

## ***Chapter 7***

### ***Preparers and References***

<b>7.1</b>	<b>LIST OF PREPARERS</b>	<b>7-1</b>
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## Chapter 7

### Preparers and References

#### 7.1 LIST OF PREPARERS

The Draft and Final SEISs were prepared by an interdisciplinary team from Montana Department of Environmental Quality (DEQ), the Bureau of Land Management (BLM), and Spectrum Engineering, Inc., a third-party consulting firm working under the direction of the two agencies. DEQ, BLM, and Spectrum Engineering personnel (consisting of Spectrum Engineering, Timberline Resources, HydroSolutions, and Robertson GeoConsultants) were involved in the production of the Draft and Final SEISs. Their responsibilities and qualifications are listed below.

#### **What has changed in Chapter 7 since the DSEIS?**

Chapter 7 provides a list of the preparers of the SEIS, references used in the SEIS and a glossary of terms found in the SEIS. Based on additional data and public comments, the following changes have been made:

- Additional information on the preparers of the SEIS were added.
- References were updated and/or added based on new documents provided.
- Additional definitions were added to the glossary.
- Text was corrected based on references.

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### 7.3 GLOSSARY

Acid Generating Potential	A material's potential to generate acid and produce acid drainage. Analytical tests used to assess acid generating potential are either static or kinetic.
Acidity	The state, quality, or degree of being acid.
Acid Neutralizing Potential	The measure of a neutralizing material theoretically available to neutralize potential acid generated by ore or waste rock.
Acid Rock Drainage (ARD)	Water from pits, underground workings, waste rock, and tailings containing free sulfuric acid. The formation of acid drainage is primarily due to the weathering of iron pyrite and other sulfur-containing minerals. Acid drainage can mobilize and transport heavy metals which are often characteristic of metal deposits.
Adit	A horizontal or nearly horizontal access opening into an underground mine.
Aerobic/Anaerobic Interface	Zone in a soil or other porous media where the concentration of oxygen is detected to drop from a positive to a zero value.
Alluvium, alluvial	Unconsolidated fine to coarse material, deposited by flowing water.
Ambient	The baseline condition of a resource.
Amphibole	Any of a group of complex silicate minerals that contain calcium, sodium, magnesium, aluminum, and iron ions or a combination of them.
Amphibolite	A metamorphic rock composed chiefly of amphibole with minor plagioclase and little quartz.
Analog	Something that is similar to something else.

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Angle of Repose	The angle at which a loose pile of earth or rock will stand when left to itself, usually between 30° and 39°.
Aquifer	A stratum of permeable rock, sand, etc., which contains water. Water source for a well.
Archaeology	The science that investigates the history of peoples by the remains belonging to the earlier periods of their existence.
Armoring	A protective covering.
Artesian Well	A well drilled through impermeable strata to reach water capable of rising to the surface under its own pressure.
Attenuate, Attenuation	To lessen, decrease, reduce in concentration.
Backfill	Any material placed back in the pit or that would have to be removed from the pit.
Barite	A heavy yellow, white, or colorless crystalline mineral of barium sulfate that is used in paint and is the chief source of barium chemicals.
Basalt	A hard, dense, dark volcanic rock, rich in iron and magnesium.
Basin Divide	A ridge dividing two drainage basins.
Bedding Plane	A planar or nearly planar surface which visibly separates successive layers of stratified rock.
Bedrock	The solid rock that underlies gravel, soil, or other superficial material.
Belt Supergroup	A thick succession of Precambrian rocks found in Montana and nearby states and provinces.
Benchmark	A surveyor's mark made on a stationary object of previously determined position and elevation and used as a reference point in surveys.
Beneficial Use	Public use of water, including but not limited to agricultural, domestic, fish and wildlife,

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	industrial, irrigation, mining, municipal, power, water leasing, and recreation.
Berm	A horizontal, earthen structure, often constructed on exposed slopes, which increases slope stability, redirects the flow of water or other materials, or provides a place for sloughing material to collect.
Biofouling	The undesirable accumulation of microorganisms on pump and well components.
Biotite	A dark-brown or dark-green to black mica, which forms in igneous and metamorphic rocks.
Block Failure/Block Slip	A very general term that refers to a slope failure where the failing material consists of blocks of rock. The failure surface may also consist of a stepped path around blocks rather than a single plane.
Bond	A sum of money which, under contract, one party pays another party under conditions that, when certain obligations are met, the money is then returned (such as after mining reclamation occurs).
Bore Hole	A circular small-diameter hole made by a drill to a desired depth.
Bornite	A copper-iron sulfide mineral; important ore of copper.
Borrow Area	An area which provides a source of earthen construction material such as sand, gravel or topsoil for use in construction or reclamation.
Breccia	Rock composed of angular fragments embedded in a fine-grained matrix.
Buffer	A substance that minimizes change in the acidity of a solution when an acid or base is added to the solution.

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Calcareous	Composed of, containing, or characteristic of calcium carbonate, calcium, or limestone; chalky.
Calcite	A common crystalline form of natural calcium carbonate, $\text{CaCO}_3$ , that is the basic constituent of limestone, marble, and chalk.
Calcium Carbonate	See calcite.
Candidate Species	Plant or animal species under consideration by the United States Fish and Wildlife Service listing as threatened or endangered under the Endangered Species Act.
Cap	Barren rock and/or soil covering for reclaimed areas.
Capture Point	Well for removing groundwater.
Cation Exchange Capacity	The amount of positively charged ions a soil can hold expressed in milliequivalents per 100 grams (meq/100g) of soil.
Cemented	Describes rock or soil particles held together by secondary substances like silica, calcite, or oxides.
CFR	Code of Federal Regulations. A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.
Chalcopyrite	A copper iron sulfide ( $\text{CuFeS}_2$ ); an important ore of copper.
Chemical Weathering	Process by which chemical reactions transform rocks or minerals into new chemical combinations stable at the earth's surface.
Chimney Effect	Convective air movement in waste rock dumps by which air is warmed and rises and is replaced by cooler air.

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Circular Failure	Any slope failure where the failure surface has a circular shape.
Clean Water Act	Federal Water Pollution Control Act, as amended.
Colloidal	Pertaining to fine particles suspended in a liquid or gas.
Colluvium/Colluvial	Consisting of a mixture of soils and angular fragments of rock that have accumulated at the foot and on slopes of mountainsides under the influence of gravity.
Column Leach Test	A procedure for measuring the concentrations of constituents that can be rinsed from a material. The materials are placed in a cylindrical shaped apparatus (i.e. column) and fluid, usually distilled water, is passed through the materials. The effluent is collected and analyzed for concentration of constituents.
Compaction	An increase in the density of something; the act of crushing together.
Cone of Depression	The geometry or shape of an inverted cone on the water table or artesian pressure surface caused by the pumping of a well. The cone of depression will disappear over time when well pumping ceases.
Confidence Interval	A statistical range with a specified probability that a given parameter lies within the range.
Conglomerate	A rock consisting of rounded pebbles and gravel embedded in a finer-grained matrix.
Contrast	The effect of differences in the form, line, color, or texture of a landscape's features.
Conventional Blasting	Also called production blasting. Blast holes are drilled on a square or equilateral triangular grid. No particular design changes are made near the pit wall to improve the strength of the wall.

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Corrosion	A state of deterioration in metals caused by oxidation or chemical action.
County Tax Base	Private property that is taxed by a county government.
Covellite	A dark blue sulfide of copper (CuS); an important ore of copper.
Cretaceous	The geologic period at the end of the Mesozoic Era; the span of time between approximately 136 and 65 million years ago.
Cross Section	A drawing showing a vertical section through a feature.
Crusher Reject	Crushed and screened waste rock of uniform size.
Cultural Resources	Remains of human activity, occupation, or endeavor as reflected in sites, buildings, artifacts, ruins, etc.
Darcy's Law	Is a generalized relationship for flow in porous media. It shows that the volumetric flow rate is a function of the flow area, elevation, fluid pressure and a proportionality constant. It may be stated in several different forms depending on the flow conditions. Since its discovery, it has been found valid for any Newtonian fluid. Likewise, while it was established under saturated flow conditions, it may be adjusted to account for unsaturated and multiphase flow.
Daylight Level	The lowest point on the rim of an open pit.
Debris Flow	A mass of unsorted rock fragments, soil, and mud which has flowed downhill by gravity.
Decarbonization	The act of removing carbon from something.
Decay	To break down into component parts.
Devonian	The geologic period between approximately 405 million and 345 million years ago.

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Dewatering	The act of removing water.
Diffusion	The process whereby particles of liquids, gases, or solids intermingle and move from a region of higher to one of lower concentration.
Digenite	A copper sulfide mineral.
Distal	Located far from a point of reference.
Downgradient	At a lower point of elevation in relation to any fixed point with regard to the direction of drainage or flow.
Drawdown	Vertical distance that a water elevation is lowered or the pressure head is reduced due to the removal of water from the same system.
Drift	A mine passage; the nearly horizontal opening driven along a vein or ore body.
Drill Log	A written record kept by drillers or geologists of materials encountered while drilling a hole.
Dynamic Systems Model	A computer tool that allows time-dependent calculations of many physical processes within a certain environment (i.e., system).
Effluent	Something that flows out, like water seeping from the pit or treated water leaving the water treatment plant.
Enargite	An iron-black mineral containing sulfur, arsenic, copper, and often silver.
Endangered species	Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.
Enrichment	Concentration of valuable constituents in an ore by mechanical or chemical weathering.

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Environment	The physical, biological, and social conditions that exist within an area, including land, air, water, minerals, flora, fauna, social and economic values, and objects of historical, aesthetic, or cultural significance. The sum of all external conditions that affect an organism or community and ultimately determine its form and survival.
Environmental Assessment (EA)	A public document for which a federal or state agency is responsible that serves to: 1) Provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; 2) Aid an agency's compliance with the National or Montana Environmental Policy Act (NEPA or MEPA) when no environmental impact statement is necessary; 3) Facilitate preparation of an environmental impact statement when one is necessary.
Environmental Impact Statement (EIS)	An analytical document prepared under the National Environmental Policy Act (NEPA) and Montana Environmental Policy Act (MEPA) that evaluates potential impacts to the environment of a Proposed Action and its possible alternatives. An EIS is developed for use by decision makers to weigh the environmental consequences of a potential decision.
Eocene	A geological epoch of the Tertiary Period; approximately 58 million to 40 million years ago.
Ephemeral (streams)	Flowing in response only to direct precipitation or snow melt.
Erosion	The group of processes whereby earth or rock material is loosened and/or dissolved and removed from any part of the earth's surface.
Ethnographic	Pertaining to the branch of anthropology that deals with the scientific description of specific human cultures.

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Evaporate, Evaporation	To change into vapor.
Evapotranspiration	Loss of water by evaporation from the soil and transpiration from plants.
Expanded Ramp Pit	This refers to a particular open pit at Golden Sunlight Mines. This was the last pit stage mined before the current Stage 5B Pit. It consisted of mining an old haul road and an extension that was recovered by removing an old pit highwall instability.
Facies	The aspect and characteristics of a sedimentary rock unit, usually reflecting the conditions of its origin.
Factor of Safety	A calculation defining the relationship of the strength of the resisting force of an element (C) to the demand (D) or stress on the disturbing force where $F=C/D$ . When F is less than 1, failure can occur.
Failure Modes and Effects Analysis	An estimate of how an engineered structure might fail, the likelihood of failure, and the kind and intensity of the possible impacts.
Fault	A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.
Fee Simple	Private ownership of real estate in which the owner has the right to control, use, and transfer the property at will.
Ferricrete	Surficial sands and gravel cemented into a hard mass by iron oxide derived from the oxidation of sulfide minerals into solutions of iron salts.
Floodplain, 100-year	That portion of a river valley, adjacent to the river channel, built of sediments and inundated with water at least once every 100 years.
Flow Path	The route by which groundwater moves.

Fluid Pressure	A force that is equal in all directions.
Fluvial	Of or relating to a stream or river.
Free Draining	Allowing water to flow off a surface.
Freeze and Thaw Cycle	Alternating episodes of freezing and thawing.
Fugitive Emissions	Those air emissions, such as road dust, which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.
Galena	A gray mineral, lead sulfide (PbS); the principal ore of lead.
Gallons Per Minute (gpm)	A measurement of flow per minute. Seepage volumes are sometimes annualized to show what the steady flow in gpm would be if spread out over the entire year.
Geochemistry, Geochemical	The study of the chemical composition of, and actual or possible chemical changes in, the crust of the earth.
Geology	The science that relates to the earth, the rocks of which it is composed, and the changes that the earth has undergone or is undergoing.
Geosynthetic	Polymeric products used with soil, rock or other material as a liner or barrier to contain material or prevent erosion.
Geotechnical	Pertaining to the application of scientific methods and engineering principles to the acquisition, interpretation, and use of knowledge of materials of the earth's crust for the solution of engineering problems. It embraces the fields of soil mechanics and rock mechanics, and many of the engineering aspects of geology, geophysics, hydrology, and related sciences.
Gneiss, Feldspathic	A metamorphic rock with prominent bands of feldspar and other minerals.

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Ground Movement	General term for displacement of blocks of near-surface material by earthquakes or slow movement in response to gravity or other stresses.
Ground Support	The application of mechanical support techniques to improve stability of rock or soil slopes. These techniques include, rock bolts, rock anchors, shotcrete, wire mesh, buttresses, and retaining walls.
Groundwater	Water found beneath the land surface in the zone of saturation below the water table.
Habitat	A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.
Haul Road	A road used by large trucks to haul ore and overburden from an open pit mine to other locations.
Hazardous Waste	A waste or combination of wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may: (i) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (ii) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of or otherwise managed.
Hematite	A black or blackish-red to brick-red mineral, ferric oxide ( $\text{Fe}_2\text{O}_3$ ); an important ore of iron.
Hibernacula	Caves or other structures used by bats for hibernation.

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Highwall	The unexcavated face of exposed waste and ore in an open pit mine (same as pit wall).
Highwall Angle	The angle from horizontal at which the unexcavated face of exposed overburden in an open pit mine is standing.
Host Rock occurs.	Unmineralized rock in which an ore deposit occurs.
Humidity Cell	A geochemical test for obtaining bulk mineral reaction rates under controlled laboratory conditions.
Hydraulic	Conveyed or moved by means of water or other fluids, or pertaining to fluid in motion, or movement or action caused by water.
Hydraulic Conductivity	The capacity of a rocks or sediments to transmit water. Governed by the size and shape of pores, the interconnection between pores, and the physical properties of the fluid.
Hydraulic Gradient	In an aquifer, the rate of change of total head per unit of distance of flow at a given point and in a given direction.
Hydrogeology/Hydrogeologic	The branch of geology that deals with the occurrence, distribution, and effect of ground water.
Hydrograph Analysis	Analysis of a chart showing stage, flow velocity, or some other characteristic of water with respect to time.
Hydrologically Connected	Water-bearing rocks and sediment and water bodies that are directly connected, such as surface water bodies and groundwater and wetlands and surface water.
Hydrologic Sink	An area that captures groundwater.
Hydrology earth.	The science that relates to the water of the earth.

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Hydrostatic Pressure	Force exerted by water at any given point in a body of water at rest.
Hydrostratigraphy	The science of the arrangement of rock strata and their interrelation to water.
Impact	Influence or effect; a modification of the environment.
Impoundment	A body of water formed by the accumulation of water in a reservoir or other storage area.
Inclinometer	An instrument used by surveyors to measure an angle of inclination or elevation.
Infiltration	The movement of water or some other fluid into the soil through pores or other openings.
Interbedded rocks.	Interlayering of different kinds of sedimentary rocks.
Intercalated	Material introduced between layers of a different kind of material, for example thin layers of shale between thick layers of sandstone.
Interfingering	Intergradation of different kinds of rocks through a vertical succession of thin interlocking or overlapping wedge-shaped layers.
Intermittent Stream	A stream that runs water in most months, but does not contain water year-round.
Intrusive Rock/Intrusion	Igneous rock formed within surrounding rock as a result of magma intrusion.
Ion Exchange	A reversible chemical reaction between an insoluble solid and a solution during which ions may be interchanged.
Iron Hydroxide	An oxide characterized by the linkage of iron with the hydroxide ion.
Iron Oxide	Any of various oxides of iron, such as ferric oxide or ferrous oxide.

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Irretrievable	Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use changes, timber production can be resumed. The production lost is irretrievable, but the act is not irreversible.
Irreversible	Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.
Jarosite	An ochre-yellow mineral, a hydrous sulfate of iron and potash.
Joint	A usually planar fracture surface in rock without relative displacement of the opposite sides.
Kaolinite	A clay mineral consisting of aluminum silicate ( $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$ ); main source of kaolin.
Key Cut	The low point on the pit rim where the haul road enters the pit.
Key Observation Point (KOP)	Selected points from which a BLM visual resource assessment is conducted. KOPs are typically along commonly traveled routes, critical viewpoints ( <i>e.g.</i> , communities, crossings, or observation areas), or at typical or representative viewing points.
Lacustrine	Of or relating to lakes. Found in, living, or growing in or along the edges of lakes.
Laminae	Narrow beds of rock.
Lamprophyre	Any of several intermediate igneous rocks composed of feldspar and ferromagnesium

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	minerals that typically occur as dikes and minor intrusions.
Land Application Disposal (LAD)	The disposal of excess solution by spray irrigation over a large area where evaporation and plant uptake utilize the water. LAD is also a treatment method for some contaminants such as residual amounts of cyanide, which breaks down when exposed to oxygen and sunlight or nitrates which are used in plant growth.
Landform	A term used to describe the many types of land surfaces that exist as the result of geologic activity and weathering, e.g., plateaus, mountains, plains, and valleys.
Laramide Orogeny	A period of mountain building and deformation of the earth's crust in the western U.S., which occurred from the late Cretaceous into the early Tertiary periods.
Latite	A porphyritic volcanic rock having plagioclase and potassium feldspar present in nearly equal amounts of visible crystals, little or no quartz, and a finely crystalline to glassy groundmass; the extrusive equivalent of monzonite.
Leachate	A solution containing contaminants picked up as the liquid passes through soil or rock.
Lead Agency	The public agency(s) that has (have) the principal responsibility for carrying out or approving a project.
Lenticular	Lens shaped.
Lithology	The gross physical character or composition of a rock or rock formation.
Loam	Soil composed of a mixture of sand, clay, silt, and organic matter.
Locus of Shear	The geometrical plane or point along which shearing is taking place.

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Loess	A buff to gray windblown deposit of fine-grained, calcareous silt or clay.
Manifold	A pipe or chamber having multiple apertures for making connections.
Marcasite	A mineral with the same composition as pyrite, FeS <sub>2</sub> , but differing in crystal structure.
Mass Balance	Calculations used to estimate the amount of mass flux into, out of, and stored within a confined volume (e.g., a pond or pit).
Mass Flux	The per unit area of mass transfer or movement.
Mass Movement/Failure	A general term that refers to failure of a large mass of material.
Mass Load, Mass Loading	The summation of mass metal flux into a region.
Matrix	Fine-grained material surrounding the larger particles in a sedimentary rock.
Median	The middle value in a series of numbers or data points.
Metalliferous	Containing metal.
Metal Loading	The summation of the mass flux of metals into a region.
Metamorphose	To change rock by naturally occurring heat and pressure in the earth's crust.
Metasediment	A rock resulting from the metamorphism of a sedimentary rock.
Migratory	Periodically moving from place to place.
Milliequivalent chemical.	One thousandth of a gram equivalent of a

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Mineralized Zone, Mineralization	Process by which minerals are introduced into a rock, resulting in an economically valuable or potentially valuable deposit.
Mineral Reserve	A concentration or occurrence of natural, solid, inorganic, or fossilized organic material in or on the earth's crust in such form and quantity and of such grade or quality that it has reasonable prospects for economic extraction.
Minor Revision	A change in a mine permit that increases the permitted area by less than 10 acres or less than 5 percent, adds less than 10 acres of new disturbance, or will not significantly affect the human environment.
Mitigation	Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice or activity.
Mixing Zone	An area established in a permit where water quality standards may be exceeded to allow for initial effluent dilution.
Model, Modeling	A schematic description of a system, theory, or phenomenon that accounts for its known or inferred properties and may be used for further study of its characteristics.
Molybdenite	Molybdenum sulfide, $\text{MoS}_2$ ; the principal ore of molybdenum.
Monitoring Well	A well used to track groundwater quality or quantity.
Monzonite	An intrusive igneous rock composed chiefly of plagioclase and orthoclase, with small amounts of other minerals.
Multiple Accounts Analysis (MAA)	Multiple Accounts Analysis provides the means by which evaluators can select the most suitable, or advantageous, alternative from a list of alternatives by weighting the relative benefits.
National Environmental	An Act passed in 1969 declaring a

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Policy Act (NEPA)	national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality. A principal component of NEPA is the requirement to conduct EAs and EISs.
Neutralization	Reduction in acidity.
Non-homogeneous	Not uniform in structure or composition.
100-year Storm	A large storm predicted to occur about once every 100 years.
Noxious Weeds	Introduced plants that are officially recognized as undesirable by the state and county governments.
Ore	A mineral or an aggregate of minerals from which a commodity can be profitably mined or extracted.
Overbank Deposit	Mud or sand deposited beyond the banks of a stream by flooding.
Over-break	The impact of blasting damages the rocks beyond the location of the designed pit highwall.
Overburden	Loose or consolidated rock material that overlies a mineral deposit and must be removed prior to mining.
Oxidation, Oxidize	The process of combining with oxygen; or the process by which electrons are removed from atoms or ions.
Oxide	A mineral compound of oxygen with one or more metallic elements; or a binary compound of oxygen with some other element or with a radical.

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Oxygenated Water	Water containing dissolved oxygen gas.
Paleontology	The science that deals with the life of past geological ages through the study of the fossil remains of organisms.
Paleozoic	Span of time from end of Precambrian to beginning of Mesozoic Era, ranging from about 570 million to 250 million years ago.
Particulate(s)	Minute, separate particles, such as dust or other air pollutants.
Passivation	A patented process using potassium permanganate sprayed on pit highwalls and waste rock to prevent pyrite oxidation.
Patented	A mining claim owned by legal title.
Partial Pit Backfill	Partial filling of the pit but not attempting to mound the fractured rock to the original configuration of the mountain.
Percolation Pond	An unlined pond that allows water to seep through the bottom.
Perennial Stream	A stream that flows at all times of the year.
Permeability	The property or capacity of a porous rock, sediment, or soil for transmitting a fluid.
Petrographic	Of the description and classification of rocks.
pH	The measure of the acidity or alkalinity of a solution in terms of hydrogen ion concentration.
Physical (Mechanical) Weathering	Breakdown of rock into smaller fragments by physical means like freezing and thawing, as opposed to chemical processes.
Pit Backfilling	Process of placing waste rock back into the pit from which it came.

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Pit Highwall	Steep rock surfaces bordering a pit after removal of ore and waste. Same as pit wall.
Plaintiff	The party that brings a law suit against another party.
Plan View	Diagram showing features as seen from above; map view.
Pore Pressure	The hydrostatic pressure of the water in the pore space of a soil.
Pore Water	Water found in the pores of rock.
Porosity	The ratio of the volume of all the pores in a material to the volume of the whole.
Porphyry	Igneous rock containing relatively large conspicuous crystals, especially feldspar, in a fine-grained matrix.
Portal	Horizontal entrance to an underground mine.
Potentiometric Surface	The surface to which water in an aquifer would rise by hydrostatic pressure.
Precambrian	About 90 percent of geologic time; all time which precedes Paleozoic.
Precipitate	To cause a solid substance to be separated from a solution.
Preferential Flowpath	The most likely direction of groundwater flow.
Pre-split Blasting	A smooth blasting method in which cracks for the final contour are created by blasting prior to the drilling of the rest of the holes for the blast pattern.
Principal Deformation Zone	The principal axis of distorted rocks along a fault or other structural feature.
Proterozoic	The period of Earth's history that began 2.5 billion years ago and ended 543 million years ago; a subdivision of Precambrian time.

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Pumpback System	A series of wells designed to capture groundwater and return it to some specific location.
Pyrite	A common brass-colored sulfide mineral, FeS <sub>2</sub> ; also known as "fool's gold."
Quaternary	The second period of the Cenozoic era, following the Tertiary; began 2 to 3 million years ago and extends to the present.
Raise	A mine opening driven vertically from a lower to higher level.
Ramp	A sloping mine excavation.
Raptor	Bird of prey.
Raveling	Any small-scale localized failure of the highwall.
Receptor	Someone or something that receives a stimulus, such as noise.
Reclamation	To return a disturbed area to an approved post-mining land use.
Recontouring, Regrading	Reshaping irregular piles or dumps of rock or earth to a desired shape or form.
Record of Decision (ROD)	A document separate from, but associated with, an Environmental Impact Statement that publicly and officially discloses the responsible official's decision on the proposed action.
Redox Potential	The tendency for transfer of electrons from one compound to another. The donor is oxidized, the acceptor reduced.
Region	A large tract of land generally recognized as having similar character and physiographic types.
Right-of-Way	Strip of land over which a power line, access road, or maintenance road has a legal right to pass.

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Riparian	A type of ecological community that occurs adjacent to streams and rivers and is directly influenced by water. It is characterized by certain types of vegetation, soils, hydrology, and fauna, and requires free or unbound water or conditions more moist than normally found in the area.
Riprap	A layer of large, broken rock placed together irregularly to prevent erosion of embankments, causeways, or other surfaces.
Risk	The possibility of suffering harm or loss; danger.
Rock Bolt	Steel bolt with one flanged end and one expanding end; placed in a pre-drilled hole to control rock movement.
Runoff	Precipitation or snow melt that is not retained on the site where it falls, not absorbed by the soil; natural drainage away from an area.
Safety Bench	Wide bench in an open pit mine designed to catch falling or sliding rocks and debris and provide protection to workers and features below.
Safety Berm	Rock or earthen barrier along a bench or road, designed to keep vehicles and workers away from a dangerous edge.
Salvaged	Recovered or saved, such as soil that is picked up for future use in reclamation.
Saturated, Inundated	Soaked, filled, or loaded to capacity.
Scaling	Development of hard, brittle, cement like deposits, usually due to the precipitation of calcium and magnesium carbonates.
Scaling	The plucking down of loose rocks adhering to the solid face after a shot or round of shots has been fired.

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School Trust Land	State land set aside specifically as a source of income to public schools in Montana and managed by the Montana Department of Natural Resources and Conservation.
Scoping	A term used to identify the process for determining the scope of issues related to a Proposed Action and for identifying significant issues to be addressed in an environmental impact statement.
Sedimentary	A type of rock resulting from consolidation of loose sediment that has accumulated in layers.
Seismicity	The likelihood of an area being subjected to earthquakes; the phenomenon of earth movements.
Sericite	A fine-grained potassium mica occurring in silky scales having a fibrous structure; a common alteration product of other silicate minerals.
Shear Zone	A body of rock broken by numerous, closely spaced, nearly parallel fractures.
Silicate Dissolution	The act of dissolving minerals composed of silica (e.g., quartz).
Slip Block	A body of rock or land which has slid away from its original position along a low-angle surface; usually bounded by near-vertical breaks.
Slope Acre	An acre of land in plan view adjusted for degree of slope.
Slough	A backwater or isolated bend of a stream.
Slough	Any large-scale mass failure of the highwall.
Sludge	Semisolid material precipitated in a water treatment plant.
Slurry	A thin mixture of water and finely ground ore.

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Smectite	A group of clay minerals, often greenish.
Soil Development	The development of an unconsolidated layer of weathered rock which lies upon bedrock and is a medium for plant growth.
Sorption, Sorbing	The process in which one substance takes up or holds another by either absorption or adsorption.
Species	A group of individuals of common ancestry that closely resemble each other structurally and physiologically and in nature interbreed producing fertile offspring.
Sphalerite	The primary ore of zinc, occurring in usually yellow-brown or brownish-black crystals or cleavage masses, essentially zinc sulfide with some cadmium, iron, and manganese.
Stakeholder	One who has a share or an interest in something.
Steady State	A stable condition that does not change over time or in which change in one direction is continually balanced by change in another.
Stipulation	A condition attached to a mine's operating permit.
Stockpiled	Set aside for future use.
Stope	Any excavation underground to remove the ore, other than the development work. The outlines of a stope are determined either by the limits of the ore body or by raises.
Stratigraphy, Stratigraphic	Form, arrangement, geographic distribution, chronologic succession, classification, and relationships of rock strata.
Subsidence	Settling caused by the collapse of an underground mine.
Sulfate	A chemical compound containing $\text{SO}_4$ .

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Sulfide	A mineral composed of sulfur combined with a metal or semi-metal, for example pyrite and bornite.
Sump	The bottom of a shaft or any other place in a mine that is used as a collecting point for drainage water.
Supplemental EIS	A supplemental analytical document prepared under the National Environmental Policy Act (NEPA) and Montana Environmental Policy Act (MEPA) that portrays potential impacts to the environment of a Proposed Action and its possible alternatives. A SEIS is developed for use by decision makers to weigh the environmental consequences of a potential decision.
Surficial Geology	Of or relating to the geology of the surface of the earth.
Survey Prism	Device used to monitor movement of slip blocks or other features.
Syncline	A fold in rocks in which the rock layers dip inward from both sides toward the axis.
Tailings	The non-economic constituents of processed ore material that remain after the valuable minerals have been removed from raw materials by milling.
Talus	Heaps of coarse debris at the foot of cliffs and steep slopes resulting from weathering processes and gravity transport.
Tectonic Zone	Large-scale structural feature of the upper part of the earth's crust characterized by present or past seismic movements.
Telluride	A binary compound of tellurium usually with an element or radical, such as gold or silver. Metal tellurides are sometimes regarded as alloys.

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Tertiary	A geologic period; the span of time between about 65 and 3 to 2 million years ago.
Texture	The composition of soil in terms of the relative proportions of sand, silt, and clay, such as loam.
Threatened species	Any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.
Topographically Controlled	Constrained by the shape of the land surface.
Tributary	A stream flowing into a larger stream or other body of water.
Uncertainty	The estimated amount or percentage by which an observed or calculated value may differ from the true value.
Unconformably, Disconformably	Characterized by a substantial break or gap in the geologic record.
Unnecessary or Undue Degradation	Under BLM regulations: conditions, activities, or practices that: (1) Fail to comply with one or more of the following: the performance standards in Sec. 3809.420, the terms and conditions of an approved plan of operations, operations described in a complete notice, and other federal and state laws related to environmental protection and protection of cultural resources; (2) Are not "reasonably incident" to prospecting, mining, or processing operations as defined in Sec. 3715. 0-5 of this chapter; or (3) Fail to attain a stated level of protection or reclamation required by specific laws in areas such as the California Desert Conservation Area, Wild and Scenic Rivers, BLM-administered portions of the National Wilderness System, and BLM-administered National Monuments and National Conservation Areas.
Unpatented	A mining claim controlled by staking and assessment work, not by full legal ownership.

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Unsaturated	Not soaked, filled, or loaded to capacity
Upgradient	At a higher point of elevation in relation to any fixed point with regard to the direction of drainage or flow.
Vat Cyanide Leach Process	Recovery of gold and other metals by soaking a concentrate milled from ore in a cyanide solution contained in a cylindrical vertical vat.
Visual Contrast	Noticeable visual difference between the natural landscape and adjacent reclaimed areas.
Visual Resource Inventory	A BLM system of determining visual values in an area by inventorying existing scenic quality, sensitivity level, and distance zones. Inventory classes of one through four are assigned.
Visual Resource Management	A BLM system of analyzing the potential visual impacts of a proposed project or activity by assessing the visual contrasts that would be created between a project and the existing landscape. The major features of form, line, color, and texture are evaluated.
Volcanic	Activities, structures, or rock types produced by a volcano.
Waste-to-Ore Ratio	Number of units of waste rock which must be removed to allow mining of a unit of ore.
Waste Rock	Rock that is removed to access precious metal-bearing ore, but does not contain enough mineral to be mined and processed at a profit.
Waste Rock Dump	Storage area for waste rock.
Water Balance	An account of all the inflows and outflows for a given basin with no net change in storage. Factors include precipitation, evapotranspiration, streamflow, water use, and any transfers of groundwater out of the basin.

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Water Holding Capacity	The amount of water stored in a soil after the large (macro) pores have drained. Dependent upon soil texture and organic matter content.
Water Quality Standards	Limits on water pollutants designed to protect human health, aquatic life, and beneficial uses, as listed in DEQ's Circular DEQ-7.
Watershed	The entire land area that contributes water to a particular drainage system or stream.
Water Table	The level below which the ground is completely saturated with water.
Weathered Waste Rock	Waste material which has been subjected to chemical and mechanical weathering after being moved to dumps.
Wedge Failure	Any failure where the planes which failure is occurring along have a wedge shaped geometry.
Well Completion Details	A record of the depth and manner in which a water or monitoring well has been constructed and equipped.
Wetlands	Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian- Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.
Working Surface	An area leveled off to provide a place to work, as the bottom of an open pit.

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## 7.4 ACRONYMS AND ABBREVIATIONS

AGP	Acid Generating Potential
ARD	Acid Rock Drainage
ARM	Administrative Rules of Montana
BLM	U.S. Bureau of Land Management
CEC	Cation Exchange Capacity
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm/sec	centimeter per second
cy	cubic yard
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resources and Conservation
DSL	Montana Department of State Lands
DSM	Dynamic Systems Model
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
g	gram
gpm	gallons per minute
GPS	Global Positioning System
GSM	Golden Sunlight Mine
HDPE	High-density Polyethylene
HSI	HydroSolutions Inc
hp	horsepower
ISB	Intermountain Seismic Belt
KOP	Key Observation Point
LAD	Land Application Disposal
LSI	Langelier Saturation Index
LTA	Lost Time Accident
MAA	Multiple Accounts Analysis
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MEPA	Montana Environmental Policy Act
meq	millequivalent
mg/l	milligram per liter
MMRA	Montana Metal Mine Reclamation Act
MSHA	Mine Safety and Health Administration
MTARNG	Montana Army National Guard
NEPA	National Environmental Policy Act
NNP	Net Neutralizing Potential
NOI	Notice of Intent
PDZ	Principal Deformation Zone
ppm	parts per million
PVC	Polyvinyl Chloride
RMP	Resource Management Plan

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ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SHPO	Montana State Historic Preservation Office
T/Q	Tertiary/Quaternary
Tba	Tertiary Bozeman Group alluvial facies
Tbf	Tertiary Bozeman Group fluvial facies
Tdf	Tertiary debris flow
TDS	Total Dissolved Solids
Tg	Tertiary alluvial fan gravels
Tls	Tertiary land slide
Ts	Tertiary lacustrine sands
TWG	Technical Working Group
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WTP	Water Treatment Plant

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