Section 9

Glossary of Technical Terms, Acronyms, Symbols and Units

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Acronyms

AADT – Average Annual Daily Traffic

ABS – Australian Bureau of Statistics

ADGC – Australian Code for the Transport of Dangerous Goods by Road and Rail

AEP – Annual Exceedance Probability. The probability of exceedance of a given discharge within the nominated period **(10% = 1 in 10 years, 1% = 1 in 100 years)**

ANC – acid-neutralising capacity

ANCOLD – Australia National Council on Large Dams

ANE – ammonium nitrate emulsion used as a blasting agent

ANZECC – Australian and New Zealand Environment and Conservation Council

ANZG – Australian and New Zealand Guideline

AR&R – Australian Rainfall and Runoff

ARD – acid rock drainage

ARI – average recurrence interval

AS – Australian Standard

ASX – Australian Securities Exchange

bcm – bank cubic metre – a volume of 1 m^3 in the ground prior to disturbance.

CEC – Cation Exchange Capacity

CCT – correlated colour temperature

CSIRO – Commonwealth Scientific and Industrial Research Organisation

DA – Development Application

DBYD – Dial-Before-You-Dig

DG – Dangerous Goods

DoEE – Commonwealth Department of Energy and Environment

DPE – Department of Planning and Environment

DPIE – Department of Planning, Industry and Environment

DSC – Dam Safety Committee

EC – see electrical conductivity

EIS – Environmental Impact Statement

EP&A Act – *Environmental Planning and Assessment Act 1979* (NSW)

EPA – Environment Protection Authority

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*

ESD – Ecologically Sustainable Development

GDE – Groundwater Dependent Ecosystem

HAZMAT – Hazardous Materials

HCN – hydrogen cyanide

HDPE – High Density Polyethylene

IPC – Independent Planning Commission

KFH – Key Fish Habitat

LED – light emitting diode

LEP – Local Environmental Plan

LGA – Local Government Area

MCA – Minerals Council of Australia

MIC – Maximum Instantaneous Charge

MLA – Mining Lease Application

MOP – Mining Operations Plan

NAF - non-acid forming

NAG – net acid generation

NAPP – net acid-producing potential

NFR – non-filterable residue of suspended solids

NP&W Act – *National Parks and Wildlife Act 1974*

NPWS – National Parks and Wildlife Service

PAF – potentially-acid forming

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline).

PHA – Preliminary Hazard Analysis

PMF – Probable Maximum Flood

PNTL – project noise trigger level

ppm – parts per million

PVS – peak vector sum

RMP – Rehabilitation Management Plan

RO – reverse osmosis

ROM – Run-of-Mine

RWC – R.W. Corkery & Co. Pty Limited

SAG – semi-autogenous grinding

SG – specific gravity

SEARs – Secretary's Environmental Assessment Requirements

SCSC – Specialist Consultants Studies Compendium

swl – standing water level

TDS – total dissolved solids (expressed in mg/L)

tph – tonnes per hour

TSF – tailings storage facility

WAD – weak acid dissociable

WRE – waste rock emplacement

Symbols and Units

~ - approximately

ºC – degrees Celsius

ºC/100 m – degrees Celsius per 100m

µg/g – micrograms per gram

µg/L – micrograms per litre

µg/m^3 – micrograms per cubic metre

µm – micron, one millionth of a metre (one thousandth of a millimetre)

µS/cm – microsiemens per centimetre; a measure of electrical conductivity

% – percentage

$M – one million dollars

3-D – three dimensional

24-hour air quality standard – value of an air quality variable not to be exceeded when averaged over 24 hours

72-hour rainstorm – total rainfall recorded over a 72-hour period

100 year flood limit – predicted extent of a 1 in 100 year flood occurrence

'000 t – multiples of one thousand tonnes

< – less than

≤ – less than or equal to

> – greater than

≥ – greater than or equal to

95% exceedance – a value that is exceeded by 95% of sample values

AHD – Australian Height Datum (in metres)

As – arsenic, a metal-like element (i.e. a metalloid)

A-Scale – a sound level measurement scale. It disseminates against low frequencies and approximates the human ear

bcm – Bank cubic metre – a volume of 1m^3 in the ground prior to disturbance

Ca – calcium

Cd – cadmium

cm – centimetre (unit of distance)

CN_{FREE} – free cyanide, generally includes the cyanide ion (CN^-) and hydrogen cyanide (HCN)

CN_{TOT} – total cyanide; the total amount of all cyanide whether free, weak acid dissociable, or bound in a stable complex

CN_{WAD} – weak acid dissociable cyanide; cyanide existing in complexes, generally with metal ions, which break up (dissociate) in the presence of weak acid; includes free cyanide

Cu – copper

dB – decibel, unit used to express sound intensity

dB(A) – the unit of measurement of sound pressure level heard by the human ear, expressed in "A" scale

dB(Linear) – the measurement of sound pressure level in which the amplitudes of the sound signal, though all frequencies of the signal, are treated equally, i.e. not weighted – relied upon for blasting

Fe – iron

g – gram (= 0.001 kilogram)

GL – gigalitre

g/m^2/month – grams per square metre per month unit for deposited dust

g/t – grams per tonne

GWh – gigawatt hours

H_2SO_4/t – kilograms sulphuric acid per tonne

ha – hectare (100 m x 100 m)

Hg – mercury

Hz – Hertz – a unit of frequency

K – potassium

K – degrees Kelvin

kg – kilogram (weight measure)

kL – kilolitre (thousand litre)

km – kilometre (= 1 000 metres)

km^2 – square kilometres

km/h – kilometres per hour

kV – thousand volts (Electrical Potential Unit)

kVA – kilovolt amps

kVh – kilowatt hours

kW – thousand Watts (energy unit)

L – litre

lcm – loose cubic metre

L_{A10} – sound level exceeded 10 per cent of the sampling time

L_{A90} – sound level exceeded 90 per cent of the sampling time

L_{Aeq} – the L_{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures

$L_{Aeq\ 1\ hour}$ – the "equal energy" average noise level over 60 minutes – used for assessing impacts of motor vehicles on public roads

$L_{Aeq\ T}$ – Sound level of continuous noise which emits the same energy as the fluctuation sound over a given time period (T)

L_{Amax} – the absolute maximum noise level measured in a given time interval

L_{AN} – the A-weighted sound pressure level exceeded by N% of a given measured period

lux – the measure of illuminance.

m – metre

m AHD – metres Australian Height Datum

M – million

m^2 – square metre

m^3 – cubic metre

mg – milligram (weight unit)

mg/L – milligrams per litre (parts per million)

Mg – magnesium

MJ – mega joules (energy unit)

ML – megalitre

mm – millimetre (= 0.001 metres)

Mn – manganese

Mo – molybdenum

Mt – million tonnes (metric tonne = 1 000 kg)

Mtpa – million tonnes per annum

MW – megawatt

Na – sodium

NaCN – sodium cyanide

NaOH – sodium hydroxide

oz – ounce

Pb – lead

pH – measurement indicating whether water or soil is acid or alkaline

PM_{10} – particulate matter <10μm in diameter

Sb – antimony

t – tonnes

μg/m^3 – micrograms per cubic metre

μm – micron (1 micron=0.001 millimetre)

μS/cm – micro siemens per centimetre

V – volt

W – Watt (energy unity)

w/v – weight per volume

Zn – zinc

Technical Terms

A2 horizon – part of soil profile immediately below the topsoil.

A-weighted – an electronic filter having the frequency response corresponding approximately to that of human hearing.

accelerated oxidation testing – see net acid generation test.

acceleration lane – a lane used for increasing speed before merging with the through lanes.

acid – substance with a pH less than 7.0; the lower the pH, the higher the corrosive ability of the substance.

acid rock drainage (ARD) – runoff of acidic water, typically from mine waste rock, following acid formation within the rock.

acid-base results – data generated from test work investigating acid-generating and acid-neutralising properties, generally of mine waste rock and soil.

acid-neutralising capacity testing (ANC) – the ability of a substance (e.g. a particular mineral) to neutralise acid.

acidic – having a pH less than 7.0.

acoustic barrier – an earthen wall, bund or barrier formed to reduce noise and visual impact of extraction and processing activities.

acoustics – the science of sound and vibration.

activators – chemicals used to improve the selection of minerals in the flotation process.

adsorption – the attraction and adhesion of a layer of ions from an aqueous solution to the solid mineral surfaces with which it is in contact.

adverse weather conditions (in respect of noise and dust) – conditions, such as high wind, that assist the movement of dust or propagation of noise away from the Mine Site towards receivers.

aerial photographs – photographs of landscape taken from a plane (typically areas several kilometres across) used for the surveying and interpretation of vegetation type, geology, land use, etc.

airblast overpressure – a shock wave from a blast transmitted through the air, normally measured in dB(Linear).

air pollutant - a substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment (also called "air contaminant").

air pollution - presence of air pollutants.

alkaline – having a pH greater than 7.0.

alkalinity – in water analysis a measure of the carbonates, bicarbonates, hydroxides and occasionally the borates, silicates and phosphates in the water.

alluvial – pertaining to material, such as sand or silt, deposited by running water (e.g. a creek or river).

alluvium – a general term for stream-deposited sediment (sand, silt, gravel, etc.) within stream beds or on flood plains or alluvial fans.

ambient air quality – the quality of the ambient air near ground level, expressed as concentrations or deposition rates of air pollutants – also expressed as existing air quality.

ambient level – existing level of a phenomenon without the influence of the proposed Project.

amenity – the desirability of an area.

ammonia (NH_3) – a product from the chemical breakdown of cyanide.

ammonium nitrate – NH_4NO_3; used to make explosives (see ANFO).

amphibians – animals (such as frogs) adapted to live both on land and in water.

anaemometer – an instrument for measuring the speed of wind.

anion – a negatively charged ion that migrates to an anode.

anthropogenic – affected by, or relating to, human beings.

anti-seepage membrane – layer of natural or artificial material (e.g. clay or plastic) placed on the ground to prevent seepage (e.g. from a tailings storage).

aquatic – living in or on water, or concerning water.

aquifer - rock or sediment capable of holding and transmitting groundwater.

arboreal – tree dwelling.

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past.

artefact – anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).

artesian water – water contained in an aquifer.

assay – a chemical analysis.

atmospheric stability - a measure of turbulence which determines the rate at which the effluent is dispersed as it is transported by the wind.

attenuation – reduction in sound pressure levels between two locations.

audio-visual bund – an earthen wall, bund or barrier formed to reduce noise and visual impact of quarrying and processing activities.

average annual daily traffic (AADT) – unit of assessment of traffic flow along a road.

Average Recurrence Interval (ARI) - statistical period in years for a design storm event.

avifauna – birds.

B horizon – subsoil material located below the A horizon material and above the parent rock.

backfill – material used to fill a created void.

background noise levels - the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source; or sound generated for test purposes).

backhoe – a machine designed for small-scale excavation work.

ball mill – plant for fine grinding of ore using metal balls.

base-course – road material placed on sub-base to receive bitumen seal.

baseline data – a body of information collected over time to define specific characteristics of an area (e.g. species occurrence or noise levels) prior to the commencement of an activity (e.g. a mining operation); baseline data allows any impacts arising from the activity to be identified by comparison with previously existing conditions.

basic – having a pH greater than 7.0.

batter – an earth slope formed from placed fill material or cut into the natural hillside, during road construction.

beach – a deposit of tailings solids lying exposed to the atmosphere in a tailings storage facility.

bedrock – unweathered rock lying below the soil and weathering profile.

bench - a step in the face of the open cut pit which could be up to 25 m high.

berm – a low bank or steep slope built onto a slope to improve its structural stability and reduce erosion.

best management practice – the most effective actions which minimise human impact on the environment.

biodiversity – the full range of living things and the ecosystem in which they live.

biomass – the quantity of living material present at a given time within a given area. Synonymous with standing crop, stock and standing stock.

biota – living components of a habitat.

blasthole – hole drilled into rock to position explosive for blasting.

blasting – the operation of breaking rock by means of explosives.

bore – a well, usually of less than 20 cm diameter, drilled into the ground and from which water is pumped.

buffering – the chemical process by which some substances or mixtures can resist or retard changes to their pH.

bulldozer – an item of tracked mobile earth moving equipment fitted with a front blade and with rear rippers used for pushing and ripping soil and rock.

bund - embankment of clay or weathered rock emplaced for visual or acoustic screening.

bund wall – a man-made earth mound used to visually and acoustically screen nearby receivers.

burden distance – distance between rows of blast holes measured at right angles to the free face of a free face blast.

capped (drillholes) – drillholes sealed after use to prevent infiltration of water or soil and to protect livestock and native fauna.

catch drains – drains used to intercept and redirect runoff.

catchment – the entire land area from which water (e.g. rainfall) drains to a specific water course or waterbody.

catenary – the natural bending or curving shape of a line strung between two fixed points, such as the shape of power transmission lines between power poles.

cation – an ion having a positive charge and characteristically moving toward a negative electrode.

channel – river or irrigation channel, includes bed and bank.

chemically stable – a chemical substance that does not readily decompose.

chloride – the univalent negative iron of the element chlorine.

chronic effects – the effect on an organism of a continuous abnormal condition applied over 10% or more of its lifespan.

Class A pan evaporation record – Bureau of Meteorology standard method of measuring evaporation.

clay - a size term denoting particles, regardless of mineral composition, with diameter less than 0.004 mm.

CN_{FREE} – free cyanide, generally includes the cyanide ion (CN^-) and hydrogen cyanide (HCN).

CN_{TOT} – total cyanide; the total amount of all cyanide whether free, weak acid dissociable, or bound in a stable complex.

CN_{WAD} – weak acid dissociable cyanide; cyanide existing in complexes, generally with metal ions, which break up (dissociate) in the presence of weak acid; includes free cyanide.

coarse ore – ore that has been crushed but not ground.

colluvium – unconsolidated soil and rock material moved largely by gravity, deposited on lower slopes and/or at the base of a slope.

colonial species – plant species that are the first to grow in a disturbed area, also known as pioneer species.

colonise – the process of animal and plant species establishing themselves in a disturbed area.

comfort criteria – controlling limits of ground vibration and airblast overpressure from blasting above which they may be harmful, offensive or interfere with the comfort or response of the person.

competent rock – rock having substance strength characteristics requiring significant energy to dislodge or fracture.

concentration – the amount of a substance, expressed as mass or volume, in a unit volume of matter.

conditioner – a reagent added to improve the flotation response of target minerals.

conductivity – the measurement of the ability of a substance (either a measure of solid, liquid or gas) to transmit electricity; used to determine the amount of salt in a soil or water sample.

cone of depression – a depression of the potentiometric surface which has the shape of an inverted cone that develops around a well from which water is being withdrawn. It defines the area of influence of a well.

confined aquifer – an aquifer bounded by an impermeable upper surface. If the impermeable bounding layer is breached the water is under sufficient pressure to cause it to rise above the confining contact. The level to which the water rises is called the potentiometric or static water level or head.

confined aquifer – a saturated aquifer, overlain by a relatively impervious formation in which the pressure of the water at the top of the aquifer is greater than atmospheric pressure.

confluence - junction of watercourses.

conservation – the management of resources in a way that will benefit both present and future generations.

contaminant – a chemical compound or element which has been introduced as a result of human activity. It is noted, however, that some chemical compounds and elements also occur naturally in water and sediments.

contingency procedures – procedures put in place to handle an event considered unlikely to occur.

contractor – specialist brought in to perform a specific task, such as the construction of mine infrastructure or the excavation (mining) of the open cut pit.

conveyor - a device fitted with an endless rubber belt used for moving crushed rock within the processing plant.

correlated colour temperature (CCT) - assessment of the colour appearance of the light source with reference to the appearance of a black body radiator at a specific temperature. While it is indicative of the tendency of the light to warm or cool, it does not provide definitive information with respect to the spectral distribution.

cross-section – a two-dimensional diagram of an object presented as if the object had been cut along its length.

crushing – the mechanical process of reducing rock size usually by pressure or impact.

culvert – large pipe or channel carrying water underneath a structure (e.g. a road) or underneath the ground.

cumulative – increasing by successive additions.

cut-off drains – drains constructed to divert upslope runoff around disturbed areas.

cut-off grade – the lowest grade of mineralised material considered in the calculation of grade in a given deposit.

cyanate – a chemical species (CNO^-) formed by the oxidation of cyanide.

cyanide decay – the chemical and physical processes by which cyanide is degraded and lost from a system (e.g. a tailings storage facility).

cyanide pellets – a compressed form of cyanide as delivered to the Mine Site.

dB(A) – decibels, A-weighted scale; unit used for most measurements of environmental noise; the scale is based upon typical responses of the human ear to sounds of different frequencies.

decant pond – a pond, formed on the surface of the residue storage facility by runoff of tailings supernatant liquor, from which water is pumped (decanted) from the pond and fed back to the processing plant as process water.

deceleration lane – a lane used for decreasing speed before leaving the road.

detection limit – the smallest concentration of a substance that an analytical procedure can accurately and precisely detect.

detonator – a device that triggers an explosive.

development application - an application to a consent authority for approval of an activity deemed to require an approval prior to commencement.

Devonian - a period of geological time from 395 to 345 million years before present.

diamond drill hole – drill hole constructed by equipment using rotary fluid flushing and a diamond faced bit to obtain core from the rock being drilled.

dip - the angle that rock strata make with a horizontal surface measured at right angles to the strike.

dispersibility - a characteristic of soils relating to their structural breakdown in water into individual particles.

dispersion model – a set of mathematical equations relating to the release of air pollutant to the corresponding concentrations in the ambient atmosphere or deposition on the surface.

dissolved oxygen – the amount of gaseous oxygen dissolved in water and available for a biochemical activity (e.g. breathing in by fish).

diversion bank – an earth bank constructed to divert water away from disturbed areas.

drainage grading works – earthmoving and levelling activities to carefully regulate drainage (e.g. from topsoil stockpiles).

drainage line – a passage along which water concentrates and flows towards a watercourse during or following rain.

drawdown – the difference between the water level observed during pumping and the non-pumping water level (static water level or static head).

drill core - the cylindrical sample of rock recovered by means of diamond drilling.

dust - particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials.

dust concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air typically expressed in $\mu g/m^3$.

dust gauge – instrument set up to record the rate of deposition of dust.

ecology – the relationship between living things and their environment.

ecologically sustainable development (ESD) – development that improves the quality of life, in a way that maintains the ecological processes on which life depends.

ecosystem - the totality of biological processes and interactions within a specified physical environment.

electrical conductivity (EC) – the ability of a substance (either solid, liquid or gas) to transmit electricity.

element – a substance consisting entirely of atoms of the same atomic number (e.g. silver, oxygen, carbon).

Elliot trap – a baited cage used in faunal surveys to capture small animals.

emission – a discharge of a substance (e.g. dust) into the environment.

emission factor – an expression for the rate at which a pollutant is generated as a result of some activity, divided by the level of that activity.

empirical evidence – evidence based on, and verifiable by, observation and experiment.

environment – a general term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms (including human beings) exists.

environmental constraints - limitations on a project by components of the environment.

Environmental Impact Statement (EIS) – a formal description of a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and an overall justification of the project. The EIS is used as a vehicle to facilitate public comment and as the basis for analysing the project with respect to granting approval under relevant legislation.

environmental officer – person at a mine in charge of environmental compliance and monitoring.

environmental planning – planning (e.g. of a mining operation) that places emphasis on the possible environmental impacts of a development.

ephemeral – not permanent, e.g. a watercourse that flows only seasonally or after rainfall.

erodibility – the tendency of soil, earth or rock to erode.

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice.

ethnography – the branch of anthropology that deals with the regional distribution and characteristics of the human race.

evapotranspiration – loss of water from a land mass through transpiration from plants and evaporation from the soil.

excavate – to dig into natural material or fill using an excavator or other machinery.

excavator - item of earth moving equipment fitted with a bucket on an articulated boom and used for digging material from a face in front of, or below the machine.

existing air quality – the quality of the ambient air near ground level, expressed as concentrations or deposition rates or air pollutants – also expressed as ambient air quality.

exotic - introduced or foreign, not native.

exploration licence (EL) – a licence issued for exploration in a defined area.

explosive column – the explosive in a blasthole which is initiated by the primer.

face – sub-vertical slope generally forming limits of benches.

fault - a fracture in rock along which there has been observable displacement.

fauna – animals including birds, mammals, fish, etc.

feasibility study – a preliminary technical and economic study to assess the viability of a project.

feral - animal or plant that lives in the wild but is descended from domesticated specimens.

fill – material placed to raise the general surface level of a site.

fire regime – the history of fire at a particular place expressed in terms of frequency, intensity and season of occurrence; may relate to wildfires or prescribed burning.

flitch – a section of a mining bench – e.g. blasted rock on a 5m bench can be extracted and loaded into haul trucks in two x 2.5m flitches, one flitch at a time.

flocculant – an additive to fine material suspended in water which causes fine particles to agglomerate together resulting in a larger "flocculated particle" which will naturally settle out of the suspension to result in clean water.

flora – plants including trees, shrubs, grasses and herbs.

flotation – the separation of a mixture (e.g. sulfide minerals and waste material) in water, often by the addition of chemicals that carry one component (e.g. sulfides) to the surface as a froth.

flowsheet – diagram representing the sequence of events and decision-making logic of a particular process.

flyrock - rock that is propelled into the air by the force of an explosion. Usually comes from pre-broken material on the surface or upper open face.

formation (or unit) - a (named) succession of sedimentary beds having some common characteristics.

fragmentation – the extent to which rock is broken into small pieces by primary blasting.

freeboard – the vertical distance between a dam spillway or overflow and the top of a dam's embankment.

free cyanide – cyanide in a chemically available and generally toxic form; the cyanide ion (CN^-) and molecular hydrogen cyanide (HCN).

fresh rock – rock unaffected by natural weathering processes.

front-end loader – machine used to lift and place soil, earth, rocks, etc. on a construction site.

froth – material (e.g. sulfides and flocculant) that has floated to the surface during the process of flotation.

fugitive emissions – emissions not entering the atmosphere from a stationary vent (stack). Examples of fugitive dust sources include vehicular traffic on unpaved roads, handling of raw materials, wind erosion of dusty surfaces, etc.

gangue – minerals associated with an ore, such as quartz, that do not contain the metal(s) being extracted.

geochemistry – the study of the chemical composition of the earth or of the chemical interaction of elements, molecules, or particles derived from the earth.

geological reserves - the measured total quantity of in-situ mineralisation in a deposit, prior to consideration of mining parameters.

germination – the time at which a seed sprouts and the embryonic plant begins to grow.

grade – the concentration of gold either in an individual rock sample or averaged over a specified volume of rock; gold grade is usually given in grams per tonne.

grader – an item of earthmoving equipment, rubber tyred and fitted with a centrally mounted blade and rippers used to shape and trim the ground surface.

gradient – rate of change of a given variable (such as temperature or elevation) with distance.

grazing capability – the maximum amount of stock able to be maintained on a given area of land.

grinding – a process used to reduce the particulate size of a mine rock or soil, typically occurs after crushing.

ground level concentration – applied to the concentration, calculated or observed, in the neighbourhood of the ground surface.

ground vibration – oscillatory motion of the ground caused by the passage of seismic waves originating from a blast.

groundcover – vegetation that grows close to the ground (such as grasses and herbs) providing protection from erosion.

groundwater – water contained in voids such as fractures, cavities and inter-particle spaces in rocks.

groundwater surface – the upper surface of the water table.

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics.

haul road – road used in a mine for haulage of waste rock and ore from the active face to its destination on site.

haul truck – a truck specifically designed for hauling and tipping soil or rock within the Mine Site.

heavy metals – metals of high density.

heritage – the things of value which are inherited.

heritage significance – of aesthetic, historic, scientific, cultural, social, archaeological, natural or aesthetic value for past, present or future generations.

hydraulic conductivity (k) – the rate of flow of water in an aquifer through a cross section of unit area under a unit hydraulic gradient, at the prevailing temperature. Usually expressed in units of metres per second or metres per day.

hydraulic drill – an item of mobile mechanical equipment fitted with a hydraulically operated drilling apparatus for drilling 75-150mm diameter holes in rock.

hydraulic gradient - the direction of flow of groundwaters.

hydrogeology – the study of groundwater and the related geologic aspects of surface waters.

hydrology – the study of water, particularly its movement in streams, rivers, or underground.

hydroseeding – the application of a mixture of seed, fertiliser and mulch in water to disturbed surfaces.

illuminance – the amount of light that falls on a surface or plane. The illuminance is independent of the characteristics of that surface or plane. Illuminance is measured in Lumens/metre2 or lux.

impervious – a layer (e.g. a bed of rock) that does not allow water to pass through.

in-fill drilling – exploratory drilling in a specific area of interest conducted at a closer drillhole spacing than initial drilling of the area.

in situ – a term sued to distinguish material (e.g. rocks, minerals, fossils, etc.) found in its original position of formation, deposition, or growth, as opposed to transported material.

indigenous – belonging to, or found naturally in, a particular environment (see also exotic).

infiltration – the process of surface water soaking into the soil.

infrastructure – the necessary buildings, roads and equipment associated with a mining operation.

inter-generational equity – the principle that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

intermittent – flows periodically, irregularly.

inversion - generally used in meteorology with respect to an increase of temperature with height in contrast with the usual decrease of temperature with height in the troposphere. An inversion layer is distinguished by its large stability, which limits the turbulence and therefore the dispersion of pollutants.

invertebrates – commonly, animals without a backbone (jellyfish, worms, molluscs, etc.).

jaw crusher – a crusher which uses the pressure applied to the rock between the fixed and moving plate to reduce rock size.

jointing – planes of discontinuity in rockmass which exhibit no evidence of relative movement.

katabatic – topographically generated wind; flow of cold air downslope onto valleys at night.

Kevlin – Correlated Colour Temperature – is a specification of the colour appearance of light emitted by a lamp relating its colour to the colour of light from a reference source when heated to a particular temperature.

laminite – a sedimentary rock comprising alternate layers (lamallae) of sand and clays.

landform – a specific feature of a landscape (such as a hill) or the general shape of the

leachate – the liquid which has percolated through solid waste and has dissolved soluble components.

lithology – refers to the general characteristics of rocks or sediments.

low-grade – a mineralised deposit with uneconomic or only marginally economic metal concentrations.

low loader – is a trailer which has a relatively low carrying deck and used to transport large items of equipment such as bulldozers or scrapers.

luminance – the amount of light leaving a surface. It may be reflected or transmitted. Luminance is typically measured in candelas / metre^2.

luminous intensity – the amount of luminous flux leaving the light source in a given direction. It is measured in lumens / steradian or candelas.

mammal – animal of the class mammalia, distinguished by the presence of hair and mammary glands.

migratory – passing, usually predictably (based on aquatic species), from one region or climate to another, for purposes of feeding, breeding, or other biological purposes.

mill – a cylindrical item of equipment that rotates to reduce the size of the rocks fed into it.

mitigation measures – measures employed to reduce (mitigate) an impact (such as the construction of a bund wall to reduce sound emissions).

mobile equipment - wheeled or tracked self-propelled equipment such as trucks and front-end loaders.

monitoring - the regular or event-related measurement of components of the environment to establish environmental standards are being met.

mulch - straw, leaves, loose earth, etc. spread on the ground or produced by tillage to protect the roots of newly planted trees, crops, etc.

net acid-generating capacity (NAG) – capacity of a rock to generate acid upon exposure to air and water as determined by NAG testing.

net acid-generation testing – experimental determination of the potential of a material (e.g. mine waste) to generate acid upon exposure to air and water; testing involves pH monitoring as: 1) acid is generated by the accelerated oxidation of reactive sulfides and 2) other minerals within the rock react with the acid generated and partially or completely neutralise it.

net acid-producing potential (NAPP) – potential of a material (e.g. waste rock) to generate acid upon exposure to air and water as predicted by 1) its total sulphur content (indicative of its acid-forming capability) and 2) its reaction with hydrochloric acid (indicative of the acid-neutralising capacity of other minerals within the rock).

neutral weather conditions – weather conditions that neither particularly exacerbate nor mitigate the dispersal of pollutant emissions (dust, noise etc.) from the project area.

noise contours – theoretical lines connecting points of equal noise value.

non-perennial - refers to streams which do not flow the whole year through - also known as intermittent streams.

noxious – introduced species considered to be harmful to native species or to the habitat of native species.

nuisance dust – relatively large dust particles which settle out – not detrimental to health.

nutrients – generally refers to nitrogen and phosphorus, which are essential for biological growth.

open cut pit – large hole excavated in an open-cut mining operation to remove ore and waste rock.

operational constraints - limitations upon a project by equipment or machinery.

ore – a mineral or mixture of minerals containing a metal in sufficient amounts for its extraction to be profitable.

orebody – a solid mass of ore (both high and low grade) that is geologically distinct from the rock that surrounds it and that is commercially extractable.

oxide ore reserve – that component of the ore reserve composed of weathered (oxidised) rock.

particulate matter - small solid or liquid particles suspended in or falling through the atmosphere - sometimes expressed by the term particulates.

peak airblast – the maximum level of the airborne shockwave resulting from the detonation of explosives.

peak particle velocity – a measure of ground vibration reported in millimetres per second (mm/sec).

percussion drill hole – drill hole performed by equipment using the repetitive impact of tungsten tipped bit onto rock; rock cuttings are usually returned uphole by flushing with compressed air.

perennial – refers a watercourse which has flow throughout the year.

permeability - a material property relating to the ability of the material to transmit water.

Permian - the geological period of time from 280 to 225 million years.

piezometer – a drill hole specifically drilled for the monitoring of groundwater levels and water quality.

piezometric surface – water table surface.

podzolic – soil descriptive term for soils that are strongly acid and highly differentiated.

pollution – the alteration of air, soil, or water as a result of human activities such that it is less suitable for any purpose for which it could be used in its natural state.

porosity – the porosity of a soil or rock is its property of containing cavities that can hold liquid (e.g. between grains of sand).

potable - water suitable for human consumption.

precipitation – natural water phenomena producing quantities of water measurable by standard methods (e.g. rainfall, snow).

prestripping – the removal of waste or overburden, before mining, to expose an orebody.

primary ore – unweathered mineralised rock.

process liquors – solutions used and produced in ore treatment.

process reagents – the chemicals and solutions used to recover the economic elements from the ore.

processing plant – a group of equipment used to recover the economic elements from the ore.

progressive rehabilitation – rehabilitation of disturbed areas as soon as practicable after they are no longer required during the life of the mine.

propagation – reproduction of plants by the natural or artificial germination of seeds or cuttings.

pump test – the systematic pumping of water from a bore to test the response of an aquifer.

pyrite – the most wide-spread sulphide material FeS_2. Found throughout the ore and waste rock within the Mine Site.

raw water pond – storage pond for make-up water for the processing plant.

reagent – substance used to produce or control a chemical reaction.

receptor – a designated place at which an impact may occur (e.g. a residence).

recharge – addition of water to the zone of saturation; also, the amount of water added.

recharge – the addition of water to an aquifer, directly from the surface, indirectly from the unsaturated zone, or by discharge from overlying or underlying aquifer systems.

recolonise – the process of animal and plant species re-establishing themselves in a disturbed area.

recovery – the difference between the observed water level during the recovery period following pumping and the maximum drawdown when pumping stopped.

rehabilitation - the preparation of a final landform after land disturbance and its stabilisation with trees, shrubs and ground covers.

relative humidity – the ratio of actual moisture in the air to the amount the air could hold if saturated, at a given temperature.

reptiles – cold-blooded vertebrates, including lizards, snakes, turtles, and crocodiles.

reserves - in the mining context refers to those parts of a resource where sufficient information is available to undertake mine planning.

reside cells – an individual deposition cell that, combined with other cells, forms the tailings storage.

residual environmental impacts – impacts from an activity (e.g. mining) that remain after mitigation measures are implemented.

respirable dust – dust that is capable of being breathed in.

revegetated – an area that has been planted with trees, shrubs and groundcovers after being disturbed.

riparian – pertaining to or situated on the bank of a waterway.

road base – road pavement usually made up of densely graded crushed rock in varying sizes.

road grades – the longitudinal slope of the road surface commonly expressed in per cent gradient (i.e. 10 per cent is a gradient of 1 vertical in 10 horizontal).

run-of-mine (ROM) pad – is a hardstand area use to temporarily store ore or low-grade material prior to transportation to the processing plant.

run in mine (RIM) pad - is a hardstand area use to temporarily store ore or low-grade material prior to transportation to the run-of-mine (ROM) pad.

salinity – the dissolved salt content of water expressed in terms of milligrams per litre.

scarify – to stir the soil without altering its form, or disturbing its sequence of layers.

sclerophyll – hard, leathery-leafed plants (e.g. eucalyptus).

secondary crusher – the second crusher from which rock passes to be further reduced in size.

sediment basin – a small excavation designed to trap the coarse material washed from disturbed areas.

seepage – subsurface movement of water.

seepage paths – the path that seepage water takes through the ground.

semi-autogenous grinding (SAG) mill – a revolving mill where coarse rock fragments are ground partly under their own weight and partly with the aid of stainless steel balls.

silica – silicon dioxide (SiO_2).

siliceous – having a high silica (quartz) content.

siltstone – general term for sedimentary rock with grain size from 0.004 mm to 0.063 mm – individual grains not discernible with unaided eye.

silt-stop fencing – fine mesh fencing normally installed downslope of a sediment source, designed to trap silt and sediment and allow the water to pass through.

Siluran – a period of geological time from 435 to 395 million years ago.

sky glow – Sky glow is the brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter) in the direction of observation.

slurry – mixture of fluid and solid (e.g. tailings water and solids).

smelting – extraction of a metal from its ore at great heat.

sodic – having a high Na content.

soluble salts – salts that are capable of being dissolved.

spatial – related to areal extent.

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species.

species diversity – a measure of the number of different species in a given area.

specific gravity – the weight of any body or substance considered with regard to the weight of an equal bulk of pure water.

stable – used with respect to the atmospheric boundary layer, when the vertical temperature gradient is greater than the adiabatic lapse rate. Vertical air motions are suppressed. The turbulence intensity is low resulting in poor dispersion conditions.

standing water – water that is pooled and still.

stemming – the fine material placed in a blast drill hole after the explosive to ensure blast force is directed laterally.

Sterilisation drill hole – a drill hole designed to confirm the absence of mineralisation that could be considered as economic in the future which would be sterilised by the construction of one or more of the proposed mine components.

stockpile – a pile used to store material (such as low-grade ore) for future use.

subaerial – exposed to the atmosphere.

subsoil – the layer of soil lying below the topsoil; usually contains less organic matter and is less fertile.

sulphide – a concentration of sulphide minerals, derived from ore by grinding and flotation.

sulphate – a bivalent negative ion of sulphur and oxygen (SO_4).

sump (surface) – a dam within the lowest point of the open cut pits or processing plant site designed to collect the first runoff or aggregate nuisance flow.

surface waters – all water flowing over, or contained on, a landscape (e.g. runoff, watercourses, etc.).

suspended solids – solids held in suspension by the turbulent flow of a fluid.

tailings also known as residue – by-product of the metal extraction process consisting of crushed rock from which the metal has been extracted (the solid fraction or portion) and a liquid fraction or portion composed of water and residual chemicals used in the extraction process.

tailings supernatant – the liquid portion of a tailings slurry after the solids have settled.

temperature inversion – an increase in air temperature with height.

terrestrial – of the land as distinct from water.

throughput – quantity of material (ore, chemicals, etc.) moving through a system (e.g. an ore processing plant).

topsoil – the upper layer of soil, usually containing more organic material and nutrients than the subsoil beneath it.

total cyanide – total concentration of cyanide in waters, includes free cyanide and cyanide complexed with metals.

total sulfur – the total mass of all forms of sulfur in a sample.

total suspended particulate matter (TSP) – the mass of all particulate matter suspended in a solution.

total suspended solids – a common measure used to determine suspended solids concentrations in a waterbody and expressed in terms of mass per unit of volume (e.g. milligrams per litre).

transect – a fixed line along which observations are made of flora and fauna.

transect – a line across a study area along which observations are made and changes can be observed (e.g. changes in vegetation).

transmissivity – the rate at which groundwater is transmitted at a specific hydraulic gradient through rock of a specified width.

Triassic – a geological period extending from 245 to 208 million years before present.

tubestock – tree seedlings supplied with roots enclosed in soil.

tuff – a pyroclastic rock.

underdrainage – artificial drainage that removes infiltration or seepage water from underneath a structure (e.g. a tailings storage facilities or waste rock emplacement).

understorey – the layer of forest vegetation between the overstorey (or canopy) and the ground layer.

undulation – the gentle rise and fall or wave-like structure of a landscape.

upward light ratio (ULR) - the proportion of the flux of a light fitting and/or installation that is emitted at or above the horizontal, excluding reflected light, when the light fitting is mounted in its installed position.

vehicle movement – a one-way trip.

volcanic rocks – rocks that have formed from molten rock extruded near to or over the surface of the earth (lava).

waste rock – uneconomic rock extracted from the ground during a mining operation to gain access to the ore.

waste rock emplacement – structure to hold waste rock, formed by the placement of waste rock in stacked layers (typically 2 metres thick in each layer), engineered in such a way as to maximise stability and minimise erosion.

waste oils – old oils and lubricants retrieved from machinery.

water table – the upper limit of the saturated zone within a rock mass, generally at atmospheric pressure. It is characteristic of unconfined aquifers.

watercourse – creek or river, running water.

weathered rock – rock affected to any degree by the processes of chemical or physical weathering.

weathering – the in-situ physical disintegration and chemical decomposition of rock materials at or near the earth's surface.

weed – any plant (in particular an herbaceous one) that survives in an area where it is harmful or troublesome to the desired land use.

wildlife – non-domesticated fauna.

wind direction – the direction from which the wind is blowing.

wind rose – diagrammatic representation of wind direction, strength, and frequency of occurrence over a specified period.

woodland – plant communities dominated by trees whose crowns shade less than 30% of the ground.

yield – (of a water bore) 1) the capacity of the bore to produce water. 2) the amount of water actually withdrawn.

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