

US EPA ARCHIVE DOCUMENT

III. METHODS AND DATA SOURCES

This chapter details EPA's step-wise methodology for both defining the universe of mineral processing sectors, facilities, and waste streams potentially affected by the proposed Phase IV Land Disposal Restrictions and estimating the corresponding waste volumes.

The Agency developed a step-wise methodology that began with the broadest possible scope of inquiry in order to assure that EPA captured all of the potentially affected mineral commodity sectors and waste streams. The Agency then narrowed the focus of its data gathering and analysis at each subsequent step. The specific steps and sources of data employed throughout this analysis are described below, and are summarized in Exhibit 3-1.

EXHIBIT 3-1

Overview of the Agency's Methodology for Defining the Universe of Potentially Affected Mineral Processing Waste Streams

Graphic Not Available.

A. Identify Mineral Commodity Sectors of Interest

EPA reviewed the 36 industrial sectors (commodities) and 97 different general categories of wastes previously developed under this contract and published in the October 21, 1991 Advanced Notice of Public Rule Making (ANPRM). EPA also reviewed the U.S. Bureau of Mines's 1991 Minerals Yearbook, 1995 Mineral Commodities Summary, and the 1985 Mineral Facts and Problems. The Agency reviewed this comprehensive listing of all of the mineral commodity sectors and removed from further consideration all non-domestically produced mineral commodities; all inactive mineral commodities, such as nickel; and all mineral commodities generated from operations known not to employ operations that meet the Agency's definition of mineral processing.¹ As a result of this process, EPA identified a total of 62 mineral commodities that potentially generate "mineral processing" waste streams of interest. These mineral commodity sectors are listed in Exhibit 3-2.

The Agency notes that Exhibit 3-2 represents EPA's best efforts at identifying mineral commodities which may generate mineral processing wastes. Omission or inclusion on this list does not relieve the generator from managing wastes that would be subject to RCRA Subtitle C requirements.

B. Conduct Exhaustive Information Search on Mineral Commodity Sectors of Interest

EPA researched and obtained information characterizing the mineral processing operations and wastes associated with the mineral commodities listed in Exhibit 3-2. This information was used by EPA both to update existing data characterizing mineral processing wastes obtained through past Agency efforts and to obtain characterization information on newly identified waste streams not previously researched.

To provide the necessary foundation to develop a fully comprehensive inventory of mineral commodity sectors, facilities, and waste streams that might be affected by the Phase IV LDRs program, EPA embarked on an ambitious information collection program. Specifically, to capitalize on information collected through past efforts, as well as to collect more recent data, the Agency conducted the following activities:

- Reviewed mineral processing survey instruments (NSSWMPF) and public comments (submitted in response to the 1991 ANPRM) for process-related information (e.g., process flow diagrams, waste characterization data, and waste management information) contained in our in-house files.

¹ Sectors that employ operations that mill (e.g., grind, sort, wash), physically separate (e.g., magnetic, gravity, or electrostatic separation, froth flotation), concentrate using liquid separation (e.g., leaching followed by ion exchange), and/or calcine (i.e., heat to drive off water or carbon dioxide), and use no techniques that the Agency considers to be mineral processing operations (e.g., smelting or acid digestion) are unaffected by the proposed Phase IV LDRs.

EXHIBIT 3-2

MINERAL COMMODITIES OF POTENTIAL INTEREST

1)	Alumina	32)	Lightweight Aggregate
2)	Aluminum	33)	Lithium (from ores)
3)	Ammonium Molybdate	34)	Lithium Carbonate
4)	Antimony	35)	Magnesia (from brines)
5)	Arsenic Acid	36)	Magnesium
6)	Asphalt (natural)	37)	Manganese and MnO ₂
7)	Beryllium	38)	Mercury
8)	Bismuth	39)	Mineral Waxes
9)	Boron	40)	Molybdenum
10)	Bromine (from brines)	41)	Phosphoric Acid
11)	Cadmium	42)	Platinum Group Metals
12)	Calcium Metal	43)	Pyrobitumens
13)	Cerium, Lanthanides, and Rare Earths	44)	Rhenium
14)	Cesium/Rubidium	45)	Scandium
15)	Chromium	46)	Selenium
16)	Coal Gas	47)	Silicomanganese
17)	Copper	48)	Silicon
18)	Elemental Phosphorus	49)	Soda Ash
19)	Ferrocchrome	50)	Sodium Sulfate
20)	Ferrocchrome-Silicon	51)	Strontium
21)	Ferrocolumbium	52)	Sulfur
22)	Ferromanganese	53)	Synthetic Rutile
23)	Ferromolybdenum	54)	Tantalum/Columbium
24)	Ferrosilicon	55)	Tellurium
25)	Gemstones	56)	Tin
26)	Germanium	57)	Titanium/TiO ₂
27)	Gold and Silver	58)	Tungsten
28)	Hydrofluoric Acid	59)	Uranium
29)	Iodine (from brines)	60)	Vanadium
30)	Iron and Steel	61)	Zinc
31)	Lead	62)	Zirconium/Hafnium

- Reviewed numerous documents provided by EPA (e.g., Bureau of Mines publications, the Randol Mining Directory and other Industrial Directories, and various Agency contractor reports) for process-related information.
- Reviewed trip reports prepared both by EPA and its contractors from sampling visits and/or inspections conducted at approximately 50 mineral processing sites located through out the United States.
- Reviewed sampling data collected by EPA's Office of Research and Development (ORD), EPA's Office of Water (OW), and Agency survey data collected to support the preparation of the 1990 Report to Congress.
- Reviewed both the 1993, 1994, and 1995 "Mineral Commodity Summaries" prepared by the U.S. Bureau of Mines (BOM) for salient statistics on commodity production.
- Partially reviewed and summarized damage case information presented in the "Mining Sites on the National Priorities List, NPL Site Summary Reports" to support work on assessing the appropriateness of the Toxicity Characteristic Leaching Procedure (TCLP) for mineral processing wastes.
- Contacted the BOM Commodity Specialists associated with the commodity sectors of interest to (1) obtain current information on mining companies, processes, and waste streams, and (2) identify other potential sources of information.
- Retrieved applicable and relevant documents from the BOM's FAXBACK document retrieval system. Documents retrieved included monthly updates to salient statistics, bulletins, and technology review papers.
- Conducted an electronic query of the 1991 Biennial Reporting System (BRS) for waste generation and management information on 34 mineral processing-related Standard Industrial Classification (SIC) numbers.
- Conducted an electronic literature search for information related to mineral processing and waste treatment technologies contained in numerous technical on-line databases, including: NTIS, Compendex Plus, METADEX, Aluminum Industry Abstracts, ENVIROLINE, Pollution Abstracts, Environmental Bibliography, and GEOREF.

B.1 Review of Hard Copy Reports, Comments, and Survey Instruments

Using the information obtained from our in-house files and the various BOM and contractor documents, EPA was able to find reasonably detailed process flow diagrams for the following 27 commodities:

- | | |
|--|-----------------------------|
| • Alumina | • Lightweight Aggregate |
| • Aluminum | • Magnesium |
| • Antimony | • Mercury |
| • Bismuth | • Molybdenum |
| • Cerium/Lanthanides/Rare Earth Metals | • Phosphoric Acid |
| • Cesium/Rubidium | • Rhenium |
| • Coal Gas | • Scandium |
| • Copper | • Soda Ash |
| • Elemental Phosphorus | • Synthetic Rutile |
| • Germanium | • Titanium/TiO ₂ |
| • Gold and Silver | • Tungsten |
| • Hydrofluoric Acid | • Uranium |
| • Iron and Steel | • Zinc |
| • Lead | |

EPA also found either less detailed or fewer (in number) process flow diagrams for all of the remaining mineral commodities except:

- Ammonium Molybdate
- Asphalt (natural)
- Ferrocolumbium
- Ferromolybdenum
- Ferrosilicon
- Gemstones
- Mineral Waxes
- Pyrobitumens
- Silicomanganese

EPA were unable to locate any process information for the above nine commodities. All of the process-related information that we retrieved was then photocopied and filed by commodity.

B.2 Electronic Literature Search

EPA devised a search strategy and performed an electronic literature search for journal articles, conference reports, technical reports and bulletins, books, doctoral dissertations, patents, and news articles containing information related to the production of mineral commodities, and the characterization and treatment of mineral processing wastes. We searched the on-line databases summarized below in Exhibit 3-3.

Using the on-line databases summarized in Exhibit 3-3, we searched for relevant information (published since 1990) on the mineral commodities listed in Exhibit 3-2 using the keywords presented in Exhibit 3-4. We chose 1990 as the cutoff year so as not to duplicate past information collection activities conducted by EPA and EPA contractors, and to obtain information on mineral processes "retooled" since clarification of the Bevill Amendment to cover truly "high volume, low toxicity" wastes.

EXHIBIT 3-3

SUMMARY OF ON-LINE DATABASES SEARCHED

Databases	Description	Subjects Covered	Sources
<p>NTIS</p> <p><u>Dates Covered</u> 1964 to the present.</p> <p><u>File Size</u> 1,639,906 records as of 1/93.</p> <p><u>Update Frequency</u> Biweekly.</p>	<p>The NTIS database consists of government-sponsored research, development, and engineering plus analyses prepared by federal agencies, their contractors, or grantees. It is the means through which unclassified, publicly available, unlimited distribution reports are made available for sale from agencies such as NASA, DDC, DOE, EPA, HUD, DOT, Department of Commerce, and some 240 other agencies. In addition, some state and local government agencies now contribute their reports to the database. Truly multi-disciplinary, this database covers a wide spectrum of subjects including: administration and management, agriculture and food, behavior and society, building, business and economics, chemistry, civil engineering, energy, health planning, library and information science, materials science, medicine and biology, military science, transportation, and much more.</p>	<p>Administration and Management -- Aeronautics and Aerodynamics -- Agriculture and Food -- Astronomy and Astrophysics -- Atmospheric Sciences -- Behavior and Society -- Biomedical Technology and Engineering -- Building Industry Technology -- Business and Economics -- Chemistry -- Civil Engineering -- Communication -- Computers, Control, and Information Theory -- Electrotechnology -- Energy -- Environmental Pollution and Control -- Health Planning -- Industrial and Mechanical Engineering -- Library and Information Sciences -- Materials Sciences -- Mathematical Sciences -- Medicine and Biology -- Military Sciences -- Missile Technology -- Natural Resources and Earth Sciences -- Navigation, Guidance, and Control -- Nuclear Science and Technology -- Ocean Technology and Engineering -- Photography and Recording Devices -- Physics -- Propulsion and Fuels -- Space Technology -- Transportation -- Urban and Regional Technology.</p>	<p>The NTIS database represents the reports of four major U.S. federal government agencies: U.S. Department of Energy (DOE), U.S. Department of Defense (DoD), U.S. Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), plus many other agencies.</p>
<p>COMPENDEX PLUS</p> <p><u>Dates Covered</u> 1970 to the present.</p> <p><u>File Size</u> 3,015,116 records as of 1/93.</p> <p><u>Update Frequency</u> Weekly.</p>	<p>The COMPENDEX PLUS database is the machine-readable version of the Engineering Index (monthly/annual), which provides abstracted information from the world's significant engineering and technological literature. The COMPENDEX database provides worldwide coverage of approximately 4,500 journals and selected government reports and books. Subjects covered include: civil, energy, environmental, geological, and biological engineering; electrical, electronics, and control engineering; chemical, mining, metals, and fuel engineering; mechanical, automotive, nuclear, and aerospace engineering; and computers, robotics, and industrial robots. In addition to journal literature, over 480,000 records of significant published proceedings of engineering and technical conferences formerly indexed in Ei ENGINEERING MEETINGS are included.</p>	<p>Aeronautical and Aerospace Engineering -- Applied Physics (High Energy, Plasma, Nuclear and Solid State) -- Bioengineering and Medical Equipment -- Chemical Engineering, Ceramics, Plastics and Polymers, Food Technology -- Civil and Structural Engineering, Environmental Technology -- Electrical, Instrumentation, Control Engineering, Power Engineering -- Electronics, Computers, Communications -- Energy Technology and Petroleum Engineering -- Engineering Management and Industrial Engineering -- Light and Optical Technology -- Marine Engineering, Naval Architecture, Ocean and Underwater Technology -- Mechanical Engineering, Automotive Engineering and Transportation -- Mining and Metallurgical Engineering, and Materials Science.</p>	<p>Publications from around the world are indexed, including approximately 4,500 journals, publications of engineering societies and organizations, approximately 2,000 conferences per year, technical reports, and monographs.</p>
<p>METADEX</p> <p><u>Dates Covered</u> 1966 to the present.</p> <p><u>File Size</u> 911,907 records as of 1/93.</p> <p><u>Update Frequency</u> Monthly.</p>	<p>The METADEX (Metals Abstracts/Alloys Index) database, produced by Materials Information of ASM International and the Institute of Metals, provides comprehensive coverage of international metals literature. The database corresponds to the printed publications: Review of Metal Literature (1966-1967), Metals Abstracts (1968 to the present), Alloys Index (1974 to the present), Steels Supplement (1983-1984), and Steels Alert (January - June 1985). The Metals Abstracts portion of the file includes references to about 1,200 primary journal sources. Alloys Index supplements Metals Abstracts by providing access to the records through commercial, numerical, and compositional alloy designations; specific metallic systems; and intermetallic compounds found within these systems.</p>	<p>Materials -- Processes -- Properties -- Products -- Forms -- Influencing Factors.</p>	<p>Each month over 3,000 new documents from a variety of international sources are scanned and abstracted for the ASM database, with intensive coverage of appropriate journals, conference papers, reviews, technical reports, and books. Dissertations, U.S. patents, and government reports have been included since 1979, British (GB) patents since 1982, and European (EP) patents since 1986.</p>

EXHIBIT 3-3 (Continued)

SUMMARY OF ON-LINE DATABASES SEARCHED

Databases	Description	Subjects Covered	Sources
<p>ALUMINUM INDUSTRY ABSTRACTS</p> <p><u>Dates Covered</u> 1968 to the present.</p> <p><u>File Size</u> 172,000 records as of 7/93.</p> <p><u>Update Frequency</u> Monthly.</p>	<p>ALUMINUM INDUSTRY ABSTRACTS (AIA), formerly World Aluminum Abstracts (WAA), provides coverage of the world's technical literature on aluminum, ranging from ore processing through applications. The AIA database includes information abstracted from approximately 2,300 scientific and technical journals, government reports, conference proceedings, dissertations, books, and patents. All aspects of the aluminum industry, aside from mining, are covered.</p>	<p>Aluminum Industry - General -- Ores, Extraction of Alumina and Aluminum -- Melting, Casting, and Foundry -- Physical and Mechanical Metallurgy -- Business Information -- Extractive Metallurgy -- Metalworking, Fabrication, and Finishing -- Engineering Properties and Tests -- Quality Control and Tests -- End Uses of Aluminum -- Aluminum Intermetallics -- Patents.</p>	<p>The AIA database includes information abstracted from approximately 2,300 scientific and technical journals, patents, government reports, conference proceedings, dissertations, books, and other publications.</p>
<p>ENVIROLINE</p> <p><u>Dates Covered</u> January 1, 1971 to the present.</p> <p><u>File Size</u> 165,000 records as of 10/93.</p> <p><u>Update Frequency</u> Monthly.</p>	<p>ENVIROLINE covers the world's environmental related information. It provides indexing and abstracting coverage of more than 1,000 international primary and secondary publications reporting on all aspects of the environment. These publications highlight such fields as management, technology, planning, law, political science, economics, geology, biology, and chemistry as they relate to environmental issues.</p>	<p>Air Pollution -- Environmental Design & Urban Ecology -- Energy -- Environmental Education -- Food and Drugs -- General Environmental Topics -- International Environmental Topics -- Land Use & Pollution -- Noise Pollution -- Non-Renewable Resources -- Oceans and Estuaries -- Population Planning & Control -- Radiological Contamination -- Renewable Resources -- Terrestrial -- Water -- Toxicology & Environmental Safety -- Transportation -- Waste Management -- Water Pollution -- Weather Modification & Geophysical Change -- Wildlife.</p>	<p>ENVIROLINE draws material from over 1,000 scientific, technical, trade, professional, and general periodicals; conference papers and proceedings; government documents; industry reports; newspapers; and project reports.</p>
<p>POLLUTION ABSTRACTS</p> <p><u>Dates Covered</u> 1970 to the present.</p> <p><u>File Size</u> 185,551 records as of 1/93.</p> <p><u>Update Frequency</u> Bimonthly.</p>	<p>POLLUTION ABSTRACTS is a leading resource for references to environmentally related literature on pollution, its sources, and its control.</p>	<p>Air Pollution -- Environmental Action -- Freshwater Pollution -- Land Pollution -- Marine Pollution -- Noise -- Radiation -- Sewage and Wastewater Treatment -- Toxicology and Health -- Waste Management.</p>	<p>References in POLLUTION ABSTRACTS are drawn from approximately 2,500 primary sources from around the world, including books, conference papers/proceedings, periodicals, research papers, and technical reports.</p>

EXHIBIT 3-3 (Continued)

SUMMARY OF ON-LINE DATABASES SEARCHED

Databases	Description	Subjects Covered	Sources
<p>ENVIRONMENTAL BIBLIOGRAPHY</p> <p><u>Dates Covered</u> 1973 to the present.</p> <p><u>File Size</u> 451,702 records as of 1/93.</p> <p><u>Update Frequency</u> Bimonthly (4,000 records per update).</p>	<p>ENVIRONMENTAL BIBLIOGRAPHY provides access to the contents of periodicals dealing with the environment. Coverage includes periodicals on water, air, soil, and noise pollution, solid waste management, health hazards, urban planning, global warming, and many other specialized subjects of environmental consequence.</p>	<p>Air -- Energy -- Human and Animal Ecology -- Land Resources -- Nutrition and Health -- Water Resources.</p>	<p>More than 400 of the world's journals concerning the environment are scanned to create ENVIRONMENTAL BIBLIOGRAPHY.</p>
<p>GEOREF</p> <p><u>Dates Covered</u> 1785 to the present (North American material). 1933 to the present (worldwide material).</p> <p><u>File Size</u> 1,818,777 records as of 1/93.</p> <p><u>Update Frequency</u> Monthly (approximately 6,700 records per update).</p>	<p>GEOREF, the database of the American Geological Institute (AGI), covers worldwide technical literature on geology and geophysics. GEOREF corresponds to the print publications Bibliography and Index of North American Geology, Bibliography of Theses in Geology, Geophysical Abstracts, Bibliography and Index of Geology Exclusive of North America, and the Bibliography and Index of Geology. GEOREF organizes and indexes papers from over 3,500 serials and other publications representative of the interests of the twenty professional geological and earth science societies that are members of the AGI.</p>	<p>Areal Geology -- Economic Geology -- Energy Sources -- Engineering Geology -- Environmental Geology -- Extraterrestrial Geology -- Geochemistry -- Geochronology -- Geomorphology -- Geophysics -- Hydrology -- Marine Geology -- Mathematical Geology -- Mineralogy -- Mining Geology -- Paleontology -- Petrology -- Seismology -- Stratigraphy -- Structural Geology -- Surficial Geology.</p>	<p>GEOREF is international in coverage with about 40 percent of the indexed publications originating in the United States and the remainder from outside the U.S. Publications of international organizations represent about 7 percent of the file. The database includes coverage of over 3,500 journals as well as books and book chapters, conference papers, government publications, theses, dissertations, reports, maps, and meeting papers.</p>
<p>MATERIALS BUSINESS FILE</p> <p><u>Dates Covered</u> 1985 to the present.</p> <p><u>File Size</u> 83,228 records as of 1/93.</p> <p><u>Update Frequency</u> Monthly.</p>	<p>MATERIALS BUSINESS FILE covers technical and commercial developments in iron and steel, nonferrous metals, composites, plastics, etc. Over 1,300 publications including magazines, trade publications, financial reports, dissertations, and conference proceedings are reviewed for inclusion. Subjects covered are grouped into nine categories: 1) Fuel, Energy Usage, Raw Materials, Recycling; 2) Plant Developments and Descriptions; 3) Engineering, Control and Testing, Machinery; 4) Environmental Issues, Waste Treatment, Health and Safety; 5) Product and Process Development; 6) Applications, Competitive Materials, Substitution; 7) Management, Training, Regulations, Marketing; 8) Economics, Statistics, Resources, and Reserves; and 9) World Industry News, Company Information, and General Issues.</p>	<p>Fuel, Energy Usage, Raw Materials, Recycling -- Plant Developments and Descriptions -- Environmental Issues, Waste Treatment, Health and Safety -- Product and Process Development -- Applications, Competitive Materials, Substitution -- Management, Training, Regulations, Marketing -- Economics, Statistics, Resources, and Reserves -- World Industry News, Company Information, and General Issues.</p>	<p>Each month over 1,300 magazines, trade publications, journals, financial reports, dissertations, and conference proceedings are reviewed and abstracted from worldwide sources.</p>

LIST OF PERSONAL COMMUNICATIONS

EXHIBIT 3-3 (Continued)

SUMMARY OF ON-LINE DATABASES SEARCHED

Accordingly, using the strategy outlined in Exhibit 3-4, an article would have been selected if anywhere in either the title, record descriptors, or full text, one of the mineral commodities listed in Exhibit 3-2 and the keywords (waste, residue, wastewater, sludge, slag, dust, or blowdown) with one or more modifiers was found. For example, if a particular record had the industrial sector - "alumina" or "aluminum" and the keyword - "waste" and the modifier - "characteristics", the database record would have been selected. Unfortunately, this search strategy proved to be too expansive; the first search for information on alumina and aluminum turned up over 3,000 citations. We therefore elected to modify the search strategy by requiring the commodity, keyword, and modifier to be present in either the title or record descriptor (and not in the full text). This modification allowed for a more manageable number of citations -- 1,242 titles.

EXHIBIT 3-4

KEYWORDS AND SEARCH STRATEGY

	<u>Keywords</u>		<u>Modifiers</u>
Industrial Sector	Waste	<u>with</u>	Characteristics
	or		or
	Residue		Composition
	or		or
	Wastewater		Properties
	or		or
	Sludge		Recovery
	or		or
	Slag		Recycling
	or		or
	Dust		Reduction
	or		or
	Blowdown		Reuse
			or
			Generation
			or
			Management
			or
			Treatment

To conserve resources, we first reviewed the results of the literature search output which contained the full title of the selected record to see if the article seemed promising. If, based on our review of the title the record appeared promising, we then requested the full abstract. We then reviewed the full abstract to further screen the appropriateness of the record. If the abstract appeared relevant, we then ordered the document. Using the alumina/aluminum example, we reviewed the 1,242 title citations and determined that it was necessary to request full abstracts for 333 of the title citations. Using this protocol, we identified a total of 10, 298 citations relating to one or more of the commodities

EXHIBIT 3-3 (Continued)

SUMMARY OF ON-LINE DATABASES SEARCHED

listed in Exhibit 3-2. We then reviewed the title citations and requested a total of 1,776 full abstracts. Lastly, based on our review of the abstracts, we requested a total of 863 documents (using a tracking system to ensure that a selected reference material was not requested more than once). Not surprisingly, the top five industrial sectors that appear to be the most studied (based on number of citations meeting our search strategy specifications) are:

- Iron and Steel (1,460 titles);
- Alumina/Aluminum (1,242 titles);
- Copper (1,081 titles);
- Chromium (833 titles); and
- Lead (800 titles).

Lastly, as part of the electronic literature search, we queried the Chemical Economics Handbook (CEH) database prepared by SRI International and last updated in February 1994. Due to the high cost of using the database (i.e., \$85 per record -- each chemical is divided into numerous records -- and \$3 per minute of on-line time), we only attempted to retrieve information on the following ten commodities:

- Arsenic Acid
- Asphalt (natural)
- Ferroalloys (all of them)
- Manganese
- Pyrobitumens

EXHIBIT 3-3 (Continued)

SUMMARY OF ON-LINE DATABASES SEARCHED

- Rare Earths
- Rubidium
- Tantalum/Columbium
- Waxes (mineral)
- Zirconium/Hafnium

Limited process information was only available for ferroalloys, manganese, rare earths, waxes (natural), and zirconium/hafnium.

B.3 Contacts with Bureau of Mines

EPA contacted commodity experts at the U.S. Bureau of Mines in an attempt to collect up-to-date information on the names and locations of the facilities within each mineral sector. We also attempted to obtain process and waste characterization information; however, only several commodity specialists were able to provide technical information. We present below in Exhibit 3-5, a listing of the Bureau of Mines personnel contacted by EPA.

B.4 Review of Outside Data/Reports

In light of both the significant changes in the regulatory status of many of these wastes and the passing of several years since the 91' ANPRM was published, EPA also reviewed:

- Sampling Data from EPA's Office of Research and Development
- Data from the Effluent Guidelines from the Office of Water
- Survey Data contained in the 1990 Report to Congress
- Publications from the Bureau of Mines, Randol Mining Directory, and other Industrial Directories and Sources

EXHIBIT 3-5**LIST OF PERSONAL COMMUNICATIONS**

Contacts	Telephone Nos.	Commodity Sectors
John Blossom	202-501-9435	Molybdenum Rhenium
Larry Cunningham	202-501-9443	Columbium (niobium) Tantalum
Joseph Gambogi	202-501-9390	Zirconium/Hafnium
James Hedrick	202-501-9412	Cerium Lanthanides Rare Earths Scandium
Henry Hillard	202-501-9429	Vanadium
Steve Jasinski	202-501-9418	Mercury Selenium Tellurium
Thomas Jones	202-501-9428	Manganese
Deborah Kramer	202-501-9394	Beryllium
Peter Kuck	202-501-9436	Cadmium
Roger Loebenstein	202-501-9416	Arsenic Acid Platinum Group Metals
John Lucas	202-501-9417	Gold
Phyllis Lyday	202-501-9405	Bromine Iodine
McCaulin	202-501-9426	Antimony
Dave Morris	202-501-9402	Elemental Phosphorus Phosphoric Acid
Joyce Ober	202-501-9406	Lithium
John Papp	202-501-9438	Chromium Ferrochrome Ferrochrome-silicon
Robert Reese	202-501-9413	Cesium Rubidium Silver
Erol Sehnke	202-501-9421	Alumina Aluminum Germanium
Gerald Smith	202-501-9431	Tungsten

- Files available from the Waste Treatment Branch and the Special Wastes Branch in OSW
- Industry Profiles
- Comments and Information received through the 1991 ANPRM

to (1) determine which industrial commodities and waste streams are still generated today and (2) identify new commodities and/or waste streams that should be added to the existing universe.

EPA also queried the 1991 Biennial Reporting System (BRS) for waste generation and management information on 34 mineral processing-related Standard Industrial Classification (SIC) numbers. Specific information requested included:

- | | |
|------------------------------------|-------------------------------|
| - RCRA Facility Identification No. | - Facility Name |
| - Location (City & State) | - Origin Code |
| - Source Code | - Form Code |
| - Waste Volume | - On-site/Off-site Management |
| - EPA Hazardous Waste ID No.(s) | |

As shown in Exhibit 3-6, the 1991 BRS contained data for 24 (71 percent) of the 34 mineral processing related SIC numbers. We note that several of these SICs encompass a wide variety of mineral/inorganic chemical products. For example, SIC 2819 represents the "Industrial Inorganic Chemicals, Not Elsewhere Classified," which includes over 170 products ranging from activated carbon, alkali metals, and alumina to tin salts, water glass, and zinc chloride. Although some of these materials are outside the scope of primary mineral processing, there was no effective way to screen these products from the BRS search.

Also shown in Exhibit 3-6 is the relative ranking of the quantity of available information contained in the BRS (1 being the greatest and 24 being the smallest). The top five SIC number categories are:

- SIC 2819 - Industrial Inorganic Chemicals, Not Elsewhere Classified;
- SIC 3312 - Blast Furnaces (including Coke Ovens), Steel Works, and Rolling Mills;
- SIC 3334 - Primary Smelting and Refining of Aluminum;
- SIC 2812 - Alkalies and Chlorine; and
- SIC 3339 - Primary Smelting and Refining of Nonferrous Metals, Not Elsewhere Classified.

It is not surprising that the above SIC number categories comprised the top five because these industries are: (1) known to generate listed hazardous wastes such as K061, K062, K064, K065, K066, K071, K088, K090, K091, and K106, and (2) are SICs that encompass a wide variety of mineral/inorganic chemical products. The lack of information for the other mineral processing related wastes may be explained by the age of the data evaluated. Specifically, the most recent data available are from the 1991 Biennial Reports. Thus, many of the respondents (and potential respondents) may not have yet been required to manage their mineral processing-derived wastes as if they were no longer considered "high volume, low toxicity wastes."

EXHIBIT 3-6

SUMMARY OF SIC CODES SEARCHED IN THE 1991 BRS

SIC Code	INDUSTRIAL COMMODITY SECTOR	REPORTED IN 1991 BRS	RANK IN BRS
1011	Iron Ores	Yes	8
1021	Copper Ores	Yes	7
1031	Lead and Zinc Ores	Yes	19
1041	Gold Ores	Yes	9
1044	Silver Ores	Yes	17
1051	Bauxite and Other Aluminum Ores	No	-
1061	Ferroalloy Ores, Except Vanadium	Yes	22
1092	Mercury Ores	No	-
1094	Uranium-Radium-Vanadium Ores	Yes	21
1099	Metal Ores Not Elsewhere Classified	Yes	16
1446	Industrial Sand	Yes	20
1452	Bentonite	No	-
1453	Fire Clay	No	-
1455	Kaolin and Ball Clay	No	-
1459	Clay, Ceramic, and Refractory Minerals, Not Elsewhere Classified	No	-
1472	Barite	Yes	15
1473	Fluorspar	No	-
1474	Potash, Soda, and Borate Minerals	Yes	23
1475	Phosphate Rock	Yes	14
1477	Sulfur	No	-
1479	Chemical and Fertilizer Mineral Mining, Not Elsewhere Classified	Yes	24
1499	Miscellaneous Nonmetallic Minerals, Not Elsewhere Classified	Yes	10
2812	Alkalies and Chlorine	Yes	4
2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	Yes	1
2874	Phosphatic Fertilizers	Yes	12
3274	Lime	Yes	18
3295	Minerals and Earths, Ground or Otherwise Treated	Yes	13
3312	Blast Furnaces (Including Coke Ovens), Steel Works, and Rolling Mills	Yes	2
3313	Electrometallurgical Products	Yes	6
3331	Primary Smelting and Refining of Copper	Yes	11
3332	Primary Smelting and Refining of Lead	No	-
3333	Primary Smelting and Refining of Zinc	No	-
3334	Primary Smelting and Refining of Aluminum	Yes	3

EXHIBIT 3-6 (Continued)

SUMMARY OF SIC CODES SEARCHED IN THE 1991 BRS

SIC Code	INDUSTRIAL COMMODITY SECTOR	REPORTED IN 1991 BRS	RANK IN BRS
3339	Primary Smelting and Refining of Nonferrous Metals, Not Elsewhere Classified	Yes	5

EXHIBIT 3-11 (Continued)