

# Regional-scale multi-element in soil baseline surveys over prospective mineral camps in New Zealand

*Martin, A.P.<sup>1</sup>, Turnbull, R.E.<sup>2</sup>, Rattenbury, M.S.<sup>3</sup>, Strong, D.T.<sup>4</sup>, Christie, A.B.<sup>5</sup>, Rogers, K.M.<sup>6</sup>, Gazley, M.F.<sup>7</sup> and Smillie, R.W.<sup>8</sup>*

1.  
GNS Science, Private Bag 1930, Dunedin 9054. Email: a.martin@gns.cri.nz
2.  
GNS Science, Private Bag 1930, Dunedin 9054. Email: r.turnbull@gns.cri.nz
3.  
GNS Science, PO Box 30-368, Lower Hutt. Email: m.rattenbury@gns.cri.nz
4.  
GNS Science, PO Box 30-368, Lower Hutt. Email: d.strong@gns.cri.nz
5.  
GNS Science, PO Box 30-368, Lower Hutt. Email: t.christie@gns.cri.nz
6.  
National Isotope Centre, GNS Science, PO Box 30-312, Lower Hutt. Email: k.rogers@gns.cri.nz
7.  
RSC Mining & Mineral Exploration, PO Box 5647, Dunedin 9058. Email: m.gazley@rscmme.com
8.  
GNS Science, Private Bag 1930, Dunedin 9054. Email: r.smillie@gns.cri.nz

## ABSTRACT

In the past five years, approximately 55,000 km<sup>2</sup> or 36% of New Zealand's South Island has been included in a multi-element soil geochemical baseline survey: a non-contiguous area approximately the size of Tasmania or New York state. Soil samples were collected from two depths at each site (typically 2 – 20 cm and 50 – 70 cm). Sites were spaced at regular intervals of 2, 4 or 8 kilometres dependant on the geological feature being targeted.

The <180-µm fraction of the soil samples were analysed by inductively coupled plasmas mass spectrometry after an aqua regia partial digest at Bureau Veritas Minerals in Vancouver, Canada. One in five samples were investigated for quality assurance and control utilising duplicates, replicates, blanks and standards. Samples were randomised and renumbered prior to analysis. Additionally, subsets of samples were analysed by laboratory XRF for major elements, Leco analyser for total C and S, and by mass spectrometry for Sr, C, N and S isotopes. Mass specific magnetic susceptibility and other magnetic (hysteresis, isothermal remanence and thermomagnetic) measurements were also made on some samples.

Within the survey boundaries, there are areas prospective for orogenic, intrusion-related, placer and skarn-style deposits, for commodities including gold, platinum-group elements, nickel, silver, tungsten, antimony and rare earth elements. Also, the recent recognition of New Zealand as part of the new continent Zealandia, makes areas within the survey analogous to continental-margin

settings replete with precious- and base-metal deposits. The resulting data sets, available online, are a new and highly valuable resource for potentially detecting alteration haloes at surface and through cover, defining background element thresholds and tracing chemical and mineral disbursement patterns to aid mineral exploration.