PETROGRAPHIC DESCRIPTIONS

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Trinity Explorations

Locality: Munro Township
Project No.: MSL-94-01

Date Completed: March 6, 1995
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-226.5' (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is a classic sample of a serpentinized cumulate-textured dunite, i.e., olivine cumulate. It is the type of rock typically found in layered intrusions and in the cumulate zones of komatiitic sequences, and thus is typical of the Munro Township flows. The sample is dominated by cumulate-textured (euhedral to subhedral, equant), medium-grained (ave. grain size 1-3 mm) olivine. The olivine itself is no longer present, as it has been completely serpentinized. Interstitial to the serpentinized olivine grains are clinopyroxenes, which have undergone minor to extensive chloritic (or possibly anthophyllitic) alteration. Traces of carbonate (probably an alteration mineral) and phlogopite (possibly a primary mineral) are present.

In reflected light, the original fine euhedral chromite grains are still present. They range from little altered to moderately altered with rims of magnetite. Some grains are partially replaced by magnetite. There is also considerable magnetite occurring in the form of very fine, discontinuous gash and fracture fillings and interstitial areas; this is very typical of heavily serpentinized, chromite-bearing rocks. Traces of pyrite are present.

MINERALOGY

75% Serpentine + Remnant Olivine: small fragments of olivine remain here and there, but by far the majority of the olivine has been altered pseudomorphously to a fibrous serpentine assemblage, which retains the original cumulate texture.

10% Clinopyroxene: interstitial to the serpentinized olivine.

10% Anthophyllite and/or Chlorite: there is a fibrous, colourless (to light brown) alteration mineral with slightly anomalous interference colours; because it is fibrous it is impossible to identify without XRD or another analytical technique, but most likely it is chlorite or anthophyllite altering interstitial clinopyroxene.

5% Opaques, consisting (in order of decreasing abundance) of:

Magnetite: the most abundant opaque mineral in the sample; accounts for about 2-3% of the rock as a whole; does not occur euhedrally, but instead
occurs in very fine gashes and fractures and interstitial to other grains, as well as partially replacing serpentinized olivine grains (these occurrences are typical for magnetite that is part of an alteration assemblage in a serpentinized zone); occurs as rims and partial replacement of chromite.

Chromite: minor (about half as abundant as magnetite, accounting for no more than about 2% of the rock as a whole); occurs as euheral, ocathedral grains, ave. 0.1 mm; typically shows rims of magnetite alteration and/or partial replacement by magnetite.

Pyrite: trace; very fine grains, very lightly disseminated throughout the sample.

Tr. Carbonate.

Tr. Phlogopite.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-397.7" (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is a brecciose, almost net-textured rock. It consists of angular fragments of a very fine-grained, brownish, altered material, probably volcanic in origin, within a breccia-like matrix. Most of the fragments are made of the same brownish volcanic material. Some of the fragments display concentric zoning, suggesting that they have interacted chemically with the surrounding matrix material. The matrix consists partially of sulphides but is dominated by a submicroscopic opaque material that ranges from non-reflectant to poorly reflectant. It is unlikely that this material consists of clay particles, because it is completely opaque (i.e., black in plane polarized light). The sulphides in the matrix are dominated by pyrrhotite with minor chalcopyrite.

MINERALOGY

~50% Matrix, consisting (in order of decreasing abundance) of:

Non reflectant Opaque Material: most of the matrix material is opaque but nonreflectant to poorly reflectant; it is unidentifiable by simple optical techniques; it is probably not argillaceous material, nor is it glass, because it is not only isotropic, but completely opaque (black in plane polarized light); my guess is that it is dominated by submicroscopic oxides, probably containing at least some magnetite.

Pyrrhotite: about 25% of the matrix (10-12% of the rock as a whole) consists of irregular masses of pyrrhotite.

Chalcopyrite: minor; fairly common as inclusions in pyrrhotite.

Pentlandite: trace; typical flame-like inclusions in pyrrhotite.

Chromite: trace; small clusters of very fine grains.

~50% Fragments, consisting (in order of decreasing abundance) of:

Brownish Alteration Assemblage: the fragments are dominated by a submicroscopic to extremely fine-grained, brownish alteration material that
appears to consist of epidote, possibly mixed with chlorite (this would be consistent with alteration of a mafic volcanic fragment).

Anthophyllite(?): accessory; colourless, needle-like grains, probably either anthophyllite or tremolite.

Carbonate: accessory; occurs mainly in one fragment that is of different composition from the rest (more felsic?).

Feldspar: accessory; occurs with carbonate, mainly in one fragment that is of different composition from the rest (more felsic?).

Chlorite: trace to accessory; tends to be associated with pyrrhotite within the fragments; colourless, fibrous, with low, slightly anomalous bluish to brownish interference colours.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-432.9© (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This appears to be a heavily altered, porphyritic, vesicular, partially brecciated mafic flow. It may be an altered flow-top breccia in a mafic-ultramafic flow sequence. The sample is dominated by a submicroscopic brownish material that may contain epidote (but is mostly not identifiable by simple optical means). This is essentially the same material that comprises the fragments in sample MSL-94-01-397.7'. The brownish material occurs in large, irregular masses, with an interstitial alteration assemblage dominated by carbonate, opaques, and chlorite, with minor quartz. The overall texture ranges from a swirling, irregular, flow-like or tuffaceous texture to a brecciose, fragmented texture. Within the brownish submicroscopic material are euhedral remnants of microphenocrysts, probably mainly clinopyroxene microphenocrysts (possibly some olivines), now completely chloritized. There are also some round and ovoid masses which appear to be vesicles (amygdules), now filled with chlorite and needle-like opaques.

As in sample MSL-94-01-397.7', much of the opaque material is nonreflectant or poorly reflectant. The reflectant opaques are dominated by pyrrhotite and pyrite, with accessory chromite and trace to accessory pentlandite.

MINERALOGY

≈65% Brownish Material: most of the sample consists of large, irregular masses of a brownish, altered material; it is clearly of volcanic origin, because it contains altered remnants of microphenocrysts, probably mainly clinopyroxene, as well as chlorite-carbonate-opaque-filled vesicles; there are some possible devitrification textures are visible in some parts of the material, which suggests an originally glassy rock; the swirling, tuffaceous texture of the sample would be consistent with this.

≈15% Opaques, consisting (in order of decreasing abundance) of:

Nonreflectant Opaque Material: by far the majority of the opaque material in the sample is nonreflectant, submicroscopic material; it is unlikely (but possible) that it is argillaceous, because it is truly opaque--black in plane polarized light; it could consist of submicroscopic oxide material; I have also
seen carbonaceous material that looks like this; a microprobe analysis could probably establish the composition of this material with some certainty; most of the nonreflectant opaque material occurs in areas interstitial to the volcanic fragments, in association with alteration minerals carbonate, quartz, and chlorite; some extremely fine opaque material also rims the vesicles within the fragments.

Pyrrhotite: the most abundant sulphide in the sample (but note that in the rock as a whole, sulphides are present only as an accessory mineral, perhaps 1% of the total rock); occurs as very fine, irregular masses.

Pyrite: accessory.

Chalcopyrite: trace to accessory; associated with pyrrhotite.

Chromite: trace to accessory; very fine, euhedral grains.

Pentlandite: trace; flame-like inclusions in pyrrhotite.

≈5-7% Carbonate: occurs primarily in areas interstitial to the volcanic fragments; associated with chlorite, quartz, and opaque material (not sulphides); carbonate also fills vesicles within the volcanic fragments (associated with chlorite).

≈5% Chlorite: occurs throughout the sample, both in interstitial areas and within the brownish volcanic fragments; within the volcanic fragments, chlorite commonly occurs as alteration of remnant euhedral microphenocrysts (probably clinopyroxene microphenocrysts); chlorite also fills some of the vesicles, along the carbonate and needle-like extremely fine opaques; the chlorite is colourless to very pale green, fibrous, with low, slightly anomalous bluish interference colours.

≈3% (or more?) Quartz: mostly extremely fine-grained (although some is coarse enough to be clearly identifiable; part of the alteration assemblage; occurs in areas interstitial to the brownish volcanic material; associated with carbonate and opaque material.

Acc. Tremolite or Anthophyllite: needle-like colourless alteration mineral; occurs mainly in areas interstitial to the large, irregular masses of brownish volcanic material.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-474' (hand sample & polished thin section)
ZONE: LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This sample is similar to the preceding (sample MSL-94-01-432.9'). It overall texture ranges from a swirling, tuff-like rock with irregular masses and interstitial alteration, to an almost brecciose texture. What appears to be the "host" rock is mostly extremely fine-grained to submicroscopic and heavily altered. It is clearly volcanic in origin, with remnants of altered microphenocrysts and vesicles. The vesicles are mostly flattened. Large portions of the rock, interstitial to the volcanic host material, have been altered to a carbonate-chlorite assemblage, with abundant opaque, nonreflectant material as seen in previous samples. Carbonate and quartz-carbonate veinlets cut both the interstitial matrix material and the volcanics. Sulphides, present as accessories, are dominated by pyrite in this sample.

MINERALOGY

≈45% Brownish Altered Volcanic Host: the volcanic host has been altered to a greyish-brown (in plane polarized light), extremely fine-grained material; I suspect that there may be appreciable carbonate within this material, but unlike the interstitial and vein carbonate, it does not effervesce in cold HCl (which means, at least, that it is not calcite); otherwise, the material is to fine-grained (to submicroscopic) to permit optical identification of its constituents; there are remnants of microphenocrysts and vesicles within the volcanic material; it may have been originally glassy.

≈20% Opaques, consisting (in order of decreasing abundance) of:

Nonreflectant Opaque Material: dominates the opaque material in this sample; forms the "matrix" between the irregular masses of volcanic material; associated with alteration minerals such as carbonate; also alters the fragments themselves.

Pyrite: the most abundant sulphide (but an accessory, probably less than 2% in the rock as a whole); occurs as clusters of very fine, subidiomorphic grains.

Chalcopyrite: accessory.
Chromite: trace.

Pyrrhotite: trace.

Galena(?): trace, very fine grains of a whitish-grey mineral; looks like galena, but it could be a number of minerals (even violartie).

$\approx 20\%$ Carbonate: occurs in masses of fine grains, associated with chlorite, quartz, and nonreflectant opaque material, forming a sort of matrix interstitial to the volcanics; in addition to the identifiable, interstitial carbonate, there may be appreciable carbonate within the fragments (i.e., altering the volcanic material itself), although this material is too fine-grained to identify with certainty; there are also several carbonate veins that cut across both matrix and volcanics; at least some of the carbonate effervesces in cold HCl.

$\approx 10\%$ Chlorite: extremely fine, fibrous chlorite (so fine-grained that it is almost isotropic); common in areas interstitial to the masses of volcanic host, associated with other alteration minerals, especially carbonate; the chlorite is colourless to very pale green, with low, slightly anomalous bluish interference colours; also alters remnants of microphenocrysts and vesicles within the volcanic material.

$\approx 5\%$ Quartz: mostly very fine-grained (though some is coarse enough to be clearly identifiable); associated with carbonate in the altered matrix material between the volcanics.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-508.2' (hand sample & polished thin section)

ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This rock is so heavily altered that it is difficult to know what to call it. At first look I was tempted to call it a partially spinifex-textured peridotite or clinopyroxenite, but it is clearly not a classic spinifex. Parts of the sample are quite coarse-grained, consisting predominantly of altered clinopyroxene. The sample does contain abundant, extremely elongated, hopper-type (hollow) grains, but instead of pyroxene or olivine these seem to be mainly altered plagioclase. The rock is probably part of a mafic-ultramafic flow sequence. The feldspar hopper crystals are almost certainly indicative of rapid cooling, but I am not quite sure what to make of the coarser clinopyroxenes; perhaps a two-stage cooling process is indicated(?). I would interpret this as a feldspathic periodotite with a texture that is transitional to spinifex texture.

The alteration is heavy and pervasive, dominated by chlorite, with heavy saussuritic (sericite + epidote + carbonate) alteration of the feldspars. Opaques are dominated by oxides—mostly magnetite and ilmenite. Some of the oxides may have been generated through the alteration of pyroxenes, and some through the alteration of primary oxides, probably a titanomagneteite or ilmenite.

MINERALOGY

≈40% Feldspar & Altered Feldspar: feldspar occurs in the form of coarse but highly elongate grains, which are typically hollow, "hopper"-type grains; this texture is usually indicative of rapid cooling; the feldspars are so heavily altered that they are barely recognizable, but probably consist of mainly or exclusively plagioclase; the alteration is a submicroscopic, cloudy, saussuritic assemblage, probably containing a mixture of epidote, carbonate, and sericite, as well as other minerals.

≈35% Clinopyroxene & Altered Clinopyroxene: the recognizable clinopyroxene grains are quite coarse, ranging up to 3 mm or more; they typically retain euhedral to subhedral grain boundaries and, though heavily altered, simple twinning is commonly preserved; the alteration is heavy, typically attacking the cores of grains and along fractures; the alteration consists of fibrous chlorite with carbonate and possibly some talc or actinolite(?).
=20% Chlorite: in addition to the chlorite altering clinopyroxene, there is abundant extremely fine-grained, fibrous chlorite altering what may have been a very fine groundmass interstitial to the clinopyroxene and feldspar grains; this may also be associated with submicroscopic, cloudy epidote.

=5% Opaques, consisting (in order of decreasing abundance) of:

Magnetite: in clusters, in skeletal intergrowths with ilmenite; about twice as abundant as ilmenite.

Ilmenite: in skeletal intergrowths with magnetite.

Pyrrhotite: trace.

Acc. Carbonate: in cross-cutting veinlets.

Tr. Quartz: in veinlets, associated with carbonate.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-536.5' (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This sample appears to be an altered fine-grained gabbro. The original texture, which is probably best defined as diabasic (fine plagioclase needles and slightly coarser clinopyroxene grains) is well-preserved in spite of the alteration. The original texture is clearly visible when the thin section is held up to the light. The feldspars are heavily altered to a cloudy, saussurite assemblage. The clinopyroxenes are altered to a fibrous assemblage that seems to consist primarily of a strongly coloured chlorite. The clinopyroxenes themselves, where they are less altered, are quite strongly coloured. There are some fine, cross-cutting veinlets containing carbonate and albite (or possibly adularia?), as well as a cloudy mineral that could be prehnite.

MINERALOGY

≈50% Plagioclase & Altered Plagioclase: elongate tabular to needle-like grains, ave. 1-1.5 mm in length; now heavily to completely altered to a cloudy, saussuritic alteration assemblage.

≈40% Clinopyroxene & Altered Clinopyroxene: irregular to subhedral prismatic grains, now heavily to completely altered; original grain size ave. 1-2 mm; alteration is an extremely fine-grained mixture of green fibrous minerals, probably mainly actinolite or chlorite + actinolite, with minor exsolved oxide material; the original clinopyroxenes, where preserved, also show strong green colour and pleochroism.

≈5% Opaques, consisting (in order of decreasing abundance) of:

Magnetite/IImenite: skeletal intergrowths; by far the most abundant opaque mineral in the sample.

Pyrite: accessory.

Pyrrhotite: trace; extremely fine-grained.

Chalcopyrite: trace; extremely fine-grained.
Acc. Quartz: minor interstitial silicification in limited areas.

Tr.-Acc. Albite: in fine, cross-cutting veinlets, associated with prehnite(?) and carbonate.

Tr.-Acc. Carbonate: in fine, cross-cutting veinlets, associated with prehnite(?) and albite.

Tr.-Acc. Prehnite(?) : in fine, cross-cutting veinlets, associated with carbonate and albite.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-562.4 (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This rock is similar mineralogically to the preceding sample (MSL-94-01-536.5'), but coarser-grained. It consists of altered plagioclase laths with an altered ferromagnesian mineral. The protolith could have been either gabbo or diorite, depending on the identity of the original ferromagnesian mineral (if pyroxene, then the rock was a gabbor; if amphibole, then the rock was a diorite). The igneous texture is well-preserved, in spite of alteration; the texture is best described as gabbroic, consisting of randomly-oriented feldspar laths with irregular, interstitial ferromagnesians. Because the mafic minerals are interstitial, there are few subhedral grain outlines preserved, which makes it even more difficult to determine whether the original mineral was an amphibole or a pyroxene. The colour of the alteration of the ferromagnesians is such a bright bluish-green that it suggests an amphibole as the original mineral; it would be unusual for pyroxene to alter to such a strongly-coloured assemblage.

Assuming that the original ferromagnesian mineral was amphibole, then the protolith was a diorite, dominated by plagioclase laths and amphibole (probably hornblende). The plagioclase is now heavily altered to a cloudy, saussuritic (epidote-dominated) assemblage. The amphibole has clearly undergone some metasomatism (moving around of chemical constituents) during alteration. The less-altered remnants in the cores of some original grains are colourless, while the heavily altered rims consist of a very strongly coloured (blue-green to deep green) mixture of fibrous amphibole, probably with some chlorite.

There is a small amount of interstitial quartz, about 5-7% of the total rock. This is typical of diorite (and, in fact, not all that unusual in gabbro either). There is also a small amount of quartz that seems to be associated with chloritic veining.

MINERALOGY

≈50% Plagioclase & Altered Plagioclase: long, slender laths, ave. grain size 1-2 mm in length; plagioclase is now heavily to totally altered to a cloudy, saussuritic (epidote-dominated) assemblage, although ghosts of twinning are preserved in many grains; in some parts of the sample there are myrmekitic intergrowths between the feldspar and interstitial quartz.
≈30% Amphibole & Altered Amphibole: irregular grains, interstitial to feldspar laths; original grain size very variable (depending on the sizes of interstitial spaces), ranging up to several mm per individual grain; less-altered cores of grains are colourless, with very strongly coloured (blue-green) altered rims, suggesting the movement of chemical constituents during alteration; a strong blue-green colour in amphiboles often (but not always) indicates an alkalic composition; the alteration tends to be fibrous, probably mostly actinolite, sometimes with chlorite.

≈10% Chlorite: extremely fine-grained, fibrous, part of the assemblage altering amphibole; there is also a limited amount of chloritic veining associated with quartz; the chlorite is unusually strongly coloured, pleochroic in deep emerald green to pale tan, with anomalous greenish interference colours.

≈5% Opaques, consisting (in order of decreasing abundance) of:

Ilmenite/Magnetite: the dominant opaque mineral is a strongly skeletal ilmenite or ilmenite/magnetite intergrowth; closely associated (intergrown) with amphibole.

Pyrite: minor; irregular masses.

≈5% Quartz: interstitial to the amphibole and plagioclase; looks like primary (i.e., igneous) quartz; there is also a small amount of quartz associated with chloritic veining.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-628.2' (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is a plagioclase-dominated rock. Given the ultramafic-mafic association, it would be reasonable to assume that the protolith was an anorthosite (or gabbroic anorthosite, or plagioclase-rich diorite), although it is impossible to check the original composition of the plagioclase given the degree of alteration. The style of alteration—heavily pervasive, along with open-space-filling veinlets, and dominated by carbonate—is different from that observed in preceding samples.

The plagioclase grains in the rock are elongate, lath-shaped, medium-grained. They are heavily to totally altered to a cloudy, submicroscopic, saussuritic (epidote-dominated) assemblage. Twinning is preserved in a large number of grains. Interstitial to the plagioclase laths there are some irregular, cloudy patches of submicroscopic material. It is possible that these were originally mafic minerals, in which case the rock would have been very similar to the preceding sample (MSL-94-01-562.4') in both texture and mineralogy. However, absolutely nothing remains of the material that originally occupied the interstitial areas, so it is impossible to be sure.

The sample is cut by fine and very fine quartz-carbonate veining with a colourless fibrous mineral that could be fibrous albite. There is a suggestion of open-space-filling textures in these veinlets. The veinlets cross-cut each other, perhaps suggesting more than one episode of veining (or continuing, overlapping veining). There is a lot of carbonate in the alteration assemblage overall, both in the submicroscopic alteration (where it is difficult to identify) and in the veining. None of the carbonate effervesces in cold HCl, which indicates that it is not calcite (could be ankerite or magnesite, among other possibilities).

MINERALOGY

≈70% Plagioclase & Altered Plagioclase: elongate, lath-like grains, ranging from 1 to 3 mm in length; twinning is preserved in spite of the very heavy alteration; alteration is cloudy, submicroscopic, saussuritic, with a high proportion of carbonate.

≈25% Submicroscopic Alteration & Carbonate: probably the majority of the submicroscopic, greyish-brown (in plane polarized light) alteration in this
sample is composed of carbonate, although in the finest-grained parts of the
sample it is difficult to identify with certainty; none of the carbonate
effervesces in cold HCl, indicating that it is not calcite (could be ankerite or
magnesite, among others); the carbonate alters plagioclase (see above) and
areas interstitial to the plagioclase, where it is the finest-grained, and probably
mixed with some other submicroscopic alteration minerals; carbonate (also
non-effervescent) also occurs in fine veinlets, sometimes alone and sometimes
associated with quartz and a fibrous mineral, possibly albite.

≈3% Opaques, consisting (in order of decreasing abundance) of:

Leucoxene-Altered Ilmenite/Magnetite: most of this is nonreflectant, probably
a leucoxene-type alteration that preserves the original skeletal intergrowth
texture of the oxides.

Chalcopyrite: minor; irregular masses, associated with carbonate veining.

Pyrite: trace; extremely fine grains.

Acc. Quartz: in very fine veinlets, associated with carbonate and a fibrous mineral
(albite?).

Acc. Albite(?): a fibrous, colourless mineral in very fine veinlets, associated with
quartz and carbonate.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-629.5’ (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is another heavily altered, plagioclase-dominated rock (anorthosite? gabbroic anorthosite? plagioclase-dominated diorite?). It is very similar to the preceding sample (MSL-94-01-628.2’) but noticeably coarser-grained. The alteration is carbonate-dominated and, as in MSL-94-01-628.2’, the carbonate does not effervesce in cold HCl, indicating that it is not calcite. In this sample, there is also a suggestion of sericitic alteration, in the form of a very, very fine web of gash-like veinlets consisting of a fibrous sericitic material. The discrete quartz and carbonate veining observed in sample MSL-94-01-628.2’ is present but less apparent in this thin section. Some brittle deformation (brittle fracturing of feldspar grains) is evident in this sample.

MINERALOGY

≈45% Submicroscopic Alteration & Carbonate: a brownish-grey (in plane polarized light), submicroscopic alteration assemblage is pervasive throughout the sample, but especially heavy in areas interstitial to the plagioclase grains; is is carbonate-dominated, but other minerals may also be present; the carbonate (even where it is clearly identifiable) does not effervesce in cold HCl, indicating that it is not calcite (could be ankerite or magnesite, among other possibilities); there is a small amount of carbonate veining.

≈40% Plagioclase & Altered Plagioclase: elongate, lath-like grains, ave. 2-3 mm (not as slender and needle-like as in previous samples, more tabular); heavily to totally altered to a submicroscopic, cloudy saussuritic-sericitic assemblage; twinning is preserved in many grains; some grains have undergone brittle fracturing.

≈10% (?) Sericitic Alteration: very difficult to separate from the carbonate-dominated alteration, described above; sericitic occurs mainly in the form of a very fine web of stringers or gash-like veinlets of fibrous sericite, throughout the entire sample;

2-3% Opaques, consisting (in order of decreasing abundance) of:

Leucoxene-Altered Ilmenite/Magnetite: mostly nonreflectant, a leucoxene-type
alteration that preserves the original fine skeletal intergrowth texture of the oxides.

Pyrite: accessory; very fine, irregular grains.

Acc. Quartz: in extremely fine veining, associated with carbonate.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-809.4© (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This sample is extremely fine-grained overall (essentially submicroscopic), and heavily altered. My best guess--based on a preserved randomly-oriented, needle-like texture and the overall mafic aspect of the sample--is that it was probably a fine-grained mafic flow.

The mineral constituents in this sample are mostly unidentifiable by simple optical means. The abundance of cloudy material suggests the presence of submicroscopic epidote, which would be typical of the alteration of a mafic flow. Some fibrous green chlorite is present. The remainder is essentially a submicroscopic clay mixture of some type, pseudomorphously preserving the needle-like texture of the original minerals (probably mainly plagioclase). A small amount of carbonate is present, mostly in very fine veinlets; it does not effervesce in cold HCl. There are also a few very fine veinlets containing the colourless fibrous mineral tentatively identified in sample MSL-94-01-628.2© as albite; it could be a fibrous colourless chlorite, but it would be unusual for there to be two chlorites (one colourless, the other green) in one sample. Most of the sulphides (pyrite) in the sample are associated with veining of this material. There is some altered oxide present, but pyrite (with traces of chalcopyrite) dominates the opaque assemblage (less than 3% of the rock as a whole).
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-966.8° (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is a coarse-grained, intrusive rock. It is similar in many respects to sample MSL-94-01-562.4°, described above, although this sample is coarser-grained. The protolith was probably a diorite. The presence of apatite as an accessory definitely supports the conclusion that this sample is out of the mafic-ultramafic family and more in the range of a diorite-tonalite-quartz diorite association. The sample consists of coarse, tabular plagioclase grains (mostly in the size range 2-4 mm in length), now moderately to heavily altered to a cloudy saussuritic-sericitic assemblage. The original mafic mineral (probably amphibole, although pyroxene is still a possibility), interstitial to the plagioclase grains, has been altered to a fibrous mixture of strongly coloured chlorite and very strongly coloured, blue-green fibrous amphibole. Chlorite—strongly coloured—also occurs in cross-cutting, irregular, gash-like veinlets. (Strong colour in chlorite often indicates an iron-rich composition.) Where it has been preserved, in the cores of coarse grains, the original ferromagnesian mineral appears to have been almost colourless. Quartz is common in interstitial areas, where it forms myrmekitic intergrowths with plagioclase (this texture suggests, but does not prove, that at least some of the quartz is primary, i.e., igneous quartz). There are also some fine, irregular quartz-bearing veinlets, suggesting minor silicification.

MINERALOGY

~50% Plagioclase & Altered Plagioclase: coarse, tabular grains, mostly in the size range 2-4 mm; moderately altered to a cloudy, saussuritic-sericitic assemblage.

~30% Amphibole & Altered Amphibole: the original mafic mineral, occurring in coarse, irregular grains interstitial to the plagioclase, was probably an amphibole (although pyroxene is possible too); where preserved, the original mineral appears to have been almost colourless, now heavily altered to a strongly coloured mixture of fibrous amphibole and chlorite; colour (blue-green) in amphiboles can indicate an iron-rich and/or alkaline composition.

~10% Chlorite: forms part of the assemblage altering amphibole; also occurs in gash-like, irregular veinlets; the chlorite is fibrous, unusually strongly coloured (pleochroic from strong emerald green to pale yellow), with strong anomalous green interference colours; strong colour in chlorite often (but not always)
indicates an iron-rich composition.

5-7% Quartz: interstitial to the plagioclase and amphibole; forms myrmekitic intergrowths with plagioclase; also occurs in some very fine, irregular veinlets.

3-5% Opaques, consisting (in order of decreasing abundance) of:

Leucoxene-Altered Magnetite/Ilmenite: relatively coarse, skeletal intergrowths of oxides, now altered to a semi-translucent leucoxene-type mixture.

Pyrite: about half as abundant as the altered oxides; it looks like pyrite occurs as alteration of the oxides, i.e., rimming altered skeletal oxide masses.

Tr. Apatite.
PETROGRAPHIC DESCRIPTION

SAMPLE No. MSL-94-01-983.5' (hand sample & polished thin section)
ZONE:
LOCATION:

SUMMARY & TEXTURAL DESCRIPTION

This is a coarse-grained, plagioclase-dominated sample. It may have originally been quite similar to sample MSL-94-01-966.8' (preceding), but has been much more extensively altered and deformed. The alteration is heavily pervasive; nothing remains of the original interstitial mafic grains, which have been altered to a combination of pale fibrous chlorite and carbonate. Interestingly, the carbonate in this sample--unlike the carbonate observed in other samples of this group--effervesces vigorously in cold HCl, indicating that it is calcite. The sample is cut by quartz veining with incipient crack-seal textures. Deformation is fairly extensive, primarily brittle in character.

MINERALOGY

≈40% Plagioclase & Altered Plagioclase: relatively coarse, tabular grains (mostly in the size range 1-3 mm); abundant evidence of brittle fracturing; moderate to heavy alteration to a cloudy, saussuritic-sericitic assemblage.

≈25% Carbonate (& Other Submicroscopic Alteration): carbonate-dominated alteration is pervasive; mostly very fine-grained; effervesces vigorously in cold HCl, which indicates that it is mainly or exclusively calcite (unlike the carbonate alteration described in preceding samples).

≈25% Chlorite: fibrous, altering the remnants of interstitial mafic minerals; unlike the chlorite described in some preceding samples (such as MSL-94-01-966.8'), the chlorite is pale, faintly pleochroic from pale green to colourless, with low, slightly anomalous bluish interference colours; this suggests a different composition for the chlorite in this sample.

5-7% Quartz: some quartz (primary?) occurs interstitially to the plagioclase grains, forming myrmekitic intergrowths with the feldspar; quartz also occurs in veinlets, some with incipient crack-seal texture (typical in rocks undergoing brittle deformation during the period of vein formation).

≈5% Opaques, consisting (in order of decreasing abundance) of:

Leucoxene-Altered Ilmenite/Magnetite: skeletal intergrowths of oxides, now
altered to a semi-translucent leucoxene-type mixture.

Pyrite: considerably less abundant than oxides (an accessory mineral in the rock as a whole); may be present as alteration of oxides.
PHOTOMICROGRAPHS
(All photos taken in transmitted light.)

1. Sample MSL-94-01-226.5': typical serpentinized cumulate-textured olivine (dunite) with interstitial pyroxene; dimensions ≈5.25 x 3.6 mm; plane polarized light.

2. Sample MSL-94-01-226.5': same as 1, with crossed polarizers; the interstitial pyroxene is the most brightly-coloured material (yellow, blue, green) in this view; the serpentinized olivine appears grey.

3. Sample MSL-94-01-397.7': brecciose sample; subangular fragments in an opaque, nonreflectant matrix; dimensions ≈5.25 x 3.6 mm; plane polarized light.

4. Sample MSL-94-01-397.7': similar to 3, at higher magnification; presence of round, vesicle-like bodies suggests that the fragments are volcanic in origin; dimensions ≈2.35 x 1.61 mm; plane polarized light.

5. Sample MSL-94-01-432.9': similar to preceding sample, irregular fragments in a dark, brecciose or tuffaceous matrix, but texture is much more variable overall; dimensions ≈5.25 x 3.6 mm; plane polarized light.

6. Sample MSL-94-01-432.9': similar to 5, showing a different field of view with flattened vesicle-like bodies and remnants of microphenocrysts in volcanic fragments; dimensions ≈5.25 x 3.6 mm; plane polarized light.

7. Sample MSL-94-01-474': irregular volcanic fragments in a brecciose or tuffaceous matrix; cross-cutting carbonate veining; dimensions ≈5.25 x 3.6 mm; plane polarized light.

8. Sample MSL-94-01-474': similar to 7, showing a different field of view with variable texture; dimensions ≈5.25 x 3.6 mm; plane polarized light.

9. Sample MSL-94-01-508.2': highly elongate, needle-like hopper crystals of feldspar in a heavily altered chloritic groundmass; the needle-like texture usually indicates rapid cooling but is not a pinifex texture in the classic sense; dimensions ≈5.25 x 3.6 mm; plane polarized light.

10. Sample MSL-94-01-508.2': same as 9, with crossed polarizers.

11. Sample MSL-94-01-536.5': heavily altered, fine-grained gabbro; plagioclase laths (cloudy) with interstitial altered mafics (green); dimensions ≈5.25 x 3.6 mm; plane polarized light.

12. Sample MSL-94-01-536.5': same as 11, with crossed polarizers.
13. **Sample MSL-94-01-562.4**: similar to 11, an altered fine-grained gabbro (diorite?) with cloudy plagioclase laths and interstitial mafics; mafics (amphibole or pyroxene, now amphibolitized) are very strongly coloured; interstitial quartz (clear, colourless); dimensions ≈5.25 x 3.6 mm; plane polarized light.

14. **Sample MSL-94-01-562.4**: same as 13, with crossed polarizers.

15. **Sample MSL-94-01-628.2**: cloudy plagioclase laths; texture is similar to that shown in 11 and 13, but interstitial mafics are completely altered, with no remnants; dimensions ≈5.25 x 3.6 mm; plane polarized light.

16. **Sample MSL-94-01-628.2**: same as 15, with crossed polarizers.

17. **Sample MSL-94-01-629.5**: cloudy plagioclase laths with altered interstitial mafics; similar mineralogically to the preceding sample, but coarser-grained; dimensions ≈5.25 x 3.6 mm; plane polarized light.

18. **Sample MSL-94-01-629.5**: same as 17, with crossed polarizers.

19. **Sample MSL-94-01-809.4**: altered very fine-grained mafic flow(?); random needle-like texture; cross-cutting fine veinlets of unknown fibrous material (looks like chalcedonic quartz but isn't); dimensions ≈5.25 x 3.6 mm; plane polarized light.

20. **Sample MSL-94-01-809.4**: same as 19, with crossed polarizers.

21. **Sample MSL-94-01-809.4**: same as 19, at higher magnification to show texture; dimensions ≈2.35 x 1.61 mm; plane polarized light.

22. **Sample MSL-94-01-809.4**: same as 21, with crossed polarizers.

23. **Sample MSL-94-01-966.8**: relatively coarse-grained intrusive, probably diorite; fine myrmekitic intergrowth of quartz and feldspar is visible (above center of photo); plagioclase laths appear dark and cloudy due to alteration; dimensions ≈5.25 x 3.6 mm; plane polarized light.

24. **Sample MSL-94-01-966.8**: same as 23, with crossed polarizers.

25. **Sample MSL-94-01-966.8**: similar to 23, showing cloudy plagioclase laths and altered (amphibolitized) interstitial mafics (deep greens), with a small portion of unaltered interstitial mafic (the cracked, colourless material altering to green chlorite left of center); chloritic veining cuts almost horizontally across the center of the photo; dimensions ≈5.25 x 3.6 mm; plane polarized light.

26. **Sample MSL-94-01-966.8**: same as 25, with crossed polarizers.
27. **Sample MSL-94-01-983.5**: brittle deformation (fracturing) in altered plagioclase grains; heavy, near-pervasive chlorite-carbonate alteration; dimensions = 5.25 x 3.6 mm; plane polarized light.

28. **Sample MSL-94-01-983.5**: same as 27, with crossed polarizers.

29. **Sample MSL-94-01-983.5**: same sample at higher magnification, showing incipient crack-seal texture in quartz veining; dimensions = 2.35 x 1.61 mm; plane polarized light.

30. **Sample MSL-94-01-983.5**: same as 29, with crossed polarizers.
<table>
<thead>
<tr>
<th>Depth</th>
<th>Core Azi.</th>
<th>Core Dip</th>
<th>Collar Azi.</th>
<th>Collar Dip</th>
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<th>Date Finished</th>
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<th>Purpose</th>
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<td>104</td>
<td>02 Oct. 94</td>
<td>04 Oct. 94</td>
<td>Glenn J. Mullan</td>
<td>Bradley Brothers Ltd.</td>
<td>BQ</td>
<td>Diepdaume Mine, Timmins.</td>
<td>NW Casing</td>
<td>To Test HLEM &amp; INPUT Anomaly.</td>
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**Geology**

- **Sample**
- **From**
- **To**
- **OZ/TON**
- **Au**
- **In**
- **Cu**
- **Zn**
- **m**

**Depth**

- 102.0 of 14

**Core Description**

- **Type**: Serpentinitized Dunite
- **Description**: Fine grained, dark green to black, massive, textured ultramafic intrusive. Strongly magnetic (i.e. source of magnetic anomaly). Blocky core cut by numerous 1/16 inch wide calcite (and/or brucite) veins. Carbonate veins, veins of chrysotile, and quartz. Local, irregular veinlets of chrysotile.

**Notes**

- **Purpose**: To test HLEM & INPUT Anomaly.
### Geology

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<th>To ft.</th>
<th>sample</th>
<th>From</th>
<th>To</th>
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<th>CU</th>
<th>ZN</th>
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</tbody>
</table>

- **Faint relict mesh-like fabric.**
- **133.8 137.2** Bleached (carbonatized).
- **140.8 145.0** Pyrite, pyrrhotite, chalcopyrite and sphalerite (<2% over sample no. 14505: reddish hue.
- **213.0 224.0** Altered, more quartz carbonate (and/or brucite) veinlets.
- **218.0 224.5** Felsic dike (Diorite). Greyish, medium grained, equigranular.
- **226.5** Hand Sample and Polished Thin Section: of serpenitized cumulate textured dunite.

**Typical of layered intrusions and cumulate zones of komatiitic sequences (i.e. Munro Township). Constituents:** medium grained, cumulate textured serpenized olivine; interstitial clinopyroxenes (chloritized); significant magnetite, trace chalcopyrites (chloritized).
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<th>Geochemistry</th>
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</thead>
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<tr>
<td>CU</td>
<td>320.0</td>
<td>Gradual increase in grain size (fine to medium grained).</td>
<td></td>
</tr>
<tr>
<td>ZN</td>
<td>325.6</td>
<td>0.3° quartz carbonate vein and alteration halo (brucite).</td>
<td></td>
</tr>
<tr>
<td>NI</td>
<td>370.0</td>
<td>More carbonatization (matrix), less magnetic, decrease grain size (medium to fine grained).</td>
<td></td>
</tr>
<tr>
<td>AU</td>
<td>380.0</td>
<td>Fine grained, wisps of pyrrhotite, trace pyrite. Contact halo: aphanitic, silicified (?) , weakly carbonatized.</td>
<td></td>
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</tbody>
</table>

**VOLCANIC BRECCIA** composed of dark grey to black breccia sub-equal fragments and carbonaceous (?) matrix. Fragments are both angular and subrounded (redigested by matrix = volcanic, not sedimentary ?). Some fragments compressed parallel to core. Contact halo: aphanitic, weakly carbonatized. 

Local cut by dykes (?) of matrix material (no fragments); fragments range from < 1/16 to 1 inch. Some fragments compressed parallel to core. 

**NOTE:** Photomicrograph #1 (MSL-94-1-79.2). Vesicle like bodies observed under higher magnification suggest fragments are of volcanic origin. 

<table>
<thead>
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<th>From</th>
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<th>Value</th>
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<tr>
<td>383.7</td>
<td>488.3</td>
<td>VOLCANIC BRECCIA</td>
</tr>
</tbody>
</table>

- **Volcanic origin**: Suggest fragments are of volcanic origin. 
- **Fragmentation**: Contact halo: aphanitic, weakly carbonatized. 
- **Alteration**: Alteration halo (brucite). 
- **Gradual Increase**: Gradual increase in grain size.
From | To | Geology
---|---|---
---|---|---

**Part 1**

- Pyrrhotite pyrite, as blebs in dark matrix, breccia
- Black, fine grained matrix
- Matrix, replacing carbonates in as blebs in dark carbonaceous breccia
- Pyrrhotite pyrite, chalcopyrite

**Part 2**

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<th>Sample</th>
<th>Au</th>
<th>Ag</th>
<th>Cu</th>
<th>Zn</th>
<th>In</th>
<th>Sn</th>
<th>Fe</th>
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</tbody>
</table>

**General**

- Alteration: carbonate (calcite) in matrix and fragments. Increase calcite in matrix.
- Veins: Narrow quartz carbonate veins at 5 degrees to core axis.
- Mineralization: Pyrrhotite and pyrite occur as replacement texture (replace fragments, matrix = sulphides).
From ft. to ft.:

**Sample:** Hand Sample and Polished Thin Section

**Location:** Alterred, Porphyritic, Vesciluvar, Brecciated Mafic Flow

Texture: Swirling, Irregular to Brecciose - Fragmented.

Constituents: 65% Brownish Material (volcanic origin), 15% Opaques, 1% Pyrrhotite, Trace Pyrite, Chalcopyrite, Chromite, Pentlandite, Magnetite (volutic origin), 15% unidentified material and sulfides (10 to 15%)

Matrix: Matrix consists of chlorite, chalcopyrite, magnetite, and carbonate, and carbonates, chlorite, and chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, chlorite, 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NOTE: Most pyrrhotite-pyreite wisps hosted within dark carbonaceous layers.

474.0 0.2 foot wide band of quartz at 25 degrees to core axis.

477.2 Interbedded tuffaceous breccia has a greenish hue.

477.8 0.2 foot wide pyrrhotite band at core.

477.8 Interbedded tuffaceous breccia.

479.0 Matrix, tuffaceous breccias - fragments gabbroic (?).
45 degrees to core axis.

445.0 | 449.0 PERIDOTITIC KOMATIITE

Dark green, inequigranular, hypidiomorphic intrusive; non magnetic, grain size fines downhole to massive - aphanitic; some lath-like crystals (feldspar). Weak but pervasive (ubiquitous) carbonatization. Lm pyrrhotite disseminated in matrix.

561.0 | 563.0 PERIDOTITIC KOMATIITE

508.2

Hand Sample & Polished Thin Section: Peridotitic Peridotite.

574.0 | 579.0 PERIDOTITIC KOMATIITE

Hand Sample & Polished Thin Section: Peridotitic Peridotite.
<table>
<thead>
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<th>From Ft</th>
<th>To Ft</th>
<th>Geology</th>
</tr>
</thead>
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<td>611.0</td>
<td>628.0</td>
<td>628.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GABBRO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Trans. con. (lath like feldspars).</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>587.0</td>
<td>602.7</td>
<td>611.0</td>
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</tr>
<tr>
<td>592.0</td>
<td>562.4</td>
<td>602.7</td>
<td>THIN SECT. Altered GABBRO: Similar to 536.5 but coarser grained, 50% altered plagioclase laths (gabbro - diorite protolith). 30% amphibole; 10% chlorite; 5% opaques. Gabbroic texture (randomly oriented feldspar laths).</td>
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<td>536.5</td>
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<td>GABBROIC KOMATITE</td>
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<td>Transitional contact (lath like feldspars).</td>
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<td>616.0</td>
<td>628.0</td>
<td>5.7</td>
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<tr>
<td></td>
<td>602.7</td>
<td>611.0</td>
<td>HAND SAMPLE &amp; POLISHED THIN SECT.: Altered, fine-grained, magnetic, dark, equigranular. Provider: 50% altered plagioclase laths (gabbro - diorite protolith); 30% amphibole; 10% chlorite; 5% opaques. Gabbroic texture (randomly oriented feldspar laths).</td>
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<tr>
<td></td>
<td>611.0</td>
<td>628.0</td>
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</tbody>
</table>
Geology

Sample: ANORTHOSITE
628.0 - 629.5
Hand sample and polished thin section: GABBROIC ANORTHOSITE

- 70% plagioclase, altered plagioclase (saussurite)
- 25% carbonate (microscopic)
- 5% opaque minerals (ilmenite, magnetite, pyrite)

Alteration is pervasive quartz carbonate veining.

629.5
THIN SECTION: GABBROIC ANORTHOSITE

- Coarse grained, 45% plagioclase, 40% carbonate (microscopic), 10% saussurite
- Plagioclase and carbonate products (sand)

ANORTHOSITE: Coarse grained, 45%

631.7 - 636.4
MAFIC FLOW

Dark green to green grey mafic flows (fine grained to aphanitic), spherulitic texture

ANORTHOSITE: Core is altered, 45%

631.7 - 636.4
MAFIC FLOW

Vein at 15 degrees to core axis.

VEIN: Core is altered, 45%

631.7 - 636.4
MAFIC FLOW

Vein at 15 degrees to core axis.

631.7 - 636.4
MAFIC FLOW

Vein at 15 degrees to core axis.

631.7 - 636.4
MAFIC FLOW

Vein at 15 degrees to core axis.
<table>
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<tr>
<th>Sample</th>
<th>From</th>
<th>To</th>
<th>Lng</th>
<th>CU</th>
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</table>

**Geology**

Quartz veins at 632.4° (0.5°) and 634.5 (0.7°) at 30 degrees to core axis. FELDSPAR PORPHYRY DYKE

636.4° to 637.9° cumulate texture (?) mafic flows (komatitide).

64 1.0° to 64 2.7°, 64 4.3°, 64 6.5°, to 64 7.8° and 64 9.4°, to 65 0.5°, to 65 2.6°, 65 5.9°, to 65 7.9°, 65 9.9°, to 66 1.0°, and 66 3.6°, to 66 5.7°

Alteration: Local bleaching (carbonate) at 64 2.7° to 64 4.3°, 64 6.5° to 64 7.8° and 64 9.4° to 65 0.5°.

Veining: Cut by narrow (1/2 inch) quartz carbonate veinlets at various orientations.

Medium to coarse grained, inequigranular, mafic intrusive; weakly magnetic, blotchy texture and crystals. Carbonatized, irregular contacts.

Veining: Cut by narrow (1/2 inch) quartz carbonate veinlets at various orientations.

Medium to coarse grained, inequigranular, mafic intrusive; weakly magnetic, blotchy texture and crystals. Carbonatized, irregular contacts.

64 1.0° to 64 2.0°, 64 4.0°, 64 6.0°, 64 8.0°, and 64 9.4°, to 65 0.5°, to 65 2.6°, 65 5.9°, to 65 7.9°, 65 9.9°, to 66 1.0°, and 66 3.6°, to 66 5.7°

**GABBRO**

64 1.0° to 64 2.0°, 64 4.0°, 64 6.0°, 64 8.0°, and 64 9.4°, to 65 0.5°, to 65 2.6°, 65 5.9°, to 65 7.9°, 65 9.9°, to 66 1.0°, and 66 3.6°, to 66 5.7°
**Geology**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>FL.</th>
<th>Cu</th>
<th>Zn</th>
<th>Au</th>
<th>Sample</th>
<th>Geochemical</th>
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<tr>
<td>14554</td>
<td>808.7</td>
<td>0.3</td>
<td>1.7</td>
<td>0.038</td>
<td>0.20</td>
<td>QUARTZ VEIN</td>
<td></td>
</tr>
</tbody>
</table>

- Bull white quartz vein with crosscutting narrow sub veinlets of smoky grey quartz (1/2 inch); dark (chlorite) fragments in white quartz; minor calcite stringers, vein contacts at 20 degrees to core axis; < 3% fine silvery pyrite in grey quartz near both contacts.

- Approximately 2% fine pyrite in grey quartz near both contacts.

- Mafic flow, altered mafic flow, smokey grey to dark grey, conchoidal fracture, hard, brittle, interlayered coarse to medium grained.

- Tuffaceous gabbro, quartz carbonate veins (white and dark grey), well banded, more quartz carbonate veins near core.

**Altered Mafic Flow**

- Veining: quartz carbonate veins (white and dark grey), well banded, more quartz carbonate veins near core.

- quartz carbonate veins > 732° at 35 degrees to core axis. Leucocratic gabbro > 748°, breccia, wall rock fragments, quartz carbonate veins. Intercalated coarse and medium grained phases with both gradational and abrupt contacts. Well laminated banded quartz carbonate veins < 1/2 inch pyrite (771° to 778°). Alteration: grey, conchoidal fracture, hard, brittle, altered mafic flow, smokey grey to dark grey.
Geology

Epidote - chlorite, clay minerals, minor carbonate.

811.0 812.6 QUARTZ VEIN

Brecciated quartz vein. White, quartz-calcite vein, well developed breccia texture. Contacts at 20 degrees to core axis.

812.6 1000.0 GABBRO

Breccia - diorite, similar to above. Coarse grained, equigranular and inequigranular phases; both melanocratic and leucocratic phases; probably gabbro to about 900', diorite thereafter.

830.0 910.0 1/2 inch wide quartz carbonated veinlets, 1/2 inch wide quartz carbonated pyrite. Weakly magnetic.

890.0 910.0 0.91 Mafic dike.
<table>
<thead>
<tr>
<th>Sample</th>
<th>From</th>
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<th>Lng</th>
<th>CU</th>
<th>ZN</th>
<th>Au</th>
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</table>

916.0 2 inch wide smoky grey quartz veinlets (1 per foot), 1% pyrite, in gabbroic host and at vein contacts.

921.0 2.5' wide quartz calcite vein, vein breccia, n.% pyrite, 15% wall rock fragments.

966.8 THIN SECTION: 50% plagioclase, 30% amphiboles, 10% chlorite, 5% quartz, 5% opaques. Similar to 562.4' - altered gabbro. Apatite in sample, therefore dioritic, not gabbroic.

982.0 990.0 Bleached and brecciated (?) in not gabbrolic. In sample, therefore dioritic.

983.5 HAND SAMPLE AND POLISHED THIN SECTION: DIOIRITE: Coarse constituents: 40% plagioclase, 25% submicroscopic alteration (and carbonate), 25% chlorite, 2% opaques. Strong pervasive deformation, brittle altered gabbroic (chlorite).

991.2 992.1 Feldspar porphyry dike at 55 degrees to core axis.

994.6 995.0 Bleached and brecciated gabbro.
# Rapport sur les travaux exécutés après l’enregistrement d’un claim

## Loi sur les mines

Les renseignements personnels contenus dans la présente formule sont recueillis en vertu de la Loi sur les mines. Toute question sur la collecte de ces renseignements au chef provincial des terrains miniers doit être adressée à l’Office de la Protection de l’environnement, 4e étage, Sudbury (Ontario) P3E 6A5; téléphone : (705) 670-7254.

### Directives :
- Dactylographier ou écrire en lettres moulées.
- Se reporter à la Loi sur les mines et aux règlements d'évaluation ou consulter le registrateur de claims.
- Remplir une formule pour chaque groupe de travaux.
- Joindre à la présente formule deux exemplaires des rapports techniques et des cartes.
- Joindre à la présente formule une esquisse indiquant les claims ayant fait l'objet des travaux.

### Titulaire(s) enregistré(s)

<table>
<thead>
<tr>
<th>Adresse</th>
<th>N° de client</th>
</tr>
</thead>
<tbody>
<tr>
<td>297 3090 Canada Inc.</td>
<td>300 337</td>
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### Division des mines

<table>
<thead>
<tr>
<th>Lieu</th>
<th>Canton/secteur</th>
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<tbody>
<tr>
<td>126, Rue Savoie Sullivan, Québec</td>
<td>Munro</td>
</tr>
</tbody>
</table>

### Dates d’exécution des travaux

- du : October 1, 1994
- au : October 31, 1994

### Travaux exécutés (cocher un seul groupe de travaux)

<table>
<thead>
<tr>
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<tr>
<td>Levé géotechnique</td>
<td>RECEIVED</td>
</tr>
<tr>
<td>Travaux physiques, y compris forage</td>
<td>MAY - 5 1995</td>
</tr>
<tr>
<td>Réhabilitation</td>
<td>MINING LANDS BRANCH</td>
</tr>
<tr>
<td>Autres travaux autorisés</td>
<td>Sections H. Regulations - Photographic Descriptions - Thin Sections - Analysis Report</td>
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<tr>
<td>Essais</td>
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</table>

### Total des travaux d'évaluation réclamé sur le relevé des frais ci-annexe

| Total des travaux d’évaluation réclamé sur le relevé des frais ci-annexe | $2100 |

### Notes :
Le ministre peut rejeter une partie ou la totalité des travaux d’évaluation présentés pour obtenir des crédits d’évaluation si le titulaire enregistré ne peut vérifier les dépenses réclamées sur le relevé des frais dans les trente jours suivant une demande de vérification.

### Personnes et la compagnie d’arpentage qui ont exécuté les travaux (donner le nom et l’adresse de l’auteur du rapport)

<table>
<thead>
<tr>
<th>Nom</th>
<th>Adresse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara Munch</td>
<td>317 Mississauga Road South, Mississauga, ON L4Y 5K6</td>
</tr>
<tr>
<td>Geoplastech Inc.</td>
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</table>

### Certification d’intérêt bénéficiaire

Je certifie qu’au moment où les travaux ont été exécutés, les claims dont il est question dans le présent rapport étaient enregistrés au nom de leur titulaire actuel ou détenus à titre bénéficiaire par l’actuel titulaire enregistré.

### Certification sur les travaux exécutés

Je certifie que j’ai une connaissance directe des faits exposés dans le présent rapport, pour avoir exécuté les travaux ou en avoir constaté l’exécution avant ou après leur achèvement. Je certifie aussi que le rapport ci-annexé est exact.

### Valeur totale des crédits enregistrés

| Valeur totale des crédits enregistrés | $2100 |

### Date d’envoi de l’avis de modification

| Date d’envoi de l’avis de modification | April 10 / 95 |

### Date de l’approbation prévue

| Date de l’approbation prévue | July 9 / 95 |

### Renseignements de la réserve

<table>
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</table>

### Date d’enregistrement de l’article

| Date d’enregistrement de l’article | April 10 / 95 |

### Nom du registrateur ou représentant (signature)

<table>
<thead>
<tr>
<th>Nom du registrateur ou représentant (signature)</th>
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| | }

### Dépôt au ministère

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### N° d’enregistrement du rapport sur les travaux exécutés

| N° d’enregistrement du rapport sur les travaux exécutés | 0010202 |

### Date d’approbation

| Date d’approbation | 0010202 |

### Date de l’approbation du rapport sur les travaux exécutés

| Date de l’approbation du rapport sur les travaux exécutés | 0010202 |

### Date d’approbation du rapport sur les travaux exécutés

| Date d’approbation du rapport sur les travaux exécutés | 0010202 |
Les crédits que vous réclamez dans le présent rapport peuvent être réduits. Afin de diminuer les conséquences défavorables de telles réductions, veuillez indiquer l’ordre dans lequel vous désirez qu’elles soient appliquées à vos claims. Veuillez cocher (✓) l’une des options suivantes :

1. Les crédits doivent être réduits en commençant par le dernier claim sur la liste.
2. Les crédits doivent être réduits également entre tous les claims figurant dans le présent rapport.
3. Les crédits doivent être réduits selon l’ordre donné en annexe. L-1111551, L-1049499

Si vous n’avez pas choisi d’option, la première sera appliquée.

Note 1 : Examples d’intérêts bénéficiaires : cessions non enregistrées, ententes sur des options, protocoles d’entente, etc. relatifs aux claims.

Note 2 : Si des travaux ont été exécutés sur un terrain faisant l’objet de lettres patentes ou d’un bail, veuillez remplir ce qui suit:

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<thead>
<tr>
<th>Nombre de claim</th>
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Statement of Costs - "Munro Prospect"

Munro Township - Ontario

Fall Program, 1994

Item (Description):  

Cost:

A) Direct Field Costs: ($2100)
- sample preparation for thin sections
- preparation of thin sections, plates, etc.
- evaluation of thin sections, core samples, petrographic report, etc
- coloured plates (photomicrographs)  
  = $2100

** all inclusive cost (consultants: approx. $1800, own time preparing samples, log preparation, etc. $300 (1.5 days)**

Total Allowable For Assessment Credits: $2100

Total Claimed: $2100

Yours truly,

Glenn J. Mullen
April 4th, 1995
June 21, 1995

Mining Recorder
Ministry of Northern Development & Mines
4 Government Road East
Kirkland Lake, Ontario
P2N 1A2

Dear Mr. Spooner:

SUBJECT: APPROVAL OF ASSESSMENT WORK CREDITS ON MINING CLAIMS 1049488 ET AL. IN MUNRO TOWNSHIP

Assessment work credits have been approved as outlined on the original report of work forms for this submission. The credits have been approved under Section 18, Microscopic studies, Mining Act Regulations.

The approval date is June 12, 1995. Please indicate this approval on the claim record sheets.

If you have any questions regarding this correspondence, please contact Bruce Gates at (705) 670-5856.

Yours sincerely,

Ron C. Gashinski
Senior Manager, Mining Lands Section
Mining and Land Management Branch
Mines and Minerals Division

cc: Resident Geologist
Kirkland Lake, Ontario

Assessment Files Library
Sudbury, Ontario