circumstances. According to the U.S. EPA, atrazine is one of the two most widely used agricultural pesticides in the United States (based on pounds of active ingredient applied per year).

  Trend analysis has shown that the concentration of atrazine has decreased in central Minnesota, while the concentration of atrazine remains the same in southeast Minnesota. In cooperation with affected counties, the MDA is expanding its groundwater monitoring program in the Anoka Sand Plain. The MDA uses surface water stations to evaluate impacts of pesticides in small watersheds in southern Minnesota.

- **Waste pesticide collection program.** The MDA has conducted pesticide collections since 1990. These collections provide Minnesota residents and businesses an opportunity to properly manage and dispose of unwanted pesticides. This effort helps eliminate unused pesticides held in storage and mitigates uncontrolled toxic waste disposal.

  Since the collection program began, 1.9 million pounds of obsolete, canceled and unusable pesticides have been collected for proper disposal. Collection events are held each year, alternating between southern and northern locations, so that every county has at least one collection event every two years. Most Minnesota counties have had three or four pesticide collection events, yet the pounds of waste pesticides collected continues to increase.

  The program has collected over 150,000 pounds of products that are categorized as persistent, bioaccumulative toxic chemicals (PBTs). More than 28 tons of PBT were collected during 1997 and 1998. Nearly 30 tons of DDT has been collected since the program began, making it the most common PBT collected through the MDA program, followed by pentachlorophenol, chlordane, lindane and toxaphene. These toxic substances represent a significant and cumulative environmental hazard that must be carefully collected and properly destroyed to prevent discharge and adverse impacts to the environment.

- **Empty container collection and recycling program.** MDA is the coordinator for the statewide collection effort and liaison with the national agricultural chemical manufacturers who produce and distribute products in containers. This program provides an environmentally sound and fiscally prudent option for the disposal of empty pesticide containers. Recycling of the plastic containers helps reduce the environmental threat from improperly rinsed and disposed containers.

Conclusion

The TRI reports filed by industries on the toxic chemicals they generate and release provide an important, but limited basis for assessing pollution prevention in Minnesota. Preventing pollution in the 21st century requires us to think beyond factory walls, and begin to develop and act on a more comprehensive understanding of the sources of pollution. The OEA will continue to work with other state agencies such as the MDA, MPCA and MDH to coordinate information on pollution prevention efforts throughout the state.

Table 5-1: Pesticide Industry Sales and Usage, 1997 estimates

	Active Ingredient Millions of pounds	Percent
Conventional Pesticides*	975	21%
Other pesticide chemicals primarily sulfur, petroleum (oil and distillates), sulfuric acid	256	6%
Wood preservatives	665	14%
Specialty biocides	2,731	60%
Pools and industrial water treatment	*186*	*4%*
Disinfectants	*35*	*0.8%*
Sealants, coatings, etc.	*51*	*1%*
Chlorination for drinking water and wastewater	*1,476*	*32%*
Chlorination for disinfectant and pools and spas	*983*	*21%*
Total pesticides	**4,627**	**100%**

* U.S. EPA data focused on “conventional pesticides,” chemicals developed and produced exclusively or primarily for use as pesticides.

The U.S. EPA’s 1999 *Pesticides Industry Sales and Usage* report (# 733-R-99-001) is available online at: http://www.epa.gov/oppbead1/pestsales/, or contact the U.S. EPA, NCEPI, PO Box 42419, Cincinnati, Ohio 45242-2419; phone: 513-489-8190

Table 5-2: Most Commonly used Conventional Pesticides in United States Agricultural Crop Production, 1997

	Millions of Pounds		Millions of Pounds
Atrazine[1]	75-82	**Chlorpyrifos**[1]	9-13
Metolachlor	63-69	**Chlorothalonil**[1]	7-10
Metham Sodium[1]	53-58	**Dicamba**[1]	7-10
Methyl Bromide[1]	38-45	**Mancozeb**	7-10
Glyphosate	34-38	**EPTC**[1]	7-10
Dichloropropene[1]	32-37	**Terbufos**	6-9
Acetochlor	31-36	**Dimethenamid**	6-9
2,4-D[1]	29-33	**Bentazone**	6-8
Pendimethalin[1]	24-28	**Propanil**[1]	6-8
Trifluralin[2]	21-25	**Simazine**[1]	5-7
Cyanazine[1]	18-22	**MCPA**[1]	5-6
Alachlor[1]	13-16	**Chloropicrin**[1]	5-6
Copper Hydroxide	10-13		

[1]Also listed as a TRI Chemical

[2]Also listed as a PBT and a TRI Chemical

Table 5-3: Most Commonly used Conventional Pesticides used by Industry/Commercial/Government/Residential, Applied by Professional

	Millions of Pounds		Millions of Pounds
2,4-D[1]	16-18	**Methyl Bromide**[1]	3-6
Glyphosate	9-12	**Pendimethalin**[1]	2-4
Copper Sulfate	5-7	**Chlorothalanil**[1]	2-4
Chlorpyrifos[1]	4-7	**Malathion**[1]	2-3
MSMA	4-5		

[1]Also listed as a TRI Chemical

[2]Also listed as a PBT and a TRI Chemical

Table 5-4: Most Commonly used Conventional Pesticides in Home and Garden Market, Applied by Homeowner

	Millions of Pounds		Millions of Pounds
2,4-D[1]	7-9	**Chlorpyrifos**[1]	2-4
Glyphosate	5-7	**Carbaryl**[1]	1-3
Dicamba[1]	3-5	**Benefin**[1]	1-3
MCPP[1]	3-5	**Dacthal**	1-3
Diazinon[1]	2-4		

[1]Also listed as a TRI Chemical

[2]Also listed as a PBT and a TRI Chemical

Does not include moth control; paradichlorobenzene, 30-35 million pounds, and naphthaline, 2-4 million pounds/year

Does not include insect repellant; N,N-diethyl-meta-toluamide, 5-7 million pounds/year.

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