This report is one in a series of volumes published by the U.S. Environmental Protection Agency (EPA) to provide information of general interest regarding environmental issues associated with specific industrial sectors. The documents were developed under contract by Abt Associates (Cambridge, MA), and Booz-Allen & Hamilton, Inc. (McLean, VA). This publication may be purchased from the Superintendent of Documents, U.S. Government Printing Office. A listing of available Sector Notebooks and document numbers is included on the following page.

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Complimentary volumes are available to certain groups or subscribers, such as public and academic libraries, Federal, State, local, and foreign governments, and the media. For further information, and for answers to questions pertaining to these documents, please refer to the contact names and numbers provided within this volume.

Electronic versions of all Sector Notebooks are available free of charge at the following web address: **www.epa.gov/oeca/sector**. Direct technical questions to the "Feedback" button at the bottom of the web page.

All photographs by Steve Delaney, EPA. Photographs courtesy of Luck Stone Corporation, Leesburg, Virginia. Special thanks to John LeGore.

EPA / 310-R-95-011

EPA Office of Compliance Sector Notebook Project

Profile of the Non-Metal, Non-Fuel Mining Industry

September 1995

Office of Compliance
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
401 M St., SW (MC 2221-A)
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Sector Notebook Contacts

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EPA/310-R-95-003.	Wood Furniture and Fixtures Industry	Bob Marshall	564-7021
EPA/310-R-95-004.	Inorganic Chemical Industry*	Walter DeRieux	564-7067
EPA/310-R-95-005.	Iron and Steel Industry	Maria Malave	564-7027
EPA/310-R-95-006.	Lumber and Wood Products Industry	Seth Heminway	564-7017
EPA/310-R-95-007.	Fabricated Metal Products Industry*	Scott Throwe	564-7013
EPA/310-R-95-008.	Metal Mining Industry	Jane Engert	564-5021
EPA/310-R-95-009.	Motor Vehicle Assembly Industry	Anthony Raia	564-6045
EPA/310-R-95-010.	Nonferrous Metals Industry	Jane Engert	564-5021
EPA/310-R-95-011.	Non-Fuel, Non-Metal Mining Industry	Rob Lischinsky	564-2628
EPA/310-R-95-012.	Organic Chemical Industry*	Walter DeRieux	564-7067
EPA/310-R-95-013.	Petroleum Refining Industry	Tom Ripp	564-7003
EPA/310-R-95-014.	Printing Industry	Ginger Gotliffe	564-7072
EPA/310-R-95-015.	Pulp and Paper Industry	Seth Heminway	564-7017
EPA/310-R-95-016.	Rubber and Plastic Industry	Maria Malave	564-7027
EPA/310-R-95-017.	Stone, Clay, Glass, and Concrete Industry	Scott Throwe	564-7013
EPA/310-R-95-018.	Transportation Equipment Cleaning Ind.	Virginia Lathrop	564-7057
EPA/310-R-97-001.	Air Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-002.	Ground Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-003.	Water Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-004.	Metal Casting Industry	Jane Engert	564-5021
EPA/310-R-97-005.	Pharmaceuticals Industry	Emily Chow	564-7071
EPA/310-R-97-006.	Plastic Resin and Man-made Fiber Ind.	Sally Sasnett	564-7074
EPA/310-R-97-007.	Fossil Fuel Electric Power Generation Ind.	Rafael Sanchez	564-7028
EPA/310-R-97-008.	Shipbuilding and Repair Industry	Anthony Raia	564-6045
EPA/310-R-97-009.	Textile Industry	Belinda Breidenbach	564-7022
EPA/310-R-97-010.	Sector Notebook Data Refresh-1997	Seth Heminway	564-7017
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EPA/310-R-98-002.	Agricultural Chemical, Pesticide, and Fertilizer Industry	Amy Porter	564-4149
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EPA/310-R-98-004.	Agricultural Livestock Production Ind.	Ginah Mortensen	(913)551-7864
EPA/310-R-98-005.	Oil and Gas Exploration and Production Industry	Dan Chadwick	564-7054
EPA/310-R-98-008.	Local Government Operations	John Dombrowski	564-7036

*Spanish translations available.

Non-Fuel, Non-Metal Mining (SIC 14)

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NON-METAL , NON-FUEL MINING
(SIC 14)
LIST OF EXHIBITS

NON-FUEL , NON-METAL MINING
LIST OF ACRONYMS

AFS - AIRS Facility Subsystem (CAA database)
AIRS - Aerometric Information Retrieval System (CAA database)
AMD - Acid Mine Drainage
ARD - Acid Rock Drainage
BIFs - Boilers and Industrial Furnaces (RCRA)
BOD - Biochemical Oxygen Demand
CAA - Clean Air Act
CAAA - Clean Air Act Amendments of 1990
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS - CERCLA Information System
CFCs - Chlorofluorocarbons
CO - Carbon Monoxide
COD - Chemical Oxygen Demand
CSI - Common Sense Initiative
CWA - Clean Water Act
D&B - Dun and Bradstreet Marketing Index
ELP - Environmental Leadership Program
EPA - United States Environmental Protection Agency
EPCRA Emergency Planning and Community Right-to-Know Act
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FINDS - Facility Indexing System
f.o.b.- Free On Board or Freight On Board
HAPs - Hazardous Air Pollutants (CAA)
HSDB - Hazardous Substances Data Bank
IDEA - Integrated Data for Enforcement Analysis
LDR - Land Disposal Restrictions (RCRA)
LEPCs - Local Emergency Planning Committees
MACT - Maximum Achievable Control Technology (CAA)
MCLGs - Maximum Contaminant Level Goals
MCLs - Maximum Contaminant Levels
MEK - Methyl Ethyl Ketone
MSDSs - Material Safety Data Sheets
NAAQS - National Ambient Air Quality Standards (CAA)
NAFTA - North American Free Trade Agreement
NCDB - National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP - National Oil and Hazardous Substances Pollution Contingency Plan
NEIC - National Enforcement Investigation Center
NESHAP - National Emission Standards for Hazardous Air Pollutants
NO2 - Nitrogen Dioxide
NOV - Notice of Violation

NON-FUEL, NON-METAL MINING (SIC 14) LIST OF ACRONYMS (CONT'D)

NO_X - Nitrogen Oxide
NPDES - National Pollution Discharge Elimination System (CWA)
NPL - National Priorities List
NRC - National Response Center
NSPS - New Source Performance Standards (CAA)
OAR - Office of Air and Radiation
OECA - Office of Enforcement and Compliance Assurance
OPA - Oil Pollution Act
OPPTS - Office of Prevention, Pesticides, and Toxic Substances
OSHA - Occupational Safety and Health Administration
OSW - Office of Solid Waste
OSWER - Office of Solid Waste and Emergency Response
OW - Office of Water
P2 - Pollution Prevention
PCS - Permit Compliance System (CWA Database)
POTW - Publicly Owned Treatments Works
RCRA - Resource Conservation and Recovery Act
RCRIS - RCRA Information System
SARA - Superfund Amendments and Reauthorization Act
SDWA - Safe Drinking Water Act
SEPs - Supplementary Environmental Projects
SERCs - State Emergency Response Commissions
SIC - Standard Industrial Classification
SO_2 - Sulfur Dioxide
SX/EW - Solvent Extraction/Electrowinning
TOC - Total Organic Carbon
TRI - Toxic Release Inventory
TRIS - Toxic Release Inventory System
TRIS - Toxic Chemical Release Inventory System
TSCA - Toxic Substances Control Act
TSS - Total Suspended Solids
UIC - Underground Injection Control (SDWA)
UST - Underground Storage Tanks (RCRA)
VOCs - Volatile Organic Compounds

NON-FUEL, NON-METAL MINING (SIC 14)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Environmental policies based upon comprehensive analysis of air, water, and land pollution are an inevitable and logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (air, water, and land) affect each other, and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the EPA Office of Compliance led to the creation of this document.

The Sector Notebook Project was initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for eighteen specific industrial sectors. As other EPA offices, States, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded. The ability to design comprehensive, common sense environmental protection measures for specific industries is dependent on knowledge of several inter-related topics. For the purposes of this project, the key elements chosen for inclusion are: general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for

each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. As a check on the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those that participated in this process and enabled us to develop more complete, accurate, and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project, 401 M St., SW (2223-A), Washington, DC 20460. Comments can also be uploaded to the Enviroene Bulletin Board or the Enviroene World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing these data systems. Once you have logged in, procedures for uploading text are available from the on-line Enviroene Help System.

Adapting Notebooks to Particular Needs

The scope of the existing notebooks reflect an approximation of the relative national occurrence of facility types that occur within each sector. In many instances, industries within specific geographic regions or States may have unique characteristics that are not fully captured in these profiles. For this reason, the Office of Compliance encourages State and local environmental agencies and other groups to supplement or re-package the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested States may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with State and local requirements. Compliance or technical assistance providers may also

want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in the further development of the information or policies addressed within this volume.

If you are interested in assisting in the development of new notebooks for sectors not covered in the original eighteen, please contact the Office of Compliance at 202-564-2395.

Because this profile was not intended to be a stand-alone document concerning the non-fuel, non-metal mining industry, appended is a full reference of additional EPA documents and reports on this subject, as listed in the March edition of the Federal Register.

II. INTRODUCTION TO THE NON-FUEL , NON-METAL MINING INDUSTRY

This section provides background information on the size, geographic distribution, employment, production, sales, and economic condition of the non-fuel, non-metal mining industry. The type of facilities described within the document are also described in terms of their Standard Industrial Classification (SIC) codes. Additionally, this section contains a list of the largest companies in terms of production.

II.A. Introduction, Background and Scope of the Notebook

This profile provides an overview of SIC code 14, which includes mining and quarrying of nonmetallic minerals, except fuels; and establishments engaged primarily in mining or quarrying, developing mines, or exploring for non-fuel, nonmetallic minerals. Also included are certain well and brine operations, and primary preparation plants engaged in crushing, grinding, and washing.

Mining is defined simply as the taking of minerals from the earth. Minerals can be classified as either fuel minerals or non-fuel minerals. Non-fuel minerals can be further divided into metallic and nonmetallic minerals. This industrial profile is concerned only with the mining and quarrying of non-fuel, nonmetallic minerals, although many of the mining activities and processes involved are very similar to those performed in mining metallic minerals. Quarrying is an open-pit mining process designed specifically for the removal of either dimension stone or crushed stone by the cutting and loosening of blocks or blasting.

Establishments engaged primarily in crushing, pulverizing, or otherwise treating non-metal minerals are classified as mining facilities, whether or not they operate in conjunction with mines. However, if the crushing, pulverizing, or other treating activities take place off-site, the establishments are classified under SIC 3295 and are not addressed by this profile.

SIC 14 categorizes the industry according to the types of minerals mined. The following list indicates the three-digit SIC codes used to further distinguish the types of minerals within the industry, and their associated end uses:

SIC 141 - Dimension Stone/End Uses: Construction
SIC 142 - Crushed and Broken Stone, Including Riprap/End Uses: Construction

SIC 144 - Sand and Gravel/End Uses: Construction, Lime Manufacturing
SIC 145 - Clay, Ceramic, and Refractory Minerals/End Uses: Bricks, Cement and Paper
SIC 147 - Chemical and Fertilizer Mineral Mining/End Uses: Glass, Soaps, and Fertilizer
SIC 148 - Nonmetallic Minerals Services, Except Fuels
SIC 149 - Miscellaneous Nonmetallic Minerals, Except Fuels/End Uses: Insulation, Textiles, and Abrasives.

Separate profiles have been developed for the metal mining, and stone, clay, glass, and concrete products industries.

II.B. Characterization of the Non-Metal, Non-Fuel Mining Industry

The industry covered in this profile comprises establishments engaged in mining or quarrying, developing mines, or exploring for non-fuel, nonmetallic minerals such as dimension stone; crushed and broken stone; sand and gravel; clay, ceramic, and refractory minerals; chemical and fertilizer minerals, and other miscellaneous non-fuel, nonmetallic minerals. Also included under this SIC code are primary preparation plants, such as those engaged in crushing, grinding, or washing non-fuel, nonmetallic minerals. This section of the profile provides information on industry size and geographic distribution, product characterization, and economic trends. The predominant industries in this SIC code are crushed stone and sand and gravel. This section of the profile concentrates heavily on these two industries.

II.B.1. Industry Size and Geographic Distribution [1]

Crushed Stone Producers

A total freight on board (f.o.b.) of 1.1 billion metric tons of crushed stone, valued at $5.9 billion was reported produced in the United States in 1993 by 1,566 companies with 3,213 operations and 3,915 active quarries through open-pit mining. (See Section III.A. for a discussion of mining processes.) Most of the crushed stone produced in 1993 came from operations with an annual output greater than 300,000 tons; 1,182 operations, representing 37 percent of the total, produced 84 percent of the total tonnage.

In 1993 the ten top producing states, in descending order of tonnage were Texas, Pennsylvania, Florida, Illinois, Missouri, Ohio, Virginia, Georgia, Kentucky, North Carolina, accounting for 51 percent of the total domestic output.

Exhibit 1 lists the ten leading companies that produce crushed stone in the United States. These ten companies, with a total of 507 active operations and 509 quarries, account for 31 percent of the total output of crushed stone in the United States.

Exhibit 1
10 Leading Crushed Stone Producers
(In terms of total output of crushed stone)

Company	Number of Active Operations	States
1. Vulcan Materials Company	158	Alabama, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, Wisconsin
2. Beazer USA, Inc. / Hanson PLC	98	Alabama, Arizona, California, Georgia, Indiana, Kentucky, Michigan, New Mexico, New York, North Carolina, Ohio, Oregon, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington
3. Martin Marietta Aggregates	130	Georgia, Indiana, Iowa, Kansas, Maryland, Missouri, Nebraska, North Carolina, Ohio, South Carolina, Virginia, Wisconsin
4. CSR America, Inc.	24	Florida, Georgia, Indiana, Ohio, South Carolina

Source: Directory of Principal Crushed Stone Producers in the United States in 1993, U.S. Department of the Interior, Bureau of Mines.

Exhibit 1 (cont'd)
Leading Crushed Stone Producers
(In terms of total output of crushed stone)

Company	Number of Active Operations	States
5 Rogers Group Inc.	27	Alabama, Indiana, Kentucky, Ohio, Tennessee, Virginia
6. Lafarge Corporation	20	Illinois, Iowa, Kansas, Kentucky, Michigan, Missouri, New York, Ohio, Pennsylvania, Texas
7. Florida Rock Industries, Inc.	18	Florida, Georgia, Maryland, Virginia
8. Tarmac America, Inc.	11	Florida, South Carolina, Texas, Virginia
9. Dravo Corporation	11	Alabama, Florida, Illinois, Kentucky, Louisiana, Ohio
10. Lone Star Industries, Inc.	12	California, Illinois, Indiana, Missouri, New York, Oklahoma, Oregon, Pennsylvania, Texas

Source: Directory of Principal Crushed Stone Producers in the United States in 1993, U.S. Department of the Interior, Bureau of Mines

A total of 93 underground mines produced 65.2 million metric tons of crushed stone in 1993, as opposed to 1.1 billion metric tons produced from open-pit mining. Underground mines were located in 20 states. The leading states in descending order of tonnage were Kentucky, Iowa, Illinois, Missouri, Indiana, Maryland, and Tennessee. Their production represented 76 percent of the total U.S. crushed stone produced from underground mines.

Sand and Gravel Producers

A total of 919 (834 million short tons) of construction sand and gravel valued at 3.3 billion, f.o.b. plant, was reported produced in 1992 by 4,213 companies with 5,999 operations. Some companies produced both construction and industrial sand and gravel from the same operations. In 1992, most of the sand and gravel came from operations that produced more than 200,000 tons per year; 1,290 operations, representing 22 percent of the total, produced 71 percent of the total tonnage.

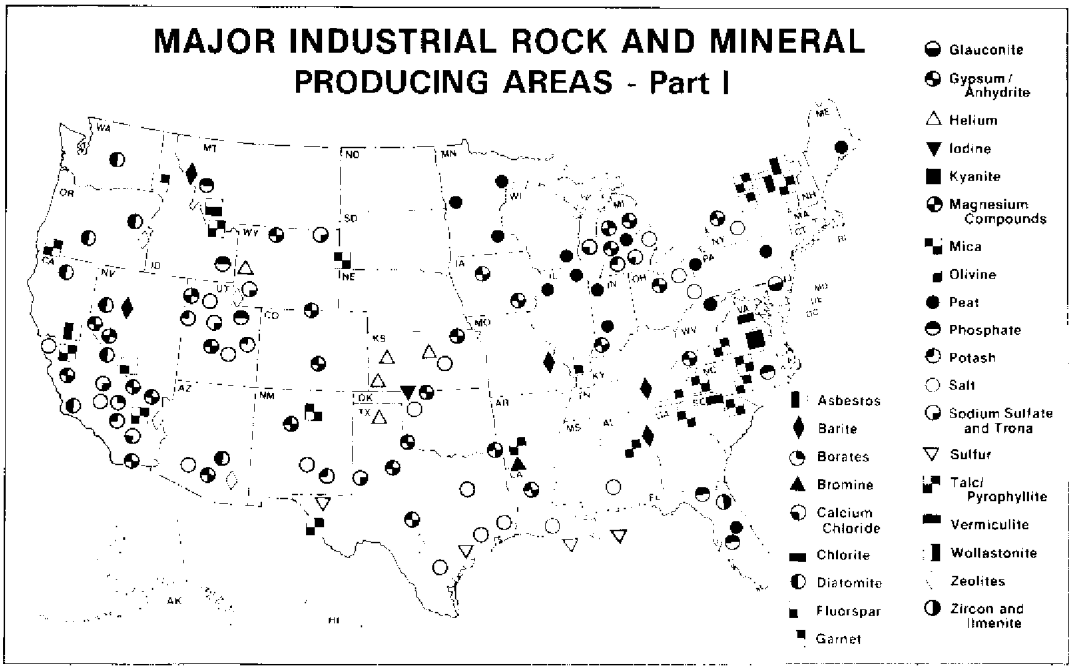
Exhibit 2 lists the ten leading companies that produce sand and gravel in the United States.

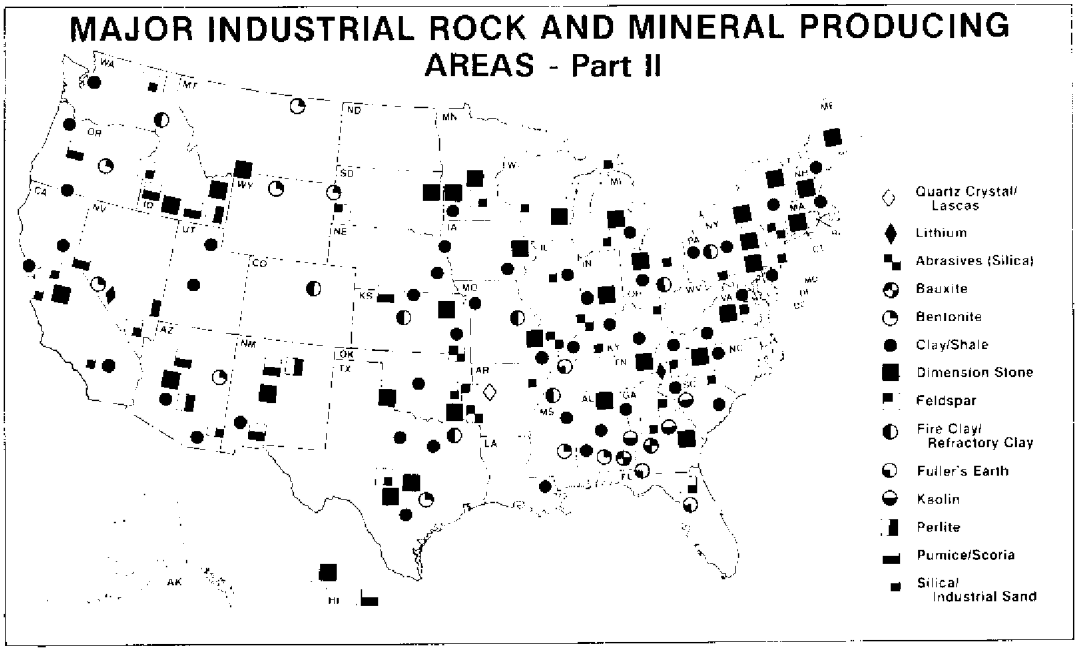
Exhibit 2
10 Leading Companies in Order of Total Output of Sand and Gravel

Company	Number of Active Operations	States
1. Calmat Co.	28	Arizona, California, New Mexico
2. Beazer USA, Inc. / Hanson PLC	43	Arkansas, California, Georgia, Indiana, Louisiana, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Texas, Washington
3. CSR America Inc.	39n	Arizona, Georgia, Florida, Indiana, Michigan, Nevada, Ohio, South Carolina, Washington
4. Ashland Oil, Inc. / APAC, Inc.	41	Alabama, Arizona, Arkansas, Florida, Georgia, Mississippi, Oklahoma, North Carolina, South Carolina
5. Redland PLC	38	Colorado, Kansas, Maryland, New Mexico, Texas
6. Dravo Corporation	17	Alabama, Florida, Ohio, Pennsylvania, West Virginia
7. Vulcan Materials Co.	22	Alabama, Florida, Illinois, Indiana, Iowa, Tennessee, Texas, Wisconsin
8. Lonestar Industries, Inc.	8	California
9. Pioneer Concrete of America	10	Pennsylvania, Texas
10. Lafarge Corp.	19	Louisiana, Missouri, New York, Ohio, Pennsylvania, Texas, Washington, West Virginia

Source: Directory of Principal Sand and Gravel Producers in the United States in 1992, U.S. Department of the Interior, Bureau of Mines.

Exhibit 3
Geographic Distribution of the Industry





II.B.2. Product Characterization

Crushed stone and sand and gravel are the two main sources of natural aggregate. Both are used in almost all residential, commercial, and industrial buildings, and in most public works projects such as roads and highways, bridges, railroads, dams, airports, water and sewer systems, and tunnels. Together, crushed stone and sand and gravel make up approximately half the volume of mined minerals in the United States.

Crushed stone and sand and gravel are widely used commodities that are important elements in many national industries. Sand and gravel (or sand alone) can be used for industrial purposes such as foundry operations, in glass manufacturing, as an abrasive, and in filtration beds of water-treatment facilities. Crushed stone is used as a source of calcium for fertilizers, as a metallurgic fluxstone, and as the major resource in the manufacture of cement and lime. It is also used in water and sewer filtration systems and in the manufacture of glass.

Crushed stone and sand and gravel, however, are most commonly used as aggregate in the construction industry. As an example, an average 1,500-square-foot home requires approximately 114 tons of aggregate. If you add each home's proportional share of new streets, schools, churches, municipal projects, and shopping centers, the total aggregate use per home increases to approximately 328 tons (Shumway and Silva, 1993).

Many types of non-fuel, nonmetallic minerals comprise this industry. The major SIC groups of non-fuel, nonmetallic minerals and some of the minerals within each group include: dimension stone (mica schist, granite, limestone, marble, sandstone, slate), crushed and broken stone (limestone, granite, dolomite, cement rock, sandstone, trap rock), sand and gravel (industrial sand, construction sand, gravel, pebble, silica, abrasive sand), clay, ceramic, and refractory minerals (kaolin, ball clay, fire clay, china clay, paper clay, kyanite), chemical and fertilizer minerals (potassium compounds, boron compounds, sodium compounds, phosphate rock, sulfur), and miscellaneous nonmetallic minerals (asbestos, diatomite, gypsum, asphalt rock, graphite, precious stones). Some of the more commonly mined non-fuel, nonmetallic minerals include crushed and broken stone (limestone), sand and gravel (silica sand), and clay (kaolin clay). Non-fuel, nonmetallic minerals are also referred to as industrial minerals.

II.B.3. Economic Trends

According to a Bureau of Mines Study, the demand for crushed stone in 1994 was expected to be about 1.17 billion metric tons (1.29 billion short tons), a 5 percent increase compared with that of 1993. Gradual increases in demand for construction aggregates have occurred after 1994, based on increased volume of work on the infrastructure that is being financed by the Intermodal Surface Transportation Efficiency Act of 1991 and is the result of the recovery of the U.S. economy. The law authorized $151 billion to be spent in the next 6 years on transportation projects, of which $119.5 billion was allocated for highway work and $32.5 billion for mass transit.

It was estimated that the demand for crushed stone will reach 1.3 billion tons in 1995 although the final numbers for 1995 have not been released. The projected increases will be influenced by construction activity primarily in the public as well as the private sector.

Crushed stone f.o.b. prices are not expected to increase significantly, even if the demand for construction aggregates will rise over the forecasts. However, the delivered prices of crushed stone are expected to increase, especially in and near metropolitan areas, mainly because more aggregates are transported from distant sources.

The demand for construction sand and gravel in 1993 was expected to be about 940 million tons, a 2.5 percent increase compared with that of 1992. Gradual increases in demand for construction aggregates are anticipated after 1993 as well. The factors that stimulate demand in the construction sand and gravel industry are similar to those that affect the crushed stone industry (i.e., the Intermodal Surface Transportation Efficiency Act of 1991 and the recovery of the U.S. economy). Similarly, construction sand and gravel prices are not expected to rise significantly, except for the delivered prices. It is estimated that the demand for construction sand and gravel will reach 975 million tons in 1995. The projected increases will be influenced by construction activity, primarily in the public construction sector.

Dimension stone production for 1993 was estimated at 1.17 million tons, approximately the same as in 1992. The construction industry, a major consumer of stone and stone products, is expected to boost demand for stone and stone products. Increases in new residential construction should also boost demand for stone and stone products.

The domestic construction industry also provided an impetus for mineral demand in 1994. The construction industry is the largest domestic consumer of brick, clay, cement, sand and gravel, and stone. Expenditures for road construction and maintenance (which consume large quantities of asphalt, cement, crushed stone, and sand and gravel) continued at a high level in 1994 and are expected to remain strong in 1995 due to continued funding for mass transit projects. In addition, apartment building construction (a major end-use sector for brick clay, cement, sand and gravel, steel, and stone) rose sharply in 1994.

III. INDUSTRIAL PROCESS DESCRIPTION

This section describes the major industrial processes within the non-fuel, non-metal mining industry, including the materials and equipment used, and the processes employed. The section is designed for those interested in gaining a general understanding of the industry, and for those interested in the inter-relationship between the industrial process and the topics described in subsequent sections of waste outputs, pollution prevention opportunities, and Federal regulations. This section does not attempt to replicate published engineering information that is available for this industry. Refer to Section IX for a list of reference documents that are available to supplement this document.

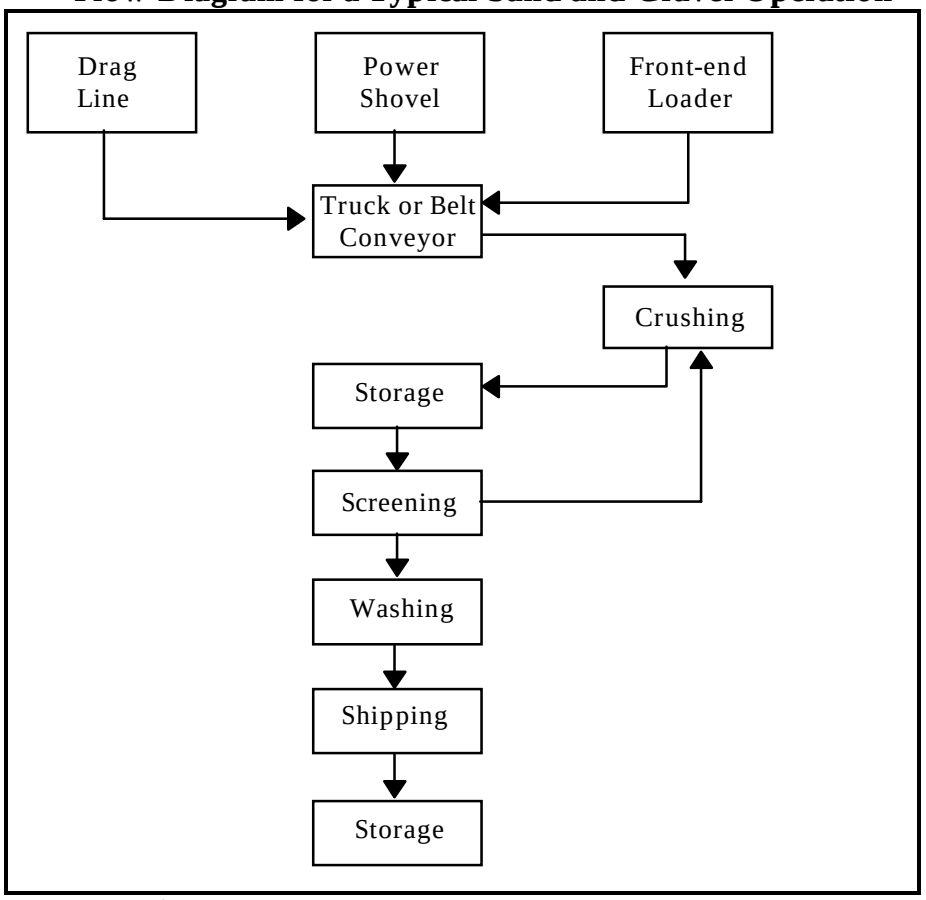
This section specifically contains a description of commonly used production processes, associated raw materials, the byproducts produced or released, and the materials either recycled or transferred off-site. This discussion, coupled with schematic drawings of the identified processes, provide a concise description of where wastes may be produced in the process. This section also describes the potential fate (air, water, land) of these waste products.

III.A. Industrial Processes in the Non-Fuel, Non-Metal Mining Industry

Minerals extraction is broadly divided into three basic methods: open-pit or surface, underground, and solution mining. The mining method used depends on the particular mineral, the nature of the deposit, and the location of the deposit. Each method is discussed briefly below. For this industry, most mining is open-pit or surface mining.

Surface or open-pit mining requires extensive blasting, as well as rock, soil, and vegetation removal to reach mineral deposits. Waste rock, or overburden, is piled away from the mine. Benches are cut into the walls of the mine to provide access to progressively deeper ore, as upper-level ore is depleted. Ore is removed from the mine and transported to processing plants for concentration.

Exhibit 4
Flow Diagram for a Typical Sand and Gravel Operation



Source : California EPA and the National Stone Association, Aggregate Plants Compliance Assistance Program, September, 1993.

Underground mining involves extraction from beneath the surface at depths as great as 10,000 feet. This requires sinking shafts to reach the main body of deposits. "Drifts," or passages, are then cut from the shaft at various depths to access the ore, which is removed to the surface for processing. Waste rock may be either returned to the mine as fill or put in a disposal area.

Fluid or solution mining entails drilling into intact rock and using chemical solutions to dissolve lode deposits. During solution mining, the leaching solution (usually a dilute acid) penetrates the ore, dissolving soluble minerals. This pregnant leach solution is then retrieved for recovery at a solvent extraction / electrowinning plant.

Historically, the primary mining method has been underground mining. However, with the advent in recent decades of large earth moving

equipment, less expensive energy sources, and improved extraction and beneficiation technologies, surface mining now prevails in most industry sectors. It usually costs less to mine a ton of rock from an open-pit mine than from an underground mine. Whether open-pit mining is ultimately less costly than underground mining is closely related to other factors such as stripping ratios, physical properties of the ore body, rates and productivity.

Minerals Extraction

The extraction of minerals from the earth often involves the use of mechanical means such as drilling. Some drill types include rock, diamond, water-jet, and jet flame. Rock and diamond drills involve the rotation of a pipe or rod tipped with a rolling gear-like bit; water-jet drills use a powerful jet of water to blast materials loose; jet flame drills use a high-velocity flame to create holes in hard rock. Other machines unique to mining include mechanical miners and specially adapted materials-handling equipment for use in underground and surface mining. Diesel engines are used for generating small quantities of electric power in remote areas and for transportation units.

Blasting is a method of mineral extraction involving the displacement of solid rock through the use of explosives. Blasting also fragments the deposit into sizes that require a minimum of secondary breakage, and that can be handled by loading and hauling equipment. The explosive charge (usually a mixture of ammonium nitrate and fuel oil) used in blasting must be strategically placed so as to break the solid material efficiently.

Extraction without the use of mechanical methods is also possible if the material surrounding the mine opening is not adequately supported. By removing underlying support, the rock caves into the opening left by the removed supports. If rock needs to be broken down further for transportation, secondary breakage may be required. This involves using drop-ball cranes on the oversized rock to further reduce its size.

Minerals Transportation

The excavation and loading of broken rock is normally performed by mechanical shovels and front-end loaders. The broken rock is either loaded into a haulage vehicle, such as a truck or railroad track-type car for transport to a processing plant, or directly into a primary crusher. At most quarries, large capacity haulage vehicles are used to transport broken rock from the quarry to the primary crusher. Pipelines have also been used successfully to transport many different minerals, such as

limestone, phosphates, and sand fills: the dry material is first combined with water to form a slurry and is then pumped to its destination for dewatering. If sufficient dump room or storage capacity exists near the mine, a system of belt conveyors can handle material at high rates and relatively low cost, but only if proper feed control of a sized material allows a continuous, even flow that matches the system design. Other factors that determine the practicality and size of a conveyor system are the rate at which the material must be handled, the material's density and stickiness, the dusting or degradation on transfer, and the need for the system to handle more than one product.

Minerals Processing

Processing minerals after their extraction and transportation to the processing plant involves the use of crushers, grinders, and screens. This equipment is used to separate or scalp larger boulders from the finer rocks that do not need primary crushing, thus minimizing the load to the primary crusher. Following crushing, a variety of mechanical concentration techniques are used to concentrate the desired minerals. Techniques used for non-fuel, nonmetallic minerals include flotation, heavy media separation, and electromagnetic separation.

Flotation is a method of concentrating targeted minerals which uses the physical and chemical properties of the minerals along with process chemicals to separate desired minerals from remaining wastes. Typically, the mineral is entered into an acidic or basic bath of flotation agents. Depending on the type of mineral being concentrated, this bath may consist of such chemicals as sulfuric acid, chromium, phenols, zinc, ammonia, hydrochloric acid, and phosphoric acid. The wastes, including the spent process liquids, are discarded.

Heavy media separation utilizes mainly organic chemicals to separate minerals using the minerals' density differences. Electromagnetic separation uses a magnetic field to remove impurities from the target mineral.

Following are brief descriptions of processes used in mining major non-fuel, nonmetallic minerals.

Dimension Stone

Dimension stone refers to rock that is cut to a certain shape and size. It is commonly used as building material in the construction industry. Common types of dimension stone are limestone, granite, dolomite, sandstone, marble, and slate. Processing the stone begins with sawing the

excavated rock into slabs using a rotating diamond or circular saw. Water is used to cool the saws and to remove particles. After the stone has been cut to the desired size, it is finished using natural and synthetic abrasives. Natural abrasives include iron oxide, silica, garnet, and diamond dust. Synthetic abrasives include silicon carbide, boron carbide, and fused alumina.

Crushed and Broken Stone, Including Riprap

Nearly all principal types of stone, including granite, diabase, limestone, sandstone, dolomite, and marble may be used as sources of commercial crushed stone. Stone that breaks in chunky, cubical fragments and is free of surface alteration from weathering is preferred for crushed stone. Such stone should also be free of impurities such as opalescent quartz, which may react with lime in cement and cause disintegration of the concrete in which the stone may be used. Most crushed and broken stone is mined from open quarries; however, in many areas, factors favoring large-scale production by underground mining are becoming more frequent and more prominent.

Surface mining equipment varies with the kind of stone mined, the production capacity needed, the size and shape of the deposit, estimated life of the operation, location of the deposit with respect to urban centers, and other important factors. Ordinarily, drilling is done with tricone rotary drills, long-hole percussion drills, and churn drills. Blasting in smaller operations may still be done with dynamite, but in most medium- to large-size operations, ammonium nitrate fuel oil mixtures (AN-FO), which are much lower in cost, are used.

Other processing activities include conveying, screening, secondary and tertiary crushing, and sizing. Screening is the single most important part of the processing cycle of crushed stone particles. A wide variety of screen types exists, and their selection is a function of the material processed as well as the final product required. Inclined vibratory screens are most commonly used in stationary installations, while horizontal screens are used extensively in portable plants. For screening large sizes of crushed stone, grizzly bars, rod decks, and heavy punched steel or plastic plates are used; for smaller sizes, woven wire, welded wire cloth, rubber, or plastic screens are used. Stone washing is something performed, which consists of processing the crushed stone across sizing screens where it is saturated with water, in order to remove unwanted material.

Underground operations are becoming more common, especially for limestone mining in the central and eastern parts of the United States, as the advantages of such operations are increasingly recognized by the producers. By operating underground, a variety of problems usually connected with surface mining such as environmental impacts and community acceptance are significantly reduced. Underground room-and-pillar mines can be operated on a year-round basis, do not require extensive removal of overburden, and produce a minimum of environmental disturbance.

Of the total crushed stone produced in 1993, about 71 percent was limestone and dolomite; 15 percent granite; and eight percent traprock. The remaining six consisted of sandstone and quartzite, miscellaneous stone, calcareous marl, shell, marble, volcanic cinder and scoria, and slate. Limestone is used in the manufacture of products such as glass, paper, paint, sugar, and cement; of the 1.2 billion tons of crushed stone produced in 1993, approximately 81 percent was used as construction aggregates, mostly for highway and road construction and maintenance; 15 percent for chemical and metallurgical uses including cement and lime manufacture; three percent for agricultural purposes; and one percent for miscellaneous uses and products.

Sand and Gravel

Sand and gravel are the unconsolidated granular materials resulting from the natural disintegration of rock or stone. Sand and gravel deposits are commonly found adjacent to or in river courses or in areas with glaciated or weathered rock. Such deposits often contain the fine alluvial silt that is the primary source of process and fugitive dust from sand and gravel operations.

There are two main types of sand and gravel. Construction sand and gravel are used mainly in concrete, road-base, asphaltic concrete aggregates, and construction fill. Generally, the physical characteristics of construction sand and gravel and their proximity to construction sites is more important than their chemical characteristics. Industrial sand and gravel are used mainly in manufacturing glass, ceramics, and chemicals. The chemical and physical characteristics of industrial sand and gravel are very important to their end uses, and are therefore subject to stricter chemical and physical characterization than construction sand and gravel.

Loose sand and gravel deposits are usually mined without the necessity of drilling and blasting. On rare occasions, blasting with light charges is used to loosen deposits.

Extraction and mining is done by any number of methods, depending on whether the deposit is above or below the water table. Where sand and gravel are above water, extraction is done by power shovels, drag line scrapers, and/or by highly mobile, rubber-tired front-end loaders.

When the sand and gravel deposit is consolidated to the point where digging with a front-end loader or power shovel is too difficult, a bulldozer equipped with a ripper is used to loosen the material. A ripper consists of a large tooth (or series of teeth) which is attached to the rear of the bulldozer and pulled through the material as the bulldozer moves forward. Materials mined below water, in rivers, estuaries, lakes, and oceans must be removed with specialized equipment. This equipment includes dredges, draglines and floating cranes.

Clay, Ceramic, and Refractory Minerals

Common types of clay, ceramic, and refractory minerals include kaolin, ball clay, bentonite, fuller's earth, fire clay, common clay, and shale. Processing of minerals in this category usually entails a combination of crushing, grinding, screening, and shredding to reduce particle size. For kaolin and ball clay, wet and dry processing methods are used. The wet process employs liquid chemical dispersants (phosphates, phosphoric acid, hydroxides) and water to remove impurities. A clay slurry is formed and is made either acidic or basic using sulfuric acid or alum. The slurry is then chemically leached using a reducing agent such as zinc hydrosulfide, ozone, or peroxide to remove unwanted iron and titanium ions. The slurry is dried to remove water and unwanted chemical compounds such as phosphates, phosphoric acids, silicates, iron, and zinc. Clay beads are then formed that are pulverized and calcined (heat treated).

Chemical and Fertilizer Minerals

These minerals include potash and phosphate rock. Potash, a term that describes minerals containing potassium compounds, is used in fertilizers. Processing potash involves mixing crushed potash ore with a brine which is saturated with potassium chloride and sodium chloride. Froth flotation, crystallization, or heavy media separation methods are then used to recover potassium-bearing compounds from the saturated solution.

Processing phosphate rock usually consists of sizing and flotation. Crude ore is pumped and slurried in wells and is transported to a washing plant for sizing. Fine concentrate is sent to flotation, where various flotation

methods are used on the concentrate. Typical flotation reagents used include sulfuric acid, which is used in product scrubbing, and soda ash. Additional flotation reagents include fatty acids and amines. Phosphate rock is used mainly in fertilizer manufacturing. Phosphate rock mining involves the movement of huge volumes of soil and other materials in overburden. Phosphate rock preparation involves beneficiation to remove impurities, drying to remove moisture, and grinding to improve reactivity. Usually, direct-fired rotary kilns are used to dry phosphate rock.

Non-fuel, Nonmetallic Minerals Services

This industry code includes facilities which specialize in specific areas of mining operations and which perform services on a contract basis. Specialty areas include exploration and mine development. From a process and chemical use standpoint, activities in this SIC code are similar to other activities conducted in other SIC codes. During the exploration and characterization of a mineral deposit, samples of rock must be collected and analyzed. Drill-based sampling methods are routinely used to characterize a mineral deposit at different depths. These methods include rotary, percussion, auger, and diamond drilling. Diamond drilling will extract a cylindrical core of material, while the former three methods will extract fragmented material. All share the objective of collecting ore material for analysis.

Miscellaneous Non-fuel, Nonmetallic Minerals

Minerals included in this category include lightweight aggregates (pumice, vermiculite), asphaltic minerals (gilsonite, wurtzilite), natural abrasives (millstone, diatomite), gemstones (jade, sapphire), and other minerals, such as asbestos and gypsum. Processing these minerals usually involves crushing, grinding, screening, flotation, heavy media separation, and drying methods similar to those used for other minerals. As in processing other non-fuel, nonmetallic minerals, wet methods are more chemically intensive than dry methods due to the use of various flotation agents to refine the mineral.

III.B. Mining Process Waste Outputs

III.B.1. Process-Specific Wastes

Minerals Extraction

The extraction of minerals requires the removal and disposal of overburden, a layer of soil, vegetation, and rock. Waste rock generated in both surface and underground operations is removed and usually disposed of in impoundment areas or is used to backfill mines. Wastewater is generated from the use of water to suppress dust, wash away waste from the working zone, and cool excavation machinery such as drills. Dusts are generated from the cutting, drilling, sawing, and blasting required to remove the rock. Explosives used in excavation contain mixtures of ammonium nitrate and fuel oil. Hydrocarbons used in machinery as lubricants and fuels can be sources of pollution.

Minerals Processing

Wastes generated from minerals processing include dusts, solid matter, and water effluents. Crushing and screening operations performed to reduce the size of particles are also sources of dust emissions and solid waste. This waste may contain minerals that react with air and water to produce metal ions capable of contaminating water resources such as rivers, streams, and groundwater.

Processes used to remove mineral impurities can be a major source of water contamination. Flotation, a wet method used to refine certain non-fuel, nonmetallic minerals (sand and gravel, kaolin, potash, phosphate rock) is a potential source of water pollution due to the chemicals used to separate impurities from the mineral. Flotation involves placing minerals in an acidic or basic bath of chemicals where pH modifiers such as sulfuric acid, ammonia, and hydrofluoric acid are used to control pH levels in order to separate impurities from the target mineral. Additional materials may be added to the flotation bath to assist in removing impurities, including frothers, conditioning agents, sulfonated oils, and heavy alcohol.

Exhibit 5 summarizes the types of wastes produced at various points in the non-fuel, nonmetal mining industry.

Exhibit 5
Process Waste Materials

Primary	Subprocesses	Air Emissions	Process Waste Water	Other Waste Generated
Minerals Extraction	Drilling, blasting, secondary breakage	Particulates, exhaust from machinery	Surface runoff, groundwater seepage	Overburden (soil, rock)
Minerals Transportation	Loading, conveying, off-road haulage, unloading	Particulates, exhaust from vehicles and machinery	Water for transporta-tion of ore to process plant	
Minerals Processing	Crushing, grinding, screening, washing, drying, calcining, floating	Particulates	Transport water, ore and product wash water, dust suppression water, classification water, heavy media separation water, flotation water, solution water, air emissions control equipment water, equipment, and floor wash down water	Tailings

III.B.2. Mineral-Specific Pollutants

Sand and Gravel

Particulate matter is emitted from sand and gravel operations and is made up principally of inert crustal material (e.g., soil and rock particles). Dust emissions in the form of fugitive dust occur during removal of overburden and sand and gravel from the deposit; from wind-blown dust from storage piles; from traffic on haul roads; from open conveyors exposed to the wind; during material dumping from trucks, front-end loaders, and conveyors; from screening; and from transfer points in conveyor systems. If wet screening is used to produce a washed gravel product, negligible amounts of dust are produced, but effluent water must be clarified by settling before reuse or discharge. The amount of moisture a deposit contains affects the amount of dust emissions that occur. If the deposit is dry and the material and overburden have a high silt content, dust emissions may be significant. If the deposit is wet or is

removed by dredging, dust emissions tend to be negligible as long as a high moisture content is maintained in the material.

Methods of controlling dust emissions from sand and gravel operations include using water sprays to keep materials and roads wet, limiting the drop heights of materials, covering trucks and conveyors, using enclosures or hooding material at transfer points and screening operations, and exhausting air from these points to air pollution control systems.

Stone

The source of crushed stone is usually a deposit of relatively solid rock such as limestone, dolomite, trap rock, granite or sandstone. Dust emissions occur from many operations in stone quarrying and processing. Dust is released when rock and crushed stone products are loosened by drilling or blasting them from their deposit beds. Dust is also released when the loosened rock is loaded into trucks by power shovels or front-end loaders. Transporting the quarried material to the processing plant generates dust from the rock inside the truck and from the road. Sources of dust at the processing plant include the dumping of rock into primary crushers; primary, secondary, and tertiary crushing; screening; transferring rock by belt conveyor; loading rock onto storage piles from conveyors; and wind blowing dust from storage piles and open conveyors.

Particulate matter produced during stone quarrying and processing is usually of relatively large particle size. The chemical composition of the dust tends to be homogeneous since its ancestry is the rock formation from which the rock deposit was taken.

Air pollution control techniques for stone quarrying and processing plants include wetting the material and/or surfaces; covering open operations to prevent dust entrainment by the wind; reducing the drop height of dusty material; and using hooding, industrial ventilation systems, and dust collectors (e.g., baghouses) on dusty processes amenable to enclosure. Dust recovered from air pollution control systems is often a valuable product in road building and other construction operations.

Phosphate Rock

Although there are no significant emissions from phosphate rock beneficiation plants, emissions in the form of fine rock dust may be expected from drying and grinding operations. Phosphate rock grinders

can be a considerable source of particulates. Because of the extremely fine particle size, baghouse collectors are normally used to reduce emissions. Effluents produced in the mining and beneficiation of phosphate rock are contained in the water suspensions leaving the washer plant. These suspensions are the phosphatic clays and sand tailings. The major effluent is that of the phosphatic clays which contain a suspension of clays and very fine solids. These phosphatic clays are impounded in slime ponds to allow settling and clarification to occur. Clear water is returned from the ponds to the beneficiation plant. When phosphate rock is calcined, fluoride is produced. The fluoride produced is scrubbed with water or dilute hydrofluoric acid.

Because proposed mining activities may also impact aquatic sources, vegetation and wildlife, EPA suggests the following potential mitigation measures for use at mine sites:

Exhibit 6
Ecosystem Mitigation Measures

- Employ sediment retention structures to minimize amount of sediment migrating off-site
- Employ spill prevention and control plans to minimize discharge of toxic/hazardous materials into water bodies
- Site roads, facilities, and structures to minimize extent of physical disturbance
- Avoid construction or new disturbance during critical life stages
- Minimize use of fences or other such obstacles in big game migration corridors; if fences are necessary, use tunnels, gates, or ramps to allow passage of these animals
- Use "raptor proof" designs on power poles to prevent electrocution of raptors
- Use buses to transport employees to and from mine from outer parking areas to minimize animals killed on mine-related roadways
- Limit impacts from habitat fragmentation, minimize number of access roads, and close and restore roads no longer in use
- Prohibit use of firearms on site to minimize poaching.

Source: US EPA, OSW Technical Document/Background for NEPA Reviewers: Non-Coal Mining Operations, 1994.

IV. WASTE RELEASE PROFILE

This section provides a general overview of the waste release activities and issues common to the non-fuel, non-metal mining industry. Unlike facilities covered by SIC codes 20 through 39 (manufacturing facilities), non-fuel, non-metal mining facilities are not required by the Emergency Planning and Community Right-to-Know Act to report to the Toxic Release Inventory (TRI). Because TRI reporting is not required for the non-fuel, non-metal mining industry, other sources of waste release data have been identified for this profile. EPA is considering expanding TRI reporting requirements in the future, which may affect such previously exempt industries such as non-fuel, non-metal mining.

IV.A. Data Sources

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry.

AIRS Data

The Aerometric Information Retrieval System (AIRS) is an air pollution data delivery system managed by the Technical Support Division in EPA's Office of Air Quality Planning and Standards, located in Research Triangle Park, North Carolina. AIRS is a national repository of data related to air pollution monitoring and control. It contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. States are the primary suppliers of data to AIRS. Data are used to support monitoring, planning, tracking, and enforcement related to implementation of the Clean Air Act. AIRS users include State environmental agency staff, EPA staff, the scientific community, other countries, and the general public.

Exhibit 7 summarizes AIRS annual releases of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 microns or less (PM10), total particulates (PT), sulfur dioxide (SO_2), and volatile organic compounds (VOCs). This information is compared across industry sectors.

Exhibit 7
Pollutant Releases (Short Tons/Year)

Industry	CO	NO_2	PM_{10}	PT	SO_2	VOC
U.S. Total	97,208,000	23,402,000	45,489,000	7,836,000	21,888,000	23,312,000
Metal Mining	5,391	28,583	39,359	140,052	84,222	1,283
Nonmetal Mining	**4,525**	**28,804**	**59,305**	**167,948**	**24,129**	**1,736**
Lumber and Wood Products	123,756	42,658	14,135	63,761	9,149	41,423
Wood Furniture and Fixtures	2,069	2,981	2,165	3,178	1,606	59,426
Pulp and Paper	624,291	394,448	35,579	113,571	341,002	96,875
Printing	8,463	4,915	399	1,031	1,728	101,537
Inorganic Chemicals	166,147	108,575	4,107	39,082	182,189	52,091
Organic Chemicals	146,947	236,826	26,493	44,860	132,459	201,888
Petroleum Refining	419,311	380,641	18,787	36,877	648,153	309,058
Rubber and Misc. Plastic Products	2,090	11,914	2,407	5,355	29,364	140,741
Stone, Clay, Glass, and Concrete	58,043	338,482	74,623	171,853	339,216	30,262
Iron and Steel	1,518,642	138,985	42,368	83,017	238,268	82,292
Nonferrous Metals	448,758	55,658	20,074	22,490	373,007	27,375
Fabricated Metals	3,851	16,424	1,185	3,136	4,019	102,186
Electronics	367	1,129	207	293	453	4,854
Motor Vehicles, Bodies, Parts, and Accessories	35,303	23,725	2,406	12,853	25,462	101,275
Dry Cleaning	101	179	3	28	152	7,310

Source U.S. EPA Office of Air and Radiation, AIRS Database, May 1995.

Exhibit 8 lists the air emissions of particular chemicals reported for SIC 14 in the Air Facility Subsystem (AFS) of AIRS, presented in a "SIC Code Profile, Non-Metal Mining," prepared by EPA's Office of Pollution Prevention and Toxics in April, 1992. The release data are expressed in pounds released per year, per facility.

Exhibit 8
AIRS Releases

Chemical	Facilities	Med. Releases (lbs/Year/Facility)	Total Releases (lbs/Year/Facility)
Acetaldehyde	19	420	8,200
Acetone	24	80	16,209
Acrolein	19	385	7,789
Acrylic acid	12	54	1,212
Acrylonitrile	16	290	4,599
Aniline	13	95	3,278
Antimony	49	377	37,608
Arsenic	284	2	56,371
Barium	284	3	19,960
Benzene	59	89	70,324
Benzyl chloride	12	50	1,131
Biphenyl	12	2	75
1,3-Butadiene	16	134	45,662
Butyl acrylate	16	215	1,865
sec-Butyl alcohol	15	170	5,753
tert-Butyl alcohol	12	50	1,131
Butyraldehyde	16	220	1,222
Cadmium	286	2	22,557
Carbon disulfide	15	45	1,522
Carbon tetrachloride	16	325	2,706
Chlorine	1,036	1,096	2,177,738
Chlorobenzene	17	142	19,065
Chloroethane	15	145	4,853
Chloroform	16	255	1,506
Chloromethane	4	1	37
Chloroprene	15	170	5,753
Chromium	300	20	85,079
Cobalt	281	24	80,282
Copper	295	16	106,526
Creosote	12	74	8,532
Cresol (mixed isomers)	12	46	1,024
Cumene	13	46	1,024
Cyclohexane	51	62	19,991
1,2-Dibromoethane	12	50	1,131
Dibutyl phthalate	12	6	124
1,2-Dichlorobenzene	16	200	9,112
1,3-Dichlorobenzene	4	1	37
1,4-Dichlorobenzene	15	360	12,202
Dichlorodifluorome-thane CFC-1	15	175	6,008
1,2, Dichoroethane	15	290	9,590

Exhibit 8 (cont'd)
AIRS Releases

Chemical	Facilities	Med. Releases (lbs/Year/Facility)	Total Releases (lbs/Year/Facility)
Dichloromethane	11	120	2,016
Dichlorotetrafluoroethane CFC	15	5	239
Dimethyl phthalate	12	10	353
Epichlorohydrin	12	50	1,131
2-Ethoxyethanol	11	58	968
Ethyl acrylate	16	250	3,067
Ethylbenzene	34	194	11,940
Ethylene	36	401	48,592
Ethylene glycol	12	74	8,532
Ethylene oxide	15	190	1,250
Formaldehyde	48	126	48,119
Formic acid	16	210	1,455
Freon	15	200	1,362
Glycol Ethers	16	220	1,339
HCFC-22	15	80	2,725
Isobutyraldehyde	12	50	1,132
Lead	1,039	126	361,044
Maleic anhydride	15	35	1,144
Manganese	1,038	69	135,959
Mercury	41	23	5,542
Methanol	15	700	13,074
2-Methoxyethanol	12	47	1,051
Methyl acrylate	12	46	1,024
Methyl ethyl ketone	16	610	10,214
Methyl isobutyl ketone	16	280	2,876
Methyl methacrylate	16	230	10,150
Methylene bromide	15	15	559
Monochloropenta-fluoroethane	15	10	282
Naphthalene	24	29	4,768
n-Butyl alcohol	15	345	5,429
Nickel	295	7	36,560
Nitrobenzene	12	40	889
Phenol	16	220	13,750
Phosphorus (yellow or white)	284	4	68,277
Phthalic anhydride	15	100	3,443
Propionaldehyde	15	50	1,132
Propylene oxide	16	250	1,405

Exhibit 8 (cont'd)
AIRS Releases

Chemical	Facilities	Med. Releases (lbs/Year/Facility)	Total Releases (lbs/Year/Facility)
Propylene (Propene)	38	53	19,610
Selenium	288	8	31,144
Silver	53	13	2,330
Styrene	17	240	44,591
Tetrachloroethylene	11	112	1,882
Toluene	59	125	87,231
1,1,1-Trichloroethane	11	69	1,156
1,1,2-Trichloroethane	11	56	941
Trichloroethylene	11	69	1,156
Trichlorofluorome-thane {CFC-11	15	305	5,310
1,2,4-Trimethylbenzene	16	2	120
Vinyl acetate	15	275	9,318
Vinyl chloride	15	210	6,254
m-Xylene	15	68	2,216
o-Xylene	34	89	12,679
p-Xylene	20	200	1,335
Xylene (mixed isomers)	18	112	8,553
Zinc (fume or dust)	1,039	32	191,766
TOTAL	**1,051**	**64**	**4,099,173**

Source: U.S. EPA Office of Air and Radiation, AIRS Database, May 1995.

V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

In order to encourage these approaches, this section provides both general and industry-specific descriptions of some pollution prevention advances that have been implemented within the non-fuel, non-metallic industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. When possible, this section provides information from real activities that can, or are, being implemented by this sector. This section provides summary information from activities that may be, or are being implemented by this sector. When possible, information is provided that gives the context in which the techniques can be effectively used. Please note that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must examine how each option affects, air, land, and water pollutant releases.

The use of pollution prevention technologies and environmental controls can reduce substantially the volume and concentration of the contaminants released / discharged into the surrounding environment. In some cases, these pollution prevention approaches may be economically beneficial to mine operators because they may decrease the process chemicals needed, and therefore the cost of producing a given amount of mineral. The approaches actually used depend on many criteria, including the nature of the mine environment, the funds available for enforcement and inspection, the availability of new technological solutions, and the relationships between government and mine operators.

Waste minimization generally encompasses any source reduction or recycling that results in either the reduction of total volume or the toxicity of hazardous waste. Source reduction is a reduction of waste generation at the source, usually within a process. Source reduction can include process modifications, feedstock (raw material) substitution,

housekeeping and management processes, and increases in efficiency of machinery and equipment. Source reduction includes any activity that reduces the amount of waste that exits a process. Recycling refers to the use or reuse of a waste as an effective substitute for a commercial product or as an ingredient or feedstock in an industrial process.

Opportunities for waste minimization may include raw material substitutions, though these opportunities are somewhat limited for mining facilities because of the transportation costs involved in using ores or concentrates produced in other regions or countries. In elemental phosphorous production, raw materials substitution generally takes the form of improving the separation of value from the raw ore during beneficiation, so that the furnace operations would begin with a higher grade of ore concentrate. Processing a feedstock with a higher concentration of phosphorous results in decreased slag generation, although presumably increasing the generation of related beneficiation wastes. Other source reduction opportunities may involve process modifications to increase efficiency during the furnace operation.

Utilization of mineral processing wastes can be a viable alternative to disposal. In 1988, Occidental's Columbia, Tennessee plant reported selling all of its slag while three other facilities sold some portion of their slag for off-site use (specific data are confidential). Phosphorous slag can be used as an aggregate in asphalt manufacturing, and elemental phosphorous slag has been used extensively in highway construction for many years in Idaho, Montana, and Tennessee.

The list below summarizes some of the environmental control technologies and regulatory approaches that may serve as effective pollution prevention techniques for this industry.

Water Pollution Prevention

- Reduce the amount of contaminated water produced by using diversion systems to channel runoff away from exposed mine pits and waste dumps.
- Channel contaminated water into containment ponds for treatment or recycling.
- Reuse contaminated water in the extraction process for dust elimination or drilling.
- Utilize subsurface drainage systems and barriers to collect or deflect groundwater prior to contact with exposed mine pits.

Air Pollution Prevention and Control

- Utilize dust elimination technologies such as wet suppression systems to reduce dust created during excavation and transport.
- Use dust suppressant agents such as magnesium chloride to reduce dust in solid piles and tailings.

Closure and Reclamation Approaches

- Use plant cover and landscape alteration to reduce erosion, dust, and runoff contamination; reintroduce native species to the former mine site; and allow alternative uses of the land.

Sample Planning, Monitoring, Enforcement, and Compliance Approaches

- Use company-managed audits, environmental monitoring, and reporting systems to supplement government-run enforcement efforts.
- Prepare detailed environmental impact statements that estimate potential environmental impacts, outline compliance plans, and detail the management of future environmental problems.
- Discuss alternative mine design and extraction/beneficiation approaches prior to issuing mine permits, and explore options for minimizing environmental impacts.

Additional Pollution Prevention Activities

According to 1992 industry information, pollution prevention activities under evaluation in the non-fuel, nonmetallic mineral mining industry include the physical and chemical stabilization of tailings for backfilling, subaqueous disposal of tailings for chemical stabilization, tailings beneficiation to remove toxic and acid components and recover valuable minerals, and procedures for the reclamation and final closure of mines. Each of these methods is discussed briefly below.

Using mine wastes as backfill can minimize surface subsidence by filling in underground voids. It can also minimize the impacts of surface disposal by reducing the volume of waste on the surface. A potential problem with this is that the material used as backfill could contaminate water resources by generating acid mine waters.

A froth flotation process has been developed by the Bureau of Mines to remove heavy-metal-bearing minerals from tailings. This process

recovers the mineral components of the tailings while removing acid-forming minerals, rendering the wastes less susceptible to contaminating ground and surface waters. The Bureau is also investigating a new device called the air-sparged hydrocyclone, which provides a portable, compact unit to treat large volumes of tailings on-site without the usual expensive capital requirements.

Bureau researchers are also developing effective methods for reclamation and closure of mining operations. The focus of this work is on controlling hydrology at sites, decontaminating wastes when necessary, and stabilizing wastes for closure. For example, the current practice for sealing mine shafts and portals is to install a concrete plug. This practice is difficult and expensive because it requires drilling into rock walls to provide support for the plug. Access to remote shafts and portals is also a problem. One possible solution is the use of low-density foaming plastics and/or cements. Studies have shown that injecting foaming materials may cost half that of concrete plugs. In addition, the expansion characteristic of the foaming materials may eliminate the need for drilling into intact rock. Another advantage of using foamed plastic or cement plugs is the provision of a resistant seal to acidic mine waters.

Wastes are also generated from maintenance activities associated with the operation of a mine. Exhibit 9 presents some of these activities, along with the wastes generated by each activity and some waste minimization options.

Exhibit 9
Waste Minimization Options

Activity	Waste Generated	Waste Minimization Options
Metal Parts Cleaning	Miscellaneous chlorinated solvents	Switch to semi-aqueous cleaners or water-based cleaning solutions to reduce or eliminate solvent emission and liquid waste generation.
Flotation	Zinc sulfate, sodium cyanide	Use flotation process control equipment that uses sensors, computing elements, and control units to reduce the amount of flotation reagents needed and to improve separation of waste from product.
Blasting	Ammonium	Maintain storage containers properly.
Changing Lubricating Fluids	Lead, cadmium	Do not mix used oil with solvents or other materials; segregate and recycle used oil; use fluid filtration systems to extend fluid life; segregate and recycle antifreeze; use washable rags instead of disposable rags.

Exhibit 9 (cont'd)
Waste Minimization Options

Activity	Waste Generated	Waste Minimization Options
Mining Vehicle Battery Replacement	Lead, acids	Recycle used batteries. Trade in old batteries when buying new batteries.

Source: Mining and Quarrying of Nonmetallic Minerals, U.S. EPA, Office of Pollution Prevention and Toxics.

V.A. Innovative Waste Management Practices

Pipe Recycling/Reuse

IMC operates phosphate rock mines in West Central Florida and has implemented a waste minimization program involving the reuse and recycling of steel pipe used to transport slurry, water, tailings, and other materials. IMC obtains maximum use from its pipe in several ways:

- Pipe used for matrix and clay transport is periodically rotated to ensure that wear is evenly spaced over the full diameter of the pipe
- To the extent possible, pipe no longer suitable for the most demanding use is used in other, less demanding pipelines
- Pipe no longer suitable for use in pipelines is either used for other purposes (such as culverts) or is sold for off-site reuse or scrap.

IMC has developed a computerized model to predict how long a section of pipe can remain in each position and when it needs to be turned. When pipe can no longer be used for materials transport, any undamaged portions of pipe are removed for onsite reuse as culvert or sold to a local scrap dealer as usable pipe. Damaged pipe is sold to a scrap dealer. By reusing pipe onsite, IMC estimates that it saves approximately $1.5 million each year. In 1991, $316,000 was received for pipe that could be reused offsite, and 4,200 tons of scrap piping was sold for an estimated total of $42,000 - $84,000. IMC's program reduces capital expenditures by reducing the amount of new pipe that must be purchased, as well as saving operating costs by avoiding costly shutdowns when pipes fail.

Mine Tire Recycling

Two Federal regulations will increasingly effect the scrap tire industry markets. First, the Clean Air Act Amendments have redefined tire derived fuel (TDF) as a fuel, no longer considering it a waste fuel. Increased demand for TDF has already occurred as a result: in 1990 about 10 percent of scrap tires were used as TDF, while in 1992 27 percent, or 65

million scrap tires, were used. Projections for 1994 were that 50 to 55 percent of scrap tires, or 141 million tires, would be needed to meet market demand. Second, the Intermodal Surface Transportation Efficiency Act (ISTEA) requires that five percent of all Federally-funded road projects use rubber from scrap tires in 1994; use of scrap tires must increase five percent annually until 1997, when it tops out at 20 percent. By 1995, 17 million scrap tires will be required in Federal road projects; by 1997 the number will increase to 50 million.

Mine representatives have estimated the price of one large tire to range from $10,000 to $16,000, or over $100,000 to fit one large piece of equipment. Several options exist for recycling or reusing whole large tires. One alternative is retreading the tires for reuse; retreading reduces the demand for new tires and conserves resources (retreading a used tire requires less than 40 percent of the fossil fuel to make a new tire). The purchase price for retreaded tires is less than for new tires, providing an additional savings incentive. In addition to retreading, whole scrap tires are used in civil engineering applications, including construction, erosion control, and agriculture (feeding troughs, for example).

Processing scrap tires involves shearing, cutting and/or shredding tires into smaller pieces. The major markets for processed tires are as TDF and in civil engineering applications. Scrap tires are an excellent fuel source, generating about 80 percent as much energy as crude oil per pound. In recent years, there have been major increases in the use of scrap tires as fuel by a number of industries, including power plants, cement kilns, pulp and paper mills, and tire manufacturing facilities.

VI. SUMMARY OF FEDERAL STATUTES AND REGULATIONS

This section discusses the Federal statutes and regulations that may apply to this sector. The purpose of this section is to highlight, and briefly describe the applicable Federal requirements, and to provide citations for more detailed information. The three following sections are included.

- Section IV.A contains a general overview of major statutes
- Section IV.B contains a list of regulations specific to this industry
- Section IV.C contains a list of pending and proposed regulations

The descriptions within Section IV are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Resource Conservation And Recovery Act

The Resource Conservation And Recovery Act (RCRA) of 1976 which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitibility, corrosivity, reactivity, or toxicity and designated with the code "D").

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and recordkeeping standards. Facilities that

treat, store, or dispose of hazardous waste must obtain a permit, either from EPA or from a State agency which EPA has authorized to implement the permitting program. Subtitle C permits contain general facility standards such as contingency plans, emergency procedures, recordkeeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.10) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA-regulated facilities.

Although RCRA is a Federal statute, many States implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 46 of the 50 States.

Most RCRA requirements are not industry specific but apply to any company that transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) lays out the procedure every generator should follow to determine whether the material created is considered a hazardous waste, solid waste, or is exempted from regulation.

- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.

- **Land Disposal Restrictions** (LDRs) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs (40 CFR 268), materials must meet land disposal restriction (LDR) treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Wastes subject to the LDRs include solvents, electroplating wastes, heavy metals, and acids. Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation,

burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil marketer (one who generates and sells off-specification used oil directly to a used oil burner), additional tracking and paperwork requirements must be satisfied.

- **Tanks and Containers** used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities who store such waste, including generators operating under the 90-day accumulation rule.

- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substances are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also establishes increasingly stringent standards, including upgrade requirements for existing tanks, that must be met by 1998.

- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with strict design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and restrict the type of waste that may be burned.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. The RCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Comprehensive Environmental Response, Compensation, And Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response costs incurred by EPA. The Superfund Amendments and Reauthorization Act (SARA) of 1986 revised various sections of CERCLA,

extended the taxing authority for the Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA **hazardous substance release reporting regulations** (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which exceeds a reportable quantity. Reportable quantities are defined and listed in 40 CFR § 302.4. A release report may trigger a response by EPA, or by one or more Federal or State emergency response authorities.

EPA implements **hazardous substance responses** according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as "removals." EPA generally takes remedial actions only at sites on the National Priorities List (NPL), which currently includes approximately 1300 sites. Both EPA and states can act at other sites; however, EPA provides responsible parties the opportunity to conduct removal and remedial actions and encourages community involvement throughout the Superfund response process.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. The CERCLA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Emergency Planning And Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State and local governments. EPCRA required the establishment of State emergency response commissions (SERCs), responsible for coordinating certain emergency response activities and for appointing local emergency planning committees (LEPCs).

EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA §302** requires facilities to notify the SERC and LEPC of the presence of any "extremely hazardous substance" (the list of such substances is in 40 CFR Part 355, Appendices A and B) if it has such substance in excess of the substance's threshold planning quantity, and directs the facility to appoint an emergency response coordinator.

- **EPCRA §304** requires the facility to notify the SERC and the LEPC in the event of a release exceeding the reportable quantity of a CERCLA hazardous substance or an EPCRA extremely hazardous substance.

- **EPCRA §§311 and 312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC, and local fire department material safety data sheets (MSDSs) or lists of MSDSs and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.

- **EPCRA §313** requires manufacturing facilities included in SIC codes 20 through 39, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, commonly known as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media, and allows EPA to compile the national Toxic Release Inventory (TRI) database.

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's EPCRA Hotline, at (800) 535-0202, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. The EPCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA include "priority"

pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The **National Pollutant Discharge Elimination System (NPDES)** program (CWA §402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either EPA or an authorized State (EPA has presently authorized forty States to administer the NPDES program), contain industry-specific, technology-based and/or water quality-based limits, and establish pollutant monitoring and reporting requirements. A facility that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from State to State, and site to site, depending on the use classification of the receiving body of water. Most States follow EPA guidelines which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address **storm water discharges**. In response, EPA promulgated the NPDES storm water permit application regulations. Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant (40 CFR 122.26(b)(14)). These regulations require that facilities with the following storm water discharges apply for a NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, the regulation should be consulted.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 29-petroleum refining; and SIC 311-leather tanning and finishing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC 44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-

converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather and tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-industrial and commercial machinery and computer equipment; SIC 36-electronic and other electrical equipment and components; SIC 37-transportation equipment (except ship and boat building and repairing); SIC 38-measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly-owned treatment works (POTWs). The national **pretreatment program** (CWA §307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under §307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants. Discharges to a POTW are regulated primarily by the POTW itself, rather than the State or EPA.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a State is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than Federal standards.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water resource center, at (202) 260-7786.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal-State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized States enforce the primary drinking water standards, which are, contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA **Underground Injection Control (UIC)** program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. UIC permits include design, operating, inspection, and monitoring requirements. Wells used to inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is primarily State-enforced, since EPA has authorized all but a few States to administer the program.

The SDWA also provides for a Federally-implemented Sole Source Aquifer program, which prohibits Federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a State-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The Hotline operates from 9:00 a.m. through 5:30 p.m., EST, excluding Federal holidays.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their

manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA §5, EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemical's effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA §6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under §6 authority are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs).

EPA's TSCA Assistance Information Service, at (202) 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., EST, excluding Federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments, including the Clean Air Act Amendments (CAAA) of 1990, are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the States to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAAA, many facilities will be required to obtain permits for the first time. State and local governments oversee, manage, and enforce many of the requirements of the CAAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a

given pollutant are classified as attainment areas; those that do not meet NAAQSs are classified as non-attainment areas. Under §110 of the CAA, each State must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet Federal air quality standards.

Title I also authorizes EPA to establish New Source Performance Standards (NSPSs), which are nationally uniform emission standards for new stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source but allow the affected industries the flexibility to devise a cost-effective means of reducing emissions.

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Title III of the CAAA further directed EPA to develop a list of sources that emit any of 189 HAPs, and to develop regulations for these categories of sources. To date EPA has listed 174 categories and developed a schedule for the establishment of emission standards. The emission standards will be developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV establishes a sulfur dioxide emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances, which, beginning in 1995, will be set below previous levels of sulfur dioxide releases.

Title V of the CAAA of 1990 created a permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States are developing the permit programs in accordance with guidance and regulations from EPA. Once a State program is approved by EPA, permits will be issued and monitored by that State.

Title VI is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their use and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs), will be phased out entirely by the year 2000, while certain hydrochlorofluorocarbons (HCFCs) will be phased out by 2030.

EPA's Control Technology Center, at (919) 541-0800, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996, provides general information about regulations promulgated under Title VI of the CAA, and EPA's EPCRA Hotline, at (800) 535-0202, answers questions about accidental release prevention under CAA §112(r). In addition, the Technology Transfer Network Bulletin Board System (modem access (919) 541-5742)) includes recent CAA rules, EPA guidance documents, and updates of EPA activities.

VI.B. Industry Specific Regulations

The environmental impacts of the non-fuel, nonmetallic mining industry are regulated primarily by two statutes: the Clean Air Act (CAA) and the Clean Water Act (CWA). Other statutes that might be applied to the non-fuel, non-metal mining industry are the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the General Mining Law of 1872, and State statutes.

Clean Air Act (CAA)

Although nonmetallic mining operations are not specifically regulated by the CAA, businesses involved in the processing of the minerals are regulated. 40 CFR Part 60 Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants, and 40 CFR Part 60 Subpart UUU, Standards of Performance for Calciners and Dryers in Mineral Industries, require these industries to control or reduce emissions of particulate matter and impose specific monitoring, recordkeeping, and reporting requirements. Under the Clean Air Act, sources are required to obtain construction and operating permits, not only for particulate emissions but also for NOx, SO2, and CO which are often products of combustion from engines for power and also dryers.

40 CFR Part 60 Subpart OOO applies to facilities that process any of the following 18 minerals: crushed and broken stone, sand and gravel, clay,

rock salt, gypsum, sodium compounds, pumice, gilsonite, talc and pyrophyllite, boron, barite, fluorspar, feldspar, diatomite, perlite, vermiculite, mica, and kyanite. The affected facilities are: crushers, grinding mills, screening operations, bucket elevators, belt conveyors, bagging operations, storage bins, and enclosed trucks or railcar loading stations.

40 CFR Part 60 Subpart UUU applies to calciners and dryers used to process the following minerals: aluminum, ball clay, bentonite, diatomite, feldspar, fire clay, fuller's earth, gypsum, industrial sand, kaolin, lightweight aggregate, magnesium compounds, perlite, roofing granules, talc, titanium dioxide, and vermiculite.

Clean Water Act (CWA)

Discharges from mine sites are addressed under two principal regulatory programs: the NPDES permit program (for process water and storm water point source discharges) and the Non-point source program.

NPDES Point Source Program

A point source is defined in Section 502(14) of the CWA as "any discernible, confined and discrete conveyance, included but not limited to, any pipe, ditch, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged." The Water Quality Act amendments of 1987 added discharges from "landfill leachate collection systems" to this definition. All point source discharges to waters of the U.S. must be addressed by NPDES permits.

Storm water is defined in 40 CFR 122.26(b)(13) as "storm water runoff, snow melt runoff, and surface runoff and drainage." Storm water associated with industrial activity is defined in 40 CFR Section 122.26(b)(14) as the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. Section 402(p) of the CWA generally requires EPA to issue NPDES permits for point source discharges of storm water associated with industrial activity, including active and inactive mines. At mine sites, Section 402(1)(2) specifically limits the permit requirements for storm water that has come into contact with any overburden, raw material, intermediate products, finished products, byproducts, or waste products located on the site of the operation.

EPA is currently developing a storm water program for those point source discharges from active and inactive mines not already permitted. Several States are also currently developing general storm water permits for mine sites.

Non-point Source Program

Non-point sources of pollution are addressed under Sections 304(f)(b) and 319 of the CWA of 1972. Non-point source runoff is caused by runoff from diffuse sources, and is generally caused by rainfall or snow melt. Section 304(f)(b) establishes guidelines for identifying and evaluating the nature and source of non-point sources of pollutants, and processes, procedures, and methods to control pollution resulting from mining activities, including runoff and siltation from new, currently operating, and abandoned surface and underground mines. Non-point source discharges may be to streams, lakes, rivers, wetlands, or to groundwater. Specific best management practices (BMPs) requirements for non-point source control at mine sites have not been promulgated at the national level, nor has any national guidance been issued. However, individual States are currently developing programs for storm water management at mine sites. For example, Idaho recently prepared a document that describes practices to minimize non-point source water quality impacts.

Under Section 319 of the Clean Water Act, States developing plans to address problems and solutions to non-point source pollution, are eligible for grants that are administered by the Regions.

In addition to applicable general CWA requirements, active mineral mining and processing operations are subject to the requirements contained in 40 CFR 436, EPA Effluent Guidelines and Standards for Mineral Mining and Processing. The regulation establishes effluent limitation guidelines and pretreatment standards that limit the discharge of pollutants into navigable waters, and requires the application of best practicable control technologies (BPT). For the purposes of these guidelines and standards of performance, the industry is divided into 38 subcategories consisting of specific mineral types or classes of minerals. Effluent limitations are based on factors such as the type of ore, method of transport, type of processing, use of wet air emissions control devices, type of product, and groundwater seepage and runoff into mine and process wastewater impoundments.

Mine dewatering can invoke environmental regulation under CWA. Dewatering is the removal of water that has infiltrated the mining site. Wells, pumps, or ditches and tunnels are typically used to divert the water away from the site. Dewatering can also lead to the unintentional creation of wetlands, requiring a permit under the CWA. EPA's Office of Water, Office of Wastewater Management/Permits Division is currently developing a mining strategy for hard rock mining which will be completed by the fall of 1995.

Exhibit 10
Mine Discharges Subject to Permitting

Runoff/drainage discharges subject to 40 CFR Part 440 effluent limitation guidelines	Subject to storm water permitting (not subject to 40 CFR Part 440)
Land application area Crusher area Spent ore piles, surge piles, ore stockpiles, waste rock/overburden piles Pumped and unpumped drainage and mine water from pits/underground mines Seeps/French drains On-site haul roads, if constructed of waste rock or spent ore or if wastewater subject to mine drainage limits is used for dust control Tailings dams/dikes when constructed of waste rock/tailings Unreclaimed disturbed areas	Topsoil piles Haul roads not on active mining area On-site haul roads not constructed of waste rock or spent ore (unless wastewater subject to mine drainage limits is used for dust control) Tailings dams, dikes when not constructed of waste rock/tailings Concentration/mill building/site (if discharge is storm water only, with no contact with piles) Reclaimed areas released from reclamation bonds prior to 12/17/90 Partially, inadequately reclaimed areas or areas not released from reclamation bond Most ancillary areas (e.g., chemical and explosives storage, power plant, equipment/truck maintenance and wash areas, etc.)

Resource Conservation and Recovery Act (RCRA)

The Bevill Amendment

In 1980, Congress amended RCRA in the Solid Waste Disposal Act Amendments, adopting what has been dubbed the Bevill Amendment, after Representative Tom Bevill of Alabama. The amendment temporarily exempted from Subtitle C regulation solid waste from ore and mineral extraction, beneficiation, and processing. The Amendment directed EPA either to develop Subtitle C regulations for the waste or determine that the exemption should continue, and to present its findings in a report to Congress.

EPA modified its hazardous waste regulations to reflect the Bevill exclusion and issued a preliminary, and quite broad, interpretation of the exclusion's scope. In particular, it interpreted the exclusion as covering "solid waste from the exploration, mining, milling, smelting and refining of ores and minerals."

In 1985 the U.S. District Court for the District of Columbia awarded judgment to the Environmental Defense Fund and two public interest groups that had sued EPA for failing to submit the required report to Congress and make the regulatory determination by the statutory deadline. The court imposed two schedules, one for completing studies of extraction and beneficiation wastes and submitting them in a report to Congress, and the second for proposing reinterpretation of mineral-processing wastes. In so doing, the court effectively split the wastes that might be eligible for exclusion from regulation into two groups: mineral extraction and beneficiation wastes; and mineral processing wastes.

In December 1985 EPA submitted a report to Congress on mining wastes (*1985 Report to Congress: Wastes from the Extraction and Beneficiation of Metallic Ores, Phosphate Rock, Asbestos, Overburden from Uranium Mining, and Oil Shale*) in which EPA found that some mining wastes exhibit hazardous characteristics, that waste management practices have caused environmental damage, and that the range of risk from mining waste is broad. In July 1986 EPA published a regulatory determination, upheld in subsequent court challenges, that RCRA Subtitle C regulation of extraction and beneficiation wastes was unwarranted because mining wastes tend to be disposed of in arid climates, facilities and wastes are located in sparsely populated areas where human contact is minimal, and waste volumes are high. It also determined that it should develop a risk-based, State-run mining waste program under RCRA Subtitle D.

In keeping with its court-ordered directive to reinterpret the Mining Waste exclusion for mineral processing wastes, EPA proposed to narrow the scope of the exclusion for mineral-processing wastes to include only a few specific waste streams. Unable to articulate criteria for selecting these wastes, EPA later withdrew this proposal and was subsequently sued by the Environmental Defense Fund. The courts ruled against EPA, holding that the Agency's interpretation of Bevill exclusions was overbroad. The court ordered EPA to restrict the scope of the exclusion as it applied to mineral-processing wastes to include only "large volume, low hazard" wastes.

In a series of rulemaking notices, EPA reinterpreted the exclusion for mineral-processing wastes and defined which mineral-processing wastes met the high-volume, low-hazard criteria. The vast majority of mineral-processing wastes did not meet both criteria. EPA published its final regulatory determination in 1991, in compliance with a court-ordered deadline. The final rule permanently retains the Bevill exemption for 20 mineral-processing wastes. EPA determined that regulation under RCRA Subtitle C was inappropriate for these wastes because of the extremely

high cost to industry and the technical infeasibility of managing them under Subtitle C requirements; 18 of the wastes are subject to applicable State requirements, while the remaining two (phosphogypsum and phosphoric acid process waste water) are currently being evaluated by EPA.

Wastes from the extraction and beneficiation of ores and minerals remain exempt from Subtitle C requirements, irrespective of their chemical characteristics; EPA may, in the future, evaluate the appropriateness of regulating these wastes under RCRA Subtitle D as an industrial waste. Wastes from mineral processing, however, are not exempt from Subtitle C unless they are one of the 20 specific wastes identified in EPA's final ruling.

In addition, only wastes that are uniquely associated with the extraction and beneficiation of ores and minerals (or one of the 20 listed mineral processing wastes) are excluded from hazardous waste regulation. Non-uniquely associated wastes are typically generated as a result of maintaining mining machinery or as a result of other facility activities, and continue to be subject to Subtitle C regulation. These non-uniquely associated wastes may include used oil, polychlorinated biphenyls, discarded commercial chemicals, cleaning solvents, filters, empty drums, laboratory wastes, and general refuse.

Determining how and under what circumstances the Bevill Amendment exclusions should be interpreted in regulating mining wastes continues to be a subject of discussion and study, at least in part because many beneficiation terms are used to describe activities common to a wide range of nonexempt industries and to describe mineral-processing operations that occur at the same location as the beneficiation operations. Beneficiation and mineral-processing operations are often closely linked; in order to apply Subtitle C regulations at a mine site, a regulator often must prove that the waste is not a beneficiation waste. Because a variety of regulators, at both Federal and State levels, are independently interpreting the Bevill rules, the potential for inconsistent interpretations is significant. Staff in EPA's OSW have suggested the following guidelines for regulators and the regulated community in distinguishing between exempt and nonexempt wastes at mines and mineral-processing sites:

- Determine whether the material is considered a solid waste under RCRA.

- Determine whether the facility is using a primary ore or mineral to produce a final or intermediate product and also whether 50 percent of the feedstocks are from secondary sources.
- Establish whether the material and the operation that generates it are uniquely associated with mineral production.
- Determine where in the sequence of operations beneficiation ends and mineral processing begins.
- If the material is a mineral-processing waste, determine whether it is one of the 20 special wastes from mineral processing.

This sequence will result in one of three determinations: 1) the material is not a solid waste and therefore not subject to RCRA; 2) the material is a solid waste but is exempt from RCRA Subtitle C because of the Mining Waste Exclusion; or 3) the material is a solid waste that is not exempt from RCRA Subtitle C and is subject to regulation.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Although Bevill wastes are excluded from regulation under RCRA Subtitle C, they can be addressed under CERCLA. Mining companies may be liable under CERCLA for the release or threat of release of hazardous substances, covering releases to air, surface water, groundwater and soils. Many mines, where practices did not incorporate the safeguards now required under the CWA, allowed runoff from mine and tailings sites to flow into nearby streams and lakes. In general, the CERCLA problems associated with mining operations are much more frequent in metal rather than non-metal mining. Even newer mines, which have been subject to CWA regulations, have been targeted for CERCLA enforcement. Mine owners may also be liable for damages to natural resources as a result of mining activity.

National Environmental Policy Act (NEPA)

NEPA requires that all Federal agencies prepare detailed statements assessing the environmental impact of, and alternatives to, major Federal actions that may "significantly affect" the environment. An environmental impact statement (EIS) must provide a fair and full discussion of significant environmental impacts and inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts on the environment; EISs must explore and evaluate all reasonable alternatives, even if they are not within the authority of the lead agency. NEPA authorities are solely procedural; NEPA cannot compel selection of the environmentally preferred alternative.

Federal actions specifically related to mining that may require EISs include Federal land management agency (e.g. BLM and Forest Service) approval of plans of operations for hardrock mining on Federally-managed lands. All effected media (e.g., air, water, soil, geologic, cultural, economic resources, etc.) must be addressed. The EIS provides the basis for the permit decision; for example, an NPDES permit may be issued or denied based on EPA's review of the overall impacts, not just discharge-related impacts, of the proposed project and alternatives. Issues may include the potential for acid rock drainage, aquatic and terrestrial habitat value and losses, sediment production, mitigation, and reclamation.

Endangered Species Act (ESA)

The ESA provides a means to protect threatened or endangered species and the ecosystems that support them. It requires Federal agencies to ensure that activities undertaken on either Federal or non-Federal property do not have adverse impacts on threatened or endangered species or their habitat. In a June 1995 ruling, the U.S. Supreme Court upheld interpretations of the Act that allow agencies to consider impact on habitat as a potential form of prohibited "harm" to endangered species. Agencies undertaking a Federal action (such as a BLM review of proposed mining operations) must consult with the U.S. Fish and Wildlife Service (USFWS); an EIS must be prepared if "any major part of a new source will have significant adverse effect on the habitat" of a Federally or State-listed threatened or endangered species.

State Statutes

In addition to Federal laws, State and common laws also affect waste generation from mining activities. State law generally requires that permits be obtained prior to commencement of mining activities; permits may require design, performance, closure, and reclamation standards, and may impose monitoring requirements. Under common law, a mine owner may be liable for trespassing if wastes migrate into and damage another's property, or if the waste impacts the community as a whole, a miner may be liable for creating a public nuisance. Over the last five years several States have substantially altered their mining regulations to prevent the damage caused by past mining operations. Considerable disagreement remains, however, between mining industry groups and the environmental community regarding the effectiveness of these State regulations in preventing damage to the environment.

Many Western States require mining operations to obtain reclamation bonds and mining permits that are designed to regulate and monitor mining activity. States that require bonding and/or permitting include Alaska, Arizona, California, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, South Dakota, Montana, Wyoming, and Colorado. To regulate mining activity in the State of Colorado, for example, the State requires mining operations to obtain: 1) a performance bond, 2) a reclamation bond, and 3) a permit. The performance bond outlines what the mining operation intends to do on the land, and is simply a promise from the mining operation that it will reclaim the land. This bond gives Colorado the authority to pursue reclamation costs from mining operations that fail to properly reclaim the land. The reclamation bond, also known as a financial warranty, equals the cost the State would incur if it were to hire someone to reclaim the site should the mining operation fail to do so. Although performance bonds are updated periodically, the bonds have not always been adequate to cover closure costs.

VI.C. Pending and Proposed Regulatory Requirements

Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)

EPCRA Section 313 mandates that owners and operators of facilities that manufacture, process, or otherwise use a listed chemical to report to EPA their annual releases of these chemicals to any environmental medium. EPA makes this information available to the public in the form of the Toxic Release Inventory (TRI). TRI currently requires reporting from facilities in SIC codes 20-39 which meet various threshold requirements.

EPCRA Section 313 gives EPA discretionary authority to modify the coverage of facilities required to report to EPA for inclusion in the TRI.

EPA is considering expanding the TRI through the development of reporting requirements for additional facilities. These additional facilities include a list of 25 SIC codes that contribute 99 percent of the non-manufacturing TRI chemical loadings to the environment. SIC 14 is among these 25 SIC codes. EPA anticipates publication of a proposed rule in late 1995 or early 1996 requiring additional facilities to report the use, release, and transfer of TRI chemicals.

Clean Air Act (CAA)

Clean Air Act Amendments (CAAA) of 1990

In 1992, EPA published an initial list of all categories of major and area sources of the hazardous air pollutants (HAPs) listed in Section 112(b) of the CAA. EPA is required to establish dates for the promulgation of emission standards for each of the listed categories of HAP emission sources and develop emission standards for each source of HAPs such that the schedule is met. The standards are to be technology-based and are to require the maximum degree of emission reduction determined to be achievable by the Administrator. Proposed standards for most mineral industries are due by November 1, 1997. The Agency has determined that the phosphoric acid manufacturing industry may be anticipated to emit several of the 189 HAPs listed in Section 112(b) of the CAAA. As a consequence, this source category is included on the initial list of HAP-emitting categories scheduled for standards promulgation.

New Emissions Standards for Hazardous Air Pollutants (NESHAP)

Another proposed rule under the CAA concerns the development of maximum achievable control technology (MACT) or generally achievable control technology (GACT) standards for the asbestos processing source category that is comprised of the milling, manufacturing, and fabrication subcategories of the asbestos NESHAP. Pollutants to be regulated include asbestos and other HAPs emitted in major amounts by these subcategories. Final action on this proposed rule is scheduled for November 1995.

National Ambient Air Quality Standards (NAAQS)

EPA is reviewing and updating the air quality criteria for particulate matter to incorporate new scientific and technical information that has become available since the last review. Based on the revised criteria, EPA will determine whether revisions to the standards are appropriate. This will affect the mining and quarrying of non-fuel, nonmetallic minerals.

Clean Water Act (CWA)

A comprehensive bill was introduced in Congress in 1995 to reauthorize the Clean Water Act. The bill may affect EPA's authority to require changes in production processes, products, or raw materials to control emissions of toxins; may require risk assessments for water quality standards, effluent limitations or other regulatory requirements; and may require social, economic, and environmental benefits to be weighed in establishing regulations. Potentially large sectors of the non-fuel, non-metal mining industry could be affected by this legislation.

Safe Drinking Water Act (SDWA)

Arsenic is one of the non-fuel, nonmetallic minerals covered by SIC 14. A proposed rule will set a maximum contaminant level goal (MCLG) and revised national primary drinking water regulation (NPDWR) for arsenic in drinking water, pursuant to the SDWA amendments of 1986. The SDWA requires EPA to promulgate national primary drinking water regulations for 83 specific contaminants of which arsenic is one.

VII. COMPLIANCE AND ENFORCEMENT PROFILE

Background

To date, EPA has focused much of its attention on measuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-media databases, extract compliance records, and match the records to individual facilities. The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

Compliance and Enforcement Profile Description

Using inspection, violation, and enforcement data from the IDEA system, this section provides information regarding the historical compliance and enforcement activity of this sector. In order to mirror the facility universe reported in the Toxic Chemical Profile, the data reported within this section consists of records only from the TRI reporting universe. With this decision, the selection criteria are consistent across sectors with certain exceptions. For the sectors that do not normally report to the TRI program, data have been provided from EPA's Facility Indexing System (FINDS) which tracks facilities in all media databases. Please note, in this section, EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the section portrays the records of a subset of facilities within the sector that are well defined within EPA databases.

As a check on the relative size of the full sector universe, most notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe within the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section should be consistent with this sector's general make-up.

Following this introduction is a list defining each data column presented within this section. These values represent a retrospective summary of inspections and enforcement actions, and solely reflect EPA, State, and local compliance assurance activities that have been entered into EPA databases. To identify any changes in trends, the EPA ran two data queries, one for the past five calendar years (August 10, 1990 to August 9, 1995) and the other for the most recent twelve-month period (August 10, 1994 to August 9, 1995). The five-year analysis gives an average level of activity for that period for comparison to the more recent activity.

Because most inspections focus on single-media requirements, the data queries presented in this section are taken from single media databases. These databases do not provide data on whether inspections are State/local or EPA-led. However, the table breaking down the universe of violations does give the reader a crude measurement of the EPA's and States' efforts within each media program. The presented data illustrate the variations across regions for certain sectors. This variation may be attributable to State/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Hence, the exhibited data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

Compliance and Enforcement Data Definitions

General Definitions

Facility Indexing System (FINDS) -- this system assigns a common facility number to EPA single-media permit records. The FINDS identification number allows EPA to compile and review all permit, compliance, enforcement, and pollutant release data for any given regulated facility.

Integrated Data for Enforcement Analysis (IDEA) -- is a data integration system that can retrieve information from the major EPA program office databases. IDEA uses the FINDS identification number to "glue together" separate data records from EPA's databases. This is done to create a "master list" of data records for any given facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRIS (Resource Conservation and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and the Occupational Safety and Health Administration (OSHA). Most data queries displayed in notebook Sections IV and VII were conducted using IDEA.

Data Table Column Heading Definitions

Facilities in Search -- are based on the universe of TRI reporters within the listed SIC code range. For industries not covered under TRI reporting requirements, the notebook uses the FINDS universe for executing data queries. The SIC code range selected for each search is defined by each notebook's selected SIC code coverage described in Section II.

Facilities Inspected --- indicates the level of EPA and State agency facility inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a 12 or 60 month period. This column does not count non-inspectional compliance activities such as the review of facility-reported discharge reports.

Number of Inspections -- measures the total number of inspections conducted in this sector. An inspection event is counted each time it is entered into a single media database.

Average Time Between Inspections -- provides an average length of time, expressed in months, that a compliance inspection occurs at a facility within the defined universe.

Facilities with One or More Enforcement Actions -- expresses the number of facilities that were party to at least one enforcement action within the defined time period. This category is broken down further into Federal and State actions. Data are obtained for administrative, civil/judicial, and criminal enforcement actions. Administrative actions

include Notices of Violation (NOVs). A facility with multiple enforcement actions is only counted once in this column (facility with 3 enforcement actions counts as 1). All percentages that appear are referenced to the number of facilities inspected.

Total Enforcement Actions -- describes the total number of enforcement actions identified for an industrial sector across all environmental statutes. A facility with multiple enforcement actions is counted multiple times (a facility with 3 enforcement actions counts as 3).

State Lead Actions -- shows what percentage of the total enforcement actions are taken by State and local environmental agencies. Varying levels of use by States of EPA data systems may limit the volume of actions accorded State enforcement activity. Some States extensively report enforcement activities into EPA data systems, while other States may use their own data systems.

Federal Lead Actions -- shows what percentage of the total enforcement actions are taken by the U.S. EPA. This value includes referrals from State agencies. Many of these actions result from coordinated or joint State/Federal efforts.

Enforcement to Inspection Rate -- expresses how often enforcement actions result from inspections. This value is a ratio of enforcement actions to inspections, and is presented for comparative purposes only. This measure is a rough indicator of the relationship between inspections and enforcement. This measure simply indicates historically how many enforcement actions can be attributed to inspection activity. Related inspections and enforcement actions under the Clean Water Act (PCS), the Clean Air Act (AFS) and the Resource Conservation and Recovery Act (RCRA) are included in this ratio. Inspections and actions from the TSCA/FIFRA/EPCRA database are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. This ratio does not account for enforcement actions arising from non-inspection compliance monitoring activities (e.g., self-reported water discharges) that can result in enforcement action within the CAA, CWA and RCRA.

Facilities with One or More Violations Identified -- indicates the number and percentage of inspected facilities having a violation identified in one of the following data categories: In Violation or Significant Violation Status (CAA); Reportable Noncompliance, Current Year Noncompliance, Significant Noncompliance (CWA); Noncompliance and Significant Noncompliance (FIFRA, TSCA, and EPCRA); Unresolved

Violation and Unresolved High Priority Violation (RCRA). The values presented for this column reflect the extent of noncompliance within the measured time frame, but do not distinguish between the severity of the noncompliance. Percentages within this column can exceed 100% because facilities can be in violation status without being inspected. Violation status may be a precursor to an enforcement action, but does not necessarily indicate that an enforcement action will occur.

Media Breakdown of Enforcement Actions and Inspections -- four columns identify the proportion of total inspections and enforcement actions within EPA Air, Water, Waste, and TSCA/FIFRA/EPCRA databases. Each column is a percentage of either the "Total Inspections," or the "Total Actions" column.

VII.A. Non-Fuel, Non-Metal Mining Industry Compliance History

Exhibit 11 presents enforcement and compliance information specific to the non-fuel, non-metal mining industry. As indicated in the chart, Regions III, IV, V, VIII, and X have been the most active in terms of enforcement actions against this sector.

Exhibit 11
Five Year Enforcement and Compliance Summary for the Non-Metal, Non-Fuel Mining Industry

A	B	C	D	E	F	G	H	I	J
Non-Fuel, Non-Metal Mining SIC 14	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/one or more Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Region I	48	22	80	36	1	1	0%	100%	0.01
Region II	52	39	203	15	8	26	100%	0%	0.13
Region III	62	44	396	9	6	13	85%	15%	0.03
Region IV	428	203	1,310	20	32	59	71%	29%	0.05
Region V	164	100	382	26	6	6	100%	0%	0.02
Region VI	71	36	123	35	8	19	63%	37%	0.15
Region VII	57	19	84	41	5	6	33%	67%	0.07
Region VIII	133	64	347	23	10	31	74%	26%	0.09
Region IX	64	58	297	13	3	10	100%	0%	0.03
Region X	64	46	200	19	5	21	71%	29%	0.11
Total/Average	1,143	631	3,422	20	84	192	76%	24%	0.06

VII.B. Comparison of Enforcement Activity Between Selected Industries

Exhibits 12-15 provide enforcement and compliance information for selected industries. The non-fuel, non-metal mineral mining industry has the fourth largest number of facilities tracked by EPA across the selected industries. Of the total number of enforcement actions over five years, 76 percent are State-lead actions and 24 percent are federal-lead actions. For this industry, Clean Air Act inspections comprise 65 percent of all inspections conducted, and Clean Water Act inspections account for 31 percent of all inspections. This inspection pattern seems consistent with the general priority of environmental concerns within this sector. Importantly, the non-fuel, non-metal mining sector exhibits the lowest number of enforcement actions in relations to inspections that any other industry covered under this project over the last five years (see Exhibit 12).

Exhibit 12
Five Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E	F	G	H	I	J
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/One or More Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Metal Mining	873	339	1,519	34	67	155	47%	53%	0.10
Non-metallic Mineral Mining	1,143	631	3,422	20	84	192	76%	24%	0.06
Lumber and Wood	464	301	1,891	15	78	232	79%	21%	0.12
Furniture	293	213	1,534	11	34	91	91%	9%	0.06
Rubber and Plastic	1,665	739	3,386	30	146	391	78%	22%	0.12
Stone, Clay, and Glass	468	268	2,475	11	73	301	70%	30%	0.12
Nonferrous Metals	844	474	3,097	16	145	470	76%	24%	0.15
Fabricated Metal	2,346	1,340	5,509	26	280	840	80%	20%	0.15
Electronics/Computers	405	222	777	31	68	212	79%	21%	0.27
Motor Vehicle Assembly	598	390	2,216	16	81	240	80%	20%	0.11
Pulp and Paper	306	265	3,766	5	115	502	78%	22%	0.13
Printing	4,106	1,035	4,723	52	176	514	85%	15%	0.11
Inorganic Chemicals	548	298	3,034	11	99	402	76%	24%	0.13
Organic Chemicals	412	316	3,864	6	152	726	66%	34%	0.19
Petroleum Refining	156	145	3,257	3	110	797	66%	34%	0.25
Iron and Steel	374	275	3,555	6	115	499	72%	28%	0.14
Dry Cleaning	933	245	633	88	29	103	99%	1%	0.16

Exhibit 13
One Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E		F		G	H
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Facilities w/One or More Violations		Facilities w/One or More Enforcement Actions		Total Enforcement Actions	Enforcement to Inspection Rate
				Number	Percent*	Number	Percent*		
Metal Mining	873	114	194	82	72%	16	14%	24	0.13
Non-metallic Mineral Mining	1,143	253	425	75	30%	28	11%	54	0.13
Lumber and Wood	464	142	268	109	77%	18	13%	42	0.15
Furniture	293	160	113	66	41%	3	2%	5	0.04
Rubber and Plastic	1,665	271	435	289	107%	19	7%	59	0.14
Stone, Clay, and Glass	468	146	330	116	79%	20	14%	66	0.20
Nonferrous Metals	844	202	402	282	140%	22	11%	72	0.18
Fabricated Metal	2,346	477	746	525	110%	46	10%	114	0.15
Electronics/Computers	405	60	87	80	133%	8	13%	21	0.24
Motor Vehicle Assembly	598	169	284	162	96%	14	8%	28	0.10
Pulp and Paper	306	189	576	162	86%	28	15%	88	0.15
Printing	4,106	397	676	251	63%	25	6%	72	0.11
Inorganic Chemicals	548	158	427	167	106%	19	12%	49	0.12
Organic Chemicals	412	195	545	197	101%	39	20%	118	0.22
Petroleum Refining	156	109	437	109	100%	39	36%	114	0.26
Iron and Steel	374	167	488	165	99%	20	12%	46	0.09
Dry Cleaning	933	80	111	21	26%	5	6%	11	0.10

*Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.

Exhibit 14
Five Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/ EPCRA/Other*	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	339	1,519	155	35%	17%	57%	60%	6%	14%	1%	9%
Non-metallic Mineral Mining	631	3,422	192	65%	46%	31%	24%	3%	27%	<1%	4%
Lumber and Wood	301	1,891	232	31%	21%	8%	7%	59%	67%	2%	5%
Furniture	293	1,534	91	52%	27%	1%	1%	45%	64%	1%	8%
Rubber and Plastic	739	3,386	391	39%	15%	13%	7%	44%	68%	3%	10%
Stone, Clay and Glass	268	2,475	301	45%	39%	15%	5%	39%	51%	2%	5%
Nonferrous Metals	474	3,097	470	36%	22%	22%	13%	38%	54%	4%	10%
Fabricated Metal	1,340	5,509	840	25%	11%	15%	6%	56%	76%	4%	7%
Electronics/ Computers	222	777	212	16%	2%	14%	3%	66%	90%	3%	5%
Motor Vehicle Assembly	390	2,216	240	35%	15%	9%	4%	54%	75%	2%	6%
Pulp and Paper	265	3,766	502	51%	48%	38%	30%	9%	18%	2%	3%
Printing	1,035	4,723	514	49%	31%	6%	3%	43%	62%	2%	4%
Inorganic Chemicals	302	3,034	402	29%	26%	29%	17%	39%	53%	3%	4%
Organic Chemicals	316	3,864	726	33%	30%	16%	21%	46%	44%	5%	5%
Petroleum Refining	145	3,237	797	44%	32%	19%	12%	35%	52%	2%	5%
Iron and Steel	275	3,555	499	32%	20%	30%	18%	37%	58%	2%	5%
Dry Cleaning	245	633	103	15%	1%	3%	4%	83%	93%	<1%	1%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Control Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

Exhibit 15
One Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/ EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	114	194	24	47%	42%	43%	34%	10%	6%	<1%	19%
Non-metallic Mineral Mining	253	425	54	69%	58%	26%	16%	5%	16%	<1%	11%
Lumber and Wood	142	268	42	29%	20%	8%	13%	63%	61%	<1%	6%
Furniture	293	160	5	58%	67%	1%	10%	41%	10%	<1%	13%
Rubber and Plastic	271	435	59	39%	14%	14%	4%	46%	71%	1%	11%
Stone, Clay, and Glass	146	330	66	45%	52%	18%	8%	38%	37%	<1%	3%
Nonferrous Metals	202	402	72	33%	24%	21%	3%	44%	69%	1%	4%
Fabricated Metal	477	746	114	25%	14%	14%	8%	61%	77%	<1%	2%
Electronics/ Computers	60	87	21	17%	2%	14%	7%	69%	87%	<1%	4%
Motor Vehicle Assembly	169	284	28	34%	16%	10%	9%	56%	69%	1%	6%
Pulp and Paper	189	576	88	56%	69%	35%	21%	10%	7%	<1%	3%
Printing	397	676	72	50%	27%	5%	3%	44%	66%	<1%	4%
Inorganic Chemicals	158	427	49	26%	38%	29%	21%	45%	36%	<1%	6%
Organic Chemicals	195	545	118	36%	34%	13%	16%	50%	49%	1%	1%
Petroleum Refining	109	439	114	50%	31%	19%	16%	30%	47%	1%	6%
Iron and Steel	167	488	46	29%	18%	35%	26%	36%	50%	<1%	6%
Dry Cleaning	80	111	11	21%	4%	1%	22%	78%	67%	<1%	7%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Control Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

VII.C. Review of Major Legal Actions

VII.C.1. Review of Major Cases

As indicated in EPA's *Enforcement Accomplishments Report, FY 1991* through *FY 1993* publications, two significant enforcement cases were resolved between 1991 and 1993 for the mining and quarrying of non-fuel, nonmetallic minerals. The cases were comprised of CERCLA and the Marine Protection Research and Sanctuaries Act (MAPRSA) violations. Both cases were related to companies in the sand and gravel business.

One of the three cases resulted in the assessment of a penalty. In U.S. v. Petersen Sand & Gravel, Inc. (1993), the defendant failed to furnish accurate and complete information relating to its disposal of hazardous wastes at its site. The defendant mined sand and gravel at the site, during which time several hundred drums of paints, solvents, and other industrial wastes were dumped. The company was required to pay $700,000 and to provide a full response to EPA's original information requests.

In U.S. v. Custom Sand and Gravel (1993), an administrative order was issued under MAPRSA for unauthorized construction of dikes and roadways and for clearing and leveling activities associated with sand and gravel mining operations that impacted wooded swamp. A restoration plan was submitted to restore approximately 65 acres of wetland habitat.

VIII. COMPLIANCE ACTIVITIES AND INITIATIVES

This section highlights the activities undertaken by this industry sector and public agencies to voluntarily improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations. In this section, the notebook also contains a listing and description of national and regional trade associations.

VIII.A. Sector-Related Environmental Programs and Activities

EPA's Office of Solid Waste (OSW) conducts research into mining waste issues, including engineering studies conducted on innovative methods of mining to reduce mine waste. OSW prepares reports that evaluate current mining designs and how these designs impact the environment. The reports, which are subject to peer review, cover topics such as the design and operation of waste rock piles, subaqueous disposal of tailings, and cyanide detoxification. OSW also provides outreach and technical support to other program and Regional offices to address mine waste problems located on Indian reservations. OSW is currently involved in providing outreach and technical support to approximately six different sites. (Contact: Steve Hoffman, 703-308-8413)

U.S. Bureau of Mines Environmental Research Program

The U.S. Bureau of Mines environmental research program is developing technology to prevent pollution and to maintain a healthy work environment. In the pollution prevention area, the USBM, in conjunction with the Florida phosphate industry and the Florida Institute of Phosphate Research, is researching the environmental pollution associated with phosphogypsum stacks, and the large process/cooling water ponds associated with them. The Bureau is also evaluating the potential for in-situ mining of western phosphate ores, a technique that would significantly reduce gypsum production in the processing of western phosphate rock. (Contact: Frank Lanzetta, Research Staff, (202) 501-9272)

The focus of the environmental health research is the monitoring and control of small airborne dusts that can be inhaled deep into the lungs and cause respiratory diseases. Emphasis is on the monitoring and control of coal and rock dusts and emissions from diesel engines. A continuous monitor to evaluate dust conditions during the extraction process for mineral ores is being developed to provide a means to alert workers to hazardous dust conditions. Dust control techniques are directed primarily towards reducing concentrations through the application of water sprays,

more effective use of ventilation air, and modification of mining operating parameters. (Contact: Dr. J. Harrison, Research Staff (202) 501-9309)

Mine Safety and Health Administration (MSHA) Mines Initiative

Electrical transformers or capacitors containing polychlorinated biphenyls (PCBs) are often used as power sources in underground mines. This equipment is regulated by EPA to ensure against environmental release of PCBs, chemicals classified as probable human carcinogens. Abandoned mines often fill with ground water, which can cause PCB-containing equipment to corrode and leak chemicals into the water.

EPA and MSHA launched a joint effort in early 1993 to identify all underground mines using electrical transformers or capacitors that contain PCBs. During 1993, MSHA inspectors completed PCB checklists that identified mines using PCB- or other liquid-filled equipment underground, and whether there were any violations of EPA regulations governing PCB use, marking, storage, or disposal. In total, 85 underground mines that may use PCB-containing equipment were identified. EPA has used the PCB checklists as part of its enforcement efforts. As a result of these efforts, four mining companies have been cited for mismanaging PCBs and face Federal penalties of up to $317,575. EPA has settled one of these cases and filed three additional complaints.

Miscellaneous Activities

Members of several government agencies have been informally meeting over the past five years to share and communicate ideas on mining waste issues. Known as the Federal Land Management Agencies, this group includes EPA, the National Park Service, the Department of Agriculture, the Department of the Interior, the Bureau of Land Management, and the U.S. Forest Service. According to Steve Hoffman of EPA's Office of Solid Waste, a memo of understanding is currently under development to formalize the group's meetings at the senior level.

EPA has provided a multi-year grant to the Southwest Research and Information Center to conduct research and outreach activities regarding mine waste issues. The Center maintains a clearinghouse of technical studies conducted on mine waste topics. (Contact: Paul Robinson, 505-262-1862)

Over the last few years, EPA has enlisted the advice and assistance of the States in developing a Federally-mandated RCRA mine waste program. In order to facilitate the involvement of the States in this effort, EPA has

provided funding to the Western Governors' Association (WGA), an independent non-partisan organization of 21 member governors. In 1988, WGA formed a Mine Waste Task Force to coordinate the views of the member States and to work with EPA, the mining industry, the environmental community, and the public in the development of a workable mine waste management program.

Kansas State University's Hazardous Substance Research Center (HSRC) is an EPA-funded center providing research and technology transfer services for pollution prevention and other waste management techniques. HSRC programs include outreach for industry, assistance to government, videos, radio programs, written materials, data bases, and workshops on pollution prevention and hazardous waste remediation. One pollution prevention focus of HSRC is on soils and mining waste.

Contact: Dr. Larry E. Erickson, Director
Hazardous Substance Research Center (HSRC)
Ward Hall, Room 101
Kansas State University
Manhattan, Kansas 66506-5102
(913) 532-6519

The Arizona Department of Environmental Quality (ADEQ) (602-779-0313) has established a multifaceted pollution prevention program to encourage generators of hazardous waste to prepare a pollution prevention plan. ADEQ encourages companies to prepare pollution prevention plans by reducing environmental permit filing fees 50 percent if companies implement a pollution prevention plan. Some mining companies have participated in this program. In addition, a joint partnership between the State and private industry has been formed, called the Arizona Pollution Prevention Partnership. The Partnership consists of 22 of the State's largest hazardous waste generators. These companies, which include some mining companies, have spelled out specific hazardous waste reduction plans for a two to three year period.

The Mineral Policy Center is a non-profit organization that provides technical, legal, and political strategy assistance to deal with mineral threats to sensitive areas. The main goal of the Center is to promote environmentally responsible mining. The organization educates and assists citizens' groups and agency personnel working with conservation problems related to legislation such as the 1872 Mining Law and RCRA. The Mineral Policy Center provides educational materials such as fact sheets, information packets, videos, and publications that summarize the results of research conducted on the environmental impacts of mining. Its

publications include Burden of Guilt, which provides a current assessment of the abandoned mine problem and a proposal to develop and fund an effective nationwide reclamation program. The Center also conducts roundtable discussions with mining companies to discuss environmental issues facing the mining industry. (Contact: Gary Kravis, 202-887-1872)

In 1990, a funding agreement was entered into between EPA and the Interstate Mining Compact Commission (IMCC) (Contact: Greg Conrad 703-709-8654). IMCC is an association that studies and recommends techniques for the protection and restoration of land, water, and other resources affected by mining. The purpose of the funding agreement between EPA and IMCC is to facilitate State involvement in developing and implementing mine waste regulation. Fifteen member States have participated in this effort thus far.

VIII.B. EPA Voluntary Programs

Environmental Leadership Program

The Environmental Leadership Program (ELP) is a national initiative piloted by EPA and State agencies in which facilities have volunteered to demonstrate innovative approaches to environmental management and compliance. EPA has selected 12 pilot projects at industrial facilities and Federal installations which will demonstrate the principles of the ELP program. These principles include: environmental management systems, multimedia compliance assurance, third-party verification of compliance, public measures of accountability, community involvement, and mentoring programs. In return for participating, pilot participants receive public recognition and are given a period of time to correct any violations discovered during these experimental projects. (Contact: Tai-ming Chang, ELP Director, 202-564-5081 or Robert Fentress, 202-564-7023)

Project XL

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. The projects seek to achieve cost effective environmental benefits by allowing participants to replace or modify existing regulatory requirements on the condition that they produce greater environmental benefits. EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific objectives that the regulated entity shall satisfy. In exchange, EPA will allow the participant a certain degree of regulatory flexibility and

may seek changes in underlying regulations or statutes. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories including facilities, sectors, communities, and government agencies regulated by EPA. Applications will be accepted on a rolling basis and projects will move to implementation within six months of their selection. For additional information regarding XL Projects, including application procedures and criteria, see the May 23, 1995 Federal Register Notice, or contact Jon Kessler at EPA's Office of Policy Analysis (202) 260-4034.

Green Lights Program

EPA's Green Lights program was initiated in 1991 and has the goal of preventing pollution by encouraging U.S. institutions to use energy-efficient lighting technologies. The program has over 1,500 participants which include major corporations; small and medium sized businesses; Federal, State and local governments; non-profit groups; schools; universities; and health care facilities. Each participant is required to survey their facilities and upgrade lighting wherever it is profitable. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and a financing registry. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. (Contact: Susan Bullard at 202-233-9065 or the Green Light/Energy Star Hotline at 202-775-6650)

WasteWi$e Program

The WasteWi$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection, and the manufacturing and purchase of recycled products. As of 1994, the program had about 300 companies as members, including a number of major corporations. Members agree to identify and implement actions to reduce their solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA in turn provides technical assistance to member companies and allows the use of the WasteWi$e logo for promotional purposes. (Contact: Lynda Wynn, 202-260-0700 or the WasteWi$e Hotline at 1-800-372-9473)

Climate Wise Recognition Program

The Climate Change Action Plan was initiated in response to the U.S. commitment to reduce greenhouse gas emissions in accordance with the Climate Change Convention of the 1990 Earth Summit. As part of the Climate Change Action Plan, the Climate Wise Recognition Program is a partnership initiative run jointly by EPA and the Department of Energy. The program is designed to reduce greenhouse gas emissions by encouraging reductions across all sectors of the economy, encouraging participation in the full range of Climate Change Action Plan initiatives, and fostering innovation. Participants in the program are required to identify and commit to actions that reduce greenhouse gas emissions. The program, in turn, gives organizations early recognition for their reduction commitments; provides technical assistance through consulting services, workshops, and guides; and provides access to the program's centralized information system. At EPA, the program is operated by the Air and Energy Policy Division within the Office of Policy Planning and Evaluation. (Contact: Pamela Herman, 202-260-4407)

NICE^3

The U.S. Department of Energy and EPA's Office of Pollution Prevention are jointly administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE^3). By providing grants of up to 50 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, demonstrate, and assess the feasibility of new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the pulp and paper, chemicals, primary metals, and petroleum and coal products sectors. (Contact: DOE's Golden Field Office, 303-275-4729)

VIII.C. Trade Association/Industry-Sponsored Activity

The Missouri Limestone Producers Association, along with EPA's Region VII developed a voluntary compliance program for Missouri rock crushing companies in violation of the Clean Air Act. Affected rock crusher facilities in Missouri's pilot program must comply with New Source Performance Standards (NSPS) of the Clean Air Act. The EPA regulations, commonly called Subpart OOO, are designed to control air

pollution from specific new equipment at nonmetallic mineral processing plants. This includes: rock crushing units, screens, conveyors, and bins. Regulations require owners, who have purchased new equipment since August 31, 1983, to maintain records, conduct performance testing of air emissions, and provide notification to EPA. Many Missouri rock crushers have failed to provide necessary notification and to conduct required performance testing. These failures are violations of Federal regulations and owners are liable for penalties under the Clean Air Act. The maximum penalty can be as much as $25,000 per day, per violation. By participating in the voluntary compliance program, sources are eligible for reduced penalties for notification and testing violations. Forty five companies have taken advantage of this voluntary compliance program and have achieved significant penalty reductions as a result of their participation.

VIII.C.1. Environmental Programs

The National Stone Association produces a Clean Air Management Guide, summarizing provisions of the Clean Air Act, that has been praised by the California Air Resources Board. Additionally, the National Stone Association, along with the Florida Concrete & Products Association and Aggregate Institute produces a course on the Clean Air Act Amendments of 1990 and Title V Operating Permits for the Florida Aggregates Industry. This course has also been taught in other areas of the country i.e. Northern California and Kansas City. The National Stone Association also runs an environmental excellence program for its members with winners receiving Environmental Eagle Awards.

VIII.C.2. Summary of Trade Associations

Trade and professional organizations serving the mining industry in general are divided along mining processes as well as type of mineral mined.

In 1990, a funding agreement was entered into between EPA and the Interstate Mining Compact Commission (IMCC) (Contact: Greg Conrad 703-709-8654). IMCC is an association that studies and recommends techniques for the protection and restoration of land, water, and other resources affected by mining. The purpose of the funding agreement between EPA and IMCC is to facilitate state involvement in developing and implementing mine waste regulation. Fifteen member states have participated in this effort thus far.

National Aggregates Association 900 Spring Street Silver Spring, Maryland 20910 Phone: (301) 587-1400 Fax: (301) 587-9419	Members: 350 Staff: 28 Budget: $1.2 million Contact: Richard A. Morris

The National Aggregates Association (NAA) represents producers of construction aggregates, which include sand, gravel, and crushed and broken stone. For over 75 years, NAA has provided its members with education, training, research, technology, and representation before the Congress and federal regulatory bodies to increase the growth and professionalism of the aggregates industry. NAA is an international trade association with a membership of over 400 companies throughout the United States, Canada, and various foreign countries.

Aggregate Producers Association of Northern California 400 Capitol Mall, Suite 900 Sacramento, CA 95814-4407 Phone: (916) 449-3926 Fax: (916) 443-5369	Members: Staff: 7 Budget: $200,000 Contact: George Cope

The Aggregate Producers Association (APA) is a non-profit trade association comprised of rock, sand and gravel producers, ready-made concrete companies and asphalt companies in Northern California. APA provides its members with a variety of committees that monitor legislation, regulations and other industry issues e.g. environment, safety, product education and promotion, and technical and government affairs. Currently, APA sponsors a Stormwater/NPDES Group Compliance Program for 140 plant locations. APA also meetings regularly with the Mine Safety and Health Administration (MSHA) to address and resolve issues of concern.

The National Stone Association 1415 Elliot Place, NW Washington, DC 20007 Phone: (202) 342-1100 Fax: (202) 342-0702	Members: 579 Staff: 20 Budget: $3.26 million Contact: Bill Ford

The National Stone Association (NSA) is the national trade association representing the many interests and concerns of the crushed stone industry in the United States. NSA, now celebrating its 75th anniversary, is based in Washington, DC. It provides support to member companies, provides technical assistance to universities and schools, and works cooperatively with other national, state and regional groups and associations that help advance the interests of the industry.

National Mining Association 1130 17th Street Washington, DC 20036 Phone: (202) 861-2800 Fax: (202) 861-7535	Contact: Richard L. Lawson

Founded in 1995 as a result of a merger between the American Mining Congress and the National Coal Association, the National Mining Association represents producers of domestic coal, metals, and industrial and agricultural minerals; manufacturers of mining and mineral processing machinery, equipment, and supplies; engineering/consulting firms; and financial institutions that serve the mining industry. It also offers tax, communications, and technical workshops.

Missouri Limestone Producers Association P.O. Box 1725 Jefferson City, Missouri 65102 Phone: (314)-635-0208 Fax: (314)-634-8006	Members: 66 Staff: 2 Budget: $220,000 Contact: Steve Rudloff

The Missouri Limestone Producers Association represents the crushed stone producers for the state of Missouri. This association has taken an active role in voluntary compliance initiatives with EPA's Region VII office.

American Society for Surface Mining and Reclamation (ASSMR) 21 Grandview Dr. Princeton, WV 24740 Phone: (304) 425-8332	Members: 450 Regional Groups: 2 Contact: William T. Plass

Founded in 1973, ASSMR members consist of mining companies and corporations, representatives from Federal agencies and State governments, and individuals from the academic community. It encourages efforts to protect and enhance land disturbed by mining. In addition, ASSMR assists in research and demonstrations and fosters communication among research scientists, regulatory agencies, landowners, and the surface mining industry. Its publications include the Reclamation Newsletter (quarterly).

InterState Mining Compact Commission (IMCC) 459B Carlisle Dr. Herndon, VA 22070 Phone: (703) 709-8654 Fax: (703) 709-8655	Members: 17 Staff: 2 Budget: $150,000 Contact: Gregory E. Conrad

Founded in 1971, IMCC consists of States engaged in surface mining. Its purposes are to study and recommend techniques for the protection and restoration of land, water, and other resources affected by mining; to assist in reducing, eliminating, or counteracting pollution or deterioration of natural resources; to encourage programs of member States that will achieve comparable results in protecting and improving the usefulness of natural resources; and to maintain an efficient and productive mining industry. IMCC also compiles industry statistics, disseminates studies and reports on surface mining and legislative developments, and maintains liaison between State and Federal governments. IMCC publications include The Compact (quarterly).

Society for Mining, Metallurgy, and Exploration, Inc. (SME, Inc.) P.O. Box 625005 Littleton, CO 80162 Phone: (303) 973-9550 Fax: (303) 973-3845	Members: 20,000 Staff: 31 Budget: $3,700,000 Contact: Tom Hendricks

Founded in 1871, SME, Inc. consists of persons engaged in the finding, exploitation, treatment, and marketing of all classes of minerals (metal ores, industrial minerals, and solid fuels) except petroleum. SME, Inc. promotes the arts and sciences connected with the production of useful minerals and metals. Specialized education programs are offered, as well as publications such as Minerals and Metallurgical Processing (quarterly), Mining Engineering (monthly), and handbooks and other materials on mining.

Coalition for Responsible Mining Law (CRML) c/o Coeur D'Alene Mines Corp. P.O. Box 1 Coeur D'Alene, ID 83816-0316 Phone: (208) 667-3511 Fax: (208) 667-2213	Members: 300 Contact: Justin Rice

Founded in 1979, CRML consists of mining company executives, exploration geologists, small miners, and others interested in mining laws. CRML is organized as a means of focusing Western mining interests behind a proposal to preserve the basic provisions of the National Mining Law of 1872. It seeks to raise the level of awareness about the law within the mineral industry, Congress, and the general public through specialized education. Publications include a periodic newsletter.

Clay Minerals Society (CMS) P.O. Box 12210 Boulder, CO 80303 Phone: (303) 444-6405	Members: 950 Contact: Jo Eberl

Founded in 1963, CMS consists of professionals concerned with clay mineralogy and technology in industry, university research, and government. It includes students of mineralogy and other scientific disciplines as well as representatives of clay mining companies. CMS seeks to stimulate research and disseminate information relating to all aspects of clay science and technology. It maintains a store of clay minerals at the Geology Department of the University of Missouri. CMS publications include Clays and Clay Minerals (bimonthly), and Quantitative Mineral Analysis.

Asbestos Information Association / North America (AIA / NA) 1745 Jefferson Davis Hwy., Ste. 509 Arlington, VA 22202 Phone: (703) 979-1150 Fax: (703) 979-1152	Members: 45 Staff: 30 Budget: $300,000 Contact: B.J. Pigg

Founded in 1970, AIA / NA represents manufacturers, processors, and miners / millers of asbestos or products containing asbestos. Its main purposes are: to provide industry-wide information on asbestos and health and on industry efforts to eliminate existing hazards; to cooperate with government agencies in developing and implementing industry-wide standards for exposure to asbestos dust and for the control of asbestos dust emissions into air and water; to exchange information on methods and techniques of asbestos dust control; to assist in solving problems arising from the health effects of asbestos; and to increase public knowledge of the unique benefits and importance of asbestos products. AIA / NA acts as a central information center for collecting and disseminating medical and technical information on asbestos-related disease, asbestos dust control, and other asbestos-related ecological considerations. Publications include News and Notes (monthly) and other technical materials.

Gypsum Association (GA) 810 1st St., N.E., No. 510 Washington, D.C. 20002 Phone: (202) 289-5440	Members: 17 Staff: 30 Budget: $1,000,000 Contact: Jerry A. Walker

Founded in 1930, GA represents miners and manufacturers of gypsum and gypsum products. It sponsors basic and applied research programs at educational institutions and commercial testing laboratories on fire resistant assemblies, structural assemblies, wallboard application techniques, and new uses for gypsum products. GA also compiles market statistics and publishes technical bulletins and data on gypsum products.

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[1]Please Note: Bureau of Mines data for the crushed stone and sand and gravel industries is reported in alternate years. This profile presents crushed stone industry data for 1993, and sand and gravel industry data for 1992.

[2]Please Note: Bureau of Mines data for the crushed stone and sand and gravel industries is reported in alternate years. This profile presents crushed stone industry data for 1993, and sand and gravel industry data for 1992.

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