



# Publications on Mining Waste Management in Indian Country

**M**ining waste from the exploration and removal of minerals presents challenges for many tribes. Mineral extraction and beneficiation can create environmental problems including acid mine drainage, erosion and sedimentation, chemical releases, fugitive dust emission, habitat destruction, surface- and ground-water contamination, and subsidence.

*This document includes descriptions of U.S. Environmental Protection Agency (EPA) publications designed to assist tribal leaders, environmental personnel, and the general public with mining and mineral processing issues. It includes publications relating to mining waste management and engineering practices. These publications discuss environmental impacts from mining operations, mining source reduction and recycling opportunities, and innovative techniques for waste management. They also address mineral processing of specific ores, such as lead, zinc, gold, iron, and copper, and focus specifically on EPA's mining research and waste management activities.*

*Documents are grouped according to topic area (e.g., General Mining Publications and Environmental Impacts and Risk). Many are available on the Internet, and Internet addresses have been included. The National Service Center for Environmental Publications (NSCEP) stocks a limited number of these publications and makes them available through their online ordering system at <[www.epa.gov/ncepihom](http://www.epa.gov/ncepihom)>. Once a document is out of stock at NSCEP, you will be referred to the National Technical Information Service (NTIS). Publications not available electronically or from NSCEP are available for a fee from NTIS. See the Ordering Information section on page 12 for more details.*



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# Publications

## I. GENERAL MINING PUBLICATIONS

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▼  
**Introduction to Hard Rock Mining: A CD-ROM Application (CD-ROM). September 1997. EPA530-C-97-005 (NSCEP).**

Provides an introduction to hard rock mining in the United States. Includes an overview of exploration, extraction, and beneficiation mining methods. Defines potential impacts of mining wastes, such as mine water, waste rock, mill tailings, and spent ore. Addresses pollution prevention issues and explains the environmental concerns associated with mining, including acid mine drainage, erosion, sedimentation, chemical releases, fugitive dust emissions, habitat modification, and surface- and ground-water impacts. Contains the full text of a number of the mining publications listed in this document.

▼  
**Profile of The Non-Fuel, Non-Metal Mining Industry: Sector Notebook Project. 1995. EPA310-R-95-011 (NSCEP). (95 pages)**  
<[es.epa.gov/oeca/sector/index.html](http://es.epa.gov/oeca/sector/index.html)>

**Profile of The Metal Mining Industry: Sector Notebook Project. 1995. EPA310-R-95-008 (NSCEP). (137 pages)**  
<[es.epa.gov/oeca/sector/index.html](http://es.epa.gov/oeca/sector/index.html)>

**Profile of the Coal Mining Industry: Sector Notebook Project. Available soon (NSCEP).**  
<[es.epa.gov/oeca/sector/index.html](http://es.epa.gov/oeca/sector/index.html)>

Developed by EPA's Office of Compliance, this series of profiles, or notebooks, contains information on selected major industrial groups. These notebooks, which focus on key release indicators and data for air, water, and land pollutant releases, have been thoroughly reviewed by experts from both inside and outside EPA. Each sector-specific notebook provides comprehensive, well-researched data gathered for the first time in a single source. The notebooks include a comprehensive environmental profile, industrial process information, pollution prevention techniques, pollutant release data, regulatory requirements, compliance and enforcement history, government and industry partnerships, innovative programs, contact names, bibliographic references, and descriptions of research methodology.

▼  
**Historic Hardrock Mining: West's Toxic Legacy, the Critical Link Between Water Quality and Abandoned Mine Sites. 1995. EPA908-F-95-002. U.S. EPA Region 8, Office of Ecosystems Protection and Remediation. (4 pages)**

Describes the environmental and water-quality damage historic mining activities caused in the western United States. Cautions that each mining site is unique and presents different geologic, hydrologic, and physical challenges. Emphasizes the importance of proper site investigation and characterization, and outlines questions to answer and steps to take prior to commencing mine site cleanup activities.

▼  
**This Is Mining... 1995. SP 07-95. National Institute for Occupational Safety and Health (NIOSH). (31 pages) Order directly from NIOSH online.**  
<[www.cdc.gov/niosh/pit/welcome.html](http://www.cdc.gov/niosh/pit/welcome.html)>

Provides a good introduction to the mining industry and explains the importance of mining in our daily lives. Provides basic information on mining methods for coal mining and metal and nonmetal mining. Briefly describes mine closure. Written by the U.S. Bureau of Mines, but now distributed by NIOSH.

## II. EXTRACTION AND BENEFICIATION OF SPECIFIC ORES AND MINERALS

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▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 1: Lead-Zinc. June 1994. EPA530-R-94-011. Order Number: PB94-170 248 (NTIS). (126 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic lead-zinc mining industry. Briefly characterizes the geology of lead-zinc ores and the economics of the industry. Reviews lead-zinc extraction and beneficiation methods and discusses potential environmental effects of lead-zinc mining. Describes current regulatory programs implemented by EPA, federal

land management agencies, and selected states. Appendices include specific flotation activities employed for polymetallic ores and associated process flow sheets, National Priority List site summaries related to lead and zinc extraction and beneficiation, and a summary of comments on the report with EPA responses.

▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 2: Gold. July 1994. EPA530-R-94-013. Order Number: PB94-170 305 (NTIS). (382 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic gold mining industry. Briefly characterizes the geology of gold ores and the economics of the industry. Reviews gold extraction and beneficiation methods and discusses the potential environmental effects of gold mining. Describes current regulatory programs implemented by EPA, federal land management agencies, and selected states. Appendices include flow sheets of specific mine operations, National Priority List site summaries related to gold extraction and beneficiation, and comments on site visits with EPA responses.

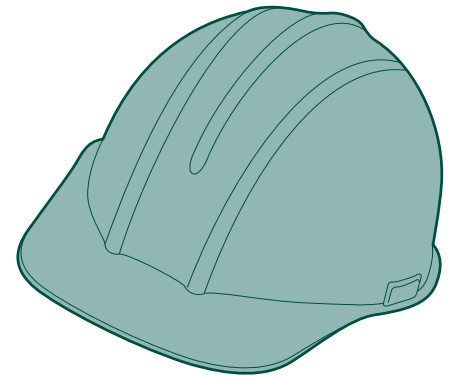
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**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 3: Iron. August 1994. EPA530-R-94-030. Order Number: PB94-195 203 (NTIS). (121 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Profiles the domestic iron mining industry. Characterizes the geology of iron ores and the economics of the industry. Reviews iron extraction and beneficiation methods. Discusses potential environmental effects of iron mining. Describes current regulatory programs that apply to the iron mining industry as implemented by EPA, federal land management agencies, and selected states. Appendix includes comments on the report with EPA responses.

▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 4: Copper. August 1994. EPA530-R-94-031. Order Number: PB94-200 979 (NTIS). (180 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic copper mining industry. Briefly characterizes the geology of copper ores and the economics of the industry. Reviews copper extraction and beneficiation methods and discusses potential environmental effects of copper mining. Describes current regulatory programs implemented by EPA, federal land management agencies, and selected states. Appendices include a summa-

ry of comments and EPA responses, case studies of published information on copper mine waste management practices, National Priority List site summaries related to copper mining, and an acronym list.



▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 5: Uranium. December 1994. EPA530-R-94-032. Order Number: PB94-200 987 (NTIS). (125 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic uranium mining industry. Briefly characterizes the geology of uranium ores and the economics of the industry. Reviews uranium extraction and beneficiation methods and discusses potential environmental effects of uranium mining. Describes current regulatory programs implemented by EPA, federal land management agencies, and selected states. Appendices include National Priority List site summaries related to the extraction and beneficiation of uranium, an acronym list, and the ground-

water standards for remedial actions at inactive uranium processing sites.

▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 6: Gold Placers. October 1994. EPA530-R-94-035. Order Number: PB94-201 811 (NTIS). (135 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic gold placer mining industry. Briefly characterizes the geology of gold placer deposits and the economics of the industry. Reviews gold placer extraction and beneficiation methods and discusses potential environmental effects of gold placer mining. Describes current regulatory programs implemented by EPA, federal land management agencies, and selected states. Appendix includes comments on the report with EPA responses.

▼  
**Technical Resource Document: Extraction and Beneficiation of Ores and Minerals; Volume 7: Phosphate and Molybdenum. November 1994. EPA530-R-94-034. Order Number: PB94-201 001 (NTIS). (135 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the results of EPA's research into the domestic phosphate and molybdenum mining industry. Comprises two reports of site visits conducted by EPA to a phosphate mine in Florida and a molybdenum

mine in Idaho during 1991 and 1992. Both reports include a general facility description, the environmental setting (i.e., climate, surface water, geology, hydrogeology, wildlife), facility operations, waste and materials management, regulatory requirements and compliance, and ground-water monitoring data. Appendix includes comments on the report and EPA responses.

### III. ENVIRONMENTAL IMPACTS AND RISK

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**Seminar Publication: Managing Environmental Problems at Inactive and Abandoned Metals Mine Sites. 1995. EPA625-R-95-007 (NSCEP). (91 pages)**  
<[www.epa.gov/ttbnrmrl/Sempubs.htm](http://www.epa.gov/ttbnrmrl/Sempubs.htm)>

Summarizes information presented at the three 1994 EPA- and U.S. Department of Energy-sponsored available control technologies seminars. The information concerned how to control problems associated with mining and beneficiation waste generated from active and inactive mining sites. Other seminar discussion topics included the fundamentals of acid mine drainage, known and probable effects on public health and the environment, and control technologies such as bioremediation, composting, and other innovative approaches currently being investigated.

▼  
**Innovative Methods of Managing Environmental Releases at Mine Sites. April 1994. EPA530-R-94-012. Order Number: PB94-170 255 (NTIS). (119 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Describes source reduction and recycling practices and innovative techniques for waste management currently used in mining. Discusses process controls that help produce purer and more saleable products while reducing hazardous constituents in the waste stream. Examines recycling opportunities unique to mining, such as slag reprocessing, tailings reprocessing, pipe recycling and reuse, and mine tire recycling. Lists technical contacts familiar with each technology described.

▼  
**Technical Document: Background for NEPA Reviewers: Non-Coal Mining Operations. December 1994. EPA530-R-95-043. Order Number: PB96-109 103 (NTIS). (79 pages)**

Assists in preparing environmental impact statements for noncoal mining operations. Describes the general types of environmental impacts likely to occur from hard rock (noncoal) mining. Provides valuable information at an introductory, nontechnical level on these types of operations.

▼  
**Location of Mines and Factors Affecting Exposure. June 1986. EPA530-SW-86-023. Order Number: PB86-219 409/AS (NTIS). (79 pages)**

Relates qualitative perspective on risks of mining wastes. Reports on mine locations, locations of potential receptor populations, and environmental characteristics at those locations, and also compares selected sites.

## **IV. WASTE CHARACTERIZATION AND TESTING**

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▼  
**ASTM-D-6234-98 Standard Test Method for Shake Extraction of Mining Waste by the Synthetic Precipitation Leaching Procedure. June 1998. Order Number: ASTM-D-6234-98INL (NTIS). (6 pages) Order directly from ASTM's online store. <[www.astm.org](http://www.astm.org)>**

Covers a procedure for the shake leaching of mining waste containing at least 80 percent dry solids (20 percent moisture) in order to generate a solution to be used to determine the inorganic constituents leached under the specified testing conditions, which conform to the synthetic precipitation leaching procedure.

▼  
**Long-Term Dissolution Testing of Mine Waste. March 1995. EPA530-R-95-040. Order Number: PB95-260 287 (NTIS). (98 pages)**

Describes the long-term dissolution testing of mine waste

and the effects of particle size on the quality of drainage from waste rock. Characterizes the quality of drainage from four waste rock and six tailing samples physically, chemically, and mineralogically. Conducted under grant to EPA by the state of Minnesota.

▼  
**Long-Term Dissolution Testing of Mine Waste: Appendices. March 1995. EPA530-R-95-040A. Order Number: PB95-260 295 (NTIS). (148 pages)**

Contains the appendices for the long-term laboratory studies examining the dissolution of abandoned mine wastes and the consequent drainage quality. Includes solid phase characterization, wet-dry cycle test, elevated temperature test, particle size experiment, and quality assurance and quality control.

▼  
**Statistical Analysis of Mining Waste Data. June 1986. EPA530-SW-86-024. Order Number: PB86-219 383/AS (NTIS). (42 pages)**

Contains analyses conducted to measure the concentration of various elements, anion, radio nuclides, and other parameters in raw mining waste samples and acetic acid extracts of samples.

▼  
**Technical Studies Supporting the Mining Waste Regulatory Determination. June 1986. EPA530-SW-86-026. Order Number: PB86-219 417/AS (NTIS). (59 pages)**

Describes the study procedure and techniques for the

extraction procedure toxicity test to evaluate RCRA hazardous characteristics of mining and smelting wastes, particularly lead and cadmium. Two principal tasks are described. The first assesses the validity of arsenic, lead, cadmium, barium, silver, and chromium concentrations in extraction procedure-toxicity leachates. The second task compares the extraction efficiency of four leachate techniques. Presents conclusions and the recommendations of researchers.

## **V. ACID MINE DRAINAGE**

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**Application of Geophysics to Acid Mine Drainage Investigations, Volume 1: Literature Review and Theoretical Background. September 1994. EPA530-R-95-013A. Order Number: PB95-191 268 (NTIS). (144 pages)**

Evaluates the utility of geophysical techniques in detecting and monitoring acid mine drainage contamination from mine wastes. Discusses the geochemistry of acid mine drainage, the relationship between ion concentration and specific conductance, the empirical relationships available to predict the resistivity of soil and rock, and formulas for determining the optimum line spacing for geophysical surveys and the associated probabilities. Includes a review and summary of literature on geophysical methods that might be useful in evaluating migration of the highly specific conductance contaminants in ground water.

▼ **Application of Geophysics to Acid Mine Drainage Investigations, Volume 2: Site Investigations.** September 1994. EPA530-R-95-013B. Order Number: PB95-191 276 (NTIS). (103 pages)

Describes site investigations undertaken to evaluate the utility of surface geophysical techniques in detecting and monitoring ground-water pollution from mine waste in the western United States. Discusses results of investigations at the Spenceville copper mine, Leviathan sulfur mine, Iron Mountain copper mine, and Walker copper mine. Includes maps, charts, and tables.

▼ **Technical Document: Acid Mine Drainage Prediction.** December 1994. EPA530-R-94-036. Order Number: PB94-201 829 (NTIS). (71 pages)  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Examines acid generation prediction methods as they apply to noncoal mining sites. Reviews acid forming processes at mine sites. Summarizes current methods used to predict acid formation, including sampling, testing, and modeling. Presents case histories from active mining sites and sites on the Superfund National Priorities List.

▼ **Handbook for Constructed Wetlands Receiving Acid Mine Drainage.** 1993. EPA540-R-93-523. Order Number: PB93-233 914 (NTIS). (288 pages)

Details the theory, design, and construction of wetlands receiving acid mine drainages, based on the second and third years of operation of the pilot constructed wetland built at the Big Five Tunnel in Idaho Springs, Colorado. Contains sections on theoretical developments and design considerations. Focuses on removal of metals by precipitation of sulfides through the activity of sulfate reducing bacteria. Funded by EPA under the SITE Emerging Technologies Program.

## VI. MINE PIT WATER

▼ **Water Quality in Open Pit Precious Metal Mines.** February 1994. EPA530-R-95-011. Order Number: PB95-191 243 (NTIS). (74 pages)

Documents the current level of understanding for issues

concerning open-pit metal mine water quality, and determines where additional research is needed. Examines factors that contribute to pit-water quality, such as flow of ground water, water-wall rock reactions, pH, trace element concentrations (especially arsenic), evapoconcentration, and hydrothermal activity. Discusses how pit lakes exist from the mining of minerals such as phosphate, uranium, coal, copper, silver, and gold. Determines that variabilities in contributing factors affect pit-water quality and the unique geology in each mine make predictions of pit-water quality difficult.

▼ **Geochemical Modeling of Mine Pit Water: Overview and Application of Computer Codes.** December 1994. EPA530-R-95-012. Order Number: PB95-191 250 (NTIS). (192 pages)

Evaluates the suitability of hydrogeochemical computer modeling codes BALANCE, MINTEQA2, PHREEQE, WATEQF, and WATEQF4 to the task of modeling post-mining pit-water geochemistry. Discusses the advantages and disadvantages of these codes for pit-water modeling. Provides detailed descriptions of the operation of each software code. Includes a detailed discussion of introductory aqueous geochemistry and how the concepts are integrated into chemical models.



## VII. TAILINGS DAMS

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**Guide to Tailings, Dams and Impoundments, Design, Construction, Use and Rehabilitation. 1997. ISBN 92-807-1590-7. Order Number: UN-0186INP (NTIS). (240 Pages)**

An important United Nations reference book and guide that addresses both the safety and the environmental issues of tailing impoundments. This invaluable guide for mine owners and operators, as well as government agencies concerned with the disposal of tailings, discusses common problems in the disposal of tailings at mines, quarries, and other industries.

▼  
**Technical Report: Design and Evaluation of Tailings Dams. August 1994. EPA530-R-94-038. Order Number: PB94-201 845 (NTIS) (69 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents an introduction to the subject of tailings dams and impoundments, particularly with regard to their engineering features and their ability to mitigate or minimize adverse effects to the environment. Provides an overview of the various methods used to dispose of mine tailings and the types of impoundments used. Describes the basic concepts used in the design of impoundments, including a number of site-specific variables of concern. Discusses tailings embankment and stability and addresses water management in tailings impoundments. Offers a case study on a lined tailings impoundment. Includes an

appendix with comments received on the draft document with EPA responses.

## VIII. CYANIDE WASTE ISSUES

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**Technical Report: Treatment of Cyanide Heap Leaches and Tailings. September 1994. EPA530-R-94-037. Order Number: PB94-201 837 (NTIS). (70 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Provides information on cyanide treatment methods for heap leaches and tailings activities associated with cyanidation operations. Discusses cyanide detoxification treatment in terms of chemistry, duration, removal efficiencies, and advantages and limitations. Describes treatment techniques and typical closure and reclamation activities for heaps and tailings impoundments. Includes selected case studies and federal and state requirements that apply to cyanide operations. Presents treatment options without evaluating their efficiency.

▼  
**Development of a Solid Analytical Procedure for Cyanide in Spent Ore. June 1991. EPA530-R-92-006. Order Number: PB93-203 496 (NTIS). (239 pages)**

Explores three methods used to test cyanide levels in tailings from heap leach cyanidation facilities for mining gold and silver. Establishes that bottle-roll tests give the closest approxi-

mation of cyanide levels in ore samples and best chances for predicting levels of cyanide in leachate from depositories. Presents detailed analytical results.

▼  
**Quantities of Cyanide-Bearing and Acid-Generating Wastes Generated by the Mining and Beneficiating Industries, and Potentials for Contaminant Release. June 1986. EPA530-SW-86-025. Order Number: PB86-219 391/AS (NTIS). (201 pages)**

Documents the initial phases of human exposure and ecological impact assessment of mining and beneficiation wastes bearing cyanides or generating acids. Data regarding waste quantities, with limited information on cyanide concentrations and the potential for acid formation of wastes, are summarized.

## IX. CERCLA/ SUPERFUND ISSUES

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▼  
**Mining and Mineral Processing Sites Listed on the Superfund's National Priorities List (NPL). February 1997. F-97-2P4P-S0043 (RCRA Hotline/ RCRA Information Center).**  
<[www.epa.gov/epaoswer/hazwaste/ldr/ldr-supl.htm#mining](http://www.epa.gov/epaoswer/hazwaste/ldr/ldr-supl.htm#mining)>

Identifies mining and mineral processing sites listed on Superfund's National Priorities List and summarizes environmental damage information on each site.



▼  
**Mining Sites in the National Priorities List; NPL Site Summary Reports (Complete Set). June 1991. EPA530-SW-91-065. Order Number: PB92-124 759 (NTIS). (4210 pages)**

Provides descriptions of the 48 mining sites on the National Priorities List (NPL) in a five-volume set. Contains reports prepared to support EPA's mining program activities. Summarizes environmental damages and associated mining waste management practices at sites on, or proposed for, NPL as of the February 11, 1991, *Federal Register* notice (56 FR 5598). Based on information obtained from EPA files and reports, an individual report was prepared for each site. Maps and charts are included.

▼  
**Superfund Guide to RCRA Management Requirements for Mineral Processing Wastes. January 1991. OSWER-9347.3-12FS. Order Number: PB91-921 318 (NTIS). (5 pages)**

Summarizes revisions to the 1980 mining waste exclusion, explains the potential effects of these revisions on waste management options for mineral processing wastes, and provides a general framework for managing mineral processing wastes at CERCLA sites in accordance with RCRA land disposal restrictions and the toxicity characteristics rule.

▼  
**Consideration of RCRA Requirements in Performing CERCLA Responses at Mining Waste Sites. August 1986. EPA/9234.0-04. Order Number: PB91-214 205 (NTIS). (13 pages)**

Discusses mining wastes that will not be regulated under Subtitle C of RCRA. Mining waste problems will be addressed by developing a program for regulation under Subtitle D. In the interim, Superfund will continue to address these mining waste problems through the remedial investigation and feasibility study and record of decision and enforcement decision document processes taking into account current Subtitle D requirements as well as options for addressing risks not addressed by Subtitle D requirements.

## **X. REPORTS TO CONGRESS ON MINING WASTES**

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▼  
**Summary and Technical Review of Supporting Literature for the 1985 Report to Congress on Wastes from Extraction and Beneficiation of Metallic Ores, Phosphate Rock, Asbestos Overburden from Uranium Mining, and Oil Shale. October 1993. EPA530-R-93-025. Order Number: PB94-113 404 (NTIS). (126 pages)**

Presents a technical review of the sampling and analytical data cited in the *1985 Report to Congress on Wastes from the Extraction and*

*Beneficiation of Metallic Ore, Phosphate Rock, Asbestos, Overburden From Uranium Mining, and Oil Shale.* Examines the sampling and analysis methodologies and describes the data collected for each of the three sources used in the Report to Congress.

▼  
**Report to Congress on Special Wastes from Mineral Processing: Summary and Findings. July 1990. EPA530-SW-90-070B (NSCEP). (22 pages)**

Summarizes findings pertaining to special wastes from mineral processing. Includes sources and volumes of materials generated per year, and presents disposal and utilization practices; the potential danger to health and environment; documented and proved cases of danger to health and environment; alternatives to current disposal methods and costs of alternatives; impacts of alternatives on use of phosphate rock, uranium ore, and other natural resources; and current and potential uses of waste materials.

▼  
**Report to Congress on Special Wastes from Mineral Processing: Summary and Findings; Methods and Analysis; Appendices. July 1990. EPA530-SW-90-070C. Order Number: PB90-258 492 (NTIS). (643 pages)**

Examines RCRA waste exemption for mineral processing. Describes events in the rulemaking process and criteria used by EPA to exempt

20 special wastes from mineral processing operations. Reports sources and volumes of wastes, including present disposal practices, documented cases of danger, alternatives to current disposal methods, costs of alternatives, and impacts of alternatives on natural resources.

▼  
**Summary of Comments on Mining Waste Report to Congress. May 1986. EPA530-SW-86-030. Order Number: PB86-222 486/AS (NTIS). (87 pages)**

Describes the approach used to summarize comments included in the document. Lists companies, organizations, agencies, and individuals who responded. Organized into five chapters covering legal issues and procedures, technical information, regulations, economics, and recommendations.

▼  
**Report to Congress: Wastes from the Extraction and Beneficiation of Metallic Ores, Phosphate Rock, Asbestos, Overburden from Uranium Mining, and Oil Shale. December 1985. EPA530-SW-85-033. Order Number: PB88-162 631 (NTIS). (293 pages)**

Addresses wastes from the extraction and beneficiation of metallic ores (with special

emphasis on copper, gold, iron, lead, silver, and zinc), uranium overburden, and the nonmetals asbestos and phosphate rock. Provides a comprehensive assessment of possible adverse effects on human health and the environment resulting from the disposal of solid wastes from the extraction and beneficiation of ores and minerals. Covers mine waste, mill tailings, and waste from heap and dump leaching operations. Summarizes EPA's findings on oil shales in Appendix A.

## **XI. REGULATORY RECOMMENDATIONS**

▼  
**U.S. EPA Mine Waste Policy Dialogue Committee Meeting Summaries and Supporting Material. March 1994. EPA530-R-94-043. Order Number: PB95-122 529 (NTIS). (114 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Summaries of the 1991 to 1993 Policy Dialogue Committee meetings and other information describing the committee. The purpose is to provide additional technical, policy, and regulatory information concerning the domestic mining industry.

▼  
**Projected Regulatory, Programmatic, and Fiscal Impacts of EPA's Strawman II on State Mine Waste Management Programs (Complete Set, Volumes I-III). December 1991. EPA530-R-92-008. Order Number: PB92-190 149 (NTIS). (1,157 pages)**

Reports on the projected regulatory, programmatic, and fiscal impacts of EPA's Strawman II on state mine waste management programs. Volume I provides preliminary assessment of the effects that EPA's Strawman II draft regulatory approach for mining waste would have on existing state programs for environmental control and management of mining waste. Volume II reports on the impacts of EPA's Strawman II report from the participating states of the Western Governorship Association Mine Waste Task Force. Volume III contains the appendices to the reports.

▼  
**Strawman II: Recommendations for a Regulatory Program for Mining Wastes and Materials Under Subtitle D of the Resource Conservation and Recovery Act. May 1991. EPA530-SW-91-056. Order Number: PB91-178 418 (NTIS). (119 pages)**



Represents EPA's staff position on an effective federal program to regulate wastes and other materials uniquely associated with noncoal mining. Describes the prerulemaking process, and provides background and overview of mining waste program. Discusses the scope of the program and regulatory approach.

## **XII. LAND DISPOSAL RESTRICTIONS, PHASE IV**

▼  
**Land Disposal Restrictions, Phase IV - Treatment Standards Proposed for Toxicity Characteristic (TC) Metal and Mineral Processing Wastes - Proposed Rule. May 12, 1997. *Federal Register* (62 FR 26041) (RCRA Hotline). (44 pages)**  
<[www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm](http://www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm)>

The third proposed rule related to treatment standards for certain metal wastes and wastes from mineral processing. EPA was seeking comment on a conditional exclusion for secondary mineral processing materials, on coprocessing of materials in Bevill-exempt mining units, and on whether certain mineral processing and mining wastes currently excluded from federal hazardous waste regulations warranted regulatory controls.

▼  
**Environmental Fact Sheet: Treatment Standards Proposed for Toxicity Characteristic (TC) Metal and Mineral Processing Wastes. April 1997. EPA530-F-97-016 (RCRA Hotline). (2 pages)**  
<[www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm](http://www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm)>

Describes EPA's repropo- s- Land Disposal Restriction treatment standards for metal-bearing hazardous wastes, including wastes from mineral processing operations. Discusses how the proposed revised Universal Treatment Standards would apply to wastes from mineral processing operations, a group of wastes not currently subject to treatment standards. Seeks comment on three specific issues related to recycled secondary materials from mineral processing and wastes excluded by the Bevill amendment under RCRA. The three issues were: which materials are wastes and which are in-process materials outside EPA's jurisdiction, whether the Bevill exclusion should extend to Bevill-exempt mining facilities in which mineral processing wastes are coprocessed, and whether the risks posed by some Bevill-exempt wastes warrant future regulatory controls.

▼  
**Docket Index: Land Disposal Restrictions Phase IV: Second Supplemental Proposal on Treatment Standards for Metal Wastes and Mineral Processing Wastes, Mineral Processing and Bevill Exclusion Issues, and the Use of Hazardous Waste as Fill.**

**RCRA Docket No. F-97-2P4P-FFFFF (RCRA Hotline). (6 pages)**  
<[www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm](http://www.epa.gov/epaoswer/hazwaste/ldr/ldr-rule.htm)>

Records the name, citation, and docket number for the information placed in RCRA Docket No. F-97-2P4P-FFFFF to support the *Land Disposal Restrictions Phase IV: Second Supplemental Proposal on Treatment Standards for Metal Wastes and Mineral Processing Wastes, Mineral Processing and Bevill Exclusion Issues and the Use of Hazardous Waste as Fill*.

▼  
**Identification and Description of Mineral Processing Sectors and Waste Streams. April 1998. RCRA Docket No. F-98-2P4F-FFFFF (RCRA Hotline/RCRA Information Center). (1,106 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Identifies waste streams produced by mineral processing that could potentially exhibit one of the characteristics of a RCRA hazardous waste. If a mineral processing waste stream is found to be hazardous, it may be subject to the Land Disposal Restrictions. The Agency cautions that this draft document should not be construed to be an exclusive list of mineral processing and associated waste streams; other types of mineral processing waste streams might exist. Each chapter contains separate metal-by-metal evaluations.

▼  
**Applicability of the Toxicity Characteristic Leaching Procedure to Mineral Processing Wastes. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (21 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Demonstrates that mineral processing wastes are susceptible to mismanagement. Discusses the considerations incorporated into the Agency's expanded mismanagement scenario rationale, specifically the basis for the Agency's conservative approach, past incidents of codisposal of mineral processing wastes with municipal solid waste, and the location of mineral processing facilities relative to population centers and sensitive environments. In addition, addresses the American Mining Congress' suggestion that the synthetic precipitation leaching procedure be used as an alternative to the toxicity characteristic leaching procedure to determine the toxicity of mineral processing wastes.

▼  
**Mineral Processing Facilities Placing Mixtures of Exempt and Non-Exempt Wastes in On-Site Waste Management Units. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (10 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Summarizes the Agency's review of waste disposal practices at mineral processing facilities to determine if such facilities place, or have placed in the past, mixtures of exempt and nonex-

empt wastes in onsite waste management units. Identifies cases where such codisposal might have taken place.

▼  
**Remanded Smelting Wastes. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (14 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Discusses the history of Agency actions with regard to remanded smelting wastes, industrial smelting processes, and waste management procedures, and provides a factual basis for considering a no-list decision. (See *American Mining Congress v. EPA*, 907 F.2d 1179, D.C. Cir., 1990).

▼  
**Lightweight Aggregate Production and Air Pollution Control Wastes. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (16 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents EPA's rationale for withdrawing air pollution control (APC) dust and sludge generated in the production of

lightweight aggregate from the Federal Mining Waste Exclusion. APC was one of many mineral processing wastes made conditionally exempt from RCRA Subtitle C requirements under the Bevill Amendment. In response to a 1991 Federal Appeals Court decision requesting EPA to reexamine whether lightweight aggregate APC dust/sludge is eligible for coverage under the Mining Waste Exclusion (*Solite Corporation v. EPA* 952 F.2d 473 D.C. Cir. 1991). Organized into eight sections with Section 1 providing background information. Section 2 briefly describes the commodity in question. Sections 3 and 4 describe the production process and the resultant waste streams, respectively. Section 5 discusses industry and market characteristics and the potential impact of EPA's decision to withdraw the Bevill Exclusion. Section 6 revisits the rationale behind EPA's decision to withdraw the Bevill Exclusion based on the high-volume criterion. Section 7 summarizes and responds to Solite's arguments against EPA's high-volume criterion. Finally, Section 8 presents the conclusions of the document.



▼  
**Titanium Tetrachloride Production by the Chloride Ilmenite Process. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (9 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents EPA's factual basis for proposing to withdraw titanium tetrachloride waste acids (which implicitly includes iron chloride) generated in the production of titanium tetrachloride by the chloride-ilmenite process from the RCRA Mining Waste Exclusion. These wastes were one of numerous mineral processing wastes made conditionally exempt from RCRA Subtitle C requirements under the Bevill Amendment to RCRA, (40 CFR Part 261.4(b)(7)). Provides a description of the DuPont chloride-ilmenite process and the generation of the iron chloride waste. Provides EPA's evaluation of the process, which serves as the technical basis for EPA's determination regarding the regulatory status of the iron chloride waste.

▼  
**Human Health and Environmental Damages from Mining and Mineral Processing Wastes. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (113 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Describes the human health and environmental damages caused by management of wastes from mining (i.e., extraction and beneficiation) and mineral processing, particularly damages

caused by placement of mining and mineral processing wastes in land-based units. EPA prepared this report by compiling existing damage case summaries; reviewing relevant inspection, enforcement, permitting, and other relevant files for mining and mineral processing facilities in selected states; and soliciting the help of EPA Region 10 in drafting new damage cases.

▼  
**Site Visit Reports to Mines and Mineral Processing Facilities. April 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (26 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents information collected at five site visits to mines and mineral processing facilities conducted by the EPA. Each site visit report includes information about the types of wastes generated and how such wastes are managed. Sites visited include DuPont Antioch, California; McLaughlin Gold Mine, Lower Lake, California; Rand Gold Mine, Randsburg, California; Newmont North Operations Gold Mine, Carlin, Nevada; and Magma Copper and Cyprus Miami Mines, Tucson, Arizona.

▼  
**Regulatory Impact Analysis of the Supplemental Proposed Rule Applying Phase IV Land Disposal Restrictions to Newly Identified Mineral Processing Wastes. May 1998. RCRA Docket No. F-98-2P4F-FFFF (RCRA Hotline/RCRA Information Center). (26 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Estimates the costs, economic impacts, and benefits of the supplemental rule addressing newly identified hazardous mineral processing wastes. The supplemental rule expands upon the proposed Phase IV Land Disposal Restriction rule published on August 22, 1995 (60 FR 43654). EPA proposes standards for mineral processing wastes no longer exempt from Subtitle C requirements under the Bevill exemption. Proposed that previously exempt Bevill mineral processing wastes must meet RCRA Universal Treatment Standards before management or disposal in a land-based unit.

▼  
**Capacity Analysis Background Document. December 1995. RCRA Docket No. F-965-PH4A-S0053 (RCRA Hotline/RCRA Information Center). (63 pages)**  
<[www.epa.gov/epaoswer/other/mining.htm](http://www.epa.gov/epaoswer/other/mining.htm)>

Presents the capacity analysis EPA conducted to support the proposed Land Disposal Restrictions Phase IV: Newly Identified Mineral Processing Wastes (Supplemental Rule). EPA conducted capacity analyses to evaluate the need for national capacity variances from the land disposal prohibitions. The capacity analysis provides estimates of the quantities of wastes that will require alternative commercial treatment prior to land disposal as a result of the LDRs and estimates alternative commercial treatment capacity available to manage wastes restricted from land disposal. EPA proposed LDRs for newly identified and listed mineral processing wastes.

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