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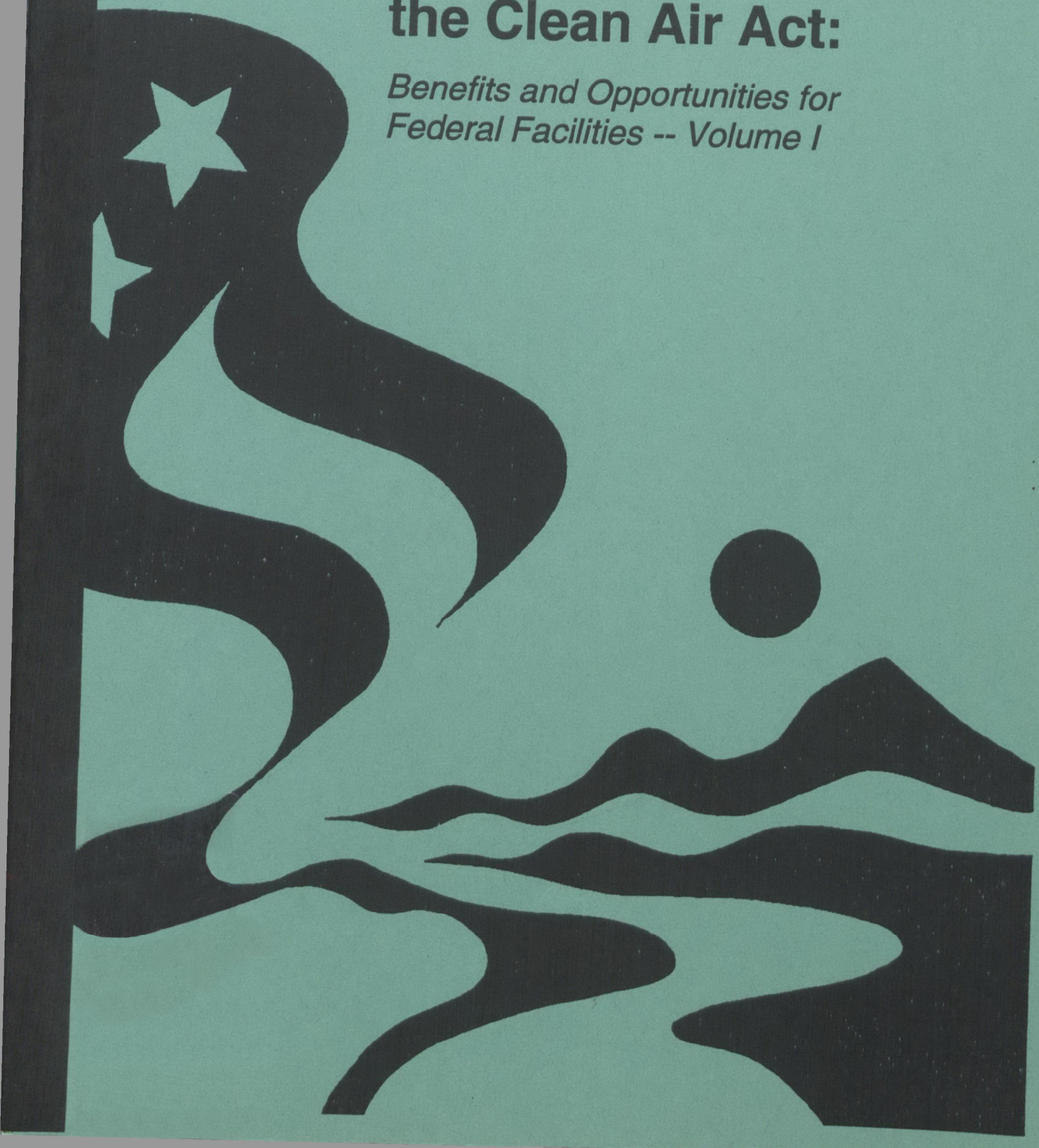
Pollution Prevention and the Clean Air Act:

Benefits and Opportunities for Federal Facilities -- Volume I



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CHAPTER 1

INTRODUCTION

This is the first of two reports on Clean Air Act pollution prevention opportunities at Federal facilities. It provides an overview of the Clean Air Act and describes how Federal facilities can facilitate compliance with the statute by taking advantage of pollution prevention opportunities. The second report is a two-part document that describes Clean Air Act pollution prevention opportunities resulting from cleaning and degreasing activities and from painting and depainting activities.

The generation of waste at the source, i.e., pollution prevention or source reduction, was established as national policy with the passage of the Pollution Prevention Act in 1990. The importance of this concept for Federal facilities has been reaffirmed by Executive Order 12856, "Federal Compliance with Right-to Know Laws and Pollution Prevention Requirements" signed by the President on August 3, 1993. With the expanding programs under the Clean Air Act, many Federal facilities have the opportunity to utilize pollution prevention techniques in developing compliance strategies. Reducing air discharges through the use of pollution prevention techniques will also help federal facilities meet the challenge of the pollution prevention planning goals in Executive Order 12856.

Federal facilities are facing a steady slate of increasing obligations as a result of the implementation of the Clean Air Act. Since the passage of the 1990 Amendments, the Environmental Protection Agency and State/local air pollution control agencies have been working diligently to put in place the regulatory framework required by Act. Many of these requirements will impact directly on the operations occurring at Federal facilities.

Historically, many Federal facilities have had a somewhat limited focus of Clean Air Act concerns, typically compliance issues with fuel combustion (boilers) requirements. But now the scope of attention has been significantly expanded, potentially addressing all Federal facility operations particularly those relying on chemicals to carry out their functions. Volatile Organic Compounds (VOCs), Hazardous Air Pollutants (HAPs), and Ozone Depleting Chemicals (ODCs) are all terms which apply to categories of materials regulated by the Clean Air Act. These materials may show up in cleaning agents, paints and coatings, fire fighting agents, cooling systems, and many other areas now subject to the Clean Air Act. Under the Act, States are developing permit programs to implement these new requirements. These permits will be explicit contracts with each facility to define compliance expectations for each air pollution source. All releases of regulated substances must be accounted for and will be the target for assessment of annual emission fees under the Act.

Federal facilities are also being asked to develop strategies to reduce their environmental discharges through pollution prevention. Executive Order 12856 requires Federal agencies to develop plans to reduce their releases of chemicals reported to the Toxic Release Inventory (TRI) by more than 50 percent by 1999. To the maximum extent possible, these reductions are to be

achieved through pollution prevention. Many of the TRI chemicals are the same compounds regulated by the Clean Air Act. Thus, Federal facilities have the opportunity to focus their pollution prevention plans on the same chemicals presenting compliance concerns under the Clean Air Act.

Federal facilities, by investing in source reduction strategies to achieve compliance with the Clean Air Act, can also minimize future regulatory burdens. Choosing alternative processes and materials, rather than focusing narrowly on traditional (end-of-pipe) control approaches, can lead to compliance solutions which decrease reliance on regulated compounds.

This report is intended to provide Federal facility managers with a baseline understanding of the breadth and scope of programs established under the Clean Air Act, and how Federal facilities can incorporate pollution prevention approaches into compliance decision making. In Chapter 2, the potential Clean Air Act impacts on Federal facilities is described. What are the different programs? What are their objectives? What materials and operations are affected? What are the compliance expectations? These are but a few of the questions addressed in Chapter 2. Chapter 3 describes some of the basic concepts which embody a pollution prevention program and how a more reasoned approach to considering the cost and benefits of control will lead to greater use of pollution prevention. Appendix A identifies the array of compounds regulated under the Clean Air Act. Appendix B includes a list of key documents to review for further consideration of the pollution prevention concepts discussed in the report.

In addition to this report, EPA has undertaken a pilot effort to provide specific information to environmental management personnel at Federal facilities to assist in the Clean Air Act compliance decision making process. To date, two reports have been generated:

- "Pollution Prevention and the Clean Air Act at Federal Facilities - Cleaning and Degreasing Activities"; and,

- "Pollution Prevention and the Clean Air Act at Federal Facilities - Painting and Depainting Activities".

These processes are widespread throughout the Federal government and have traditionally relied on the use of organic solvents. Opportunities exist to move away from the use of organic solvents through pollution preventative approaches. Additional processes are being considered for future profile reports.

CHAPTER 2

THE FEDERAL FACILITY VIEW OF THE CLEAN AIR ACT

INTRODUCTION

The Clean Air Act (CAA) is arguably the most complex environmental legislation to date. The Act itself is nearly 500 pages long. The U.S. Code of Federal Regulations holds thousands of pages of prescriptive emission limitations and methods for showing compliance. State and local agencies have file cabinets full of plans for reducing air pollution from sources ranging from lawnmowers and bakeries to power plants and refineries.

Federal facilities must comply with these rules in virtually the same way that private business must comply. Environmental managers at large Federal facilities, such as military bases and power plants, are often quite familiar with these requirements. However, the Clean Air Act Amendments of 1990 strengthened and broadened the requirements for air pollution control. As a result, managers of many Federal activities that were previously considered "insignificant" must now address the issue of air quality compliance.

This Chapter is intended to help Federal facility managers understand their long-term compliance responsibilities under the CAA. It is impossible to summarize in a few pages all of the important features of the CAA. However, it is possible to present in a few pages the major issues presented by the CAA and to gain an understanding of the actions needed to plan for compliance. This Chapter discusses three major topics:

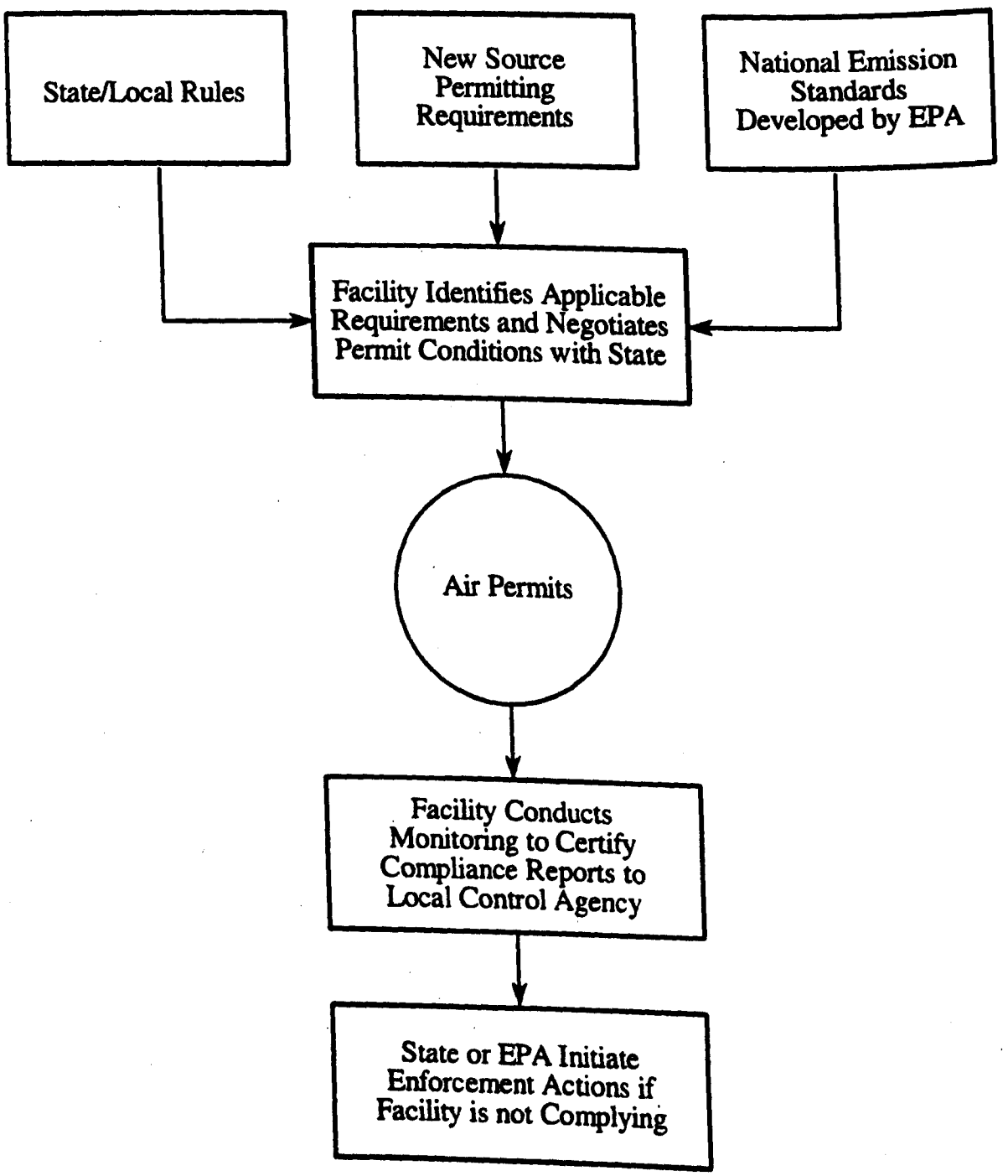
- The CAA Title V operating permit program - this program is intended to pull together in one document all of the enforceable requirements concerning air emissions that apply to each permitted source.

- The specific CAA programs that establish emission limitations or control requirements; these programs often contain overlapping and sometimes redundant pollution control requirements.

- The overlap between a Federal facility's CAA responsibilities and other responsibilities associated with Executive Orders on pollution prevention planning.

Despite the complexity of clean air rules, a Federal facility manager can begin to comprehend the CAA by considering its major components as shown in Figure 1.

Figure 1
Simplified CAA Activity Diagram



ROLE OF OPERATING PERMIT PROGRAM

Perhaps the key component of the 1990 CAAA was the Title V operating permit program. The following are major features of Title V:

- Operating permits are required for all major emitting facilities and all other facilities covered by Federal regulatory programs;
- Permits must set forth all those requirements of the Clean Air Act that apply to the facility, as well as monitoring and reporting procedures that help enforce those requirements;
- States must develop permit programs to review and approve permits;
- Permit applicants must submit a permit fee of at least $25 per ton of regulated pollutant emitted to support the State permit program;
- EPA may veto a State permit that fails to comply with Federal law.

Title V (and the implementing regulations contained in 40 CFR Part 70) does not establish new emission control requirements, but rather simply translates existing requirements into individualized enforceable conditions for each requirement.

Is My Facility Required To Obtain An Operating Permit?

Whether a particular facility of air pollution must obtain an operating permit depends on how badly the local air is polluted and on the kinds and quantities of pollutants that the facility emits into the air. The most important factor for determining whether a facility needs an operating permit is the quantity of emissions generated. This determination is not based on the amount of pollution typically generated, but rather on the amount of pollution that a facility is capable of generating when operating at maximum capacity and worst case operating parameters (this is referred to as "potential to emit"). In general, a facility must obtain an operating permit if it meets any one of the following requirements:

- **General**: any facility with the potential to emit 100 tons per year or more of any regulated air pollutant regardless of geographic location. Appendix A contains a listing of regulated air pollutants.
- **Sources of Hazardous Air Pollutants**: any facility with the potential to emit 10 tons per year or more of any of the 189 listed hazardous air pollutants (see Appendix A for a complete list), or with the potential to emit 25 tons per year or more of two or more such pollutants. For example, if the facility has the potential to emit 9 tons each of benzene, methanol, and chlorine, then its total potential to emit is 27 tons per year and the facility would be considered a "major source".

- **Sources Subject to New Source Performance Standards**: any facility with individual sources subject to a standard of performance for new stationary sources is required to obtain an operating permit.

- **Sources in Nonattainment Areas**: lower potential to emit thresholds exist for certain criteria pollutants depending upon the severity of the air quality problem. Table 1 (shown below) shows the major source emission thresholds for nonattainment areas.

TABLE 1

MAJOR SOURCE DEFINITION IN NONATTAINMENT AREAS

Pollutant	Nonattainment Status	Major Source Threshold
Ozone (VOC and NO_x)	Marginal or Moderate	100 tpy
	Serious	50 tpy
	Severe	25 tpy
	Extreme	10 tpy
	Transport Region (portions of ME, NH, VT, MA, CT, RI, NY, NJ, PA, DE, MD, DC, Northern Virginia that are not in severe or extreme areas)	50 tpy VOC 100 tpy NO_x
Carbon Monoxide	Serious Areas	50 tpy
PM-10 Particulate Matter	Serious Areas	70 tpy

Even if a facility is "major" for only one pollutant, the Part 70 regulations require an accounting in the permit for all emission sources in the facility regardless of their size or quantity of the regulated pollutants they emit.

In some circumstances, a facility may be able to reduce its potential emissions below the threshold level by agreeing to implement certain federally enforceable control measures. This would avoid the need for obtaining an operating permit. These agreed-to control measures could involve commitments to install specific emission control equipment, reduce the source's operating

time, or switch to different processes or products that are less polluting. The EPA has coined the term "synthetic minor" or "conditioned major" to refer to sources which take such measures.

Currently, non-major sources (including "synthetic minors") are exempted from the Federal operating permit program. However, many States have established minor source permit programs that may require minor sources to obtain permits.

What Must I Submit In My Permit Application?

All "major sources" must submit applications to the State or local permitting agency for approval. The timetable for submitting applications has not been finalized and will vary from State to State. Most States will begin processing permit applications in 1995.

Permit application forms vary from State to State. In general, the required information in the application will included:

- **Facility Information** - such as name, location, owner, plant manager, and other officials responsible for the permit;
- **Facility Description** - a description of emission generating processes, including production rates, fuels and raw materials used, and emissions data;
- **Air Pollution Control Equipment** - includes devices or work practices that reduce pollution;
- **Description of Applicable Requirements** - all federally enforceable emission limitations or standards must be identified;
- **Monitoring, Recordkeeping, and Reporting Procedures** - a listing of the specific test methods or monitoring that will be used for demonstrating compliance, along with the frequency of such testing or monitoring;
- **Compliance Plan** - sets specific timeframes for achieving all provisions for which the source is not currently in compliance;
- **Periodic Certification of Compliance** - set schedule for annual verification of compliance which must by signed by a responsible facility official with regards to the truth, accuracy, and completeness.

Permit applications may range in size from about 10 pages to several hundred pages of supporting information for large facilities.

In addition, the source must pay a permit fee. The amount and manner of computation varies from State to State, but in general is of the order of $25 per ton of emissions.

Who Reviews And Approves My Application?

Permit applications and other required documentation must be submitted to the State or local permitting agency for review and approval. Each permit may be reviewed by as many as five different groups:

- **Permitting agency review** - The State or local agency makes substantive determinations as to whether the permit should be issued or denied, and must respond to any adverse comments received from other parties.

- **Affected state review** - Any state within 50 miles of the source (and whose air quality is being impacted) can object to a permit's issuance if the affected state finds the permit does not meet either the applicable requirements or the Part 70 regulations.

- **Public Participation** - A 30 day public comment period is required before any permit is issued, and a public hearing may be requested.

- **EPA Review** - EPA is required to review all proposed permits within 45 days and must veto permits that fail to assure compliance with all applicable requirements.

- **Judicial Review** - There is also an opportunity for judicial review of all decisions made by the permitting agency.

The overall time frame for the permitting agency to issue permits is 18 months after the submittal of a complete application.

How Do I Certify Compliance With Permit Conditions?

A compliance certification must be included in all applications. The certification must state the source's current compliance status with all applicable regulations and the methods used to determine compliance. For Federal agencies, the compliance certification must be signed by a "principal executive officer...having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a Regional Administrator)". False statements in a compliance certification, even those made unintentionally, may subject the responsible official to fines or criminal penalties for deliberate falsification of permit records.

The Part 70 regulations require permitted sources to periodically test and monitor their emissions. For certain larger sources, proposed Part 64 regulations require monitoring to assure compliance. Examples of the types of monitoring or testing that may be required include the following:

- Continuous emission or opacity monitoring systems.
- Continuous process or control device parameter monitoring systems.
- Emission calculations using accepted engineering estimation techniques.
- Maintenance and analysis of records of fuel or raw materials usage.
- Periodic verification of emissions, process parameters or control device parameters using portable or in situ measurement devices.
- Recording results of a program or protocol to conduct specific operation and maintenance procedures, leak detection, fugitive dust control, or other work practices.

In addition to in-house monitoring and testing, State agencies and EPA have the right to conduct facility inspections to determine compliance. A permitting agency may enter a facility at any time to inspect a source's permit documents and other reports, observe the operation of control equipment, and take samples of air emissions. The permitting authority may immediately assess fines and other penalties for permit related infractions that are discovered.

How Can I Change My Permit?

Permits are generally issued for a 5-year period. During that time, there are a number of circumstances that can cause the permit to be modified. For example, EPA may promulgate a new regulation or the facility may want to expand operations or add a new source. Permitting requirements depend on the type of change being contemplated:

- States or EPA can initiate the reopening of a permit to **incorporate new requirements** established by federal or state regulations;
- A source can submit an **administrative amendment** for small changes or corrections that do not affect emissions; the State agency must review the proposed changes, but there are no provisions for EPA or public review.
- A source can submit a **minor permit modification** for certain operational changes necessary to respond with flexibility to emerging business opportunities. Small increases in the quantity and types of pollutants emitted are allowed.

- A source can submit a **significant modification** which is subject to the same review procedures as the initial permit.

- **New sources** or **major modifications** at existing facilities are subject to a rather complex new source review permitting program that is discussed in the following section.

Federal facility managers should be aware that the time required to modify air permits may seriously complicate facility planning processes.

APPLICABLE REQUIREMENTS

Perhaps the most critical step in the permitting process, and probably the most complex, is determining applicable emission limitations or standards. As noted previously, air quality regulations consist of a hodgepodge of Federal and State rules that have evolved over the past 25 years in attempt to resolve specific air quality problems. Some of the requirements are technology-based and require pollution controls that are either the best available or that can be practically applied. Other requirements are risk-based and the level of control depends upon the severity of the problem.

Determining whether a particular air quality management strategy affects your facility depends upon a number of factors, including:

- **Geographic location** - some emission standards apply nationally to all sources in a given category, others apply only to sources located in areas where air quality exceeds threshold values (i.e. nonattainment areas), still other State-specific rules apply only to sources located in that State. For example, National Emission Standards for Hazardous Air Pollutants (NESHAP) apply nationally, while Reasonable Available Control Technology (RACT) requirements can apply only in nonattainment areas.

- **Date of construction** - some emission standards apply only to sources constructed after a certain date, other rules apply only to newly constructed sources, and still other rules apply to all sources regardless of construction date. For example, New Source Performance Standards (NSPS) apply only to sources built after the date the NSPS was promulgated, whereas RACT requirements apply to all existing sources.

- **Pollutants emitted** - nearly every emission standard is targeted towards a specific pollutant or groups of pollutants that are causing a particular air quality problem. For example, the Maximum Achievable Control Technology (MACT) requirements target 189 hazardous air pollutants, while the National Recycling and Emission Reduction Program targets a few dozen ozone depleting substances.

- **Size of the source** - most emission standards apply to sources above a certain emission or size threshold (so-called major sources), others apply to all sources regardless of size. The threshold depends upon the geographic location, pollutants emitted, and applicable regulatory program.

Federal managers confused by the these distinctions should not despair of their analytical capabilities. Defining and distinguishing between these requirements have challenged private business, the EPA, State and local agencies, and the courts for years. Table 2 summarizes important aspects of each of the major air regulatory programs. The following paragraphs provide a synopsis of each program.

TABLE 2

SUMMARY OF MAJOR CLEAN AIR ACT PROGRAMS

PROGRAM	FEDERAL OR STATE PROGRAM	GEOGRAPHIC COVERAGE	PRIMARY POLLUTANTS OF CONCERN	NEW OR EXISTING SOURCES?	CONTROL TECHNOLOGY REQUIREMENT
SIP	State	Nonattainment	Criteria	Existing	RACT (Reasonable Available Control Technology) Control techniques
NSPS	Federal	National	Criteria plus TSP, dioxin, fluorides, HCl, H_2S	New	NSPS (New Source Performance Standards)
Hazardous Air Pollutants	Federal	National	189 hazardous air pollutants	New and Existing	MACT (Maximum Achievable Control Technology)
Prevention of Significant Deterioration	State	Attainment	Criteria plus NSPS-/NESHAP	New	BACT (Best Available Control Technology)
New Source Review	State	Nonattainment	Criteria plus NSPS/NESHAP	New	LAER (Lowest Achievable Emission Rate)
Acid Rain	Federal	National	Sulfur dioxide Oxides of Nitrogen	Existing	Specific controls are not required. Each of 111 affected sources are given an emissions allowance and are free to reduce emissions below the allowance in any manner they choose, including buying and selling emission credits.
Stratospheric Ozone Protection	Federal	National	Ozone Depleting Substances	New and Existing	Complete ban on the production of certain ozone depleting substances.
State Programs	State	State		New and Existing	Control requirements vary widely for State-specific programs. Some programs provide the source flexibility in choosing control techniques, while other programs require the installation of specific pieces of control equipment.

State Implementation Plans

Many urban areas experience air quality levels that fail to meet standards for human health (i.e. National Ambient Air Quality Standards, or NAAQS). NAAQS exist for six "criteria" pollutants. Areas that fail to meet the standards are called "nonattainment areas". Of these six NAAQS, ground-level ozone air pollution has been the most difficult problem to solve because of the complex interaction of meteorology and emissions of volatile organic compounds and oxides of nitrogen, the two pollutants which react to produce ozone.

The degree of control required depends upon the existing air quality in the urban area: areas are ranked from marginal to extreme, with the more polluted areas required to institute more rigorous controls. State and local agencies develop State Implementation Plans (SIPs) to reduce air pollution from stationary and mobile sources to ensure that healthy air quality levels are achieved. At a minimum, stationary sources are required to install Reasonably Available Control Technology (RACT). Stricter controls may be required in heavily polluted areas. Many smaller facilities (such as bakeries, printing plants, auto paint shops, dry cleaners) that were previously exempt from control requirements now are subject to RACT requirements.

EPA has developed Control Techniques Guidelines (CTGs) for dozens of source categories that identify control techniques that are presumed to represent RACT. For source types not covered by a CTG, the individual source is responsible for preparing a source-specific RACT determination that must be approved by the State or local agency and EPA. As noted before, control requirements may be more stringent than RACT to ensure continual progress toward attainment of the NAAQS.

Performance Standards For New Sources

The CAA has historically imposed stricter controls on new sources than on existing sources. This is based upon the premise that it is easier to incorporate state-of-the-art control technology in new (or substantially modified) plants than to retrofit such control on older plants.

EPA originally developed New Source Performance Standards (NSPS) for a few dozen source categories in the 1970's. The NSPS were to apply uniformly across the U.S., irrespective of the air quality in the area where the plant was being built. The NSPS were technology-based standards representing the "best technological system of continuous emission reduction" at the time the standards were set. Afford-ability of the control systems was one factor in setting the NSPS. Over time, NSPS must be continually upgraded in order to represent improvements in "state-of-the-art" control technology.

In the 1977 amendments to the CAA, Congress decided that standards for new sources locating in nonattainment areas should be stricter than standards for sources located in attainment areas. Sources locating in nonattainment areas became subject to a New Source Review (NSR) permitting program. In order to receive a permit to construct a new source, the source would have to install controls that represent the lowest achievable emission rate (LAER). In addition, the source would have to obtain emission reductions (or "offsets") from other sources within the

plant or from other facilities to offset any increase in emissions from the new source. Obtaining offsets has been a difficult problem for new sources trying to locate in heavily polluted areas such as Los Angeles, New York, and Philadelphia.

New sources locating in attainment areas are subject to the Prevention of Significant Deterioration (PSD) permitting program. This program imposes a best available control technology (BACT) requirement. A BACT determination requires a case-by-case, "top-down" ranking of all available control technologies. The most effective technology is considered BACT unless the applicant can demonstrate that technical considerations or economic impacts justify that the most stringent technology is not "achievable". More stringent controls than BACT may be required if the emissions from the source cause local air quality to deteriorate beyond an incremental amount (so-called PSD increments) in clean areas. For certain pristine areas, such as national parks or wilderness areas, very little air quality deterioration would be allowed. Visibility must also be protected.

Standards For Hazardous Air Pollutants

The 1970 CAA established a program to regulate a category of unique pollutants because of their toxic or hazardous properties and the localized contamination problems they posed. Originally, EPA developed National Emission Standards for Hazardous Air Pollutants (NESHAP) to ensure that communities were not exposed to excessive cancer risks. EPA found it very difficult to regulate emissions because of the scientific uncertainty concerning the linkage between emissions and cancer risks. EPA often found itself in the position of banning economically important substances that are potentially carcinogenic. As a result very few NESHAP standards were developed prior to 1990.

The 1990 CAA Amendments dealt with the problem of hazardous air pollutants in several ways. The primary method called for EPA to develop Maximum Achievable Control Technology (MACT) for hundreds of categories of industrial sources for 189 individual Hazardous Air Pollutants (HAPs) listed in the CAA. The MACT standards are scheduled to be developed over the next 10 years. A second method is for EPA to develop residual risk determination procedures to control categories of sources whose emissions still present health risks even after the application of MACT. A third method is for EPA to develop accidental release prevention regulations that require certain facilities handling extremely hazardous, "regulated toxics," substances to develop detailed risk management plans. The lists of HAPs and regulated toxic substances are included in Appendix A.

Prior to 1990, the slow Federal pace in regulating hazardous air pollutants led several states to establish their own "air toxics" programs. Many states established emission standards or procedures for determining control requirements for as many as 800 "air toxic" pollutants. Although the 1990 CAA Amendments addressed the problem of air toxics, most of these state air toxics programs remain in place. If EPA fails to meet its schedule for developing MACT standards, the States also become responsible for administering a case-by-case MACT determination program.

About half of the 189 HAPs are also volatile organic compounds regulated under the SIP provisions described earlier. In many cases these VOC emission sources will be subject to new RACT emission limits prior to the MACT emission standards. Federal facility compliance programs must consider the impact of both RACT and eventual MACT requirements and make certain that a compliance strategy is sufficient for both standards. The potential for having to control twice is a reality which must be considered.

Acid Rain Program

The acid rain program is intended to reduce emissions of sulfur dioxide by 10 million tons per year and oxides of nitrogen by 2 million tons per year. Mainly large electric generating units are affected by the program. Emission reductions are to be achieved by the application of emission allowances for a fixed set of large sources. This allowance system enables sources to minimize cost and maximize flexibility by allowing the transfer of allowances from one source to another. This will facilitate the use of a variety of options for controlling emissions, such as the use of low sulfur fuels, flue-gas desulfurization, phasing out older units, etc.

Stratospheric Ozone Protection

Although ground-level ozone adversely affects human health, stratospheric ozone found in the upper atmosphere is necessary to filter out harmful radiation from the sun that might cause skin cancer. An international agreement, the Montreal Protocol, committed all nations to the phase out of materials which deplete stratospheric ozone. The CAA was expanded to include provisions to comply with the Protocol in the U.S. EPA has developed regulations mandating a phase-out of ozone depleting chemicals (ODCs). This group of chemicals includes many that are currently commonly used in many operations such as refrigeration, air conditioning, fire fighting agents, foam blowing, and precision cleaning.

State Programs

While State agencies must enforce Federal emission control requirements, States are free to establish emission standards that are more stringent than Federal requirements. As mentioned above, many States developed air toxics programs that in some cases include additional hazardous air pollutants and impose special permitting requirements.

COMPLYING WITH THE CAA AND OTHER PROGRAMS

As can be seen from the previous discussions, developing a long-term CAA compliance action plan can be a quite complex undertaking. Making matters worse for the Federal facility manager, other environmental programs establish requirements that must be considered in developing a CAA compliance action plan. There are many overlapping and at times redundant requirements. Developing a holistic approach to these requirements will be the challenge of every Federal facilities manager. The next Chapter presents the basics on developing a holistic approach, namely, the pollution prevention approach. The remainder of this chapter briefly describes some non-CAA requirements facing Federal facility managers and how these requirements intersect with CAA requirements.

EPCRA And Pollution Prevention Planning

Executive Order 12856, entitled: "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," was signed by the President on August 3, 1993. This Executive Order requires all Federal facilities to comply with the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA, also referred to as Title III, Superfund Amendments and Reauthorization Act (SARA)) including reporting to the Toxic Release Inventory (TRI). It also initiated a pollution prevention planning process for all Federal agencies. Federal facilities are now required to file annual reports on releases to the environment and offsite transfers for over three hundred chemicals and chemical categories. Reporting is required for facilities which manufacture or process 25,000 pounds or more or otherwise use 10,000 pounds or more of any listed chemical. The 1990 Pollution Prevention Act (PPA) expanded the TRI reporting requirements to include information on waste generation and the use of source reduction and recycling to limit waste generation. A "Form R" is used for reporting. For 1987 through 1993 reporting was required for over three hundred chemicals and chemical categories. EPA then added 32 chemicals and 2 chemical categories to the list of TRI substances, requiring reporting for the first time for calendar year 1994 (12/1/93, 58FR63496 and 58FR63500). An additional 286 chemicals were added for the 1995 calendar year reporting requirements (11/30/94, 59FR61432), bringing the number of listed chemicals to over 600.

The TRI will serve as the accounting system for demonstrating compliance with the pollution prevention planning goals established by EO 12856. Federal agencies are committed to achieving a 50 percent reduction in reported TRI levels (in aggregate) for all their facilities by 1999. To the maximum extent possible the reductions are to be achieved through pollution prevention. The baseline for this planning process will be defined by the 1994 reports (due July 1, 1995). Each facility must develop a facility plan which outlines their contribution in reducing waste generation. The EO requires development of these plans by the end of 1995.

Many of the chemicals subject to reporting to TRI are also those regulated by the Clean Air Act. Thus, steps to comply with the Clean Air Act will also contribute toward meeting the goals of EO 12856. In Chapter 3, the concept of facility planning to achieve pollution prevention will be discussed as a means to meet both the Clean Air Act requirements and EO 12856.

Pollution Prevention Procurement

Federal agencies are also required to implement programs to encourage the purchase of "environmentally preferred" and recyclable products by Executive Order 12873. This Executive Order, titled: "Federal Acquisition, Recycling, and Waste Prevention" was signed October 20, 1993. EPA is charged with the responsibility of working with Federal agencies to develop guidance on what criteria should be should be used to identify acceptable products. The criteria are expected to favor the use of products which will facilitate compliance with the Clean Air Act (limited use of VOCs, HAPS, and ODCs).

Federal facilities were also encouraged to accelerate their phase out of the use of ozone depleting chemicals. Executive Order 12843, "Procurement Requirements and Polices for Federal Agencies for Ozone-Depleting Substances" (April 21, 1993) directs Federal agencies to change procurement policies to specify use of non-ozone depleting materials in advance of the 1996 deadline required by the Clean Air Act.

Conservation And Alternative Fuels

Federal facilities were tasked with expanding their focus on energy and water conservation with the signing of three additional Executive Orders.

- **EO 12844** - "Federal Use of Alternative Fueled Vehicles" - encourage the purchase of alternative fueled vehicles as a means to reduce air pollution, encourage the use of alternative energy sources, and stimulate the U. S. economy.

- **EO 12845** - "Requiring Agencies to Purchase Energy Efficient Computers" - requires Federal agencies to purchase energy efficient computer equipment as participants in the "Energy Star Computer" Program.

- **EO 12902** - "Energy Efficiency and Water Conservation at Federal Facilities" - established goals for Federal facilities to reduce energy usage in buildings and industrial processes. Facilities are also required to conduct comprehensive audits of energy and water consumption.

Implementing these Executive Orders may lead to changes in equipment and practices which may also be impacted by requirements of the Clean Air Act. Activities to reduce energy consumption may also reduce air emissions from the facility.

Media Programs

Many of the chemicals regulated by the Clean Air Act are also regulated by the "other" media programs, those to protect water quality and control waste disposal on land. Many of the same chemicals are listed in criteria for hazardous waste under the Resource Conservation and Recovery Act (RCRA). They are also regulated in water discharges through permit programs

under the Clean Water Act (CWA). The compliance burdens of these programs add to the complexity of responding to Clean Air Act requirements.

Approaching compliance through pollution prevention is one way address all of these requirements. Pollution prevention eliminates waste generation to all media and minimizes transfers between environmental media, from air to hazardous waste or air to water. Chapter 3 discusses several concepts useful in developing a pollution prevention compliance strategy to address the broad array of requirements facing Federal facilities.

CHAPTER 3

RESPONDING WITH THE P2 APPROACH

This Chapter will present some key concepts and approaches to implementing pollution prevention. Chapter 2 identified a wide array of Clean Air Act programs which will to some degree impact all Federal facilities, now, or in the future. So how do you minimize the impact of the Act? How do you reduce your compliance expenditures? Many believe the environmental management principles of pollution prevention will lessen the burden of the Clean Air Act and reduce compliance expenditures. This Chapter provides some ideas on how to incorporate a pollution prevention ethic into facility decision making. The concepts of a waste management hierarchy, pollution prevention planning, true cost accounting, and life cycle analysis are presented. These concepts lead to greater recognition of the benefits of source reduction relative to treatment approaches when considering alternative to complying with Clean Air Act requirements.

POLLUTION PREVENTION AND THE WASTE MANAGEMENT HIERARCHY

Pollution prevention (P2) is the use of materials, processes and practices that reduce or eliminate the generation of wastes at the source. EPA has defined pollution prevention as "source reduction" a term described in the Pollution Prevention Act (PPA):

> "...any practice which -- (i) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment or disposal: and (ii) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.....the term does not include any practice which alters the physical, chemical, or biological characteristics or the volume of a hazardous substance, pollutant, or contaminant through a process or activity which is not integral to and necessary for the production of a product or the providing of a service."

The PPA established as national policy, a clear preference for source reduction or P2 through a hierarchical approach to waste management:

> "....pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an

environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner."

Looking at source reduction options first, is a simple concept, but a fundamental change to traditional environmental decision making. In the past, as environmental problems surfaced, the first consideration was, how can I treat this? Or, where do I dispose of this? But with a pollution prevention perspective, the question becomes, how did I get this problem in the first place?

Solving environmental problems through pollution prevention is usually not a one shot exercise. A proactive commitment is needed, usually involving several steps over time and a greater understanding of the processes generating the waste stream. You are committed to continually reducing your waste generation. The traditional "treatment" approach for a waste stream is simpler. Generally you are in a reactive posture, working to meet a required limit by a fixed deadline. You simply size a control device to meet the limit and hope the limit doesn't change in the future. But with a pollution prevention approach, the required limit is a milestone you will achieve (or obviate the need to achieve) and hopefully exceed as you work toward the longer term goal of minimizing waste generation.

With the traditional approach, everything is understood, this level must be met by this date. But with pollution prevention, the process appears to be unbounded. What waste streams are important to tackle? Why? What's technically and economically feasible? What are the environmental implications? Are their political roadblocks? Pollution prevention requires the establishment of a planning process to consider these issues. The process requires the development of opportunity assessments and a facility plan.

POLLUTION PREVENTION PLANNING

Pollution prevention planning is a process which integrates environmental decision making into the resource planning process at a facility. The planning process generates a facility plan which identifies what steps are to be taken, when, and with what resources to reduce waste generation. Projects to implemented through the plan are usually identified through the development of opportunity assessments. The facility plan reflects a continuous and comprehensive planning process requiring reassessment and updating on a regular schedule. The planning process and periodic reassessment reflect the proactive nature of pollution prevention.

Federal Facilities are committed to a facility planning process in response to Executive Order 12856. Pollution prevention planning goals under this EO challenge Federal agencies to achieve a 50 percent reduction by 1999 from their 1994 reported releases and offsite transfers to the Toxic Release Inventory (TRI). To the maximum extent possible, federal facilities are expected to achieve these reductions through source reduction. The EO requires the development of facility plans by the end of 1995.

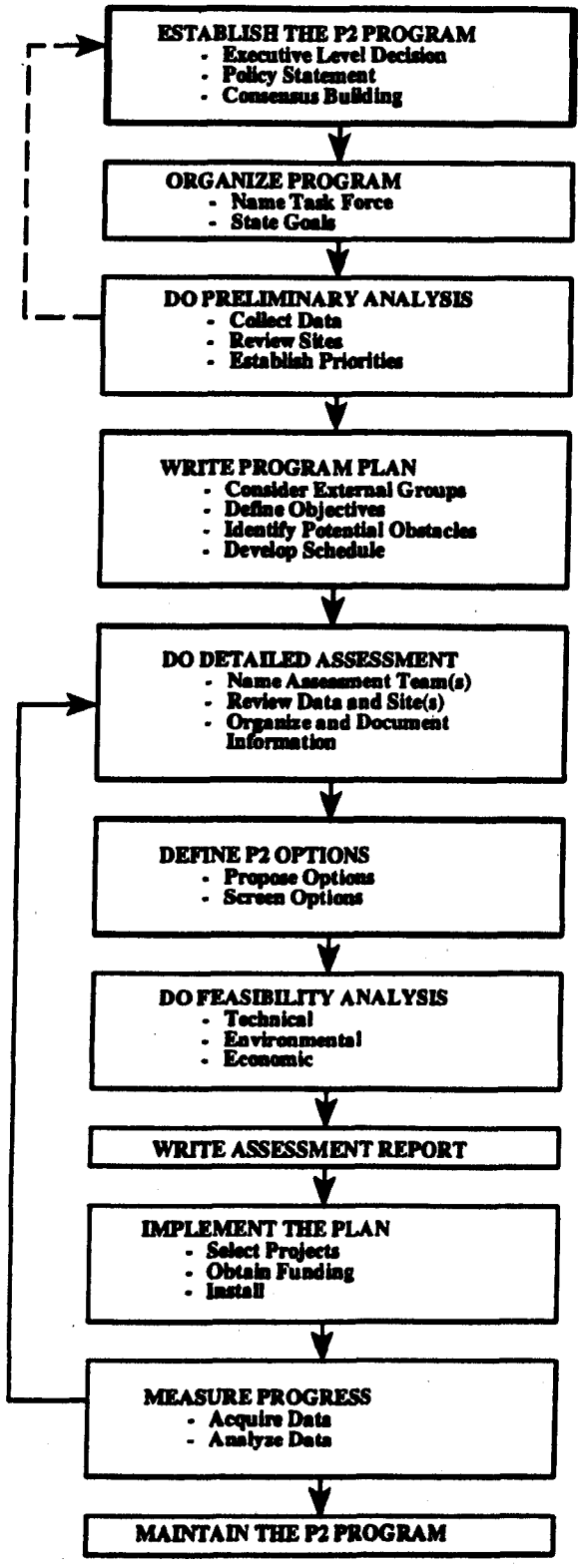
EPA's Office of Research and Development has developed a Facility Pollution Prevention Guide (5/92, EPA/600/R-92/088) which describes the pollution prevention planning process and how to conduct an opportunity assessment. Figure 2 taken from this report provides an overview of a pollution prevention planning program. Key aspects of this approach are:

- Commitment from top management through policy and resources to conduct planning;
- Baseline assessment of waste generation and the setting of priorities for further review;
- Detailed opportunity assessment of waste reduction alternatives for priority waste streams;
- Commitment to projects supported by the opportunity assessment;
- Establishment of ways to measure progress; and
- Periodic reassessment of priorities and opportunities.

The planning process requires input from all those potentially impacted by its implementation. This includes, for example, personnel representing management, procurement, facility operations and maintenance. A facility plan developed without their input has many potential pitfalls. It may not reflect reality, will be difficult to implement, and will not benefit from the knowledge of the personnel closest to the problem. The importance of the concept of "empowering the people" couldn't be more true than in pollution prevention planning.

The requirements emanating from Clean Air Act programs may drive the priority setting process and the focus of the facility plans at Federal facilities. Air emission streams resulting from the use of VOCs, HAPs, and ODCs will be prime targets for the investigation of source reduction alternatives to meet the pollution prevention goals of EO 12856. Conducting opportunity assessments is the process by which the technical, economic, environmental and political feasibility of source reduction alternatives are investigated for priority waste streams.

Figure 2
Pollution Prevention Program Overview



Opportunity assessments generally follow this approach:

- Establish an assessment team with representatives from key facility organizational units, i.e., operations, maintenance, procurement, health and safety, etc.;
- Review available data, determine information needs to define material flows and characterize sources of waste generation;
- Design site visit to fill information needs and gain the perspective of personnel most knowledgeable of the operations;
- Conduct site visit and interviews to gain targeted information;
- Organize information and propose comprehensive list of potential options in accordance with waste management hierarchy;
- Screen options to identify priority options for detailed feasibility analysis;
- Conduct detailed analyses for priority options of the technical, economic, environmental and political feasibility;
- Establish priorities for implementing options; and
- Report the results of the detailed analyses and priorities for implementation.

The results from the opportunity assessment provide the basis for identifying projects to include in the pollution prevention plan. It should also serve to identify areas where further investigation may be warranted. For a more detailed description of the pollution prevention planning process, the reader is referred to the Facility Pollution Prevention Guide.

The feasibility analyses are an important part of the opportunity assessment. The evaluation of costs and benefits can be critical when comparing source reduction alternatives with treatment options. Some of the costs associated with waste treatment can be difficult to identify or missed and, therefore, some options may be misrepresented. The concept of true cost accounting attempts to capture the full cost of potential projects. True cost accounting is important in developing feasibility assessments.

TRUE COST ACCOUNTING

True cost accounting, total cost accounting, total cost assessment, full cost accounting, and total cost analysis are all terms for accounting practices which seek to present a more accurate accounting of environmental costs. Table 3 lists many of the different costs which can be associated with capital investment projects as potential environmental expenditures. Historically, however, only the direct costs are considered in project decisions. Indirect and liability costs and less-tangible benefits associated with environmental issues are rarely considered. Many environmental costs are tracked in aggregate for facilities as overhead and not allocated to the specific waste generating operation creating the costs. Ignoring environmental costs in financial analyses results in actual costs exceeding projected costs in the long run. When comparing alternatives, the more expensive option may be chosen by mistake.

Source reduction projects can be misrepresented when only direct costs are considered. Source reduction projects almost always will have reduced indirect and liability costs in comparison to the waste treatment alternative. In some instances, source reduction approaches may have higher projected direct costs, but these costs may be offset by cost savings in other areas. For example, converting to a powder (solvent free) coating system may have greater upfront expenditures than enclosing a conventional solvent-based coater and venting it to a control device, yet significant savings would be achieved over time as a result of reduced expenses for compliance demonstration and worker protection. If only direct costs are considered, the more expensive option may be perceived as the best buy.

Accounting for these hidden costs requires more work. It requires careful review of how each option under consideration will impact the many cost categories shown in Table 3. Current cost data, such as for on-site waste management, may need to be disagregated to the specific process operation under consideration to provide a baseline to assess potential changes in costs in the feasibility analysis. Many environmental costs occur over time. Source reduction benefits would be realized over that same timeline. In analyzing these costs and benefits, the financial analysis must take into account the time value of money over time, with a time horizon which reflects the long-term costs and benefits of the alternatives considered.

Not all costs and benefits can be quantified particularly the less-tangible benefits or "social" costs, such as community relations. An effort should be made to compare in a qualitative sense the impact of alternatives on the less-tangible aspects. Recognizing the benefits of pollution prevention alternatives, such as improved working conditions, even in a qualitative sense can be factored into the feasibility analysis.

EPA has been working with the cost accounting community to develop a better understanding of the importance of environmental cost accounting and approaches to improve consideration of these costs. Several reports available on the topic are identified in Appendix B.

Table 3

COSTS AND BENEFITS OF ENVIRONMENTAL PROJECTS

Direct Costs

Capital Expenditures
- Buildings
- Equipment and Installation
- Utility Connections
- Project Engineering

Operation and Maintenance
- Raw Materials
- Labor
- Waste Disposal
- Water and Energy
- Utilities
- Value of Recovered Material

Indirect Costs

Administrative Costs

Regulatory Compliance Costs
- Permitting
- Recordkeeping and Reporting
- Monitoring
- Manifesting
- Testing
- Preparedness
- Protective Equipment
- Closure/Post Closure Assurance

Insurance

Workman's Compensation

On-Site Waste Management

On-Site Pollution Control Equipment

Liability, Health and Safety Costs

Penalties and Fines

Personal Injury

Cleanup Costs
- Superfund
- Corrective Action

Property Damage

Economic Loss

Natural Resource Damage

Worker Illness

Down Time from Accidents/Spills

Reduced Health Costs

Less-Tangible Costs and Benefits

Changing Sales or Utilization Due to:
- Improved Product or Service Quality
- Enhanced Image
- Consumer Interest in Green Products

Increased Productivity due to Improved
- Employee Relations

Avoided Future Regulatory Costs

Improved Relationships with Regulators

Improved Recruiting and Employee Retention

Enhanced Image in Budget Process

Improved Relationships with Suppliers

Improved Community Relations

LIFE CYCLE ANALYSIS

Life cycle analyses can provide a different perspective when comparing alternative projects. Life cycle analysis is a systems approach to evaluating the environmental consequences of a particular product, process or activity from "cradle to grave." Environmental effects associated with any given activity are evaluated from the initial gathering of raw materials from the earth until the point at which residuals are returned to the earth. Life cycle analyses provide organizations with a better understanding of the environmental impacts of their actions.

The concept of life cycle analysis is receiving increased acceptance in the public and private sector. Public issues such as paper versus plastic grocery bags, and disposable versus cloth diapers have been the subject of life cycle analyses. The evaluation of "green" products will increase the development of the concept and use of life cycle analyses in the future. There are no fixed ground rules or accepted practices to developing life cycle analyses and different interpretations can result from analyses prepared using different approaches. EPA's Office of Research and Development has initiated an effort to develop consensus with the scientific community on guidelines for conducting life cycle analyses.

Life cycle analyses usually contain three components:

- **Life Cycle Inventory** - process of quantifying energy and raw material requirements, releases to air, water and solid waste streams, and other environmental factors throughout the life cycle of a product, process or activity.

- **Life Cycle Impact Assessment** - assessing the impact of the environmental burdens quantified in the inventory on ecological and human health and also for social, cultural, and economic impacts.

- **Life Cycle Improvement Analysis** - analysis of opportunities to reduce or mitigate the environmental impacts throughout the life cycle.

Each of these components are not unique exercises; they overlap and build on each other in their development. The focus of most life cycle analyses prepared to date has been limited to developing life cycle inventories. Developing the inventory component for a project or competing alternatives helps define the overall resource requirements and potential targets for resource reduction efforts.

Federal facilities may want to consider developing a life cycle analysis to characterize baseline resources and impacts or compare alternatives for major new projects. For additional information on the concept of life cycle analyses, see the reports identified in Appendix B.

ADDED BENEFITS OF POLLUTION PREVENTION

Pollution preventative approaches to complying with the Clean Air Act bring about a number of added benefits. These benefits should be recognized in the development of facility plans or in the conduct of life cycle analyses. The recognition of these benefits can be key factors in project decision making. Benefits to look for include:

- **Compliance Demonstration** - as described in Chapter 2, demonstrating compliance is a continuous burden on sources. Pollution prevention options which move away from the use of regulated compounds can significantly reduce these burdens. Some aspect of monitoring, recordkeeping, and reporting requirements are generally associated with all Clean Air Act limits. Eliminating applicability of the requirements, eliminates these burdens.

- **Workplace** - source reduction options generally lead to improved workplace conditions and less concern for compliance with occupational exposure standards. Treatment options generally require use of a system to capture emissions and send them to the control device. Capture systems tend to concentrate emissions in the workplace and may lead to requirements for use of personal protective equipment such as respirators. Respirators carry with them the requirements for periodic fit testing and worker training. Source reduction techniques generally reduce workplace concentrations, provide for a more heathy workplace environment, and improve worker comfort. Improved workplace conditions lead to improved worker relations and productivity.

- **Resource Utilization** - source reduction options conserve resources, both through the elimination of material losses and the elimination of materials consumed by treatment systems, such as energy and water for scrubbers and steam stripping of carbon beds. More efficient use of materials also leads to cost savings.

- **Community Relations** -the corporate "greening" of America is driven by many companies quest for the economic benefit of improved image in the public eye. Communities react favorably to facilities' efforts to reduce waste generation. With Federal facilities reporting to the Toxic Release Inventory (TRI), communities now have a means to access changes in waste generation and the use of source reduction. Clean Air Act compliance efforts through source reduction will be visible to communities through the TRI. Facilities have the opportunity to gain positive recognition in the community for their efforts.

THE P2 APPROACH

The pollution prevention approach to Clean Air Act compliance has potential benefits not achievable through the traditional treatment approach. Source reduction won't always be the answer, but the opportunities for source reduction should always be investigated. Facility planning is the backbone of a pollution prevention program and provides a systematic process for setting priorities for reducing waste generation and investigating source reduction opportunities. This process can also be used to investigate alternatives to comply with current and future Clean Air Act requirements. Source reduction solutions to the Clean Air Act will go a long way in helping Federal facilities support their agency in achieving the pollution prevention goals of Executive Order 12856.

APPENDIX A

LISTS OF CHEMICALS REGULATED UNDER THE CLEAN AIR ACT

LIST OF REGULATED AIR POLLUTANTS

I. Pollutants For Which An NAAQS Has Been Established

lead
sulfur dioxide
nitrogen dioxide
carbon monoxide
particulate matter (PM10)
ozone, including precursors:
    nitrogen oxides (NO, NO_2, NO_3, N_2O, N_2O_3, N_2O_4, N_2O_5)
    volatile organic compounds (VOC's)

As defined in 40 CFR 51.100(s), the term VOC includes any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate) which participates in atmospheric photochemical reactions. The EPA has developed a list of substances (which is subject to change) which are excluded from the VOC definition because of their negligible reactivity. The EPA's proposal to exclude perchloroethylene from the definition was published in 57 FR 48490 (October 26, 1992) and acetone in 60 FR 31633 (June 16, 1995).

The following organic compounds are excluded from the definition of VOC because of they have been determined to have negligible photochemical reactivity:

acetone
methane
ethane
methylene chloride (dichloromethane)
1,1,1-trichloroethane (methyl chloroform)
1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113)
trichlorofluoromethane (CFC-11)
dichlorodifluoromethane (CFC-12)
chlorodifluoromethane (CFC-22)
trifluoromethane (FC-23)
1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114)
chloropentafluoroethane (CFC-115)
1,1,1-trifluoro 2,2-dichloroethane (HCFC-123)
1,1,1,2-tetrafluoroethane (HFC-134a)
1,1-dichloro 1-fluoroethane (HCFC-141b)
1-chloro 1,1-difluoroethane (HCFC-142b)
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)
pentafluoroethane (HFC-125)
1,1,2,2-tetrafluoroethane (HFC-134)
1,1,1-trifluoroethane (HFC-143a)
1,1-difluoroethane (HFC-152a)

perfluorocarbon compounds which fall into these classes:

(i) Cyclic, branched, or linear, completely fluorinated alkanes;

(ii) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;

(iii) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and

(iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

List of Regulated Air Pollutants - continued
page three

II. Pollutants Regulated Under New Source Performance Standards

Criteria pollutants (including VOC's and NO_x) plus:

dioxin/furan (defined in 40 CFR 60.53a to mean total tetra through octachlorinated dibenzo-p-dioxins and dibenzofurans)*
fluorides
hydrogen chloride*
hydrogen sulfide (H_2S)
sulfuric acid mist
total reduced sulfur
reduced sulfur compounds
total suspended particulate

* The new source performance standard (NSPS) for municipal waste combustors (MWC) controls emissions of dioxin/furans and hydrogen chloride gas (40 CFR 60.53a and 60.54a) as surrogates for controlling emissions of organic compounds and acid gases which are emitted in the exhaust gases from MWC units. Thus, the indicated dioxin/furan compounds and hydrogen chloride are regulated pollutants.

List of Regulated Air Pollutants - continued
page four

III. Class I And Class II Substances Under Title VI

Class I Substances

carbon tetrachloride
chlorofluorocarbon-11 (CFC-11)
chlorofluorocarbon-12 (CFC-12)
chlorofluorocarbon-13 (CFC-13)
chlorofluorocarbon-111 (CFC-111)
chlorofluorocarbon-112 (CFC-112)
chlorofluorocarbon-113 (CFC-113)
chlorofluorocarbon-114 (CFC-114)
chlorofluorocarbon-115 (CFC-115)
chlorofluorocarbon-211 (CFC-211)
chlorofluorocarbon-212 (CFC-212)
chlorofluorocarbon-213 (CFC-213)
chlorofluorocarbon-214 (CFC-214)
chlorofluorocarbon-215 (CFC-215)
chlorofluorocarbon-216 (CFC-216)
chlorofluorocarbon-217 (CFC-217)
halon-1211
halon-1301
halon-2402
methyl chloroform

Class II Substances

hydrochlorofluorocarbon-21 (HCFC-21)
hydrochlorofluorocarbon-22 (HCFC-22)
hydrochlorofluorocarbon-31 (HCFC-31)
hydrochlorofluorocarbon-121 (HCFC-121)
hydrochlorofluorocarbon-122 (HCFC-122)
hydrochlorofluorocarbon-123 (HCFC-123)
hydrochlorofluorocarbon-124 (HCFC-124)
hydrochlorofluorocarbon-131 (HCFC-131)
hydrochlorofluorocarbon-132 (HCFC-132)
hydrochlorofluorocarbon-133 (HCFC-133)
hydrochlorofluorocarbon-141 (HCFC-141)
hydrochlorofluorocarbon-142 (HCFC-142)
hydrochlorofluorocarbon-221 (HCFC-221)
hydrochlorofluorocarbon-222 (HCFC-222)
hydrochlorofluorocarbon-223 (HCFC-223)

List of Regulated Air Pollutants - continued
page five

Class II Substances - continued

hydrochlorofluorocarbon-224 (HCFC-224)
hydrochlorofluorocarbon-225 (HCFC-225)
hydrochlorofluorocarbon-226 (HCFC-226)
hydrochlorofluorocarbon-231 (HCFC-231)
hydrochlorofluorocarbon-232 (HCFC-232)
hydrochlorofluorocarbon-233 (HCFC-233)
hydrochlorofluorocarbon-234 (HCFC-234)
hydrochlorofluorocarbon-235 (HCFC-235)
hydrochlorofluorocarbon-241 (HCFC-241)
hydrochlorofluorocarbon-242 (HCFC-242)
hydrochlorofluorocarbon-243 (HCFC-243)
hydrochlorofluorocarbon-244 (HCFC-244)
hydrochlorofluorocarbon-251 (HCFC-251)
hydrochlorofluorocarbon-252 (HCFC-252)
hydrochlorofluorocarbon-253 (HCFC-253)
hydrochlorofluorocarbon-261 (HCFC-261)
hydrochlorofluorocarbon-262 (HCFC-262)
hydrochlorofluorocarbon-271 (HCFC-271)

IV. Pollutants Regulated Under Section 112

Pollutants for which national emission standards for hazardous air pollutants (NESHAP's) were established prior to the passage of the 1990 Clean Air Act Amendments:

arsenic
asbestos
beryllium
benzene
mercury
radionuclides
vinyl chloride

V. Pollutants listed in Section 112(b):

The following 189 pollutants were listed as Hazardous Air Pollutants (HAPs) in section 112(b) of the 1990 Clean Air Act Amendments. The section 112(b) list contains some technical errors which will be corrected in subsequent rulemaking. The majority of the technical corrections likely to be made are noted below.

CAS number	Chemical name
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitrile
98862	Acetophenone
53963	2-Acetylaminofluorene
107028	Acrolein
79061	Acrylamide
79107	Acrylic acid
107131	Acrylonitrile
107051	Allyl chloride
92671	4-Aminobiphenyl
62533	Aniline
90040	o-Anisidine
1332214	Asbestos
71432	Benzene (including benzene from gasoline
92875	Benzidine
98077	Benzotrichloride
100447	Benzyl chloride
92524	Biphenyl
117817	Bis(2-ethylhexyl)phthalate (DEHP)
542881	Bis(chloromethyl)ether
75252	Bromoform
106990	1,3-Butadiene
156627	Calcium cyanamide
105602	Caprolactam
133062	Captan
63252	Carbaryl
75150	Carbon disulfide
56235	Carbon tetrachloride
463581	Carbonyl sulfide
120809	Catechol
133904	Chloramben
57749	Chlordane

List of Regulated Air Pollutants - continued
page eight

CAS number	Chemical name
7782505	Chlorine
79118	Chloroacetic acid
532274	2-Chloroacetophenone
108907	Chlorobenzene
510156	Chlorobenzilate
67663	Chloroform
107302	Chloromethyl methyl ether
126998	Chloroprene
1319773	Cresols/Cresylic acid (isomers and mixture)
95487	o-Cresol
108394	m-Cresol
106445	p-Cresol
98828	Cumene
94757	2,4-D (2,4-Dichlorophenoxyacetic acid, including salts and esters)
	DDE [recommended technical correction: CAS number 72559] (1,1-dichloro-2,2-bis(p-chlorophenyl) ethylene)
334883	Diazomethane
132649	Dibenzofurans [recommended technical correction: Dibenzofuran]
96128	1,2-Dibromo-3-chloropropane
84742	Dibutylphthalate
106467	1,4-Dichlorobenzene(p) [recommended technical correction: 1,4-Dichlorobenzene]
91941	3,3-Dichlorobenzidene [recommended technical correction: 3,3'-Dichlorobenzidine]
111444	Dichloroethyl ether (Bis(2-chloroethyl)ether)
542756	1,3-Dichloropropene
62737	Dichlorvos
111422	Diethanolamine
121697	N,N-Diethyl aniline (N,N-Dimethylaniline) [recommended technical correction: N,N-Dimethylaniline]
64675	Diethyl sulfate
119904	3,3-Dimethoxybenzidine [recommended technical correction: 3,3'-Dimethoxybenzidine]
60117	Dimethyl aminoazobenzene
119937	3,3',-Dimethyl benzidine [recommended technical correction: 3,3',-Dimethylbenzidine]
79447	Dimethyl carbamoyl chloride [recommended technical correction: Dimethylcarbamoyl chloride]
68122	Dimethyl formamide [recommended technical correction: N,N-Dimethylformamide]

List of Regulated Air Pollutants - continued
page nine

CAS number	Chemical name
57147	1,1-Dimethyl hydrazine [recommended technical correction: 1,1-Dimethylhydrazine]
131113	Dimethyl phthalate
77781	Dimethyl sulfate
----	4,6-Dinitro-o-cresol, and salts [recommended technical correction to remove CAS number]
51285	2,4-Dinitrophenol
121142	2,4-Dinitrotoluene
123911	1,4-Dioxane (1,4-Diethyleneoxide)
122667	1,2-Diphenylhydrazine
106898	Epichlorohydrin (l-Chloro-2,3-epoxypropane)
106887	1,2-Epoxybutane
140885	Ethyl acrylate
100414	Ethyl benzene [recommended technical correction: Ethylbenzene]
51796	Ethyl carbamate (Urethane)
75003	Ethyl chloride (Chloroethane)
106934	Ethylene dibromide (Dibromoethane)
107062	Ethylene dichloride (1,2-Dichloroethane)
107211	Ethylene glycol
151564	Ethylene imine (Aziridine) [recommended technical correction: Ethyleneimine (Aziridine)]
75218	Ethylene oxide
96457	Ethylene thiourea
75343	Ethylidene dichloride (1,1-Dichloroethane)
50000	Formaldehyde
76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene
77474	Hexachlorocyclopentadiene
67721	Hexachloroethane
822060	Hexamethylene-1,6-diisocyanate
680319	Hexamethylphosphoramide
110543	Hexane
302012	Hydrazine
7647010	Hydrochloric acid [recommended technicalcorrection: Hydrochloric acid (hydrogen chloride)(gas only)]
7664393	Hydrogen fluoride (Hydrofluoric acid)
123319	Hydroquinone
78591	Isophorone

List of Regulated Air Pollutants - continued
page ten

CAS number	Chemical name
----	Lindane (all isomers) [Recommended technical correction: 1,2,3,4,5,6-Hexachlorocyclohexane (all stereo isomers, including lindane)]
108316	Maleic anhydride
67561	Methanol
72435	Methoxychlor 74839 Methyl bromide (Bromomethane)
74873	Methyl chloride (Chloromethane)
71556	Methyl chloroform (1,1,1-Trichloroethane)
78933	Methyl ethyl ketone (2-Butanone)
60344	Methyl hydrazine [recommended technical correction: Methylhydrazine]
74884	Methyl iodide (Iodomethane)
108101	Methyl isobutyl ketone (Hexone)
624839	Methyl isocyanate
80626	Methyl methacrylate
1634044	Methyl tert butyl ether [recommended technical correction: Methyl tert-butyl ether]
101144	4,4-Methylene bis(2-chloroaniline) [recommended technical correction: 4,4'-Methylenebis(2-chloroaniline]
75092	Methylene chloride (Dichloromethane)
101688	Methylene diphenyl diisocyanate (MDI) [recommended technical correction: 4-4' Methylenediphenyl diisocyanate (MDI)]
101779	4,4,-Methylenedianiline
91203	Naphthalene
98953	Nitrobenzene
92933	4-Nitrobiphenyl
100027	4-Nitrophenol
79469	2-Nitropropane
684935	N-Nitroso-N-methylurea
62759	N-Nitrosodimethylamine
59892	N-Nitrosomorpholine
56382	Parathion
82688	Pentachloronitrobenzene (Quintobenzene)
87865	Pentachlorophenol
108952	Phenol
106503	p-Phenylenediamine
75445	Phosgene
7803512	Phosphine
7723140	Phosphorus
85449	Phthalic anhydride

List of Regulated Air Pollutants - continued

CAS number	Chemical name
1336363	Polychlorinated biphenyls (Aroclors)
1120714	1,3-Propane sultone
57578	beta-Propiolactone
123386	Propionaldehyde
114261	Propoxur (Baygon)
78875	Propylene dichloride (1,2-Dichloropropane)
75569	Propylene oxide
75558	1,2-Propylenimine (2-Methyl aziridine)
91225	Quinoline
106514	Quinone
100425	Styrene
96093	Styrene oxide
1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene (Perchloroethylene)
7550450	Titanium tetrachloride
108883	Toluene
95807	2,4-Toluene diamine [recommended technical correction: 2,4-Toluenediamine]
584849	2,4-Toluene diisocyanate
95534	o-Toluidine
8001352	Toxaphene (chlorinated camphene)
120821	1,2,4-Trichlorobenzene
79005	1,1,2-Trichloroethane
79016	Trichloroethylene
95954	2,4,5-Trichlorophenol
88062	2,4,6-Trichlorophenol
121448	Triethylamine
1582098	Trifluralin
540841	2,2,4-Trimethylpentane
108054	Vinyl acetate
593602	Vinyl bromide
75014	Vinyl chloride
75354	Vinylidene chloride (1,1-Dichloroethylene)
1330207	Xylenes (isomers and mixture)
95476	o-Xylenes [recommended technical correction: o-Xylene]
108383	m-Xylenes [recommended technical correction: m-Xylene]
106423	p-Xylenes [recommended technical correction:p-Xylene]
0	Antimony Compounds

CAS number	Chemical name
0	Arsenic Compounds (inorganic including arsine)
0	Beryllium Compounds
0	Cadmium Compounds
0	Chromium Compounds
0	Cobalt Compounds
0	Coke Oven Emissions
0	Cyanide Compounds [1]
0	Glycol ethers [2]
0	Lead Compounds
0	Manganese Compounds
0	Mercury Compounds
0	Fine mineral fibers [3]
0	Nickel Compounds
0	Polycylic Organic Matter [4] [recommended technical correction: Polycyclic Organic Matter]
0	Radionuclides (including radon) [5]
0	Selenium Compounds

NOTE: For all listings above which contain the word "compounds" and for glycol ethers, the following applies: Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony, arsenic, etc.) as part of that chemical's infrastructure.

1 X'CN where X = H' or any other group where a formal dissociation may occur. For example KCN or $Ca(CN)_2$

2 Includes mono- and di- ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(OCH2CH2)n-OR' where

n = 1, 2, or 3

R = alkyl or aryl groups

R' = R, H, or groups which, when removed, yield glycol ethers with the structure: $R\text{-}(OCH2CH)_n\text{-}OH$.* [recommended technical correction: $R\text{-}(OCH2CH2)_n\text{-}OH$] Polymers are excluded from the glycol category.

3 Includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.

4 Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100°C.* [recommended technical correction: Limited to, or refers to, products from incomplete combustion of organic compounds (or material) and pyrolysis processes having more than one benzene ring, and which have a boiling point greater than or equal to 100°C.]

5 A type of atom which spontaneously undergoes radioactive decay.

VI. Pollutants Listed Under Section 112(r):

Section 112(r)(3) requires that EPA promulgate an initial list of at least 100 substances with threshold quantities which would cause or may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment if accidentally released. EPA's rule to implement 112(r)(3) was published in the Federal Register on January 31, 19943 (59 FR 4478). The list of substances includes 77 acutely toxic substances, 63 flammable gases and volatile flammable liquids, and commercial explosives (classified by the Department of Transportation in Division 1.1). The listed pollutants are shown on the attached Tables 1 and 2 from the FR notice.

TABLE 1 TO §68.130 - LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION
[ALPHABETICAL ORDER - 77 SUBSTANCES]

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Acrolein [2-Propenal]	107-02-8	5,000	b
Acrylonitrile [2-Propenenitrile]	107-13-1	20,000	b
Acrylyl chloride [2-Propenoyl chloride]	814-68-6	5,000	b
Allyl alcohol [2-Propen-1-ol]	107-18-6	15,000	b
Allylamine [2-Propen-1-amine]	107-11-9	10,000	b
Ammonia (anhydrous)	7664-41-7	10,000	a, b
Ammonia (conc 20% or greater)	7664-41-7	20,000	a, b
Arsenous trichloride	7784-34-1	15,000	b
Arsine	7784-42-1	1,000	b
Boron trichloride [Borane, trichloro-]	10294-34-5	5,000	b
Boron trifluoride [Borane, trifluoro-]	7637-07-2	5,000	b
Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[metane]]-, T-4-	353-42-4	15,000	b
Bromine	7726-95-6	10,000	a, b
Carbon disulfide	75-15-0	20,000	b
Chlorine	7782-50-5	2,500	a, b
Chlorine dioxide [Chlorine oxide (ClO2)]	10049-04-4	1,000	c
Chloroform [Methane, trichloro-]	67-66-3	20,000	b
Chloromethyl ether [Methane, oxybis[chloro-]	542-88-1	1,000	b
Chloromethyl methyl ether [Methane, chloromethoxy-]	107-30-2	5,000	b
Crotonaldehyde [2-Butenal]	4170-30-3	20,000	b
Crotonaldehyde, (E)- [2-Butenal, (E)-]	123-73-9	20,000	b
Cyanogen chloride	506-77-4	10,000	c
Cyclohexylamine [Cyclohexanamine]	108-91-8	15,000	b
Diborane	19287-45-7	2,500	b
Dimethyldichlorosilane [Silane, dichlorodimethyl-]	75-78-5	5,000	b
1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	57-14-7	15,000	b
Epichlorohydrin [Oxirane, (chloromethyl)-]	106-89-8	20,000	b
Ethylenediamine [1,2-Ethanediamine]	107-15-3	20,000	b

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Ethyleneimine [Aziridine]	151-56-4	10,000	b
Ethylene oxide [Oxirane]	75-21-8	10,000	a, b
Fluorine	7782-41-4	1,000	b
Formaldehyde (solution)	50-00-0	15,000	b
Furan	110-00-9	5,000	b
Hydrazine	302-01-2	15,000	b
Hydrochloric acid (conc 30% or greater)	7647-01-0	15,000	d
Hydrocyanic acid	74-90-8	2,500	a, b
Hydrogen chloride (anhydrous) [Hydrochloric acid]	7647-01-0	5,000	a
Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	7664-39-3	1,000	a, b
Hydrogen selenide	7783-07-5	500	b
Hydrogen sulfide	7783-06-4	10,000	a, b
Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	13463-40-6	2,500	b
Isobutyronitrile [Propanenitrile, 2-methyl-]	78-82-0	20,000	b
Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	108-23-6	15,000	b
Methacrylonitrile [2-Propenenitrile, 2-methyl-]	126-98-7	10,000	b
Methyl chloride [Methane, chloro-]	74-87-3	10,000	a
Methyl chloroformate [Carbonochloridic acid, methylester]	79-22-1	5,000	b
Methyl hydrazine [Hydrazine, methyl-]	60-34-4	15,000	b
Methyl isocyanate [Methane, isocyanato-]	624-83-9	10,000	a, b
Methyl mercaptan [Methanethiol]	74-93-1	10,000	b
Methyl thiocyanate [Thiocyanic acid, methyl ester]	556-64-9	20,000	b
Methyltrichlorosilane [Silane, trichloromethyl-]	75-79-6	5,000	b
Nickel carbonyl	13463-39-3	1,000	b
Nitric acid (conc 80% or greater)	7697-37-2	15,000	b
Nitric oxide [Nitrogen oxide (NO)]	10102-43-9	10,000	b
Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide][1]	8014-95-7	10,000	e

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Peracetic acid [Ethaneperoxoic acid]	79-21-0	10,000	b
Perchloromethylmercaptan [Methanesulfenyl chloride, trichloro-]	594-42-3	10,000	b
Phosgene [Carbonic dichloride]	75-44-5	500	a, b
Phosphine	7803-51-2	5,000	b
Phosphorus oxychloride [Phosphoryl chloride]	10025-87-3	5,000	b
Phosphorus trichloride [Phosphorous trichloride]	7719-12-2	15,000	b
Piperidine	110-89-4	15,000	b
Propionitrile [Propanenitrile]	107-12-0	10,000	b
Propyl chloroformate [Carbonochloridic acid, propylester]	109-61-5	15,000	b
Propyleneimine [Aziridine, 2-methyl-]	75-55-8	10,000	b
Propylene oxide [Oxirane, methyl-]	75-56-9	10,000	b
Sulfur dioxide (anhydrous)	7446-09-5	5,000	a, b
Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	7783-60-0	2,500	b
Sulfur trioxide	7446-11-9	10,000	a, b
Tetramethyllead [Plumbane, tetramethyl-]	75-74-1	10,000	b
Tetranitromethane [Methane, tetranitro-]	509-14-8	10,000	b
Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	7550-45-0	2,500	b
Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-][1]	584-84-9	10,000	a
Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-][1]	91-08-7	10,000	a
Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-][1]	26471-62-5	10,000	a
Trimethylchlorosilane [Silane, chlorotrimethyl-]	75-77-4	10,000	b
Vinyl acetate monomer [Acetic acid ethenyl ester]	108-05-4	15,000	b

[1]The mixture exemption in §68.115(b)(1) does not apply to the substance.
Basis for Listing:
[a]Mandated for listing by Congress.
[b]On EHS list, vapor pressure 10 mmHg or greater.
[c]Toxic gas.
[d]Toxicity of hydrogen chloride, potential to release hydrogen chloride, and history of accidents.
[e]Toxicity of sulfur trioxide and sulfuric acid, potential to release sulfur trioxide, and history of accidents.

TABLE 2 TO §68.130 - LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION
[CAS NUMBER ORDER - 77 SUBSTANCES]

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
50-00-0	Formaldehyde (solution)	15,000	b
57-14-7	1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	15,000	b
60-34-4	Methyl hydrazine [Hydrazine, methyl-]	15,000	b
67-66-3	Chloroform [Methane, trichloro-]	20,000	b
74-87-3	Methyl chloride [Methane, chloro-]	10,000	a
74-90-8	Hydrocyanic acid	2,500	a, b
74-93-1	Methyl mercaptan [Methanethiol]	10,000	b
75-15-0	Carbon disulfide	20,000	b
75-21-8	Ethylene oxide [Oxirane]	10,000	a, b
75-44-5	Phosgene [Carbonic dichloride]	500	a, b
75-55-8	Propyleneimine [Aziridine, 2-methyl-]	10,000	b
75-56-9	Propylene oxide [Oxirane, methyl-]	10,000	b
75-74-1	Tetramethyllead [Plumbane, tetramethyl-]	10,000	b
75-77-4	Trimethylchlorosilane [Silane, chlorotrimethyl-]	10,000	b
75-78-5	Dimethyldichlorosilane [Silane, dichlorodimethyl-]	5,000	b
75-79-6	Methyltrichlorosilane [Silane, trichloromethyl-]	5,000	b
78-82-0	Isobutyronitrile [Propanenitrile, 2-methyl-]	20,000	b
79-21-0	Peracetic acid [Ethaneperoxoic acid]	10,000	b
79-22-1	Methyl chloroformate [Carbonochloridic acid, methylester]	5,000	b
91-08-7	Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-][1]	10,000	a
106-89-8	Epichlorohydrin [Oxirane, (chloromethyl)-]	20,000	b
107-02-8	Acrolein [2-Propenal]	5,000	b
107-11-9	Allylamine [2-Propen-1-amine]	10,000	b
107-12-0	Propionitrile [Propanenitrile]	10,000	b
107-13-1	Acrylonitrile [2-Propenenitrile]	20,000	b
107-15-3	Ethylenediamine [1,2-Ethanediamine]	20,000	b
107-18-6	Allyl alcohol [2-Propen-1-ol]	15,000	b
107-30-2	Chloromethyl methyl ether [Methane, chloromethoxy-]	5,000	b

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
108-05-4	Vinyl acetate monomer [Acetic acid ethenyl ester]	15,000	b
108-23-6	Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	15,000	b
108-91-8	Cyclohexylamine [Cyclohexanamine]	15,000	b
109-61-5	Propyl chloroformate [Carbonochloridic acid, propylester]	15,000	b
110-00-9	Furan	5,000	b
110-89-4	Piperidine	15,000	b
123-73-9	Crotonaldehyde, (E)- [2-Butenal, (E)-]	20,000	b
126-98-7	Methacrylonitrile [2-Propenenitrile, 2-methyl-]	10,000	b
151-56-4	Ethyleneimine [Aziridine]	10,000	b
302-01-2	Hydrazine	15,000	b
353-42-4	Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[metane]]-, T-4-	15,000	b
506-77-4	Cyanogen chloride	10,000	c
509-14-8	Tetranitromethane [Methane, tetranitro-]	10,000	b
542-88-1	Chloromethyl ether [Methane, oxybis[chloro-]	1,000	b
556-64-9	Methyl thiocyanate [Thiocyanic acid, methyl ester]	20,000	b
584-84-9	Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-][1]	10,000	a
594-42-3	Perchloromethylmercaptan [Methanesulfenyl chloride, trichloro-]	10,000	b
624-83-9	Methyl isocyanate [Methane, isocyanato-]	10,000	a, b
814-68-6	Acrylyl chloride [2-Propenoyl chloride]	5,000	b
4170-30-3	Crotonaldehyde [2-Butenal]	20,000	b
7446-09-5	Sulfur dioxide (anhydrous)	5,000	a, b
7446-11-9	Sulfur trioxide	10,000	a, b
7550-45-0	Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	2,500	b
7637-07-2	Boron trifluoride [Borane, trifluoro-]	5,000	b
7647-01-0	Hydrochloric acid (conc 30% or greater)	15,000	d
7647-01-0	Hydrogen chloride (anhydrous) [Hydrochloric acid]	5,000	a

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
7664-39-3	Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	1,000	a, b
7664-41-7	Ammonia (anhydrous)	10,000	a, b
7664-41-7	Ammonia (conc 20% or greater)	20,000	a, b
7697-37-2	Nitric acid (conc 80% or greater)	15,000	b
7719-12-2	Phosphorus trichloride [Phosphorous trichloride]	15,000	b
7726-95-6	Bromine	10,000	a, b
7782-41-4	Fluorine	1,000	b
7782-50-5	Chlorine	2,500	a, b
7783-06-4	Hydrogen sulfide	10,000	a, b
7783-07-5	Hydrogen selenide	500	b
7783-60-0	Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	2,500	b
7784-34-1	Arsenous trichloride	15,000	b
7784-42-1	Arsine	1,000	b
7803-51-2	Phosphine	5,000	b
8014-95-7	Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide][1]	10,000	e
10025-87-3	Phosphorus oxychloride [Phosphoryl chloride]	5,000	b
10049-04-4	Chlorine dioxide [Chlorine oxide (ClO2)]	1,000	c
10102-43-9	Nitric oxide [Nitrogen oxide (NO)]	10,000	b
10294-34-5	Boron trichloride [Borane, trichloro-]	5,000	b
13463-39-3	Nickel carbonyl	1,000	b
13463-40-6	Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	2,500	b
19287-45-7	Diborane	2,500	b
26471-62-5	Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-][1]	10,000	a

[1]The mixture exemption in §68.115(b)(1) does not apply to the substance.

Basis for Listing:
[a]Mandated for listing by Congress.
[b]On EHS list, vapor pressure 10 mmHg or greater.
[c]Toxic gas.
[d]Toxicity of hydrogen chloride, potential to release hydrogen chloride, and history of accidents.
[e]Toxicity of sulfur trioxide and sulfuric acid, potential to release sulfur trioxide, and history of accidents.

TABLE 3 TO §68.130 - LIST OF REGULATED FLAMMABLE SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION
[ALPHABETICAL ORDER - 63 SUBSTANCES]

Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
Acetaldehyde	75-07-0	10,000	g
Acetylene [Ethyne]	74-86-2	10,000	f
Bromotrifluorethylene [Ethene, bromotrifluoro-]	598-73-2	10,000	f
1,3-Butadiene	106-99-0	10,000	f
Butane	106-97-8	10,000	f
1-Butene	106-98-9	10,000	f
2-Butene	107-01-7	10,000	f
Butene	25167-67-3	10,000	f
2-Butene-cis	590-18-1	10,000	f
2-Butene-trans [2-Butene, (E)]	624-64-6	10,000	f
Carbon oxysulfide [Carbon oxide sulfide (COS)]	463-58-1	10,000	f
Chlorine monoxide [Chlorine oxide]	7791-21-1	10,000	f
2-Chloropropylene [1-Propene, 2-chloro-]	557-98-2	10,000	g
1-Chloropropylene [1-Propene, 1-chloro-]	590-21-6	10,000	g
Cyanogen [Ethanedinitrile]	460-19-5	10,000	f
Cyclopropane	75-19-4	10,000	f
Dichlorosilane [Silane, dichloro-]	4109-96-0	10,000	f
Difluoroethane [Ethane, 1,1-difluoro-]	75-37-6	10,000	f
Dimethylamine [Methanamine, N-methyl-]	124-40-3	10,000	f
2,2-Dimethylpropane [Propane, 2,2-dimethyl-]	463-82-1	10,000	f
Ethane	74-84-0	10,000	f
Ethyl acetylene [1-Butyne]	107-00-6	10,000	f
Ethylamine [Ethanamine]	75-04-7	10,000	f
Ethyl chloride [Ethane, chloro-]	75-00-3	10,000	f
Ethylene [Ethene]	74-85-1	10,000	f
Ethyl ether [Ethane, 1,1'-oxybis-]	60-29-7	10,000	g
Ethyl mercaptan [Ethanethiol]	75-08-1	10,000	g
Ethyl nitrite [Nitrous acid, ethyl ester]	109-95-5	10,000	f
Hydrogen	1333-74-0	10,000	f

Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
Isobutane [Propane, 2-methyl]	75-28-5	10,000	f
Isopentane [Butane, 2-methyl-]	78-78-4	10,000	g
Isoprene [1,3-Butadiene, 2-methyl-]	78-79-5	10,000	g
Isopropylamine [2-Propanamine]	75-31-0	10,000	g
Isopropyl chloride [Propane, 2-chloro-]	75-29-6	10,000	g
Methane	74-82-8	10,000	f
Methylamine [Methanamine]	74-89-5	10,000	f
3-Methyl-1-butene	563-45-1	10,000	f
2-Methyl-1-butene	563-46-2	10,000	g
Methyl ether [Methane, oxybis-]	115-10-6	10,000	f
Methyl formate [Formic acid, methyl ester]	107-31-3	10,000	g
2-Methylpropene [1-Propene, 2-methyl-]	115-11-7	10,000	f
1,3-Pentadiene	504-60-9	10,000	f
Pentane	109-66-0	10,000	g
1-Pentene	109-67-1	10,000	g
2-Pentene, (E)-	646-04-8	10,000	g
2-Pentene, (Z)-	627-20-3	10,000	g
Propadiene [1,2-Propadiene]	463-49-0	10,000	f
Propane	74-98-6	10,000	f
Propylene [1-Propene]	115-07-1	10,000	f
Propyne [1-Propyne]	74-99-7	10,000	f
Silane	7803-62-5	10,000	f
Tetrafluoroethylene [Ethene, tetrafluoro-]	116-14-3	10,000	f
Tetramethylsilane [Silane, tetramethyl-]	75-76-3	10,000	g
Trichlorosilane [Silane, trichloro-]	10025-78-2	10,000	g
Trifluorochloroethylene [Ethene, chlorotrifluoro-]	79-38-9	10,000	f
Trimethylamine [Methanamine, N,N-dimethyl-]	75-50-3	10,000	f
Vinyl acetylene [1-Buten-3-yne]	689-97-4	10,000	f
Vinyl chloride [Ethene, chloro-]	75-01-4	10,000	a, f
Vinyl ethyl ether [Ethene, ethoxy-]	109-92-2	10,000	g
Vinyl fluoride [Ethene, fluoro-]	75-02-5	10,000	f

Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
Vinylidene chloride [Ethene, 1,1-dichloro-]	75-35-4	10,000	g
Vinylidene fluoride [Ethene, 1,1-difluoro-]	75-38-7	10,000	f
Vinyl methyl ether [Ethene, methoxy-]	107-25-5	10,000	f

Basis for Listing:

[a]Mandated for listing by Congress.
[f]Flammable gas.
[g]Volatile flammable liquid.

TABLE 4 TO §68.130 - LIST OF REGULATED FLAMMABLE SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION
[CAS NUMBER ORDER - 63 SUBSTANCES]

CAS No.	Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
60-29-7	Ethyl ether [Ethane, 1,1'-oxybis-]	60-29-7	10,000	g
74-82-8	Methane	74-82-8	10,000	f
74-84-0	Ethane	74-84-0	10,000	f
74-85-1	Ethylene [Ethene]	74-85-1	10,000	f
74-86-2	Acetylene [Ethyne]	74-86-2	10,000	f
74-89-5	Methylamine [Methanamine]	74-89-5	10,000	f
74-98-6	Propane	74-98-6	10,000	f
74-99-7	Propyne [1-Propyne]	74-99-7	10,000	f
75-00-3	Ethyl chloride [Ethane, chloro-]	75-00-3	10,000	f
75-01-4	Vinyl chloride [Ethene, chloro-]	75-01-4	10,000	a, f
75-02-5	Vinyl fluoride [Ethene, fluoro-]	75-02-5	10,000	f
75-04-7	Ethylamine [Ethanamine]	75-04-7	10,000	f
75-07-0	Acetaldehyde	75-07-0	10,000	g
75-08-1	Ethyl mercaptan [Ethanethiol]	75-08-1	10,000	g
75-19-4	Cyclopropane	75-19-4	10,000	f
75-28-5	Isobutane [Propane, 2-methyl]	75-28-5	10,000	f
75-29-6	Isopropyl chloride [Propane, 2-chloro-]	75-29-6	10,000	g
75-31-0	Isopropylamine [2-Propanamine]	75-31-0	10,000	g
75-35-4	Vinylidene chloride [Ethene, 1,1-dichloro-]	75-35-4	10,000	g
75-37-6	Difluoroethane [Ethane, 1,1-difluoro-]	75-37-6	10,000	f
75-38-7	Vinylidene fluoride [Ethene, 1,1-difluoro-]	75-38-7	10,000	f
75-50-3	Trimethylamine [Methanamine, N,N-dimethyl-]	75-50-3	10,000	f
75-76-3	Tetramethylsilane [Silane, tetramethyl-]	75-76-3	10,000	g
78-78-4	Isopentane [Butane, 2-methyl-]	78-78-4	10,000	g
78-79-5	Isoprene [1,3-Butadiene, 2-methyl-]	78-79-5	10,000	g

CAS No.	Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
79-38-9	Trifluorochloroethylene [Ethene, chlorotrifluoro-]	79-38-9	10,000	f
106-97-8	Butane	106-97-8	10,000	f
106-98-9	1-Butene	106-98-9	10,000	f
106-99-0	1,3-Butadiene	106-99-0	10,000	f
107-00-6	Ethyl acetylene [1-Butyne]	107-00-6	10,000	f
107-01-7	2-Butene	107-01-7	10,000	f
107-25-5	Vinyl methyl ether [Ethene, methoxy-]	107-25-5	10,000	f
107-31-3	Methyl formate [Formic acid, methyl ester]	107-31-3	10,000	g
109-66-0	Pentane	109-66-0	10,000	g
109-67-1	1-Pentene	109-67-1	10,000	g
109-92-2	Vinyl ethyl ether [Ethene, ethoxy-]	109-92-2	10,000	g
109-95-5	Ethyl nitrite [Nitrous acid, ethyl ester]	109-95-5	10,000	f
115-07-1	Propylene [1-Propene]	115-07-1	10,000	f
115-10-6	Methyl ether [Methane, oxybis-]	115-10-6	10,000	f
115-11-7	2-Methylpropene [1-Propene, 2-methyl-]	115-11-7	10,000	f
116-14-3	Tetrafluoroethylene [Ethene, tetrafluoro-]	116-14-3	10,000	f
124-40-3	Dimethylamine [Methanamine, N-methyl-]	124-40-3	10,000	f
460-19-5	Cyanogen [Ethanedinitrile]	460-19-5	10,000	f
463-49-0	Propadiene [1,2-Propadiene]	463-49-0	10,000	f
463-58-1	Carbon oxysulfide [Carbon oxide sulfide (COS)]	463-58-1	10,000	f
463-82-1	2,2-Dimethylpropane [Propane, 2,2-dimethyl-]	463-82-1	10,000	f
504-60-9	1,3-Pentadiene	504-60-9	10,000	f
557-98-2	2-Chloropropylene [1-Propene, 2-chloro-]	557-98-2	10,000	g
563-45-1	3-Methyl-1-butene	563-45-1	10,000	f
563-46-2	2-Methyl-1-butene	563-46-2	10,000	g
590-18-1	2-Butene-cis	590-18-1	10,000	f
590-21-6	1-Chloropropylene [1-Propene, 1-chloro-]	590-21-6	10,000	g

CAS No.	Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
598-73-2	Bromotrifluorethylene [Ethene, bromotrifluoro-]	598-73-2	10,000	f
624-64-6	2-Butene-trans [2-Butene, (E)]	624-64-6	10,000	f
627-20-3	2-Pentene, (Z)-	627-20-3	10,000	g
646-04-8	2-Pentene, (E)-	646-04-8	10,000	g
689-97-4	Vinyl acetylene [1-Buten-3-yne]	689-97-4	10,000	f
1333-74-0	Hydrogen	1333-74-0	10,000	f
4109-96-0	Dichlorosilane [Silane, dichloro-]	4109-96-0	10,000	f
7791-21-1	Chlorine monoxide [Chlorine oxide]	7791-21-1	10,000	f
7803-62-5	Silane	7803-62-5	10,000	f
10025-78-2	Trichlorosilane [Silane, trichloro-]	10025-78-2	10,000	g
25167-67-3	Butene	25167-67-3	10,000	f

Basis for Listing:

[a]Mandated for listing by Congress.
[f]Flammable gas.
[g]Volatile flammable liquid.

APPENDIX B

INFORMATION RESOURCES

INFORMATION RESOURCES

ON-LINE RESOURCES

For Access to Information and Professionals Concerning Pollution Prevention and Environmental Compliance:

Enviro$ense

Enviro$ense is a free, public, integrated environmental information system. It is designed to:

- Assist users in finding and implementing common sense solutions, such as pollution prevention, to environmental problems.
- Facilitate the sharing of technology, procedures, and experience across federal agencies, other governmental organizations, manufacturers, suppliers, researchers, and others.
- Encourage the development and demonstration of pollution prevention technologies suitable for export.
- Help federal agencies attain compliance with the Right-to-Know provisions of Executive Order 12856, which requires Federal compliance with Right-to-Know law and pollution prevention requirements.

Enviro$ense is accessible by modem and via the World Wide Web on the Internet:

Via Modem: The telephone number is (703) 908-2092. Use a personal computer with a modem and communications software set to the following: (Data bits=8, parity=N, and stop bits=1); Emulation - ANSI or VT-100.

Via the Internet: The address is http://wastenot.inel.gov/envirosense/ You need to have access to the Internet and World Wide Web navigational software such as Mosaic.

For Information and Documents on the Clean Air Act:

Technology Transfer Network (TTN) Bulletin Board System

The TTN is operated by the EPA's Office of Air Quality Planning & Standards (OAQPS), the system can be accessed with a computer by calling (919) 541-1447 for 9600 & 19200 bps modems or (919) 541-5742 for 1200 & 2400 bps modems (Data bits=8, parity=N, and stop bits=1). Help Line: (919) 541-5384.

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