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CHEMICAL INTERACTION BETWEEN PICRITIC MAGMAS AND UPPER CRUST ALONG THE MARGINS OF THE MUSKOX INTRUSION, NORTHWEST TERRITORIES

Don Francis

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Cover description

Thin section photograph of sample Po-24 showing contact between contaminated norite (Po-24b, right side) of Muskox intrusion and diorite melt (Po-24a, left side) of the paragneiss host rock; crossed nicols GSC KGS 2428.

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CONTENTS

Tables

CHEMICAL INTERACTION BETWEEN PICRITIC MAGMAS AND UPPER CRUST ALONG THE MARGINS OF THE MUSKOX INTRUSION, NORTHWEST TERRITORIES

Abstract

The contact between the Muskox intrusion and its gneissic host rocks is exposed from a narrow Keel dyke in the south to a large layered chamber in the north. The presence of granophyric textures, elevated ratios of large-ion lithophile (LIL) to high field-strength (HFS) elements, and enhanced orthopyroxene crystallization along the margin of the layered series indicate that the early magmas of the chamber were contaminated by their gneissic host rocks. The margins of the lower two megacycles indicate that the contamination was selective, with the extent of chemical exchange between Muskox magmas and host paragneiss increasing in the order: HFS elements, heavy rare-earth elements, light rare-earth elements, U, Th, LIL elements, and chalcophile elements. Two distinct hybrid magmas were simultaneously forming along the margin of the chamber, one a hypersthene-normative basalt produced by the contamination of Muskox magma and the other a high-Al basalt to andesite, produced by the metasomatic melting of the host paragneiss. These buoyant hybrid magmas rose from the margin to form layers of contaminated magma along the roof of the magma chamber during each megacycle. Following the sealing of the margins with cumulates, these layers remained relatively isolated from the underlying magma of the chamber until the crystallization of feldspar in the lower two megacycles. Anomalous LIL/HFS element ratios associated with enhanced crystallization of orthopyroxene in Megacycles #3 and #4 indicate, however, that episodic mixing began to occur as the Muskox chamber matured.

Résumé

Le contact entre l'intrusion de Muskox et ses roches encaissantes gneissiques affleure depuis un étroit dyke de Keel, au sud, jusqu'à une grande chambre magmatique stratifiée, au nord. La présence de structures granophyriques, les rapports élevés entre les éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ, et la cristallisation approfondie des orthopyroxènes en bordure de la série stratifiée indiquent que les roches gneissiques encaissantes ont contaminé les premiers magmas de la chambre. À en juger d'après les bordures des deux mégacycles inférieurs, la contamination a été sélective, l'échange chimique entre les magmas de Muskox et les paragneiss encaissants augmentant dans l'ordre suivant : éléments à forte intensité de champ, lanthanides lourds, lanthanides légers, U, Th, éléments lithophiles à grands rayons ioniques et éléments chalcophiles. Deux magmas hybrides distincts se sont formés simultanément en bordure de la chambre, l'un un basalte à hypersthène normatif produit par suite de la contamination du magma de Muskox, et l'autre, un magma basaltique ou andésitique riche en Al, produit par fusion métasomatique des paragneiss encaissants. Au cours de chaque mégacycle, ces magmas hybrides flottants ont migré à partir de la bordure pour former des couches de magma contaminé le long du toit de la chambre. Après que les cumulats eurent scellé les bordures, ces couches sont restées relativement isolées du magma sous-jacent de la chambre jusqu'au moment de la cristallisation du feldspath dans les deux mégacycles inférieurs. Toutefois, les rapports anormaux entre les éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ que l'on associe à la cristallisation approfondie des orthopyroxènes dans les mégacycles 3 et 4 indiquent que les épisodes de mélange secondaire se sont produits au fur et à mesure de la maturation de la chambre magmatique de Muskox.

SUMMARY

A meaningful evaluation of the role of crustal contamination in the genesis of continental volcanic suites requires an understanding of the chemical interaction between mafic magmas and continental crust. The contact between the Proterozoic Muskox intrusion and its gneissic country rocks is exposed over the entire stratigraphic depth of the intrusion, from a 200 m wide Keel dyke in the south to a layered magma chamber more than 5 km across in the north, offering an extraordinary opportunity to study the chemical interaction between picritic magmas and the upper crust. Norite (NOR) and gabbronorite (GBN) marginal rocks of the layered chamber contain granophyric intergrowths of quartz and potassium feldspar and are enriched in large-ion lithophile (LIL) elements and light rare-earth elements (LREE) compared to the gabbronorite (GBN) margins of the Keel dyke, despite the former's higher MgO content. These differences between the margins of the Keel dyke and the chamber of the Muskox intrusion indicate that the magmas of the chamber were assimilating their gneissic host rocks. The paragneiss host rocks along this contact have melted to produce rocks ranging from marble-textured migmatite to plagioclase porphyritic diorite.

The degree and character of contamination along the margin of the Muskox intrusion changes up section across the layered series. The width of the preserved contaminated norite and gabbronorite decreases upward within each of the first two megacycles of the Muskox intrusion and across the intrusion as a whole. The composition of contaminated norite and gabbronorite preserved in the margins of the lower two megacycles of the Muskox intrusion indicates that the contamination process was selective, with the extent of chemical exchange between the Muskox magma and its host paragneiss increasing in the order: high field-strength (HFS) elements, heavy rare-earth elements (HREE), LREE, U, Th, LIL elements, and chalcophile elements. In the upper two megacycles of the Muskox intrusion, neither contaminated magma nor melted country rock are well preserved along the contact and olivine cumulates lie in almost direct contact with a hornfels of the paragneiss. The lack of chilled margin and the proximity of picrite cumulates to the contact with paragneiss in the upper two megacycles require, however, that the magma of the intrusion was eroding its host paragneiss in bulk at this level in the intrusion.

Two distinct hybrid magmas were being simultaneously produced along the margin of the intrusion whose chemical compositions converged towards Fe-enrichment. One was a magnesian hypersthene-normative basalt (NOR) produced by the contamination of the parental magma of the intrusion and the other was a high-Al basalt to andesite (Pl-DIOR), produced by the metasomatic melting of the surrounding paragneiss. These lighter hybrid magmas were buoyant and rose from the margin to accumulated as segregated layers of magma along the roof of the magma chamber, now represented by the zoned granophyres of Megacycle #4, at the top of the Muskox intrusion.

SOMMAIRE

Afin de pouvoir procéder à une évaluation significative du rôle de la contamination crustale dans la genèse des séries volcaniques continentales, il faut comprendre l'interaction chimique qui se produit entre les magmas mafiques et la croûte continentale. Le contact de l'intrusion de Muskox du Protérozoïque et de ses roches encaissantes gneissiques affleure sur toute la profondeur stratigraphique de l'intrusion, à partir d'un dyke de Keel de 200 m de large, au sud, jusqu'à une chambre magmatique stratifiée de plus de 5 km de large, au nord, et offre donc une occasion extraordinaire d'étudier l'interaction chimique entre les magmas picritiques et la croûte supérieure. Les norites (NOR) et les gabbronorites (GBN) de la bordure de la chambre stratifiée contiennent des inclusions granophyriques de quartz et de feldspath potassique et sont riches en éléments lithophiles à grands rayons ioniques et en lanthanides légers, comparativement au gabbronorite (GBN) des bordures du dyke de Keel, et ce malgré la teneur plus élevée en MgO du premier. Ces différences entre la marge du dyke de Keel et celle de la chambre magmatique de l'intrusion de Muskox indiquent que les magmas de la chambre assimilaient leurs roches encaissantes gneissiques. Les paragneiss encaissants le long de ce contact ont fondu pour donner des roches dont la composition va d'une migmatite à texture marbrée à une diorite à phénocristaux de plagioclase.

Le niveau et la nature de la contamination en bordure de l'intrusion de Muskox varient vers le haut de la coupe en travers de la série stratifiée. La largeur de la norite et du gabbronorite contaminés conservés diminue vers le haut dans chacun des deux premiers mégacycles de l'intrusion de Muskox et en travers de l'ensemble de l'intrusion. La composition de la norite et du gabbronorite contaminés conservés dans les bordures des deux mégacycles inférieurs de l'intrusion de Muskox indique que la contamination a été sélective, l'échange chimique entre le magma de Muskox et les paragneiss encaissants augmentant dans l'ordre suivant : éléments à forte intensité de champ, lanthanides lourds, lanthanides légers, U, Th, éléments lithophiles à grands rayons ioniques et éléments chalcophiles. Dans les deux mégacycles supérieurs de l'intrusion de Muskox, ni le magma contaminé ni la roche encaissante fondue sont bien conservés le long du contact, et des cumulats d'olivine se trouvent presque directement en contact avec une cornéenne du paragneiss. Toutefois, l'absence de bordure figée et la proximité des cumulats de picrite au contact du paragneiss dans les deux mégacycles supérieurs indiquent que le magma de l'intrusion érodait fortement ses paragneiss encaissants à ce niveau de l'intrusion.

Deux magmas hybrides distincts se formaient simultanément en bordure de l'intrusion; leurs compositions chimiques convergeaient vers un enrichissement en Fe. Un de ces magmas, un basalte à hypersthène normatif (NOR), a été produit par suite de la contamination du magma parental de l'intrusion. L'autre, un magma basaltique ou andésitique riche en Al, a été produit par fusion métasomatique des paragneiss encaissants. Ces magmas hybrides flottants et légers ont migré de la bordure jusqu'au toit de la chambre magmatique où ils ont formé des couches ségrégées de magma; ils sont maintenant représentés par les granophyres zonés du mégacycle 4, au sommet de l'intrusion de Muskox.

Although granophyres are only preserved at the top of the Muskox intrusion, anomalous LIL/HFS element ratios in the first plagioclase cumulates of Megacycle #1, #2, and #3 indicate the presence of a segregated contaminated magma at the top of the chamber during each megacycle. Following the sealing of the margins with cumulates, however, the underlying magma of the chamber remained relatively isolated from this contaminated layer through the development of much of the dunite and olivine-clinopyroxenite layered series of the first two megacycles. Near the top of each of these megacycles, however, this isolation broke down with the appearance of plagioclase as a cumulate phase. The complete expulsion of these segregated batches of contaminated magma at the ends of the first two megacycles was probably responsible for the eruption of the contaminated lavas in the lower Coppermine River basalts. In Megacycles #3 and #4, however, spike-like anomalies in LIL/HFS element ratios associated with the appearance of olivine-websterite cumulate layers indicate the occurrence of episodic mixing between contaminated and pristine magma before the appearance of plagioclase as a cumulate phase.

The ratios of LIL/HFS elements are simple and effective indicators of upper-crustal contamination in the layered series of the Muskox intrusion, the Coppermine River basalts, and the Mackenzie dykes. Elevated LIL/HFS element ratios are commonly associated with elevated sulphide contents suggesting a connection between contamination and the development of sulphide mineralization throughout the intrusion. Nevertheless, sulphide mineralization is not always associated with elevated LIL/HFS element ratios and the magmas of Megacycle #1 in particular appear to have been anomalously rich in Fe, S, and PGE. This unit holds the greatest potential for hosting economic accumulations of sulphides.

Bien que les granophyres ne soient conservés qu'au sommet de l'intrusion de Muskox, les rapports anormaux entre les éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ dans les premiers cumulats à plagioclase des mégacycles 1, 2 et 3 indiquent qu'un magma contaminé ségrégé se trouvait au sommet de la chambre durant chaque mégacycle. Toutefois, après que les cumulats eurent scellé les bordures, le magma sous-jacent de la chambre est resté relativement isolé de cette couche contaminée en raison de la formation d'une grande partie de la série stratifiée à dunite et à olivine-clinopyroxénite des deux premiers mégacycles. Or, près du sommet de ces mégacycles, l'apparition de plagioclase sous la forme d'une phase à cumulats a mis fin à l'isolation. L'expulsion complète de ses masses ségrégées de magma contaminé à la fin des deux premiers mégacycles a vraisemblablement provoqué l'éruption de laves contaminées dans la partie inférieure des basaltes de Coppermine River. Toutefois, dans les mégacycles 3 et 4, les anomalies dans les rapports éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ forment des pics qui sont associés à l'apparition de couches à cumulats d'olivine et webstérite; ces anomalies indiquent qu'il y a eu mélange secondaire de magmas contaminés et non contaminés avant la formation de plagioclase sous la forme d'une phase à cumulats.

Les rapports éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ sont des indicateurs simples et efficaces de la contamination par la croûte supérieure des séries stratifiées de l'intrusion de Muskox, des basaltes de Coppermine River et des dykes de Mackenzie. Les rapports élevés entre les éléments lithophiles à grands rayons ioniques et les éléments à forte intensité de champ sont fréquemment associés à de fortes teneurs en sulfures, phénomène qui porte à croire qu'il existe un lien entre la contamination et la minéralisation sulfurée partout dans l'intrusion. Toutefois, la minéralisation sulfurée n'est pas toujours associée à des rapports élevés de ces éléments, et les magmas du mégacycle 1 notamment semblent avoir été anormalement riches en Fe, en S et en éléments du groupe du platine. Cette unité offre la meilleure possibilité de contenir des accumulations rentables de sulfures.

INTRODUCTION

The possibility of crustal contamination has long complicated attempts to use the chemistry of intra-continental magmatic suites as probes of their mantle source regions. The similarities between the chemical signatures of enriched mantle and probable crustal contaminants makes a unique interpretation and inversion of chemical data difficult (Marsh, 1989). The phenomena of crustal contamination in intra-plate magmas has most frequently been addressed by combined geochemical and isotopic studies of continental volcanic suites (Hawkesworth et al., 1988; Dewey and Cox, 1987; Mantovani and Hawkesworth, 1990; Thompson et al., 1986; Fodor et al., 1985; Carlson et al., 1981a, b). Two contrasting styles of crustal contamination have been documented in these studies. One style corresponds to the assimilation/fractional crystallization (AFC) model of DePaolo (1981) in which contamination is coupled with fractional crystallization and the degree of contamination increases in the more fractionated lavas (e.g., Parana flood basalts, Hawkesworth et al., 1988). In the other style, the more magnesian, least fractionated lavas show the greatest evidence of crustal contamination (e.g. Deccan flood basalts, Dewey and Cox, 1987) and the degree of contamination decreases in the more evolved lavas. In this case, the crystals which formed to provide the thermal energy required for the assimilation of country rock are thought not to have been removed from the magma, but are carried as phenocrysts in the erupted lava. Dewey and Cox (1987) have termed this style of contamination assimilation/equilibrium crystallization (AEC, although equilibrium is not required) and have proposed that the least fractionated, most magnesian magmas are the most contaminated because of their higher temperatures. The assimilation/fractional crystallization style of contamination is thought to occur in large crustal magma chambers where the assimilation of country rock is accompanied by the fractionation of cumulates during crystallization. In contrast, the assimilation/equilibrium crystallization style of contamination is thought to occur in crustal conduits as magmas rise to the surface (Dewey and Cox, 1987; Dicken et al., 1987; Huppert and Sparks, 1985). Despite the relative success of these studies, the unique inversion of volcanic compositional data into the physical parameters of the contamination process remains a treacherous endeavour because of the assumptions required about both the compositions of possible contaminants and the actual mechanisms of the contamination process.

Recent studies of crustal contamination in large crustal magma chambers have concentrated on the isotopic variations in their layered-series rocks. Despite the facts that the Earth's major layered intrusions displace large volumes of continental crust and that the estimated compositions of their parental magmas represent the most siliceous basaltic magmas on the Earth, the amount of contamination estimated from isotopic studies of layered series rocks is typically small. Studies by DePaolo and Stewart (DePaolo, 1985; Stewart and DePaolo, 1990a) have shown that the Sr and Nd isotopic variations in the layer series rocks of the Kiglapait and Skaergaard intrusions suggest only relatively small amounts of crustal contamination (on the order of 2-4 wt.%) largely restricted to the lower portions of both intrusions. In the case of the Muskox intrusion, Irvine's (1970, 1977) original proposals, that both the upward advance in the crystallization of orthopyroxene in pyroxenite cumulate assemblages and the formation of chromite-bearing 'reef' horizons reflect crustal contamination, have been challenged by the results of a Sr and Nd isotope study (Stewart and DePaolo, 1988, 1990b) which detects little evidence for crustal contamination across the stratigraphy of the Muskox intrusion until just below the granophyre at the top of the intrusion (Stewart and DePaolo, 1992). These authors propose that the evidence of contamination cited by Irvine can be explained by mixing between new batches of primitive magma and isotopically identical residual magma derived from earlier batches by closed-system crystal fractionation.

In contrast to the evidence in layered-series rocks, the more complicated marginal rocks of layered intrusions, such as the Skaergaard and Bushveld, show obvious signs of contamination in the form of visible crustal inclusions, anomalous geochemistry, and disturbed isotopic ratios (Sharpe, 1981; Hoover, 1989a, b; Stewart and DePaolo, 1990a). The significance of these observations is supported by recent theoretical models (Huppert and Sparks, 1989, 1988) which have shown that primitive magmas are capable of actively assimilating both their own chilled margins and the enclosing host rocks if the magma adjacent to the country rock is actively convecting.

This paper presents the results of a study of the upper crustal interaction between picritic to basaltic magmas and enclosing paragneiss in the marginal rocks of the Muskox layered intrusion in the Northwest Territories. A comparison of the margin rocks of the Keel dyke of the intrusion with those of the main chamber indicates that the primitive magmas of the main chamber were actively assimilating their country rocks. A comparison of the margins of successive megacyclic units in the main body of the intrusion suggests that the extent of this assimilation increased upwards in the intrusion. The chemical signature of contamination established in the Muskox marginal rocks provides a simple criteria for the evaluation of both the mechanisms and the importance of crustal contamination in the layered series of the Muskox intrusion and in the associated Coppermine River continental basalts.

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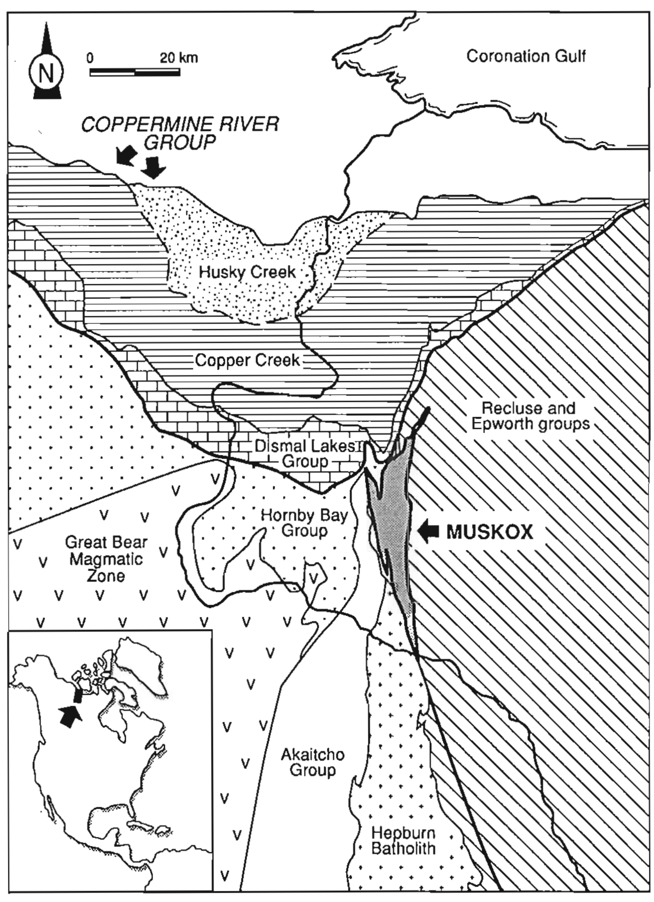

Figure 1. *Location map showing the spatial relationship between the Muskox intrusion and the formations of the middle Proterozoic Coppermine River Group, Copper Creek, and Husky Creek, along with elements of the Wopmay orogen.*

And finally, I would like to thank my field assistants: Stefano Salvi, Sébastien Desrochers, Anne Charland, and Abigail Francis.

GEOLOGICAL SETTING

The Muskox intrusion is part of the late Proterozoic Coppermine River-Mackenzie-Muskox magmatic system located south of Coronation Gulf in the District of Mackenzie, Northwest Territories (Fig. 1). The spatial relationship (Smith et al., 1966; Baragar and Donaldson, 1973) and synchroneity (ca. 1270 Ma, LeCheminant and Heaman, 1989) of the Coppermine River continental basalts, the Mackenzie dyke swarm, and the Muskox layered intrusion suggest that these three are co-magmatic elements of a Proterozoic continental magmatic system.

The stratigraphic relationship between the Coppermine River lavas and the Muskox intrusion indicates that the intrusion was emplaced in the upper crust and reached to within a few hundred metres of the surface (and perhaps breached the surface to the north). The Muskox intrusion cuts the early Proterozoic Wopmay orogen (1900 Ma), separating the paragneiss-dominated rocks of the Asiak fold and thrust belt on the east (Fig. 1) from the granitic and volcanic rocks of the Hepburn and Great Bear magmatic zones on the west (Hoffman, 1984). The position of the intrusion may represent a major crustal suture, at the western limit of the Archean continental basement of the Slave province to the east, through which the Coppermine River continental basalts erupted. The northward plunge of the intrusion and a large gravity anomaly indicate that the main mass of the Muskox intrusion lies under the Coronation Gulf to the north. The origin of the Coppermine River-Mackenzie-Muskox magmatic event is now a matter of active debate, with hypotheses ranging from meteorite impact to a recent proposal by LeCheminant and Heaman (1989) that it represents the surfacing of a mantle plume centred under the Coronation Gulf.

STRUCTURE AND STRATIGRAPHY OF THE MUSKOX INTRUSION

The north-plunging structural attitude of the Muskox intrusion (Smith et al., 1966) presents a continuous stratigraphic section of the contact between paragneiss country rocks and magmas of the intrusion from a narrow Keel dyke in the south to a large layered intrusion in the North (Fig. 2). South of the Coppermine River, the Muskox intrusion consists of a zoned dyke approximately 200 m in width which

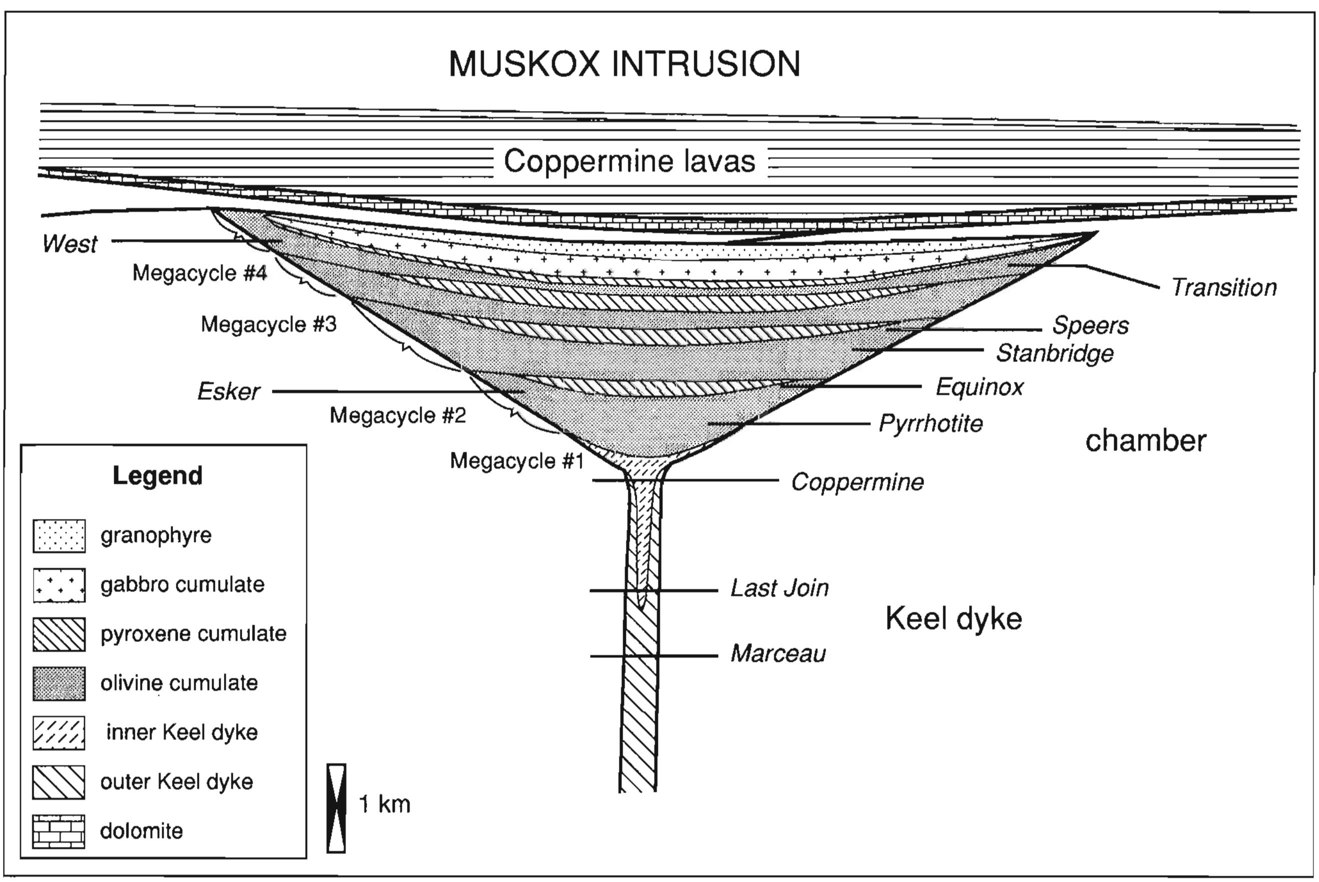

Figure 2. Schematic cross-section of the Muskox intrusion showing the locations of sampled sections with respect to the two intrusive phases of the Keel dyke and the four megacycles of the magma chamber.

has vertical contacts with its host paragneiss. The Keel dyke of the Muskox intrusion both cuts and is cut by subparallel narrower dykes of the Mackenzie dyke swarm (Smith et al., 1966). The Keel dyke structurally underlies the main body of the Muskox intrusion and probably represents a lateral southward injection from the main conduit system which fed the intrusion in the north. North of the Coppermine River, the intrusion opens into a funnel-shaped magma chamber consisting of layered cumulates, which reaches more than 5 km in width at its northernmost exposure. Along the margins of the magma chamber, the contact with the enclosing paragneiss has an average slope of ~30°.

The layered series of the magma chamber of the Muskox intrusion can be divided into four megacycles. The first three are easily recognized on the basis of the mapping by Smith et al. (1966) (Fig. 2, 3). Each of these first three megacycles begins with a thick olivine cumulate which becomes interbedded with cyclic pyroxenite layers up-section. In Megacycles #1 and #2, the pyroxenite layers grade from olivine clinopyroxenite at their base to clinopyroxenite at their top and the first gabbroic cumulates are troctolitic. The crystallization sequence is olivine followed by clinopyroxene, plagioclase, and finally orthopyroxene (Irvine, 1970). Both the whole rock and mineral Mg nos. ($Mg/(Mg+Fe^{2+})$) of pyroxenite layers increase up-section across Megacycle #1 to the maximum values in Megacycle #2 (Fig. 4). Within individual pyroxenite layers of Megacycle #2, Mg Nos. decrease up-section, but the maximum Mg nos. at the base of successive pyroxenite layers remains constant.

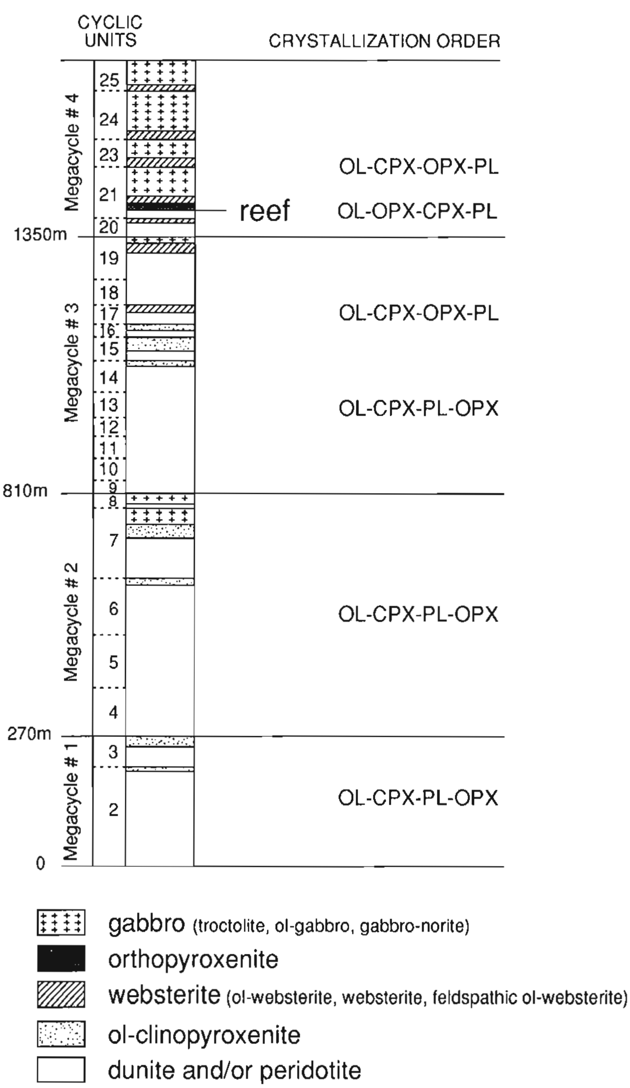

__Figure 3.__ Stratigraphic column of the Muskox intrusion showing the correlation between megacycles defined in this paper and the cyclic layer numbering scheme of Irving (1970). Adapted from DesRoches (1992).

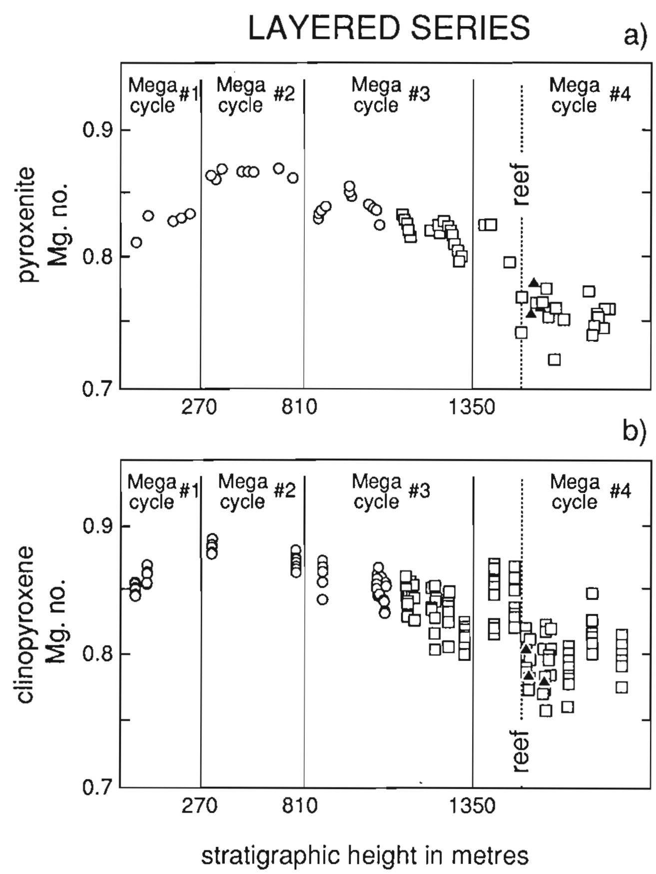

__Figure 4.__ The variation of Mg no. (Mg/(Mg+Fe)) for whole rock __a)__ and clinopyroxene __b)__ in pyroxenite layers across the stratigraphy of the layered series of the Muskox intrusion, adapted from DesRoches (1992). For ease of comparison, the sequences of olivine cumulates have been removed from the section, thus the metre scale of the X-axis is not continuous between megacycles and does not reflect true stratigraphic position within the intrusion as a whole. The metre scale is however, constant within the pyroxenite- bearing sequences of individual megacycles and an accurate reflection of relative stratigraphic position. Symbols: open circle – olivine clinopyroxenite cumulates; open square – websterite cumulates; solid triangle – orthopyroxenite cumulates.

Across Megacycle #3, there is a progressive up-section decrease in both the maximum Mg nos. at the base of successive pyroxenite layers and of Mg nos. across individual pyroxenite layers. As originally documented by Irvine (1970), there is a change in the inferred crystallization sequence up-section in the Muskox intrusion. In Megacycle #3, the first clinopyroxenite layers are succeeded abruptly by websterite layers as orthopyroxene becomes the third and then the second phase to crystallize (Fig. 2, 3). The work of DesRoches (1992) has established that the base of each of these websterite layers corresponds to a spike in the normative proportion of orthopyroxene (Fig. 5), which decreases with olivine up-section across individual websterite layers. Although the tops of these websterite layers have low normative orthopyroxene contents, similar to those of the clinopyroxenite units in Megacycles #1, #2, and the lower part of Megacycle #3, the orthopyroxene they contain occurs as large (>2 cm) megacrysts rather than the intercumulus oikocrysts which characterize the lower clinopyroxene layers.

Megacycle #4 differs from the first three megacycles in being dominated by three-pyroxene gabbroic cumulates in contrast to the troctolitic character of the minor gabbros of the lower two megacycles. The position of the boundary between Megacycles #3 and #4 is somewhat interpretative, but is here taken to lie between the top of the gabbroic layer in Megacycle #3 and the base of the peridotite unit containing an anomalous thin pyroxenite layer, which is characterized by elevated Mg nos. in the chemical stratigraphy of both the whole rock and mineral compositions of the Muskox clinopyroxenite layers (Fig. 4). The presence of orthopyroxene inclusions in clinopyroxene indicates that orthopyroxene became the second phase to crystallize after olivine in the lower pyroxenite units of Megacycle #4, which have higher average orthopyroxene contents than the pyroxenites of the lower megacycles. A 'reef-type' pegmatite layer with associated chromitite seams preceeds the gabbros of Megacycle #4 and is associated with a large increase in orthopyroxene content (Fig. 5). The presence of clinopyroxene inclusions in orthopyroxene suggests that clinopyroxene returned as the second phase to crystallize after olivine in some of the picritic websterite layers within the overlying gabbros of Megacycle #4 of the Muskox intrusion. Irvine (1970) attributed the prominence of orthopyroxene and the development of chromitite horizons in the upper portion of the Muskox intrusion to the progressive contamination of the Muskox parental magma by granophyric melt developed along the roof of the intrusion.

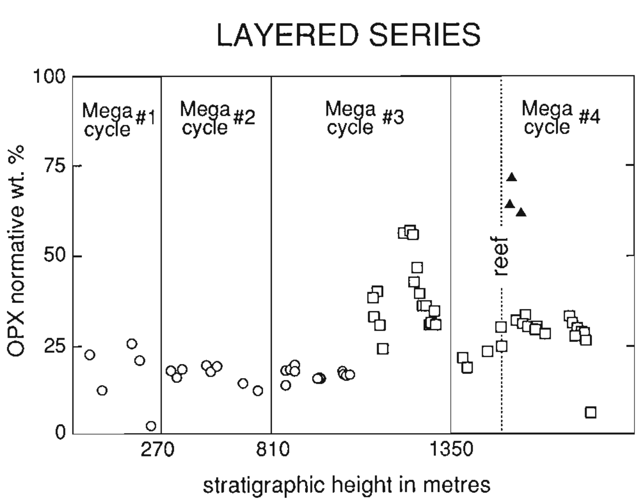

Figure 5. Normative proportion of orthopyroxene in pyroxenite cumulate layers across the stratigraphy of the layered series of the Muskox intrusion, adapted from DesRoches (1992) with symbols as in Figure 4.

MARGINAL ROCKS OF THE MUSKOX INTRUSION

In the following presentation, rock lithologies are defined on the basis of their normative mineralogy calculated in oxygen units from the bulk rock chemical composition in the manner described in Figure 6. This nomenclature differs somewhat from the standard IUGS classification in order to maintain consistency with previous studies and to reflect the natural distribution in the mineralogy of the marginal rocks.

Keel dyke

The Keel dyke extending south of the Coppermine River from the Muskox intrusion is thought to represent the lateral extension of a dyke (Fig. 2) beneath the intrusion (Smith et al., 1966) formed by the southward injection of magma from the main feeder system located to the north of the presently exposed portion of the Muskox intrusion. The dyke is bordered on both sides by a homogenous chilled margin (~ 20 m) of fine grained (0.2 mm) gabbronorite (GBN) comprised of subophitic intergrowths of granular clinopyroxene grains and euhedral laths of plagioclase with interstitial skeletal opaques, anhedral quartz, and minor biotite. Plumose quench-textured pyroxenes locally characterize the outermost contact. Towards the centre of the intrusion, this homogeneous margin gives way to a 50 m wide heterogeneous zone of magmatic breccia consisting of rounded autoliths of gabbronorite reaching one metre in size in a gabbronorite igneous matrix. This transition is associated with the first appearance of euhedral to rounded olivine grains (1 mm) and larger (5 mm) tabular crystals of orthopyroxene which poikilitically enclose laths of plagioclase. There is, however, a complex variety of grain sizes, textures, and proportions of olivine and orthopyroxene in this magmatic breccia zone, indicative of multiple magmatic injections containing numerous texturally-different fragment types. In places, stellate clusters of plagioclase laths in oikocrystic orthopyroxene suggest rapid or disequilibrium crystallization. Despite the heterogeneous nature of this magmatic breccia, there is a systematic inward increase in the proportion of olivine in the magmatic matrix across this zone and the dominant lithology becomes olivine gabbronorite (Ol-GBN). There is a concomitant textural change in orthopyroxene, which becomes increasingly anhedral and oikocrystic, enclosing rounded crystals of olivine and anhedral clinopyroxene in addition to euhedral laths of plagioclase. The contact to an inner olivine-rich picrite (PIC) zone is marked by a rapid increase in the abundance of olivine which is recognized in the field by the development of a distinct reddish-brown weathering colour. This rock is comprised of

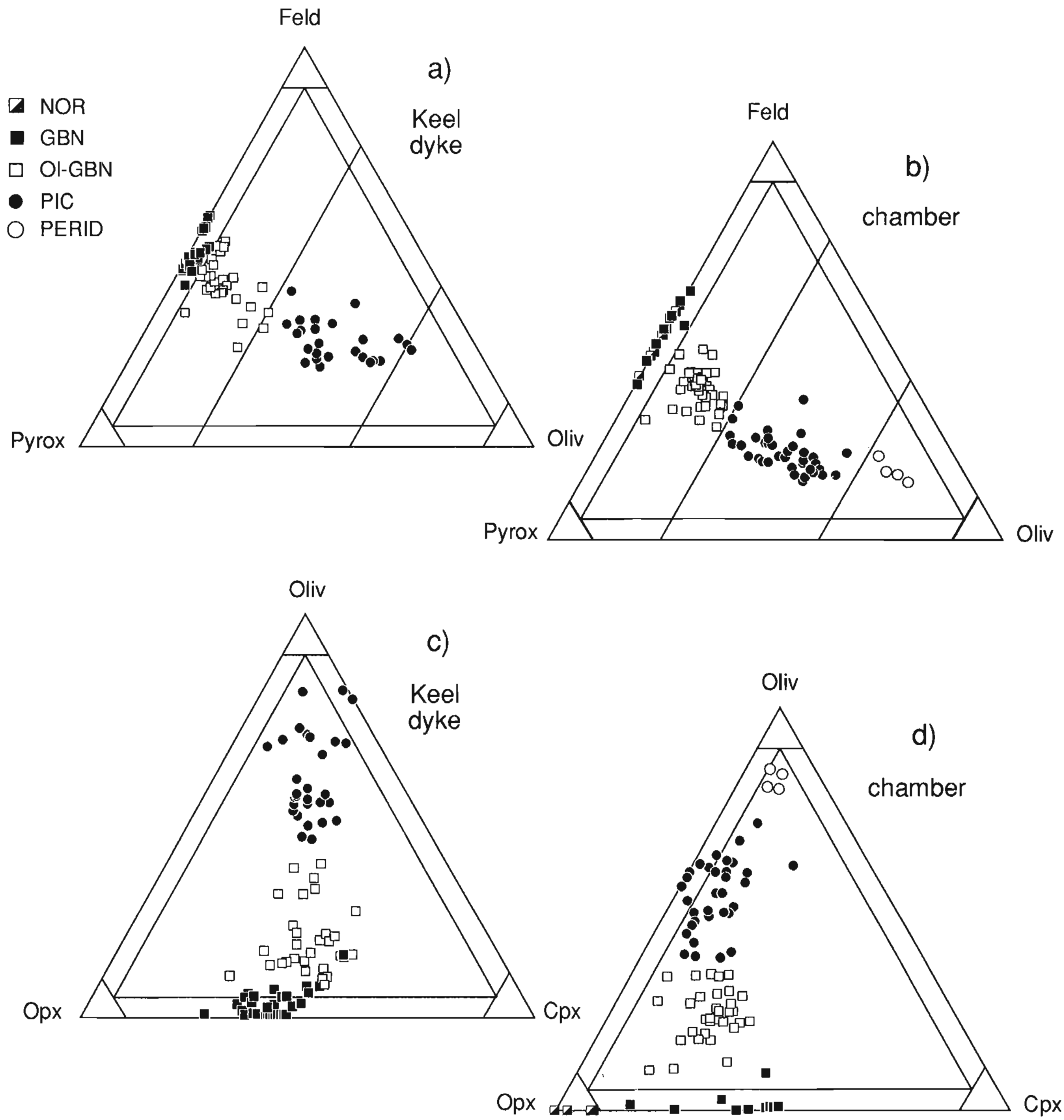

Figure 6. *Normative mineralogy classification of the marginal rocks of the Keel dyke* ***(a,c)*** *and chamber* ***(b,d)*** *of the Muskox intrusion calculated in oxygen units from their bulk rock compositions. The ratio of* Fe^{3+}/Fe *total was adjusted so that the normative olivine forsterite content matched the olivine compositions analyzed by electron microprobe in the olivine-rich rocks. The value of this ratio was taken as 0.0 for rocks from the Keel dyke and 0.10 for the marginal rocks of the magma chamber. Norite (NOR, half-filled square) contains less than 10% clinopyroxene and no olivine, gabbronorite (GBN, solid square) contains less than 5% olivine, olivine gabbronorite (Ol-GBN, open square) has between 5 and 25% olivine, picrite (PIC, solid circle) has between 25 and 60% normative olivine, and feldspathic peridotite (PERID, open circle) has more than 60% olivine.*

closely-packed subhedral to rounded olivine (1 mm) and anhedral clinopyroxene (1 mm) with larger (up to >1 cm) orthopyroxene oikocrysts which contain inclusions of plagioclase laths and rounded olivine. In the southern portion of the Keel dyke (Marceau section, Fig. 2), this picrite zone constitutes the central core of the dyke. Towards the north, however, a central zone of olivine-gabbronorite appears, the margins of which are finer grained than the rocks of the adjacent picrite zones (Last Join section, Fig. 2). The sharpness of the inner olivine gabbronorite-picrite contacts and the finer grained nature of the inner olivine gabbronorite suggests that it is intrusive into the enclosing picrite zones. This central olivine gabbronorite zone is also a heterogeneous magmatic breccia containing abundant autoliths. Despite its heterogeneous nature, the dominant lithology is olivine gabbronorite consisting of euhedral crystals of olivine and subhedral crystals of clinopyroxene in a matrix of plagioclase laths and oikocrystic orthopyroxene. North of the Coppermine River, the central zone of olivine gabbronorite develops its own picrite core (Coppermine River #1 section, Fig. 2) which swells towards the appearance of a magmatic breccia zone consisting football-shaped picritic fragments (Fig. A-4) which underlies the first peridotite and dunite cumulates of the layered series. The outer picrite zones are absent at this level, apparently replaced by the southward encroachment of the olivine gabbronorite of the central zone.

The dominant country rock of the Muskox Keel dyke is a finely laminated paragneiss consisting of interlocking, but granular crystals (0.4 mm) of quartz and sericitized orthoclase, and preferentially-oriented muscovite and phlogopite which are concentrated into alternating phlogopite-rich and phlogopite-poor laminae on a centimetre-scale. Within one metre of the Keel dyke, the paragneiss is converted to an isotropic hornfels which has been remobilized at the contact, and is continuous with narrow felsite veins cutting the gabbronorite chilled margin of the Keel dyke. In the outermost veins, quartz and feldspar retain the granular shape which characterizes the hornfels, but further into the Keel dyke they take on an igneous texture characterized by the presence of granophyric intergrowths of quartz and potassium feldspar, disseminated sulphides, and bladed opaques.

Sulphides within the Keel dyke are relatively sparse and tend to occur as disseminated grains in infrequent gabbronorite and olivine gabbronorite fragments, which seem to occur preferentially along both contacts of the magmatic breccia zones, and in the veins of melted country rock which cut the gabbronorite chilled margin of the intrusion. The dominate sulphide in the gabbronorite fragments is pyrrhotite, but chalcopyrite is noticeably more abundant in the veins of melted country rock.

Chamber

The marginal rocks of the chamber also exhibit a systematic evolution up-section in the Muskox intrusion. In Megacycle #1, the outermost zone of the Pyrrhotite Lake section (Fig. 2) consists of norite (NOR) which displays plumose arborescent orthopyroxene at the contact with the host rocks of the intrusion. Towards the centre of the intrusion, the grain size of the orthopyroxene in the norite becomes more equant and plagioclase becomes successively euhedral laths with high aspect ratios and then subhedral and more equant, and is typically partially replaced by fine grained sericite. Large anhedral grains of fresh sanidine partially enclose, but do not replace the euhedral crystals of plagioclase and orthopyroxene, and granophyric intergrowths of sanidine and quartz are common. Phlogopite occurs as late interstitial single-crystal patches, commonly preferentially enclosing sulphide grains.

The proportion of clinopyroxene increases across the norite zone until an abrupt change to olivine gabbronorite with the appearance of olivine, after which the proportion of clinopyroxene decreases inwards. The olivine of the olivine gabbronorite zone occurs as isolated (0.5 mm) euhedral to rounded, 'rain drop'-like grains enclosed in a matrix of much coarser (>2 mm) subhedral plagioclase and to a lesser extent clinopyroxene and orthopyroxene. The granophyric intergrowths of quartz and sanidine, which characterize the outer norite margin, are absent in the olivine gabbronorite zone. With an increasing proportion of olivine, the pyroxenes become increasingly oikocrystic and the olivine gabbronorite grades to picrite and then feldspathic peridotite (PERID) towards the centre of the intrusion.

The marginal zonation described above telescopes towards the contact as one rises stratigraphically along the contact within Megacycle #1, with the width of the granophyre-bearing outermost margin decreasing from 4 m of norite in the Pyrrhotite Lake section to 0.5 m of gabbronorite at the level of the Equinox section (Fig. 2), in which clinopyroxene is present as well as orthopyroxene. Despite this overall trend, local variations exist, such as the 7 m thick lens of granophyre-bearing gabbronorite along the western margin of Megacycle #1 in the Esker section (Fig. 2). The upwards telescoping of the zonation in the marginal rocks is repeated in Megacycle #2, with the width of the norite zone decreasing from 3 m in the Stanbridge section to less than 0.4 m at the level of the Speers Lake section. The norite zone has not been observed along the margins of Megacycles #3 and #4 (although this may reflect a paucity of both outcrop and drill holes across the margins of the Muskox intrusion at these stratigraphic levels). In the few places where the contact can almost be observed, picrite appears to be in almost direct contact with country rock migmatite.

The country rocks of the chamber of the Muskox intrusion range from orthogneiss in the vicinity of the Coppermine sections (Fig. 2) to a paragneiss further north, in the vicinity of the Pyrrhotite Lake and Equinox sections. The paragneiss is more thickly laminated than that which hosts the Keel dyke to the south and contains locally-abundant lenses of granite. Compared to the paragneiss, the orthogneiss is coarser grained (1 mm), enriched in plagioclase at the expense of quartz, and contains prismatic orthopyroxene and clinopyroxene as mafic minerals in addition to phlogopite. Within approximately 4 m of the contact with the Muskox intrusion, these gneisses are recrystallized and take on a marbled migmatitic texture in outcrop. In thin section, this transition corresponds to the conversion of orthoclase to sanidine and the segregation of the rock into patchy felsic zones clouded by fine granular spinel and zones rich in phlogopite. Within 2 m of the contact, granophyric intergrowths of quartz and sanidine become abundant and are concentrated into knots separated by phlogopite-rich seams. Euhedral laths (ranging to >1 cm) of plagioclase appear in these granophyric knots as the rock is transformed to a plagioclase porphyroblastic migmatite. Within one metre of the contact, the migmatite locally homogenizes, apparently completely melting to produce a plagioclase porphyritic diorite (Pl-DIOR) characterized by euhedral plagioclase phenocrysts with large aspect ratios (to >2 cm in size) and small (0.2 mm) euhedral orthopyroxene enclosed in a matrix of coarser grained (1 mm) euhedral plagioclase, anhedral sanidine, interstitial patches of single-crystals of phlogopite, granophyric intergrowths of sanidine and quartz, and irregular grains of sulphide. In places, the contact between the intrusion and the plagioclase diorite is lined with coarse pegmatitic plagioclase.

Many of the marginal rocks of the magma chamber, the plagioclase porphyry, and migmatized rocks of the enclosing paragneiss contain abundant blebs and pockets of massive sulphide consisting dominantly of pyrrhotite. Sulphide mineralization is noticeably more abundant in the margins of Megacycle #1 than in the succeeding megacycles and a massive sulphide lens near the Equinox section (Fig. 2), which is rich in chalcopyrite, contains disseminated rounded olivine grains suggesting it represents an immiscible sulphide melt. In contrast to the outer margin of the intrusion, however, the sulphide contents of the picrite and feldspathic peridotite zones are typically very low.

GEOCHEMISTRY OF THE MARGINAL ROCKS

Keel dyke

The lithological zoning across the Keel dyke is well reflected in its chemistry (Fig. 7a, b). The compositions of the fine grained gabbronorite margins are relatively constant in composition over a distance of 20 m into the Keel dyke, with an MgO content of approximately 7 wt.% MgO (Table 1). With the appearance of olivine and magmatic breccia, the MgO content of the gabbronorite margin jumps to 10 wt.% and then rises with Ca across the magmatic breccia zone as the rock grades to olivine gabbronorite. At the transition to picrite, Mg rises over a short distance to a maximum value of approximately 25 wt.% MgO. The asymmetry in the Mg profile across the picrite units in the Last Join section (Fig. 7b) supports the textural evidence suggesting that the inner olivine gabbronorite was intruded into the picrite zones. The Ca-rich compositions (reaching 13 wt. %) of the margins of the inner olivine gabbronorite zone against picrite, however, suggest that the inner olivine gabbronorite has accumulated clinopyroxene and does not represent a chilled liquid composition. The asymmetric spike in the variation of Mg content with distance into the intrusion in Coppermine #1 and #2 sections (Fig. 8) also suggests the existence of an interior intrusive contact produced by erosion associated with the injection of a new magma batch. A correlation of this inner intrusive contact with the inner olivine gabbronorite of the Last Join section suggests a southward encroachment of the inner intrusive phase on the outer margin and is evidence that the magma responsible for the inner olivine gabbronorite assimilated part of the initial outer margin of the intrusion.

The variation in the concentrations of compatible elements such as Ni and Cr across the Keel dyke closely follow that of Mg (Fig. 7, 8). The concentration of both high field strength (HFS) and large ion lithophile (LIL) incompatible elements decrease rapidly with increasing Mg (see Fig. 14, below) from the outer gabbronorite margin to the olivine gabbronorite of the magmatic breccia zone, but remain essentially constant with increasing Mg from olivine gabbronorite to the most olivine-rich picrite samples. At equivalent Mg contents, the gabbronorite samples of the outer magmatic breccia zone of the Keel dyke have contents of both compatible and incompatible elements which are similar to those of the chilled margin of the Coppermine #1 section, but the Coppermine #1 gabbronorites correspond to a population

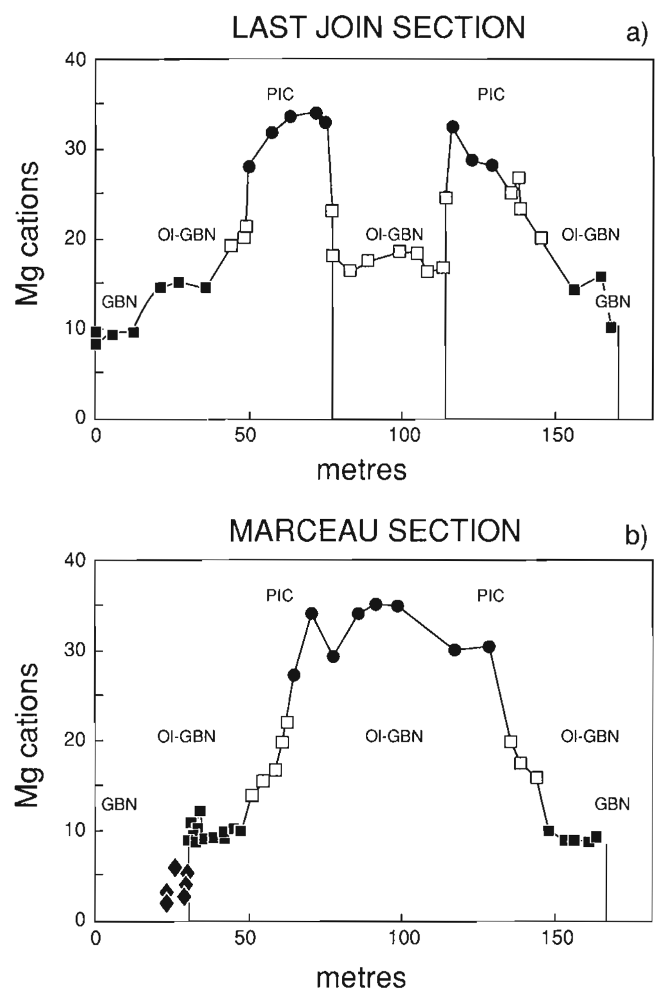

***Figure 7.** The variation of Mg in cation units across the **a)** Marceau and **b)** Last Join sections through the Keel dyke of the Muskox intrusion. Note the constant Mg values of the gabbronorite chilled margin and the asymmetry of the Mg profile across each of the two picrite units in the Last Join section. Symbols as in Figure 6, and solid diamonds – paragneiss.*

minimum in the samples of the Keel dyke, located between the compositions of samples of the homogeneous outer zone and those of the magmatic breccia zone.

The chemical compositions of gabbronorite to olivine grabbronorite samples across both the Marceau and Last Join sections define a line which has: 1) a slope required by the stoichiometry of clinopyroxene, and 2) a non zero intercept in a (Mg + Fe)/Ti versus Si/Ti Pearce plot (Fig. 9a). Although Ti is not strictly a conserved element because it enters clinopyroxene, the bulk partition for Ti is low and Ti behaves as a relatively incompatible element until the appearance of an oxide phase. Essentially equivalent stoichiometric conclusions are obtained if either Zr or K are used as conserved elements, but Ti is used to allow comparisons with the marginal rocks of the chamber of the Muskox intrusion, where contamination by the K- and Zr-rich paragneiss host rocks appears to have occurred. The inner olivine gabbronorite zone samples of the Last Join section lie at the clinopyroxene-rich end of the clinopyroxene stoichiometric line defined by the outer gabbronorite and olivine gabbronorite samples. Samples of the most magnesian olivine gabbronorite and the picrite zone scatter towards the (Mg + Fe)-rich side of this line, but despite their olivine-rich nature, they do not define a clear linear trend which can be explained by the addition or subtraction of olivine alone. The more magnesian gabbronorite chilled margins of the Coppermine River #1 section appear to fall along the clinopyroxene line defined by the Marceau and Last Join sections.

The cores of the first olivines in the gabbronorite margin of the Keel dyke have the lowest Mg (max. Fo73) and are extensively zoned to relatively Fe-rich compositions. The composition of olivine becomes both more magnesian and more homogeneous as its modal abundance increases inwards

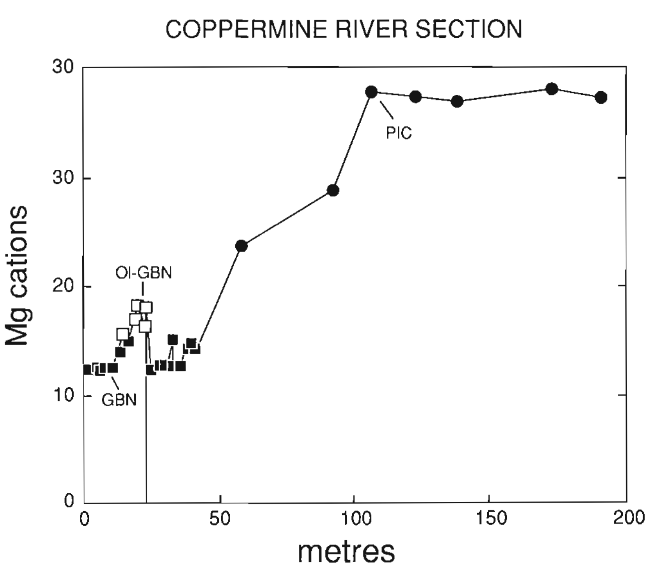

Figure 8. The variation of Mg in cation units across the Coppermine River #1 section where the Muskox Keel dyke joins the main chamber of the intrusion. The vertical line represents a probable internal intrusive contact. Symbols as in Figure 6.

Table 1. Average compositions of marginal rocks of the Muskox intrusion.

	MacKenzie Dyke	Keel Dyke GBN	Coppermine GBN	Chamber NOR	Migmatite	Para-Gneiss
Major Elements in wt%						
No.:	8	40	5	7	8	10
SiO_2	51.24	51.81	50.96	52.01	54.53	61.53
TiO_2	1.51	1.50	0.90	1.02	0.72	0.80
Al_2O_3	13.25	13.94	13.44	13.59	18.01	17.36
MgO	7.98	8.04	9.47	9.91	4.76	3.21
FeO	11.03	10.65	10.27	12.40	10.86	7.31
MnO	0.18	0.17	0.18	0.18	0.15	0.10
CaO	9.75	10.44	11.75	4.94	2.16	0.51
Na_2O	1.88	1.58	1.50	0.65	1.49	1.29
K_2O	1.06	0.98	0.63	2.36	3.36	4.53
P_2O_5	0.14	0.14	0.07	0.09	0.12	0.10
LOI	1.45	0.35	0.08	1.98	2.84	2.64
Total	99.47	99.62	99.26	99.13	99.00	99.38
Cations normalized to 100 cations						
Si	48.88	48.86	47.76	50.14	53.36	60.03
Ti	1.09	1.07	0.63	0.74	0.53	0.59
Al	14.90	15.49	14.85	15.44	20.78	19.96
Mg	11.34	11.30	13.24	14.24	6.95	4.68
Fe	8.80	8.40	8.05	1.00	8.89	5.97
Mn	0.14	0.14	0.14	0.15	0.12	0.08
Ca	9.97	10.55	11.80	5.10	2.26	0.53
Na	3.48	2.89	2.73	1.22	2.83	2.45
K	1.29	1.18	0.76	2.91	4.20	5.64
P	0.11	0.12	0.06	0.07	0.11	0.08
O	155.20	155.81	154.16	156.64	160.91	166.68
Trace Elements in ppm						
Rb	28.0	28.2	19.0	93.0	129.3	167.6
Sr	246.1	240.6	155.8	123.7	265.5	87.0
Ba	355.0	269.8	160.8	296.4	575.5	732.2
Sc	31.9	29.3	43.6	32.5	19.2	20.5
Y	19.8	18.2	14.4	15.1	15.0	23.4
Zr	103.0	106.6	53.8	67.7	124.3	175.3
Nb	9.1	9.1	5.6	6.7	10.9	15.0
Hf	3.9	4.3	2.1	2.5	3.7	5.3
Ta	0.9	0.7	0.4	0.5	0.9	1.3
V	294.9	273.7	256.0	253.3	120.5	109.6
Cr	284.7	380.3	585.4	798.6	161.6	110.6
Ni	130.0	157.8	213.6	633.4	860.4	71.3
Cu	169.4	234.3	144.0	527.7	882.4	239.4
Pb	7.5	13.0	9.4	28.7	45.5	72.5
Zn	74.8	83.4	60.4	97.4	111.7	362.4
S	336.8	408.6	751.8	8204.0	20050.0	587.7
U	1.0	0.9	0.4	0.9	2.2	3.1
Th	4.4	3.7	1.4	4.3	10.6	17.5
Rare Earth Elements in ppm						
La	16.90	19.00	7.56	14.14	34.59	52.42
Ce	36.20	39.10	19.04	31.57	67.88	104.70
Nd	21.70	22.35	10.54	16.00	25.69	41.40
Sm	4.96	5.25	2.63	3.43	4.69	7.72
Eu	1.46	1.50	0.88	0.94	1.14	1.51
Tb	0.00	0.82	0.52	0.52	0.67	0.95
Ho	1.10	1.30	0.61	0.68	0.84	1.31
Yb	2.30	2.40	1.87	1.89	2.28	3.47
Lu	0.39	0.38	0.30	0.30	0.36	0.54

The major elements, Ba, Cr, Ni, and V were analyzed by XRF on a Phillips P1400 by Tariq Ahmedali at McGill University on fused disks using an α-coefficient technique. The analytical precisions (1 S.D. in wt%) calculated from 20 replicate analyses on one disc for these elements are: Si 0.05, Ti 0.003, Al 0.03, Mg 0.058, Fe 0.01, Ca 0.01, Na 0.06 K 0.001, and P 0.004. The analytical precisions for Ba, Cr, Ni, and V are estimated to be 5%. Rb, Sr, Y, Nb, Pb, Cu and Zn were also analyzed by XRF on pressed pellets using a Rh Kb Compton scatter matrix correction. The analytical precisions for these elements are estimated to be less than 5%. REE, Sc, Ta, Hf, U, and Th were analyzed by INAA by Gilles Gauthier at the Université de Montréal. The samples were irradiated in a flux of 10^{12}n/cm^2/s for 4 hours in a SLOWEPOKE II reactor and counted over a 6-week period on two Ge detectors with resolutions of 0.6 and 1.2 respectively, at 122 KeV. The analytical precisions for La, Sm, Eu, Yb, and Sc are estimated to be less than 5%, while the precisions on the other elements range between 5 and 10%.

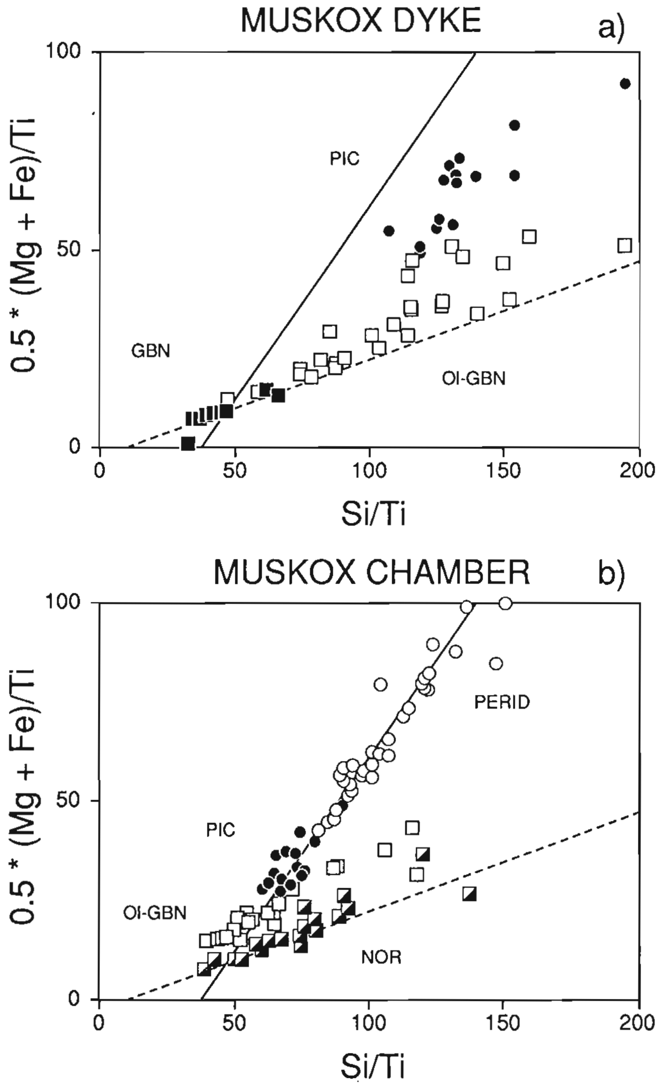

Figure 9. *Pearce plot of the marginal rocks of **a)** the Keel dyke, and **b)** the magma chamber. The dashed and solid lines represent clinopyroxene and olivine stoichiometric lines, respectively. Symbols as in Figure 6.*

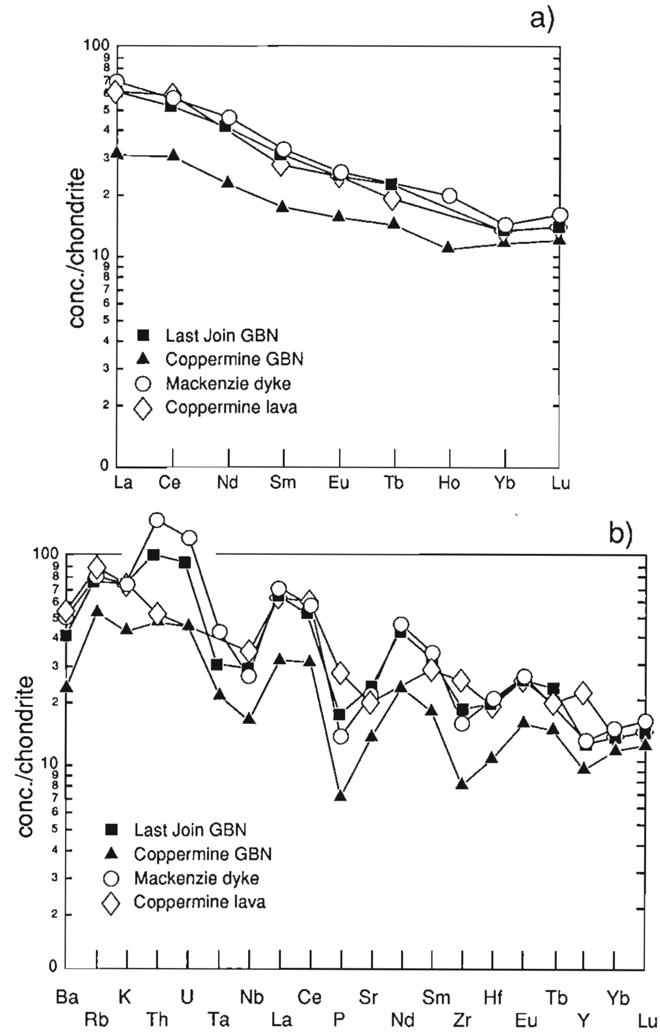

Figure 10. ***a)*** *Rare-earth element and **b)** extended trace element spider diagrams comparing GBN margin LJ-4 of the Keel dyke in the Last Join section (solid square), the average of GBN margins in the Coppermine sections (solid triangle), an average of associated Mackenzie dykes (open circle), and an average of uncontaminated Coppermine River basalts (open diamond, Dostal, Baragar, and Dupuy, 1983). Chondrite normalization values taken from McDonough and Frey (1990).*

into the Keel dyke reaching a composition of Fo_{77} in the olivine gabbronorite. The maximum measured forsterite content of olivine in the picrite zone in the Keel dyke is Fo_{83}, identical to the maximum forsterite contents analyzed in the olivine in the picrite zone of the Coppermine #1 section and in the sections across the margin of Megacycle #1 of the Muskox intrusion.

The compositions of the fine grained gabbronorite margins of the Keel dyke correspond to hypersthene-normative basalts and are similar to the least ferroan compositions of Mackenzie dyke chilled margins and Coppermine River lavas (Dostal et al., 1983). They differ from the majority of these, however, in containing slightly less Fe at equivalent Mg contents (see Fig. 25, below). Towards the north, the average MgO content of the outer gabbronorite margin rises to >9 wt.% in the Coppermine River #1 section just below the transition to the layered series of the magma chamber. The gabbronorite margins of the Muskox Keel dyke have mildly-fractionated rare-earth element (REE) profiles ($(La/Yb)_n = 5.4$, $(La/Sm)_n = 2.3$, Table 1, Fig. 10a) which flatten towards the heavy end. Extended trace element spider diagrams for the gabbronorite margins indicate the presence of a negative Nb anomaly and are indistinguishable from those of associated Mackenzie dykes ($(La/Yb)_n = 4.0$, $(La/Sm)_n = 1.9$) and the Coppermine River basalts (Fig. 10b) with the possible exception of Th and P in the Coppermine River basalts which may reflect systematic analytical differences for these elements. The more magnesian gabbronorite margins of the Coppermine #1 section have higher abundances of compatible trace elements (e.g. relative enrichment factors: $EF_{Cr} = 1.5$, $EF_{Ni} = 1.4$), but approximately half the abundances of REE (e.g. $EF_{La} = 0.4$) and other incompatible trace elements (e.g. $EF_{Zr} = 0.5$, $EF_{Rb} = 0.7$) compared to the gabbronorite samples of the chilled margin of the Keel dyke (Table 1). Despite these differences, the extended trace-element spider profiles for the Coppermine #1 gabbronorite margin are similar ($(La/Yb)_n = 3.2$, $(La/Sm)_n = 1.9$) to those of the gabbronorite margin of the Keel dyke for most incompatible elements (Fig. 10b).

Chamber

Within the Muskox magma chamber, the zoning profile of the margin evolves with stratigraphic height. Unlike the situation in the Keel dyke, the outermost margin of the Muskox intrusion is strongly chemically zoned. Across the norite zone of Megacycle #1, there is a rapid rise in Ca and Mg (Fig. 11) to values on the order of 13 wt.% MgO at the first appearance

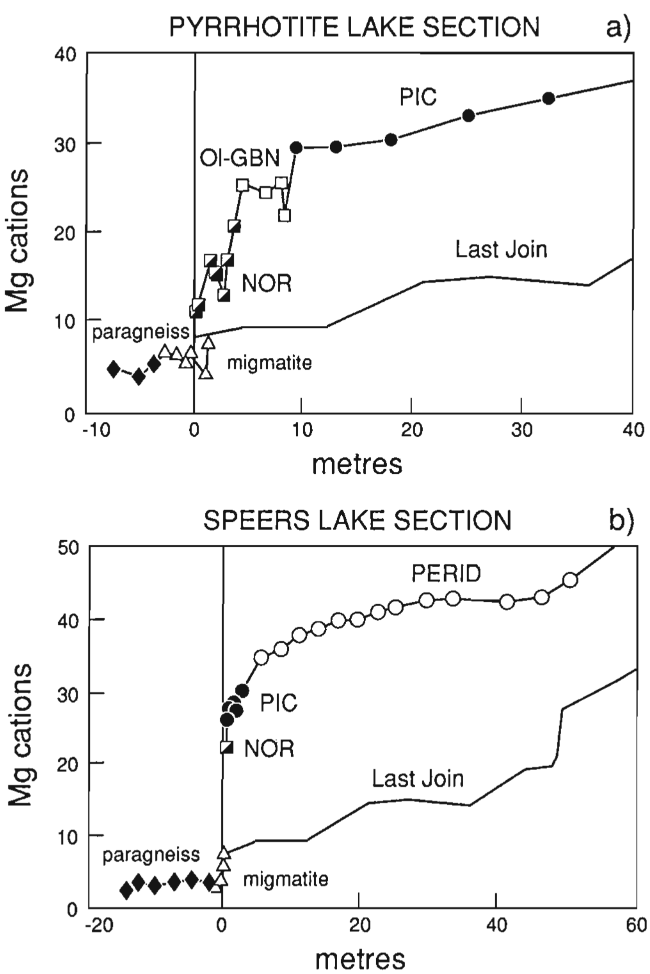

__Figure 11.__ The variation in Mg in cation units across of the margin of the Muskox magma chamber in the __a)__ Pyrrhotite Lake and __b)__ Speers Lake sections of Megacycle #1 and #2. For comparison, the solid line shows the variation across the Last Join section. Symbols as in Figure 6 except: open triangle - migmatite (MIGMA) and feldspar diorite (Pl-DIOR).

of olivine in the olivine gabbronorite zone, as compared to 10 wt.% in the Keel dyke. Into the olivine gabbronorite zone, Ca decreases rapidly while Mg remains relatively constant at values of 15 to 17 wt.% MgO. The inward transition to picrite corresponds to the beginning of a continuous inward increase in MgO content which levels off towards values of 30 wt.% MgO in feldspathic peridotite (PERID) (Fig. 11). Discontinuities in this overall Mg trend within the profiles of both the Pyrrhotite and Equinox sections of Megacycle #1, suggest the possible preservation of a number of interior intrusive contacts (Fig. 11).

In the Stanbridge section across the middle of Megacycle #2, the width of the plateau in MgO contents in the olivine gabbronorite zone has narrowed to 2 m, and in the higher Speers Lake section there is a continuous rise in Mg into the intrusion (Fig. 11). In accordance with the mineralogical zonation observed in the margins of Megacycles #1 and #2, the chemical zonation telescopes up-section, with the Mg content at any given distance from the contact increasing with stratigraphic height (Fig. 12).

In contrast to the Keel dyke, there is a great deal of scatter in the compositions of samples across the norite, gabbronorite, and olivine gabbronorite zones of the chamber margins. In the Pyrrhotite Lake section of Megacycle #1, however, the norite and olivine gabbronorite zones appear to define two separate linear trends whose slopes approach that required by clinopyroxene stoichiometry in an 0.5*(Mg + Fe)/Ti versus Si/Ti Pearce plot (Fig. 9b). Unlike the picrites of the Keel dyke, however, the more olivine-rich olivine gabbronorite through picrite to feldspathic peridotite samples of the intrusion define a linear trend whose slope is that required by olivine stoichiometry. This line passes between the compositions of the gabbronorite chilled margin of the Coppermine #1 section and the more evolved compositions of the gabbronorite chilled margin of the Keel dyke. In all sections across the margin of the Muskox intrusion,

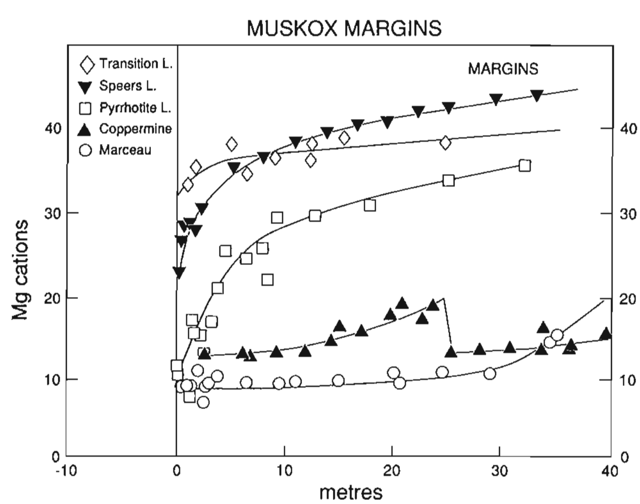

__Figure 12.__ Comparison of the Mg profiles across the Marceau and Coppermine sections of the Keel dyke and across the Pyrrhotite Lake, Speers Lake, and Transition Lake sections of the margin of the chamber of the Muskox intrusion.

however, the olivine gabbronorite and picrite samples are richer in normative orthopyroxene at the expense of normative clinopyroxene than equivalent lithologies in the Keel dyke (Fig. 6c, d).

The compositions of olivine gabbronorite and picrite in the sections across the margin of Megacycle #1 are distinctly more Fe-rich than the most magnesian Keel dyke chilled margins from the Coppermine River sections and the olivine gabbronorite and picrite of the margins of the succeeding Megacycles #2 through #4. In this regard the compositional profile of the Coppermine section #2 is particularly intriguing. The outermost olivine gabbronorite is Fe-rich, similar in composition to olivine gabbronorite in other sections of the margin of Megacycle #1. Samples of the inner olivine gabbronorite however, have relatively low Fe, similar to that of the more magnesian olivine gabbronorite and picrite samples from the margin of succeeding megacycles.

The extent of chemical zoning in olivine grains is large at its first appearance at the transition from norite or gabbronorite to olivine gabbronorite in the margins of the Muskox magma chamber. The extent of compositional zoning in olivine, however, decreases rapidly into the intrusion toward the compositionally homogeneous olivine that characterizes the most olivine-rich feldspathic peridotite samples (Fig. 13). The maximum observed forsterite content (Fo_{83}) for olivine grains is, however, approximately constant across the margin of Megacycle #1 and identical to that observed in the Coppermine #1 section and in the Keel dyke. The maximum analyzed forsterite content in the marginal rocks of the Muskox intrusion is Fo_{86}, obtained from olivine in the lower Stanbridge section of Megacycle #2. This value also corresponds to the maximum forsterite content observed at the base of pyroxenite layers in Megacycle #2 (DesRoches, 1992), marking the appearance of clinopyroxene on the liquidus of the magma of Megacycle #2.

Although there is a similar inward increase in compatible trace elements across the margins of the main chamber of the intrusion, the decrease in the contents of incompatible elements is distinctly less than that observed in sections across the Keel dyke (Fig. 14). As a result, although concentrations of incompatible trace elements and chalcophile elements decrease from olivine gabbronorite through picrite to feldspathic peridotite, at any given Mg content, samples from the margin of the chamber of the Muskox intrusion have higher incompatible element contents than equivalent lithologies in the Keel dyke. In the Pyrrhotite Lake section, there is a minimum in incompatible element content at the transition from norite to olivine gabbronorite and an inward increase with Mg into the olivine gabbronorite zone. Despite their higher Mg content (Fig. 13), the norite and gabbronorite margins of the Muskox intrusion are thus enriched in normative orthopyroxene, (LIL) incompatible elements, chalcophile elements (e.g. Cu, Zn, PGE), and Pb and Th compared to the gabbronorite chilled margins of the Keel dyke (Fig. 15). The norite margins of the Muskox intrusion have, however, lower contents of Ca, Sr, P, and Ti, but higher contents of compatible elements such as Cr and Ni. Despite these differences, the total REE and HFS element contents of the norite margin of the Muskox intrusion are similar to those of the gabbronorite margins of the Keel dyke. The LREE of the chamber norite are, however, slightly more fractionated than those of the Keel dyke gabbronorite (Fig. 15). Both the gabbronorite margin of the Keel dyke and the norite margin of Megacycle #1 are significantly enriched in all incompatible elements compared to the chilled margin of Coppermine River Section #1 (Fig. 10, Table 1).

Samples of the paragneiss which are distant from the intrusive contact of the Muskox intrusion range in Si content from 60 to 70 wt.% SiO_2 with a concomitant antithetic variation in Mg, Fe, Al, and K reflecting the alternation of

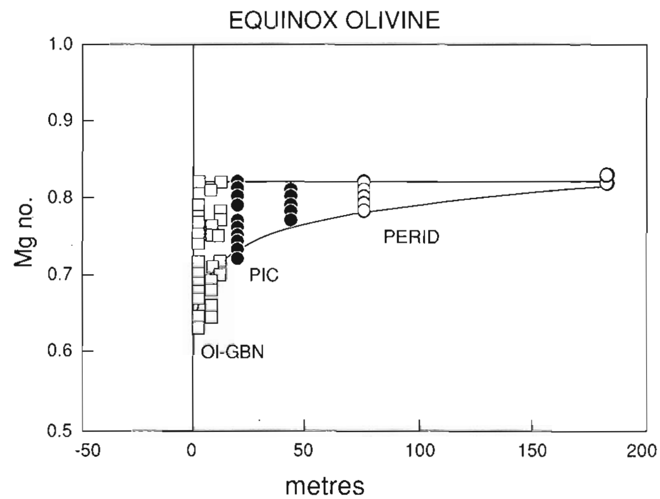

Figure 13. The variation in the compositional zoning in olivine across the Equinox section of Megacycle #1 of the Muskox intrusion. Symbols as in Figure 6.

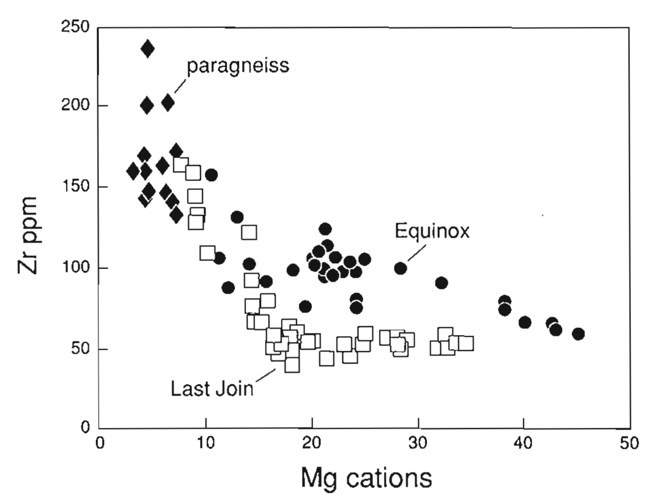

Figure 14. A comparison of the variation of Zr, an immobile incompatible element, versus Mg, a compatible element, across the Last Join section (open square) of the Keel dyke and the Equinox section (solid circle) of Megacycle #1 of the Muskox intrusion. Other symbols: solid diamond – paragneiss and migmatite.

quartz-feldspar and phlogopite-rich layers which define the gneissic banding. The paragneiss has much higher contents of U, Th, Pb, K, and LIL trace elements (e.g. EF_{Th} = 4.7, EF_K = 3.9, EF_{Rb} = 4.6), higher contents of REE and Zr (e.g. EF_{La} = 2.8, EF_{Zr} = 1.3), but lower contents of Ti (EF_{Ti} = 0.4) and compatible trace elements (EF_{Ni} = 0.1, EF_{Cr} = 0.6) compared to the chilled margins of the Muskox Keel dyke. The relative concentrations of HREE in the paragneiss parallel those of the adjacent intrusion, but the LREE are distinctly more fractionated ($(La/Yb)_n$ = 10.3, $(La/Sm)_n$ = 4.3). Samples of the orthogneiss in Coppermine #2 section contain significantly lower Si (55-60 wt.% SiO_2) and K, but higher Mg, Fe, Ca, and Na than the paragneiss samples.

Despite the heterogeneity of the gneisses, a general chemical zonation is apparent within 4 m of the intrusion contact across which the concentrations of Mg, Fe, Al, compatible trace elements (EF_{Cr} = 1.5), and chalcophile elements (EF_{Ni} = 1.2, EF_{Cu} = 1.5) increase and the concentrations of Si and incompatible elements decrease towards the plagioclase porphyritic diorite found directly adjacent to the intrusion. The decrease in incompatible element concentrations from the paragneiss to the migmatites and melts directly adjacent to the intrusion is larger for HFS elements (e.g. EF_{Zr} = 0.7) and REE (EF_{La} = 0.7) than for LIL elements ($EF_{Rb} \geq 0.8^+$). In addition, despite the decrease in REE towards the intrusion, there is no relative fractionation of the REE across this zone ($(La/Yb)_n$ = 9.9, $(La/Sm)_n$ = 4.3, Fig. 15 and 17, below).

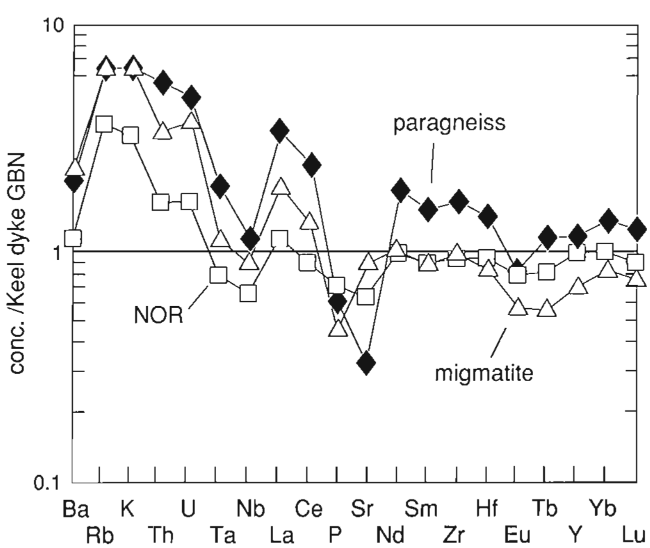

Figure 15. Extended trace element spider diagram comparing the compositions of norite Po-24b (open square), migmatite Po-24a (open triangle), and average paragneiss (solid diamond) in the Pyrrhotite Lake section, all normalized to the average of the marginal GBN sample of the Keel dyke. Data tabulated in Table 1.

DISCUSSION

Crystallization on the walls of the Muskox intrusion

The first question that must be addressed is: do the marginal rocks of the Muskox intrusion represent chilled liquids or crystal accumulates? The constant composition, fine grain size, and disequilibrium crystallization features of the gabbronorite margins of the Keel dyke suggest that they may closely approach liquid compositions. This interpretation is supported by the fact that the Fe/Mg ratios of the gabbronorite margins of the Last Join section appear to be in approximate equilibrium with the compositions of the most magnesian olivine observed in adjacent olivine gabbronorite (Fo_{77}, Fig. 25), if an Fe/Mg exchange coefficient (Fe/Mg $Kd=((Fe^{2+}/Mg)_{ol}/(Fe^{2+}/Mg)_{liq})$) of 0.30 is assumed between olivine and melt (Roeder and Emslie, 1970). The compositions of the adjacent olivine gabbronorite zone are too magnesian to co-exist as liquids with their olivine, but could be obtained by the accumulation of clinopyroxene to the compositions of the gabbronorite chilled margins (Fig. 9a). Similarly the low forsterite content (Fo_{83}) of the olivine in samples of the picrite zone require that they have accumulated olivine. The scatter of the picrite samples between olivine and clinopyroxene stoichiometric lines in a Pearce plot (Fig. 9a), however, suggests the possible existence of a reaction relationship between olivine and melt to crystallize clinopyroxene. The fine-grained gabbronorite margin of the Coppermine #1 section is anomalously low in incompatible trace elements (Table 1) compared to both the gabbronorite margin of the Keel dyke and the more magnesian norite and gabbronorite margins of the Muskox chamber, suggesting that it may represent a composition which has lost its residual liquid.

In the margins of the magma chamber, however, the answer is less simple. With a few exceptions (PO-24b), the norite and gabbronorite zones are not significantly finer grained than the interior and are strongly chemically zoned (Fig. 11). The distribution of the compositions of norite and immediately adjacent olivine gabbronorite along distinct, but parallel, clinopyroxene stoichiometric lines in the Pyrrhotite Lake section of Megacycle #1 (Fig. 9b) suggests the accumulation of clinopyroxene. The olivine gabbronorite which define a compositional bench of constant MgO along the margin of Megacycle #1 have whole rock compositions which are too magnesian to represent the liquids that crystallized the olivine crystals they contain and these rocks must also have accumulated olivine and clinopyroxene. The distribution of the more magnesian olivine gabbronorite, picrite, and feldspathic peridotite samples along an olivine stoichiometric line (Fig. 9b) requires that these rocks are cumulates of olivine alone, but the 'rain drop' texture of the olivine and the high concentration of incompatible elements compared to equivalent rocks in the Keel dyke, indicate the presence of a large proportion of trapped melt. In the margins of succeeding megacycles, the picrite and feldspathic peridotite samples also fall along an olivine stoichiometric line which is slightly displaced from that of Megacycle #1, indicating that these rocks are also olivine accumulates, but compositionally distinct from their equivalents in Megacycle #1.

Chemical interaction between magma and host rocks

The occurrence of host rock contamination in the Muskox marginal rocks is most easily demonstrated by comparing the behaviour of ratios of incompatible elements in sections of the Keel dyke with those of the chamber. The ratio of K/Ti is particularly sensitive to contamination because of the compositional differences between the paragneiss and magma. Both Ti and K rise with decreasing Mg in analyses of the Coppermine lavas and the Mackenzie dykes and thus both behaved as relatively incompatible elements in the mafic magmas of the Coppermine River - Mackenzie - Muskox system until MgO contents below 6 wt.%. Although some K enters plagioclase and some Ti enters pyroxene, the bulk partition coefficients for both K and Ti are low during gabbroic fractionation in the absence of an oxide phase, and thus, in a closed system, their ratio remains relatively constant until the magma becomes saturated with an oxide or K-bearing phase. The paragneiss has up to ten times the K content of the majority of the Muskox rocks, but a slightly lower Ti content than the chilled margins of the Keel dyke (Table 1). Interaction with the enclosing country rocks would be expected to result in a significant rise in the ratio of K/Ti both because of its high value in the paragneiss and because of the known higher mobility of K with respect to other elements in silicate magmas (Watson, 1982).

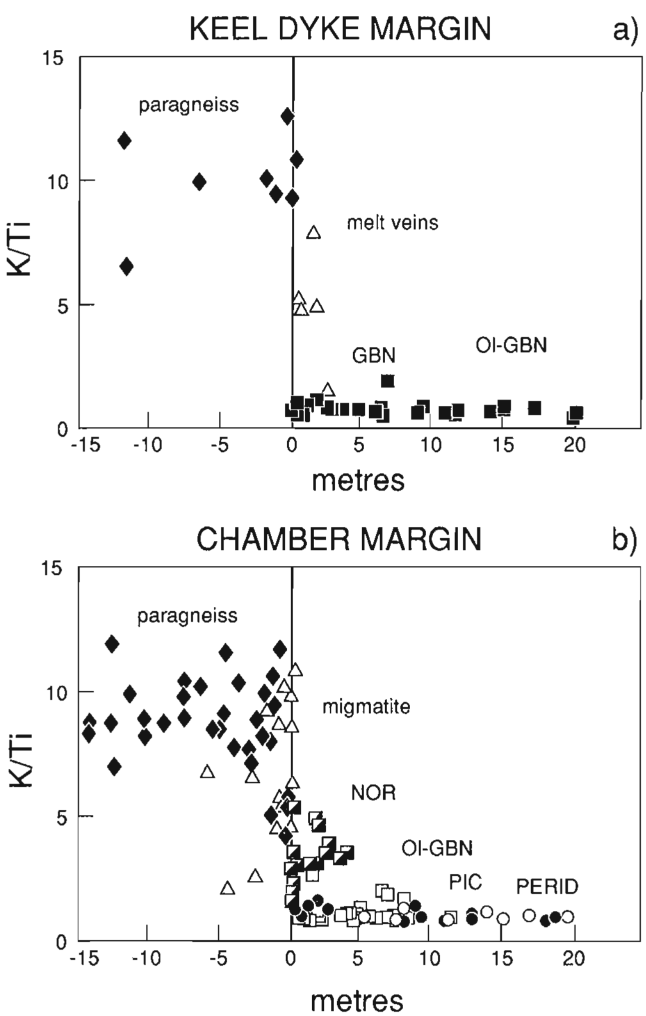

Figure 16. a) *Composite plot of K/Ti (wt.) versus distance in sections across the margins of the Keel dyke. Symbols as in Figure 6, and solid diamond – paragneiss, open triangle – veins of melted paragneiss. The vertical line represents the contact between the intrusion and the host paragneiss.* ***b)*** *Composite plot of K/Ti (wt.) versus distance in sections across the margins of the Muskox chamber. Symbols as in Figures 6 and 11.*

Although both K and Ti increase across the margin of the Keel dyke towards the contact with the paragneiss, the ratio of K/Ti remains low (≈ 1) and essentially constant (Fig. 16a). The felsic veins crosscutting the gabbronorite margin have elevated K/Ti ratios, but the gabbronorite rocks of the Keel dyke show no signs of assimilation. Across the margins of the lower portions of Megacycle #1 & #2 of the magma chamber of the Muskox intrusion, however, there is a distinct increase in the K/Ti ratio from those of olivine gabbronorite (which have K/Ti ratios similar to those of the Keel dyke) to those of norite or gabbronorite samples within 3 m of the contact (Fig. 16b). Similar or greater increases are observed for other ratios of large ion lithophile/high field strength elements, such as Rb/Ti or K/Zr, and smaller increases for ratios of LREE elements (e.g. La/Sm, Fig. 17) and radiogenic elements (e.g. Th/Ti). These features require that the marginal rocks of the magma chamber were not closed systems and have chemically interacted with their enclosing para-gneiss. A comparison (Fig. 15) of a norite chilled margin (PO-24b) from the margin of Megacycle #1 to the uncontaminated gabbronorite chilled margins of the Keel dyke indicates that the norite is enriched in LIL elements, U, Th, and LREE, but essentially indistinguishable in terms of HREE and HFS elements, despite the fact that the paragneiss is enriched in all of these elements with respect to the uncontaminated chilled margins of the Keel dyke. Paradoxically, the contaminated norite is significantly richer in compatible elements such as Cr with respect to the uncontaminated gabbronorite, even after account has been taken of their slightly different Mg contents. The ironic conclusion that high Cr content is an indicator of crustal contamination reflects the fact that closed-system crystal fractionation is more effective in reducing the levels of compatible trace elements than crystal fractionation which is accelerated by crustal assimilation, providing that the assimilation does not initiate the crystallization of a spinel phase.

The inward decrease in the magnitudes of the above ratios of incompatible elements, going into the picrite and feldspathic peridotite indicates that the extent of interaction with the paragneiss host rock decreased inward and that the magma which produced the interior olivine cumulates was effectively insolated from the adjacent paragneiss. Although the thickness of the zone with elevated LIL/HFS element ratios in the marginal rocks decreases up-section, the LIL/HFS element ratios of feldspathic peridotite and picrite samples increases at any given Mg content from Megacycle #1 to Megacycle #2 (Fig. 18). This suggests that although contaminated marginal rocks are better preserved in the lower portions of the lower two megacycles, the amount of contamination in the magma producing the olivine cumulates of the intrusion increased up-section. This interpretation is supported by the associated increase in Mg in the bulk compositions of the marginal rocks (Fig. 12) and the maximum forsterite content of olivine (Fo_{83} to Fo_{86}).

Nature and extent of contamination

The differences between the margins of the Keel dyke and magma chamber of the Muskox intrusion are essentially those predicted for the margins of non-convecting and convecting magma bodies on the basis of heat flow arguments (Huppert and Sparks, 1989). In a constricted dyke emplaced in high level, cool crust, a magma will either stagnate or move by laminar flow and heat is delivered to the contact by conduction. In this situation the heat flux is insufficient to melt the host rocks and the initial chilled margin would grow and be

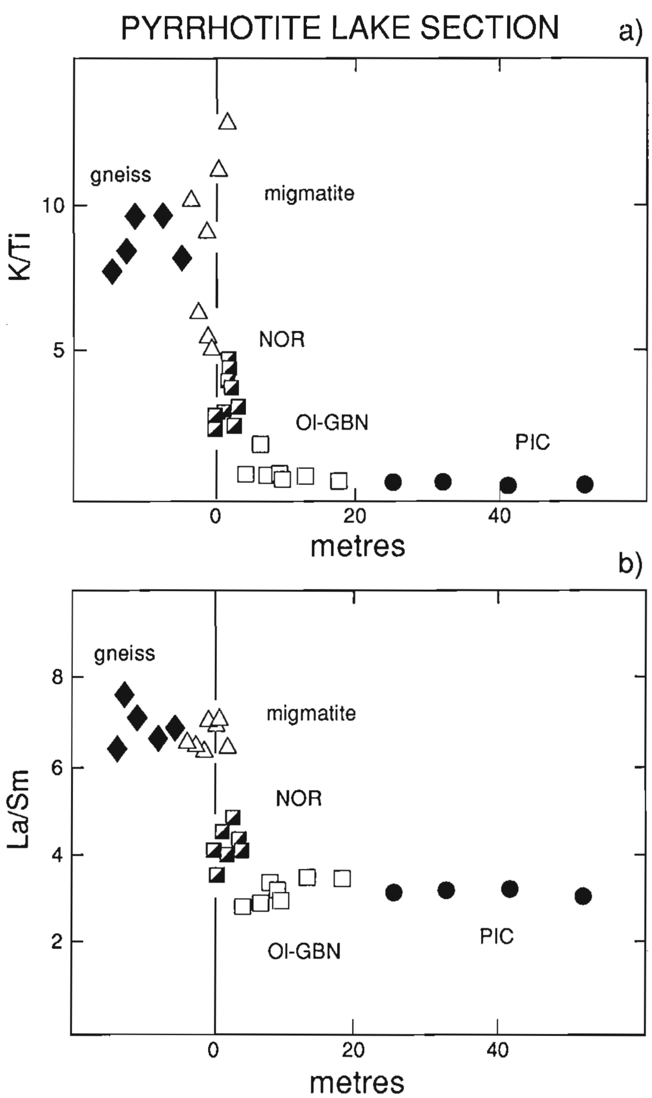

Figure 17. *The variation of **a)** K/Ti (wt.) and **b)** La/Sm (wt.) with distance across the Pyrrhotite Lake section of the margin of Megacycle #1. Symbols as in Figures 6 and 11.*

preserved, insulating the magma from chemical interaction with the country rock. In larger bodies such as magma chambers, however, active convection can continuously deliver heat to the crystallizing front by advection and the magma is capable of completely resorbing the initial chilled margin of the intrusion and the adjacent country rock. In such cases, chilled margins are absent and contaminated cumulates will be preserved in direct contact with migmatized country rock. This corresponds to the situation in the margins of Megacycle #3 and #4, where olivine cumulates with elevated K/Ti begin within 0.5 m of the paragneiss. Along these margins, the host paragneiss has been removed in bulk and there is little preserved evidence of the contamination process. Although theoretical models have not rigorously analyzed wall rock melting with the geometry of the Muskox margin (Huppert and Sparks, 1988), experimental results indicate that the contaminated magma(s) produced along such a margin would rise into the magma chamber because of its lower density; either to remix or react with the convecting magma of the intrusion as it rose to accumulate as the granophyric units at the top of the Muskox intrusion (Fig. 19).

The zones of norite and gabbronorite with elevated LIL/HFS element ratios and plagioclase porphyritic diorite in the lower portions of Megacycles #1 and #2 appear to correspond to an intermediate condition in which a boundary layer between the host magma and the country rocks has preserved evidence of the contamination process. A quantification of the extent of contamination that is preserved in these rocks requires a knowledge of the composition of pristine magmas at the margin of the intrusion. Although the marginal rocks of the magma chamber of the Muskox intrusion are accumulates, samples of olivine gabbronorite, picrite, and feldspathic peridotite which fall along common olivine-stoichiometric lines provide a means of estimating both the amount of the intercumulus melt trapped in these rocks and the composition of the magma at the margins of the chamber. The fact that the maximum forsterite content in these samples appears to be

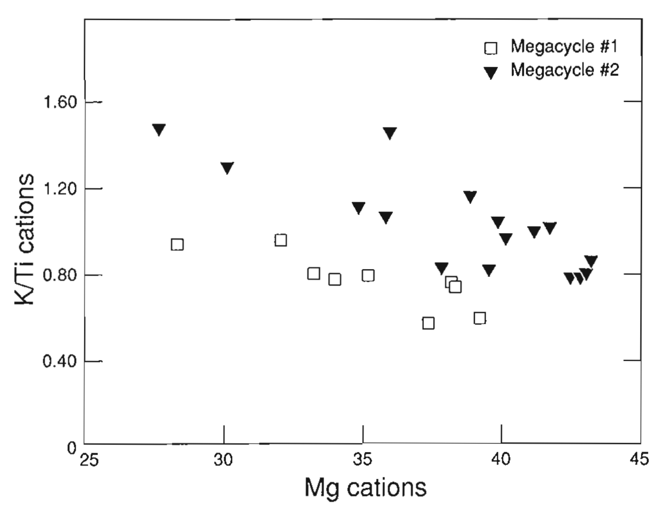

Figure 18. *The variation of K/Ti versus Mg in cation units in picrite samples from Megacycle #1 and Megacycle #2.*

Table 2. Estimated liquid compositions in the Muskox intrusion.

	Keel Dyke GBN	Mega-cycle #1	Mega-cycle #2	Parent #1a	Parent #1b	Parent #2	MORB	Hawaii Kilauea
Major Elements in wt%								
SiO_2	51.81	51.56	51.88	48.91	49.87	50.45	49.35	48.67
TiO_2	1.50	1.58	1.36	1.23	1.36	1.20	0.89	2.12
Al_2O_3	13.94	13.81	14.42	10.75	11.88	12.73	13.79	11.59
MgO	8.04	8.70	9.36	16.52	13.58	13.41	13.29	13.75
FeO	10.65	11.17	9.03	11.42	11.54	9.25	9.15	11.64
MnO	0.17	0.16	0.14	0.15	0.16	0.14	0.16	0.17
CaO	10.44	10.17	11.53	7.98	8.79	10.22	10.96	9.43
Na_2O	1.58	1.25	0.55	0.97	1.08	0.49	1.91	1.94
K_2O	0.98	0.81	0.98	0.63	0.69	0.86	0.16	0.40
P_2O_5	0.14	0.16	0.14	0.12	0.14	0.12	0.09	0.21
Total	99.27	99.37	99.38	98.67	99.07	98.88	99.76	99.92
Cations normalized to 100 cations								
Si	48.86	48.66	48.80	45.23	46.43	47.01	45.03	44.71
Ti	1.07	1.12	0.96	0.86	0.95	0.84	0.61	1.47
Al	15.49	15.36	15.98	11.71	13.03	13.99	14.83	12.55
Mg	11.30	12.24	13.12	22.77	18.84	18.63	18.08	18.83
Fe	8.40	8.82	7.10	8.83	8.98	7.21	6.98	8.94
Mn	0.14	0.13	0.11	0.12	0.12	0.11	0.12	0.14
Ca	10.55	10.29	11.62	7.90	8.77	10.21	10.71	9.28
Na	2.89	2.29	1.01	1.75	1.94	0.89	3.38	3.45
K	1.18	0.97	1.17	0.74	0.83	1.03	0.19	0.47
P	0.12	0.13	0.11	0.10	0.11	0.10	0.07	0.16
O	155.81	156.02	156.83	150.84	152.67	154.03	151.38	150.74
Trace Elements in ppm								
Rb	28.2	26.0	32.3	20.3	22.4	28.6	3.0	7.1
Sr	240.6	215.3	250.7	167.5	185.4	221.6	93.3	303.3
Ba	269.8	274.4	303.0	213.7	236.5	267.9	34.9	161.0
Sc	29.3	41.5	38.1	34.3	36.9	34.7	35.2	28.2
Y	18.2	18.3	17.2	14.2	15.7	15.2	24.8	23.1
Zr	106.6	101.6	89.4	79.2	87.5	79.0	53.6	157.2
Nb	9.1	11.6	11.0	9.0	10.0	9.7	2.6	12.9
Hf	4.3	3.8	3.0	2.9	3.2	2.7	0.0	3.4
Ta	0.7	0.7	0.8	0.6	0.6	0.7	0.0	0.0
V	273.7	330.1	277.7	256.9	284.0	245.3	208.5	248.0
Cu	234.3	718.3	242.9	608.4	653.2	224.3	67.4	0.0
Pb	13.0	12.2	9.8	9.4	10.5	8.6	0.0	1.7
Zn	83.4	142.0	145.6	110.5	122.1	128.6	69.1	113.3
U	0.9	0.7	0.8	0.5	0.6	0.7	0.2	0.4
Th	3.7	3.1	3.2	2.4	2.7	2.8	0.6	1.0
Rare Earth Elements in ppm								
La	19.00	16.31	12.69	12.74	13.98	11.25	2.56	11.42
Ce	39.10	41.65	31.72	32.50	35.69	28.12	9.18	28.39
Nd	22.35	21.61	15.11	16.86	18.52	13.39	8.93	18.37
Sm	5.25	4.66	3.46	3.64	4.00	3.07	3.12	4.76
Eu	1.50	1.49	1.13	1.16	1.28	1.00	1.10	1.64
Tb	0.82	0.78	0.60	0.61	0.67	0.54	0.00	0.00
Ho	1.30	1.00	0.91	0.77	0.85	0.80	0.00	0.00
Yb	2.40	2.42	2.12	1.90	2.08	1.88	3.10	1.74
Lu	0.38	0.38	0.33	0.30	0.32	0.30	0.34	0.28

The GNB analysis represents the chilled margin of the Keel dyke. The two megacycle analyses were obtained by mathematically removing cumulate olivine from marginal picrite and feldspathic peridotite samples until they would equilibrate with their olivine (see text). Parents #1a and #2 represent the results of fractionally adding olivine to the analyses for the liquids of Megacycle #1 and #2 until their compositions would coexist with an olivine of compositions Fo 89.5, the most magnesian olivine documented in the layered series (Irvine, 1979). For comparison, Parent #1b represents a daughter liquid of Parent #1a, following the fractionation of olivine until it had the Mg content of Parent #2; similarly, MORB and Kilauea represent the averages of the compositions of picritic lavas from DSDP37 and Kilauea volcano after normalization to the Mg content of Parent #2 by the fractional addition or subtraction of olivine.

relatively independent of bulk Mg content of the host rock or distance from the intrusion's contact suggests that these rocks represent mixtures of accumulate olivine and stagnant magma along the sloping wall of the intrusion. In such samples, the composition of the magma can be estimated by removing the composition of the olivine they contain (as determined by electron microprobe analysis) until the resultant composition would co-exist with this olivine assuming an olivine Fe/Mg Kd of 0.30 (Roeder and Emslie, 1970). This calculation was performed on all samples of olivine gabbronorite, picrite, and feldspathic peridotite which defined olivine stoichiometric lines in the sections of Megacycles #1 and #2, after screening on the basis of the ratio of K/Ti to eliminate obviously contaminated samples. The calculated compositions of the liquids at the margins of Megacycles #1 and #2 are relatively low in Mg (9 wt.% MgO) and similar in composition to the chilled margins of the Keel dyke (Table 2). Although the estimated liquid composition for Megacycle #1 is more Fe-rich than that estimated for Megacycle #2, both these estimated liquid compositions appear to sit at the point of first saturation of clinopyroxene.

The magmatic textures of the plagioclase porphyritic diorite along the margin of the intrusion require that it represents a melt of the paragneiss, but it is unlikely to represent a closed system minimum-melt composition because it is depleted in Si and enriched in Mg and Fe and compatible elements with respect to the paragneiss at a distance from the contact. The plagioclase porphyritic diorite may represent either a complete melting of the migmatite residue (although the plagioclase phenocrysts may in fact be restite crystals) following the extraction of a minimum melt, or a hybrid magma produced by the mixing of the magma of the intrusion with a melt of the paragneiss. Its composition corresponds to that of a potassic high-Al basalt or andesite and, with the exception of K, closely resembles the proposed compositions for anorthositic magmas postulated to have been present the Stillwater and Bushveld complexes (A-type magmas of Irvine and Sharpe, 1982).

Two end-member conceptual models can be formulated to explain the chemical gradients observed in the marginal rocks of the lower portions of Megacycle #1 and #2. In one, the contaminated norite samples reflect the incorporation of a melt of the plagioclase porphyritic diorite's composition and in the other it reflects the incorporation of a melt corresponding to a minimum melt of the paragneiss. The lack of fractionation of the REE elements of the plagioclase porphyritic diorite, despite their decrease in absolute abundance with respect to the paragneiss, requires that the ratio of La/Sm in the assimilant be similar in both models. Mass balance would require, however, that the absolute concentrations of REE in the minimum melt composition be significantly higher than that in the original paragneiss. As a result, the similar absolute abundances of HREE and HFS elements in the contaminated norite to those in either the chilled margins of the Keel dyke (Fig. 15) or estimates of the composition of the uncontaminated magma indicate that the plagioclase porphyritic diorite represents a more appropriate assimilant composition for the contamination preserved in the norite samples. In models in which a contaminant of plagioclase porphyritic diorite Po-24a are mixed with the estimate of the uncontaminated magma, the LIL/Ti ratios of the norite samples would require 30-50% contamination (Fig. 20a), while ratios of LREE (Fig. 20b, c), Y, Th (Fig. 20d), and U to Ti indicate lower values of 10 to 30% for the same rocks. The behaviour of ratios of HFS elements such as Zr and Nb (Fig. 20e) to Ti, however, indicate little or no contamination. The lack of accord between the extents of contamination indicated by the ratios of different incompatible elements is even worse if the bulk composition of the paragneiss is used as the contaminant composition. These results clearly indicate that bulk mixing models for the contamination process are inappropriate and that a selective exchange of elements has occurred across the margin of the Muskox intrusion. A greater increase in the ratio of K/Zr than K/Ti in the contaminated norite (Fig. 20f) may be a reflection of the combined greater exchange of K than for HFS elements and the fact that the Muskox magmas have similar Ti contents to the host paragneiss, but significantly lower Zr contents (Table 1). Although the sericitization of plagioclase and the presence of phlogopite in the contaminated norite samples indicate that the greater mobility of LIL and chalcophile elements may have been aided by hydrothermal transport, the fresh appearance of sanidine and the presence of granophyric intergrowths indicate that exchange at the magmatic stage was significant.

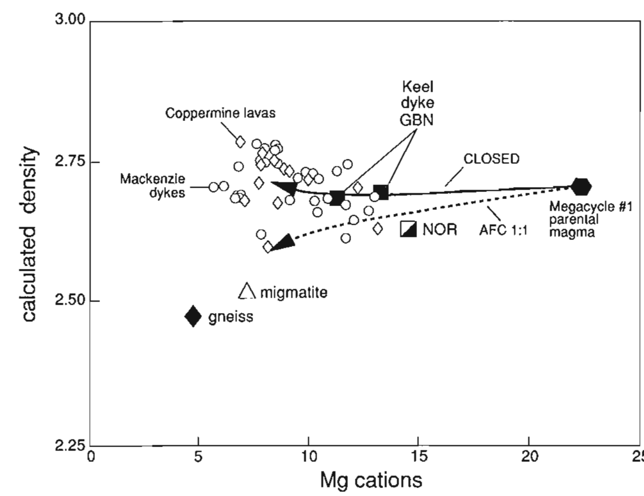

Figure 19. Calculated density versus Mg in cation units for estimated liquid compositions in the Coppermine River-Mackenzie-Muskox magmatic system. Symbols: open circle – Mackenzie dykes, open diamond – Coppermine River lavas (Dostal et al. 1983), solid diamond - average paragneiss (Table 1), open triangle - average migmatite (Table 1), half-square – average contaminated nortie, (Table 1), solid squares – uncontaminated gabbronorite margins of Keel dyke and Coppermine River section (Table 1), solid hexagon – estimated parental magma of Megacycle #1 (Table 2), solid line – calculated closed-system crystal fractionation path, dashed line – assimilation-fractional crystallization (AFC) path with a ratio of assimilant to crystallization of 1:1. Densities calculated after the scheme of Mo et al. (1982).

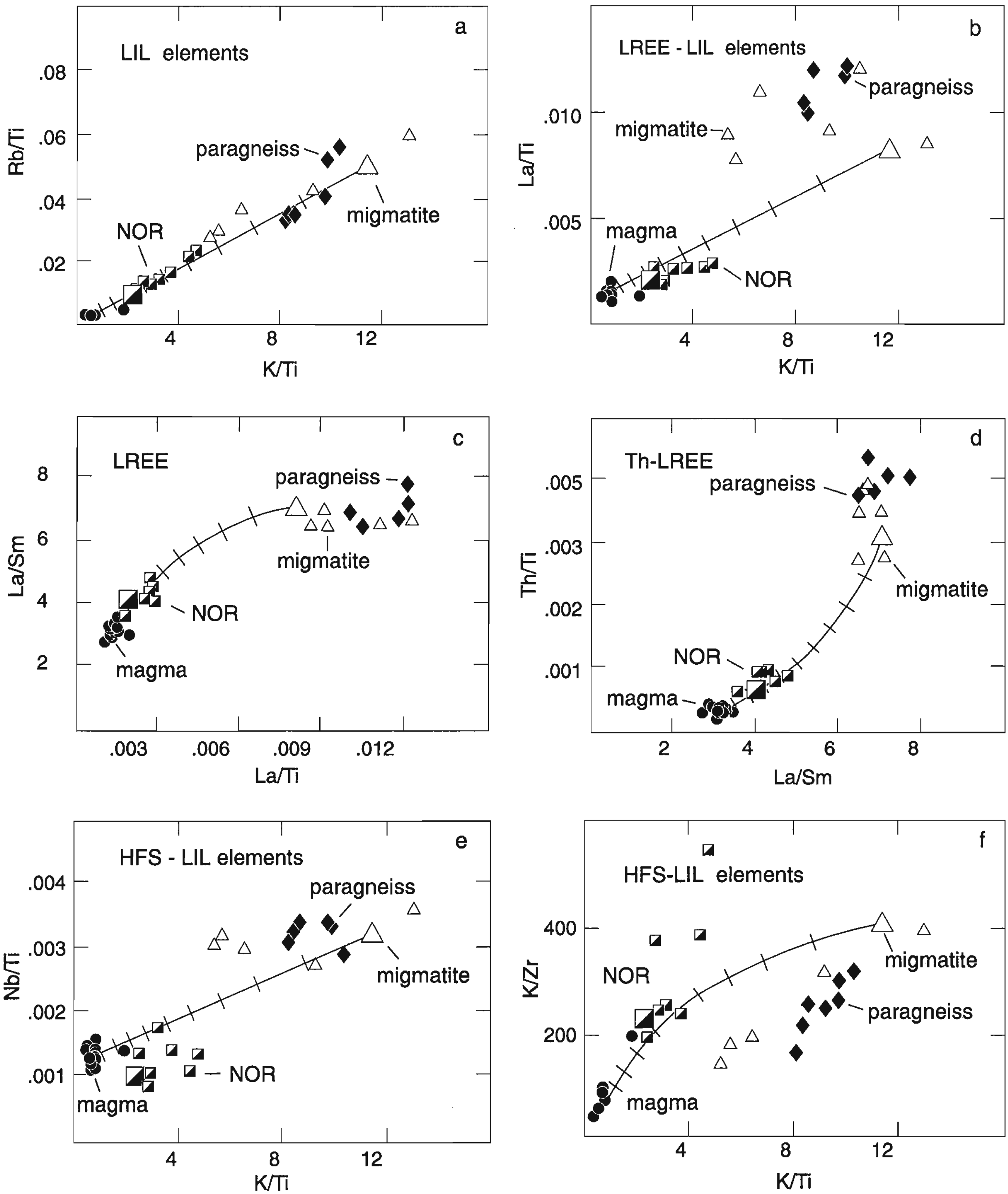

Figure 20. *Mixing models for the contaminated norite samples of the Pyrrhotite Lake section of Megacycle #1.* ***a)*** *Rb/Ti versus K/Ti,* ***b)*** *La/Ti versus K/Ti,* ***c)*** *La/Sm versus La/Ti,* ***d)*** *Th/Ti versus La/Sm,* ***e)*** *Nb/Ti versus K/Ti,* ***f)*** *K/Zr versus K/Ti (all in wt. proportions). The ticked line represents a mixing curve between the calculated composition of the liquid in the margin of Megacycle #1 (Table 2) and the composition of migmatite sample Po-24a, with ticks spaced at 10% intervals.*

Evidence of contamination in the layered series

The preferential development of orthopyroxene in the most contaminated norite margins of the Muskox intrusion clearly supports Irving's interpretation (Irvine, 1970, 1977) that the early crystallization of orthopyroxene in the upper portion of the layer series reflects crustal contamination. This interpretation is also supported by the behaviour of LIL/HFS element ratios such as K/Ti (Fig. 21a), K/Zr, Ba/Ti, Ba/Zr, etc. documented by DesRoches (1992) within the pyroxenite and gabbroic units across the stratigraphy of the Muskox intrusion (Fig. 21a). There are anomalous LIL/HFS ratios associated with: 1) the appearance of orthopyroxene-rich websterites at the top of Megacycle #3 (Fig. 21a), 2), the magnesian pyroxenite unit which marks the beginning of Megacycle #4, and 3) the troctolitic gabbros at the tops of Megacycles #1 and #2 (Fig. 21b) (DesRoches, 1992). These LIL/HFS element ratios are exactly the strongest indicators of contamination documented in the marginal rocks of the Muskox intrusion and suggest the involvement of an upper crustal component. A quantitative evaluation of magma evolution and crustal contamination within the layered series pyroxenites is presented by DesRoches (1992).

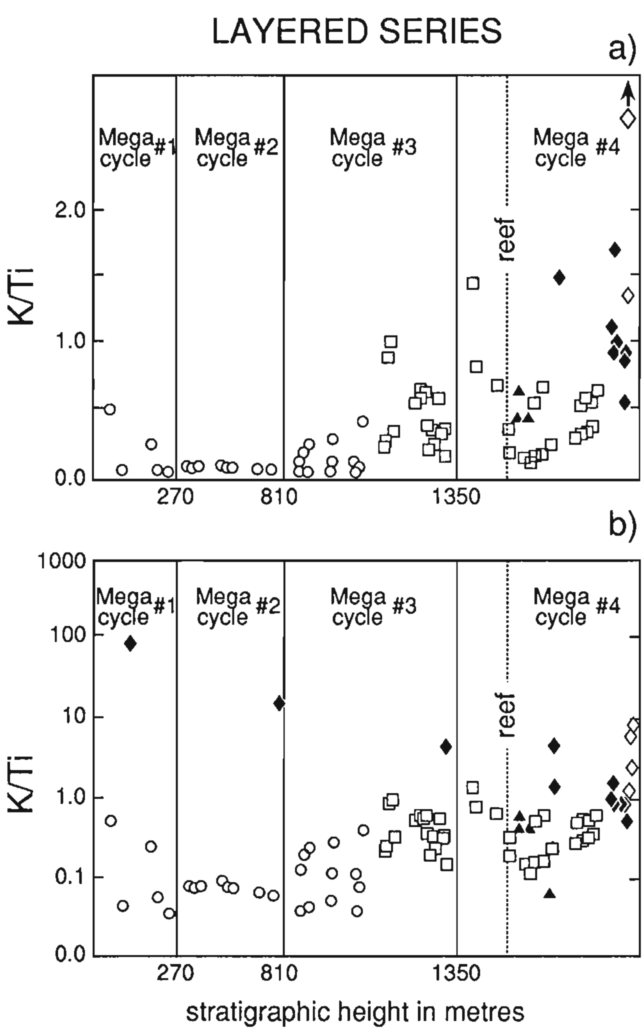

Figure 21. K/Ti (wt.) versus stratigraphy in the pyroxenite and gabbroic layers of the Muskox intrusion; ***a)*** *linear scale, and* ***b)*** *log scale to enable the plagioclase cumulates of Megacycles #1, #2, and #3 to be plotted, adapted from DesRoches (1992). Symbols as in Figure 4, and solid diamond – gabbroic cumulate, open diamond – granophyre.*

The failure of Stewart and DePaolo (1988, 1990b) to detect evidence of contamination in the ultramafic portion of the Muskox layered series appears to reflect their low sampling density in the ultramafic portion of the Muskox intrusion's stratigraphy. Still, as suggested by their isotopic data, much of the layered series of the Muskox intrusion crystallized from relatively uncontaminated magma. The spike-like behaviour of LIL/HFS ratios in the chemical stratigraphy of the layered series indicates that, following the sealing of the margins by crystal cumulates, the occurrence of large scale contamination in the main body of the intrusion was an infrequent and/or episodic event.

There is a striking correspondence between the compositions of the marginal rocks documented here and the granophyric units at the top of the Muskox intrusion which have been interpreted to represent melted roof rocks (Smith et al., 1966). The uppermost pyroxene granophyre has a trace element profile equivalent to that of the paragneiss, while the underlying mafic pyroxene granophyre has a composition which, with the obvious exception of Sr, is similar to the composition of the contaminated norite margins of the intrusion (Fig. 22). Thus the chemical zonation in the upper granophyres closely resembles that in the contaminated margins. Stewart and DePaolo (in press) have documented the selective isotopic exchange between these granophyres and the uppermost gabbros of the Muskox intrusion.

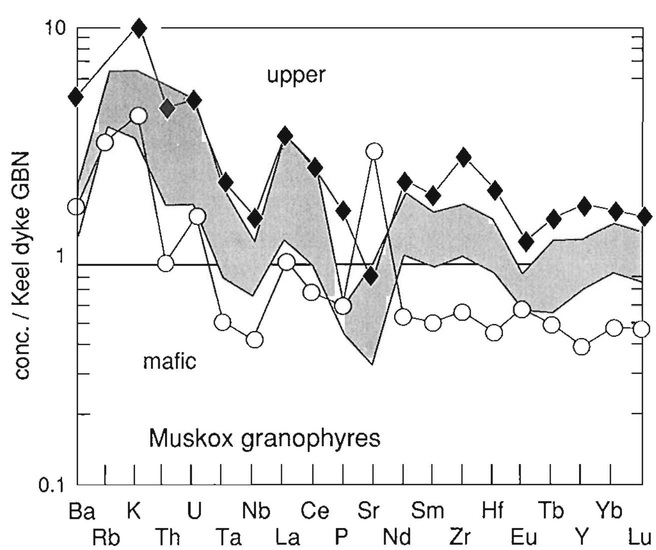

Figure 22. Extended trace element spider diagram in which the compositions of the granophyre (solid diamonds) and underlying mafic granophyre (open circles) at the top of the Muskox intrusion are superimposed on the spider diagram of Figure 15 (shaded field).

The Coppermine River-Mackenzie-Muskox magmatic system

The compositional similarity of the uncontaminated chilled margins of the Keel dyke and the primitive compositions of the Mackenzie dykes and Coppermine River lavas supports the proposed consanguinity of the Coppermine River-Mackenzie-Muskox magmatic system. The low K/Ti ratios (≤1, wt.) of many of the Coppermine River lavas (Dostal et al., 1983; Baragar, 1969) and the Mackenzie dykes (Fig. 23), however, indicates that the crystal fractionation that many of their magmas have experienced was not complicated by the upper crustal contamination documented in the Muskox intrusion. In fact, the least contaminated marginal rocks of the Muskox intrusion have K/Ti ratios which are higher than many of the lowest values in the lavas. Many of the samples in the lower two members of the Coppermine River Group, however, have elevated K/Ti ratios (2-6, wt. units) which appear to increase with Mg content and Baragar (1969) has identified evidence of crustal contamination in these lavas in the form of granophyric clots. Detailed chemical studies (Dostal et al., 1983; Dupuy et al., 1992) have established the trace element and isotopic signatures of crustal contamination in the Coppermine lavas. A comparison of the trace element signature of one of the lower contaminated lavas to that of an uncontaminated lava from the upper Husky Formation (Fig. 24) are essentially parallel to that of the paragneiss when it is normalized to the uncontaminated composition of the Keel dyke gabbronorite, and richer in HREE and HFS elements than the contaminated norite of Megacycle #1. This suggests that the contamination observed in this lava is better modeled by bulk assimilation, rather than the selective contamination preserved in Megacycles #1 and #2. Most of the Mackenzie dyke samples in our data set, on the other hand, have low K/Ti ratios and appear to be little contaminated by the upper crust. The few dykes that do have elevated LIL/HFS element ratios, however, commonly show field evidence of intermingling with country rock.

The composition of the most magnesian, parental liquid compositions in the Coppermine River-MacKenzie-Muskox magmatic system can be estimated by fractionally adding olivine to the previously estimated liquid compositions at the margins until they equilibrate with the most magnesian olivine ($Fo_{89.5}$) documented in the dunites of the layered series of the intrusion (Irvine, 1979). The application of this technique to the calculated liquid composition at the margin of Megacycle #1 yields a parental magma composition with 16 wt.% MgO (Table 2, Fig. 25), while that of Megacycle #2 gives a parental magma with only 13 wt.% MgO. When compared at the same Mg content (13 wt.% MgO, Table 2), the estimated composition of the parental magma in Megacycle #1 appears to be distinctly richer in Fe than that of Megacycle #2. This conclusion, derived from the marginal rocks, is supported by the higher clinopyroxene and bulk rock Mg nos. at the base of olivine clinopyroxenite layers in the layered series of Megacycle #2 as compared to those of Megacycle #1 (Fig. 4). This requires that clinopyroxene became a liquidus phase at a lower Mg no. in the magma of Megacycle #1 than in the magma of Megacycle #2. The anomalous nature of Megacycle #1 is also supported by the fact that both its marginal and layered series rocks are richer in Fe, S, and all incompatible and chalcophile elements than the equivalent rocks of succeeding megacycles (Table 2). The parental magma estimates for Megacycles #3 and #4 are intermediate between those for Megacycles #1 and #2, and

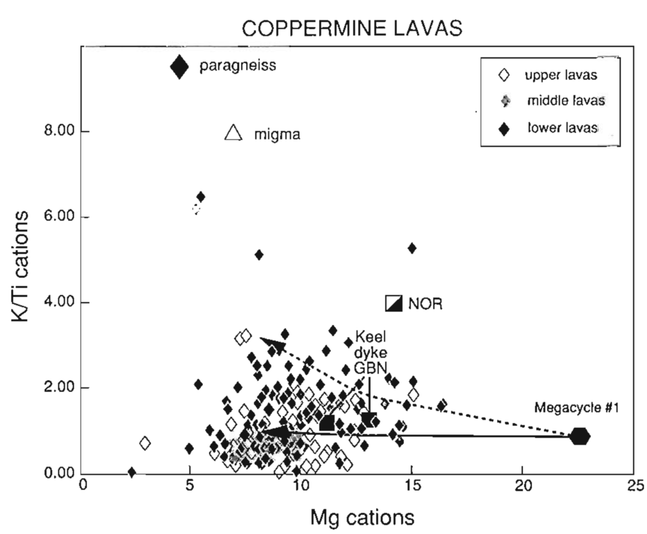

Figure 23. K/Ti versus Mg in cation units of estimated liquid compositions in the Coppermine River-Mackenzie-Muskox magmatic system. Symbols as in Figure 19, except that the Coppermine River lavas have been subdivided into lower (solid diamonds), middle (shaded diamonds), and upper (open diamonds, following the classification of Baragar (1969).

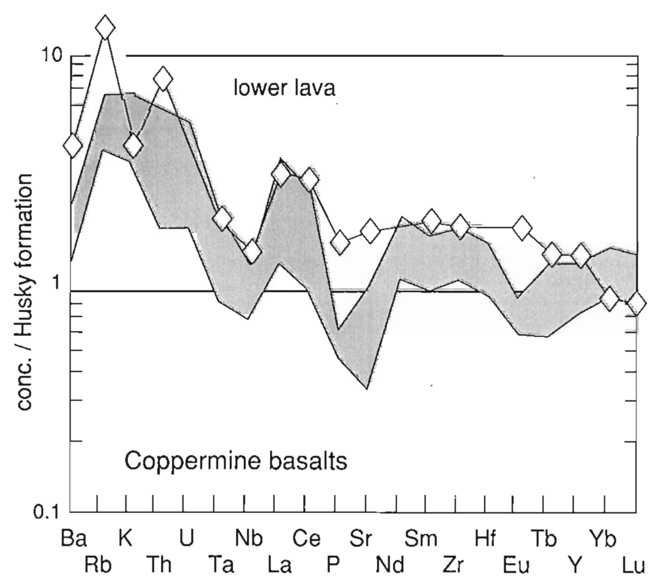

Figure 24. Extended trace element spider diagram in which an analysis of a contaminated lower lava (open diamond) is normalized with respect to a uncontaminated lava from the upper Husky formation (horizontal line), all superimposed on the spider diagram of Figure 15. Coppermine River lava data from Dostal et al. (1983).

the parental magmas for the Muskox intrusion as a whole may constitute a compositional spectrum between these two end-members (Fig. 25). The decrease in the Fe content of estimated parental magma from Megacycle #1 to Megacycle #2 appears to represent a temporal evolution in a waxing magmatic system during which the chamber was expanding, thermal mass was increasing, and convection was becoming more vigourous. The decrease in the Mg no in the bases of successive pyroxenite layers in Megacycles #3 and #4 can be explained by a increased mixing of fractionated residual magma with new influxes of primitive magma during the waning of the Muskox intrusion (DesRoches, 1992).

All the estimated compositions for uncontaminated Muskox liquids exhibit enriched incompatible trace element profiles which are characteristic of continental magmatic suites in general, in contrast to the relatively depleted character of primitive magmas from oceanic environments (Table 2). The origin of this enrichment must either lie in the subcontinental mantle source regions or reflect lower crustal contamination. The higher K content of parent #2 compared to that of parent #1 (Table 2), however, probably reflects the fact that the magmas of Megacycle #2 were more contaminated, as suggested by a comparison of the picrite samples of the first two megacycles (Fig. 18).

Sulphide fractionation

The concentration profile of S across the margins of the Muskox intrusion clearly indicates that it is preferentially concentrated in the marginal rocks along the contact of the intrusion (Fig. 26). There is considerable scatter in the bulk Fe contents of the contaminated norite, gabbronorite, and the plagioclase porphyritic diorite melts of the paragneiss, which are positively correlated with bulk S content. The high Fe concentration of the model contaminant plagioclase porphyritic diorite Po-24a reflects the presence of approximately 5% wt. sulphides. The high concentration of interstitial sulfide blebs and bulk S contents in the contaminated norite and plagioclase porphyritic diorite melts of the country rock suggests that the interaction between the paragneiss country rocks and the magmas of the intrusion may have been responsible for the formation of an immiscible sulphide phase which concentrated the platinum group elements (PGE) along the margin of the intrusion. The development of euhedral plagioclase in the contaminated norite or gabbronorite would have produced Fe-enrichment in the residual liquid of its magma and the presence of restite plagioclase porphyroblasts in the migmatized paragneiss requires that the melt produced was also Fe-rich. Such Fe-rich melts may have become preferentially enriched in S, because of the dependence of S solubility on the Fe content of silicate melts. In the falling temperature regime along the margin, such Fe-rich melts could have produced the observed sulphide mineralization by the separation of an immiscible sulphide liquid.

If sufficient Fe is removed as an immiscible sulphide phase (assuming a pyrrhotite stoichiometry) from the whole rock analyses to account for bulk S content, the compositions of the contaminated norite, gabbronorite, and melts of the country rocks define a trend of decreasing Fe with Mg which

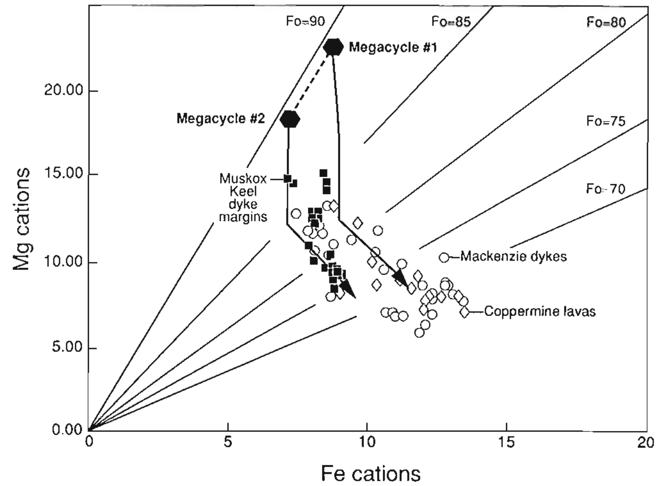

Figure 25. Mg versus Fe plot of uncontaminated (K/Ti wt. 1.0) chilled margins in the Muskox intrusion. Symbols: open diamonds – Coppermine River lavas from Dostal et al. (1983); open circles – Mackenzie dykes; solid squares – chilled margins of Keel dyke and chamber; heavy lines – closed system crystal fractionation paths for estimated parental liquid compositions for Megacycles #1 and #2 (solid hexagons, Table 2); The kinks in the fractionation paths correspond to the points at which clinopyroxene joins olivine as a cumulate phase. The heavy dashed line joining the two estimated parental magma compositions of Megacycles #1 and #2 shows the possible range of parental magma compositions in the Muskox intrusion. The radiating lines indicate the loci of liquid compositions which will co-exist with the indicated olivine compositions assuming an Fe/Mg Kd of 0.3 (Roeder and Emslie, 1970) with total Fe as FeO.

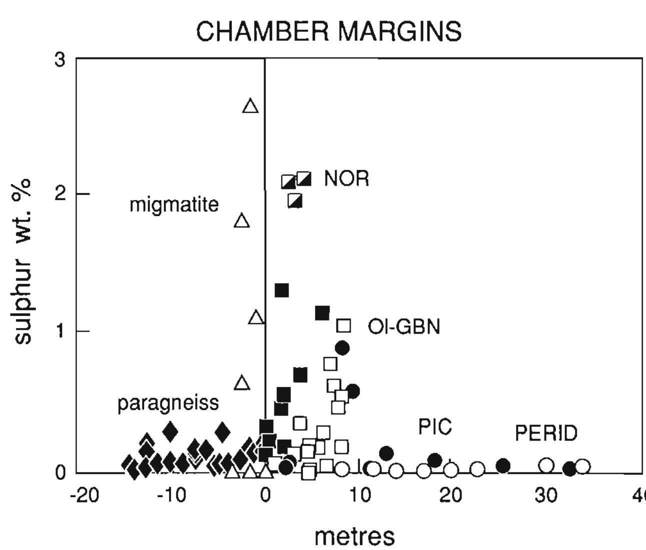

Figure 26. Composite plot of sulphur in wt% versus distance in sections across the margins of the magma chamber. Vertical line represents the contact between the Muskox intrusion and the host paragneiss. Symbols as in Figures 6 and 11.

mimics that of a calc-alkaline differentiation trend. This would be the compositional spectrum of contaminated and mixed magmas formed along the margin of the Muskox magma chamber following the segregation of an immiscible sulphide liquid. The preferential occurrence of native copper mineralization in the upper members of the Coppermine River lavas may reflect the fact that the magmas of the lower lavas were depleted in Cu by a contamination-induced immiscible-sulphide fractionation similar to that observed along the margins. This is supported by a negative correlation between K/Ti and Cu in the Coppermine River lavas.

Sasaki (1969) has shown that the isotopic composition of sulphur ($\delta^{34}S$) in the sulphides in the margin of the Muskox intrusion adjacent to paragneiss exceeds +9 per mil, suggesting that a significant proportion of this sulphur was derived from the host paragneiss. Despite the apparent link between sulphide mineralization and crustal assimilation, however, the olivine gabbronorite samples of the Equinox section have high sulphide contents despite their low K/Ti ratios and require that the mobility of chalcophile elements exceeded that of LIL elements in the Muskox margin. The fact that the highest observed concentrations of sulphides in the Muskox intrusion are restricted to Megacycle #1, however, may suggest a more important correlation with the anomalously Fe-rich character of its primary magma. This possibility, combined with the fact that the background levels for platinum group elements are significantly higher in the layered series of Megacycle #1 (Irvine, 1988), suggests that the down plunge extension of Megacycle #1 holds the most potential for future exploration efforts to find economic concentrations of base or precious metals.

CONCLUSIONS

A comparison of the marginal rocks of the Muskox Keel dyke with those of the main magma chamber indicates that the magmas of the chamber were actively assimilating their paragneiss wall rocks. The strongest chemical signal of contamination is observed in the ratios of LIL/HFS elements and, to a lesser extent, in the ratios of LREE, Y , Th, and U to HFS elements. In the selective contamination preserved in the norite and gabbronorite of the lower two megacycles of the intrusion, however, the ratios of HFS elements are poor indicators of contamination, despite the relatively large contrast in the concentrations of elements such as Zr between the Muskox magmas and the host paragneiss. The different estimates of extent of contamination obtained using different element ratios requires that a selective chemical exchange occurred during the contamination process, with the extent of exchange increasing in the order HFS elements, Y, LREE, U, Th, LIL, and chalcophile elements. Although some post-magmatic exchange may have occurred, the magmatic textures of the contaminated rocks indicates that much of the chemical exchange occurred at the magmatic stage. The relative effectiveness of ratios of LIL/HFS elements as indicators of crustal contamination in comparison to the Nd and Sr isotopic indicators of previous studies may reflect a number of factors. The contrast in LIL element contents between the intrusion and the paragneiss is significantly higher than for REE such as Nd, and the extent of exchange for LIL elements has been shown to be greater than that for REE, possibly because of the higher diffusion rates of alkali metals (Watson, 1982). The effectiveness of Sr isotopes as an indicator of contamination may be limited by the fact that the Sr content of contaminated norite is significantly less than that of the uncontaminated gabbronorite margin of the Keel dyke (Table 1), reflecting both the fact that feldspar was a restite phase retaining Sr during melting of the paragneiss and that the Sr content of the host paragneiss is low in comparison to those of the magmas of the Muskox intrusion (Table 1).

In the Coppermine lavas, contaminated flows occur preferentially in the lower part of the volcanic succession while most of the lower ultramafic cumulates which dominate the Muskox intrusion appear to have crystallized from relatively uncontaminated magma. The Coppermine River lavas thus record a contamination history that appears at first glance to differ from that seen in the Muskox magma chamber. However, the marginal rocks of the Muskox intrusion indicate that two hybrid magmas were being simultaneously produced in a boundary layer approximately 5 m across whose chemical compositions converged towards Fe-enrichment. One was a more magnesian, hypersthene-normative basalt (norite) produced by the contamination of the parental magma of the intrusion and the other was a high-Al basalt to diorite (plagioclase porphyritic diorite) produced by the metasomatic melting of the surrounding paragneiss. The lower density of these hybrid magmas with respect to the pristine magma of the intrusion and the preservation of equivalent compositions in the granophyres at the top of the Muskox intrusion, indicate that they segregated from the margin and rose to accumulate at the roof of the magma chamber. The extreme LIL/HFS element ratios in the first plagioclase cumulates of Megacycles #1 and #2 of the intrusion suggest the presence of a segregated layer of contaminated magma at the top of the chamber during each of these megacycles. According to this model, the separate layer of contaminated magma was largely erupted from the chamber at the end of the first two megacycles to produce the lower Coppermine basalts. The high LIL/HFS element ratios in the first plagioclase cumulate may indicate that eruptions were triggered by mixing between pristine and contaminated magmas as the underlying pristine magma reached plagioclase saturation. The first appearances of orthopyroxene as the third and then second phase to crystallize in the layer series of Megacycles #3 and #4 are clearly associated with spikes in LIL/HFS element ratios, indicating the involvement of upper crustal contamination as originally proposed by Irvine (1970). Still, as suggested by the isotopic data of Stewart and DePaolo (1988, 1990b), much of the layered series of the Muskox intrusion crystallized from relatively uncontaminated magma, and the spike-like behaviour of LIL/HFS element ratios in the chemical stratigraphy of the layered series indicate that the occurrence of mixing between the lower pristine magma and the overlying contaminated magma was an infrequent and/or episodic event following the sealing of the margins with cumulates.

The estimated compositions of the uncontaminated parental magmas of the Muskox intrusion exhibit enriched incompatible trace element profiles which are characteristic of continental basalts, in contrast to the relatively depleted character of primitive magmas from oceanic environments (Table 2). The origin of this enrichment must either lie in the sub-continental mantle source regions or, less likely, reflect lower crustal contamination. The origin of the more Fe-rich composition of the parental magma estimated for Megacycle #1, appears to be a primary difference and the decrease in the Fe content of estimated parental magmas from Megacycle #1 to Megacycle #2 may reflect a temporal evolution in a waxing mantle melting event possibly associated with the surfacing of a deep-seated mantle plume.

The ratios of LIL/HFS elements are simple and effective discriminants for the identification of the upper-crustal contamination in both the layered series of the Muskox intrusion and in the Coppermine River basalts. Although there is a connection between contamination and the development of sulphide mineralization throughout the intrusion, the magmas of Megacycle #1 appear to have been anomalously rich in Fe, S, and PGE and this unit holds the greatest potential for hosting economic accumulations of sulphides.

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APPENDICES

APPENDICES CONTENTS

D.I Orthopyroxene analyses in Keel dyke

D.II Average orthopyroxene analyses in layered series rocks (collected by Valérie Desroches)

Explanations:

Distances in tables are corrected true distances typically measured perpendicular to the gneiss-intrusion contact.

Whole rock analytical methods: The major elements, Ba, Cr, Ni, and V were analyzed by XRF on a Phillips P1400 by Tariq Ahmedali at McGill University on fused disks using an a-coefficient technique. The analytical precisions (1 S.D. in wt.%) calculated from 20 replicate analyses on one disc for these elements are: Si 0.05, Ti 0.003, Al 0.03, Mg 0.058, Fe 0.01, Ca 0.01, Na 0.06, K 0.001, and P 0.004. The precisions for Ba, Cr, Ni, and V are estimated to be 5%. Rb, Sr, Y, Nb, Pb, Cu and Zn were also analyzed by XRF on pressed pellets using a Rh Kb Compton scatter matrix correction. The precisions for these elements are less than 5%. REE, Sc, Ta, Hf, U, and Th were analyzed by INAA by Gilles Gauthier at the Université de Montréal. The samples were irradiated in a flux of $10^{12}n/cm^2/s$ for 4 hours in a SLOWE-POKE II reactor and counted over a 6-week period on two Ge detectors with resolutions of 0.6 and 1.2 at 122 KeV respectively. The precisions for La, Sm, Eu, Yb, and Sc are estimated to be less than 5%, while the precisions on the other elements range between 5 and 10%. Sulphur was analyed by Tariq Ahmedali at McGill University using a LECO induction furnace and an Alpha sulphur titrator with a detection limit of 10 ppm. The platinum group elements were preconcentrated by fire assay and analyzed by INAA by Sarah-Jane Barnes at the Université du Québec à Chicoutimi.

Mineral analytical method: The mineral analyses were performed at McGill University on a Cameca CAMBAX/Microprobe using the Cameca MBXCOR/Micro software package. Counting times were 30 sec for most elements at acceleration voltages of 20 kV for olivine and 15 kV for pyroxenes and currents of 10nA. Counting times of 60 seconds were used for Ni and Ca in olivine. The microprobe analyses of minerals from the layered series were performed by Valerie Desroches. Average analyses typically represent the mean of analyses from diferent grains.

Location maps: In the following sample location maps, the olivine cumulates are represented by a shaded pattern, the clinopyroxene cumulates by inclined lines, gabbro cumulates by crosses, and the upper granophyre by a dotted pattern.

APPENDIX A.I

Whole rock analyses of marginal and dyke rocks

1. Marceau Lake section, Muskox Keel dyke at 7365800m N and 593250m E, Figure A-1. Distance is measured from western contact with paragneiss.

Major elements in wt.%																				
Sample:	MR-1	MR-2	MR-3	MR-4	MR-5	MR-6	MR-7	MR-8	MR-9	MR-10	MR-10B	MR-11	MR-11B	MR-12	MR-13	MR-14	MR-15	MR-16
Rock:	GBN	MIGMA	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC
Metre	0.50	1.50	2.00	3.00	3.75	6.50	9.50	15.00	20.50	24.50	29.00	34.50	41.00	47.75	51.50	54.00	58.00	66.75
SiO_2	52.09	59.24	52.05	52.41	51.92	52.54	52.11	52.33	52.18	52.11	52.11	51.60	51.26	51.37	49.76	47.58	46.77	44.07
TiO_2	1.88	0.80	1.61	1.84	1.52	1.90	1.88	1.82	1.85	1.46	1.56	1.11	0.91	0.75	0.52	0.74	0.52	0.38
Al_2O_3	14.28	18.31	14.23	14.28	14.64	14.38	14.28	14.42	14.26	14.59	14.64	13.25	13.05	13.00	12.19	11.93	8.96	6.38
MgO	6.49	3.81	7.77	6.54	7.16	6.44	6.42	6.65	6.57	7.37	7.23	9.88	11.29	12.05	14.35	16.10	19.90	24.64
FeO	11.26	7.62	10.11	11.09	10.29	11.20	11.18	11.07	11.16	10.50	10.48	10.23	9.82	9.21	8.78	10.36	11.12	11.90
MnO	0.18	0.10	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.18	0.16	0.18	0.19	0.19
CaO	9.78	1.11	9.93	9.93	10.96	9.70	9.63	9.88	9.92	10.39	10.30	10.81	11.01	10.44	12.12	10.90	9.49	7.83
Na_2O	1.82	0.60	1.59	1.80	1.65	1.77	1.81	1.79	1.78	1.69	1.72	1.23	1.10	0.99	0.63	0.78	0.45	0.08
K_2O	1.35	4.65	1.42	1.19	0.92	1.32	1.41	1.24	1.19	1.13	1.16	0.86	0.66	0.99	0.49	0.42	0.26	0.15
P_2O_5	0.20	0.06	0.17	0.19	0.14	0.19	0.19	0.18	0.19	0.13	0.15	0.10	0.07	0.07	0.03	0.07	0.05	0.03
LOI	-	3.39	0.39	-	-	-	-	-	-	-	-	0.15	-	0.76	0.05	0.12	1.20	3.30
Total	99.33	99.69	99.43	99.44	99.37	99.63	99.10	99.55	99.27	99.54	99.52	99.40	99.34	99.81	99.08	99.17	98.91	98.95
Trace elements in ppm																		
Rb	38.0	167.0	43.0	36.0	25.0	36.0	39.0	37.0	34.0	30.0	28.0	24.0	17.0	27.0	12.0	14.0	8.0	7.0
Sr	288.0	279.0	298.0	276.0	273.0	268.0	288.0	263.0	273.0	284.0	278.0	189.0	174.0	194.0	133.0	127.0	89.0	57.0
Ba	337.0	960.0	331.0	327.0	272.0	329.0	327.0	338.0	320.0	272.0	273.0	188.0	174.0	266.0	140.0	156.0	102.0	73.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	22.0	17.0	20.0	21.0	17.0	23.0	22.0	21.0	22.0	17.0	19.0	16.0	12.0	9.0	8.0	11.0	8.0	5.0
Zr	138.0	168.0	126.0	138.0	101.0	145.0	139.0	132.0	136.0	98.0	110.0	79.0	53.0	49.0	30.0	49.0	32.0	20.0
Nb	11.0	13.0	10.0	11.0	9.0	11.0	11.0	10.0	11.0	9.0	9.0	7.0	6.0	5.0	5.0	6.0	5.0	4.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	298.0	129.0	286.0	292.0	282.0	307.0	283.0	291.0	291.0	269.0	264.0	259.0	228.0	210.0	188.0	189.0	164.0	127.0
Cr	154.0	140.0	280.0	195.0	258.0	179.0	181.0	194.0	180.0	254.0	239.0	649.0	866.0	959.0	1336.0	1752.0	2045.0	2751.0
Ni	92.0	50.0	131.0	102.0	103.0	93.0	93.0	100.0	99.0	113.0	112.0	189.0	229.0	273.0	390.0	492.0	666.0	822.0
Co	100.0	56.0	85.0	88.0	110.0	105.0	106.0	93.0	98.0	98.0	91.0	108.0	89.0	94.0	95.0	127.0	133.0	159.0
Cu	274.0	76.0	141.0	308.0	278.0	117.0	159.0	246.0	256.0	54.0	116.0	229.0	197.0	92.0	93.0	313.0	203.0	59.0
Pb	6.0	25.0	8.0	9.0	2.0	8.0	3.0	8.0	8.0	5.0	2.0	3.0	8.0	4.0	5.0	5.0	2.0	3.0
Zn	87.0	141.0	73.0	93.0	81.0	100.0	94.0	105.0	90.0	84.0	81.0	83.0	72.0	60.0	54.0	60.0	67.0	74.0
S	159.8	16.0	191.8	215.9	128.2	168.2	167.8	160.2	175.8	-	127.8	127.8	119.7	295.6	295.6	352.4	215.9	215.5
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm																		
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb																		
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

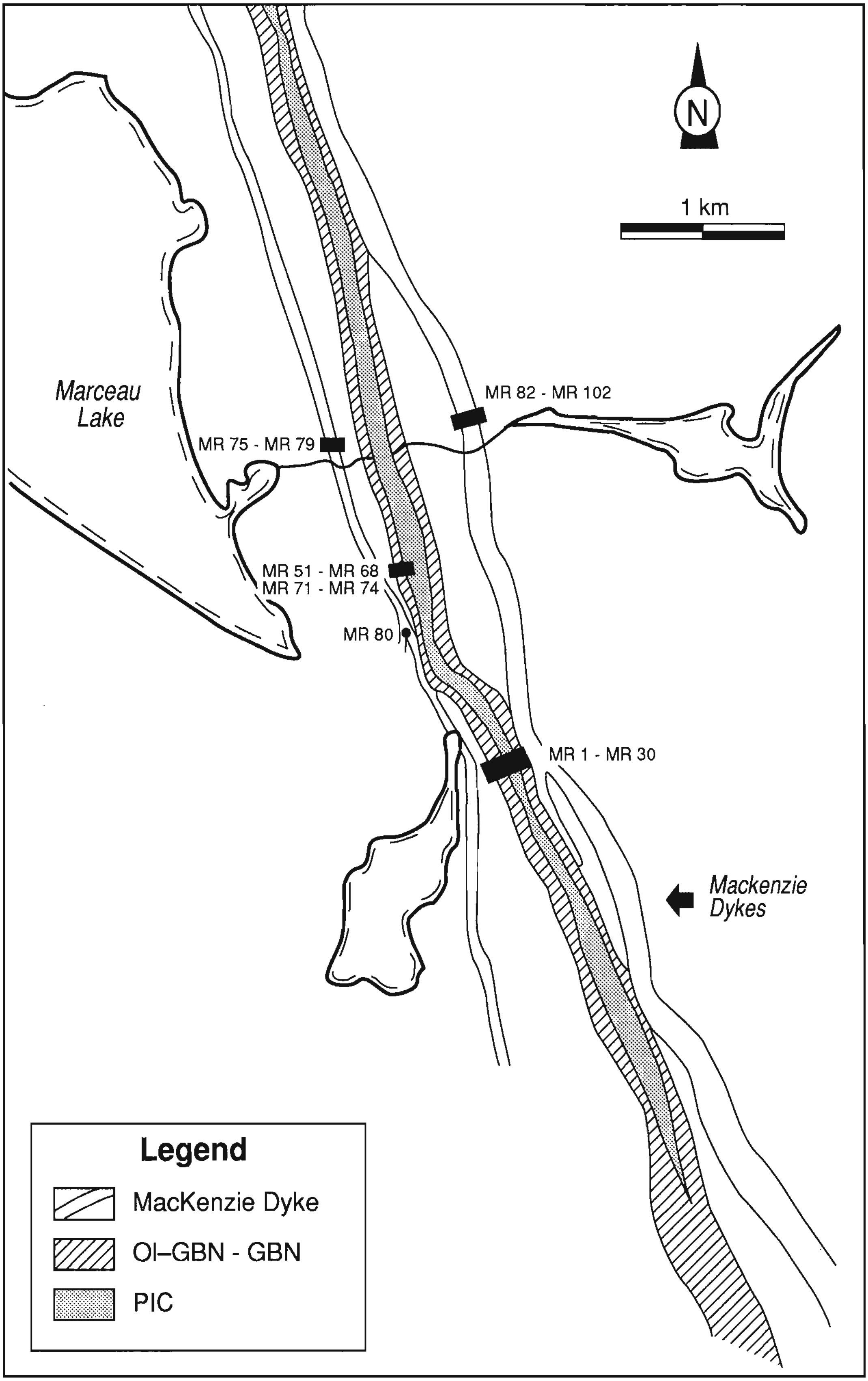

N
1 km
Marceau
Lake
MR 82 - MR 102
MR 75 - MR 79
MR 51 - MR 68
MR 71 - MR 74
MR 80
MR 1 - MR 30
Mackenzie
Dykes
Legend
MacKenzie Dyke
Ol–GBN - GBN
PIC

Figure A-1.

1. **Marceau Lake section** (cont.)

Major elements in wt.%																		
Sample:	MR-17	MR-18	MR-19	MR-20	MR-21	MR-22	MR-23	MR-24	MR-25	MR-26	MR-27	MR-28	MR-29	MR-30	MR-51A	MR-51B	MR-52	MR-53
Rock:	PIC	PIC	PIC	PIC	PIC	PIC	Ol-GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GNEISS	GNEISS	GNEISS	GNEISS
Metre	79.00	92.25	102.75	114.00	145.00	163.00	175.00	180.00	188.50	195.00	205.00	209.25	218.00	222.00	-11.50	-11.50	-6.50	-1.75
SiO_2	45.18	44.43	45.31	45.25	45.48	43.92	49.61	50.96	50.87	51.86	52.03	52.37	51.99	51.81	60.22	80.65	64.18	72.12
TiO_2	0.39	0.45	0.46	0.45	0.48	0.30	0.57	0.82	0.65	1.58	1.83	1.87	1.86	1.77	0.86	0.28	0.54	0.38
Al_2O_3	8.64	6.45	6.23	6.26	8.37	9.14	11.77	12.11	13.41	14.48	14.26	14.14	14.33	14.14	19.93	7.89	14.11	14.22
MgO	21.34	25.02	26.42	26.18	21.92	21.99	14.56	12.81	11.58	7.33	6.62	6.57	6.40	6.73	1.49	1.98	4.12	1.77
FeO	10.64	12.15	12.52	12.49	10.80	10.82	9.60	10.09	8.92	10.65	11.13	11.24	10.97	11.17	4.17	4.67	8.00	3.70
MnO	0.18	0.20	0.20	0.20	0.18	0.17	0.17	0.18	0.17	0.17	0.17	0.18	0.17	0.18	0.03	0.05	0.10	0.08
CaO	9.97	7.28	7.24	7.34	8.79	9.35	11.69	11.00	11.98	10.72	10.07	10.05	9.75	10.07	0.30	0.42	0.24	0.24
Na_2O	0.25	0.26	0.19	0.23	0.45	0.20	0.64	0.95	0.97	1.72	1.84	1.87	1.86	1.75	1.13	0.37	0.38	2.05
K_2O	0.51	0.18	0.21	0.18	0.29	0.19	0.61	0.51	0.48	0.84	1.03	1.09	1.22	1.16	7.29	1.34	3.92	2.79
P_2O_5	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.07	0.04	0.14	0.18	0.18	0.17	0.14	0.05	0.04	0.04	0.06
LOI	1.50	2.31	-	0.37	2.16	2.90	-	-	-	-	-	-	0.44	0.72	3.87	1.88	3.66	2.36
Total	98.64	98.78	98.81	98.99	98.96	99.00	99.26	99.49	99.07	99.49	99.16	99.56	99.15	99.64	99.35	99.57	99.29	99.77
Trace elements in ppm																		
Rb	14.0	6.0	8.0	8.0	10.0	6.0	12.0	14.0	12.0	25.0	29.0	31.0	34.0	33.0	237.0	38.0	114.0	88.0
Sr	111.0	60.0	63.0	61.0	93.0	82.0	157.0	155.0	167.0	256.0	257.0	264.0	282.0	290.0	107.0	29.0	90.0	80.0
Ba	193.0	87.0	96.0	90.0	119.0	76.0	127.0	163.0	136.0	260.0	307.0	314.0	314.0	273.0	932.0	70.0	599.0	306.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	6.0	7.0	7.0	7.0	7.0	4.0	8.0	11.0	10.0	17.0	21.0	23.0	23.0	20.0	27.0	6.0	20.0	11.0
Zr	25.0	26.0	28.0	28.0	31.0	16.0	32.0	49.0	35.0	103.0	138.0	143.0	133.0	107.0	194.0	133.0	196.0	129.0
Nb	4.0	5.0	4.0	5.0	4.0	4.0	5.0	6.0	5.0	9.0	11.0	11.0	11.0	9.0	16.0	5.0	10.0	9.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	139.0	155.0	136.0	149.0	141.0	119.0	192.0	226.0	199.0	285.0	286.0	292.0	295.0	287.0	133.0	25.0	76.0	56.0
Cr	2330.0	2794.0	2984.0	2965.0	2497.0	2350.0	1316.0	989.0	852.0	240.0	190.0	184.0	153.0	201.0	135.0	21.0	82.0	32.0
Ni	1180.0	931.0	982.0	955.0	773.0	789.0	362.0	276.0	244.0	121.0	104.0	96.0	91.0	92.0	38.0	26.0	29.0	29.0
Co	146.0	159.0	181.0	179.0	150.0	140.0	104.0	114.0	83.0	91.0	102.0	110.0	93.0	88.0	19.0	49.0	65.0	30.0
Cu	601.0	210.0	211.0	81.0	131.0	128.0	150.0	41.0	76.0	128.0	160.0	47.0	142.0	154.0	126.0	72.0	93.0	80.0
Pb	7.0	3.0	5.0	5.0	6.0	2.0	2.0	4.0	4.0	3.0	3.0	7.0	10.0	2.0	16.0	8.0	18.0	4.0
Zn	75.0	78.0	81.0	75.0	69.0	65.0	55.0	69.0	57.0	79.0	98.0	99.0	95.0	86.0	28.0	20.0	164.0	218.0
S	2240.0	240.3	199.8	199.8	199.4	135.0	152.2	199.0	104.1	176.2	232.3	175.8	240.3	198.6	191.8	259.9	400.9	80.1
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm																		
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb																		
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1. Marceau Lake section (cont.)

Major elements in wt.%																	
Sample:	MR-54	MR-55	MR-56	MR-57	MR-58	MR-59	MR-60	MR-61	MR-62	MR-63	MR-64	MR-65	MR-66	MR-67	MR-72	MR-73	MR-74
Rock:	GNEISS	GNEISS	GNEISS	MIGMA	GBN	MIGMA	MIGMA	GBN	GBN	GBN	GBN	GBN	GBN	GBN	MIGMA	MIGMA	GBN
Metre	-1.10	-0.40	0.00	0.30	0.50	0.45	0.75	0.80	1.20	2.70	7.00	11.00	15.00	20.00	1.80	2.60	35.00
SiO_2	67.99	62.49	65.08	61.16	52.46	79.09	78.58	52.22	52.48	53.59	51.49	52.33	52.20	52.14	78.90	54.96	47.15
TiO_2	0.73	0.70	0.66	0.75	1.95	0.26	0.40	1.94	1.92	1.85	1.02	1.87	1.81	1.52	0.28	1.49	1.14
Al_2O_3	16.91	17.86	15.30	18.20	14.28	8.42	8.49	14.11	14.02	14.01	15.91	14.26	14.23	14.46	8.42	13.33	11.59
MgO	2.70	2.52	3.52	3.33	6.43	2.41	1.88	6.34	6.36	6.24	8.71	6.54	6.52	7.20	2.01	5.04	10.32
FeO	5.49	5.22	6.08	5.76	11.44	4.30	4.69	11.37	11.24	11.08	8.41	11.18	11.08	10.49	3.95	11.57	11.41
MnO	0.07	0.04	0.09	0.06	0.19	0.08	0.09	0.18	0.18	0.17	0.15	0.17	0.17	0.17	0.06	0.12	0.14
CaO	0.13	0.17	0.18	0.13	9.95	0.48	0.52	9.96	9.68	9.38	9.56	10.17	10.06	10.71	0.86	5.35	11.95
Na_2O	0.61	0.49	0.31	0.44	1.80	1.53	2.14	2.03	1.77	1.76	1.44	1.81	1.82	1.72	2.27	1.98	0.58
K_2O	5.06	6.44	4.48	5.97	0.83	1.01	1.41	0.79	1.30	1.27	1.49	1.02	1.08	0.85	1.01	1.83	1.22
P_2O_5	0.05	0.06	0.08	0.06	0.20	0.02	0.03	0.19	0.19	0.19	0.10	0.18	0.18	0.13	0.04	0.15	0.11
LOI	-	3.46	3.63	3.80	-	2.08	1.33	-	-	-	1.19	-	-	-	1.66	2.03	2.30
Total	99.74	99.45	99.41	99.66	99.52	99.68	99.56	99.13	99.14	99.54	99.48	99.53	99.14	99.38	99.46	97.85	97.91
Trace elements in ppm																	
Rb	158.0	220.0	143.0	183.0	30.0	31.0	38.0	27.0	39.0	40.0	42.0	29.0	30.0	23.0	16.0	76.0	36.0
Sr	106.0	134.0	77.0	107.0	255.0	33.0	93.0	259.0	265.0	277.0	303.0	259.0	265.0	259.0	74.0	225.0	161.0
Ba	641.0	918.0	580.0	684.0	339.0	100.0	236.0	335.0	359.0	353.0	275.0	316.0	316.0	265.0	76.0	323.0	320.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	17.0	24.0	19.0	16.0	23.0	8.0	10.0	23.0	23.0	23.0	12.0	21.0	22.0	17.0	12.0	21.0	16.0
Zr	206.0	182.0	217.0	176.0	143.0	151.0	152.0	145.0	149.0	149.0	72.0	135.0	133.0	103.0	173.0	148.0	87.0
Nb	13.0	13.0	13.0	14.0	12.0	7.0	7.0	12.0	12.0	11.0	7.0	11.0	11.0	9.0	6.0	11.0	7.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	92.0	100.0	81.0	106.0	320.0	34.0	56.0	314.0	288.0	289.0	204.0	301.0	289.0	269.0	44.0	218.0	238.0
Cr	101.0	110.0	81.0	112.0	163.0	28.0	28.0	185.0	169.0	165.0	367.0	174.0	192.0	230.0	27.0	174.0	709.0
Ni	43.0	38.0	39.0	44.0	97.0	22.0	18.0	93.0	96.0	94.0	146.0	97.0	96.0	109.0	21.0	1416.0	887.0
Co	34.0	29.0	40.0	38.0	107.0	38.0	56.0	106.0	102.0	97.0	82.0	103.0	101.0	91.0	58.0	144.0	141.0
Cu	97.0	91.0	112.0	177.0	155.0	120.0	239.0	156.0	147.0	111.0	87.0	165.0	159.0	101.0	299.0	3637.0	4384.0
Pb	8.0	16.0	21.0	14.0	28.0	11.0	107.0	7.0	8.0	7.0	2.0	4.0	5.0	2.0	176.0	36.0	13.0
Zn	40.0	54.0	97.0	92.0	118.0	146.0	108.0	98.0	96.0	97.0	56.0	98.0	87.0	73.0	93.0	87.0	81.0
S	32.0	48.1	56.1	104.1	401.7	255.9	459.0	223.5	240.3	247.5	80.1	175.8	32.0	88.1	6.2	12260.0	10370.0
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm																	
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb																	
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

2. Last Join section, Muskox Keel dyke at 7377900m N and 588500m E; Figures A-2 & A-3. Distances from western contact to MacKenzie dyke.

Sample:	LJ-4	LJ-5	LJ-6	LJ-7	LJ-8A	LJ-8B	LJ-9	LJ-10	LJ-11	LJ-12	LJ-13A	LJ-14	LJ-15	LJ-16	LJ-17	LJ-18	LJ-19	LJ-20
Major elements in wt.%																		
Rock:	GBN	GBN	GBN	GBN	GBN	GBN	GBN	GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	PIC	Ol-GBN	Ol-GBN
Metre	0.10	0.20	5.00	12.00	21.00	21.00	27.00	36.00	44.00	48.00	48.80	49.50	57.00	63.00	72.00	75.00	76.80	77.10
SiO_2	52.11	53.74	52.73	52.39	50.45	51.64	50.96	51.47	49.48	49.78	48.63	46.74	45.03	44.95	44.31	44.93	47.75	49.76
TiO_2	1.80	1.87	1.73	1.65	1.38	0.78	0.77	1.15	0.52	0.52	0.43	0.52	0.43	0.45	0.46	0.46	0.47	0.34
Al_2O_3	14.40	14.30	14.29	14.56	12.64	13.76	13.13	13.02	11.91	11.92	11.38	9.22	7.45	6.62	6.44	6.67	10.70	13.10
MgO	6.81	5.82	6.68	6.80	10.24	10.51	10.82	10.27	14.04	14.69	15.67	20.63	23.37	24.59	24.79	24.29	16.78	13.31
FeO	11.22	11.09	11.28	10.81	11.41	9.11	9.55	10.08	9.50	8.83	8.67	11.18	11.66	11.85	12.22	12.86	11.17	7.89
MnO	0.17	0.18	0.17	0.17	0.18	0.16	0.17	0.17	0.16	0.16	0.16	0.18	0.18	0.18	0.19	0.20	0.18	0.15
CaO	10.28	9.20	10.07	10.35	10.41	12.34	12.31	11.62	12.38	13.04	13.26	9.51	8.55	7.70	7.26	7.72	11.13	14.58
Na_2O	1.88	1.90	1.79	1.84	1.29	1.29	1.12	1.37	0.84	0.78	0.71	0.58	0.51	0.42	0.45	0.38	0.68	0.72
K_2O	1.07	1.23	1.16	0.99	0.80	0.40	0.37	0.64	0.35	0.30	0.18	0.26	0.19	0.19	0.20	0.18	0.15	0.10
P_2O_5	0.18	0.23	0.18	0.17	0.15	0.07	0.07	0.10	0.04	0.04	0.03	0.05	0.04	0.04	0.05	0.04	0.04	0.02
LOI	0.01	0.10	0.01	0.01	0.10	0.01	0.01	0.09	0.01	0.01	0.18	0.97	2.46	2.50	3.15	1.53	0.01	0.01
Total	99.93	99.66	100.10	99.74	99.04	100.08	99.27	99.98	99.23	100.07	99.29	99.84	99.87	99.49	99.52	99.26	99.06	99.98
Trace elements in ppm																		
Rb	27.0	46.0	31.0	25.0	26.0	9.0	11.0	18.0	9.0	7.0	4.0	8.0	8.0	8.0	8.0	7.0	6.0	4.0
Sr	269.0	277.0	264.0	265.0	169.0	171.0	142.0	156.0	128.0	134.0	113.0	98.0	64.0	68.0	63.0	70.0	98.0	111.0
Ba	290.0	351.0	299.0	275.0	221.0	133.0	116.0	163.0	175.0	97.0	66.0	102.0	80.0	85.0	82.0	100.0	88.0	69.0
Sc	30.8	27.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41.1
Y	19.0	25.0	21.0	19.0	18.0	11.0	11.0	16.0	8.0	8.0	7.0	7.0	6.0	6.0	6.0	7.0	7.0	6.0
Zr	121.0	157.0	132.0	118.0	108.0	41.0	44.0	72.0	28.0	27.0	18.0	32.0	26.0	28.0	28.0	26.0	25.0	14.0
Nb	10.0	12.0	11.0	10.0	9.0	5.0	5.0	6.0	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	5.0	4.0
Hf	3.8	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
Ta	0.6	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
V	319.0	293.0	317.0	302.0	243.0	230.0	230.0	290.0	187.0	200.0	196.0	169.0	157.0	165.0	158.0	155.0	179.0	190.0
Cr	186.0	133.0	192.0	159.0	733.0	725.0	812.0	715.0	1249.0	1273.0	1597.0	2204.0	2574.0	2761.0	2769.0	2683.0	1791.0	1371.0
Co	86.0	81.0	78.0	89.0	99.0	77.0	81.0	77.0	174.0	80.0	92.0	131.0	133.0	152.0	147.0	146.0	129.0	76.0
Ni	99.0	98.0	104.0	95.0	237.0	192.0	193.0	195.0	352.0	370.0	426.0	702.0	863.0	912.0	979.0	863.0	529.0	279.0
Cu	49.0	86.0	51.0	31.0	40.0	45.0	25.0	62.0	65.0	49.0	37.0	61.0	72.0	87.0	47.0	15.0	14.0	24.0
Pb	4.0	285.0	6.0	5.0	5.0	2.0	2.0	5.0	2.0	5.0	2.0	2.0	5.0	3.0	2.0	4.0	3.0	2.0
Zn	77.0	102.0	89.0	85.0	87.0	51.0	53.0	66.0	86.0	51.0	39.0	67.0	64.0	67.0	81.0	113.0	65.0	34.0
S	24.0	36.0	40.0	44.0	76.1	32.0	40.0	120.1	160.2	95.7	123.8	319.6	251.5	244.3	135.8	127.8	92.1	44.0
U	0.8	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Th	3.0	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
Rare-earth elements in ppm																		
La	16.00	22.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.80
Ce	33.50	44.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.00
Nd	19.80	24.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.00
Sm	4.75	5.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86
Eu	1.44	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.37
Tb	0.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.19
Ho	-	1.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.30
Yb	2.20	2.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.80
Lu	0.35	0.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12
Platinum group elements in ppb																		
Os	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.90	0.90	1.10	0.70	1.60	0.60	2.00	1.40	0.50
Ir	0.20	0.19	0.26	0.21	0.37	0.32	0.28	0.26	0.50	0.61	0.71	0.83	1.04	1.19	0.68	1.47	1.19	0.14
Ru	5.00	5.00	5.00	5.00	5.00	7.00	5.00	5.00	9.00	5.00	5.00	6.00	5.00	5.00	5.00	6.00	5.00	7.00
Rh	0.57	0.35	0.63	0.36	1.57	0.79	0.91	0.50	0.70	1.81	2.57	2.05	0.56	1.24	2.07	1.69	1.77	0.60
Pt	8.00	5.00	7.00	5.00	6.00	9.00	11.00	10.00	5.00	13.00	13.00	14.00	11.00	11.00	12.00	24.00	23.00	13.00
Pd	9.00	8.00	9.00	4.00	42.00	7.00	3.00	8.00	6.00	3.00	62.00	24.00	2.00	3.00	7.00	18.00	20.00	5.00
Au	2.13	2.76	2.47	1.98	4.18	2.24	2.67	3.41	2.70	1.17	4.45	3.71	1.44	0.99	1.61	2.12	3.81	0.68

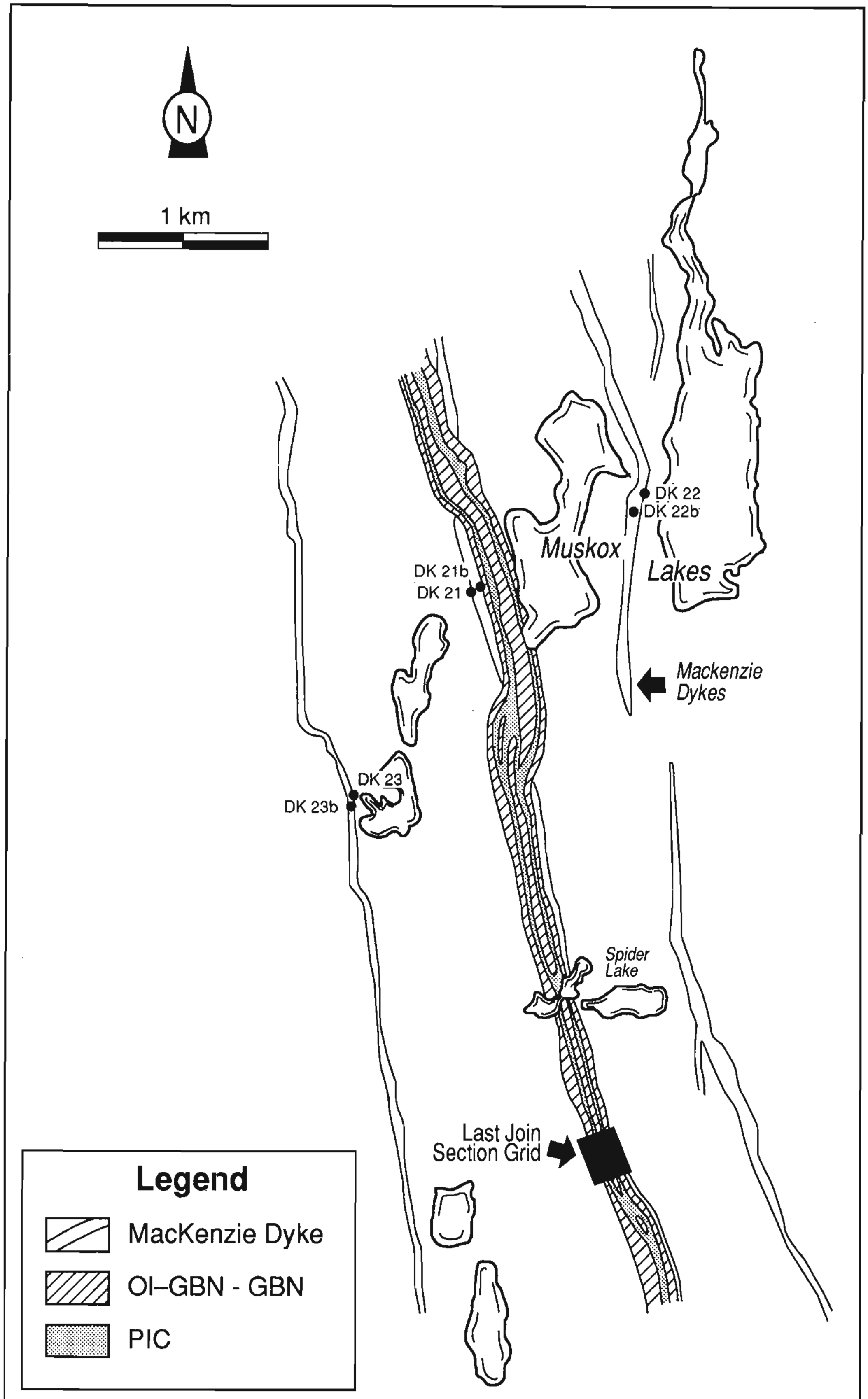
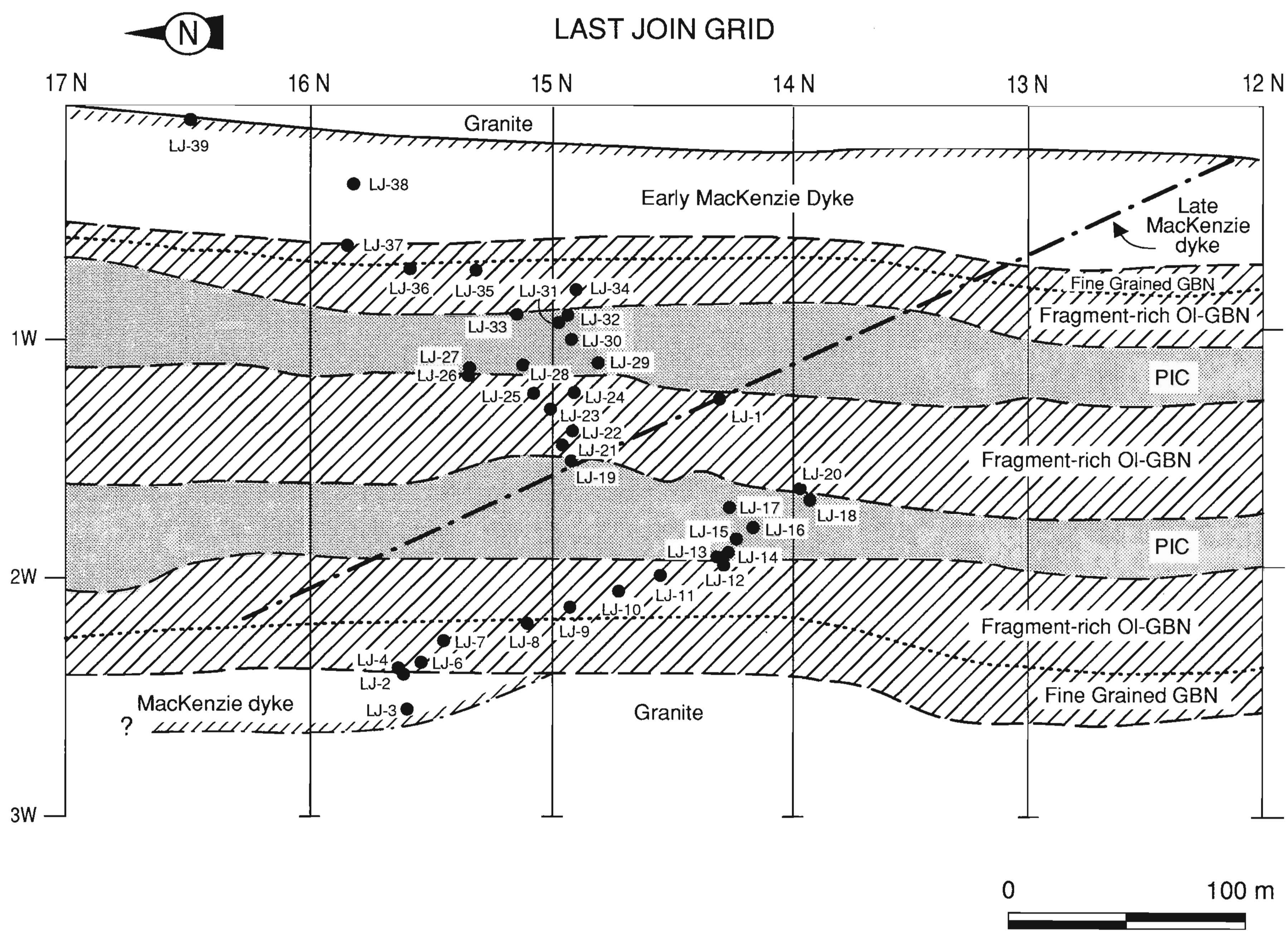

N
1 km
DK 22
DK 22b
Muskox
Lakes
DK 21b
DK 21
Mackenzie
Dykes
DK 23
DK 23b
Spider
Lake
Last Join
Section Grid
Legend
MacKenzie Dyke
Ol–GBN - GBN
PIC

Figure A-2.


N
LAST JOIN GRID
17 N
16 N
15 N
14 N
13 N
12 N
1W
2W
3W
Granite
Early MacKenzie Dyke
Late MacKenzie dyke
Fine Grained GBN
Fragment-rich Ol-GBN
PIC
Fragment-rich Ol-GBN
PIC
Fragment-rich Ol-GBN
Fine Grained GBN
Granite
MacKenzie dyke
?
LJ-1
LJ-2
LJ-3
LJ-4
LJ-6
LJ-7
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LJ-37
LJ-38
LJ-39
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100 m

Figure A-3.

2. **Last Join section** (cont.)

Major elements in wt.%																	
Sample:	LJ-21	LJ-22	LJ-23	LJ-24	LJ-25	LJ-26	LJ-27	LJ-28	LJ-29	LJ-30	LJ-31	LJ-33	LJ-32	LJ-34	LJ-35	LJ-36	LJ-37
Rock:	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	Ol-GBN	Ol-GBN	01-GBN	01-GBN	GBN	GBN	GBN
Metre	83.00	89.00	99.00	105.00	108.00	113.00	113.50	116.00	122.00	129.00	135.00	137.00	137.90	144.00	155.00	164.00	167.00
SiO_2	50.02	49.48	49.53	49.44	50.53	50.32	48.37	44.58	45.38	46.25	47.26	48.31	50.36	48.80	51.13	50.85	51.39
TiO_2	0.58	0.65	0.52	0.60	0.48	0.44	0.49	0.55	0.48	0.47	0.55	0.55	0.42	0.56	0.86	0.90	1.68
Al_2O_3	13.08	12.58	12.18	12.24	13.61	13.54	9.27	6.84	9.29	9.29	9.93	7.54	10.37	12.11	13.32	12.53	14.46
MgO	11.85	12.86	13.46	13.55	11.98	12.26	18.19	23.56	21.16	20.83	18.27	19.85	17.28	14.53	10.22	11.47	7.32
FeO	8.67	10.07	9.73	9.95	8.21	8.14	12.73	12.37	11.22	10.85	10.95	12.17	9.68	9.84	9.67	11.31	11.04
MnO	0.16	0.17	0.17	0.17	0.15	0.16	0.20	0.19	0.17	0.17	0.18	0.20	0.17	0.16	0.17	0.19	0.17
CaO	13.44	12.67	12.41	12.51	14.03	13.80	9.54	7.30	9.32	9.50	10.48	10.14	9.91	11.47	12.02	10.47	10.91
Na_2O	0.98	1.02	0.84	0.97	0.89	0.87	0.62	0.42	0.64	0.67	0.71	0.46	0.57	0.86	1.33	1.24	1.80
K_2O	0.25	0.26	0.28	0.24	0.17	0.20	0.21	0.22	0.20	0.23	0.25	0.16	0.22	0.26	0.45	0.50	0.72
P_2O_5	0.04	0.06	0.04	0.05	0.04	0.02	0.05	0.05	0.05	0.05	0.05	0.04	0.03	0.04	0.07	0.09	0.13
LOI	0.03	0.01	0.01	0.01	0.01	0.02	0.01	3.01	1.53	1.16	0.24	0.01	0.19	0.01	0.01	0.01	0.01
Total	99.10	99.83	99.16	99.73	100.10	99.77	99.68	99.10	99.44	99.47	98.87	99.43	99.20	98.63	99.25	99.56	99.62
Trace elements in ppm																	
Rb	6.0	8.0	9.0	7.0	5.0	6.0	8.0	9.0	7.0	8.0	9.0	8.0	7.0	8.0	12.0	15.0	19.0
Sr	147.0	120.0	117.0	127.0	123.0	125.0	95.0	69.0	85.0	85.0	99.0	73.0	97.0	121.0	161.0	164.0	267.0
Ba	127.0	104.0	103.0	99.0	25.0	85.0	124.0	91.0	90.0	88.0	103.0	83.0	112.0	110.0	137.0	175.0	233.0
Sc	-	39.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	9.0	10.0	9.0	9.0	7.0	7.0	7.0	8.0	7.0	7.0	8.0	9.0	6.0	9.0	12.0	13.0	17.0
Zr	29.0	38.0	29.0	33.0	22.0	17.0	27.0	33.0	30.0	29.0	34.0	30.0	20.0	31.0	53.0	60.0	92.0
Nb	5.0	5.0	4.0	5.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	6.0	6.0	9.0
Hf	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	214.0	223.0	199.0	211.0	193.0	197.0	172.0	158.0	155.0	157.0	168.0	203.0	165.0	192.0	241.0	239.0	301.0
Cr	972.0	1036.0	1047.0	991.0	1101.0	1225.0	1573.0	2560.0	2212.0	2213.0	1607.0	1544.0	2047.0	1287.0	707.0	882.0	218.0
Ni	236.0	331.0	327.0	363.0	251.0	218.0	524.0	882.0	780.0	683.0	638.0	588.0	1408.0	550.0	190.0	307.0	134.0
Co	67.0	89.0	100.0	94.0	83.0	60.0	128.0	149.0	127.0	130.0	122.0	137.0	117.0	98.0	87.0	106.0	92.0
Cu	43.0	53.0	32.0	61.0	19.0	10.0	12.0	93.0	76.0	51.0	85.0	14.0	1779.0	538.0	48.0	172.0	83.0
Pb	3.0	7.0	2.0	7.0	4.0	2.0	18.0	3.0	4.0	3.0	8.0	34.0	11.0	48.0	5.0	16.0	3.0
Zn	47.0	57.0	57.0	59.0	34.0	36.0	84.0	95.0	80.0	77.0	69.0	66.0	69.0	56.0	55.0	96.0	86.0
S	112.1	203.9	128.2	160.2	80.1	36.0	80.1	322.8	308.0	312.0	511.8	364.1	4726.0	1682.0	40.0	116.1	144.2
U	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm																	
La	-	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	12.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	7.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	1.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	0.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	0.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	1.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb																	
Os	0.50	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	0.11	0.25	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	6.00	9.00	7.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	0.20	0.52	0.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	9.00	5.00	7.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	7.00	2.00	11.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	1.66	1.41	1.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3a. Coppermine River section #1, Muskox Keel dyke at 7399300m N and 5881500m E; Figure A-4. Distances from eastern contact with gneiss.

Major elements in wt.%

Sample:	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9	CR-10	CR-11	CR-12	CR-13	CR-14	CR-22	CR-15	CC-0	CC-1	CC-2	CC-3	CR-16
Rock:	GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	GBN	GBN	GBN	GBN	GBN
Metre	457.50	455.00	420.00	345.00	308.00	287.50	268.00	242.50	217.50	196.20	176.50	141.50	126.20	108.70	93.70	60.00	41.30	40.90	39.60	36.30	36.20
SiO_2	50.96	50.40	50.68	44.43	41.27	41.03	41.42	42.23	41.78	40.13	41.05	41.05	41.29	39.98	43.77	47.24	51.07	50.81	50.40	48.01	50.53
TiO_2	0.99	0.98	0.73	0.70	0.47	0.33	0.39	0.32	0.43	0.38	0.47	0.40	0.47	0.34	0.56	0.96	1.00	0.55	0.57	0.64	0.94
Al_2O_3	13.66	13.06	13.36	8.30	6.26	6.92	5.98	7.58	6.81	5.69	5.63	5.76	5.79	7.12	9.10	10.41	12.39	14.04	14.17	13.58	13.77
MgO	8.62	9.93	11.14	22.04	26.73	24.81	26.95	24.54	25.14	26.00	26.98	26.60	27.01	27.16	20.73	17.45	10.21	10.65	10.35	9.39	9.24
FeO	10.41	10.64	9.23	12.53	12.80	11.21	12.42	11.30	12.26	12.53	13.15	12.72	13.28	12.50	11.15	12.09	10.83	9.24	9.33	12.46	10.16
MnO	0.18	0.18	0.16	0.19	0.19	0.17	0.18	0.17	0.18	0.18	0.20	0.19	0.19	0.17	0.17	0.18	0.18	0.17	0.17	0.17	0.18
CaO	11.79	10.74	11.78	6.81	4.67	7.36	6.14	7.66	6.50	5.72	4.76	5.50	5.20	5.22	7.61	8.50	11.02	12.30	12.20	11.81	11.92
Na_2O	1.78	1.56	1.35	0.82	0.21	0.21	0.24	0.50	0.93	0.28	0.28	0.90	0.38	0.33	1.31	1.21	1.25	1.09	1.11	1.12	1.80
K_2O	0.69	1.04	0.67	0.37	0.25	0.11	0.15	0.11	0.19	0.13	0.20	0.15	0.17	0.13	0.22	0.52	0.79	0.56	0.52	0.61	0.66
P_2O_5	0.08	0.08	0.05	0.07	0.06	0.03	0.04	0.03	0.04	0.04	0.05	0.04	0.04	0.03	0.04	0.10	0.09	0.03	0.04	0.04	0.06
LOI	0.01	0.58	0.24	2.43	5.62	6.08	4.57	3.89	3.91	6.76	5.13	5.18	3.90	5.93	4.00	0.03	0.29	0.06	0.18	0.85	0.07
Total	99.17	99.19	99.39	98.69	98.53	98.26	98.47	98.34	98.17	97.84	97.90	98.50	97.72	98.91	98.66	98.68	99.12	99.50	99.04	98.68	99.33

Trace elements in ppm

	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9	CR-10	CR-11	CR-12	CR-13	CR-14	CR-22	CR-15	CC-0	CC-1	CC-2	CC-3	CR-16
Rb	19.0	26.0	10.0	11.0	11.0	7.0	6.0	6.0	8.0	8.0	9.0	7.0	8.0	6.0	8.0	15.0	27.0	16.0	15.0	14.0	17.0
Sr	160.0	214.0	230.0	113.0	103.0	148.0	65.0	77.0	79.0	58.0	91.0	76.0	66.0	85.0	115.0	129.0	170.0	168.0	169.0	226.0	182.0
Ba	154.0	186.0	165.0	136.0	125.0	112.0	73.0	51.0	74.0	70.0	95.0	79.0	75.0	66.0	91.0	153.0	209.0	146.0	136.0	130.0	149.0
Sc	40.3	-	56.0	35.0	-	-	-	-	-	-	-	-	-	-	34.0	41.0	42.2	39.3	-	-	-
Y	15.0	15.0	10.0	8.0	5.0	4.0	4.0	3.0	5.0	4.0	5.0	5.0	5.0	3.0	7.0	12.0	19.0	8.0	8.0	10.0	13.0
Zr	61.0	61.0	34.0	43.0	29.0	19.0	21.0	16.0	27.0	24.0	28.0	21.0	26.0	19.0	30.0	66.0	70.0	19.0	18.0	26.0	40.0
Nb	6.0	5.0	5.0	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	7.0	6.0	4.0	4.0	5.0	5.0
Hf	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	0.9	-	-	-
Ta	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	0.3	-	-	-
V	262.0	246.0	235.0	164.0	131.0	119.0	127.0	128.0	136.0	126.0	134.0	135.0	156.0	117.0	158.0	209.0	286.0	219.0	223.0	222.0	272.0
Cr	547.0	656.0	909.0	2764.0	3659.0	3288.0	3619.0	3270.0	3466.0	3647.0	3810.0	3690.0	3747.0	3682.0	2611.0	2025.0	665.0	546.0	544.0	490.0	484.0
Ni	162.0	240.0	448.0	984.0	1295.0	1138.0	1357.0	1165.0	1240.0	1306.0	1374.0	1310.0	1342.0	1362.0	1093.0	803.0	427.0	204.0	201.0	2003.0	235.0
Co	79.0	96.0	83.0	136.0	148.0	142.0	146.0	145.0	147.0	146.0	161.0	159.0	161.0	148.0	132.0	135.0	73.0	94.0	71.0	164.0	95.0
Cu	95.0	204.0	106.0	86.0	111.0	147.0	160.0	107.0	126.0	136.0	181.0	122.0	152.0	137.0	169.0	192.0	43.0	323.0	39.0	3078.0	212.0
Pb	7.0	7.0	2.0	7.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.0	29.0	2.0	2.0	143.0	12.0
Zn	55.0	61.0	45.0	81.0	91.0	58.0	63.0	53.0	62.0	63.0	83.0	73.0	71.0	60.0	57.0	70.0	46.0	78.0	44.0	73.0	53.0
S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2043.0	60.1	16.0	20590.0	-
U	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	0.2	-	-	-
Th	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	0.6	-	-	-

Rare-earth elements in ppm

	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9	CR-10	CR-11	CR-12	CR-13	CR-14	CR-22	CR-15	CC-0	CC-1	CC-2	CC-3	CR-16
La	7.80	-	6.70	8.60	-	-	-	-	-	-	-	-	-	-	6.00	12.70	9.40	2.70	-	-	-
Ce	17.00	-	16.00	24.00	-	-	-	-	-	-	-	-	-	-	16.00	28.00	29.10	7.80	-	-	-
Nd	11.30	-	9.00	12.00	-	-	-	-	-	-	-	-	-	-	7.00	15.00	13.80	5.40	-	-	-
Sm	2.58	-	2.50	2.30	-	-	-	-	-	-	-	-	-	-	1.80	3.40	3.60	1.27	-	-	-
Eu	0.84	-	0.87	0.72	-	-	-	-	-	-	-	-	-	-	0.56	1.03	1.07	0.59	-	-	-
Tb	0.48	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	0.30	0.60	0.64	0.37	-	-	-
Ho	0.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.47	-	-	-
Yb	1.90	-	1.70	1.42	-	-	-	-	-	-	-	-	-	-	1.12	1.98	2.20	1.10	-	-	-
Lu	0.30	-	0.26	0.22	-	-	-	-	-	-	-	-	-	-	0.16	0.30	0.33	0.18	-	-	-

Platinum group elements in ppb

	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9	CR-10	CR-11	CR-12	CR-13	CR-14	CR-22	CR-15	CC-0	CC-1	CC-2	CC-3	CR-16
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

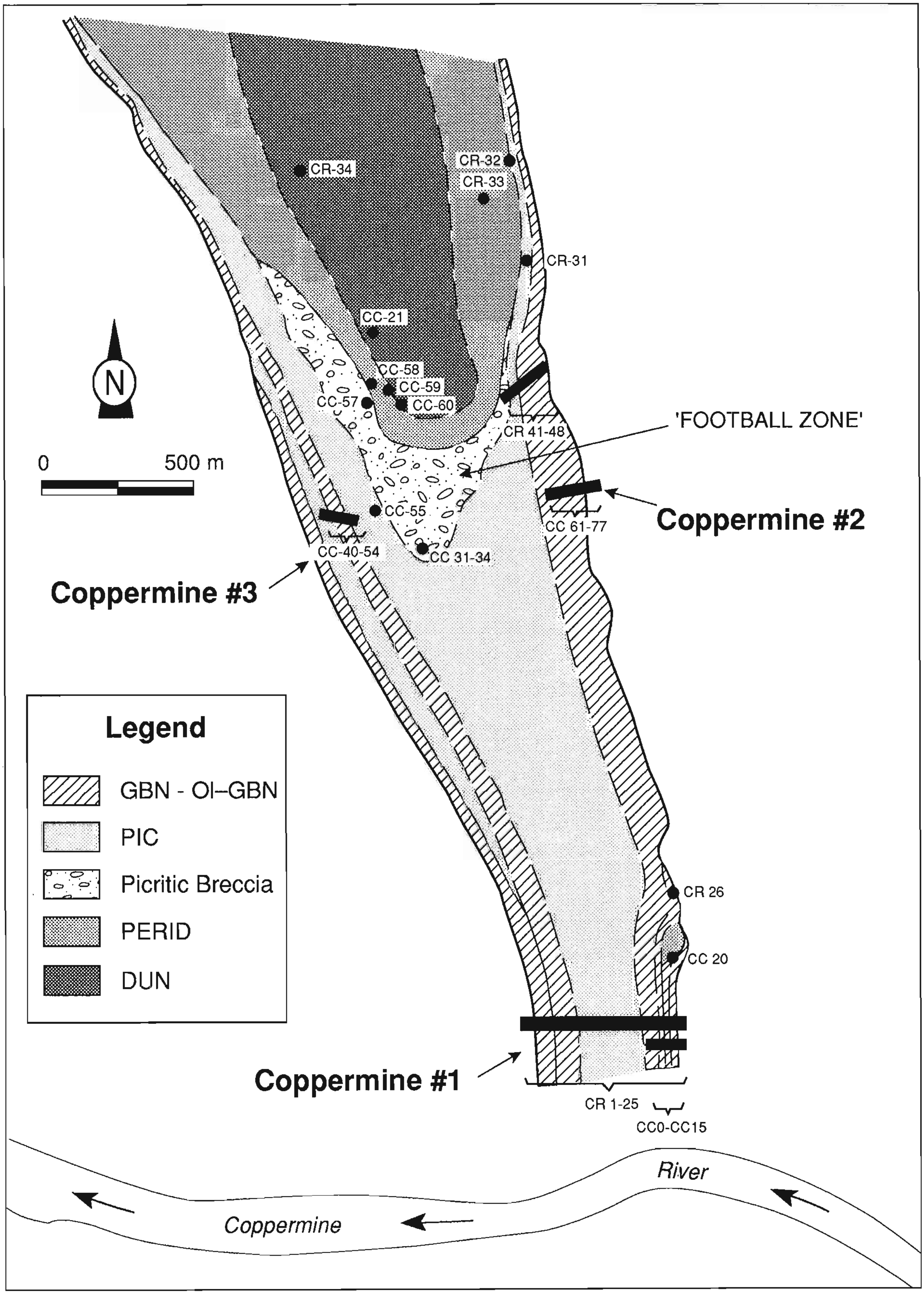

CR-34
CR-32
CR-33
CR-31
CC-21
CC-58
CC-59
CC-57
CC-60
CR 41-48
'FOOTBALL ZONE'
N
0
500 m
CC-55
CC 61-77
Coppermine #2
CC-40-54
CC 31-34
Coppermine #3
Legend
GBN - Ol–GBN
PIC
Picritic Breccia
PERID
DUN
CR 26
CC 20
Coppermine #1
CR 1-25
CC0-CC15
River
Coppermine

Figure A-4.

3a. Coppermine River section #1 (cont.)

Major elements in wt.%																				
Sample:	CC-4	CR-17	CC-5	CC-6	CC-7	CR-18	CC-8	CC-9	CC-10	CC-11	CR-19	CC-12	CC-13	CC-14	CC-15	CR-20	CR-21	CR-23	CR-24	CR-25
Rock:	GBN	GBN	GBN	GBN	GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	GBN	Ol-GBN	GBN	GBN	GBN	GBN	GBN	GBN	GNEISS	GNEISS	GNEISS
Metre	33.90	33.70	30.80	27.90	25.20	23.70	22.70	20.90	19.70	17.20	15.00	14.20	11.70	9.20	6.70	6.20	2.50	-36.30	-38.80	-68.80
SiO_2	50.19	50.75	50.25	50.40	50.77	49.42	49.61	49.76	49.80	50.72	50.10	50.70	51.26	51.07	51.07	50.68	50.89	55.60	53.08	58.06
TiO_2	0.68	0.90	0.73	1.00	0.95	0.81	0.87	0.79	0.85	0.91	0.98	0.92	0.98	0.99	0.98	0.95	0.97	1.11	0.61	1.08
Al_2O_3	12.74	13.87	13.81	13.76	13.81	11.76	12.38	11.97	12.15	12.91	12.45	13.09	13.55	13.69	13.66	13.54	13.46	19.27	17.17	18.37
MgO	10.80	9.14	9.16	9.10	8.89	12.98	11.76	13.25	12.25	10.89	11.30	10.14	9.14	9.05	8.84	9.09	9.06	3.28	7.35	4.19
FeO	11.98	9.91	9.74	10.46	10.20	11.53	11.42	11.52	11.49	10.84	11.09	10.89	10.43	10.47	10.40	10.22	10.46	8.11	9.57	7.95
MnO	0.19	0.17	0.17	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.18	0.08	0.26	0.07
CaO	10.61	11.96	11.58	11.77	12.06	10.26	11.25	10.30	10.72	11.37	10.56	11.56	11.93	11.97	11.99	12.00	11.64	1.60	5.72	1.03
Na_2O	1.15	1.95	1.48	1.47	1.54	1.42	1.16	1.12	1.16	1.20	1.40	1.24	1.37	1.38	1.37	1.61	2.02	3.14	2.30	4.34
K_2O	0.46	0.58	1.09	0.79	0.55	0.40	0.38	0.39	0.36	0.58	0.66	0.51	0.50	0.52	0.48	0.542	0.64	4.46	2.03	2.86
P_2O_5	0.05	0.08	0.05	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.10	0.08	0.09	0.09	0.09	0.08	0.08	0.16	0.23	0.10
LOI	0.14	0.02	1.16	0.16	0.12	0.01	0.01	0.03	0.01	0.04	0.22	0.01	0.01	0.01	0.01	0.01	0.01	2.23	1.22	0.84
Total	98.99	99.32	99.22	99.19	99.13	98.84	99.10	99.39	99.05	99.72	99.05	99.32	99.42	99.41	99.07	98.88	99.43	99.04	99.54	98.89

Trace elements in ppm																				
Sample:	CC-4	CR-17	CC-5	CC-6	CC-7	CR-18	CC-8	CC-9	CC-10	CC-11	CR-19	CC-12	CC-13	CC-14	CC-15	CR-20	CR-21	CR-23	CR-24	CR-25
Rb	15.0	16.0	32.0	19.0	16.0	13.0	14.0	13.0	13.0	20.0	22.0	16.0	16.0	16.0	15.0	15.0	18.0	117.0	66.0	64.0
Sr	156.0	172.0	275.0	183.0	167.0	116.0	127.0	120.0	123.0	143.0	143.0	141.0	142.0	144.0	140.0	140.0	141.0	181.0	467.0	105.0
Ba	134.0	148.0	163.0	147.0	143.0	121.0	141.0	120.0	129.0	160.0	180.0	134.0	146.0	150.0	141.0	139.0	154.0	783.0	484.0	1428.0
Sc	-	61.0	39.4	-	-	-	-	-	-	-	-	-	-	-	40.3	-	56.0	30.0	-	24.0
Y	9.0	13.0	11.0	15.0	13.0	12.0	14.0	11.0	14.0	14.0	15.0	14.0	16.0	16.0	15.0	14.0	15.0	23.0	10.0	32.0
Zr	31.0	52.0	36.0	58.0	55.0	52.0	57.0	49.0	53.0	54.0	67.0	50.0	61.0	60.0	58.0	55.0	61.0	219.0	103.0	232.0
Nb	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	19.0	-	18.0
Hf	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-
Ta	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-
V	212.0	243.0	243.0	259.0	270.0	205.0	229.0	195.0	236.0	243.0	236.0	257.0	262.0	265.0	261.0	251.0	252.0	172.0	135.0	147.0
Cr	463.0	477.0	492.0	449.0	510.0	758.0	775.0	719.0	780.0	798.0	733.0	709.0	596.0	570.0	576.0	634.0	593.0	118.0	324.0	142.0
Ni	1159.0	169.0	200.0	245.0	177.0	328.0	300.0	380.0	340.0	235.0	262.0	185.0	155.0	136.0	135.0	140.0	140.0	82.0	105.0	96.0
Co	107.0	94.0	80.0	92.0	79.0	113.0	106.0	101.0	103.0	91.0	99.0	99.0	94.0	78.0	79.0	85.0	83.0	47.0	72.0	39.0
Cu	1588.0	103.0	124.0	110.0	413.0	157.0	433.0	92.0	75.0	231.0	196.0	192.0	63.0	54.0	138.0	155.0	121.0	146.0	192.0	92.0
Pb	46.0	4.0	10.0	15.0	2.0	6.0	4.0	5.0	2.0	11.0	10.0	2.0	3.0	4.0	5.0	2.0	4.0	230.0	-	234.0
Zn	79.0	53.0	56.0	63.0	56.0	59.0	74.0	70.0	69.0	73.0	464.0	62.0	64.0	64.0	64.0	56.0	59.0	713.0	211.0	1225.0
S	7129.0	-	428.1	1064.0	36.0	-	156.2	284.0	187.8	175.8	-	175.8	160.2	112.1	152.2	-	-	-	-	-
U	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	0.4	-	-	-	-	-
Th	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-

Rare-earth elements in ppm																				
Sample:	CC-4	CR-17	CC-5	CC-6	CC-7	CR-18	CC-8	CC-9	CC-10	CC-11	CR-19	CC-12	CC-13	CC-14	CC-15	CR-20	CR-21	CR-23	CR-24	CR-25
La	-	10.40	4.80	-	-	-	-	-	-	-	-	-	-	-	7.60	-	10.30	56.00	-	52.10
Ce	-	24.00	11.40	-	-	-	-	-	-	-	-	-	-	-	16.30	-	25.00	115.00	-	107.00
Nd	-	11.00	8.00	-	-	-	-	-	-	-	-	-	-	-	10.20	-	12.00	34.00	-	35.00
Sm	-	3.30	1.84	-	-	-	-	-	-	-	-	-	-	-	2.59	-	3.10	8.70	-	8.90
Eu	-	1.20	0.68	-	-	-	-	-	-	-	-	-	-	-	0.82	-	1.07	2.41	-	2.34
Tb	-	0.30	0.41	-	-	-	-	-	-	-	-	-	-	-	0.52	-	0.60	1.10	-	1.00
Ho	-	-	0.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	2.26	1.40	-	-	-	-	-	-	-	-	-	-	-	1.90	-	2.25	3.77	-	4.19
Lu	-	0.33	0.23	-	-	-	-	-	-	-	-	-	-	-	0.35	-	0.34	0.65	-	0.70

Platinum group elements in ppb																				
Sample:	CC-4	CR-17	CC-5	CC-6	CC-7	CR-18	CC-8	CC-9	CC-10	CC-11	CR-19	CC-12	CC-13	CC-14	CC-15	CR-20	CR-21	CR-23	CR-24	CR-25
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	9.00	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	0.90	-	-	-	-	-	-

3b. Coppermine River section #2, Eastern margin of Intrusion at 7401000m N and 581750m E, Figure A-4. Distances from eastern contact with gneiss.

Major elements in wt.%															
Sample:	CC-61	CC-62	CC-64	CC-66	CC-67	CC-68	CC-69	CC-70	CC-71	CC-72	CC-73	CC-74	CC-75	CC-76	CC-77
Rock:	GNEISS	GNEISS	GNEISS	GNEISS	OL-GBN	OL-GBN	Ol-GBN	Ol-GBN	PIC	Ol-GBN	GBN	GBN	Ol-GBN	Ol-GBN	Ol-GBN
Metre	-7.50	-3.50	-2.50	-0.75	0.25	0.75	1.75	3.50	5.00	8.00	11.50	14.00	18.00	26.00	37.50
SiO_2	55.43	53.57	52.26	49.42	48.33	47.64	47.45	47.45	46.81	49.97	50.66	50.53	50.25	49.65	48.97
TiO_2	1.21	0.78	0.67	0.45	1.00	0.71	0.42	0.97	0.98	1.21	1.13	1.20	1.13	0.99	1.19
Al_2O_3	17.73	18.29	18.01	19.20	10.86	11.43	10.45	9.83	9.14	11.79	12.75	12.40	12.41	11.61	12.25
MgO	4.39	6.39	7.12	8.08	16.35	15.97	18.49	19.20	20.76	12.92	11.79	12.55	12.85	13.67	14.30
FeO	8.13	8.77	9.39	9.95	11.98	12.85	11.30	11.98	12.28	11.33	10.12	10.50	10.73	10.53	10.48
MnO	0.16	0.18	0.16	0.15	0.17	0.17	0.16	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.16
CaO	6.76	6.49	7.55	7.63	8.64	8.44	8.51	7.00	7.09	9.97	10.88	10.20	10.02	10.84	9.45
Na_2O	2.88	2.78	2.15	1.57	1.07	1.05	0.61	0.90	0.86	1.24	1.28	1.27	1.24	1.07	1.35
K_2O	1.84	1.36	1.17	1.67	0.44	0.39	0.15	0.54	0.49	0.66	0.58	0.69	0.71	0.45	0.81
P_2O_5	0.18	0.08	0.18	0.05	0.08	0.08	0.04	0.11	0.11	0.12	0.10	0.12	0.12	0.07	0.14
LOI	0.82	0.63	0.89	1.19	0.22	0.25	1.46	1.13	0.61	0.01	0.01	0.01	0.01	0.01	0.18
Total	99.53	99.32	99.56	99.36	99.13	98.98	99.04	99.30	99.31	99.39	99.47	99.64	99.64	99.06	99.28
Trace elements in ppm															
Rb	61.0	41.0	40.0	39.0	14.0	6.0	11.0	16.0	17.0	17.0	15.0	16.0	18.0	11.0	22.0
Sr	571.0	626.0	544.0	571.0	142.0	106.0	139.0	137.0	131.0	188.0	192.0	206.0	202.0	187.0	206.0
Ba	611.0	502.0	362.0	367.0	122.0	77.0	123.0	161.0	153.0	179.0	172.0	175.0	184.0	146.0	220.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	8.0	3.0	4.0	2.0	9.0	5.0	9.0	14.0	12.0	16.0	15.0	15.0	15.0	13.0	16.0
Zr	91.0	61.0	104.0	43.0	27.0	20.0	41.0	64.0	67.0	78.0	71.0	77.0	74.0	53.0	90.0
Nb	8.0	6.0	6.0	5.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	8.0	6.0	8.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	220.0	230.0	238.0	153.0	217.0	202.0	156.0	208.0	2.1	260.0	238.0	261.0	250.0	250.0	215.0
Cr	107.4	212.8	159.4	223.7	1682.0	-	2247.0	2035.0	2441.0	991.4	820.4	886.0	977.7	1134.0	1264.0
Ni	53.0	101.0	446.0	175.0	1049.0	1623.0	2425.0	839.0	894.0	517.0	408.0	519.0	424.0	559.0	560.0
Co	48.0	73.0	83.0	102.0	128.0	161.0	142.0	121.0	132.0	101.0	80.0	89.0	92.0	95.0	88.0
Cu	30.0	163.0	170.0	514.0	983.0	853.0	2160.0	169.0	170.0	338.0	410.0	96.0	138.0	357.0	283.0
Pb	104.0	46.0	19.0	120.0	134.0	18.0	60.0	5.0	2.0	2.0	2.0	3.0	2.0	2.0	5.0
Zn	126.0	86.0	86.0	83.0	119.0	129.0	55.0	76.0	76.0	74.0	63.0	62.0	78.0	63.0	70.0
S	471.7	2042.0	4285.0	6968.0	3884.0	10610.0	9771.0	299.9	227.9	631.1	348.0	271.9	247.9	1095.0	308.0
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm															
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb															
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3c. Coppermine River section #3, Section across Megacycle #1 at 7401300m N and 580750m E, Figure A-4. Distances from western contact between outer picrite and inner 01-GBN.

Major elements in wt.%												
Sample:	CC-40	CC-41	CC-42	CC-43	CC-44	CC-45	CC-46	CC-47	CC-48	CC-49	CC-50	CC-52
Rock:	PIC	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC
Metre	-10.00	3.40	5.00	6.90	8.60	10.30	11.80	16.00	20.00	23.50	25.80	33.80
SiO_2	42.49	49.65	49.97	48.88	49.31	48.76	49.59	48.18	50.06	46.89	47.00	42.98
TiO_2	0.45	1.09	1.10	0.83	0.87	0.79	0.78	0.45	0.60	0.52	0.64	0.70
Al_2O_3	6.63	12.74	12.74	12.35	12.26	11.53	11.48	13.62	11.73	10.64	10.84	6.87
MgO	24.56	12.32	12.14	14.04	14.26	15.01	15.11	13.95	15.92	17.91	17.18	23.61
FeO	13.03	10.84	10.88	11.02	10.47	10.96	10.57	8.74	9.34	10.76	10.81	13.26
MnO	0.18	0.17	0.17	0.16	0.17	0.17	0.17	0.14	0.16	0.17	0.17	0.18
CaO	5.82	10.06	9.80	10.22	10.53	10.68	9.93	12.89	9.80	10.37	9.83	6.21
Na_2O	0.30	1.14	0.97	0.94	0.96	0.92	0.76	0.92	0.68	0.63	0.68	0.32
K_2O	0.18	0.92	1.44	0.99	0.65	0.51	0.95	0.34	0.85	0.30	0.76	0.31
P_2O_5	0.05	0.10	0.11	0.07	0.07	0.06	0.06	0.03	0.04	0.04	0.05	0.07
LOI	5.74	0.05	0.14	0.03	0.01	0.01	0.01	0.01	0.32	0.99	1.19	4.46
Total	99.43	99.08	99.46	99.53	99.56	99.39	99.41	99.26	99.50	99.22	99.15	98.98
Trace elements in ppm												
Rb	9.0	22.0	27.0	14.0	13.0	11.0	14.0	4.0	12.0	7.0	13.0	11.0
Sr	63.0	206.0	290.0	195.0	200.0	189.0	196.0	197.0	261.0	141.0	188.0	107.0
Ba	82.0	220.0	269.0	133.0	139.0	124.0	119.0	74.0	105.0	83.0	182.0	112.0
Sc	-	-	33.1	-	-	-	-	-	-	-	-	-
Y	7.0	13.0	16.0	10.0	11.0	10.0	9.0	6.0	6.0	7.0	8.0	8.0
Zr	27.0	74.0	78.0	46.0	46.0	43.0	41.0	16.0	26.0	25.0	35.0	44.0
Nb	5.0	7.0	7.0	6.0	5.0	6.0	5.0	3.0	5.0	4.0	5.0	6.0
Hf	-	-	2.7	-	-	-	-	-	-	-	-	-
Ta	-	-	0.5	-	-	-	-	-	-	-	-	-
V	131.0	239.0	259.0	232.0	233.0	201.0	215.0	169.0	183.0	167.0	192.0	178.0
Cr	982.5	962.0	911.4	1159.0	1179.0	1264.0	1217.0	1456.0	1573.0	1588.0	1624.0	2590.0
Ni	807.0	415.0	348.0	612.0	458.0	527.0	488.0	464.0	455.0	669.0	634.0	1041.0
Co	150.0	92.0	102.0	102.0	89.0	109.0	94.0	85.0	80.0	114.0	107.0	165.0
Cu	357.0	196.0	80.0	263.0	161.0	172.0	67.0	77.0	138.0	162.0	63.0	91.0
Pb	38.0	4.0	17.0	7.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0
Zn	186.0	67.0	68.0	58.0	66.0	60.0	57.0	43.0	50.0	56.0	59.0	84.0
S	1001.0	200.2	454.9	1362.0	144.2	108.1	128.1	68.1	92.1	108.1	183.8	-
U	-	-	0.5	-	-	-	-	-	-	-	-	-
Th	-	-	2.1	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm												
La	-	-	10.10	-	-	-	-	-	-	-	-	-
Ce	-	-	21.60	-	-	-	-	-	-	-	-	-
Nd	-	-	13.30	-	-	-	-	-	-	-	-	-
Sm	-	-	3.10	-	-	-	-	-	-	-	-	-
Eu	-	-	0.98	-	-	-	-	-	-	-	-	-
Tb	-	-	0.49	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	1.70	-	-	-	-	-	-	-	-	-
Lu	-	-	0.27	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb												
Os	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-

3c. **Coppermine River section #3** (cont.)

Major elements in wt.%											
Sample:	CC-53	CC-54	CC-55	CC-57	CC-58	CC-59	CC-60	CR-34	CR-33	CR-32	CR-31
Rock:	PIC	PIC	PIC	PIC	PERID	DUN	DUN	DUN	PERID	PIC	PIC
Metre	38.40	44.70	86.00	100.00	150.00	170.00	200.00	210.00	-	-	-
SiO_2	41.61	41.63	40.33	41.08	36.58	36.05	36.03	34.49	37.84	40.88	48.99
TiO_2	0.61	0.57	0.30	0.20	0.20	0.19	0.24	0.16	0.46	0.70	1.02
Al_2O_3	5.83	5.72	6.40	6.26	2.84	2.44	2.28	1.30	3.59	5.56	8.97
MgO	25.06	25.82	25.57	25.55	30.30	32.02	32.45	32.32	29.47	25.87	18.82
FeO	13.51	13.75	12.89	12.66	14.65	14.65	14.88	16.30	14.28	13.88	11.30
MnO	0.19	0.19	0.18	0.18	0.22	0.19	0.20	0.16	0.19	0.18	0.18
CaO	5.09	4.63	5.77	6.33	2.19	0.82	0.51	0.08	2.48	3.65	6.92
Na_2O	0.20	0.19	0.01	0.12	0.01	0.01	0.01	0.01	0.04	0.61	1.23
K_2O	0.22	0.17	0.07	0.10	0.01	0.01	0.02	0.02	0.16	0.32	0.68
P_2O_5	0.06	0.06	0.03	0.02	0.02	0.02	0.03	0.03	0.06	0.09	0.09
LOI	6.23	5.82	7.23	6.34	11.27	12.08	12.27	12.44	8.63	6.03	0.91
Total	98.61	98.55	98.78	98.84	98.29	98.48	98.92	97.31	97.20	97.77	99.11
Trace elements in ppm											
Rb	9.0	8.0	5.0	5.0	4.0	5.0	4.0	3.0	8.0	10.0	16.0
Sr	72.0	94.0	71.0	119.0	6.0	5.0	4.0	5.0	32.0	88.0	132.0
Ba	95.0	89.0	57.0	88.0	30.0	27.0	28.0	23.0	79.0	136.0	167.0
Sc	-	-	-	-	-	-	-	-	-	-	-
Y	7.0	6.0	3.0	2.0	2.0	2.0	2.0	2.0	5.0	7.0	13.0
Zr	34.0	34.0	11.0	5.0	6.0	6.0	10.0	7.0	29.0	39.0	65.0
Nb	5.0	5.0	3.0	3.0	3.0	3.0	3.0	4.0	5.0	5.0	7.0
Hf	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-
V	163.0	149.0	133.0	108.0	97.0	107.0	112.0	84.0	117.0	157.0	212.0
Cr	2704.0	2818.0	2692.0	2560.0	3589.0	3585.0	4196.0	4265.0	3897.0	3719.0	1548.0
Ni	1149.0	1201.0	1195.0	1160.0	1523.0	1562.0	1654.0	1794.0	1633.0	1384.0	717.0
Co	162.0	165.0	162.0	168.0	201.0	197.0	195.0	206.0	179.0	167.0	115.0
Cu	178.0	184.0	129.0	25.0	83.0	86.0	24.0	68.0	139.0	144.0	175.0
Pb	2.0	2.0	8.0	3.0	2.0	2.0	2.0	2.0	2.0	4.0	6.0
Zn	84.0	87.0	90.0	61.0	56.0	31.0	42.0	49.0	90.0	74.0	69.0
S	167.8	348.0	356.0	60.1	0.5	92.1	72.1	-	-	-	-
U	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm											
La	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb											
Os	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-

4. Pyrrhotite Lake section, eastern margin of Megacycle #1 at 7410500m N and 580600m E; Figure A-5. Equinox drillhole 87-P-4, distances with respect to contact with gneiss.

Major elements in wt.%																
Sample:	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PO-13	PO-14	PO-15	PO-16	PO-17	PO-18	PO-19
Rock:	PIC	PIC	PIC	PIC	Ol-GBN	Ol-GBN	Ol-GBN	GBN	Ol-GBN	Ol-GBN	Ol-GBN	NOR	NOR	NOR	NOR	NOR
Metre	51.69	41.27	32.38	25.05	18.02	12.92	9.36	8.36	8.10	6.63	4.46	3.68	3.08	2.60	2.00	1.77
SiO_2	39.24	41.18	42.19	42.92	43.77	44.80	43.15	47.94	47.69	47.86	46.72	52.41	51.07	49.70	52.67	52.82
TiO_2	0.58	0.60	0.75	0.83	0.90	0.89	0.93	1.03	0.72	0.60	0.54	0.58	0.75	0.83	0.79	0.76
Al_2O_3	5.35	5.94	6.62	7.27	7.74	8.32	9.10	10.50	9.08	10.72	9.64	10.51	11.03	14.20	13.20	13.36
MgO	26.52	25.99	24.71	23.58	21.13	20.36	19.93	15.35	18.17	17.59	18.06	14.86	11.72	8.96	10.81	10.93
FeO	13.46	13.04	12.93	13.12	12.46	11.71	11.83	11.84	11.56	9.70	9.88	12.09	14.56	14.09	10.62	11.90
MnO	0.18	0.19	0.18	0.19	0.17	0.17	0.14	0.14	0.16	0.16	0.15	0.19	0.18	0.16	0.18	0.18
CaO	2.69	3.77	4.34	5.00	5.18	5.53	4.51	7.22	7.31	9.18	10.07	4.85	5.63	5.21	6.31	4.77
Na_2O	-	0.08	0.19	0.18	0.33	0.36	0.30	0.81	0.68	0.54	0.38	0.62	0.78	0.94	0.57	0.46
K_2O	0.20	0.20	0.35	0.39	0.41	0.48	0.52	0.56	0.40	0.81	0.30	1.33	1.34	2.24	2.53	2.60
P_2O_5	0.06	0.05	0.07	0.09	0.09	0.08	0.10	0.10	0.06	0.06	0.04	0.05	0.07	0.09	0.06	0.05
LOI	10.02	7.24	5.79	4.64	5.96	5.79	7.97	3.36	3.04	2.31	3.22	1.75	1.87	2.10	1.38	1.70
Total	98.29	98.28	98.12	98.21	98.14	98.49	98.49	98.85	98.87	99.53	99.00	99.24	99.00	98.51	99.12	99.53
Trace elements in ppm																
Rb	10.0	9.0	11.0	13.0	14.0	16.0	17.0	15.0	13.0	16.0	9.0	49.0	53.0	81.0	100.0	107.0
Sr	71.0	84.0	96.0	133.0	110.0	109.0	94.0	129.0	114.0	123.0	96.0	105.0	129.0	154.0	136.0	126.0
Ba	97.0	105.0	129.0	175.0	148.0	166.0	163.0	176.0	133.0	125.0	88.0	208.0	242.0	307.0	272.0	256.0
Sc	13.9	15.5	16.9	18.5	20.6	23.1	23.5	26.3	25.3	29.4	29.4	30.5	31.7	28.3	34.2	29.9
Y	6.0	6.0	8.0	9.0	10.0	11.0	15.0	13.0	10.0	8.0	7.0	10.0	12.0	12.0	14.0	14.0
Zr	34.0	32.0	45.0	50.0	58.0	57.0	58.0	53.0	46.0	35.0	25.0	44.0	58.0	80.0	55.0	40.0
Nb	5.0	5.0	5.0	6.0	7.0	7.0	7.0	7.0	6.0	5.0	5.0	6.0	6.0	7.0	5.0	6.0
Hf	1.3	1.2	2.0	2.1	2.0	2.0	2.5	1.9	1.6	1.2	1.0	1.8	2.1	2.6	2.3	1.7
Ta	0.2	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.3	0.1	0.3	0.4	0.4	0.4	0.4
V	128.0	141.0	157.0	172.0	188.0	186.0	196.0	194.0	162.0	166.0	153.0	309.0	356.0	245.0	198.0	225.0
Cr	3075.0	3875.0	4471.0	4904.0	3586.0	2432.0	2811.0	1886.0	1861.0	1635.0	1964.0	996.0	899.0	745.0	980.0	975.0
Ni	1373.0	1415.0	1340.0	1210.0	1367.0	1417.0	1636.0	1713.0	907.0	319.0	762.0	1508.0	1507.0	1396.0	289.0	519.0
Co	182.0	178.0	176.0	177.0	175.0	174.0	185.0	168.0	145.0	135.0	116.0	144.0	240.0	222.0	100.0	127.0
Cu	231.0	156.0	181.0	142.0	446.0	616.0	1299.0	1065.0	288.0	115.0	196.0	2553.0	1223.0	1618.0	50.0	311.0
Pb	2.0	2.0	2.0	3.0	7.0	14.0	13.0	23.0	5.0	5.0	4.0	90.0	68.0	70.0	8.0	17.0
Zn	55.0	85.0	70.0	68.0	51.0	134.0	35.0	51.0	57.0	55.0	49.0	118.0	117.0	111.0	81.0	94.0
S	64.1	287.6	332.0	579.9	841.9	1330.0	5567.0	10490.0	1840.0	344.4	1773.0	6889.0	19780.0	20990.0	1738.0	5327.0
U	0.3	0.2	0.3	0.3	0.3	0.3	0.6	0.3	0.3	0.3	0.1	0.6	0.9	0.9	0.8	0.9
Th	1.2	1.1	1.6	1.5	1.6	1.6	2.2	1.2	1.4	1.4	0.9	3.2	4.3	4.3	3.8	4.2
Rare-earth elements in ppm																
La	4.60	4.70	6.10	7.00	8.30	8.30	11.00	8.80	6.20	4.90	3.60	9.10	12.00	13.50	13.10	13.20
Ce	14.00	12.00	18.00	20.00	21.00	24.00	29.00	25.00	16.00	13.00	9.00	19.00	28.00	32.00	29.00	32.00
Nd	8.00	8.00	8.00	10.00	11.00	12.00	16.00	12.00	9.00	7.90	4.50	10.20	12.00	15.00	13.60	16.00
Sm	1.52	1.46	1.89	2.22	2.39	2.39	3.73	2.83	1.89	1.67	1.31	2.21	2.78	2.83	2.91	3.26
Eu	0.54	0.52	0.62	0.73	0.92	0.98	1.02	1.00	0.85	0.58	0.51	0.61	0.82	0.98	0.86	0.82
Tb	0.27	0.29	0.31	0.32	0.40	0.44	0.56	0.50	0.30	0.29	0.28	0.34	0.46	0.40	0.50	0.40
Ho	0.30	0.30	0.40	0.60	0.50	0.60	0.70	0.50	0.40	0.40	0.40	-	0.60	0.50	0.70	0.60
Yb	0.80	0.90	1.00	1.10	1.30	1.50	1.50	1.50	1.10	1.10	0.90	1.30	1.60	1.50	1.60	1.70
Lu	0.12	0.10	0.18	0.23	0.20	0.19	0.28	0.22	0.24	0.15	0.11	0.21	0.22	0.24	0.27	0.31
Platinum group elements in ppb																
Os	2.60	-	3.80	-	2.50	-	2.20	1.00	1.10	1.00	1.00	1.00	1.50	1.00	0.90	0.80
Ir	2.48	-	3.11	-	2.03	-	1.20	0.76	0.87	0.46	0.68	0.44	0.47	0.73	0.34	0.41
Ru	5.00	-	6.00	-	6.00	-	6.00	11.00	3.00	2.00	4.00	3.00	11.00	14.00	1.00	6.00
Rh	0.94	-	0.94	-	2.86	-	5.17	6.47	1.92	0.47	1.88	2.55	8.18	13.56	0.85	3.17
Pt	7.00	-	7.00	-	14.00	-	26.00	55.00	18.00	5.00	12.00	69.00	18.00	21.00	11.00	13.00
Pd	3.00	-	7.00	-	80.00	-	138.00	257.00	103.00	2.00	102.00	605.00	297.00	189.00	10.00	55.00
Au	0.28	-	0.73	-	7.00	-	11.16	25.95	9.13	0.67	12.62	54.60	8.77	28.31	1.49	4.95

4. **Pyrrhotite Lake section** (cont.)

Major elements in wt.%															
Sample:	PO-20	PO-21	PO-23	PO-24A	PO-24B	PO-25	PO-26	PO-27	PO-28	PO-29	PO-30	PO-31	PO-32	PO-33	PO-34
Rock:	NOR	MIGMA	NOR	MIGMA	NOR	MIGMA	MIGMA	MIGMA	MIGMA	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS
Metre	1.56	1.32	0.22	-0.10	0.10	-0.34	-0.82	-1.69	-2.73	-3.73	-5.18	-7.58	-14.29	-11.43	-12.77
SiO_2	50.08	50.57	53.59	50.25	54.13	56.24	53.98	60.29	50.70	54.60	66.77	63.07	69.59	60.48	60.54
TiO_2	1.28	0.46	1.38	0.57	1.36	0.82	0.73	0.61	0.83	0.75	0.67	0.74	0.65	0.75	0.79
Al_2O_3	13.07	19.23	14.90	18.20	15.36	20.31	15.09	15.96	21.18	21.31	15.32	16.33	12.96	18.27	18.04
MgO	11.71	5.16	7.85	4.78	7.39	4.30	3.50	4.23	4.29	3.67	2.63	3.41	2.84	3.07	3.22
FeO	13.11	13.37	10.98	14.64	11.53	10.31	16.75	8.04	12.99	8.67	6.77	6.89	5.84	7.55	7.87
MnO	0.19	0.10	0.17	0.11	0.18	0.15	0.17	0.14	0.17	0.11	0.10	0.12	0.15	0.06	0.10
CaO	3.81	0.88	4.34	0.50	4.51	0.48	0.57	1.47	0.99	0.43	0.16	0.52	0.41	0.12	0.19
Na_2O	0.26	1.24	0.60	0.82	0.97	0.65	0.71	1.66	1.21	0.86	0.15	0.45	1.17	0.27	0.24
K_2O	2.71	4.29	2.79	4.67	2.33	3.10	2.94	4.04	3.86	5.58	4.05	5.20	3.84	5.31	4.89
P_2O_5	0.13	0.06	0.10	0.07	0.11	0.07	0.07	0.14	0.10	0.08	0.10	0.10	0.12	0.07	0.08
LOI	2.45	3.90	2.69	3.84	1.69	2.93	3.71	2.35	2.59	3.51	2.74	2.89	1.95	3.40	3.48
Total	98.80	99.26	99.39	98.45	99.55	99.37	98.21	98.92	98.92	99.57	99.46	99.72	99.52	99.35	99.45
Trace elements in ppm															
Rb	95.0	165.0	121.0	169.0	94.0	136.0	130.0	155.0	184.0	252.0	141.0	179.0	130.0	234.0	166.0
Sr	93.0	184.0	101.0	185.0	127.0	165.0	115.0	217.0	180.0	122.0	37.0	60.0	97.0	69.0	68.0
Ba	268.0	542.0	414.0	668.0	316.0	498.0	510.0	756.0	665.0	1159.0	623.0	611.0	441.0	664.0	650.0
Sc	31.7	11.2	35.6	12.4	35.6	22.1	18.6	19.2	24.0	23.1	14.5	16.9	14.2	19.2	19.7
Y	18.0	13.0	18.0	13.0	18.0	19.0	21.0	18.0	22.0	27.0	18.0	23.0	21.0	22.0	25.0
Zr	93.0	90.0	62.0	95.0	86.0	177.0	135.0	106.0	165.0	145.0	155.0	163.0	188.0	147.0	159.0
Nb	8.0	10.0	7.0	11.0	8.0	15.0	14.0	10.0	15.0	13.0	13.0	15.0	12.0	15.0	16.0
Hf	3.1	3.2	2.2	3.2	3.5	5.8	4.5	3.4	5.4	4.9	5.0	5.8	6.5	4.8	4.9
Ta	0.5	0.8	0.8	0.8	0.5	1.4	0.7	1.0	1.1	1.0	1.2	1.6	1.3	1.5	1.2
V	231.0	117.0	259.0	135.0	259.0	134.0	118.0	99.0	142.0	131.0	82.0	88.0	78.0	102.0	112.0
Cr	1144.0	225.0	432.0	242.0	415.0	162.0	152.0	105.0	180.0	133.0	65.0	165.0	90.0	96.0	86.0
Ni	386.0	1645.0	155.0	2196.0	182.0	267.0	2133.0	40.0	1599.0	102.0	89.0	120.0	52.0	51.0	34.0
Co	133.0	235.0	94.0	277.0	104.0	99.0	356.0	67.0	155.0	71.0	55.0	48.0	52.0	57.0	50.0
Cu	82.0	1331.0	145.0	1884.0	265.0	669.0	2017.0	189.0	1579.0	692.0	233.0	144.0	309.0	504.0	148.0
Pb	7.0	83.0	16.0	71.0	15.0	44.0	72.0	33.0	60.0	54.0	33.0	50.0	12.0	17.0	77.0
Zn	100.0	173.0	82.0	165.0	97.0	89.0	147.0	90.0	207.0	179.0	579.0	126.0	156.0	48.0	427.0
S	4446.0	28080.0	2024.0	42570.0	3124.0	2566.0	46420.0	40.0	6248.0	107.7	483.4	865.5	244.3	595.9	1393.0
U	0.8	2.5	1.1	2.5	1.1	3.2	2.1	1.9	3.3	3.0	2.7	3.7	3.1	3.3	3.1
Th	3.3	9.7	5.1	10.6	5.1	17.3	12.3	10.0	19.2	17.9	15.3	19.3	14.6	18.2	19.2
Rare-earth elements in ppm															
La	16.00	23.70	15.00	27.50	16.20	44.50	34.60	33.60	55.00	54.90	40.10	52.20	40.70	54.50	57.00
Ce	32.00	47.00	33.00	53.00	35.00	92.00	71.00	72.00	112.00	112.00	84.00	102.00	81.00	104.00	109.00
Nd	17.00	19.00	18.10	21.50	20.30	35.00	31.00	28.00	46.00	47.00	33.00	43.00	34.00	45.00	44.00
Sm	4.02	3.66	4.21	3.90	3.99	6.37	4.90	5.20	8.41	8.24	5.85	7.80	6.30	7.60	7.40
Eu	0.88	0.69	1.02	0.85	1.19	0.93	0.84	1.47	1.44	1.41	0.89	1.27	1.31	1.38	1.33
Tb	0.70	0.60	0.60	0.41	0.60	0.70	0.90	0.70	0.80	1.00	0.70	1.00	0.80	0.90	0.90
Ho	0.90	0.70	0.80	0.60	-	0.90	1.00	1.00	1.00	1.50	1.00	1.40	1.60	1.10	1.50
Yb	2.20	1.80	2.30	1.90	2.30	2.60	2.80	2.40	2.80	3.70	3.00	3.40	2.90	3.30	3.40
Lu	0.34	0.29	0.37	0.28	0.33	0.45	0.43	0.43	0.47	0.54	0.44	0.60	0.44	0.46	0.48
Platinum group elements in ppb															
Os	1.00	0.50	1.00	0.50	1.00	1.00	1.00	-	-	-	-	-	-	-	-
Ir	0.41	0.36	0.10	0.14	0.43	0.07	0.79	-	-	-	-	-	-	-	-
Ru	5.00	6.00	4.00	1.00	9.00	5.00	6.00	-	-	-	-	-	-	-	-
Rh	0.83	10.44	0.62	0.88	13.10	0.12	16.82	-	-	-	-	-	-	-	-
Pt	12.00	40.00	11.00	6.00	67.00	5.00	18.00	-	-	-	-	-	-	-	-
Pd	14.00	199.00	10.00	14.00	177.00	5.00	173.00	-	-	-	-	-	-	-	-
Au	2.13	6.11	1.15	0.72	11.00	1.08	18.45	-	-	-	-	-	-	-	-

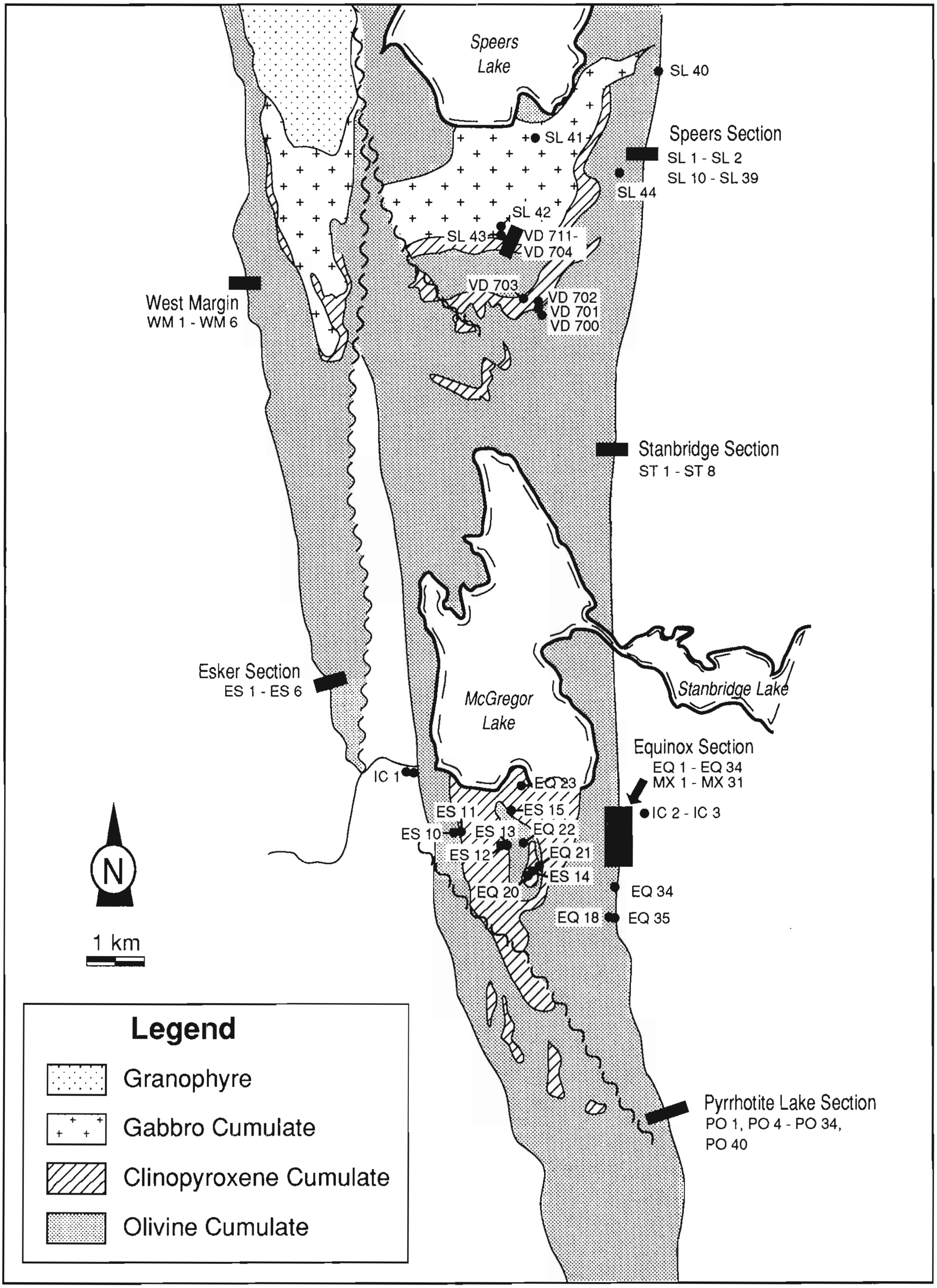
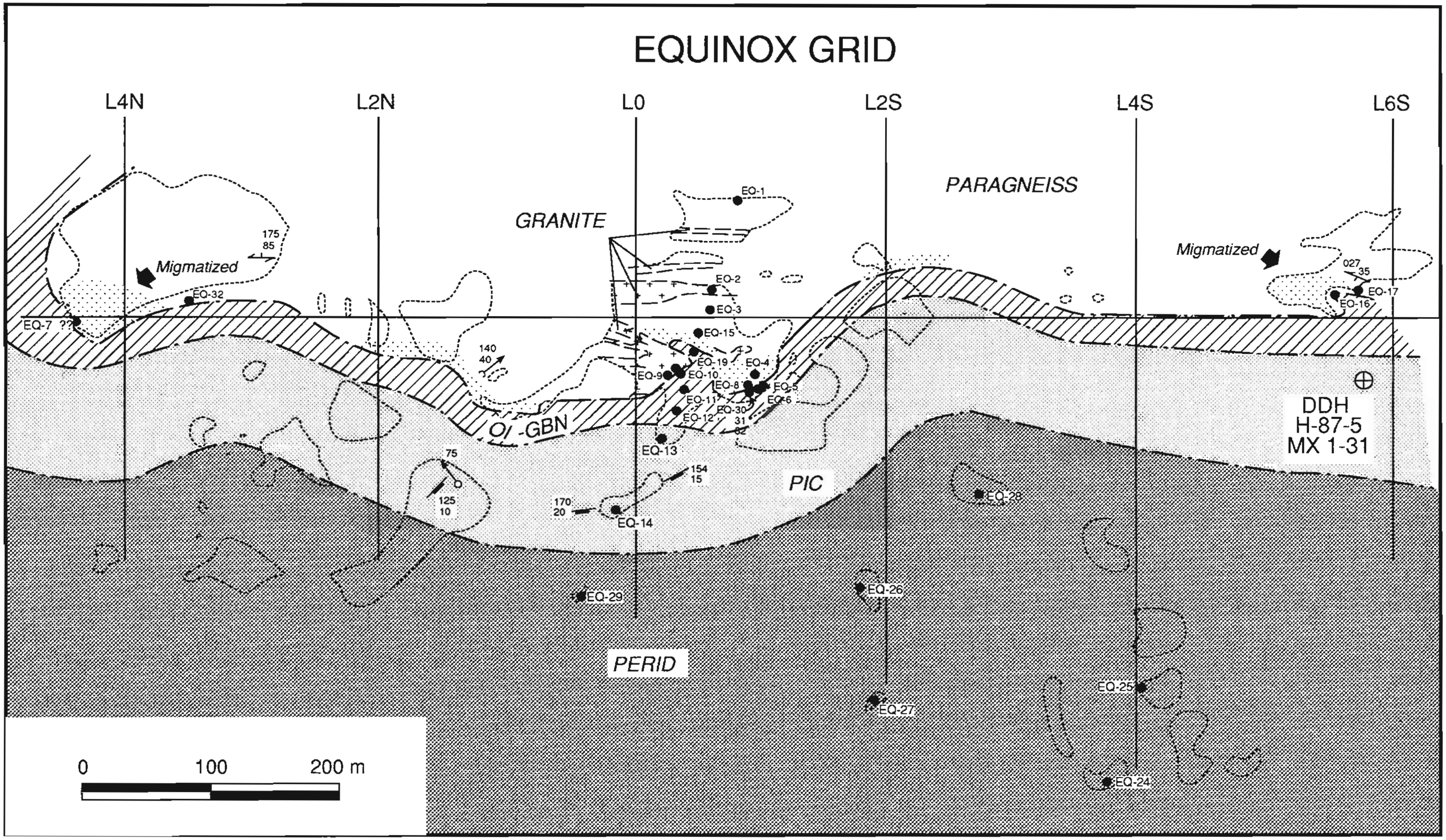

Speers Lake
SL 40
Speers Section
SL 1 - SL 2
SL 10 - SL 39
SL 41
SL 44
SL 42
SL 43
VD 711-
VD 704
West Margin
WM 1 - WM 6
VD 703
VD 702
VD 701
VD 700
Stanbridge Section
ST 1 - ST 8
Esker Section
ES 1 - ES 6
McGregor Lake
Stanbridge Lake
Equinox Section
EQ 1 - EQ 34
MX 1 - MX 31
IC 1
EQ 23
ES 11
ES 15
IC 2 - IC 3
ES 10
ES 13
EQ 22
ES 12
EQ 21
ES 14
EQ 20
EQ 34
EQ 18
EQ 35
N
1 km
Pyrrhotite Lake Section
PO 1, PO 4 - PO 34,
PO 40
Legend
Granophyre
Gabbro Cumulate
Clinopyroxene Cumulate
Olivine Cumulate

Figure A-5.

5. Equinox grid section, eastern margin of Megacycle #1 at 7415300m N and 579600m E; Figures A-5 & A-6. Outcrop samples (EQ) & Equinox drillhole H-87-5 (MX), distances from contact with gneiss.

Major elements in wt.%																
Sample:	EQ-1	EQ-2	EQ-3	EQ-15	EQ-4	EQ-7	EQ-17	EQ-8	EQ-9	EQ-32	EQ-35	EQ-30	EQ-31	EQ-34	EQ-18	EQ-6
Rock:	GNEISS	GRANITE	GNEISS	MIGMA	Pl-DIOR	MIGMA	GNEISS	Pl-DIOR	GRANITE	PL-DIOR	Pl-DIOR	GBN	GBN	GBN	GBN	Ol-GBN
Metre	-50.00	-25.00	-12.50	-6.00	-4.50	-3.50	-2.50	-1.00	-0.50	-0.05	-	-	0.05	0.50	1.00	1.00
SiO_2	62.21	73.34	66.75	56.24	54.87	58.19	50.72	63.26	74.19	58.51	51.90	51.39	51.77	52.01	51.17	48.69
TiO_2	0.82	0.23	0.58	0.66	1.12	0.61	0.46	1.80	0.16	0.80	0.85	0.91	0.92	1.79	1.59	1.00
Al_2O_3	17.11	14.54	15.82	21.35	17.15	20.60	19.22	13.99	14.54	20.77	17.58	14.80	16.52	13.74	13.11	13.25
MgO	2.89	0.80	2.33	4.80	4.34	4.42	4.96	1.47	0.96	4.28	7.36	10.18	8.05	7.61	9.29	13.14
FeO	6.95	1.77	4.86	8.38	7.13	7.19	14.92	7.74	0.98	7.77	9.47	7.70	8.02	10.74	10.88	10.72
MnO	0.12	0.04	0.09	0.16	0.09	0.15	0.11	0.13	0.02	0.12	0.26	0.15	0.13	0.17	0.18	0.16
CaO	0.29	0.56	1.11	0.73	7.23	0.38	0.75	2.09	0.31	0.47	5.76	10.61	9.78	10.12	9.58	9.63
Na_2O	1.22	3.95	3.19	1.34	3.54	1.20	1.12	1.38	7.85	1.54	2.11	1.28	1.92	2.21	2.30	1.31
K_2O	4.82	3.60	2.87	3.15	1.64	3.47	2.91	5.69	0.84	3.58	2.73	1.78	1.76	1.33	1.03	0.65
P_2O_5	0.08	0.08	0.14	0.06	0.25	0.08	0.07	0.23	0.06	0.05	0.18	0.08	0.10	0.18	0.14	0.09
LOI	2.93	1.15	2.01	2.68	1.80	3.04	3.31	1.29	0.94	1.98	1.16	1.02	0.90	0.06	0.19	0.35
Total	99.44	100.06	99.75	99.55	99.16	99.32	98.55	99.07	100.85	99.87	99.35	99.90	99.87	99.96	99.46	98.99
Trace elements in ppm																
Rb	201.0	85.0	93.0	136.0	64.0	134.0	133.0	158.0	16.0	126.0	81.0	40.0	44.0	35.0	30.0	16.0
Sr	53.0	264.0	170.0	129.0	531.0	82.0	104.0	173.0	111.0	104.0	645.0	399.0	426.0	283.0	263.0	222.0
Ba	485.0	572.0	198.0	394.0	380.0	395.0	425.0	1083.0	24.0	480.0	855.0	254.0	271.0	359.0	278.0	178.0
Sc	26.5	-	-	-	27.4	20.3	-	-	3.5	-	22.7	-	25.4	-	-	25.6
Y	22.0	3.0	22.0	15.0	14.0	14.0	10.0	32.0	4.0	12.0	8.0	11.0	11.0	21.0	18.0	11.0
Zr	176.0	135.0	162.0	143.0	165.0	149.0	103.0	261.0	105.0	181.0	77.0	57.0	62.0	135.0	101.0	63.0
Nb	15.0	7.0	13.0	11.0	10.0	10.0	9.0	19.0	6.0	16.0	7.0	6.0	6.0	11.0	9.0	7.0
Hf	-	-	-	-	-	-	-	-	-	-	2.3	-	2.1	-	-	2.3
Ta	-	-	-	-	-	-	-	-	-	-	0.5	-	0.3	-	-	0.5
V	113.0	11.0	61.0	142.0	139.0	94.0	164.0	140.0	10.0	132.0	128.0	249.0	192.0	300.0	293.0	204.0
Cr	116.0	-	84.0	218.0	111.0	195.0	341.0	-	21.0	237.0	101.0	900.0	936.0	408.0	718.0	882.0
Ni	55.0	12.0	48.0	90.0	88.0	349.0	1309.0	-	70.0	279.0	165.0	193.0	1834.0	170.0	272.0	523.0
Co	48.0	10.0	34.0	67.0	55.0	59.0	184.0	45.0	10.0	48.0	78.0	61.0	63.0	70.0	88.0	119.0
Cu	67.0	81.0	292.0	164.0	92.0	702.0	3638.0	69.0	68.0	389.0	175.0	132.0	526.0	113.0	138.0	147.0
Pb	5.0	18.0	109.0	20.0	4.0	29.0	49.0	57.0	2.0	29.0	28.0	6.0	7.0	12.0	8.0	4.0
Zn	81.0	36.0	151.0	148.0	10.0	120.0	201.0	302.0	10.0	139.0	100.0	52.0	45.0	75.0	72.0	66.0
S	-	-	300.0	-	-	600.0	18200.0	-	-	-	-	-	600.0	-	-	200.0
U	-	-	-	-	-	-	-	-	-	-	1.0	-	0.7	-	-	0.5
Th	-	-	-	-	-	-	-	-	-	-	3.8	-	2.3	-	-	1.7
Rare-earth elements in ppm																
La	70.90	-	-	-	37.60	41.70	-	-	14.60	-	33.50	-	11.30	-	-	9.40
Ce	147.00	-	-	-	67.00	82.00	-	-	23.00	-	59.00	-	23.40	-	-	20.00
Nd	62.00	-	-	-	26.00	26.00	-	-	8.00	-	19.00	-	11.20	-	-	11.70
Sm	9.90	-	-	-	4.90	5.80	-	-	1.40	-	2.76	-	2.79	-	-	2.58
Eu	1.75	-	-	-	2.02	1.00	-	-	0.70	-	1.33	-	0.92	-	-	0.90
Tb	1.30	-	-	-	0.70	1.00	-	-	0.20	-	0.34	-	0.36	-	-	0.42
Ho	-	-	-	-	-	-	-	-	-	-	-	-	0.43	-	-	0.48
Yb	3.82	-	-	-	2.63	2.67	-	-	0.52	-	1.40	-	1.40	-	-	1.50
Lu	0.62	-	-	-	0.39	0.44	-	-	0.10	-	0.18	-	0.22	-	-	0.23
Platinum group elements in ppb																
Os	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	0.20	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-	-	-
Rh	-	-	-	-	-	-	13.00	-	-	-	-	-	3.03	-	-	-
Pt	-	-	-	-	-	-	20.80	-	-	-	-	-	22.00	-	-	11.90
Pd	-	-	-	-	-	-	373.50	-	-	-	-	-	62.00	-	-	18.30
Au	-	-	-	-	-	-	41.00	-	-	-	-	-	4.79	-	-	4.90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L2N
L0
L2S
L4S
L6S
GRANITE
PARAGNEISS
Migmatized
Migmatized
OI -GBN
PIC
PERID
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H-87-5
MX 1-31
EQ-1
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175
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40
75
125
10
170
20
154
15
31
82
027
35
0
100
200 m

Figure A-6.

5. Equinox grid section (cont.)

Major elements in wt.%

Sample:	EQ-5	EQ-19	EQ-10	EQ-11	EQ-12	EQ-13	EQ-14	EQ-28	EQ-29	EQ-26	EQ-27	EQ-25	EQ-24	MX-1	MX-2	MX-3
Rock:	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	PERID	PERID	PERID	PERID	Ol-GBN	Ol-GBN	Ol-GBN
Metre	1.50	2.00	4.00	7.50	11.25	18.75	42.50	75.00	75.00	87.50	125.00	145.00	182.00	8.18	7.79	7.34
SiO_2	51.22	47.77	48.50	48.61	47.28	44.71	43.39	41.03	40.73	39.53	39.06	38.83	37.33	45.08	48.39	47.86
TiO_2	0.58	0.73	1.29	1.31	1.15	0.98	0.81	0.61	0.58	0.44	0.42	0.38	0.31	1.50	1.35	1.31
Al_2O_3	12.70	9.99	10.57	10.63	9.33	8.18	7.26	5.35	5.19	5.07	4.13	3.75	3.26	11.72	11.47	11.21
MgO	14.06	17.59	15.34	15.48	18.12	20.43	22.72	27.01	27.16	28.46	30.53	30.81	31.52	16.23	14.68	15.55
FeO	7.89	12.23	11.77	11.88	12.30	12.71	12.62	13.35	13.23	13.29	13.73	13.60	13.57	10.44	11.39	13.04
MnO	0.15	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.18	0.19	0.10	0.15	0.18
CaO	9.60	8.14	8.05	8.17	7.31	6.38	5.72	4.23	3.84	3.99	3.22	3.31	2.61	4.83	8.01	7.96
Na_2O	1.34	1.04	1.32	1.47	1.09	1.53	0.50	0.25	0.71	0.62	0.39	0.51	0.32	0.73	1.04	1.01
K_2O	1.04	0.34	0.84	0.75	0.65	0.54	0.46	0.27	0.25	0.16	0.15	0.11	0.07	1.63	0.70	0.62
P_2O_5	0.05	0.06	0.13	0.13	0.12	0.09	0.08	0.07	0.06	0.04	0.04	0.04	0.03	0.15	0.13	0.12
LOI	0.68	0.56	0.51	0.24	0.77	2.56	4.16	6.41	7.35	7.36	7.20	7.70	9.45	6.98	2.10	0.48
Total	99.30	98.63	98.49	98.84	98.30	98.29	97.90	98.77	99.28	99.14	99.06	99.22	98.67	99.38	99.41	99.34

Trace elements in ppm

	EQ-5	EQ-19	EQ-10	EQ-11	EQ-12	EQ-13	EQ-14	EQ-28	EQ-29	EQ-26	EQ-27	EQ-25	EQ-24	MX-1	MX-2	MX-3
Rb	18.0	10.0	25.0	20.0	17.0	15.0	14.0	11.0	11.0	8.0	7.0	6.0	5.0	29.0	22.0	19.0
Sr	300.0	150.0	170.0	173.0	153.0	135.0	154.0	80.0	65.0	72.0	77.0	35.0	16.0	119.0	165.0	168.0
Ba	161.0	120.0	208.0	209.0	181.0	155.0	144.0	103.0	97.0	82.0	80.0	69.0	37.0	377.0	216.0	209.0
Sc	43.2	-	41.4	38.5	37.9	31.2	-	-	-	-	-	-	-	-	-	-
Y	7.0	9.0	17.0	15.0	15.0	11.0	9.0	6.0	6.0	3.0	3.0	3.0	3.0	21.0	17.0	15.0
Zr	30.0	40.0	90.0	80.0	75.0	64.0	53.0	37.0	35.0	25.0	24.0	23.0	16.0	91.0	89.0	86.0
Nb	4.0	5.0	9.0	8.0	7.0	6.0	6.0	5.0	5.0	5.0	5.0	4.0	4.0	8.0	8.0	8.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	207.0	195.0	241.0	258.0	218.0	199.0	175.0	149.0	131.0	111.0	108.0	105.0	95.0	276.0	260.0	250.0
Cr	1407.0	1708.0	1269.0	1355.0	1656.0	2107.0	2382.0	2933.0	2858.0	3063.0	3583.0	3699.0	3948.0	1715.0	1445.0	1212.0
Ni	493.0	780.0	625.0	617.0	784.0	978.0	1085.0	1343.0	1300.0	1384.0	1534.0	1537.0	1544.0	1752.0	1647.0	1563.0
Co	68.0	131.0	115.0	122.0	124.0	138.0	138.0	159.0	163.0	156.0	172.0	161.0	168.0	139.0	136.0	156.0
Cu	170.0	117.0	134.0	220.0	89.0	158.0	136.0	114.0	86.0	123.0	83.0	91.0	50.0	2640.0	1223.0	1918.0
Pb	6.0	2.0	5.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	69.0	27.0	27.0
Zn	42.0	72.0	70.0	79.0	74.0	78.0	72.0	78.0	72.0	81.0	72.0	73.0	80.0	647.0	77.0	89.0
S	-	-	-	-	-	-	-	-	-	-	-	-	-	5207.0	4606.0	6168.0
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rare-earth elements in ppm

	EQ-5	EQ-19	EQ-10	EQ-11	EQ-12	EQ-13	EQ-14	EQ-28	EQ-29	EQ-26	EQ-27	EQ-25	EQ-24	MX-1	MX-2	MX-3
La	-	-	-	-	-	-	-	6.60	-	35.10	16.30	15.60	11.20	-	-	-
Ce	-	-	-	-	-	-	-	16.00	-	42.00	34.00	36.00	29.00	-	-	-
Nd	-	-	-	-	-	-	-	6.00	-	21.00	19.00	17.00	14.00	-	-	-
Sm	-	-	-	-	-	-	-	1.90	-	4.70	3.90	4.00	3.00	-	-	-
Eu	-	-	-	-	-	-	-	0.77	-	1.45	1.28	1.12	0.78	-	-	-
Tb	-	-	-	-	-	-	-	0.50	-	0.70	0.70	0.70	0.40	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	1.20	-	2.52	1.99	2.08	1.48	-	-	-
Lu	-	-	-	-	-	-	-	0.16	-	0.39	0.30	0.30	0.24	-	-	-

Platinum group elements in ppb

	EQ-5	EQ-19	EQ-10	EQ-11	EQ-12	EQ-13	EQ-14	EQ-28	EQ-29	EQ-26	EQ-27	EQ-25	EQ-24	MX-1	MX-2	MX-3
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.90	-
Ir	-	-	-	-	1.40	1.30	1.60	-	1.60	-	-	-	2.60	-	0.81	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	-
Rh	-	-	-	-	3.00	-	-	-	-	-	-	-	-	-	6.40	-
Pt	8.90	-	16.40	16.40	40.10	22.30	29.70	-	14.90	-	-	-	32.70	-	52.00	-
Pd	12.20	-	8.50	3.70	11.00	23.10	3.70	-	12.20	-	-	-	34.10	-	237.00	-
Au	6.60	-	9.80	6.60	6.60	8.20	4.90	-	13.10	-	-	-	16.40	-	18.20	-

5. Equinox grid section (cont.)

Sample:	MX-4	MX-5	MX-6	MX-7A	MX-7B	MX-8	MX-9	MX-10	MX-11	MX-12	MX-13	MX-14A	MX-14B	MX-15	MX-16
Rock:	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	GBN
Metre	6.91	6.09	5.51	4.83	4.75	4.45	3.52	2.86	2.13	1.87	1.25	0.94	0.68	0.36	0.17
Major elements in wt.%															
SiO_2	47.73	48.16	48.22	48.80	48.76	40.26	48.52	48.41	48.52	48.76	48.39	48.56	48.63	46.74	52.24
TiO_2	1.29	1.31	1.26	1.40	1.44	1.04	1.28	1.31	1.27	1.34	1.29	1.14	1.17	0.87	1.10
Al_2O_3	10.12	10.34	10.76	11.08	10.54	8.39	10.90	10.66	10.51	10.95	10.57	10.70	10.60	8.01	13.13
MgO	15.92	16.45	15.65	14.72	14.82	14.93	15.53	16.12	16.27	15.72	16.28	16.14	16.37	16.78	11.10
FeO	13.17	12.58	12.15	12.34	12.71	10.55	12.22	12.26	11.92	11.88	11.97	11.64	11.86	13.52	9.60
MnO	0.18	0.17	0.18	0.18	0.19	0.15	0.17	0.18	0.18	0.18	0.18	0.17	0.17	0.16	0.18
CaO	7.85	7.91	8.28	8.09	8.25	6.45	8.52	8.01	8.08	8.01	7.95	8.06	7.94	6.30	8.96
Na_2O	0.91	1.08	1.03	1.12	1.08	0.85	1.11	1.15	1.11	1.05	1.08	1.12	1.11	0.60	1.11
K_2O	0.73	0.71	0.83	0.90	0.82	0.50	0.76	0.72	0.69	0.95	0.65	0.67	0.65	0.43	0.88
P_2O_5	0.11	0.08	0.08	0.10	0.07	0.10	0.07	0.12	0.13	0.13	0.14	0.15	0.11	0.13	0.14
LOI	1.20	0.26	0.19	0.17	0.06	16.03	0.27	0.03	0.07	0.34	0.48	0.43	0.45	5.21	0.64
Total	99.22	99.09	98.68	98.93	98.82	99.26	99.41	98.99	98.75	99.30	98.98	98.75	99.06	98.72	99.05
Trace elements in ppm															
Rb	23.0	20.0	22.0	22.0	23.0	19.0	20.0	21.0	20.0	23.0	19.0	22.0	21.0	14.0	43.0
Sr	164.0	174.0	207.0	224.0	224.0	159.0	189.0	174.0	179.0	185.0	169.0	161.0	163.0	106.0	189.0
Ba	272.0	211.0	248.0	271.0	284.0	191.0	204.0	208.0	213.0	231.0	208.0	204.0	199.0	136.0	190.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	26.7	-	-
Y	15.0	16.0	15.0	17.0	18.0	15.0	15.0	17.0	16.0	16.0	15.0	15.0	15.0	11.0	13.0
Zr	82.0	88.0	81.0	96.0	91.0	80.0	86.0	86.0	88.0	92.0	90.0	81.0	83.0	55.0	71.0
Nb	8.0	9.0	8.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	8.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-
V	229.0	235.0	252.0	280.0	273.0	199.0	241.0	246.0	252.0	255.0	252.0	227.0	231.0	210.0	240.0
Cr	1475.0	1342.0	1234.0	1163.0	1181.0	1187.0	1316.0	1286.0	1394.0	1344.0	1316.0	1388.0	1368.0	2706.0	814.2
Ni	1833.0	1121.0	951.0	552.0	757.0	827.0	1188.0	785.0	664.0	651.0	683.0	694.0	718.0	1160.0	304.0
Co	162.0	124.0	111.0	112.0	120.0	113.0	124.0	130.0	126.0	110.0	111.0	105.0	128.0	153.0	73.0
Cu	2666.0	1158.0	963.0	54.0	360.0	613.0	1250.0	293.0	197.0	201.0	263.0	111.0	160.0	282.0	79.0
Pb	38.0	16.0	20.0	10.0	12.0	10.0	16.0	5.0	2.0	10.0	2.0	2.0	2.0	14.0	16.0
Zn	102.0	77.0	90.0	92.0	95.0	63.0	73.0	80.0	78.0	85.0	74.0	76.0	78.0	86.0	68.0
S	7650.0	2804.0	1802.0	183.8	2.0	1482.0	3364.0	1242.0	271.5	352.0	324.8	664.0	424.1	1922.0	1063.0
U	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	-
Rare-earth elements in ppm															
La	-	-	-	-	-	-	-	-	-	-	-	-	12.10	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	30.00	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	16.00	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	3.31	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	0.62	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	0.80	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	1.80	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	-
Platinum group elements in ppb															
Os	1.30	-	0.50	-	-	0.90	-	1.00	0.50	1.20	0.90	-	1.20	2.30	0.50
Ir	0.98	-	0.56	-	-	0.77	-	0.86	0.78	0.81	0.71	-	0.76	1.57	0.20
Ru	13.00	-	22.00	-	-	10.00	-	14.00	8.00	8.00	5.00	-	6.00	13.00	5.00
Rh	11.91	-	2.46	-	-	3.08	-	2.79	1.13	1.25	1.47	-	2.22	2.68	1.29
Pt	54.00	-	28.00	-	-	25.00	-	32.00	17.00	13.00	20.00	-	11.00	21.00	13.00
Pd	346.00	-	108.00	-	-	60.00	-	92.00	6.00	14.00	33.00	-	32.00	54.00	13.00
Au	29.20	-	10.30	-	-	3.59	-	7.82	1.86	2.06	3.14	-	2.27	3.14	2.08

5. Equinox grid section (cont.)

Major elements in wt.%																
Sample:	MX-17	MX-18	MX-19	MX-20	MX-21A	MX-21B	MX-22	MX-23	MX-24	MX-25	MX-26	MX-27	MX-28	MX-29	MX-30	MX-31
Rock:	NOR	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS
Metre	0.05	-0.30	-0.47	-0.95	-1.49	-1.66	-2.14	-2.85	-3.07	-4.04	-4.74	-5.55	-6.34	-7.46	-8.85	-10.28
SiO_2	56.33	59.60	57.93	61.85	56.91	59.86	54.79	63.73	62.81	61.68	64.57	62.73	66.49	64.18	64.44	67.86
TiO_2	1.00	0.82	1.08	0.67	0.98	0.64	0.73	0.83	0.85	0.79	0.66	0.73	0.58	0.66	0.69	0.66
Al_2O_3	14.58	20.05	19.61	17.09	20.31	15.61	13.72	16.52	16.92	18.57	16.35	17.37	15.57	16.95	16.60	14.87
MgO	8.56	4.91	5.19	3.14	4.58	2.92	2.94	3.26	3.22	3.38	3.09	3.42	2.68	2.90	2.90	2.27
FeO	8.77	8.05	9.47	8.81	9.06	12.24	17.06	7.10	6.78	7.08	6.12	6.29	5.49	6.30	6.53	5.41
MnO	0.16	0.12	0.13	0.10	0.13	0.11	0.11	0.10	0.09	0.11	0.09	0.09	0.08	0.09	0.09	0.07
CaO	7.06	0.51	0.61	0.54	0.38	0.46	0.36	0.41	0.43	0.36	0.42	0.39	0.42	0.38	0.31	0.72
Na_2O	1.08	0.94	0.83	1.14	0.88	0.91	1.07	1.01	1.15	1.05	1.21	1.28	1.26	1.26	1.11	1.63
K_2O	1.16	3.30	3.23	4.15	3.43	3.66	4.23	4.19	4.63	4.37	4.29	4.38	4.23	4.21	4.29	3.89
P_2O_5	0.11	0.08	0.08	0.10	0.07	0.10	0.07	0.11	0.10	0.08	0.09	0.08	0.13	0.10	0.11	0.11
LOI	0.68	1.37	1.89	2.24	2.53	2.61	2.94	2.63	2.54	2.13	2.79	2.57	2.46	2.68	2.39	2.15
Total	99.49	99.75	100.05	99.83	99.26	99.12	98.02	99.89	99.52	99.60	99.67	99.32	99.39	99.71	99.46	99.64
Trace elements in ppm																
Rb	63.0	139.0	149.0	161.0	152.0	154.0	175.0	168.0	187.0	171.0	172.0	177.0	166.0	176.0	192.0	165.0
Sr	195.0	108.0	98.0	126.0	108.0	127.0	116.0	110.0	119.0	119.0	95.0	93.0	64.0	78.0	78.0	113.0
Ba	278.0	382.0	300.0	550.0	367.0	563.0	530.0	535.0	414.0	635.0	462.0	506.0	422.0	343.0	478.0	228.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.8	-
Y	12.0	15.0	15.0	19.0	18.0	19.0	16.0	21.0	17.0	20.0	18.0	23.0	20.0	18.0	21.0	18.0
Zr	72.0	130.0	169.0	138.0	207.0	152.0	141.0	207.0	245.0	185.0	171.0	182.0	145.0	157.0	169.0	171.0
Nb	7.0	13.0	18.0	12.0	16.0	13.0	16.0	15.0	15.0	15.0	13.0	14.0	12.0	13.0	14.0	13.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-
V	214.0	155.0	165.0	117.0	153.0	94.0	105.0	105.0	115.0	107.0	81.0	94.0	67.0	72.0	71.0	77.0
Cr	608.3	204.6	271.6	124.5	166.9	118.4	97.2	115.6	134.8	128.0	144.0	187.0	115.0	70.0	95.0	90.0
Ni	200.0	91.0	188.0	794.0	85.0	1273.0	6867.0	70.0	66.0	66.0	66.0	94.0	58.0	32.0	32.0	26.0
Co	62.0	56.0	47.0	104.0	55.0	194.0	335.0	47.0	38.0	54.0	50.0	51.0	54.0	45.0	40.0	40.0
Cu	43.0	101.0	120.0	391.0	90.0	1252.0	7742.0	169.0	192.0	63.0	60.0	104.0	162.0	89.0	59.0	105.0
Pb	20.0	4.0	5.0	17.0	5.0	30.0	81.0	34.0	14.0	17.0	20.0	21.0	29.0	17.0	13.0	18.0
Zn	88.0	85.0	92.0	76.0	81.0	98.0	137.0	145.0	109.0	110.0	93.0	44.0	96.0	117.0	90.0	71.0
S	336.0	571.1	1007.0	11050.0	-	26470.0	50380.0	942.0	112.1	352.0	320.0	296.0	1474.0	1197.0	424.0	560.0
U	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	3.1	-
Th	-	-	-	-	-	-	-	17.8	-	-	-	-	-	-	17.8	-
Rare-earth elements in ppm																
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.80	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	86.00	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.00	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.06	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.80	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.10	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.20	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.47	-
Platinum group elements in ppb																
Os	0.50	0.50	0.50	0.50	-	0.50	-	0.50	0.50	-	-	-	-	-	-	-
Ir	0.21	0.05	0.04	0.20	-	0.33	-	0.02	0.02	-	-	-	-	-	-	-
Ru	9.00	5.00	5.00	14.00	-	16.00	-	5.00	5.00	-	-	-	-	-	-	-
Rh	0.49	0.30	0.30	8.21	-	13.90	-	0.20	0.20	-	-	-	-	-	-	-
Pt	5.00	5.00	5.00	22.00	-	5.00	-	5.00	5.00	-	-	-	-	-	-	-
Pd	5.00	2.00	2.00	137.00	-	55.00	-	2.00	2.00	-	-	-	-	-	-	-
Au	0.98	0.29	1.92	9.37	-	5.84	-	0.14	0.40	-	-	-	-	-	-	-

6. Esker section, western margin of Megacycle #1 at 7418000m N and 574450m E; Figure A-5. Distances from western contact with gneiss.

Major elements in wt.%						
Sample:	ES-1	ES-2	ES-3	ES-4	ES-5	ES-6
Rock:	GBN	GBN	GBN	GBN	Ol-GBN	PIC
Metre	0.20	1.80	4.00	6.00	8.10	10.90
SiO_2	51.15	49.05	47.75	50.40	44.56	42.44
TiO_2	1.16	0.96	0.83	1.11	0.98	0.86
Al_2O_3	11.61	14.02	13.43	14.96	8.24	6.74
MgO	10.79	8.54	8.21	7.65	19.45	23.95
FeO	9.50	10.96	12.41	9.93	14.74	13.21
MnO	0.17	0.16	0.16	0.15	0.18	0.19
CaO	11.22	10.52	10.30	10.13	6.12	5.14
Na_2O	0.98	1.15	0.96	1.07	0.63	0.16
K_2O	1.71	1.97	2.03	2.09	0.46	0.39
P_2O_5	0.10	0.08	0.09	0.12	0.09	0.05
LOI	0.74	1.53	1.76	1.49	2.40	5.10
Total	99.13	98.94	97.93	99.10	97.86	98.23
Trace elements in ppm						
Rb	41.0	55.0	51.0	38.0	15.0	11.0
Sr	463.0	579.0	540.0	344.0	137.0	125.0
Ba	236.0	337.0	576.0	566.0	255.0	170.0
Sc	-	-	-	-	-	-
Y	15.0	12.0	12.0	16.0	12.0	7.0
Zr	74.0	65.0	56.0	92.0	68.0	43.0
Nb	7.0	6.0	6.0	7.0	8.0	6.0
Hf	-	-	-	-	-	-
Ta	-	-	-	-	-	-
V	257.0	207.0	220.0	219.0	191.0	164.0
Cr	879.0	482.0	547.0	424.0	3224.0	3826.0
Ni	216.0	932.0	274.0	630.0	1267.0	998.0
Co	78.0	127.0	155.0	105.0	201.0	168.0
Cu	151.0	1157.0	1792.0	545.0	843.0	234.0
Pb	2.0	70.0	45.0	38.0	59.0	4.0
Zn	60.0	90.0	122.0	114.0	129.0	95.0
S	152.0	13140.0	21190.0	11370.0	8691.0	160.0
U	-	-	-	-	-	-
Th	-	-	-	-	-	-
Rare-earth elements in ppm						
La	-	-	-	-	-	-
Ce	-	-	-	-	-	-
Nd	-	-	-	-	-	-
Sm	-	-	-	-	-	-
Eu	-	-	-	-	-	-
Tb	-	-	-	-	-	-
Ho	-	-	-	-	-	-
Yb	-	-	-	-	-	-
Lu	-	-	-	-	-	-
Platinum group elements in ppb						
Os	1.00	-	-	-	-	-
Ir	0.18	-	-	-	-	-
Ru	4.00	-	-	-	-	-
Rh	0.62	-	-	-	-	-
Pt	25.00	-	-	-	-	-
Pd	4.00	-	-	-	-	-
Au	1.59	-	-	-	-	-

7. Stanbridge section, eastern margin of Megacycle #2 at 7422500m N and 579300m E; Figure A-5. Distances from contact with gneiss.

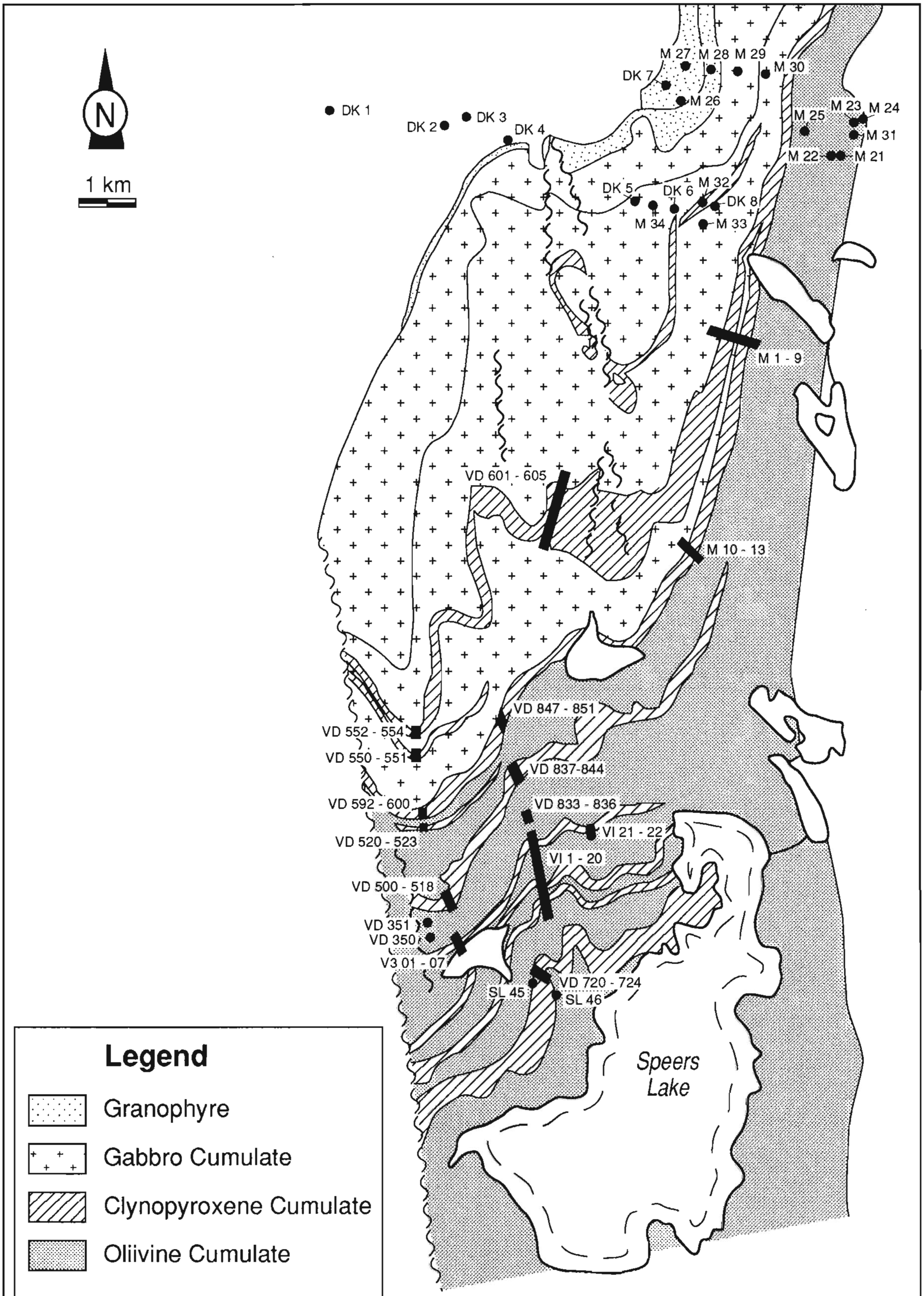
Major elements in wt.%								
Sample:	ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8
Rock:	MIGMA	NOR	GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC
Metre	-0.05	0.05	2.50	5.00	7.00	9.00	13.00	15.00
SiO_2	57.66	55.60	52.11	49.38	47.96	46.57	42.17	41.05
TiO_2	1.04	0.54	0.86	1.03	0.96	0.81	0.62	0.52
Al_2O_3	20.44	14.46	13.66	10.18	9.77	8.62	6.72	5.90
MgO	4.59	10.40	10.25	16.45	17.20	19.90	25.12	27.58
FeO	9.29	7.47	7.90	10.37	10.94	11.57	9.74	9.70
MnO	0.11	0.16	0.16	0.17	0.16	0.18	0.15	0.16
CaO	0.73	6.80	9.93	8.78	7.80	6.67	5.13	3.98
Na_2O	1.20	1.12	1.29	1.11	0.93	0.96	0.69	0.33
K_2O	3.22	2.02	2.07	0.87	1.15	0.71	0.39	0.25
P_2O_5	0.08	0.03	0.09	0.11	0.10	0.08	0.06	0.05
LOI	1.48	1.25	1.15	0.76	1.29	2.97	7.88	8.80
Total	99.84	99.85	99.47	99.21	98.26	99.04	98.67	98.32
Trace elements in ppm								
Rb	131.0	59.0	54.0	24.0	27.0	18.0	11.0	9.0
Sr	82.0	288.0	267.0	158.0	150.0	117.0	80.0	75.0
Ba	475.0	311.0	422.0	190.0	223.0	153.0	90.0	82.0
Sc	-	-	34.3	30.5	-	-	-	-
Y	17.0	10.0	12.0	14.0	16.0	10.0	8.0	6.0
Zr	180.0	58.0	70.0	79.0	72.0	55.0	37.0	29.0
Nb	16.0	7.0	6.0	7.0	6.0	6.0	5.0	5.0
Hf	-	-	2.6	2.6	-	-	-	-
Ta	-	-	0.5	0.4	-	-	-	-
V	152.0	137.0	211.0	231.0	188.0	169.0	145.0	128.0
Cr	182.0	580.0	701.0	1621.0	2070.0	1513.0	4049.0	5139.0
Ni	88.0	199.0	180.0	500.0	1566.0	668.0	1535.0	1791.0
Co	60.0	65.0	63.0	96.0	120.0	121.0	110.0	113.0
Cu	90.0	92.0	93.0	170.0	1469.0	120.0	98.0	103.0
Pb	22.0	3.0	9.0	5.0	37.0	5.0	2.0	2.0
Zn	164.0	48.0	65.0	73.0	68.0	80.0	47.0	42.0
S	-	-	-	-	3700.0	-	-	-
U	-	-	0.6	0.7	-	-	-	-
Th	-	-	2.6	2.6	-	-	-	-
Rare-earth elements in ppm								
La	-	-	10.80	11.50	-	-	-	-
Ce	-	-	24.00	28.00	-	-	-	-
Nd	-	-	12.00	16.00	-	-	-	-
Sm	-	-	2.61	3.01	-	-	-	-
Eu	-	-	0.80	0.88	-	-	-	-
Tb	-	-	0.50	0.60	-	-	-	-
Ho	-	-	0.60	0.80	-	-	-	-
Yb	-	-	1.60	1.70	-	-	-	-
Lu	-	-	0.26	0.26	-	-	-	-
Platinum group elements in ppb								
Os	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-

8. Speers Lake section, eastern margin of Megacycle #2 at 7427900m N and 579600m E; Figure A-5. Equinox drillhole 88-S-2, grid loc.: 138+52 N, 3+42 W, distances from contact with gneiss.

Major elements in wt.%															
Sample:	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15	SL-16	SL-17	SL-18	SL-19	SL-20	SL-21	SL-22	SL-23	SL-24
Rock:	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	GNEISS	MIGMA	MIGMA	MIGMA	MIGMA	MIGMA	NOR	Ol-GBN	Ol-GBN	Ol-GBN
Metre	-14.22	-12.72	-10.20	-7.43	-4.66	-2.00	-1.31	-0.89	-0.55	-0.18	-0.07	0.20	0.51	0.80	1.19
SiO_2	71.18	61.63	65.89	61.87	60.50	61.06	63.97	62.15	60.18	54.66	47.30	50.10	47.94	46.96	47.15
TiO_2	0.60	0.67	0.69	0.69	0.65	0.67	0.64	0.65	0.71	0.89	0.91	0.88	0.95	0.93	0.83
Al_2O_3	13.24	18.58	16.57	18.65	19.27	18.64	17.07	18.40	19.44	21.07	25.53	11.98	10.10	9.35	9.42
MgO	1.58	2.35	2.15	2.51	2.73	2.39	2.07	2.24	2.85	4.19	5.20	15.75	19.24	20.45	20.84
FeO	4.76	5.88	5.96	6.59	7.55	6.70	6.57	7.02	7.68	9.34	9.46	8.77	10.35	10.42	10.24
MnO	0.08	0.07	0.08	0.12	0.14	0.09	0.07	0.10	0.13	0.15	0.13	0.13	0.16	0.16	0.16
CaO	0.65	0.39	0.58	0.60	0.31	0.66	0.56	0.39	0.40	0.42	0.65	3.95	7.27	7.55	7.22
Na_2O	1.02	0.66	0.99	0.85	0.69	0.84	0.77	0.88	0.83	0.85	0.62	0.38	0.70	0.68	0.60
K_2O	3.69	5.72	4.39	5.16	5.40	4.73	4.86	5.45	5.16	6.24	5.56	2.11	0.72	0.51	0.67
P_2O_5	0.11	0.09	0.12	0.11	0.10	0.09	0.11	0.09	0.10	0.08	0.04	0.08	0.10	0.09	0.08
LOI	2.57	3.84	2.41	2.56	2.28	2.92	2.86	2.33	1.72	1.80	3.99	4.73	1.40	1.77	1.71
Total	99.47	99.89	99.83	99.71	99.62	98.79	99.54	99.70	99.20	99.69	99.38	98.86	98.92	98.86	98.93
Trace elements in ppm															
Rb	144.0	224.0	193.0	221.0	235.0	195.0	206.0	221.0	227.0	228.0	220.0	87.0	20.0	15.0	22.0
Sr	96.0	97.0	96.0	84.0	71.0	146.0	116.0	98.0	89.0	136.0	182.0	92.0	152.0	131.0	173.0
Ba	495.0	940.0	625.0	671.0	785.0	705.0	686.0	750.0	707.0	1310.0	1326.0	379.0	176.0	152.0	163.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.2
Y	19.0	21.0	24.0	23.0	22.0	22.0	22.0	21.0	23.0	17.0	26.0	16.0	12.0	12.0	11.0
Zr	145.0	133.0	145.0	137.0	134.0	138.0	134.0	139.0	141.0	126.0	167.0	64.0	65.0	62.0	57.0
Nb	12.0	13.0	13.0	13.0	12.0	13.0	13.0	12.0	13.0	15.0	15.0	7.0	7.0	7.0	6.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
V	71.0	100.0	80.0	99.0	93.0	101.0	82.0	88.0	106.0	146.0	147.0	182.0	186.0	168.0	166.0
Cr	60.9	105.4	103.3	118.4	117.7	122.5	106.1	93.1	118.4	165.6	175.2	2353.0	2787.0	3050.0	3187.0
Ni	16.0	51.0	35.0	35.0	55.0	49.0	41.0	29.0	67.0	75.0	172.0	758.0	997.0	1073.0	1086.0
Co	36.0	34.0	26.0	26.0	44.0	41.0	35.0	53.0	58.0	76.0	80.0	104.0	124.0	113.0	130.0
Cu	101.0	93.0	98.0	141.0	109.0	115.0	113.0	94.0	67.0	224.0	92.0	76.0	109.0	197.0	67.0
Pb	54.0	35.0	39.0	32.0	31.0	31.0	31.0	29.0	31.0	38.0	45.0	363.0	4.0	4.0	3.0
Zn	148.0	111.0	143.0	135.0	171.0	132.0	120.0	136.0	178.0	213.0	361.0	84.0	74.0	71.0	76.0
S	3124.0	1872.0	2800.0	1447.0	2746.0	1638.0	1298.0	1161.0	777.0	2313.0	1160.0	1136.0	288.4	332.0	368.5
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1
Rare-earth elements in ppm															
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.40
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.00
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.29
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.40
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.60
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.40
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22
Platinum group elements in ppb															
Os	-	-	-	-	-	-	-	-	-	-	-	2.00	3.00	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	0.80	1.01	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	7.00	7.00	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	0.92	1.06	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	15.00	15.00	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	9.00	11.00	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	1.57	1.52	-	-

8. Speers Lake section (cont.)

Major elements in wt.%															
Sample:	SL-25	SL-26	SL-27	SL-28	SL-29	SL-30	SL-31	SL-32	SL-33	SL-34	SL-35	SL-36	SL-37	SL-38	SL-39
Rock:	Ol-GBN	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PERID
Metre	1.80	2.44	5.39	8.19	11.15	13.94	16.79	19.54	22.42	25.09	29.63	33.50	41.47	46.39	50.45
SiO_2	47.34	45.55	43.49	42.68	42.06	42.23	41.25	41.14	40.50	40.28	39.75	39.49	40.07	39.56	35.98
TiO_2	0.89	0.83	0.70	0.64	0.60	0.57	0.54	0.51	0.48	0.47	0.44	0.43	0.44	0.40	0.46
Al_2O_3	9.47	8.62	7.32	6.78	6.40	6.08	5.74	5.53	5.36	5.10	4.88	4.71	4.76	4.73	4.77
MgO	20.03	21.81	24.94	25.60	26.91	27.76	28.26	28.44	29.07	29.17	29.65	29.52	29.22	29.67	30.36
FeO	10.42	10.48	10.23	10.09	10.38	10.22	10.32	10.47	10.56	10.54	10.58	11.00	10.81	10.84	11.84
MnO	0.17	0.17	0.16	0.16	0.15	0.15	0.16	0.16	0.16	0.15	0.15	0.16	0.17	0.16	0.16
CaO	7.42	7.11	5.84	6.06	5.02	4.81	4.61	4.56	4.17	3.46	2.93	2.29	2.42	2.17	0.33
Na_2O	0.32	0.34	0.27	-	0.14	-	0.04	-	-	-	-	-	-	-	-
K_2O	0.97	0.64	0.46	0.55	0.29	0.39	0.33	0.29	0.28	0.28	0.20	0.20	0.20	0.20	0.26
P_2O_5	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05
LOI	1.90	3.07	4.71	5.75	6.28	6.62	6.93	7.40	7.81	9.17	9.68	10.40	10.30	10.30	14.06
Total	99.02	98.70	98.19	98.37	98.30	98.89	98.23	98.55	98.44	98.67	98.31	98.25	98.44	98.06	98.28
Trace elements in ppm															
Rb	32.0	17.0	15.0	20.0	12.0	12.0	12.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	13.0
Sr	156.0	145.0	100.0	194.0	80.0	117.0	96.0	73.0	68.0	52.0	52.0	38.0	53.0	70.0	17.0
Ba	292.0	250.0	140.0	169.0	104.0	108.0	108.0	95.0	90.0	96.0	90.0	146.0	103.0	185.0	91.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	11.0	11.0	9.0	8.0	7.0	7.0	7.0	6.0	5.0	5.0	5.0	5.0	6.0	5.0	6.0
Zr	58.0	56.0	47.0	42.0	39.0	35.0	35.0	33.0	31.0	31.0	28.0	28.0	28.0	26.0	32.0
Nb	7.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	5.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	181.0	168.0	150.0	133.0	125.0	122.0	111.0	110.0	116.0	103.0	104.0	103.0	104.0	107.0	125.0
Cr	2247.0	3533.0	4609.0	4828.0	5093.0	4110.0	4376.0	5271.0	4841.0	4744.0	4801.0	4073.0	4171.0	4546.0	6603.0
Ni	949.0	1323.0	1475.0	1457.0	1692.0	1560.0	1714.0	1658.0	1719.0	1779.0	1456.0	1727.0	1531.0	1530.0	1645.0
Co	130.0	139.0	135.0	123.0	138.0	149.0	142.0	151.0	156.0	185.0	165.0	168.0	152.0	157.0	169.0
Cu	103.0	162.0	166.0	52.0	152.0	147.0	85.0	80.0	141.0	260.0	137.0	212.0	160.0	116.0	70.0
Pb	11.0	15.0	5.0	6.0	2.0	2.0	2.0	3.0	4.0	2.0	2.0	4.0	2.0	2.0	9.0
Zn	80.0	93.0	93.0	65.0	64.0	73.0	65.0	63.0	67.0	48.0	39.0	55.0	43.0	46.0	41.0
S	520.2	584.3	199.4	192.2	208.3	191.8	191.8	216.3	207.9	543.5	591.9	528.3	263.9	159.8	807.8
U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm															
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb															
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-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DK 2
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M 29
M 30
M 31
M 32
M 33
M 34
M 1 - 9
VD 601 - 605
M 10 - 13
VD 847 - 851
VD 552 - 554
VD 550 - 551
VD 837-844
VD 592 - 600
VD 833 - 836
VI 21 - 22
VD 520 - 523
VI 1 - 20
VD 500 - 518
VD 351
VD 350
V3 01 - 07
SL 45
VD 720 - 724
SL 46
Speers
Lake
Legend
Granophyre
Gabbro Cumulate
Clynopyroxene Cumulate
Oliivine Cumulate

Figure A-7.

9. Transition Lake section, eastern margin of Cycle #4 at 7442600m N and 579900m E; Figure A-7. Distances from eastern gneiss contact.

Major elements in wt.%													
Sample:	M-31	M-24	M-23	M-32	M-22	M-25	M-8	M-7	M-6	M-10	M-12	M-13	M-5
Rock:	PIC	PIC	PIC	PERID	PERID	DUN	PERID	PERID	Ol-WEBST	Ol-WEBST	Reef	Reef	WEBST
Metre	5.00	12.50	25.00	50.00	75.00	-	-	-	-	-	-	-	-
SiO_2	41.87	42.83	43.15	39.68	39.98	37.10	39.68	39.86	41.12	49.23	53.57	53.63	52.99
TiO_2	0.52	0.56	0.39	0.35	0.44	0.23	0.35	0.44	0.60	0.76	0.83	0.84	1.05
Al_2O_3	5.65	6.03	5.40	4.13	4.35	2.82	4.51	4.52	4.03	4.90	4.71	4.71	5.77
MgO	26.55	25.49	27.11	29.35	30.28	34.38	27.16	27.81	23.96	19.20	21.84	22.30	14.76
FeO	11.04	11.56	11.45	11.26	10.57	10.49	12.94	12.17	15.17	11.71	12.32	12.29	1-
MnO	0.17	0.18	0.18	0.17	0.16	0.12	0.19	0.18	0.17	0.19	0.22	0.22	0.18
CaO	4.67	5.16	4.46	2.78	3.69	0.82	4.56	4.41	5.84	11.43	4.59	4.60	12.98
Na_2O	0.19	0.60	0.19	0.22	0.13	0.01	0.01	0.20	0.19	0.66	1.04	1.08	0.92
K_2O	0.34	0.31	0.26	0.18	0.22	0.04	0.09	0.14	0.29	0.20	0.27	0.27	0.52
P_2O_5	0.06	0.06	0.04	0.04	0.05	0.01	0.03	0.05	0.07	0.05	0.07	0.07	0.09
LOI	7.52	6.00	6.47	10.14	8.84	11.78	8.92	8.85	6.23	0.64	0.56	0.04	0.32
Total	98.58	98.78	99.10	98.30	98.72	97.79	98.45	98.62	97.67	98.97	100.02	100.06	99.58
Trace elements in ppm													
Rb	10.0	10.0	9.0	8.0	10.0	4.0	6.0	7.0	10.0	7.0	9.0	8.0	13.0
Sr	74.0	67.0	59.0	36.0	39.0	8.0	35.0	23.0	58.0	108.0	160.0	82.0	111.0
Ba	115.0	96.0	75.0	62.0	73.0	16.0	52.0	69.0	124.0	110.0	125.0	125.0	171.0
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	6.0	7.0	5.0	4.0	5.0	2.0	3.0	5.0	7.0	9.0	4.0	9.0	14.0
Zr	33.0	34.0	27.0	22.0	28.0	8.0	16.0	24.0	40.0	39.0	30.0	37.0	64.0
Nb	5.0	5.0	5.0	4.0	4.0	3.0	3.0	4.0	6.0	5.0	5.0	5.0	6.0
Hf	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	-	-	-	-	-	-	-	-	-	-	-	-
V	125.0	138.0	97.0	87.0	107.0	68.0	122.0	116.0	174.0	186.0	167.0	165.0	240.0
Cr	2233.0	1652.0	1914.0	2754.0	2304.0	5716.0	3320.0	2597.0	6230.0	2111.0	2053.0	2042.0	2361.0
Ni	1278.0	937.0	918.0	979.0	1603.0	2113.0	414.0	1340.0	1255.0	713.0	665.0	668.0	371.0
Co	140.0	148.0	146.0	147.0	130.0	149.0	160.0	159.0	185.0	138.0	152.0	136.0	92.0
Cu	281.0	146.0	637.0	64.0	121.0	86.0	267.0	146.0	102.0	135.0	1820.0	252.0	245.0
Pb	5.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	9.0	6.0	2.0
Zn	67.0	78.0	75.0	26.0	56.0	25.0	67.0	68.0	48.0	60.0	92.0	78.0	51.0
S	-	-	-	-	-	-	-	-	-	-	-	-	-
U	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm													
La	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb													
Os	-	-	-	-	-	-	-	-	-	2.60	7.80	1.10	-
Ir	-	-	-	-	-	-	-	-	-	2.09	5.41	0.91	-
Ru	-	-	-	-	-	-	-	-	-	4.00	30.00	5.00	-
Rh	-	-	-	-	-	-	-	-	-	0.35	9.21	1.02	-
Pt	-	-	-	-	-	-	-	-	-	4.00	55.00	6.00	-
Pd	-	-	-	-	-	-	-	-	-	2.00	292.00	47.00	-
Au	-	-	-	-	-	-	-	-	-	1.50	32.80	3.61	-

9. Transition Lake section (cont.)

Major elements in wt.%

Sample:	M-4	M-3	M-2	M-1	M-33	M-21	M-34	M-30	M-29	M-28	M-26	M-27
Rock:	GBN	Ol-WEBST	GBN	GBN	GBN	WEBST	GBN	GBN	GBN	GRPHYR	GRPHYR	GRPHYR
Metre	-	-	-	-	-	-	-	-	-	-	-	-
SiO_2	51.17	49.91	50.79	51.52	52.09	45.18	52.14	53.03	49.14	55.00	49.59	66.58
TiO_2	0.88	0.80	0.73	0.89	0.97	0.43	1.36	1.6	2.75	2.68	0.62	1.22
Al_2O_3	4.75	5.93	15.60	15.48	16.49	6.96	14.88	14.19	14.00	11.97	18.69	14.08
MgO	9.64	18.32	9.43	8.10	7.38	21.79	6.58	6.00	5.42	3.04	9.14	1.85
FeO	7.32	10.20	6.99	8.05	7.70	15.94	9.95	11.37	14.49	14.27	7.85	5.41
MnO	0.13	0.18	0.13	0.15	0.14	0.23	0.17	0.16	0.18	0.16	0.13	0.05
CaO	12.41	12.53	12.08	12.11	11.70	6.27	10.60	9.21	9.68	4.21	7.41	0.31
Na_2O	1.44	1.51	1.70	2.39	1.83	0.62	2.66	2.73	2.03	2.61	1.50	0.45
K_2O	0.95	0.37	0.91	0.61	0.69	0.14	0.91	1.08	1.12	2.66	2.94	7.54
P_2O_5	0.06	0.06	0.06	0.07	0.08	0.03	0.12	0.15	0.13	0.93	0.09	0.24
LOI	0.94	0.38	1.36	1.82	0.86	1.31	0.82	0.67	0.49	1.79	1.72	1.75
Total	99.69	100.19	99.78	101.19	99.93	98.90	100.19	100.29	99.43	99.32	99.68	99.47

Trace elements in ppm

Rb	18.0	9.0	15.0	17.0	16.0	4.0	24.0	23.0	29.0	57.0	79.0	165.0
Sr	339.0	96.0	281.0	261.0	281.0	130.0	281.0	306.0	304.0	294.0	545.0	152.0
Ba	182.0	126.0	152.0	160.0	225.0	111.0	289.0	424.0	412.0	1029.0	454.0	1395.0
Sc	-	-	-	-	-	-	-	-	-	21.9	17.5	13.8
Y	9.0	9.0	8.0	10.0	11.0	3.0	16.0	19.0	17.0	45.0	7.0	31.0
Zr	49.0	46.0	44.0	53.0	66.0	14.0	95.0	116.0	99.0	265.0	54.0	261.0
Nb	6.0	6.0	5.0	6.0	6.0	4.0	8.0	9.0	9.0	18.0	5.0	18.0
Hf	-	-	-	-	-	-	-	-	-	8.5	1.7	7.4
Ta	-	-	-	-	-	-	-	-	-	1.3	0.4	1.5
V	186.0	214.0	159.0	203.0	198.0	120.0	248.0	313.0	753.0	170.0	127.0	73.0
Cr	595.3	2531.0	409.8	47.2	25.3	2035.0	113.6	43.1	48.6	10.3	203.2	27.4
Ni	244.0	488.0	178.0	124.0	103.0	1051.0	98.0	71.0	150.0	13.0	366.0	46.0
Co	66.0	105.0	60.0	65.0	61.0	151.0	81.0	95.0	118.0	106.0	64.0	25.0
Cu	119.0	71.0	135.0	352.0	111.0	75.0	157.0	224.0	151.0	149.0	316.0	316.0
Pb	2.0	2.0	2.0	2.0	4.0	4.0	10.0	6.0	3.0	2.0	7.0	20.0
Zn	39.0	41.0	28.0	41.0	43.0	100.0	100.0	101.0	121.0	34.0	43.0	15.0
S	-	-	-	-	-	-	-	-	-	-	-	-
U	-	-	-	-	-	-	-	-	-	1.4	1.0	3.2
Th	-	-	-	-	-	-	-	-	-	6.6	2.9	13.6

Rare-earth elements in ppm

La	-	-	-	-	-	-	-	-	-	38.10	13.40	47.80
Ce	-	-	-	-	-	-	-	-	-	91.00	27.00	97.00
Nd	-	-	-	-	-	-	-	-	-	47.00	11.00	44.00
Sm	-	-	-	-	-	-	-	-	-	11.20	2.19	8.00
Eu	-	-	-	-	-	-	-	-	-	2.90	0.87	1.71
Tb	-	-	-	-	-	-	-	-	-	1.70	0.36	1.10
Ho	-	-	-	-	-	-	-	-	-	2.10	0.50	1.50
Yb	-	-	-	-	-	-	-	-	-	4.40	1.10	3.60
Lu	-	-	-	-	-	-	-	-	-	0.69	0.17	0.55

Platinum group elements in ppb

Os	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-

10. Whole rock analyses of West Margin section, western margin of Megacycle #4 at 7425300m N and 572700m E, Figure A-5. Distances from the gneiss

Major elements in wt.%						
Sample:	WM-1	WM-2	WM-3	WM-4	WM-5	WM-6
Rock:	PIC	PIC	PIC	PIC	PIC	PIC
Metre	0.80	1.75	6.00	9.45	12.50	15.50
SiO_2	44.69	43.54	43.94	42.55	42.06	42.08
TiO_2	0.74	0.67	0.66	0.61	0.57	0.55
Al_2O_3	7.35	6.70	6.73	6.11	5.77	5.65
MgO	23.91	25.11	24.34	25.79	26.47	27.21
FeO	10.61	10.54	12.03	11.64	11.27	10.84
MnO	0.16	0.16	0.18	0.20	0.17	0.16
CaO	5.86	5.30	5.03	4.60	4.50	4.29
Na_2O	0.18	0.10	-	-	-	-
K_2O	0.46	0.32	0.68	0.31	0.29	0.26
P_2O_5	0.08	0.07	0.07	0.06	0.06	0.07
LOI	4.21	6.20	4.77	6.37	7.04	7.65
Total	98.25	98.70	98.44	98.24	98.20	98.76
Trace elements in ppm						
Rb	13.0	11.0	22.0	12.0	11.0	10.0
Sr	91.0	77.0	66.0	85.0	81.0	64.0
Ba	147.0	126.0	178.0	157.0	154.0	109.0
Sc	-	-	-	-	-	-
Y	9.0	9.0	7.0	8.0	7.0	7.0
Zr	50.0	44.0	44.0	41.0	37.0	37.0
Nb	6.0	5.0	5.0	5.0	5.0	4.0
Hf	-	-	-	-	-	-
Ta	-	-	-	-	-	-
V	149.0	136.0	143.0	123.0	117.0	122.0
Cr	2018.0	2204.0	1890.0	2271.0	2178.0	2144.0
Ni	1160.0	1261.0	1118.0	1294.0	1350.0	1310.0
Co	136.0	141.0	162.0	167.0	170.0	153.0
Cu	259.0	126.0	356.0	256.0	262.0	116.0
Pb	3.0	2.0	7.0	36.0	16.0	3.0
Zn	82.0	63.0	94.0	156.0	89.0	66.0
S	1138.0	471.8	5126.0	3324.0	3324.0	1402.0
U	-	-	-	-	-	-
Th	-	-	-	-	-	-
Rare-earth elements in ppm						
La	-	-	-	-	-	-
Ce	-	-	-	-	-	-
Nd	-	-	-	-	-	-
Sm	-	-	-	-	-	-
Eu	-	-	-	-	-	-
Tb	-	-	-	-	-	-
Ho	-	-	-	-	-	-
Yb	-	-	-	-	-	-
Lu	-	-	-	-	-	-
Platinum group elements in ppb						
Os	1.00	-	-	-	-	-
Ir	0.36	-	-	-	-	-
Ru	5.00	-	-	-	-	-
Rh	0.55	-	-	-	-	-
Pt	9.00	-	-	-	-	-
Pd	5.00	-	-	-	-	-
Au	0.42	-	-	-	-	-

11. Whole rock analyses of Mackenzie dykes listed by Section, metre indicates thickness. See appropriate section map for location.

Major elements in wt.%																
Sample:	MR-75	MR-76	MR-77	MR-78	MR-79	MR-80	MR-85	MR-99	LJ-1	LJ-2	LJ-38	LJ-39	DK-21	DK-22	DK-23	PO-1
Sec:	Marceau	Marceau	Marceau	Marceau	Marceau	Marceau	Marceau	Marceau	Last	Last	Last	Last	Last	Last	Last	Pyrr
Metre	24.00	24.00	0.30	15.00	15.00	0.30	0.40	75.00	1.00	50.00	50.00	50.00	250.00	50.00	45.00	4.00
SiO_2	53.36	52.09	49.14	48.22	47.69	48.48	52.58	53.10	48.63	52.56	53.36	52.56	51.58	52.18	50.34	47.13
TiO_2	2.71	2.47	2.35	2.54	2.28	2.33	2.28	2.27	3.28	1.89	1.22	1.78	1.83	2.24	2.34	2.45
Al_2O_3	12.54	12.62	12.78	13.78	12.81	12.74	13.15	13.22	12.07	14.27	13.58	13.90	13.91	13.15	12.77	11.25
MgO	3.96	4.21	5.81	6.80	5.87	5.80	4.62	4.78	5.21	6.45	7.35	7.32	7.78	4.65	5.53	7.71
FeO	14.68	14.73	15.76	15.26	15.63	15.84	13.89	13.24	16.43	11.20	10.31	11.01	11.21	13.57	15.28	11.59
MnO	0.20	0.23	0.27	0.18	0.25	0.25	0.22	0.20	0.23	0.17	0.18	0.17	0.17	0.18	0.21	0.26
CaO	8.26	7.72	10.01	5.24	8.32	10.22	7.30	8.28	9.66	9.80	9.82	9.93	9.56	8.12	9.51	12.65
Na_2O	2.24	1.95	1.62	1.90	1.82	1.66	1.80	1.99	1.57	1.84	1.72	1.86	1.59	2.17	1.97	0.09
K_2O	1.16	1.41	0.38	0.62	2.07	0.37	1.85	1.31	0.99	1.23	1.26	1.04	1.69	1.66	0.67	3.67
P_2O_5	0.28	0.27	0.27	0.31	0.26	0.28	0.20	0.22	0.47	0.19	0.13	0.17	0.17	0.21	0.21	0.24
LOI	-	1.36	0.79	4.04	1.42	0.84	0.96	0.32	1.12	0.09	0.41	0.01	0.56	0.96	0.03	2.35
Total	99.38	99.06	99.18	98.89	98.41	98.80	98.86	98.93	99.65	99.69	99.34	99.76	100.05	99.09	98.86	99.39
Trace elements in ppm																
Rb	34.0	48.0	12.0	20.0	77.0	17.0	51.0	45.0	27.0	33.0	43.0	36.0	55.0	60.0	17.0	69.0
Sr	225.0	215.0	157.0	120.0	242.0	161.0	263.0	266.0	198.0	262.0	185.0	239.0	280.0	270.0	199.0	581.0
Ba	364.0	396.0	146.0	145.0	233.0	136.0	549.0	391.0	287.0	384.0	326.0	264.0	324.0	350.0	165.0	1575.0
Sc	-	-	-	-	-	-	-	-	40.0	30.1	-	31.9	34.2	31.1	40.3	-
Y	36.0	33.0	33.0	45.0	31.0	33.0	26.0	29.0	46.0	23.0	21.0	20.0	20.0	27.0	30.0	26.0
Zr	206.0	199.0	155.0	166.0	141.0	153.0	156.0	169.0	273.0	149.0	115.0	120.0	119.0	157.0	144.0	182.0
Nb	14.0	14.0	18.0	17.0	15.0	17.0	12.0	12.0	25.0	11.0	9.0	10.0	10.0	11.0	12.0	14.0
Hf	-	-	-	-	-	-	-	-	7.6	4.5	-	3.9	3.9	4.8	4.8	-
Ta	-	-	-	-	-	-	-	-	1.5	0.8	-	0.9	0.7	0.7	0.9	-
V	473.0	429.0	435.0	458.0	391.0	434.0	404.0	371.0	517.0	314.0	268.0	308.0	320.0	419.0	451.0	349.0
Cr	21.0	55.0	81.0	98.0	79.0	72.0	39.0	47.0	39.0	190.2	260.7	301.0	355.1	49.9	104.0	10.0
Ni	58.0	63.0	91.0	101.0	53.0	61.0	51.0	58.0	94.0	122.0	115.0	132.0	135.0	70.0	78.0	91.0
Co	135.0	128.0	148.0	147.0	148.0	144.0	119.0	134.0	124.0	86.0	82.0	93.0	78.0	100.0	117.0	97.0
Cu	131.0	250.0	825.0	914.0	162.0	321.0	189.0	249.0	369.0	65.0	147.0	59.0	124.0	127.0	157.0	97.0
Pb	4.0	22.0	2.0	25.0	3.0	11.0	98.0	7.0	2.0	13.0	21.0	13.0	3.0	2.0	7.0	8.0
Zn	117.0	137.0	132.0	167.0	147.0	154.0	136.0	113.0	167.0	129.0	78.0	98.0	79.0	103.0	122.0	97.0
S	240.0	441.0	659.0	513.0	820.0	560.0	834.0	481.0	316.0	36.0	267.1	328.0	416.1	496.2	368.1	104.0
U	-	-	-	-	-	-	-	-	0.6	1.0	-	1.0	0.6	0.8	0.4	-
Th	-	-	-	-	-	-	-	-	2.7	4.1	-	4.4	2.7	3.3	1.7	-
Rare-earth elements in ppm																
La	-	-	-	-	-	-	-	-	27.00	19.80	-	16.90	14.60	17.90	14.60	-
Ce	-	-	-	-	-	-	-	-	57.60	41.50	-	36.20	32.40	39.20	33.80	-
Nd	-	-	-	-	-	-	-	-	37.50	23.90	-	21.70	19.50	24.30	22.90	-
Sm	-	-	-	-	-	-	-	-	9.05	5.58	-	4.96	4.78	6.14	5.68	-
Eu	-	-	-	-	-	-	-	-	2.41	1.54	-	1.46	1.40	1.71	1.80	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	0.78	0.97	0.91	-
Ho	-	-	-	-	-	-	-	-	2.10	1.20	-	1.10	1.00	1.10	1.20	-
Yb	-	-	-	-	-	-	-	-	4.80	2.50	-	2.30	2.10	2.90	3.40	-
Lu	-	-	-	-	-	-	-	-	0.81	0.41	-	0.39	0.35	0.46	0.57	-
Platinum group elements in ppb																
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

11. **Mackenzie dykes** (cont.)

Sample:	PO-40	IC-1	IC-2	SL-44	SL-1	SL-2	SL-47	SL-48	DK-1	DK-2A	DK-3	DK-4	DK-5	DK-6	DK-7	DK-8
Sec:	Pyrr	Equin	Equin	S Speers	Speers	Speers	N Speer	N Speers	Trans	Trans	Trans	Trans	Trans	Trans	Trans	Trans
Metre	-	24.00	1.50	10.00	6.00	-	2.00	2.00	20.00	20.00	10.00	10.00	1.00	5.00	25.00	12.00
Major elements in wt.%																
SiO_2	51.69	50.75	51.86	52.65	50.47	51.75	47.30	48.18	54.27	49.63	49.61	48.63	50.51	49.91	50.47	48.69
TiO_2	1.33	2.34	2.26	1.89	1.36	1.37	1.50	1.80	1.82	1.81	1.54	3.30	1.39	2.51	1.48	2.96
Al_2O_3	14.57	12.90	12.92	15.60	13.56	13.88	13.51	13.28	11.19	13.50	13.65	12.33	13.65	12.47	12.65	12.84
MgO	8.38	5.40	4.73	5.54	8.97	8.18	8.10	6.74	8.18	6.57	7.42	5.45	8.17	4.64	9.10	5.92
FeO	10.36	15.36	13.33	10.93	9.38	10.09	12.84	13.84	10.53	13.21	12.98	16.08	9.84	15.10	10.64	14.81
MnO	0.17	0.21	0.19	0.22	0.18	0.18	0.21	0.22	0.13	0.20	0.20	0.21	0.14	0.21	0.20	0.23
CaO	7.25	9.84	8.18	5.15	9.75	10.73	10.87	9.16	6.39	9.87	10.10	8.96	10.21	9.21	9.97	10.67
Na_2O	0.52	1.95	2.33	3.00	1.74	1.44	1.46	2.22	2.93	1.82	2.09	1.97	1.94	2.81	1.62	1.96
K_2O	3.14	0.57	1.07	2.51	1.77	0.72	0.77	1.19	1.49	1.33	1.10	0.70	1.25	0.40	0.85	0.27
P_2O_5	0.11	0.21	0.22	0.18	0.13	0.13	0.13	0.19	0.18	0.18	0.13	0.58	0.13	0.24	0.13	0.34
LOI	1.61	0.04	1.60	1.74	2.00	0.84	1.86	1.80	2.84	1.29	1.08	0.72	1.92	0.97	2.61	0.68
Total	99.12	99.57	98.69	99.41	99.30	99.31	98.55	98.62	99.95	99.41	99.90	98.93	99.14	98.47	99.72	99.37
Trace elements in ppm																
Rb	111.0	16.0	39.0	90.0	37.0	21.0	11.0	25.0	33.0	25.0	21.0	21.0	37.0	9.0	22.0	7.0
Sr	184.0	192.0	274.0	289.0	633.0	218.0	333.0	319.0	269.0	280.0	212.0	193.0	300.0	202.0	213.0	269.0
Ba	343.0	157.0	467.0	436.0	300.0	242.0	336.0	460.0	508.0	361.0	511.0	238.0	336.0	243.0	317.0	151.0
Sc	-	39.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	17.0	31.0	26.0	26.0	17.0	18.0	22.0	23.0	20.0	21.0	23.0	52.0	16.0	32.0	18.0	28.0
Zr	85.0	138.0	165.0	152.0	96.0	96.0	79.0	106.0	154.0	124.0	78.0	311.0	95.0	170.0	87.0	195.0
Nb	7.0	13.0	12.0	11.0	8.0	9.0	9.0	12.0	12.0	16.0	8.0	28.0	8.0	13.0	8.0	25.0
Hf	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ta	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	259.0	451.0	392.0	316.0	235.0	239.0	336.0	365.0	289.0	331.0	337.0	428.0	291.0	506.0	291.0	435.0
Cr	445.0	98.5	65.0	31.5	196.0	204.0	259.0	118.0	374.3	120.4	238.8	79.4	257.9	51.3	381.8	127.3
Ni	144.0	84.0	66.0	100.0	125.0	122.0	108.0	70.0	159.0	101.0	90.0	57.0	166.0	83.0	148.0	70.0
Co	94.0	113.0	100.0	82.0	79.0	91.0	127.0	131.0	84.0	115.0	104.0	123.0	80.0	118.0	77.0	117.0
Cu	127.0	166.0	91.0	29.0	212.0	291.0	181.0	291.0	171.0	262.0	206.0	475.0	171.0	321.0	129.0	328.0
Pb	7.0	4.0	29.0	5.0	2.0	7.0	2.0	3.0	4.0	4.0	2.0	3.0	4.0	18.0	7.0	2.0
Zn	69.0	124.0	108.0	37.0	58.0	91.0	72.0	108.0	88.0	89.0	84.0	137.0	15.0	132.0	72.0	108.0
S	268.0	356.0	428.1	88.1	124.0	552.0	200.0	144.0	-	-	-	-	-	-	-	-
U	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Th	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rare-earth elements in ppm																
La	-	13.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ce	-	31.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nd	-	22.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sm	-	5.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eu	-	1.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ho	-	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yb	-	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lu	-	0.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum group elements in ppb																
Os	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX A.II

1. Whole rock analyses of layered series Megacycle #1, Figure A-5.

Major elements in wt.%								
Sample:	ES-10	(ES-11 →	ES-15)	ES-12	EQ-22	(EQ-21 →	ES-14 →	EQ-20)
Rock:	Perid	Cpxnite	Cpxnite	Troct	Perid	Cpxnite	Cpxnite	Cpxnite
Metres		0.0	8.0			1.0	4.0	10.0
SiO_2	42.58	48.87	45.19	40.48	44.22	42.85	43.80	48.48
TiO_2	0.32	0.55	0.32	0.04	0.26	0.23	0.25	0.39
Al_2O_3	2.46	4.13	2.18	19.68	1.52	1.63	1.65	2.35
MgO	26.86	21.35	24.70	15.50	26.31	27.31	26.05	21.77
Fe_2O_3	12.20	9.87	9.87	6.58	10.03	11.28	10.53	8.59
MnO	0.17	0.17	0.16	0.16	0.19	0.19	0.15	0.16
CaO	7.43	13.32	12.16	6.49	9.24	6.86	9.07	15.18
Na_2O	0.01	0.07	0.01	0.01	0.58	0.01	0.01	0.74
K_2O	0.01	0.20	0.01	2.46	0.02	0.04	0.01	0.01
P_2O_5	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.01
LOI	8.21	1.50	5.27	8.68	7.96	9.03	7.76	2.39
Total	100.26	100.06	99.88	100.10	100.34	99.44	99.28	100.07
Major elements in cation proportions (based on 100 cations)								
Si	41.304	45.151	42.854	39.675	42.445	42.128	42.705	44.764
Ti	0.233	0.382	0.228	0.029	0.188	0.170	0.183	0.271
Al	2.813	4.498	2.437	22.745	1.720	1.889	1.896	2.558
Mg	38.831	29.400	34.913	22.645	37.634	40.005	37.849	29.950
Fe_3	8.907	6.863	7.044	4.853	7.244	8.346	7.727	5.969
Mn	0.140	0.133	0.129	0.133	0.154	0.158	0.124	0.125
Ca	7.723	13.188	12.357	6.815	9.503	7.226	9.476	15.020
Na	0.019	0.125	0.018	0.019	1.079	0.019	0.019	1.325
K	0.012	0.236	0.012	3.076	0.024	0.050	0.012	0.012
P	0.016	0.023	0.008	0.008	0.008	0.008	0.008	0.008
O	147.458	151.111	147.867	151.990	146.626	147.447	147.748	148.685
Trace elements in ppm								
Rb	6.0	9.0	5.0	24.0	4.0	4.0	5.0	3.0
Sr	9.0	59.0	11.0	179.0	9.0	9.0	10.0	13.0
Ba	37.0	93.0	31.0	95.0	22.0	20.0	28.0	31.0
Y	5.0	9.0	6.0	3.0	4.0	3.0	5.0	6.0
Zr	14.0	28.0	10.0	5.0	5.0	3.0	5.0	9.0
V	146.0	236.0	184.0	10.0	189.0	170.0	169.0	253.0
Nb	6.0	6.0	5.0	6.0	3.0	3.0	5.0	4.0
Cr	3088.0	3950.0	4059.0	88.3	6547.0	3689.0	4102.0	4631.0
Ni	969.0	443.0	861.0	646.0	2524.0	965.0	815.0	540.0
Co	162.0	109.0	131.0	81.0	104.0	118.0	139.0	81.0
Cu	10.0	10.0	10.0	10.0	55.0	308.0	10.0	71.0
Zn	36.0	48.0	26.0	31.0	33.0	10.0	13.0	10.0
S	38.0	48.1	71.7	40.0	-	-	16.0	-
Normative minerals in wt.%								
OLn	39.92	16.48	31.83	28.69	40.00	37.24	33.63	26.33
OPXn	23.06	22.67	12.87	12.92	11.39	28.18	22.86	2.29
CPXn	26.23	45.05	45.80	0.00	37.95	26.26	35.31	58.72
FDSn	7.40	12.34	6.36	51.46	7.01	5.11	5.00	9.59
Calculated modal proportions in wt.%								
OLm	39.16	17.95	31.83	30.27	36.22	39.21	35.41	22.00
OPXm	19.41	18.28	4.17	0.00	9.64	16.95	11.74	0.00
CPXm	28.46	53.61	55.60	17.89	43.19	31.06	42.26	71.91
FDSm	3.99	7.64	2.03	33.47	2.41	2.13	1.29	2.69

2. Whole rock analyses of layered series Megacycle #2, Figure A-5.

Major elements in wt.%									
Sample:	(VD-701→	VD-702→	VD-703)	(VD-705→	VD-706→	VD-707→	VD-709→	VD-710)	SL-42
Rock:	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Ol-gbn
Metres	1.0	4.0	7.5	2.0	5.0	8.0	22.0	30.0	
SiO_2	46.23	47.30	46.15	43.35	45.27	46.36	47.09	49.17	48.03
TiO_2	0.17	0.19	0.18	0.15	0.18	0.19	0.21	0.23	0.15
Al_2O_3	1.43	1.41	1.37	1.23	1.27	1.35	1.48	1.61	16.35
MgO	25.83	24.44	25.76	29.11	26.91	25.61	24.75	22.54	11.82
Fe_2O_3	8.14	7.85	7.79	8.92	8.28	7.85	7.41	7.21	3.95
MnO	0.17	0.14	0.17	0.16	0.16	0.14	0.12	0.14	0.08
CaO	11.72	13.43	11.68	7.96	10.63	11.76	13.54	16.22	15.15
Na_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.24
K_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.69
P_2O_5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
LOI	6.55	5.51	7.08	8.89	7.55	7.04	5.33	3.11	2.39
Total	100.27	100.30	100.21	99.80	100.28	100.34	99.96	100.26	99.86
Major elements in cation proportions (based on 100 cations)									
Si	43.862	44.634	44.011	41.793	43.197	44.181	44.380	45.610	44.913
Ti	0.121	0.135	0.129	0.109	0.129	0.136	0.149	0.160	0.105
Al	1.599	1.568	1.540	1.398	1.428	1.516	1.644	1.760	18.020
Mg	36.519	34.361	36.616	41.835	38.264	36.376	34.764	31.169	16.476
Fe_3	5.811	5.575	5.591	6.472	5.945	5.630	5.256	5.034	2.780
Mn	0.137	0.112	0.137	0.131	0.129	0.113	0.096	0.110	0.063
Ca	11.913	13.577	11.936	8.224	10.868	12.008	13.673	16.119	15.183
Na	0.018	0.018	0.018	0.019	0.019	0.018	0.018	0.018	0.435
K	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	2.016
P	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
O	147.735	148.385	147.753	145.889	147.062	147.938	148.024	149.210	154.225
Trace elements in ppm									
Rb	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	15.0
Sr	9.0	11.0	8.0	6.0	8.0	8.0	9.0	11.0	176.0
Ba	30.0	26.0	26.0	21.0	20.0	24.0	25.0	29.0	144.0
Y	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	3.0
Zr	3.0	4.0	4.0	3.0	5.0	4.0	4.0	4.0	3.0
V	107.0	121.0	119.0	104.0	114.0	112.0	127.0	162.0	135.0
Nb	5.0	5.0	5.0	5.0	6.0	5.0	5.0	5.0	3.0
Cr	4118.0	4139.0	4098.0	3732.0	3882.0	3953.0	4027.0	3004.0	1240.0
Ni	567.0	413.0	535.0	835.0	737.0	574.0	593.0	486.0	219.0
Co	107.0	98.0	92.0	122.0	112.0	98.0	94.0	87.0	21.0
Cu	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	17.0
Zn	20.0	18.0	15.0	24.0	18.0	17.0	14.0	26.0	10.0
S	120.1	175.4	40.0	127.8	88.1	64.9	152.2	56.1	200.2
Normative minerals in wt.%									
OLn	28.30	23.87	27.60	40.57	32.36	26.65	25.27	18.43	11.21
OPXn	18.96	16.90	19.62	21.42	19.08	20.32	15.04	12.61	5.81
CPXn	45.90	52.51	46.12	31.55	42.14	46.44	52.81	62.13	29.86
FDSn	4.23	4.13	4.08	3.77	3.81	4.02	4.33	4.59	51.89
Calculated modal proportions in wt.%									
OLm	26.14	21.37	25.71	39.07	30.71	26.98	25.48	15.72	-
OPXm	13.23	11.43	13.65	14.87	12.68	6.24	0.00	0.00	-
CPXm	53.76	61.62	53.45	35.70	48.84	60.24	69.48	81.32	-
FDSm	0.25	0.14	0.37	1.11	0.33	0.28	0.22	0.00	-

3. Whole rock analyses of layered series Megacycle #3, Figure A-7.

Major elements in wt.%												
Sample:	VD-720	(VD-722→	VD-723→	VD-724)	(SL-46→	SL-45)	V1-01	(V1-02→	V1-03→	V1-04)	V1-05	(V1-06→
Rock:	Dunite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Cpxnite	Perid	Cpxnite	Cpxnite	Cpxnite	Perid	Cpxnite
Metres		1.0	3.0	6.0	1.0	6.0		0.0	0.8	1.5		0.0
SiO_2	34.15	49.44	51.18	50.58	48.97	51.90	34.92	46.28	51.73	50.88	34.40	49.21
TiO_2	0.04	0.35	0.35	0.31	0.32	0.34	0.14	0.26	0.35	0.34	0.15	0.36
Al_2O_3	0.38	2.87	3.07	2.77	2.90	3.01	1.36	2.85	2.85	3.05	1.48	2.89
MgO	36.91	21.58	19.29	20.44	21.20	18.96	35.88	25.03	19.99	20.64	34.22	22.59
Fe_2O_3	13.52	8.64	7.39	7.72	8.33	7.15	12.99	8.63	6.65	7.29	15.53	8.54
MnO	0.14	0.16	0.14	0.14	0.19	0.15	0.14	0.14	0.14	0.14	0.16	0.16
CaO	0.03	15.41	17.64	16.57	15.99	17.88	0.27	12.11	18.18	17.00	0.27	14.71
Na_2O	0.01	0.01	0.01	0.01	0.01	0.14	0.01	0.01	0.02	0.04	0.01	0.02
K_2O	0.01	0.01	0.05	0.01	0.03	0.06	0.01	0.01	0.03	0.07	0.01	0.03
P_2O_5	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.02
LOI	15.32	1.47	0.49	1.08	2.52	0.33	14.13	4.63	0.56	0.73	13.27	1.57
Total	100.52	99.96	99.63	99.64	100.48	99.95	99.87	99.96	100.52	100.18	99.52	100.10
Major elements in cation proportions (based on 100 cations)												
Si	34.147	45.592	47.168	46.717	45.404	47.619	34.800	43.344	47.099	46.472	34.603	45.156
Ti	0.030	0.243	0.243	0.215	0.223	0.235	0.105	0.183	0.240	0.234	0.113	0.248
Al	0.448	3.119	3.336	3.016	3.169	3.255	1.598	3.146	3.058	3.283	1.755	3.127
Mg	55.010	29.659	26.501	28.134	29.294	25.925	53.298	34.942	27.123	28.093	51.300	30.900
Fe_3	10.174	5.996	5.126	5.367	5.812	4.937	9.744	6.083	4.556	5.011	11.753	5.898
Mn	0.119	0.125	0.109	0.110	0.149	0.117	0.118	0.111	0.108	0.108	0.136	0.124
Ca	0.032	15.221	17.425	16.396	15.888	17.578	0.288	12.153	17.731	16.639	0.291	14.460
Na	0.019	0.018	0.018	0.018	0.018	0.249	0.019	0.018	0.035	0.071	0.020	0.036
K	0.013	0.012	0.059	0.012	0.035	0.070	0.013	0.012	0.035	0.082	0.013	0.035
P	0.008	0.016	0.016	0.016	0.008	0.016	0.017	0.008	0.015	0.008	0.017	0.016
O	139.551	150.444	151.667	151.174	150.146	151.853	140.649	148.185	151.175	150.830	141.541	149.949
Trace elements in ppm												
Rb	3.0	6.0	7.0	6.0	5.0	6.0	5.0	5.0	5.0	6.0	5.0	5.0
Sr	3.0	21.0	37.0	20.0	21.0	32.0	3.0	12.0	25.0	32.0	5.0	33.0
Ba	17.0	80.0	95.0	60.0	36.0	60.0	13.0	24.0	55.0	74.0	17.0	67.0
Y	3.0	6.0	6.0	5.0	6.0	6.0	5.0	5.0	6.0	6.0	5.0	7.0
Zr	3.0	16.0	14.0	12.0	13.0	14.0	7.0	8.0	11.0	12.0	6.0	15.0
V	16.0	128.0	143.0	138.0	149.0	175.0	92.0	159.0	216.0	187.0	123.0	166.0
Nb	6.0	5.0	5.0	5.0	4.0	3.0	5.0	4.0	4.0	4.0	4.0	4.0
Cr	3951.0	4877.0	5612.0	5283.0	4926.0	5679.0	7663.0	3558.0	4995.0	4379.0	12110.0	3900.0
Ni	1280.0	238.0	302.0	326.0	324.0	283.0	1385.0	586.0	321.0	330.0	1638.0	527.0
Co	235.0	98.0	82.0	81.0	-	-	-	-	-	-	-	-
Cu	10.0	10.0	10.0	10.0	-	-	-	-	-	-	-	-
Zn	84.0	29.0	23.0	25.0	-	-	-	-	-	-	-	-
S	32.0	136.2	71.7	95.7	-	-	-	-	-	-	-	-
Normative minerals in wt.%												
OLn	86.94	15.40	6.88	9.70	16.76	5.67	78.60	28.75	7.97	11.46	76.95	18.31
OPXn	8.97	18.14	18.14	19.61	14.08	17.87	14.31	16.72	16.12	16.25	14.35	18.07
CPXn	0.00	55.34	63.34	60.02	58.00	64.56	0.00	43.63	65.24	60.88	0.00	52.58
FDSn	0.27	8.01	8.61	7.72	8.20	8.95	1.58	8.23	7.92	8.72	1.56	8.18
Calculated modal proportions in wt.%												
OLm	0.00	15.48	5.67	9.34	16.68	2.45	0.00	30.07	7.90	10.85	0.00	18.28
OPXm	0.00	10.83	11.05	12.10	6.13	13.77	0.00	9.27	7.65	9.54	0.00	0.74
CPXm	0.00	68.37	78.99	74.48	71.43	80.23	0.00	52.33	82.57	75.99	0.00	75.38
FDSm	0.00	3.61	3.54	2.91	3.69	3.21	0.00	4.32	2.79	3.66	0.00	3.66

3. Whole rock analyses of layered series Megacycle #3, Figure A-7 (cont.)

Major elements in wt.%												
Sample:	V1-07→	V1-08→	V1-09)	V1-10	V3-01	(V3-02→	V3-03→	V3-04→	V3-05→	V3-06)	VD-351	(VD-501→
Rock:	Cpxnite	Cpxnite	Cpxnite	Perid	Perid	Webst	Webst	Webst	Webst	Webst	Perid	Webst
Metres	0.8	2.3	4.3			0.0	1.3	2.7	4.2	5.8		1.0
SiO_2	49.06	49.21	50.60	36.31	34.75	52.55	52.57	53.25	52.42	51.71	41.74	53.77
TiO_2	0.35	0.35	0.40	0.10	0.09	0.36	0.41	0.40	0.45	0.52	0.31	0.40
Al_2O_3	3.10	3.10	3.37	0.84	0.80	4.31	3.89	3.90	3.91	3.48	2.83	2.91
MgO	21.62	21.75	20.64	35.27	36.08	21.63	19.82	21.15	19.66	19.56	27.17	23.36
Fe_2O_3	8.26	8.41	8.62	14.84	13.00	8.52	8.00	8.71	8.33	8.67	12.65	9.93
MnO	0.15	0.15	0.15	0.12	0.19	0.17	0.17	0.18	0.17	0.18	0.19	0.21
CaO	15.34	15.36	16.01	0.49	0.11	12.81	14.86	12.90	14.73	15.88	7.60	9.43
Na_2O	0.01	0.01	0.11	0.01	0.01	0.14	0.12	0.11	0.09	0.12	0.01	0.01
K_2O	0.01	0.02	0.12	0.01	0.01	0.06	0.08	0.26	0.33	0.13	0.04	0.16
P_2O_5	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.03	0.02	0.04	0.03	0.02
LOI	2.87	1.88	0.71	12.12	15.00	0.14	0.25	0.21	0.32	0.48	7.03	0.01
Total	100.78	100.26	100.74	100.12	100.05	100.71	100.19	101.10	100.43	100.77	99.61	100.20
Major elements in cation proportions (based on 100 cations)												
Si	45.418	45.346	46.092	35.676	34.874	47.432	48.032	48.073	47.882	47.234	40.241	48.744
Ti	0.244	0.243	0.274	0.074	0.068	0.244	0.282	0.272	0.309	0.357	0.225	0.273
Al	3.383	3.368	3.619	0.973	0.946	4.586	4.190	4.150	4.209	3.747	3.216	3.109
Mg	29.824	29.868	28.016	51.647	53.972	29.101	26.995	28.457	26.762	26.625	39.041	31.559
Fe_3	5.755	5.832	5.909	10.974	9.820	5.788	5.501	5.917	5.726	5.960	9.178	6.775
Mn	0.118	0.117	0.116	0.100	0.161	0.130	0.132	0.138	0.132	0.139	0.155	0.161
Ca	15.213	15.170	15.624	0.516	0.118	12.390	14.548	12.479	14.421	15.543	7.851	9.161
Na	0.018	0.018	0.194	0.019	0.019	0.245	0.213	0.193	0.159	0.213	0.019	0.018
K	0.012	0.024	0.139	0.013	0.013	0.069	0.093	0.299	0.385	0.151	0.049	0.185
P	0.016	0.016	0.015	0.008	0.008	0.015	0.015	0.023	0.015	0.031	0.024	0.015
O	150.283	150.234	151.029	141.783	140.387	152.771	153.070	153.209	152.950	152.350	146.717	153.926
Trace elements in ppm												
Rb	5.0	6.0	6.0	5.0	5.0	6.0	6.0	9.0	9.0	8.0	7.0	5.0
Sr	19.0	22.0	49.0	3.0	3.0	84.0	46.0	149.0	106.0	78.0	18.0	13.0
Ba	37.0	46.0	89.0	14.0	10.0	96.0	118.0	245.0	294.0	202.0	61.0	53.0
Y	6.0	7.0	7.0	5.0	5.0	7.0	7.0	6.0	7.0	9.0	5.0	5.0
Zr	12.0	13.0	17.0	4.0	4.0	14.0	14.0	19.0	19.0	26.0	17.0	11.0
V	174.0	192.0	187.0	70.0	62.0	181.0	190.0	175.0	192.0	201.0	90.0	128.0
Nb	4.0	4.0	4.0	5.0	5.0	5.0	4.0	4.0	3.0	4.0	5.0	6.0
Cr	3763.0	3421.0	3489.0	5542.0	6842.0	4379.0	3832.0	3353.0	3489.0	3216.0	2347.0	3053.0
Ni	471.0	464.0	438.0	1409.0	1460.0	390.0	379.0	441.0	396.0	442.0	1437.0	194.0
Co	-	-	-	-	-	-	-	-	-	-	158.0	117.0
Cu	-	-	-	-	-	-	-	-	-	-	10.0	10.0
Zn	-	-	-	-	-	-	-	-	-	-	62.0	49.0
S	-	-	-	-	-	-	-	-	-	-	175.8	55.7
Normative minerals in wt.%												
OLn	16.39	16.91	13.44	76.20	80.24	4.76	1.95	2.50	3.56	6.58	45.73	0.00
OPXn	17.21	16.83	17.19	16.91	14.14	38.33	33.05	39.80	30.76	24.30	16.40	56.68
CPXn	54.90	54.83	56.56	0.14	0.00	41.58	50.84	43.13	50.81	55.75	26.00	31.37
FDSn	8.71	8.71	9.99	2.69	0.74	12.43	11.34	11.77	12.00	10.34	8.56	8.48
Calculated modal proportions in wt.%												
OLm	14.04	17.53	11.81	-	-	0.63	0.89	1.67	3.19	5.51	49.38	0.00
OPXm	0.90	4.18	5.78	-	-	42.56	28.28	40.32	26.12	21.49	0.00	52.27
CPXm	79.58	72.99	76.88	-	-	49.67	63.86	49.73	62.22	68.16	35.27	43.20
FDSm	4.46	3.81	5.04	-	-	7.61	6.33	7.88	7.44	4.95	7.02	4.33

3. **Whole rock analyses of layered series Megacycle #3, Figure A-7** (cont.)

Major elements in wt.%

Sample:	VD-502→	VD-503→	VD-504→	VD-505→	VD-506→	VD-507→	VD-508→	VD-510→	VD-512→	VD-513→	VD-513B)	VD-514
Rock:	Webst	Webst	Webst	Webst	Webst	Webst	Webst	Webst	Webst	Webst	Webst	Ol-gbn
Metres	4.0	5.0	6.6	7.6	9.1	10.9	12.3	14.3	15.8	16.8	17.8	
SiO_2	53.72	53.57	53.42	53.34	52.78	52.57	53.19	53.25	52.61	52.20	51.78	49.02
TiO_2	0.43	0.45	0.48	0.47	0.41	0.39	0.40	0.46	0.47	0.51	0.44	0.24
Al_2O_3	3.31	3.06	3.46	3.22	2.75	2.55	2.48	3.32	3.64	3.68	3.69	13.71
MgO	23.24	23.11	21.04	21.78	20.97	20.35	20.22	18.50	18.65	19.08	19.19	13.61
Fe_2O_3	9.72	9.93	8.53	8.78	8.70	8.59	8.71	8.47	8.72	9.47	9.28	6.15
MnO	0.19	0.12	0.18	0.18	0.18	0.19	0.19	0.18	0.18	0.19	0.19	0.12
CaO	9.08	9.39	12.63	11.79	13.76	14.52	14.99	15.52	15.82	14.59	15.28	15.11
Na_2O	0.01	0.01	0.07	0.01	0.01	0.01	0.01	0.09	0.03	0.04	0.01	0.15
K_2O	0.20	0.19	0.22	0.13	0.06	0.10	0.07	0.19	0.11	0.13	0.05	0.78
P_2O_5	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.01
LOI	0.01	0.01	0.05	0.15	0.18	0.02	0.01	0.07	0.08	0.16	0.15	1.38
Total	99.93	99.86	100.10	99.87	99.82	99.31	100.28	100.07	100.33	100.08	100.08	100.28

Major elements in cation proportions (based on 100 cations)

Si	48.803	48.759	48.677	48.691	48.363	48.429	48.600	49.006	48.298	48.095	47.641	45.444
Ti	0.294	0.308	0.329	0.323	0.283	0.270	0.275	0.318	0.325	0.353	0.305	0.167
Al	3.545	3.284	3.716	3.464	2.969	2.770	2.672	3.601	3.938	3.997	4.002	14.982
Mg	31.465	31.345	28.564	29.634	28.634	27.947	27.538	25.368	25.511	26.194	26.321	18.809
Fe_3	6.645	6.801	5.849	6.032	5.999	5.956	5.989	5.866	6.024	6.566	6.426	4.291
Mn	0.146	0.093	0.139	0.139	0.140	0.148	0.147	0.140	0.140	0.148	0.148	0.094
Ca	8.838	9.157	12.331	11.532	13.509	14.337	14.672	15.301	15.567	14.406	15.064	15.012
Na	0.018	0.018	0.124	0.018	0.018	0.018	0.018	0.161	0.053	0.071	0.018	0.270
K	0.232	0.221	0.256	0.151	0.070	0.118	0.082	0.223	0.129	0.153	0.059	0.923
P	0.015	0.015	0.015	0.015	0.016	0.008	0.008	0.016	0.016	0.016	0.016	0.008
O	154.136	154.059	153.665	153.745	153.152	153.049	153.210	153.929	153.575	153.682	153.186	154.688

Trace elements in ppm

Rb	9.0	9.0	8.0	8.0	5.0	7.0	6.0	8.0	7.0	7.0	6.0	14.0
Sr	92.0	79.0	91.0	70.0	40.0	51.0	55.0	68.0	69.0	51.0	50.0	190.0
Ba	141.0	127.0	153.0	79.0	133.0	146.0	84.0	180.0	144.0	114.0	76.0	74.0
Y	6.0	6.0	7.0	7.0	7.0	6.0	6.0	9.0	8.0	9.0	8.0	4.0
Zr	18.0	19.0	19.0	18.0	12.0	10.0	10.0	18.0	15.0	19.0	15.0	9.0
V	127.0	143.0	159.0	148.0	170.0	171.0	179.0	190.0	190.0	187.0	181.0	116.0
Nb	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	6.0	4.0
Cr	3058.0	2890.0	3170.0	2995.0	3133.0	3020.0	2769.0	2359.0	2410.0	2170.0	2367.0	1425.0
Ni	490.0	456.0	388.0	364.0	395.0	413.0	473.0	423.0	484.0	494.0	533.0	276.0
Co	108.0	107.0	91.0	101.0	96.0	95.0	100.0	85.0	93.0	107.0	101.0	65.0
Cu	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Zn	48.0	50.0	42.0	34.0	34.0	33.0	34.0	36.0	37.0	43.0	39.0	27.0
S	80.1	79.7	72.1	127.8	48.1	56.1	80.1	63.7	80.1	103.7	145.0	136.2

Normative minerals in wt.%

OLn	0.00	0.00	0.00	0.00	0.79	1.05	0.10	0.00	0.08	0.93	3.09	6.46
OPXn	57.20	56.24	43.15	47.09	39.84	36.25	36.16	31.26	31.70	35.05	31.00	18.14
CPXn	29.29	31.08	43.17	40.08	48.80	52.63	54.05	55.08	55.08	50.47	52.82	32.80
FDSn	9.71	9.01	10.39	9.26	7.77	7.36	7.02	10.01	10.38	10.64	10.30	40.86

Calculated modal proportions in wt.%

OLm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	3.80	-
OPXm	53.67	51.90	32.77	38.15	27.48	30.56	28.89	24.17	24.37	28.99	22.01	-
CPXm	40.18	42.65	61.46	56.68	69.22	66.32	69.24	71.25	70.59	63.79	67.84	-
FDSm	5.78	4.87	5.79	4.94	2.74	2.25	2.07	4.95	5.32	5.72	5.72	-

4. Whole rock analyses of layered series Megacycle #4, Figure A-7. See appendix A1.9 for rare-earth and platinum group elements for some of these rocks.

Major elements in wt.%														
Sample:	VD-518	VD-520	(VD-521→	VD-522)	VD-523	(VD-592→	VD-595→	VD-596→	VD-597→	VD-598→	VD-599)	VD-600	VD-847	VD-848
Rock:	Perid	F-Per	Webst	Webst	Perid	Webst	Webst	Webst	Webst	Webst	Webst	Gbn	F-Per	F-Web
Metres			2.5	4.5		0.0	8.0	11.0	14.0		-2.5 reef	2.0	5.0	
SiO_2	37.10	38.98	52.01	52.08	38.70	52.61	52.82	53.29	52.57	52.76	51.80	50.41	40.82	44.91
TiO_2	0.24	0.22	0.66	0.74	0.56	0.70	0.69	0.75	0.73	0.77	0.88	0.52	0.24	0.32
Al_2O_3	3.22	4.77	7.24	6.70	2.31	4.23	4.27	4.06	4.26	4.11	4.50	16.43	5.18	11.56
MgO	30.92	30.44	15.67	15.61	31.98	16.92	17.27	17.04	16.67	16.71	16.45	10.45	29.46	19.86
Fe_2O_3	15.28	11.77	6.50	6.50	13.13	9.89	10.33	10.29	10.55	10.27	10.65	6.80	12.27	9.95
MnO	0.20	0.16	0.13	0.13	0.13	0.18	0.19	0.19	0.19	0.18	0.18	0.13	0.17	0.14
CaO	2.57	4.02	16.15	17.00	2.91	15.04	14.87	14.78	15.04	14.94	15.85	11.91	4.23	9.31
Na_2O	0.01	0.01	0.34	0.44	0.01	0.18	0.22	0.20	0.21	0.20	0.19	0.70	0.01	0.27
K_2O	0.02	0.03	0.69	0.44	0.15	0.10	0.08	0.07	0.09	0.10	0.16	1.84	0.05	0.16
P_2O_5	0.02	0.02	0.04	0.07	0.05	0.04	0.03	0.04	0.03	0.04	0.05	0.03	0.02	0.02
LOI	10.73	9.17	0.86	0.56	10.02	0.08	0.08	0.03	0.23	0.02	0.16	1.60	7.52	2.56
Total	100.31	99.59	100.29	100.27	99.96	99.97	100.86	100.74	100.57	100.10	100.87	100.82	99.97	99.05
Major elements in cation proportions (based on 100 cations)														
Si	36.498	37.659	48.036	48.000	37.621	48.911	48.668	49.218	48.786	49.069	47.937	46.907	38.867	42.090
Ti	0.178	0.160	0.458	0.513	0.409	0.489	0.478	0.521	0.509	0.539	0.613	0.364	0.172	0.226
Al	3.733	5.433	7.882	7.279	2.648	4.636	4.637	4.420	4.661	4.505	4.910	18.022	5.814	12.770
Mg	45.338	43.828	21.573	21.449	46.333	23.445	23.712	23.448	23.060	23.155	22.693	14.497	41.807	27.737
Fe_3	11.316	8.557	4.517	4.509	9.605	6.919	7.162	7.151	7.369	7.188	7.418	4.762	8.792	7.018
Mn	0.167	0.131	0.102	0.102	0.107	0.142	0.148	0.149	0.149	0.142	0.141	0.102	0.137	0.111
Ca	2.710	4.161	15.979	16.790	3.031	14.984	14.683	14.621	14.958	14.892	15.720	11.876	4.315	9.350
Na	0.019	0.019	0.609	0.786	0.019	0.324	0.393	0.358	0.378	0.361	0.341	1.263	0.018	0.491
K	0.025	0.037	0.813	0.517	0.186	0.119	0.094	0.082	0.107	0.119	0.189	2.184	0.061	0.191
P	0.017	0.016	0.031	0.055	0.041	0.031	0.023	0.031	0.024	0.032	0.039	0.024	0.016	0.016
O	144.259	144.863	154.063	153.870	144.173	155.041	154.876	155.389	155.141	155.299	154.543	156.994	146.378	151.927
Trace elements in ppm														
Rb	6.0	7.0	12.0	11.0	11.0	6.0	7.0	7.0	7.0	6.0	9.0	35.0	6.0	8.0
Sr	11.0	25.0	187.0	151.0	11.0	63.0	71.0	63.0	65.0	65.0	67.0	375.0	68.0	196.0
Ba	37.0	42.0	300.0	210.0	56.0	80.0	79.0	76.0	88.0	86.0	106.0	339.0	65.0	104.0
Y	3.0	3.0	11.0	12.0	7.0	11.0	10.0	12.0	11.0	13.0	14.0	7.0	3.0	4.0
Zr	10.0	9.0	32.0	38.0	34.0	28.0	25.0	32.0	29.0	34.0	44.0	29.0	14.0	15.0
V	86.0	79.0	204.0	199.0	117.0	193.0	199.0	202.0	209.0	214.0	225.0	123.0	71.0	129.0
Nb	6.0	6.0	4.0	6.0	7.0	4.0	5.0	5.0	5.0	5.0	6.0	4.0	6.0	4.0
Cr	3816.0	5389.0	3359.0	3231.0	4759.0	2426.0	3097.0	2911.0	2328.0	2352.0	1786.0	793.0	3661.0	9442.0
Ni	1643.0	1350.0	304.0	231.0	1423.0	346.0	359.0	284.0	432.0	299.0	476.0	201.0	1146.0	657.0
Co	232.0	179.0	62.0	59.0	197.0	101.0	112.0	112.0	108.0	102.0	115.0	63.0	182.0	130.0
Cu	27.0	11.0	10.0	10.0	27.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	19.0	10.0
Zn	70.0	69.0	28.0	18.0	67.0	42.0	54.0	52.0	52.0	53.0	49.0	29.0	57.0	60.0
S	216.3	271.5	120.1	96.1	367.3	135.8	64.1	70.9	48.1	63.7	176.2	48.1	207.5	72.1
Normative minerals in wt.%														
OLn	66.44	57.61	0.81	0.87	60.64	0.00	0.00	0.00	0.00	0.00	0.00	2.37	50.40	23.43
OPXn	16.00	17.97	21.87	19.50	19.73	30.57	32.01	31.35	30.67	30.42	28.64	23.11	24.64	24.82
CPXn	3.55	6.11	50.99	54.99	7.37	51.53	50.48	50.45	51.51	51.47	54.05	18.56	6.01	13.39
FDSn	9.97	14.54	23.27	21.39	7.56	12.62	12.71	12.04	12.75	12.35	13.49	53.70	15.55	34.07
Calculated modal proportions in wt.%														
OLm	65.57	53.29	0.00	0.00	54.81	0.00	0.00	0.00	0.00	0.00	0.14	-	-	23.51
OPXm	11.74	16.77	15.57	11.98	19.53	27.01	29.14	16.75	15.69	20.06	17.76	-	-	24.70
CPXm	2.77	5.98	65.46	71.30	6.77	63.10	61.65	74.83	74.93	70.00	72.06	-	-	15.32
FDSm	8.12	12.00	17.45	15.43	5.21	9.01	8.89	8.96	9.09	9.12	8.84	-	-	30.71

4. **Whole rock analyses of layered series Megacycle #4, Figure A-7** (cont.)

Major elements in wt.%														
Sample:	(VD-850→	VD-851)	VD-551	(VD-552→	VD-553→	VD-554)	(VD-602→	VD-603→	VD-604)	VD-605	M-8	M-7	M-6	M-10
Rock:	Opxnite	Webst	F-Web	F-Web	F-Web	F-Web	F-Web	F-Web	F-Web	Gbn	F-Per	F-Per	F-Per	F-Web
Metres		-	3.0	6.0	1.0	10.0	15.0						-1.5	reef 0.8
SiO_2	54.34	52.87	45.12	47.75	49.83	48.59	48.80	48.67	49.47	51.13	39.69	39.86	41.12	49.23
TiO_2	0.56	0.71	0.24	0.52	0.62	0.52	0.54	0.57	0.67	0.81	0.35	0.44	0.60	0.76
Al_2O_3	4.51	4.30	8.08	5.97	5.53	5.61	8.13	5.42	6.50	9.97	4.51	4.52	4.03	4.90
MgO	23.46	17.65	23.16	20.52	18.75	20.09	18.55	20.47	17.90	12.83	27.17	27.82	23.97	19.21
Fe_2O_3	12.92	9.97	13.30	13.65	11.99	12.38	12.76	12.90	11.97	9.64	14.38	13.52	16.86	13.01
MnO	0.22	0.19	0.17	0.19	0.18	0.18	0.17	0.18	0.18	0.15	0.19	0.18	0.17	0.19
CaO	4.42	14.08	7.06	10.78	13.00	11.78	10.74	10.96	12.61	13.95	4.56	4.41	5.84	11.43
Na_2O	0.12	0.27	0.07	0.18	0.21	0.23	0.34	0.20	0.28	0.58	0.01	0.20	0.19	0.66
K_2O	0.26	0.29	0.05	0.12	0.15	0.14	0.21	0.24	0.27	0.65	0.09	0.14	0.29	0.20
P_2O_5	0.03	0.04	0.02	0.03	0.04	0.03	0.04	0.06	0.06	0.06	0.03	0.05	0.07	0.05
LOI	0.01	0.24	2.73	1.16	0.13	0.58	0.66	0.84	0.58	0.54	8.92	8.85	6.23	0.64
Total	100.85	100.60	100.00	100.87	100.42	100.13	100.94	100.52	100.48	100.32	99.90	99.99	99.37	100.28
Major elements in cation proportions (based on 100 cations)														
Si	49.280	48.748	42.063	44.104	45.930	44.876	44.917	44.923	45.837	47.808	38.988	38.834	40.341	45.591
Ti	0.382	0.492	0.168	0.361	0.430	0.361	0.374	0.396	0.467	0.570	0.259	0.322	0.443	0.529
Al	4.821	4.674	8.877	6.500	6.009	6.107	8.820	5.897	7.099	10.988	5.222	5.190	4.660	5.348
Mg	31.701	24.256	32.174	28.245	25.751	27.652	25.441	28.157	24.719	17.882	39.783	40.395	35.048	26.513
Fe_3	8.818	6.918	9.330	9.487	8.317	8.605	8.839	8.960	8.347	6.783	10.633	9.913	12.445	9.068
Mn	0.169	0.148	0.134	0.149	0.141	0.141	0.133	0.141	0.141	0.119	0.158	0.149	0.141	0.149
Ca	4.295	13.907	7.052	10.667	12.840	11.658	10.592	10.839	12.520	13.975	4.800	4.604	6.139	11.342
Na	0.211	0.483	0.127	0.322	0.375	0.412	0.607	0.358	0.503	1.052	0.019	0.378	0.362	1.185
K	0.301	0.341	0.059	0.141	0.176	0.165	0.247	0.283	0.319	0.775	0.113	0.174	0.363	0.236
P	0.023	0.031	0.016	0.023	0.031	0.023	0.031	0.047	0.047	0.048	0.025	0.041	0.058	0.039
O	156.305	154.710	151.306	152.301	153.332	152.379	153.776	152.537	153.723	156.449	147.196	146.544	149.108	152.715
Trace elements in ppm														
Rb	8.0	9.0	5.0	7.0	8.0	9.0	10.0	10.0	12.0	17.0	6.0	7.0	10.0	7.0
Sr	95.0	88.0	102.0	75.0	78.0	80.0	15.0	68.0	100.0	164.0	35.0	23.0	58.0	108.0
Ba	117.0	148.0	64.0	86.0	100.0	88.0	107.0	115.0	155.0	185.0	52.0	69.0	124.0	110.0
Y	6.0	10.0	3.0	8.0	10.0	8.0	8.0	8.0	10.0	12.0	3.0	5.0	7.0	9.0
Zr	23.0	30.0	12.0	27.0	32.0	27.0	31.0	36.0	43.0	50.0	16.0	24.0	40.0	39.0
V	138.0	204.0	81.0	135.0	156.0	149.0	127.0	159.0	176.0	193.0	122.0	116.0	174.0	186.0
Nb	5.0	4.0	5.0	5.0	5.0	6.0	5.0	6.0	5.0	6.0	3.0	4.0	6.0	5.0
Cr	2381.0	2574.0	2846.0	1500.0	2291.0	2426.0	1305.0	2030.0	2260.0	1442.0	3320.0	2597.0	6230.0	2111.0
Ni	482.0	369.0	835.0	668.0	487.0	587.0	760.0	608.0	528.0	284.0	414.0	1340.0	1255.0	713.0
Co	164.0	113.0	179.0	175.0	147.0	146.0	154.0	165.0	141.0	95.0	160.0	159.0	185.0	138.0
Cu	15.0	13.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	267.0	146.0	102.0	135.0
Zn	85.0	52.0	73.0	67.0	52.0	61.0	66.0	56.0	68.0	51.0	67.0	68.0	48.0	60.0
S	72.1	64.1	32.0	32.0	32.0	40.0	71.7	79.7	176.2	112.1	-	-	-	-
Normative minerals in wt.%														
OLn	0.00	0.00	27.97	19.80	10.33	16.57	13.75	16.43	10.10	0.00	49.46	52.43	42.41	16.08
OPXn	71.57	33.93	34.51	28.13	28.94	27.12	31.94	30.34	28.70	26.56	23.38	19.46	21.78	25.31
CPXn	8.64	48.06	11.09	31.09	40.77	36.06	26.73	33.17	37.70	37.54	9.27	9.32	16.73	37.91
FDSn	13.56	13.67	23.26	17.56	16.42	16.81	24.29	16.47	19.78	31.68	13.96	14.95	13.59	16.76
Calculated modal proportions in wt.%														
OLm	0.00	0.00	29.01	23.51	12.24	17.65	14.54	17.45	11.96	0.00	-	-	-	19.86
OPXm	80.49	28.85	32.53	17.49	18.76	19.82	24.11	24.06	19.03	18.46	-	-	-	12.82
CPXm	7.25	61.16	12.97	41.19	54.28	47.01	36.74	42.94	49.96	49.96	-	-	-	50.45
FDSm	11.90	9.42	20.53	15.22	13.00	13.22	21.46	12.96	16.54	29.63	-	-	-	14.26

4. Whole rock analyses of layered series Megacycle #4, Figure A-7 (cont.)

Sample:	(M-12 →	M-13)	M-5	M-4	M-3	M-2	M-1	M-33	M-32	M-34	M-30	M-29	M-28	M-26	M-27
Major elements in wt.%															
Rock:	Opxnite	Opxnite	F-Web	Gbn	F-Web	Gbn	Gbn	Gbn	F-Per	Gbn	Gbn	Gbn	grphyr	grphyr	grphyr
Metres	1.5														
SiO_2	53.57	53.64	53.00	51.18	49.91	50.79	51.52	52.10	39.69	52.14	53.04	49.14	55.01	49.59	66.58
TiO_2	0.83	0.84	1.06	0.88	0.80	0.73	0.89	0.97	0.35	1.36	1.69	2.75	2.68	0.62	1.22
Al_2O_3	4.71	4.71	5.77	14.75	5.93	15.60	15.48	16.49	4.13	14.88	14.19	14.00	11.97	18.69	14.08
MgO	21.85	22.31	14.76	9.64	18.33	9.43	8.10	7.38	29.36	6.58	6.00	5.42	3.04	9.14	1.85
Fe_2O_3	13.69	13.66	11.11	8.14	11.33	7.77	8.95	8.56	12.51	11.06	12.64	16.10	15.86	8.72	6.01
MnO	0.22	0.22	0.18	0.13	0.18	0.13	0.15	0.14	0.17	0.17	0.16	0.18	0.16	0.13	0.05
CaO	4.59	4.60	12.98	12.41	12.53	12.08	12.11	11.70	2.78	10.60	9.21	9.68	4.21	7.41	0.31
Na_2O	1.04	1.08	0.92	1.44	1.51	1.70	2.39	1.83	0.22	2.66	2.73	2.03	2.61	1.50	0.45
K_2O	0.27	0.27	0.52	0.95	0.37	0.91	0.61	0.69	0.18	0.91	1.08	1.12	2.66	2.94	7.54
P_2O_5	0.07	0.07	0.09	0.06	0.06	0.06	0.07	0.08	0.04	0.12	0.15	0.13	0.93	0.09	0.24
LOI	0.56	0.04	0.32	0.94	0.38	1.36	1.82	0.86	0.14	0.82	0.67	0.49	1.79	1.72	1.75
Total	101.40	101.44	100.71	100.51	101.33	100.56	102.09	100.80	89.57	101.30	101.56	101.04	100.91	100.55	100.08
Major elements in cation proportions (based on 100 cations)															
Si	48.642	48.336	49.279	47.749	45.221	47.382	47.782	48.753	38.983	48.841	49.898	47.295	54.203	46.321	64.993
Ti	0.567	0.569	0.741	0.618	0.545	0.512	0.621	0.683	0.259	0.958	1.196	1.991	1.986	0.436	0.896
Al	5.041	5.003	6.325	16.220	6.331	17.153	16.923	18.188	4.782	16.429	15.735	15.882	13.902	20.577	16.200
Mg	29.564	29.966	20.458	13.407	24.750	13.114	11.199	10.296	42.983	9.187	8.415	7.776	4.466	12.726	2.691
Fe_3	9.354	9.264	7.775	5.715	7.725	5.455	6.247	6.028	9.248	7.797	8.949	11.660	11.758	6.129	4.415
Mn	0.169	0.168	0.142	0.103	0.138	0.103	0.118	0.111	0.141	0.135	0.127	0.147	0.134	0.103	0.041
Ca	4.465	4.442	12.933	12.406	12.163	12.076	12.035	11.732	2.926	10.640	9.284	9.982	4.445	7.416	0.324
Na	1.831	1.887	1.659	2.605	2.652	3.075	4.298	3.322	0.419	4.831	4.980	3.788	4.986	2.717	0.852
K	0.313	0.310	0.617	1.131	0.428	1.083	0.722	0.824	0.226	1.087	1.296	1.375	3.344	3.504	9.390
P	0.054	0.053	0.071	0.047	0.046	0.047	0.055	0.063	0.033	0.095	0.119	0.106	0.776	0.071	0.198
O	155.459	155.064	156.072	157.557	151.360	157.209	157.578	159.582	146.037	159.112	160.494	160.649	166.034	157.122	171.387
Trace elements in ppm															
Rb	9.0	8.0	13.0	18.0	9.0	15.0	17.0	16.0	8.0	24.0	23.0	29.0	57.0	79.0	165.0
Sr	160.0	82.0	111.0	339.0	96.0	281.0	261.0	281.0	36.0	281.0	306.0	304.0	294.0	545.0	152.0
Ba	125.0	125.0	171.0	182.0	126.0	152.0	160.0	225.0	62.0	289.0	424.0	412.0	1029.0	454.0	1395.0
Y	4.0	9.0	14.0	9.0	9.0	8.0	10.0	11.0	4.0	16.0	19.0	17.0	45.0	7.0	31.0
Zr	30.0	37.0	64.0	49.0	46.0	44.0	53.0	66.0	22.0	95.0	116.0	99.0	265.0	54.0	261.0
V	167.0	165.0	240.0	186.0	214.0	159.0	203.0	198.0	87.0	248.0	313.0	753.0	170.0	127.0	73.0
Nb	5.0	5.0	6.0	6.0	6.0	5.0	6.0	6.0	4.0	8.0	9.0	9.0	18.0	5.0	18.0
Cr	2053.0	2042.0	2361.0	595.3	2531.0	409.8	47.2	25.3	2754.0	113.6	43.1	48.6	10.3	203.2	27.4
Ni	665.0	668.0	371.0	244.0	488.0	178.0	124.0	103.0	979.0	98.0	71.0	150.0	13.0	366.0	46.0
Co	152.0	136.0	92.0	66.0	105.0	60.0	65.0	61.0	147.0	81.0	95.0	118.0	106.0	64.0	25.0
Cu	1820.0	252.0	245.0	119.0	71.0	135.0	352.0	111.0	64.0	157.0	224.0	151.0	149.0	316.0	316.0
Zn	92.0	78.0	51.0	39.0	41.0	28.0	41.0	43.0	26.0	100.0	101.0	121.0	34.0	43.0	15.0
S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Normative minerals in wt.%															
OLn	1.98	4.01	0.00	0.00	24.04	2.68	3.50	0.00	53.31	0.00	0.00	0.00	0.00	12.96	0.00
OPXn	63.99	61.81	29.94	22.60	6.25	19.35	14.98	20.14	25.46	19.55	21.36	23.07	25.42	16.42	11.37
CPXn	12.06	12.15	43.41	24.76	42.73	22.45	24.56	18.82	3.41	21.49	17.96	18.21	1.77	0.71	0.00
FDSn	17.80	17.86	20.97	49.26	23.15	52.73	53.78	54.73	14.26	54.09	52.85	49.98	52.08	66.86	49.70
Calculated modal proportions in wt.%															
OLm	0.00	0.00	-	-	-	-	-	-	48.77	-	-	-	-	-	-
OPXm	73.25	74.94	-	-	-	-	-	-	25.74	-	-	-	-	-	-
CPXm	9.56	8.89	-	-	-	-	-	-	0.00	-	-	-	-	-	-
FDSm	14.05	13.52	-	-	-	-	-	-	11.68	-	-	-	-	-	-

APPENDIX B.I

1. Olivine analyses in Last Join section Muskox Keel dyke at 7377900m N and 588500m E, Figures A-2 & A-3.

Major elements in wt.%					
Sample:	LJ-8	LJ-10	LJ-12	LJ-13	LJ-14
Oliv:	max Fo	max Fo	max Fo	max Fo	max Fo
Rock:	GBN	GBN	Ol-GBN	PIC	PIC
SiO_2	37.33	37.84	38.49	38.79	39.26
MgO	30.96	36.07	38.44	39.82	40.54
FeO	32.55	26.55	25.50	23.56	21.33
MnO	0.38	0.30	0.24	0.25	0.30
NiO	0.16	0.14	0.22	0.19	0.17
CaO	0.07	0.10	0.06	0.11	0.06
Total	101.45	101.01	102.94	102.71	101.66
Cations normalized to 3 cations					
Si	1.007	0.993	0.982	0.983	0.998
Mg	1.245	1.411	1.462	1.505	1.537
Fe	0.734	0.583	0.544	0.499	0.454
Mn	0.009	0.007	0.005	0.005	0.006
Ni	0.003	0.003	0.005	0.004	0.003
Ca	0.002	0.003	0.002	0.003	0.002
O	4.007	3.993	3.982	3.983	3.998

2. Olivine analyses in the Coppermine River #1 section, Muskox Keel dyke at 7399300m N and 5881500m E, Figure A-4.

Major elements in wt.%																
Sample:	CR-3	CR-3	CR-4	CR-4	CR-5	CR-5	CR-6	CR-6	CR-14	CR-14	CR-15	CR-15	CR-18	CR-18	CR-19	CR-19
Oliv:	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo
Rock:	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	PIC	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN
SiO_2	37.87	37.72	39.92	39.30	40.16	39.75	39.47	39.21	39.75	39.51	39.09	38.47	37.44	37.33	37.72	37.82
MgO	32.19	31.94	42.24	40.40	43.88	42.82	42.90	43.00	43.76	42.55	40.63	36.76	32.52	31.42	31.79	31.13
FeO	29.06	29.68	18.18	20.31	16.18	16.93	17.47	17.12	16.79	17.68	19.76	24.70	30.13	30.77	30.89	30.89
MnO	0.35	0.38	0.24	0.27	0.23	0.24	0.24	0.24	0.23	0.25	0.24	0.31	0.38	0.38	0.40	0.40
NiO	0.23	0.25	0.20	0.21	0.23	0.23	0.22	0.22	0.24	0.22	0.23	0.23	0.16	0.15	0.15	0.14
CaO	0.05	0.06	0.05	0.06	0.07	0.06	0.07	0.06	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05
Total	99.75	100.02	100.82	100.55	100.75	100.01	100.37	99.86	100.82	100.27	99.99	100.52	100.68	100.11	100.99	100.43
Cations normalized to 3 cations																
Si	1.026	1.022	1.011	1.008	1.008	1.009	0.999	0.996	0.998	1.003	1.005	1.008	1.006	1.014	1.015	1.026
Mg	1.300	1.290	1.594	1.545	1.641	1.620	1.619	1.629	1.638	1.610	1.558	1.437	1.303	1.273	1.276	1.259
Fe	0.659	0.672	0.385	0.436	0.340	0.359	0.370	0.364	0.353	0.375	0.425	0.542	0.677	0.699	0.695	0.701
Mn	0.008	0.009	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.007	0.009	0.009	0.009	0.009
Ni	0.005	0.005	0.004	0.004	0.005	0.005	0.004	0.005	0.005	0.005	0.005	0.005	0.003	0.003	0.003	0.003
Ca	0.001	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
O	4.026	4.022	4.011	4.008	4.008	4.009	3.999	3.996	3.998	4.003	4.005	4.008	4.006	4.014	4.015	4.026

3. Olivine analyses in the Equinox grid section, eastern margin of Megacycle #1 at 7415300m N and 579600m E, Figures A-5 & A-6. Outcrop samples (EQ) & Equinox drillhole H-87-5 (MX).

Major elements in wt.%																		
Sample:	EQ-5	EQ-5	EQ-6	EQ-6	EQ-11	EQ-11	EQ-12	EQ-12	EQ-13	EQ-13	EQ-14	EQ-14	EQ-19	EQ-19	EQ-24	EQ-24	EQ-29	EQ-29
Oliv:	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo
Rock:	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	Ol-GBN	Ol-GBN	PERID	PERID	PIC	PIC
SiO_2	38.89	38.91	38.74	38.42	39.66	38.29	39.75	38.81	39.94	39.24	39.30	39.34	40.01	38.68	38.62	39.66	39.64	39.75
MgO	41.22	39.98	35.49	33.02	41.26	35.25	42.65	38.89	43.15	39.57	42.97	40.88	43.48	37.53	44.16	43.50	43.28	41.76
FeO	19.16	20.37	26.01	28.50	17.68	25.52	16.99	21.63	17.17	21.16	18.18	19.67	16.69	23.81	16.54	16.38	17.60	18.64
MnO	0.24	0.26	0.32	0.34	0.24	0.33	0.23	0.28	0.20	0.28	0.25	0.26	0.22	0.31	0.23	0.23	0.23	0.24
NiO	0.20	0.20	0.18	0.21	0.22	0.21	0.24	0.22	0.23	0.21	0.21	0.23	0.25	0.23	0.25	0.24	0.23	0.22
CaO	0.04	0.04	0.05	0.06	0.05	0.06	0.05	0.06	0.07	0.05	0.05	0.05	0.09	0.05	0.06	0.06	0.05	0.06
Total	99.75	99.76	100.79	100.54	99.11	99.67	99.91	99.88	100.76	100.50	100.95	100.43	100.73	100.61	99.86	100.06	101.03	100.67
Cations normalized to 3 cations																		
Si	0.999	1.007	1.021	1.029	1.022	1.019	1.011	1.009	1.006	1.011	0.991	1.007	1.006	1.009	0.976	1.003	0.997	1.010
Mg	1.579	1.542	1.394	1.319	1.585	1.399	1.617	1.508	1.621	1.521	1.615	1.560	1.630	1.459	1.663	1.640	1.622	1.582
Fe	0.412	0.441	0.573	0.638	0.381	0.568	0.361	0.470	0.362	0.456	0.383	0.421	0.351	0.519	0.350	0.346	0.370	0.396
Mn	0.005	0.006	0.007	0.008	0.005	0.007	0.005	0.006	0.004	0.006	0.005	0.006	0.005	0.007	0.005	0.005	0.005	0.005
Ni	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Ca	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.002	0,001	0.001	0.001	0.002	0.001	0.002	0.002	0.001	0.002
O	3.999	4.007	4.021	4.029	4.022	4.019	4.011	4.009	4.006	4.011	3.991	4.007	4.006	4.009	3.976	4.003	3.997	4.010

4. Olivine analyses in the Stanbridge section, eastern margin of Megacycle #2 at 7422500m N and 579300m E, Figure A-5.

Major elements in wt.%										
Sample:	ST-4	ST-4	ST-5	ST-5	ST-6	ST-6	ST-7	ST-7	ST-8	ST-8
Oliv:	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo
Rock:	Ol-GBN	Ol-GBN	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC	PIC	PIC
SiO_2	38.14	37.65	38.42	37.78	38.51	38.36	39.45	39.26	39.15	39.41
MgO	41.64	37.91	40.68	38.11	40.51	38.94	44.71	44.33	44.99	44.84
FeO	18.58	23.32	20.25	23.03	20.71	22.00	15.22	15.68	13.97	14.32
MnO	0.24	0.30	0.20	0.28	0.27	0.28	0.19	0.22	0.18	0.20
NiO	0.26	0.22	0.21	0.21	0.24	0.21	0.37	0.36	0.40	0.37
CaO	0.06	0.06	0.05	0.07	0.08	0.08	0.12	0.07	0.04	0.08
Total	98.92	99.47	99.81	99.47	100.32	99.86	100.06	99.91	98.73	99.21
Cations normalized to 3 cations										
Si	0.985	0.989	0.990	0.991	0.990	0.998	0.991	0.990	0.992	0.995
Mg	1.602	1.485	1.563	1.491	1.552	1.510	1.674	1.666	1.699	1.688
Fe	0.401	0.513	0.436	0.505	0.445	0.479	0.320	0.331	0.296	0.302
Mn	0.005	0.007	0.004	0.006	0.006	0.006	0.004	0.005	0.004	0.004
Ni	0.005	0.005	0.004	0.004	0.005	0.004	0.007	0.007	0.008	0.008
Ca	0.002	0.002	0.001	0.002	0.002	0.002	0.003	0.002	0.001	0.002
O	3.985	3.989	3.990	3.991	3.990	3.998	3.991	3.990	3.992	3.995

5. Olivine analyses in the Speers Lake section, eastern margin of Megacycle #2 at 7427900m N and 579600m E, Figure A-5. Equinox drillhole 88-S-2, grid loc.: 138+52 N, 3+42 W.

Major elements in wt.%						
Sample:	SL-23	SL-23	SL-27	SL-27	SL-33	SL-33
Oliv:	max Fo	aver Fo	max Fo	aver Fo	max Fo	aver Fo
Rock:	Ol-GBN	Ol-GBN	PIC	PIC	PIC	PIC
SiO_2	39.28	38.81	39.86	39.71	39.81	39.81
MgO	43.25	41.49	44.29	43.78	45.24	44.96
FeO	15.89	18.23	15.82	15.67	14.54	14.65
MnO	0.26	0.25	0.20	0.21	0.21	0.21
NiO	0.33	0.33	0.34	0.35	0.32	0.32
CaO	0.07	0.09	0.06	0.07	0.06	0.06
Total	99.07	99.21	100.57	99.79	100.18	100.01
Cations normalized to 3 cations						
Si	1.002	0.999	1.000	1.004	0.996	0.999
Mg	1.645	1.593	1.656	1.651	1.687	1.681
Fe	0.339	0.393	0.332	0.331	0.304	0.307
Mn	0.006	0.006	0.004	0.005	0.004	0.004
Ni	0.007	0.007	0.007	0.007	0.006	0.006
Ca	0.002	0.003	0.002	0.002	0.002	0.002
O	4.002	3.999	4.000	4.004	3.996	3.999

APPENDIX B.II

1. Average olivine analyses from layered series of Megacycle #1, Figure A-5.

Major elements in wt.%												
Sample:	ES-11a	ES-11b	ES-11c	ES-11d	ES-11e	ES-11f	ES-11g	ES-15a	ES-15b	ES-15c	ES-15d	ES-15e
	core	rim	core	rim	core	rim	core	core	core	core	core	core
SiO_2	38.94	38.76	39.09	38.74	39.17	39.02	39.02	39.98	40.13	39.96	40.35	40.24
MgO	41.82	41.49	41.66	41.39	41.57	40.86	41.36	44.62	44.26	44.33	44.38	43.51
FeO	18.99	18.80	18.94	18.78	19.05	19.07	19.26	15.97	15.97	15.77	15.89	15.79
MnO	0.94	0.67	0.67	0.98	0.74	0.91	0.86	0.16	0.12	0.17	0.20	0.15
CaO	0.05	0.06	0.05	0.04	0.06	0.04	0.09	0.09	0.09	0.07	0.06	0.07
NiO	0.18	0.16	0.18	0.18	0.17	0.19	0.16	0.22	0.18	0.17	0.18	0.19
Total	100.92	99.94	100.58	100.12	100.77	100.09	100.75	101.04	100.75	100.47	101.05	99.95
Cations normalized to 3 cations												
Si	0.989	0.993	0.995	0.992	0.997	1.002	0.994	0.997	1.005	1.003	1.007	1.017
Mg	1.583	1.585	1.582	1.580	1.577	1.564	1.571	1.659	1.652	1.658	1.652	1.640
Fe	0.403	0.403	0.403	0.402	0.405	0.409	0.410	0.333	0.334	0.331	0.332	0.334
Mn	0.020	0.015	0.014	0.021	0.016	0.020	0.019	0.003	0.003	0.004	0.004	0.003
Ca	0.001	0.002	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002
Ni	0.004	0.003	0.004	0.004	0.003	0.004	0.003	0.004	0.004	0.003	0.004	0.004
O	3.989	3.993	3.995	3.992	3.997	4.002	3.994	3.997	4.005	4.003	4.007	4.017

Major elements in wt%											
Sample:	ES-15f	ES-15g	EQ-20a	EQ-20b	EQ-20c	EQ-20d	EQ-20e	EQ-20f	EQ-20g	EQ-20h	EQ-20i
	core	core	core	core	core	core	core	core	core	core	core
SiO_2	39.90	40.03	40.07	40.09	40.31	40.09	40.28	40.52	39.92	40.20	40.24
MgO	43.60	43.41	43.07	43.20	43.03	43.16	43.03	42.95	42.77	42.87	42.90
FeO	16.24	15.90	16.79	16.69	16.83	16.85	16.74	16.70	16.87	16.92	16.90
MnO	0.17	0.11	0.22	0.22	0.24	0.23	0.22	0.22	0.20	0.23	0.23
CaO	0.07	0.06	0.11	0.08	0.09	0.10	0.07	0.10	0.04	0.08	0.05
NiO	0.17	0.19	0.20	0.21	0.21	0.19	0.20	0.20	0.21	0.22	0.21
Total	100.14	99.70	100.45	100.48	100.70	100.63	100.54	100.69	100.00	100.51	100.53
Cations normalized to 3 cations											
Si	1.007	1.015	1.012	1.012	1.016	1.011	1.017	1.022	1.014	1.016	1.017
Mg	1.641	1.640	1.622	1.625	1.617	1.622	1.619	1.615	1.619	1.615	1.616
Fe	0.343	0.337	0.355	0.352	0.355	0.355	0.353	0.352	0.358	0.358	0.357
Mn	0.004	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005
Ca	0.002	0.002	0.003	0.002	0.002	0.003	0.002	0.003	0.001	0.002	0.001
Ni	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
O	4.007	4.015	4.012	4.012	4.016	4.011	4.017	4.022	4.014	4.016	4.017

2. Average olivine analyses from layered series of Megacycle #2, Figure A-5.

Major elements in wt.%													
Sample:	VD-701a	VD-701b	VD-701c	VD-701d	VD-701e	VD-701f	VD-701g	VD-710a	VD-710b	VD-710c	VD-710d	VD-710e	VD-710f
	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	40.31	40.24	40.37	40.41	40.52	40.54	40.52	39.60	39.98	39.60	40.26	39.79	40.45
MgO	45.77	46.51	45.92	46.32	46.42	46.12	46.15	45.69	45.67	45.82	45.59	45.17	45.79
FeO	13.21	13.24	13.21	13.20	13.24	12.90	13.15	13.97	13.93	13.80	14.06	13.74	13.74
MnO	0.17	0.20	0.19	0.18	0.17	0.21	0.19	0.76	0.78	0.74	0.67	0.67	0.56
CaO	0.11	0.10	0.07	0.10	0.10	0.10	0.08	0.06	0.05	0.08	0.08	0.09	0.10
NiO	0.13	0.16	0.13	0.13	0.15	0.16	0.11	0.15	0.15	0.16	0.16	0.14	0.14
Total	99.70	100.45	99.89	100.34	100.59	100.03	100.20	100.23	100.57	100.20	100.82	99.60	100.78
Cations normalized to 3 cations													
Si	1.008	0.997	1.007	1.003	1.003	1.009	1.008	0.988	0.995	0.988	1.000	1.000	1.004
Mg	1.706	1.718	1.708	1.714	1.713	1.712	1.711	1.700	1.694	1.704	1.688	1.692	1.694
Fe	0.276	0.274	0.276	0.274	0.274	0.269	0.273	0.292	0.290	0.288	0.292	0.289	0.285
Mn	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.016	0.016	0.016	0.014	0.014	0.012
Ca	0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.002	0.001	0.002	0.002	0.002	0.003
Ni	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.003
O	4.008	3.997	4.007	4.003	4.003	4.009	4.008	3.988	3.995	3.988	4.000	4.000	4.004

3. Average olivine analyses from layered series of Megacycle #3, Figure A-7.

Major elements in wt.%														
Sample:	SL-46a	SL-46b	SL-46c	SL-46d	SL-46e	SL-46f	SL-46g	SL-45a	SL-45b	SL-45c	SL-45d	SL-45e	SL-45f	SL-45g
	core	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	39.58	39.90	40.07	39.90	39.86	39.86	40.11	39.43	39.45	39.90	39.77	39.66	39.98	39.77
MgO	42.72	42.95	43.36	42.14	42.12	42.97	42.80	42.44	42.39	43.02	42.55	42.88	42.58	42.57
FeO	16.60	16.60	16.61	16.79	16.79	16.25	16.78	17.19	17.41	17.29	17.16	17.42	17.38	17.52
MnO	0.18	0.21	0.21	0.21	0.20	0.19	0.20	0.18	0.15	0.15	0.17	0.17	0.14	0.16
CaO	0.08	0.07	0.05	0.06	0.09	0.08	0.07	0.06	0.06	0.06	0.08	0.05	0.09	0.07
NiO	0.11	0.09	0.12	0.09	0.11	0.09	0.10	0.11	0.12	0.11	0.12	0.13	0.11	0.11
Total	99.26	99.81	100.42	99.18	99.16	99.43	100.06	99.40	99.57	100.52	99.85	100.32	100.29	100.20
Cations normalized to 3 cations														
Si	1.011	1.013	1.011	1.022	1.022	1.015	1.017	1.008	1.007	1.008	1.012	1.004	1.014	1.010
Mg	1.626	1.626	1.631	1.610	1.609	1.631	1.618	1.617	1.614	1.620	1.614	1.619	1.610	1.611
Fe	0.354	0.352	0.350	0.360	0.360	0.346	0.356	0.367	0.372	0.365	0.365	0.369	0.369	0.372
Mn	0.004	0.005	0.004	0.005	0.004	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.003	0.003
Ca	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002
Ni	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002
O	4.011	4.013	4.011	4.022	4.022	4.015	4.017	4.008	4.007	4.008	4.012	4.004	4.014	4.010

Major elements in wt.%														
Sample:	V1-06a	V1-06b	V1-06c	V1-06d	V1-06e	V1-06f	V1-07a	V1-07b	V1-07c	V1-07d	V1-07e	V1-08a	V1-08b	V1-08c
	core	core	core	rim	core	core	core	core	core	core	core	core	core	core
SiO_2	40.05	40.03	40.07	40.39	40.41	40.03	39.79	40.22	39.94	40.11	40.16	39.73	39.66	40.05
MgO	44.09	44.71	44.43	44.66	44.44	44.31	43.83	44.06	43.93	43.51	43.55	43.61	43.76	44.06
FeO	15.32	15.19	15.09	15.27	15.64	15.39	14.94	15.32	15.55	15.35	15.53	16.22	16.13	16.04
MnO	0.24	0.25	0.26	0.25	0.27	0.24	0.23	0.28	0.22	0.25	0.26	0.30	0.26	0.33
CaO	0.09	0.04	0.06	0.06	0.06	0.08	0.06	0.05	0.10	0.07	0.04	0.06	0.06	0.07
NiO	0.13	0.12	0.11	0.12	0.13	0.15	0.13	0.15	0.16	0.14	0.15	0.17	0.14	0.16
Total	99.92	100.34	100.02	100.75	100.96	100.19	98.98	100.08	99.90	99.43	99.68	100.09	100.02	100.71
Cations normalized to 3 cations														
Si	1.010	1.003	1.008	1.009	1.009	1.006	1.012	1.013	1.008	1.018	1.017	1.004	1.002	1.004
Mg	1.657	1.670	1.666	1.663	1.654	1.660	1.661	1.654	1.653	1.646	1.644	1.642	1.648	1.647
Fe	0.323	0.318	0.317	0.319	0.327	0.323	0.318	0.323	0.328	0.326	0.329	0.343	0.341	0.336
Mn	0.005	0.005	0.006	0.005	0.006	0.005	0.005	0.006	0.005	0.005	0.006	0.006	0.006	0.007
Ca	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.003	0.002	0.001	0.002	0.002	0.002
Ni	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
O	4.010	4.003	4.008	4.009	4.009	4.006	4.012	4.013	4.008	4.018	4.017	4.004	4.002	4.004

Major elements in wt.%														
Sample:	V1-08d	V1-08e	V1-08f	V1-08g	V1-09a	V1-09b	V1-09c	V1-09d	V1-09e	V1-09f	V3-02a	V3-02b	V3-02c	V3-02d
	core	rim	core	core	core	rim	core	core	core	core	core	rim	core	core
SiO_2	39.75	39.53	39.88	39.90	39.88	39.75	39.73	39.34	39.51	39.73	39.75	39.79	39.66	39.45
MgO	43.71	43.89	43.53	43.75	42.87	43.05	42.77	42.49	41.71	42.17	43.21	44.06	43.25	42.83
FeO	16.00	16.13	16.57	16.45	17.01	16.79	16.96	16.88	17.51	18.47	17.10	16.57	17.24	17.41
MnO	0.34	0.30	0.30	0.32	0.26	0.30	0.26	0.24	0.30	0.32	0.31	0.28	0.33	0.34
CaO	0.09	0.05	0.05	0.06	0.08	0.05	0.07	0.08	0.07	0.07	0.07	0.06	0.09	0.07
NiO	0.18	0.14	0.15	0.16	0.14	0.15	0.11	0.13	0.12	0.16	0.14	0.15	0.12	0.12
Total	100.07	100.05	100.48	100.64	100.23	100.09	99.89	99.16	99.22	100.92	100.58	100.91	100.69	100.22
Cations normalized to 3 cations														
Si	1.004	0.998	1.005	1.003	1.010	1.007	1.010	1.007	1.015	1.006	1.003	0.997	1.000	1.000
Mg	1.645	1.651	1.635	1.639	1.619	1.626	1.620	1.621	1.598	1.591	1.625	1.645	1.625	1.619
Fe	0.338	0.340	0.349	0.346	0.360	0.356	0.360	0.361	0.376	0.391	0.361	0.347	0.363	0.369
Mn	0.007	0.006	0.006	0.007	0.006	0.006	0.006	0.005	0.007	0.007	0.007	0.006	0.007	0.007
Ca	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Ni	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.002	0.003	0.003	0.003	0.002	0.002
O	4.004	3.998	4.005	4.003	4.010	4.007	4.010	4.007	4.015	4.006	4.003	3.997	4.000	4.000

3. Average olivine analyses from layered series of Megacycle #3, Figure A-7 (cont.)

Major elements in wt.%															
Sample:	V3-03a	V3-03b	V3-03c	V3-03d	V3-03e	V3-03f	V3-03g	V3-04a	V3-04b	V3-04c	V3-04d	V3-04e	V3-05a	V3-05b	V3-05c
	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	39.49	39.90	40.01	39.77	39.90	39.79	39.77	39.66	39.88	39.45	39.51	39.49	39.06	39.47	39.19
MgO	42.92	42.97	42.52	42.93	42.95	42.67	43.15	41.36	41.94	42.12	42.27	42.12	41.82	41.41	41.76
FeO	17.39	17.59	17.55	17.50	17.61	17.35	17.28	18.71	18.45	18.31	18.32	18.42	19.19	19.17	19.26
MnO	0.15	0.17	0.12	0.16	0.15	0.15	0.30	0.19	0.15	0.16	0.20	0.17	0.16	0.17	0.17
CaO	0.10	0.11	0.07	0.12	0.11	0.08	0.07	0.13	0.07	0.08	0.12	0.10	0.12	0.12	0.14
NiO	0.17	0.17	0.21	0.15	0.16	0.15	0.14	0.20	0.19	0.18	0.20	0.20	0.18	0.16	0.16
Total	100.22	100.90	100.4	100.63	100.88	100.19	100.71	100.25	100.67	100.30	100.62	100.50	100.54	100.50	100.68
Cations normalized to 3 cations															
Si	1.001	1.005	1.014	1.004	1.006	1.010	1.003	1.013	1.012	1.004	1.002	1.003	0.994	1.007	0.997
Mg	1.621	1.614	1.606	1.616	1.614	1.614	1.622	1.575	1.587	1.598	1.598	1.595	1.587	1.574	1.583
Fe	0.369	0.371	0.372	0.370	0.371	0.368	0.364	0.400	0.392	0.390	0.388	0.391	0.409	0.409	0.410
Mn	0.003	0.004	0.003	0.003	0.003	0.003	0.006	0.004	0.003	0.003	0.004	0.004	0.003	0.004	0.004
Ca	0.003	0.003	0.002	0.003	0.003	0.002	0.002	0.004	0.002	0.002	0.003	0.003	0.003	0.003	0.004
Ni	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003
O	4.001	4.005	4.014	4.004	4.006	4.010	4.003	4.013	4.012	4.004	4.002	4.003	3.994	4.007	3.997

Major elements in wt.%															
Sample:	V3-05d	V3-05e	V3-05f	V3-05g	V3-06a	V3-06b	V3-06c	V3-06d	V3-06e	V3-06f	V3-06g	VD-351a	VD-351b	VD-351c	VD-351d
	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	39.36	39.41	39.58	39.30	39.49	39.47	39.13	39.36	39.34	39.36	39.24	40.13	39.81	39.73	39.81
MgO	42.14	41.39	41.81	41.94	40.88	41.06	41.39	40.73	40.93	40.81	40.71	43.40	42.85	43.16	43.55
FeO	19.19	19.31	19.19	19.31	18.77	18.85	18.89	19.26	19.13	19.23	19.13	16.63	17.05	16.83	16.83
MnO	0.19	0.15	0.17	0.15	0.23	0.27	0.26	0.24	0.19	0.22	0.22	0.20	0.19	0.23	0.23
CaO	0.13	0.08	0.10	0.10	0.09	0.12	0.13	0.11	0.09	0.10	0.07	0.07	0.12	0.11	0.07
NiO	0.15	0.14	0.16	0.17	0.19	0.18	0.18	0.20	0.21	0.18	0.16	0.27	0.23	0.25	0.27
Total	101.16	100.48	101.01	100.97	99.65	99.95	99.97	99.90	99.89	99.91	99.53	100.71	100.25	100.31	100.76
Cations normalized to 3 cations															
Si	0.995	1.005	1.003	0.996	1.016	1.013	1.002	1.012	1.011	1.012	1.012	1.010	1.009	1.004	1.001
Mg	1.588	1.574	1.580	1.585	1.568	1.570	1.580	1.561	1.567	1.564	1.565	1.628	1.618	1.627	1.633
Fe	0.406	0.412	0.407	0.409	0.404	0.404	0.405	0.414	0.411	0.413	0.413	0.350	0.361	0.356	0.354
Mn	0.004	0.003	0.004	0.003	0.005	0.006	0.006	0.005	0.004	0.005	0.005	0.004	0.004	0.005	0.005
Ca	0.004	0.002	0.003	0.003	0.002	0.003	0.004	0.003	0.002	0.003	0.002	0.002	0.003	0.003	0.002
Ni	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.005	0.005	0.005	0.005
O	3.995	4.005	4.003	3.996	4.016	4.013	4.002	4.012	4.011	4.012	4.012	4.010	4.009	4.004	4.001

Major elements in wt.%															
Sample:	VD-351e	VD-351f	VD-351g	VD-512a	VD-512b	VD-512c	VD-512d	VD-512e	VD-512f	VD-513a	VD-513b	VD-513c	VD-513d	VD-513e	VD-513f
	core	core	core	core	rim	core	rim	core	core	core	core	core	core	core	core
SiO_2	39.79	39.47	39.79	39.06	39.43	39.34	39.64	39.36	39.34	39.00	39.26	39.36	39.30	39.45	39.34
MgO	42.65	42.60	43.12	40.96	41.36	41.14	41.72	42.55	42.17	40.64	40.50	40.76	40.61	40.58	40.83
FeO	17.06	16.88	16.96	19.16	19.10	19.17	19.00	18.50	18.41	19.45	19.36	19.39	19.31	19.76	19.64
MnO	0.21	0.23	0.21	0.21	0.25	0.23	0.25	0.21	0.21	0.21	0.26	0.25	0.24	0.23	0.23
CaO	0.13	0.10	0.10	0.11	0.09	0.09	0.10	0.09	0.08	0.10	0.15	0.12	0.14	0.11	0.12
NiO	0.27	0.26	0.27	0.25	0.26	0.24	0.27	0.25	0.27	0.28	0.27	0.29	0.30	0.28	0.27
Total	100.11	99.54	100.44	99.75	100.49	100.21	100.99	100.96	100.48	99.69	99.79	100.17	99.90	100.41	100.43
Cations normalized to 3 cations															
Si	1.010	1.007	1.005	1.005	1.006	1.007	1.006	0.995	1.000	1.005	1.012	1.010	1.011	1.011	1.007
Mg	1.614	1.620	1.624	1.570	1.573	1.570	1.578	1.603	1.597	1.562	1.556	1.559	1.558	1.551	1.558
Fe	0.362	0.360	0.358	0.412	0.408	0.410	0.403	0.391	0.391	0.419	0.417	0.416	0.416	0.424	0.421
Mn	0.005	0.005	0.004	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.006	0.005	0.005	0.005	0.005
Ca	0.004	0.003	0.003	0.003	0.002	0.002	0.003	0.002	0.002	0.003	0.004	0.003	0.004	0.003	0.003
Ni	0.006	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006
O	4.010	4.007	4.005	4.005	4.006	4.007	4.006	3.995	4.000	4.005	4.012	4.010	4.011	4.011	4.007

4. Average olivine analyses from layered series of Megacycle #4, Figure A-7.

Major elements in wt.%																	
Sample:	VD-520a	VD-520b	VD-520c	VD-520d	VD-520e	VD-520f	VD-520g	VD-848a	VD-848b	VD-848c	VD-848d	VD-848e	VD-848f	M-10a	M-10b	M-10c	M-10d
	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	40.22	39.90	40.45	40.54	40.60	40.39	40.35	39.94	40.07	40.16	40.26	40.07	40.18	38.87	38.62	38.70	38.85
MgO	45.69	45.77	45.74	45.32	45.54	45.64	45.75	43.02	43.12	42.78	42.90	42.97	42.58	37.63	37.68	37.61	37.36
FeO	13.79	13.83	13.59	13.69	14.05	14.13	13.74	16.45	16.48	16.49	16.66	16.04	16.36	23.09	23.04	23.20	23.43
MnO	0.16	0.17	0.21	0.19	0.17	0.18	0.17	0.17	0.14	0.17	0.14	0.15	0.16	0.29	0.23	0.27	0.29
CaO	0.10	0.10	0.10	0.09	0.15	0.13	0.12	0.10	0.07	0.09	0.10	0.10	0.06	0.12	0.11	0.12	0.12
NiO	0.24	0.19	0.21	0.22	0.22	0.20	0.21	0.16	0.18	0.20	0.17	0.18	0.18	0.22	0.20	0.23	0.23
Total	100.20	99.96	100.30	100.05	100.73	100.66	100.34	99.84	100.05	99.89	100.23	99.51	99.53	100.22	99.87	100.13	100.28
Cations normalized to 3 cations																	
Si	1.003	0.997	1.008	1.014	1.009	1.004	1.005	1.014	1.015	1.020	1.019	1.019	1.024	1.016	1.012	1.012	1.016
Mg	1.698	1.704	1.698	1.689	1.687	1.691	1.698	1.627	1.628	1.620	1.619	1.630	1.618	1.465	1.471	1.466	1.457
Fe	0.288	0.289	0.283	0.286	0.292	0.294	0.286	0.349	0.349	0.350	0.353	0.341	0.349	0.505	0.505	0.507	0.512
Mn	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.003	0.003	0.003	0.006	0.005	0.006	0.006
Ca	0.003	0.003	0.003	0.002	0.004	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.003
Ni	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.004	0.003	0.004	0.004	0.005	0.004	0.005	0.005
O	4.003	3.997	4.008	4.014	4.009	4.004	4.005	4.014	4.015	4.020	4.019	4.019	4.024	4.016	4.012	4.012	4.016

Major elements in wt.%																	
Sample:	M-10e	M-10f	M-10g	VD-599a	VD-599b	VD-599c	VD-599d	VD-599e	VD-599f	VD-599g	VD-551a	VD-551b	VD-551c	VD-551d	VD-551e	VD-551f
	core	core	core	core	core	core	core	core	core	core	core	rim	core	core	core	core
SiO_2	38.72	38.79	38.53	38.59	38.70	38.53	38.68	38.64	38.70	38.68	39.06	39.32	39.19	39.53	39.13	39.19
MgO	36.95	37.73	37.73	37.59	37.46	37.94	37.31	37.15	37.66	37.43	40.83	40.78	41.06	40.61	40.33	40.48
FeO	23.20	22.89	22.98	24.12	24.17	24.20	24.47	24.29	24.25	24.47	19.70	19.55	19.63	19.80	19.81	20.29
MnO	0.27	0.27	0.26	0.22	0.24	0.19	0.21	0.21	0.20	0.22	0.84	0.92	0.88	0.65	0.92	0.79
CaO	0.12	0.14	0.14	0.10	0.10	0.10	0.09	0.11	0.09	0.08	0.09	0.07	0.06	0.10	0.10	0.08
NiO	0.22	0.21	0.22	0.27	0.26	0.26	0.27	0.27	0.27	0.27	0.16	0.17	0.16	0.17	0.18	0.15
Total	99.47	100.02	99.85	100.90	100.93	101.22	101.03	100.66	101.17	101.15	100.68	100.81	100.98	100.87	100.47	100.98
Cations normalized to 3 cations																
Si	1.021	1.014	1.009	1.004	1.007	0.998	1.007	1.009	1.004	1.005	0.999	1.004	0.998	1.010	1.005	1.002
Mg	1.453	1.471	1.473	1.458	1.453	1.465	1.448	1.447	1.457	1.450	1.556	1.553	1.559	1.547	1.544	1.542
Fe	0.512	0.501	0.503	0.525	0.526	0.524	0.533	0.531	0.526	0.532	0.421	0.418	0.418	0.423	0.425	0.434
Mn	0.006	0.006	0.006	0.005	0.005	0.004	0.005	0.005	0.004	0.005	0.018	0.020	0.019	0.014	0.020	0.017
Ca	0.003	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.002
Ni	0.005	0.004	0.005	0.006	0.005	0.005	0.006	0.006	0.006	0.006	0.003	0.003	0.003	0.003	0.004	0.003
O	4.021	4.014	4.009	4.004	4.007	3.998	4.007	4.009	4.004	4.005	3.999	4.004	3.998	4.010	4.005	4.002

Major elements in wt.%																
Sample:	VD-551g	VD-554a	VD-554b	VD-554c	VD-554d	VD-554e	VD-554f	VD-554g	M-32a	M-32b	M-32c	M-32d	M-32e	M-32f	M-32g	M-32h
	rim	core	core	core	core	core	core	core	core	core	core	core	core	core	core	core
SiO_2	39.11	38.23	38.74	39.11	38.83	39.06	39.09	39.06	40.31	40.35	40.54	40.16	40.37	40.26	40.33	40.16
MgO	40.58	38.62	38.51	38.92	38.87	38.99	38.85	38.87	45.67	44.92	43.70	44.08	44.16	43.86	44.24	44.47
FeO	20.09	21.72	22.63	22.66	22.78	22.56	22.50	22.58	14.40	14.91	15.95	15.88	15.72	15.62	15.50	15.42
MnO	0.94	0.82	0.20	0.21	0.20	0.21	0.23	0.21	0.14	0.15	0.17	0.17	0.17	0.16	0.17	0.17
CaO	0.09	0.06	0.06	0.08	0.05	0.07	0.06	0.06	0.07	0.07	0.11	0.15	0.11	0.11	0.13	0.10
NiO	0.16	0.15	0.18	0.17	0.17	0.15	0.16	0.16	0.15	0.16	0.15	0.15	0.13	0.17	0.13	0.16
Total	100.97	99.60	100.32	101.14	100.90	101.05	100.89	100.94	100.73	100.56	100.62	100.58	100.66	100.18	100.50	100.49
Cations normalized to 3 cations																
Si	0.999	0.999	1.007	1.007	1.003	1.007	1.009	1.008	1.001	1.008	1.019	1.008	1.012	1.014	1.011	1.006
Mg	1.545	1.504	1.492	1.494	1.496	1.498	1.495	1.495	1.692	1.673	1.637	1.649	1.650	1.647	1.654	1.661
Fe	0.429	0.474	0.492	0.488	0.492	0.486	0.486	0.487	0.299	0.311	0.335	0.333	0.329	0.329	0.325	0.323
Mn	0.020	0.018	0.004	0.005	0.004	0.005	0.005	0.005	0.003	0.003	0.004	0.004	0.004	0.003	0.004	0.004
Ca	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.004	0.003	0.003	0.003	0.003
Ni	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
O	3.999	3.999	4.007	4.007	4.003	4.007	4.009	4.008	4.001	4.008	4.019	4.008	4.012	4.014	4.011	4.006

APPENDIX C.I

1. Clinopyroxene analyses in Last Join section of Keel dyke, Figure A-3.

Major elements in wt.%																		
Sample:	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18	LJ-18
Rock:	core	core	rim	core	rim	core	core	core	core	rim	core	core	core	rim	core	core	core	rim
SiO_2	51.28	51.30	51.26	51.60	52.03	50.98	51.75	53.74	51.94	51.79	51.02	51.11	52.16	52.31	52.67	52.35	52.24	51.81
TiO_2	0.56	0.61	0.61	0.56	0.34	0.83	0.48	0.28	0.41	1.23	1.01	0.39	0.25	0.45	0.39	0.30	0.34	1.10
Al_2O_3	1.96	1.72	1.64	1.37	0.97	1.84	2.17	0.96	3.04	2.36	2.95	3.86	2.24	2.60	2.49	2.79	3.06	2.52
Cr_2O_3	0.31	0.32	0.22	0.08	0.09	0.15	0.29	0.10	1.02	0.43	0.65	1.08	0.86	0.82	0.90	1.00	1.08	0.71
MgO	15.68	13.92	14.30	14.10	14.23	14.81	17.49	24.49	17.38	16.20	16.36	17.69	18.04	16.88	18.22	17.56	18.12	16.12
FeO	13.38	11.30	10.40	11.23	10.83	12.12	10.46	18.67	6.32	6.75	6.62	5.99	6.85	7.31	6.51	5.33	5.74	7.39
MnO	0.25	0.21	0.22	0.23	0.14	0.23	0.20	0.39	0.19	0.17	0.19	0.12	0.22	0.17	0.22	0.20	0.21	0.15
NiO	-	0.01	-	0.05	-	0.02	-	0.06	0.04	-	0.04	0.07	0.05	0.01	0.03	0.09	0.08	-
CaO	16.13	19.95	20.13	19.84	20.79	18.44	16.50	1.45	19.35	20.18	20.02	19.28	18.71	19.04	18.79	20.13	18.86	19.57
Na_2O	0.28	0.34	0.33	0.30	0.29	0.26	0.22	0.03	0.37	0.41	0.35	0.23	0.27	0.40	0.22	0.21	0.17	0.36
K_2O	-	-	-	-	-	-	-	-	0.01	-	-	0.01	-	-	-	0.02	-	0.01
Total	99.83	99.68	99.11	99.36	99.71	99.68	99.56	100.17	100.07	99.52	99.21	99.83	99.65	99.99	100.45	99.99	99.91	99.75
Cations normalized to 4 cations																		
Si	1.920	1.928	1.930	1.944	1.950	1.913	1.917	1.967	1.898	1.915	1.889	1.868	1.913	1.920	1.915	1.912	1.907	1.916
Ti	0.016	0.017	0.017	0.016	0.010	0.023	0.013	0.008	0.011	0.034	0.028	0.011	0.007	0.012	0.011	0.008	0.009	0.031
Al	0.086	0.076	0.073	0.061	0.043	0.081	0.095	0.041	0.131	0.103	0.129	0.166	0.097	0.112	0.107	0.120	0.132	0.110
Cr	0.009	0.010	0.007	0.002	0.003	0.004	0.008	0.003	0.029	0.013	0.019	0.031	0.025	0.024	0.026	0.029	0.031	0.021
Mg	0.875	0.780	0.803	0.792	0.795	0.828	0.966	1.337	0.946	0.893	0.903	0.964	0.986	0.924	0.988	0.956	0.986	0.888
Fe	0.419	0.355	0.327	0.354	0.339	0.380	0.324	0.571	0.193	0.209	0.205	0.183	0.210	0.225	0.198	0.163	0.175	0.229
Mn	0.008	0.007	0.007	0.007	0.004	0.007	0.006	0.012	0.006	0.005	0.006	0.004	0.007	0.005	0.007	0.006	0.006	0.005
Ni	-	-	-	0.002	-	0.001	-	0.002	0.001	-	0.001	0.002	0.001	-	0.001	0.003	0.002	-
Ca	0.647	0.803	0.812	0.801	0.835	0.742	0.655	0.057	0.757	0.799	0.794	0.755	0.735	0.749	0.732	0.788	0.738	0.775
Na	0.020	0.025	0.024	0.022	0.021	0.019	0.016	0.002	0.026	0.029	0.025	0.016	0.019	0.028	0.016	0.015	0.012	0.026
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-
O	5.973	5.975	5.975	5.980	5.972	5.970	5.974	5.996	5.976	5.992	5.979	5.969	5.971	5.986	5.985	5.986	5.992	5.998

Major elements in wt.%																		
Sample:	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-13	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11
Rock:	core	core	core	core	rim	core	core	core	core	core	core	core	core	core	rim	core	core	core
SiO_2	52.01	51.90	51.69	52.54	52.24	52.22	52.44	51.96	52.67	52.69	50.68	51.60	50.72	52.11	51.15	50.81	51.81	51.62
TiO_2	0.34	1.17	0.99	0.69	0.97	1.09	0.97	0.44	0.48	0.58	1.15	0.82	1.00	0.40	0.87	0.49	0.37	0.50
Al_2O_3	2.78	2.38	2.48	2.33	2.52	2.57	2.42	2.35	2.40	2.29	2.47	2.44	2.39	2.81	2.31	2.89	2.19	2.38
Cr_2O_3	1.18	0.53	0.44	0.48	0.51	0.52	0.47	0.43	0.42	0.53	0.14	0.41	0.45	1.12	0.31	1.01	0.58	0.47
MgO	16.86	17.08	16.11	17.89	16.80	16.42	16.98	16.63	17.03	18.04	15.88	16.36	15.20	18.64	17.81	16.98	16.52	17.06
FeO	6.19	8.16	6.86	8.28	7.81	7.37	7.86	7.43	6.95	7.51	9.52	8.91	8.35	6.24	10.79	9.21	7.36	8.95
MnO	0.16	0.22	0.13	0.23	0.11	0.20	0.19	0.24	0.17	0.24	0.32	0.25	0.18	0.15	0.30	0.23	0.23	0.25
NiO	-	0.01	0.08	0.08	0.07	0.01	-	0.04	0.02	0.03	0.02	0.09	-	0.07	0.09	0.05	0.07	0.03
CaO	20.34	18.15	20.11	16.92	19.36	19.07	18.62	19.85	19.20	17.66	19.08	19.06	20.69	17.57	15.99	17.29	20.20	17.56
Na_2O	0.24	0.28	0.36	0.28	0.33	0.32	0.28	0.26	0.29	0.29	0.31	0.30	0.33	0.18	0.27	0.30	0.25	0.31
K_2O	-	-	0.01	-	-	-	-	0.01	0.02	0.02	0.01	-	-	0.01	-	-	-	-
Total	100.11	99.87	99.25	99.73	100.73	99.79	100.23	99.66	99.65	99.88	99.58	100.23	99.31	99.31	99.89	99.26	99.59	99.13
Cations normalized to 4 cations																		
Si	1.905	1.914	1.916	1.933	1.909	1.928	1.925	1.917	1.938	1.931	1.885	1.902	1.892	1.913	1.889	1.886	1.914	1.916
Ti	0.009	0.032	0.028	0.019	0.027	0.030	0.027	0.012	0.013	0.016	0.032	0.023	0.028	0.011	0.024	0.014	0.010	0.014
Al	0.120	0.103	0.108	0.101	0.109	0.112	0.105	0.102	0.104	0.099	0.108	0.106	0.105	0.122	0.101	0.126	0.095	0.104
Cr	0.034	0.015	0.013	0.014	0.015	0.015	0.014	0.013	0.012	0.015	0.004	0.012	0.013	0.032	0.009	0.030	0.017	0.014
Mg	0.921	0.939	0.890	0.981	0.915	0.903	0.930	0.915	0.934	0.986	0.880	0.899	0.845	1.020	0.980	0.940	0.909	0.944
Fe	0.190	0.252	0.213	0.255	0.239	0.228	0.241	0.229	0.214	0.230	0.296	0.275	0.260	0.192	0.333	0.286	0.227	0.278
Mn	0.005	0.007	0.004	0.007	0.003	0.006	0.006	0.007	0.005	0.007	0.010	0.008	0.006	0.005	0.009	0.007	0.007	0.008
Ni	-	-	0.002	0.002	0.002	-	-	0.001	0.001	0.001	0.001	0.003	-	0.002	0.003	0.001	0.002	0.001
Ca	0.799	0.717	0.799	0.667	0.758	0.754	0.733	0.785	0.757	0.693	0.761	0.753	0.827	0.691	0.633	0.688	0.800	0.698
Na	0.017	0.020	0.026	0.020	0.023	0.023	0.020	0.019	0.021	0.021	0.022	0.021	0.024	0.013	0.019	0.022	0.018	0.022
K	-	-	-	-	-	-	-	-	0.001	0.001	-	-	-	-	-	-	-	-
O	5.983	5.996	5.992	6.000	5.986	6.010	6.001	5.977	5.999	5.993	5.962	5.973	5.967	5.994	5.958	5.967	5.971	5.978

1. **Clinopyroxene analyses in Last Join section of Keel dyke, Figure A-3** (cont.)

Major elements in wt.%																		
Sample:	LJ-12	LJ-12	LJ-12	LJ-12	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-16	LJ-16	LJ-16	LJ-16	LJ-16
Rock:	rim	core	core	core	core	core	core	core	core	core	core	rim	core	core	rim	core	core	core
SiO_2	51.22	51.09	51.99	52.95	52.37	52.31	52.37	51.56	52.86	51.96	52.69	52.69	52.03	52.22	51.77	51.26	51.96	52.99
TiO_2	1.05	1.02	0.79	0.45	0.41	0.73	0.54	0.32	0.24	1.14	0.26	0.94	0.81	0.31	0.50	0.33	0.35	0.26
Al_2O_3	2.47	2.78	2.15	1.97	3.23	2.69	2.77	3.05	2.58	2.44	2.65	2.18	2.80	2.59	2.52	2.57	2.48	2.17
Cr_2O_3	0.39	0.50	0.26	0.34	1.06	0.97	1.02	0.81	0.89	0.62	1.30	0.31	1.06	0.86	0.88	0.96	0.85	0.86
MgO	16.73	15.77	16.20	19.19	17.99	16.23	16.88	17.46	18.80	16.67	18.14	16.50	15.79	18.17	17.54	17.46	18.92	21.46
FeO	8.67	8.08	7.86	11.47	6.57	5.83	5.86	5.35	6.78	5.96	5.06	6.06	5.42	6.68	7.12	6.73	6.97	8.40
MnO	0.22	0.24	0.15	0.28	0.11	0.24	0.12	0.15	0.16	0.17	0.12	0.16	0.14	0.20	0.19	0.26	0.21	0.20
NiO	0.04	0.03	0.07	0.06	0.05	-	0.08	0.01	-	0.06	0.02	0.08	0.03	-	0.05	-	-	-
CaO	18.37	20.15	20.06	14.79	17.63	20.13	19.56	20.16	17.39	20.25	19.43	20.72	20.60	18.27	18.20	19.50	17.43	13.53
Na_2O	0.28	0.33	0.31	0.22	0.22	0.37	0.44	0.21	0.33	0.43	0.20	0.38	0.45	0.30	0.38	0.36	0.29	0.19
K_2O	-	-	-	-	0.01	0.01	0.01	0.01	0.01	-	0.01	-	-	0.01	-	-	-	0.01
Total	99.43	99.99	99.84	101.72	99.65	99.51	99.65	99.09	100.05	99.70	99.89	100.02	99.12	99.62	99.16	99.44	99.47	100.06
Cations normalized to 4 cations																		
Si	1.899	1.888	1.920	1.914	1.920	1.931	1.924	1.897	1.924	1.912	1.922	1.933	1.928	1.913	1.911	1.885	1.902	1.919
Ti	0.029	0.028	0.022	0.012	0.011	0.020	0.015	0.009	0.007	0.032	0.007	0.026	0.023	0.009	0.014	0.009	0.010	0.007
Al	0.108	0.121	0.094	0.084	0.140	0.117	0.120	0.132	0.111	0.106	0.114	0.094	0.122	0.112	0.110	0.111	0.107	0.093
Cr	0.011	0.015	0.008	0.010	0.031	0.028	0.030	0.024	0.026	0.018	0.037	0.009	0.031	0.025	0.026	0.028	0.025	0.025
Mg	0.925	0.869	0.892	1.034	0.983	0.893	0.924	0.958	1.020	0.914	0.987	0.902	0.872	0.992	0.965	0.957	1.032	1.158
Fe	0.269	0.250	0.243	0.347	0.201	0.180	0.180	0.165	0.206	0.183	0.154	0.186	0.168	0.205	0.220	0.207	0.213	0.254
Mn	0.007	0.008	0.005	0.009	0.003	0.008	0.004	0.005	0.005	0.005	0.004	0.005	0.004	0.006	0.006	0.008	0.007	0.006
Ni	0.001	0.001	0.002	0.002	0.001	-	0.002	-	-	0.002	0.001	0.002	0.001	-	0.001	-	-	-
Ca	0.730	0.798	0.794	0.573	0.693	0.796	0.770	0.795	0.678	0.798	0.760	0.815	0.818	0.717	0.720	0.768	0.684	0.525
Na	0.020	0.024	0.022	0.015	0.016	0.026	0.031	0.015	0.023	0.031	0.014	0.027	0.032	0.021	0.027	0.026	0.021	0.013
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.978	5.972	5.981	5.966	6.008	6.010	5.997	5.976	5.987	5.990	5.998	5.997	6.011	5.979	5.979	5.951	5.967	5.977

Major elements in wt.%																		
Sample:	LJ-16	LJ-16	LJ-16	LJ-16	LJ-16	LJ-16	LJ-17	LJ-17	LJ-17	LJ-17	LJ-17	LJ-17	LJ-17	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19
Rock:	rim	core	core	core	core	core	core	rim	core	core	core	core	core	core	core	core	core	core
SiO_2	51.22	52.54	51.45	51.58	51.49	52.01	53.18	52.18	52.78	52.67	52.76	53.06	52.52	52.20	51.73	51.99	53.18	52.91
TiO_2	0.37	0.37	1.12	0.36	0.36	0.35	0.28	1.06	0.30	0.60	1.26	0.28	0.33	0.29	0.68	0.38	0.39	0.28
Al_2O_3	3.00	2.43	2.39	2.73	2.85	2.60	2.48	2.50	2.57	2.72	2.43	2.71	3.13	2.94	3.01	2.71	2.24	2.88
Cr_2O_3	1.19	0.69	0.55	0.80	1.02	0.95	0.91	0.65	1.04	0.83	0.57	0.84	1.07	1.02	0.86	0.85	0.40	1.14
MgO	17.35	19.70	16.40	16.98	17.36	18.32	17.76	16.56	18.62	15.95	16.67	20.46	16.98	17.46	16.50	16.65	17.26	17.81
FeO	6.06	7.32	6.65	5.61	5.90	6.00	5.62	7.17	6.25	6.34	6.34	6.89	5.15	5.69	6.72	7.12	7.65	5.75
MnO	0.15	0.18	0.15	0.23	0.17	0.12	0.11	0.11	0.17	0.14	0.15	0.13	0.20	0.20	0.17	0.16	0.15	0.11
NiO	-	0.03	0.02	0.03	0.05	0.04	-	0.05	0.04	-	0.01	0.03	-	0.03	0.04	-	0.08	-
CaO	19.39	16.50	20.54	20.58	19.60	18.41	19.13	19.22	17.17	20.46	19.15	15.15	19.90	19.49	19.50	19.03	18.18	18.97
Na_2O	0.35	0.25	0.40	0.19	0.31	0.30	0.28	0.44	0.24	0.31	0.39	0.16	0.20	0.18	0.31	0.32	0.21	0.20
K_2O	-	0.01	-	-	0.01	-	0.02	-	0.01	-	0.02	-	-	-	-	-	-	-
Total	99.08	100.02	99.67	99.09	99.13	99.10	99.77	99.94	99.19	100.02	99.75	99.71	99.48	99.50	99.52	99.21	99.75	100.05
Cations normalized to 4 cations																		
Si	1.888	1.909	1.897	1.904	1.898	1.911	1.945	1.920	1.939	1.938	1.943	1.928	1.931	1.917	1.910	1.924	1.958	1.931
Ti	0.010	0.010	0.031	0.010	0.010	0.010	0.008	0.029	0.008	0.017	0.035	0.008	0.009	0.008	0.019	0.011	0.011	0.008
Al	0.130	0.104	0.104	0.119	0.124	0.113	0.107	0.108	0.111	0.118	0.105	0.116	0.136	0.127	0.131	0.118	0.097	0.124
Cr	0.035	0.020	0.016	0.023	0.030	0.028	0.026	0.019	0.030	0.024	0.017	0.024	0.031	0.030	0.025	0.025	0.012	0.033
Mg	0.953	1.067	0.901	0.935	0.954	1.004	0.968	0.908	1.020	0.875	0.915	1.109	0.931	0.956	0.908	0.919	0.948	0.969
Fe	0.187	0.223	0.205	0.173	0.182	0.184	0.172	0.221	0.192	0.195	0.195	0.209	0.158	0.175	0.208	0.221	0.236	0.176
Mn	0.005	0.006	0.005	0.007	0.005	0.004	0.003	0.003	0.005	0.004	0.005	0.004	0.006	0.006	0.005	0.005	0.005	0.003
Ni	-	0.001	0.001	0.001	0.001	0.001	-	0.001	0.001	-	-	0.001	-	0.001	0.001	-	0.002	-
Ca	0.766	0.642	0.811	0.814	0.774	0.725	0.749	0.758	0.676	0.807	0.756	0.590	0.784	0.767	0.771	0.755	0.717	0.742
Na	0.025	0.018	0.029	0.014	0.022	0.021	0.020	0.031	0.017	0.022	0.028	0.011	0.014	0.013	0.022	0.023	0.015	0.014
K	-	-	-	-	-	-	0.001	-	-	-	0.001	-	-	-	-	-	-	-
O	5.969	5.972	5.974	5.979	5.973	5.980	6.009	5.997	6.009	6.015	6.025	6.000	6.016	5.997	5.995	5.995	6.016	6.010

1. Clinopyroxene analyses in Last Join section of Keel dyke, Figure A-3 (cont.)

Major elements in wt.%																		
Sample:	LJ-19	LJ-19	LJ-19	LJ-20	LJ-20	LJ-20	LJ-20	LJ-20	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-4	LJ-4	LJ-4	LJ-4	LJ-4
Rock:	core	core	rim	core	rim	core	core	core	core	core	rim	core	core	core	core	rim	core	core
SiO_2	53.40	52.78	52.39	51.24	51.84	51.26	51.24	51.54	51.30	51.22	51.43	51.96	51.88	51.41	50.79	51.39	51.60	51.19
TiO_2	0.27	0.35	0.39	0.68	0.74	0.67	0.28	0.68	0.96	0.94	0.90	0.88	0.74	0.62	0.77	0.80	0.56	0.86
Al_2O_3	2.73	2.65	2.65	2.10	2.15	2.21	2.51	2.14	2.43	2.28	2.15	2.11	1.97	1.91	1.86	1.97	1.56	2.04
Cr_2O_3	0.99	0.91	0.81	0.43	0.42	0.37	0.72	0.39	0.25	0.22	0.31	0.14	0.18	0.23	0.06	0.09	0.17	0.20
MgO	17.51	17.18	15.73	15.96	15.93	16.35	17.76	16.48	15.13	15.74	15.29	15.37	15.45	15.02	14.59	14.63	14.23	14.49
FeO	5.80	7.71	8.52	8.74	7.76	8.21	10.00	8.78	9.86	10.73	9.62	9.44	9.25	12.61	15.58	14.20	16.93	13.56
MnO	0.12	0.17	0.19	0.23	0.15	0.27	0.20	0.14	0.19	0.27	0.22	0.20	0.20	0.25	0.29	0.21	0.31	0.33
NiO	0.04	0.02	0.06	0.01	0.07	0.06	0.02	0.04	0.08	0.02	0.06	0.09	0.05	0.07	0.04	0.01	-	0.06
CaO	19.69	17.85	19.04	19.90	19.90	19.92	16.01	19.32	19.25	17.92	19.22	19.52	20.46	17.00	15.81	16.44	14.89	17.25
Na_2O	0.18	0.23	0.32	0.27	0.30	0.29	0.29	0.24	0.30	0.24	0.27	0.26	0.30	0.21	0.21	0.27	0.17	0.24
K_2O	0.01	-	0.01	-	-	-	-	-	-	0.01	-	-	0.01	-	-	0.02	-	-
Total	100.74	99.86	100.11	99.55	99.25	99.61	99.02	99.74	99.75	99.59	99.47	99.97	100.48	99.33	100.00	100.03	100.42	100.22
Cations normalized to 4 cations																		
Si	1.939	1.942	1.936	1.903	1.927	1.897	1.903	1.907	1.912	1.912	1.921	1.930	1.915	1.938	1.916	1.932	1.949	1.921
Ti	0.007	0.010	0.011	0.019	0.021	0.019	0.008	0.019	0.027	0.026	0.025	0.025	0.021	0.018	0.022	0.023	0.016	0.024
Al	0.117	0.115	0.115	0.092	0.094	0.096	0.110	0.093	0.107	0.100	0.095	0.092	0.086	0.085	0.083	0.087	0.069	0.090
Cr	0.028	0.026	0.024	0.013	0.012	0.011	0.021	0.011	0.007	0.006	0.009	0.004	0.005	0.007	0.002	0.003	0.005	0.006
Mg	0.948	0.943	0.866	0.884	0.883	0.902	0.983	0.909	0.841	0.876	0.851	0.851	0.850	0.844	0.821	0.820	0.801	0.810
Fe	0.176	0.237	0.263	0.271	0.241	0.254	0.310	0.272	0.307	0.335	0.300	0.293	0.285	0.398	0.492	0.446	0.535	0.425
Mn	0.004	0.005	0.006	0.007	0.005	0.008	0.006	0.004	0.006	0.009	0.007	0.006	0.006	0.008	0.009	0.007	0.010	0.010
Ni	0.001	0.001	0.002	-	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.003	0.001	0.002	0.001	-	-	0.002
Ca	0.766	0.704	0.754	0.792	0.793	0.790	0.637	0.766	0.769	0.717	0.769	0.777	0.809	0.686	0.639	0.662	0.602	0.693
Na	0.013	0.016	0.023	0.019	0.022	0.021	0.021	0.017	0.022	0.017	0.020	0.019	0.021	0.015	0.015	0.020	0.012	0.017
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-
O	6.013	6.015	6.004	5.964	5.991	5.959	5.966	5.970	5.985	5.983	5.989	5.994	5.970	5.993	5.973	5.989	5.996	5.984

Major elements in wt.%																		
Sample:	LJ-4	LJ-4	LJ-6	LJ-6	LJ-6	LJ-6	LJ-6	LJ-6	LJ-6	LJ-6	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-9	LJ-9
Rock:	core	rim	core	core	core	core	core	core	core	core	core	core	rim	core	core	core	core	core
SiO_2	52.35	52.16	51.64	51.47	50.53	51.04	50.08	51.47	51.24	51.07	51.81	50.96	51.88	51.64	50.96	51.11	51.73	51.43
TiO_2	0.54	0.62	0.42	0.37	0.69	0.61	0.83	0.79	0.69	0.69	0.42	0.49	0.62	0.70	0.94	0.89	0.76	0.86
Al_2O_3	2.02	1.97	0.95	0.91	2.09	2.24	2.66	2.07	1.93	2.07	2.73	3.23	2.38	1.86	2.02	1.89	1.95	1.90
Cr_2O_3	0.39	0.26	-	-	0.13	0.16	0.36	0.12	0.09	0.11	0.78	1.14	0.33	0.14	0.31	0.18	0.25	0.22
MgO	17.40	15.51	13.29	12.94	13.43	14.75	13.31	14.93	13.21	13.89	17.53	17.30	15.31	16.85	14.93	14.83	14.96	15.16
FeO	8.44	11.24	12.92	13.38	13.32	14.11	13.33	11.57	15.32	14.51	7.05	7.88	8.54	13.51	11.45	10.84	10.31	11.17
MnO	0.22	0.20	0.35	0.26	0.19	0.33	0.22	0.26	0.21	0.29	0.19	0.15	0.26	0.33	0.15	0.26	0.18	0.23
NiO	0.02	-	0.01	0.05	-	0.05	-	0.01	0.03	0.03	0.04	0.02	0.04	0.07	0.07	0.02	0.03	0.09
CaO	18.27	17.85	19.50	19.41	18.96	16.73	18.74	18.23	17.60	16.80	17.50	18.26	20.20	15.06	18.76	18.57	19.90	19.14
Na_2O	0.27	0.24	0.24	0.25	0.36	0.32	0.33	0.29	0.29	0.31	0.21	0.26	0.25	0.20	0.29	0.29	0.30	0.28
K_2O	-	-	-	0.01	-	-	-	0.01	-	-	-	0.01	-	-	-	-	0.01	-
Total	99.92	100.05	99.32	99.05	99.69	100.35	99.85	99.75	100.61	99.77	98.27	99.70	99.81	100.36	99.88	98.87	100.37	100.48
Cations normalized to 4 cations																		
Si	1.926	1.942	1.961	1.964	1.908	1.910	1.890	1.927	1.929	1.930	1.931	1.876	1.926	1.917	1.906	1.928	1.919	1.909
Ti	0.015	0.017	0.012	0.011	0.020	0.017	0.024	0.022	0.020	0.020	0.012	0.014	0.017	0.020	0.026	0.025	0.021	0.024
Al	0.088	0.086	0.043	0.041	0.093	0.099	0.118	0.091	0.086	0.092	0.120	0.140	0.104	0.081	0.089	0.084	0.085	0.083
Cr	0.011	0.008	-	-	0.004	0.005	0.011	0.004	0.003	0.003	0.023	0.033	0.010	0.004	0.009	0.005	0.007	0.006
Mg	0.954	0.861	0.752	0.736	0.756	0.822	0.749	0.833	0.741	0.783	0.974	0.949	0.847	0.932	0.832	0.834	0.827	0.839
Fe	0.260	0.350	0.410	0.427	0.420	0.442	0.421	0.362	0.482	0.459	0.220	0.243	0.265	0.419	0.358	0.342	0.320	0.347
Mn	0.007	0.006	0.011	0.008	0.006	0.010	0.007	0.008	0.007	0.009	0.006	0.005	0.008	0.010	0.005	0.008	0.006	0.007
Ni	0.001	-	-	0.002	-	0.002	-	-	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.003
Ca	0.720	0.712	0.793	0.793	0.767	0.671	0.757	0.731	0.710	0.681	0.699	0.720	0.804	0.599	0.752	0.751	0.791	0.761
Na	0.019	0.017	0.018	0.018	0.026	0.023	0.024	0.021	0.021	0.023	0.015	0.019	0.018	0.014	0.021	0.021	0.022	0.020
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.980	5.998	5.985	5.985	5.963	5.967	5.966	5.985	5.982	5.986	6.006	5.967	5.991	5.972	5.971	5.988	5.976	5.968

1. Clinopyroxene analyses in Last Join section of Keel dyke, Figure A-3 (cont.)

Major elements in wt.%															
Sample:	LJ-9	LJ-9	LJ-9	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14
Rock:	rim	core	core	core	core	core	core	rim	core	core	core	core	rim	core	core
SiO_2	50.98	51.32	51.28	51.58	51.52	52.03	51.17	51.54	51.37	52.46	51.54	52.05	51.58	51.90	52.69
TiO_2	0.92	0.82	0.77	0.63	1.09	0.30	0.43	0.36	0.37	0.85	0.88	0.34	0.83	0.89	0.34
Al_2O_3	2.27	2.22	1.80	2.65	2.76	2.97	4.12	2.91	3.44	1.89	2.78	3.09	2.59	2.80	2.70
Cr_2O_3	0.14	0.18	0.17	0.90	0.75	1.05	0.91	1.11	0.89	0.43	0.74	1.05	0.91	0.89	0.97
MgO	14.19	15.32	14.76	17.59	16.91	18.57	16.28	17.38	19.05	16.33	17.13	17.61	17.26	16.02	18.74
FeO	10.38	10.64	10.05	7.23	6.73	6.37	4.88	6.65	6.12	6.44	6.74	5.34	7.71	6.54	6.07
MnO	0.28	0.26	0.28	0.10	0.13	0.15	0.10	0.21	0.14	0.13	0.17	0.14	0.18	0.16	0.15
NiO	-	0.01	0.09	0.12	0.02	-	-	0.04	0.01	0.02	0.12	-	0.10	0.02	0.01
CaO	20.13	19.34	19.94	18.86	20.12	17.97	22.00	19.13	18.34	21.39	20.04	20.15	19.01	20.76	18.46
Na_2O	0.30	0.29	0.33	0.40	0.37	0.23	0.19	0.34	0.18	0.39	-	-	-	-	-
K_2O	-	-	0.01	-	0.02	-	0.01	-	-	-	-	-	-	0.01	-
Total	99.59	100.40	99.47	100.07	100.42	99.64	100.09	99.66	99.91	100.33	100.13	99.77	100.18	99.99	100.13
Cations normalized to 4 cations															
Si	1.912	1.902	1.920	1.887	1.883	1.902	1.870	1.892	1.867	1.922	1.892	1.907	1.897	1.916	1.919
Ti	0.026	0.023	0.022	0.017	0.030	0.008	0.012	0.010	0.010	0.023	0.024	0.009	0.023	0.025	0.009
Al	0.100	0.097	0.079	0.114	0.119	0.128	0.177	0.126	0.147	0.082	0.120	0.133	0.112	0.122	0.116
Cr	0.004	0.005	0.005	0.026	0.022	0.030	0.026	0.032	0.026	0.012	0.021	0.030	0.026	0.026	0.028
Mg	0.793	0.846	0.824	0.960	0.922	1.012	0.887	0.951	1.032	0.892	0.938	0.962	0.946	0.882	1.018
Fe	0.325	0.330	0.315	0.221	0.206	0.195	0.149	0.204	0.186	0.197	0.207	0.164	0.237	0.202	0.185
Mn	0.009	0.008	0.009	0.003	0.004	0.005	0.003	0.007	0.004	0.004	0.005	0.004	0.006	0.005	0.005
Ni	-	-	0.003	0.004	0.001	-	-	0.001	-	0.001	0.004	-	0.003	0.001	-
Ca	0.809	0.768	0.800	0.739	0.788	0.704	0.861	0.752	0.714	0.840	0.788	0.791	0.749	0.821	0.720
Na	0.022	0.021	0.024	0.028	0.026	0.016	0.013	0.024	0.013	0.028	-	-	-	-	-
K	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-
O	5.979	5.965	5.972	5.960	5.969	5.981	5.977	5.969	5.957	5.978	5.987	5.998	5.989	6.015	6.000

APPENDIX C.II

1. Average clinopyroxene analyses from layered series of Megacycle #1, Figure A-5.

Major elements in wt.%

Sample:	ES-11a	ES-11b	ES-11c	ES-11d	ES-11e	ES-11f	ES-15a	ES-15b	ES-15c	ES-15d	ES-15e	ES-15f	ES-15g	ES-15h
Rock:	core	rim	core	rim	rim	core	core	rim	core	rim	core	rim	core	rim
SiO_2	51.34	51.99	53.23	52.69	53.21	53.01	52.52	52.37	52.22	52.67	53.08	53.40	52.93	52.71
TiO_2	0.46	0.89	0.37	0.48	0.44	0.46	0.42	0.49	0.46	0.41	0.57	0.58	0.43	0.59
Al_2O_3	2.94	2.01	2.19	2.58	2.51	2.60	2.46	2.49	2.64	2.52	2.42	2.42	2.53	2.43
Cr_2O_3	0.99	0.49	0.75	0.97	0.97	0.96	1.01	1.10	0.95	1.01	0.96	0.93	1.01	0.89
MgO	16.15	16.73	16.53	16.81	16.20	16.31	17.13	16.77	17.63	17.18	17.20	16.24	17.00	17.48
FeO	5.04	5.31	5.06	5.26	5.22	4.94	5.18	4.85	5.41	4.96	4.88	4.43	5.10	5.30
MnO	0.15	0.09	0.19	0.15	0.13	0.18	0.14	0.16	0.10	0.12	0.09	0.09	0.19	0.15
NiO	0.06	0.06	0.06	0.07	0.08	0.05	-	0.04	0.04	0.09	0.05	0.04	0.12	0.01
CaO	21.88	21.55	21.67	20.55	21.53	21.81	21.30	21.65	19.76	20.95	21.42	21.86	20.95	20.48
Na_2O	0.26	0.32	0.33	0.34	0.33	0.31	0.23	0.31	0.23	0.28	0.27	0.29	0.28	0.27
K_2O	-	-	-	0.01	-	-	0.01	0.02	-	-	-	0.02	0.01	-
Total	99.27	99.44	100.37	99.92	100.61	100.63	100.40	100.24	99.43	100.19	100.93	100.29	100.54	100.31

Cations normalized to 4 cations

Si	1.896	1.914	1.942	1.930	1.941	1.931	1.913	1.912	1.917	1.921	1.923	1.952	1.927	1.920
Ti	0.013	0.025	0.010	0.013	0.012	0.013	0.012	0.013	0.013	0.011	0.016	0.016	0.012	0.016
Al	0.128	0.087	0.094	0.111	0.108	0.112	0.106	0.107	0.114	0.108	0.103	0.104	0.109	0.104
Cr	0.029	0.014	0.022	0.028	0.028	0.028	0.029	0.032	0.028	0.029	0.027	0.027	0.029	0.026
Mg	0.889	0.919	0.899	0.918	0.881	0.886	0.930	0.912	0.965	0.934	0.929	0.885	0.922	0.949
Fe	0.156	0.164	0.154	0.161	0.159	0.150	0.158	0.148	0.166	0.151	0.148	0.135	0.155	0.161
Mn	0.005	0.003	0.006	0.005	0.004	0.006	0.004	0.005	0.003	0.004	0.003	0.003	0.006	0.005
Ni	0.002	0.002	0.002	0.002	0.002	0.001	-	0.001	0.001	0.003	0.001	0.001	0.004	-
Ca	0.866	0.850	0.847	0.807	0.842	0.852	0.831	0.847	0.777	0.819	0.831	0.856	0.817	0.799
Na	0.019	0.023	0.023	0.024	0.023	0.022	0.016	0.022	0.016	0.020	0.019	0.021	0.020	0.019
K	-	-	-	-	-	-	-	0.001	-	-	-	0.001	-	-
O	5.977	5.978	5.999	6.001	6.009	6.003	5.984	5.983	5.992	5.991	5.994	6.022	5.997	5.992

2. Average clinopyroxene analyses from layered series of Megacycle #2, Figure A-5.

Major elements in wt.%

Sample:	VD-701a	VD-701b	VD-701c	VD-701d	VD-701e	VD-701f	VD-710a	VD-710b	VD-710c	VD-710d	VD-710e	VD-710f	VD-710g
Rock:	core	rim	core	rim	core	rim	core	rim	core	rim	core	core	rim
SiO_2	52.82	52.01	52.05	52.44	52.65	52.16	52.95	52.97	52.95	53.06	53.29	52.80	53.38
TiO_2	0.24	0.24	0.20	0.28	0.25	0.24	0.42	0.28	0.28	0.27	0.24	0.28	0.32
Al_2O_3	1.97	1.93	1.89	1.94	2.00	1.99	2.13	1.94	1.83	1.88	1.90	2.14	1.88
Cr_2O_3	1.16	1.10	1.19	0.93	1.06	1.21	0.59	0.62	0.69	0.63	0.60	0.54	0.49
MgO	17.81	18.17	18.37	18.32	18.04	18.01	18.61	18.14	18.79	18.80	18.82	18.67	21.26
FeO	4.01	4.50	4.48	4.49	4.31	4.23	5.02	4.43	4.97	4.94	4.89	5.23	5.86
MnO	0.11	0.10	0.16	0.14	0.18	0.11	0.07	0.1	0.10	0.09	0.05	0.15	0.14
NiO	-	0.03	0.10	0.03	0.01	0.08	0.02	0.03	0.04	0.08	0.09	-	0.05
CaO	21.86	20.75	20.90	20.33	21.04	20.86	19.38	20.26	19.48	19.32	19.55	19.17	15.60
Na_2O	0.16	0.23	0.19	0.22	0.17	0.19	0.18	0.18	0.11	0.14	0.16	0.15	0.11
K_2O	-	0.02	0.01	0.01	-	-	-	-	-	-	-	0.01	-
Total	100.13	99.08	99.55	99.13	99.71	99.07	99.36	99.04	99.23	99.21	99.59	99.14	99.09

Cations normalized to 4 cations

Si	1.921	1.909	1.901	1.922	1.922	1.916	1.937	1.945	1.939	1.943	1.943	1.935	1.943
Ti	0.007	0.007	0.005	0.008	0.007	0.007	0.012	0.008	0.008	0.007	0.007	0.008	0.009
Al	0.084	0.083	0.081	0.084	0.086	0.086	0.092	0.084	0.079	0.081	0.082	0.092	0.081
Cr	0.033	0.032	0.034	0.027	0.031	0.035	0.017	0.018	0.020	0.018	0.017	0.016	0.014
Mg	0.966	0.994	1.001	1.002	0.982	0.986	1.015	0.993	1.026	1.026	1.023	1.020	1.153
Fe	0.122	0.138	0.137	0.138	0.131	0.130	0.154	0.136	0.152	0.151	0.149	0.160	0.178
Mn	0.003	0.003	0.005	0.004	0.006	0.003	0.002	0.006	0.003	0.003	0.002	0.005	0.004
Ni	-	0.001	0.003	0.001	-	0.002	0.001	0.001	0.001	0.002	0.003	-	0.001
Ca	0.852	0.816	0.818	0.799	0.823	0.821	0.759	0.797	0.764	0.758	0.764	0.753	0.608
Na	0.011	0.016	0.013	0.016	0.012	0.014	0.013	0.013	0.008	0.010	0.011	0.011	0.008
K	-	0.001	-	-	-	-	-	-	-	-	-	-	-
O	5.981	5.964	5.958	5.977	5.981	5.976	5.996	5.997	5.992	5.995	5.994	5.991	5.995

3. Average clinopyroxene analyses from layered series of Megacycle #3, Figure A-7.

Major elements in wt.%																		
Sample:	SL-46a	SL-46b	SL-46c	SL-46d	SL-46e	SL-46f	SL-46g	V1-06a	V1-06b	V1-06c	V1-06d	V1-06e	V1-06f	V1-06g	V1-06h	V1-07a	V1-07b	V1-07c
Rock:	core	rim	core	rim	core	core	rim	core	core	rim	rim	core	core	rim	core	rim	rim	core
SiO_2	52.24	51.58	52.18	51.66	52.39	52.22	52.52	52.97	53.03	52.39	52.48	53.12	53.08	52.58	52.29	52.39	52.05	52.31
TiO_2	0.27	0.45	0.22	0.35	0.28	0.31	0.35	0.34	0.36	0.42	0.54	0.30	0.29	0.38	0.38	0.48	0.68	0.26
Al_2O_3	1.86	2.39	2.17	2.34	1.90	2.41	2.27	1.91	2.06	2.75	2.34	1.80	1.91	2.28	2.54	2.06	2.24	1.86
Cr_2O_3	1.15	0.97	1.13	1.00	1.11	1.09	0.81	-	0.84	0.82	0.84	0.72	0.77	0.92	0.77	0.91	0.75	0.71
MgO	17.18	17.48	17.83	17.41	17.28	16.75	19.24	18.87	18.24	17.93	17.15	19.48	20.76	17.69	18.32	17.45	17.11	19.68
FeO	4.71	5.27	4.84	5.25	4.52	4.72	6.43	5.88	5.22	5.49	5.19	5.69	6.42	5.24	5.48	5.20	5.04	6.30
MnO	0.10	0.19	0.16	0.09	0.15	0.19	0.19	0.15	0.13	0.16	0.16	0.18	0.13	0.16	0.10	0.17	0.11	0.12
NiO	0.02	-	0.11	0.03	-	0.01	0.02	0.04	0.06	0.02	0.05	0.01	0.02	-	0.07	0.02	0.01	0.03
CaO	21.58	20.12	20.46	19.95	21.39	21.23	17.08	18.83	19.59	19.29	21.46	18.48	16.38	20.05	19.08	20.61	20.95	17.81
Na_2O	0.28	0.27	0.29	0.27	0.25	0.23	0.24	0.17	0.19	0.27	0.26	0.19	0.16	0.26	0.24	0.30	0.30	0.18
K_2O	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.02	-	-	-	-	-	-	-	-
Total	99.41	98.73	99.39	98.37	99.28	99.17	99.17	99.17	99.73	99.56	100.47	99.98	99.92	99.57	99.27	99.59	99.24	99.26
Cations normalized to 4 cations																		
Si	1.919	1.906	1.913	1.916	1.926	1.926	1.925	1.940	1.938	1.918	1.910	1.929	1.922	1.927	1.917	1.921	1.916	1.912
Ti	0.007	0.013	0.006	0.010	0.008	0.009	0.010	0.009	0.010	0.012	0.015	0.008	0.008	0.010	0.010	0.013	0.019	0.007
Al	0.081	0.104	0.094	0.102	0.082	0.105	0.098	0.082	0.089	0.119	0.100	0.077	0.082	0.098	0.110	0.089	0.097	0.080
Cr	0.033	0.028	0.033	0.029	0.032	0.032	0.023	-	0.024	0.024	0.024	0.021	0.022	0.027	0.022	0.026	0.022	0.021
Mg	0.941	0.963	0.974	0.963	0.947	0.921	1.051	1.030	0.994	0.978	0.931	1.055	1.121	0.966	1.001	0.954	0.939	1.073
Fe	0.145	0.163	0.148	0.163	0.139	0.146	0.197	0.180	0.159	0.168	0.158	0.173	0.194	0.161	0.168	0.159	0.155	0.193
Mn	0.003	0.006	0.005	0.003	0.005	0.006	0.006	0.005	0.004	0.005	0.005	0.006	0.004	0.005	0.003	0.005	0.003	0.004
Ni	0.001	-	0.003	0.001	-	-	0.001	0.001	0.002	0.001	0.001	-	0.001	-	0.002	0.001	-	0.001
Ca	0.849	0.797	0.803	0.793	0.843	0.839	0.671	0.739	0.767	0.757	0.837	0.719	0.636	0.787	0.750	0.810	0.826	0.698
Na	0.020	0.019	0.021	0.019	0.018	0.016	0.017	0.012	0.013	0.019	0.018	0.013	0.011	0.018	0.017	0.021	0.021	0.013
K	0.001	-	-	-	-	0.001	0.001	-	-	0.001	-	-	-	-	-	-	-	-
O	5.973	5.975	5.971	5.982	5.982	5.994	5.987	5.984	5.997	5.990	5.978	5.979	5.976	5.991	5.984	5.982	5.984	5.963

Major elements in wt.%																		
Sample:	V1-07d	V1-07e	V1-08a	V1-08b	V1-08c	V1-09a	V1-09b	V1-09c	V1-09d	V1-09e	V1-09f	V1-09g	V1-09h	V3-02a	V3-02b	V3-03a	V3-03b	V3-03c
Rock:	rim	core	core	core	core	core	core	core	rim	rim	core	core	core	rim	core	core	rim	rim
SiO_2	52.18	52.07	52.37	52.56	52.24	52.54	52.48	52.73	53.06	52.09	52.97	52.63	52.01	51.58	51.60	52.97	52.35	53.21
TiO_2	0.58	0.27	0.37	0.38	0.47	0.27	0.62	0.48	0.45	0.56	0.36	0.43	0.37	0.54	0.28	0.30	0.38	0.63
Al_2O_3	2.34	1.81	2.39	2.21	2.24	1.71	2.31	2.13	2.06	2.27	1.47	1.68	2.31	2.30	2.08	1.91	2.55	2.18
Cr_2O_3	0.76	0.68	0.67	0.74	0.73	0.56	0.63	0.65	0.69	0.52	0.62	0.57	0.59	0.78	0.97	0.84	0.92	0.70
MgO	17.31	19.35	18.46	17.13	17.71	19.32	17.20	17.11	17.30	17.79	19.20	16.91	19.82	17.28	17.74	17.48	17.30	18.72
FeO	4.78	6.29	5.76	5.18	5.19	6.02	5.76	5.79	5.74	6.36	6.81	5.17	6.68	5.59	5.12	5.42	5.78	6.85
MnO	0.16	0.12	0.13	0.13	0.11	0.14	0.12	0.13	0.13	0.13	0.19	0.11	0.11	0.25	0.18	0.21	0.08	0.14
NiO	0.04	0.06	0.02	-	-	0.03	0.05	0.01	0.02	-	-	0.06	0.04	0.01	0.02	0.08	0.09	0.03
CaO	20.67	18.32	18.74	20.67	20.16	18.57	20.75	20.68	20.33	19.27	18.13	21.67	17.43	20.76	20.83	20.43	20.26	17.76
Na_2O	0.32	0.15	0.20	0.34	0.24	0.20	0.30	0.30	0.29	0.29	0.16	0.18	0.16	0.23	0.27	0.23	0.26	0.26
K_2O	0.01	-	-	0.01	0.01	-	-	-	-	-	-	-	-	0.01	-	0.02	0.01	-
Total	99.14	99.12	99.10	99.35	99.11	99.36	100.22	100.02	100.06	99.28	99.92	99.41	99.52	99.33	99.10	99.89	99.98	100.48
Cations normalized to 4 cations																		
Si	1.920	1.909	1.923	1.932	1.922	1.920	1.916	1.929	1.939	1.916	1.932	1.938	1.896	1.899	1.898	1.939	1.915	1.933
Ti	0.016	0.007	0.010	0.011	0.013	0.007	0.017	0.013	0.012	0.015	0.010	0.012	0.010	0.015	0.008	0.008	0.010	0.017
Al	0.101	0.078	0.103	0.096	0.097	0.074	0.099	0.092	0.089	0.098	0.063	0.073	0.099	0.100	0.090	0.082	0.110	0.093
Cr	0.022	0.020	0.019	0.022	0.021	0.016	0.018	0.019	0.020	0.015	0.018	0.017	0.017	0.023	0.028	0.024	0.027	0.020
Mg	0.950	1.058	1.010	0.939	0.971	1.052	0.936	0.933	0.943	0.976	1.044	0.928	1.077	0.948	0.973	0.954	0.943	1.014
Fe	0.147	0.193	0.177	0.159	0.160	0.184	0.176	0.177	0.175	0.196	0.208	0.159	0.204	0.172	0.157	0.166	0.177	0.208
Mn	0.005	0.004	0.004	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.006	0.003	0.003	0.008	0.006	0.007	0.002	0.004
Ni	0.001	0.002	0.001	-	-	0.001	0.001	-	0.001	-	-	0.002	0.001	-	0.001	0.002	0.003	0.001
Ca	0.815	0.719	0.737	0.814	0.795	0.727	0.812	0.811	0.796	0.759	0.709	0.855	0.681	0.819	0.821	0.801	0.794	0.691
Na	0.023	0.011	0.014	0.024	0.017	0.014	0.021	0.021	0.021	0.021	0.011	0.013	0.011	0.016	0.019	0.016	0.018	0.018
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-
O	5.986	5.960	5.988	5.989	5.985	5.965	5.981	5.987	5.996	5.978	5.976	5.988	5.959	5.966	5.955	5.991	5.984	5.998

3. Average clinopyroxene analyses from layered series of Megacycle #3, Figure A-7 (cont.)

Major elements in wt.%																		
Sample:	V3-03d	V3-03e	V3-03f	V3-03g	V3-03h	V3-04a	V3-04b	V3-05a	V3-05b	V3-06a	V3-06b	V3-06c	VD-351a	VD-351b	VD-351c	VD-501a	VD-501b	VD-501c
Rock:	core	rim	core	core	rim	core	rim	core	rim	core	rim	core	core	core	core	core	rim	rim
SiO_2	52.73	52.31	52.48	53.23	52.61	52.33	53.18	52.58	52.16	51.96	53.25	52.07	51.37	51.66	51.73	52.61	52.84	52.35
TiO_2	0.46	0.68	0.68	0.31	0.37	0.43	0.53	0.39	0.57	0.42	0.36	0.44	0.81	0.70	0.31	0.47	0.67	0.55
Al_2O_3	2.23	2.22	2.13	1.83	2.45	2.28	2.17	2.13	2.31	2.26	1.88	2.37	2.38	2.34	2.27	2.04	2.09	2.11
Cr_2O_3	0.83	0.75	0.71	0.81	0.76	0.69	0.67	0.88	0.60	0.77	0.50	0.70	0.76	0.87	1.05	0.67	0.84	0.80
MgO	16.81	16.83	17.69	17.13	18.42	16.86	17.01	17.08	16.98	16.70	20.73	16.34	16.80	19.05	16.60	18.76	18.54	16.78
FeO	5.51	6.12	6.48	5.15	6.23	5.05	5.49	5.22	5.53	5.49	7.66	5.41	5.76	6.62	5.09	7.38	6.70	5.57
MnO	0.14	0.21	0.14	0.13	0.21	0.16	0.16	0.13	0.09	0.19	0.20	0.10	0.13	0.17	0.14	0.21	0.12	0.12
NiO	0.13	0.14	0.04	0.02	0.01	0.09	0.08	0.06	-	-	0.11	0.02	0.01	0.08	0.05	0.02	0.03	0.07
CaO	21.04	20.78	18.83	21.06	18.53	21.80	20.81	20.96	20.68	21.17	14.75	21.62	20.41	17.10	20.79	18.18	17.48	20.67
Na_2O	0.25	0.27	0.31	0.26	0.28	0.25	0.28	0.25	0.31	0.23	0.23	0.31	0.40	0.34	0.30	0.22	0.25	0.29
K_2O	0.03	-	0.01	0.01	0.01	-	-	-	0.02	-	0.01	-	0.01	-	-	-	-	0.01
Total	100.17	100.31	99.51	99.93	99.88	99.94	100.38	99.68	99.25	99.19	99.68	99.38	98.84	98.94	98.33	100.55	99.56	99.32
Cations normalized to 4 cations																		
Si	1.929	1.914	1.929	1.948	1.919	1.915	1.940	1.930	1.921	1.919	1.937	1.920	1.902	1.900	1.925	1.911	1.938	1.931
Ti	0.013	0.019	0.019	0.009	0.010	0.012	0.015	0.011	0.016	0.012	0.010	0.012	0.023	0.019	0.009	0.013	0.018	0.015
Al	0.096	0.096	0.092	0.079	0.105	0.098	0.093	0.092	0.100	0.098	0.081	0.103	0.104	0.101	0.100	0.087	0.090	0.092
Cr	0.024	0.022	0.021	0.023	0.022	0.020	0.019	0.026	0.017	0.022	0.014	0.020	0.022	0.025	0.031	0.019	0.024	0.023
Mg	0.917	0.918	0.970	0.935	1.002	0.920	0.925	0.934	0.933	0.919	1.124	0.898	0.927	1.045	0.921	1.016	1.014	0.923
Fe	0.169	0.187	0.199	0.158	0.190	0.155	0.167	0.160	0.170	0.170	0.233	0.167	0.178	0.204	0.158	0.224	0.206	0.172
Mn	0.004	0.007	0.004	0.004	0.006	0.005	0.005	0.004	0.003	0.006	0.006	0.003	0.004	0.005	0.004	0.006	0.004	0.004
Ni	0.004	0.004	0.001	0.001	-	0.003	0.002	0.002	-	-	0.003	0.001	-	0.002	0.001	0.001	0.001	0.002
Ca	0.825	0.815	0.742	0.826	0.724	0.855	0.813	0.824	0.816	0.838	0.575	0.854	0.810	0.674	0.829	0.707	0.687	0.817
Na	0.018	0.019	0.022	0.018	0.020	0.018	0.020	0.018	0.022	0.016	0.016	0.022	0.029	0.024	0.022	0.015	0.018	0.021
K	0.001	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-
O	5.992	5.982	5.993	5.998	5.983	5.977	6.001	5.990	5.985	5.983	5.986	5.983	5.973	5.971	5.988	5.969	6.005	5.993

Major elements in wt.%																		
Sample:	VD-501d	VD-501e	VD-501f	VD-842a	VD-842b	VD-842c	VD-842d	VD-842e	VD-842f	VD-842g	VD-513a	VD-513b	VD-513c	VD-513d	VD-513e	VD-513f	VD-513g	VD-513h
Rock:	core	core	rim	core	core	rim	rim	core	rim	core	core	rim	core	rim	core	rim	core	rim
SiO_2	52.95	52.56	52.58	52.69	52.56	52.95	52.99	52.03	51.64	51.64	52.54	52.41	52.44	52.18	52.52	52.95	53.16	52.88
TiO_2	0.44	0.63	0.75	0.40	0.54	0.46	0.45	0.70	0.91	0.71	0.34	0.67	0.43	0.53	0.33	0.42	0.43	0.51
Al_2O_3	1.83	2.01	1.76	2.18	2.29	2.18	1.90	2.29	2.21	2.20	1.86	2.09	2.21	2.27	2.00	2.00	1.94	2.03
Cr_2O_3	0.67	0.72	0.69	0.59	0.45	0.43	0.39	0.39	0.40	0.46	0.57	0.53	0.52	0.51	0.65	0.50	0.43	0.48
MgO	19.35	16.90	16.47	16.81	16.73	18.14	19.85	16.57	17.18	16.55	16.48	16.54	16.13	16.22	16.26	16.27	19.00	16.30
FeO	8.26	5.52	4.99	5.29	5.69	6.15	8.39	5.68	6.37	5.83	6.17	7.05	6.31	6.88	6.09	6.44	8.30	6.28
MnO	0.25	0.17	0.14	0.19	0.23	0.23	0.17	0.21	0.24	0.15	0.18	0.18	0.18	0.20	0.17	0.15	0.22	0.29
NiO	0.05	-	0.01	0.08	-	0.07	0.06	0.09	-	-	0.05	0.07	0.08	-	0.02	0.11	0.04	0.12
CaO	16.59	20.18	21.28	21.07	21.41	19.50	16.01	21.17	20.46	21.55	21.04	20.18	21.65	21.23	21.32	21.51	16.64	21.09
Na_2O	0.16	0.31	0.31	0.32	0.24	0.27	0.19	0.31	0.28	0.33	0.26	0.24	0.31	0.31	0.23	0.30	0.22	0.27
K_2O	-	0.01	-	0.01	-	-	0.01	-	-	-	0.02	0.01	-	-	-	-	0.02	0.02
Total	100.55	99.01	98.98	99.64	100.14	100.39	100.40	99.44	99.69	99.42	99.51	99.97	100.25	100.32	99.59	100.64	100.41	100.27
Cations normalized to 4 cations																		
Si	1.924	1.944	1.947	1.934	1.923	1.924	1.923	1.917	1.898	1.903	1.938	1.930	1.922	1.913	1.938	1.934	1.935	1.939
Ti	0.012	0.018	0.021	0.011	0.015	0.013	0.012	0.019	0.025	0.020	0.009	0.019	0.012	0.015	0.009	0.012	0.012	0.014
Al	0.078	0.088	0.077	0.094	0.099	0.093	0.081	0.099	0.096	0.096	0.081	0.091	0.096	0.098	0.087	0.086	0.083	0.088
Cr	0.019	0.021	0.020	0.017	0.013	0.012	0.011	0.011	0.012	0.013	0.017	0.015	0.015	0.015	0.019	0.014	0.012	0.014
Mg	1.048	0.932	0.909	0.920	0.913	0.983	1.074	0.910	0.941	0.909	0.906	0.908	0.881	0.886	0.894	0.886	1.031	0.891
Fe	0.251	0.171	0.155	0.162	0.174	0.187	0.255	0.175	0.196	0.180	0.190	0.217	0.194	0.211	0.188	0.197	0.253	0.193
Mn	0.008	0.005	0.004	0.006	0.007	0.007	0.005	0.007	0.007	0.005	0.006	0.006	0.006	0.006	0.005	0.005	0.007	0.009
Ni	0.001	-	-	0.002	-	0.002	0.002	0.003	-	-	0.001	0.002	0.002	-	0.001	0.003	0.001	0.004
Ca	0.646	0.799	0.844	0.829	0.839	0.759	0.622	0.836	0.805	0.851	0.832	0.796	0.850	0.834	0.843	0.842	0.649	0.829
Na	0.011	0.022	0.022	0.023	0.017	0.019	0.013	0.022	0.020	0.024	0.019	0.017	0.022	0.022	0.016	0.021	0.016	0.019
K	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	0.001	0.001
O	5.980	6.004	6.006	5.990	5.985	5.980	5.975	5.981	5.967	5.966	5.987	5.992	5.979	5.973	5.992	5.985	5.987	5.994

4. Average clinopyroxene analyses from layered series of Megacycle #4, Figure A-7.

Major elements in wt.%

Sample:	VD-522a	VD-522b	VD-522c	VD-522d	VD-522e	VD-522f	VD-522g	VD-522h	VD-848a	VD-848b	VD-848c	VD-848d	VD-848e	VD-848f	VD-848g	M-10a
Rock:	core	rim	core	rim	core	rim	core	rim	core	core	core	rim	core	core	core	core
SiO_2	52.91	53.01	53.18	52.46	53.40	53.23	53.33	53.23	51.77	51.45	51.45	52.07	51.90	51.28	51.79	52.37
TiO_2	0.37	0.45	0.34	0.57	0.97	0.90	0.35	0.56	0.33	0.57	0.42	0.74	0.43	0.81	0.79	0.54
Al_2O_3	2.79	2.40	2.25	2.33	1.73	1.95	2.24	2.28	3.00	2.60	2.75	2.52	2.73	2.45	2.42	1.77
Cr_2O_3	0.65	0.84	0.84	0.78	0.64	0.58	0.67	0.73	1.24	0.95	1.01	0.89	1.13	0.84	0.80	0.87
MgO	17.33	17.30	17.68	16.83	15.98	15.93	16.73	18.59	17.36	16.56	17.31	16.36	16.57	16.44	17.59	17.25
FeO	4.73	4.67	5.21	5.21	6.15	5.99	4.39	5.98	4.61	5.68	4.92	5.93	5.09	6.25	6.26	7.59
MnO	0.09	0.14	0.19	0.15	0.15	0.13	0.21	0.11	0.13	0.08	0.21	0.14	0.20	0.17	0.15	0.22
NiO	0.04	0.04	0.03	0.01	-	0.07	0.12	0.01	0.07	0.05	0.01	0.03	-	-	0.02	0.08
CaO	20.41	20.60	19.08	20.68	21.09	21.02	21.73	18.53	19.98	20.48	20.82	20.34	20.47	20.34	18.41	18.86
Na_2O	0.25	0.30	0.23	0.27	0.42	0.34	0.19	0.28	0.27	0.23	0.26	0.33	0.27	0.34	0.27	0.26
K_2O	-	-	0.01	0.02	-	0.01	-	0.01	0.01	-	0.01	-	-	0.01	-	-
Total	99.57	99.74	99.05	99.31	100.52	100.14	99.96	100.30	98.77	98.65	99.17	99.35	98.79	98.93	98.51	99.81
Cations normalized to 4 cations																
Si	1.937	1.940	1.960	1.933	1.957	1.957	1.952	1.933	1.911	1.912	1.893	1.925	1.924	1.903	1.923	1.929
Ti	0.010	0.012	0.009	0.016	0.027	0.025	0.010	0.015	0.009	0.016	0.012	0.021	0.012	0.023	0.022	0.015
Al	0.120	0.103	0.098	0.101	0.075	0.085	0.097	0.098	0.131	0.114	0.119	0.110	0.119	0.107	0.106	0.077
Cr	0.019	0.024	0.024	0.023	0.019	0.017	0.019	0.021	0.036	0.028	0.029	0.026	0.033	0.025	0.023	0.025
Mg	0.946	0.943	0.971	0.925	0.873	0.873	0.913	1.007	0.955	0.917	0.949	0.901	0.915	0.909	0.974	0.947
Fe	0.145	0.143	0.161	0.161	0.188	0.184	0.134	0.182	0.142	0.177	0.151	0.183	0.158	0.194	0.194	0.234
Mn	0.003	0.004	0.006	0.005	0.005	0.004	0.007	0.003	0.004	0.003	0.007	0.004	0.006	0.005	0.005	0.007
Ni	0.001	0.001	0.001	-	-	0.002	0.004	-	0.002	0.001	-	0.001	-	-	0.001	0.002
Ca	0.801	0.807	0.753	0.817	0.828	0.828	0.852	0.721	0.790	0.821	0.821	0.806	0.813	0.809	0.732	0.744
Na	0.018	0.021	0.016	0.019	0.030	0.024	0.013	0.020	0.019	0.017	0.019	0.024	0.019	0.024	0.019	0.019
K	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-
O	6.008	6.005	6.022	6.001	6.015	6.021	6.013	5.998	5.993	5.991	5.969	6.001	6.002	5.979	6.000	5.986

Major elements in wt.%

Sample:	M-10b	M-10c	M-11a	M-11b	M-11c	M-11d	M-11e	M-11f	M-11g	M-13a	M-13b	M-13c	M-13d	M-13e	M-13f	VD-592a
Rock:	core	rim	core	core	core	core	core	rim	core	core	rim	core	core	core	core	core
SiO_2	52.785	1.39	51.49	52.41	51.79	51.96	53.18	52.03	52.16	51.49	51.24	52.35	51.90	52.33	52.26	52.07
TiO_2	0.35	0.89	0.69	0.62	0.52	0.76	0.51	0.70	0.59	0.86	1.24	0.56	0.47	0.52	0.48	0.54
Al_2O_3	1.58	2.64	2.37	2.33	2.35	2.21	1.98	2.38	2.49	2.61	2.36	2.33	2.40	2.07	2.19	2.05
Cr_2O_3	0.82	0.53	0.75	0.65	0.80	0.75	0.78	0.71	0.85	0.70	0.40	0.85	0.91	0.81	0.93	0.68
MgO	17.28	15.75	16.75	17.74	17.71	16.09	19.58	16.75	16.19	15.54	16.67	16.70	16.29	17.61	16.12	16.18
FeO	6.87	7.32	8.04	9.09	8.69	7.22	9.33	8.38	6.53	6.55	8.65	6.17	6.26	7.44	6.11	6.19
MnO	0.14	0.13	0.22	0.25	0.13	0.19	0.20	0.17	0.13	0.14	0.25	0.10	0.16	0.26	0.17	0.19
NiO	0.04	0.07	0.07	0.03	0.06	0.10	0.06	0.13	0.09	0.05	0.02	0.08	0.04	0.03	0.06	-
CaO	19.43	20.74	18.29	17.04	16.44	20.26	15.01	18.60	20.75	21.30	18.72	20.43	20.62	18.58	21.60	21.42
Na_2O	0.25	0.37	0.27	0.24	0.20	0.30	0.17	0.26	0.29	0.51	0.38	0.30	0.25	0.22	0.25	0.28
K_2O	-	-	-	0.01	-	-	-	-	0.02	0.01	0.02	-	0.01	0.03	0.01	-
Total	99.54	99.82	98.94	100.42	98.69	99.84	100.81	100.10	100.09	99.76	99.94	99.87	99.31	99.90	100.19	99.60
Cations normalized to 4 cations																
Si	1.945	1.898	1.917	1.921	1.929	1.920	1.931	1.917	1.917	1.900	1.891	1.924	1.921	1.922	1.919	1.922
Ti	0.010	0.025	0.019	0.017	0.015	0.021	0.014	0.019	0.016	0.024	0.034	0.015	0.013	0.014	0.013	0.015
Al	0.069	0.115	0.104	0.101	0.103	0.096	0.085	0.103	0.108	0.113	0.103	0.101	0.105	0.090	0.095	0.089
Cr	0.024	0.015	0.022	0.019	0.024	0.022	0.022	0.021	0.025	0.020	0.012	0.025	0.027	0.024	0.027	0.020
Mg	0.950	0.867	0.929	0.969	0.983	0.886	1.060	0.920	0.887	0.855	0.917	0.915	0.899	0.964	0.882	0.890
Fe	0.212	0.226	0.250	0.278	0.270	0.223	0.283	0.258	0.201	0.202	0.267	0.190	0.194	0.229	0.188	0.191
Mn	0.004	0.004	0.007	0.008	0.004	0.006	0.006	0.005	0.004	0.004	0.008	0.003	0.005	0.008	0.005	0.006
Ni	0.001	0.002	0.002	0.001	0.002	0.003	0.002	0.004	0.003	0.001	0.001	0.002	0.001	0.001	0.002	-
Ca	0.768	0.821	0.729	0.669	0.656	0.802	0.584	0.734	0.817	0.842	0.740	0.804	0.818	0.731	0.850	0.847
Na	0.018	0.027	0.019	0.017	0.014	0.021	0.012	0.019	0.021	0.036	0.027	0.021	0.018	0.016	0.018	0.020
K	-	-	-	-	-	-	-	-	0.001	-	0.001	-	-	0.001	-	-
O	5.992	5.975	5.989	5.989	5.999	5.989	5.993	5.989	5.989	5.973	5.968	5.991	5.990	5.985	5.984	5.981

4. Average clinopyroxene analyses from layered series of Megacycle #4, Figure A-7 (cont.)

Major elements in wt.%

Sample:	VD-592b	VD-592c	VD-592d	VD-592e	VD-592	VD-592g	VD-592h	VD-596a	VD-596b	VD-596c	VD-596d	VD-596e	VD-596f	VD-596g	VD-596h	VD-599a
Rock:	rim	core	rim	rim	core	rim	core	core	rim	core	rim	core	rim	core	rim	core
SiO_2	52.03	51.43	52.07	51.66	52.18	52.07	52.37	51.62	51.58	52.67	51.49	52.33	51.90	51.75	51.71	52.14
TiO_2	0.62	0.65	0.52	0.67	0.56	0.68	0.63	0.84	0.97	0.63	0.83	0.62	0.86	0.84	0.92	0.56
Al_2O_3	2.12	2.33	2.06	1.99	2.23	1.90	2.13	2.25	2.23	2.03	2.15	1.96	2.19	2.24	2.37	2.05
Cr_2O_3	0.54	0.59	0.48	0.48	0.47	0.44	0.38	0.66	0.56	0.46	0.57	0.67	0.51	0.56	0.60	0.23
MgO	15.94	15.45	15.92	15.72	15.84	16.00	15.49	16.37	15.21	18.79	16.17	17.08	15.60	15.81	15.39	15.94
FeO	6.36	6.70	7.36	6.94	6.80	6.88	7.29	7.97	7.67	10.52	8.23	8.69	7.79	8.04	7.65	6.65
MnO	0.14	0.19	0.22	0.16	0.22	0.19	0.12	0.22	0.18	0.26	0.22	0.22	0.16	0.16	0.16	0.12
NiO	0.09	0.06	0.06	0.05	0.01	0.08	0.05	0.10	0.02	0.09	0.06	0.12	0.10	0.11	0.06	0.05
CaO	21.39	21.53	20.22	21.31	21.23	21.55	21.07	20.30	21.30	14.52	19.42	18.43	21.28	20.89	21.03	21.34
Na_2O	0.28	0.30	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.20	0.34	0.25	0.37	0.26	0.32	0.27
K_2O	0.01	0.03	0.01	-	-	0.01	-	-	0.01	-	-	0.03	-	0.01	0.01	-
Total	99.52	99.26	99.17	99.25	99.82	100.10	99.85	100.68	100.08	100.17	99.49	100.39	100.76	100.67	100.22	99.34

Cations normalized to 4 cations

	VD-592b	VD-592c	VD-592d	VD-592e	VD-592	VD-592g	VD-592h	VD-596a	VD-596b	VD-596c	VD-596d	VD-596e	VD-596f	VD-596g	VD-596h	VD-599a
Si	1.924	1.911	1.937	1.920	1.926	1.916	1.936	1.891	1.908	1.934	1.911	1.922	1.904	1.901	1.909	1.931
Ti	0.017	0.018	0.015	0.019	0.016	0.019	0.018	0.023	0.027	0.017	0.023	0.017	0.024	0.023	0.026	0.016
Al	0.092	0.102	0.090	0.087	0.097	0.082	0.093	0.097	0.097	0.088	0.094	0.085	0.095	0.097	0.103	0.089
Cr	0.016	0.017	0.014	0.014	0.014	0.013	0.011	0.019	0.016	0.013	0.017	0.019	0.015	0.016	0.018	0.007
Mg	0.879	0.856	0.883	0.871	0.871	0.878	0.854	0.894	0.839	1.028	0.894	0.935	0.853	0.866	0.847	0.880
Fe	0.197	0.208	0.229	0.216	0.210	0.212	0.226	0.244	0.237	0.323	0.256	0.267	0.239	0.247	0.236	0.206
Mn	0.004	0.006	0.007	0.005	0.007	0.006	0.004	0.007	0.006	0.008	0.007	0.007	0.005	0.005	0.005	0.004
Ni	0.003	0.002	0.002	0.001	-	0.002	0.001	0.003	0.001	0.003	0.002	0.004	0.003	0.003	0.002	0.001
Ca	0.848	0.857	0.806	0.848	0.839	0.850	0.835	0.797	0.844	0.571	0.772	0.725	0.836	0.822	0.832	0.847
Na	0.020	0.022	0.018	0.019	0.021	0.021	0.023	0.024	0.025	0.014	0.024	0.018	0.026	0.019	0.023	0.019
K	-	0.001	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-
O	5.985	5.977	5.994	5.979	5.986	5.972	5.994	5.961	5.979	5.995	5.977	5.982	5.969	5.972	5.983	5.985

Major elements in wt.%

Sample:	VD-599b	VD-599c	VD-599d	VD-599e	VD-599f	VD-599g	VD-599h	VD-851a	VD-851b	VD-851c	VD-851d	VD-851e	VD-851f	VD-851g	VD-851h	VD-551a
Rock:	rim	core	rim	rim	core	core	rim	core	rim	core	rim	core	rim	core	rim	core
SiO_2	52.09	52.93	53.10	51.64	52.26	52.26	52.18	52.03	52.37	52.24	52.48	52.37	52.52	52.61	51.94	52.14
TiO_2	0.57	0.44	0.48	0.97	0.62	0.78	0.69	0.76	1.00	0.46	0.55	0.49	0.39	0.84	0.94	0.43
Al_2O_3	1.89	1.80	1.74	2.57	2.12	1.82	1.98	2.17	1.93	2.21	2.00	1.91	1.81	1.67	1.89	2.59
Cr_2O_3	0.33	0.38	0.34	0.40	0.34	0.34	0.24	0.46	0.45	0.59	0.41	0.59	0.53	0.49	0.59	0.90
MgO	16.24	19.78	18.87	15.10	15.81	15.61	15.65	16.07	16.19	15.98	18.90	16.65	18.51	16.16	15.99	16.88
FeO	7.31	9.54	10.40	7.44	6.90	7.80	7.26	7.22	7.22	6.74	9.08	6.33	8.11	7.16	6.99	5.30
MnO	0.17	0.26	0.21	0.24	0.17	0.25	0.15	0.19	0.22	0.15	0.23	0.15	0.19	0.14	0.20	0.12
NiO	0.08	0.08	0.04	0.04	0.04	0.04	0.02	0.01	0.00	0.09	0.08	0.02	0.09	0.02	-	0.01
CaO	20.53	14.80	14.57	21.58	21.11	20.48	21.20	20.06	19.88	20.46	17.01	20.25	17.85	20.06	20.40	20.74
Na_2O	0.28	0.20	0.17	0.38	0.27	0.37	0.29	0.32	0.35	0.32	0.19	0.23	0.22	0.30	0.32	0.30
K_2O	-	-	0.03	0.03	-	0.01	-	-	-	0.01	-	0.03	-	0.01	-	0.01
Total	99.49	100.21	99.94	100.39	99.65	99.77	99.66	99.29	99.61	99.25	100.93	99.02	100.22	99.46	99.26	99.41

Cations normalized to 4 cations

	VD-599b	VD-599c	VD-599d	VD-599e	VD-599f	VD-599g	VD-599h	VD-851a	VD-851b	VD-851c	VD-851d	VD-851e	VD-851f	VD-851g	VD-851h	VD-551a
Si	1.928	1.930	1.952	1.903	1.933	1.936	1.932	1.931	1.938	1.937	1.905	1.942	1.918	1.950	1.930	1.918
Ti	0.016	0.012	0.013	0.027	0.017	0.022	0.019	0.021	0.028	0.013	0.015	0.014	0.011	0.023	0.026	0.012
Al	0.082	0.077	0.075	0.112	0.092	0.079	0.086	0.095	0.084	0.097	0.086	0.083	0.078	0.073	0.083	0.112
Cr	0.010	0.011	0.010	0.012	0.010	0.010	0.007	0.013	0.013	0.017	0.012	0.017	0.015	0.014	0.017	0.026
Mg	0.896	1.076	1.034	0.829	0.871	0.862	0.864	0.889	0.893	0.883	1.023	0.920	1.008	0.893	0.885	0.926
Fe	0.226	0.291	0.320	0.229	0.213	0.242	0.225	0.224	0.224	0.209	0.276	0.196	0.248	0.222	0.217	0.163
Mn	0.005	0.008	0.007	0.007	0.005	0.008	0.005	0.006	0.007	0.005	0.007	0.005	0.006	0.004	0.006	0.004
Ni	0.002	0.002	0.001	0.001	0.001	0.001	0.001	-	-	0.003	0.002	0.001	0.003	0.001	-	-
Ca	0.814	0.578	0.574	0.852	0.837	0.813	0.841	0.798	0.788	0.813	0.662	0.804	0.699	0.797	0.812	0.817
Na	0.020	0.014	0.012	0.027	0.019	0.027	0.021	0.023	0.025	0.023	0.013	0.017	0.016	0.022	0.023	0.021
K	-	-	0.001	0.001	-	-	-	-	-	-	-	0.001	-	-	-	-
O	5.980	5.979	6.001	5.977	5.992	5.989	5.987	5.994	6.002	5.995	5.962	5.997	5.968	6.006	5.994	5.988

4. Average clinopyroxene analyses from layered series of Megacycle #4, Figure A-7 (cont.)

Major elements in wt.%

Sample:	VD-551b	VD-551c	VD-551d	VD-551e	VD-551f	VD-551g	VD-551h	VD-554a	VD-554b	VD-554c	VD-554d	VD-554e	VD-554f	VD-554g	VD-554h
Rock:	rim	core	rim	core	rim	rim	core	core	rim	core	rim	core	rim	core	rim
SiO_2	51.92	52.91	53.12	51.81	52.58	52.22	53.06	53.57	52.44	52.05	52.20	51.99	51.88	51.99	52.35
TiO_2	0.48	0.40	0.41	0.49	0.67	0.43	0.40	0.27	0.69	0.48	0.47	0.41	0.51	0.50	0.55
Al_2O_3	2.73	2.46	2.42	2.70	2.35	2.53	2.38	1.89	2.11	2.58	2.30	2.00	2.36	2.41	2.35
Cr_2O_3	0.85	0.85	0.72	0.78	0.77	0.91	0.76	0.46	0.52	0.74	0.71	0.22	0.59	0.89	0.49
MgO	16.44	18.67	18.22	16.05	17.54	17.21	19.25	22.77	18.85	16.63	16.47	16.58	16.25	17.66	16.19
FeO	5.99	7.69	7.66	5.86	7.64	6.84	7.49	9.97	9.56	6.81	7.60	6.88	7.31	6.96	7.04
MnO	0.20	0.17	0.18	0.11	0.21	0.20	0.20	0.22	0.25	0.16	0.20	0.17	0.15	0.14	0.11
NiO	0.03	0.08	0.06	0.07	0.08	0.04	0.03	0.11	-	0.03	-	0.01	0.05	0.04	-
CaO	20.50	17.14	17.69	20.86	17.91	18.94	16.08	9.84	15.82	20.27	20.55	20.68	20.23	18.41	20.47
Na_2O	0.30	0.24	0.25	0.28	0.26	0.30	0.23	0.13	0.28	0.31	0.37	0.32	0.35	0.28	0.40
K_2O	-	-	-	-	0.01	-	-	-	-	-	-	0.01	-	-	-
Total	99.44	100.61	100.73	99.01	100.03	99.63	99.88	99.22	100.52	100.07	100.87	99.27	99.68	99.28	99.95

Cations normalized to 4 cations

	VD-551b	VD-551c	VD-551d	VD-551e	VD-551f	VD-551g	VD-551h	VD-554a	VD-554b	VD-554c	VD-554d	VD-554e	VD-554f	VD-554g	VD-554h
Si	1.916	1.922	1.931	1.922	1.930	1.921	1.936	1.953	1.913	1.910	1.904	1.921	1.915	1.917	1.926
Ti	0.013	0.011	0.011	0.014	0.018	0.012	0.011	0.007	0.019	0.013	0.013	0.011	0.014	0.014	0.015
Al	0.119	0.105	0.104	0.118	0.102	0.110	0.102	0.081	0.091	0.112	0.099	0.087	0.103	0.105	0.102
Cr	0.025	0.024	0.021	0.023	0.022	0.026	0.022	0.013	0.015	0.021	0.020	0.006	0.017	0.026	0.014
Mg	0.904	1.011	0.987	0.887	0.960	0.944	1.048	1.238	1.025	0.910	0.896	0.913	0.894	0.971	0.888
Fe	0.185	0.234	0.233	0.182	0.235	0.211	0.229	0.304	0.292	0.209	0.232	0.213	0.226	0.215	0.217
Mn	0.006	0.005	0.006	0.003	0.007	0.006	0.006	0.007	0.008	0.005	0.006	0.005	0.005	0.004	0.003
Ni	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.003	-	0.001	-	-	0.001	0.001	-
Ca	0.810	0.667	0.689	0.829	0.704	0.747	0.629	0.384	0.618	0.797	0.803	0.819	0.800	0.727	0.807
Na	0.021	0.017	0.018	0.020	0.019	0.021	0.016	0.009	0.020	0.022	0.026	0.023	0.025	0.020	0.029
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.990	5.990	5.995	5.996	6.001	5.991	6.001	6.003	5.974	5.979	5.964	5.968	5.976	5.986	5.985

APPENDIX D.I

1. Orthopyroxene analyses in Last Join section of Keel dyke, Figure A-3.

Major elements in wt.%																			
Sample:	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10	LJ-10
Rock:	core	core	rim	core	core	core	rim	core	core	core	core	rim	core	core	core	rim	core	core	core
SiO_2	52.58	53.93	53.08	53.38	54.68	54.45	53.08	54.17	54.47	54.45	54.68	53.18	54.60	54.04	54.64	52.20	54.15	54.34	53.89
TiO_2	0.51	0.43	0.45	0.47	0.28	0.26	0.43	0.37	0.22	0.29	0.19	0.36	0.26	0.30	0.29	0.66	0.30	0.26	0.23
Al_2O_3	1.00	1.17	1.19	1.33	1.42	1.43	1.27	1.29	1.33	1.46	1.24	1.34	1.19	1.50	1.35	1.14	1.46	1.40	0.97
Cr_2O_3	0.02	0.09	0.05	0.11	0.24	0.19	0.09	0.12	0.17	0.18	0.19	0.10	0.14	0.19	0.18	0.09	0.14	0.26	0.12
MgO	22.67	25.67	23.25	25.62	27.69	27.94	24.36	26.93	28.14	27.74	27.81	24.69	27.74	27.71	27.66	22.44	27.79	27.81	25.24
FeO	20.53	16.03	19.35	16.79	13.71	13.46	18.24	14.42	13.08	12.70	13.08	17.32	13.41	12.84	13.20	20.51	12.89	13.33	18.11
MnO	0.37	0.37	0.28	0.31	0.29	0.26	0.42	0.31	0.32	0.29	0.23	0.32	0.23	0.24	0.24	0.31	0.26	0.30	0.41
NiO	0.09	0.02	0.09	0.11	0.06	-	-	0.12	0.05	-	0.09	0.07	0.08	0.05	0.09	-	0.05	0.06	0.02
CaO	2.12	2.24	2.25	2.33	2.37	2.34	2.18	2.33	2.41	2.38	2.37	2.23	2.35	2.33	2.36	2.02	2.36	2.42	1.31
Na_2O	0.03	0.03	0.03	0.03	0.02	0.03	0.01	0.01	0.05	0.05	0.04	0.05	0.03	0.04	0.02	0.03	0.02	0.07	0.02
K_2O	-	-	-	-	-	0.01	-	-	0.01	-	-	-	-	-	-	-	0.01	-	0.01
Total	99.93	99.98	100.01	100.48	100.77	100.36	100.08	100.07	100.25	99.54	99.92	99.66	100.02	99.24	100.03	99.39	99.43	100.25	100.33
Cations normalized to 4 cations																			
Si	1.950	1.958	1.957	1.932	1.946	1.941	1.943	1.949	1.941	1.955	1.958	1.948	1.955	1.947	1.957	1.948	1.947	1.940	1.962
Ti	0.014	0.012	0.012	0.013	0.007	0.007	0.012	0.010	0.006	0.008	0.005	0.010	0.007	0.008	0.008	0.019	0.008	0.007	0.006
Al	0.044	0.050	0.052	0.057	0.060	0.060	0.055	0.055	0.056	0.062	0.052	0.058	0.050	0.064	0.057	0.050	0.062	0.059	0.042
Cr	0.001	0.003	0.001	0.003	0.007	0.005	0.003	0.003	0.005	0.005	0.005	0.003	0.004	0.005	0.005	0.003	0.004	0.007	0.003
Mg	1.253	1.389	1.278	1.382	1.469	1.485	1.330	1.445	1.495	1.485	1.484	1.348	1.481	1.488	1.477	1.248	1.490	1.480	1.370
Fe	0.637	0.487	0.597	0.508	0.408	0.401	0.559	0.434	0.390	0.381	0.392	0.530	0.401	0.387	0.395	0.640	0.388	0.398	0.551
Mn	0.012	0.011	0.009	0.010	0.009	0.008	0.013	0.009	0.010	0.009	0.007	0.010	0.007	0.007	0.007	0.010	0.008	0.009	0.013
Ni	0.003	0.001	0.003	0.003	0.002	-	-	0.003	0.001	-	0.003	0.002	0.002	0.001	0.003	-	0.001	0.002	0.001
Ca	0.084	0.087	0.089	0.090	0.090	0.089	0.086	0.090	0.092	0.092	0.091	0.088	0.090	0.090	0.091	0.081	0.091	0.093	0.051
Na	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.003	0.003	0.003	0.004	0.002	0.003	0.001	0.002	0.001	0.005	0.001
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.986	5.995	5.995	5.973	5.986	5.980	5.984	5.988	5.976	5.994	5.990	5.986	5.988	5.988	5.995	5.992	5.987	5.978	5.989

Major elements in wt.%																			
Sample:	LJ-18	LJ-18	LJ-18	LJ-18	LJ-13	LJ-13	LJ-13	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-11	LJ-12	LJ-12
Rock:	core	rim	core	core	core	core	core	core	core	core	rim	core	rim	core	core	core	core	core	core
SiO_2	54.79	54.51	55.02	54.23	54.13	53.93	54.38	54.51	53.74	53.89	54.02	54.27	54.04	54.06	54.08	54.45	53.70	53.38	53.61
TiO_2	0.20	0.26	0.21	0.66	0.52	0.65	0.56	0.25	0.40	0.37	0.38	0.27	0.30	0.24	0.37	0.32	0.37	0.63	0.54
Al_2O_3	1.66	1.73	1.37	1.60	1.24	1.55	1.53	1.29	1.49	1.56	1.23	1.29	1.26	1.53	1.42	1.28	1.35	1.56	1.49
Cr_2O_3	0.50	0.43	0.37	0.29	0.17	0.23	0.29	0.26	0.13	0.21	0.20	0.27	0.17	0.40	0.17	0.18	0.14	0.23	0.19
MgO	30.01	28.77	30.01	28.77	27.74	27.69	27.46	28.16	27.03	27.44	26.93	28.32	27.23	27.84	27.49	27.10	26.85	26.95	27.46
FeO	11.04	12.40	11.17	13.15	14.73	14.42	14.28	13.37	14.32	14.19	14.96	12.64	15.23	13.39	13.65	14.56	15.54	15.14	15.18
MnO	0.19	0.21	0.24	0.25	0.38	0.24	0.23	0.30	0.25	0.29	0.32	0.29	0.28	0.28	0.26	0.26	0.32	0.30	0.26
NiO	0.09	0.02	0.04	0.07	0.04	-	0.03	0.05	0.05	0.04	0.05	0.08	0.04	0.03	0.14	0.06	-	0.11	0.09
CaO	2.22	2.17	2.24	1.89	1.70	1.71	1.95	2.33	2.31	2.26	2.04	2.41	1.56	2.53	2.30	2.34	2.20	2.04	1.94
Na_2O	0.03	0.05	0.02	0.03	0.03	0.06	0.02	0.03	0.05	0.05	0.05	0.03	0.02	0.05	0.03	0.03	0.06	0.06	0.06
K_2O	-	-	-	0.01	-	-	0.01	-	0.03	-	-	-	-	-	-	-	-	-	0.01
Total	100.73	100.55	100.70	100.95	100.68	100.49	100.74	100.54	99.80	100.30	100.18	99.88	100.13	100.36	99.92	100.57	100.53	100.40	100.83
Cations normalized to 4 cations																			
Si	1.923	1.930	1.933	1.918	1.933	1.927	1.941	1.939	1.936	1.929	1.944	1.939	1.944	1.928	1.941	1.949	1.927	1.917	1.914
Ti	0.005	0.007	0.006	0.018	0.014	0.017	0.015	0.007	0.011	0.010	0.010	0.007	0.008	0.006	0.010	0.009	0.010	0.017	0.014
Al	0.069	0.072	0.057	0.067	0.052	0.065	0.064	0.054	0.063	0.066	0.052	0.054	0.053	0.064	0.060	0.054	0.057	0.066	0.063
Cr	0.014	0.012	0.010	0.008	0.005	0.007	0.008	0.007	0.004	0.006	0.006	0.008	0.005	0.011	0.005	0.005	0.004	0.007	0.005
Mg	1.571	1.519	1.572	1.517	1.477	1.475	1.461	1.493	1.452	1.464	1.445	1.509	1.460	1.481	1.471	1.446	1.437	1.443	1.461
Fe	0.324	0.367	0.328	0.389	0.440	0.431	0.426	0.398	0.431	0.425	0.450	0.378	0.458	0.400	0.410	0.436	0.466	0.455	0.453
Mn	0.006	0.006	0.007	0.007	0.011	0.007	0.007	0.009	0.008	0.009	0.010	0.009	0.009	0.008	0.008	0.008	0.010	0.009	0.008
Ni	0.003	0.001	0.001	0.002	0.001	-	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.004	0.002	-	0.003	0.003
Ca	0.084	0.082	0.084	0.072	0.065	0.065	0.075	0.089	0.089	0.087	0.079	0.092	0.060	0.097	0.088	0.090	0.085	0.079	0.074
Na	0.002	0.003	0.001	0.002	0.002	0.004	0.001	0.002	0.003	0.003	0.003	0.002	0.001	0.003	0.002	0.002	0.004	0.004	0.004
K	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-
O	5.969	5.978	5.972	5.972	5.974	5.979	5.991	5.976	5.978	5.973	5.981	5.976	5.981	5.971	5.983	5.986	5.966	5.969	5.960

1. Orthopyroxene analyses in Last Join section of Keel dyke, Figure A-3 (cont.)

Major elements in wt.%																		
Sample:	LJ-12	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-15	LJ-16	LJ-16	LJ-16	LJ-16	LJ-16	LJ-16	LJ-17	LJ-17	LJ-17
Rock:	core	core	rim	core	core	core	core	core	core	core	rim	core	rim	core	core	core	core	rim
SiO_2	53.85	55.45	55.30	55.00	55.22	55.24	55.02	55.13	54.77	55.19	54.00	54.08	54.60	54.98	54.55	55.79	55.75	55.77
TiO_2	0.58	0.21	0.28	0.26	0.23	0.25	0.49	0.48	0.61	0.11	0.27	0.62	0.36	0.24	0.72	0.15	0.18	0.22
Al_2O_3	1.45	1.72	1.78	1.66	1.65	1.47	1.56	1.62	1.34	1.14	1.71	1.48	0.95	1.76	1.50	1.92	1.86	1.63
Cr_2O_3	0.24	0.47	0.55	0.49	0.50	0.48	0.36	0.43	0.35	0.38	0.59	0.32	0.14	0.50	0.29	0.56	0.55	0.48
MgO	27.36	28.82	28.52	28.66	29.02	28.79	28.07	27.76	29.40	30.60	29.45	29.50	29.58	29.47	29.37	29.30	29.29	28.51
FeO	15.23	9.90	11.44	10.69	10.84	10.83	12.07	11.81	12.32	10.71	11.67	12.15	12.20	10.57	12.30	10.02	10.08	10.66
MnO	0.26	0.17	0.19	0.25	0.19	0.28	0.26	0.32	0.28	0.22	0.24	0.27	0.25	0.26	0.24	0.23	0.24	0.22
NiO	0.01	0.05	-	0.04	0.08	-	0.05	0.03	-	0.08	-	0.08	0.08	0.05	0.10	-	0.04	-
CaO	1.74	2.23	2.06	2.14	2.23	2.12	1.93	2.00	1.66	2.30	2.17	1.93	1.44	2.27	1.79	2.59	2.34	2.19
Na_2O	0.03	0.03	0.04	0.06	0.04	0.03	0.03	-	0.04	0.04	0.04	0.05	0.05	0.04	0.04	0.06	0.05	0.03
K_2O	-	-	0.01	-	-	-	0.02	-	-	-	-	-	-	-	-	-	0.01	-
Total	100.75	99.05	100.17	99.25	100.00	99.48	99.87	99.58	100.77	100.77	100.14	100.48	99.65	100.14	100.90	100.62	100.38	99.71
Cations normalized to 4 cations																		
Si	1.925	1.982	1.965	1.967	1.959	1.971	1.967	1.979	1.933	1.932	1.912	1.912	1.944	1.943	1.924	1.962	1.966	1.988
Ti	0.016	0.006	0.007	0.007	0.006	0.007	0.013	0.013	0.016	0.003	0.007	0.016	0.010	0.006	0.019	0.004	0.005	0.006
Al	0.061	0.072	0.075	0.070	0.069	0.062	0.066	0.069	0.056	0.047	0.071	0.062	0.040	0.073	0.062	0.080	0.077	0.068
Cr	0.007	0.013	0.015	0.014	0.014	0.014	0.010	0.012	0.010	0.011	0.017	0.009	0.004	0.014	0.008	0.016	0.015	0.014
Mg	1.459	1.536	1.511	1.528	1.535	1.532	1.496	1.485	1.547	1.596	1.555	1.555	1.571	1.553	1.544	1.536	1.539	1.514
Fe	0.456	0.296	0.340	0.320	0.322	0.323	0.361	0.355	0.364	0.313	0.346	0.359	0.363	0.312	0.363	0.295	0.297	0.318
Mn	0.008	0.005	0.006	0.008	0.006	0.008	0.008	0.010	0.008	0.007	0.007	0.008	0.008	0.008	0.007	0.007	0.007	0.007
Ni	-	0.001	-	0.001	0.002	-	0.001	0.001	-	0.002	-	0.002	0.002	0.001	0.003	-	0.001	-
Ca	0.067	0.085	0.078	0.082	0.085	0.081	0.074	0.077	0.063	0.086	0.082	0.073	0.055	0.086	0.068	0.098	0.088	0.084
Na	0.002	0.002	0.003	0.004	0.003	0.002	0.002	-	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.002
K	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-
O	5.974	6.030	6.016	6.014	6.005	6.015	6.017	6.032	5.981	5.962	5.962	5.962	5.974	5.992	5.977	6.011	6.015	6.034

Major elements in wt.%																		
Sample:	LJ-17	LJ-17	LJ-17	LJ-17	LJ-17	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-19	LJ-20	LJ-20	LJ-20
Rock:	core	core	core	core	core	core	core	rim	core	core	core	core	core	rim	core	core	rim	rim
SiO_2	55.22	55.54	55.97	55.58	54.70	54.64	55.11	54.40	54.98	54.87	54.83	55.19	55.41	54.72	55.75	54.02	54.06	53.80
TiO_2	0.57	0.24	0.21	0.49	0.67	0.20	0.26	0.25	0.21	0.23	0.19	0.24	0.15	0.19	0.17	0.22	0.44	0.20
Al_2O_3	1.16	1.46	1.38	1.11	1.58	1.66	1.74	1.27	1.46	1.53	1.54	1.66	1.17	1.39	1.16	1.30	1.22	1.33
Cr_2O_3	0.24	0.44	0.33	0.22	0.29	0.34	0.35	0.19	0.31	0.23	0.38	0.30	0.31	0.25	0.25	0.23	0.20	0.26
MgO	28.41	28.94	29.17	29.00	28.61	28.79	29.37	26.60	27.53	28.80	26.93	28.24	28.31	26.28	27.71	28.21	26.75	26.81
FeO	11.96	10.60	11.49	11.17	11.79	11.83	11.04	15.53	12.97	10.85	12.97	12.27	11.27	14.10	11.53	13.95	14.99	15.55
MnO	0.30	0.20	0.26	0.25	0.23	0.21	0.28	0.26	0.27	0.19	0.26	0.20	0.30	0.29	0.29	0.32	0.24	0.30
NiO	-	0.01	-	0.06	-	0.10	0.06	0.02	0.05	0.06	0.04	0.01	-	0.07	-	0.05	0.04	0.07
CaO	1.47	2.11	2.15	1.90	1.89	2.31	2.47	2.17	2.30	2.31	2.32	2.25	2.17	2.27	2.20	2.34	1.76	2.20
Na_2O	0.04	0.06	0.06	0.06	0.06	0.03	0.01	0.07	0.03	0.01	0.05	0.03	0.03	0.04	0.06	0.03	0.02	0.02
K_2O	-	-	-	0.01	-	-	0.01	-	0.01	-	0.01	-	-	-	-	-	-	-
Total	99.36	99.59	101.02	99.85	99.82	100.11	100.70	100.76	100.12	99.09	99.52	100.40	99.12	99.61	99.12	100.66	99.72	100.55
Cations normalized to 4 cations																		
Si	1.982	1.977	1.968	1.977	1.951	1.941	1.940	1.950	1.967	1.964	1.977	1.961	1.989	1.981	2.007	1.921	1.956	1.932
Ti	0.015	0.006	0.006	0.013	0.018	0.005	0.007	0.007	0.006	0.006	0.005	0.006	0.004	0.005	0.005	0.006	0.012	0.005
Al	0.049	0.061	0.057	0.047	0.066	0.069	0.072	0.054	0.062	0.065	0.065	0.070	0.050	0.059	0.049	0.054	0.052	0.056
Cr	0.007	0.012	0.009	0.006	0.008	0.010	0.010	0.005	0.009	0.007	0.011	0.008	0.009	0.007	0.007	0.006	0.006	0.007
Mg	1.520	1.536	1.529	1.538	1.521	1.524	1.541	1.422	1.468	1.537	1.448	1.496	1.515	1.419	1.487	1.495	1.443	1.435
Fe	0.359	0.316	0.338	0.332	0.352	0.351	0.325	0.466	0.388	0.325	0.391	0.365	0.338	0.427	0.347	0.415	0.453	0.467
Mn	0.009	0.006	0.008	0.008	0.007	0.006	0.008	0.008	0.008	0.006	0.008	0.006	0.009	0.009	0.009	0.010	0.007	0.009
Ni	-	-	-	0.002	-	0.003	0.002	0.001	0.001	0.002	0.001	-	-	0.002	-	0.001	0.001	0.002
Ca	0.057	0.080	0.081	0.072	0.072	0.088	0.093	0.083	0.088	0.089	0.090	0.086	0.083	0.088	0.085	0.089	0.068	0.085
Na	0.003	0.004	0.004	0.004	0.004	0.002	0.001	0.005	0.002	0.001	0.003	0.002	0.002	0.003	0.004	0.002	0.001	0.001
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	6.023	6.019	6.005	6.015	6.004	5.985	5.988	5.984	6.007	6.006	6.018	6.005	6.022	6.018	6.038	5.956	5.996	5.968

1. **Orthopyroxene analyses in Last Join section of Keel dyke, Figure A-3** (cont.)

Major elements in wt.%																		
Sample:	LJ-20	LJ-20	LJ-20	LJ-20	LJ-20	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-21	LJ-4	LJ-4
Rock:	core	core	core	rim	core	core	rim	core	core	core	core	core	rim	core	core	core	core	core
SiO_2	54.47	54.57	54.36	53.74	53.89	53.70	52.97	54.38	54.47	53.87	54.98	55.11	53.48	54.92	53.91	54.42	52.01	51.64
TiO_2	0.22	0.19	0.17	0.44	0.16	0.22	0.57	0.20	0.19	0.28	0.14	0.16	0.40	0.28	0.21	0.21	0.30	0.32
Al_2O_3	1.29	1.37	1.08	1.28	1.00	1.22	1.30	1.39	1.33	1.13	1.04	1.20	1.20	1.44	1.24	1.30	0.54	0.57
Cr_2O_3	0.25	0.26	0.24	0.18	0.24	0.20	0.06	0.26	0.22	0.17	0.26	0.14	0.11	0.21	0.25	0.21	-	0.03
MgO	27.76	28.69	28.54	25.99	28.29	24.94	23.96	27.93	27.69	24.72	28.37	27.99	24.39	27.69	26.65	27.18	18.95	18.77
FeO	14.13	12.37	12.59	15.46	13.16	17.11	19.28	12.78	14.06	17.75	13.10	12.90	18.11	12.68	14.86	14.06	26.86	27.65
MnO	0.30	0.21	0.30	0.31	0.30	0.30	0.35	0.34	0.26	0.33	0.19	0.22	0.38	0.28	0.25	0.20	0.41	0.49
NiO	0.02	0.01	0.04	0.11	0.02	0.05	0.02	0.04	0.05	0.02	0.02	0.02	0.09	0.09	0.04	0.06	0.04	0.03
CaO	2.25	2.35	2.34	2.09	2.19	2.24	1.90	2.35	2.26	2.10	2.33	2.27	1.94	2.09	2.25	2.31	1.58	1.29
Na_2O	0.06	0.05	0.04	0.01	0.06	0.04	0.01	0.05	0.05	0.03	0.06	0.04	0.02	0.02	0.06	0.02	0.01	0.02
K_2O	-	-	0.01	-	-	0.02	-	-	0.02	-	0.01	-	-	-	-	-	0.03	-
Total	100.74	100.08	99.71	99.61	99.31	100.04	100.43	99.72	100.60	100.41	100.50	100.05	100.13	99.70	99.72	99.98	100.73	100.81
Cations normalized to 4 cations																		
Si	1.939	1.941	1.943	1.954	1.937	1.957	1.940	1.949	1.942	1.961	1.954	1.968	1.957	1.971	1.949	1.956	1.968	1.957
Ti	0.006	0.005	0.005	0.012	0.004	0.006	0.016	0.005	0.005	0.008	0.004	0.004	0.011	0.008	0.006	0.006	0.009	0.009
Al	0.054	0.057	0.045	0.055	0.042	0.052	0.056	0.059	0.056	0.048	0.044	0.051	0.052	0.061	0.053	0.055	0.024	0.025
Cr	0.007	0.007	0.007	0.005	0.007	0.006	0.002	0.007	0.006	0.005	0.007	0.004	0.003	0.006	0.007	0.006	-	0.001
Mg	1.473	1.521	1.521	1.409	1.516	1.355	1.309	1.492	1.472	1.342	1.503	1.491	1.331	1.481	1.436	1.456	1.069	1.061
Fe	0.421	0.368	0.376	0.470	0.396	0.522	0.591	0.383	0.419	0.541	0.389	0.385	0.554	0.381	0.449	0.423	0.850	0.876
Mn	0.009	0.006	0.009	0.010	0.009	0.009	0.011	0.010	0.008	0.010	0.006	0.007	0.012	0.009	0.008	0.006	0.013	0.016
Ni	0.001	-	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.003	0.001	0.002	0.001	0.001
Ca	0.086	0.090	0.090	0.081	0.084	0.087	0.075	0.090	0.086	0.082	0.089	0.087	0.076	0.080	0.087	0.089	0.064	0.052
Na	0.004	0.003	0.003	0.001	0.004	0.003	0.001	0.003	0.003	0.002	0.004	0.003	0.001	0.001	0.004	0.001	0.001	0.001
K	-	-	-	-	-	0.001	-	-	0.001	-	-	-	-	-	-	-	0.001	-
O	5.974	5.977	5.972	5.996	5.964	5.990	5.985	5.985	5.976	5.995	5.981	5.999	5.995	6.011	5.982	5.992	5.987	5.979

Major elements in wt.%																		
Sample:	LJ-4	LJ-6	LJ-6	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-8	LJ-9	LJ-9	LJ-9	LJ-9
Rock:	core	core	core	core	core	core	core	core	rim	core	core	core	core	core	core	rim	core	core
SiO_2	51.73	51.75	51.96	54.13	53.48	54.27	52.48	54.38	52.54	54.15	53.72	52.03	52.52	52.80	53.16	53.08	52.73	53.18
TiO_2	0.19	0.23	0.30	0.33	0.34	0.30	0.72	0.35	0.54	0.35	0.40	0.65	0.59	0.36	0.64	0.56	0.72	0.53
Al_2O_3	0.46	0.49	0.99	1.15	1.27	1.15	1.39	1.41	1.17	1.23	1.35	1.18	1.21	0.98	1.06	1.11	1.53	1.05
Cr_2O_3	0.03	0.02	0.05	0.14	0.22	0.19	0.05	0.19	0.13	0.24	0.22	0.11	0.06	0.12	0.05	0.03	0.10	0.08
MgO	18.77	18.67	19.34	26.65	25.97	26.50	23.12	27.08	22.88	26.70	26.83	23.13	22.40	23.43	24.16	23.58	24.03	23.73
FeO	27.23	27.08	22.59	14.78	15.19	14.60	19.34	14.46	19.72	14.92	14.58	20.00	20.46	20.53	18.53	19.49	18.42	19.67
MnO	0.49	0.50	0.43	0.22	0.29	0.26	0.31	0.32	0.38	0.29	0.29	0.36	0.42	0.38	0.38	0.40	0.29	0.41
NiO	0.07	0.04	0.04	0.15	0.04	0.05	0.05	0.05	0.01	0.01	0.05	0.10	0.09	-	-	-	-	0.06
CaO	1.44	1.35	4.63	2.35	2.32	2.36	2.20	2.35	2.13	1.91	2.35	2.06	2.05	1.47	2.09	1.93	2.21	1.95
Na_2O	0.03	0.01	0.08	0.03	0.05	0.04	0.05	0.03	0.08	0.02	0.03	0.07	0.04	0.01	0.06	0.05	0.02	0.05
K_2O	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01	-	-	-	0.01
Total	100.45	100.14	100.41	99.93	99.18	99.73	99.70	100.62	99.59	99.82	99.82	99.70	99.85	100.09	100.13	100.23	100.05	100.72
Cations normalized to 4 cations																		
Si	1.966	1.973	1.949	1.954	1.950	1.963	1.942	1.946	1.950	1.957	1.939	1.928	1.951	1.949	1.949	1.952	1.935	1.946
Ti	0.005	0.007	0.008	0.009	0.009	0.008	0.020	0.009	0.015	0.010	0.011	0.018	0.016	0.010	0.018	0.015	0.020	0.015
Al	0.021	0.022	0.044	0.049	0.055	0.049	0.061	0.059	0.051	0.052	0.057	0.052	0.053	0.043	0.046	0.048	0.066	0.045
Cr	0.001	0.001	0.001	0.004	0.006	0.005	0.001	0.005	0.004	0.007	0.006	0.003	0.002	0.004	0.001	0.001	0.003	0.002
Mg	1.063	1.061	1.081	1.434	1.412	1.429	1.275	1.444	1.266	1.439	1.444	1.278	1.241	1.290	1.320	1.293	1.314	1.295
Fe	0.865	0.863	0.709	0.446	0.463	0.442	0.598	0.433	0.612	0.451	0.440	0.620	0.636	0.634	0.568	0.599	0.565	0.602
Mn	0.016	0.016	0.014	0.007	0.009	0.008	0.010	0.010	0.012	0.009	0.009	0.011	0.013	0.012	0.012	0.012	0.009	0.013
Ni	0.002	0.001	0.001	0.004	0.001	0.001	0.001	0.001	-	-	0.001	0.003	0.003	-	-	-	-	0.002
Ca	0.059	0.055	0.186	0.091	0.091	0.091	0.087	0.090	0.085	0.074	0.091	0.082	0.082	0.058	0.082	0.076	0.087	0.076
Na	0.002	0.001	0.006	0.002	0.004	0.003	0.004	0.002	0.006	0.001	0.002	0.005	0.003	0.001	0.004	0.004	0.001	0.004
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.981	5.990	5.978	5.988	5.988	5.997	5.991	5.986	5.989	5.996	5.980	5.971	5.994	5.982	5.988	5.990	5.988	5.983

1. Orthopyroxene analyses in Last Join section of Keel dyke, Figure A-3 (cont.)

Major elements in wt.%																	
Sample:	LJ-9	LJ-9	LJ-9	LJ-9	LJ-9	LJ-9	LJ-9	LJ-9	LJ-9	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14	LJ-14
Rock:	core	rim	core	core	core	core	core	core	rim	core	core	core	rim	core	rim	core	core
SiO_2	52.46	52.44	52.65	52.52	53.27	52.78	52.56	53.83	52.44	54.66	54.72	54.38	54.62	54.62	53.85	54.66	54.68
TiO_2	0.37	0.47	0.66	0.63	0.63	0.67	0.70	0.31	0.48	0.27	0.24	0.23	0.37	0.40	0.67	0.19	0.64
Al_2O_3	1.14	1.28	1.29	1.53	1.38	1.41	1.41	1.41	1.15	1.82	1.88	1.82	1.43	1.55	1.42	1.43	1.53
Cr_2O_3	0.07	0.08	0.11	0.15	0.09	0.10	0.08	0.15	0.14	0.48	0.57	0.56	0.39	0.32	0.34	0.39	0.30
MgO	23.90	23.81	24.03	24.71	25.04	24.34	23.58	26.73	24.26	29.12	28.95	28.92	28.82	28.64	28.44	29.17	28.61
FeO	19.95	20.40	19.23	17.47	17.46	18.49	19.12	14.49	19.30	11.87	12.12	11.73	12.24	12.26	13.20	11.72	12.69
MnO	0.39	0.34	0.34	0.27	0.34	0.32	0.34	0.29	0.31	0.32	0.25	0.24	0.31	0.30	0.30	0.19	0.26
NiO	0.02	0.02	0.01	0.08	0.09	0.05	0.02	0.04	0.05	0.12	-	0.04	0.04	0.04	0.05	-	0.04
CaO	1.48	1.64	2.15	2.32	2.23	2.07	2.22	2.40	1.94	2.27	2.24	2.23	1.90	2.26	1.87	2.30	2.05
Na_2O	-	0.01	0.04	0.01	0.02	0.05	0.04	0.03	0.04	0.05	0.01	-	-	-	-	-	-
K_2O	-	0.01	-	0.02	-	-	0.01	-	-	0.02	-	-	0.02	0.02	-	-	-
Total	99.78	100.50	100.51	99.71	100.55	100.28	100.08	99.67	100.10	101.00	100.99	100.15	100.14	100.41	100.14	100.05	100.80
Cations normalized to 4 cations																	
Si	1.936	1.924	1.926	1.924	1.934	1.930	1.934	1.945	1.924	1.924	1.929	1.930	1.943	1.939	1.923	1.940	1.937
Ti	0.010	0.013	0.018	0.017	0.017	0.018	0.019	0.008	0.013	0.007	0.006	0.006	0.010	0.011	0.018	0.005	0.017
Al	0.050	0.055	0.056	0.066	0.059	0.061	0.061	0.060	0.050	0.075	0.078	0.076	0.060	0.065	0.060	0.060	0.064
Cr	0.002	0.002	0.003	0.004	0.003	0.003	0.002	0.004	0.004	0.013	0.016	0.016	0.011	0.009	0.010	0.011	0.008
Mg	1.315	1.303	1.310	1.349	1.355	1.327	1.293	1.440	1.327	1.528	1.521	1.530	1.528	1.516	1.514	1.543	1.511
Fe	0.616	0.626	0.588	0.535	0.530	0.565	0.588	0.438	0.592	0.349	0.357	0.348	0.364	0.364	0.394	0.348	0.376
Mn	0.012	0.011	0.011	0.008	0.010	0.010	0.011	0.009	0.010	0.010	0.007	0.007	0.009	0.009	0.009	0.006	0.008
Ni	0.001	0.001	-	0.002	0.003	0.001	0.001	0.001	0.001	0.003	-	0.001	0.001	0.001	0.001	-	0.001
Ca	0.059	0.064	0.084	0.091	0.087	0.081	0.088	0.093	0.076	0.086	0.085	0.085	0.072	0.086	0.072	0.087	0.078
Na	-	0.001	0.003	0.001	0.001	0.004	0.003	0.002	0.003	0.003	0.001	-	-	-	-	-	-
K	-	-	-	0.001	-	-	-	-	-	0.001	-	-	0.001	0.001	-	-	-
O	5.972	5.965	5.972	5.976	5.982	5.978	5.983	5.984	5.962	5.973	5.982	5.982	5.988	5.986	5.975	5.980	5.990

APPENDIX D.II

1. Average orthopyroxene analyses from layered series of Megacycle #1, Figure A-5.

Major elements in wt.%									
Sample:	ES-11a	ES-11b	ES-11c	ES-11d	ES-11e	ES-11f	ES-11g	ES-11h	ES-11i
	rim	core	core	core	core	rim	core	core	rim
SiO_2	54.70	54.68	54.87	54.83	54.60	54.68	54.72	54.55	54.92
TiO_2	0.41	0.31	0.28	0.30	0.34	0.42	0.40	0.43	0.36
Al_2O_3	1.21	1.41	1.35	1.33	1.34	1.31	1.09	1.08	0.94
Cr_2O_3	0.36	0.33	0.42	0.36	0.32	0.41	0.26	0.27	0.19
MgO	29.53	29.93	30.26	30.15	29.88	29.60	30.10	29.92	29.95
FeO	12.27	10.95	11.36	11.07	11.32	12.13	12.06	11.96	11.68
MnO	0.29	0.17	0.20	0.28	0.15	0.26	0.29	0.30	0.30
NiO	-	-	0.03	-	0.06	0.05	0.04	0.05	0.04
CaO	1.84	2.26	2.17	2.21	2.32	1.93	1.62	1.62	1.32
Na_2O	0.02	0.02	0.03	0.03	0.03	0.02	0.05	0.03	0.02
K_2O	-	0.01	-	-	-	-	-	0.02	0.02
Total	100.64	100.07	100.98	100.56	100.36	100.81	100.63	100.23	99.74
Cations normalized to 4 cations									
Si	1.932	1.932	1.922	1.928	1.925	1.927	1.927	1.930	1.950
Ti	0.011	0.008	0.007	0.008	0.009	0.011	0.011	0.011	0.010
Al	0.050	0.059	0.056	0.055	0.056	0.054	0.045	0.045	0.039
Cr	0.010	0.009	0.012	0.010	0.009	0.011	0.007	0.008	0.005
Mg	1.555	1.576	1.580	1.580	1.571	1.555	1.580	1.578	1.586
Fe	0.362	0.323	0.333	0.325	0.334	0.358	0.355	0.354	0.347
Mn	0.009	0.005	0.006	0.008	0.004	0.008	0.009	0.009	0.009
Ni	-	-	0.001	-	0.002	0.001	0.001	0.001	0.001
Ca	0.070	0.086	0.081	0.083	0.088	0.073	0.061	0.061	0.050
Na	0.001	0.001	0.002	0.002	0.002	0.001	0.003	0.002	0.001
K	-	-	-	-	-	-	-	0.001	0.001
O	5.972	5.973	5.962	5.967	5.966	5.970	5.962	5.966	5.981

2. Average orthopyroxene analyses from layered series of Megacycle #3, Figure A-7.

Major elements in wt.%																
Sample:	SL-46a	SL-46b	SL-46c	SL-46d	V1-06a	V1-06b	V1-06c	V1-07a	V1-07b	V1-07c	V1-08a	V1-08b	V1-08c	V1-08d	V3-02a	V3-02b
	core	rim	core	rim	core	rim	core	core	rim	rim	core	core	core	core	rim	core
SiO_2	55.09	54.92	55.11	55.13	55.30	54.96	55.60	55.41	54.70	54.87	54.98	55.99	55.79	55.82	55.28	54.66
TiO_2	0.17	0.26	0.22	0.19	0.28	0.33	0.32	0.24	0.30	0.25	0.31	0.30	0.26	0.38	0.22	0.20
Al_2O_3	1.39	1.28	1.47	1.37	1.22	1.37	1.29	1.32	1.34	1.37	1.26	1.29	1.35	1.28	1.51	1.38
Cr_2O_3	0.37	0.33	0.43	0.43	-	-	-	-	0.37	0.34	0.32	0.28	0.34	0.32	0.40	0.44
MgO	30.71	31.16	30.61	30.63	30.46	30.66	30.53	30.68	29.98	29.98	29.72	29.87	29.88	30.10	29.65	29.87
FeO	10.95	10.90	10.68	10.92	9.87	9.99	9.88	10.23	10.30	10.25	10.06	10.61	10.36	9.99	11.17	10.86
MnO	0.25	0.24	0.20	0.24	0.19	0.22	0.23	0.23	0.20	0.26	0.23	0.21	0.23	0.24	0.15	0.26
NiO	0.07	-	0.04	0.07	0.06	0.07	0.07	0.07	0.13	0.11	0.06	0.03	0.08	0.02	0.04	0.05
CaO	1.65	1.60	1.80	1.72	2.07	1.64	2.15	2.10	2.17	2.25	2.14	1.95	2.12	2.12	2.23	2.37
Na_2O	0.02	0.05	0.03	0.03	0.02	0.02	0.02	0.06	0.02	0.03	0.07	0.04	0.03	0.04	0.03	0.01
K_2O	0.01	0.01	-	-	-	-	-	-	0.01	-	0.02	0.02	0.02	-	0.01	-
Total	100.68	100.75	100.59	100.73	99.47	99.26	100.09	100.34	99.52	99.71	99.16	100.58	100.46	100.30	100.69	100.10
Cations normalized to 4 cations																
Si	1.930	1.919	1.932	1.931	1.956	1.947	1.956	1.943	1.941	1.943	1.957	1.969	1.963	1.964	1.945	1.931
Ti	0.004	0.007	0.006	0.005	0.007	0.009	0.008	0.006	0.008	0.007	0.008	0.008	0.007	0.010	0.006	0.005
Al	0.057	0.053	0.061	0.057	0.051	0.057	0.053	0.055	0.056	0.057	0.053	0.053	0.056	0.053	0.063	0.057
Cr	0.010	0.009	0.012	0.012	-	-	-	-	0.010	0.010	0.009	0.008	0.009	0.009	0.011	0.012
Mg	1.604	1.623	1.600	1.600	1.606	1.619	1.601	1.604	1.586	1.582	1.577	1.566	1.568	1.579	1.555	1.573
Fe	0.321	0.318	0.313	0.320	0.292	0.296	0.291	0.300	0.306	0.303	0.299	0.312	0.305	0.294	0.329	0.321
Mn	0.007	0.007	0.006	0.007	0.006	0.007	0.007	0.007	0.006	0.008	0.007	0.006	0.007	0.007	0.004	0.008
Ni	0.002	-	0.001	0.002	0.002	0.002	0.002	0.002	0.004	0.003	0.002	0.001	0.002	0.001	0.001	0.001
Ca	0.062	0.060	0.068	0.065	0.078	0.062	0.081	0.079	0.082	0.085	0.082	0.073	0.080	0.080	0.084	0.090
Na	0.001	0.003	0.002	0.002	0.001	0.001	0.001	0.004	0.001	0.002	0.005	0.003	0.002	0.003	0.002	0.001
K	-	-	-	-	-	-	-	-	-	-	0.001	0.001	0.001	-	-	-
O	5.967	5.955	5.973	5.970	5.988	5.983	5.990	5.975	5.981	5.982	5.994	6.006	6.001	6.004	5.986	5.971

Major elements in wt.%																
Sample:	V3-02c	V3-02d	V3-02e	V3-02f	V3-02g	V3-02h	V3-02i	V3-02j	V3-03a	V3-03b	V3-03c	V3-03d	V3-03e	V3-04a	V3-04b	V3-04c
	core	core	rim	rim	core	core	core	core	rim	core	rim	core	core	rim	core	core
SiO_2	54.96	54.40	54.40	53.48	54.62	54.60	54.19	54.02	54.21	55.47	55.67	55.13	55.28	55.54	56.35	55.22
TiO_2	0.23	0.30	0.32	0.33	0.14	0.15	0.13	0.16	0.35	0.14	0.32	0.15	0.16	0.27	0.13	0.15
Al_2O_3	1.39	1.35	1.34	1.27	1.01	1.04	1.12	1.32	1.57	1.05	1.31	1.10	1.41	1.32	0.94	1.00
Cr_2O_3	0.42	0.46	0.33	0.49	0.51	0.47	0.51	0.55	0.36	0.42	0.38	0.36	0.34	0.42	0.39	0.39
MgO	30.20	29.63	30.05	30.01	30.55	31.51	31.24	31.21	29.12	30.68	28.67	29.87	29.68	30.51	30.56	30.83
FeO	10.32	11.26	11.08	11.60	9.48	9.51	9.03	9.55	11.91	10.34	11.63	10.19	10.59	10.32	9.39	9.59
MnO	0.15	0.19	0.14	0.27	0.23	0.23	0.21	0.23	0.24	0.20	0.20	0.22	0.21	0.24	0.23	0.14
NiO	0.10	0.09	0.03	0.06	0.05	0.06	0.09	0.03	0.05	0.10	0.04	0.07	0.07	0.04	0.07	0.09
CaO	2.45	2.15	1.48	2.17	2.82	2.75	3.04	2.24	1.71	2.24	1.97	2.38	2.30	1.65	2.85	2.58
Na_2O	0.07	0.03	0.04	0.03	0.02	0.04	0.07	0.07	0.04	0.05	0.05	0.02	0.02	0.02	0.02	0.03
K_2O	0.01	0.02	-	-	0.01	0.02	0.01	-	0.04	0.01	0.01	-	0.02	-	-	0.01
Total	100.30	99.89	99.21	99.72	99.43	100.37	99.64	99.37	99.60	100.70	100.25	99.48	100.08	100.33	100.93	100.02
Cations normalized to 4 cations																
Si	1.933	1.929	1.937	1.898	1.932	1.907	1.905	1.906	1.933	1.942	1.977	1.957	1.953	1.952	1.967	1.941
Ti	0.006	0.008	0.009	0.009	0.004	0.004	0.003	0.004	0.009	0.004	0.009	0.004	0.004	0.007	0.003	0.004
Al	0.058	0.056	0.056	0.053	0.042	0.043	0.046	0.055	0.066	0.043	0.055	0.046	0.059	0.055	0.039	0.041
Cr	0.012	0.013	0.009	0.014	0.014	0.013	0.014	0.015	0.010	0.012	0.011	0.010	0.009	0.012	0.011	0.011
Mg	1.583	1.567	1.595	1.588	1.611	1.641	1.637	1.641	1.548	1.601	1.518	1.580	1.564	1.599	1.590	1.615
Fe	0.304	0.334	0.330	0.344	0.280	0.278	0.265	0.282	0.355	0.303	0.345	0.302	0.313	0.303	0.274	0.282
Mn	0.004	0.006	0.004	0.008	0.007	0.007	0.006	0.007	0.007	0.006	0.006	0.007	0.006	0.007	0.007	0.004
Ni	0.003	0.003	0.001	0.002	0.001	0.002	0.003	0.001	0.001	0.003	0.001	0.002	0.002	0.001	0.002	0.003
Ca	0.092	0.082	0.056	0.083	0.107	0.103	0.115	0.085	0.065	0.084	0.075	0.091	0.087	0.062	0.107	0.097
Na	0.005	0.002	0.003	0.002	0.001	0.003	0.005	0.005	0.003	0.003	0.003	0.001	0.001	0.001	0.001	0.002
K	-	0.001	-	-	-	0.001	-	-	0.002	-	-	-	0.001	-	-	-
O	5.971	5.970	5.977	5.939	5.963	5.937	5.936	5.942	5.978	5.971	6.016	5.988	5.991	5.992	5.994	5.969

2. Average orthopyroxene analyses from layered series of Megacycle #3, Figure A-7 (cont.)

Major elements in wt.%															
Sample:	V3-04d	V3-04e	V3-04f	V3-04g	V3-04h	V3-04i	V3-04j	V3-04k	V3-05a	V3-05b	V3-06a	V3-06b	V3-06c	V3-06d	V3-06e
	core	core	rim	rim	core	core	core	rim	rim	core	rim	core	core	core	rim
SiO_2	55.43	55.05	55.34	54.66	55.75	55.56	55.82	55.58	54.92	56.20	55.39	54.21	54.53	54.23	54.83
TiO_2	0.17	0.15	0.18	0.33	0.12	0.13	0.15	0.40	0.39	0.15	0.37	0.36	0.30	0.31	0.34
Al_2O_3	0.95	1.12	1.06	1.28	0.89	0.92	0.96	1.23	1.15	0.91	1.13	1.28	1.36	1.27	1.35
Cr_2O_3	0.48	0.34	0.37	0.36	0.33	0.34	0.39	0.35	0.38	0.25	0.24	0.22	0.27	0.23	0.29
MgO	30.68	29.90	30.86	30.00	30.60	30.86	30.53	29.43	28.67	30.41	29.32	29.42	29.47	29.22	29.09
FeO	10.11	10.29	10.64	11.52	10.25	9.48	9.65	11.62	13.24	10.27	11.96	11.76	12.03	11.27	11.98
MnO	0.18	0.22	0.13	0.50	0.24	0.18	0.23	0.24	0.22	0.25	0.20	0.24	0.20	0.24	0.20
NiO	0.09	0.05	-	-	0.07	0.11	0.05	-	0.05	0.07	0.07	0.10	0.08	0.01	0.09
CaO	2.40	2.63	1.30	1.48	2.41	2.49	2.69	1.34	1.93	2.34	1.65	2.20	1.95	2.45	2.04
Na_2O	0.03	0.05	0.01	0.01	-	0.03	0.03	0.02	0.03	-	-	0.03	0.03	0.02	0.05
K_2O	-	0.03	-	-	-	-	-	-	-	-	0.01	-	-	-	0.01
Total	100.52	99.82	99.89	100.14	100.65	100.10	100.49	100.22	100.98	100.85	100.34	99.82	100.22	99.25	100.27
Cations normalized to 4 cations															
Si	1.943	1.947	1.951	1.933	1.953	1.951	1.956	1.969	1.943	1.967	1.962	1.927	1.931	1.937	1.944
Ti	0.004	0.004	0.005	0.009	0.003	0.003	0.004	0.011	0.010	0.004	0.010	0.010	0.008	0.008	0.009
Al	0.039	0.047	0.044	0.053	0.037	0.038	0.040	0.051	0.048	0.038	0.047	0.054	0.057	0.053	0.056
Cr	0.013	0.010	0.010	0.010	0.009	0.009	0.011	0.010	0.011	0.007	0.007	0.006	0.008	0.006	0.008
Mg	1.603	1.576	1.622	1.582	1.598	1.616	1.595	1.555	1.513	1.587	1.548	1.559	1.556	1.556	1.537
Fe	0.296	0.304	0.314	0.341	0.300	0.278	0.283	0.344	0.392	0.301	0.354	0.350	0.356	0.337	0.355
Mn	0.005	0.007	0.004	0.015	0.007	0.005	0.007	0.007	0.007	0.007	0.006	0.007	0.006	0.007	0.006
Ni	0.003	0.001	-	-	0.002	0.003	0.001	-	0.001	0.002	0.002	0.003	0.002	-	0.003
Ca	0.090	0.100	0.049	0.056	0.090	0.094	0.101	0.051	0.073	0.088	0.063	0.084	0.074	0.094	0.077
Na	0.002	0.003	0.001	0.001	-	0.002	0.002	0.001	0.002	-	-	0.002	0.002	0.001	0.003
K	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.973	5.976	5.983	5.974	5.979	5.977	5.984	6.010	5.982	5.993	5.999	5.965	5.970	5.974	5.983

Major elements in wt.%															
Sample:	V3-06f	V3-06g	V3-06h	V3-06i	V3-06j	V3-06k	VD-501a	VD-501b	VD-501c	VD-501d	VD-501e	VD-501f	VD-501g	VD-501h	VD-842a
	rim	core	core	core	core	rim	core	rim	core	rim	core	rim	core	rim	core
SiO_2	54.32	55.39	55.32	55.79	55.28	53.38	54.98	55.09	55.05	55.45	55.22	55.99	55.09	55.43	55.13
TiO_2	0.34	0.18	0.24	0.12	0.17	0.39	0.27	0.31	0.27	0.36	0.25	0.18	0.23	0.31	0.26
Al_2O_3	1.33	1.22	1.05	0.93	1.25	1.25	1.17	1.20	1.38	1.12	1.53	1.23	1.31	1.04	1.28
Cr_2O_3	0.31	0.38	0.43	0.38	0.29	0.35	0.38	0.24	0.38	0.32	0.33	0.35	0.27	0.30	0.28
MgO	29.14	31.24	31.56	31.24	30.69	29.45	29.33	29.43	29.70	30.00	29.83	29.50	29.75	29.60	29.40
FeO	11.35	9.42	9.29	9.39	9.90	12.15	11.57	11.84	11.74	11.30	10.48	11.07	11.47	11.53	11.82
MnO	0.30	0.20	0.26	0.22	0.19	0.27	0.24	0.34	0.23	0.27	0.26	0.24	0.30	0.23	0.27
NiO	0.07	0.08	0.04	0.06	0.02	0.04	-	0.05	0.09	0.02	0.08	0.03	0.08	-	0.05
CaO	2.28	2.42	2.29	2.43	2.43	1.97	1.76	1.72	1.62	1.54	1.69	2.27	1.96	1.58	2.46
Na_2O	0.06	0.04	0.02	0.02	0.05	0.02	0.02	0.02	0.01	0.01	0.01	0.04	-	0.04	0.03
K_2O	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-
Total	99.49	100.57	100.51	100.58	100.27	99.27	99.73	100.24	100.47	100.39	99.68	100.90	100.46	100.06	100.98
Cations normalized to 4 cations															
Si	1.937	1.933	1.930	1.948	1.939	1.908	1.957	1.951	1.943	1.956	1.958	1.968	1.943	1.965	1.939
Ti	0.009	0.005	0.006	0.003	0.004	0.010	0.007	0.008	0.007	0.010	0.007	0.005	0.006	0.008	0.007
Al	0.056	0.050	0.043	0.038	0.052	0.053	0.049	0.050	0.057	0.047	0.064	0.051	0.054	0.043	0.053
Cr	0.009	0.010	0.012	0.010	0.008	0.010	0.011	0.007	0.011	0.009	0.009	0.010	0.008	0.008	0.008
Mg	1.549	1.625	1.641	1.626	1.605	1.569	1.556	1.554	1.563	1.578	1.577	1.546	1.565	1.564	1.541
Fe	0.338	0.275	0.271	0.274	0.290	0.363	0.344	0.351	0.347	0.333	0.311	0.325	0.338	0.342	0.348
Mn	0.009	0.006	0.008	0.007	0.006	0.008	0.007	0.010	0.007	0.008	0.008	0.007	0.009	0.007	0.008
Ni	0.002	0.002	0.001	0.002	0.001	0.001	-	0.001	0.003	0.001	0.002	0.001	0.002	-	0.001
Ca	0.087	0.091	0.086	0.091	0.091	0.075	0.067	0.065	0.061	0.058	0.064	0.085	0.074	0.060	0.093
Na	0.004	0.003	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.003	-	0.003	0.002
K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	5.976	5.967	5.963	5.975	5.972	5.949	5.993	5.987	5.984	5.993	6.001	6.001	5.981	5.997	5.975

2. Average orthopyroxene analyses from layered series of Megacycle #3, Figure A-7 (cont.)

Major elements in wt.%

Sample:	VD-842b	VD-842c	VD-842d	VD-842e	VD-842f	VD-842g	VD-842h	VD-513a	VD-513b	VD-513c	VD-513d	VD-513e	VD-513f	VD-513g	VD-513h	VD-513i
	rim	core	rim	core	rim	core	rim	core	rim	core	rim	core	rim	core	core	rim
SiO_2	55.02	55.07	54.64	55.30	55.05	55.00	55.60	54.85	55.05	54.96	54.81	54.36	54.75	55.07	54.34	54.17
TiO_2	0.26	0.16	0.42	0.25	0.30	0.23	0.17	0.19	0.30	0.12	0.17	0.15	0.13	0.13	0.20	0.28
Al_2O_3	1.15	1.20	1.15	1.18	1.12	1.36	1.06	1.25	1.20	1.14	1.21	1.18	1.19	1.13	1.28	1.11
Cr_2O_3	0.22	0.23	0.22	0.18	0.23	0.23	0.22	0.21	0.20	0.28	0.17	0.29	0.24	0.26	0.28	0.21
MgO	29.19	29.33	29.04	29.48	29.52	30.33	29.47	28.19	28.24	29.27	29.14	29.20	29.14	30.06	28.14	27.93
FeO	11.35	11.12	12.36	11.55	12.33	10.02	11.49	12.59	13.65	11.38	11.64	11.51	11.41	11.30	12.84	13.29
MnO	0.24	0.20	0.22	0.26	0.32	0.21	0.23	0.26	0.24	0.19	0.22	0.29	0.17	0.29	0.22	0.25
NiO	0.02	0.02	0.04	0.14	0.10	0.05	0.10	0.06	0.07	0.09	0.08	0.08	0.05	0.03	0.06	0.07
CaO	2.13	2.12	1.96	2.34	1.78	1.86	2.08	2.08	1.68	2.37	2.16	2.17	2.40	1.91	2.10	1.68
Na_2O	0.03	0.02	0.03	0.05	0.02	0.01	0.02	0.02	0.03	0.01	0.03	0.02	0.02	0.03	0.02	0.01
K_2O	-	0.02	-	0.01	-	-	-	0.01	0.02	-	-	-	0.02	0.01	0.01	-
Total	99.61	99.49	100.08	100.75	100.76	99.30	100.44	99.72	100.68	99.81	99.63	99.25	99.51	100.22	99.49	98.99

Cations normalized to 4 cations

	VD-842b	VD-842c	VD-842d	VD-842e	VD-842f	VD-842g	VD-842h	VD-513a	VD-513b	VD-513c	VD-513d	VD-513e	VD-513f	VD-513g	VD-513h	VD-513i
Si	1.960	1.961	1.943	1.948	1.942	1.951	1.964	1.964	1.957	1.953	1.952	1.943	1.951	1.943	1.950	1.958
Ti	0.007	0.004	0.011	0.007	0.008	0.006	0.005	0.005	0.008	0.003	0.005	0.004	0.003	0.003	0.005	0.008
Al	0.048	0.050	0.048	0.049	0.047	0.057	0.044	0.053	0.050	0.048	0.051	0.050	0.050	0.047	0.054	0.047
Cr	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.006	0.006	0.008	0.005	0.008	0.007	0.007	0.008	0.006
Mg	1.550	1.557	1.539	1.548	1.552	1.604	1.552	1.504	1.497	1.551	1.547	1.556	1.548	1.582	1.506	1.504
Fe	0.338	0.331	0.368	0.340	0.364	0.297	0.339	0.377	0.406	0.338	0.347	0.344	0.340	0.333	0.385	0.402
Mn	0.007	0.006	0.007	0.008	0.010	0.006	0.007	0.008	0.007	0.006	0.007	0.009	0.005	0.009	0.007	0.008
Ni	0.001	0.001	0.001	0.004	0.003	0.001	0.003	0.002	0.002	0.003	0.002	0.002	0.001	0.001	0.002	0.002
Ca	0.081	0.081	0.075	0.088	0.067	0.071	0.079	0.080	0.064	0.090	0.082	0.083	0.092	0.072	0.081	0.065
Na	0.002	0.001	0.002	0.003	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.002	0.001	0.001
K	-	0.001	-	-	-	-	-	-	0.001	-	-	-	0.001	-	-	-
O	5.993	5.992	5.980	5.979	5.976	5.988	5.993	5.997	5.992	5.984	5.984	5.975	5.982	5.972	5.986	5.991

3. Average orthopyroxene analyses from layered series of Megacycle #4, Figure A-7.

Sample:	VD-520a	VD-520b	VD-520c	VD-520d	VD-520e	VD-522a	VD-522b	VD-522c	VD-522d	VD-522e	VD-522f	VD-522g	VD-522h	VD-848a	VD-848b	VD-848c	VD-848d	VD-848e
	core	core	core	core	rim	core	rim	core	core	core	core	rim	core	core	core	core	core	rim
Major elements in wt.%																		
SiO_2	54.38	54.66	54.19	53.93	54.21	55.17	54.68	54.98	55.26	55.26	54.83	55.13	54.55	54.75	54.77	55.02	55.41	54.79
TiO_2	0.30	0.29	0.14	0.38	0.43	0.19	0.32	0.32	0.25	0.22	0.16	0.24	0.24	0.28	0.22	0.25	0.23	0.32
Al_2O_3	1.50	1.45	1.49	1.43	1.25	1.32	0.77	1.25	1.25	1.34	1.44	1.09	1.28	1.69	1.66	1.53	1.55	1.39
Cr_2O_3	0.52	0.49	0.54	0.53	0.43	0.40	0.28	0.35	0.35	0.41	0.45	0.32	0.41	0.65	0.49	0.58	0.51	0.41
MgO	31.19	31.34	31.64	31.03	31.51	31.01	29.32	31.46	30.53	31.11	30.48	29.73	30.74	29.40	30.06	29.98	29.98	28.72
FeO	9.51	9.45	9.20	9.26	9.45	9.16	13.15	11.05	9.66	9.00	9.32	10.61	9.58	10.73	10.54	10.40	10.30	11.99
MnO	0.12	0.17	0.19	0.21	0.33	0.24	0.30	0.21	0.18	0.15	0.17	0.24	0.21	0.26	0.19	0.17	0.24	0.29
NiO	0.08	0.10	0.12	0.13	0.10	0.05	0.04	0.07	0.08	0.03	0.05	0.04	0.04	-	0.04	0.07	0.06	0.04
CaO	1.96	1.99	2.00	2.05	1.79	2.19	1.31	1.02	2.12	1.98	2.26	1.99	2.22	2.25	2.23	2.19	2.23	1.93
Na_2O	0.04	0.04	0.05	0.06	0.02	0.04	0.04	0.04	0.04	0.03	0.05	0.04	0.03	0.03	0.04	0.05	0.01	0.04
K_2O	0.02	0.01	-	0.02	-	0.02	-	0.03	0.01	-	0.02	-	-	-	-	0.01	-	-
Total	99.62	99.99	99.55	99.02	99.51	99.79	100.21	100.78	99.73	99.52	99.23	99.43	99.30	100.04	100.24	100.25	100.52	99.92
Cations normalized to 4 cations																		
Si	1.915	1.917	1.904	1.910	1.910	1.940	1.944	1.920	1.950	1.946	1.942	1.960	1.930	1.939	1.929	1.939	1.948	1.952
Ti	0.008	0.008	0.004	0.010	0.011	0.005	0.009	0.008	0.007	0.006	0.004	0.006	0.006	0.007	0.006	0.007	0.006	0.009
Al	0.062	0.060	0.062	0.060	0.052	0.055	0.032	0.051	0.052	0.056	0.060	0.046	0.053	0.071	0.069	0.064	0.064	0.058
Cr	0.014	0.014	0.015	0.015	0.012	0.011	0.008	0.010	0.010	0.011	0.013	0.009	0.011	0.018	0.014	0.016	0.014	0.012
Mg	1.637	1.639	1.657	1.638	1.655	1.625	1.554	1.638	1.606	1.634	1.609	1.576	1.622	1.552	1.579	1.575	1.571	1.526
Fe	0.280	0.277	0.270	0.274	0.278	0.269	0.391	0.323	0.285	0.265	0.276	0.315	0.283	0.318	0.310	0.306	0.303	0.357
Mn	0.004	0.005	0.006	0.006	0.010	0.007	0.009	0.006	0.005	0.004	0.005	0.007	0.006	0.008	0.006	0.005	0.007	0.009
Ni	0.002	0.003	0.003	0.004	0.003	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	-	0.001	0.002	0.002	0.001
Ca	0.074	0.075	0.075	0.078	0.068	0.082	0.050	0.038	0.080	0.075	0.086	0.076	0.084	0.085	0.084	0.083	0.084	0.074
Na	0.003	0.003	0.003	0.004	0.001	0.003	0.003	0.003	0.003	0.002	0.003	0.003	0.002	0.002	0.003	0.003	0.001	0.003
K	0.001	-	-	0.001	-	0.001	-	0.001	-	-	0.001	-	-	-	-	-	-	-
O	5.959	5.960	5.945	5.955	5.953	5.976	5.971	5.957	5.986	5.985	5.980	5.993	5.968	5.989	5.975	5.983	5.993	5.994

Sample:	VD-848f	VD-848g	M-10a	M-10b	M-10c	M-10d	M-10e	M-10f	M-10g	M-11a	M-11b	M-11c	M-13a	M-13b	M-13c	M-13d	M-13e	M-13f
	rim	core	core	rim	core	rim	core	core	core	core	rim	core	core	rim	core	rim	core	rim
Major elements in wt.%																		
SiO_2	54.90	55.22	54.36	54.21	54.40	54.15	54.55	54.02	54.36	55.60	54.98	54.60	55.05	54.40	55.02	54.36	55.11	54.66
TiO_2	0.36	0.18	0.46	0.41	0.43	0.48	0.22	0.27	0.28	0.24	0.33	0.23	0.29	0.39	0.29	0.30	0.29	0.40
Al_2O_3	1.37	1.56	1.34	1.33	1.28	1.31	0.98	1.12	1.05	0.92	1.22	1.13	1.25	1.32	0.96	1.38	1.25	1.24
Cr_2O_3	0.38	0.53	0.18	0.23	0.21	0.29	0.38	0.27	0.38	0.44	0.34	0.43	0.39	0.28	0.32	0.39	0.49	0.32
MgO	29.82	29.72	27.08	26.81	27.44	26.58	28.17	27.46	27.06	29.65	27.28	27.71	28.54	28.26	28.61	27.54	28.26	27.76
FeO	11.11	10.63	14.78	14.47	14.61	15.17	13.68	13.61	14.16	11.09	13.97	13.69	12.50	13.51	12.99	13.60	12.84	13.95
MnO	0.22	0.20	0.30	0.31	0.23	0.29	0.26	0.26	0.18	0.28	0.23	0.32	0.23	0.22	0.28	0.25	0.23	0.30
NiO	0.11	0.09	0.13	0.01	0.08	0.03	-	-	0.06	0.03	0.06	0.06	0.04	0.11	0.05	0.10	0.10	0.02
CaO	2.05	2.22	2.14	2.13	2.12	2.10	2.38	2.33	2.57	2.31	2.22	2.26	2.03	2.03	1.99	2.07	2.04	1.91
Na_2O	0.04	0.03	0.09	0.05	0.01	0.04	0.02	0.07	0.04	0.03	0.03	0.02	0.04	0.06	0.02	0.06	0.05	0.01
K_2O	-	-	0.01	-	0.02	0.01	0.02	0.01	0.02	-	-	0.01	0.03	0.01	-	-	-	-
Total	100.35	100.37	100.87	99.97	100.84	100.45	100.66	99.42	100.17	100.59	100.66	100.45	100.39	100.59	100.53	100.05	100.66	100.56
Cations normalized to 4 cations																		
Si	1.937	1.946	1.941	1.954	1.941	1.948	1.941	1.948	1.953	1.960	1.964	1.950	1.956	1.935	1.955	1.949	1.958	1.951
Ti	0.010	0.005	0.012	0.011	0.012	0.013	0.006	0.007	0.008	0.006	0.009	0.006	0.008	0.010	0.008	0.008	0.008	0.011
Al	0.057	0.065	0.056	0.056	0.054	0.056	0.041	0.048	0.044	0.038	0.051	0.048	0.052	0.055	0.040	0.058	0.052	0.052
Cr	0.011	0.015	0.005	0.007	0.006	0.008	0.011	0.008	0.011	0.012	0.010	0.012	0.011	0.008	0.009	0.011	0.014	0.009
Mg	1.568	1.562	1.442	1.441	1.460	1.425	1.494	1.476	1.449	1.558	1.453	1.475	1.512	1.498	1.515	1.472	1.496	1.477
Fe	0.328	0.313	0.442	0.436	0.436	0.456	0.407	0.410	0.425	0.327	0.417	0.409	0.372	0.402	0.386	0.408	0.382	0.416
Mn	0.007	0.006	0.009	0.009	0.007	0.009	0.008	0.008	0.005	0.008	0.007	0.010	0.007	0.007	0.008	0.008	0.007	0.009
Ni	0.003	0.003	0.004	-	0.002	0.001	-	-	0.002	0.001	0.002	0.002	0.001	0.003	0.001	0.003	0.003	0.001
Ca	0.077	0.084	0.082	0.082	0.081	0.081	0.091	0.090	0.099	0.087	0.085	0.086	0.077	0.077	0.076	0.079	0.078	0.073
Na	0.003	0.002	0.006	0.003	0.001	0.003	0.001	0.005	0.003	0.002	0.002	0.001	0.003	0.004	0.001	0.004	0.003	0.001
K	-	-	-	-	0.001	-	0.001	-	0.001	-	-	-	0.001	-	-	-	-	-
O	5.979	5.990	5.981	5.995	5.982	5.991	5.971	5.980	5.986	5.990	6.003	5.985	5.993	5.975	5.987	5.989	5.997	5.992

3. Average orthopyroxene analyses from layered series of Megacycle #4, Figure A-7 (cont.)

Major elements in wt.%																		
Sample:	M-13g	VD-592a	VD-592b	VD-592c	VD-592d	VD-592e	VD-592f	VD-592g	VD-592h	VD-596a	VD-596b	VD-596c	VD-596d	VD-596e	VD-596f	VD-596g	VD-596h	VD-596i
	core	core	rim	core	rim	core	rim	core	rim	core	rim	core	rim	core	rim	core	core	rim
SiO_2	54.98	54.42	54.23	54.49	54.21	54.90	54.79	55.11	55.13	53.29	52.78	52.65	53.06	52.82	53.44	52.67	54.55	53.42
TiO_2	0.29	0.31	0.34	0.27	0.33	0.28	0.26	0.32	0.36	0.33	0.44	0.34	0.49	0.30	0.36	0.60	0.28	0.51
Al_2O_3	1.28	1.13	1.14	1.01	1.19	1.21	1.13	1.21	1.16	1.13	0.93	1.12	1.02	1.12	1.05	1.60	1.01	1.06
Cr_2O_3	0.46	0.24	0.28	0.22	0.23	0.29	0.26	0.32	0.18	0.32	0.28	0.27	0.27	0.32	0.27	0.34	0.25	0.27
MgO	28.29	26.63	26.35	26.48	25.80	27.96	27.46	27.56	27.58	27.18	26.05	27.11	27.01	27.36	26.96	27.46	26.02	25.70
FeO	12.72	14.27	15.58	15.72	15.54	13.56	14.46	13.56	14.14	16.09	17.59	16.22	16.17	15.68	16.04	15.15	15.67	16.63
MnO	0.16	0.29	0.32	0.35	0.30	0.28	0.25	0.32	0.26	0.30	0.33	0.25	0.30	0.30	0.30	0.30	0.33	0.23
NiO	0.05	0.07	0.13	0.12	0.04	0.09	0.08	0.14	0.04	0.10	0.10	0.11	0.07	0.14	0.09	-	0.04	0.04
CaO	1.98	2.76	2.17	2.20	2.20	2.39	1.74	1.98	1.98	1.71	1.64	1.82	2.01	1.69	1.95	1.50	2.28	2.01
Na_2O	0.44	0.04	0.04	0.06	0.05	0.06	0.04	0.05	0.01	0.03	0.01	0.03	0.05	0.03	0.03	0.01	0.06	0.03
K_2O	0.01	-	-	-	0.01	-	0.01	0.02	0.02	-	0.01	-	-	-	-	-	-	0.02
Total	100.66	100.16	100.58	100.92	99.90	101.01	100.48	100.59	100.86	100.48	100.16	99.92	100.45	99.76	100.50	99.64	100.49	99.93
Cations normalized to 4 cations																		
Si	1.945	1.959	1.952	1.954	1.967	1.947	1.961	1.967	1.964	1.915	1.917	1.902	1.909	1.908	1.921	1.902	1.967	1.943
Ti	0.008	0.008	0.009	0.007	0.009	0.007	0.007	0.009	0.010	0.009	0.012	0.009	0.013	0.008	0.010	0.016	0.008	0.014
Al	0.053	0.048	0.048	0.043	0.051	0.051	0.048	0.051	0.049	0.048	0.040	0.048	0.043	0.048	0.044	0.068	0.043	0.045
Cr	0.013	0.007	0.008	0.006	0.007	0.008	0.007	0.009	0.005	0.009	0.008	0.008	0.008	0.009	0.008	0.010	0.007	0.008
Mg	1.492	1.429	1.414	1.416	1.395	1.478	1.465	1.466	1.465	1.456	1.411	1.460	1.449	1.473	1.445	1.478	1.399	1.394
Fe	0.376	0.429	0.469	0.471	0.471	0.402	0.433	0.405	0.421	0.484	0.534	0.490	0.486	0.474	0.482	0.458	0.473	0.506
Mn	0.005	0.009	0.010	0.011	0.009	0.008	0.008	0.010	0.008	0.009	0.010	0.008	0.009	0.009	0.009	0.009	0.010	0.007
Ni	0.001	0.002	0.004	0.003	0.001	0.003	0.002	0.004	0.001	0.003	0.003	0.003	0.002	0.004	0.003	-	0.001	0.001
Ca	0.075	0.106	0.084	0.085	0.085	0.091	0.067	0.076	0.076	0.066	0.064	0.070	0.077	0.065	0.075	0.058	0.088	0.078
Na	0.030	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.001	0.002	0.001	0.002	0.003	0.002	0.002	0.001	0.004	0.002
K	-	-	-	-	-	-	-	0.001	0.001	-	-	-	-	-	-	-	-	0.001
O	5.971	5.993	5.988	5.984	6.002	5.982	5.993	6.003	6.000	5.951	5.952	5.938	5.946	5.943	5.956	5.957	5.998	5.982

Major elements in wt.%																		
Sample:	VD-596j	VD-596k	VD-599a	VD-599b	VD-599c	VD-599d	VD-599e	VD-599f	VD-599g	VD-851a	VD-851b	VD-851c	VD-851d	VD-851e	VD-851f	VD-851g	VD-551a	VD-551b
	core	rim	core	rim	core	rim	rim	core	core	core	rim	core	rim	core	rim	core	core	rim
SiO_2	54.21	54.08	53.98	54.13	54.51	54.51	54.81	54.85	54.42	54.42	54.57	54.90	54.75	54.92	54.83	54.66	54.75	54.25
TiO_2	0.25	0.26	0.55	0.62	0.45	0.49	0.61	0.57	0.50	0.24	0.27	0.25	0.44	0.36	0.41	0.21	0.26	0.33
Al_2O_3	1.10	1.17	1.20	1.04	1.24	1.17	1.20	1.20	1.20	1.29	1.14	1.06	0.96	1.10	1.01	0.98	1.42	1.47
Cr_2O_3	0.32	0.33	0.15	0.11	0.22	0.16	0.18	0.15	0.20	0.29	0.29	0.26	0.22	0.21	0.18	0.25	0.46	0.45
MgO	26.80	26.45	26.70	26.35	26.57	26.57	26.58	26.53	26.45	27.56	27.18	27.53	27.34	27.94	27.01	27.79	28.99	28.94
FeO	15.85	16.35	15.32	15.86	14.59	14.91	14.85	14.97	15.06	14.64	14.78	13.80	14.60	14.22	14.68	14.31	12.58	12.38
MnO	0.28	0.30	0.37	0.29	0.28	0.33	0.24	0.32	0.29	0.23	0.27	0.33	0.33	0.28	0.22	0.25	0.29	0.25
NiO	0.09	0.08	0.09	0.07	0.14	0.07	0.11	0.07	0.10	0.06	0.02	0.02	0.04	0.09	0.02	0.03	0.05	0.04
CaO	2.09	2.36	2.01	1.91	2.40	1.71	1.91	2.02	2.13	1.86	2.08	2.65	1.86	1.77	1.84	2.05	2.12	1.93
Na_2O	0.05	-	0.05	0.06	0.01	0.04	0.04	0.05	0.01	0.04	0.04	0.06	0.03	0.02	0.01	0.06	0.04	0.04
K_2O	-	-	-	-	-	0.02	0.01	0.02	0.01	-	0.01	-	-	0.01	0.01	-	-	-
Total	101.04	101.38	100.42	100.44	100.40	99.98	100.54	100.76	100.38	100.63	100.66	100.86	100.57	100.91	100.22	100.59	100.96	100.08
Cations normalized to 4 cations																		
Si	1.940	1.934	1.942	1.952	1.960	1.969	1.970	1.968	1.961	1.944	1.953	1.954	1.960	1.953	1.972	1.950	1.932	1.929
Ti	0.007	0.007	0.015	0.017	0.012	0.013	0.016	0.015	0.014	0.006	0.007	0.007	0.012	0.010	0.011	0.006	0.007	0.009
Al	0.046	0.049	0.051	0.044	0.053	0.050	0.051	0.051	0.051	0.054	0.048	0.044	0.041	0.046	0.043	0.041	0.059	0.062
Cr	0.009	0.009	0.004	0.003	0.006	0.005	0.005	0.004	0.006	0.008	0.008	0.007	0.006	0.006	0.005	0.007	0.013	0.013
Mg	1.429	1.410	1.432	1.417	1.424	1.431	1.424	1.419	1.420	1.467	1.450	1.461	1.460	1.482	1.448	1.478	1.525	1.534
Fe	0.474	0.489	0.461	0.478	0.439	0.450	0.446	0.449	0.454	0.437	0.442	0.411	0.437	0.423	0.441	0.427	0.371	0.368
Mn	0.008	0.009	0.011	0.009	0.009	0.010	0.007	0.010	0.009	0.007	0.008	0.010	0.010	0.008	0.007	0.008	0.009	0.008
Ni	0.003	0.002	0.003	0.002	0.004	0.002	0.003	0.002	0.003	0.002	0.001	0.001	0.001	0.003	0.001	0.001	0.001	0.001
Ca	0.080	0.090	0.078	0.074	0.092	0.066	0.074	0.078	0.082	0.071	0.080	0.101	0.071	0.067	0.071	0.078	0.080	0.074
Na	0.003	-	0.003	0.004	0.001	0.003	0.003	0.003	0.001	0.003	0.003	0.004	0.002	0.001	0.001	0.004	0.003	0.003
K	-	-	-	-	-	0.001	-	0.001	-	-	-	-	-	-	-	-	-	-
O	5.972	5.970	5.983	5.990	6.002	6.008	6.013	6.008	6.002	5.980	5.986	5.985	5.994	5.988	6.006	5.978	5.973	5.974

3. Average orthopyroxene analyses from layered series of Megacycle #4, Figure A-7 (cont.)

Major elements in wt.%																			
Sample:	VD-551c	VD-551d	VD-551e	VD-551f	VD-554a	VD-554b	VD-554c	VD-554d	VD-554e	VD-554f	VD-554g	VD-554h	M-32a	M-32b	M-32c	M-32d	M-32e	M-32f	M-32g
	rim	core	rim	core	rim	core	core	rim	rim	core	core	rim	core	core	core	core	core	core	core
SiO_2	54.42	54.04	54.04	54.40	54.70	54.79	54.47	54.27	54.30	53.72	53.78	53.57	56.39	56.18	56.44	56.20	55.94	56.35	55.77
TiO_2	0.46	0.22	0.25	0.24	0.29	0.26	0.25	0.44	0.40	0.41	0.49	0.51	0.12	0.14	0.11	0.28	0.26	0.14	0.15
Al_2O_3	1.15	1.78	1.36	1.49	1.26	1.41	1.41	1.30	0.97	1.21	1.13	1.03	1.11	1.34	1.30	1.31	1.47	1.07	1.34
Cr_2O_3	0.20	0.40	0.27	0.46	0.33	0.36	0.44	0.29	0.24	0.25	0.21	0.17	0.51	0.59	0.47	0.44	0.44	0.49	0.58
MgO	28.52	28.44	28.26	28.79	28.16	28.87	29.27	27.56	27.56	27.61	27.53	27.44	31.28	30.78	30.93	30.46	30.58	31.84	30.98
FeO	13.20	12.85	13.21	12.30	13.33	12.51	12.45	14.18	14.18	14.99	14.82	14.29	8.63	8.66	8.54	9.27	9.27	8.35	8.67
MnO	0.27	0.22	0.22	0.28	0.28	0.27	0.21	0.27	0.23	0.29	0.32	0.33	0.27	0.21	0.19	0.14	0.28	0.21	0.23
NiO	0.02	0.02	0.11	0.04	0.06	0.11	0.10	0.04	-	0.02	-	0.02	0.06	0.05	-	0.09	0.07	0.08	0.08
CaO	1.80	2.23	2.24	2.22	2.13	2.30	2.28	2.07	1.73	1.96	1.87	1.72	2.15	2.34	2.16	2.14	2.12	1.97	2.33
Na_2O	0.04	0.05	0.04	0.03	0.06	0.05	0.06	0.05	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.05	0.03	0.06	-
K_2O	-	0.01	-	0.01	-	-	-	-	-	0.02	0.01	-	0.01	0.02	0.01	0.01	0.01	0.02	0.01
Total	100.09	100.26	100.00	100.26	100.60	100.93	100.94	100.47	99.63	100.50	100.19	99.11	100.55	100.34	100.20	100.39	100.47	100.58	100.13
Cations normalized to 4 cations																			
Si	1.942	1.922	1.931	1.932	1.945	1.934	1.919	1.940	1.957	1.922	1.931	1.942	1.967	1.966	1.976	1.971	1.960	1.959	1.955
Ti	0.012	0.006	0.007	0.006	0.008	0.007	0.007	0.012	0.011	0.011	0.013	0.014	0.003	0.004	0.003	0.007	0.007	0.004	0.004
Al	0.048	0.075	0.057	0.062	0.053	0.059	0.059	0.055	0.041	0.051	0.048	0.044	0.046	0.055	0.054	0.054	0.061	0.044	0.055
Cr	0.006	0.011	0.008	0.013	0.009	0.010	0.012	0.008	0.007	0.007	0.006	0.005	0.014	0.016	0.013	0.012	0.012	0.013	0.016
Mg	1.517	1.508	1.505	1.524	1.493	1.519	1.537	1.469	1.481	1.473	1.473	1.483	1.626	1.606	1.614	1.593	1.597	1.650	1.619
Fe	0.394	0.382	0.395	0.365	0.396	0.369	0.367	0.424	0.427	0.449	0.445	0.433	0.252	0.253	0.250	0.272	0.271	0.243	0.254
Mn	0.008	0.007	0.007	0.008	0.008	0.008	0.006	0.008	0.007	0.009	0.010	0.010	0.008	0.006	0.006	0.004	0.008	0.006	0.007
Ni	0.001	0.001	0.003	0.001	0.002	0.003	0.003	0.001	-	0.001	-	0.001	0.002	0.001	-	0.003	0.002	0.002	0.002
Ca	0.069	0.085	0.086	0.084	0.081	0.087	0.086	0.079	0.067	0.075	0.072	0.067	0.080	0.088	0.081	0.080	0.080	0.073	0.087
Na	0.003	0.003	0.003	0.002	0.004	0.003	0.004	0.003	0.002	0.001	0.002	0.001	0.002	0.003	0.003	0.003	0.002	0.004	-
K	-	-	-	-	-	-	-	-	-	0.001	-	-	-	0.001	-	-	-	0.001	-
O	5.980	5.969	5.968	5.975	5.982	5.974	5.959	5.982	5.991	5.961	5.970	5.980	5.999	6.004	6.010	6.010	6.002	5.989	5.994