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INTRODUCTION TO MINING AND MINERALS

Exploration Operations

- Geological theory and identification of prospective ground.
- Identification of anomalies (search for economic ore bodies).
- Collection, identification and analysis of data.
- Types of techniques – geological mapping, airborne geophysical work, soil sampling, geochemical analysis, drilling, assaying.
- JORC Resource (estimation of tonnes and grade of mineralisation with expectation of being mined economically).
- Feasibility study, mining proposal, environmental impact assessment.

Mining Operations

- Mining of open pit requires removal of top soil and waste.
- Blasting – patterns of drillholes charged with explosives (ANFO).
- Pits extend down in benches to access ore-body.
- Underground mines – access by way of tunnel/decline or shafts.
- Minimise movement of waste.
- Mine dewatering – massive “use” of water.
- Mine safety.

Mineral Processing

- Crushing of ore (grinding circuit) to slurry.
- Concentrating – process of separation and increasing the percentage of valuable material.
- Tailings: waste material remaining after removal of valuable minerals.
- Smelting: process by which concentrate is converted to metal.

Infrastructure: From Mine to Port

- High volume/low value bulk commodities: iron ore, coal, bauxite, manganese.
- Road, rail and pipelines convey products to port.
- At port receipt, stockpile, berthing and ship loading.
- Ownership and operatorship of mine to port infrastructure may be fully integrated (BHP, RIO, FMG) or fully disaggregated (Gladstone, Dalrymple Bay).
- Efficient operation critical to business.
- Operating costs significant.

Common Law of Minerals

- Common law maxim: *“cujus est solum ejus est usque ad coelum et usque ad inferos”*
- The common law of England, inherited by the colonies upon settlement, provided that minerals form part of the land in which they are located. A Common Law presumption subject to the royal prerogative to gold, silver and precious metals.

Wooley v Attorney General of Victoria (1877) 2 App Cas 163: *‘ever since the decision in Plowden (1568 The Case of Mines, 1 Plow. 310)... it has been settled law in England that the prerogative right of the Crown to gold and silver found in mines will not pass under a grant of land from the Crown, unless by apt and precise words the intention of the Crown be expressed that it shall pass.’*

- Interests in land: estate in fee simple, leasehold (exclusive possession for a term of years), *profit à prendre* (interest in land, right to access land and extract), easement (access, transport) and licence.
- 19th Century legislation has furthered a policy of statutorily reserving all minerals from future grants of land.
- See *Wade v NSW Rutile Mining Company* (1969) 121 CLR 177

State Appropriation of Rights to Minerals

Australian Waste Lands Act 1855 (Imp): authorisation to Governor to dispose of Crown lands in the colony and prescribed that grants reserved gold, silver and precious metals to the Crown.

Western Australian Constitution Act 1890 (Imp) (53 & 54 Vict c26), section 3: management and control of waste lands of the Crown in the colony and proceeds of the sale, letting and disposal thereof, including all royalties, moneys and minerals “were vested in the legislature.”

State Ownership of Minerals

Land Act 1898 (repealed), section 15: all Crown grants made on or after 1 January 1899 must contain a reservation to the Crown of all minerals.

Mining Act 1904 (repealed), section 138 (formerly section 117)

Subject to the provisions of this Act and the Regulations:

- Gold, silver and other precious metals on or below the surface of all land in Western Australia, whether alienated or not alienated from the Crown and if alienated, whensoever alienated, are the property of the Crown.
- All other minerals on or below the surface of any land in Western Australia which was not alienated in fee simple from the Crown before the first day of January 1899 are the property of the Crown.

Land Act 1933 (repealed) Section 15

Section 15: Reservation in grants

(1) All Crown grants issued under this Act shall contain a reservation of all gold, silver, copper, tin, or other metals, ore minerals, or other substances containing metals and all gems or precious stones and coal, or mineral oil, and all phosphatic substances in or upon the land comprised therein, and shall be in the form or in the effect of the 2nd or 3rd schedules as the case may be, subject to the variations required to meet social circumstances.

(2) Crown grants, leases or licences issued under this Act may be issued for an estate in the land to a limited depth only, and reserving to the Crown all land below such depth.

Provided that, subject to the provisions of the Rights in Water and Irrigation Act 1914, notwithstanding such limitations of depth and reservation, the grantee shall have the right

to enjoy all wells and springs of water which may at any time be upon the land, and to bore and sink wells for water through such land to any depth and to enjoy the same.

Mining Act 1978 Section 9(1)

(1) Subject to this Act;

(a) all gold, silver, and any other precious metal existing in its natural condition on or below the surface of any land in the State whether alienated or not alienated from the Crown and if alienated whenever alienated, is the property of the Crown;

(b) all other minerals existing in their natural condition on or below the surface of any land in the State that was not alienated in fee simple from the Crown before 1 January 1899 are the property of the Crown.

Land Administration Act 1997: Section 24

Section 24 Minerals and petroleum reserved to the Crown

Minerals within the meaning of the Mining Act 1978 and petroleum within the meaning of the Petroleum Act 1967 or the Petroleum (Submerged Lands) Act 1982 in Crown land are