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GUIDANCE FOR REVIEW OF HIGH RISK POINT SOURCES UNDER SECTION 112 OF THE 1990 CLEAN AIR ACT AMENDMENTS



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FORWARD

The purpose of this High Risk Point Source (HRPS) guidance is to outline policy and technical issues State, local, and tribal agencies may wish to consider in developing a HRPS program. The Environmental Protection Agency (EPA) envisions the main audience to be agencies that do not already have an established air toxics program, although all State/local/tribal agencies may benefit from the information presented, and from the resources listed in the appendices.

The EPA intends this document to be descriptive rather than prescriptive; the document offers the reader suggestions and resources regarding the development of a HRPS program. Further, the Agency considers this to be a "living" document, and will update it as necessary. Information in this document represents a compilation of information from existing EPA documents, listed in the reference section, which are available for those interested in obtaining them.

This document, was developed to fulfill Congress's directive concerning the HRPS program under section 112(1)(2), and is based in large part on information and documentation that the EPA has developed from its experience with the program since 1986. See Senate Report 101-108, pages 193-194 (U.S. Senate Report, 1989) which describes the Agency's efforts and support for the HRPS program.

1.0 HRPS IN THE 1990 CLEAN AIR ACT AMENDMENTS

1.1 Section 112(1) of the 1990 Clean Air Act Amendments

Section 112(1) of the 1990 Clean Air Act Amendments (1990 Amendments) requires the EPA to establish guidance for approval of State, local, or tribal air toxics control rules or programs, where the parties voluntarily submit applications. Agencies can receive program approval under this section if their programs are at least as stringent as the applicable Federal rules. Once approved, a State, local or tribal program (or specified portion of the program) would be Federally enforceable in lieu of the Federal program.

Section 112(1) of the 1990 Amendments also instructs the EPA to develop guidance to assist these agencies in developing programs for submission under section 112(1). Congress requires the EPA to "include, as an element of the guidance, an optional program begun in 1986 for the review of high-risk point sources of air pollutants including, but not limited to, hazardous air pollutants listed pursuant to subsection (b)." (Section 112(1)(2)).

1.2 Definitions: "High Risk", "Point Source"

Under the previous HRPS program (see appendix 1), the EPA did not define a "bright line" benchmark of what was to be called "high risk". That definition was addressed on a case-by-case basis. Under the 1990 program, the EPA suggests that agencies consult section 112(f) of the 1990 Amendments for Congress's guidance on acceptable risk levels under the residual risk program. The language states that residual risk standards must provide an ample margin of safety to protect public health, and states that such standards must be promulgated for sources that exceed a lifetime risk to the most exposed individual of one in one million (section 112(f)(2)(A)). Further reading of this

subsection may be of help to State local and tribal agencies in defining "high risk".

With regard to the definition of "point source", the EPA initially equated a point source with an industrial source (U.S. EPA, 1985). Beyond that, the Agency left the definition of a point source up to the State or local agency. Under this new version of the HRPS program, the EPA envisions the definition of point source to be the equivalent of a stationary source as defined in section 111 of the 1990 Amendments. Further, the EPA envisions that a point source may be either a major source, or an area source, as defined in sections 112(a)(1) and 112(a)(2), of the 1990 Amendments.

1.3 Benefits of a HRPS Program

A high risk point source program can provide several benefits to air pollution control agencies. First, a HRPS program can help agencies evaluate and regulate sources which will not be regulated in the near term via section 112(d) of the 1990 Amendments (e.g. Maximum Achievable Control Technology (MACT) program). For example, a listed source category may consist of major sources (those that emit greater than 10 tons per year of one Hazardous Air Pollutant (HAP), or 25 tons per year of a combination of HAP), and area sources (sources that emits less than 10 or 25 tons per year). The major sources in the category will be covered by a MACT standard, but the area sources may not be regulated unless the EPA finds that such sources warrant Federal regulation under section 112 (section 112(c)(3)) (see source category list 57 FR 31576, dated July 16, 1992). In cases where the EPA determines that the area source category does not warrant Federal regulation, the State, local, or tribal agency may choose to assess a source to determine whether it wishes to pursue regulation. This evaluation could be conducted as part of a high risk point source program.

Secondly, an agency may wish to regulate sources under a faster timetable than the Federal program. Section 112(e) of the 1990 Amendments requires the EPA to regulate source categories on a specific schedule, either within 2, 4, 7, or 10 years after the date of enactment (November 15, 1990). A State/municipality/tribe may wish to apply the methodology offered in the HRPS guidance to evaluate sources to determine whether early regulation at the State level is warranted. Similarly, States/locals/tribes may wish to evaluate sources in order to set residual risk standards sooner than the Federal program.

Section 112(f) requires the EPA to address the issue of residual risk within 8 years of the promulgation of a MACT standard. A State, local, or tribal agency may wish to examine the need for a residual risk examination before the 8 year Federal analysis would be conducted.

Thirdly, agencies may wish to determine the risks associated with sources of air toxics in response to public concern. For example, members of the public may ask health-related questions during operating permit hearings, or they may make general inquiries as to the safety of ambient air.

A HRPS program can also increase equity in the environmental arena by helping an agency address a source that will not be regulated under the Federal program. For example, a State, local or tribal agency could use a HRPS program to evaluate and regulate a single source or limited number of sources that will not be a source category to be regulated under the Federal regulatory program.

Finally, the methodology and resources presented in the HRPS guidance can add to the available tools that States, locals, and tribes can use to evaluate the potential for adverse health impacts and protect public health from local sources of toxic air pollutants. In addition, exposure and risk information collected from HRPS evaluations will be useful to other State, local, and tribal agencies, and to the EPA as well.

1.4 Organization of Document

The document begins with a discussion of policy issues: how to determine what chemicals to assess; how to choose sources to assess; and how to communicate program objectives and risks to health. The document then briefly introduces the concept of risk assessment; outlines a tiered methodology agencies may choose to follow to determine whether the risk from a particular source (or set of sources) is significant; and apprises the reader of existing State programs that may be adaptable to other agencies for use as HRPS programs. The appendices direct the reader to appropriate EPA documents, other agency's documents, and selected services. These documents and services may assist agencies in evaluating health effects from potentially high risk point sources.

2.0 DEVELOPING A HIGH RISK POINT SOURCE PROGRAM

2.1 Policy issues

2.1.1 Selecting Chemicals to Evaluate

The first question to answer in developing up a HRPS program might be, "What chemicals should the program include?". There are at least three ways to answer this question. First, an agency may wish to prepare a list of toxic air pollutants that will be evaluated if emitted. Second, an agency may wish to evaluate chemicals of concern on an ad hoc basis. Third, an agency may wish to use a combination of these two approaches, perhaps using a list to evaluate existing sources and the ad hoc approach for new sources (EPA, 1990).

In preparing their own chemical list, a State/local/tribal agency may wish to look to other existing lists of toxic air pollutants. There are several Federal lists to examine, including, but not limited to, the Hazardous Air Pollutant list under section 112(b) of the 1990 Amendments, and the SARA 313 list (EPA, 1992a). Some States have existing chemical lists as well. Names and addresses of State air toxics contacts can be found in the annual Database Report on State, Local, and EPA Air Toxics Activities, published by the National Air Toxics Information Clearinghouse (NATICH) or by searching the NATICH bulletin board on the EPA's Technology Transfer Network Bulletin board (see Appendices 2 and 6).

In addition to looking at existing pollutant lists, an agency may wish to consider other information, such as toxicity and exposure information, in developing a chemical list. While existing lists of chemicals may include a consideration of these factors, each list was developed for a specific purpose, and may have considered these parameters differently than a specific State, local, or tribal agency would. For example, a chemical may have been left off of the SARA 313 list because it was not

used on a national scale. If sources under a State, local, or tribal agency's jurisdiction emit a significant amount of this chemical, the agency may want to include such a chemical on their list, even though the national lists or other State lists do not.

The open-ended approach to choosing chemicals for a HRPS program requires evaluating chemicals, as needed, to see if they are candidates for such a program rather than looking to a specific list for chemicals. An evaluation may include considerations of the health effects of individual chemicals, the expected occurrence of emissions, and environmental effects. For resources to aid agencies in considering health effects one may wish to look at the data sources in Appendices 2, and 3.

2.1.2 Selecting Sources to Evaluate

In determining which specific sources to include in a high risk point source program, an agency may wish to consider several factors. An agency may wish to evaluate all sources that emit chemicals on the established list, or that emit chemicals the agency determines to be of concern. An agency may wish to look to the source category list (57 FR 31576) that the EPA developed under section 112, for a list of type of sources that emit chemicals of concern (to the Federal program) and limit evaluations to those sources. Some agencies may wish to make a conscious decision about whether to include certain types of sources in the HRPS program (for example, "non-traditional" sources including waste-water treatment facilities and hazardous waste landfills). An agency may wish to consider the number size and type of these facilities, and determine the practicality of evaluating and potentially regulating such sources, at least at the beginning of a HRPS program. Similarly, some types of area sources can collectively emit significant amounts of toxic air pollutants (for example, dry cleaners, wood-stoves, and fireplaces). Because of their large number, these sources may be difficult to review on an individual basis. As such, an agency

may want to evaluate whether these types of sources should be included in a HRPS program (EPA, 1990). In determining which sources to include in a HRPS program (and in determining what chemicals to assess), an agency should carefully evaluate its available resources to insure that the program can be implemented.

2.1.3 Communicating About Risks

Any high risk point source program, in fact any air toxics program, should include a conscious effort to effectively communicate about risks. Environmental risk communication is a specialized skill that all agencies, Federal, State, local, and tribal, should develop. Communication on environmental issues is distinctive in at least four ways. The first distinctive feature involves the *complexity of information*. Environmental communication involves many disciplines including toxicology, statistics, economics, law, human behavior, engineering, and business management. The second feature is the *gap in technical knowledge of the general public*. Technical information is often full of jargon, and discussions about technical processes may be unintelligible to the public. The third distinctive feature is the *personal impact of the issues* at stake. The air people breathe is of course a deeply personal concern. The fourth feature is the concept of *relative risks*. The distinction of voluntary and involuntary risks is frequently a factor in environmental communication (EPA, 1990). Appendix 4 includes a partial list of available risk communication documents.

2.2 Technical Issues

2.2.1 Risk Assessment Methodologies

The EPA envisions that the methods used to evaluate potential high risk point sources would be based on the principle of risk assessment. Risk assessment is the process of estimating and characterizing the potential adverse health effects of human exposure to environmental hazards. It generally includes four steps: hazard identification; dose-response assessment; exposure assessment, and risk characterization. Hazard identification is a qualitative determination that exposure to a certain substance can cause adverse health effects in humans. A dose-response assessment quantifies the relationship between the dose of a toxicant received and the effect incurred. This can take the form of specific levels of concern such as an inhalation reference concentration (RfC) or as a slope of a dose-response curve such as often developed for carcinogens. Exposure assessment is the process of measuring or estimating the level (e.g., concentration in the air breathed or water ingested), duration, and frequency of human exposure to a chemical. Risk characterization is the final step which quantitatively estimates the magnitude of the risk to human health, and discusses uncertainty in the assessment (EPA, 1990). See appendix 2 for further information regarding risk assessment.

The "tiered approach to source assessment" described below, is essentially a screening method to estimate human exposure to toxicants. This method is designed to estimate an ambient concentration, in the air, of a chemical(s). Since this is a screening procedure, this ambient concentration is considered as the exposure. Once this exposure step is complete, the next step is to determine whether the concentration of a specific chemical (or chemicals) can cause an adverse health effect. This is done by comparing the exposure concentration to an appropriate "benchmark", that is, a quantitative characterization of the

dose-response interaction of the chemical(s) (see appendix 2 for sources of risk assessment information).

2.2.2 A Tiered Approach to Source Assessment

This portion of the document discusses a tiered approach to assessing sources that may be high risk. The term "tiered" is used because such an approach consists of different levels, or tiers of analysis that can be completed, depending on need and resources, where each tier increases in sophistication and requirements needed to complete the analysis. Much of the discussion in this section comes from the EPA document, *A Tiered Modeling Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants (Tiered Approach)* (EPA, 1992b). Resource information related to this section can be found in appendices 5, and 6.

Tier 1 is a simple screening method used to evaluate the exposure potential of sources. It consists of a procedure in which the user can estimate the off-site concentrations of a toxic air pollutant without extensive knowledge regarding the source, and without using a computer. Tier 1 requires the user to have information on emission rates, stack heights, and fence lines of a source¹. The user performs the analysis by using tables of look-up values to obtain the maximum off-site ambient air concentration of the modeled source. These ambient air concentrations are then compared to the appropriate benchmark (see section 2.2.1) to assess the impact of the modeled source. If the predicted screening impacts are above what an agency considers a level of concern, then the user may want to proceed to a higher tier to obtain more accurate results.

The second tier is a more sophisticated screening technique which requires additional knowledge of the source being modeled,

¹ Relatively conservative assumptions were made in the generation of the look-up table.

and requires the use of a computer program. Tier 2 is less conservative than Tier 1. In the "Tiered Approach" referenced above, Tier 2 is structured around the EPA's SCREEN model (EPA, 1992b). It requires information beyond that of Tier 1, and again results in the maximum off-site ambient concentration.

The third tier is a more detailed modeling exercise, using more site-specific inputs than Tier 2, and the Industrial Source Complex Long Term Model (ISCLT) (EPA, 1992b). Tier 3 also identifies the maximum off-site concentrations, but requires more information to execute and is less conservative than the previous tiers.

Tier 4 incorporates the level of modeling used in Tier 3, with population data, to estimate potential exposures to a specific population. The EPA's Human Exposure Models (HEM, HEM-II) can serve this purpose (see appendix 5), as they combine dispersion modeling with population information, to more specifically characterize exposure. Note that all tiers represent screening analyses.

2.2.3 Existing State Programs

Agencies interested in pursuing a HRPS program should also consult with State and local agencies for other approaches to assessing potential high risk point sources. For example, California requires that certain sources in the State assess risks from specific toxics air pollutants in its "Hot Spots Program" under California Assembly Bill 2588 (California Air Pollution Control Officers Association, 1992). Interested parties can search the NATICH bulletin board (see appendices 2, and 6) for States that use risk assessment in assessing sources of toxic air pollutants. Such programs might be either adapted or used directly as high risk point source programs.

REFERENCES

California Air Pollution Control Officers Association (CAPCOA), 1992. Air Toxics "Hot Spots" Program: Risk Assessment Guidelines.

U.S. EPA, Office of Air Quality Planning and Standards, 1985. A Strategy to Reduce Risks to Public Health from Air Toxics. (reprint available through NATICH).

U.S. EPA, Office of Air Quality Planning and Standards, 1990. Designing and Implementing an Air Toxics Control Program: A Program Development Manual for State and Local Agencies. EPA-450/2-90-012.

U.S. EPA, Office of Solid Waste and Emergency Response, 1992a. Title III List of Lists: Consolidated List of Chemicals Subject to Reporting Under the Emergency Planning and Right-to-Know Act. EPA-560/4-92-001.

U.S. EPA, Office of Air Quality Planning and Standards, 1992b. A Tiered Modeling Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants. EPA-450/4-92-001

U.S. Senate Report 101-108, 1989. Report of the Committee on Environment and Public Works to Accompany S. 1630. 101st Congress, First Session.

APPENDICES

- Appendix 1 - HRPS Program 1985 - 1990
- Appendix 2 - Human Toxicity Information
- Appendix 3 - Ecological Toxicity Information
- Appendix 4 - Risk Communication Information
- Appendix 5 - Technical Guidance Information
- Appendix 6 - How to Obtain Documents; How to Access Databases

APPENDIX 1 - HRPS PROGRAM 1985-1990

In 1985, the Environmental Protection Agency (EPA) developed an air toxics strategy to control emissions of hazardous air pollutants presenting the greatest risks to public health. The strategy documented existing programs and identified needed actions to address emissions from both routine and accidental releases. One component of the strategy called for the development of programs to assist State and local air pollution control agencies in their efforts to evaluate and control some types of routine emissions of air toxics. The strategy noted that some toxic air pollutants are emitted in large amounts, in several states, and that these types of emissions would be controlled under section 112 of the Clean Air Act. However, the EPA stated that some toxic air pollutant emissions may not be so prevalent as to be a national problem, but may still account for areas of high risk in some communities. Such emissions would not support a national standard, but may require targeted action by State or local agencies (EPA, 1985). Among the specific actions the Agency decided to take as a result of this 1985 strategy, was to initiate a partnership with State and local air pollution control agencies to reduce public health risks from these localized sources. One of these efforts came to be called the High Risk Point Source (HRPS) Program.

In the process of determining whether sufficient information was available to add pollutants to the list of hazardous air pollutants and then promulgate emission standards, the EPA determined that national regulation might not be required in all cases if sufficient reductions could be accomplished at the State and local level. As a result of this conclusion, the Agency initiated a pilot program to refer information on a given chemical to a State for evaluation, with the expectation of

regulation at the State level¹. This form of the program was not continued due to criticism from public interest groups and from States who argued that by simply "referring" a chemical to the States for possible regulation, the EPA was abdicating its responsibility to protect public health.

The next iteration of the HRPS program was called the "promoted initiative program". Under this program, the EPA committed grant money from section 105 of the Clean Air Act, to States. These grants were to help States/locals further assess sources that, based on screening studies, the EPA had identified as potentially "high risk", but for which the risk was not high enough to warrant federal regulation. The next year, 1987, the EPA responded to a request from the States to broaden the program so that States could submit grant applications to assess sources that States identified as potential high risk point sources, in addition to the those the EPA targeted. This broadened program was termed the Promoted and State Initiative Program.

The goals of the Promoted and State Initiative program were to: (1) assist State/local agencies in building the capability to evaluate sources of potential health concern; (2) require controls of toxic emissions where appropriate; and (3) obtain documentation of results in order to distribute the information to interested State and local agencies. The criteria for selecting a source as a promoted initiative, included the following. During evaluation of pollutants for possible listing under section 112, the EPA conducted screening level risk analyses of selected sources emitting the pollutants under study. If the Agency identified a source or a limited number of sources that posed a potential risk to human health, such sources were identified by the Agency as possible high risk point sources, and

¹ Because acrylonitrile was of concern for its cancer causing potential, and, because it was emitted from a limited number of sources in a limited number of states, it became the first chemical addressed in the referral program.

considered for the promoted initiative portion of the program. The EPA and State(s) then typically entered into discussions about possible funding of further source evaluation. For funding to occur, the State needed to demonstrate a commitment by conducting the evaluation itself and by preparing a report summarizing the findings. For a proposal to be accepted into the State initiative program the State needed to show that the study was of national utility, that the State or local agency was a new program participant with limited resources, that there was little chance of overlap with ongoing Federal regulatory efforts, that there was a high value relative to the cost, and that there was a potential for high risk to the public. The final reports summarized the results of the study, included a decision on whether or not the State/local was going to regulate the source(s), and provided the rationale for that decision.

The EPA funded the promoted and State initiative program from 1986 to 1990, using money available under section 105 of the Clean Air Act. Funding for this program stopped in 1990 by mutual agreement between the EPA and the State and Territorial Air Pollution Control Association (STAPPA). Reasons for discontinuing the funding included: (1) the fact that many States had developed air toxics programs (2) the availability of other mechanisms to reduce toxic air emissions, (3) the need to address higher priority air quality management with the available limited funding. As of April 1992, the EPA funded 86 projects in 37 States, at a cost of 1.5 million dollars. Of the 86 projects, 49 were complete, 29 were ongoing, and eight had been dropped. Of the 49 completed projects, EPA now has 42 submitted written reports which are on file in the Office of Air Quality Planning and Standards' (OAQPS) Control Technology Center (CTC), and are disseminated to interested parties upon request (see appendices 5 and 6). Of these completed reports, 23 quantified health effects, and 17 achieved emission reductions. In addition, the EPA estimates that the HRPS program provided

"seed money" to 10-15 States to improve their own developing air toxics programs, enhanced Regional and Federal office cooperation, and promoted future evaluation of, and monitoring of sources by State and local agencies.

APPENDIX 2 - HUMAN TOXICITY INFORMATION

EPA Sources

The following documents are prepared by the EPA's Office of Environmental Effects Assessment (OHEA). See appendix 6 for how to obtain documents.

1. *Health Assessment Documents (HAD):*

HAD are comprehensive evaluations of the known health data, including carcinogenicity, mutagenicity, developmental and reproductive effects, pharmacokinetics, and metabolism, from exposure to particular chemicals. HAD are developed for the OAQPS.

2. *Health Effects Assessments (HEA):*

HEA are brief, quantitatively orientated, assessments of relevant health effects data. HEA are prepared for the Office of Emergency and Remedial Response (Superfund).

3. *Health and Environmental Effects Documents (HEED):*

HEED are summaries of the literature concerning health hazards associated with environmental exposures to particular chemicals. They are prepared for the Office of Solid Waste and Emergency Response's (OSWER) Resource Conservation and Recovery Act (RCRA) and Superfund programs. (Former documents are called Health and Environmental Effects Profiles (HEEPs)).

4. *Reportable Quantities Documents (RQCAR, RQTOX)*

RQ documents are brief data summaries prepared for OSWER's Comprehensive Environmental Response, Compensation, and Liability ACT (CERCLA) program.

5. *Ambient Water Quality Criteria Documents (WQCD):*

WQCD are prepared for the Office of Water and provide an assessment of the potential risk of adverse effects of a pollutant on human health and aquatic life.

6. *Drinking Water Criteria Documents (DWCD):*

DWCD are comprehensive health effects evaluations of data on pharmacokinetics, human exposure, acute and chronic toxicity to animals and humans, epidemiology, and mechanisms of toxicity. They are developed for the Office of Water (OW) (often developed by the OW), and are available from NTIS, or from the OW.

Non-EPA sources: See appendix 6 for how to contact these organizations.

1. *American Conference of Governmental Industrial Hygienists (ACGIH)*

The ACGIH is a non-governmental agency that publishes recommended occupational health limits called Threshold Limit Values (TLV) in a yearly document called *Threshold Limit Values and Biological Indices*. The ACGIH has also published the book, *Documentation of the Threshold Limit Values*, which provides some references as well as the reasoning behind the TLV. Both documents are available from the ACGIH.

2. *National Institute of Occupational Safety and Health (NIOSH):*

NIOSH publishes Recommended Exposure Levels (REL) which the Occupational Safety and Health Administration, or the Mine Safety and Health Administration (MSHA), may adopt as legal standards. NIOSH publishes criteria documents that present critical evaluations of relevant data on a chemical. The criteria documents are available from NIOSH.

3. *International Agency for Research on Cancer (IARC):*

IARC is part of the World Health Organization (WHO), and publishes monographs and updates on chemicals it has reviewed. The monographs are referenced in RTECS (see below), and are available at most university libraries.

4. *Agency for Toxic Substances and Disease Registry (ATSDR)*

ATSDR publishes Toxicological Profiles which are used by the Superfund program. The profiles contain toxicological and health effects data and can be obtained through NTIS and university libraries which contain federal repositories.

5. *National Toxicology Program (NTP):*

The NTP publishes National Cancer Institute (NCI)/NTP technical reports on long-term cancer bioassays. These reports can be obtained from the NTP.

Databases/Clearinghouses:

EPA sources:

1. *Integrated Risk Information System (IRIS):*

The IRIS database maintained by EPA's OHEA, contains agency consensus positions on the potential adverse health effects of approximately 500 substances. Information on IRIS can be obtained from IRIS user support (see appendix 6).

2. *National Air Toxics Information Clearinghouse (NATICH):*

NATICH is an information service offered by the U.S. EPA in conjunction with the State and Territorial Air Pollution Program Administrators (STAPPA), and the Association of Local Air Pollution Control Officials (ALAPCO), to support efforts at controlling toxic air pollutants. NATICH collects, classifies and disseminates air toxics information submitted by State and local air agencies. It also publishes a bimonthly newsletter, responds to telephone requests for specific information ((919) 541-0850) and publishes special reports on specific air toxics issues. NATICH is also available on-line (see appendix 6).

3. *Air Risk Information Support Center (Air RISC)*

Air RISC is an information service offered by the U.S. EPA in cooperation with the State and Territorial Air Pollution Program Administrators (STAPPA), and the Association of Local Air Pollution Control Officials (ALAPCO), to support efforts at controlling toxic air pollutants. Air RISC provides a hotline service (919) 541-0888, and produces technical guidance on topics involving health, exposure, and risk assessment issues related to emissions of air toxics.

Non-EPA sources: The following databases can be accessed through the National Library of Medicine's Toxicology Data Network (TOXNET) For information on how to access TOXNET, see appendix 6.

1. *Registry of Toxic Effects of Chemical Substances (RTECS):*

The RTECS database is built and maintained by NIOSH. It contains toxic effects data on over 114,000 chemicals. Review of these data however, is limited.

2. *Hazardous Substances Data Bank (HSDB):*

The HSDB contains peer-reviewed information on 4300 chemicals. Information includes: toxicity data; emergency medical treatment; safety and handling; environmental fate; potential exposure, and regulatory requirements.

3. *Chemical Carcinogenesis Research Information System (CCRIS):*

CCRIS is sponsored by the National Cancer Institute, and contains data derived from carcinogenicity, mutagenicity, tumor promotion, and tumor inhibition studies.

4. *GENE-TOX:*

GENE-TOX is an EPA database which contains genetic toxicology data on 3000+ chemicals. Data entered into GENE-TOX has been expert-reviewed.

5. *Developmental and Reproductive Toxicology Database/
Environmental Teratology Information Center Backfile
(DART/ETICBACK):*

Both DART and ETICBACK contain citations to publications to developmental toxicology. DART covers publication from 1989 to the present; ETICBACK covers years prior to 1989. The EPA and the National Institute of Environmental Health Sciences jointly support these databases.

6. Toxic Chemical Release Inventory (TRI)

TRI is a database which contains information on estimated annual releases of toxic chemicals to the environment, and is based on information reported to the EPA by emitting facilities. TRI is built and maintained by the EPA and is authorized under Section 313 of the Emergency Planning and Right-to-Know Act (SARA 313).

Additional Information: The following information is available through the National Library of Medicine's Toxicology Information Program (TIP) (For information on how to access TIP, see appendix 6):

TIP provides several online services as part of the National Library of Medicine's Medical Literature Analysis and Retrieval System (MEDLARS). It includes some of the databases in the TOXNET system, and in addition:

- Chemical Identification File (CHEMID)
- Chemical Dictionary Online (CHEMLINE)
- Toxicology Information Online/Toxicology Literature from Special Sources (TOXLINE/TOXLIT)
- Directory of Information Resources Online (DIRLINE)

Chemical Lists:

1. *Title III List of Lists: Consolidated List of Chemicals Subject to Reporting Under the Emergency Planning and Right-to-Know Act.* (EPA 560/4-92-011).

This document contains chemical lists as required by Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Lists include: SARA Section 302 list of Extremely Hazardous Substances, CERCLA Hazardous Substances list, SARA Section 313 Toxic Chemicals list. It is available from NTIS.

2. *Clean Air Act Amendments of 1990* (P.L. 101-546 104 Stat. 2399, November 15, 1990)

Section 112(b) of the 1990 Amendments contains the list of hazardous air pollutants to be regulated.

APPENDIX 3 - ECOLOGICAL RISK ASSESSMENT INFORMATION

The EPA's Office of Research and Development, and the EPA's Risk Assessment Forum have developed the following documents regarding ecological risk assessment. The documents are available through CERl, or NTIS (see appendix 6).

Norton, Susan, B. et, al. 1992. A Framework for Ecological Risk Assessment at the EPA. *Environmental Toxicology and Chemistry.* 11: 1663-1672.

U.S. EPA, Environmental Research Laboratory, Corvallis, Oregon. 1989. Ecological Assessment of Hazardous Waste Sites. EPA/600/3-89/013

U.S. EPA, Risk Assessment Forum, 1991. Summary Report on Issues in Ecological Risk Assessment. EPA/625/3-91-008.

U.S. EPA, Office of Research and Development, 1992. Evaluation of Terrestrial Indicators for use in Ecological Assessment at Hazardous Waste Sites. EPA/600/R-92/183.

U.S. EPA, Risk Assessment Forum, 1993. A Review of Ecological Case Studies from a Risk Assessment Perspective. EPA/630/R-92-005.

APPENDIX 4 - RISK COMMUNICATION INFORMATION

Risk Communication Reports (Developed and available through the EPA's Risk Communication Project 202-260-5606)

Bord, Richard, J., Donald J. Epp and Robert O'Connor. 1989. Achieving Greater Consistency Between Subjective and Objective Risks. Pennsylvania State University. (EPA-230/11-89-071; NTIS No. PB9-229832/AS).

Regan, Michael J., and William H. Desvousges. 1990. Communicating Environmental Risks: A Guide to Practical Evaluations. (EPA-230/01-91-001; NTIS No. PB91-168336)

Weinstein, Neil, D., Peter M. Sandman, and Nancy E. Roberts. 1989. Communicating Effectively about Risk Magnitudes. (EPA 230/08-89-064; NTIS No. PB90-141292/AS)

Additional Risk Communication Publications:

American Chemical Society. 1988. Chemical Risk Communication. Washington, DC. American Chemical Society.

Arkin, Elaine Bratic. 1989. Making Health Communication Programs Work. National Cancer Institute, NIH.

Covello, Vincent T., David B. McCallum, Maria Pavlova (eds.) 1987. Effective Risk Communication. New York & London: Plenum Press.

Covello, Vincent T., and Frederick W. Allen. 1988. Seven Cardinal Rules of Risk Communication. Washington, DC. U.S. EPA.

Davies, J. Clarence, Vincent T. Covello and Frederick W. Allen (eds.) 1987. Risk Communication: Proceedings of the National Conference on Risk Communication. Washington, DC. The Conservation Foundation.

Fischhoff, Baruch, S. Lichtenstein, Paul Slovic, S. Derby, R. Keeney. 1981. Acceptable Risk. Cambridge, MA. Cambridge University Press.

Fisher, Ann, Maria Pavlova, Vincent Covello (eds.) 1991. Evaluation and Effective Risk Communication: Workshop Proceedings (Interagency Task Force on Environmental Cancer and Heart and Lung Disease). Washington, DC. Interagency Task Force.

Hammond, P. Brett, and Rob Coppock (eds.) 1990. Valuing Health Risks, Costs, and Benefits for Environmental Decision Making - Report of a Conference. Washington, DC. National Academy Press.
Hance, Billie Jo, Caron Chess and Peter M. Sandman. 1988 Improving Dialogue with Communities: A Risk Communication Manual for Government. Washington, DC. U.S. EPA.

Johnson, Branden B. and Vincent T. Covello. 1987. The Social and Cultural Construction of Risk. Dordrecht/Boston/Lancaster/Tokyo. D. Reidel Publishing Company, Member Kluwer Academic Publishing Group.

Krimsky, Sheldon, and Alonzo Plough. 1988. Environmental Hazards Communicating Risks as a Social Process. Dover, MA. Auburn House Publishing Co.

McCallum, David B., Sharon Lee Hammond, Louis A. Morris. 1990. Public Knowledge and Perceptions of Chemical Risks in Six Communities. Washington, DC. U.S. EPA.
National Research Council Commission/National Academy of Sciences 1989. Improving Risk Communication. Washington, DC. National Academy Press.

Sandman, Peter, M. 1986. Explaining Environmental Risk. Washington, DC. U.S. EPA.

U.S. EPA, 1990. Communicating Environmental Risks: A Guide to Practical Evaluations. 230/01-91-001

U.S. EPA, Air Risk Information and Support Center, 1991. Air Pollution and the Public: A Risk Communication Guide for State and Local Agencies. (EPA 450/3-90-025)

APPENDIX 5 - POLICY AND TECHNICAL GUIDANCE

The EPA has developed a number of models and related guidance documents that can be used to estimate ambient impacts from toxic air releases. In addition, the Agency has developed guidance for State and local agencies regarding the development of Air Toxics Programs, and risk assessment methodology guidance. The following is a list of some of these documents. State and local air pollution control agencies communicate directly with the EPA regional offices for updated and relevant references. Computer code for the models is available from the OAQPS, Technology Transfer Network Bulletin Board System (see appendix 6). User's guides and guidance documents may be obtained from NTIS, or CERL, using the information listed below.

Policy and Modeling Guidance:

U.S. EPA, 1978. Guideline on Air Quality Models (Revised). EPA-450/2-78-027R (NTIS No. PB 86-245248), and its supplements.

U.S. EPA, 1990. Designing and Implementing an Air Toxics Control Program: A Program Development Manual for State and Local Agencies. EPA-450/2-90-012.

U.S. EPA, 1991. Guidance on the Application of Refined Dispersion Models for Air Toxics Releases. EPA-450/4-91-007 (NTIS No. PB 93-210359).

U.S. EPA, 1991. HEM-II Users Guide. EPA/450/3-91-0010. Interested parties can obtain this document, and information on how to access HEM-II, by contacting Warren Peters, at the EPA's Office of Air Quality Planning and Standards. (919) 541-5337.

U.S. EPA, 1992. User's Guide for the Industrial Source Complex (ISC2) Dispersion Models. Volumes 1, 2, and 3. EPA-450/4-92-008a-c. (NTIS Nos. PB 92-232461, and PB 92-232453, and PB 92-232479, respectively).

U.S. EPA, 1992. A Tiered Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants. EPA-450/4-92-001. (NTIS No. PB 92-164748).

U.S. EPA, 1992. User's Guide to TSCREEN: A Model for Screening Toxic Air Pollutant Concentrations. EPA-450/4-90-013. (NTIS No. PB 91-141820).

U.S. EPA, 1992. Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised). EPA-450/R-92-024. (NTIS PB 93-210367).

U.S. EPA, 1993. Contingency Analysis Modeling for Superfund Sites and Other Sources. EPA-454/R-93-001. (NTIS No. PB 93-169126).

Risk Assessment Methodologies:

The following references include basic information on risk assessment methodologies. See also appendix 2, particularly IRIS, NATICH and Air RISC, for additional resources.

Calabrese, Edward, J., and Elaine M. Kenyon, 1991. Air Toxics and Risk Assessment. Lewis Publishers, Inc., Chelsea, MI.

U.S. EPA, 1986. Risk Assessment Guidelines of 1986. EPA-600/8-87/045.

U.S. EPA, 1990. Interim Methods for Development of Inhalation Reference Concentrations. EPA/600-8-90-066A.

U.S. EPA, 1991. Guidelines for Developmental Toxicity Risk Assessment; Notice. 56 FR 63798. December 5, 1991.

U.S. EPA, 1992. Guidelines for Exposure Assessment; Notice. 57 FR 22888. May 29, 1992.

APPENDIX 6 - HOW TO OBTAIN DOCUMENTS; HOW TO ACCESS DATABASES

HOW TO OBTAIN DOCUMENTS:

ATSDR DOCUMENTS

Department of Health and Human Services
U.S. Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Toxicology
1800 Clifton Road, Northeast, Mail Stop E-29
Atlanta, Georgia 30333
(404) 639-6300

OHEA DOCUMENTS

Technical Information Staff
Office of Health and Environmental Assessment (8601)
U.S. EPA
401 M Street, Southwest
Washington D.C. 20460
(202) 260-7345
The OHEA Technical Information Staff distributes documents
published by the Office of Health and Environmental Assessment
Documents (includes many documents published by ECAO)

CERI

Center for Environmental Research Information (CERI)
Office of Research and Development
U.S. EPA
26 West Martin Luther King Drive
Cincinnati, Ohio 45268
(513) 569-7562
CERI disseminates documents published by the Office of Research
and Development (ORD)

NTIS

National Technical Information Service
5285 Port Royale Road
Springfield, Virginia 22161
(703) 487-4650
(800) 553-6847 (sales)
NTIS is the clearinghouse for all Federal documents.

NIOSH - documents

National Institute of Occupational Safety and Health
Publications Dissemination
Division of Standards Development and Technology Transfer
4676 Columbia Parkway
Cincinnati, Ohio 45226

NTP - reports

National Toxicology Program
Central Data Management
Mail Drop-AO-01
National Institute of Environmental Health Sciences
Post Office Box 12233
Research Triangle Park, North Carolina 27709

ACGIH - documents

American Conference of Governmental Industrial Hygienists
6500 Glenway Avenue, Building D-5
Cincinnati, Ohio 45211
(513) 661-7881

HOTLINES/CLEARINGHOUSES

Air RISC

Air Risk Information Support Center
U.S. EPA
Office of Air Quality Planning and Standards (MD-13)
Research Triangle Park, North Carolina 27711
Hotline number (919) 541-0888

NATICH

National Air Toxics Information Clearinghouse
U.S. EPA
Office of Air Quality Planning and Standards (MD-13)
Research Triangle Park, North Carolina 27711
(919) 541-0850

to access NATICH on line:

Dial (919)541-5742. NATICH is available 24 hours a day except for
Mondays from 8:00 a.m. - 12:00 p.m.
Call (919) 541-0850 for assistance in accessing NATICH via
bulletin board.

COMPUTERIZED DATABASES/BULLETIN BOARDS

IRIS

Integrated Risk Information System
User Support (for General Information on how to access IRIS)
(513) 569-7254

TOXNET

Toxicology Data Network
Specialized Information Services Division
National Library of Medicine
8600 Rockville Pike
Bethesda, Maryland 20894
(301) 496-6531

TIP

Toxicology Information Program
National Library of Medicine
Specialized Information Services
8600 Rockville Pike
Bethesda, Maryland 20894
(301) 496-1131

TTN

Technology Transfer Network
(919) 541-5742
for a 1200, 2400, or 9600 bps modem