Model 6a	Ultramafic extrusive-komatiite Ni-Cu-PGE
Alternative Model Name	Kambalda Ni-Cu-PGE – Komatiite-associated Ni-Cu-PGE sulphides
Commodities	Ni, Cu (Pt, Pd, Au, Co)
% Global Production	12% Ni (1998); 10th quantile has >195 000 tonnes
% Australian Prod.	95? (Australia's only production of PGEs; ~100 kg Pt, 600 kg Pd)
World Class Deposit Size	Small high-grade (Kambalda, Agnew): >50 Mt @ 2-4% Ni, 0.15% Cu Large low-grade (Mt Keith): >300 Mt @ 0.5-1% Ni
World Class Deposit Examples	Kambalda, Mt Keith (WA) Langmuir, Munro (Canada)
Geological Setting	Archaean Greenstone-Granitoid terrain-intracratonic rift zones or extensional zones
Age	Archaean, in particular 2.7-3.0 Ga (~2.0 Ga at Cape Smith, Canada)
Components:	
Source	Komatiitic lavas
Transport/Pathway	Flow of lavas partly controlled by pre-existing topographic substrate or along transgressive channels deepened by thermal erosion of footwall
Trap	Massive ores localised in transgressive embayments and structural traps along basal ultramafic-basalt contact and in basal channel facies; disseminated and matrix ores at higher stratigraphic levels; remobilised ores in structural traps (faults)
Other	
Critical Elements	• Regionally extensive komatiite sequence (in particular 2.7-3 Ga) within rift zones of Archaean greenstone belts (1) • Need source of S (crustal versus magmatic) and mechanism (assimilation, falling temperature) for S saturation (1) • Coeval komatiitic-tholeiitic-felsic volcanism and presence of sulphidic footwall flows and/or sulphidic sediments as substrates to flows (2) • Preferred lava pathways or lava tubes for mineralised komatiites (3) • Deposits in close proximity to major strike faults and on limbs of major plunging anticlines and generally in lowermost high-Mg flows (4) • Olivine cumulate flow units 5–50 m thick for (5)
Other Comments	Although various volcanic exhalative, intrusive, and metamorphic-hydrothermal models have been previously proposed, general consensus now favours a magmatic origin for Ni-Cu ores; ores modified by regional metamorphism (greenschist to amphibolite) and deformation; source of S (mantle versus crustal) still controversial
Key References	Dowling, S.E. & Hill, R.E.T., 1998. AGSO Journal Geology & Geophysics, 17(4), 121-127. Lesher, C.M., 1989. Komatiite-associated nickel sulfide deposits. Reviews in Economic Geology 4, 45-101. Hill, R.E.T., Gole, M.J. & Barnes, S.J., 1987. Physical Volcanology of Komatiites. Geological Society of Australia Excursion Guidebook 1, 74 pp.

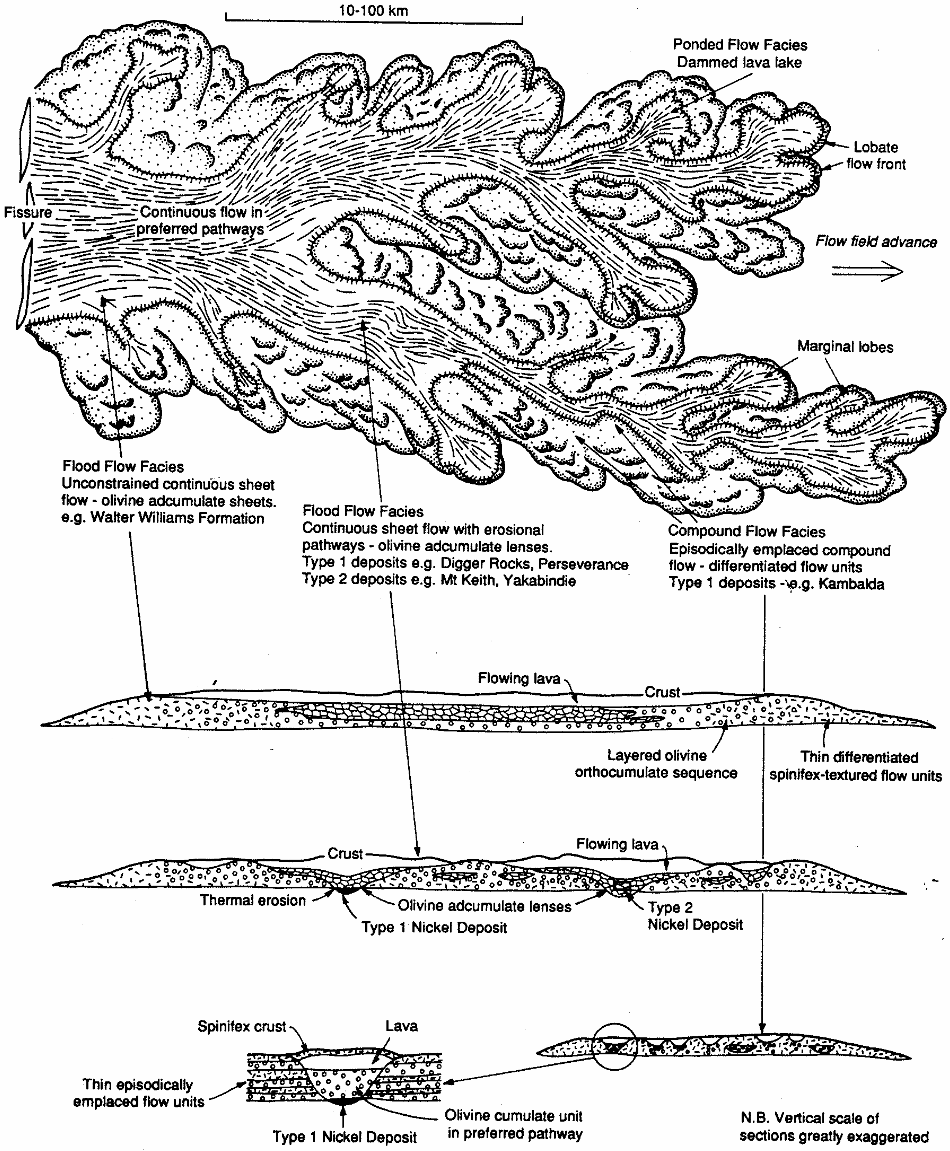

Figure 3. ***Upper*** **Schematic lateral section through a regional inflationary komatiite flow field developing via sustained eruption of lava, portraying possible relationships between various volcanic facies, and depicting those eruptive environments (with examples) conducive to the formation of types 1 and 2 Ni deposits (after Hill et al. 1995).** ***Lower*** **Vertical sections through the regional komatiite flow field, illustrating the various volcanic facies depicted in the upper figure, showing lithological associations and the environments of accumulation of types 1 and 2 Ni deposits.**