

CLASSIFICATION OF BULK-LOW-GRADE COPPER DEPOSITS - W.C. LACY

	IGNEOUS ROCKS				LAGOON (REEF)		OPEN SEA		
	FORCEFUL		PERMISSIVE		EXTRUSIVE HIGH		HIGH (OPEN SEA)		
DIAGRAM OF CONTROLLING PARAMETERS AND TYPES OF DEPOSITS	POST-MAGMATIC				(JUV. ASSIM. & METEORIC)		D		
	MAGMATIC A		B		C		E		
CONFINEMENT:	HIGH		MODERATE		LOW		LOW		
BRECCIA PIPES:	COLLAPSE SYNGENETIC (MAGMATIC)		OSCILLATORY EPIGENETIC		EXPLOSIVE		SYNGENETIC (SEDIMENTARY)		
SUMMARY:	Mg: K-Na: SiO ₂ : S: Fe:								
CATEGORY	A Nonreactive Wallrock	A Reactive Wallrock	B Nonreactive Wallrock	B Reactive Wallrock	C Nonreactive Wallrock	C Reactive Wallrock	D Nonreactive Environment	D Reactive Environment	E
CONTROLLING PARAMETERS:	High		Moderate (Capped)		Medium to Low (Deroofed)		Low - lagoonal or protected basin		Low - open ocean
Fluid Supply:	Low (Juvenile)		Low to Medium (Juvenile & Assimilated)		Moderate (Juvenile, Assimilated and Meteoric)		Limited dilution by surface runoff or currents		Free circulation
Timing:	Magmatic		Late Magmatic to Pegmatitic		Post-magmatic (Hydrothermal)		Post magmatic - hot spgs.		Sedimentary
INTRUSIVES	Forceful, Blind, Intermediate Composition, Granitic to Porphyritic Texture, Parallel Walls		Forceful to Passive, Crown of Dikes and Breccia, Monzonite to Qtz Monz, Walls Diverge Upward		Passive, Deroofed or Cap Diated, Qtz Monz to Monz with Aplitic Groundmass, Peripheral Dikes and Sills		Volcanic sediments generally preceded metal deposition -- tuffs and agglomerates		Remote
STRUCTURAL ENVIRONMENT:	Regional: Intrusives aligned along regional break or lineament		Regional: Intrusives and dikes parallel to regional break or lineament, dikes often normal to main structure		Regional: Regional break determines general elongation of intrusive alteration complex		Regional: Adjacent to break which controls shoreline and forms locus for hot spring emanations		Undetermined
Local:	Domes or broad domal pyramids, collapse-type breccia pipes (recemented by magma or pegmatites), tensional sheeting		Domes or domal pyramids (sharp), oscillatory-type breccia pipes (recemented by quartz & tourmaline), tensional sheeting		Domal pyramids (sharp), concentric to radial fracturing to stockwork; explosive-type breccia pipes, dikes & irregular masses (often milled) of many generations		Basins of organic accumulation reef control, fracture intersections control springs		Undetermined
ALTERATION:	Plus: K, Na, Mg, (dry) Bio, chl, plag, px, talc, orth.		Plus: K (Mg, S) Orth, chl, bio, ser, qtz, tour.		Plus: K, S Qtz, ser, alun, chl, mont, kaol		Jasper, chert, sid, greenalite, hm		Undetermined
WALLROCK:	Basic to intermediate igneous rocks		Silicified ls. or ls. xenolith masses		Interm ign rock or sh-ss country rock		Ls. adjacent to intrusive area, alt. and.		Cong, sh, red beds, volc.
SHAPE:	Layered to irregular injections, pipe-like to conical cap		Pipe-like to inverted cone, irregular to dike injections		Broad inverted cones to cylindrical shatter pipes		Lenticular to tabular		Blanket accumulation
MINERALOGY:	Cu Minerals: cc, cv, bn, cp, cub Accessories: py, po, mg, sp, mo % Sulphides: ± 5% (dissem) Assoc metals: W, Au, Mo		Cu Minerals: cc, cv, bn, cp Accessories: py, po, mg, mo % Sulphides: ± 5% (dissem) W, Au, Mo		Cu Minerals: cc, bn, cp Accessories: py, sp, mo + 5% seg & vns W, Au, Mo		Cu Minerals: cp, en, td Accessories: py, sp, mg, mo 7-10% vns & seg Pb, Zn, Ag, Mo		Cu Minerals: cp, td, bn, (en) Accessories: py, sp, mhg, mo * 7% vns & seg Pb, Zn, Ag, Mo
OXIDATION & ENRICHMENT:	Capping: Low limonite, brown to not discernible		Capping: Limonite fixed as goeth, cup & ten -- no stain		Capping: Low to mod lim, dk brown to rd, Cu-ox near sur.		Capping: Abt supgne alt, acid attack, mig lim, Fe & Cu staining abt		Capping: Heavy gossan, lim flooding
Enrichment:	Little (low permeability)		Little to weak		Little to none		Well developed, may make ore-body		Locally impt.
EXAMPLES:	Frood, Bushveld, B.C. (Granduc, Cranisle, W. Sierrita)		Palabora (?)		Ajo, Cuesta, Bradshaws, Ithaca Peak		Pima, Mission, Battle Mt.		Bisbee, Morenci, Santa Rita
EXPLORATION:	Soil geochemistry (Rock geochem & geophysics limited)		Soil geochemistry (rock & water geochem & geophysics limited) IP or Mag may be correlated.		Geochem: rock, soil & water Geophysics: IP, SP, EM, Mag, etc.		Geochemistry of rocks and soils, paleogeography, geophysics (IP, SP, EM) aid where pyrite abundant only.		TV scanning