

APPENDIX A

ACRONYM LIST and

GLOSSARY OF MINING TERMS

(This Page Intentionally Blank)

A - 2 Appendix A: Acronym List and Glossary of Mining Terms

NPS	National Park Service
OSC	On-Scene Coordinator
OPPTS	Office of Prevention Pesticides and Toxic Substances
ORD	Office of Research and Development
O&M	Operating and maintenance
OSM	Office of Surface Mining
OSHA	Occupational Safety and Health Act
OSW	Office of Solid Waste
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Units
OW	Office of Water
PAHs	Poly Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenols
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation and Feasibility Study
RFS	RCRA Facility Assessment
RPMs	Remedial Project Managers
ROD	Record of Decision
SACM	Superfund Accelerated Cleanup Model
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SITE	Superfund Innovative Technology Evaluation
SDWA	Safe Drinking Water Act
SPLC	Synthetic Precipitation Leaching Procedure
SVOCs	Semi-Volatile Organic Compounds
TAG	Technical Assistance Grant
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TOSC	Technical Outreach Services for Communities
TSCA	Toxic Substances Control Act
TMDL	Total Maximum Daily Load
TRW	Technical Review Workgroup
USFS	US Forest Service
USGS	U.S. Geological Survey
USCG	U.S. Coast Guard
WET	California's Waste Extraction Test
XRF	X-ray Fluorescence analytical method
VOCs	Volatile Organic Compounds
WGA	Western Governors' Association

PLEASE NOTE: use of these terms does not constitute a regulatory determination under either RCRA or CERCLA. This glossary may only be used to assist the user and should not be used to regulatory purposes

Active treatment systems: Systems that require periodic or continual maintenance or upkeep to maintain system effectiveness. Examples include treatment plants and alkaline chemical addition.

Adit: A nearly horizontal passage from the surface by which a mine is entered and drained.

Aerobic: In the presence of oxygen. Aerobic wetlands are those in which oxidizing processes dominate.

Alkalinity: The capacity of water to accept protons (acidity). Alkalinity is imparted to natural waters by bicarbonate, carbonate, or hydroxide anions.

Alkalinity producing systems: A type of passive treatment system designed to produce neutral effluent with excess alkalinity. Typically these alkalinity producing systems combine anoxic limestone drains with anaerobic wetlands.

Alluvial mining: The use of dredges or hydraulic water to extract ore from placer deposits.

Amalgamation: The use of mercury to catch native gold by sorption, forming a liquid "amalgam" from which the mercury is later removed by distillation.

AMD: Acid mine drainage, characterized by low pH, high sulfate, and high iron and other metal species.

Anaerobic: In the absence of oxygen. Anaerobic wetlands are those in which reducing processes dominate.

Anfo: A free running explosive used in mine blasting made of 94% prilled aluminum nitrate and 6% No. 3 fuel oil.

Anionic species: Ions with a negative charge.

Anode: The negative electrode.

Anoxic limestone drain: A type of passive treatment system consisting of a trench of buried limestone into which acid water is diverted. Dissolution of limestone increases pH and alkalinity.

Anoxic: In the absence of oxygen.

ARD: Acid Rock Drainage. See AMD

Assay: To determine the amount of metal contained in an ore.

Beneficiation: Physical treatment of crude ore to improve its quality for some specific purpose. Also called mineral processing. RCRA defines beneficiation as: restricted to the following activities: Crushing; grinding; washing; dissolution; crystallization; filtration; sorting; sizing; drying; sintering;

A - 4 Appendix A: Acronym List and Glossary of Mining Terms

pelletizing; briquetting; calcining to remove water and/or carbon dioxide; roasting, autoclaving, and/or chlorination in preparation for leaching; gravity concentration; magnetic separation; electrostatic separation; flotation; ion exchange; solvent extraction; electrowinning; precipitation; amalgamation; and heap, dump, vat, tank, and *in situ* leaching. See 40 CFR 261.4 (b)7 for more information

Bioreactor: An engineered container filled with untreated waters and organic matter such as hay or manure which provides sulfate-reducing bacteria and a carbon source to sustain the bacteria.

Block Caving: Large massive ore bodies may be broken up and removed by this method with a minimum of direct handling of the ore required. Generally, these deposits are of such a size that they would be mined by open-pit methods if the overburden were not so thick. Application of this method begins with the driving of horizontal crosscuts below the bottom of the ore body, or below that portion which is to be mined at this stage. From these passages, inclined raises are driven upward to the level of the bottom of the mass which is to be broken. Then a layer is mined so as to undercut the ore mass and allow it to settle and break up. Broken ore descends through the raises and can be dropped into mine cars for transport to the surface. When waste material appears at the outlet of a raise it signifies exhaustion of the ore in that interval. If the ore extends to a greater depth, the entire process can be continued by mining out the mass which contained the previous working passage.

Cathode: The positive electrode.

Cation exchange: A reverseable exchange process, that uses a resin, mineral or other exchange medium, in which one cation is removed from solution and replaced by another cation displaced from the exchange medium without destruction of the exchange medium or disturbance of electrical neutrality. The process is accomplished by diffusion.

Cationic species: Ions with a positive charge.

Classification: Separation of particles in accordance with their rate of fall through a fluid (usually water). The hydrocyclone is the most commonly used classification machine.

Clinoptilolite: A common zeolite mineral that has sodium and potassium as the primary cations and that commonly forms by alteration of natural volcanic glass by ground water or in a saline lake environment.

Comminution: Crushing and/or grinding of ore by impact and abrasion. Usually, the word "crushing" is used for dry methods and "grinding" for wet methods. Also, "crushing" usually denotes reducing the size of coarse rock while "grinding" usually refers to the reduction of the fine sizes.

Complexing: The chemical process of forming metal complexes.

Concentrate: The concentrate is the valuable product from mineral processing, as opposed to the tailing, which contains the waste minerals. The concentrate represents a smaller volume than the original ore.

Crushing: See "Comminution".

Cut and Fill Stopping: If it is undesirable to leave broken ore in the stope during mining operations (as in shrinkage stopping), the lower portion of the stope can be filled with waste rock and/or mill tailings. In this case, ore is removed as soon as it has been broken from overhead, and the stope filled with waste to within a few feet of the mining surface. This method eliminates or reduces the waste disposal problem associated with mining as well as preventing collapse of the ground at the surface.

Cyanidation: The process of extracting gold and silver by leaching with cyanide (CN⁻). Cyanide, usually added in the form of a salt (e.g., NaCN, KCN), dissolves gold by the following reaction:



Cyclone (hydrocyclone): A classifying (or concentrating) separation machine into which pulp is fed so as to take a circular path. Coarser and heavier fractions of solids report at the apex of a long cone while the finer particles overflow from the vortex.

Drift: A horizontal mining passage underground. A drift usually follows the ore vein, as distinguished from a crosscut, which intersects it.

Eh: The redox or oxidation potential. A measure of the ability of a natural environment to bring about any oxidation or reduction process by supplying electrons to an oxidizing agent or accepting electrons from a reducing agent.

Extraction: The process of removing ore from the ground.

Extractive metallurgy: The processes of chemically separating the valuable metal from its mineral matrix (ore or concentrate) to produce the pure metal. Includes the disciplines of hydrometallurgy and pyrometallurgy.

Ferric iron: Iron present in its oxidized state, with an ionic charge of +3.

Ferrous iron: Iron present in its reduced state, with an ionic charge of +2.

Flotation: Separation of minerals based on the interfacial chemistry of the mineral particles in solution. Reagents are added to the ore slurry to render the surface of selected minerals hydrophobic. Air bubbles are introduced to which the hydrophobic minerals attach. The selected minerals are levitated to the top of the flotation machine by their attachment to the bubbles and into a froth product, called the "flotation concentrate." If this froth carries more than one mineral as a designated main constituent, it is called a "bulk float". If it is selective to one constituent of the ore, where more than one will be floated, it is a "differential" float. The remaining slurry left after flotation is called the "flotation tailing." Flotation is the dominant method of mineral concentration currently in use.

Fluvial: Of or pertaining to rivers.

Flux: A component intentionally added to high temperature processing to modify properties (e.g., melting point, viscosity, chemical properties) of the slag.

A - 6 Appendix A: Acronym List and Glossary of Mining Terms

Gangue: The fraction of ore rejected as tailing in a separating process. It is usually the valueless portion, but may have some secondary commercial use.

Grade: Percentage of a metal or mineral composition in an ore or processing product from mineral processing.

Gravity separation: Exploitation of differences in the densities of particles to achieve separation. Machines utilizing gravity separation include jigs and shaking tables.

Grinding: See "Comminution".

Hydrometallurgy: A type of extractive metallurgy utilizing aqueous solutions/solvents to extract the metal value from an ore or concentrate. Leaching is the predominant type of hydrometallurgy.

Ion: An atom, group of atoms, or molecule that has acquired a net electric charge by gaining or losing electrons from an initially electrically neutral configuration.

Iron hydroxide: A chemical compound composed of iron cation and a hydroxide (oxygen plus hydrogen) anion, with the chemical formula $\text{Fe}(\text{OH})_3$. It is a common precipitate in acidic environments, with a yellowish, orangish or reddish coloration.

Layered base amendments: Alkaline (base) materials that are interlayered with acid generating materials in order to provide a measure of neutralizing capacity.

Liberation: Freeing, by comminution, of particles of specific mineral from their interlock with other constituents of the ore.

Limestone: A sedimentary rock formed by chemical precipitation from sea water or fresh water that is composed primarily of the mineral calcite (calcium carbonate).

Lode: An unusually large vein or set of veins containing ore minerals.

Longwall mining: In level, tabular ore bodies it is possible to recover virtually all of the ore by using this method (in the United States, only coal is known to have been mined using longwall methods). Initially, parallel drifts are driven to the farthest boundary of the mine area. The ore between each pair of drifts is then mined along a continuous face (the longwall) connecting the two drifts. Mining proceeds back toward the shaft or entry, and only enough space for mining activities is held open by moveable steel supports. As the longwall moves, the supports are moved with it and the mined out area is allowed to collapse. Various methods can be used to break up and remove the ore. In many cases, the rock stresses that are caused by the caving of the unsupported area aids in breaking the material in the longwall face.

Magnetic separation: Use of permanent or electro-magnets to remove relatively strong ferromagnetic particles from para- and dia-magnetic ores.

Matte: An impure metallic sulfide product obtained from the smelting of sulfide ores of metals such as copper, lead, and nickel.

Metal complexes: An ion consisting of several atoms including at least one metal cation.

Metallurgy: The science and art of extracting metals from their ores, refining them, and preparing them for use. Metallurgy consists of three major disciplines: mineral processing metallurgy, extractive metallurgy, and physical metallurgy.

Microbial mat: A naturally occurring mat of organic matter found in wetland environments, typically composed predominantly of blue-green algae.

Mill: Includes any ore mill, sampling works, concentration, and any crushing, grinding, or screening plant used at, and in connection with, an excavation or mine.

Mine: An opening or excavation in the earth for the purpose of extracting minerals.

Mineral: A naturally occurring, solid, inorganic element or compound, with a definite composition or range of compositions, usually possessing a regular internal crystalline structure.

Mineral processing: Preparation of ores by physical methods. A subcategory of metallurgy. Methods of mineral processing include comminution, classification, flotation, gravity separation, etc.

Native metal: A natural deposit of a metallic element in pure metallic form, not combined as a mineral with other elements.

Open Stope: In competent rock, it is possible to remove all of a moderate sized ore body, resulting in an opening of considerable size. Such large, irregularly-shaped openings are called stopes. The mining of large inclined ore bodies often requires leaving horizontal pillars across the stope at intervals in order to prevent collapse of the walls.

Ore: A natural deposit in which a valuable metallic element occurs in high enough concentration to make mining economically feasible.

Overburden: Material of any nature, consolidated or unconsolidated, that overlies a deposit of ore that is to be mined.

Oxidizing: Increasing in oxidation number (valence charge). The process of oxidation involves a loss of electrons.

Oxyhydroxides: Chemical compounds that contain one or more cations bonded to both oxygen and hydroxide (OH) anions.

Passive treatment systems: Systems that do not require periodic or continual maintenance or upkeep to maintain system effectiveness. Examples include aerobic or anaerobic wetlands, anoxic limestone drains, open limestone channels, alkalinity producing systems, and limestone ponds.

pH: The negative logarithm of the hydrogen ion concentration, in which $pH = -\log [H^+]$. Neutral solutions have pH values of 7, acidic solutions have pH values less than 7, and alkaline solutions have pH values greater than 7.

Placer: A sedimentary deposit of unconsolidated material (usually gravel in river beds or sand dunes) containing high concentrations of a valuable mineral or native metal, usually segregated because of its greater density.

A - 8 Appendix A: Acronym List and Glossary of Mining Terms

Porous reactive walls: Trenches constructed to intercept contaminated ground water and which are filled with materials such as activated charcoal that sorb or precipitate metals from solution.

Pyrometallurgy: A type of extractive metallurgy where furnace treatments at high temperature are used to separate the metal values from an ore or concentrate. The waste product is removed as slag and/or gases. Smelting and refining are common pyrometallurgical processes.

Reducing: Decreasing in oxidation number (valence charge). The process of reduction involves a gain of electrons.

Reduction-oxidation potential: The redox potential or Eh.

Refining: A high temperature process in which impure metal is reacted with flux to reduce the impurities. The metal is collected in a molten layer and the impurities in a slag layer. Refining results in the production of a marketable material.

Riparian: Pertaining to the bank of a natural watercourse.

Roasting: The oxidation of ore or concentrate (usually of sulfide concentrates) at an elevated temperature to obtain metal oxides. The material is not melted. Roasting is usually used to change metallic compounds into forms more easily treated by subsequent processing.

Room and Pillar: This method is suitable for level deposits that are fairly uniform in thickness. It consists of excavating drifts (horizontal passages) in a rectilinear pattern so that evenly spaced pillars are left to support the overlying material. A fairly large portion of the ore (40%-50%) must be left in place. Sometimes the remaining ore is recovered by removing or shaving the pillars as the mine is vacated, allowing the overhead to collapse or making future collapse more likely.

Sedges: Any of numerous plants of the family Cyperaceae, resembling grasses but having solid rather than hollow stems.

Sequential extraction: A chemical extraction process in which chemical species are removed from solution for analysis in a sequential manner using laboratory techniques that do not affect the concentrations of the constituents remaining in solution.

Shaft: An excavation of limited area compared with its depth, made for finding or mining ore or coal, raising ore, rock or water, hoisting and lowering men and materials, or ventilating underground workings.

Shrinkage Stopping: In this method, mining is carried out from the bottom of an inclined or vertical ore body upwards, as in open stoping. However, most of the broken ore is allowed to remain in the stope in order both to support the stope walls and to provide a working platform for the overhead mining operations. Ore is withdrawn from chutes in the bottom of the stope in order to maintain the correct amount of open space for working. When mining is completed in a particular stope, the remaining ore is withdrawn, and the walls are allowed to collapse.

Slag: A mixture of oxides (sometimes halides) of metals or nonmetals formed in the liquid state at high temperatures. A flux is usually added to encourage slag production, where the slag represents the undesirable (waste) constituents from smelting and refining an ore or concentrate.

Smelting: Obtaining a metal from an ore or concentrate by melting the material at high temperatures. Fluxes are added that, in the presence of high temperatures, reduce the metal oxide to metal resulting in a molten layer containing the heavy metal values and form a slag layer containing impurities. Smelting is usually performed in blast furnaces.

Sorption: The process of sorbing as by adsorption or absorption.

Spoil: Debris or waste material from a mine.

Square-set Stopping: Ore bodies of irregular shape and/or that occur in weak rock can be mined by providing almost continuous support as operations progress. A square set is a rectangular, three-dimensional frame usually of timber, which is generally filled with waste rock after emplacement. In this method, a small square section of the ore body is removed, and the space created is immediately filled by a square-set. The framework provides both lateral and vertical support, especially after being filled with waste. Use of this method may result in a major local consumption of timber and/or other materials utilized for construction of the sets.

Stope: An excavation in a mine, other than development workings, made for the purpose of extracting ore.

Sublevel Caving: In this method, relatively small blocks of ore within a vertical or steeply sloping vein are undercut within a stope and allowed to settle and break up. The broken ore is then scraped into raises and dropped into mine cars. This method can be considered as an intermediate between block carving and top slicing.

Substrate: An underlayer. In passive treatment systems this refers to a layer of organic or other matter that underlies ponded acidic water.

Taconite: A chemical precipitate sedimentary rock composed of iron-bearing chert and which can serve as an ore material for iron.

Tailings: Residue from milling processes (e.g., flotation tailings, gravity tailings, leach tailings, etc.).

Top Slicing: Unlike the previously described methods in which mining begins at the bottom of an ore body and proceeds upward, this procedure involves mining the ore in a series of slices from the top downward, first removing the topmost layer of the ore and supporting the overhead with timber. Once the top layer of an area is completely removed, the supports are removed and the overlying material allowed to settle onto the new top of the ore body. The process is then repeated, so that as slices of ore are removed from the ore body, the overburden repeatedly settles. Subsequent operations produce an ever-thickening mat of timber and broken supports. This method consumes major quantities of timber.

Vein: A mineralized zone having a more or less regular development in length, width, and depth to give it a tabular form.

Wetlands: A lowland area such as a marsh or swamp that is saturated with moisture. They can be natural features of an environment or engineered impoundments.

Zeolite: A group of hydrous aluminosilicate minerals containing sodium, calcium, potassium or other alkali or alkaline earth elements, which typically have an open crystal structure. These minerals are widely used in chemical processes for their cation exchange capabilities.

(This page intentionally left blank)