



FRIEDA RIVER

Frieda River Limited
Sepik Development Project
Environmental Impact Statement
Chapter 17 – Glossary

SDP-6-G-00-01-T-084-018



17 GLOSSARY

17.1 Units and Symbols

%	percentage (proportion out of one hundred).
/	per.
<	less than.
>	greater than.
µg	microgram (one millionth of a gram).
µg/L	micrograms per litre; unit commonly used to express the concentration of trace metals in a liquid.
µm	micron (one millionth of a metre).
µg/m ³	micrograms per cubic metre.
µS/cm	microsiemens per centimetre; a measure of conductivity.
ACC	asphalt concrete core.
Bm ³	billion cubic metres.
Bt	billion tonnes.
CO ₂ -e	carbon dioxide equivalent.
dB	decibel, unit used to express sound intensity.
dBA	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.
dbh	diameter at breast height.
g	gram.
g/m ² /month	grams per square metre per month.
g/t	grams per tonne.
GWh/year	gigawatt hours per year.
GL	gigalitre.
ha	hectare.
hr	hour.
kg	kilogram.
kL	kilolitre.
kL/year	kilolitres per year.
km	kilometre.
km ²	square kilometre.
kV	kilovolt.
L	litre.
L _{Aeq}	the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.
L _{Amax}	A-weighted maximum noise level. The highest noise level that occurs during the measurement period.
m	metre.
m/s	metres per second.
m ²	square metre.
m ³	cubic metre.
m ³ /h	cubic metres per hour.

m ³ /s	cubic metres per second.
mg	milligrams (one thousandth of a gram).
mg/kg	milligrams per kilogram; unit commonly used to express the concentration of metal (such as copper) in a rock or sediment; is equal to parts per million.
mg/L	milligrams per litre; unit commonly used to express the concentration of suspended solids in a liquid (i.e., total suspended solids).
ML	megalitre, one million litres.
ML/day	megalitres per day.
mm	millimetre.
mm/s	millimetres per second.
Mm ²	million square metres.
Mm ³	million cubic metres.
MPa	megapascal.
Mt	million tonnes.
Mt/year	million tonnes per year.
MVA	megavolt amperes.
MW	megawatt.
Mwmt	million wet metric tonnes.
NM	nautical miles.
NTU	nephelometric turbidity unit.
oz	ounce.
s	second.
t	tonne.
t/day	tonnes per day.
t/h	tonnes per hour.
t/m ³	tonnes per cubic metre.
v/v	volume per volume.
w/w	weight per weight.
wmt	wet metric tonnes.
wmt/year	wet metric tonnes per year.

17.2 Terms and Abbreviations

A

abundance	total numbers of individual animals or of taxonomic groups of animals.
acid	substance with a pH less than 7.0; the lower the pH the higher the corrosive ability of the substance.
acid formation	the process whereby acid is formed by the oxidation of minerals (particularly sulphides) exposed to air and water.
acid and metalliferous drainage (AMD)	runoff of water that is acidic or contains high concentrations of dissolved metals, typically from mined materials, following acid formation within the material.
acid-forming	see acid formation.
acidic	having a pH less than 7.0.
acoustics	the science of sound and vibration.
adsorption	the adhesion of a molecule or particle to a surface.
adsorption affinity, K _d ,	refers to the strength and efficiency of the binding interaction between dissolved copper ions and suspended particulate matter (measured as TSS).

adsorption capacity	the ability of the naturally present suspended particulate matter in the water to reduce dissolved copper concentrations via adsorption onto suspended particulate matter.
adventive	not native and usually not yet well established, as exotic plants or animals.
aerial photography	photographs of landscape taken from a plane (typically areas several kilometres across) used for the surveying and interpretation of vegetation type, geology, land use and similar.
AGE	Australasian Groundwater and Environmental Consultants.
airblast	the vibration of the atmosphere immediately following blasting.
airblast overpressure	a measure of the magnitude of an airblast, based on measurements of air pressure.
Al	aluminium.
ALA	Andrew Long and Associates.
alkaline	having a pH greater than 7.0.
allochthonous	organic carbon that is washed into streams from terrestrial sources.
alluvial	pertaining to material, such as sand or silt, deposited by running water (e.g., a creek or river).
alluviation	the process of deposition of alluvium.
alluvium	a general term for stream-deposited sediment (sand, silt, gravel, etc.) within stream beds or on flood plains or alluvial fans.
ambient	referring to background conditions.
ambient monitoring	monitoring of background conditions (e.g., noise levels, water quality parameters).
AMD	see acid and metalliferous drainage.
AML	Alluvial Mining Lease.
amenity	the desirability of an area.
amphibians	animals (such as frogs) adapted to living both on land and in water.
amphiphytes	plants that grow on the edges of water or wetlands, and are sometimes submerged.
AnaBat	a system designed to help users identify and survey bats by detecting and analysing their echolocation calls.
ANC	acid neutralisation capacity.
ANCOLD	Australian National Committee On Large Dams.
andesite	a volcanic rock composed essentially of plagioclase feldspar together with pyroxene, resembling trachyte in appearance.
anecdotal evidence	informal, oral or written evidence of an event.
ANFO	mixture of ammonium nitrate and fuel oil (diesel) used as an explosive.
ANSI	American National Standards Institute.
Anthropogenic	caused by human beings.
anthropometric	measurement of variability of average dimensions in human body with respect to age and race.
ANZECC	Australian and New Zealand Environment and Conservation Council.
AP	Assessment Point.
aquatic	living in or on water, or concerning water.
aquifer	a water-bearing layer of sediment or rock.
aquitard	a layer in the geological profile that separates two aquifers and restricts the flows between them.
archaeology	the scientific study of human history, particularly the relics and cultural remains of the distant past.

ARMCANZ	Agricultural and Resource Management Council of Australian and New Zealand.
artefact	anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).
artesian aquifer	confined aquifer with a potentiometric level that is above the ground surface. When a well penetrates an artesian aquifer, water will rise to the ground surface without the need for pumping.
As	arsenic.
AS	Australian Standard.
ASS	acid sulphate soils.
ASX	Australian Securities Exchange.
Austral summer	summer of the southern hemisphere.
autochthonous food resources	organic carbon produced by in-stream primary production.
average annual rainfall	the average amount of rain to fall at a specific location over the period of 1 year (measured in millimetres).
B	
Ba	barium.
background	the conditions (e.g., noise levels, bird populations) already present in an area before the commencement of a specific activity (e.g., a mining operation).
ball mill	a mill that uses free-falling steel balls to assist in the grinding of ore.
basement rock	unweathered rock lying below the soil and weathering profile.
basin	the area drained by a major river and its tributaries.
Be	beryllium.
bench	when referring to an open-pit: a ledge that forms a single level of operation above which mineral or waste materials are mined back to a bench face; the mineral or waste is removed in successive layers, each of which is a bench.
benthic	relating to or living on the bottom of a body of water.
berm	a predetermined width of bench left behind at intervals on open-pit walls; 2. dirt and rock piled alongside a haul road or similar.
bioaccumulation	(of a substance, especially a toxin) to remain within an organism, increasing in concentration with repeated doses.
biodiversity	the diversity of different species of plants, animals and microorganisms, including the genes they contain, in the ecosystem of which they are part.
biological diversity	the diversity of different species of plants, animals and microorganisms, including the genes they contain, in the ecosystem of which they are part.
biomagnification	the increase in toxicity of a chemical as a result of its progress along a food chain.
biomass	the total weight of all biota in a natural system (such as a lake).
biota	all living organisms; plants and animals.
blasthole	hole drilled into rock to position explosive for blasting.
blasting	detonation of explosive charge in a mine to assist in the removal of hard rock.
BMI	body mass index.
boom	long, moveable arm.
buffering	the chemical process by which some substances or mixtures can resist or retard changes to their pH.
bund	an earth, rock, or concrete embankment constructed to prevent the inflow or outflow of liquids or the transmission of noise.
buried prior-stream channels	Ancient river beds, now buried beneath recent sediments; sometimes called palaeochannels, and often filled with coarser and more permeable clastic material than adjacent and underlying strata.

C

Ca	calcium.
CaCO ₃	calcium carbonate.
CALMET	a meteorological model developed by the US EPA that develops wind and temperature fields on a three-dimensional gridded modelling domain.
CALPUFF	a transport and dispersion model developed by the US EPA that advects “puffs” of material emitted from modelled sources, simulating dispersion and transformation processes along the way.
carbon dioxide equivalent	a unit of greenhouse gas emissions calculated by multiplying the actual mass of emissions by the appropriate Global Warming Potential; this enables emissions of different gases to be added together and compared with carbon dioxide.
catchment	the entire land area from which water (e.g., rainfall) drains to a specific water course or waterbody.
CEH	Centre for Environmental Health.
Cenozoic era	The current and most recent of the three Phanerozoic geological eras covering the period from 65.5 million years ago to the present.
CEPA	Conservation and Environment Protection Authority.
CEPA Act	<i>Conservation and Environment Protection Authority Act 2014.</i>
Cd	cadmium.
CH ₄	methane.
channel	river or irrigation channel, includes bed and bank.
chronic effects	the effect on an organism of a continuous abnormal condition applied over 10% or more of its lifespan.
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora.
clay	a discrete mineral species, belonging to the layered silicate group and less than 2 to 4 microns in diameter.
CLF	Community Leaders Forum.
Co	cobalt.
CO	carbon monoxide.
CO ₂	carbon dioxide.
Coffey	Coffey Services Australia Pty Ltd.
colloidal state	a system of particles in a dispersion medium in which the particle diameters are between 10 ⁻⁷ m and 10 ⁻⁹ m, i.e., between a true molecular solution and a coarse suspension.
colluvial	loose and incoherent deposits, usually at the foot of a slope or cliff line and brought by gravity.
comminution circuit	part of the concentrator where ore is crushed and ground.
community	A generic term for a set of people who interact socially, and includes villages and settlements.
compaction	the process of close packing of individual grains in a soil or sediment as a response to pressure.
complex	a molecule formed by the interaction between a metal ion (e.g., a copper ion, Cu ²⁺) and a ligand (e.g., a hydroxide ion, OH ⁻).
complexation	the formation of a compound by the union of a metal ion with a non-metallic ion or molecule called a ligand or complexing agent.
complexing capacity	the capacity of a system to form strong bonds with dissolved metal ions in solution, thereby making the metals less bioavailable.
concentration	the amount of a substance per unit of mass or volume of the medium in which it occurs.

concentrator	an industrial plant in which a mineral concentrate is obtained from ore.
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 sample.
confluence	junction of two streams.
conservative	a prediction, assumption, or measurement that errs on the side of safety.
consequence	outcome of an event affecting objectives.
contact water	water that has been in contact with PAF waste materials.
contingency plan	plan 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 an open pit.
conveyor	a contrivance for transporting material, as from one part of a building to another.
counts	individual recordings or sightings (e.g., of a particular species of bird).
Cr	chromium.
cross section	a two-dimensional diagram of an object presented as if the object had been cut along its length.
crusher	that part of an ore processing plant where the ore is mechanically crushed into smaller pieces.
crustal abundance	amount of an element occurring naturally in the earth's crust.
crustal deformation	the displacement of part of the earth's crust as a result of tectonic plate movement, volcanic activity, and similar.
Cu	copper.
culvert	large pipe or channel carrying water underneath a structure (e.g., a road or railway track) or underneath the ground.
cumulative	increasing by successive additions.
cut-off trench or drain	a drain constructed to intercept and divert runoff from a natural drainage line.
cyclone	a device that generates a vortex to clear particulate matter from air or water.
D	
decant	water that is pumped (decanted) from the mine waste facility and fed back to the processing plant as process water.
density	1. the mass of a substance (e.g., sediment) divided by its volume; water has a density of exactly 1 kilogram per litre. 2. the coverage of vegetation (e.g., trees) per unit of distance (along a linear transect) or unit of area (in an area transect); with respect to animals, the numbers (of individuals or taxa) per unit area.
depauperate	relates to a fish community that is lacking in biomass density and biological diversity.
deposit	minerals in the ground, but not necessarily commercially extractable.
deposition	laying down of particulate material (e.g., sediment in a lake).
desiccation	the process of becoming dry or dehydrated.
detection limit	the smallest concentration of a substance (e.g., copper) that an analytical procedure can accurately and precisely detect.
detritus	accumulation of fragments of rock or organic material removed from a source by disintegration.
dewater	to remove water from (e.g., a mine pit or an aquifer).
diorites	a granular igneous rock consisting essentially of plagioclase feldspar and hornblende.
dispersion	the spreading and dilution of substances emitted in a medium (e.g., air or water) through turbulence and mixing effects.

dissolved oxygen	the amount of gaseous oxygen dissolved in water and available for a biochemical activity (e.g., fish respiration).
disturbance area	clearing an area of land that will be occupied by the project footprint and a buffer to allow for construction and maintenance activities. Structures may be in place for a temporary or permanent time frame.
diversity	a statistical index describing, in combination, the numbers of individuals representing the numbers of species within a sample or location.
DOC	dissolved organic carbon.
drawdown	a reduction in water level and/or pressure level in an aquifer as a result of groundwater extractions.
drilling	the action of boring holes (usually less than 30 centimetres in diameter and up to several hundred metres deep) into the ground, typically to establish a water bore or to collect samples to investigate the below surface geology.
E	
East Asian-Australasian Flyway	The East Asian-Australasian Flyway extends from the Arctic Circle through Eastern and South East Asia to Australia and New Zealand and encompasses 22 countries.
EC	see electrical conductivity.
EC ₅₀	effective concentration that affects 50% of a biological population.
ECP	environmental code of practice.
ecology	the science dealing with the relationships between organisms and their environments.
ecosystem	an interacting system of animals, plants, other organisms and non-living parts of the environment.
effluent	a complex waste material (e.g., liquid industrial discharge or sewage) that may be discharged into the environment.
EGi	Environmental Geochemistry International.
EIA	environmental impact assessment.
EIR	environmental inception report.
EIS	environmental impact statement.
EL	exploration license.
electrical conductivity (EC)	the ability of a substance (either solid, liquid or gas) to transmit electricity.
electrofishing	fishing using electric shocks to stun the fish.
elevated concentration	a concentration of an element that substantially exceeds the average crustal abundance of that element.
emission	a discharge of a substance (e.g., dust) into the environment.
emissions inventory	a database that lists, by source, the amount of air pollutants discharged into the atmosphere from a facility over a set period of time (e.g., per annum, per hour).
EMMP	Environmental Management and Monitoring Plan.
emulsion	liquid explosive based on ammonium nitrate specifically designed for wet blasting applications.
endemism	the limiting a species to a particular area or habitat.
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.
Environment Act	<i>Environment Act 2000.</i>
environmental baseline	characterisation of the biophysical and socio-economic conditions pre-development to provide a base for later comparison.
EOR	Engineer of Record.
epilimnion	the upper layer of water in a stratified lake system.

epiphytic	a plant which grows upon another but does not get food, water, or minerals from it.
erosion	the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice.
ESP	exchangeable sodium percentage.
evaporation	the loss of water as vapour from the surface of a liquid that has a temperature lower than its boiling point.
excavators	vehicles used to excavate holes and move soil, earth, or rocks.
exhumation	to dig or recover something that has been buried.
exotic	introduced to a particular environment (see also introduced).
expatriate	someone living or working in a country of which they are not a citizen.
extinction	when the entire population of a species dies out.

F

failure	(of wall) structural collapse or breach.
fault	fracture of the earth's crust caused by the relative movement of the rock masses.
fauna	a general term for animals (birds, reptiles, marsupials, fish, etc.), particularly in a defined area or over a defined time period.
Fe	iron.
feasibility study	a technical and economic study to assess the viability of a project.
feed	material being fed into a process.
FRL	Frieda River Limited.
FRP	filterable reactive phosphorous.
FIMS	Forest Inventory and Mapping System.
flocculants	chemical substance added to a flotation process to aid flocculation.
flood-plain	a low-lying plain adjacent to a river subject to occasional or frequent flooding and formed by sediment deposition during flooding episodes.
flora	a general term for plants, particularly those found in a defined area or characteristic of a defined time period.
fly-in fly-out	an employment model whereby employees fly to remote areas temporarily to work on-site instead of permanent relocation.
food chain	the assemblage of organisms of various energy (trophic) levels linked by the transfer of food energy.
foraging	searching for food over a wide area.
formation	a large stratigraphic sequence of rock beds (sandstone, shale, limestone, etc.) generally deposited over a distinct geological period (e.g., during a glacial period).
FOS	factor of safety.
FRCGP	Frieda River Copper-Gold Project. Component of Sepik Development Project, includes the HITEK open-pit, processing plant, accommodation village, conveyor, MIA, mine access road, Link road, mine transmission line, concentrate pipeline Vanimo infrastructure area and concentrate export facilities at the Vanimo Ocean Port.
FRHEP	Frieda River Hydroelectric Project. Component of Sepik Development Project, includes reservoir, embankment, powerhouse, Frieda River Port and FRHEP access road.
Frieda River Igneous Complex (FRIC)	the remnant of a single stratovolcano that forms the dominant lithological unit in the Project area and immediate surrounds.
front-end loader	machine used to lift and place soil, earth, rocks, and similar on a construction site.

fugitive noise, dust or light that has escaped into the environment (e.g., from a mine site).

G

GARD Guide	Global Acid Rock Drainage Guide.
gastropod	belonging to the phylum of Mollusca, gastropods are soft bodied animals with a head, a foot, a visceral body mass and a mantle, often (but not always) protected by an external shell.
GDP	gross domestic product.
GEL	generally expected level.
general arrangement	plan of the project area, including open-pit, mine waste storage, concentrator and similar.
geochemistry	the study of the chemical composition of the earth or of the chemical interaction of elements, molecules, or particles derived from the earth.
geotechnical	a term currently employed to cover the fields of soil mechanics, rock mechanics, and engineering geology.
GHG	greenhouse gas.
GIS	geographic information system.
gill net	type of net used for fishing, which traps fish by their gills.
GpAh	gypsum-anhydrite transition zone.
grade	the concentration of metal, e.g., copper, either in an individual rock sample or averaged over a specified volume of rock; copper grade is usually given in %.
grader	vehicle used to smooth a soil or rock surface.
gradient	rate of change of a given variable (such as temperature or elevation) with distance.
GRAM	Guangdong Rising Assets Management Co. Ltd.
gravel	sedimentary particles or rock fragments generally between 2 and 10 mm in size.
greenhouse gases	carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride.
GRI	Global Reporting Initiative.
grinding	a process used to reduce the particulate size of a mine rock or soil, typically occurs after crushing.
gross domestic product	gross domestic product (or, for states, gross state product) represents the sum total in any period of economic output of selected goods and services traded on the monetary market.
ground vibration	vibration transmitted through the ground following blasting.
groundwater	all waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.
groundwater discharge	discharge of groundwater into rivers, streams or open pits.
groundwater flow system	the pattern of flow within a groundwater catchment from recharge areas to discharge areas, typically defined by geological and topographical characteristics.
gypsum	hydrated calcium sulphate, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.
H	
habitat	the particular local environment occupied by an organism.
haul trucks	heavy vehicles used for the transportation of ore or waste rock.
hazardous material	any substance, mixture or article that satisfies the criteria of one or more <i>Globally Harmonised System of Classification and Labelling of Chemicals</i> (GHS) hazard classes.
HDPE	high density polyethylene.

heavy metals	generally used to describe the following metals: arsenic, iron, manganese, silver, mercury, chromium, lead, zinc, copper, nickel, selenium and cadmium.
HEC-RAS	Hydrologic Engineering Centre's River Analysis System.
heliophytic	a plant that flourishes under conditions of full sunlight.
herpetofauna	reptiles and amphibians.
heterogeneity	the quality of being diverse and not comparable.
HFCs	hydrofluorocarbons.
Hg	mercury.
HIA	health impact assessment.
HIT	Horse-Ivaal-Trukai.
HITEK	Horse-Ivaal-Trukai, Ekwai and Koki.
HIV/AIDS	human immunodeficiency virus/ acquired immune deficiency syndrome.
HV	high voltage.
hydraulic loading (in terms of groundwater)	change in volume available for input to a groundwater flow system.
hydrogeology	the study of groundwater, including its occurrence, recharge and discharge processes and the properties of aquifers.
hydrology	the study of water, particularly its movement in streams, rivers, or underground.
hydroxides	an oxide compound derived from water by the replacement of one of the hydrogen atoms by another atom or group (e.g., sodium hydroxide, NaOH).
hypothesis	a supposition put forward in explanation of observed facts.
hyporheic	a zone beneath and alongside a stream bed, where there is mixing of shallow groundwater and surface water.
I	
ICMM	International Council on Mining and Metals.
ICOLD	International Commission on Large Dams.
IFC	International Finance Corporation.
IFO	intermediate fuel oil.
igneous	rock formed through the cooling and solidification of magma or lava.
implementation period	the period from Partial Notice to Proceed for the Project to production ramp up.
impoundment	alternative term for ISF reservoir.
indicated resource	a resource whose size and grade have been estimated from sampling at places spaced closely enough that its continuity can be reasonable assumed.
indicator	any physical, chemical, or biological characteristic of the environment used to assess (i.e., indicate) environmental condition.
inferred resource	a resource whose size and grade have been estimated mainly or wholly from limited sampling data, assuming that the mineralised body is continuous based on geological evidence.
infauna	animals living in the sediments of the ocean floor or river or lake beds.
inflow	flow directed into a particular feature, such as a lake or a mine pit.
infrastructure	the supporting installations and services that supply the needs of a project.
in-migrants	people who have moved into an area, generally in response to perceived better conditions.
in-migration	movement of people into an area in anticipation of economic opportunities and improved services, which are stimulated by the development of a project.
integrated storage facility	storage facility for tailings and PAF waste rock.

intermediate groundwater flow system	occurs at an intermediate-scale and has moderately long response between recharge and discharge and a greater storage capacity than local groundwater flow systems, and the distance between recharge and discharge areas might typically be between 10 and 100 km.
introduced	see exotic.
invertebrates	commonly, animals without a backbone (e.g., jellyfish, worms, molluscs).
ion	an atom or compound that has gained or lost an electron, so that it is no longer electrically neutral but carries a positive or negative charge.
ISF	integrated storage facility.
ISO	International Standards Organisation.
ISQG	Interim Sediment Quality Guidelines.
IUCN	International Union for Conservation of Nature.
J	
JORC	Joint Ore Reserves Committee.
JPCC	Joint Provincial Consultative Committee.
L	
labile metal ions	Free unbound metals ions in solution.
lacustrine	formed at the bottom or along the shore of lakes.
landform	a specific feature of a landscape (such as a hill) or the general shape of the land.
leach	dissolution and removal of a soluble substance from a soil or a rock, e.g., the leaching of salt (by water) from a soil.
leachate	the fluid in which a leached substance is dissolved or transported.
LC ₅₀	Lethal concentration that affects 50% of a biological population.
lift	each separate layer placed in the construction of an embankment or waste rock emplacement.
likelihood	chance of something happening.
liquefaction	a process which results in something with characteristics of a liquid, as in soil liquefaction.
lithify	transformation of soil, sediment or other material into solid rock.
lithology	the description of rocks on the basis of colour, mineralogical composition, and grain size.
littoral zone (ISF)	areas adjacent to the ISF reservoir banks to a depth of 7 m.
LLG	Local Level Government.
LMP	Lease for Mining Purposes.
load	the amount of a substance discharged into a body of water (e.g., salt or sediment); usually expressed as mass over a specified time (e.g., tonnes per year).
local groundwater flow system	occurs at the local-scale and responds quickly to recharge events and drains relatively quickly and has relatively small storage capacity, and the distance between recharge and discharge areas might typically be less than 10 km.
LPG	liquid petroleum gas.
LUCF	land use change and forestry.
M	
macroinvertebrate	invertebrate animals, visible to the naked eye, which live in or on the sediments and include crustaceans, molluscs and polychaetes.

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macrophyllous	plants with long or large leaves.
macrophyte	an aquatic plant that grows in or near water and is either emergent, submergent, or floating.
Magnitude (significance assessment)	amount and type of change, including the severity, geographic extent and duration of the impact.
Malesia	a biogeographical region straddling the boundaries of the Indomalaya ecozone and Australasia ecozone.
MCE	maximum credible earthquake.
mean	average; the sum of the data divided by the number of data points.
mean annual rainfall	the average amount of rain that falls each year.
median	the middle value of a set of numbers arranged in order of magnitude (or the mean of the middle two numbers).
megapode	large, terrestrial birds that bury their eggs in large mounds of soil and leaf litter, where incubation is achieved by heat generated from decomposing vegetation.
Melanesia	region extending from the western side of the Pacific Ocean to the Arafura Sea.
metallurgical	pertaining to metals, particularly their extraction from ore.
ME	Mining Easement.
maximum instantaneous charge	the maximum amount of explosive in kilograms on any one specific delay detonator in any one blast hole.
MIA	mine infrastructure area.
MIBC	methyl isobutyl carbinol.
microchiropteran	one of two suborders of bats in the world.
microhabitat	a habitat peculiar to a small area, particularly an area distinct from that surrounding it (e.g., a decaying log in a grazing paddock).
mine materials	material removed during excavation of the open-pit (e.g., topsoil, waste rock or ore).
mine waste	by-products of mining operations with no economic value.
mine water	all water used in mining and processing (e.g., for dust suppression, in leach tanks).
mineralisation	the occurrence of metals or minerals within a rock sequence that may potentially constitute ore.
mixing zone	body of water into which waste (water) is discharged and where the prescribed water quality guidelines are not required to be met.
ML	Mining Lease.
MLs	maximum levels.
Mn	manganese.
model	a mathematical simulation of a natural system (such as the variation of particulate levels within a lake) used to predict how the system will change with time, particularly where external changes have been imposed upon it (such as from mining operations).
mollusc	belonging to the phylum of Mollusca, molluscs are soft bodied animals with a head, a foot, a visceral body mass and a mantle, often (but not always) protected by an external shell.
monitoring	systematic sampling and, if appropriate, sample analysis to record changes over time caused by impacts such as mining.
morphospecies	A taxonomic species based wholly on morphological differences from related species.
MRA	Minerals Resources Authority.
MV	medium voltage.

N

N ₂ O	nitrous oxide.
NAF	non-acid forming material that does not form acid on exposure to air.
natural	existing in, or formed by, nature (generally excludes anything obviously modified by human beings).
neutral	neither acidic nor basic (e.g., a pH equal to 7.0).
New Guinea	the island of New Guinea.
NGO	non-government organisation.
Ni	nickel.
nitrate	NO ₃ ⁻ , nitrogen compound commonly found in waterbodies and used by plants and algae as a nutrient.
NO ₂	nitrogen dioxide.
noxious	introduced species considered to be harmful to native species or to the habitat of native species.
NPV	net present value.
NSO	National Statistical Office.
nutrients	generally refers to nitrogen and phosphorus, which are essential for biological growth.

O

O ₂	oxygen.
ogee	a double curve formed by the union of a concave and a convex line.
oligotrophic	lacking in plant nutrients and having a large amount of dissolved oxygen throughout.
open-pit	large hole excavated in an open-cut mining operation to remove the ore.
open-pit water	water inflow into the open-pit from incident rainfall or groundwater seepage from open-pit walls.
operations	mining and ore processing activities.
operations phase	that period of the mining project, after construction and prior to decommissioning, during which pit excavation and metal extraction takes place.
order of magnitude	an approximate 10-fold difference between two numbers (e.g., 21 and 230) is one order of magnitude; an approximate 100-fold difference is two orders of magnitude (e.g., 21 and 2,150).
ore	a mineral or mixture of minerals containing a metal in sufficient amounts for its extraction to be profitable.
ore processing	the mechanical and chemical process by which a metal is extracted from an ore.
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.
organic carbon	carbon derived from the decomposition of biological organisms.
ORWB	off-river waterbody.
overburden	material that overlies a deposit of ore which must be removed for the ore to be mined.
oxidation	the process by which an element or compound undergoes a chemical reaction involving the removal of electrons; often involves reaction with oxygen to form an oxide (e.g., the rusting of iron).

P

PAF	potentially acid-forming material that has the potential to form acid on exposure to air.
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PanAust	PanAust Limited.
PASS	potentially acid sulphate soils.
passive	performing a function without electrical or mechanical action or movement (e.g., a jar-and-funnel rain gauge).
Pb	lead.
perennial	1. a plant living for at least several years, and usually flowering each year. 2. waters or streams lasting throughout the year.
perimeter	outer boundary.
permeability	the ability of a rock or soil to allow fluid to pass through it.
peri-urban settlement	a living area in the transition zone between a township and a surrounding rural area (where one would find a village comprised mainly of customary landowners). A peri-urban settlement could be termed a village (if they were mainly customary owners) and would probably consist of a mixture of bush material and/or improved housing, often with some service infrastructure (such as piped water with communal standpipes or electricity reticulation).
PET	Plecoptera, Ephemeroptera and Trichoptera.
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 and 14 is most basic (alkaline).
photosynthesis	the process by which green plants, algae, diatoms, and certain forms of bacteria make carbohydrates from carbon dioxide and water in the presence of chlorophyll, using energy captured from sunlight by chlorophyll, and releasing excess oxygen as a by-product.
phytoplankton	the photosynthesising organisms residing in the plankton.
physiognomy	general or characteristic appearance.
piezometer	a small-diameter cased bore used to measure groundwater levels.
plinth (ISF)	a concrete structure designed to support the lateral pressure of the ISF embankment.
PM ₁₀	the fraction of dust with a particle size of 10 µm (microns) or less; a health indicator for the fine particles of respirable dust capable of being inhaled into the lungs.
PM _{2.5}	the fraction of dust with a particle size of 2.5 µm or less; a health indicator for the very fine particles of respirable dust capable of deep penetration into the lungs and alveoli.
PMF	probable maximum flood.
PMP	probable maximum precipitation.
PNG	The Independent State of Papua New Guinea.
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.
POMSoX	Port Moresby Stock Exchange.
potable water	water of quality suitable for human consumption.
potamodromous	fish that undertake regular migrations in large freshwater systems.
potentiometric surface	the level to which water rises in a well due to water pressure in the confined aquifer.
PQL	practical quantification limit
precipitation	1. the process of changing from a dissolved compound into a solid, insoluble compound. 2. rain, hail and snow.
primary ore	unweathered mineralised rock.
process plant	where the extraction of metals from the mined ore occurs.

process water	water used during the processing of ore.
Project area	the total area covered by the Project, including open-pit, process plant, ISF, stockpiles, infrastructure corridor and ports.
PSD	particle size distribution.
Q	
quality control	procedures built into a sampling and analytical program to maintain the quality of the results obtained.
quantify	to determine the quantity or amount of a component in a substance.
quarry	an open-pit from which construction materials are excavated.
R	
rainfall events	periods of rainfall.
RAP	resettlement action plan.
reagents	chemicals used as part of an industrial process.
receptor	a person, fauna, flora, site (e.g., village), environmental value and/or resource potentially impacted.
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.
refining	to bring to pure state.
regional groundwater flow system	Occurs at a regional-scale and has very long response times between recharge and discharge and very large storage capacity, and the distance between recharge and discharge areas might typically be more than 100 km.
regrowth	natural regeneration of vegetation following clearing, fire and similar.
rehabilitation	the restoration of a landscape and especially the vegetation following its disturbance to an agreed state.
remobilisation (of sediment)	resuspension of deposited sediment.
reptiles	cold-blooded vertebrates, including lizards, snakes, turtles, and crocodiles.
reserve	commercially extractable minerals.
reservoir	a natural or artificial place where water is collected and stored for use, i.e., ISF reservoir, also referred to as impoundment.
residual environmental and social impacts	impacts from an activity (e.g., mining) that remain after management measures and been applied.
resource	minerals in the ground with reasonable prospect of eventual economic extraction.
revegetated	an area that has been planted with trees, bushes and grasses after being disturbed.
rheophytic	plants that grow in or on the banks of running water.
richness (of fauna or flora)	a measure of the number of species in a given area or assemblage.
riparian	pertaining to, or situated on the bank of, a body of water, especially a water course such as a river.
risk	effect of uncertainty on objectives.
river system	a river and its tributaries draining a catchment.
RL	reduced level.
ROM	run-of-mine.
routine monitoring	monitoring performed on a regular basis, with the same observations and tests conducted each time.
runoff	that portion of precipitation (rain, hail and snow) that flows from a specific area as water.

S

S	sulphur.
SAG	semi-autogenous grinding.
salvage	to recover or save property (including archaeological and cultural heritage artefacts or sites) from destruction.
sampling period	range of time over which samples are taken.
sand	siliceous group of particles within the size range 63 microns to 2 millimetres.
SDS	Safety Data Sheet.
Se	selenium.
sediment transport	the movement of sediment particles by the action of water, wind or gravity.
seepage	1. subsurface movement of water. 2. emergence of subsurface flow at the ground surface.
seismic risk	the possibility of earth movement due to a seismic event (e.g., an earthquake).
sensitive receptor	sites, environmental values and/or resources that may be affected by Project impacts.
sensitivity (significance assessment)	susceptibility of the environment to change, including its capacity to adapt to, or accommodate, the kinds of changes that the Project may bring about.
settlement	non-landowners living in a self-identified group of households, either under an arrangement with customary landowners (formal settlement) or with no customary arrangement or other entitlement (informal settlement).
SF ₆	sulphur hexafluoride.
SG	specific gravity.
SHE	Safety, Health and Environment.
SIA	social impact assessment.
silt	a sediment with particles finer than sand and coarser than clay, i.e., 2 or 4 to 63 microns.
SIP	Sepik Infrastructure Project. Component of Sepik Development Project, includes the Vanimo Ocean Port, Green River Airport, Upper Sepik River Port, May River Port and a public road from Vanimo to Hotmin.
site-specific	an observation that is particular to one site.
slurry	mixture of fluid and solid (e.g., tailings water and solids).
SML	Special Mining Lease.
SO ₂	sulphur dioxide.
SO ₄	sulphate.
SOC	soil organic carbon.
solubilisation	the process of dissolving.
solvents	organic liquids that will dissolve solids (e.g., benzene or toluene).
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.
species richness	the number of different species in an area.
SPGP	Sepik Power Grid Project. Component of Sepik Development Project, includes the Northern Transmission Line.
SRK	SRK Consulting (Australasia) Pty Ltd.
stakeholder	a person or group (e.g., an industry, a government authority or a community group) who has an interest or concern in a particular project.
standing water	water that is pooled and still.

station	a specific location established for repeated sampling, gauging, weather measurements and similar.
stratovolcano	volcano consisting of layers of lava alternating with ash and pyroclastic rocks.
stockpile	a pile used to store material (such as low-grade ore) for future use.
stockpiled	stored in a stockpile.
stoloniferous	producing or bearing stolons.
storage capacity	the maximum volume of liquid able to be retained in a structure or container (e.g., a reservoir or lake).
stream gauging	determination of water level and velocity in a stream or river for the purpose of calculating the rate of flow.
stressor	physical, chemical or biological factor that can cause an adverse effect in an aquatic ecosystem.
stripping	removal of vegetation and topsoil.
subaqueous	below the surface of water.
subsistence	hunting, gardening or similar where produce is consumed by hunter and family leaving no surplus for marketing.
substrate	an underlying layer (e.g., of sediment under water).
sumps	pits sunk to collect water.
surface waters	all water flowing over, or contained on, a landscape (e.g., runoff, streams, lakes).
suspended (solids or sediments)	solids held in suspension by the turbulent flow of a fluid.
SV	social value.
SWER	single wire earth return.
T	
tailings	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.
taxa	classification of organisms into groups (taxa) according to similarity.
TDS	total dissolved solids.
terrestrial	pertaining to land.
terrigenous	produced by the earth.
texture (of soil)	variations in composition, grain size distribution, and structure.
the Project	Sepik Development Project.
throughput	quantity of material (ore, chemicals, etc.) moving through a system (e.g., an ore-processing plant).
TIRP	Tailings Independent Review Panel.
tissue	cellular fabric of which animals or plants are made.
TOC	total organic carbon.
topography	physical relief and contour of a region.
topsoil	upper layer of soil, usually containing more organic material and nutrients than the subsoil beneath it.
total metal	total mass of filterable and non-filterable metal in a water sample.
total suspended particulate matter (TSP)	mass of all suspended particulates.
total suspended solids (TSS)	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).

township	an area containing residential housing (usually in some ordered pattern with street access), with a complementary commercial area supporting retail/wholesale buildings and/or administrative buildings.
toxic	poisonous to a specific organism, sometimes resulting in death.
toxicant	a substance that is poisonous.
toxicity	effect of any substance that produces a harmful effect on living organisms; described as acute (short term) or chronic (long term).
transect	a line across a study area along which observations are made and changes can be observed (e.g. changes in vegetation).
transport	movement (e.g., of sediment) via a medium such as river water.
tributary	a stream or river that flows into a larger river or lake.
TSF	tailings storage facility.
TSP	see total suspended particulate matter.
TSS	see total suspended solids.
tsunami	an ocean wave generated by a submarine earthquake, volcano or landslide (also known as a seismic sea wave and, incorrectly, as a tidal wave).
turbidity	the optical property of water that prevents light from being transmitted; turbidity or muddiness is caused by the presence of very fine suspended matter such as clay or organic matter.
TVET	Technical and Vocational Education and Training.
U	
understorey	the smaller species of plants that form neither the canopy nor the ground cover.
UNFCCC	United Nations Framework Convention on Climate Change.
upper limits	the higher values within a defined range.
V	
V	vanadium.
variable	1. not constant, subject to change (e.g., temperature, rainfall or population). 2. water quality indicator (e.g., pH, metal concentration).
vegetated	covered with plants.
velocity	speed in a given direction.
VHF	very high frequency.
vibration	oscillating movement.
village	customary landowners living in a self-identified group of households.
VOCs	volatile organic compounds.
W	
waste oils	used oils and lubricants retrieved from machinery.
waste rock	uneconomic rock extracted from the ground during a mining operation to gain access to the ore.
water balance	the sum of the inputs and outputs and changes in storage levels of water in a given locality.
water chemistry	the interaction of the chemical constituents (e.g., dissolved metals, suspended particles) of water.
water column	the body of water overlying the bed of a stream, lake, swamp or ocean.
water hardness	the concentration in water of certain mineral salts (particularly calcium carbonate, CaCO ₃); generally a function of calcium and magnesium concentrations.

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water quality	degree of the lack of contamination of water.
water quality criteria	generally refers to numeric levels specified for key water quality variables, such as dissolved metals or pH, which can be measured to determine the suitability of water for human consumption, supporting aquatic life and similar; can also refer to narrative text.
water table	the surface of the groundwater, below which soil and rock are saturated.
waterbird	any bird that frequents the water in, or inhabits the margins of, lakes or rivers.
watercourse	stream or river, running water.
watershed	area of land that catches precipitation and drains into a waterbody such as a river.
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.
well	an opening in the ground that gives access to underground water.
wetland	a low-lying area regularly inundated or permanently covered by shallow water.
WHO	World Health Organization.
wind erosion	wearing away of exposed soil, earth, or rock surfaces by the abrasive action of wind-blown particles (e.g., grains of sand).
WMA	Wildlife Management Area.
WMP	waste management sub-plan.
worst-case scenario	a sequence of events likely to result in the worst-case effects on the environment.
Z	
Zn	zinc.

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