GLOSSARY OF TERMS USED IN
METAL LEACHING AND ACID ROCK DRAINAGE WORK

Abiotic Factors	Environmental influences that arise from non-living entities, for example, climate.
Absorption	The uptake of a gas by a solid or a liquid or a liquid by a solid. Absorption differs from *adsorption* in that the absorbed substance permeates the bulk of the absorbing substance. Also used to describe uptake by plants and animals.
Acid Generation	Production of *acidity* irrespective of its effect on the adjacent pore water or whether the material is net acid producing or neutralizing. Various *oxidation* reactions produce *acidity*, including the decomposition of organic matter and the *oxidation* of ammonium fertilizers. The primary sources of *acid generation* in *mine* materials are *sulfide oxidation* and the *dissolution* of residual acidic *sulfide oxidation* products. Generated *acidity* may be *neutralized*, released directly into solution or retained in the form of acid salts with the potential to dissolve at a later time. This term may be confused with the generation of *acid drainage* and *ARD*, phenomena that require drainage and acid production in excess of neutralization. See *ARD generation*.
Acid Mine Drainage (AMD)	See *acid rock drainage*.
Acid Neutralizing Capacity (ANC)	See *neutralization potential (NP)* and *Acronyms*.
Acid Potential (AP)	The maximum potential *acid generation* from a sample. The calculation of AP (or MPA) is an integral part of *acid/base accounting*. In the traditional Sobek method of *acid/base accounting*, AP is calculated by multiplying one or more of the sulfur assays by 31.25, on the assumption that acidity will result from *sulfide mineral oxidation* and all the *sulfur* in the given fraction occurs as *pyrite*. Knowledge of sample chemistry (especially pH), sulfur *mineralogy* and *sulfide mineral* chemistry are required for an accurate assessment. In neutral pH samples, use of the *sulfide sulfur* plus *del* %S typically provides a conservative measure of AP, while avoiding large errors as a result of the inclusion of basic *sulfates* and organic sulfur. *Del* %S (unidentifiable sulfur forms) is included to ensure *acid generating* elemental or thiosulfate sulfur is included. Acidic species, secondary minerals and amorphous materials including acid producing sulfate minerals such as jarosite and alunite are likely to be present and should be considered if the sample has an acidic pH. *Total sulfur* may be substituted for *sulfide sulfur* if there is no *sulfate* or *organic sulfur*. The procedures used to derive AP should be clearly identified. Accurate data interpretation requires an understanding of the analytical procedures, the physical and geochemical conditions the material will be subjected to and the identity, location and reactivity of the contributing minerals. Sulfides differ in their AP and a correction may be required to the AP calculation where non-pyrite sulfide minerals occur in significant amounts. A mineralogical assessment will be required to determine the sulfide mineralogy. The concentration of common *sulfide* metals like Cu, Mo, Pb and Zn can be used to estimate the concentration of non-iron sulfides.

Acid Rock Drainage (ARD)	Low *pH drainage* derived from materials with an insufficient capacity to neutralize the acidic products of *sulfide* and elemental sulfur *oxidation* and the dissolution products of acidic minerals and amorphous materials. ARD is produced when the *NP* is no longer capable of maintaining *neutral pH* conditions in a measurable volume of drainage. In the context of mining, may be referred to as *acid mine drainage* (AMD). See also *acid generation*, *ARD onset* and *effective field neutralization potential*.
Acid-Base Accounting (ABA)	A series of chemical analyses and calculated values that provide a preliminary evaluation of the amounts, and relative balance, of the acid generation potential (AP or MPA) and acid-neutralization potential (NP or ANC) of a *sample*. The calculated values are used to make preliminary projections about whether a sample will produce acid drainage. Note that in Australia, acid base accounting calculations are based on the net acidity of samples (kg of H_2SO_4/t), whereas in North America it is based on the net neutralizing potential available (kg of $CaCO_3$/t). ABA includes the most common *static tests* used in the prediction of *acid rock drainage*. The potential acid production (AP) is commonly determined by analysis for sulfur species. The neutralization potential (NP) can be determined by strong acid (Sobek, modified Sobek and BC Research) *bulk NP* procedures, weak acid *bulk NP* procedures and/or various carbonate measures. Since considerable variation is possible in sample preparation, the analytical procedures, the number of tests and the manner in which the analytical data is interpreted, the procedures used should be clearly identified. Uses of ABA data include: 1. an initial coarse estimation of geochemical variability and the potential for ARD; 2. part of the information used in a more refined, site-specific prediction of future geochemical conditions; 3. operational characterization of the variability and ARD potential of excavated material and exposed surfaces, based on relationships observed in 2. It is important to note that on their own these procedures should only be used as a screening tool which can determine the acid-producing nature of a mine waste only if there is a large imbalance between the AP and NP. Accurate ARD prediction and ABA data interpretation requires an understanding of the analysis procedures, the future physical and geochemical conditions and the identity, location and reactivity of the contributing minerals. *Kinetic tests*, *mineral* identification and detailed material characterization are required to provide this information. See also *static NP procedures*. See also *acid generation* and *neutralization potential*.
Acidic Drainage (AD)	A general term applied to any *drainage* with an *acidic pH* or excess *acidity*. Note that drainage could contain elevated concentrations of Fe^{2+} and have a pH > 7. However, once the ferrous iron oxidizes and precipitates, the pH will drop. See *acid rock drainage*.
Acidic pH	By a strict chemical definition any pH < 7 is considered acidic. Based on this glossary's arbitrary definition of a *near-neutral pH* as between 6.0 to 8.0, acidic pH is defined as *pH* values less than 6. The point of concern regarding acidic pH values is typically determined by the pH value at which there is a significant increase in the solubility of the site-specific metals of concern. See also *alkaline* pH.

Acidity	A measure of the capacity of a solution to *neutralize* a strong base. Analytically determined by *titration*. The analytical value will depend on the pH end point for the *titration*. A measure of excess hydrogen ions in solution and dissolved species (for example, trivalent aluminium and hydroxyaluminium complexes) capable of producing an excess. The *acidity* of a solution generally increases as its *pH* decreases. However solutions with similar pH values may have very different acidity's. See also *alkalinity*.
Acid-Leachable Sulfate Sulfur	A measure of *sulfate sulfur* in a sample, excepting that which occurs as *barite*. Assumed to be non-acid generating in neutral pH samples. Acid pH samples may include acidic sulfate species such as jarosite and alunite. One of a series of sulfur analyses that are a part of *acid-base accounting*, expressed as %S. See also *total sulfate sulfur* and *barium sulfate sulfur*.
Active Chemical Treatment	Processes in which chemicals or natural compounds are added to contaminated *drainage* to improve water quality. Operator control can vary from relatively simple batch treatment to a sophisticated computerized treatment plant with multiple additives and detailed process monitoring and control. Improvements in water quality usually result from the acid neutralization and the precipitation or co-precipitation of the *deleterious contaminants*. See also *treatment sludge*.
Acute Toxicity Tests	Measure of whether an organism can survive exposure to the test solution for a specified period-of-time. See also *acute toxicity*, *bioassay* and *chronic toxicity*.
Acute Toxicity	Lethal effects. See also *chronic toxicity*.
Adit	Horizontal or near horizontal passage driven from the surface into the side of a mountain or hill to access workings or *dewater* the *mine*. See also *drift*, *crosscut*, *level* and *portal*.
Adsorption	Process by which atoms, molecules or ions are retained on the surfaces of solids by chemical or physical binding. See also *absorption*.
Aerial	In the presence of the *earth*'s atmosphere. See also *aerobic* and *subaerial*.
Aerobic	In the presence of oxygen. See also *aerial* and *anaerobic*.
Alienation of Land and Water Courses	Actions which prevent the *reclamation* of the disturbed landscape to a productive use after the cessation of mining.
Alkaline Drainage	A general term applied to any *drainage* with an *alkaline pH*.
Alkaline pH	By a strict chemical definition any pH > 7 is considered acidic. Based on this glossary's arbitrary definition of *near-neutral* as pH 6.0 to 8.0, alkaline pH is defined as *pH* values greater than 8.0. Depending on government guidelines and intended usage of the water, maximum permitted pH values in receiving waters from mine discharge vary between 8.5 and 9.5. See also *acidic pH*.
Alkalinity Amendment	Material that dissolves in water to give bicarbonate/*carbonate* and/or hydroxide ions and *neutralizes* some or all of the *acidity* present in *acidic drainage*.
Alkalinity	A measure of the capacity of a solution to neut*ralize* a strong acid. Analytically determined by *titration*. The analytical value will depend on the pH end point for the *titration*. A measure of excess bicarbonate/*carbonate* and/or hydroxide in solution or of a solid material's ability to produce an excess. The *alkalinity* of a solution generally decreases as *pH* decreases. However solutions with similar pH values may have very different alkalinities. See also *acidity*.

Alteration	Changes in the chemical or mineralogical composition of a *rock*, generally produced by *weathering* or *hydrothermal* solutions.
Aluminosilicates	Compounds containing silica, aluminium and oxygen as main constituents. See also *silicates*.
Amorphous	Substances lacking detectable crystal structure or order. Usually used with reference to oxides or organic matter. See also *mineral*.
Anaerobic	An *environment* without free oxygen. See also *aerobic*.
Anhydrous	To exist in a dehydrated state. See also *hydration*.
Anomaly	Any departure from the norm which may indicate the presence of mineralization in the underlying *bedrock*. In geophysics and *geochemistry*, an area where the property being measured is significantly higher or lower than the larger, surrounding area.
Anoxic Limestone Drain	A *limestone* bed designed to receive and neutralize acidic drainage with an oxygen-consuming or relatively impervious cover to minimize oxygen entry. The incorporation of *anaerobic* conditions is to prevent iron precipitation and the resultant armouring or "blinding" of the *limestone*.
Anoxic	See *anaerobic*.
Anthropogenic	Formed or influenced by man.
Aqua-regia	A mixture of two concentrated acids, 1 part nitric (HNO_3) to 3 parts hydrochloric (HCl) acids.
ARD Onset	The first appearance of persistent *acidic pH* values in *drainage*. Detection sensitivity will depend on the monitoring location(s) and frequency. Zones of pervasive acid *weathering*, with significant ARD *generation*, may occur locally or internally within a particular *mine component* prior to *ARD* detection or persistent *acidic pH* values occurring at the monitoring point.
Assay	To determine the size or composition (Verb). The mass of a *metal* contained within a *sample* of *rock* (Noun). Assay results are determined by chemical and analytical analyses and usually expressed in one of the following units: ppm, ppb, g/t or oz/t.
Attenuate	Reduce in magnitude. Reductions in *loading* resulting from processes like precipitation, *absorption* and *adsorption*. Reductions in concentration also result from *dilution*.
Autogenous Grinding	A method of *grinding rock* (*ore*) into a fine powder using large pieces or pebbles of the *ore* being ground as a grinding media instead of conventional steel balls or rods. See also *ball mill* and *semi-autogenous grinding*.
Backfill	Material used to fill voids created by mining an *ore body* or coal deposit. Due to the expanded volume only a portion of the originally excavated material can be used as *backfill*. See also *hydraulic backfill*.
Ball Mill	A cylindrically or conical shaped steel container which is partially filled with steel balls and crushed *ore* and which rotates about its own axis. The rotation causes the balls to cascade, which in turn grinds the *ore*. See also *autogenous* and *semi-autogenous grinding*.
Barium Sulfate Sulfur	Sulfur that occurs as sulfate associated with barium. Conservatively estimated from the barium content assuming all the barium occurs in this form. Barium is measured by *whole-rock elemental analyses*. One in a series of parameters used in *acid-base accounting*. Expressed as %S.

Base Metal	A general term applied to relatively less expensive *metals*, such as copper, zinc, nickel, lead, tin, iron and aluminium, which based on cost can be distinguished from *precious metals* (gold, silver, platinum and palladium) and the alkali and alkali earth metals. Costs vary according to supply and demand. In the past molybdenum has been more expensive than silver. Base metals are the source of most metal contamination problems. See also *heavy metal*.
Baseline Information	Information gathered prior to disturbance. Used to define pre-mining conditions.
Basic Rock	*Igneous rock* relatively low in silica and rich in iron, magnesium and/or calcium. One of a number of geological terms for rock, such as acidic, alkali and ultrabasic, that describe the relative amount of silica and the predominant cations. The terms do not imply the presence of acidity or free bases in the chemical sense.
Basic	A term used to describe a water solution with an excess of hydroxide ions and a *pH* value greater than 7. See also *near-neutral* and *alkaline pH*.
Bedrock	A general term for solid masses of *rock. Bedrock can be* exposed at the surface or buried beneath *non-lithified materials*.
Bench Height	The vertical distance between adjacent benches in an *open pit* or *dump*. Measured from the *toe* of one *bench* to the crest of the connecting slope.
Bench	A relatively flat, horizontal surface, elevated within an *open pit* or a *waste rock dump* or natural formation. Commonly referred to by its elevation or depth.
Beneficiate	To treat an *ore* in order to *concentrate* its valuable metal or *mineral* content or otherwise improve its properties. The treatment may utilize a variety of processes. These include *classification*, magnetic concentration, *washing* and *flotation*. See also *mill* and *wash plant*.
Bioaccumulation	A process of concentration or accumulation within a 'food chain' of organisms. Usually used with reference to *contaminant metals*, including Hg, Cd and Pb. See also *bioconcentration* and *bioavailability*.
Bioassay	A test that measures the response of live organisms to physical or chemical stresses in controlled test conditions to gain information about impacts in the receiving *environment*. See also *acute* and *chronic toxicity tests* and *bioavailability*.
Bioavailability	A property of a substance which makes it accessible and potentially able to affect an organism's health. Depends on site-specific conditions.
Bioconcentration	A process of concentration or accumulation within an organism. May take place at the cellular, body organ or whole organism level. Pathways include simple diffusion into cells or tissues from the water column or substrate, or through food consumption. Usually used with reference to *contaminant metals* that may bioaccumulate, including Hg, Cd and Pb. See also *absorption*, *adsorption* and *bioavailability*.
Biogeoclimatic Conditions	The *biotic*, *geological*, topographic, *hydrological*, ecological, *soil* and climatic conditions, and the change in those conditions over time.
Bio-Leaching	A process in which the *metals* are dissolved with the aid of bacteria. Used for recovering *metal*s from refractory or *low-grade ore*s. See also *heap leach*.
Bioremediation	A process to reduce *contaminant* levels in *soil* or water using microorganisms or vegetation.
Biotic Factor	The influence exerted upon a habitat by the flora and fauna that inhabit the area.

Blasthole	A hole drilled for the placement of explosives. The usual purpose of the blast is to break apart bedrock permitting its excavation.
Blending	In the context of *ML/ARD mitigation*, *blending* refers to the co-deposition of potentially ARD generating (PAG or PAF) mine wastes with materials with excess *neutralization potential* (NPAG or NAF). The objective in *blending* is generally to create a composite material in which the acid produced by the PAG waste material is neutralized by NPAG materials, with a consequent precipitation of the majority of the released *metals* as *secondary minerals*.
Buffering Capacity	The ability of a substance to resist an increase or decrease in *pH*. See also *neutralization*.
Bulk Neutralization Potential	*Static* laboratory measurement of the capability of a *sample* to neutralize applied acid. Determined by means of relatively simple chemical tests. The resulting data does not consider the mineralogical and elemental sources or other factors that might reduce the effectiveness of the field effectiveness of the measured NP. Test procedures vary according to the strength and volume of acid and the value to which the pH is lowered. In the Sobek test, a fizz test is used to determine the strength and volume of acid. In other tests acid is added incrementally until a specified acidic pH value is reached and maintained. In some cases the NP is determined by the amount of acid required to reach the designated pH (e.g., BC Research and Lapakko weak acid tests). In the Sobek and the Modified Sobek procedures, the NP (the amount of acid neutralized by the sample) is determined by titrating the reacted solution with a strong base to determine the amount of acid remaining. The most commonly used bulk NP tests are the BC Research, Sobek or Modified Sobek procedures, tests in which strong acid is added. See also the discussion of *Acronyms*.
Bulk Sample	A large *sample* of mineralized rock, frequently hundreds or thousands of tonnes and selected in such a manner as to be representative of the critical properties of the potential *ore body*. Bulk samples are used to verify *ore grades* and determine *metallurgical* characteristics.
Bulkhead	A tight partition of wood, *rock* or concrete used to prevent the movement of *backfill*, gas, fire and/or water in *underground workings*.
Carbonate Neutralization Potential	The maximum *neutralization* capacity that would be available if all the *carbonate* minerals in the sample reacted like *calcite*. Determined by means of relatively simple carbon [NP(CO_3-C)] or carbon dioxide [NP(CO_3-CO_2)] assays. Unless it is corrected the data does not consider the effect of differences in carbonate mineralogy or any other factors that might reduce the effectiveness of the measured NP. An important correction is for the contribution of non-acid neutralizing Fe and Mn carbonates to the measured carbon or carbon dioxide i.e., [NP($CaMgCO_3$-CO_2)]. The simplest analytical procedure is an *assay* for total-carbon. In materials containing organic matter, like coal, an *assay* of total inorganic-carbon is recommended (NP[CO_3-TIC]). The percentage of carbon is multiplied by 83.4 to obtain the tonnes $CaCO_3$/1000 tonnes. XRD and/or sub-microscopic procedures are required to determine the contribution of Fe and Mn carbonates to the measured carbon or carbon dioxide. See also *static NP procedures*.

Carbonate	A compound or mineral containing the CO_3^{2-} ion. The most important carbonate minerals from the perspective of ML/ARD are the hexagonal carbonates *calcite* ($CaCO_3$), *dolomite* [$Ca,Mg(CO_3)_2$], *magnesite* ($MgCO_3$), *ankerite* [$Ca(Mg,Fe)(CO_3)_2$], *siderite* ($FeCO_3$), *rhodocrosite* ($MnCO_3$) and *smithsonite* ($ZnCO_3$), and the basic carbonates *malachite* [$CuCO_3Cu(OH)_2$] and *azurite* ($2CuCO_3Cu(OH)_2$). Carbonate minerals are important in ARD neutralization. The trace metal carbonate minerals are important sources and sinks of soluble metals. Note that calcium and magnesium carbonates are very effective in neutralizing acidity. Iron and manganese provide no net neutralization under oxidizing conditions.
Catchment Area	A recharge area or *drainage* basin and all areas that contribute water to it. The area that contributes water to a particular watercourse; a watershed.
Chemical Equilibrium	A chemical condition in which the rates of forward and reverse reactions are equal and the concentrations of reactants and products do not change with time. One of two major chemical conditions affecting drainage chemistry. See also *kinetic effect*.
Chip Sample	A series of small pieces of *rock* taken in a continuous line across a *rock* exposure or at uniformly distributed intervals. May also refer to *sample* taken from the *rock* fragments created in drilling, termed chippings.
Chronic Toxicity Tests	A measure of reduction in growth, reproduction and/or development, or the mutation of an organism exposed to a test solution over a specified time period. See *bioassay* and *acute toxicity tests*.
Chronic Toxicity	A reduction in growth, reproduction and/or development, or the mutation of an exposed organism. Chronic toxicity is also referred to as sub-lethal. See also *acute toxicity*.
Classes of Drainage Chemistry	Categories of *drainage chemistry*. Commonly based on *pH*. See also *acidic drainage*, *near-neutral mine drainage* and *alkaline drainage*.
Classifier	Mineral processing equipment that separates *minerals* according to size and density, including grizzlies, screens, cyclones and other mechanical devices.
Clay Mineral	Phyllosilicate *mineral*, such as biotite, muscovite, smectite and kaolinite.
Clay-Sized	*Particles* < 2 μm in diameter. See also *soil-sized*.
Cleaner Stage	A term applied to measures used to upgrade the *concentrate* produced in the rougher and scavenger circuits. The term cleaning may also be used for the processes used to reduce the ARD potential of rougher *tailings*. Processes may include regrinding and selective flotation of waste iron *sulfides*. See also *flotation circuit* and *rougher* and *cleaner stages*.
Cleaner Tailings	*Tailings* generated in the cleaner stage(s) of mill *processing*, from either upgrading the concentrate or measures to reduce the ARD potential of the main *tailings* mass. Cleaner *tailings* often have a high *ARD* potential.
Coarse Fragment	*Particles* > 2 mm in diameter. See also *soil-sized*.
Coarse Refuse	Coarse waste product of coal *wash plant*. See also *fine refuse*.
Collar	Term applied to the timbering or concrete around the top of a *shaft*. Also used to describe the start of a drill hole.
Collection Ditch	A drainage channel used to collect surface run-off or near-surface seepage. Uses include *diversion* of clean water, collection of *process water* and collection and containment of *contaminated* drainage.

Colluvium	Materials that reached their present positions as a result of direct, gravity-induced movement involving no agent of transportation such as water or ice, although the moving material may have contained water or ice. Generally consist of *massive* to moderately well-stratified, non-sorted to poorly-sorted *sediments* with any range of *particle* sizes from clay to boulders and blocks. The character of a colluvial deposit depends upon the nature of the material from which it was derived and the specific process whereby it was deposited. See also *talus slope*.
Colorimetric or Colourimetric	Analyses which utilize the relationship between species absorbance (or transmission) in solution and species concentration (Beers-Lambert Law). Frequently a species is intentionally complexed to give suitable absorbance characteristics for light of a given wave number.
Comminution	Reduction in particle size. See also *crush* and *grind*.
Compaction	A process resulting in a reduction in volume. The change typically results from externally applied loads, creating tighter packing of the solid particles. In fine soils in particular, this requires an egress of pore water. Greater compaction often results in increased *consolidation*.
Composite Sample	A *sample* created by combining different fractions (subsamples). Subsamples can be collected at different times or from different locations.
Concentrate	The product of the milling process, enriched in the valuable *metal* or *mineral* relative to the *ore*; typically a fine powder. The waste product of the concentration process is typically discarded as *tailings*.
Concentrator	A milling plant that produces a *concentrate* of the valuable *mineral*s or *metal*s using processes such as *cyanidation* and *flotation*. Further treatment is required to recover the pure *metal*. See also *mill*.
Conductance	The ease with which a material transmits an electric current. A high conductivity indicates a solution with a high charged ion content, a property sometimes used to detect ARD.
Consolidation	A process by which loose, soft or liquid *non-lithified* materials become firm and coherent. Consolidation typically results from tighter packing with greater inter-particle cohesion or friction and less pore water holding particles apart. See also *compaction*.
Contaminant	Introduced *species* or materials which were either not previously present or were present in lesser amounts. The introduction of contaminants may make something toxic or otherwise unfit for use. The most important contaminant species in *metal leaching* and *acid rock drainage* are *metal* and *metalloid* elements, which are often present in large enough amounts to have a deleterious effect on flora and fauna. Below certain amounts *contaminant species* (for example, nutrients) may be desirable constituents. Synonymous with the term pollutant. See also *deleterious contaminants*.
Copper Equivalent (*Grade*)	A measure of the total value of the ore calculated by converting the value of each valuable constituent to an equivalently valuable grade of copper. A cumulative *assay* equivalent or *grade* derived when other economic constituents are present in addition to copper. The formula used to convert other species concentrations into a copper grade (for example, 1% Cu = 1 g/t Au) is sensitive to numerous factors.
Core Log	A visual description of the geological (for example, *rock* type, mineralogy, alteration and *structures*) and economic (for example, type, style and degree of mineralization) characteristics of *drill core*.

Core	The long cylindrical piece of rock, about 5-10 cm or more in diameter, recovered by diamond drilling.
Country Rock	A term applied to *rocks* intruded by an *igneous intrusion* or surrounding a *mineral deposit*.
Crosscut	A horizontal opening driven from a *shaft* or *drift* at right angles to the strike of a vein or rock formation.
Cross-section	A profile or vertical section used to illustrate geological information, often obtained from diamond drilling. See also *plan view*.
Crush	Reduce in particle size by squeezing or forcing under pressure. See *crusher* and *grind*.
Crusher	Equipment for reducing the *particle* size of *rock* or other materials; includes gyratory, jaw, roll and cone *crushers*. Commonly the first step in milling. See also *crush* and *grind.*
Cumulative Effect	The consequence of simultaneous or successive impacts and additions occurring within a defined area or from a prescribed set of activities. The cumulative effects of a *mine* are the combined effects of all *mine* components and from all mining activities.
Cut-Off Grade	The lowest *grade* of mineralized material in a given deposit that qualifies as *ore*. Used in the calculation of *ore reserves*.
Cyanidation	A method of extracting exposed gold or silver grains from crushed or ground *ore* by dissolving it in a weak solution of sodium- or calcium-cyanide. Also known as cyanide *leaching*. May be carried out in tanks inside a mill or in heaps of *ore* outdoors. See also *heap leach*.
Decline	Downward sloping *underground working*. Includes *adits* and passages connecting different *levels* (ramps).
Decommissioning	Process by which a mining operation is shut down.
Deflation	The removal of sand and *silt-sized particles* from unconsolidated materials by wind action; wind erosion.
Deionized Water	Chemically or electro-chemically purified water used in chemical analysis to avoid contamination of the materials being tested.
del %S	*Total sulfur* minus all other measured sulfur species such as *sulfide sulfur*, *total sulfate sulfur*, and *organic sulfur*. The portion of *total sulfur* not identified by the more specific sulfur analyses carried out in *acid-base accounting*. Reported in units of %S. Represents errors and omissions in measurements of sulfur species. This might include thiosulfates or elemental sulfur. In the absence of further characterization this fraction should be conservatively assumed to be acid-generating *sulfide sulfur*.
Deleterious Contaminant	Contaminant species which cause a reduction in quality or performance. Deleterious contaminants may make something toxic or otherwise unfit for use. The most important contaminants in *metal leaching* and *acid rock drainage* are *metal* and *metalloid* elements, which are often present in large enough amounts to have a deleterious effect on flora and fauna. See also *chronic* and *acute toxicity tests.*
Desulfurized	Material (commonly *tailings*) that has had sulfur removed.
Development	Work carried out for the purpose of opening up or exposing a *mineral* deposit. Includes the removal of *non-lithified material*, *rock overburden*, sinking a *shaft*, crosscutting, drifting, ramping and raising.
Dewatering	The process of removing water from an underground *mine* or *open pit*, or from the surrounding *rock* or *non-lithified materials*. The term is also commonly used for the reduction of water content in concentrates, tailings and treatment sludges.

Diamond Drill	A rotary type of rock drill in which cutting is done by abrasion rather than percussion. The cutting bit is set with diamonds and is attached to the end of long hollow rods through which water is pumped to the cutting face. The drill cuts a core of rock that is recovered in long cylindrical sections, two centimetres or more in diameter.
Digestion	The process of dissolving and breaking down chemical compounds and *minerals* into an aqueous solution. See *aqua regia*.
Dilution	To diminish the concentration by mixing one mass with another. For example, the mixing of one flow of water with another flow to obtain a flow with an intermediate aqueous concentration. This process is used to reduce the concentration of *metals or other potentially deleterious contaminants* in the more concentrated flow. *Dilution* may take place by diffusion and dispersion. Dispersion mechanisms include turbulent flow in a river or creek, or currents and wind generated mixing in lakes.
Dip	The angle at which a *structure* or *rock* bed is inclined from the horizontal as measured at right angles to the strike and in the vertical plane.
Discharge Limits	The maximum allowable concentrations of *contaminants* and/or volumes of discharge. Conditions under which discharges may take place.
Dissolution	The process whereby solid matter dissolves in a liquid. For example, the dissolving of limestone (calcium *carbonate*) in rain and *groundwater*. See also *solubility*.
Diversion Ditch	A channel used to divert clean water away from a mine component. An important part of water management at most *mines*. See also *collection ditch*.
Drainage Chemistry	The concentrations of dissolved components in drainage, including element concentrations, chemical species and other aqueous chemical parameters.
Drainage	The manner in which the waters of an area exist and move, including surface streams and *groundwater* pathways. A collective term for all concentrated and diffuse water flow.
Drawdown	A reduction in the height of the *water table*, or a reduction in subsurface fluid pressures, as a result of either *groundwater* withdrawal or reduced input.
Drift	Horizontal or near-horizontal *underground working* or *adit*, in or parallel to *ore*. Follows along the length of a *rock* formation, as opposed to a *crosscut*, which crosses the *rock* formation.
Drill Core	See *core*.
Dump	A man-made pile, heap or accumulation of broken *ore*, *rock* or *non-lithified material*. Term commonly used for piles of *waste rock*.
Dyke (Dike)	**1.** An *earth*-filled embankment or dam. **2.** A tabular body of *igneous rock* that cuts across the rock *structure* or cuts *massive rocks*.
Earth	**1.** Inorganic *non-lithified material*. **2.** The planet we live on.
Ecology	The study of relationships between organisms and their *environment*. Ecological developments include the introduction, growth and change in plant and animal inhabitants. See also *biotic factors*, *ecosystem* and *biogeoclimatic conditions*.
Ecosystem	A community of organisms and their immediate physical, chemical and biological *environment*.

Effective Neutralization Potential (ENP)	The fraction of the NP which will neutralize *acid generation* and acidity *inputs* maintaining a *drainage pH* of 6.0 or above. Depends on various factors including the type of material (e.g., tailings, waste rock or mine wall), environmental conditions (e.g., atmospheric CO_2 content, drainage chemistry, leaching rate and temperature), scale (e.g., whether the material is part of a *mine component*, a test pad or a humidity cell/column), the *minerals* with n*eutralization potential* (NP), the rate of *in-situ acid generation* and/or external acid inputs in drainage, the weathering rate of the potentially neutralizing *minerals*, the physical occlusion of *minerals* in *coarse fragments* or *rock* walls and the fact that the dissolution of some carbonate minerals might produce excess alkalinity in drainage. See also *empirical*, *bulk*, *carbonate* and *unavailable* n*eutralization potential*.
Effluent	Water discharged into the *environment* from a man-made structure. For example, the *drainage* products from a water treatment plant.
Eh	An electrical potential which is a measure of the redox or *oxidation*/reduction potentials. Reported in units of millivolts (mV) relative to the standard hydrogen electrode. See also *pe*.
Electrolysis	A process in which an electric current is passed through a solution containing high concentrations of dissolved *metal*s, causing the *metal*s to be deposited on to a cathode.
Empirical Neutralization Potential (EmpNP)	Measured dissolution of NP minerals or the amount of acidity neutralized prior to the onset of acid pH drainage (pH < 6). Empirical NP will depend on the same factors as the *effective NP*. Measurements used to predict the *effective NP* should be made under test conditions that simulate the rate of in-situ *acid generation* and drainage acidity *inputs*. Critical test conditions should be indicated [e.g., EmpNP(hum.cell)]. The dissolution of NP minerals can be calculated from the cumulative calcium and magnesium released in drainage and precipitated in secondary minerals [EmpNP(Ca+Mg)]. Acid neutralization can be calculated from the sulfate released in drainage and precipitated in secondary minerals [EmpNP(SO_4)]. See also *bulk*, *carbonate* and *unavailable* n*eutralization potential*.
Environment	The interrelated physical, chemical, biological, social, spiritual and cultural components that affect the growth and development of living organisms. See also *minesite environment*.
Equilibrium	See *chemical equilibrium*.
Erosion	The detachment and subsequent removal of either rock or surface material by wind, rain, wave action, freezing, thawing and other processes. See also *mass wasting* and *gully erosion*.
Euhedral	Term used to describe a crystal displaying well-formed and regularly developed crystal faces.
Evaporation	The physical process by which a liquid is changed into a gas. See also *evapotranspiration*.
Evapotranspiration	The loss of moisture to the atmosphere due to *evaporation* and *transpiration* by vegetation.
Exponential Rate	To increase or decrease at a geometric rather than an arithmetic rate.
Fabric	**1.** The spatial and geometrical configuration of all those components that make up a *rock* including texture, *structure* and preferred orientation. **2.** The spatial arrangement of solid *particles* and voids in *unconsolidated non-lithified materials* (for example, *till*).

Face	Any surface on which mining operations are active. The site of progressive excavation or deposition, commonly vertical or steeply sloping. The end of an active *drift*, *crosscut* or slope in an underground mine. The working face in an *open pit*. A *dump* slope that is being pushed out as a *waste rock dump* expands. See also *bench*.
Facies	A *rock* unit or group of *rock* units that exhibit lithological, mineralogical, sedimentological and paleontological characteristics which enable them to be classified as distinct from another *rock* unit or group. Usually reflecting its mode of origin.
Fault	A *fracture* or fracture zone in *rock* strata resulting from strain and with observable displacement.
Feasible	Capable of being done, used or dealt with successfully. In order to be feasible, a method must be compatible with the mitigation objectives and site-specific mining and environmental constraints and must not entail excessive costs.
Financial Security	Funds provided through various financial instruments, which may be used by a regulatory authority to offset closure costs. See also *liability*.
Fine Refuse	Fine, *tailings*-like, waste product of coal *wash plant*. See also *coarse refuse*.
Flocculent	A substance that causes suspended *particles* to aggregate or clump together The higher mass causes the aggregated clumps to settle. Flocculents are used to reduce high concentrations of fine-*silt-size* and *clay-size* suspended *sediment*, particles whose slow settling rate makes them otherwise very difficult to remove. See also *suspension* and *sediment/settling pond*.
Flood Return Period	The average length of time within which a specific magnitude of flood will occur once. Predicted from the historic record and/or the site-specific runoff and climatic conditions of the contributing watershed. Important factors include variations in storm duration and the intensity of rain, rain-on-snow and snow melt events. A one-in-200-year flood event is a flow event that has an annual average reoccurrence interval of 0.005. See also *return period*.
Flotation Circuit	System of flotation cells and auxiliary equipment arranged to yield optimum *concentration* and *recovery*. The circuit may be divided into *rougher*, *scavenger* and *cleaner stages*.
Flotation	A *milling* process using surface active chemicals to selectively modify some *mineral* surfaces causing them to become attached to air bubbles and float, while others do not and sink. This process allows the selective *concentration* and *recovery* of the valuable *mineral*s. Pre-treatments include *grinding* and addition of the reagents.
Flow Rate	Amount (volume) of discharge per unit time (for example, mL/s).
Fluvial Materials	*Non-lithified materials* transported and deposited by streams and rivers; synonymous with alluvial. Deposits generally consist of gravel and/or sand, and/or silt (rarely, clay). Gravels are typically rounded and contain interstitial sand. Fluvial *sediments* are commonly moderately-to-well-sorted, and display *stratification*, although *massive*, non-sorted fluvial deposits do occur.
Footwall	The wall *rock* beneath an inclined vein, *ore deposit* or *fault* structure. See also *hanging wall*.
Fracture	**1.** A crack, joint, *fault* or other break in *rocks*. **2.** The breaking of a *mineral* other than along planes of cleavage.

Framboidal	A type of crystal structure characterized by clusters of tiny *pyrite* crystals (octohedrons), often in spheroidal aggregates resembling raspberry seeds.
Freshet	Period of sustained snowmelt during the spring. Often one of the highest periods of flow.
Geochemistry	Study of the distribution and abundance of elements in *minerals*, *rocks*, *soils*, water and the atmosphere.
Geology	The study of the *earth*, its history and the changes that have occurred or are occurring, and the *rocks* and *non-lithified materials* of which it is composed and their mode of formation and transformation.
Geomorphology	The study of landforms, their classification, description, nature, origin and development, their relationships to underlying *structures* and the history of geologic changes as recorded by these surface features.
Geotechnical Engineering	The application of scientific principles and engineering practices to materials of the *earth*'s crust for the solution of engineering problems. It includes the study of *soil* and *rock mechanics*, and aspects of *geology*, geophysics, *hydrology* and related sciences.
Glaciofluvial Materials	*Non-lithified materials* that exhibit clear evidence of having been deposited by glacial meltwater streams either downstream of, or in contact with, glacial ice.
Glaciolacustrine Materials	*Non-lithified materials* deposited in, or along, the margins of glacial (ice-dammed) lakes; includes *sediments* that were released by the melting of floating ice.
Glaciomarine Materials	*Non-lithified materials* of glacial origin laid down in a marine *environment* in close proximity to glacial ice. They include materials settling from *suspension* and from submarine gravity flows, and settled *particles* released by melting of both floating ice and ice shelves. Glaciomarine *sediments* range from *massive* diamictons to stratified, well-sorted sand, silt and/or clay. They commonly contain ice-rafted stones and lenses of *till* and/or *glaciofluvial material*. Abrupt changes in texture and distorted bedding are common. Marine shells, shell casts and the remains of other marine organisms may be present in the *sediment*.
Glory Hole	Surface depression created by an underground excavation which continues to or removes the crown pillar supporting the surface. Ore is removed through the underground workings. The connection to the surface may significantly increase air and water movement and alter drainage conditions, increasing metal leaching, reducing or preventing flooding and resulting in unstable geotechnical conditions.
Gossan	The rust-coloured oxidized capping or staining of a *mineral* deposit, generally formed by the oxidation or *alteration* of iron *sulfide*s.
Gouge	Fine, putty-like material composed of ground-up *rock* found along a *fault*.
Grade	Amount or weight of *metal* or *mineral* present in the host *rock*. Commonly expressed as %, ppm, ppb, g/t or oz/t.
Grain Size	The size range of fragments or crystals in consolidated materials. A description of the textural coarseness of a *rock*.
Grain	Crystals or multi-crystal fragments within a *lithified matrix*. For example, sand grains in sandstone and quartz grains in sand-sized particles.
Grind	Reduce *particle size* into a fine powder through the impact or attrition. On a large scale typically achieved in a rotating cylinder. Includes rod and *ball mills* and *autogenous* and *semi-autogenous grinding*.

Groundmass	Finer grained material occurring between *phenocrysts* in porphyritic *igneous rock*. See also *matrix*.
Groundwater	The part of subsurface water in the zone of saturation. Distinct from surface water. See also *phreatic*.
Grouting	The injection of a cement slurry or other suitable materials (grout) under pressure into fissured, jointed or permeable *rock* in order to reduce the *permeability* or increase the strength. A process used to reduce water flow around *bulkheads*. The injection of grout into *bedrock* is usually done through *diamond drill* holes. Bentonite grout curtains have been used to reduce the *permeability* of *waste rock*.
Gully Erosion	The modification of unconsolidated and consolidated surfaces by processes such as running water, mass movement and snow avalanching, resulting in the formation of parallel and sub-parallel long, narrow ravines. Gullies may have steep or gently sloping sides, and steep or gently sloping longitudinal profiles. They are much smaller than valleys but larger than rills, and occur on various types of terrain such as steep mountain slopes, escarpments and terraces.
Hanging Wall	The wall or *rock* on the upper side of a vein, *ore deposit* or *fault* structure. See also *footwall*.
Hardpan	A general term used to describe a hard, low *permeability*, subsurface layer produced by the cementation of *soil particles*.
Hazen's Formula	A formula used to estimate *hydraulic conductivity* from the *particle size* distribution of unconsolidated, sand-sized sediments.
Heap Leach	An extraction process in which stockpiled *ore* is leached to remove target *metals*. *Leaching* solutions, generally weak acids or alkaline cyanide, are percolated through heaps of *ore*. *Leachate* is collected and *metals* contained in the *leachate* are extracted chemically or electrochemically. Typically the *particle size* of the *ore* to be leached is reduced to increase surface exposure of metal-containing minerals. Despite the reduced *particle size*, after *leaching* ceases the heap typically has many properties in common with a *waste rock dump*. See also *bio-leaching* and *cyanidation*.
Heavy Metal	A general term applied to *base metals* such as copper, lead and zinc that commonly occur in urban and industrial pollution. See also *precious metals*.
Humidified Aeration	Introduction of air with a high water vapour content. Pumping air through water can create humidified air. Exposure to humidified aeration is part of the standard protocol of the *humidity cell test*.

Humidity Cell Test	A *kinetic test* procedure used primarily to measure rates of *acid generation* and neutralization in *sulfide*-bearing *rock*. Critical test conditions include detailed pre- and post-test sample characterization, carrying out the test for a sufficient duration, aerobic weathering conditions, the use of excess drainage to fully dissolve the soluble products of primary mineral weathering and carrying out the necessary chemical analyses on the drainage to permit ARD prediction and geochemical modeling of mineral solubility. The accuracy of the subsequent prediction will depend on the test procedures, the sample composition, the validity of the various assumptions and the manner in which the analytical data is interpreted. Details of the test protocols are critical to the interpretation and must be included with the results (see ASTM Standard D5744). The standard methodology used in British Columbia is to place a *sample* of *rock* (about 1 kg) into an enclosed vertical Plexiglas column and expose the *sulfides* within the *rock* to 3 days each of humid and dry air. On the seventh day, the test material is flushed and resultant *leachate sample* is collected and analyzed to determine its chemical composition. Results from the chemical analyses of the leachate are used to calculate "primary mineral reaction rates". See also *humidified aeration*.
Hydrated Lime	Calcium hydroxide [$Ca(OH)_2$]. Produced from calcium oxide (CaO) or *quick lime*. Used as a neutralizing agent. See also *lime*.
Hydration	The incorporation or presence of water within the chemical structure. See also *anhydrous*.
Hydraulic Backfill	Slurry *backfill* material, typically consisting of cycloned *tailings* sands, pumped and/or fed by gravity to the disposal site. Transportation as a slurry allows the solid fraction to be moved relatively cheaply to the *backfill* location. The post-deposition strength of the *backfill* is provided by inter-particle friction after the slurry drains. To enable the material to drain in a timely manner and create sufficient inter-particle friction, the solid fraction must be relatively free of fine-sized *particles*. See also *paste backfill*.
Hydraulic Conductivity	A measure of the ability of a fluid to move through the interconnected void spaces in a sediment or rock. Flow through a porous medium in response to a unit potential gradient. Hydraulic conductivity depends upon both *permeability* and properties of the fluid such as viscosity and density. *Permeability* is a property of the *rock* or *non-lithified material*.
Hydrogeology	The study of *groundwater*. A branch of ***hydrology*.**
Hydrology	The study of all waters in and upon the earth, including ground water, surface water and precipitation. When used in conjunction with the term *hydrogeology*, hydrology is more restrictively defined as the study of precipitation and surface waters.
Hydrolysis	A chemical reaction of a compound or ion with water in which water is split into H^+ and OH^-.
Hydrothermal	Heated aqueous-rich solutions, and the processes (hydrothermal alteration) in which they are involved.
Igneous Rock	*Rock* formed by the solidification of molten or partially molten magma.

Impoundment	A structure or location used for confined storage. Impoundments are used to retain drainage, potentially *ARD* generating *waste rock* that must be stored in a flooded state and fine textured materials like tailings and treatment sludges. Lakes or other natural depressions may serve as natural impoundments. Dams or *dykes* are used to construct artificial impoundments.
Incline	Upward sloping *underground working* or ramp.
Incongruent Weathering	Selective *weathering* of different components or locations of a *particle*, *rock* or *mineral*. Typically some components remain relatively unaltered. An example is the selective removal of inter-layer potassium ions from muscovite (the silicon tetrahedron and aluminum octahedron layers remain relatively intact), producing illite if potassium is replaced by hydrogen or smectite if potassium is replaced by calcium.
Industrial Minerals	A non-metallic ore, non-fuel or non-gemstone *rock*, *mineral* or *non-lithified material* of economic value. Industrial minerals are primarily used for construction or in chemical and manufacturing industries. They often require some beneficiation. Examples include asbestos, gypsum, salt, limestone, barite, garnet, wollastonite, graphite, mica, gravel, building stone and talc.
Infiltration	The entry of water into a porous substance. See also *percolation* and *leaching*.
Initial Dilution Zone	The volume of water required to *dilute* an *effluent* or *contaminant* sufficiently to reach a specified set of *contaminant* concentrations in the *receiving environment*. The size and location are spatially defined by the discharge requirements, the *dilution* needs, the hydraulic conditions, water use and the material being discharged. The specified concentrations, which must be met at the boundary of the zone, are defined by state / provincial *water quality criteria* or site-specific *water quality objectives*. Also called the initial impact or mixing zone.
Initial Impact Zone	See *initial dilution zone*.
Intrusion	A body of *igneous rock* that invades older, pre-existing *rock*.
Inundated	Beneath standing water.
Kinetic Effects	The magnitude and results of dynamic physical or chemical processes. Dynamic processes include the rates of chemical reactions and the physical changes that determine properties like *particle size*, surface area, *metal loadings* and *drainage chemistry*. To a large degree the dynamic ML/ARD processes result from the *weathering* processes that occur when *bedrock minerals* are exposed to oxygen and water. Kinetic chemical conditions are described through reaction rates in which concentrations will continue to increase or decrease through time until the system reaches *chemical equilibrium*, the other major chemical conditions affecting *drainage chemistry*.

Kinetic Test	A procedure used to measure the magnitude and/or effects of dynamic processes, including rates of reaction, material alteration and drainage chemistry and loadings that result from weathering. Unlike *static tests*, kinetic tests measure the performance of a *sample* over a prolonged period of time. Material composition and/or environmental conditions are often simplified or controlled to permit measurement of the physical, chemical, or biological characteristics, processes or relationships which are of interest. Kinetic tests have many different forms and locations, including *lysimeters*, field test pads, *leach columns* and *humidity cells*. In ML/ARD studies the most common form of kinetic tests are laboratory procedures designed to determine the quality of water and rates of reaction resulting from the interaction of water and the mine material. Tests can be divided into two categories those designed to simulate drainage chemistry (e.g., *leach columns*) and those designed to measure primary reaction rates (e.g., *humidity cell test*).
Labile	*Rocks* and *minerals* that easily decompose.
Lacustrine Materials	*Sediments* that have settled from *suspension* and underwater gravity flows, such as *turbidity* currents, in bodies of standing fresh water, or *sediments* that have accumulated at their margins through the action of waves.
Leach Column	A *kinetic test* designed to simulate the leaching and secondary mineral precipitation and dissolution that determine drainage chemistry. In a leach column the test material is placed in some form of tube and subjected to natural *leaching* in a field test or an artificial *leaching* regime in a laboratory study. Columns are most commonly set up in the laboratory. Laboratory studies attempt to simulate the important aspects of field *weathering* conditions. Secondary mineral precipitation and dissolution in the areas of *leaching* may be detected through changes in *leachate* composition. Columns may be constructed of Plexiglas to allow the observation of changes in colour or other physical properties. Post-test analysis of the test materials may be used to evaluate changes in the solid phase, spatial variability and/or the mineral factors controlling drainage chemistry. The accuracy of the subsequent prediction will depend on the test procedures, the sample composition, the validity of the various assumptions and the manner in which the analytical data is interpreted. Details of the test protocols are critical to the interpretation and must be included with the results.
Leachability	A quantitative or qualitative term used to describe the degree of reaction with a *leaching* agent. Leachability can be reported for the whole or a portion of a sample or mine component and is determined by the solubility of the reactant and the type, relative volume and *percolation* rate of solvent.
Leachate	Solution obtained from a *leaching* process.
Leaching	The extraction of soluble constituents by percolating a solvent through it. Natural or induced process. See *metal leaching*, *kinetic test*, retained *weathering products* and *dissolution*.
Level	A system of horizontal or near horizontal *underground workings* at or originating from an identified elevation or depth, connected to a *shaft* or opening to the surface. Provides access for excavation of *ore* above or below.
Liability	All outstanding work requirements or equivalent monetary requirements. See also *financial security*.

Lime	Calcium oxide (CaO). Also referred to as *quick lime*. Produced by heating *limestone* above 550^{o}C in a kiln. Used to make calcium hydroxide [$Ca(OH)_2$] or *hydrated lime*, a cheap neutralizing agent, and to produce a slag from the impurities in *metal ores*.
Limestone Drain	*Limestone* placed in a *drainage* channel or trench constructed to collect and neutralize acidic drainage. See also *anoxic limestone drain*.
Limestone	A sedimentary rock consisting largely of calcite ($CaCO_3$). Dolomite, chert and clay are common impurities.
Lithify	To make into *rock*.
Lithology	**1.** The description of *rocks*, especially in hand specimens and *outcrops*, generally determined megascopically or with the aid of a low-power magnifier. **2.** A rock type defined by a distinct set of physical and mineralogical characteristics.
Littoral	Belonging to, inhabiting or taking place on or near the shore.
Loading	Concentration multiplied by flow, providing a mass per unit of time flowing through or from a *mine component*.
Low-Grade Ore	*Ore* that is relatively deficient in the target *metals*/*minerals*. A term usually used for materials that could be *ore* under favourable economic conditions. See also *waste rock*.
Low-Grade-Ore Stockpile	A *mined-rock pile* containing *low-grade ore* segregated to permit milling at some later date when economic conditions become more favourable. See also *ore stockpile*.
Lysimeter	A device for collecting *drainage* passing through overlying material. The term lysimeter is primarily used for field test apparatus. Lysimeters are installed in real *mine components* or under field test pads to measure the quality and/or quantity of *drainage*.
Marine Materials	*Sediments* deposited in salt or brackish water bodies by settling from *suspension* and submarine gravity flows, or *sediments* that have accumulated in the *littoral* zone through shoreline processes such as wave action and longshore drift. Marine *sediments* deposited offshore generally consist of clay, silt and sand that is well-to-moderately-well-sorted and well-stratified to *massive*. *Littoral* marine *sediments* consist of well-sorted and well-rounded gravels and sand. Both *littoral* and offshore marine *sediments* may contain shells and the remains of other marine organisms.
Mass Wasting	A general term for processes by which large masses of *non-lithified material* are moved by gravity, either slowly or quickly, from one place to another.
Massive	A homogeneous *structure*, without *stratification*, flow-banding, foliation or bedding.
Material Handling	A term used to describe the combined processes of *waste rock* and *ore* excavation, transportation and deposition, including any temporary stockpiling, rehandling and secondary treatment.
Matrix	The *groundmass* of an *igneous rock* or the finer-grained material enclosing the larger grains in *non-lithified materials*, a *sediment* or sedimentary *rock*.
Maximum Potential Acidity (MPA)	see *acid potential (AP)* and *Acronyms*.
Metal Leaching	The extraction of soluble *metals* by percolating solvents. *Leaching* may be natural or induced. Primary mineral *weathering* commonly accelerates *metal dissolution* and removal in *minesite drainage*.

Metal	A class of chemical elements generally characterized by ductility, malleability, luster and conductivity of heat and electricity including alkali, alkali earth, *base*, *heavy* and *precious metals*. See also *metalloid*.
Metalloid	A class of elements chemically intermediate in properties between *metals* and non-*metals* including boron, silicon, germanium, arsenic and tellurium. Electrical semi-conductors and their oxides are amphoteric. Also called semi-metals. See also *sulfosalt*.
Metallurgy	Study of metals and their properties and structure, the *concentration* and refining of *ore*, the production of alloys and the shaping and treatment of metals by heat and rolling.
Metasomatism	A metamorphic change which involves the introduction of material from an external source.
Microbial Oxidation	The process by which bacteria, such as *Thiobacillus ferrooxidans*, increase the rate of *oxidation* of *sulfide*-bearing materials. Sometimes used in *heap leaching* and *leach columns.*
Mill	**1.** *Milling plant*. **2.** A piece of grinding equipment using a revolving drum. Examples include rod and *ball mills*. See also *autogenous* and *semi-autogenous grinding*.
Milling Plant	A plant in which *ore* is treated for the recovery and/or concentration of valuable *mineral*s prior to shipment to a smelter or refinery. Milling processes include *crushing*, *grinding*, *screening*, *concentration* and dewatering. At a coal mine, the mill is referred to as a wash plant, tipple or cleaner. Some processes are divided into *rougher*, *scavenger* and *cleaner stages* of recovery and/or concentration.
Mine Component	A physically distinct portion of a *mine* such as a *tailings impoundment*, *waste rock dump*, *ore stockpile*, *open pit*, *underground workings*, a building foundation or a road.
Mine	A mine includes: a) a place where mechanical disturbance of the ground or any excavation is made to explore for or produce coal, metallic *ore*, *industrial minerals* or placer minerals, b) all cleared areas, machinery and equipment for use in servicing a mine or for use in connection with a mine and buildings other than bunk-houses, cook houses and related residential facilities, c) excavation and any associated activities including exploratory drilling, processing, *concentrating*, waste disposal and site *reclamation*, and d) closed and abandoned *minesites*. See also *mine component*, *minesite*, *open pit* and *underground workings*.
Mined-Rock Piles	A general term for the accumulation of excavated *rock* at a *mine*, including *waste rock dumps*, *ore* and *low-grade-ore stockpiles*. Used for roads, heap-leach piles and building foundations.
Mineral Deposit	A naturally occurring mass of economically valuable metallic or non-metallic *minerals* that are not necessarily economically recoverable. See also *ore*.
Mineral	A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.
Mineralogy	Study of *minerals* including their formation, occurrence, properties, composition and classification.
Minesite Drainage	Water that runs off or flows through a *minesite*, including surface and subsurface (*groundwater*) flow. See also *acid mine drainage*, *near-neutral pH*, *alkaline drainage* and *drainage chemistry*.

Minesite Environment	In the context of *metal leaching* and *acid rock drainage*, the additive and interactive physical, chemical, biological and anthropogenic conditions at a *minesite*.
Minesite	The location of a mining project including the area or areas of excavation and adjoining areas or nearby facilities for materials handling, processing and waste disposal. See also *mine* and *mine component*.
Mitigation	An activity aimed at avoiding, controlling or reducing the severity of adverse physical, chemical, biological and/or socioeconomic impacts of a project activity.
Mixing Zone	See *initial dilution zone*.
Model	A formalized expression of a theory, event, object, process or system used for prediction or control; an experimental design based on a causal situation that generates observed data. A *model* can be viewed as a selective approximation which by the elimination of incidental detail, allows some fundamental, relevant or interesting aspect of the real world to appear in a generalized form.
Muck	*Ore* or *waste rock* that has been broken apart usually by blasting.
Near-Neutral pH	A near-neutral *pH* is arbitrarily defined as a value between 6.0 and 8.0. See also *acidic pH* and *alkaline* pH.
Net Neutralization Potential (NNP)	*Neutralization potential* minus *acid potential* (NP minus AP). Calculated as part of *acid-base accounting*. Expressed in units of kilogram of $CaCO_3$ equivalent per metric *tonne* of *sample* (kg $CaCO_3$/t), t $CaCO_3$ equivalent/1000 t, parts per thousand (ppt) $CaCO_3$ equivalent [all are equal], mg $CaCO_3$/g or g $CaCO_3$/kg. The methods used to determine NP and AP should be clearly identified.
Neutralization Potential (NP)	A general term for a *sample*'s or a material's capability to neutralize *acidity*. NP can be measured using different laboratory acid-neutralization procedures (*bulk NP*), carbon and carbon dioxide analyses (*carbonate NP*) and mineralogical analyses and from the cation release in drainage chemistry prior to, or residual NP remaining after, ARD onset (*empirical NP*). NP can be expressed in units of kilogram of $CaCO_3$ equivalent per metric *tonne* of *sample* (kg $CaCO_3$/t), t $CaCO_3$ equivalent/1000 t of *sample*, or parts per thousand (ppt) $CaCO_3$ equivalent, mg $CaCO_3$/g or g $CaCO_3$/kg [all are equal]. In Australasia, units of H_2SO_4 equivalent are used instead of $CaCO_3$. Since there are a number of different NP forms, the type and the procedures used to measure it should be clearly identified. The objective of NP analysis is usually to determine the ARD potential. The objective is to predict the effective NP, defined here as the capacity of the materials at the *minesite* to maintain a *pH* 6.0 or above. The first NP measurements are usually the static laboratory measures, the *bulk neutralization potential* and *carbonate neutralization potential*, required in *acid-base accounting*. Assessment of the best static-test NP measures for prediction and determination of the *effective neutralization potential* requires a knowledge of future physical and geochemical conditions, the rate of *acid generation* and the identity, exposure (*unavailable NP*) and reactivity (*unreactive NP*) of the *minerals* with NP and an understanding of the various analytical procedures. See also *acid-base accounting*.
Neutralization Potential Ratio (NPR)	*Neutralization potential* divided by *acid potential* (NP divided by AP). Calculated as part of acid-base accounting. The methods used to determine NP and AP should be clearly identified.

Neutralization	Raising the *pH* of *acidic* materials or lowering the *pH* of *alkaline* materials to *near-neutral pH* values through a reaction in which the hydrogen ion of an acid and the hydroxyl ion of a base combine to form water, the other product being a salt. See also *buffering capacity*.
Non-Lithified Material	Unconsolidated inorganic and organic matrices produced by *weathering*, *sediment* deposition, biological accumulation, human or volcanic activity and occurring on the planet earth's surface. Natural *non-lithified material*s include *particles* created from the in-situ *weathering* of *rock*, transported and deposited by water, wind, ice or gravity, chemically precipitated from solution, secreted by organisms, or any combination of these agents. Anthropogenic *non-lithified material*s include *waste rock* and *tailings*. Terms with similar meanings include "Quaternary *sediments*", "surficial materials" and "unconsolidated materials" (*geology*), "*soil*" and "*earth*" (engineering), and "*overburden*" (*soil* scientist). S*urficial materials* are classified according to their mode of formation. Differences in the processes of formation, such as erosion, transportation, deposition, *mass wasting* and *weathering*, produce materials with differing physical characteristics.
On-Site Test Pads	Tests run to show progress of *weathering* and resulting *drainage chemistry* in *mine* materials under the actual *minesite* conditions. Testing allows the evaluation of different *rock* types with varying *ABA* conditions. There is no standard design. See also *wall washing* stations.
Open Cast	See *open pit*.
Open Cut	See *open pit*.
Open Pit	A surface depression created by the excavation of near surface metallic *ore*, *industrial minerals*, placer minerals or coal. In *open pit* mining, *overburden* covering the deposit is removed, exposed *ore* is blasted and moved to a *mill*, and *waste rock* is placed in one or more *waste rock dumps*. Referred to as an open cast *mine* or quarry in some places. An alternative to *underground workings*.
Ore Deposit or Body	A continuous well-defined mass of material containing sufficient quantities of the valuable material to make extraction economical.
Ore Reserves	The calculated tonnage and grade of *ore* that can be extracted profitably. Ore reserves can be classified according to the level of confidence that can be placed in the data.
Ore	*Rock*, *sediments*, or *non-lithified materials* that contain economically recoverable levels of coal, *metals* or *minerals*. See *cut-off grade*, *low-grade-ore stockpile*, *tailings* and *waste rock*.
Organic Sulfur	Sulfur bound to organic compounds. Potentially a significant portion of *total sulfur* in coal deposits, black shales and materials that now or in the past supported plant growth.
Outcrop	A surface exposure of *bedrock*, not covered with surficial material or water.
Overburden	At *metal mines*, the term *overburden* refers to naturally *non-lithified materials*. At coal *mines*, the term *overburden* is also used for the *bedrock* on top of the coal seams.
Oxidant (Oxidizing Agent)	A compound capable of receiving electrons and being itself reduced while bringing about the *oxidation* of other compounds.
Oxidation	**1.** The removal of one or more electrons from an ion or atom. **2.** A process of decomposition in which electrons that hold matter together are transferred to another compound called an *oxidant*. **3.** Process of combining with oxygen.

Parent Material	The material from which it is derived.
Particle	Separate fragments in an unconsolidated *matrix*. For example, the particle of various sizes in *waste rock* and *till*. To avoid confusion, it is recommended that use of the term *grain* be limited to crystals or multi-crystal fragments within a consolidated *matrix*. For example, sand grains in sandstone.
Particle-Size	The dimension of *particles*. Commonly measured by sieving, settling velocities and image analysis. Particle-sizes include the various types of coarse fragments (> 2 mm), such as boulders, stones and gravel, and the different *soil-sizes* (< 2 mm), *sand* (2 mm-62.5 um), *silt* (2 um-62.5 um) and *clay* (< 2 um).
Paste Backfill	Slurry *backfill* material, pumped and/or fed by gravity to the disposal site. Transportation as a slurry allows the solid fraction to be moved relatively cheaply to the *backfill* location. Paste backfill is created with whole *tailings* as opposed to the cycloned sands used in *hydraulic backfill*. In cemented *paste backfill*, cementing agents like hydrated lime and fly ash may be used to increase strength and accelerate curing. Experience has shown that materials where at least 15% of the *particles* are less than 20 μm are likely to exhibit *paste* properties.
Paste pH Analysis	The *pH* of the solution created when a pulverized *sample* is mixed with distilled / *deionized water*. Carried out as part of acid-base accounting. Important variables include the solid:water ratio and the relative magnitude of weathered surfaces and the unweathered interior of particles. See also *rinse pH*.
Paste	A mixture of solids and water that when left to stand idle adhere together. See also *paste backfill*.
pe	The negative logarithm to the base 10 of the hypothetical activity of the free electrons in solution. Calculated from the *Eh*.
Percolation	Downward flow of water within an unsaturated porous medium.
Permeability	The capacity of a *rock* or *non-lithified material* to transmit fluid. See also *hydraulic conductivity*.
Petrography	The branch of *geology* dealing with the description and systematic classification of *rocks*, especially by means of microscopic examination of thin sections. More limited in scope than *petrology*.
Petrology	The branch of *geology* dealing with the origin, occurrence, history and structure of *rocks* as determined from *petrography* and *geochemistry*. See also *lithology*.
pH	The negative logarithm to the base 10 of the hydrogen ion activity $[H^+]$ in solution.
Phenocryst	A relatively large crystal within the finer-grained *matrix* of an *igneous rock*. See also *porphyry* and *groundmass*.
Phreatic	Below the watertable. See also *ground water* and *water table*.
Pillar	A block of solid *ore* or rock left in place to structurally support the *shaft*, walls or roof in a mine.
Pipe	A vertical conduit along which gas and magma ascended to the surface. Usually filled with breccia and may be mineralized. A term also used for a more or less vertical, cylindrical *ore* body.
Piping	Subterranean erosion of *non-lithified materials* caused by flowing water. Results in the formation of conduits due to the removal of *particles*.
Pit	See *open pit*.
Plan View	A horizontal section. Used to illustrate features at the surface or a specific depth.

Plant Site	The location of the *process plant*.
Pneumatolysis	Those processes brought about by the action of hot gaseous substances (other than water) associated with igneous activity. The commonest volatiles are fluorine, hydrofluoric acid and boron fluorides; other substances may be present to greater or lesser extent in local instances and give rise to unusual mineralogies. Pneumatolysis is a process associated with a late stage of cooling of an igneous mass and may therefore affect both the *county rock* and the main mass of igneous material.
Polishing Pond	The last in a series of treatment or settling ponds through which *mill* effluent, or other potentially contaminated *drainage*, flows before being discharged into the natural environment. The term polishing infers that only minor improvements in *water quality* are required or anticipated.
Pollutant	See *contaminant.*
Porphyry Deposit	A large tonnage, low grade *mineral deposit* with relatively uniform grade, which may be mined by *open pit* methods if it occurs in close proximity to surface.
Porphyry	An *igneous rock* of any composition that contains conspicuous *phenocrysts* in a finer grained *matrix*.
Portal	Surface entrance to an *adit*, *level*, *incline* or *decline*.
Precious Metals	A general term applied to relatively more expensive metals, such as gold, silver and platinum, which based on cost can be distinguished from *base* and the alkali and alkali earth metals. Sometimes called the noble metals. Costs vary according to supply and demand. In the past silver has been less expensive than the so-called non-precious (*base*) *metal* molybdenum.
Primary Mineral	A *mineral* that came into existence at the time the *rock* was formed by and that retains its original composition and form. Includes *minerals* formed by *igneous*, *hydrothermal* or *pneumatolytic* processes. See also *secondary mineral*.
Probable Maximum Earthquake	A geotechnical engineering parameter determined by the maximum recorded earthquake at the site, the maximum recorded earthquake for a site in a similar location for which historic data is available or the one-in-10,000-year earthquake predicted statistically from previous earthquakes in the region. See also *return period*.
Probable Maximum Flood	The most severe precipitation and/or snowmelt event considered reasonably possible at a particular geographic location. A site-specific determination based on the possible range in meteorological and hydrological events and conditions. Variables include the duration, the area and the time of year. Usually defined as the 1:10,000 year flood or two or three times the 1:200 year flood. See also *return* period and *flood return period*.
Process Plant	See *milling plant*.
Process Water	Water used in the *milling* process.
Proponent	An individual, organization, company or institution operating or planning to initiate a project.
Pulp	**1.** Pulverize or grind to powder. The term can refer to both the action and the product. **2.** In a mill, the term refers to any slurry of solid particles and water.
Quality Assurance/Quality Control (QA/QC)	Methods used to assure the quality of information in the planning/testing stages (QA) and to check the quality of the resulting information from the execution stage (QC).
Quick Lime	See *lime.*

Radioactivity	The spontaneous emission of alpha, beta or gamma rays caused by the decay of the nuclei of atoms.
Raise	A vertical or inclined *underground working* excavated upwards. See also *adit*.
Receiving Environment Objectives	Target conditions protective of water uses. The receiving environment objectives, which can be generic or site-specific, provide a quantifiable means of determining whether environmental protection measures are effective (goal posts). Due to the relative ease of measurement and the sensitivity of the environment, the most common receiving environment objectives are *metal* concentrations in *drainage*. Other important aquatic parameters include physical and chemical attributes of water and *sediment* and species diversity, abundance and toxicity. See *bioassay*, *water quality criteria* and *water quality objectives*.
Reclamation	An activity aimed at rehabilitating a disturbed site to a near-natural state or an agreed post-mine level of productivity.
Recontouring	Reshaping a land surface.
Recovery	The percentage of valuable *metal* in the *ore* that is recovered from the host rock by metallurgical treatment.
Redox Conditions	A measure of the theoretical electron activity of an *environment*. A high redox potential indicates *aerobic* conditions. A low redox potential indicates oxygen-poor or reducing conditions. See *Eh*.
Relative Density	Ratio of the density of a solid or liquid to the density of water at a specified temperature. See also *bulk density*.
Residual Effects	Effects that persist after processes have finished or measures have been applied.
Retained Weathering Products	The portion of a material altered by *weathering* not removed by *leaching*. Affected by physical factors such as the quantity of *drainage* and geochemical processes like the precipitation and *dissolution* of *secondary minerals*. See also *incongruent weathering*.
Return Period	The average length of time separating events of similar magnitude. Usually determined statistically. See *flood return period*.
Revegetation	As a part of *reclamation*, an activity aimed at re-establishing vegetation on cleared surfaces.
Rinse pH	The *pH* of the solution created when a non-pulverized *sample* is mixed with distilled/*deionized water*. Pulverising is avoided to ensure only the weathered surfaces contribute to the measured pH. This procedure should be substituted for *paste pH* in acid-base accounting for weathered samples. Testing is usually carried out on fine sized materials or the finer fraction (for example, <2 mm) of coarse materials. Rinse pH can provide an estimate of *drainage* pH. Important variables include the solid:water ratio
Risk	The probability and consequences of failure.
Rock Mechanics	The study of the mechanical properties of *rock*s, which includes stress conditions around mine openings and the ability of *rock*s and underground structures to withstand these stresses. See *geotechnical engineering*.
Rock	Naturally formed, solid mass of one or more *mineral*, amorphous inorganic matter or organic matter. See also *lithify*.

Rougher Stage	A term applied to the initial phase of *concentration* and *recovery*. This term is most commonly used in the processing of metallic ores. The feed may include recycled scavenger concentrate or cleaner tailings in addition to the initial mill feed. The rougher concentrate may be upgraded by further processing (cleaner stages). Typically most of the *tailings* mass is produced in the rougher stage. Rougher tailings may also be treated further (cleaned) to reduce the ARD potential of the main tailings mass. The ARD potential is typically reduced by removing sulfides. See also *flotation circuit* and *scavenger* and *cleaner stages*.
Rougher Tailings	*Tailings* generated in mill *processing* in the initial stage(s) of *ore* concentration. The distinction of rougher tailings suggests that further more refined processing is carried out resulting in other tailings and/or a higher *grade concentrate*. Typically most of the tailings mass occurs in this fraction. A *sulfide*-rich *cleaner tailings* may be produced where sulfide flotation is used to reduce the ARD potential of the rougher *tailings*.
Runoff	That part of precipitation and snowmelt that does not infiltrate but moves as overland flow. See also *minesite drainage*, *evapotranspiration* and *infiltration*.
Sample	A representative fraction, usually relatively small, collected for analysis or description. See also *composite sample*.
Sand-Sized	*Particles* 62.5 μm to 2 mm in diameter.
Saprolite	Weathered *bedrock* decomposed in-situ by processes of chemical *weathering*.
Scatterplot	A graphical plot showing the distribution of data points between two axes.
Scavenger Stage	A term commonly used in the processing of metallic ores for the last phase of *recovery* of the valuable material from tailings. Scavenging may occur at the latter part of the rougher or cleaner circuits or separately with a separate feed box. The feed in a scavenger circuit is tailings from the previous circuit. Scavenger concentrate may be added to the concentrate, recycled to the previous circuit or treated separately, with or without regrinding. See also *flotation circuit* and *scavenger* and *cleaner stages*.
Scope	The definition of what has been or needs to be done in a study program.
Secondary Mineral	A *mineral* formed by surface processes, usually at the expense of an earlier-formed *primary mineral*. The result of *alteration*, *dissolution* or precipitation. See also *primary mineral*.
Security	See *financial security*.
Sediment Pond/Settling Pond	Natural or constructed *drainage impoundment* used to reduce the concentration of suspended particles in surface run-off water or *mine effluent* prior to re-use or discharge to the *environment*. Design features include sufficient storage capacity to achieve the minimum retention period required for sediment removal and/or conditions for safe and effective *flocculent* use. Often a series of ponds are constructed to allow regular *sedimen*t removal. See also *suspension* and *polishing pond*.
Sediment	Solid fragmental materials, both *inorganic* and organic, which have been deposited after being transported by air, water, or ice, chemically precipitated from solution or secreted by organisms.
Seismic	Pertaining to an earthquake or *earth* vibration.

Semi-Autogenous Grinding (SAG)	A method of *grinding rock* (*ore*) into a fine powder using a grinding media which includes both the larger chunks of the *ore* itself and steel balls. See also *autogenous grinding* and *ball mill*.
Shaft	Vertical or inclined *underground working* excavated downwards. Commonly used for hoist-based transportation of workers and/or *ore* and *waste rock.* See also *incline* and *raise*.
Shotcreted	A slurry of cement, aggregate (primarily sand) and water applied pneumatically with compressed air and sprayed as a surface coating.
Silicates	Compounds containing silica and oxygen as main constituents. See also *aluminosilicates*.
Sill	**1.** A tabular *igneous intrusion* that parallels the planar *structure* of the surrounding *rock*. See also *dyke*. **2.** A submarine ridge at a shallow depth, separating a basin from another basin or from the open sea. An example is ridges near the mouth of a fjord, separating the deep water of the fjord from the deep ocean water outside.
Silt-Sized	*Particles* 2 μm to 62.5 μm in diameter.
Skarn	*Metasomatic* rocks formed by the introduction of fluids containing large amounts of Si, Al, Fe and Mg into nearly pure limestone or dolomite country rocks. Composed mostly of lime-bearing silicates.
Slaking	The crumbling and disintegration of materials upon exposure to air and moisture. See also *weathering*.
Slurry pH Analysis	See *paste pH analysis*.
Snow Pack	Residual accumulated snow and ice. In cold temperate climates the snow pack contributes a major part of the site *drainage* (*freshet*).
Soil Science	The study of the non-lithified portion of the earth, its alteration as a result of time, plant growth, climate (including moisture and temperature effects), drainage, macro- and microorganism activity or topographical position, the resulting physical, chemical, biological and morphological properties and processes, and their effect on soil use and other resources.
Soil Separate	One of the individual groups of inorganic *soil-sized particles*: sand, silt and clay.
Soil Texture	The relative proportions of *sand-sized* (62.5 μm – 2 mm), *silt-sized* (2 μm – 62.5 μm) and *clay-sized* (< 2 μm) *particles* in the *soil-sized* (< 2 mm) fraction.
Soil	The upper portion of *non-lithified materials* that has been altered over a period of time, as result of plant growth, climate (including moisture and temperature effects), drainage, macro- and microorganism activity or topographical position, producing a product – *soil* – that differs from the *parent material* (regolith) in many physical, chemical, biological processes and morphological properties. Soil can develop from both natural and anthropogenic *parent materials*. Soil either serves or has the potential to serve as a medium for the growth of terrestrial or wetland plants.
Soil-Sized	*Particles* < 2 mm in diameter.
Solubility	The quantity of solute that dissolves in a given volume and type of solvent, at given temperature and pressure, to form a saturated solution. The degree to which compounds are soluble depends on their ability, and that of the other dissolved *species*, to form ions and aqueous complexes in a particular *drainage chemistry*.

Sorting	The variation of *particle* sizes within a sedimentary unit. Statistically measurements include the spread of the *particle* size distribution on either side of the mean. Materials consisting of *particle*s of nearly uniform size are said to be well-sorted:. Non-sorted materials like *till* tend to have a wide variation of *particle* sizes.
Speciation	The chemical form in which an element is present or the process whereby various states or forms of an element become differentiated into ions.
Species	A chemical entity such as an ion, atom or molecule.
Specific Gravity	See *relative density*.
Spoils	See *waste rock.*
Static Test	A procedure for characterizing the physical, chemical, or biological status of a *sample* at one point in time. Includes measurements of the *mineral* and chemical composition and the analyses required in *acid-base accounting*.
Stock	A body of intrusive *rock* which has steep contacts and which generally *crosscuts* the *country rock*.
Stockpile	A pile of excavated *rock* or naturally *non-lithified material* placed in anticipation of later use or re-handling. See also *low-grade ore* and *ore*.
Stope	Excavation in an underground *mine* from which *ore* is being, or has been extracted.
Stratification	A horizontal or inclined *structure* in a sedimentary unit that results from its mode of deposition; includes beds, laminae, abrupt and gradational textural changes and orientation of *particles*.
Strip Mine	A general term for an *open pit mine*, usually used for coal mines. The term strip may refer to the removal of the surface or that mining occurs in long, linear strips. In the later case, coal may be mined by removing *overburden*, excavating the coal seam and filling the excavation with overburden removed from the adjacent strip.
Stripping Ratio	The ratio of non-*ore* or non-coal material (*lithified* or *non-lithified*) that must be excavated to extract a given amount of *ore* or coal. A measure of the amount of material that must be excavated in order to remove the coal or *ore grade* material. See also *ultimate pit*.
Structure	**1.** The general disposition, attitude, arrangement or relative positions of *rock* masses in region, including bedding, *stratification*, laminations, *faults, fractures* and folds. **2.** The physical arrangement of *particles* within natural or anthropogenic *non-lithified materials*, including bedding, *stratification*, aggregation and *bulk density*.
Subaerial	Occurring on the land surface. See also *subaqueous* and *aerial*.
Subaqueous	Occurring under water. See also *subaerial*.
Sublethal	*See chronic toxicity*.
Sublevel	A system of horizontal *underground workings* between main *levels*. Commonly used to drill and excavate *ore* and normally within stoping areas.
Submarine Tailings Disposal	The disposal of tailings to deep-sea locations. See also *tailings*.
Sulfate	A *mineral*, compound or ion containing the radical (SO_4^{2-}).
Sulfide Oxidation	Exothermic *oxidation* of chemically reduced *sulfide* (S_2^{2-}) to a partially or fully oxidized form, such as *sulfate* (SO_4^{2-}). One indication of *sulfide oxidation* is elevated *sulfate* concentrations in *minesite drainage*.
Sulfide Sulfur	Sulfur occurring in the oxidation state of negative two. The analysis for sulfide-sulfur is one in a series of sulfur analyses that are a part of acid-base accounting. Expressed as %S.

Sulfide	An inorganic compound characterized by the linkage of S_2^{2-} and S^{2-} with a *metal* or *metalloid* (for example, *galena*, PbS or *arsenopyrite*, FeAsS).
Sulfosalt	A *sulfide mineral* in which a *metal* and a *metalloid* are present.
Sulfur Species	The different chemical entities of sulfur (see *species*). See also *acid-leachable sulfate sulfur, barium sulfate sulfur, del %S, organic sulfur, sulfate sulfide, sulfide sulfur, sulfosalt and total sulfur*.
Sump	An excavation or natural depression where water accumulates allowing it to be pumped to an alternative location.
Surficial Materials	See *non-lithified material*.
Suspension	A mixture of solid *particles* and liquid in which the fluid dynamic forces (for example, upward currents in turbulent flow) exceed gravitational forces and the *particles* are unable to settle. See also *flocculent* and s*ettling pond*.
Tailings Impoundment	A *tailings*-disposal area in which *tailings* are confined by the natural topography or by one or more engineered *dykes* or dams. See also *impoundment*.
Tailings Pond	See *tailings impoundment*.
Tailings	The ground rock waste product from a *mill* or *process plant*, the materials remaining after the economically valuable elements are removed from the *ore*. To remove the valuable elements, blasted *rock* typically goes through several steps of crushing and extraction or washing. The *tailings* usually leave the *mill* as a slurry of *sand-sized* and/or *silt-sized particles* in water. *Tailings* are commonly stored in a surface *impoundment* but can also be placed subaqueously in natural water bodies or backfilled into *underground workings*.
Talus (Scree) Slope	An accumulation of sharp angular *rock* fragments at the base of a cliff. Produced by frost action and other processes acting on the exposed *bedrock* slope. See also *colluvium*.
Test Heaps	See *on-site test pads.*
Thiobacillus ferrooxidans	A naturally occurring bacteria that can derive energy from the oxidation of *sulfide* to *sulfate* and ferrous to ferric-iron. Thought to accelerate the *oxidation* of *sulfides*.
Till	*Non-lithified material* deposited directly by glacial ice without modification by any other agent of transportation. *Till* can be transported beneath, beside, on, within and in front of a glacier. The mineralogical, textural, structural and topographic characteristics of *till* deposits are highly variable and depend upon the original source and the mode of deposition. In general, *till* consists of well-compacted to non-compacted material that is non-stratified and contains a heterogeneous mixture of *coarse fragments* in a *matrix* of sand, silt and clay.
Titration	Determining the amount of one substance by adding standardized increments of another. Often with an indicator to identify the endpoint.
Toe	The bottom of a slope.
Tonne	Metric weight measurement equal to 1000 kg (2204 lbs).
Total Sulfate Sulfur	All sulfur occurring as sulfate. One in a series of sulfur analyses that is a part of *acid-base accounting*. Expressed as %S. See *acid-leachable sulfate sulfur*.
Total Sulfur	All the sulfur in a sample. One in a series of analyses that are a part of acid-base accounting. Expressed as %S. See also *sulfide sulfur, acid-leachable sulfate sulfur, total sulfate sulfur, organic sulfur, del %S*.

Trace Elements	Those elements in the *Earth*'s crust which commonly occur in very small quantities, such as boron, cadmium, and cobalt. Elements that generally occur in geological materials at concentrations of less than 1000 mg/L. Includes all *precious metals* and *base metals*, with the exception of aluminium and iron.
Transpiration	Process by which plants release water vapour to the atmosphere. See also *evapotranspiration*.
Treatment Sludge	Precipitated solid matter produced by a treatment process. See also *active chemical treatment*
Trench	A narrow surface-dug excavation. Blasting may be required in *bedrock*.
Tunnel	A horizontal underground opening, open to the atmosphere at both ends. See also *adit*.
Turbidity	A condition of reduced transparency in water caused by suspended colloidal or particulate material.
Ultimate Pit	The maximum expected extent of an *open pit*. A design that maximizes the amount of *ore* recovered while minimizing the amount of *waste rock* material and ensuring operational pit wall stability. See also *stripping ratio*.
Ultrapure	Chemical substances containing essentially no impurities.
Unavailable Neutralization Potential (UNP)	The portion of the *neutralization potential* that is unable to neutralize acidity and maintain a *near-neutral drainage pH* because it is physically occluded. Occlusion may result from the precipitation of surface coatings or a mineral's occurrence within a larger mineral, in the interior of a particle or beneath the surface of minewalls. Unavailable or *unreactive NP* can be predicted from the NP measured in materials that are just about to and have just gone acid. See also *effective and empirical neutralization potential*.
Unconsolidated Surficial Material	See *non-lithified materials*.
Underground Workings	Any *anthropogenic* underground excavation, including *adits*, *crosscuts*, *declines*, *drifts*, *inclines*, *levels*, *portals*, *raises* and *shafts*. Also referred to as galleries in some countries. An alternative to *open pit mines*.
Unreactive Neutralization Potential (UNP)	The portion of a laboratory *neutralization potential* measurement that is unable to neutralize acidity and maintain a *near-neutral drainage pH* because the weathering rate is insignificant relative to the rate of acid inputs. Unreactive or *unavailable NP* can be predicted from the NP measured in materials that are just about to and have just gone acid. See also *unavailable, effective and empirical field neutralization potential*.
Wall Washing	Generic term for in-field *kinetic test* involving periodic rinsing of *mine* walls by water. Standardized in Canada as the MEND Minewall Technique.
Wash Plant	Coal preparation facility where saleable coal is separated from impurities using *comminution* and *specific gravity* differences (for example, breakers, heavy media separation and sieving). After cleaning the coal is typically dried. Waste byproducts include *coarse* and *fine* (*tailings*) *refuse*.
Waste Handling	See *material handling*.
Waste Rock Dump	A *mined-rock pile* containing *waste rock*.

Waste Rock	Rock with insufficient amounts of the economically valuable elements to warrant its extraction, but which has to be removed to allow physical access to the *ore*. *Waste rock* is typically blasted into smaller *particles* to allow its removal by truck and shovel. Disposal occurs in *subaerial* or *subaqueous* surface *dumps* or backfill to *open pits* or *underground workings*. In *heap leaching*, spent *ore* is sometimes referred to as *waste rock*. In coal mining, *waste rock* may be referred to as "*spoils*", "gob", or "rejects", terms which can also apply to waste materials from density separation and the *wash plant*. See also *coarse refuse, fine refuse and mined-rock piles*.
Water Balance	A term used in the context of mining to describe an inventory of *drainage* inputs and outputs, water volumes and the rate of flow. The water balance should be provided for each *mine component* that is a *ML/ARD* concern and for the site as a whole, at selected periods throughout the *mine*'s history.
Water Quality Criteria	Maximum or minimum values of physical, chemical or biological characteristics of water, biota or *sediment* whose exceedance under specified conditions may result in detrimental effects to a water use. Include numerical concentration or narrative statement established by the state / province for both organic and inorganic *contaminants* for a variety of water uses. *Metal* concentrations at or below these levels should protect the specified water use in any water body in the state / province. See also *water quality objective*.
Water Quality Objective	A numerical concentration or narrative statement which has been established to support and protect the designated uses of water at a specified site. Based on the site-specific physical, chemical and biological conditions. Established with an adequate degree of safety and taking local circumstances into account. Often *water quality criteria* are adapted to protect the most sensitive designated water use at a specified location. See also *water quality criteria*.
Water Quality	Chemical and physical properties defined by measurable attributes of water, *sediment* and aquatic life. See also *drainage chemistry* and *receiving environment objectives*.
Water Table	The elevation at which the fluid pressure is equal to atmospheric pressure. The surface separating the vadose zone (where water is held under tension) from the saturated zone (where fluid pressures are greater than zero). The level to which water will rise in a well just penetrating the saturated zone.
Weathering	The processes by which *particles*, *rocks* and *minerals* are altered on exposure to surface temperature and pressure, and atmospheric agents such as air, water and biological activity.
Wetlands	Land where *soils* are water saturated for a sufficiently prolonged period of time such that excess water and resulting low *soil*-oxygen levels are the principle determinants of vegetation and *soil* development.
Whole-Rock Elemental Analysis	*Assays* which measure the total concentration of cations in the solid phase. Common procedures include XRF and wet chemical digestion methods. Concerns include accuracy, detection limits and, for wet chemical digestion, the potential for incomplete digestion.