### Ultramafic extrusive komatiite–related Ni-Cu-PGEs

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<th>Province Blank</th>
<th>Potential:</th>
<th>Certainty:</th>
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<th>Critical Elements (Assessment Criteria)</th>
<th>Identified</th>
<th>Not Identified, but likely</th>
<th>Unlikely</th>
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#### Setting
- Archaean/Palaeoproterozoic greenstone–granitoid terrain–intracratonic rift zones or extensional zones
- Volcanic activity associated with intraplate rift zones or extensional zones
- Regionally extensive komatiitic sequences which contain thick olivine cumulate flow units.
- Olivine cumulate flow units 5–800 m thick and deposits generally in the lowermost high–Mg flows
- Deposits in close proximity to major strike faults and on limbs of major plunging anticlines

#### Source (fluid, metal, energy)

**Fluids**
- Nil

**Metals (including sulphur)**
- Komatiitic lavas for Ni, Cu
- Sulphidic substrate to lava flows for S (sulphidic sediments or sulphidic footwall flows)
- Mantle source for S has also been proposed

**Energy**
- Coeval komatiitic–tholeiitic–felsic volcanic activity

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Last printed 2/7/2004 10:53 AM
### Fluid/magma pathway
- Crustal structures for magmas
- Flow of lavas along palaeo-topographic substrate or along transgressive channels deepened by thermal erosion of footwall
- Preferred lava pathways or lava tubes for mineralised komatiites.

### Trap (any of the following)
- S–saturation by sulphidic substrate for high-grade massive Ni sulphide deposits at base of komatiitic basalt flows
- S–saturation by falling temperatures for disseminated Ni sulphide deposits
- Large R factor for basal Ni deposits by large volumes of lava passing over trapped sulphide melt
- Transgressive embayment features at base of preferred lava pathway massive sulphide deposits; change in slope or direction of preferred lava flow.

### Signs of mineralising process (any of the following, but if occurrences have been identified the level of certainty increases)
- Komatiitic flow unit containing lava pathways represented by olivine ortho–mesocumulates.
- Ni depleted parent lava due to scavenging of chalcophile elements, including PGE by sulphide during ascent or after eruption (Barnes et al, 1995)
- Presence of sulphidic flows and or sulphide bearing country rock or wall rock
- Evidence of substrata erosion and immediate host rock contamination (elevated LREE, Nd, Zr, Y, Ti, Al, Fe)
- Coincident Ni, Cu, PGE, Cr soil, RAB, outcrop geochemical anomalies indicative of sulphide mineralisation.
- Massive sulphide orebodies are magnetic.
- Known occurrences of Ni, Cu deposits with variable Ag, Au, PGM, and Co contents.

### Age
- Age of extrusion of komatiite lavas in the Yilgarn and Pilbara Cratons 3.0–2.7 Ga; ~2.0 Ga at Cape Smith, Canada.

### Preservation
- Komatiitic lavas need to be preserved.