FLUID CONTROLLED METAMORPHISM OF ECLOGITIC PSEUDOTACHYLITE-BEARING SHEAR ZONES, FLAKSTADØY, NORTHERN NORWAY

A thesis submitted to the faculty of
San Francisco State University
In partial fulfillment of
The Requirement for
The Degree

Master of Science
In
Geosciences

by

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January 2012

CERTIFICATION OF APPROVAL

I certify that I have read *Fluid controlled metamorphism of eclogitic pseudotachylite-bearing shear zones, Flakstadøy, northern Norway* by Deborah Joy Shulman, and in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree: Master of Science in Geosciences at San Francisco State University.

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AN EBSD STUDY OF ECLOGITE FACIES PSEUDOTACHYLITE-BEARING SHEAR ZONES, NORTHERN NORWAY

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2012

The Lofoten Islands in northern Norway represent the lower crust in the Baltica-Laurentia collision during the Caledonian Orogeny ~460 Ma. The island of Flakstadøy consists of ~1.8 Ga granulite-facies gneisses and AMCG units cut by discrete Caledonian shear zones, some containing pseudotachylite veins. A combination of petrography, mineral chemistry, and electron backscatter diffraction analyses show a spatial relationship between pseudotachylite formation, shear zone development, fluid infiltration, and metamorphism. Microfractures and backscatter imaging indicate that pseudotachylite-forming processes seismically shattered the rocks, reducing grain sizes and opening fluid pathways. Evidence of eclogite-facies metamorphism in omphacite and/or albite-diopside symplectite is found exclusively in the shear zones. A strong amphibolite-facies overprint in the shear zones replaced eclogite with amphibolite; a strong alignment of amphibole <001> parallel to the shear zone fabric indicates fluid availability during shearing. A lack of amphibole growth in the host rock indicates they remained effectively dry. I propose that co-seismic pseudotachylite formation opened fluid pathways in an otherwise effectively dry, impermeable granulitic crust. The advection of fluids led to localized strain and eclogite-facies metamorphism in otherwise metastable granulites. Permeability was maintained through localized strain during exhumation leading to a nearly complete amphibolite-facies overprint in the shear zones.

I certify that the Abstract is a correct representation of the content of this thesis.

Mary Leech, Chair, Thesis Committee — 12/15/11 — Date

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1.0 Introduction

Exposed shear zones of ancient mountain belts provide a window into lower crustal processes during orogenesis (e.g., such as that happening in the Himalaya today but is not directly observable). In the lower crust, deformation is commonly localized along discrete shear zones where metamorphic and deformational processes occur, and these shear zones influence patterns of heat flow, kinematics, metamorphism, and topographic variance (Huerta et al., 1998; Willet, 1999; Koons et al., 2002). Although great strides have been made to understand lower crust processes, questions remain about the relationships between metamorphism, fluids, and brittle and ductile deformation as they pertain to rheology during orogenesis (e.g., Austrheim, 1987; Austrheim et al., 1997; Früh-Green, 1994; Culshaw and Gerbi, 2009). The exhumed lower crustal rocks exposed in the Lofoten Islands of northern Norway provide a rare glimpse of deep crustal processes resulting from continental collision. The Lofoten Islands are one of two reported locations where eclogite-facies pseudotachylite have been found, the other being in southern Norway in the Bergen Arcs. Pseudotachylite-bearing shear zones provide insight to the interplay of brittle and viscous deformation at depth, as well as the role of metamorphism on the cm- to dm- scale.

This study uses pseudotachylite-bearing, eclogite-facies shear zones at two sites on the island of Flakstadøy (Fig. 1) to explore the role metamorphism and deformation had in shear zone formation and propagation. Studies investigating the roles of fluids and deformation in the Bergen Arcs suggest pseudotachylite formation opened fluid pathways

that subsequently led to eclogite-facies metamorphism and deformation (Austrheim, 1987, Austrheim et al., 1997, Engvik et al., 2000), indicating a close interplay between brittle and ductile deformation. The shear zones of the Lofoten Islands have a different metamorphic history than those of the Bergen Arcs, as evidenced by a strong amphibolite-facies overprint found on Flakstadøy. This study uses microstructural evidence to show that, as in the Bergen Arcs, the shear zones were initiated by pseudotachylite formation, and further explores the relationships between fluids, deformation, and metamorphism during shear zone propagation on Flakstadøy.

2.0 Geologic Background

The Lofotens represent the Caledonian continental subduction zone boundary from the Silurian Baltica-Laurentia collision (Steltenpohl et al., 2004; 2006; Fig. 1). The Lofoten Islands are a series of horsts that create an archipelago bounded by the western and eastern Lofoten ridge faults. The extensive geologic history of the Lofoten Islands includes multiple metamorphic events (Griffin et al., 1978; Markl and Bucher, 1997). Bergh et al. (2007) suggested that the Northern Lofoten Ridge was exhumed in the Permo-Triassic during post-Caledonian extension while the Central Lofoten Ridge (the southernmost islands of the archipelago) was denuded last, in the mid-Cretaceous. This study focuses on the island of Flakstadøy, the second-most southern island in the archipelago.

The geology of Flakstadøy consists of the Leknes group, a suite of folded, amphibolite-facies metasedimentary rocks thrust onto basement granulite-facies Archean-Proterozoic intrusive rocks, known as the Flakstadøy Basic Complex (FBC; Romey, 1971; Markl and Bucher, 1997; Steltenpohl et al., 2004). The FBC comprises an anorthosite, mangerite, charnokite, granite suite (AMCG), thought to have intruded into Archean crust during granulite-facies metamorphism (Griffin, 1978; Markl and Bucher, 1997). The AMCG basement is crosscut by narrow shear zones varying in width (cm- to dm-scale), length (m- to km-scale), and orientation. The shear zones show evidence of eclogite-facies metamorphism with relict omphacite crystals, but have been largely retrograded at amphibolite-facies. Pseudotachylite veins have been documented in some of the eclogitic shear zones (this study; Steltenpohl et al., 2006) that result from frictional melting during brittle faulting. These pseudotachylites are of special interest because they indicate that brittle deformation of metastable gabbroic gneisses occurred below the nominal brittle-ductile transition in the lower crust.

Emplacement ages for the AMCG range from 1870-1860 Ma and may have continued until as late as c. 1790 Ma based on U-Pb dating (Corfu, 2004a) including ages of 1793±4 Ma and 1789±2 Ma for gabbros on Flakstadøy. Griffin et al. (1978) attributed an 1830±35 Ma whole-rock Rb-Sr age for the AMCG to regional granulite-facies metamorphism, but Corfu (2004a) interpreted U-Pb ages of 1780-1760 to that high-grade event.

There is limited dating of the eclogitic shear zones found throughout the Lofoten basement due to extensive retrograde metamorphism. However, field observations of crosscutting relationships indicate coeval formation of shear zones and pseudotachylite. Zircon U-Pb lower intercept ages of 478±41 Ma and 457±49 Ma suggest a Caledonian age for eclogitization (Polito and Leech, 2006; Steltenpohl et al., 2011). A minimum age for eclogitization can be constrained by U-Pb ages of 469±3 to 461±1 Ma for amphibolite-facies metamorphism associated with thrusting of the Leknes group on top of the basement (Corfu, 2004b) and 433±9 Ma based on $^{40}Ar/^{39}Ar$ dating of amphibolite by Steltenpohl et al. (2003). Reported P-T estimates for the eclogite-facies shear zones are 680°C and >1.4 GPa based on Fe-Mg exchange between clinopyroxene and garnet and the plagioclase to quartz and clinopyroxene reaction in TWEEQU (Markl and Bucher, 1997; Markl et al., 1998), suggesting >~45 km depth for shear zone eclogitization. Retrograde amphibolite-facies metamorphism occurred at c. 675°C and 1.1 GPa based on garnet-biotite thermobarometry (Kullerud et al., 2001).

3.0 Fluids in the lower crust

Fluids have a profound role in crustal processes by altering the physical properties of a rock through (1) physical influences on rheology, and (2) chemical influences through dissolution, precipitation, and inducing element mobility (Yardley, 2009). Interactions between free fluids and rocks occur in two primary ways: (1) structurally bound fluids can be released or incorporated during metamorphism and/or (2) they can

flow along grain boundaries inducing element mobility and increasing diffusion rates (Vernon and Clarke, 2008). Fluids can enter a system through pressure gradient flow or metamorphic reactions (i.e., prograde metamorphism), but the source of the fluid is not always clear, nor when fluid influxes occurred, or how many influxes occurred. Nonetheless, petrologic indicators, such as hydrous mineral assemblages (i.e., mica- and amphibole-bearing assemblages) in exhumed metamorphic rocks, allow us to assess whether or not fluids were present at depth. Furthermore, the presence of exhumed, relatively pristine, or minimally retrograded, granulites indicates that fluids are not readily available in the mid-lower crust (Yardley and Baumgartner, 2007).

Permeability, as an inherent rock property, decreases with depth with a marked decrease to a predicted constant state permeability at the frictional-viscous transition (e.g., Fig. 1 of Ingebritsen and Manning, 2003). Granulite-facies rocks are dry with minimal porosity and are therefore considered effectively impermeable (Newton, 1990; Yardley and Baumgartner, 2007). However, the presence of retrograde mineral assemblages that form in deep shear zones is evidence of fluids at such depths. Volume changes associated with metamorphic phase changes, grain size reduction, and the formation of microcracks can increase lower crustal permeability during deformation (Oliver, 1996; Austrheim and Engvik, 1997; Vernon and Clarke, 2008). At lower crustal depths, permeability is controlled by grain boundary geometries and the resulting pore space (Watson and Brenan, 1987; Manning, 1999) and flow is dominated by thermally-driven, or buoyancy-driven, convection. Hydraulic head differences associated with

structural features, such as faults and shear zone foliation, drives mid-lower crustal fluid flow (Oliver, 1996). Fluids may also be driven by thermal gradients in the mid-lower crust, but flow paths are often limited to structural features that create pathways in otherwise impermeable rocks.

The influence of fluids in the lower crust has both chemical and rheologic consequences, promoting metamorphism and deformation. Unlike prograde metamorphism where fluids are produced during dehydration reactions, retrograde metamorphism requires the advection of external fluids though the system (Yardley and Baumgartner, 2007; Yardley, 2009). As granulites start to cool (move through P-T space), their metamorphism is controlled by the amount of fluids available. Therefore, any fluids that infiltrate the granulites will be quickly absorbed by the metastable rock (Newton, 1990; Yardley, 2009). Incomplete retrograde metamorphism may indicate insufficient fluid because they are often the limiting factor in retrograde reactions.

The fluids associated with retrograde metamorphism can dramatically reduce the amount of stress needed to strain a rock, or its strength. Intergranular fluids can lubricate grain boundaries, facilitating deformation by grain boundary slip (Yardley and Baumgartner, 2007). Also, crystal-entrained fluids, such in those in hydrous retrograde phases, will reduce the strength of a mineral allowing it to deform more readily (Austrheim, 1987; Boundy et al 1992; Handy and Stünitz, 2002; Rybacki and Dresen, 2004). A positive feedback between deformation, metamorphism and fluid permeability may develop such that deformation results in grain-size reduction (and possibly

microfractures), which will open additional fluid pathways, which will lead to retrograde hydration reactions, that will further weaken the rock and localize strain.

4.0 Methods

Samples were collected along a transect from undeformed (during eclogite-facies metamorphism) host rock across the shear zones (e.g., Fig. 2). I used a rock hammer where feasible, otherwise a gas-powered hand-held core drill with a 1-inch diamond core bit was used. For each shear zone a series of cores were collected to capture not only shear zone and host rock samples, but also to insure the boundary between the two was captured on the thin section.

Thin sections were cut perpendicular to the shear zone walls and parallel to the presumed transport direction to analyze the transition from host rock to shear zone. Thin sections were mechanically polished followed by polishing using colloidal silicon in a vibratory polisher for at least 12 hours and then they were coated with a thin layer of carbon for EDS analysis.

All analytical work presented herein was collected at the University of Maine. For modal analysis, I used the EDAX Apollo 40 SDD Energy Dispersive Spectrometer (EDS) component of the Tescan Vega II XMU scanning electron microscopes (SEM) at the University of Maine, Orono. I made phase maps based on the chemical analyses using Orientation Imaging Microscopy (OIM) Analysis software. Representative areas on each thin section and for each of the three zones (host rock, eclogitic shear zone, and

pseudotachylite) were selected for modal composition maps. Mapping parameters were: a beam energy of 20 kV, a current of ~85pA, a spot size of ~1100 nm, a working distance of 25 mm on a horizontal thin section with a fine carbon coat, and 3 to 10 μm step sizes. To determine individual mineral chemistries, I used a Cameca Microprobe SX-100 electron microprobe with beam energy of 15 kV, heat of 250 nA, a spot size of 5 μm, a background dwell time of 10 s and a peak dwell time of 20 s. Almandine standard was used for garnets, diopside standard for pyroxene, hornblende standard for amphibole, and plagioclase feldspar standard for plagioclase.

The samples were analyzed for crystallographic orientation using the TSL-OIM Data Collection v.5 electron backscatter diffraction (EBSD) software. EBSD map areas were selected to best represent the microstructure for each of the three zones: host rock, shear zone, and pseudotachylite. Each sample was analyzed for grain orientations of garnet, pyroxene, plagioclase, amphibole, and quartz. SEM and EBSD parameters for each run consisted of a working distance of 25 mm, a tilt of 70°, a beam current of ~85 pA and varying step sizes from 10-20 μm (Table 1). OIM v. 5.1 software was used to identify minerals by chemistry and then match phases to EBSD orientations. Map areas ranged in size, from single field of view beam scans to combination beam and stage scans spanning the length of the thin section. EBSD analysis consists of a software conversion of an electron backscatter diffraction pattern through a Hough transform that is used to determine crystallographic orientations. The degree of rotation within a grain or between grains is called misorientation, such that a 10° misorientation is classified as a grain

boundary. A common error associated with EBSD analyses are misindexed crystallographic orientations due to inclusions, the fine-grained nature of the samples, subgrain boundaries, and microfractures (Prior et al., 2010). Misindexing is identifiable and can be corrected during post-processing procedures. Post-processing procedures included assigning an average orientation per grain and the removal of data with confidence indices lower than 0.05. The confidence index (CI) is a parameter used by the OIM software to determine pattern-indexing accuracy. Because there are usually several possible orientations for a given diffraction pattern, the program uses a voting system in which each pattern solution is compared to the next best solution and then ranked. The CI is calculated by subtracting the rank of the next best solution and dividing by an ideal solution rank: $CI = \frac{(V_1 - V_2)}{V_{ideal}}$, where CI is confidence index, V_1 is the rank of the first solution, V_2 the rank of a second solution, and V_{ideal} is the rank of an ideal solution. However, the CI can be misleading because if V_2 is just as accurate as the V_1, the CI will be 0.

EBSD post-processing procedures were carefully selected to ensure only the best quality data were used in crystallographic preferred orientations (CPOs) analyses. All data that could not be matched are automatically assigned a CI of -1 and can therefore easily be removed from the data set during post-processing procedures. All EBSD data were plotted as contoured equal-area plots of one point per grain using harmonic expansion with 10° Gaussian half-width and a series rank of 10 (out of 34), but only plots

of the relevant minerals with at least 100 indexable grains were included in this paper. The Gaussian half-width and series rank influence the sharpness of the contours, where low Gaussian half-width leads to less smoothing and low rank leads to more smoothing. Choosing 10 for both is a compromise between the analysis speed and appropriate smoothing of the data. Pole figures presented in this paper plot poles to planes (100), (010), and (001) which effectively correspond to crystallographic axes <100>, <010>, and <001> and therefore interpretations refer to alignment of axes in the development of CPOs.

Table 1: EBSD mapping parameters

Sample	Step Size	Notes
LI-5c	10	Flakstad shear zone (Fig. 5)
LI-5b	15	Flakstad orthogneiss (Fig. 4)
LI-26b	15	Flakstad transition from host-sz-pseud (Fig. 6)
LI-9a1	20	Nusfjord transition from host-pseud (Fig. 7)
LI-11	10	Nusfjord shear zone (Fig.8)
LI-9c	10	Nusfjord pseudotachylite (Fig. 9)

EBSD data was also plotted using the inverse pole figure (IPF) mapping tool of the TSL OIM Analysis software: these maps show the crystallographic axes in reference to the thin section. If a CPO exists, the map will show which axis is oriented perpendicular to the face of the thin section. Also, on a finer scale, a color gradient within a single grain in an IPF map indicates internal deformation of that grain.

Mineral chemistries were collected from samples LI-5b (Flakstad), LI-9a1, and LI-9a2 (Nusfjord) because they all span the boundary between two zones (see sample descriptions for more details). Data collection consisted of 10 spots per grain and 10

grains per zone (host rock, shear zone, and pseudotachylite) for the four minerals of interest: garnet, plagioclase, amphibole, and pyroxene. Any analyses that totaled above 101 or below 98 were rejected they represent a different mineral or error in data collection. Mineral chemistries were averaged per grain to give mean mineral chemistries per phase per zone.

5.0 Sample Descriptions

I focused this study on two sites that have pseudotachylite-bearing and eclogite-facies shear zones. Flakstad is located on the north coast and Nusfjord is located on the southeast coast of Flakstadøy (Fig. 1). Some of the shear zones at both sites contain evidence for relict omphacite indicating eclogite-facies metamorphism and some of the shear zones contain pseudotachylite. Shear zone orientations varied in strike and are generally sub-vertical. At both sites the host rocks tended to deform along the shear zone boundaries creating a strain gradient (e.g., Fig. 2b). In the pseudotachylite-bearing shear zones, the boundaries of the pseudotachylite are sharp (Figs. 2c, 3f-g). However, transitions between the shear zone and host rock were often less well-defined (i.e., Fig. 2h). Thin sections were cut to best represent the transition between the three zones: host rock, pseudotachylite, and shear zone. More detailed descriptions of samples are provided in the following sections.

5.1 Flakstad

The Flakstad site is located ~1 km west of the town of Flakstad in northern Flakstadøy where outcrops of orthogneiss abut leucogabbro along the coast of the Norwegian Sea (Fig. 1). Retrogressed eclogite-facies shear zones occur in both units. They vary in length from 1 to 30 meters long, are 2-4 cm wide. Only one of the Flakstad shear zones contains pseudotachylite (LI-26 series described below).

Samples LI-26a, LI-26b and LI-26g (N68°06.247'/E013°16.286')

Samples LI-26a, LI-26b, and LI-26g are from a ~2 cm-wide shear zone containing retrogressed eclogite and pseudotachylite (Figs. 2h and 2i, respectively). The LI-26 series thin sections were cut perpendicular to foliation. The samples chosen for this study best represent the transition from the orthogneiss host rock to pseudotachylite (LI-26a and b) and the transition from orthogneiss to shear zone (LI-26g).

Samples LI-5b and LI-5c (N68°06.332'/E013°15.802)

Samples LI-5b and LI-5c are from a ~4 cm-wide shear zone containing retrogressed eclogite, but no pseudotachylite (Fig. 2d). The LI-5 thin section suite was cut perpendicular to foliation with the fabric parallel to the y-direction of the thin section. Sample LI-5c was taken in the middle of the shear zone and LI-5b is from the edge of the shear zone and includes orthogneiss (Figs. 2e and 2f).

5.2 Nusfjord

The Nusfjord location is approximately one km west of the village of Nusfjord on the southeast coast of Flakstadøy (Fig. 1). The shear zones cut through leucogabbro and lack any regular orientation as in Flakstad (Fig. 3). The Nusfjord shear zones contain more pseudotachylite veins than those observed at Flakstad. Three shear zones have been discovered at the site (Griffin et al., 1978; Markl and Bucher, 1997; Steltenpohl et al., 2006), one of which was traced for over 2 km with thicknesses varying between 1-2 m. One shear zone was observed to contain pseudotachylite during this study and it is the focus of the Nusfjord study. This shear zone traces the contact between the leucogabbro and a mangeritic outcrop and it is 1 m wide and <10 m long. Very fine-grained recrystallized pseudotachylite veins were observed throughout the shear zone where all minerals but the garnets were undetectable with a handlens (Fig. 3c).

*Samples LI-9a1, LI-9a2, and LI-9b (*N68°6.254/E013°16.195*)*

Samples LI-9a1, LI-9a2, and LI-9b were cut from the same sample in a N60W-trending shear zone. Samples LI-9a1 and LI9a2 show the transition from a retrogressed eclogite-facies shear zone to the pseudotachylite then to leucogabbro host rock over the two thin sections (Figs. 3f-g), and LI-9c includes the transition from leucogabbro to pseudotachylite to shear zone (Fig. 3e). The thin sections were cut sub-perpendicular to foliation with the shear zone fabric aligned parallel to the y-axis of the thin section. I used all three thin sections to ensure accuracy.

*Samples LI-11 (*N68°6.254/E013°16.195*)*

Sample LI-11 is from an eclogite lens within the same N60W-trending Nusfjord shear zone (Fig. 3d). The thin section is cut perpendicular to foliation with the shear zone fabric oriented oblique to the x-axis of the thin section. In general, the sample is garnetiferous and green in color.

6.0 Results

In the following sections I refer to the three zones in the studied rocks: host, pseudotachylite, and shear zone, where pseudotachylite veins are narrower than and contained within the shear zone. The three zones are distinguished by both modal variations and grain size, with grain size increasing from finest in the pseudotachylite to coarsest in the host rocks. The modal distribution is summarized in Table 2 and is another of the key factors in deciding the spatial extent of each zone. This section describes the results of modal, chemical, and microstructural analyses of 4 thin sections from Nusfjord (LI-9a1, LI-9a2, LI-9b, LI-11) and 4 thin sections from Flakstad (LI-26b, LI-26g, LI-5b and LI-5c).

6.1 Modal Results

Below I report on all minerals observed to characterize each rock zone, then highlight the key minerals in the metamorphic history of the rocks (amphibole, garnet, and pyroxene) and do a modal comparison between the zones: shear zone,

pseudotachylite, and host rocks (orthogneiss and leucogabbro for Flakstad and Nusfjord, respectively; Table 2).

The Flakstad orthogneiss largely consists of plagioclase + amphibole + enstatite + diopside ± apatite ± pyrite ± ilmenite ± magnetite (Fig. 4). The Flakstad shear zone has an assemblage of amphibole + plagioclase + garnet + enstatite + diopside ± omphacite ± ilmenite ± magnetite ± pyrite ± apatite ± calcite (Fig. 5). Flakstad pseudotachylite contains plagioclase + amphibole + quartz + biotite + garnet ± diopside ± magnetite ± ilmenite ± apatite (Fig. 6).

The Nusfjord leucogabbro consists of plagioclase + garnet + amphibole + clinopyroxene ± orthopyroxene ± biotite ± quartz ± magnetite ± ilmenite (Fig. 7). The Nusfjord shear zone contains garnet + plagioclase + amphibole + clinopyroxene ± orthopyroxene ± quartz ± ilmenite ± magnetite ± pyrite (Fig. 8). The pseudtachylite at Nusfjord contains plagioclase + amphibole + clinopyroxene + biotite with trace amounts of quartz + ilmenite + magnetite (Fig. 9).

The modal percent of plagioclase in the leucogabbro and orthogneiss is ~65% of the rock. The modal percentage drops to ~45% in the shear zones and pseudotachylite at Nusfjord, but Flakstad shear zones contain the least amount of plagioclase at 25%. Plagioclase comprises 67% of Flakstad pseudotachylite, but unlike the other zones examined at either site, the Flakstad pseudotachylite contains 26% albitic plagioclase (Table 2; Fig. 6).

The modal distribution at both sites indicates higher percentages of amphibole in the shear zones and associated pseudotachylite. The Flakstad orthogneiss contains approximately 30% amphibole and the adjacent shear zone contains approximately 50%; Flakstad pseudotachylite contains 6% amphibole. The Nusfjord leucogabbro contains ~2.5% amphibole while the pseudotachylite and shear zone contain ~22% and 18%, respectively.

Other distinctive modal differences are abundances of pyroxene and garnet: pyroxene abundances are generally greater in the host rocks at both sites, while garnet abundances are lower in the host rock compared to the pseudotachylite and shear zone. Orthogneiss and leucogabbro contain ~13% and ~2% pyroxene (Opx+Cpx), respectively. Flakstad shear zones contain ~6%, Nusfjord shear zones contain ~<10%. Flakstad pseudotachylite contains <1% and Nusfjord pseudotachylite contains ~0% pyroxene. Orthogneiss and leucogabbro contain ~9% and ~10% garnet, respectively. Flakstad shear zones contain ~22%, Nusfjord shear zones contain ~<20%. Flakstad pseudotachylite contains ~1% garnet and Nusfjord pseudotachylite contains ~14% garnet.

Table 2: Average modal percentages for major minerals at Nusfjord and Flakstad.

	Nusfjord			Flakstad		
	Leuco-gabbro	Shear zone	Pseudo-tachylite	Ortho-gneiss	Shear zone	Pseudo-tachylite
Amphibole	3	20	20	5	25	6
Garnet	10	21	14	15	41	1
Plagioclase	67	47	45	65	12	67
Pyroxene	14	7	12	14	16	2

6.2 Mineral Chemistries

Mineral chemistries were measured for amphibole, garnet, pyroxene, and plagioclase to study the eclogite- and amphibolite-facies metamorphic history of the rocks. Chemistries were collected from 10 spots per grain and the viable data were averaged. Tables 3-5 show the results for end-member compositions for each phase to indicate the range of compositions in each zone except Flakstad pseudotachylite, which was not analyzed by electron microprobe. All mineral chemistry data are included in Appendix A.

Garnet

The garnets compositions in both Flakstad and Nusfjord are almandine-rich (Table 3; Fig. 10). There is no evidence of compositional zoning, but the garnets are variably preserved (see microstructural results for more details). Table 3 shows that garnets from all zones at both field sites are almandine-rich with compositions ranging from $Alm_{41-64}Prp_{13-37}Grs_{14-30}Sps_{0.5-4}$ (abbreviations after Whitney and Evans, 2010). Garnets from the Nusfjord shear zone are the most almandine-rich at Alm_{58-64} and the pseudotachylite and leucogabbro garnets are slightly less almandine-rich, but remain $>Alm_{50}$. Grossular and pyrope components are similar in the leucogabbro and shear zone with values ranging between 15-25%. There is one anomalous grain from the leucogabbro with composition: $Pyr_{57.9}Alm_{40.3}Grs_{0.9}Sps_{0.9}$. The pseudotachylite garnet compositions have a higher Ca component, 25-30%, and Mg concentrations are tightly constrained to 15-18%. Flakstad garnets from the orthogneiss and the shear zone range

between Alm_{40-50}, slightly lower than the averages from Nusfjord. There are no garnets observed in the Flakstad pseudotachylite.

Table 3: Range of garnet compositions for each zone at both Nusfjord and Flakstad.

	Nusfjord						Flakstad			
	Pseudo-tachylite	Pseudo-tachylite	Shear Zone	Shear Zone	Leuco-gabbro	Leuco-gabbro	Ortho-gneiss	Ortho-gneiss	Shear zone	Shear zone
Wt % oxide	2	7	2	3	5	8	2	9	1	4
SiO2	38.233	38.191	37.588	38.093	39.383	38.235	39.163	38.734	39.249	39.170
TiO2	0.003	0.087	0.078	0.036	0.011	0.165	0.003	0.029	0.020	0.037
Al2O3	21.250	20.733	20.585	22.699	20.120	21.068	22.377	22.691	22.377	22.325
Cr2O3	--	--	--	--	--	--	-0.004	0.009	-0.013	-0.013
FeO	24.575	25.756	30.278	26.283	25.053	28.797	19.711	20.646	22.871	20.389
MnO	0.529	0.798	0.569	0.778	0.805	0.981	0.703	0.912	0.489	0.404
MgO	4.809	4.084	3.787	4.636	5.480	5.584	8.000	7.867	9.972	8.936
CaO	10.741	10.319	7.400	7.901	9.207	5.723	10.159	9.257	5.042	8.466
Na2O	0.024	0.009	0.020	0.009	0.048	0.016	-0.003	-0.001	-0.012	-0.006
Y2O3	0.014	-0.018	0.013	0.013	-0.021	0.015	-0.014	-0.008	0.031	0.043
Total	100.179	99.960	100.316	100.448	100.086	100.584	100.095	100.136	100.026	99.751
Atoms per formula unit (24 O)										
Si	6.763	6.779	6.744	6.808	6.928	6.785	6.796	6.752	6.803	6.795
Ti	0.000	0.005	0.011	0.005	0.001	0.022	0.000	0.004	0.003	0.005
Al	2.215	2.219	2.176	2.391	2.086	2.203	0.000	0.000	-0.001	-0.001
Cr	--	--	--	--	--	--	2.288	2.331	2.285	2.282
Fe2+	3.252	3.584	4.210	3.623	3.310	3.858	2.829	2.969	3.292	2.933
Fe3+	0.383	0.365	0.332	0.305	0.375	0.415	0.031	0.040	0.023	0.025
Mn	0.079	0.122	0.086	0.118	0.120	0.147	0.103	0.135	0.072	0.059
Mg	1.268	1.246	1.013	1.235	1.437	1.477	2.070	2.044	2.577	2.311
Ca	2.035	1.675	1.422	1.513	1.735	1.088	1.889	1.729	0.936	1.573
Na	0.004	0.003	0.003	0.002	0.008	0.003	-0.001	0.000	-0.002	-0.001
Y	0.001	0.001	0.001	0.001	-0.001	0.001	-0.006	-0.003	0.013	0.017
Total	16.000	16.000	16.000	16.000	16.000	16.000	16.000	16.000	16.000	16.000

Pyroxene

The pyroxene compositions vary from the shear zones to host rock at each site (Table 4; Fig. 11). All pyroxenes analyzed from the Nusfjord shear zone totaled less than 98% and they were therefore not considered reliable (see Appendix A for all mineral chemistry data). Ferrous iron was calculated using half the excess oxygen in cation normalization calculations. Leucogabbro from Nusfjord contain both diopside and enstatite (Fig. 11a) and the pseudotachylite contain only diopside of similar composition to those found in the leucogabbro. The Flakstad orthogneiss is enstatite-rich; pyroxenes

in Flakstad shear zones are both relict enstatite (similar to pyroxene in orthogneiss) and sodic diopside (Fig. 11b). Omphacite was found in sample LI-5b in the Flakstad shear zone. There are no pyroxenes observed in the Flakstad pseudotachylite.

Table 4: Range of pyroxene compositions for each zone at both Nusfjord and Flakstad.

	Nusfjord				Flakstad					
	Pseudo	Pseudo	Leuco-gabbro	Leuco-gabbro	Ortho-gneiss	Ortho-gneiss	Shear Zone	Shear Zone	Shear Zone	Shear Zone
Wt % oxide	1	3	1	2	1.1	1.5	2.2	2.8	Omph (2)	Omph (3)
SiO2	0.115	0.195	51.781	51.887	39.409	55.083	54.720	53.881	54.682	55.192
TiO2	0.006	0.006	0.232	0.028	-0.032	-0.013	0.015	0.024	0.017	0.099
Al2O3	0.029	0.046	2.291	0.736	0.003	1.010	1.021	1.967	4.497	7.490
Cr2O3	52.533	52.154	0.016	0.002	0.026	-0.011	0.003	-0.026	0.022	0.039
FeO	8.317	7.946	8.267	24.034	17.959	15.021	16.289	16.309	9.085	4.726
MnO	1.884	2.199	0.122	0.448	0.164	0.186	0.130	0.111	0.084	0.025
MgO	0.084	0.094	13.803	22.438	42.044	27.708	26.959	25.860	17.522	10.721
CaO	12.891	12.966	21.668	0.315	0.007	0.246	0.251	0.938	9.959	15.800
Na2O	21.832	22.449	1.056	0.014	0.000	0.001	0.019	0.074	2.799	4.782
K2O	1.196	1.071	0.014	0.001	-0.005	0.011	-0.006	0.056	0.012	0.006
V2O3	0.013	0.020	--	--	-0.029	0.024	0.038	0.017	0.015	0.071
Total	98.899	99.146	99.250	99.903	99.547	99.267	99.441	99.210	98.950	98.693
Atoms per formula unit (6 O)										
Si	2.010	1.991	1.970	1.947	1.345	0.000	1.998	1.987	2.093	2.181
Ti	0.003	0.006	0.007	0.001	-0.001	2.004	0.000	0.001	0.000	0.003
Al	0.042	0.049	0.051	0.016	0.000	0.000	0.022	0.043	0.101	0.174
Cr	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Fe 2+	0.266	0.254	0.254	0.732	0.184	0.457	0.497	0.503	0.291	0.156
Fe 3+	0.000	0.000	0.009	0.022	0.328	0.006	0.000	0.000	0.000	0.000
Mn	0.003	0.003	0.004	0.014	0.005	1.502	0.004	0.003	0.003	0.001
Mg	0.735	0.738	0.783	1.255	2.139	0.010	1.467	1.422	1.000	0.631
Ca	0.895	0.918	0.883	0.013	0.000	0.000	0.010	0.037	0.408	0.669
Na	0.044	0.040	0.039	0.001	0.000	0.000	0.001	0.003	0.104	0.183
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
V	0.000	0.001	--	--	0.000	0.022	0.001	0.000	0.000	0.001
Total	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.00	4.00

Plagioclase feldspar

Flakstad plagioclase feldspar compositions vary between orthogneiss and shear zone (Table 5; Fig. 12). The orthogneiss contains mostly Ca-rich plagioclase (An_{62}), while the shear zone shows a wide range of compositions (An_{20-60}). Feldspars from the Nusfjord leucogabbro are more albite-rich and encompasses a broader range of compositions (An_{30-50}). Both the Nusfjord pseudotachylite and the shear zone show a

range of chemistries, with the shear zone being the most variable with An_{10-48}. Plagioclase in the Flakstad pseudotachylite was not analyzed by electron microprobe.

Table 5: Range of plagioclase compositions for each zone at both Nusfjord and Flakstad

	Nusfjord						Flakstad			
	Pseudo-tachylite	Pseudo-tachylite	Shear Zone	Shear Zone	Leuco-gabbro	Leuco-gabbro	Ortho-gneiss	Ortho-gneiss	Shear Zone	Shear Zone
weight % oxid	10	3	7	10	9	6	8	6	3	7
SiO2	55.04	62.95	69.53	56.47	62.43	56.78	55.32	52.42	64.01	53.68
Al2O3	29.21	24.00	18.67	28.49	24.44	28.35	29.37	31.26	23.43	30.19
FeO	0.05	0.32	0.28	0.17	0.60	0.07	0.13	0.03	0.35	0.38
MnO	0.01	-0.01	0.02	0.00	0.00	0.02	-0.01	0.01	-0.02	0.00
MgO	-0.01	-0.02	0.01	-0.01	0.01	-0.01	0.00	-0.01	0.00	0.09
CaO	11.30	5.20	2.27	9.40	5.69	10.04	10.39	13.27	3.70	10.69
Na2O	5.02	8.56	10.96	5.84	8.25	5.78	5.30	3.87	8.93	4.35
K2O	0.16	0.31	0.24	0.10	0.19	0.14	0.10	0.06	0.18	0.65
BaO	0.08	0.03	-0.14	0.13	0.06	0.04	0.05	0.07	0.18	0.08
Total	100.86	101.33	108.84	100.59	101.67	101.22	100.65	100.98	100.76	100.10
Atoms per formula unit (8 O)										
Si	2.751	2.465	2.996	2.523	2.719	2.524	2.455	2.362	2.811	2.419
Al	1.236	1.542	0.948	1.500	1.255	1.485	1.574	1.654	1.213	1.606
Fe	0.018	0.005	0.023	0.015	0.033	0.005	0.010	0.002	0.029	0.031
Mn	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001	-0.001	0.000
Mg	-0.001	-0.001	0.001	-0.001	0.001	-0.001	0.000	-0.001	0.000	0.006
Ca	0.243	0.542	0.105	0.450	0.266	0.478	0.514	0.639	0.174	0.517
Na	0.726	0.435	0.916	0.506	0.697	0.498	0.438	0.338	0.760	0.379
K	0.017	0.009	0.013	0.006	0.011	0.008	0.006	0.003	0.010	0.038
Ba	0.001	0.001	-0.002	0.002	0.001	0.001	0.001	0.001	0.003	0.001
Total	4.991	5.000	5.000	5.000	4.982	4.999	4.998	5.000	5.000	4.997

Amphibole

Amphiboles from both sites and across all zones are calcic and all but the leucogabbro amphibole are pargasitic (Table 6; Fig. 13). The Flakstad orthogneiss amphibole clusters closely in the pargasite field (Fig. 13a). Amphibole in the Flakstad pseudotachylite was not analyzed by electron microprobe. Amphiboles from Flakstad shear zones show a compositional transition into more Mg- and Si-rich chemistries, spanning the transition from pargasite to edenite. The Nusfjord pseudotachylite amphibole chemistries form a tight cluster within the pargasite field whereas the eclogite amphiboles indicate a change in chemistry toward more Mg and Si-rich, although a

smaller range in chemistry than those in the Flakstad shear zone. The Nusfjord leucogabbro has a low a-site occupancy of Na and K, which requires a different classification (Fig. 13b). Site occupancy rules were followed as outlined in Leake et al. (1997). The leucogabbro pyroxene analyses cluster tightly in the magnesiohornblende field.

Table 6: Range of amphibole compositions for each zone at both field sites, Nusfjord and Flakstad.

	Nusfjord						Flakstad			
	Pseudo-tachylite	Pseudo-tachylite	Shear Zone	Shear Zone	Leuco-gabbro	Leuco-gabbro	Ortho-gneiss	Ortho-gneiss	Shear Zone	Shear Zone
location	5	7	3	6	5	10	7	9	2	7
weight % oxide										
SiO2	40.946	39.855	39.476	43.105	52.044	51.208	40.369	41.391	51.152	40.847
TiO2	1.913	1.851	1.786	1.735	0.244	0.317	0.008	0.843	0.155	1.804
Al2O3	12.896	13.972	14.054	11.894	2.311	3.118	18.938	14.649	7.104	15.902
Cr2O3	0.039	0.043	0.091	0.051	0.033	0.039	0.016	0.008	-0.001	0.004
FeO	15.259	15.306	15.735	12.702	7.305	8.677	7.417	11.697	6.381	9.456
MnO	0.062	0.059	0.018	0.055	0.081	0.133	-0.006	0.085	0.020	0.007
MgO	10.118	9.732	9.369	12.336	13.476	12.569	14.380	11.667	18.853	13.085
CaO	11.562	11.569	11.304	11.622	22.129	21.696	11.653	12.685	11.358	11.520
Na2O	1.701	1.708	2.190	1.994	1.164	1.197	2.967	2.356	1.856	3.160
K2O	1.816	1.871	1.388	0.905	0.001	0.053	1.134	1.384	0.253	0.748
F	0.079	0.071	0.032	0.046	0.038	-0.023	0.122	0.079	0.004	0.115
Cl	0.002	-0.002	0.841	0.114	0.010	0.010	0.003	0.037	0.005	0.010
BaO	-0.030	0.042	0.152	0.006	0.122	0.029	0.028	-0.038	-0.038	0.121
V2O3	0.094	0.140	0.112	0.131	0.008	0.012	-0.010	0.073	0.022	0.125
H2O3	1.926	1.921	1.704	1.956	2.061	2.068	1.999	1.959	2.114	1.975
Total	98.383	98.138	98.252	98.652	101.024	101.102	99.017	98.875	99.237	98.880
Atoms per formula unit (23 O)										
Si	5.989	5.859	5.867	6.173	7.184	7.098	5.640	5.927	6.930	5.777
Ti	0.211	0.205	0.200	0.187	0.025	0.033	0.001	0.091	0.016	0.192
Al	2.223	2.421	2.463	2.007	0.376	0.510	3.118	2.476	1.135	2.651
Cr	0.005	0.005	0.011	0.006	0.004	0.004	0.002	0.001	0.000	0.001
Fe	1.867	1.882	1.957	1.521	0.844	1.006	0.867	1.402	0.723	1.119
Mn	0.008	0.007	0.002	0.007	0.009	0.016	-0.001	0.010	0.002	0.001
Mg	2.206	2.133	2.075	2.633	2.773	2.597	2.995	2.491	3.808	2.759
Ca	1.812	1.822	1.800	1.783	3.273	3.222	1.744	1.945	1.649	1.746
Na	0.482	0.487	0.631	0.554	0.312	0.322	0.804	0.655	0.488	0.866
K	0.339	0.351	0.264	0.165	0.000	0.009	0.202	0.253	0.044	0.135
F	0.036	0.033	0.015	0.021	0.016	-0.010	0.054	0.036	0.002	0.051
Cl	0.000	-0.001	0.212	0.028	0.010	0.002	0.001	0.009	0.001	0.002
Ba	-0.002	0.002	0.009	0.000	0.007	0.002	0.002	-0.002	-0.002	0.007
V	0.011	0.017	0.013	0.015	0.001	0.001	-0.001	0.008	0.002	0.014
H	1.880	1.884	1.689	1.868	1.898	1.912	1.862	1.872	1.910	1.863
Total	17.068	17.108	17.209	16.968	16.731	16.725	17.289	17.174	16.707	17.184

6.3 Microstructural Results

Grain size varies depending on phase, but when comparing like phases, there is a general trend of grain size reduction from host rock to shear zone at both Flakstad and Nusfjord, and a further grain size reduction in the pseudotachylite (Fig. 9). CPOs are documented in the shear zones at both sites and for the pseudotachylite in Nusfjord. Pole figures presented in this report indicating a CPO are valued in strength by the maximal number, calculated from a distribution probability function. Most maxima reported are less than 3, indicating a weak clustering of poles, but a CPO is present. For all phase maps and pole figures, the x- and y- directions are parallel to the x- and y- axes of the thin section, and the z-direction is perpendicular to the thin section (pointing out of the page). The shear zone fabric is generally aligned with, or slightly oblique to, the y-direction (see Figs. 4-9) with the exception of LI-11 where the shear zone fabric is denoted on pole figures (see Fig. 8). The following section compares phase microtextural development from host to shear zone to pseudotachylite.

Garnet

The garnets in the Flakstad orthogneiss form corona textures surrounding enstatite grains (Fig. 4). Flakstad shear zone garnets occur in stringers aligned with the shear zone fabric (Fig. 5). No detectable garnet was found in the Flakstad pseudotachylite (Fig. 6). No CPO was detected for garnets in any of the zones.

Pyroxene

The Flakstad orthogneiss and shear zones contain both enstatite and diopside (Figs. 4-5). Any enstatite found within the shear zones is assumed to be relict from the host rock. The leucogabbro of Nusfjord is mostly diopside with lesser amounts of enstatite (Fig. 7). There are trace amounts of diopside in the Nusfjord shear zone (Fig. 8). No pyroxene was found in the pseudotachylite at both sites (Figs. 6, 9).

Pyroxene pole figures from the Flakstad orthogneiss indicate a CPO, but the pattern is drawn from ≤10 grains (as shown in the inverse pole figure map (IPFM) in Fig. 4), therefore insufficient to produce a statistically-significant pole figure (Fig. 4). Flakstad shear zone and pseudotachylite pyroxene does not have a discernible CPO (Figs. 5, 6).

Pyroxene pole figures from Nusfjord leucogabbro do not indicate a CPO (Fig. 7). EBSD analysis of diopside from the Nusfjord shear zone were collected from sample LI-11, the least retrogressed sample from Nusfjord (Fig. 8). Pole figures indicate an alignment of <001> with the shear zone fabric and a spread of <100> forming a girdle orthogonal to the shear fabric with a submaximum parallel to the z-direction. The <010> form maxima oblique to the fabric.

Amphibole

There is minimal amphibole in the host rocks at both sites, but fine-grained amphibole (on the order of 10 μm) is abundant in the shear zones and pseudotachylite

(Figs. 8-13). Amphibole exists in the matrix with plagioclase as well as interspersed between other phases.

Pole figures for amphibole in the Flakstad shear zone show <001> parallel to the shear zone fabric, <010> form a weak girdle perpendicular to the shear zone fabric with a sub-maxima parallel to z, and a <100> maximum perpendicular to the shear zone fabric (Fig. 5). Flakstad pseudotachylite has no discernible amphibole.

Amphibole in the Nusfjord shear zone show similar patterns to those in Flakstad, with <001> forming maxima parallel to the shear zone fabric (Fig. 8). There is a weak girdle of <010> orthogonal to the shear zone fabric. <100> form a diffuse girdle with sub-maxima nearly orthogonal to the shear zone fabric. Amphibole from Nusfjord pseudotachylite show a similar pattern to those in the shear zone, with <001> maxima parallel to the shear zone, a girdle of <010> within the shear zone plane, and <100> forming a diffuse girdle orthogonal to the shear zone fabric (Fig. 9) .

Plagioclase

Flakstad orthogneiss plagioclase varies in grain size up to ~10 mm, much larger than pseudotachylite plagioclase that are ~10 μm (Fig. 6). Flakstad orthogneiss plagioclase pole figures indicate a CPO of the <001> orthogonal to the x-y plane of the thin section and of the <010> parallel to the x-y plane of the thin section (Fig. 4). There is also a weak girdle of the <100> parallel to the x-y plane of the thin section. The plagioclase pole figures of the Flakstad shear zone indicate a clustering of <001> parallel to the shear zone fabric, the <100> parallel to the z-direction, and a spread of <010>

around the periphery of the pole figure and parallel to the shear zone plane (Fig. 5). Due to the fine-grained nature of the Flakstad pseudotachylite, an EBSD analysis could not be successfully acquired.

Nusfjord leucogabbro plagioclase textures consist of larger grains mantled by finer-grained aggregates (Fig. 14). Small grains of iron oxide are found throughout the mantle region interspersed between plagioclase grains. Some of the larger grains have deformation twinning (Fig. 14b). Leucogabbro CPOs show a weak cluster of <010> and possibly a weak spread of <100> along the periphery of the pole figure (Fig. 7). Nusfjord shear zone plagioclase show a CPO with <100> forming maxima aligned with the shear zone fabric and <001> creating a weak girdle oblique to the fabric (Fig. 8). The <010> axes form a maximum parallel to z. Nusfjord pseudotachylite has two populations of plagioclase: (1) areas, or "pockets", consisting of plagioclase with interspersed oxides (Fig. 14) and (2) plagioclase intergrown with amphibole making up the matrix of the pseudotachylite (Fig. 9).

The plagioclase pockets consist of highly fractured, fine-grained plagioclase, are often elongate and found to be aligned with the pseudotachylite fabric, many with tails also in line with the fabric (Fig. 14). EBSD analyses of various pockets show strong CPOs in the core surrounded by similarly-sized plagioclase in different or scattered orientations (Fig. 15). EDS analyses of the cores and surrounding plagioclase indicate homogenous anorthite composition (Fig. 15a). However, microprobe analyses of the pocket edges indicate a more sodic rim compared to the interior of the pockets (Fig. 12).

The pockets are commonly surrounded by a narrow rim of Na-rich plagioclase at the border of the pseudotachylite (Fig. 15b).

The Nusfjord pseudotachylite matrix plagioclase show CPO patterns reflecting those of the Nusfjord shear zone with a diffuse girdle of <100> sub-parallel to the fabric and a girdle of <001> orthogonal to the fabric. Unlike the Nusfjord shear zone, plagioclase <010> in the Nusfjord pseudotachylite does not indicate a preferred orientation (Fig. 9).

Quartz

The only sample with sufficient quartz for CPO analysis is LI-26b that spans from pseudotachylite through relict orthogneiss containing shear bands (Fig. 6). The orthogneiss can be recognized by coarser-grained quartz and plagioclase when compared to the fine-grained pseudotachylite and shear bands. The quartz pole figures show a cross-girdle of the <0001> and clusters of 10-10 and 11-20 around the periphery of the pole figure.

Reaction Textures

Symplectite, a common texture of intergrown materials indicative of decompression reactions, is found in samples LI-5b and LI-11 (Vernon, 2004). Sample LI-11 symplectite consists of diopside and plagioclase (Fig. 16).

7.0 Discussion

Here I summarize the results and what they say about the deformational and metamorphic history of the Flakstadøy shear zones.

7.1 Pre-Caledonian Deformation

To understand the relationship between deformation and metamorphism in the shear zones, I looked at the host rocks at each site to determine what the starting conditions were prior to shearing and pseudotachylite formation.

Plagioclase and quartz CPOs from Flakstad orthogneiss indicate pre-Caledonian deformation (Figs. 4, 6). Orthogneiss located between shear bands on sample LI-26b consists of coarse-grained plagioclase and quartz, indicating the associated CPOs represent pre-Caledonian strain. The symmetrical cross-girdle of the <0001> quartz pole figure indicates a component of pure shear (Fig. 6; Passchier and Trouw, 2005). However, it is possible that the quartz is recording a pure shear component of the Caledonian shear zones. The plagioclase CPOs from Flakstad orthogneiss confirm the presence of a weak pre-Caledonian fabric, but, unlike quartz, kinematics can not be distinguished based on plagioclase pole figure patterns alone (Figs. 4, 7). Flakstad orthogneiss amphibole pole figures also indicate a CPO, but orthogneiss amphiboles are only found surrounding, in, or adjacent to pyroxene suggesting late-stage growth during amphibolite-facies metamorphism.

Nusfjord leucogabbro, like the Flakstad orthogneiss, is plagioclase-rich and amphibole-poor (Table 2). Pole figures for plagioclase in the leucogabbro plagioclase indicate a weak clustering of the <010>, but no interpretable CPO is evident (Fig. 18). Diopside grains from the leucogabbro are equally inconclusive. Despite the lack of CPO and based on their proximity the leucogabbro most likely underwent similar stress conditions as the orthogneiss at Flakstad. It is possible that the leucogabbro records less deformation than the orthogneiss because of the strength difference between the two rock types.

The protoliths at both sites are amphibole-poor compared to the shear zones and Nusfjord pseudotachylite, which indicates the granulite-facies host rocks must have been relatively fluid free during the retrograde history to preserve the granulite-facies mineral assemblages (Table 2).

7.2 Spatial Relationships

There is a clear spatial relationship between the pseudotachylite, shear zones and metamorphic grades on Flakstadøy. Pseudotachylite is only found associated with the shear zones at both Flakstad and Nufjord. The concentration of shear fabric along shear zones and absence of it from host rocks indicates strain was partitioned along these discrete zones. The shear zones preserve a multistage metamorphic history of eclogite-facies metamorphism with amphibolite-facies overprint, a history virtually absent from the surrounding metastable host rocks.

7.3 Caledonian Metamorphism

Caledonian metamorphism of the granulites occurs primarily along shear zones and accompanying pseudotachylite, with only minor metamorphism in the host rocks at both sites. The role of fluids in retrograde metamorphism is well studied and there are several lines of evidence to support the advection of fluids in the Flakstadøy shear zones.

7.3.1 Eclogite-facies metamorphism

Evidence of eclogite-facies metamorphism is present, although sparse, within the Flakstadøy shear zones. There are small grains of omphacite found within the matrix of the Flakstad shear zone (Fig. 11). In Nusfjord, symplectite of diopside and albitic plagioclase (An_{12}) is found within the shear zone; symplectite forms from a decompression reaction of omphacite and indicates that eclogite-facies assemblages also grew at Nusfjord (Fig. 16; Mysen and Griffin, 1973; Markl and Bucher, 1997; Kassos, 2008; Steltenpohl, 2011).

The abundance of garnet in the shear zones at both sites and the Nusfjord pseudotachylite are further indication of eclogite-facies metamorphism. The shear zones at both sites contain a higher abundance of garnet than the corresponding host rocks, with a ~3 fold increase in the Flakstad shear zone and a ~7 fold increase in the Nusfjord shear zone and pseudoatchylite (Table 2). The abundance of garnet in the shear zones is not evidence enough to indicate eclogite-facies metamorphism, but when considered with the omphacite and symplectite discussed above, there is compelling evidence that the shear

zones formed at eclogite-facies conditions. Unlike omphacite, garnets are also stable at amphibolite-facies P-T conditions and may have continued to grow throughout retrograde metamorphism.

Eclogite-facies textural and chemical evidence has largely been consumed by amphibolite-facies overprint making it difficult to parse the metamorphic and deformation processes involved in the granulite- to eclogite-facies transition.

7.3.2 Amphibolite-facies metamorphism

The Flakstadøy shear zones underwent extensive amphibolite-facies metamorphism after eclogite-facies metamorphism. Percentages of amphibole in the Flakstad shear zone, Nusfjord shear zone, and Nusfjord pseudotachylite are 20, 20, and 25%, respectively. When compared to leucogabbro (3%) and orthogneiss (5%) abundances, it is evident that amphibolite-facies retrogression concentrated in the shear zones. Amphibole is a hydrous mineral with two hydroxyls per formula unit in the crystal lattice indicating that fluids were clearly available during amphibole growth. The high modal percent of amphibole in the shear zones at both sites indicates that fluid pathways were available during retrograde metamorphism.

The chemical evolution of amphiboles from pargasite in orthogneiss to edenite in the shear zone represents an edenite exchange of $MgSi \leftrightarrow Al^{VI}Al^{IV}$, with preferences for Al^{VI} with high pressures and Al^{IV} with high temperatures (Spear, 1993). Therefore, an increase in Mg and Si indicates of the reduction of pressure and temperature during

retrograde metamorphism. This element exchange also implies a component of element mobility within the shear zone, a further indication of the presence of fluids. If fluid pathways are restricted to the shear zones, as the modal abundances suggest, it follows that the most recent amphibole growth would represent lower P-T conditions and that they would concentrate in the shear zone.

7.4 Caledonian Strain History

The presence of pseudotachylite in the shear zones indicates both brittle and ductile deformation were at play in development of the shear zones. On the microscopic scale, EBSD analyses allow us to determine which minerals are deformed and the mere presence of a CPO indicates that the rocks experienced strain. The eclogite-facies assemblage is strongly overprinted, but the amphibolite-facies metamorphism is pervasive in the shear zone and the relict plagioclase pockets incorporated in the Nusfjord pseudotachylite provide clues to fluid infiltration.

7.4.1 Pseudotachylite Formation

Pseudotachylites were found as veinlets associated with shear zones. At Flakstad the pseudotachylite in LI-26 are veinlets interwoven in the shear zones (Fig. 2c) and at Nusfjord the pseudotachylite is a network of anastomosing veins (Fig. 3c). When compared to LI-5 and Nusfjord shear zones, the lack of amphibole in the LI-26

pseudotachylite is anomalous (Fig. 6). Instead of amphibole, the pseudotachylite matrix consists of intergrowths of anorthitic and albitic feldspar, possibly indicating the LI-26 shear zone escaped amphibolite-facies overprint or that the shear zone and pseudotachylite formed at a later stage. Nusfjord pseudotachylite comprises plagioclase pockets within an amphibole- and plagioclase-rich matrix.

7.4.1.1 Pseudotachylite Matrix

Figure 18 shows a stronger CPO in amphibole than in plagioclase in the Nusfjord pseudotachylite matrix. Deformation of polymineralic materials is dependent on the percent and interconnectivity of the weak phase (Handy, 1990; Handy, 1994; Gerbi et al., 2010): The more interconnected the weak phase, the closer the strength of the rock will lie to the Reuss, or isostress, bound (Reuss, 1929) and strain will be accommodated in the weak phase. In the case of the Nusfjord pseudotachylite matrix, amphibole is the stronger mineral. Below ~650-700°C amphibole deformation is dominated by cataclasis or rigid rotation, and crystal slip (Díaz Aspiroz et al., 2007; Tatham et al., 2008; Cao et al., 2010). Although uncommon in naturally-deformed amphiboles, ductile deformation of amphiboles can occur at high temperatures through dislocation creep (Rooney, et al., 1975; Berger and Stünitz, 1996; Passchier and Trouw, 2005). Limited EBSD analysis of amphibole grains from the Nusfjord pseudotachylite matrix indicates that rigid rotation amphibole deformation dominated (Fig. 19). If the amphiboles deformed internally, the grains would show a color gradient within each grain in the inverse pole figure map, but

most of the grains indicate fracturing and then rotating. However, because both eclogite- and amphibolite-facies metamorphism on Flakstadøy are thought to have occurred at temperatures spanning 750°-650°C it is possible that some amphiboles deformed plastically or that both brittle and viscous deformation mechanisms were active (Markl and Bucher, 1997; Markl et al., 1998; Kullerud et al., 2001). It is well known that dislocation creep often results in CPO development, but due to the anisotropic nature of amphiboles rigid-rotation and crystal slip can also lead to CPO development (Passchier and Trouw, 2005; Díaz Aspiroz et al., 2007; Tatham, et al., 2008). Because the pseudotachylite consists of intergrown plagioclase and amphibole with minimal interconnectivity between plagioclase grains, the strength of the pseudotachylite will fall closer to the Voight bound, or isostrain bound (Voight, 1928), indicating the pseudotachylite matrix components will deform together and not along paths of interconnected weak layers. Therefore, if we are seeing a CPO in amphibole, the stronger mineral, we should also see deformation in the weaker plagioclase, but that is not the case.

The lack of CPO development in plagioclase in the pseudotachylite matrix can be explained in two ways: (1) The fine-grained nature of the matrix plagioclase indicates diffusion creep processes dominated, a deformation mechanism not usually associated with CPO development (Passchier and Trouw, 2005) and/or (2) the plagioclase may have recrystallized. Plagioclase begins recrystallizing between 450°-600°C, particularly along grain boundaries (Passchier and Trouw, 2005). Recrystallization is evident in the

leucogabbro by larger plagioclase grains mantled by finer-grained aggregates (Fig. 14). Recrystallization of the leucogabbro plagioclase may have occurred anytime between granulite-facies (or earlier) through amphibolite-facies; therefore, there is no way to know which textures were inherited by the pseudotachylite. However, it is likely that no matter when plagioclase recrystallization began, there were intermittent periods of dynamic and static recrystallization in the shear zones leading to the diffuse textures that are present. It is reasonable for any pre-existing plagioclase CPO to become muddled due to recrystallization at the reported temperatures of amphibolite-facies retrograde metamorphism.

7.4.1.2 Pseudotachylite Plagioclase Pockets

The plagioclase pockets in the Nusfjord pseudotachylite are chemically and texturally different than the pseudotachylite matrix plagioclase. Microprobe analyses were conducted on four individual pockets (Fig. 12). Rim measurements were taken on the edges of the plagioclase pockets bordered by pseudotachylite matrix. Two pockets, PP-1 and PP-4, indicate a slight chemical distinction along the rims, and PP-2 and PP-3 pockets indicate more homogenous chemistries. The interiors of PP-1 and PP-4 correlate well with the Na-content of PP-2 and PP-3 and the range of compositions in the Nusfjord leucogabbro, showing a chemical relationship between the plagioclase pockets and the leucogabbro-mantled plagioclase. EBSD analyses of the interior of some pockets show

monomaximal cores that are texturally and chemically indistinct from adjacent plagioclase within the interior of the pockets (Fig. 15).

Cataclasis associated with pseudotachylite-producing brittle faulting most likely milled the leucogabbro plagioclase into finer-grained aggregates and the monomaximal recrystallized cores of these larger pockets preserved the original crystallographic orientation of the parent grain (Lloyd et al., 1992; Pauli et al., 1996; Prior et al., 2001; Fig. 15). The mantled cores were buffered from post-cataclasis strain and chemical interaction with the pseudotachylite matrix as evidenced by the narrow sodic rims of the pockets (Fig. 15b) and the elongate and whispy tails created by mantled grains being incorporated into the pseudotachylite flow (Fig. 14). Subsequent deformation of the pseudotachylite created a fabric and reinforced the pocket shapes through recrystallization. It is unclear how much of the original leucogabbro grain is preserved in the cores of the pockets and therefore difficult to distinguish between inherited mantle texture and mantling due to cataclasis and pseudotachylite deformation. However, it is evident that the fine-grained mantle and melt shadow accommodated strain through a combination of brittle fracture and ductile deformation (and recrystallization).

7.4.2 Amphibolite-facies strain

In general, Flakstad shear zone amphibole and plagioclase show relatively strong CPOs. The plagioclase pole figures indicate a- and c-axes slightly rotated from the orthogneiss to alignment with the fabric in the shear zone (Fig. 17). Shear zone

amphibole grains also rotated from the orthogneiss with c-axes forming relatively strong alignment with the shear zone fabric, and a well-defined b-axis girdle perpendicular to the shear zone. The CPO pattern in the shear zone amphibole may be recording an early stage deformation regime and/or an inherited fabric from eclogite-facies shear zone deformation. If the pyroxene of the eclogite-facies assemblage in the shear zone formed a CPO during deformation, it is possible for the amphibole, replacing the pyroxene as it grew, to adopt the CPO from the pyroxene (Imon, et al., 2004).

The Nusfjord shear zone pole figures indicate CPOs for all three minerals analyzed (plagioclase, amphibole, and diopside). The Nusfjord shear zone plagioclase pole figures indicate rotation of c-axes with the shear zone fabric and rotation of the a-axes parallel to the z direction (Fig. 18). The CPOs of shear zone amphibole correlate well with those of pseudotachylite amphibole, showing c-axes aligned with the shear zone fabric and a-axes perpendicular to the shear zone. There is little correlation between plagioclase pole figures in the shear zones and pseudotachylite as previously discussed.

8.0 Role of Fluids

The Flakstadøy shear zones propagated through effectively dry, hot granulite-facies rock, indicating a strength difference between the shear zone rock and the surrounding rock. The presence of retrograde assemblages and hydrous minerals and evidence of element mobility indicates that fluids played a key role in metamorphism and shear zone development. Advection of fluids in granulites led to lubricating grain

boundaries and the growth of weaker, hydrous retrograde minerals. However, if permeability is effectively nil in the lower crust, how did fluids penetrate the granulites? Data from both sites support the interpretation that pseudotachylite formation created fluid pathways leading to strain localization and metamorphism at eclogite-facies P-T conditions and continued strain localization through amphibolite-facies metamorphism.

The pseudotachylite formation reduced plagioclase grain size significantly and in doing so created intergranular fluid pathways. Plattner et al. (2003) indicated the pseudotachylites found in similar shear zones found on islands north of Flakstadøy formed under anhydrous conditions because the biotite comprised <2% of the anorthositic host rock equating to <0.08% H_2O in the rock. The Nusfjord leucogabbro contain <4% biotite and the Flakstad orthogneiss contains 5% amphibole. However, the orthogneiss amphibole only occurs surrounding large grains of enstatite and most likely grew at the expense of enstatite during the amphibolite-facies retrograde metamorphism. There is no way to know the abundance of hydrous minerals in the granulite-facies orthogneiss, but Nusfjord leucogabbro modal percentages indicate that, like observed by Plattner et al. (2003), there was a minimal (perhaps <1%) amount of fluid available prior to pseudotachylite formation. However, anhydrous conditions are not necessary for pseudotachylite formation and crosscutting relationships indicate that pseudotachylite formation continued throughout eclogite-facies metamorphism. If pseudotachylite formation occure pre- and syn-eclogitization, continued strain is further evidenced by the

Nusfjord pseudotachylite plagioclase and amphibole CPOs, indicating that upon and/or during devitrification, the pseudotachylite veins were being deformed (Fig. 9).

Austrheim (1987) concluded pseudotachylite formation in the Bergen Arcs resulted from fluids in the granulites, but conceded that, conversely, pseudotachylites could have had a role in eclogite formation. However, he did not provide a mechanism for fluid infiltration in the lower crust. In my interpretation, pseudotachylite-forming processes created am intergranular fluid network through plagioclase grain-size reduction. The initial fluid infiltration had two consequences: (1) fluids acted as a catalyst for eclogite-facies metamorphism in otherwise metastable rocks and (2) sufficiently weakened the rock to initiate shearing.

The source of the fluids is unknown. Kullerud et al. (2001) reported that changing Cl-content of amphiboles in the Nusfjord shear zone is an indication of evolving fluid composition during periodic fluid fluxes. Also, Markl et al. (1997) used Cl-isotopes in amphiboles to determine that associated fluids were not mantle-derived, but most likely remobilization of crustal fluids. It is unlikely that there was one source for fluid infiltration throughout the history of the shear zones, but rather varying sources at intermittent time intervals.

9.0 Conclusions

The intricate relationship between deformation, metamorphism, and fluid availability is evident in the shear zones of Flakstadøy. Pseudotachylite veins are only

found in the presence of shear zones at both Flakstad and Nusfjord. The presence of omphacite in the Flakstad shear zone and diopside-albite symplectite in the Nusfjord shear zone is evidence of eclogite-facies metamorphism in the shear zones. The concentration of amphibole in the shear zones at both sites and in Nusfjord pseudotachylite indicate that fluids were present in the shear zones and virtually absent from the bounding host rocks. Lastly, the development of CPOs in the shear zone amphibole indicates that shear zone strain continued through amphibolite-facies metamorphism.

Although there is no direct evidence of when pseudotachylite formed, the data presented here indicate that shear zone propagation was initiated due to fluid infiltration associated with brittle fracturing and pseudotachylite formation in the lower crust. Pseudotachylite formation reduced plagioclase grain size significantly and created intergranular fluid pathways. The initial fluid infiltration had two consequences: (1) fluids acted as a catalyst for retrograde metamorphism in otherwise metastable rocks and (2) sufficiently weakened the rock to initiate shearing. The fluids associated with retrograde metamorphism significantly reduced the strength of the rock by lubricating grain boundaries. Once formed, the pathways remained available for periodic fluid influxes that in turn lead to metamorphic evolution during amphibolite facies-metamorphism as the rocks were exhumed. The presence of both brittle and ductile deformation led to a positive feedback between strain, metamorphism, and fluid permeability that kept the fluid pathways open and active during exhumation.

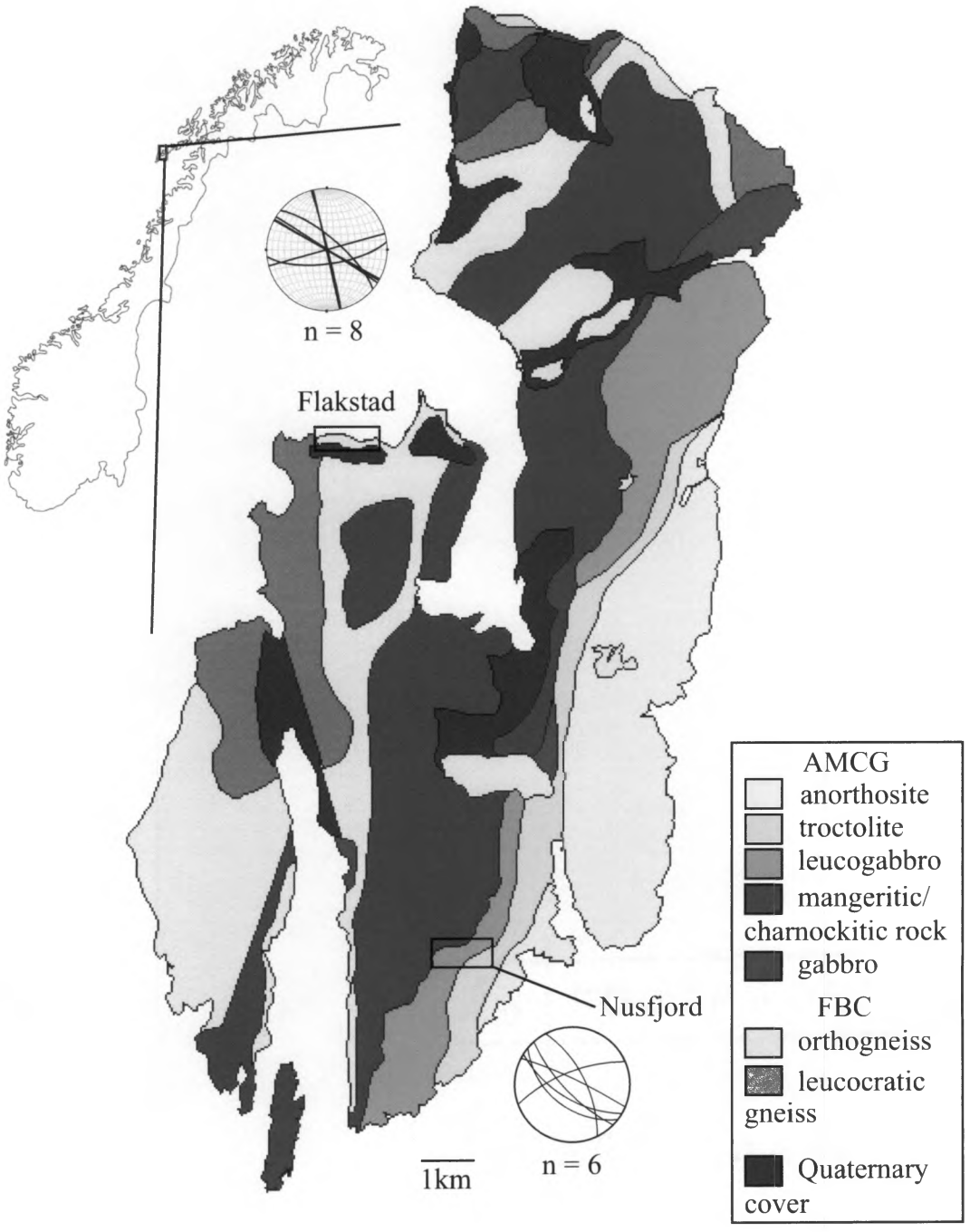


Figure 1. General geology map of Flakstadøy showing the Flakstad and Nusfjord sampling locations (adapted from Romey, 1971, and Kullerud, 2001). Stereonets show shear zone orientations at each site.

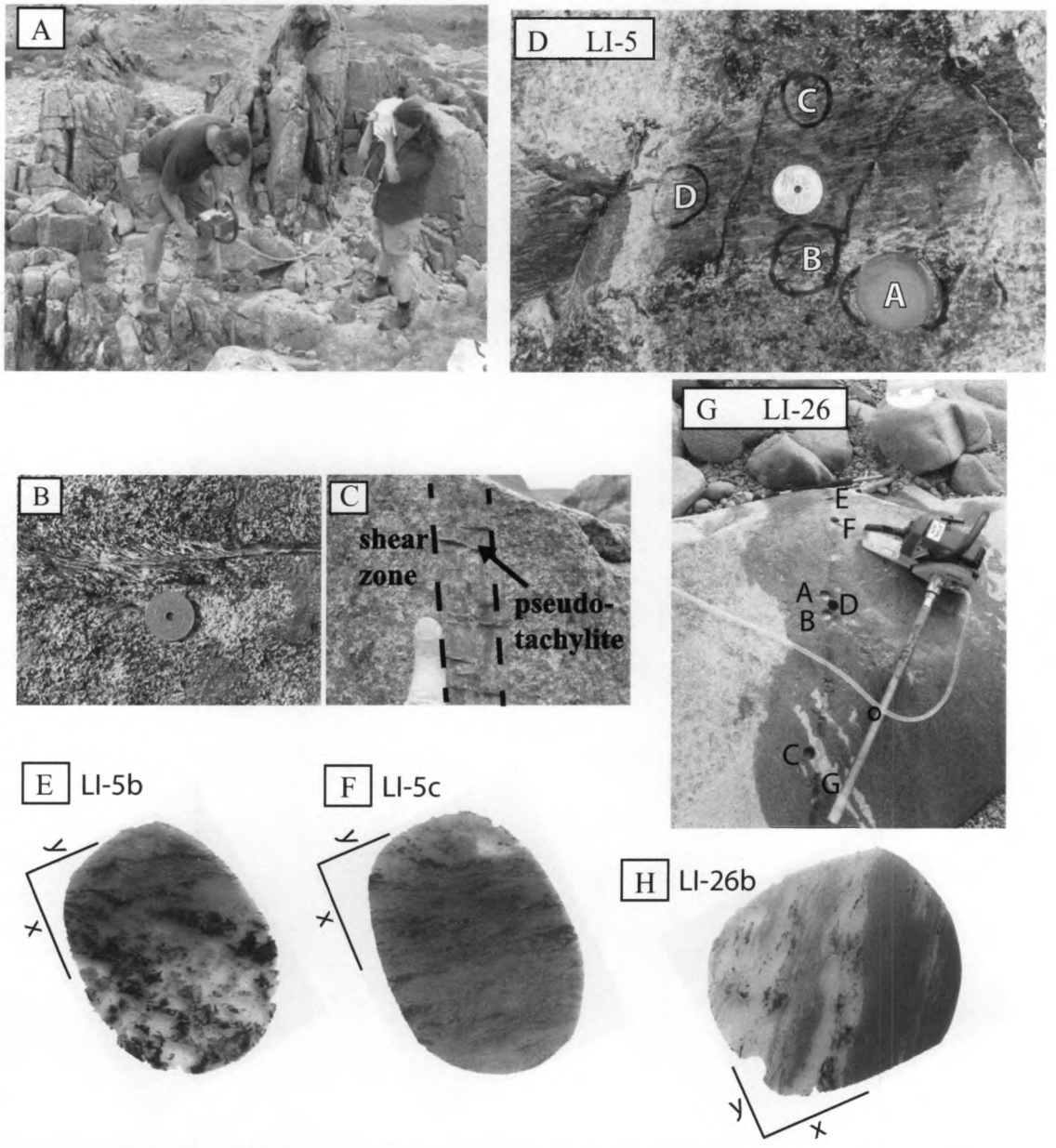


Figure 2. Flakstad site. A. Core drilling a sample using a wet diamond blade drill bit. B. Example of shear zone bounded by sheared host rock. C. Pseudotachylite bearing shear zone. D. Series LI-5 showing core locations across shear zone. E. LI-5b thin section scan spanning the orthogneiss to shear zone boundary. F. LI-5c thin section scan spanning the shear zone. G. Series LI-26 showing core locations along shear zone. H. LI-26b spanning pseudotachylite into host rock and shear band, exhibiting poorly-defined boundary between the shear zone and host rock. For E, F, H: X-Y plot indicates X- and Y-axes of the thin section.

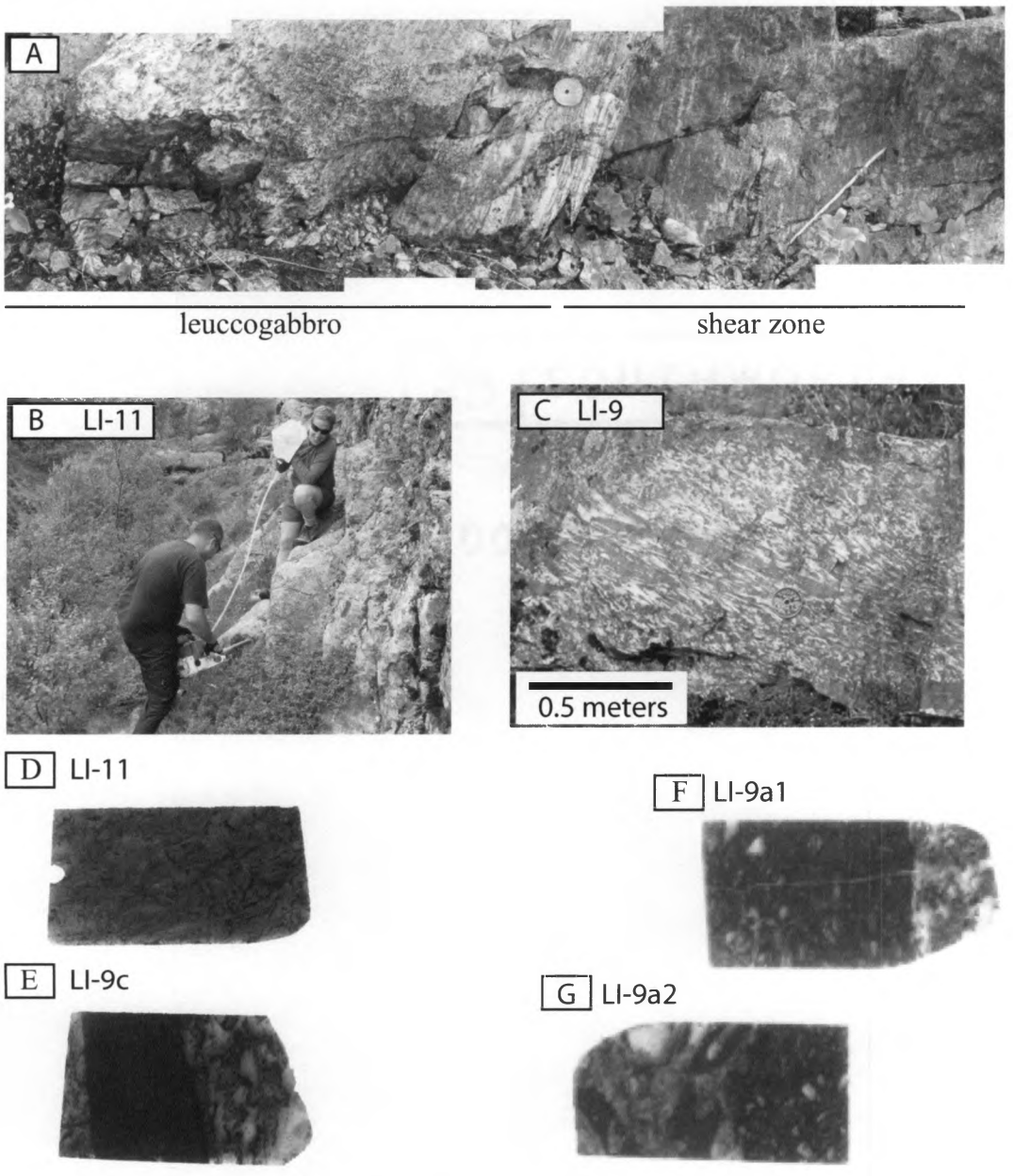


Figure 3. Nusfjord Site. A. Contact between leucogabbro and relict eclogitic shear zone. B. Coring of sample LI-11. C. Pseudotachylite network within the eclogitic shear zone. D. Scan of LI-11 thin section showing retrogressed eclogite. E. Thin section LI-9b showing the transitions from leucogabbro to pseudotachylite to shear zone. F. Thin section LI-9a1 cut from block shown in C. G. Thin section LI-9a2 cut from same pseudotachylite vein as LI-9a1 showing the transition from leuccogabbro to pseudotachylite to eclogite over two thin sections.

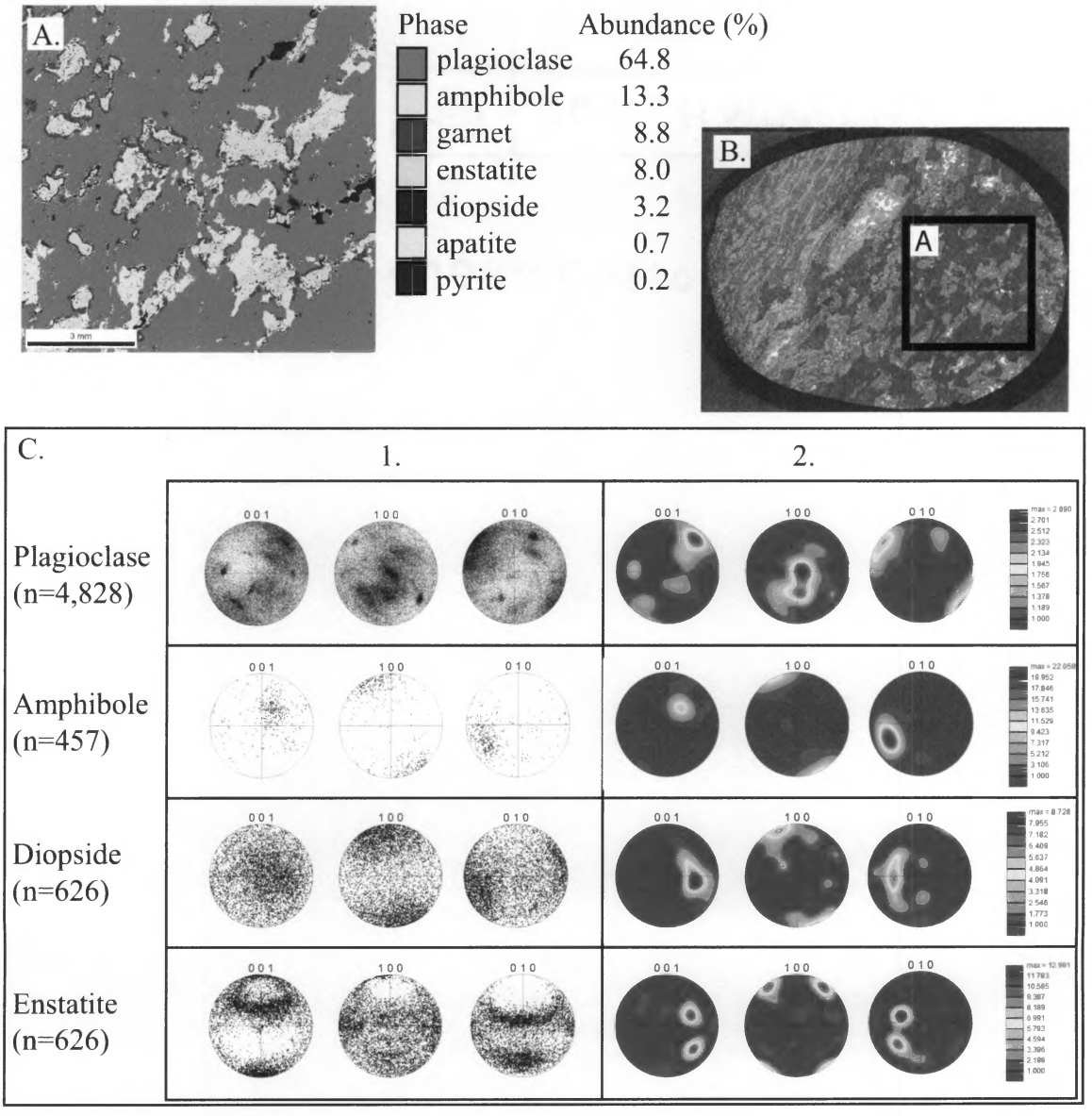


Figure 4. Flakstad orthogneiss, LI-5b. A. Phase map collected using EDS on sample LI-5b with modal abundances. B. Backscatter image of thin section LI-5b, square shows area mapped in A. C. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures 001, 100, and 010 correspond to miller indices for the poles to the c-, a-, and b-planes, respectively. 2. Upper hemisphere pole figure contour with linear scale. Clean up procedure for each phase included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.

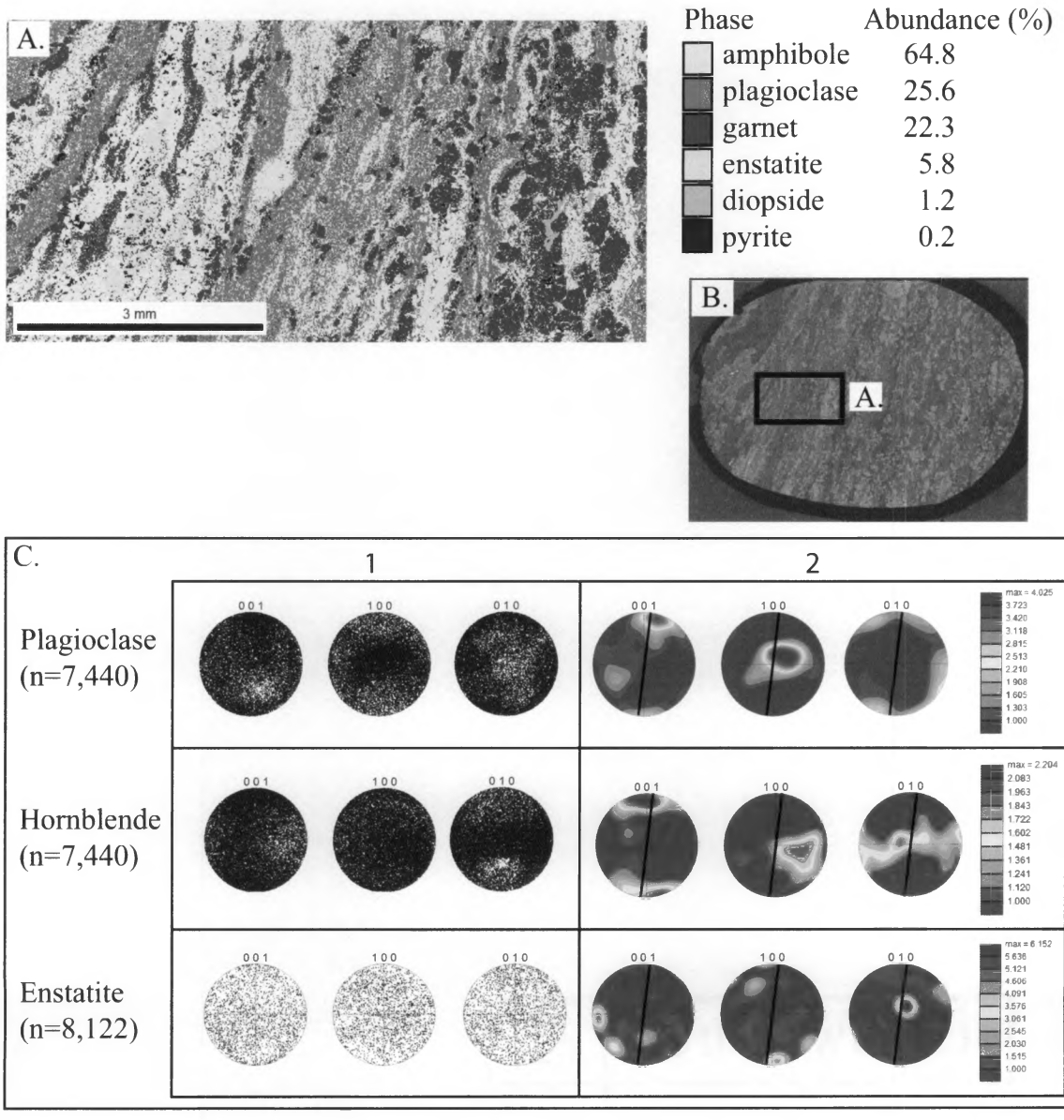
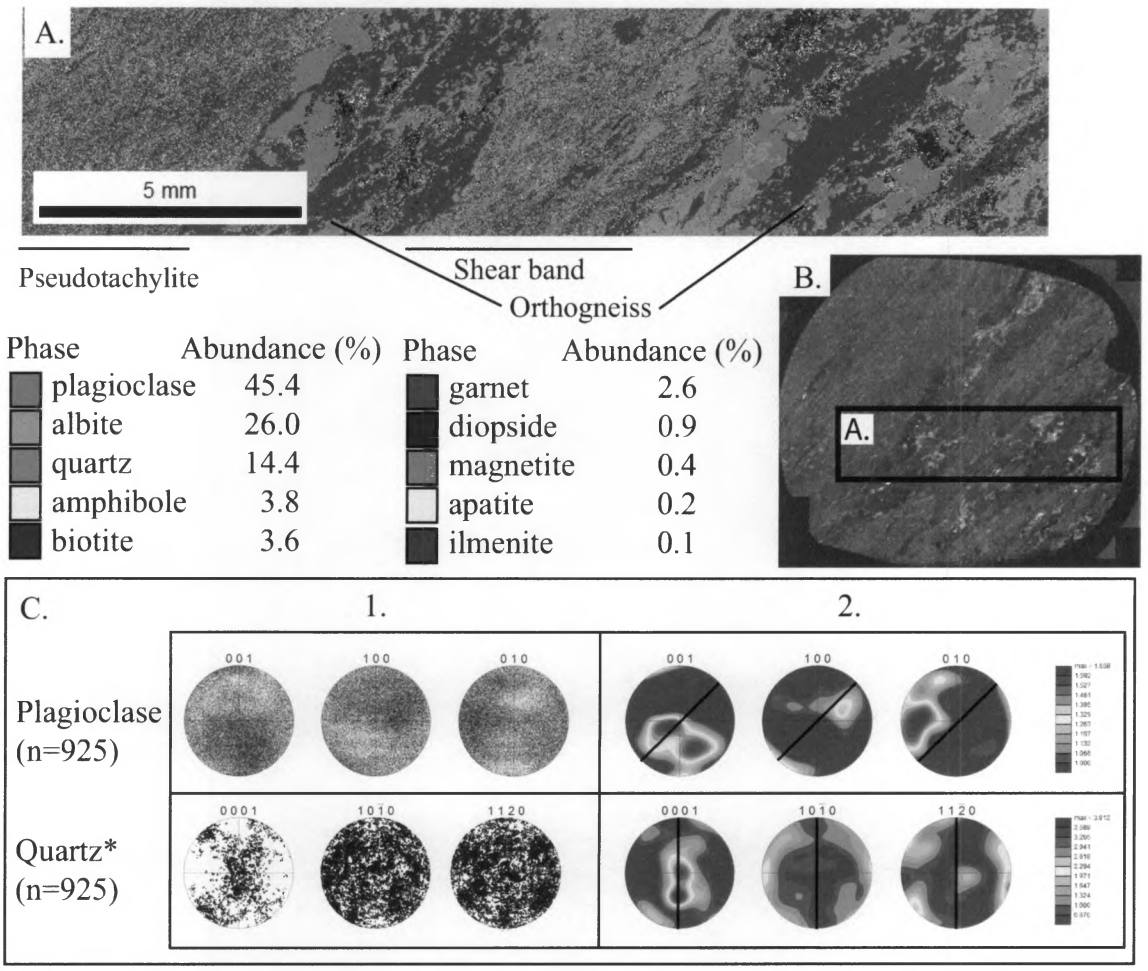
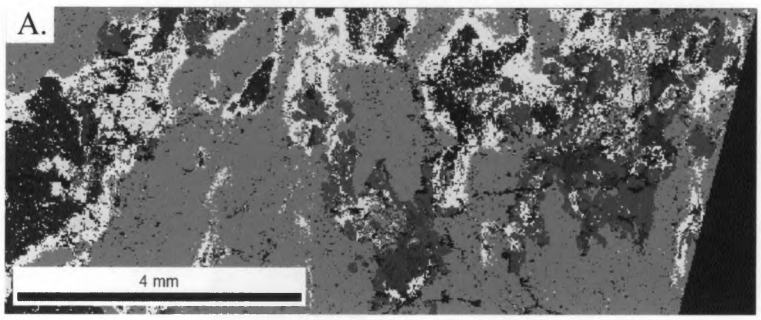


Figure 5. Flakstad shear zone, LI-5c. A. Phase map collected using EDS on sample LI-5c with modal abundances. B. Backscatter image of thin section LI-5c, box shows area mapped in A. C. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures 001, 100, and 010 correspond to poles to the c-, a-, and b-planes. 2. Upper hemisphere, equal area pole figures contoured with linear scale. Shear zone orientation indicated by black line. Clean up procedure for each phase included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.

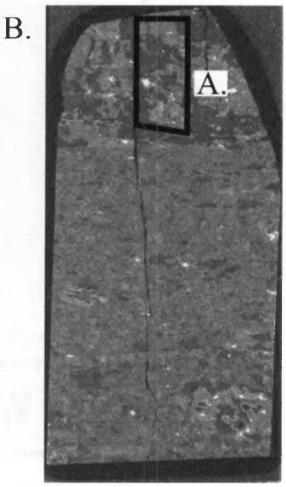


*Quartz grain clean up procedure included: one orientation per grain, minimum CI of 0.1, pseudosymmetry correction of 0001 by 60 degrees, and rotation to correct for errors in thin section cutting.

Figure 6. Flakstad pseudotachylite and shear zone, LI-26g. A. Phase map collected using EDS on sample LI-26g showing pseudotachylite and relict orthogneiss with shear bands. B. Backscatter image of thin section LI-26g, box shows area mapped in A. C. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures 001, 100, and 010 correspond to miller indices for the c-, a-, and b-axis. 2. Upper hemisphere pole figure contour with linear scale, fabric orientation indicated by black line Quartz data were collected from relict orthogneiss. Plagioclase data were collected from the whole map (spanning pseudotachylite through the shear zone). Plagioclase data clean-up procedure included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.



Phase	Abundance (%)	Phase	Abundance (%)
plagioclase	41.7	enstatite	2.6
amphibole	14.0	quartz	2.5
garnet	10.4	ilmenite	1.2
diopside	8.2	magnetite	0.3
biotite	3.4		



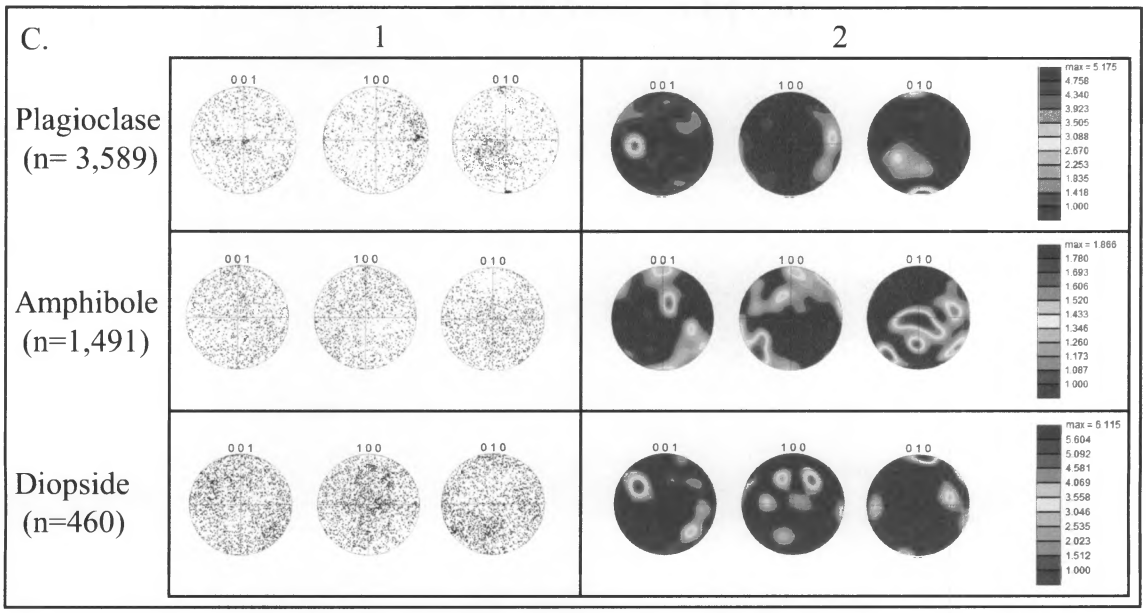


Figure 7. Nusfjord leucogabbro, LI-9a1. A. Phase map collected using energy dispersive spectrometry. B. Backscatter image of thin section LI-9a1, outline shows area mapped in A. C. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures 001, 100, and 010 correspond to miller indices for poles to the c-, a-, and b- planes. 2. Upper hemisphere pole figure contour with linear scale Clean up procedure for each phase included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.

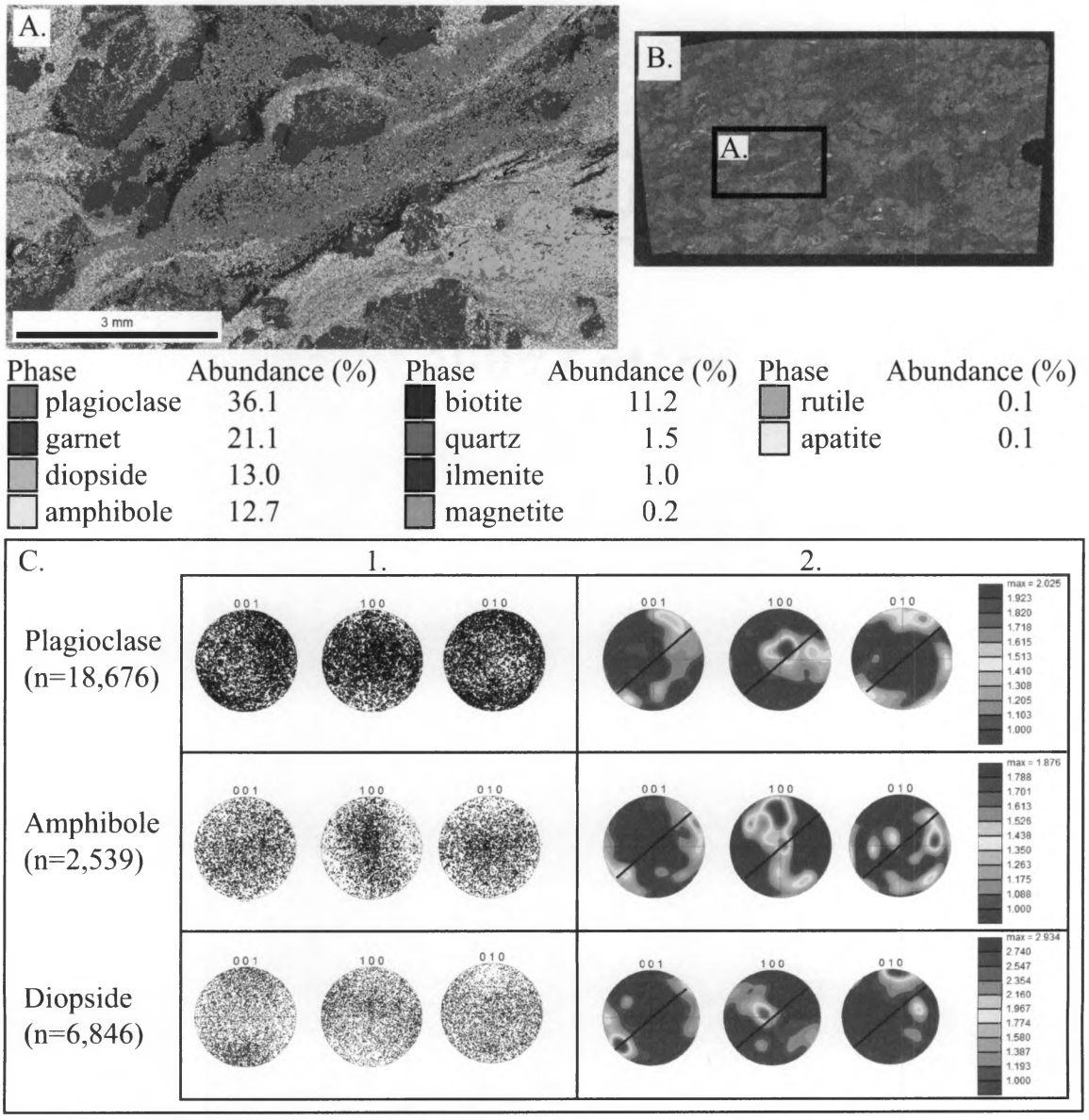


Figure 8. Nusfjord shear zone, LI-11. A. Phase map collected using energy dispersive spectrometry on sample LI-11. B. Backscatter image of thin section LI-11, rectangle shows area mapped in A. C. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures 001, 100, and 010 correspond to miller indices for the poles to the c-, a-, and b-planes. Shear zone orienation indicated by black line. 2. Upper hemisphere pole figure contour with linear scale. Clean up procedure for each phase included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.

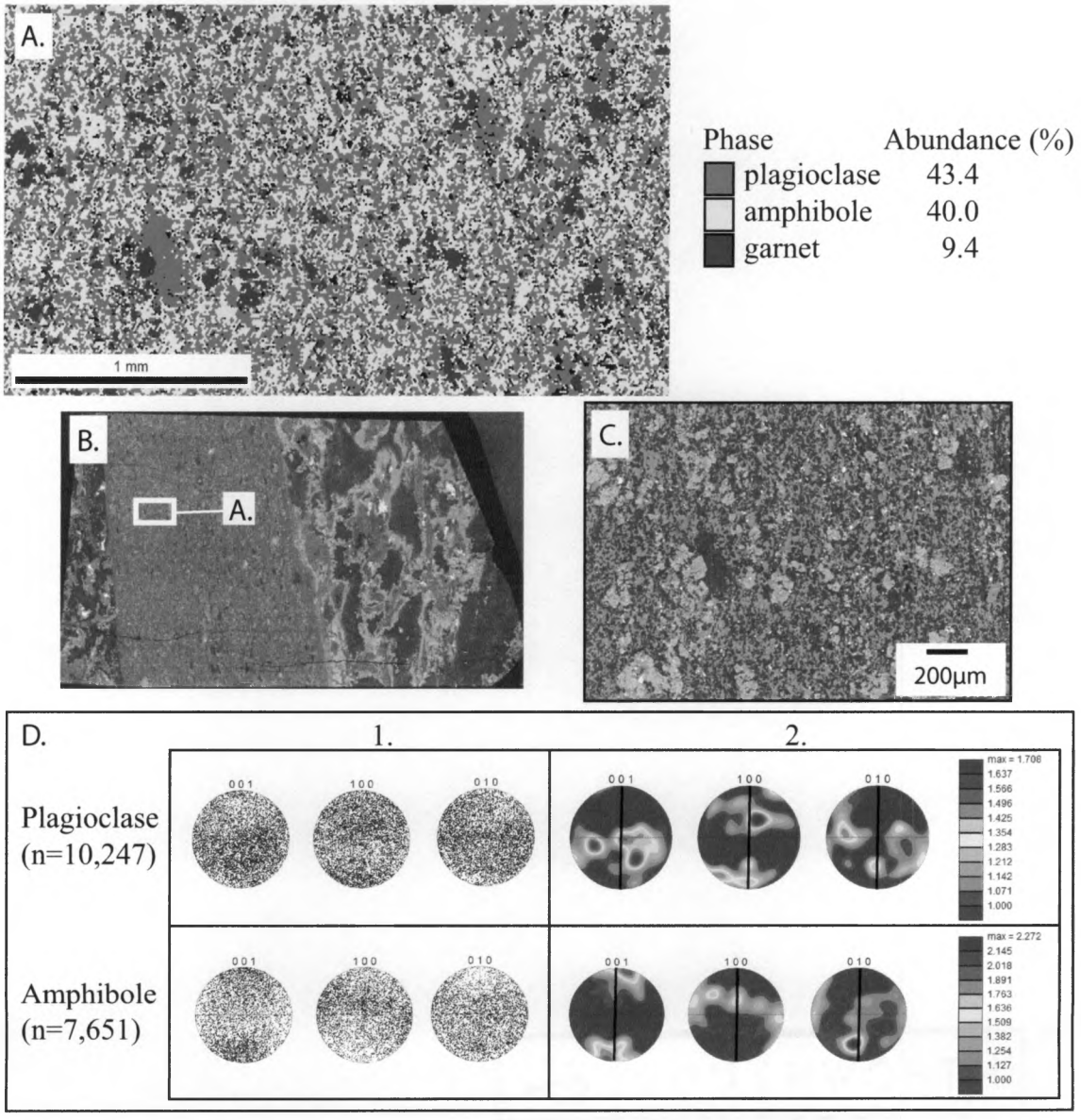


Figure 9. Nusfjord pseudotachylite. A Phase map collected using EDS on sample LI-9c. B. Backscatter image of LI-9c thin section. Rectangle is mapped area of A. C. BSE image of pseudotachylite, a much smaller grain size than that of the other zones. D. Mineral microstructural data of relevant phases, n is number of points in partition. 1. Upper hemisphere equal area pole figure. Pole figures, 001, 100, and 010 correspond to miller indices for the poles to c-, a-, and b-planes. Pseudotachylite orientation is indicated by black line. 2. Upper hemisphere pole figure contour with linear scale. Clean up procedure for each phase included average orientation per grain, omition of points with a confidence index less than 0.05, and plotting all data in partition.

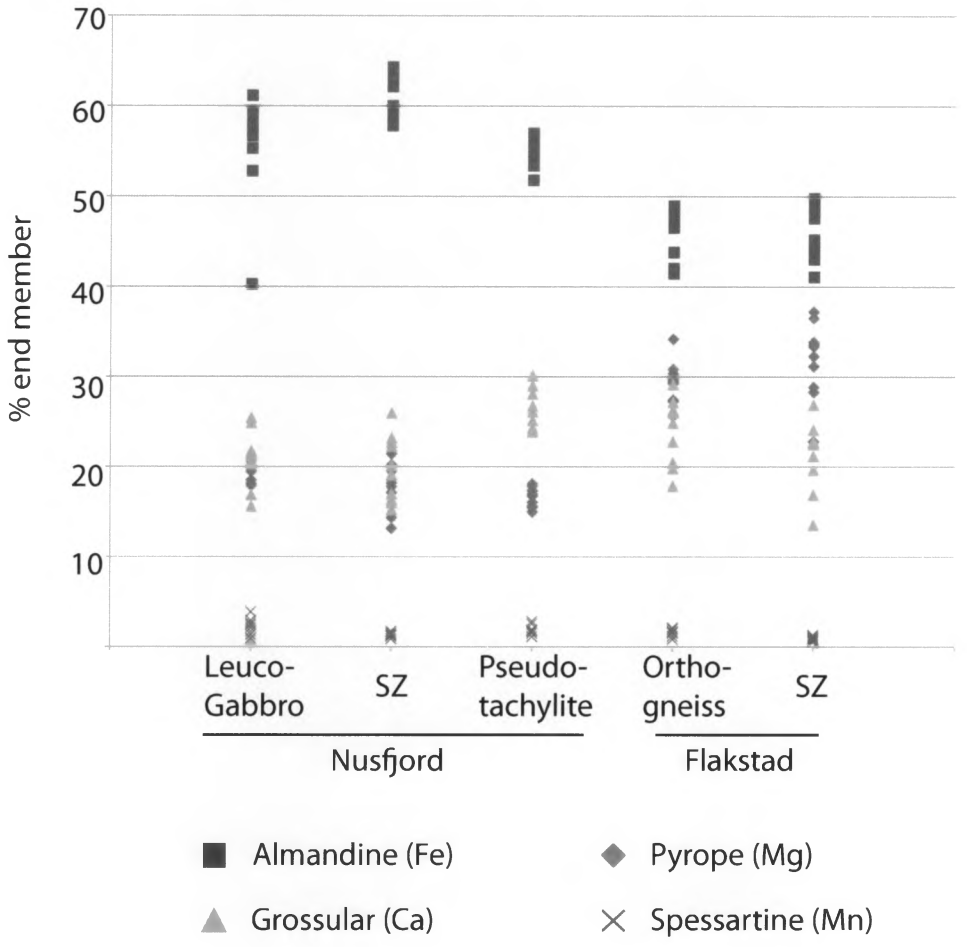


Figure 10. Garnet classification of chemical analyses from samples LI-9a1 and LI-9a2 from Nusfjord and LI-5b from Flakstad. Plot gives percent end member for each zone at each site.

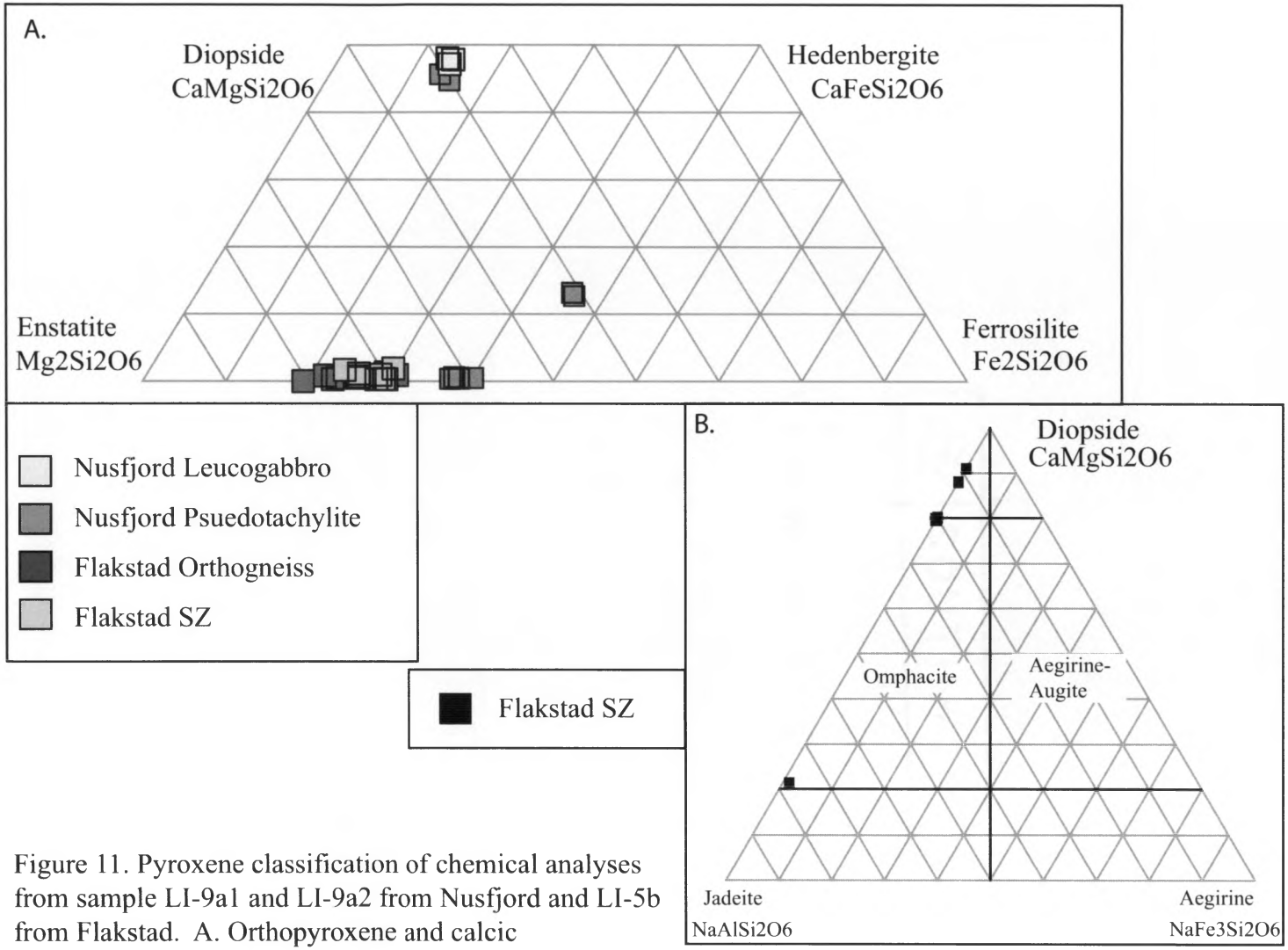


Figure 11. Pyroxene classification of chemical analyses from sample LI-9a1 and LI-9a2 from Nusfjord and LI-5b from Flakstad. A. Orthopyroxene and calcic clinopyroxene plot. B. Sodic clinopyroxene plot.

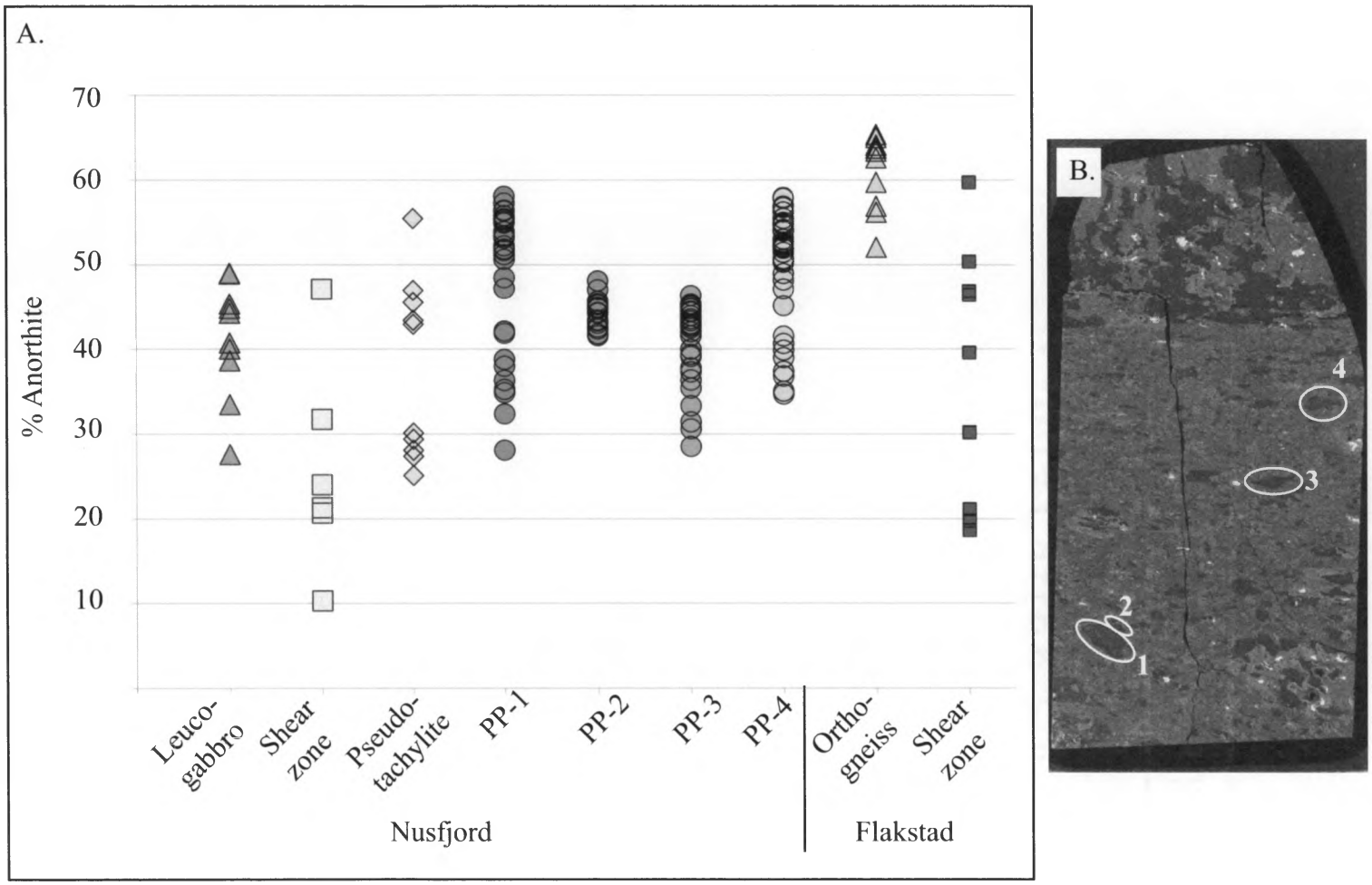


Figure 12. Plagioclase classifications of chemical analyses in % anorthite from sample LI-9a1 and LI-9a2 from Nusfjord and LI-5b from Flakstad. PP= plagioclase pocket, numbers correlate with plagioclase pockets highlighted in B. B. Backscatter image of thin section LI-9a1. Circles highlight plagioclase pockets labeled PP-1, -2, -3, -4 in A.

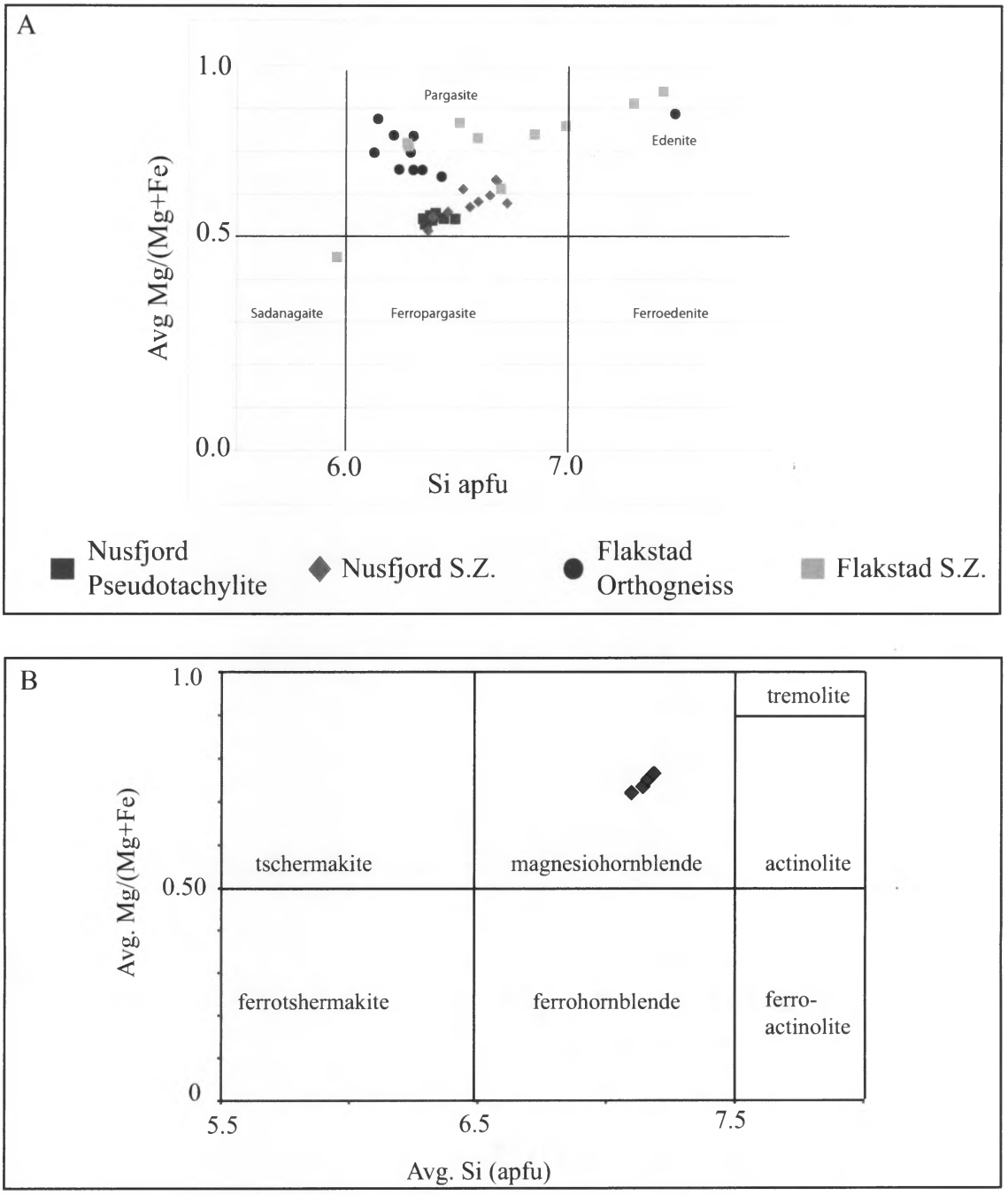


Figure 13. Amphibole classification of chemical analyses from samples LI-9a1 and LI-9a2 from Nusfjord and LI-5b from Flakstad. A. Calcic amphibole with a-site occupancy of Na and K > 0.50. B. Calcic amphiboles with a-site occupancy of Na and K < 0.50.

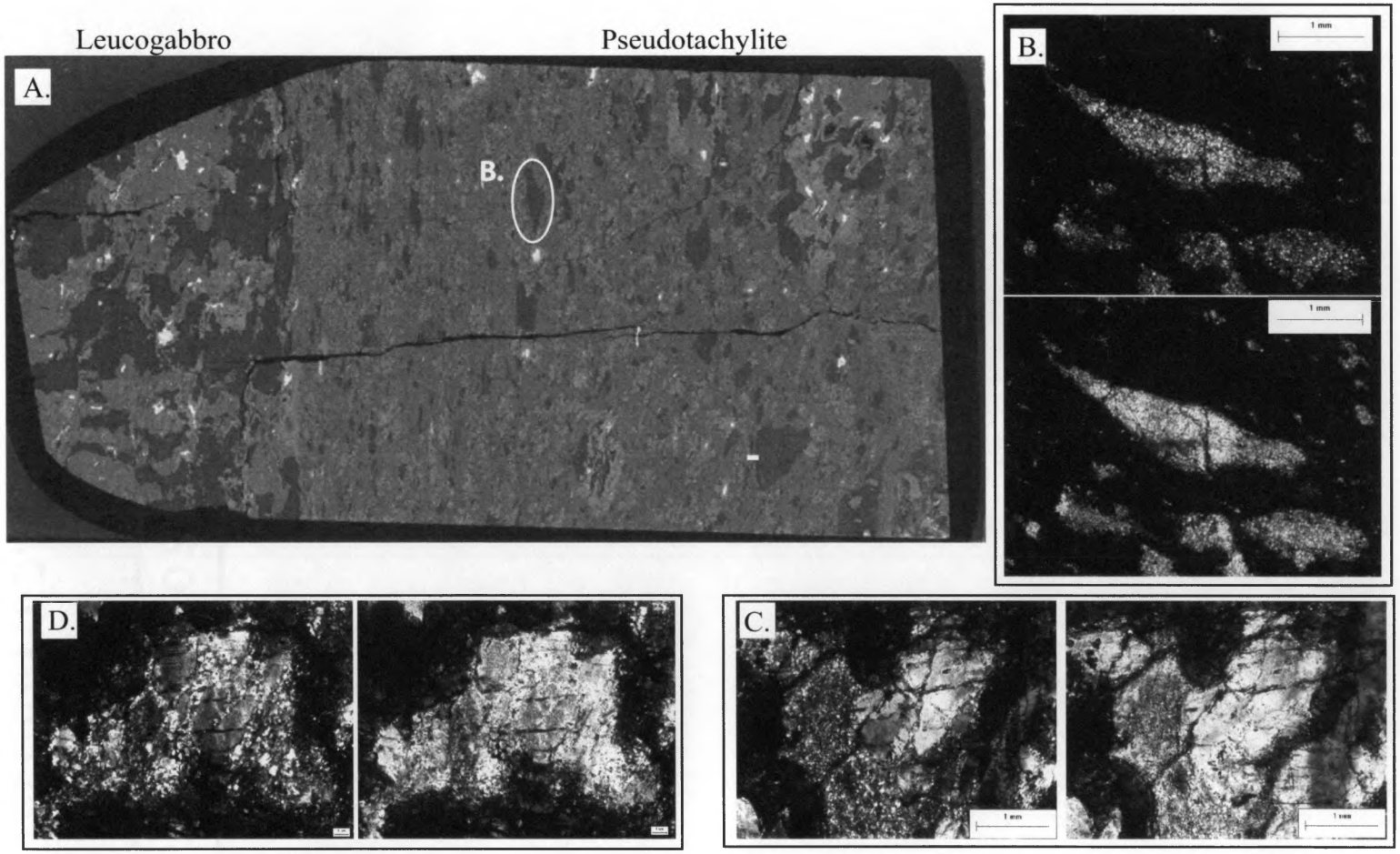


Figure 14. Nusfjord plagioclase textures. A. Backscatter image of LI-9a1 with a plagioclase pockets highlighted by a circle. B. Plagioclase pocket from LI-9a1 depicting whispy tails to many of the pockets. Note the thin section is rotated from A. C. Leucogabbro mantle structure. The larger grain in the upper left corner contains deformation twinning. D. Larger plagioclase grains free of opaque iron oxides adjacent to recrystallized mantle densely populated intergranular oxides.

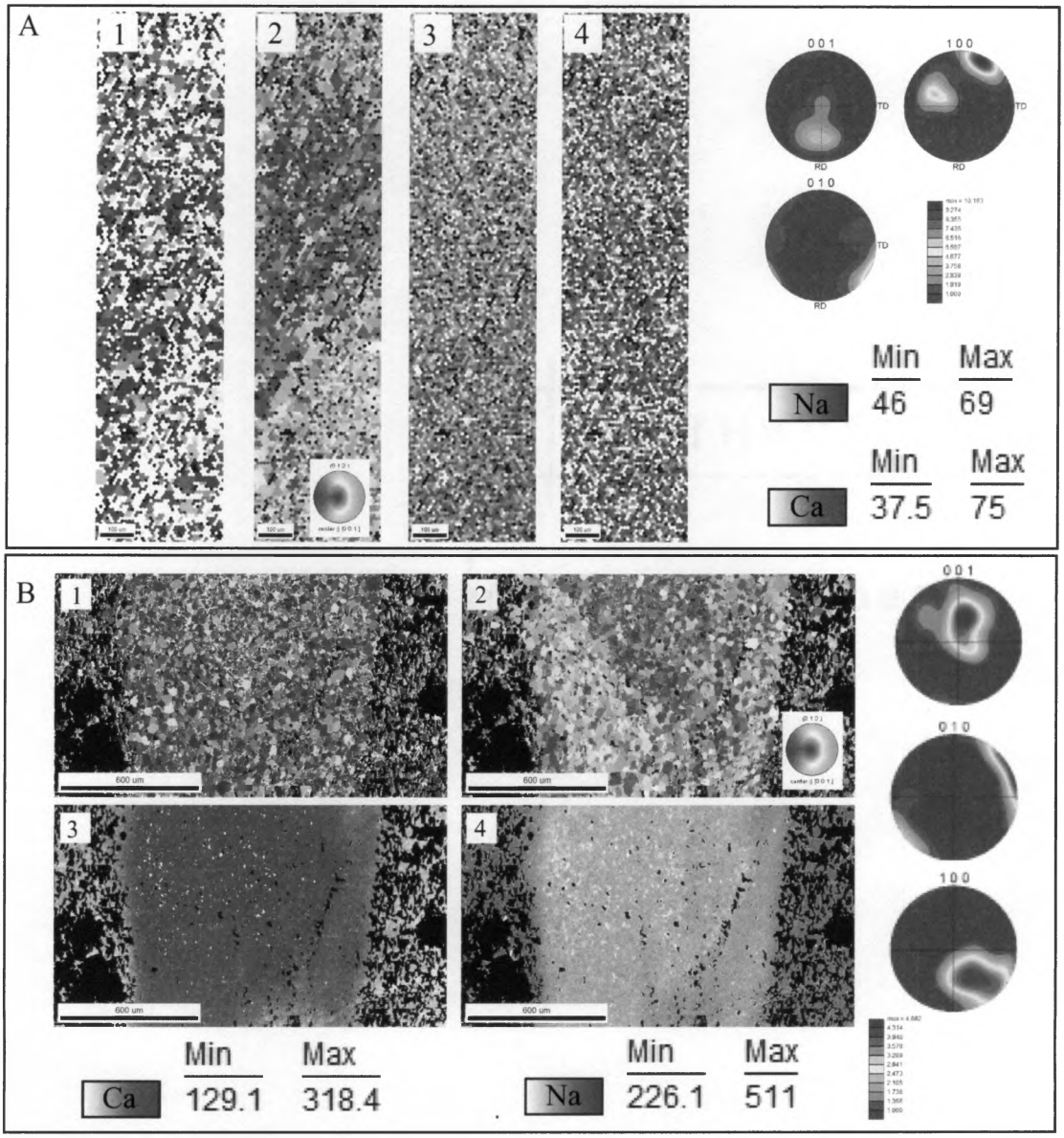


Figure 15: Plagioclase recrystallization. A. Map area completely inclosed in a relict plagioclase in pseudotachylite of sample LI-9a2. B. Area of map contains relict plagioclase and matrix plagioclase along both sides from pseudotachylite in sample LI-9a1.In both A and B: 1. Unique grain color map with 10% misorientation for grain boundaries. 2. Inverse Pole Figure (IPF) map. 3. Ca EDS map showing more Ca-rich recrystallized plagioclase compared to matrix plagioclase. 4. Na EDS map showing more Na-rich matrix plagioclase compared to recrystallized plagioclase. Both areas indicate no chemical change or grain size differences within the boundaries of the relict grain.

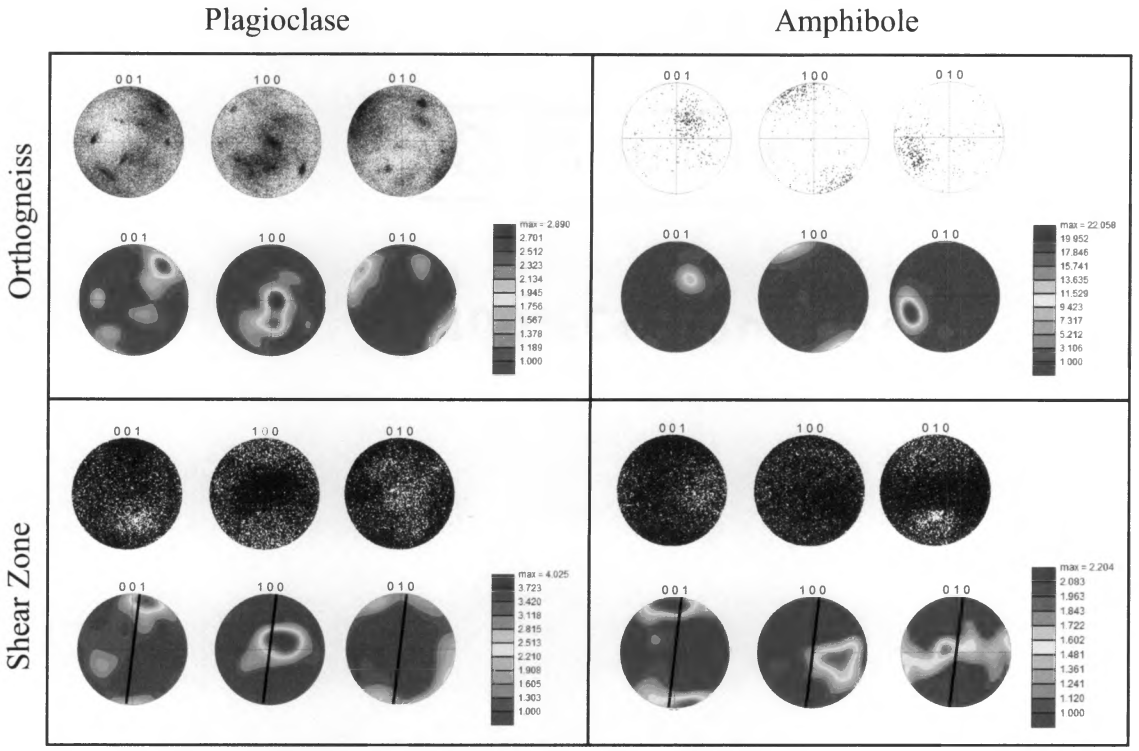


Figure 17. Flakstad zone comparison of shear zone and orthogneiss CPOs. Upper hemisphere, equal area scatter plots, and contoured pole figures are shown for plagioclase and amphibole at each zone of Flakstad. Black lines in shear zone pole figures represents shear zone orientation.

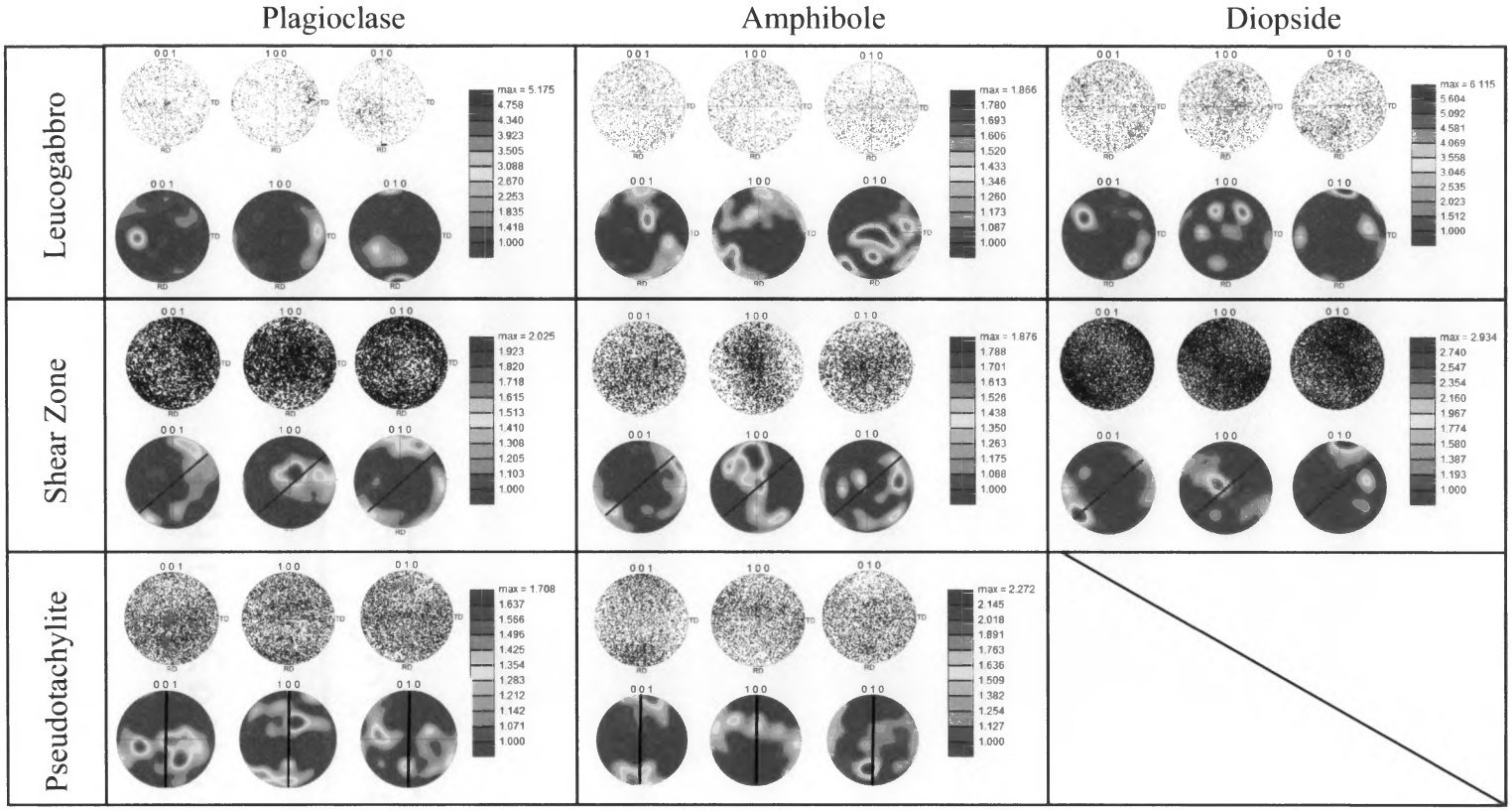


Figure 18. Nusfjord zone comparison of shear zone and orthogneiss CPOs. Upper hemisphere, equal area scatter plots and contoured pole figures. Leucogabbro data from sample LI-9a1, shear zone data from sample LI-11, and pseudotachylite data from LI-9c. Black lines in shear zone and pseudotachylite pole figures represents shear zone orientation. No diopside was detected in the pseudotachylite.

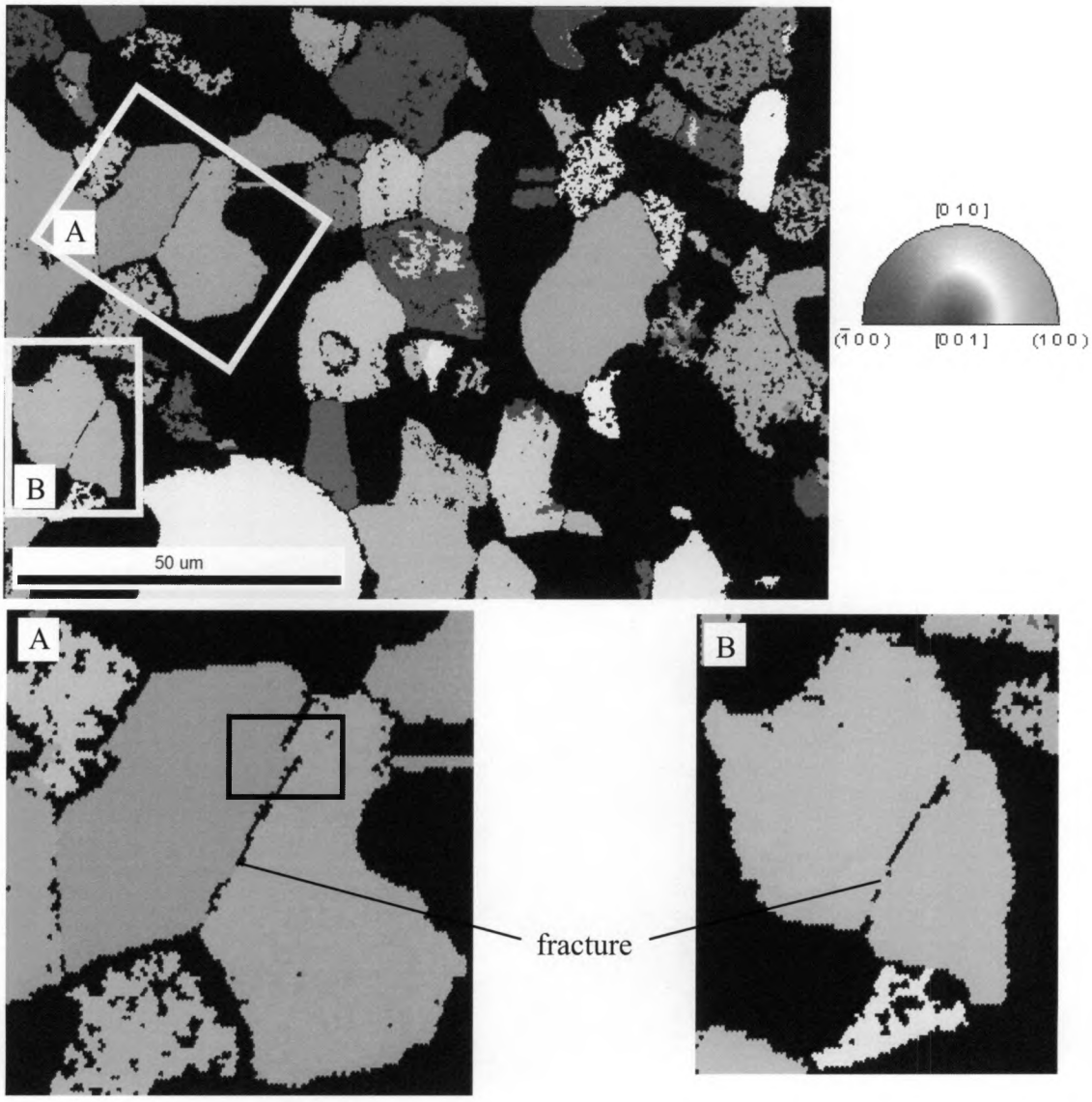


Figure 19. Inverse pole figure maps showing amphibole deformation by cataclasis from the matrix of shear zone in LI-9a2. Black areas represent the phases and/or areas of poor CI values. A. Amphibole grain that underwent incomplete fracturing during deformation. Although the two sides are still attached by a small bridge (highlighted by box), a slight rotation can be seen in the darker pink left side. B. Amphiboles that fractured completely. A slight rotation is visible in B from blue to greenish-blue, representing more rotation than in A and indicating that once the fracture was completed, the two sides were free to rigidly rotate.

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Appendix A

CERTIFICATION OF APPROVAL

I certify that I have read *Fluid controlled metamorphism of eclogitic pseudotachylite-bearing shear zones, Flakstadøy, northern Norway* by Deborah Joy Shulman, and in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree: Master of Science in Geosciences at San Francisco State University.

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Associate Professor of Geoscience

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Professor of Geoscience

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Assistant Professor of Earth Sciences

5b Orthogneiss Garnet
Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
1 / 1 .	0.000	8.970	7.250	0.880	21.370	22.260	-0.010	-0.030	39.510	-0.010	100.250
1 / 2 .	0.000	8.450	8.860	0.830	20.380	22.360	0.000	-0.040	39.270	-0.020	100.140
1 / 3 .	0.000	7.880	10.530	0.780	19.260	22.260	0.010	-0.020	38.960	0.020	99.700
1 / 4 .	0.000	7.640	11.160	0.780	18.880	22.290	0.000	-0.020	39.250	0.030	100.030
1 / 5 .	0.000	7.970	10.540	0.800	18.870	22.330	0.020	-0.030	39.150	0.030	99.710
1 / 6 .	-0.010	8.440	9.940	0.800	19.460	22.530	0.010	-0.030	39.290	0.000	100.470
1 / 7 .	0.020	8.970	8.400	0.700	18.870	27.270	0.010	-0.020	35.730	-0.020	99.960
1 / 8 .	0.000	8.260	9.950	0.770	19.240	22.480	0.000	0.000	39.530	0.000	100.240
1 / 9 .	0.000	8.090	10.160	0.780	19.490	22.470	0.000	0.000	39.370	0.030	100.400
1 / 10 .	0.000	7.780	10.130	0.700	19.650	22.220	0.040	-0.040	38.940	0.010	99.470
2 / 1 .	0.000	7.140	12.250	0.720	18.630	22.260	0.020	-0.020	39.450	-0.010	100.480
2 / 2 .	0.000	8.650	8.560	0.700	20.470	22.390	-0.040	-0.030	39.720	-0.030	100.500
2 / 3 .	0.010	8.820	8.120	0.710	20.820	22.390	0.020	-0.030	39.010	-0.020	99.890
2 / 4 .	-0.010	9.460	7.040	0.710	21.310	22.180	-0.010	-0.010	39.130	0.050	99.870
2 / 5 .	0.000	8.820	8.250	0.690	20.770	22.390	0.010	-0.050	39.360	0.010	100.310
2 / 6 .	-0.010	7.560	11.280	0.750	18.970	22.420	0.020	-0.030	39.310	0.000	100.310
2 / 7 .	0.000	6.570	13.340	0.570	18.070	22.370	-0.030	-0.010	38.850	0.010	99.790
2 / 8 .	-0.010	7.530	10.970	0.740	19.650	22.170	0.000	-0.020	39.200	0.000	100.260
2 / 9 .	0.000	7.420	11.490	0.720	18.870	22.810	0.000	0.050	38.360	0.010	99.730
2 / 10 .	-0.010	8.030	10.290	0.720	19.550	22.390	-0.030	0.010	39.240	0.010	100.240
3 / 1 .	0.010	8.850	7.360	0.880	21.370	22.600	0.020	-0.040	39.270	0.010	100.370
3 / 2 .	0.000	8.230	9.420	0.850	20.270	21.980	0.000	-0.030	39.420	0.110	100.280
3 / 3 .	-0.020	8.640	8.200	0.780	20.570	22.460	-0.010	-0.020	39.670	0.000	100.310
3 / 4 .	-0.010	8.410	8.970	0.860	19.980	22.700	0.030	0.010	39.220	0.020	100.200
3 / 5 .	-0.010	8.190	9.500	0.790	19.870	22.450	-0.020	-0.030	38.990	0.010	99.810
3 / 6 .	0.000	8.020	10.070	0.750	19.500	22.460	-0.010	0.020	39.080	-0.010	99.920
3 / 7 .	0.010	8.150	10.030	0.790	19.360	22.420	-0.010	-0.020	39.250	0.000	100.000
3 / 8 .	0.010	7.710	10.860	0.780	18.930	22.330	-0.020	-0.020	39.350	0.020	99.990
3 / 9 .	0.010	7.350	11.410	0.790	19.040	22.580	0.000	-0.010	39.370	0.040	100.600
3 / 10 .	0.020	7.520	10.930	0.710	19.360	22.540	-0.010	-0.020	38.960	0.040	100.100
4 / 1 .	0.000	7.890	6.400	1.060	23.470	22.280	0.000	0.020	38.940	0.040	100.100
4 / 2 .	0.000	8.010	6.340	1.030	23.460	21.980	0.030	-0.010	39.040	-0.010	99.880
4 / 3 .	-0.010	7.710	7.000	1.000	23.070	22.070	0.000	0.010	38.850	0.030	99.740
4 / 4 .	0.000	7.910	6.470	1.050	23.650	22.140	0.020	-0.030	38.730	0.010	99.990

5b Orthogneiss Garnet
Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
4 / 5 .	-0.010	7.820	6.570	1.060	23.800	22.210	-0.010	0.000	38.840	0.050	100.340
4 / 6 .	0.010	7.900	6.800	1.000	23.030	22.480	0.010	-0.020	39.020	0.060	100.300
4 / 7 .	0.000	7.960	6.900	0.890	23.010	22.210	-0.030	0.000	39.230	0.010	100.200
4 / 8 .	0.000	7.380	8.370	0.860	22.060	22.630	-0.010	0.000	38.740	0.010	100.050
4 / 9 .	0.000	7.340	8.860	0.860	21.570	23.420	0.010	-0.030	38.010	0.020	100.090
4 / 10 .	0.000	7.310	9.080	0.830	21.710	23.260	0.010	-0.040	38.100	0.010	100.320
5 / 1 .	-0.010	7.810	7.640	0.970	22.350	22.300	-0.040	0.010	38.920	0.040	100.050
5 / 2 .	-0.010	7.760	7.660	1.000	22.330	22.400	-0.010	-0.020	39.220	-0.010	100.380
5 / 3 .	0.010	7.670	7.680	0.920	22.310	23.660	0.030	0.000	37.940	0.010	100.230
5 / 4 .	0.000	7.840	7.490	0.960	22.440	23.630	0.000	0.010	38.130	0.020	100.520
5 / 5 .	-0.010	7.330	8.440	0.960	21.940	22.260	-0.040	0.010	39.180	0.030	100.150
5 / 6 .	0.000	7.760	7.550	0.880	22.480	22.640	0.010	-0.030	38.950	0.020	100.290
5 / 7 .	0.000	8.140	6.750	0.870	22.260	25.240	-0.030	0.000	36.520	0.060	99.840
5 / 8 .	-0.010	8.090	6.850	1.030	22.960	22.400	0.010	-0.020	38.940	0.010	100.280
5 / 9 .	0.010	8.080	7.620	0.850	22.280	24.740	0.000	-0.010	36.670	-0.020	100.250
5 / 10 .	0.000	8.130	8.050	0.790	21.610	27.390	0.000	-0.030	35.280	0.050	101.290
6 / 1 .	0.010	7.550	7.340	0.350	23.940	21.830	0.010	-0.010	38.140	0.070	99.230
6 / 2 . *	0.000	7.700	7.490	0.390	23.250	21.640	0.020	0.010	38.100	0.000	98.610
6 / 3 .	0.000	7.570	7.660	0.410	23.750	21.740	0.050	0.000	38.180	-0.010	99.360
6 / 4 . *	0.010	7.550	7.690	0.390	23.470	21.700	0.040	0.010	37.960	0.020	98.850
6 / 5 .	0.010	7.550	7.470	0.430	23.590	21.760	0.010	-0.020	38.460	0.020	99.290
7 / 1 .	-0.020	7.710	7.800	0.370	22.870	21.740	0.000	-0.030	38.580	-0.010	99.070
7 / 2 .	0.000	7.330	8.740	0.410	22.390	21.820	0.020	-0.010	38.420	0.050	99.180
7 / 3 .	0.000	6.930	10.360	0.400	21.410	21.930	-0.010	-0.010	38.620	0.050	99.710
7 / 4 .	-0.010	6.880	10.070	0.370	21.510	22.020	-0.010	-0.020	38.870	0.060	99.770
7 / 5 .	0.050	6.820	7.980	0.460	23.970	21.800	-0.010	-0.010	38.310	0.150	99.540
8 / 1 .	0.010	8.400	6.770	0.700	22.670	28.010	0.020	0.000	33.560	0.060	100.190
8 / 2 .	0.000	7.580	8.120	0.790	22.580	22.450	0.010	-0.030	38.770	-0.010	100.310
8 / 3 .	0.000	7.890	7.720	0.690	22.570	22.360	0.000	-0.020	38.690	0.020	99.960
8 / 4 .	-0.010	7.470	8.740	0.720	22.000	22.290	0.020	-0.030	39.110	0.040	100.380
8 / 5 . *	0.000	7.110	9.430	0.690	22.150	22.790	0.010	-0.030	38.910	0.030	101.120
8 / 6 .	0.010	6.020	11.630	0.700	20.690	23.010	0.010	-0.040	38.120	0.010	100.190
8 / 7 .	-0.010	6.420	10.260	0.680	21.710	22.180	-0.030	-0.020	39.040	0.030	100.330
8 / 8 .	0.000	6.420	9.930	0.770	21.740	22.260	0.010	0.020	38.740	0.000	99.900

5b Orthogneiss Garnet
Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
8 / 9 .	-0.010	6.010	11.440	0.740	21.330	22.070	0.050	-0.010	38.500	0.000	100.130
8 / 10 .	0.000	5.190	13.150	0.670	20.000	22.910	-0.010	-0.020	38.060	0.030	100.010
9 / 1 .	0.010	8.090	7.600	1.000	22.090	22.320	0.050	-0.020	39.160	0.040	100.350
9 / 2 .	0.000	7.700	8.930	0.930	21.250	22.320	0.010	-0.020	39.020	0.030	100.180
9 / 3 .	-0.020	7.610	9.130	0.910	21.230	23.180	0.010	0.000	37.890	0.030	99.980
9 / 4 .	0.010	7.960	9.020	0.930	20.730	22.890	0.010	-0.010	38.510	0.000	100.060
9 / 5 .	0.000	7.870	9.320	0.820	20.150	23.210	0.020	0.020	38.050	0.050	99.510
9 / 6 .	0.000	7.690	10.680	0.910	19.470	22.430	0.010	0.010	39.160	0.030	100.390
9 / 7 .	-0.010	7.630	10.650	0.880	19.430	22.250	0.000	0.010	39.370	0.040	100.250
9 / 8 .	0.000	7.880	10.020	0.890	20.130	22.410	0.010	-0.010	39.170	0.010	100.520
9 / 9 .	0.000	8.160	8.730	0.930	20.910	23.220	0.000	-0.020	38.400	0.020	100.370
9 / 10 .	0.000	8.080	8.490	0.920	21.070	22.680	-0.030	-0.040	38.610	0.040	99.880
10 / 1 .	0.010	7.570	10.190	0.770	19.950	22.470	-0.030	0.030	39.380	0.020	100.370
10 / 2 .	0.000	8.710	8.370	0.720	20.070	25.880	0.000	-0.030	37.080	0.000	100.840
10 / 3 .	0.000	7.880	9.790	0.770	20.100	22.650	0.010	-0.020	39.050	0.010	100.270
10 / 4 .	-0.010	7.780	9.980	0.800	19.810	22.540	-0.010	0.020	39.360	0.040	100.330
10 / 5 .	-0.010	7.780	10.070	0.750	19.910	22.460	-0.020	0.000	39.130	0.000	100.090
10 / 6 .	0.010	5.870	11.950	0.680	20.320	22.280	-0.020	-0.020	38.700	0.020	99.830
10 / 7 .	0.000	6.030	12.900	0.690	18.990	22.450	0.010	0.000	38.890	0.020	99.970
10 / 8 .	-0.020	6.350	12.610	0.630	18.570	23.020	-0.020	-0.010	38.960	0.010	100.140
10 / 9 .	-0.010	6.810	12.180	0.730	18.990	22.410	0.000	-0.030	39.090	0.020	100.220
10 / 10 .	0.010	7.680	9.770	0.760	20.600	22.490	0.010	-0.020	38.910	0.010	100.240
11 / 1 .	0.000	9.590	5.160	0.580	22.940	22.520	-0.020	-0.010	39.840	0.020	100.660
11 / 2 .	0.010	9.830	5.040	0.550	23.150	22.490	0.030	-0.010	39.160	0.080	100.340
11 / 3 .	0.000	9.780	4.980	0.550	22.960	22.570	0.000	-0.010	39.790	0.050	100.680
11 / 4 .	-0.010	9.940	4.890	0.610	22.930	22.360	0.010	0.010	39.730	0.030	100.520
11 / 5 .	-0.010	9.590	5.620	0.580	22.610	22.460	0.010	-0.020	39.910	0.000	100.780
11 / 6 .	-0.010	9.700	5.110	0.590	22.850	22.450	-0.020	-0.020	39.460	0.030	100.190
11 / 7 .	0.010	8.680	7.150	0.510	22.170	22.370	0.020	-0.030	39.210	0.030	100.160
11 / 8 .	0.000	8.830	7.430	0.550	21.900	22.260	0.030	-0.010	39.350	0.010	100.350
11 / 9 .	0.020	8.170	9.050	0.510	21.100	22.020	0.030	-0.040	39.110	0.050	100.070
11 / 10 .	0.000	7.070	11.800	0.500	19.500	22.340	0.030	-0.020	39.260	0.070	100.580

5b Shear zone Garnet
Date: 11/11/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
1 / 1 .	-0.030	9.900	4.580	0.520	23.360	22.400	-0.020	0.010	39.250	0.020	100.050
1 / 2 .	-0.010	10.090	4.370	0.530	23.530	22.520	-0.020	0.040	39.100	0.040	100.220
1 / 3 .	-0.010	10.080	4.630	0.480	23.340	22.440	0.020	0.040	39.240	0.020	100.280
1 / 4 .	-0.010	10.200	4.830	0.490	23.070	22.210	-0.030	0.030	39.260	-0.010	100.100
1 / 5 .	-0.010	10.200	4.670	0.480	22.980	22.570	-0.020	0.030	39.570	0.010	100.500
1 / 6 .	-0.010	10.150	4.730	0.490	23.030	22.330	0.000	0.030	39.560	0.010	100.320
1 / 7 .	-0.020	9.790	5.660	0.490	22.350	22.310	-0.050	0.020	38.920	0.010	99.550
1 / 8 .	0.000	9.750	5.590	0.410	22.430	22.370	0.010	0.020	39.340	0.070	99.990
1 / 9 .	-0.010	9.680	5.950	0.520	21.830	22.330	-0.020	0.030	39.280	0.010	99.630
1 / 10 .	-0.010	9.880	5.410	0.480	22.790	22.290	0.000	0.060	38.970	0.020	99.890
2 / 1 .	-0.020	11.510	4.700	0.690	20.720	22.860	0.000	0.030	39.860	0.010	100.390
2 / 2 .	0.000	9.070	9.180	0.520	19.260	22.560	-0.020	0.030	39.840	0.020	100.480
2 / 3 .	0.000	8.820	10.200	0.380	18.580	22.730	-0.010	0.040	39.810	0.010	100.580
2 / 4 .	0.000	9.650	7.880	0.550	19.780	22.650	-0.020	0.040	39.420	0.010	99.990
2 / 5 .	-0.010	8.890	9.620	0.540	19.060	22.670	-0.030	0.040	39.790	0.030	100.640
2 / 6 .	-0.020	10.120	7.330	0.600	19.770	22.660	-0.010	0.040	39.430	0.010	99.960
2 / 7 .	-0.010	9.320	9.050	0.490	19.100	22.640	-0.020	0.030	39.580	-0.010	100.220
2 / 8 .	-0.010	11.890	4.340	0.690	20.970	22.890	-0.010	0.000	39.210	0.020	100.010
2 / 9 .	0.000	9.080	9.100	0.620	19.080	22.250	0.040	0.010	39.300	0.010	99.490
2 / 10 .	-0.020	9.810	7.790	0.650	19.450	22.450	0.000	0.040	39.320	0.060	99.560
3 / 1 .	-0.020	8.270	8.730	0.400	21.030	22.340	-0.020	0.050	38.890	0.040	99.750
3 / 2 .	-0.010	8.340	9.050	0.410	21.290	22.150	-0.020	0.020	38.990	0.030	100.280
3 / 3 .	-0.010	8.850	7.650	0.440	21.490	22.140	-0.010	0.020	39.110	0.020	99.720
3 / 4 .	-0.010	8.950	7.710	0.410	21.640	22.410	0.010	0.040	39.220	0.010	100.390
3 / 5 .	0.000	9.290	6.750	0.460	21.380	22.200	-0.020	0.040	39.250	0.020	99.390
3 / 6 .	-0.020	8.610	8.860	0.380	20.680	22.460	0.010	0.050	39.180	0.030	100.250
3 / 7 .	-0.030	8.710	8.570	0.330	20.630	22.290	0.030	0.010	39.500	0.040	100.100
3 / 8 .	-0.010	8.590	8.860	0.310	20.530	22.480	0.000	-0.010	39.010	0.020	99.810
3 / 9 .	-0.010	8.480	9.230	0.370	20.410	22.530	-0.010	0.040	39.320	0.040	100.430
3 / 10 .	-0.010	8.390	8.970	0.380	20.550	22.430	0.000	0.020	39.240	0.010	100.000
4 / 1 .	0.000	9.060	7.050	0.540	21.800	21.880	-0.030	0.030	38.510	0.050	98.930
4 / 2 .	0.010	9.660	6.580	0.490	21.950	21.890	0.000	0.080	38.820	0.010	99.500
4 / 3 .	-0.010	9.550	6.820	0.460	21.230	22.260	-0.020	0.030	38.990	0.030	99.370
4 / 4 .	0.000	8.570	9.520	0.400	19.770	22.270	0.000	0.060	39.130	0.060	99.790

5b Shear zone Garnet
Date: 11/11/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
4 / 5 .	-0.020	8.520	9.190	0.390	20.050	22.590	-0.010	0.050	39.060	0.050	99.910
4 / 6 .	-0.010	9.080	8.130	0.420	20.510	22.220	0.000	0.060	39.140	0.050	99.610
4 / 7 .	-0.010	8.710	9.110	0.380	19.970	22.850	0.010	0.030	39.570	0.020	100.640
4 / 8 .	0.000	8.720	9.390	0.350	19.620	22.430	-0.050	0.040	39.440	0.010	100.010
4 / 9 .	0.000	8.720	9.600	0.320	19.380	22.420	-0.010	0.020	39.430	0.070	99.970
4 / 10 .	-0.020	8.770	9.270	0.290	19.610	22.440	-0.020	0.030	39.610	0.020	100.040
5 / 1 .	-0.020	7.080	8.850	0.220	22.820	22.020	-0.010	0.040	38.730	0.060	99.820
5 / 2 .	0.000	7.340	8.610	0.220	22.850	22.140	-0.020	0.040	38.790	0.050	100.040
5 / 3 .	-0.010	7.140	8.670	0.240	22.900	22.020	0.000	0.050	38.960	0.040	100.010
5 / 4 .	0.010	7.420	8.820	0.270	22.460	22.140	-0.010	-0.020	38.790	0.040	99.940
5 / 5 .	-0.010	7.400	8.900	0.270	22.360	22.120	0.020	0.030	38.840	0.010	99.950
5 / 6 .	-0.010	7.500	8.320	0.350	22.560	21.980	-0.020	0.030	38.890	0.020	99.660
5 / 7 .	-0.010	7.400	9.230	0.290	22.360	22.170	0.010	0.030	38.770	0.030	100.320
5 / 8 .	0.000	7.470	8.710	0.340	22.230	22.230	0.040	0.040	38.760	0.060	99.880
5 / 9 .	-0.010	8.180	6.720	0.290	23.530	22.090	-0.010	0.020	38.750	0.040	99.620
5 / 10 .	-0.010	8.210	6.360	0.340	24.080	22.270	-0.010	0.020	38.710	0.050	100.040
6 / 1 .	0.000	8.040	7.140	0.380	23.520	22.260	-0.010	0.030	39.140	0.000	100.510
6 / 2 .	-0.010	7.650	8.250	0.360	22.720	22.260	0.010	0.040	38.760	0.060	100.110
6 / 3 .	-0.020	7.110	9.960	0.380	21.690	22.410	-0.010	0.030	38.950	0.070	100.600
6 / 4 .	-0.020	7.640	9.100	0.340	21.560	22.210	0.010	0.030	38.970	0.030	99.890
6 / 5 .	-0.010	7.760	8.990	0.290	21.470	22.450	0.010	0.020	39.140	0.050	100.170
6 / 6 .	0.000	7.830	9.330	0.370	21.140	22.630	0.010	0.030	39.220	0.060	100.620
6 / 7 .	-0.010	8.150	7.140	0.350	23.410	22.090	0.010	0.070	39.180	0.050	100.460
6 / 8 .	0.010	7.670	7.580	0.340	22.990	22.040	0.010	0.070	38.850	0.050	99.610
6 / 9 .	-0.010	7.710	7.910	0.330	23.070	21.970	0.020	0.060	38.800	0.020	99.890
6 / 10 .	-0.010	7.160	8.910	0.340	22.660	22.270	0.020	0.040	38.900	0.070	100.360
7 / 1 .	0.000	9.230	6.000	0.430	23.390	22.250	0.040	0.030	39.210	0.060	100.630
7 / 2 .	-0.010	9.040	6.100	0.400	23.150	22.200	-0.020	0.040	38.990	0.030	99.940
7 / 3 .	-0.020	8.930	6.490	0.430	23.180	22.200	-0.010	0.050	39.120	0.020	100.420
7 / 4 .	-0.010	8.940	6.250	0.460	23.330	22.320	0.000	0.070	39.180	0.040	100.590
7 / 5 .	-0.010	8.750	6.740	0.400	22.900	22.240	0.020	0.010	38.890	0.040	99.990
7 / 6 .	-0.010	8.810	6.480	0.500	22.830	21.980	0.010	0.030	38.890	0.050	99.580
7 / 7 .	-0.010	8.940	6.220	0.440	23.230	22.410	-0.020	0.050	39.240	0.040	100.570
7 / 8 .	-0.020	9.020	6.170	0.410	22.900	22.300	0.000	0.050	39.260	0.080	100.190

5b Shear zone Garnet
Date: 11/11/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	Y2O3	SiO2	TiO2	Total
7 / 9 .	-0.010	8.990	6.440	0.430	22.840	22.200	-0.020	0.040	39.180	0.040	100.160
7 / 10 .	-0.020	9.160	5.850	0.400	22.620	22.420	0.030	0.010	39.260	0.040	99.790
8 / 1 .	0.000	8.990	6.970	0.420	21.980	22.160	0.000	0.000	39.300	0.030	99.860
8 / 2 .	0.000	8.480	8.510	0.390	21.240	22.130	-0.030	0.010	38.830	0.010	99.610
8 / 3 .	0.030	7.850	9.470	0.270	19.870	22.200	-0.020	0.030	38.110	0.080	97.900
8 / 4 .	-0.010	8.790	7.840	0.360	21.270	22.310	0.010	0.030	39.610	0.040	100.260
8 / 5 .	0.000	8.110	9.650	0.300	20.070	22.410	-0.030	0.040	39.310	0.050	99.950
8 / 6 .	-0.010	8.310	9.570	0.340	20.640	21.650	-0.020	0.040	37.660	0.080	98.300
8 / 7 .	0.000	8.060	9.550	0.280	20.400	22.410	0.010	0.030	39.080	0.020	99.860
8 / 8 .	0.000	8.350	9.220	0.320	20.730	22.200	0.010	0.060	39.090	0.050	100.020
8 / 9 .	0.010	8.230	9.300	0.350	20.810	22.330	0.010	0.040	39.150	0.030	100.260
8 / 10 .	0.000	8.120	9.630	0.360	20.460	22.420	-0.030	0.030	39.240	0.020	100.270
9 / 1 .	-0.010	6.030	9.860	0.240	23.230	22.180	0.010	0.030	38.580	0.040	100.210
9 / 2 .	0.000	5.880	10.260	0.210	22.780	21.920	-0.020	0.020	38.320	0.050	99.440
9 / 3 .	-0.010	6.040	10.150	0.210	22.980	22.160	-0.010	0.050	38.480	0.050	100.130
9 / 4 .	-0.010	6.060	9.470	0.250	23.680	22.010	0.010	0.020	38.550	0.010	100.060
9 / 5 .	-0.010	6.140	9.530	0.250	23.580	22.170	-0.020	0.000	38.610	0.090	100.360
9 / 6 .	-0.030	6.480	8.560	0.240	23.840	21.950	-0.010	0.040	38.870	0.040	100.020
9 / 7 .	-0.020	6.280	8.980	0.260	24.170	22.200	-0.010	0.030	38.550	0.030	100.490
9 / 8 .	0.000	5.790	10.210	0.230	22.600	22.010	-0.010	0.020	38.510	0.100	99.470
9 / 9 .	0.000	5.420	11.070	0.220	22.060	22.450	-0.010	0.080	38.480	0.020	99.810
9 / 10 .	0.000	5.930	10.300	0.220	23.230	21.830	0.020	0.030	38.680	0.010	100.250
10 / 1 .	0.000	8.510	8.420	0.620	20.730	22.560	-0.030	0.030	39.590	0.060	100.510
10 / 2 .	0.000	9.490	6.370	0.690	21.790	22.540	0.030	0.030	39.700	0.010	100.650
10 / 3 .	-0.010	9.000	7.070	0.590	21.860	22.590	-0.010	0.020	39.610	0.040	100.770
10 / 4 .	-0.010	8.600	8.070	0.560	21.130	22.360	-0.010	0.060	39.330	0.010	100.120
10 / 5 .	-0.020	9.390	6.670	0.600	21.520	22.510	-0.010	0.040	39.240	0.020	100.000
10 / 6 .	-0.010	8.460	8.520	0.540	20.750	22.380	-0.020	0.040	39.440	0.020	100.150
10 / 7 .	-0.010	9.680	6.050	0.610	21.950	22.480	-0.040	0.020	39.500	0.020	100.320
10 / 8 .	0.010	8.260	8.950	0.580	20.610	22.360	-0.020	0.040	39.350	0.060	100.220
10 / 9 .	0.000	9.330	6.650	0.640	21.850	22.340	0.020	0.030	39.040	0.020	99.920
10 / 10 .	0.010	9.580	6.110	0.710	21.950	22.180	-0.040	0.030	39.070	0.020	99.640

5b Orthogneiss Pyroxene Wt% Oxide
Date: 6/16/2011

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	-0.0039	-0.0073	42.1899	0.0191	0.1863	17.8161	0.0011	-0.0041	0.0111	39.2960	-0.0336	99.520
1 / 2 .	-0.0120	0.0047	42.1195	0.0031	0.1729	17.8550	0.0029	-0.0185	0.0257	39.3097	-0.0538	99.493
1 / 3 .	-0.0019	-0.0017	42.1561	0.0122	0.1705	18.0842	0.0017	-0.0062	0.0220	39.3803	-0.0386	99.827
1 / 4 .	0.0135	-0.0115	42.0550	0.0118	0.1741	18.0561	0.0092	-0.0471	0.0513	39.2617	-0.0336	99.633
1 / 5 .	-0.0008	-0.0003	41.8841	0.0103	0.1498	17.8742	0.0006	-0.0267	0.0220	39.3795	-0.0386	99.321
1 / 6 .	0.0000	-0.0140	42.0133	-0.0038	0.1655	18.1792	-0.0051	-0.0369	0.0257	39.7241	-0.0260	100.108
1 / 7 .	0.0050	-0.0038	41.9862	0.0008	0.1717	18.0151	-0.0029	-0.0369	0.0202	39.5477	-0.0109	99.747
1 / 8 .	0.0012	-0.0045	42.1150	0.0053	0.1607	17.9691	0.0126	-0.0328	0.0239	39.3263	-0.0210	99.614
1 / 9 .	0.0039	-0.0101	41.8624	0.0034	0.1376	18.0380	0.0069	-0.0472	0.0293	39.5382	-0.0109	99.620
1 / 10 .	-0.0004	-0.0017	42.0593	0.0050	0.1523	17.7043	0.0046	-0.0308	0.0312	39.3261	-0.0538	99.283
1 Average	0.0005	-0.0050	42.0441	0.0067	0.1641	17.9591	0.0031	-0.0287	0.0262	39.4090	-0.0321	99.616
2 / 1 .	-0.0056	-0.0080	24.8440	0.2824	0.3938	18.2107	2.6137	0.0246	-0.0026	52.9203	0.0259	99.315
2 / 2 .	0.0143	0.0036	24.6568	0.3304	0.4120	18.0560	2.7024	0.0102	-0.0026	52.9499	0.0360	99.172
2 / 3 .	0.0087	0.0057	24.6859	0.2984	0.3791	18.1535	2.6319	0.0368	0.0504	52.7398	0.0007	98.991
2 / 4 .	0.0040	0.0008	24.6069	0.2573	0.3890	18.1203	2.6605	0.0532	-0.0117	52.7870	0.0083	98.887
2 / 5 .	0.0103	0.0064	24.7394	0.3233	0.4170	18.0750	2.6640	-0.0184	0.0066	52.5314	-0.0194	98.773
2 / 6 .	0.0448	-0.0007	24.5209	0.5361	0.3551	17.9047	2.7128	-0.0082	-0.0117	53.0367	0.0284	99.140
2 / 7 .	0.0056	-0.0038	24.5448	0.3114	0.3610	17.9887	2.6052	0.0082	0.0212	52.5719	-0.0068	98.418
2 / 8 .	0.0091	-0.0119	24.8076	0.2985	0.3817	18.0449	2.6803	0.0348	0.0377	52.7193	0.0083	99.022
2 / 9 .	0.0131	-0.0017	24.6375	0.5208	0.3527	17.8172	2.7099	0.0205	-0.0264	53.0097	0.0335	99.115
2 / 10 .	0.0020	0.0082	24.6015	0.2873	0.3626	17.5474	2.6974	0.0082	0.0066	53.0336	0.0083	98.563
2 Average	0.0106	-0.0002	24.6645	0.3446	0.3804	17.9918	2.6678	0.0170	0.0068	52.8300	0.0123	98.940
3 / 1 . *	2.1408	1.8232	11.6156	11.6566	0.0687	11.3325	12.6843	0.0901	-0.0203	40.6604	2.5358	94.608
3 / 2 . *	2.1946	1.8476	11.6800	11.4557	0.0601	11.4026	12.8068	0.1236	0.0042	40.6607	2.4538	94.690
3 / 3 . *	2.1374	1.8930	11.7372	11.6614	0.0798	11.1890	12.6144	0.1573	0.0099	40.4865	2.5045	94.470
3 / 4 . *	2.0348	1.6369	11.8311	12.8773	0.0725	10.7218	11.4107	0.0946	-0.0355	42.1061	2.0448	94.831
3 / 5 . *	2.1579	1.9013	11.6842	11.7125	0.0944	11.2751	12.8541	0.1006	0.0005	40.2598	2.3905	94.431
3 / 6 . *	2.1231	1.8777	11.7586	11.4995	0.1042	11.4472	12.7456	0.0985	0.0042	40.1814	2.4254	94.265
3 / 7 . *	2.1390	1.8834	11.6547	11.6188	0.0810	11.3891	12.7784	0.0943	0.0231	40.5648	2.6599	94.887
3 / 8 . *	1.9977	1.7141	11.9332	12.7499	0.0516	10.6983	11.6525	0.1471	-0.0469	41.6433	2.2059	94.794
3 / 9 . *	2.1330	1.9025	11.5314	11.4734	0.0994	11.2618	12.7849	0.0797	-0.0297	40.4922	2.6704	94.429
3 / 10 . *	2.1118	1.9263	11.6796	11.9682	0.0981	11.3342	12.6066	0.0797	-0.0128	40.6524	2.3862	94.843

5b Orthogneiss Pyroxene Wt% Oxide
Date: 6/16/2011

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 1 .	0.0539	0.0031	23.9604	0.5237	0.2806	18.6396	2.6939	0.0368	0.0119	52.8010	0.1008	99.106
4 / 2 .	0.0427	0.0094	23.9855	0.4748	0.2708	18.6992	2.6577	0.0020	-0.0064	52.8512	0.0705	99.064
4 / 3 .	0.0224	0.0080	24.0889	0.4322	0.3194	18.6699	2.6824	0.0041	0.0119	52.7635	0.0228	99.025
4 / 4 .	0.0535	0.0007	23.8460	0.5039	0.2842	18.5770	2.7574	0.0184	0.0046	52.7137	0.0605	98.820
4 / 5 .	0.0535	-0.0001	24.0500	0.4871	0.3340	18.5132	2.7757	0.0061	-0.0045	52.5506	0.0278	98.798
4 / 6 .	0.0596	0.0070	23.8274	0.4773	0.3071	18.8260	2.7180	-0.0061	-0.0027	52.6431	0.0479	98.913
4 / 7 .	0.0436	0.0109	23.7717	0.4557	0.2795	18.6661	2.6902	0.0532	0.0009	52.7337	0.0026	98.708
4 / 8 .	0.0384	0.0038	23.7716	0.4483	0.3267	18.7079	2.8010	0.0041	0.0009	52.4286	0.0278	98.559
4 / 9 .	0.0064	0.0052	23.9210	0.3359	0.3035	18.8807	2.6738	-0.0061	0.0101	52.5375	0.0127	98.687
4 / 10 .	0.0244	0.0031	23.9064	0.3201	0.2597	19.0273	2.5906	0.0163	-0.0100	52.5862	0.0102	98.744
4 Average	0.0398	0.0051	23.9129	0.4459	0.2966	18.7207	2.7041	0.0129	0.0017	52.6609	0.0383	98.842
5 / 1 .	-0.0062	0.0215	27.7755	0.2387	0.1508	14.8398	0.9917	0.0207	0.0025	55.3688	0.0071	99.417
5 / 2 .	0.0012	0.0094	28.0750	0.1876	0.2158	14.7651	0.9690	0.0021	-0.0161	55.3797	-0.0335	99.605
5 / 3 .	0.0112	0.0332	27.7029	0.2643	0.1948	15.1731	1.1320	0.0601	-0.0013	54.9904	0.0046	99.567
5 / 4 .	-0.0108	-0.0023	28.5140	0.1914	0.1520	15.1718	0.8271	0.0352	-0.0180	54.8513	-0.0386	99.743
5 / 5 . *	0.9246	0.1551	17.7660	12.4801	0.1599	7.2229	9.2820	0.0085	-0.0454	45.4145	0.0151	93.429
5 / 6 .	0.0123	0.0144	27.2811	0.2629	0.1778	14.6809	1.2622	-0.0083	-0.0273	54.4719	-0.0157	98.163
5 / 7 .	-0.0085	-0.0012	26.7915	0.2507	0.1886	15.4256	0.7603	0.0248	-0.0198	55.4609	-0.0208	98.902
5 / 8 .	0.0100	0.0144	27.6294	0.2570	0.1887	15.1362	1.0239	0.0269	-0.0142	55.0892	-0.0157	99.376
5 / 9 .	0.0042	0.0126	27.6583	0.2523	0.2009	15.0083	0.9522	0.0249	0.0136	54.7929	0.0249	98.945
5 / 10 .	-0.0019	-0.0009	27.8939	0.3186	0.2232	14.9757	1.1131	0.0311	0.0043	55.0513	0.0097	99.621
5 Average	0.0009	0.0111	27.7079	0.2464	0.1865	15.0210	1.0099	0.0241	-0.0112	55.0829	-0.0129	99.299
6 / 1 .	0.0104	0.0071	24.6124	0.4326	0.4283	17.8394	2.5816	-0.0185	-0.0501	52.3262	0.0582	98.296
6 / 2 .	0.0188	0.0067	24.5253	0.3957	0.4529	18.0522	2.5424	-0.0144	-0.0611	52.9050	0.0608	98.960
6 / 3 .	0.0207	0.0106	24.5641	0.4358	0.4113	17.9225	2.5976	-0.0247	-0.0483	52.4023	0.0633	98.428
6 / 4 .	0.0239	0.0064	24.6527	0.4845	0.4233	17.9963	2.6222	0.0103	-0.0519	52.6508	0.0784	98.949
6 / 5 .	-0.0112	0.0060	24.6525	0.3732	0.4285	17.7609	2.4631	-0.0185	-0.0152	52.5886	0.0532	98.326
6 / 6 .	0.0272	0.0088	24.5084	0.5015	0.4431	18.0313	2.5678	0.0144	-0.0189	52.6269	0.1796	98.909
6 / 7 .	0.0331	0.0081	24.5043	0.7135	0.4580	17.7786	2.5868	0.0144	-0.0428	52.5809	0.0431	98.721
6 / 8 .	0.0842	0.0007	24.3545	1.1754	0.4157	17.1898	2.6176	0.0351	-0.0374	52.5623	0.0838	98.519
6 / 9 .	0.0068	0.0209	24.6667	0.3674	0.4102	17.8557	2.6105	-0.0596	-0.0152	52.5335	0.0861	98.558
6 / 10 .	-0.0052	0.0053	24.8468	0.2849	0.4398	17.7029	2.5035	-0.0082	-0.0171	52.6651	0.0887	98.537
6 Average	0.0209	0.0081	24.5888	0.5165	0.4311	17.8129	2.5693	-0.0070	-0.0358	52.5842	0.0795	98.620
7 / 1 . *	2.1744	1.7207	12.9145	11.6214	0.0735	10.7441	12.3336	0.1362	-0.0051	40.1101	2.6224	94.451

5b Orthogneiss Pyroxene Wt% Oxide
Date: 6/16/2011

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
7 / 2 . *	2.1333	1.7082	13.1326	11.5761	0.0834	10.6356	12.3127	0.0964	-0.0107	40.2352	2.6948	94.608
7 / 3 . *	2.1262	1.6880	12.8831	11.5861	0.0870	10.7719	12.2290	0.1319	0.0195	40.0496	3.0618	94.634
7 / 4 . *	2.1540	1.7291	12.9727	11.5342	0.0588	10.7995	12.2493	0.0964	0.0270	40.2357	2.7092	94.566
7 / 5 . *	2.1694	1.7007	13.0340	11.4800	0.0784	11.0439	12.4794	0.1110	0.0100	39.9371	2.8858	94.930
7 / 6 . *	2.1792	1.7256	13.1052	11.7953	0.0957	10.2289	12.4857	0.0923	-0.0032	40.6817	2.2176	94.607
7 / 7 . *	2.2350	1.7275	12.9594	11.7050	0.0699	10.3167	12.4223	0.0818	0.0082	41.0503	2.2123	94.788
7 / 8 . *	2.1712	1.7393	12.9630	11.6429	0.0908	10.4719	12.5221	0.0860	-0.0353	40.0992	2.7228	94.509
7 / 9 . *	2.1618	1.7348	12.9590	11.5367	0.0969	10.4021	12.4132	0.1112	-0.0183	40.7595	2.2218	94.397
7 / 10 . *	2.1368	1.7874	13.0715	11.7183	0.0982	10.3184	12.5834	0.1112	0.0025	40.5063	2.2385	94.573
8 / 1 . *	0.0059	-0.0041	27.2902	0.3156	0.0953	15.8728	0.7102	-0.0062	0.0052	49.3022	0.0021	93.599
8 / 2 . *	0.0355	0.0175	25.1744	0.2486	0.0563	14.8895	1.0043	0.0186	-0.0225	49.0849	-0.0461	90.530
8 / 3 . *	0.0043	-0.0027	27.2990	0.2416	0.0733	15.9615	0.5516	0.0454	0.0034	49.6902	-0.0157	93.870
8 / 4 . *	0.0094	-0.0045	27.0640	0.2360	0.1026	15.7866	0.6020	0.0309	0.0144	49.4945	0.0096	93.350
8 / 5 . *	0.0322	0.0065	26.0117	0.2923	0.0661	14.7371	0.7365	-0.0021	-0.0040	49.5087	-0.0005	91.391
8 / 6 . *	0.0086	0.0125	27.3434	0.2897	0.1015	15.4010	0.7980	0.0372	0.0163	48.8108	-0.0182	92.819
8 / 7 . *	0.0618	0.0029	26.5191	0.9889	0.0709	14.7477	0.9471	0.0207	0.0219	48.0747	0.0071	91.463
8 / 8 . *	0.0573	0.0221	26.1776	0.1996	0.0869	14.4478	0.9834	0.0021	-0.0244	49.5883	-0.0056	91.565
8 / 9 . *	0.0156	0.0054	27.7730	0.2244	0.1160	15.9459	0.4421	0.0289	-0.0040	49.7909	0.0096	94.352
8 / 10 . *	0.0223	0.0061	26.8516	0.2142	0.1027	15.6483	0.8620	-0.0289	-0.0279	49.5324	-0.0030	93.240
9 / 1 .	-0.0019	0.0076	28.6822	0.1519	0.1582	14.8732	0.2833	-0.0270	-0.0057	55.4663	0.0617	99.684
9 / 2 .	0.0127	0.0083	28.5176	0.1088	0.1545	14.9099	0.2867	-0.0041	-0.0094	55.7003	0.0489	99.748
9 / 3 .	0.0015	0.0129	28.6209	0.1318	0.1324	15.1318	0.4000	0.0021	-0.0150	55.4137	-0.0096	99.847
9 / 4 .	-0.0015	0.0200	28.1468	0.2071	0.1299	15.0586	0.5203	-0.0021	-0.0465	55.3219	0.0006	99.405
9 / 5 .	0.0081	0.0058	28.7627	0.1234	0.1275	15.2133	0.2206	-0.0373	-0.0558	55.7696	0.0108	100.242
9 / 6 .	0.0143	0.0112	28.3660	0.1157	0.1288	15.0774	0.2186	-0.0249	-0.0224	56.0114	0.0133	99.957
9 / 7 .	0.0131	0.0037	28.5817	0.1318	0.1557	15.2564	0.2378	0.0207	-0.0336	56.0169	0.0591	100.477
9 / 8 .	0.0069	0.0041	28.3162	0.1835	0.1239	15.0356	0.3595	0.0166	-0.0243	55.7718	0.0541	99.872
9 / 9 .	0.0166	0.0165	28.0354	0.2277	0.1203	14.7557	0.6768	0.0021	-0.0206	55.0674	0.0184	98.937
9 / 10 .	0.0085	0.0037	28.2468	0.1999	0.1054	14.9573	0.6040	0.0104	-0.0410	55.4324	0.0108	99.579
9 Average	0.0078	0.0094	28.4276	0.1582	0.1337	15.0269	0.3808	-0.0044	-0.0274	55.5972	0.0268	99.775
10 / 1 .	0.0491	0.0098	25.7600	0.5440	0.3277	16.5923	2.9531	-0.0430	0.0038	52.8128	0.0455	99.098
10 / 2 .	0.0249	0.0113	25.9428	0.3073	0.2831	16.3558	2.6447	-0.0779	-0.0035	53.0006	0.0758	98.646
10 / 3 .	-0.0016	0.0025	26.4218	0.2195	0.2828	16.6468	2.6911	-0.0348	-0.0145	52.7981	0.0078	99.070
10 / 4 .	0.0055	0.0067	26.2120	0.2173	0.2307	16.6486	2.2873	-0.0840	-0.0328	53.1304	0.0380	98.776

5b Orthogneiss Pyroxene Wt% Oxide
Date: 6/16/2011

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
10 / 5 . *	0.0446	0.0130	25.9837	0.3324	0.2468	15.6584	1.2722	-0.0329	-0.0311	52.4825	-0.0124	96.034
10 / 6 . *	2.7402	0.4380	14.9246	12.1273	0.0515	8.3289	11.9402	0.0315	-0.0340	43.0674	1.3820	95.032
10 / 7 . *	2.7402	0.3556	14.6737	13.5259	0.0540	8.1568	11.4053	0.0316	0.0058	41.9141	1.3348	94.198
10 / 8 . *	2.5954	0.3521	15.8908	11.7901	0.0626	8.6259	11.3882	0.0294	-0.0055	43.8732	1.3370	95.945
10 / 9 .	0.0020	0.0098	26.0490	0.2259	0.2244	17.1153	1.1980	-0.0020	-0.0017	53.8987	0.0606	98.784
10 / 10 .	0.0051	-0.0021	26.3701	0.2217	0.2332	16.7056	0.8423	-0.0697	0.0001	54.1647	0.0078	98.551
10 Average	0.0142	0.0063	26.1259	0.2893	0.2636	16.6774	2.1027	-0.0519	-0.0081	53.3009	0.0392	98.821

5b Orthogneiss Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .*	0.000	0.000	32.000	0.120	0.120	12.680	0.700	-0.010	55.940	0.010	101.570
1 / 2 .*	-0.010	0.000	32.180	0.110	0.180	12.740	0.750	-0.030	55.740	0.030	101.730
1 / 3 .*	0.000	0.000	32.330	0.120	0.140	12.620	0.610	-0.020	55.830	0.020	101.670
1 / 4 .*	-0.010	0.010	31.890	0.130	0.120	12.590	0.630	-0.030	55.740	0.030	101.130
1 / 5 .*	-0.010	0.000	32.030	0.140	0.140	12.740	0.670	0.000	55.470	0.020	101.200
1 / 6 .*	0.000	0.000	31.650	0.840	0.130	12.530	0.740	0.000	55.360	0.020	101.280
1 / 7 .*	0.000	0.000	31.810	0.140	0.200	12.700	0.820	-0.050	55.640	0.030	101.340
1 / 8 .*	0.000	-0.010	31.900	0.130	0.130	12.700	0.620	-0.070	55.900	0.040	101.410
1 / 9 .*	0.000	0.000	32.150	0.110	0.150	12.620	0.470	-0.040	55.730	0.020	101.260
1 / 10 .*	-0.010	0.010	31.770	0.130	0.150	13.190	0.880	-0.020	55.170	0.000	101.290
2 / 1 .	0.000	0.000	28.550	0.170	0.270	16.280	2.590	-0.020	52.930	0.040	100.830
2 / 2 .	0.010	0.000	27.610	0.370	0.270	16.140	3.030	-0.010	52.480	0.060	99.970
2 / 3 .	0.030	0.000	27.130	0.460	0.290	16.420	3.000	-0.020	52.220	0.080	99.630
2 / 4 .	0.030	0.000	26.910	0.600	0.320	16.740	2.920	-0.020	52.720	0.110	100.340
2 / 5 .	0.030	0.000	26.860	0.640	0.390	16.920	3.040	-0.030	52.390	0.140	100.410
2 / 6 .	0.060	0.010	27.230	0.730	0.340	17.000	3.090	0.000	52.300	0.070	100.820
2 / 7 .	0.040	0.010	26.790	0.670	0.430	16.930	3.080	0.000	52.710	0.050	100.700
2 / 8 .	0.040	0.000	26.980	0.500	0.430	17.070	3.050	0.000	52.380	0.110	100.560
2 / 9 .	0.050	0.000	27.020	0.460	0.440	17.010	2.990	-0.040	52.670	0.130	100.760
2 / 10 .	0.060	0.010	27.050	0.590	0.350	16.540	2.880	0.000	52.660	0.070	100.220
2 Average	0.035	0.003	27.213	0.519	0.353	16.705	2.967	-0.014	52.546	0.086	100.424
3 / 1 .*	1.340	0.430	14.840	5.970	0.030	14.140	37.760	-0.020	22.440	0.060	97.010
3 / 2 .*	0.860	0.300	14.930	3.710	0.050	16.480	45.180	-0.010	13.560	0.040	95.090
3 / 3 .*	0.890	0.290	15.050	3.840	0.060	16.030	45.120	0.000	14.290	0.030	95.600
4 / 1 .	0.010	-0.010	27.170	0.520	0.200	17.070	2.660	-0.030	52.340	0.050	100.020
4 / 2 .	0.000	0.000	27.240	0.510	0.200	17.320	2.690	-0.030	52.200	0.060	100.200
4 / 3 .	0.000	0.000	27.440	0.510	0.220	17.080	2.690	-0.020	52.460	0.060	100.470
4 / 4 .	0.000	0.010	27.310	0.480	0.230	17.280	2.670	-0.030	52.550	0.080	100.630
4 / 5 .	-0.010	0.000	27.390	0.470	0.210	17.420	2.710	-0.010	52.490	0.070	100.770
4 / 6 .	0.010	0.000	27.440	0.480	0.210	16.790	2.750	-0.030	52.530	0.090	100.290
4 / 7 .	0.000	0.000	27.420	0.450	0.180	17.230	2.750	0.000	52.510	0.060	100.590
4 / 8 .	0.000	0.000	27.530	0.410	0.220	17.270	2.640	-0.040	52.570	0.040	100.700
4 / 9 .	-0.010	0.000	27.760	0.210	0.170	17.040	2.370	-0.020	53.200	0.060	100.820
4 / 10 .*	-0.010	0.000	27.870	0.220	0.160	17.450	2.360	0.000	52.860	0.070	101.000
4 Average	0.000	0.000	27.411	0.449	0.204	17.167	2.659	-0.023	52.539	0.063	100.499

5b Orthogneiss Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
5 / 1 .	-0.010	-0.010	28.640	1.530	0.170	15.330	1.360	-0.020	53.280	0.060	100.380
5 / 2 .	-0.010	0.000	28.960	0.150	0.180	15.950	1.690	-0.020	53.780	0.070	100.790
5 / 3 .	0.000	0.000	29.060	0.150	0.210	15.930	1.110	-0.020	54.510	0.060	101.040
5 / 4 .*	0.000	0.010	28.170	0.180	0.180	19.380	1.670	0.000	51.840	0.090	101.510
5 / 5 .*	0.000	-0.010	29.100	0.170	0.220	15.920	1.000	0.000	54.580	0.080	101.060
5 / 6 .	0.020	-0.010	28.850	0.170	0.220	16.360	1.000	0.010	54.320	0.020	100.980
5 / 7 .	0.030	-0.010	28.620	0.170	0.180	16.150	1.040	-0.030	54.500	0.020	100.710
5 / 8 .	0.010	0.000	28.890	0.190	0.210	15.980	1.300	-0.040	54.170	0.020	100.760
5 / 9 .*	0.000	0.000	29.130	0.170	0.210	15.890	0.970	-0.050	54.780	0.030	101.180
5 / 10 .*	-0.010	0.000	29.110	0.150	0.210	16.030	0.710	-0.010	54.980	0.050	101.250
5 Average	0.007	-0.005	28.837	0.393	0.195	15.950	1.250	-0.020	54.093	0.042	100.777
6 / 1 .	0.030	-0.010	25.160	0.660	0.460	19.150	2.900	-0.010	51.870	0.050	100.270
6 / 2 .	0.040	0.010	24.900	0.610	0.450	18.970	2.900	-0.010	51.770	0.130	99.790
6 / 3 .	0.010	0.000	25.500	0.340	0.480	19.200	2.920	-0.020	52.260	0.050	100.760
6 / 4 .	0.040	0.000	25.180	0.600	0.410	18.900	2.910	-0.030	52.060	0.070	100.170
6 / 5 .	0.070	0.010	24.870	1.290	0.470	18.660	3.010	-0.020	51.290	0.060	99.730
6 / 6 .	0.040	0.010	25.220	0.560	0.400	18.720	2.980	0.050	51.970	0.130	100.080
6 / 7 .	0.040	0.010	25.310	0.620	0.390	18.560	3.030	-0.020	51.950	0.090	100.000
6 / 8 .	0.030	0.010	25.380	0.620	0.380	18.760	2.940	-0.010	51.670	0.100	99.880
6 / 9 .	0.040	0.000	25.370	0.620	0.420	19.020	2.990	-0.050	51.790	0.090	100.350
6 / 10 .	0.050	0.010	25.420	0.610	0.420	18.450	2.880	-0.020	52.070	0.020	99.930
6 Average	0.039	0.005	25.231	0.653	0.428	18.839	2.946	-0.014	51.870	0.079	100.096
7 / 1 .	0.000	0.000	25.840	0.210	0.340	19.350	2.660	-0.040	51.550	0.060	100.020
7 / 2 .	0.000	0.010	26.010	0.170	0.310	19.340	2.620	-0.020	51.710	0.070	100.240
7 / 3 .	0.000	0.010	26.010	0.190	0.330	19.190	2.780	-0.020	51.680	0.070	100.270
7 / 4 .	0.000	0.000	26.220	0.210	0.350	18.610	2.620	-0.020	51.960	0.050	100.030
7 / 5 .	-0.010	0.000	26.370	0.250	0.370	18.710	2.900	-0.020	51.890	0.050	100.530
7 / 6 .	0.010	0.000	26.330	0.470	0.360	18.200	2.830	-0.030	52.020	0.090	100.310
7 / 7 .	0.020	0.000	26.440	0.550	0.340	18.490	2.910	-0.020	52.210	0.060	101.030
7 / 8 .	0.010	0.000	26.700	0.440	0.300	17.900	2.880	-0.020	52.210	0.100	100.550
7 / 9 .	-0.010	0.010	26.660	0.190	0.310	18.040	3.130	0.010	52.010	0.160	100.530
7 / 10 .	-0.020	0.000	26.930	0.230	0.290	17.570	2.640	-0.020	52.420	0.040	100.120
7 Average	0.000	0.003	26.351	0.291	0.330	18.540	2.797	-0.020	51.966	0.075	100.363
8 / 1 .*	2.350	1.540	13.100	11.510	0.040	11.170	14.370	0.000	39.810	1.860	95.760
8 / 2 .*	2.360	1.500	13.350	11.510	0.040	10.960	13.810	-0.050	40.160	1.720	95.420

5b Orthogneiss Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
8 / 3 .*	2.320	1.620	13.270	11.650	0.040	10.850	14.160	0.000	40.040	1.790	95.730
8 / 4 .*	2.300	1.580	13.420	11.590	0.020	11.090	13.410	0.010	40.750	1.930	96.100
8 / 5 .*	2.320	1.690	13.290	11.650	0.030	10.990	13.970	0.000	39.950	2.000	95.890
8 / 6 .*	2.160	2.090	13.200	11.150	0.030	11.450	14.130	0.000	39.650	2.010	95.880
8 / 7 .*	2.290	1.610	13.260	11.590	0.080	11.400	13.810	-0.020	40.350	1.870	96.260
8 / 8 .*	2.150	1.850	13.170	11.520	0.030	11.060	13.430	0.040	40.460	1.900	95.610
8 / 9 .*	2.190	1.770	13.100	11.700	0.050	11.300	13.780	-0.020	40.180	2.150	96.220
8 / 10 .*	2.080	2.040	13.070	11.480	0.050	11.140	13.660	0.010	40.360	2.020	95.900
9 / 1 .	-0.010	0.010	26.940	0.520	0.200	18.410	0.520	0.040	53.960	0.040	100.640
9 / 2 .	0.000	0.010	27.170	0.230	0.190	18.820	0.540	-0.020	53.940	0.030	100.920
9 / 3 .	-0.010	0.010	26.940	0.260	0.190	18.560	0.690	-0.010	53.860	0.050	100.560
9 / 4 .	-0.020	0.000	26.520	0.250	0.200	18.980	1.760	-0.050	53.140	0.070	100.920
9 / 5 .	-0.010	0.010	26.290	0.240	0.240	18.670	1.860	-0.020	52.720	0.080	100.110
9 / 6 .	0.000	0.000	26.540	0.240	0.220	19.000	1.840	-0.020	53.090	0.050	100.970
9 / 7 .*	0.000	-0.010	26.750	0.240	0.240	19.110	1.550	-0.020	53.240	0.060	101.200
9 / 8 .	-0.010	0.000	26.740	0.250	0.230	18.850	1.370	-0.020	53.520	0.050	101.020
9 / 9 .*	-0.010	0.010	26.770	0.240	0.230	18.690	1.180	-0.010	53.960	0.020	101.100
9 / 10 .*	0.000	0.010	26.960	0.300	0.230	18.740	0.730	0.010	54.050	0.040	101.070
9 Average	-0.009	0.006	26.734	0.284	0.210	18.756	1.226	-0.014	53.461	0.053	100.734
10 / 1 .	0.020	0.000	25.820	0.410	0.380	19.430	2.460	-0.010	52.430	0.080	101.040
10 / 2 .	0.020	0.010	25.820	0.330	0.420	19.120	2.500	0.020	52.350	0.070	100.660
10 / 3 .	0.060	0.010	25.280	0.460	0.400	19.010	2.800	-0.030	51.340	0.120	99.480
10 / 4 .	0.020	0.010	25.840	0.220	0.420	19.400	2.620	-0.030	52.180	0.040	100.750
10 / 5 .	0.010	0.000	25.590	0.410	0.420	18.920	2.980	0.000	52.180	0.040	100.550
10 / 6 .	0.060	0.010	25.720	0.310	0.480	19.190	2.500	0.010	52.390	0.060	100.740
10 / 7 .	0.150	0.010	25.600	0.400	0.430	18.770	2.530	-0.010	52.400	0.050	100.360
10 / 8 .	0.010	-0.010	25.610	0.350	0.430	18.980	2.400	0.000	52.720	0.080	100.580
10 / 9 .	0.000	-0.010	25.900	0.320	0.410	18.960	2.500	-0.020	52.770	0.080	100.940
10 / 10 .	0.100	0.000	25.250	1.080	0.400	18.070	2.780	-0.030	52.410	0.170	100.280
10 Average	0.045	0.003	25.643	0.429	0.419	18.985	2.607	-0.010	52.317	0.079	100.538
11 / 1 .	0.010	0.010	25.640	0.320	0.370	19.230	2.630	-0.010	52.190	0.030	100.430
11 / 2 .	0.010	0.000	25.700	0.250	0.370	19.060	2.630	-0.020	51.870	0.060	99.950
11 / 3 .	0.020	0.010	25.960	0.700	0.360	18.690	2.410	-0.020	52.420	0.050	100.620
11 / 4 .	0.020	0.000	25.910	0.520	0.410	18.690	2.760	0.010	51.960	0.120	100.400
11 / 5 .	0.010	0.000	25.970	0.430	0.430	18.810	2.870	-0.020	51.820	0.100	100.440

5b Orthogneiss Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
11 / 6 .	0.020	0.010	25.690	0.530	0.390	18.620	2.920	0.000	52.020	0.150	100.330
11 / 7 .	0.020	0.000	25.750	0.510	0.400	18.860	2.890	-0.010	51.860	0.080	100.380
11 / 8 .	0.010	0.030	25.590	0.300	0.380	18.780	3.110	-0.040	51.670	0.080	99.950
11 / 9 .	0.000	-0.010	26.170	0.210	0.370	18.810	2.600	-0.040	52.550	0.040	100.760
11 / 10 .	0.010	0.010	25.760	0.550	0.400	18.680	2.960	-0.010	52.100	0.100	100.590
11 Average	0.013	0.006	25.814	0.432	0.388	18.823	2.778	-0.016	52.046	0.081	100.385

5b Shear Zome Pyroxene
Date: 6/16/2011 Wt. % Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 . *	1.3326	0.3135	19.1299	11.9405	0.0320	6.5608	5.4817	0.0148	-0.0330	51.7281	0.0330	96.567
1 / 2 . *	1.3457	0.2953	19.3595	11.7986	0.0407	6.3565	5.3321	-0.0127	-0.0215	52.0437	0.1055	96.678
1 / 3 . *	1.4672	0.3186	19.1776	11.6337	0.0283	6.4792	5.5531	-0.0254	-0.0482	51.3902	0.0563	96.104
1 / 4 . *	1.4063	0.3059	19.0425	11.4901	0.0320	6.6447	5.4546	-0.0317	-0.0158	51.7502	0.0899	96.216
1 / 5 . *	1.3122	0.2828	19.3259	10.9210	0.0382	7.0924	5.2043	-0.0106	-0.0405	52.1057	0.0769	96.359
1 / 6 . *	1.4128	0.2840	19.2912	11.3527	0.0468	6.6133	5.3840	-0.0317	-0.0177	51.7158	0.1080	96.209
1 / 7 . *	1.5191	0.3354	18.6175	11.6191	0.0074	6.6818	6.1945	-0.0021	-0.0196	50.8200	0.1028	95.898
1 / 8 . *	1.7235	0.4152	18.1573	11.7249	0.0345	6.8430	7.2215	-0.0254	0.0204	49.8880	0.1053	96.134
1 / 9 . *	1.7862	0.4591	18.0018	11.7240	-0.0111	7.1239	7.6934	0.0021	-0.0291	48.8540	0.1491	95.794
1 / 10 . *	1.7120	0.4373	18.1112	11.5927	0.0160	7.0399	7.3105	-0.0127	-0.0443	49.3980	0.1104	95.728
2 / 1 .	0.0047	-0.0083	27.3026	0.1302	0.1335	15.7949	0.4162	0.0269	0.0191	55.9103	0.0166	99.755
2 / 2 .	0.0128	-0.0154	27.5537	0.1201	0.1138	16.0055	0.4008	0.0600	-0.0216	55.3031	-0.0114	99.570
2 / 3 .	0.0078	-0.0118	27.5483	0.0916	0.1271	16.3621	0.3700	0.0516	-0.0179	55.0846	-0.0113	99.643
2 / 4 .	0.0164	-0.0055	27.3264	0.1886	0.1320	16.4857	0.4338	0.0330	0.0172	54.9408	0.0216	99.596
2 / 5 .	0.0027	-0.0044	26.9642	0.1874	0.1222	16.3317	1.4652	0.0351	0.0024	54.1263	0.0039	99.241
2 / 6 .	0.0106	-0.0111	26.7188	0.1871	0.1271	16.4891	1.1942	0.0248	0.0061	54.4869	0.0419	99.287
2 / 7 .	0.0375	0.0172	26.1497	0.4838	0.1211	16.3369	2.2159	0.0041	0.0006	53.8549	0.0394	99.261
2 / 8 .	0.0711	-0.0030	26.0847	0.6649	0.1444	16.1493	2.3494	0.0558	-0.0124	53.7163	0.0140	99.250
2 / 9 .	2.7987	-0.0117	17.5223	9.9588	0.0841	9.0851	4.4973	0.0148	0.0216	54.6815	0.0169	98.681
2 / 10 .	0.0114	-0.0079	26.9829	0.2032	0.1467	16.6485	0.3414	0.0516	0.0375	55.0578	0.0241	99.505
2 Average	0.0194	-0.0056	26.9590	0.2508	0.1298	16.2893	1.0208	0.0381	0.0035	54.7201	0.0154	99.456
3 / 1 .	0.1842	0.0699	25.5876	0.8413	0.1270	16.4277	2.0498	0.0144	0.0191	53.1186	0.0374	98.477
3 / 2 .	0.0504	0.0194	26.2459	0.3882	0.1233	17.2653	1.6909	0.0082	0.0227	53.7387	0.0298	99.583
3 / 3 .	0.8856	0.2290	22.2308	4.9417	0.0921	13.6934	5.7788	0.0772	0.0287	49.9460	0.3163	98.220
3 / 4 .	0.0910	0.0470	25.9284	0.4530	0.1062	17.1250	1.1618	0.0082	0.0412	53.9176	-0.0057	98.879
3 / 5 .	4.0912	0.0232	11.6419	16.2587	0.0274	4.3124	6.7482	0.0365	0.0472	53.3871	0.0808	96.655
3 / 6 .	4.7821	0.0059	10.7209	15.7998	0.0249	4.7259	7.4902	0.0708	0.0394	55.1917	0.0989	98.950
3 / 7 .	3.5575	0.0228	12.3773	17.2443	0.0373	4.9909	6.0494	0.0193	0.0568	54.4136	0.0833	98.852
3 / 8 .	3.1645	0.0110	12.4079	18.7264	0.0523	5.0243	5.3758	0.0343	0.0394	54.1157	0.1175	99.069
3 / 9 . *	1.2312	0.2372	19.4081	11.9116	-0.0050	6.0190	4.6059	0.0470	0.0334	53.0499	0.1952	96.739
3 / 10 . *	2.2859	0.7519	15.6419	11.4755	0.0062	8.0913	10.6267	0.0509	0.0141	44.6807	1.1270	94.752
3 / 11 . *	2.4688	0.7091	15.7941	11.5796	-0.0099	8.0907	11.3742	0.0615	0.0389	44.3359	0.6630	95.116
3 Average	2.1008	0.0535	18.3926	9.3317	0.0738	10.4456	4.5431	0.0336	0.0368	53.4786	0.0948	98.586

5b Shear Zome Pyroxene

Date: 6/16/2011 Wt. % Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 1 .	0.0206	-0.0057	25.4974	0.4127	0.0965	17.6718	2.0934	0.0227	-0.0276	52.9005	0.0702	98.786
4 / 2 .	0.0349	0.0035	25.0684	0.5461	0.1014	17.3920	2.1173	0.0330	-0.0221	53.1767	0.0018	98.475
4 / 3 .	0.0286	-0.0046	25.6210	0.4355	0.1173	17.9437	2.0190	0.0227	-0.0184	53.0800	-0.0134	99.268
4 / 4 .	0.0384	-0.0007	25.5686	0.5204	0.0942	17.4831	2.1376	0.0475	-0.0313	52.8388	0.0550	98.784
4 / 5 .	0.0289	-0.0018	25.5045	0.3883	0.1161	17.5463	2.2049	0.0515	-0.0239	53.1430	0.0018	98.985
4 / 6 .	0.0044	0.0004	25.8885	0.1967	0.1112	17.4743	2.2136	0.0206	-0.0479	53.1220	0.0221	99.054
4 / 7 .	0.0225	0.0039	25.8694	0.2588	0.1064	17.2721	2.3085	0.0268	-0.0276	52.9083	-0.0159	98.777
4 / 8 .	0.0067	0.0021	25.4676	0.2540	0.1565	17.2299	2.2745	0.0371	-0.0332	52.7859	0.3716	98.586
4 / 9 .	0.0099	0.0089	25.7846	0.2147	0.1382	17.2599	2.2425	0.0413	-0.0387	53.2014	0.0753	98.977
4 / 10 .	0.0335	0.0007	25.6061	0.4142	0.1333	17.1113	2.2999	0.0227	-0.0387	53.2328	0.0246	98.879
4 Average	0.0228	0.0007	25.5876	0.3641	0.1171	17.4384	2.1911	0.0326	-0.0309	53.0389	0.0593	98.857
5 / 1 .	0.0220	-0.0083	24.8331	0.3620	0.1110	18.4522	2.2133	0.0062	-0.0407	52.9631	0.0156	98.978
5 / 2 .	0.0799	-0.0062	24.4680	0.8560	0.0672	18.2699	2.2989	0.0041	0.0033	53.0518	0.0966	99.196
5 / 3 .	0.0730	0.0037	24.4360	0.7560	0.1135	18.0416	2.3508	-0.0124	-0.0371	52.6739	0.0966	98.545
5 / 4 .	0.0746	-0.0051	24.7253	0.7178	0.0903	18.2569	2.1557	-0.0041	-0.0224	52.6490	0.0005	98.670
5 / 5 .	0.0251	0.0016	24.8300	0.3491	0.0903	18.3497	2.2082	-0.0123	-0.0040	52.9385	0.0005	98.793
5 / 6 .	0.0748	0.0023	24.6045	0.7325	0.0890	18.6002	2.2169	-0.0308	-0.0407	52.8020	0.0232	99.145
5 / 7 .	0.2766	0.0037	24.6400	2.3135	0.1199	17.2353	2.3913	0.0041	0.0218	52.2454	0.0309	99.282
5 / 8 .	0.0184	0.0044	24.6351	0.3003	0.0854	18.6952	1.9784	0.0062	-0.0095	52.6379	0.0156	98.377
5 / 9 .	0.1894	-0.0023	23.9168	1.6719	0.0940	17.7185	2.1811	0.0124	0.0052	52.4981	0.0283	98.316
5 / 10 .	0.0164	-0.0023	24.7830	0.2785	0.0525	18.6727	1.9081	-0.0021	-0.0425	53.0960	0.0460	98.853
5 Average	0.0850	-0.0008	24.5872	0.8338	0.0913	18.2292	2.1903	-0.0029	-0.0167	52.7556	0.0354	98.816
6 / 1 .	4.1666	0.0085	11.2257	16.6798	0.0398	6.0933	5.1415	0.0321	0.0389	54.6742	-0.0111	98.101
6 / 2 .	2.9167	0.0092	12.8481	18.9039	0.0386	5.2255	4.7965	0.0279	0.0197	54.6326	-0.0295	99.419
6 / 3 .	4.1118	0.0082	11.5408	16.5329	0.0199	6.4648	4.8075	-0.0021	0.0408	55.3705	-0.0059	98.897
6 / 4 .	4.0462	0.0085	11.8598	16.2118	0.0609	6.6627	4.6521	-0.0043	-0.0151	55.0239	-0.0032	98.526
6 / 5 .	4.1182	0.0089	11.2862	16.5246	0.0411	6.5399	4.8834	-0.0064	0.0003	54.9118	-0.0216	98.314
7 / 1 .	4.1940	-0.0001	11.4122	15.7630	0.0843	7.0835	4.7423	0.0533	-0.0369	54.9552	0.0678	98.356
7 / 2 .	4.0609	0.0002	11.5178	16.3457	0.0756	6.9967	4.2477	0.0341	-0.0158	55.2959	0.0835	98.658
7 / 3 .	3.9845	-0.0018	11.7203	16.9066	0.0471	6.9675	4.0568	0.0363	-0.0119	55.2585	0.1045	99.082
7 / 4 .	3.9756	-0.0108	11.7700	17.0092	0.0186	6.7738	4.0838	-0.0021	-0.0042	55.2995	0.0261	98.957
7 / 5 .	3.1942	-0.0039	12.2389	18.2298	0.0646	5.8614	4.2833	0.0043	0.0054	54.7999	0.0786	98.760
6 & 7 Avera	3.4506	0.0037	12.2842	17.9053	0.0429	6.0965	4.4266	0.0321	0.0039	54.9456	0.0375	98.707

5b Shear Zome Pyroxene

Date: 6/16/2011 Wt. % Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
8 / 1 .	0.0700	0.0907	26.2366	1.0336	0.0861	16.6839	1.9989	0.0123	0.0185	53.8161	0.0438	100.091
8 / 2 .	0.1225	0.0791	25.7464	1.4062	0.1032	16.0139	1.8285	0.0226	-0.0347	53.8904	0.0086	99.221
8 / 3 .	-0.0039	0.0722	26.4003	0.2907	0.1030	16.8198	1.8664	0.0020	-0.0309	54.0990	-0.0165	99.654
8 / 4 .	0.0186	0.0003	26.2976	0.7809	0.1358	16.4379	1.5412	-0.0082	-0.0365	54.1823	0.0413	99.436
8 / 5 .	-0.0062	-0.0047	26.2125	0.2534	0.1393	16.7935	2.1370	0.0450	-0.0236	53.7052	-0.0090	99.286
8 / 6 .	0.0528	0.1454	25.4152	1.1986	0.1165	16.1013	2.3040	0.0226	-0.0182	53.7101	0.0414	99.108
8 / 7 .	0.0054	-0.0036	25.9992	0.5373	0.1139	16.6252	2.1554	0.0328	-0.0364	53.8184	0.0111	99.299
8 / 8 .	0.4359	0.0993	24.0178	2.7670	0.1070	14.8334	2.6447	0.0185	-0.0257	53.2948	0.1325	98.351
8 / 9 .	0.0327	0.0884	25.7440	0.6883	0.0800	16.4051	1.7228	0.0184	-0.0603	53.9135	-0.0165	98.693
8 / 10 .	0.0140	-0.0050	26.5282	0.4232	0.1249	16.3722	1.4748	0.0041	-0.0127	54.3778	-0.0014	99.319
8 Average	0.0742	0.0562	25.8598	0.9379	0.1110	16.3086	1.9674	0.0170	-0.0261	53.8808	0.0235	99.246
9 / 1 .	0.0135	-0.0027	25.0880	0.2552	0.1839	18.1306	2.2479	-0.0103	-0.0266	52.4574	-0.0145	98.377
9 / 2 .	0.0322	0.0065	25.2264	0.2215	0.1559	18.1124	2.2919	0.0554	-0.0174	52.1285	-0.0271	98.231
9 / 3 .	0.0076	0.0054	25.2029	0.1968	0.1816	18.0261	2.2346	0.0431	-0.0010	52.4287	-0.0019	98.327
9 / 4 .	0.1893	0.0255	24.8785	0.8247	0.1756	17.5490	2.8957	0.0658	-0.0487	52.0547	0.0410	98.700
9 / 5 .	0.0226	0.0118	24.8882	0.4028	0.2133	17.7360	2.7613	0.0329	-0.0083	52.3706	-0.0221	98.439
9 / 6 .	0.0231	-0.0031	25.0931	0.4081	0.2057	18.2208	2.8088	0.0410	-0.0083	51.6568	0.0283	98.486
9 / 7 .	0.0576	0.0075	24.8699	0.7035	0.1682	17.7925	2.8030	0.0103	-0.0358	51.9666	0.0031	98.382
9 / 8 .	0.0458	0.0082	24.9239	0.5936	0.1924	18.1954	2.7828	0.0575	-0.0083	51.7808	0.2100	98.790
9 / 9 .	0.0346	0.0061	24.9451	0.6088	0.1816	18.0475	2.8118	0.0370	0.0101	52.2072	0.0006	98.890
9 / 10 .	0.0342	0.0026	24.8685	0.5217	0.1925	18.0445	2.8838	0.0575	-0.0321	52.0073	0.0485	98.661
9 Average	0.0460	0.0068	24.9984	0.4737	0.1851	17.9855	2.6522	0.0390	-0.0176	52.1059	0.0266	98.528
10 / 1 .	-0.0034	-0.0023	29.2998	0.1369	0.1169	14.2083	0.5007	-0.0146	-0.0267	55.6971	0.0071	99.967
10 / 2 .	0.0004	-0.0019	29.3161	0.1443	0.1108	14.0274	0.5229	-0.0208	-0.0025	55.7175	-0.0134	99.839
10 / 3 .	0.0004	-0.0080	29.2444	0.1392	0.1181	14.2866	0.5284	-0.0125	0.0013	55.9026	0.0377	100.259
10 / 4 .	-0.0004	0.0063	29.1835	0.1334	0.1735	14.1193	0.4582	-0.0208	0.0031	55.5991	-0.0108	99.676
10 / 5 .	0.0073	-0.0002	29.0921	0.1458	0.0628	14.3505	0.4621	-0.0312	-0.0025	56.0757	-0.0261	100.196
10 / 6 .	-0.0008	0.0023	28.4548	0.1969	0.1156	14.4083	0.8061	-0.0208	-0.0006	55.0985	0.0121	99.095
10 / 7 .	0.0107	-0.0026	28.8694	0.1597	0.1661	14.1023	0.4866	0.0042	0.0162	55.8696	-0.0032	99.685
10 / 8 .	0.0004	0.0016	28.8848	0.1431	0.0775	14.3179	0.4934	-0.0104	-0.0677	55.6612	0.0096	99.589
10 / 9 .	0.0138	0.0013	28.9635	0.1207	0.1070	14.4940	0.4677	-0.0333	-0.0379	55.6731	0.0198	99.861
10 / 10 .	0.0250	-0.0034	28.9662	0.1110	0.1192	14.5385	0.4597	0.0021	0.0292	55.6404	0.0479	99.939
10 Average	0.0053	-0.0007	29.0275	0.1431	0.1168	14.2853	0.5186	-0.0158	-0.0088	55.6935	0.0081	99.811

5b Shear Zome Pyx

Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	3.230	0.010	13.370	17.750	0.050	6.910	3.850	-0.020	54.450	0.040	99.640
1 / 2 .	4.120	0.000	12.340	17.020	0.030	6.630	4.240	0.000	54.410	0.060	98.860
1 / 3 .	1.630	0.010	14.200	21.170	0.030	6.400	3.240	0.000	52.800	0.040	99.520
1 / 4 .	1.540	0.000	13.670	21.010	0.030	6.240	4.210	-0.010	52.370	0.050	99.140
1 / 5 .	3.460	0.010	13.010	16.510	-0.010	6.620	4.700	0.000	54.370	0.050	98.730
1 / 6 .	1.290	0.000	14.960	21.730	0.060	5.850	2.470	-0.010	53.380	0.040	99.770
1 / 7 .	1.790	0.000	14.080	20.860	0.030	6.000	3.890	0.010	53.020	0.060	99.750
1 / 8 .*	0.030	9.300	17.190	0.070	0.020	11.260	13.990	-0.010	36.050	5.820	93.740
1 / 9 .	1.350	0.010	14.810	21.670	0.010	5.620	2.680	0.010	52.860	0.030	99.060
1 / 10 .	1.310	0.010	14.590	21.360	0.040	5.420	3.130	-0.030	53.430	0.030	99.340
1 Average	2.191	0.006	13.892	19.898	0.030	6.188	3.601	-0.006	53.454	0.044	99.312
2 / 1 .	4.200	0.000	12.050	17.090	0.030	4.750	5.610	-0.010	55.110	0.090	98.930
2 / 2 .	4.010	0.010	12.320	17.600	0.010	4.820	5.400	0.000	54.650	0.070	98.890
2 / 3 .	3.790	0.000	12.620	18.060	0.040	4.860	5.010	0.000	54.730	0.100	99.200
2 / 4 .	3.900	0.010	12.490	18.000	0.030	4.720	5.290	0.030	54.790	0.090	99.350
2 / 5 .	4.020	-0.010	12.160	17.670	0.030	5.120	5.700	-0.010	54.640	0.120	99.460
2 / 6 .	1.780	0.000	13.850	21.170	0.060	5.140	4.210	0.000	53.310	0.300	99.820
2 / 7 .	1.860	0.010	13.830	20.870	0.030	5.550	4.210	0.000	53.080	0.320	99.760
2 / 8 .	1.810	0.140	13.770	20.880	0.040	5.500	4.320	0.010	52.680	0.430	99.570
2 / 9 .	1.750	0.010	13.720	21.200	0.060	5.420	4.060	0.000	52.410	0.370	99.000
2 / 10 .	1.950	0.000	13.840	20.490	0.070	5.440	3.950	-0.020	53.090	0.230	99.070
2 Average	2.907	0.017	13.065	19.303	0.040	5.132	4.776	0.000	53.849	0.212	99.305
3 / 1 .	-0.070	0.000	27.830	0.150	0.070	17.100	1.930	0.000	53.000	0.050	100.120
3 / 2 .	-0.060	0.010	27.790	0.170	0.090	17.290	2.120	0.030	53.080	0.060	100.630
3 / 3 .	-0.060	0.010	27.880	0.130	0.120	17.270	1.990	0.000	52.960	0.040	100.400
3 / 4 .	-0.060	0.000	27.720	0.160	0.120	17.050	2.370	-0.010	53.040	0.080	100.540
3 / 5 .	-0.080	0.000	27.910	0.120	0.100	17.240	2.270	0.040	53.090	0.070	100.820
3 / 6 .	-0.060	0.000	27.680	0.110	0.100	16.910	2.400	-0.020	53.040	0.040	100.290
3 / 7 .	-0.050	0.000	27.620	0.180	0.100	17.020	2.450	-0.030	52.820	0.040	100.220
3 / 8 .	-0.050	0.000	27.770	0.190	0.100	16.870	2.440	0.020	53.270	0.040	100.700
3 / 9 .	-0.070	0.010	27.720	0.180	0.070	16.910	2.580	-0.020	52.930	0.040	100.430
3 / 10 .	-0.070	0.000	27.620	0.170	0.100	17.010	2.490	0.030	53.160	0.090	100.660
3 Average	-0.063	0.003	27.754	0.156	0.097	17.067	2.304	0.004	53.039	0.055	100.481
4 / 1 .*	1.680	0.260	19.610	11.320	0.030	6.790	6.440	0.010	50.400	0.140	96.690

5b Shear Zome Pyx

Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
4 / 2 .*	1.790	0.250	18.970	10.960	0.010	7.160	6.540	0.030	50.100	0.200	96.030
4 / 3 .*	1.740	0.250	19.150	10.900	0.030	7.190	6.460	0.000	50.620	0.170	96.510
4 / 4 .*	1.660	0.220	19.630	10.340	0.040	7.470	5.920	-0.010	50.910	0.160	96.340
4 / 5 .*	1.750	0.240	19.440	10.710	0.050	7.360	6.230	-0.030	50.530	0.140	96.450
4 / 6 .*	1.810	0.250	19.170	10.150	0.020	7.800	6.760	-0.020	49.960	0.190	96.110
4 / 7 .*	1.910	0.280	18.840	10.280	0.050	7.930	7.260	0.000	49.480	0.280	96.310
4 / 8 .*	1.960	0.300	18.620	10.860	0.040	7.290	7.470	0.000	49.550	0.190	96.280
4 / 9 .*	1.970	0.310	18.400	11.070	0.010	7.540	7.850	0.040	48.660	0.250	96.110
4 / 10 .*	2.150	0.320	18.280	10.710	0.020	7.570	8.050	-0.030	48.480	0.190	95.770
5 / 1 .	-0.080	0.000	27.760	0.180	0.140	17.760	1.110	0.000	53.410	-0.010	100.370
5 / 2 .	-0.090	0.000	27.890	0.180	0.100	17.550	1.170	-0.040	53.490	-0.020	100.380
5 / 3 .	-0.060	0.010	27.860	0.140	0.110	17.190	1.040	0.020	53.140	0.040	99.540
5 / 4 .	-0.060	0.010	27.960	0.190	0.120	17.420	1.060	-0.010	53.430	0.010	100.190
5 / 5 .	-0.080	0.000	27.920	0.230	0.130	17.790	0.740	-0.010	53.610	0.000	100.420
5 Average	-0.074	0.004	27.878	0.184	0.120	17.542	1.024	-0.008	53.416	0.004	100.180

5b Shear Zome Pyx

Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
6 / 1 .	-0.030	0.300	27.640	0.180	0.100	17.260	1.650	-0.010	52.930	0.060	100.120
6 / 2 .	-0.080	0.000	27.810	0.160	0.140	17.590	1.280	0.000	53.720	0.010	100.740
6 / 3 .	-0.070	0.000	27.650	0.160	0.120	17.330	1.300	-0.010	53.220	0.010	99.780
6 / 4 .	-0.060	0.010	27.680	0.170	0.140	17.540	1.410	0.000	53.530	0.020	100.490
6 / 5 .	-0.070	0.010	27.970	0.200	0.140	17.590	1.190	-0.040	53.320	0.000	100.420
7 / 1 .	-0.070	0.010	27.170	0.110	0.140	18.190	1.580	0.010	53.560	0.010	100.790
7 / 2 .	-0.080	0.010	27.160	0.100	0.120	18.140	1.850	0.010	52.840	0.040	100.270
7 / 3 .	-0.070	0.000	27.120	0.100	0.120	17.800	2.180	0.000	52.790	0.170	100.280
7 / 4 .	-0.040	0.010	27.080	0.160	0.110	17.700	2.450	0.060	52.720	0.070	100.350
7 / 5 .	-0.050	0.010	27.090	0.150	0.160	17.660	2.490	0.010	52.670	0.030	100.280
7 / 6 .	-0.070	0.010	27.090	0.110	0.100	17.900	2.500	-0.030	52.270	0.050	100.050
7 / 7 .	-0.060	0.010	26.870	0.160	0.150	17.910	2.730	-0.020	52.490	0.080	100.410
7 / 8 .	-0.060	0.000	27.160	0.100	0.120	17.900	2.250	0.000	52.610	0.070	100.210
7 / 9 .	-0.070	0.000	27.710	0.120	0.130	17.920	1.670	0.000	53.070	0.020	100.650
7 / 10 .*	-0.060	0.010	28.290	0.130	0.140	17.720	0.800	0.000	53.920	0.050	101.060
6&7 Average	-0.066	0.020	27.523	0.154	0.126	17.684	1.634	-0.003	53.112	0.033	100.296
8 / 1 .*	1.660	0.330	19.970	10.670	0.050	7.060	5.870	-0.010	52.100	0.160	97.870
8 / 2 .*	1.640	0.330	19.960	10.320	0.020	7.360	5.660	0.000	51.920	0.130	97.350
8 / 3 .*	1.690	0.340	20.010	10.630	0.050	6.960	5.700	-0.020	52.200	0.150	97.740
8 / 4 .*	1.460	0.380	20.210	10.360	0.060	7.420	5.430	-0.010	52.290	0.160	97.770
8 / 5 .*	1.620	0.330	20.120	10.610	0.020	6.500	5.520	-0.010	52.540	0.180	97.440
8 / 6 .*	1.560	0.330	20.390	10.830	0.020	6.460	5.370	-0.010	52.790	0.150	97.900
8 / 7 .*	1.410	0.280	20.500	10.800	0.040	6.270	5.030	-0.040	52.490	0.170	97.000
8 / 8 .*	1.390	0.260	20.810	10.900	0.000	6.250	4.670	-0.030	53.350	0.140	97.770
8 / 9 .*	1.440	0.240	20.590	11.230	0.030	6.180	5.120	-0.030	52.260	0.130	97.200
8 / 10 .*	1.680	0.330	19.740	11.390	0.030	6.420	6.640	-0.030	50.670	0.200	97.100
9 / 1 .*	-0.070	0.000	28.860	0.130	0.130	16.420	0.430	-0.030	55.200	0.010	101.170
9 / 2 .*	-0.070	0.010	29.040	0.110	0.120	16.360	0.400	-0.010	55.270	0.030	101.340
9 / 3 .*	-0.080	0.010	29.270	0.090	0.140	16.370	0.360	0.000	55.240	0.010	101.490
9 / 4 .*	-0.060	-0.010	29.240	0.080	0.120	16.310	0.380	0.000	54.980	0.000	101.110
9 / 5 .*	-0.050	0.010	29.160	0.070	0.150	16.380	0.370	0.000	54.890	0.020	101.040
9 / 6 .*	-0.060	0.000	29.470	0.060	0.140	16.330	0.430	0.010	54.780	0.030	101.260
9 / 7 .*	-0.070	0.000	29.400	0.060	0.100	16.400	0.420	-0.010	54.740	0.020	101.160
9 / 8 .*	-0.060	0.010	29.640	0.080	0.130	16.500	0.420	0.010	54.940	0.030	101.750

5b Shear Zome Pyx

Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
9 / 9 .*	-0.060	0.000	29.800	0.080	0.130	16.380	0.340	-0.010	54.530	-0.010	101.270
9 / 10 .*	-0.060	0.010	29.840	0.100	0.110	16.480	0.430	-0.040	54.250	0.050	101.270
10 / 1 .*	1.100	0.140	20.990	11.010	0.030	6.540	3.700	-0.010	53.460	0.030	97.000
10 / 2 .*	1.070	0.140	21.350	9.420	0.040	8.570	3.270	0.010	53.790	0.070	97.710
10 / 3 .*	1.070	0.120	20.970	9.720	0.060	8.050	3.710	-0.020	53.520	0.080	97.290
10 / 4 .*	1.200	0.110	20.780	10.560	0.020	7.300	4.050	-0.010	53.010	0.030	97.070
10 / 5 .*	1.400	0.150	20.380	10.160	0.030	7.720	4.790	-0.010	52.310	0.070	97.000
10 / 6 .*	1.810	0.220	19.000	10.720	-0.010	7.490	6.900	-0.020	50.280	0.090	96.510
10 / 7 .*	2.110	0.270	18.400	10.840	0.020	7.940	8.060	-0.020	49.280	0.100	97.030
10 / 8 .*	2.060	0.250	18.530	10.780	0.010	7.800	7.900	0.000	49.480	0.110	96.930
10 / 9 .*	1.640	0.160	19.850	10.990	0.050	7.030	5.800	-0.040	51.400	0.050	96.980
10 / 10 .*	1.950	0.220	18.780	10.820	0.020	7.290	7.500	0.010	49.770	0.110	96.470
11 / 1 .*	1.350	0.270	20.910	8.660	0.110	8.080	5.530	0.000	51.210	0.310	96.430
11 / 2 .*	1.490	0.270	20.570	9.440	0.050	7.800	5.790	0.000	51.080	0.220	96.700
11 / 3 .*	1.500	0.310	20.420	9.960	0.050	7.200	6.060	0.020	50.460	0.290	96.260
11 / 4 .*	1.550	0.300	20.310	10.180	0.050	7.210	6.100	-0.050	50.890	0.270	96.840
11 / 5 .*	1.500	0.310	20.310	9.690	0.080	7.500	6.060	-0.040	50.740	0.280	96.480
11 / 6 .*	1.570	0.330	20.110	9.280	0.090	7.870	6.300	-0.020	50.270	0.360	96.180
11 / 7 .*	1.600	0.340	20.050	9.970	0.060	7.150	6.540	0.000	50.300	0.290	96.300
11 / 8 .*	1.610	0.340	20.130	9.540	0.060	7.630	6.610	0.000	49.880	0.310	96.100
11 / 9 .*	1.690	0.330	19.890	9.760	0.060	7.360	6.990	-0.010	49.810	0.360	96.260
11 / 10 .*	1.680	0.340	19.810	9.720	0.080	7.310	6.940	0.000	50.240	0.270	96.400

5b Orthogneiss Amphibole

Date: 6/16/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	0.011	0.000	2.076	1.142	0.059	13.649	21.454	0.184	6.609	-0.008	4.485	0.003	-0.040	50.556	0.320	100.549
1 / 2 .	0.033	0.002	2.060	1.303	0.066	13.472	21.494	0.173	6.577	-0.091	4.773	0.025	-0.013	50.169	0.291	100.440
1 / 3 .	0.018	0.003	2.084	1.084	-0.004	13.384	22.329	0.226	6.596	0.069	4.438	0.019	-0.021	50.801	0.304	101.355
1 / 4 .	0.029	0.005	2.074	1.128	0.000	13.446	21.958	0.190	6.565	-0.096	4.551	-0.008	-0.015	50.668	0.378	100.990
1 / 5 .	0.011	0.002	2.065	1.115	0.006	13.540	21.414	0.143	6.631	-0.060	4.601	0.013	-0.023	50.149	0.325	100.014
1 / 6 .	0.003	-0.010	2.085	1.053	-0.009	13.317	22.381	0.172	6.225	-0.080	4.385	0.010	0.001	50.753	0.347	100.731
1 / 7 .	0.066	-0.004	2.052	1.065	-0.006	13.376	22.284	0.147	6.472	-0.096	4.376	0.010	-0.011	50.650	0.328	100.825
1 / 8 .	0.001	0.008	2.087	1.151	0.000	13.203	22.394	0.144	6.387	-0.060	4.536	0.014	-0.030	50.749	0.344	101.018
1 / 9 .	-0.015	0.000	2.084	1.168	-0.005	13.375	22.432	0.149	6.299	-0.055	4.260	0.017	0.003	50.671	0.331	100.790
1 / 10 .	0.073	-0.001	2.068	1.226	-0.002	13.612	22.322	0.137	6.330	-0.101	4.010	0.010	-0.042	51.510	0.289	101.586
2 / 1 .	0.035	0.041	1.980	2.385	1.990	11.475	11.436	0.062	11.037	0.071	15.509	0.112	0.047	40.213	2.511	98.904
2 / 2 .	0.084	0.043	1.966	2.398	1.925	11.645	11.663	0.064	10.894	0.066	15.132	0.096	0.002	40.642	2.720	99.339
2 / 3 .	0.071	0.034	1.967	2.421	1.927	11.635	11.534	0.044	10.938	0.061	15.255	0.135	0.023	40.438	2.494	98.977
2 / 4 .	0.013	0.038	2.005	2.417	1.943	11.710	11.411	0.032	11.045	0.081	15.331	0.110	-0.008	40.654	2.608	99.397
2 / 5 .	0.049	0.038	1.979	2.412	1.929	11.492	11.429	0.049	10.885	0.121	15.269	0.060	0.025	40.568	2.699	99.004
2 / 6 .	0.019	0.055	1.993	2.425	1.950	11.662	11.604	0.031	11.036	0.071	15.265	0.105	0.011	40.486	2.632	99.345
2 / 7 .	0.046	0.039	1.981	2.434	1.967	11.561	11.582	0.045	10.922	0.021	15.290	0.068	0.051	40.438	2.632	99.075
2 / 8 .	0.072	0.039	1.977	2.401	1.898	11.755	11.774	0.055	10.838	0.116	15.069	0.068	-0.008	40.875	2.572	99.509
2 / 9 .	0.045	0.029	1.995	2.237	1.682	11.934	12.794	0.052	10.293	0.001	13.932	0.072	0.019	41.935	2.203	99.221
2 / 10 .	0.066	0.041	1.969	2.453	1.913	11.608	11.483	0.048	10.948	0.106	15.313	0.076	0.038	40.428	2.558	99.047
3 / 1 .	0.029	0.022	1.998	2.719	1.445	12.117	11.683	0.010	9.551	0.037	17.600	0.050	-0.052	39.454	1.745	98.460
3 / 2 .	0.046	0.033	1.983	2.666	1.359	12.404	10.891	0.049	9.845	0.194	17.889	0.089	0.011	39.061	1.761	98.281
3 / 3 .	0.074	0.012	1.987	2.802	1.366	12.322	11.502	0.030	9.333	0.103	17.217	0.056	0.003	40.037	1.849	98.696
3 / 4 .	0.060	0.027	1.998	2.802	1.451	12.331	11.477	0.016	9.290	0.088	17.721	0.077	-0.018	39.911	1.821	99.069
3 / 5 .	0.054	0.013	1.998	2.777	1.475	12.181	11.554	0.019	9.448	0.073	17.741	0.048	-0.010	39.632	1.841	98.854
3 / 6 .	0.022	0.026	2.007	2.769	1.534	12.272	11.653	0.042	9.402	0.083	17.552	0.070	0.015	39.477	1.888	98.811
3 / 7 .	0.032	0.034	1.991	2.803	1.406	12.193	12.053	0.035	9.297	0.129	17.225	0.075	-0.042	39.243	2.004	98.519
3 / 8 .	0.077	0.020	1.984	2.795	1.381	12.271	11.799	0.027	9.557	0.083	17.369	0.064	-0.008	39.663	1.866	98.955
3 / 9 .	0.022	0.031	1.996	2.766	1.481	12.115	11.725	0.035	9.583	0.103	17.149	0.059	-0.025	39.467	1.912	98.444
3 / 10 .	0.079	0.024	1.981	2.686	1.525	12.118	11.806	-0.021	9.703	0.108	17.190	0.083	-0.014	39.650	2.159	99.115
4 / 1 .	0.066	0.033	1.978	2.410	1.974	12.182	11.679	0.080	9.628	-0.009	15.818	0.132	0.037	40.343	2.473	98.835
4 / 2 .	0.057	0.042	1.997	2.307	1.718	12.807	12.652	0.055	8.722	0.072	13.747	0.086	0.001	42.419	2.387	99.069
4 / 3 .	0.054	0.032	1.999	2.456	1.876	12.536	11.661	0.092	9.510	-0.034	15.213	0.119	0.037	41.140	2.570	99.295
4 / 4 .	0.074	0.031	1.982	2.362	2.006	12.343	11.442	0.082	9.844	0.036	15.869	0.087	0.022	40.454	2.529	99.163
4 / 5 .	0.048	0.034	1.986	2.383	2.037	12.240	11.547	0.039	9.762	0.082	15.813	0.104	0.030	40.434	2.291	98.830
4 / 6 .	0.045	0.044	1.994	2.376	1.986	12.324	11.506	0.075	9.616	-0.019	15.781	0.108	0.016	40.685	2.478	99.033
4 / 7 .	0.036	0.048	1.999	2.452	1.904	12.373	11.557	0.091	9.619	-0.014	15.824	0.131	0.022	40.659	2.403	99.117
4 / 8 .	0.114	0.036	1.954	2.445	1.983	12.370	11.558	0.070	9.803	0.052	15.568	0.093	0.018	40.398	2.509	98.972
4 / 9 .	0.023	0.031	1.998	2.375	1.975	12.354	11.517	0.106	9.868	0.026	15.385	0.089	0.015	40.432	2.568	98.761

5b Orthogneiss Amphibole

Date: 6/16/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 10 .	0.081	0.040	1.978	2.392	1.948	12.419	11.593	0.087	9.662	-0.004	15.416	0.104	0.020	40.750	2.690	99.180
5 / 1 .	-0.003	0.025	2.013	2.413	1.972	13.419	11.532	0.037	8.687	0.041	15.189	0.089	0.016	40.696	2.180	98.309
5 / 2 .	0.095	0.034	1.973	2.400	1.957	13.278	11.695	0.027	8.801	0.137	15.504	0.072	0.023	40.573	2.424	98.994
5 / 3 .	0.021	0.026	2.007	2.397	1.941	13.350	11.713	0.018	8.851	0.021	15.443	0.101	0.033	40.496	2.259	98.677
5 / 4 .	0.062	0.026	1.994	2.393	2.029	13.444	11.776	0.011	8.759	0.076	15.269	0.084	0.018	40.818	2.294	99.054
5 / 5 .	0.024	0.037	2.015	2.459	1.940	13.242	11.673	0.031	8.583	0.066	15.615	0.059	0.002	40.980	2.302	99.028
5 / 6 .	0.027	0.028	2.008	2.423	1.921	13.469	11.606	0.032	8.492	0.127	15.286	0.066	0.037	40.930	2.246	98.698
5 / 7 .	0.022	0.026	2.016	2.413	1.902	13.776	11.697	0.037	8.433	0.056	14.968	0.072	-0.003	41.358	2.012	98.788
5 / 8 .	0.020	0.039	2.015	2.442	1.910	13.477	11.707	0.058	8.571	0.006	15.469	0.106	0.061	41.065	1.998	98.942
5 / 9 .	0.009	0.013	2.018	2.430	1.919	13.434	11.688	0.046	8.627	0.076	15.216	0.087	0.014	40.911	2.100	98.589
5 / 10 .	0.031	0.037	2.013	2.439	1.715	13.594	12.046	0.037	8.457	-0.010	15.010	0.066	0.018	41.812	1.553	98.827
6 / 1 .	0.100	0.017	1.972	2.755	1.321	13.126	11.885	0.051	8.609	-0.016	18.081	0.044	0.039	39.280	1.147	98.426
6 / 2 .	0.110	0.018	1.967	2.814	1.315	13.241	12.064	0.082	8.593	-0.001	17.180	0.056	0.028	39.767	1.296	98.530
6 / 3 .	0.088	0.028	1.995	2.816	1.308	13.719	11.640	0.075	8.236	-0.062	16.641	0.047	0.037	41.015	1.320	98.965
6 / 4 .	0.097	0.037	1.987	2.774	1.490	13.581	11.725	0.052	8.527	0.050	16.818	0.060	0.041	40.666	1.347	99.252
6 / 5 .	0.125	0.023	1.965	2.691	1.576	13.429	11.757	0.068	8.406	-0.021	16.883	0.047	0.009	40.481	1.190	98.649
6 / 6 .	0.078	0.035	1.987	2.768	1.495	13.324	11.796	0.091	8.518	-0.026	16.869	0.056	0.045	40.417	1.319	98.799
6 / 7 .	0.144	0.038	1.954	2.689	1.477	13.369	11.615	0.063	8.524	-0.026	16.819	0.038	0.035	40.637	1.272	98.674
6 / 8 .	0.130	0.040	1.961	2.722	1.566	13.339	11.759	0.044	8.562	-0.042	16.910	0.055	0.056	40.406	1.348	98.897
6 / 9 .	0.151	0.024	1.965	2.562	1.841	13.425	11.857	0.074	8.584	0.045	16.694	0.052	0.016	40.701	1.540	99.531
6 / 10 .	0.191	0.044	1.932	2.509	1.916	13.325	11.677	0.059	8.580	0.035	16.447	0.060	0.053	40.861	1.421	99.108
7 / 1 .	0.054	0.006	2.030	2.851	1.214	14.179	11.617	-0.012	7.380	-0.035	19.299	0.013	0.003	40.211	0.008	98.864
7 / 2 .	0.126	0.007	1.986	2.899	1.167	14.361	11.761	-0.001	7.271	0.067	18.783	-0.024	0.034	40.154	-0.031	98.616
7 / 3 .	0.131	0.011	2.000	2.922	1.120	14.672	11.593	0.005	7.321	0.001	18.700	-0.016	0.040	40.776	0.003	99.294
7 / 4 .	0.109	0.004	2.003	3.037	1.103	14.114	11.549	-0.015	7.593	0.006	19.326	0.003	0.015	40.105	0.034	99.001
7 / 5 .	0.124	-0.006	2.002	2.986	1.089	14.558	11.497	-0.037	7.340	0.047	18.941	-0.011	0.013	40.512	-0.015	99.109
7 / 6 .	0.134	-0.005	2.002	3.042	1.133	14.392	11.690	0.020	7.444	0.042	19.392	-0.009	0.005	40.232	-0.020	99.527
7 / 7 .	0.095	0.004	2.004	2.970	1.197	14.103	11.747	-0.027	7.440	0.108	19.282	-0.020	0.040	39.835	0.039	98.864
7 / 8 .	0.213	-0.003	1.957	2.957	1.141	14.475	11.732	0.001	7.443	0.052	18.607	0.000	-0.018	40.621	0.052	99.251
7 / 9 .	0.122	0.007	1.999	3.000	1.103	14.416	11.580	-0.007	7.568	0.032	18.674	-0.030	-0.014	40.639	-0.007	99.140
7 / 10 .	0.107	0.007	2.003	3.008	1.077	14.530	11.768	0.017	7.366	-0.040	18.375	-0.009	0.038	40.604	0.019	98.918
8 / 1 .	0.105	0.037	1.950	2.300	1.876	12.111	11.582	0.018	11.067	0.020	15.117	0.106	0.032	40.365	2.313	99.000
8 / 2 .	0.091	0.033	1.964	2.311	1.866	12.186	11.590	0.047	11.197	0.106	15.021	0.121	-0.021	40.507	2.409	99.449
8 / 3 .	0.151	0.025	1.919	2.336	1.894	11.775	11.615	0.004	11.249	0.040	15.669	0.087	0.008	39.715	2.209	98.694
8 / 4 .	0.124	0.032	1.949	2.346	1.959	12.051	11.504	0.052	11.045	0.065	15.217	0.039	0.032	40.525	2.432	99.370
8 / 5 .	0.140	0.026	1.942	2.340	1.895	12.010	11.491	0.015	11.249	0.055	15.371	0.065	0.015	40.466	2.316	99.396
8 / 6 .	0.126	0.022	1.944	2.451	1.810	12.065	11.645	0.038	11.011	0.075	15.374	0.087	0.004	40.117	2.365	99.134
8 / 7 .	0.122	0.007	1.955	2.453	1.759	12.082	11.653	0.039	10.890	0.080	15.593	0.078	0.015	40.341	2.150	99.219
8 / 8 .	0.111	0.020	1.951	2.474	1.670	12.034	11.722	0.038	11.055	0.085	15.610	0.084	-0.008	40.041	2.161	99.057

5b Orthogneiss Amphibole

Date: 6/16/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
8 / 9 .	0.151	0.032	1.931	2.571	1.651	11.825	11.686	0.021	11.191	0.045	16.249	0.058	0.030	39.775	2.028	99.244
8 / 10 .	0.131	0.025	1.940	2.568	1.642	11.432	11.632	0.022	11.101	0.106	16.917	0.064	0.004	39.416	2.042	99.041
9 / 1 .	0.129	0.047	1.936	2.528	1.403	11.611	11.812	0.093	11.984	-0.085	15.754	0.085	0.048	40.773	0.921	99.124
9 / 2 .	0.050	0.036	1.969	2.468	1.520	11.521	11.699	0.084	12.192	-0.035	15.730	0.073	0.024	40.594	0.832	98.793
9 / 3 .	0.174	0.027	1.913	2.473	1.492	11.544	11.903	0.094	12.147	0.011	15.613	0.043	-0.018	40.656	0.896	98.986
9 / 4 .	0.086	0.045	1.952	2.435	1.446	11.577	12.282	0.083	12.228	0.051	15.206	0.050	0.016	40.880	0.783	99.122
9 / 5 .	0.027	0.028	2.034	1.748	0.748	12.457	17.635	0.073	9.081	-0.055	9.679	0.047	0.013	46.207	0.479	100.254
9 / 6 .	0.104	0.033	1.929	2.386	1.551	11.590	12.188	0.091	12.030	-0.115	15.115	0.071	-0.010	40.298	0.958	98.345
9 / 7 .	0.049	0.032	1.966	2.396	1.470	11.614	11.972	0.060	12.200	-0.005	15.169	0.087	0.003	40.676	0.929	98.624
9 / 8 .	0.013	0.026	2.010	2.271	1.237	11.880	13.549	0.099	10.979	-0.070	13.418	0.095	0.016	42.837	0.815	99.246
9 / 9 .	0.080	0.052	1.942	2.421	1.449	11.575	11.922	0.077	12.060	-0.090	15.232	0.098	-0.006	40.623	0.904	98.436
9 / 10 .	0.079	0.039	1.943	2.438	1.519	11.302	11.887	0.095	12.067	0.011	15.574	0.085	-0.010	40.365	0.914	98.318
10 / 1 .	0.008	0.027	2.012	2.551	1.439	11.501	12.362	0.059	10.467	0.017	14.883	0.047	-0.009	41.459	2.189	99.021
10 / 2 .	0.003	0.024	2.019	2.466	1.476	11.774	12.630	0.092	10.416	0.082	14.431	0.051	0.042	41.873	1.921	99.301
10 / 3 .	0.054	0.030	1.987	2.533	1.681	11.588	11.800	0.070	10.810	0.097	15.344	0.073	-0.009	40.979	2.216	99.263
10 / 4 .	-0.006	0.025	1.998	2.527	1.744	11.445	11.638	0.042	10.961	-0.014	15.362	0.085	0.021	40.375	2.319	98.543
10 / 5 .	-0.018	0.039	2.004	2.501	1.876	11.370	11.564	0.061	10.954	0.047	15.707	0.064	0.053	40.481	2.314	99.036
10 / 6 .*	0.054	0.042	1.949	2.359	1.765	11.099	11.285	0.045	10.821	0.072	15.839	0.054	0.061	39.822	2.270	97.536
10 / 7 .	-0.015	0.022	2.002	2.412	1.854	11.365	11.976	0.032	10.663	0.092	15.321	0.064	0.008	40.607	2.263	98.681
10 / 8 .	-0.002	0.021	2.018	2.289	1.628	11.608	13.015	0.066	10.159	0.062	14.099	0.075	0.027	42.032	2.010	99.108
10 / 9 .	-0.027	0.025	2.008	2.393	1.769	11.527	11.888	0.051	10.891	0.092	15.186	0.057	0.019	40.888	2.194	98.989
10 / 10 .	0.041	0.034	1.988	2.433	1.789	11.387	11.725	0.032	10.927	0.092	15.555	0.076	0.025	40.759	2.257	99.122

5b Shear zone Amphibole
Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	0.077	-0.007	2.047	2.206	0.198	13.421	18.217	0.012	6.030	0.028	8.769	0.025	-0.013	48.464	0.401	99.896
1 / 2 .	0.164	0.004	1.941	3.083	0.591	13.899	11.746	0.056	9.243	-0.013	15.287	0.067	0.010	41.156	0.878	98.124
1 / 3 .	0.043	0.001	2.102	2.594	0.018	11.991	20.576	0.046	4.762	-0.070	8.429	0.040	-0.009	50.511	0.306	101.418
1 / 4 .	0.022	-0.011	2.127	3.422	0.000	10.999	19.536	0.046	4.217	-0.018	9.631	0.041	0.031	51.097	0.314	101.485
1 / 5 .	0.043	-0.015	2.130	4.059	-0.004	10.616	18.463	0.046	4.329	-0.008	10.066	-0.021	0.000	51.855	0.200	101.808
1 / 6 .	0.025	-0.008	2.130	3.912	-0.008	10.691	18.727	0.044	4.267	-0.044	10.079	0.027	0.037	51.343	0.227	101.509
1 / 7 .	0.024	-0.005	2.129	3.656	-0.003	10.736	19.099	0.025	4.404	-0.070	10.266	0.045	0.010	50.974	0.213	101.580
1 / 8 .	0.031	-0.007	2.127	3.700	0.000	10.758	19.108	0.045	4.166	-0.034	10.111	0.013	0.018	51.196	0.269	101.541
1 / 9 .	0.046	-0.007	2.094	1.406	0.008	13.840	22.280	0.054	4.770	-0.080	4.982	0.049	0.031	51.659	0.174	101.394
1 / 10 .	0.059	-0.007	2.104	1.276	-0.003	14.773	22.870	0.046	4.546	-0.003	3.071	0.005	-0.009	53.215	0.098	102.063
2 / 1 .	-0.056	-0.008	2.139	1.599	0.217	19.576	11.558	0.051	6.032	0.008	5.964	0.025	0.001	52.460	0.149	99.777
2 / 2 .	0.000	0.009	2.123	1.657	0.194	19.352	11.573	0.005	6.091	-0.012	6.181	0.047	-0.024	51.912	0.138	99.284
2 / 3 .	-0.020	-0.009	2.121	1.769	0.217	19.083	11.519	0.027	6.105	-0.068	6.846	0.009	-0.018	51.311	0.120	99.128
2 / 4 .	0.004	0.004	2.115	1.822	0.243	18.952	11.387	0.010	6.409	0.023	7.007	0.006	0.015	51.043	0.177	99.218
2 / 5 .	0.014	0.003	2.107	1.981	0.249	18.551	11.191	0.034	6.664	-0.002	7.517	0.028	0.003	50.672	0.156	99.172
2 / 6 .	0.035	0.009	2.101	1.947	0.251	18.684	11.255	0.006	6.521	-0.007	7.231	0.009	-0.001	51.090	0.164	99.304
2 / 7 .	-0.006	0.002	2.122	1.939	0.281	18.692	11.365	0.021	6.427	-0.007	7.401	0.016	0.041	50.964	0.161	99.431
2 / 8 .	0.052	0.024	2.074	1.939	0.308	18.318	11.173	0.017	6.600	0.125	7.594	0.042	-0.010	50.405	0.205	98.876
2 / 9 .	0.017	0.014	2.114	1.974	0.294	18.622	11.197	-0.009	6.557	-0.007	7.721	0.027	-0.046	50.921	0.133	99.590
2 / 10 .	-0.002	0.001	2.120	1.935	0.276	18.701	11.358	0.036	6.407	-0.002	7.579	0.008	0.030	50.739	0.148	99.338
3 / 1 .	0.027	0.001	2.052	2.972	0.550	14.638	11.494	0.012	9.218	-0.042	12.110	0.094	-0.076	44.072	2.479	99.721
3 / 2 .	0.042	0.008	2.028	2.989	0.561	14.485	11.604	0.033	9.410	-0.002	12.537	0.057	-0.036	43.522	1.929	99.208
3 / 3 .	-0.004	0.014	2.050	2.985	0.550	14.388	11.396	0.012	9.291	-0.037	12.333	0.091	-0.061	43.731	2.285	99.125
3 / 4 .	0.000	0.007	2.043	3.005	0.506	14.306	11.354	0.020	9.399	0.033	12.379	0.060	-0.050	43.434	2.276	98.822
3 / 5 .	-0.012	0.008	2.050	3.026	0.522	14.515	11.424	0.042	9.400	0.048	12.285	0.076	-0.059	43.534	2.304	99.235
3 / 6 .	0.052	0.008	2.016	3.034	0.505	14.324	11.334	0.018	9.393	-0.007	12.310	0.082	-0.076	43.551	2.092	98.718
3 / 7 .	0.036	0.017	2.026	3.001	0.482	14.423	11.484	0.023	9.394	0.043	12.699	0.073	-0.042	43.281	2.085	99.066
3 / 8 .	0.042	0.003	2.020	3.094	0.564	14.114	11.360	0.012	9.493	0.043	13.202	0.054	-0.061	42.853	1.938	98.793
3 / 9 .	0.028	0.009	2.016	3.086	0.522	14.225	11.441	-0.002	9.402	-0.032	12.927	0.062	-0.074	42.712	1.924	98.352
3 / 10 .	0.032	0.014	2.018	3.049	0.543	14.086	11.515	0.046	9.567	0.148	12.976	0.118	-0.031	42.853	1.828	98.793
4 / 1 .	0.042	0.015	2.057	2.036	0.398	17.380	10.972	0.027	8.206	0.017	7.683	0.047	0.002	49.389	0.290	98.561
4 / 2 .	0.037	0.015	2.067	1.966	0.395	17.626	11.162	0.019	8.146	0.017	7.442	0.064	-0.013	49.658	0.290	98.904
4 / 3 .	0.019	0.010	2.096	1.780	0.319	18.438	11.466	0.015	7.896	0.063	6.362	0.024	0.037	50.866	0.217	99.608
4 / 4 .	-0.012	0.003	2.107	1.531	0.269	18.485	11.404	0.055	7.671	-0.008	5.760	0.024	0.010	51.607	0.236	99.161
4 / 5 .	0.049	0.014	2.095	1.375	0.210	18.675	11.053	0.031	7.231	0.058	6.837	0.038	0.004	51.557	0.249	99.477

5b Shear zone Amphibole
Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 6 .	0.084	0.023	2.015	2.894	0.710	14.659	11.429	0.042	9.914	0.098	13.268	0.064	0.016	44.091	0.503	99.810
4 / 7 .	0.055	0.027	1.997	2.963	0.768	14.181	11.448	0.036	10.170	0.078	13.997	0.056	0.031	42.441	0.479	98.727
4 / 8 .	0.112	0.029	1.968	2.963	0.773	13.990	11.279	0.031	10.354	-0.008	14.255	0.070	0.019	42.426	0.440	98.709
4 / 9 .	0.019	0.024	2.033	2.920	0.759	13.956	11.368	0.020	10.284	0.063	14.299	0.070	0.023	43.047	0.471	99.355
4 / 10 .	0.039	0.019	2.004	3.006	0.721	14.195	11.163	0.026	9.890	0.108	13.868	0.061	0.040	42.723	0.430	98.293
5 / 1 .*	0.062	-0.002	2.046	0.006	0.003	9.480	8.011	0.514	19.765	-0.040	22.960	0.030	0.049	39.424	0.038	102.389
5 / 2 .*	0.078	0.002	2.043	-0.012	0.005	9.482	7.993	0.436	19.889	0.084	23.111	0.012	0.025	39.531	0.035	102.727
5 / 3 .*	0.070	-0.005	2.042	0.017	0.005	8.966	8.855	0.419	19.524	0.059	23.110	0.014	-0.002	39.408	0.025	102.515
5 / 4 .*	0.070	-0.002	2.049	0.005	-0.001	9.861	7.370	0.486	19.889	0.114	23.156	-0.002	0.010	39.560	0.018	102.588
5 / 5 .	0.101	0.001	2.016	0.003	0.000	9.063	8.803	0.455	19.344	0.035	22.861	-0.006	0.007	39.255	0.005	101.948
5 / 6 .	0.069	-0.006	2.034	-0.004	0.012	8.989	9.040	0.405	19.104	0.059	23.000	0.035	0.038	39.233	0.005	102.023
5 / 7 .*	0.106	0.002	2.016	-0.010	0.010	8.198	10.850	0.447	18.467	-0.005	22.945	0.024	-0.008	39.182	0.066	102.315
5 / 8 .*	0.059	0.006	2.041	-0.001	0.004	8.079	11.326	0.373	18.388	0.030	22.915	0.008	0.012	39.158	0.106	102.505
5 / 9 .*	0.059	0.013	2.039	-0.009	0.001	8.230	10.962	0.353	18.091	-0.010	22.985	0.020	0.009	39.340	0.084	102.186
5 / 10 .*	0.099	-0.008	2.029	-0.010	0.006	8.418	10.619	0.360	18.767	0.099	23.002	-0.002	0.005	39.319	0.061	102.783
6 / 1 .*	0.047	0.030	1.988	2.977	1.079	12.829	11.329	0.015	9.914	0.007	14.586	0.114	0.047	40.923	2.595	98.479
6 / 2 .*	0.097	0.013	1.972	2.996	1.005	13.097	11.320	0.020	9.488	0.017	13.794	0.115	0.005	41.832	2.599	98.371
6 / 3 .*	0.077	0.015	1.984	2.993	1.059	13.044	11.358	0.028	9.755	-0.094	13.936	0.140	-0.012	41.536	2.742	98.667
6 / 4 .*	0.058	0.009	2.000	2.771	0.910	13.474	12.005	0.015	9.217	0.037	12.173	0.150	-0.001	43.241	2.456	98.515
6 / 5 .	0.079	0.015	2.020	3.060	0.796	13.189	13.087	-0.004	8.894	0.002	11.823	0.131	-0.012	44.787	2.000	99.883
6 / 6 .	0.073	0.022	1.989	2.930	0.937	13.286	11.307	0.022	9.683	-0.039	13.651	0.140	0.020	42.067	2.550	98.678
6 / 7 .	0.151	0.034	1.951	2.926	0.948	13.503	11.338	0.021	9.580	0.047	13.033	0.145	0.011	42.578	2.622	98.889
6 / 8 .*	0.012	-0.011	2.113	2.189	0.079	13.361	20.156	0.052	5.579	-0.014	4.994	0.086	0.055	52.348	0.298	101.323
6 / 9 .*	-0.045	-0.003	2.139	2.828	0.018	12.721	19.580	0.029	5.625	-0.009	5.414	0.083	0.023	53.349	0.164	101.971
6 / 10 .*	0.016	0.002	2.127	2.599	0.012	12.845	20.268	0.040	5.662	-0.009	4.895	0.071	0.011	53.325	0.156	102.030
7 / 1 .	0.101	0.013	1.979	3.119	0.725	13.419	11.536	0.009	9.293	0.078	15.222	0.149	-0.020	41.322	1.649	98.614
7 / 2 .	0.148	0.013	1.951	3.068	0.752	13.261	11.575	0.000	9.479	0.114	15.316	0.164	-0.003	41.146	1.585	98.571
7 / 3 .	0.126	0.019	1.963	3.116	0.723	13.402	11.565	0.022	9.578	0.220	14.912	0.116	0.020	41.332	1.705	98.817
7 / 4 .	0.111	0.005	1.970	3.242	0.709	13.004	11.612	-0.004	9.867	0.118	15.194	0.153	-0.018	40.816	2.021	98.823
7 / 5 .	0.162	0.011	1.943	3.122	0.897	12.398	11.653	0.015	9.699	0.103	16.565	0.126	-0.005	40.045	2.102	98.842
7 / 6 .	0.081	0.007	1.988	3.156	0.836	12.645	11.551	0.011	9.624	0.083	16.121	0.117	0.007	40.258	2.417	98.901
7 / 7 .	0.128	0.014	1.976	3.218	0.699	13.358	11.461	-0.014	9.412	0.098	15.365	0.131	0.064	41.335	1.990	99.250
7 / 8 .	0.108	0.006	1.991	3.186	0.711	13.542	11.471	-0.004	8.927	0.165	16.243	0.111	-0.016	41.327	1.258	99.046
7 / 9 .	0.071	0.009	1.995	3.139	0.743	12.660	11.403	0.005	9.441	0.053	17.563	0.092	0.033	39.889	1.636	98.731
7 / 10 .	0.111	0.005	1.991	3.230	0.686	13.159	11.374	0.032	9.239	0.179	16.524	0.094	-0.018	41.002	1.680	99.307

5b Shear zone Amphibole
Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
8 / 1 .	0.078	0.012	2.001	2.965	0.742	13.501	11.883	0.047	9.740	0.079	16.667	0.053	-0.004	41.076	0.390	99.234
8 / 2 .	0.063	0.009	2.023	2.905	0.693	13.950	11.859	0.026	9.580	0.176	16.414	0.041	0.034	41.554	0.426	99.752
8 / 3 .	0.034	0.009	2.013	3.018	0.746	13.664	11.784	-0.006	9.683	0.033	16.688	-0.003	0.000	40.756	0.212	98.639
8 / 4 .	0.132	0.015	1.978	2.877	0.735	13.852	11.910	0.027	9.330	0.110	16.326	0.031	0.015	41.627	0.227	99.192
8 / 5 .	0.089	0.002	1.991	3.001	0.711	13.513	11.812	0.027	9.764	0.155	16.541	0.038	-0.004	41.055	0.225	98.923
8 / 6 .	0.102	0.001	1.978	3.145	0.798	13.001	11.767	0.011	9.327	0.094	17.964	0.045	0.013	39.783	0.543	98.573
8 / 7 .	0.073	0.002	1.992	3.036	0.659	13.981	11.966	0.025	9.477	-0.007	15.394	0.041	0.024	41.342	0.447	98.459
8 / 8 .	0.106	0.012	1.993	3.064	0.707	13.704	11.974	0.037	9.045	0.028	16.795	0.042	-0.010	41.055	0.688	99.253
8 / 9 .	0.075	0.012	2.001	3.058	0.763	13.200	11.896	-0.001	9.318	0.049	17.620	0.000	0.000	40.583	0.411	98.986
8 / 10 .	0.126	0.005	1.977	3.012	0.789	13.227	11.768	0.001	9.240	0.089	17.630	0.006	0.026	40.560	0.481	98.939
9 / 1 .	0.077	0.011	2.017	3.071	0.507	14.680	11.629	0.006	7.695	-0.049	16.428	0.047	0.021	42.262	0.078	98.531
9 / 2 .	0.132	0.008	1.987	3.223	0.571	14.441	11.755	0.004	7.690	-0.054	16.683	0.053	0.038	41.879	0.112	98.574
9 / 3 .	0.045	-0.006	2.208	3.346	0.513	0.746	11.760	-0.010	0.283	0.018	31.336	0.016	0.014	49.050	-0.007	99.335
9 / 4 .*	0.158	0.022	1.924	3.056	0.780	13.147	12.316	-0.005	8.023	0.084	18.461	0.031	0.016	39.078	0.112	97.208
9 / 5 .*	-0.036	-0.007	2.285	3.865	0.044	-0.005	13.198	-0.010	0.094	-0.003	31.827	0.029	0.026	50.496	-0.036	101.864
9 / 6 .*	-0.053	0.002	2.296	5.590	0.067	0.188	10.404	-0.011	0.170	-0.008	29.061	0.059	-0.008	53.831	-0.031	101.669
9 / 7 .*	-0.077	-0.005	2.318	6.699	0.059	0.022	8.361	-0.046	0.180	0.012	27.474	0.056	0.020	56.719	-0.042	101.920
9 / 8 .	0.076	0.003	2.035	3.249	0.578	14.641	11.525	-0.006	7.827	-0.029	17.210	0.083	0.017	42.031	0.128	99.402
9 / 9 .	0.058	0.001	2.191	4.874	0.280	4.770	10.537	-0.007	2.912	-0.060	25.467	0.040	0.043	49.639	0.087	100.899
9 / 10 .	0.093	0.008	2.007	3.164	0.523	14.511	11.542	-0.020	7.787	-0.029	16.825	0.052	0.010	41.842	0.164	98.529
10 / 1 .	0.047	0.018	2.007	3.444	0.661	14.201	11.219	0.007	8.336	0.047	15.716	0.067	0.023	41.424	0.923	98.140
10 / 2 .	0.083	0.014	1.994	3.452	0.641	14.286	11.220	0.032	8.377	0.017	15.789	0.039	0.011	41.456	0.952	98.364
10 / 3 .	0.061	0.021	2.025	3.079	0.484	15.582	11.173	0.029	7.703	-0.014	12.953	0.034	0.009	44.479	0.818	98.452
10 / 4 .	0.055	0.010	2.030	3.138	0.500	15.636	11.276	0.031	7.669	-0.014	13.040	0.056	0.032	44.262	0.748	98.483
10 / 5 .	0.094	0.015	2.003	3.165	0.469	15.620	11.229	0.020	7.610	-0.099	13.075	0.075	0.013	44.047	0.774	98.209
10 / 6 .	0.072	0.011	2.020	3.189	0.449	15.741	11.060	0.022	7.327	-0.024	12.973	0.064	0.013	44.516	0.676	98.135
10 / 7 .	0.055	0.015	2.025	3.184	0.429	15.619	10.954	0.000	7.751	-0.049	13.003	0.073	-0.028	44.304	0.763	98.174
10 / 8 .*	0.099	0.017	1.975	3.445	0.584	14.475	11.234	0.026	8.249	-0.054	15.169	0.062	0.013	41.601	0.826	97.777
10 / 9 .	0.119	0.022	1.960	3.537	0.699	13.852	11.227	0.046	8.612	0.097	16.384	0.050	-0.013	40.590	0.861	98.056
10 / 10 .*	0.068	0.028	1.980	3.493	0.726	13.781	11.393	0.031	8.717	-0.064	16.473	0.026	0.008	40.328	0.861	97.914

5b Orthogneiss Plagioclase
Date: 6/16/11 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
1 / 1 .	3.4758	0.0672	-0.0002	14.4138	0.0175	0.0598	0.0721	31.4685	51.4099	100.9845
1 / 2 .	4.3100	0.0563	-0.0100	12.5686	-0.0112	0.0411	0.0886	30.2867	53.4821	100.8334
1 / 3 .	4.2087	0.0619	-0.0077	12.8215	0.0175	0.0262	0.0253	30.5352	53.1881	100.8843
1 / 4 . *	4.4113	0.0801	-0.0015	12.3106	-0.0087	0.0648	0.0630	30.3831	53.7991	101.1119
1 / 5 . *	3.8138	0.0593	0.0024	13.5016	0.0000	0.0561	-0.0019	31.3585	52.4197	101.2114
1 / 6 . *	4.2284	0.0626	-0.0149	12.7661	-0.0025	0.0275	0.0283	30.7313	53.4899	101.3342
1 / 7 . *	2.6319	0.0312	-0.0030	15.8173	-0.0037	0.0648	0.0344	33.0186	49.6163	101.2146
1 / 8 . *	4.4787	0.0720	-0.0036	12.4952	-0.0212	0.0050	0.1113	30.4534	53.4548	101.0703
1 / 9 . *	5.4780	0.0825	-0.0171	10.7264	0.0012	0.0424	0.0629	28.9364	55.8096	101.1394
1 / 10 .	3.9599	0.0531	-0.0030	13.0648	-0.0025	0.0349	0.0314	30.9930	52.6730	100.8101
2 / 1 .	4.0530	0.0495	-0.0176	13.1057	-0.0012	0.0124	0.0529	30.7754	52.6347	100.6837
2 / 2 .	3.7364	0.0581	-0.0142	13.7619	0.0037	0.0535	0.0017	31.1340	51.9688	100.7182
2 / 3 .	3.3782	0.0323	-0.0085	14.1744	-0.0398	0.0659	0.0093	31.6306	51.1844	100.4750
2 / 4 .	4.1020	0.0600	-0.0135	12.9928	-0.0287	0.0149	0.0710	30.5345	52.5882	100.3634
2 / 5 .	3.3206	0.0500	-0.0142	14.2253	-0.0100	0.0025	0.0349	31.7353	51.1931	100.5618
2 / 6 .	3.5319	0.0480	-0.0091	14.0701	-0.0199	0.0124	0.0695	31.3299	51.2757	100.3376
2 / 7 .	4.2053	0.0632	0.0002	12.4223	-0.0037	0.0212	0.0695	30.9017	53.2023	100.8855
2 / 8 .	4.8182	0.0681	-0.0179	11.6742	-0.0212	-0.0062	-0.0013	29.7117	54.2950	100.5673
2 / 9 .	4.0550	0.0582	-0.0122	13.0044	-0.0274	-0.0025	0.1297	30.7916	52.7559	100.7948
2 / 10 .	5.1740	0.0662	-0.0055	11.0154	-0.0037	0.0037	0.0394	29.2080	55.3276	100.8343
3 / 1 .	2.3312	0.0390	0.0027	15.8840	0.0062	0.0533	0.0631	33.3298	48.6902	100.3992
3 / 2 . *	5.8776	0.1049	-0.0136	10.0908	0.0000	-0.0062	0.0450	28.2724	56.7771	101.1678
3 / 3 . *	3.6921	0.0553	-0.0083	12.4226	-0.0012	0.0459	0.0525	33.0594	52.0263	101.3540
3 / 4 . *	3.9574	0.0593	-0.0076	13.4366	0.0037	0.0112	0.1020	31.0864	52.5437	101.2003
3 / 5 .	2.9715	0.0432	-0.0050	14.8026	0.0025	0.0421	0.0270	32.3453	50.4792	100.7133
3 / 6 . *	4.4135	0.0747	-0.0104	12.6123	0.0248	0.0050	0.0600	30.3442	53.8612	101.3955
3 / 7 .	4.7907	0.0848	-0.0066	10.5466	0.0062	0.0149	0.0135	31.1599	53.9884	100.6050
3 / 8 .	3.8751	0.0513	-0.0109	13.4430	0.0074	0.0012	-0.0090	31.2567	52.3570	100.9919
3 / 9 . *	3.8828	0.0535	-0.0083	12.9363	0.0037	0.0273	0.0210	31.9981	52.5781	101.5007
3 / 10 .	4.7496	0.0792	-0.0114	10.9283	-0.0025	0.0682	0.0794	31.2777	53.6470	100.8294
4 / 1 . *	4.6562	0.0698	-0.0265	12.3181	-0.0112	0.0473	0.0596	30.4412	53.5579	101.1500
4 / 2 . *	4.5086	0.0660	-0.0099	12.3725	0.0062	0.0535	0.0325	30.4032	53.8281	101.2706
4 / 3 .	4.8750	0.0825	-0.0006	11.7079	-0.0336	0.0411	0.0115	29.7373	54.3241	100.7793
4 / 4 .	4.3358	0.0904	0.0045	12.3097	-0.0125	0.0510	-0.0186	30.3768	53.6770	100.8453
4 / 5 . *	3.7025	0.0668	-0.0078	13.7323	-0.0012	0.0473	0.0476	31.5261	52.1546	101.2772
4 / 6 . *	6.4646	0.1072	-0.0043	9.0973	-0.0199	0.0224	0.0250	27.3409	58.1544	101.2117

5b Orthogneiss Plagioclase
Date: 6/16/11 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
4 / 7 . *	2.8088	0.0491	0.0098	13.3987	0.0012	0.2177	0.0145	35.7435	49.7429	101.9863
4 / 8 . *	4.0789	0.1014	-0.0068	12.7603	0.0000	0.0796	0.0190	31.0435	52.9717	101.0543
4 / 9 . *	5.0943	0.0914	-0.0001	11.2108	0.0025	0.0486	0.0175	29.5263	55.3989	101.3902
4 / 10 . *	3.8119	0.0653	-0.0075	9.4661	-0.0212	0.0373	0.0220	36.5953	51.3191	101.3170
5 / 1 .	4.6267	0.0736	0.4407	11.4799	0.0211	0.8606	0.0002	29.5296	53.9594	100.9919
5 / 2 .	3.8158	0.0612	1.1888	12.3751	0.0410	0.9483	0.0557	29.7964	51.7300	100.0123
5 / 3 .	5.0680	0.0814	0.7835	10.6556	0.0509	0.7550	0.0092	28.6265	54.7118	100.7419
5 / 4 .	5.1337	0.9736	0.1143	9.6680	0.0224	0.2957	0.0347	28.9520	55.2521	100.4465
5 / 5 .	4.9430	0.6016	0.0208	10.2682	0.0162	0.1516	0.0092	29.3673	55.1601	100.5380
5 / 6 . *	3.6623	0.2269	-0.0079	7.6268	0.0261	0.1777	0.0167	37.9843	52.0656	101.7865
5 / 7 .	3.8010	0.0590	-0.0116	13.8063	0.0385	0.1912	-0.0433	31.3804	50.9906	100.2669
5 / 8 . *	3.6528	0.0497	-0.0203	13.0213	0.0572	0.0969	-0.0043	32.7609	52.0353	101.6740
5 / 9 .	6.3112	0.0989	-0.0087	9.1745	0.0361	0.0783	-0.0418	27.4854	57.7539	100.9384
5 / 10 . *	4.8455	0.0858	-0.0184	11.9764	0.0261	0.1143	0.0107	30.0540	54.5040	101.6167
6 / 1 . *	4.3445	0.0590	-0.0040	12.5195	-0.0125	0.0513	0.0815	30.6358	53.3563	101.0479
6 / 2 .	3.5691	0.0438	-0.0105	13.8830	0.0100	0.0188	0.0998	31.3288	51.5125	100.4657
6 / 3 . *	4.0392	0.0607	-0.0102	13.1843	0.0175	0.0013	0.0770	31.0105	54.0764	102.4668
6 / 4 . *	4.5141	0.0637	-0.0120	11.1789	0.0175	0.0363	0.0149	31.4830	53.9908	101.2993
6 / 5 .	4.3179	0.0754	-0.0165	12.7251	0.0301	0.0050	0.0664	30.4880	53.2881	100.9959
6 / 6 . *	5.3341	0.0909	-0.0150	10.9097	0.0226	0.0200	0.0618	28.9914	55.8548	101.2853
6 / 7 .	2.7739	0.0366	-0.0063	15.4048	0.0063	0.0525	0.0968	32.7538	49.6520	100.7767
6 / 8 . *	3.6476	0.0494	-0.0051	13.6253	0.0263	0.0288	0.0967	31.4059	52.9032	101.7831
6 / 9 .	3.8119	0.0473	-0.0190	13.5712	0.0038	0.0401	0.0740	31.2785	52.1379	100.9647
6 / 10 .	2.4850	0.0349	-0.0148	15.5910	0.0213	0.0113	0.0756	32.9609	49.1199	100.2997
7 / 1 .	5.5559	0.1016	-0.0160	10.6481	-0.0012	0.0386	-0.0164	28.7491	55.6740	100.7673
7 / 2 . *	4.9343	0.0839	-0.0123	11.7327	0.0212	0.0523	0.0513	29.5870	54.5958	101.0585
7 / 3 . *	4.2356	0.0600	-0.0086	12.6939	0.0112	0.0299	0.0423	30.7946	53.1594	101.0268
7 / 4 .	4.1958	0.0760	0.0014	12.6213	0.0187	0.0349	0.0438	30.4605	52.6749	100.1272
7 / 5 . *	1.9341	3.1988	2.5650	7.2739	0.0770	1.4777	0.0855	32.3674	47.7621	96.7416
7 / 6 .	5.5758	0.1095	-0.0097	10.2474	-0.0037	0.0050	-0.0240	28.4419	56.4414	100.8210
7 / 7 .	6.0079	0.1071	-0.0137	9.6812	-0.0212	0.0586	0.0723	28.1598	56.8910	100.9779
7 / 8 . *	6.6776	0.1116	-0.0046	8.6739	0.0150	0.0062	0.0317	27.0797	58.4661	101.0617
7 / 9 . *	4.2240	0.0705	-0.0097	12.6066	0.0075	0.0187	0.0092	30.6400	53.4434	101.0197
7 / 10 .	4.5199	0.0789	-0.0022	12.2258	0.0037	0.0299	-0.0119	30.0082	53.7928	100.6592
8 / 1 .	5.0046	0.0874	-0.0078	10.6834	-0.0201	0.1628	0.0671	30.2173	53.8196	100.0422
8 / 2 .	4.5832	0.0696	0.0067	12.1764	-0.0150	0.1641	0.0415	29.8693	54.0781	100.9888

5b Orthogneiss Plagioclase
Date: 6/16/11 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
8 / 3 . *	6.0284	0.0958	-0.0100	9.6296	-0.0025	0.1078	0.0505	27.9764	57.3765	101.2650
8 / 4 . *	4.2912	0.1548	0.0020	9.3477	-0.0150	0.1416	0.0716	33.9236	53.0904	101.0229
8 / 5 .	5.9325	0.1079	-0.0136	9.1865	-0.0150	0.0927	0.0686	28.5682	56.5504	100.5068
8 / 6 .	6.3192	0.1214	-0.0108	9.0869	-0.0176	0.1128	0.0656	27.6472	57.3933	100.7465
8 / 7 .	5.4241	0.0994	-0.0089	10.6472	-0.0100	0.1228	0.0233	28.7194	55.4336	100.4697
8 / 8 .	5.4763	0.1093	0.0021	10.4229	0.0088	0.1115	0.0202	28.4801	55.6575	100.2887
8 / 9 . *	4.5654	0.0605	0.0101	11.8253	-0.0476	0.1490	0.0324	29.6640	54.7311	101.0377
8 / 10 .	5.3631	0.1025	-0.0115	10.9323	0.0138	0.1629	0.0460	28.6777	55.0430	100.3412
9 / 1 . *	4.1056	0.0623	-0.0038	13.0186	0.0199	0.0609	0.0113	30.7355	53.0212	101.0352
9 / 2 .	5.3154	0.0773	-0.0095	10.6290	0.0286	0.0510	0.0353	29.1840	54.5391	99.8597
9 / 3 . *	4.2770	0.0863	-0.0023	12.8048	0.0087	0.0807	0.0128	30.6053	53.4251	101.3007
9 / 4 . *	3.6363	0.0584	-0.0100	13.7797	0.0211	0.0311	-0.0112	31.3115	52.2807	101.1186
9 / 5 .	3.7432	0.0497	-0.0028	13.7344	0.0348	0.0435	-0.0608	31.4800	51.8728	100.9584
9 / 6 .	5.3091	0.0734	0.0285	10.7159	0.0398	0.0348	-0.0052	29.1791	54.7632	100.1439
9 / 7 . *	6.4231	0.0934	-0.0049	9.1497	0.0124	0.0448	-0.0082	27.3646	57.9773	101.0653
9 / 8 .	3.5333	0.0514	-0.0074	13.9835	-0.0062	0.0373	-0.0232	31.5400	51.7245	100.8700
9 / 9 .	2.9164	0.0561	-0.0092	14.7901	-0.0037	0.0521	-0.0338	32.1925	50.3904	100.3977
9 / 10 .	2.9055	0.0482	-0.0028	14.8037	0.0298	0.0298	0.0038	32.1922	50.5289	100.5420
10 / 1 .	2.5668	0.0342	0.0000	15.4552	-0.0326	0.0175	-0.0175	32.8509	49.3178	100.2423
10 / 2 . *	3.5470	0.0455	-0.0142	13.9924	-0.0200	0.0338	0.0310	31.3608	52.0463	101.0567
10 / 3 .	5.4415	0.0793	-0.0136	10.8340	-0.0464	0.0276	0.0627	28.8072	55.6997	100.9519
10 / 4 .	4.6516	0.0752	-0.0005	12.1456	-0.0163	0.0238	0.0174	29.7148	54.1637	100.7921
10 / 5 .	5.0819	0.0919	-0.0260	11.0824	-0.0226	0.0276	-0.0175	29.0320	55.0049	100.3207
10 / 6 .	4.1530	0.0491	-0.0039	12.9359	-0.0175	0.0275	-0.0553	30.5245	52.7836	100.4737
10 / 7 .	4.0246	0.0669	0.0026	13.2578	-0.0150	0.0313	0.0810	30.8857	52.4901	100.8399
10 / 8 .	2.8302	0.0318	0.0087	15.0088	-0.0150	0.0601	-0.0372	32.4385	49.9053	100.2835
10 / 9 .	3.3386	0.0329	-0.0065	14.2474	-0.0113	0.0300	-0.0023	31.6420	50.9851	100.2760
10 / 10 .	3.8352	0.0550	-0.0039	13.4262	-0.0163	0.0613	0.0340	30.8197	52.1182	100.3496

5b Shear zone Amphibole
Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	0.077	-0.007	2.047	2.206	0.198	13.421	18.217	0.012	6.030	0.028	8.769	0.025	-0.013	48.464	0.401	99.896
1 / 2 .	0.164	0.004	1.941	3.083	0.591	13.899	11.746	0.056	9.243	-0.013	15.287	0.067	0.010	41.156	0.878	98.124
1 / 3 .	0.043	0.001	2.102	2.594	0.018	11.991	20.576	0.046	4.762	-0.070	8.429	0.040	-0.009	50.511	0.306	101.418
1 / 4 .	0.022	-0.011	2.127	3.422	0.000	10.999	19.536	0.046	4.217	-0.018	9.631	0.041	0.031	51.097	0.314	101.485
1 / 5 .	0.043	-0.015	2.130	4.059	-0.004	10.616	18.463	0.046	4.329	-0.008	10.066	-0.021	0.000	51.855	0.200	101.808
1 / 6 .	0.025	-0.008	2.130	3.912	-0.008	10.691	18.727	0.044	4.267	-0.044	10.079	0.027	0.037	51.343	0.227	101.509
1 / 7 .	0.024	-0.005	2.129	3.656	-0.003	10.736	19.099	0.025	4.404	-0.070	10.266	0.045	0.010	50.974	0.213	101.580
1 / 8 .	0.031	-0.007	2.127	3.700	0.000	10.758	19.108	0.045	4.166	-0.034	10.111	0.013	0.018	51.196	0.269	101.541
1 / 9 .	0.046	-0.007	2.094	1.406	0.008	13.840	22.280	0.054	4.770	-0.080	4.982	0.049	0.031	51.659	0.174	101.394
1 / 10 .	0.059	-0.007	2.104	1.276	-0.003	14.773	22.870	0.046	4.546	-0.003	3.071	0.005	-0.009	53.215	0.098	102.063
2 / 1 .	-0.056	-0.008	2.139	1.599	0.217	19.576	11.558	0.051	6.032	0.008	5.964	0.025	0.001	52.460	0.149	99.777
2 / 2 .	0.000	0.009	2.123	1.657	0.194	19.352	11.573	0.005	6.091	-0.012	6.181	0.047	-0.024	51.912	0.138	99.284
2 / 3 .	-0.020	-0.009	2.121	1.769	0.217	19.083	11.519	0.027	6.105	-0.068	6.846	0.009	-0.018	51.311	0.120	99.128
2 / 4 .	0.004	0.004	2.115	1.822	0.243	18.952	11.387	0.010	6.409	0.023	7.007	0.006	0.015	51.043	0.177	99.218
2 / 5 .	0.014	0.003	2.107	1.981	0.249	18.551	11.191	0.034	6.664	-0.002	7.517	0.028	0.003	50.672	0.156	99.172
2 / 6 .	0.035	0.009	2.101	1.947	0.251	18.684	11.255	0.006	6.521	-0.007	7.231	0.009	-0.001	51.090	0.164	99.304
2 / 7 .	-0.006	0.002	2.122	1.939	0.281	18.692	11.365	0.021	6.427	-0.007	7.401	0.016	0.041	50.964	0.161	99.431
2 / 8 .	0.052	0.024	2.074	1.939	0.308	18.318	11.173	0.017	6.600	0.125	7.594	0.042	-0.010	50.405	0.205	98.876
2 / 9 .	0.017	0.014	2.114	1.974	0.294	18.622	11.197	-0.009	6.557	-0.007	7.721	0.027	-0.046	50.921	0.133	99.590
2 / 10 .	-0.002	0.001	2.120	1.935	0.276	18.701	11.358	0.036	6.407	-0.002	7.579	0.008	0.030	50.739	0.148	99.338
3 / 1 .	0.027	0.001	2.052	2.972	0.550	14.638	11.494	0.012	9.218	-0.042	12.110	0.094	-0.076	44.072	2.479	99.721
3 / 2 .	0.042	0.008	2.028	2.989	0.561	14.485	11.604	0.033	9.410	-0.002	12.537	0.057	-0.036	43.522	1.929	99.208
3 / 3 .	-0.004	0.014	2.050	2.985	0.550	14.388	11.396	0.012	9.291	-0.037	12.333	0.091	-0.061	43.731	2.285	99.125
3 / 4 .	0.000	0.007	2.043	3.005	0.506	14.306	11.354	0.020	9.399	0.033	12.379	0.060	-0.050	43.434	2.276	98.822
3 / 5 .	-0.012	0.008	2.050	3.026	0.522	14.515	11.424	0.042	9.400	0.048	12.285	0.076	-0.059	43.534	2.304	99.235
3 / 6 .	0.052	0.008	2.016	3.034	0.505	14.324	11.334	0.018	9.393	-0.007	12.310	0.082	-0.076	43.551	2.092	98.718
3 / 7 .	0.036	0.017	2.026	3.001	0.482	14.423	11.484	0.023	9.394	0.043	12.699	0.073	-0.042	43.281	2.085	99.066
3 / 8 .	0.042	0.003	2.020	3.094	0.564	14.114	11.360	0.012	9.493	0.043	13.202	0.054	-0.061	42.853	1.938	98.793
3 / 9 .	0.028	0.009	2.016	3.086	0.522	14.225	11.441	-0.002	9.402	-0.032	12.927	0.062	-0.074	42.712	1.924	98.352
3 / 10 .	0.032	0.014	2.018	3.049	0.543	14.086	11.515	0.046	9.567	0.148	12.976	0.118	-0.031	42.853	1.828	98.793
4 / 1 .	0.042	0.015	2.057	2.036	0.398	17.380	10.972	0.027	8.206	0.017	7.683	0.047	0.002	49.389	0.290	98.561
4 / 2 .	0.037	0.015	2.067	1.966	0.395	17.626	11.162	0.019	8.146	0.017	7.442	0.064	-0.013	49.658	0.290	98.904
4 / 3 .	0.019	0.010	2.096	1.780	0.319	18.438	11.466	0.015	7.896	0.063	6.362	0.024	0.037	50.866	0.217	99.608
4 / 4 .	-0.012	0.003	2.107	1.531	0.269	18.485	11.404	0.055	7.671	-0.008	5.760	0.024	0.010	51.607	0.236	99.161
4 / 5 .	0.049	0.014	2.095	1.375	0.210	18.675	11.053	0.031	7.231	0.058	6.837	0.038	0.004	51.557	0.249	99.477

5b Shear zone Amphibole
Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 6 .	0.084	0.023	2.015	2.894	0.710	14.659	11.429	0.042	9.914	0.098	13.268	0.064	0.016	44.091	0.503	99.810
4 / 7 .	0.055	0.027	1.997	2.963	0.768	14.181	11.448	0.036	10.170	0.078	13.997	0.056	0.031	42.441	0.479	98.727
4 / 8 .	0.112	0.029	1.968	2.963	0.773	13.990	11.279	0.031	10.354	-0.008	14.255	0.070	0.019	42.426	0.440	98.709
4 / 9 .	0.019	0.024	2.033	2.920	0.759	13.956	11.368	0.020	10.284	0.063	14.299	0.070	0.023	43.047	0.471	99.355
4 / 10 .	0.039	0.019	2.004	3.006	0.721	14.195	11.163	0.026	9.890	0.108	13.868	0.061	0.040	42.723	0.430	98.293
5 / 1 .*	0.062	-0.002	2.046	0.006	0.003	9.480	8.011	0.514	19.765	-0.040	22.960	0.030	0.049	39.424	0.038	102.389
5 / 2 .*	0.078	0.002	2.043	-0.012	0.005	9.482	7.993	0.436	19.889	0.084	23.111	0.012	0.025	39.531	0.035	102.727
5 / 3 .*	0.070	-0.005	2.042	0.017	0.005	8.966	8.855	0.419	19.524	0.059	23.110	0.014	-0.002	39.408	0.025	102.515
5 / 4 .*	0.070	-0.002	2.049	0.005	-0.001	9.861	7.370	0.486	19.889	0.114	23.156	-0.002	0.010	39.560	0.018	102.588
5 / 5 .	0.101	0.001	2.016	0.003	0.000	9.063	8.803	0.455	19.344	0.035	22.861	-0.006	0.007	39.255	0.005	101.948
5 / 6 .	0.069	-0.006	2.034	-0.004	0.012	8.989	9.040	0.405	19.104	0.059	23.000	0.035	0.038	39.233	0.005	102.023
5 / 7 .*	0.106	0.002	2.016	-0.010	0.010	8.198	10.850	0.447	18.467	-0.005	22.945	0.024	-0.008	39.182	0.066	102.315
5 / 8 .*	0.059	0.006	2.041	-0.001	0.004	8.079	11.326	0.373	18.388	0.030	22.915	0.008	0.012	39.158	0.106	102.505
5 / 9 .*	0.059	0.013	2.039	-0.009	0.001	8.230	10.962	0.353	18.091	-0.010	22.985	0.020	0.009	39.340	0.084	102.186
5 / 10 .*	0.099	-0.008	2.029	-0.010	0.006	8.418	10.619	0.360	18.767	0.099	23.002	-0.002	0.005	39.319	0.061	102.783
6 / 1 .*	0.047	0.030	1.988	2.977	1.079	12.829	11.329	0.015	9.914	0.007	14.586	0.114	0.047	40.923	2.595	98.479
6 / 2 .*	0.097	0.013	1.972	2.996	1.005	13.097	11.320	0.020	9.488	0.017	13.794	0.115	0.005	41.832	2.599	98.371
6 / 3 .*	0.077	0.015	1.984	2.993	1.059	13.044	11.358	0.028	9.755	-0.094	13.936	0.140	-0.012	41.536	2.742	98.667
6 / 4 .*	0.058	0.009	2.000	2.771	0.910	13.474	12.005	0.015	9.217	0.037	12.173	0.150	-0.001	43.241	2.456	98.515
6 / 5 .	0.079	0.015	2.020	3.060	0.796	13.189	13.087	-0.004	8.894	0.002	11.823	0.131	-0.012	44.787	2.000	99.883
6 / 6 .	0.073	0.022	1.989	2.930	0.937	13.286	11.307	0.022	9.683	-0.039	13.651	0.140	0.020	42.067	2.550	98.678
6 / 7 .	0.151	0.034	1.951	2.926	0.948	13.503	11.338	0.021	9.580	0.047	13.033	0.145	0.011	42.578	2.622	98.889
6 / 8 .*	0.012	-0.011	2.113	2.189	0.079	13.361	20.156	0.052	5.579	-0.014	4.994	0.086	0.055	52.348	0.298	101.323
6 / 9 .*	-0.045	-0.003	2.139	2.828	0.018	12.721	19.580	0.029	5.625	-0.009	5.414	0.083	0.023	53.349	0.164	101.971
6 / 10 .*	0.016	0.002	2.127	2.599	0.012	12.845	20.268	0.040	5.662	-0.009	4.895	0.071	0.011	53.325	0.156	102.030
7 / 1 .	0.101	0.013	1.979	3.119	0.725	13.419	11.536	0.009	9.293	0.078	15.222	0.149	-0.020	41.322	1.649	98.614
7 / 2 .	0.148	0.013	1.951	3.068	0.752	13.261	11.575	0.000	9.479	0.114	15.316	0.164	-0.003	41.146	1.585	98.571
7 / 3 .	0.126	0.019	1.963	3.116	0.723	13.402	11.565	0.022	9.578	0.220	14.912	0.116	0.020	41.332	1.705	98.817
7 / 4 .	0.111	0.005	1.970	3.242	0.709	13.004	11.612	-0.004	9.867	0.118	15.194	0.153	-0.018	40.816	2.021	98.823
7 / 5 .	0.162	0.011	1.943	3.122	0.897	12.398	11.653	0.015	9.699	0.103	16.565	0.126	-0.005	40.045	2.102	98.842
7 / 6 .	0.081	0.007	1.988	3.156	0.836	12.645	11.551	0.011	9.624	0.083	16.121	0.117	0.007	40.258	2.417	98.901
7 / 7 .	0.128	0.014	1.976	3.218	0.699	13.358	11.461	-0.014	9.412	0.098	15.365	0.131	0.064	41.335	1.990	99.250
7 / 8 .	0.108	0.006	1.991	3.186	0.711	13.542	11.471	-0.004	8.927	0.165	16.243	0.111	-0.016	41.327	1.258	99.046
7 / 9 .	0.071	0.009	1.995	3.139	0.743	12.660	11.403	0.005	9.441	0.053	17.563	0.092	0.033	39.889	1.636	98.731
7 / 10 .	0.111	0.005	1.991	3.230	0.686	13.159	11.374	0.032	9.239	0.179	16.524	0.094	-0.018	41.002	1.680	99.307

5b Shear zone Amphibole

Date: 6/16/11 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
8 / 1 .	0.078	0.012	2.001	2.965	0.742	13.501	11.883	0.047	9.740	0.079	16.667	0.053	-0.004	41.076	0.390	99.234
8 / 2 .	0.063	0.009	2.023	2.905	0.693	13.950	11.859	0.026	9.580	0.176	16.414	0.041	0.034	41.554	0.426	99.752
8 / 3 .	0.034	0.009	2.013	3.018	0.746	13.664	11.784	-0.006	9.683	0.033	16.688	-0.003	0.000	40.756	0.212	98.639
8 / 4 .	0.132	0.015	1.978	2.877	0.735	13.852	11.910	0.027	9.330	0.110	16.326	0.031	0.015	41.627	0.227	99.192
8 / 5 .	0.089	0.002	1.991	3.001	0.711	13.513	11.812	0.027	9.764	0.155	16.541	0.038	-0.004	41.055	0.225	98.923
8 / 6 .	0.102	0.001	1.978	3.145	0.798	13.001	11.767	0.011	9.327	0.094	17.964	0.045	0.013	39.783	0.543	98.573
8 / 7 .	0.073	0.002	1.992	3.036	0.659	13.981	11.966	0.025	9.477	-0.007	15.394	0.041	0.024	41.342	0.447	98.459
8 / 8 .	0.106	0.012	1.993	3.064	0.707	13.704	11.974	0.037	9.045	0.028	16.795	0.042	-0.010	41.055	0.688	99.253
8 / 9 .	0.075	0.012	2.001	3.058	0.763	13.200	11.896	-0.001	9.318	0.049	17.620	0.000	0.000	40.583	0.411	98.986
8 / 10 .	0.126	0.005	1.977	3.012	0.789	13.227	11.768	0.001	9.240	0.089	17.630	0.006	0.026	40.560	0.481	98.939
9 / 1 .	0.077	0.011	2.017	3.071	0.507	14.680	11.629	0.006	7.695	-0.049	16.428	0.047	0.021	42.262	0.078	98.531
9 / 2 .	0.132	0.008	1.987	3.223	0.571	14.441	11.755	0.004	7.690	-0.054	16.683	0.053	0.038	41.879	0.112	98.574
9 / 3 .	0.045	-0.006	2.208	3.346	0.513	0.746	11.760	-0.010	0.283	0.018	31.336	0.016	0.014	49.050	-0.007	99.335
9 / 4 .*	0.158	0.022	1.924	3.056	0.780	13.147	12.316	-0.005	8.023	0.084	18.461	0.031	0.016	39.078	0.112	97.208
9 / 5 .*	-0.036	-0.007	2.285	3.865	0.044	-0.005	13.198	-0.010	0.094	-0.003	31.827	0.029	0.026	50.496	-0.036	101.864
9 / 6 .*	-0.053	0.002	2.296	5.590	0.067	0.188	10.404	-0.011	0.170	-0.008	29.061	0.059	-0.008	53.831	-0.031	101.669
9 / 7 .*	-0.077	-0.005	2.318	6.699	0.059	0.022	8.361	-0.046	0.180	0.012	27.474	0.056	0.020	56.719	-0.042	101.920
9 / 8 .	0.076	0.003	2.035	3.249	0.578	14.641	11.525	-0.006	7.827	-0.029	17.210	0.083	0.017	42.031	0.128	99.402
9 / 9 .	0.058	0.001	2.191	4.874	0.280	4.770	10.537	-0.007	2.912	-0.060	25.467	0.040	0.043	49.639	0.087	100.899
9 / 10 .	0.093	0.008	2.007	3.164	0.523	14.511	11.542	-0.020	7.787	-0.029	16.825	0.052	0.010	41.842	0.164	98.529
10 / 1 .	0.047	0.018	2.007	3.444	0.661	14.201	11.219	0.007	8.336	0.047	15.716	0.067	0.023	41.424	0.923	98.140
10 / 2 .	0.083	0.014	1.994	3.452	0.641	14.286	11.220	0.032	8.377	0.017	15.789	0.039	0.011	41.456	0.952	98.364
10 / 3 .	0.061	0.021	2.025	3.079	0.484	15.582	11.173	0.029	7.703	-0.014	12.953	0.034	0.009	44.479	0.818	98.452
10 / 4 .	0.055	0.010	2.030	3.138	0.500	15.636	11.276	0.031	7.669	-0.014	13.040	0.056	0.032	44.262	0.748	98.483
10 / 5 .	0.094	0.015	2.003	3.165	0.469	15.620	11.229	0.020	7.610	-0.099	13.075	0.075	0.013	44.047	0.774	98.209
10 / 6 .	0.072	0.011	2.020	3.189	0.449	15.741	11.060	0.022	7.327	-0.024	12.973	0.064	0.013	44.516	0.676	98.135
10 / 7 .	0.055	0.015	2.025	3.184	0.429	15.619	10.954	0.000	7.751	-0.049	13.003	0.073	-0.028	44.304	0.763	98.174
10 / 8 .*	0.099	0.017	1.975	3.445	0.584	14.475	11.234	0.026	8.249	-0.054	15.169	0.062	0.013	41.601	0.826	97.777
10 / 9 .	0.119	0.022	1.960	3.537	0.699	13.852	11.227	0.046	8.612	0.097	16.384	0.050	-0.013	40.590	0.861	98.056
10 / 10 .*	0.068	0.028	1.980	3.493	0.726	13.781	11.393	0.031	8.717	-0.064	16.473	0.026	0.008	40.328	0.861	97.914

9a1 Leucogabbro Garnet
Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
1 / 1 .	0.010745	5.194534	7.286493	1.18006	27.27595	21.26255	-0.019232	38.40564	0.040972	100.657
1 / 2 .	0.016249	5.158761	7.359501	1.191693	27.42443	21.36631	0.017998	38.28852	-0.000939	100.8234
1 / 3 .	0.029695	5.132739	7.25428	1.131415	27.22568	21.27149	0.012689	38.49231	0.033582	100.5839
1 / 4 .	0.012269	5.080626	7.319621	1.147536	27.61744	21.36301	0.015339	38.27638	-0.03544	100.8322
1 / 5 .	0.011734	5.168352	7.354541	1.162643	27.1537	21.45459	-0.003274	38.3102	0.018793	100.6345
1 / 6 . *	0.023263	5.170828	7.707087	1.079898	27.60857	21.10821	0.023295	38.41599	0.013855	101.151
1 / 7 .	0.039185	5.046068	7.808404	1.084179	27.10467	20.91459	-0.027181	38.51303	0.08297	100.5931
1 / 8 .	0.016188	5.120948	7.700193	1.039182	27.01786	21.48196	-0.019227	38.62383	0.023746	101.0239
1 / 9 .	0.009231	5.180948	7.612061	1.059245	27.0542	21.45415	-0.021883	38.20543	0.041013	100.6163
1 / 10 . *	0.026172	5.135175	7.603759	1.025797	27.17705	21.43334	0.002045	38.51572	0.119966	101.039
2 / 1 .	0.020258	5.269937	7.783639	0.643605	27.17127	20.81507	-0.02938	38.43113	0.034261	100.1692
2 / 2 .	-0.004089	5.349648	7.549328	0.553646	27.16037	21.24197	-0.000204	38.27137	0.046601	100.1729
2 / 3 .	0.015809	5.259249	7.710928	0.628102	27.3851	21.00923	0.02367	38.15752	0.024399	100.214
2 / 4 .	0.016779	5.280606	7.460835	0.67457	27.17437	21.14588	0.002451	38.239	0.026863	100.0213
2 / 5 .	0.014785	5.281601	7.57708	0.661349	27.27013	21.29168	0.00245	38.3445	0.044101	100.4877
2 / 6 .	-0.009072	5.338916	7.492275	0.64848	27.36942	21.15797	0.021036	38.16383	0.036719	100.2286
2 / 7 .	0.026236	5.408942	7.477468	0.701872	27.44543	21.26097	-0.005515	38.41687	0.021934	100.7597
2 / 8 .	0.01782	5.387386	7.464143	0.643444	27.80248	21.28501	0.023687	38.29932	0.012076	100.9354
2 / 9 .	0.016317	5.317165	7.562103	0.625682	27.60225	21.11947	0.015718	38.26572	0.056408	100.5808
2 / 10 .	0.022783	5.332455	7.39285	0.644552	27.60553	21.07769	-0.018788	38.40791	0.009613	100.4934
3 / 1 .	0.027324	4.976233	8.716249	1.103539	26.08076	21.33314	0.003054	37.96402	0.112966	100.3173
3 / 2 .	0.021484	4.927256	8.446382	1.306036	26.38601	21.02328	0.0057	37.4952	0.028998	99.64034
3 / 3 .	0.023897	4.963722	8.580278	1.172402	26.08545	21.11099	-0.028713	37.69107	0.041366	99.66917
3 / 4 .	-0.00041	4.968091	8.253695	1.169698	26.79812	21.29652	0.018956	37.96587	0.073391	100.5443
3 / 5 .	0.017983	5.340231	7.490303	1.200813	26.99951	21.49187	-0.018169	38.11884	-0.000586	100.6595
3 / 6 .	0.12142	5.191272	7.521004	1.278323	26.56804	21.41378	0.034915	38.82698	0.026507	100.9822
3 / 7 .	0.141766	5.146043	7.487936	1.223753	26.64041	21.54028	0.01634	38.72803	0.001877	100.9264
3 / 8 .	0.011041	5.465891	6.876849	1.269844	27.28636	21.44555	0.005721	38.12467	0.07562	100.5615
3 / 9 .	0.012092	5.441504	6.800595	1.359452	27.81643	20.93593	-0.034108	38.34789	0.100122	100.814
3 / 10 . *	0.16884	3.24767	4.852422	0.765467	19.51339	14.74491	-0.021339	50.19307	0.041887	93.52764
4 / 1 .	0.003101	20.52657	0.493544	0.517805	25.08284	1.189926	0.005042	51.73835	-0.011873	99.55718
4 / 2 .	0.033303	20.6213	0.19509	0.591652	25.24819	1.195975	0.021436	51.85324	-0.021728	99.76018
4 / 3 . *	0.110571	20.17605	1.90361	0.51873	24.04228	1.466853	-0.000419	50.30724	0.035147	98.56049

9a1 Leucogabbro Garnet
Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
4 / 4 .	0.004548	20.40005	0.257799	0.523584	25.49615	1.233234	0.018707	52.18819	-0.011865	100.1223
4 / 5 .	0.001673	20.16491	0.218051	0.573345	25.7137	1.136054	0.048663	51.73657	0.475989	100.069
4 / 6 .	0.001184	20.46322	0.248785	0.588163	25.24797	1.142244	0.037831	52.30366	-0.019267	100.0331
4 / 7 .	0.002148	20.43797	0.20968	0.62381	25.56541	1.204958	0.029625	52.26133	0.044852	100.3798
4 / 8 .	-0.008904	20.39496	0.238171	0.590269	25.53511	1.279903	0.037812	51.85971	0.015262	99.9512
4 / 9 .	0.007432	20.34374	0.23523	0.566511	25.48884	1.358717	0.03236	51.86215	-0.021726	99.89498
4 / 10 .	0.005988	20.35225	0.219123	0.604839	25.41393	1.401314	0.04056	51.96347	0.017735	100.0192
5 / 1 .	-0.006969	5.002729	8.626729	0.860302	26.2901	21.42453	-0.037162	38.32992	-0.006245	100.5343
5 / 2 .	-0.002501	4.903235	9.3096	0.805462	25.78226	21.32595	0.000013	38.60425	0.025979	100.7568
5 / 3 . *	0.005905	5.14286	8.747762	0.821915	26.06115	21.47124	-0.053136	38.73824	0.013569	101.0026
5 / 4 . *	0.252024	7.211676	11.91499	0.658572	21.61504	16.34816	-0.023848	40.55847	0.021247	98.58018
5 / 5 . *	-0.013892	5.029957	8.898798	0.820462	26.19251	21.3886	-0.042477	38.75248	0.035859	101.1187
5 / 6 .	0.017202	5.323048	7.369045	0.876315	25.39014	20.05761	-0.026708	40.8564	0.021	99.91075
5 / 7 .	-0.01935	4.961174	8.815921	0.825252	26.18615	21.44499	-0.01859	38.56398	-0.008728	100.7975
5 / 8 . *	0.423611	8.779742	14.80902	0.504747	15.56188	11.04594	-0.007985	46.65831	0.016505	97.79976
5 / 9 . *	0.032506	5.515124	9.275287	0.789365	25.70015	20.62576	-0.013283	39.80135	0.023519	101.7631
5 / 10 . *	0.008907	5.278734	8.27494	0.787498	26.83773	21.31587	-0.002658	38.83974	0.030853	101.3743
6 / 1 . *	0.030343	4.533782	9.343721	0.675192	26.27882	21.41632	-0.019012	38.69955	0.056295	101.034
6 / 2 .	0.040267	4.756156	9.148987	0.640605	26.09082	21.14259	-0.021681	38.29285	-0.000828	100.1123
6 / 3 .	0.024859	4.701496	9.28965	0.639318	26.10116	21.1842	0.018192	38.46272	0.086097	100.5077
6 / 4 . *	0.072275	4.701143	9.128338	0.642411	26.77378	21.23504	-0.016351	38.53534	0.053751	101.1421
6 / 5 . *	0.087912	4.705006	9.359868	0.632972	26.30424	21.32483	0.010214	38.54266	0.058744	101.0265
6 / 6 .	0.065102	4.706457	9.371846	0.598625	26.14063	21.15756	-0.016348	38.2561	0.031459	100.3278
6 / 7 .	0.079757	4.667439	9.465276	0.640859	25.77221	21.30199	-0.000409	38.70139	0.041427	100.6703
6 / 8 .	0.010944	4.735562	9.366857	0.622957	25.90407	21.30785	-0.008384	38.31792	0.073733	100.3399
6 / 9 .	0.008473	4.734411	9.435334	0.671822	25.99852	21.23727	0.020846	38.1903	0.058805	100.3558
6 / 10 .	0.019357	4.691532	9.181223	0.640741	25.8569	21.2342	-0.066884	38.67874	0.046379	100.3491
7 / 1 .	0.028665	5.095383	7.974339	0.755091	27.46293	21.18327	-0.009989	38.07137	0.059115	100.6302
7 / 2 . *	0.019212	5.129785	7.771379	0.838233	27.65157	20.97737	-0.020602	38.70708	0.103423	101.1981
7 / 3 .	0.022182	4.853828	8.439362	0.854256	27.08808	20.81593	-0.020573	38.36108	0.086306	100.521
7 / 4 .	0.018772	4.851767	7.845978	0.871134	27.91218	21.15653	-0.036489	38.21167	0.049226	100.9173
7 / 5 .	-0.000235	5.13797	7.699427	0.798943	27.76587	21.12063	-0.025911	38.41916	0.029545	100.9715
7 / 6 . *	0.031507	4.999242	8.81562	0.67922	26.80765	21.40918	-0.007337	38.48555	0.034588	101.2626

9a1 Leucogabbro Garnet
Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
7 / 7 .	0.03954	5.099335	7.999665	0.725697	27.25629	21.22584	-0.009992	38.42932	0.12815	100.9038
7 / 8 . *	0.026735	5.025541	7.82723	0.896503	27.93913	21.17904	-0.023223	38.29625	0.036887	101.2273
7 / 9 .	0.002273	4.475401	8.085622	0.87989	28.21386	20.94552	-0.044374	38.23717	0.041811	100.8815
7 / 10 .	0.022636	4.942832	8.328237	0.755409	27.00075	21.07593	-0.041751	38.15114	0.120798	100.3977
8 / 1 .	0.007944	5.501172	5.88424	0.950453	29.03228	21.25084	0.0229	38.21314	0.078259	100.9412
8 / 2 .	0.002427	5.56761	5.569562	1.000337	29.30103	21.00846	0.006951	38.05644	0.080586	100.5934
8 / 3 .	0.01695	5.540035	5.532823	1.026755	28.60101	21.10192	0.025591	38.36523	0.144419	100.3547
8 / 4 .	0.006933	5.618124	5.559566	1.040681	28.8358	21.23621	0.009621	38.27637	0.080699	100.664
8 / 5 . *	0.071618	6.743489	4.881929	0.846846	26.06193	19.91312	0.006971	37.61768	1.247734	97.3913
8 / 6 .	0.034531	5.555227	5.853253	0.92291	28.73863	21.04617	0.009618	38.16627	0.122466	100.4491
8 / 7 .	0.021981	5.270793	6.186251	0.9843	28.60782	21.08103	0.01758	38.27102	0.080794	100.5216
8 / 8 .	0.019432	6.034193	5.475009	0.944247	28.45926	20.75063	0.012278	38.29993	0.565936	100.5609
8 / 9 . *	0.113253	14.05194	0.251205	0.007241	15.812	14.68135	-0.011916	37.03357	4.698241	86.6488
8 / 10 . *	0.115854	14.59161	0.097867	0.026557	15.54856	14.38352	-0.006482	35.89851	4.683643	85.34613
9 / 1 . *	0.004094	4.79811	7.682558	1.313986	26.99591	21.28728	-0.005302	36.67041	-0.035997	98.75235
9 / 2 .	-0.004922	4.837872	7.750324	1.329882	27.22171	21.52295	-0.018563	36.80064	-0.026157	99.46338
9 / 3 .	0.003598	4.865997	7.671793	1.394727	27.15131	21.18733	0.02919	37.03982	-0.00399	99.34377
9 / 4 .	-0.000914	4.815436	7.810731	1.35177	27.33756	21.33672	-0.010601	37.0529	-0.028605	99.70512
9 / 5 .	-0.00642	4.80407	7.974402	1.332129	27.05142	21.3123	-0.007957	37.19486	-0.036048	99.66917
9 / 6 .	0.002601	4.828653	7.686642	1.282895	27.53843	21.14161	0.007953	36.63293	-0.048294	99.12171
9 / 7 .	-0.005926	4.709313	7.951077	1.408471	27.23606	21.46792	0.031805	37.07609	-0.063117	99.88074
9 / 8 .	-0.001413	4.684042	7.924733	1.441221	26.87697	21.3383	0.007956	37.18579	-0.036035	99.45901
9 / 9 .	0.005582	4.688982	8.327933	1.374429	26.46167	21.17144	0.005301	37.12546	-0.031145	99.16079
9 / 10 .	-0.002913	4.773689	8.094285	1.385461	26.96593	21.46372	0.021209	37.20397	-0.023718	99.90827
10 / 1 .	0.020275	5.543526	6.009881	1.864983	27.88794	21.11739	0.019456	38.30168	0.047104	100.8122
10 / 2 .	0.020259	5.540712	6.180062	1.76456	27.68824	21.04731	-0.009829	38.0881	0.022572	100.3518
10 / 3 .	0.017252	5.440022	6.240903	1.767381	27.66187	21.06675	-0.028461	38.21211	0.071717	100.478
10 / 4 .	0.01228	5.165967	6.430784	1.786922	27.99565	20.92876	0.014115	38.21726	0.110985	100.6627
10 / 5 .	0.023844	5.157708	6.402241	1.866182	27.90027	20.93324	-0.028427	38.12121	0.120776	100.5255
10 / 6 .	0.018358	4.588787	6.433984	1.867943	28.09118	20.88626	0.038	38.17307	0.137821	100.2354
10 / 7 .	0.021814	5.170173	6.129189	1.701066	28.06478	21.16626	-0.015153	38.31988	0.029929	100.6031
10 / 8 .	0.020308	5.30811	6.044576	1.833751	28.1391	21.28895	0.032762	38.30013	0.022555	100.9902
10 / 9 .	0.0218	5.286134	6.08907	1.812535	27.95724	21.06546	0.03276	38.39568	0.027468	100.6881

9a1 Leucogabbro Garnet

Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
10 / 10 .	0.005739	5.310622	6.078056	1.839127	28.09271	21.14182	0.014122	38.00071	0.012734	100.4957

9a2 Shear zone Garnets

Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
1 / 1 .	0.0121	3.3666	10.4110	0.4131	27.3090	20.6750	0.0042	37.7962	0.1056	100.0929
1 / 2 . *	0.0262	3.3327	10.5235	0.4069	28.1962	20.7645	0.0016	37.8652	0.1965	101.3133
1 / 3 .	0.0261	3.2705	10.3653	0.3892	27.8881	20.6719	0.0200	37.8574	0.1793	100.6677
1 / 4 .	0.0252	3.3218	10.0313	0.3913	28.1043	20.6815	0.0095	37.7670	0.1865	100.5185
1 / 5 .	0.0182	3.4078	9.8444	0.4313	28.4759	20.6676	-0.0089	37.9060	0.1422	100.8934
1 / 6 .	0.0146	3.3341	9.8420	0.4480	28.3338	20.7325	-0.0141	38.0110	0.2012	100.9170
1 / 7 .	0.0066	3.6074	8.7719	0.4013	28.9968	20.7883	0.0174	37.8210	0.0806	100.4914
1 / 8 .	0.0162	3.6904	8.7953	0.4192	28.8549	20.7677	-0.0063	37.9987	0.2253	100.7677
1 / 9 . *	0.0117	3.7026	8.9304	0.4252	29.1174	20.8447	-0.0168	38.2400	0.1224	101.3944
1 / 10 .	0.0061	3.8719	8.5039	0.3734	28.7806	21.1117	0.0043	38.0856	0.0611	100.7985
2 / 1 .	0.0130	4.2339	6.5259	0.5469	30.4483	20.7145	0.0359	37.6164	0.1210	100.2560
2 / 2 .	0.0166	4.2846	6.7286	0.5448	30.3581	20.5262	-0.0225	37.6372	0.0868	100.1829
2 / 3 .	0.0202	4.0625	6.8244	0.5732	30.3062	20.3805	0.0253	37.8463	0.0500	100.0884
2 / 4 .	0.0135	3.9690	6.8796	0.5934	30.4641	20.7560	0.0014	37.7334	0.0917	100.5021
2 / 5 .	0.0186	3.8669	7.3441	0.5541	30.4514	20.6746	0.0094	37.5282	0.0942	100.5415
2 / 6 .	0.0268	3.6683	7.9671	0.5761	29.9174	20.5511	0.0226	37.7324	0.0870	100.5487
2 / 7 .	0.0212	3.5538	7.9794	0.5559	29.8937	20.4232	0.0067	37.5933	0.0476	100.0747
2 / 8 .	0.0095	3.6388	7.3698	0.6061	30.6075	20.6031	0.0067	37.3361	0.0255	100.2031
2 / 9 .	0.0233	3.3532	8.0138	0.5922	30.2929	20.6844	0.0173	37.4323	0.0672	100.4765
2 / 10 .	0.0340	3.2364	8.3656	0.5451	30.0355	20.5358	0.0252	37.4232	0.1091	100.3099
3 / 1 .	0.0061	4.6316	7.5972	0.7841	25.7610	23.5590	0.0203	38.0249	0.0442	100.4284
3 / 2 .	0.0037	4.9266	7.8282	0.8876	27.0049	21.2687	0.0176	38.5630	0.0046	100.5049
3 / 3 .	0.0175	4.5903	7.4649	0.8108	26.2973	23.0349	0.0070	38.1370	0.0714	100.4309
3 / 4 .	0.0122	4.9923	7.7450	0.8080	27.7397	21.4774	-0.0090	38.0663	0.0293	100.8700
3 / 5 .	0.0017	4.9864	7.5153	0.9985	27.4901	21.0198	0.0070	37.9633	0.0145	99.9965
3 / 6 .	0.0139	4.2559	7.8608	0.7111	25.1877	24.6222	0.0310	37.9428	0.0344	100.6598
3 / 7 .	0.0141	4.3458	9.6145	0.7002	26.2150	21.3735	-0.0037	38.3456	0.0368	100.6455
3 / 8 .	0.0091	4.5773	7.9763	0.6813	26.2487	22.5416	0.0283	38.1871	0.0690	100.3186
3 / 9 .	0.0071	4.6554	7.9478	0.7218	26.1308	22.7187	0.0229	38.0292	0.0021	100.2358
3 / 10 .	0.0061	4.3939	7.4558	0.6756	24.7578	25.3784	0.0123	37.6751	0.0518	100.4069
4 / 1 .	0.0582	5.6087	5.8781	0.5435	29.2369	21.0810	-0.0265	38.1926	0.1280	100.7270

9a2 Shear zone Garnets

Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
4 / 2 .	0.0376	5.6722	5.8621	0.5204	29.6057	21.1338	-0.0558	37.8545	0.0763	100.7625
4 / 3 .	0.0430	5.7164	5.8959	0.4902	29.0277	20.9872	-0.0345	38.0879	0.1774	100.4257
4 / 4 .	0.0400	5.7596	5.6741	0.4958	29.2784	20.8951	-0.0372	38.5130	0.0812	100.7372
4 / 5 .	0.0461	5.5942	5.5394	0.6227	29.3253	21.1068	-0.0265	38.1440	0.1352	100.5137
4 / 6 .	0.0301	5.7945	5.4370	0.5052	29.8815	21.1883	-0.0346	37.9395	0.0541	100.8302
4 / 7 .	0.0446	5.8116	5.4439	0.5267	29.0851	20.7058	-0.0319	37.8690	0.0960	99.5827
4 / 8 .	0.0240	5.6169	5.4707	0.5755	29.4633	20.8803	-0.0105	38.2431	0.0886	100.3623
4 / 9 .	0.0407	5.6801	5.5147	0.6074	29.6324	20.9461	-0.0345	38.0340	0.0541	100.5094
4 / 10 .	0.0463	5.5812	5.5369	0.6214	29.5593	20.7451	-0.0318	37.8846	0.1229	100.0976
5 / 1 . *	-0.0027	5.0606	6.3869	0.6048	29.9255	21.0581	0.0293	38.3253	-0.0285	101.3905
5 / 2 . *	0.0090	4.9128	6.4528	0.5497	30.0193	20.8636	-0.0320	38.1816	0.0405	101.0291
5 / 3 . *	0.0064	4.9884	5.9924	0.6520	30.0322	21.2469	0.0053	38.2196	-0.0432	101.1432
5 / 4 .	0.0181	5.0342	6.1734	0.5820	29.8059	20.9707	-0.0213	38.2211	-0.0211	100.8054
5 / 5 . *	-0.0007	5.2234	5.8591	0.5829	30.2487	20.9202	0.0187	38.3293	-0.0211	101.1822
5 / 6 . *	0.0175	4.9142	5.6426	0.5867	28.7005	20.2998	-0.0187	39.8832	1.0008	101.0453
5 / 7 . *	-0.0037	5.1822	5.9006	0.5905	29.7535	21.1674	-0.0053	38.4215	-0.0555	101.0156
5 / 8 .	0.0109	5.3066	5.8874	0.6093	29.7406	21.2685	-0.0187	38.1718	-0.0284	100.9951
5 / 9 . *	0.0175	5.2464	5.8028	0.5928	29.4885	21.1901	-0.0053	38.4752	0.2174	101.0307
5 / 10 . *	0.0170	5.4702	5.7373	0.6203	29.7101	21.1559	0.0053	38.3212	-0.0137	101.0373
6 / 1 .	0.0274	5.2132	5.8530	0.6467	29.9008	20.6643	0.0123	37.8256	0.1310	100.2743
6 / 2 .	0.0056	5.0463	5.8162	0.6228	29.4143	20.8788	-0.0196	37.8269	0.8429	100.4539
6 / 3 .	0.0278	5.1207	6.0641	0.6842	29.6806	20.9743	0.0309	38.0708	0.0870	100.7404
6 / 4 .	0.0208	5.1848	6.0517	0.6557	29.6483	20.8855	0.0229	38.0748	0.0256	100.5702
6 / 5 .	0.0005	5.1279	5.9441	0.6055	29.7359	20.6191	0.0016	37.6789	0.3688	100.0823
6 / 6 .	0.0056	5.2389	5.8678	0.5904	29.8839	20.9402	-0.0010	38.0019	0.1311	100.6597
6 / 7 .	0.0162	5.1326	5.9543	0.6340	29.9254	20.8753	0.0203	38.0748	0.1359	100.7689
6 / 8 .	0.0244	5.2176	5.8510	0.6672	30.1130	21.0313	-0.0117	37.8795	0.1040	100.8879
6 / 9 .	0.0056	5.1420	5.8726	0.6603	30.1160	21.0271	-0.0090	37.9072	0.0746	100.8054
6 / 10 .	0.0218	5.2305	5.7778	0.6173	29.9364	20.8530	0.0229	38.0397	0.1089	100.6083
7 / 1 .	0.0040	4.5211	6.5010	0.7143	30.0877	20.8005	0.0080	37.8653	0.1020	100.6039
7 / 2 .	0.0224	4.6116	6.3708	0.7551	29.8810	20.6923	0.0053	38.0395	0.0529	100.4308

9a2 Shear zone Garnets

Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
7 / 3 .	-0.0051	4.6439	6.4590	0.7566	29.8277	20.7860	0.0240	37.7348	0.1095	100.3414
7 / 4 .	0.0111	4.8206	6.2233	0.7222	29.6780	20.5898	0.0187	37.9227	0.1021	100.0885
7 / 5 .	0.0101	4.8932	6.1125	0.7840	30.0795	20.9408	-0.0053	37.9809	0.0872	100.8883
7 / 6 .	0.0132	4.9667	6.2066	0.7673	29.5601	20.7447	0.0027	37.8132	0.1439	100.2184
7 / 7 .	0.0349	4.9710	6.0548	0.7529	29.4339	20.7297	0.0080	37.9055	0.1463	100.0370
7 / 8 .	0.0086	5.1561	6.1882	0.8728	29.1530	20.7212	0.0747	37.8431	0.1514	100.1690
7 / 9 .	0.0111	5.2399	6.1818	0.8347	29.3451	20.6808	0.0320	38.2882	0.1465	100.7601
7 / 10 .	0.0050	5.3083	6.2488	0.8933	29.3979	20.8447	0.0107	37.8881	0.1318	100.7286
8 / 1 .	0.0259	4.4555	7.9274	0.4811	28.6255	20.9017	-0.0308	38.3693	0.0528	100.8392
8 / 2 .	0.0308	4.5094	8.3411	0.4271	27.9133	20.9767	0.0276	38.2560	0.0702	100.5521
8 / 3 .	0.0147	4.6562	8.2317	0.4170	27.4024	21.0929	0.0117	38.4103	0.0184	100.2553
8 / 4 .	0.0274	4.5170	8.4919	0.3845	28.0380	20.9310	-0.0096	38.1934	0.0801	100.6634
8 / 5 .	0.0038	4.3067	8.2821	0.3982	28.2943	21.1218	-0.0096	37.7605	0.0677	100.2350
8 / 6 .	0.0153	4.2857	8.4876	0.4066	28.3139	21.0106	-0.0122	38.1469	0.1269	100.7936
8 / 7 .	0.0133	4.4658	8.7528	0.4121	27.4403	21.3195	0.0116	38.1551	0.0802	100.6507
8 / 8 .	0.0141	5.3319	8.8586	0.4622	25.9790	21.0727	-0.0070	38.2750	0.1127	100.1061
8 / 9 .	0.0222	5.0989	8.2188	0.3613	27.0022	21.1765	0.0010	38.4340	0.1026	100.4176
8 / 10 .	0.0072	5.1986	7.7578	0.4520	26.2831	22.3377	-0.0070	38.0831	0.0531	100.1725
9 / 1 .	0.0112	5.2192	6.5944	0.5285	28.7302	21.1201	-0.0088	37.9065	0.0559	100.1660
9 / 2 .	0.0137	5.2679	6.7420	0.5616	28.8486	20.9018	0.0072	38.1678	0.0559	100.5666
9 / 3 .	0.0182	5.2481	6.8817	0.4789	28.2364	21.0175	0.0258	37.9985	0.0880	99.9930
9 / 4 .	0.0092	5.5423	6.6084	0.6504	28.3503	21.1068	0.0285	38.2480	0.0535	100.5973
9 / 5 .	0.0152	5.4705	6.0307	0.7001	28.8130	20.7073	-0.0088	38.0199	0.1811	99.9379
9 / 6 .	0.0258	5.4734	6.0707	0.7042	28.6097	20.7242	0.0072	37.7893	0.1812	99.5856
9 / 7 . *	0.0837	5.3116	6.9794	0.7274	27.9672	21.1372	0.0258	38.8306	0.1646	101.2274
9 / 8 .	0.1398	5.5265	6.8198	0.5674	27.7769	20.2856	0.0072	38.2255	0.2779	99.6265
9 / 9 .	0.0488	5.3287	6.8797	0.6314	28.1888	20.8235	0.0205	38.3413	0.0535	100.3161
9 / 10 .	0.0172	5.4626	6.7005	0.5460	28.1915	21.2373	0.0365	38.2823	0.0264	100.5002
10 / 1 .	0.0273	4.4453	8.3820	0.7309	27.6451	20.4789	0.0240	37.9848	0.1840	99.9022
10 / 2 .	0.0187	4.4821	8.1838	0.7254	27.6990	20.7813	0.0533	38.2741	0.1444	100.3621
10 / 3 .	0.0152	4.4587	8.3645	0.7416	27.8827	20.6787	0.0053	37.7341	0.0923	99.9730

9a2 Shear zone Garnets

Date: 6/14/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
10 / 4 .	0.0263	4.3310	8.6586	0.7012	27.7287	20.8325	0.0186	37.8445	0.1915	100.3329
10 / 5 .	0.0278	4.3827	8.5630	0.7121	27.6827	20.7435	0.0186	37.9124	0.2039	100.2466
10 / 6 .	0.0207	4.5565	8.3190	0.6645	27.7557	20.9614	0.0080	37.9059	0.1990	100.3906
10 / 7 .	-0.0106	4.4335	8.6092	0.7621	27.8607	20.7384	-0.0240	38.0324	0.1097	100.5459
10 / 8 .	-0.0085	4.5233	8.3540	0.6679	27.9917	20.8624	0.0213	38.1848	0.1543	100.7598
10 / 9 .	0.0797	5.3444	9.7901	0.5706	25.9786	19.1239	0.0133	39.3997	0.1776	100.4780
10 / 10 . *	0.0428	4.5265	8.5021	0.6636	27.7458	21.1454	0.0000	38.2532	0.1371	101.0164

9a2 Pseudotachylite Garnet

Date: 6/13/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
1 / 1 .	0.0023	4.4078	9.1419	1.2141	26.4531	20.8818	0.0098	37.9126	0.0916	100.1151
1 / 2 .	0.0193	4.3978	9.1275	1.2315	26.4132	20.9100	-0.0008	38.4007	0.0494	100.5493
1 / 3 .	0.0113	4.5609	9.0603	1.2802	26.3923	21.0399	0.0098	37.9283	0.0891	100.3722
1 / 4 .	0.0365	4.5082	8.8405	1.3483	26.7943	20.7182	0.0045	37.7838	0.0617	100.0960
1 / 5 .	0.0284	4.5467	8.8148	1.3318	26.1126	20.7369	0.0098	37.7134	0.0965	99.3909
1 / 6 .	0.0119	4.4343	9.0227	1.3980	26.4107	20.7179	0.0151	37.7619	0.1262	99.8988
1 / 7 .	0.0268	4.5885	8.9428	1.3828	26.1065	20.8713	0.0151	37.8562	0.0543	99.8444
1 / 8 .	0.0154	4.5320	8.8924	1.3423	26.3868	20.7910	-0.0247	37.9458	0.0891	99.9948
1 / 9 .	0.0164	4.4530	8.9124	1.3465	26.5651	20.8397	0.0258	37.9363	0.0915	100.1866
1 / 10 .	0.0089	4.5181	8.8309	1.3964	26.4875	20.6580	0.0231	37.8038	0.0667	99.7933
2 / 1 .	0.0307	4.9178	10.3361	0.5317	24.7358	21.1834	0.0262	38.3457	0.0967	100.2041
2 / 2 .	0.0802	4.9890	10.5430	0.5018	23.9761	21.1743	0.0183	38.5065	-0.0024	99.7891
2 / 3 .	0.0102	4.9288	10.6260	0.5323	24.4301	21.4697	-0.0028	38.3044	0.0051	100.3066
2 / 4 .	0.0136	4.9545	10.7085	0.5235	24.8831	21.4845	-0.0028	38.2355	-0.0247	100.8032
2 / 5 .	0.0131	4.8750	10.9131	0.5324	24.1982	21.1217	0.0262	38.1617	-0.0197	99.8413
2 / 6 .	0.0194	4.7941	10.8400	0.5581	24.3763	21.2522	0.0498	38.1946	-0.0048	100.0846
2 / 7 .	0.0087	4.6841	10.7588	0.4855	24.7435	21.2371	-0.0134	37.8501	-0.0370	99.7678
2 / 8 .	0.0200	4.6907	10.9511	0.5691	24.6249	21.2945	0.0024	38.1402	-0.0123	100.2929
2 / 9 .	0.0225	4.5801	10.8418	0.5225	24.7696	21.1535	0.0314	38.2590	0.0274	100.2077
2 / 10 .	0.0240	4.6782	10.8910	0.5344	25.0159	21.1277	0.0024	38.3331	0.0051	100.6117
3 / 1 .	0.0153	4.3054	10.0160	0.7486	26.4054	20.9899	0.0138	37.8980	0.0297	100.4221
3 / 2 .	0.0014	4.3599	9.6658	0.7027	26.2198	20.7594	0.0006	37.8368	0.0643	99.6108
3 / 3 .	0.0173	4.3948	9.1394	0.7695	26.7954	20.9566	0.0112	37.8410	-0.0048	99.9251
3 / 4 .	0.0355	4.4035	9.4489	0.6776	26.0774	21.2103	0.0059	37.9290	0.0371	99.8252
3 / 5 .	0.0093	4.4063	9.6521	0.7345	25.8643	20.9629	-0.0047	37.7728	0.0716	99.4737
3 / 6 .	0.0113	4.4953	9.4730	0.7046	26.6271	20.9884	0.0191	37.7928	0.0420	100.1535
3 / 7 .	0.0192	4.4624	9.6169	0.6812	26.1702	21.1743	-0.0310	38.0656	0.0766	100.2663
3 / 8 .	0.0128	4.5003	9.5680	0.5923	26.1407	20.9839	-0.0020	37.6587	0.7795	100.2362
3 / 9 .	0.0187	4.4496	9.8227	0.6985	25.6548	21.0274	-0.0152	38.1748	0.0347	99.8813
3 / 10 .	0.0187	4.4407	9.6349	0.6942	26.2455	21.1453	-0.0178	37.9369	0.0519	100.1681
4 / 1 .	0.0339	4.6530	7.4793	0.8927	27.9568	20.4611	0.0219	38.9325	0.2935	100.7247
4 / 2 .	0.0161	4.1213	7.4484	0.8170	25.3872	18.3803	0.0140	43.1510	0.0744	99.4097
4 / 3 . *	0.0212	4.2031	8.7532	0.8520	27.5710	20.1730	0.0219	41.7199	0.0816	103.3970

9a2 Pseudotachylite Garnet

Date: 6/13/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
4 / 4 .	0.0123	4.5687	8.2178	0.7737	27.6412	20.6314	0.0271	38.1422	0.3950	100.4093
4 / 5 .	0.2037	5.9740	11.5719	0.8128	23.5599	17.4275	0.0192	40.5520	0.0824	100.2034
4 / 6 .	-0.0018	4.3300	8.0093	0.9148	27.5706	20.2457	0.0511	38.9430	0.1531	100.2176
4 / 7 .	0.0236	4.0489	9.0002	0.8190	26.2817	20.4656	0.0325	40.0355	0.1512	100.8581
4 / 8 .	0.0052	4.2076	9.1808	0.7968	26.8054	20.9099	0.0404	38.0725	0.1213	100.1400
4 / 9 .	0.0138	4.3407	8.5802	0.8663	27.3463	20.7711	0.0059	38.0805	0.1038	100.1085
4 / 10 . *	1.8192	10.4402	11.4501	0.0268	15.5169	12.4253	0.0113	41.1865	2.0345	94.9108
5 / 1 .	0.0102	3.9238	9.5978	1.1635	26.2993	20.7577	-0.0136	38.0982	0.1033	99.9537
5 / 2 .	0.0321	4.2695	9.2517	1.1327	26.3585	20.6405	0.0286	37.5151	0.0590	99.2876
5 / 3 .	0.0147	4.1498	9.3079	1.1235	26.7049	20.6730	0.0312	37.8359	0.0762	99.9171
5 / 4 .	0.0230	4.1733	8.4328	1.1120	26.0646	20.4868	0.0049	38.9908	0.0787	99.3668
5 / 5 .	0.0142	4.1638	8.6705	1.1616	27.0066	21.0014	-0.0030	37.8417	0.1326	99.9923
5 / 6 .	0.0161	4.1322	9.2869	1.3104	26.2732	20.8773	0.0286	38.2679	0.0934	100.2860
5 / 7 .	0.0172	4.0559	9.6497	1.5250	26.5604	20.8670	0.0128	38.1524	0.0885	100.9288
5 / 8 .	0.0265	3.9585	9.7831	1.1539	26.1260	20.8002	-0.0162	38.1835	0.0295	100.0612
5 / 9 .	0.0082	3.8423	9.8818	1.1022	26.4160	21.0476	0.0101	38.3702	0.0862	100.7646
5 / 10 .	0.0393	4.3463	8.1452	1.1537	27.9019	20.8400	-0.0162	38.2961	0.1495	100.8720
6 / 1 .	0.0181	4.1338	10.1179	0.8764	26.2545	20.9485	0.0136	37.8272	0.0969	100.2869
6 / 2 .	0.0260	4.0323	10.8259	0.8918	25.6979	20.9056	0.0136	37.9728	0.0698	100.4356
6 / 3 .	0.0399	4.2179	9.7719	0.9264	25.7991	20.9659	0.0136	38.2110	0.1218	100.0675
6 / 4 .	0.0345	4.0887	10.2691	0.8963	26.2351	21.0159	0.0110	38.3520	0.0375	100.9403
6 / 5 .	0.0256	4.4394	9.2144	0.9024	26.3403	21.1108	0.0110	38.1493	0.0647	100.2578
6 / 6 .	0.0190	4.1727	10.5276	0.8149	25.4263	21.0141	0.0163	38.1146	0.0128	100.1183
6 / 7 .	0.0310	4.2942	10.0335	0.8570	26.0026	20.5984	-0.0181	38.0410	0.0276	99.8854
6 / 8 .	0.0316	4.4006	9.1942	0.9502	26.4877	20.7390	-0.0102	38.2266	0.1166	100.1463
6 / 9 .	0.0226	4.2770	9.2440	0.9705	26.3821	20.7915	-0.0155	38.2668	0.0696	100.0242
6 / 10 .	0.0320	4.4115	9.3324	0.9107	26.3793	21.0470	0.0031	38.1352	0.0993	100.3505
7 / 1 .	0.0309	4.5903	8.7989	0.8250	27.0412	21.3047	0.0256	38.1089	-0.0047	100.7255
7 / 2 .	0.0145	4.9550	8.6754	0.8245	26.6883	21.0264	0.0124	38.0758	0.0692	100.3415
7 / 3 .	0.0100	5.0129	8.6374	0.7685	26.6042	21.0586	0.0256	38.2827	0.0618	100.4617
7 / 4 .	0.0185	4.6255	8.9089	0.7304	26.9651	21.0631	0.0177	38.2295	0.0249	100.5835
7 / 5 .	0.0175	4.6562	8.5385	0.8192	26.6964	21.2104	0.0256	38.1374	0.0150	100.1162
7 / 6 .	0.0130	4.7245	9.4139	0.7436	26.1424	21.4183	0.0282	38.2619	0.0076	100.7534

9a2 Pseudotachylite Garnet
Date: 6/13/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
7 / 7 .	0.0110	4.3693	9.8636	0.7664	25.8885	21.6953	0.0018	38.1773	0.0027	100.7759
7 / 8 .	0.0031	4.6557	8.0621	0.9773	26.9536	21.2482	0.0468	38.3254	0.0642	100.3363
7 / 9 .	0.0180	4.8062	8.3767	0.8374	26.7127	21.0604	0.0415	38.2727	0.1012	100.2268
7 / 10 .	0.0214	4.7208	8.8730	0.8057	26.5204	21.1797	0.0520	38.2524	0.0372	100.4626
8 / 1 .	0.0035	4.1768	10.6905	0.8025	25.1703	20.9227	-0.0087	38.0078	0.0726	99.8467
8 / 2 .	0.0050	4.0296	11.0227	0.7732	25.0583	20.7617	-0.0271	38.0801	0.1073	99.8378
8 / 3 .	-0.0009	4.2058	10.0182	0.8555	26.3694	20.6971	0.0255	37.5976	0.0551	99.8241
8 / 4 .	0.0096	4.0478	10.0651	0.7636	26.7224	20.4544	-0.0245	37.6794	0.0255	99.7677
8 / 5 .	0.0144	4.0032	11.1466	0.6529	24.9255	20.8734	-0.0245	38.1830	0.0949	99.8939
8 / 6 .	0.0021	4.1287	10.6899	0.7895	25.3635	20.7817	-0.0219	38.2775	0.0899	100.1227
8 / 7 . *	0.0075	3.6638	9.1655	0.6859	26.2651	20.3007	-0.0300	43.1197	0.0107	103.2189
8 / 8 .	0.0100	4.0057	10.3666	0.8612	25.7237	20.9580	-0.0324	38.3520	0.0305	100.3077
8 / 9 .	0.0329	4.0238	9.6361	0.8597	26.5282	20.8003	-0.0271	37.9874	0.1437	100.0120
8 / 10 .	0.0021	4.1332	9.2366	0.8272	25.9452	20.3485	-0.0246	39.5580	0.1638	100.2146
9 / 1 .	0.0328	4.2205	10.1498	0.8224	25.7938	20.5187	-0.0051	37.7147	0.1421	99.3948
9 / 2 .	0.0238	4.3695	9.8145	0.7907	25.8251	20.7638	-0.0397	37.7296	0.0624	99.3794
9 / 3 .	0.0227	4.2825	10.3164	0.7826	25.3799	20.9299	0.0029	37.9951	0.1223	99.8344
9 / 4 .	0.0173	4.2371	10.1795	0.7669	25.5755	21.0489	-0.0184	38.0497	0.0749	99.9498
9 / 5 .	0.0328	4.1126	9.4304	0.7716	25.9920	20.5010	-0.0318	38.8125	0.1571	99.8102
9 / 6 .	0.0224	4.0640	8.9619	0.7767	26.1749	20.8280	-0.0371	37.9668	0.5650	99.3596
9 / 7 .	0.0168	4.0206	9.2893	0.8093	26.1123	20.9321	-0.0318	38.5096	0.1719	99.8619
9 / 8 .	0.0104	3.7968	9.7025	0.8917	26.4312	20.6039	-0.0371	38.2985	0.0598	99.7947
9 / 9 .	0.0194	3.9526	10.2730	0.7217	26.1748	20.6617	0.0029	37.6148	0.0972	99.5179
9 / 10 .	0.0215	3.8103	9.2243	0.9127	27.1646	20.4592	0.0055	38.4395	0.1443	100.1819
10 / 1 .	-0.0060	4.0535	10.4700	0.7817	25.5256	20.7770	-0.0152	37.7115	0.0830	99.4023
10 / 2 .	0.0039	4.0938	10.5511	0.6691	25.4621	21.0457	0.0323	37.9471	0.0682	99.8732
10 / 3 .	0.0044	4.0470	10.9972	0.6990	25.6652	21.0132	-0.0047	37.9323	0.0186	100.3770
10 / 4 .	0.0113	4.0022	11.2078	0.6484	25.0961	20.8615	-0.0073	38.1191	0.0758	100.0221
10 / 5 .	-0.0015	3.8752	11.3884	0.6163	25.0337	20.8076	-0.0126	38.1835	-0.0012	99.9048
10 / 6 .	0.0044	3.9022	11.6530	0.5979	24.6300	20.9322	0.0006	38.1952	0.0063	99.9218
10 / 7 .	0.0069	3.8352	11.3420	0.7512	24.8417	20.9277	-0.0073	38.1181	0.0882	99.9109
10 / 8 .	0.0079	3.8573	11.0390	0.7243	25.5535	20.8017	0.0349	38.2339	0.0360	100.2883
10 / 9 .	0.0079	3.9155	11.2190	0.7900	25.2030	21.0035	0.0190	37.9746	0.0385	100.1710

9a2 Pseudotachylite Garnet
Date: 6/13/2011 Wt% Oxide

	Na2O	MgO	CaO	MnO	FeO	Al2O3	Y2O3	SiO2	TiO2	Total
10 / 10 .	0.0039	4.0576	11.0457	0.7419	25.1261	21.1267	0.0191	38.0437	0.0510	100.2158

9a1 Leucogabbro Pyroxene

Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	1.2200	0.1200	13.6000	20.2200	0.1100	9.0400	3.5400	0.0500	49.7400	0.6900	98.3200
1 / 2 .	1.0600	0.0100	13.4300	21.6100	0.1200	8.6300	2.6600	0.0100	51.3500	0.2600	99.1300
1 / 3 .	1.1000	0.0000	13.2700	21.6200	0.1400	8.5900	2.5900	0.0000	51.3500	0.1600	98.8300
1 / 4 . *	1.3600	0.2700	13.2500	16.8200	0.0900	10.9200	5.6700	0.0000	48.3500	0.6800	97.4100
1 / 5 .	1.1800	0.0000	13.2700	21.3100	0.1200	8.6700	2.6500	0.0600	51.6300	0.3200	99.2200
1 / 6 .	0.9700	0.0000	14.2100	22.2400	0.1300	7.6100	1.9900	-0.0100	52.4400	0.1700	99.7600
1 / 7 .	0.9500	0.0000	14.2300	22.2400	0.1000	7.6100	1.8200	0.0100	52.2000	0.1300	99.2900
1 / 8 .	1.0200	0.0000	14.0200	21.6000	0.1100	8.5600	1.7000	0.0000	52.2200	0.1100	99.3300
1 / 9 .	1.0100	0.0000	13.9400	21.9500	0.1100	8.0800	1.7100	0.0100	52.8300	0.1200	99.7400
1 / 10 .	0.9900	0.0000	14.2600	22.2200	0.1600	7.6100	1.9600	0.0100	52.2700	0.1300	99.6000
1 Average	1.0556	0.0144	13.8033	21.6678	0.1222	8.2667	2.2911	0.0156	51.7811	0.2322	99.2467
1 / 1 .	0.0200	0.0000	22.0100	0.8800	0.4600	23.8000	0.6600	0.0000	50.8900	0.0500	98.7700
1 / 2 .	0.0100	0.0000	22.1800	0.2600	0.4900	24.2000	0.4800	-0.0100	52.1300	0.0200	99.7800
1 / 3 .	0.0100	0.0000	22.7600	0.1900	0.4500	24.1600	0.6200	0.0000	51.7500	0.0400	99.9800
1 / 4 .	0.0200	0.0000	22.7500	0.3600	0.4200	23.8600	0.3500	0.0200	52.4700	-0.0400	100.2600
1 / 5 .	0.0100	0.0000	22.6200	0.2200	0.4500	23.9700	0.7100	-0.0300	51.7700	0.0100	99.7700
1 / 6 .	0.0100	0.0100	22.1200	0.2200	0.4600	24.0200	1.2500	0.0100	51.5300	0.0600	99.7000
1 / 7 .	0.0100	0.0000	22.2700	0.2300	0.4100	24.1200	1.2500	0.0200	51.3500	0.0500	99.7100
1 / 8 .	0.0200	0.0000	22.7900	0.2100	0.5100	23.9600	0.7800	-0.0200	51.9700	0.0200	100.2600
1 / 9 .	0.0300	0.0000	22.3800	0.3600	0.4300	24.1700	0.6800	0.0100	52.5300	0.0400	100.6200
1 / 10 .	0.0000	0.0000	22.5000	0.2200	0.4000	24.0800	0.5800	0.0200	52.4800	0.0300	100.3100
1 Average	0.0140	0.0010	22.4380	0.3150	0.4480	24.0340	0.7360	0.0020	51.8870	0.0280	99.9160
1 / 1 .	-0.0100	0.0000	22.2800	0.2400	0.4300	24.1300	0.9300	0.0000	52.2000	0.0300	100.2400
1 / 2 . *	0.0000	0.0100	22.4500	0.1800	0.4800	24.8500	0.6400	-0.0100	52.4000	0.0500	101.0500
1 / 3 .	0.0100	0.0100	21.8700	0.5900	0.4400	23.9700	0.9600	0.0300	51.9200	0.1800	100.0000
1 / 4 .	-0.0100	0.0000	22.3100	0.2000	0.4600	24.6000	0.7700	0.0300	52.2100	0.1000	100.6800
1 / 5 .	0.0100	0.0100	22.5000	0.2000	0.4600	24.3300	0.8300	0.0000	52.1800	0.0500	100.5800
1 / 6 .	0.0100	-0.0100	22.5200	0.2200	0.4300	24.6500	0.8300	-0.0400	51.8400	0.0700	100.5700
1 / 7 .	0.0100	0.0100	22.4200	0.2100	0.4600	24.5000	0.8700	-0.0100	51.7800	0.0400	100.2800
1 / 8 .	0.0100	0.0000	22.2500	0.2200	0.4200	24.7400	0.9800	0.0100	51.6100	0.0400	100.2700

9a1 Leucogabbro Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
1 / 9 .	0.0000	0.0100	21.7600	0.2600	0.4200	24.3600	0.8100	0.0100	52.0300	0.0700	99.7200
1 / 10 .	0.0000	0.0000	22.1700	0.2100	0.4400	24.4600	0.5700	-0.0100	51.7600	0.0400	99.6600
1 Average	0.0033	0.0033	22.2311	0.2611	0.4400	24.4156	0.8389	0.0022	51.9478	0.0689	100.2222
1 / 1 .	-0.0100	0.0000	21.4800	0.2000	0.5600	25.3700	0.8200	-0.0100	52.0300	0.0100	100.4800
1 / 2 .	0.0000	0.0000	21.5900	0.2200	0.5400	25.0200	0.8800	-0.0300	51.9800	-0.0200	100.2400
1 / 3 .	0.0100	-0.0100	21.4800	0.7000	0.5900	24.7800	0.7400	0.0300	51.4100	0.0100	99.7400
1 / 4 .	0.0000	0.0000	21.5900	0.2000	0.5600	25.3200	0.8700	-0.0100	51.5100	0.0000	100.0300
1 / 5 .	0.0000	0.0100	21.9600	0.2200	0.5600	24.8600	0.5700	0.0200	51.8300	-0.0200	100.0300
1 / 6 .	0.0000	0.0000	21.9900	0.1900	0.4900	24.6900	0.8300	-0.0100	51.6800	0.0400	99.9200
1 / 7 .	-0.0100	0.0000	22.1700	0.1700	0.5000	24.3300	0.7000	-0.0200	51.8500	0.0000	99.7200
1 / 8 .	0.0100	0.0100	21.4100	0.1600	0.5700	25.4300	0.9200	-0.0200	51.8900	-0.0300	100.4000
1 / 9 .	-0.0100	0.0100	21.7400	0.1900	0.6100	25.1600	0.8200	-0.0100	51.6700	0.0100	100.2000
1 / 10 .	-0.0100	0.0000	21.4400	0.2500	0.5800	25.1900	0.9500	0.0000	51.5200	0.0200	99.9500
1 Average	-0.0020	0.0020	21.6850	0.2500	0.5560	25.0150	0.8100	-0.0060	51.7370	0.0020	100.0710
2 / 1 .	1.0000	0.0000	13.6200	22.1500	0.1600	8.4000	2.0600	-0.0300	52.3400	0.0700	99.8000
2 / 2 .	1.1700	0.0000	13.1700	21.7400	0.1800	8.6600	2.5600	-0.0500	51.8400	0.1200	99.4300
2 / 3 .	1.0100	0.0500	13.9500	21.9700	0.1700	7.8700	2.3200	0.0000	51.9800	0.1900	99.5100
2 / 4 .	0.9300	0.0100	13.9400	22.5200	0.1400	7.6600	1.9800	-0.0300	52.1900	0.1200	99.4700
2 / 5 .	0.9400	0.0100	14.0900	22.4300	0.1400	7.3700	1.8300	-0.0700	52.4100	0.0700	99.2800
2 / 6 .	1.7300	0.7500	11.5500	12.0100	0.1100	15.0300	10.0300	0.0000	44.4800	1.5300	97.2200
2 / 7 .	1.2300	0.0200	12.9900	21.1100	0.1500	8.9700	2.8500	0.0100	51.5200	0.3200	99.1900
2 / 8 . *	1.3200	0.1500	13.0900	19.8000	0.1600	9.6800	3.9500	-0.0300	50.1000	0.4600	98.7000
2 / 9 .	1.1900	0.0000	13.4800	21.7400	0.1500	8.0800	2.7500	-0.0100	51.8700	0.1200	99.3700
2 / 10 . *	1.0500	0.0000	13.6200	21.9000	0.1500	8.2300	2.3200	0.0000	50.9500	0.3000	98.5300
2 Average	1.1500	0.1050	13.3488	20.7088	0.1500	9.0050	3.2975	-0.0225	51.0788	0.3175	99.1588
3 / 1 .	0.0000	-0.0100	22.0400	0.2200	0.4600	24.7600	0.9900	0.0300	52.3000	0.0200	100.8100
3 / 2 .	0.0100	0.0000	22.2800	0.2000	0.4400	24.4100	1.0400	0.0000	51.8400	0.0500	100.2500
3 / 3 .	-0.0100	0.0000	22.0800	0.1900	0.4200	24.5500	1.0000	-0.0200	52.0600	0.0200	100.3300
3 / 4 .	0.0000	0.0000	22.1600	0.2300	0.4300	24.6100	1.0500	-0.0200	52.2300	0.0000	100.7000
3 / 5 .	-0.0100	0.0000	22.0200	0.2000	0.4600	24.5800	1.1300	-0.0200	51.8600	0.0300	100.2900
3 / 6 .	0.0000	0.0000	22.0400	0.2000	0.4000	24.7300	0.8200	0.0400	52.1600	-0.0200	100.3900

9a1 Leucogabbro Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
3 / 7 .	0.0100	0.0000	22.4800	0.1800	0.4100	24.6500	0.7800	0.0200	52.1100	0.0200	100.6600
3 / 8 .	0.0000	-0.0100	22.2600	0.2100	0.4500	24.5600	0.8800	0.0000	51.8100	0.0100	100.1700
3 / 9 .	0.0000	0.0100	22.4300	0.2100	0.4500	23.8800	0.8700	-0.0200	51.9100	0.0500	99.8200
3 / 10 .	0.0100	0.0000	22.4400	0.2200	0.4100	24.0400	1.0100	0.0300	52.1900	0.0100	100.3700
3 Average	0.0010	-0.0010	22.2230	0.2060	0.4330	24.4770	0.9570	0.0040	52.0470	0.0190	100.3790
4 / 1 .	1.0700	-0.0100	14.3700	21.6200	0.2000	7.7300	1.9300	-0.0300	52.3700	0.0800	99.3600
4 / 2 .	1.1600	0.0000	13.6000	21.3600	0.1400	8.3800	2.8300	-0.0100	51.8300	0.1600	99.4600
4 / 3 .	1.1300	0.0100	13.9900	21.4500	0.1700	7.8100	2.3000	0.0000	52.3200	0.1400	99.3100
4 / 4 .	1.1000	0.0000	13.9500	21.7100	0.1700	7.7900	2.2200	-0.0200	52.4300	0.0800	99.4400
4 / 5 .	1.1300	0.0100	13.9400	21.7500	0.2000	8.3400	2.2900	0.0000	52.0500	0.1400	99.8500
4 / 6 .	1.1100	0.0000	14.1700	22.0200	0.1900	7.6800	1.9200	0.0100	52.3500	0.1000	99.5500
4 / 7 .	1.1200	-0.0100	14.0100	21.7400	0.1800	8.1300	2.2100	0.0000	52.0100	0.1200	99.5200
4 / 8 .	1.2000	0.0000	13.8100	21.3900	0.1900	7.8600	2.4300	-0.0100	52.3400	0.1300	99.3600
4 / 9 .	1.2300	0.0000	13.7100	21.5000	0.1700	8.2400	2.6100	0.0300	51.5500	0.1500	99.1900
4 / 10 .	0.9700	0.0100	14.2500	22.0200	0.2100	7.9800	1.8700	0.0100	51.1300	0.2100	98.6600
4 Average	1.1220	0.0010	13.9800	21.6560	0.1820	7.9940	2.2610	-0.0020	52.0380	0.1310	99.3700
5 / 1 .	0.0000	0.0000	22.7600	0.1800	0.4700	23.8100	1.0600	0.0100	52.0400	0.0000	100.3400
5 / 2 .	0.0000	0.0000	22.7600	0.1800	0.4300	23.9600	1.1100	-0.0200	52.3200	0.0200	100.7900
5 / 3 .	-0.0100	0.0000	22.9300	0.1500	0.4700	23.6800	1.0000	0.0300	52.3900	0.0100	100.6700
5 / 4 .	-0.0100	0.0000	22.7400	0.2000	0.4600	23.8000	1.1700	0.0000	52.1700	0.0200	100.5700
5 / 5 . *	-0.0100	-0.0100	22.7300	0.2200	0.4600	24.2800	1.1300	0.0200	52.3100	0.0200	101.1500
5 / 6 .	0.0000	-0.0100	22.7900	0.1800	0.4300	24.0000	1.1300	-0.0100	52.1900	0.0000	100.7300
5 / 7 .	0.0000	0.0000	22.6300	0.2200	0.4200	24.0700	1.1800	-0.0100	51.9600	0.0200	100.4900
5 / 8 .	0.0100	0.0000	22.6000	0.1800	0.4600	24.0300	1.2500	0.0200	51.8800	0.0100	100.4400
5 / 9 .	0.0000	0.0000	22.9300	0.1700	0.4800	23.8800	1.1200	-0.0200	51.8700	0.0100	100.4700
5 / 10 .	0.0000	0.0000	22.7400	0.1700	0.4100	24.1500	1.2900	0.0200	51.9100	0.0300	100.7200
5 Average	-0.0011	-0.0011	22.7644	0.1811	0.4478	23.9311	1.1456	0.0022	52.0811	0.0133	100.5800
6 / 1 .	1.1400	0.0000	14.1700	21.9900	0.1400	7.3100	2.0400	-0.0100	52.7500	0.0300	99.5700
6 / 2 .	1.1600	0.0000	13.6000	21.8800	0.1000	7.6500	3.0000	-0.0100	51.7900	0.2500	99.4400
6 / 3 .	1.0400	0.0500	13.9400	21.5300	0.0800	8.0400	2.8800	-0.0100	51.3600	0.2700	99.1900
6 / 4 .	1.0500	0.0000	14.0500	21.7600	0.1300	7.3900	2.1600	0.0000	53.0400	0.0900	99.6700
6 / 5 .	1.0600	0.0000	14.0700	22.0400	0.1000	7.4700	2.3500	-0.0200	51.8200	0.3000	99.2200

9a1 Leucogabbro Pyroxene
Date: 11/11/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	Cr2O3	SiO2	TiO2	Total
6 / 6 .	1.1100	0.0500	13.7800	21.3900	0.0700	7.8100	3.1100	-0.0500	51.4900	0.2300	99.0300
6 / 7 .	1.0900	0.0000	13.7400	21.9500	0.1200	7.6400	2.4900	0.0400	52.2200	0.1400	99.4500
6 / 8 .	0.9900	-0.0100	14.2400	22.3000	0.1500	7.3500	2.1900	0.0100	52.2200	0.1400	99.5800
6 / 9 .	1.0200	0.0000	14.0900	22.3700	0.1000	7.4400	2.2600	-0.0400	52.4900	0.1100	99.8800
6 / 10 .	1.1200	0.0100	13.6500	21.1200	0.0900	8.8100	2.8000	-0.0100	50.2300	1.3300	99.1600
6 Average	1.0780	0.0100	13.9330	21.8330	0.1080	7.6910	2.5280	-0.0100	51.9410	0.2890	99.4190

9a2 Shear zone Pyroxene

Date: 6/14/2011 Wt.% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 . *	1.827574	1.959741	8.40612	11.3325	0.030232	17.23766	13.63291	0.041165	0.031654	38.02488	0.64009	93.16452
1 / 2 . *	1.785836	1.878719	8.45349	11.1942	0.042358	17.10392	13.66716	-0.047376	0.022469	38.35334	0.546877	93.04838
1 / 3 . *	1.851508	1.901751	8.531204	11.04382	0.014524	17.06656	13.74473	0.02678	-0.014367	38.34585	0.557041	93.08376
1 / 4 . *	1.894089	1.886137	8.490904	11.21765	0.039945	17.03119	13.86382	0.020604	0.020633	37.98282	0.496376	92.94417
1 / 5 . *	1.909634	1.880836	8.396031	11.22961	0.042348	17.13517	13.92473	0.012356	0.027984	37.76887	0.491086	92.81866
1 / 6 . *	1.749853	1.992002	8.160481	11.12117	0.018152	16.9447	14.22629	0.008241	0.050103	38.0422	0.435547	92.74876
1 / 7 . *	1.706292	2.076989	8.197592	10.89208	0.0242	17.05733	14.13118	-0.004119	-0.005156	38.18961	0.4734	92.74867
1 / 8 . *	1.69383	2.09684	8.204215	11.22804	0.035088	17.11499	14.27367	-0.016478	0.020624	37.69693	0.498775	92.86301
1 / 9 . *	1.808563	1.991048	8.266425	11.261	-0.004844	16.89452	14.2164	-0.016496	0.018804	38.01927	0.40549	92.88152
1 / 10 . *	1.780406	2.006026	8.40371	11.24957	0.03389	16.92575	14.07551	-0.014426	0.033536	38.10963	0.453372	93.0714

9a2 Pseudotachylite Pyroxene

Date: 6/16/2011 Wt. % Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	1.4255	0.0133	12.5592	21.4676	0.0683	8.2361	2.2905	-0.0021	-0.0316	52.4435	0.1757	98.6799
1 / 2 .	1.1229	0.0180	12.7442	21.7734	0.0794	8.6652	1.9590	0.0449	-0.0411	52.3569	0.1756	98.9396
1 / 3 .	0.9182	0.0191	13.2145	22.3774	0.0522	8.2559	1.5882	0.0514	-0.0778	52.6405	0.0657	99.1829
1 / 4 .	1.3069	0.0126	12.9488	21.6309	0.1069	8.1214	1.7422	0.0128	-0.0489	52.9266	0.1050	98.9141
1 / 5 .	1.0153	0.0054	13.1582	22.1239	0.1193	8.3148	1.7028	0.0535	-0.0316	52.4296	0.0893	99.0121
1 / 6 .	1.3847	0.0081	12.7195	21.6185	0.0795	8.3106	2.0195	0.0107	-0.0547	52.4027	0.0814	98.6352
1 Average	1.1956	0.0127	12.8907	21.8320	0.0843	8.3173	1.8837	0.0285	-0.0476	52.5333	0.1155	98.8940
2 / 1 .	0.8965	-0.0034	13.0320	22.4228	0.0445	7.6972	1.6725	0.0511	-0.0053	52.8283	0.0731	98.7178
2 / 2 .	1.0186	-0.0037	12.8912	22.3352	0.0408	7.9053	2.1019	0.0809	0.0330	52.3805	0.1200	98.9072
2 / 3 .	1.0482	-0.0034	12.2488	22.1542	0.0321	8.7668	2.5009	0.0446	0.0425	51.5450	0.1926	98.5757
2 / 4 .	1.0551	0.0075	12.4540	21.4783	0.0542	9.1214	2.0883	0.0446	0.0539	51.8227	0.1300	98.3100
2 / 5 .	0.9900	-0.0044	12.6909	22.3915	0.0876	8.4025	1.9380	0.0298	0.0158	52.5745	0.0834	99.2039
2 / 6 . *	-0.0212	-0.0219	-0.0100	0.0625	-0.0718	0.2495	-0.0050	-0.0260	-0.0133	100.8099	-0.0817	101.1219
2 Average	1.0017	-0.0015	12.6634	22.1564	0.0518	8.3786	2.0603	0.0502	0.0280	52.2302	0.1198	98.7429
3 / 1 .	1.0067	0.0516	13.1546	22.5430	0.0877	7.7530	1.9487	0.0575	-0.0194	52.3418	0.1725	99.1171
3 / 2 .	1.0644	-0.0041	13.1627	22.6222	0.0766	7.8954	2.0916	0.0511	-0.0232	52.1362	0.1622	99.2625
3 / 3 .	1.0859	0.0020	12.9161	22.5041	0.0717	7.9175	2.2129	0.0490	-0.0060	51.9026	0.2091	98.8708
3 / 4 .	1.0570	0.0040	12.7973	22.6030	0.0852	7.8018	2.2474	0.0681	-0.0002	52.0957	0.1438	98.9033
3 / 5 .	1.0666	0.0047	12.7936	22.2881	0.1173	7.9729	2.2956	0.0319	0.0247	52.0608	0.1934	98.8496
3 / 6 .	1.0462	0.0853	12.9518	22.2641	0.0950	8.1016	2.2244	0.0447	-0.0538	52.0143	0.3000	99.1275
3 / 7 .	1.1039	0.0466	12.9666	22.4191	0.0890	7.8161	2.1580	0.0320	0.0343	52.1390	0.2014	99.0061
3 / 8 .	1.0306	0.0132	12.9892	22.6486	0.1137	7.9568	2.1295	0.0511	-0.0232	52.5651	0.1595	99.6574
3 / 9 .	1.1468	0.0068	12.8401	22.3166	0.1074	8.2041	2.4901	0.0277	-0.0117	52.1044	0.2219	99.4658
3 / 10 .	1.1042	-0.0065	13.0840	22.2833	0.0913	8.0449	2.1932	0.0447	0.0036	52.1840	0.1880	99.2212
3 Average	1.0712	0.0204	12.9656	22.4492	0.0935	7.9464	2.1991	0.0458	-0.0075	52.1544	0.1952	99.1481
4 / 1 . *	1.2460	0.0090	12.1197	19.6892	0.0479	8.7873	2.1837	0.0106	0.0275	45.7278	0.1981	90.0467
4 / 2 . *	1.4112	0.0052	12.1111	18.7243	0.0845	10.7750	2.2879	0.0274	-0.0085	45.1325	0.1148	90.6739
4 / 3 . *	1.0173	0.0032	12.6767	20.0735	0.0849	8.5669	1.5319	0.0148	0.0390	46.6855	0.0844	90.7781
4 / 4 . *	0.7292	0.0140	12.8267	20.4981	0.0726	8.3843	1.2855	0.0297	-0.0391	45.9569	0.0454	89.8425
4 / 5 . *	0.9758	0.0167	12.6062	20.3274	0.0627	7.9494	1.9160	-0.0021	-0.0048	45.3721	0.1856	89.4119
4 / 6 . *	0.8722	0.0015	12.7762	20.5060	0.1120	7.8524	1.6484	0.0085	0.0028	46.0808	0.1520	90.0128

9a2 Pseudotachylite Pyroxene

Date: 6/16/2011 Wt. % Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 7 . *	0.9193	0.0313	13.3551	18.7029	0.0454	9.8523	1.6576	-0.0232	0.0066	44.5326	0.0969	89.1998
4 / 8 . *	1.2305	0.0232	12.2346	19.7797	0.0615	8.4947	2.0628	-0.0254	0.0618	45.3801	0.1776	89.5064
4 / 9 . *	0.8744	0.0066	12.3624	20.3490	0.0798	8.9143	1.7083	0.0085	0.0066	45.6516	0.1568	90.1183
4 / 10 . *	1.3196	0.0157	11.9470	19.6860	0.0676	8.8540	2.5247	0.0106	0.0408	45.4973	0.1878	90.1512

9a2 Shear zone amphibole
Date: 6/14/2011 Wt % Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	0.1071	0.2469	1.8561	1.9969	1.0178	10.9157	11.4323	0.0522	15.0029	0.1603	11.8362	0.1164	-0.0126	42.1137	1.6050	98.460
1 / 2 . *	0.1133	0.2077	1.8531	1.9279	0.9836	10.9957	11.3336	0.0279	14.9660	0.0060	11.7387	0.0873	-0.0312	42.0062	1.4832	97.730
1 / 3 . *	0.1159	0.1871	1.8603	1.8782	0.9328	11.1581	11.2528	0.0401	14.7706	-0.0538	11.4898	0.1211	0.0022	42.3336	1.5199	97.663
1 / 4 . *	0.0729	0.1984	1.8815	1.9171	0.9384	11.1976	11.2350	0.0292	14.8970	-0.0438	11.6104	0.1196	0.0282	42.3224	1.4053	97.853
1 / 5 .	0.0509	0.1734	1.9114	1.8737	0.9148	11.5944	11.4228	0.0352	14.9467	0.0508	10.9970	0.0767	-0.0108	42.9643	1.4257	98.438
1 / 6 .	0.0498	0.1717	1.9084	1.8774	0.8749	11.5185	11.3698	0.0085	14.6397	0.0858	10.9661	0.1289	0.0097	43.0130	1.4495	98.072
1 / 7 .	0.0461	0.1729	1.9172	1.8085	0.8442	11.7809	11.3692	0.0316	14.5907	0.0110	10.8478	0.0782	-0.0108	43.3317	1.4139	98.244
1 / 8 . *	0.0598	0.1809	1.9044	1.7385	0.8319	11.7264	11.2905	0.0450	14.1586	-0.0090	10.8956	0.1198	0.0190	43.4798	1.3113	97.762
1 / 9 . *	0.0756	0.1938	1.8864	1.8397	0.9104	11.3394	11.3395	0.0657	14.6184	0.0309	11.3067	0.0752	0.0059	42.8318	1.3633	97.883
1 / 10 . *	0.0793	0.1984	1.8781	1.8885	0.9207	11.2539	11.4320	0.0316	14.5764	0.0957	11.2897	0.0982	0.0208	42.5579	1.4596	97.781
2 / 1 .	0.0782	0.5640	1.7716	2.1934	1.2285	10.3235	11.5537	0.0511	14.8248	0.1722	14.1243	0.0645	0.0278	39.9431	1.4478	98.368
2 / 2 .	0.0633	0.5969	1.7693	2.1914	1.3371	10.0632	11.6618	0.0134	15.2826	0.1022	14.4447	0.0276	0.0445	39.7433	1.2281	98.569
2 / 3 . *	0.1039	0.6593	1.7226	2.0447	1.3700	10.2580	11.6478	0.0158	14.7761	0.1523	14.1867	0.0999	0.0204	39.6644	1.2478	97.970
2 / 4 .	0.0392	0.6083	1.7841	1.9187	1.2849	10.5904	11.7679	0.0487	14.6033	0.0624	13.7569	0.0476	0.0279	40.4958	1.3040	98.340
2 / 5 .	0.0746	0.5984	1.7657	1.9847	1.3287	10.3492	11.6096	0.0207	14.7691	0.1622	13.9292	0.0537	0.0018	40.3081	1.3741	98.330
2 / 6 . *	0.0220	0.5680	1.7999	2.0617	1.2411	10.3779	11.5053	0.0633	14.4669	0.1473	13.9017	0.0768	0.0502	40.4586	1.3367	98.077
2 / 7 .	0.0625	0.5343	1.7936	2.1024	1.1921	10.5593	11.5457	0.0523	14.4639	0.0924	13.9433	0.0307	0.0577	40.4946	1.3219	98.247
2 / 8 . *	0.0146	0.5283	1.8169	2.0338	1.2019	10.6419	11.4907	0.0365	14.3517	0.1324	13.6082	0.0507	0.0800	40.6715	1.4059	98.065
2 / 9 . *	0.0306	0.5396	1.8087	2.0473	1.1990	10.7420	11.4516	0.0268	14.1283	0.1525	13.5900	0.0646	0.0410	40.9011	1.3281	98.051
2 / 10 .	0.0185	0.4966	1.8885	2.8130	1.1870	8.6274	10.4237	0.0293	12.7392	0.0877	15.7274	0.0463	0.0130	43.8198	1.2796	99.197
3 / 1 .	0.0594	0.8604	1.6866	2.1870	1.3917	9.2421	11.2974	0.0060	15.8966	0.1119	14.1350	0.1401	0.1078	39.2942	2.0113	98.428
3 / 2 . *	0.0133	0.8180	1.7110	2.1525	1.3945	9.3929	11.3018	0.0544	15.7108	0.1467	13.8509	0.0976	0.0765	39.3482	1.7725	97.842
3 / 3 .	0.0266	0.9584	1.6684	2.2084	1.5384	9.0311	11.3936	0.0181	16.0848	0.1269	14.4356	0.1189	0.1115	38.8880	1.7291	98.338
3 / 4 .	0.0543	0.8981	1.6782	2.1973	1.3985	9.0661	11.1944	0.0314	16.2888	0.1267	14.3852	0.1111	0.1114	39.2715	1.7227	98.536
3 / 5 . *	0.0350	0.9058	1.6634	2.2599	1.4116	8.9035	11.1722	0.0278	16.0910	0.1912	14.3682	0.1005	0.1041	38.5957	1.7386	97.568
3 / 6 .	-0.0087	0.4764	1.8612	2.0195	0.9298	11.5252	11.4150	0.0049	13.8679	0.0628	11.8438	0.1012	0.1050	42.6813	1.5454	98.439
3 / 7 .	0.0181	0.8263	1.7139	2.2115	1.4493	9.1020	11.2743	0.0036	15.6731	0.2112	14.3716	0.0930	0.1024	39.2709	1.9095	98.231
3 / 8 . *	0.0217	0.9100	1.6829	2.2197	1.4139	9.0137	11.2591	0.0157	15.8745	0.1616	14.5899	0.1524	0.0710	38.8527	1.8280	98.067
3 / 9 .	0.0824	0.8985	1.6647	2.2578	1.4731	9.2037	11.3708	0.0169	15.9735	0.1368	14.3006	0.0945	0.0617	39.1671	1.8835	98.585
3 / 10 .	0.0193	0.8597	1.7066	2.1880	1.4810	9.2121	11.3614	0.0024	15.8898	0.2410	14.2615	0.1129	0.0562	39.3871	1.7180	98.497
4 / 1 .	0.0317	0.2454	1.8979	2.1189	1.0145	11.2643	11.4311	0.0731	14.2691	0.0420	12.2168	0.1661	0.0523	41.9299	1.5352	98.289
4 / 2 .	0.0477	0.2173	1.8959	2.1324	1.0309	11.1833	11.3667	0.0353	14.4360	0.0370	12.2531	0.1368	0.0952	41.8281	1.5802	98.276
4 / 3 . *	0.0737	0.2508	1.8674	2.1166	1.0373	11.1368	11.4326	0.0561	14.0670	0.0570	12.2605	0.1123	0.0636	41.7263	1.5997	97.858
4 / 4 .	0.0759	0.2359	1.8823	2.0782	1.0504	11.2988	11.3268	0.0256	14.5433	-0.0380	12.1759	0.1553	0.0803	42.0979	1.4762	98.503
4 / 5 .	0.0120	0.2060	1.9220	1.9828	1.0394	11.4440	11.4864	0.0548	14.2983	0.0020	11.7655	0.1153	0.0784	42.4782	1.4204	98.306
4 / 6 .	0.0539	0.2969	1.8668	1.9014	1.2231	11.1454	11.5059	0.0390	14.6366	0.0270	12.0223	0.1337	0.0579	41.7140	1.6792	98.303
4 / 7 .	0.0096	0.2147	1.9366	1.9818	0.9548	11.8492	11.5740	0.0488	13.5750	0.0270	11.7232	0.1310	0.0787	42.9652	1.5818	98.652

9a2 Shear zone amphibole
Date: 6/14/2011 Wt % Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 8 .	0.0753	0.2492	1.8806	2.0538	1.0292	11.2106	11.4964	0.0561	13.7892	-0.0080	12.3845	0.1155	0.0954	42.1132	1.7002	98.249
4 / 9 .	0.0512	0.3263	1.8489	2.1710	1.2242	10.2749	11.4022	0.0499	15.0202	0.1416	13.3996	0.1411	0.1154	40.3417	1.7603	98.268
4 / 10 .	0.0526	0.2478	1.8860	2.1995	1.0016	11.1266	11.3623	0.0670	14.3991	0.0020	12.5361	0.1153	0.0784	41.6060	1.6441	98.324
5 / 1 .	0.0059	0.1641	1.9466	1.9239	1.0244	12.3094	11.3769	0.0244	12.9106	0.1336	12.1727	0.1802	0.0563	42.7949	1.0381	98.062
5 / 2 .	-0.0114	0.1692	1.9643	1.8513	0.8888	12.4549	11.2003	0.0305	13.2121	0.0636	12.0438	0.1772	0.1123	43.4189	1.0717	98.659
5 / 3 .	0.0196	0.1543	1.9631	1.9107	0.8694	12.5959	11.4026	0.0610	12.9634	0.0285	12.1789	0.1820	0.0732	43.4503	0.9449	98.797
5 / 4 .	0.0307	0.1733	1.9535	1.8925	0.8631	12.6457	11.5321	0.0427	13.1079	0.0135	12.1821	0.1480	0.0862	43.3732	0.9189	98.963
5 / 5 .	-0.0288	0.1691	1.9758	1.9724	0.8803	12.4645	11.5410	0.0573	12.9696	-0.0115	12.5432	0.1850	0.1124	43.2794	1.0617	99.212
5 / 6 .	0.0145	0.1799	1.9415	1.8814	0.9117	12.4060	10.7323	0.0475	13.5667	0.0784	12.4265	0.1600	0.0599	42.8490	0.9272	98.183
5 / 7 .	0.0282	0.1851	1.9505	1.9778	0.9294	12.2772	11.5882	0.0524	13.1489	0.0285	12.6149	0.1618	0.0563	42.9631	1.1228	99.085
5 / 8 .	0.0764	0.1683	1.9230	1.9868	0.9249	12.3053	11.6540	0.0695	13.1554	0.0636	12.4247	0.1833	0.0208	42.8378	1.0079	98.802
5 / 9 .	-0.0139	0.1595	1.9665	1.9568	0.9141	12.4490	11.5525	0.0659	12.9110	0.0836	12.3221	0.2343	0.0657	43.0284	1.0568	98.766
5 / 10 .	0.0072	0.1643	1.9664	1.8743	0.9095	12.6098	11.5124	0.0574	12.6368	0.0235	12.0869	0.1867	0.0582	43.4904	1.1034	98.687
6 / 1 .	0.0590	0.1306	1.9455	1.9366	0.9747	12.2317	11.6362	0.0671	12.6634	0.0356	12.0750	0.1681	0.0451	43.0358	1.7276	98.732
6 / 2 .	0.0452	0.1180	1.9517	2.0416	0.9610	12.0559	11.6807	0.0525	12.7580	0.0255	12.1570	0.1588	0.0901	42.7807	1.7784	98.655
6 / 3 .	0.0215	0.1045	1.9697	1.9432	0.7979	12.6399	11.6805	0.0403	12.2939	0.0356	11.2601	0.1421	0.0640	43.6775	1.6251	98.296
6 / 4 .	0.0415	0.0985	1.9597	1.9102	0.8427	12.7484	11.5322	0.0903	12.4834	-0.0045	11.1614	0.1111	0.0620	43.6794	1.5547	98.275
6 / 5 .	0.0528	0.1039	1.9575	1.9072	0.8101	12.6553	11.7352	0.0403	12.2905	0.0105	11.4887	0.1143	0.0452	43.6287	1.5917	98.432
6 / 6 .	0.0975	0.1199	1.9390	2.0029	0.8817	12.4472	11.6160	0.0500	12.8173	-0.0345	11.8097	0.1449	0.0302	43.4102	1.7959	99.162
6 / 7 .	0.0127	0.1126	1.9658	2.0784	0.9405	11.9606	11.6135	0.0585	12.7677	-0.0145	12.5030	0.1418	0.0133	42.4106	1.8902	98.469
6 / 8 .	0.0314	0.1180	1.9645	2.0445	0.9094	12.1916	11.6090	0.0463	13.0597	0.0205	12.2046	0.0847	0.0451	42.7470	1.9406	99.017
6 / 9 .	0.0651	0.1169	1.9446	1.9974	0.9850	12.3576	11.6000	0.0451	12.8377	0.0205	11.9928	0.1126	0.0489	42.9241	1.7096	98.758
6 / 10 .	0.0289	0.1169	1.9624	2.0752	0.9474	12.0685	11.5180	0.0610	13.0501	-0.0395	12.2894	0.1325	0.0657	42.7576	1.7390	98.812
7 / 1 .	0.1220	0.2723	1.8551	1.9453	1.1088	11.6462	11.2558	0.0826	13.9519	0.0125	11.8571	0.4509	0.0526	42.6252	1.2628	98.501
7 / 2 .	0.0962	0.2775	1.8628	2.0061	1.0953	11.4576	11.3147	0.0644	13.9160	0.0423	12.1021	0.4923	0.0805	42.2829	1.3185	98.409
7 / 3 .	0.1205	0.2786	1.8445	2.0068	1.1267	11.3105	11.2129	0.0425	14.1557	0.0573	12.1482	0.4705	0.0785	42.1114	1.2871	98.252
7 / 4 . *	0.0765	0.2964	1.8536	2.0086	1.0848	11.2302	11.3231	0.0546	13.7862	0.0174	12.2196	0.5014	0.0842	41.8891	1.2901	97.716
7 / 5 .	0.0887	0.2797	1.8633	2.0401	1.1197	11.3734	11.4488	0.0619	14.0254	0.1270	12.2246	0.4906	0.0786	41.9278	1.3891	98.539
7 / 6 .	0.0802	0.2716	1.8701	2.0053	1.0868	11.4393	11.2987	0.0680	13.9090	-0.0125	12.2011	0.5491	0.0730	42.0976	1.3465	98.296
7 / 7 .	0.1515	0.3197	1.8214	2.0110	1.0489	11.6653	11.2886	0.0607	13.9323	0.0523	11.8923	0.5397	0.1176	42.1751	1.3154	98.392
7 / 8 .	0.0974	0.2455	1.8725	1.9502	1.0852	11.6565	11.3290	0.0170	13.9114	0.0324	11.9223	0.4833	0.1028	42.4862	1.2072	98.399
7 / 9 . *	0.1137	0.2580	1.8552	1.9541	1.0922	11.6407	11.3864	0.0352	13.5852	0.0224	11.7594	0.4820	0.0936	42.5034	1.2228	98.004
7 / 10 .	0.1137	0.2675	1.8591	1.8863	1.1082	11.8678	11.3272	0.0693	13.7382	-0.0224	11.5794	0.5096	0.1215	42.6484	1.2811	98.377
8 / 1 .	0.0059	0.2078	1.9381	2.1199	1.3231	11.3220	11.5553	0.0378	13.4729	0.2027	13.9807	0.0339	0.0178	41.2181	1.5772	99.013
8 / 2 .	0.0084	0.2151	1.9311	2.1721	1.2552	11.1430	11.4444	0.0622	13.7585	0.1476	14.1456	0.0724	0.0383	40.9746	1.5538	98.922
8 / 3 .	0.0603	0.2102	1.8990	2.1827	1.2610	11.1048	11.6081	0.0732	13.6475	0.1176	14.1577	0.0462	0.0234	40.7575	1.4470	98.596
8 / 4 .	0.0183	0.2246	1.9094	2.1210	1.2608	11.0447	11.5010	0.0354	13.7645	0.1126	14.0672	0.0539	0.0346	40.6836	1.4317	98.263

9a2 Shear zone amphibole
Date: 6/14/2011 Wt % Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
8 / 5 .	0.0404	0.2104	1.9092	2.1863	1.2358	11.3078	11.4456	0.0512	13.6661	0.1927	13.9393	0.0740	0.0589	40.9212	1.3629	98.602
8 / 6 .	-0.0102	0.2067	1.9357	2.1501	1.1789	11.2722	11.6694	0.0525	13.5792	0.1026	13.7079	0.0524	0.0346	41.2516	1.5036	98.697
8 / 7 .	-0.0126	0.2365	1.9270	2.0230	1.3378	11.3409	11.6598	0.0781	13.7978	0.1126	13.5929	0.0770	0.0141	41.1915	1.4905	98.880
8 / 8 .	-0.0290	0.1714	1.9645	1.8896	1.0954	12.5961	11.7252	0.0465	12.4338	0.0578	12.2500	0.0805	0.0704	43.0300	1.2983	98.709
8 / 9 .	-0.0452	0.1432	1.9677	1.9519	1.0642	12.2588	11.6912	0.0538	12.4835	0.0628	12.5492	0.0526	0.0385	42.8294	1.3416	98.488
8 / 10 .	-0.0719	0.1028	2.0022	1.6562	0.7904	13.6254	11.8768	0.0650	11.6942	0.0327	10.5278	0.0341	0.0386	45.2512	0.9857	98.683
9 / 1 .	0.0917	0.4242	1.8097	2.1443	1.2557	10.5365	11.2239	0.0134	14.7364	0.0100	12.9320	0.1827	0.3291	41.0120	1.6458	98.347
9 / 2 .	0.0462	0.3928	1.8502	2.0646	1.0950	11.2367	11.3597	0.0475	14.1217	0.0650	11.9899	0.1246	0.3038	42.1862	1.3914	98.275
9 / 3 .	0.1142	0.3601	1.8244	2.0424	1.0999	11.4194	11.1958	0.0354	14.0933	0.0750	12.0363	0.1831	0.2423	41.9526	1.5753	98.250
9 / 4 . *	0.0436	0.4520	1.8214	2.1007	1.1917	10.9994	11.2311	0.0572	14.6983	0.0200	12.4497	0.1844	0.2250	41.1285	1.4867	98.090
9 / 5 . *	0.1220	0.4949	1.7651	2.0660	1.3063	10.4023	11.1889	0.0170	15.0561	0.0199	13.0987	0.1289	0.2358	40.5874	1.5842	98.073
9 / 6 .	0.0670	0.4073	1.8444	1.9893	1.1966	11.1338	11.3327	-0.0037	14.7557	0.1348	12.3127	0.1890	0.2493	41.8718	1.6267	99.111
9 / 7 . *	0.0955	0.3482	1.7848	1.9192	1.0709	10.9174	10.4998	0.0400	17.1726	-0.0050	11.6449	0.1404	0.2082	40.0817	1.3187	97.242
9 / 8 . *	0.0856	0.4123	1.8143	2.0791	1.1505	11.0572	11.2868	0.0231	14.3312	0.0350	12.5162	0.1445	0.3128	41.3353	1.4085	97.993
9 / 9 . *	0.1030	0.4442	1.7997	2.0341	1.1883	10.9018	11.2710	0.0183	14.3664	-0.0499	12.6357	0.1552	0.2848	41.2823	1.6473	98.132
9 / 10 . *	0.0561	0.3856	1.8366	2.0790	1.1378	10.9579	11.1659	0.0061	14.1979	-0.0100	12.5372	0.1938	0.3148	41.4275	1.5362	97.832
10 / 1 . *	0.1404	0.5625	1.7299	1.9647	1.5711	9.9541	11.3816	0.0303	15.1020	0.0872	14.9657	0.1471	0.0154	39.5448	0.7284	97.925
10 / 2 .	0.1386	0.5151	1.7500	2.0174	1.4871	10.1034	11.3335	0.0182	15.3850	0.0921	15.0386	0.1042	-0.0032	39.6409	0.6342	98.258
10 / 3 . *	0.0847	0.4623	1.7844	1.9485	1.4440	10.4307	11.5075	0.0510	14.8203	0.1172	14.4606	0.1104	0.0079	39.7429	0.7492	97.721
10 / 4 .	0.1496	0.5886	1.7172	2.0379	1.5019	9.9628	11.3831	0.0327	15.6907	0.2065	14.4484	0.1760	0.0376	39.4078	1.0268	98.367
10 / 5 . *	0.1652	0.4597	1.7545	2.0275	1.3588	10.5732	11.3240	0.0523	14.8438	0.0923	13.8444	0.1703	0.0061	40.4504	0.9274	98.050
10 / 6 . *	0.1256	0.4340	1.7787	2.0356	1.3894	10.5649	11.2992	0.0291	15.0782	0.1470	13.9853	0.1150	0.0061	40.3384	0.7209	98.047
10 / 7 . *	0.0905	0.5129	1.7646	2.0108	1.3927	10.3087	11.3398	0.0595	14.9921	0.2068	14.2566	0.1103	0.0061	39.8561	0.7589	97.666
10 / 8 . *	0.1068	0.4991	1.7667	1.9902	1.4326	10.4553	11.4518	0.0632	15.0187	0.1073	13.8154	0.1873	0.0228	40.1593	0.9153	97.992
10 / 9 .	0.1492	0.5269	1.7351	2.0103	1.5651	9.8961	11.3375	-0.0085	15.6739	0.0970	15.3553	0.1132	0.0098	39.0791	0.6868	98.235
10 / 10 . *	0.0943	0.4809	1.7561	1.9744	1.4400	10.1918	11.2832	0.0219	14.9594	-0.0025	14.2655	0.1119	-0.0125	39.5241	0.6779	96.781

9a2 Pseudotachylite amphibole
Date: 6/14/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
1 / 1 .	0.0186	0.0142	1.9581	1.7913	1.7963	10.2052	11.5328	0.0487	14.8515	0.1009	13.6671	0.0722	0.0006	40.5345	1.9454	98.538
1 / 2 .	0.0386	0.0178	1.9434	1.6887	1.8563	10.4259	11.6748	0.0122	14.3797	0.0560	13.3596	0.0416	0.0043	40.5994	2.0625	98.161
1 / 3 .	0.0807	0.0202	1.9358	1.7520	1.7947	10.3231	11.6815	0.0439	14.6241	0.0960	13.7346	0.0985	0.0230	40.6732	2.0868	98.968
1 / 4 .	0.0422	0.0166	1.9411	1.7780	1.8286	10.1804	11.2992	0.0280	14.5117	0.1260	13.8563	0.0616	0.0174	40.3896	2.0496	98.126
1 / 5 . *	0.0310	0.0166	1.9374	1.7941	1.8201	10.0530	11.5245	0.0268	14.6052	0.0960	13.9073	0.0692	0.0081	40.0661	1.8700	97.825
1 / 6 .	0.0286	0.0178	1.9471	1.7965	1.7989	10.1948	11.5358	0.0366	14.5391	0.0911	13.6698	0.0693	0.0137	40.4655	1.9506	98.155
1 / 7 .	0.0236	0.0202	1.9462	1.7313	1.8960	10.1435	11.5017	0.0171	14.5305	0.2011	13.7247	0.0677	0.0361	40.2949	2.0217	98.156
1 / 8 .	0.0409	0.0220	1.9464	1.7291	1.7871	10.4357	11.4255	0.0841	14.6749	0.1360	13.6746	0.1646	0.0827	40.5361	1.8267	98.566
1 / 9 .	0.0384	0.0214	1.9381	1.6735	2.0395	10.2326	11.6057	0.0292	14.8878	0.0410	13.7506	0.0938	0.0248	40.0961	1.8699	98.342
1 / 10 .	0.0471	0.0142	1.9363	1.7549	1.8550	10.1837	11.5448	0.0293	14.5757	0.1660	13.8447	0.1215	0.0510	40.0544	2.0639	98.243
2 / 1 .	0.0000	0.0158	1.9436	1.7329	1.9922	9.7039	11.2879	0.0255	15.6650	0.0915	14.1193	0.1117	0.0549	39.3469	1.9227	98.014
2 / 2 .	-0.0124	0.0098	1.9510	1.6037	2.1198	9.8387	11.5922	0.0340	15.1062	0.0568	14.1400	0.0966	0.0365	39.5294	1.9695	98.084
2 / 3 .	-0.0346	0.0193	1.9596	1.7028	1.9195	9.9245	11.5797	0.0413	14.9580	0.0369	14.1400	0.0859	0.0235	40.0185	1.9347	98.344
2 / 4 .	0.0161	0.0093	1.9564	1.5956	1.9405	10.1571	11.5616	0.0353	14.3825	0.0619	14.0430	0.0615	0.0142	40.3295	1.9299	98.094
2 / 5 .	0.0160	0.0134	1.9442	1.6756	2.0453	9.8670	11.4972	0.0535	15.1077	0.1266	14.1089	0.1089	0.0068	39.6220	1.9977	98.191
2 / 6 . *	-0.0372	0.0116	1.9542	1.7283	1.8866	9.9388	11.5322	0.0462	14.7458	0.0369	14.1067	0.0845	-0.0286	39.9215	1.8760	97.869
2 / 7 . *	0.0235	-0.0038	1.9379	1.6892	2.0134	9.6879	11.5739	0.0912	14.7418	0.0419	14.0359	0.1258	0.0142	39.5711	2.1511	97.699
2 / 8 .	0.0012	0.0063	1.9584	1.6986	2.0053	10.0602	11.5686	0.0146	14.9028	0.0818	13.9465	0.1259	0.0161	39.8632	2.0072	98.257
2 / 9 . *	0.0507	0.0075	1.9280	1.6744	1.9831	10.0411	11.6214	0.0742	14.8499	0.0070	13.9763	0.0721	-0.0100	39.7127	1.9665	97.965
2 / 10 . *	-0.0186	0.0075	1.9574	1.6690	1.9656	9.9270	11.5256	0.0280	14.6299	0.0270	14.0677	0.0891	-0.0118	40.0502	1.9502	97.894
3 / 1 .	0.0644	-0.0039	1.9311	1.6873	1.9414	10.0079	11.5817	0.0572	15.1255	-0.0185	13.2224	0.0737	-0.0071	40.6073	1.9915	98.291
3 / 2 . *	0.0211	-0.0033	1.9421	1.6196	1.8951	10.1907	11.6860	0.0402	15.0193	0.0615	12.8367	0.0815	0.0097	40.5346	1.8574	97.795
3 / 3 .	0.0606	0.0098	1.9278	1.6503	1.8731	10.1625	11.5189	0.0548	15.1726	0.0265	13.1496	0.0615	0.0395	40.4602	2.0322	98.200
3 / 4 .	0.0520	0.0009	1.9404	1.6953	1.9101	10.3080	11.4803	0.0475	15.0338	-0.0385	13.0910	0.0876	-0.0201	40.6671	2.0680	98.382
3 / 5 .	0.0421	-0.0021	1.9496	1.6849	1.9218	10.0666	11.5902	0.0548	15.3247	0.0065	13.3249	0.0861	-0.0313	40.6177	2.0663	98.736
3 / 6 .	0.0087	-0.0015	1.9586	1.6971	1.9184	10.0892	11.5092	0.0840	15.2393	0.0265	13.1639	0.0707	0.0209	40.5307	2.0377	98.355
3 / 7 .	0.0756	-0.0009	1.9254	1.7215	1.9513	10.1335	11.5744	0.0439	15.1160	-0.0135	13.1689	0.0600	0.0041	40.4946	2.0717	98.341
3 / 8 .	0.0284	-0.0057	1.9541	1.7366	1.8951	10.1388	11.5743	0.0426	15.3941	0.1014	13.2615	0.0722	0.0060	40.5134	2.0268	98.745
3 / 9 .	0.0186	0.0074	1.9686	1.7203	1.9336	10.2045	11.6788	0.0341	15.1630	0.0365	13.1699	0.0891	0.0246	40.9412	2.1349	99.125
3 / 10 .	-0.0111	0.0032	1.9762	1.7142	1.9454	10.3816	11.5019	0.0925	15.4504	0.0664	13.0781	0.0599	-0.0015	40.7768	2.1154	99.162
4 / 1 . *	0.0640	0.0184	1.9139	1.7306	1.9967	9.8209	11.3759	0.0547	14.7986	-0.0389	13.8875	0.0660	0.0489	39.9988	1.8143	97.589
4 / 2 . *	0.0718	0.0029	1.9078	1.6441	1.9603	9.9508	11.6090	0.0353	14.2438	0.0310	13.6036	0.0661	0.0545	40.0372	1.8528	97.071
4 / 3 .	0.0802	0.0059	1.9155	1.5741	2.1326	9.8956	11.7061	0.0414	14.7501	0.1558	13.6372	0.0277	0.0285	40.3106	1.7864	98.048
4 / 4 . *	0.0567	0.0053	1.9189	1.7503	1.9967	9.5621	11.6320	0.0900	15.1963	0.0409	13.8614	0.0767	0.0451	39.6066	2.0611	97.900

9a2 Pseudotachylite amphibole
Date: 6/14/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
4 / 5 .	0.0899	0.0071	1.9119	1.7082	1.9804	9.8440	11.4673	0.0778	15.0197	0.0908	13.7814	0.0874	0.0303	40.1580	1.8937	98.148
4 / 6 . *	0.0615	-0.0036	1.9242	1.7613	1.9397	9.8044	11.4776	0.0766	15.0437	-0.0339	13.8385	0.0905	0.0135	39.9924	1.8981	97.922
4 / 7 . *	0.0603	-0.0036	1.9262	1.6904	2.0055	9.7973	11.5329	0.0158	15.0037	-0.0090	14.0217	0.0921	0.0396	39.9480	1.8377	97.971
4 / 8 .	0.0590	0.0154	1.9331	1.6787	2.0672	9.8021	11.4779	0.0838	15.3063	0.0359	13.9346	0.0797	-0.0143	40.1909	1.9841	98.649
4 / 9 . *	0.0751	0.0077	1.9097	1.6507	2.0688	9.7608	11.5620	0.0498	15.0677	0.0758	13.6441	0.0629	0.0265	39.8796	1.9792	97.820
4 / 10 . *	0.0283	0.0023	1.9383	1.6573	2.0744	9.6902	11.6968	0.0450	15.0451	-0.0040	13.9249	0.0660	0.0154	39.7455	2.0441	97.974
5 / 1 . *	0.1023	-0.0028	1.9378	1.6422	1.7353	10.1492	11.3724	0.0572	15.3318	-0.0150	12.4266	0.0736	0.0346	42.3989	1.8296	99.092
5 / 2 .	0.0774	-0.0022	1.9234	1.6885	1.8127	10.2981	11.4550	0.0583	15.4172	-0.0399	12.7753	0.1257	0.0364	40.8456	1.7620	98.275
5 / 3 .	0.0763	-0.0040	1.9240	1.7480	1.7572	10.1978	11.5938	0.0911	15.2421	-0.0399	12.9585	0.1211	0.0123	40.7052	1.8202	98.247
5 / 4 . *	0.0728	0.0037	1.9234	1.7247	1.7591	10.0510	11.4341	0.0656	15.1237	0.0000	12.9578	0.0905	0.0457	40.8095	1.9666	98.028
5 / 5 .	0.0542	0.0120	1.9355	1.7374	1.8646	9.9131	11.6252	0.0680	15.4884	-0.0149	13.3464	0.1011	0.0383	40.4441	1.9934	98.622
5 / 6 .	0.0963	-0.0028	1.9253	1.7109	1.8053	10.2952	11.6424	0.0693	15.0194	-0.0698	12.8202	0.0552	0.0327	41.1191	2.0490	98.640
5 / 7 .	0.0631	0.0085	1.9342	1.7094	1.8045	10.1909	11.6247	0.0365	14.8617	0.0000	12.7788	0.0860	0.0812	41.1150	1.9948	98.289
5 / 8 .	0.0875	-0.0017	1.9247	1.7014	1.7997	10.1814	11.6191	0.0693	15.2605	-0.0050	12.8635	0.0859	0.0086	41.0313	1.8632	98.496
5 / 9 .	0.0913	-0.0017	1.9221	1.7007	1.8766	9.9742	11.6632	0.0729	15.2861	-0.0199	13.0162	0.1027	0.0661	40.8016	2.0193	98.593
5 / 10 . *	0.0663	0.0102	1.9123	1.6428	1.9445	9.9322	11.5896	0.0340	15.5594	-0.0996	13.0158	0.1026	0.0382	40.1866	1.8347	97.869
6 / 1 .	-0.0095	0.0015	1.9602	1.6404	1.9133	10.0725	11.5762	0.0231	14.8594	-0.0403	13.6025	0.0919	-0.0088	40.2258	2.0666	98.033
6 / 2 .	0.0632	0.0104	1.9319	1.7030	1.9606	10.1197	11.6130	0.0218	15.2177	-0.0005	13.6339	0.0796	0.0097	40.2730	1.9118	98.549
6 / 3 . *	0.0016	-0.0009	1.9587	1.6265	2.0638	9.9313	11.6094	0.0036	14.6215	-0.1052	14.0177	0.0951	0.0060	40.1103	1.8770	97.923
6 / 4 . *	0.0512	0.0086	1.9324	1.5612	2.0153	10.0276	11.7407	0.0146	14.6577	-0.0005	13.5643	0.0536	0.0636	40.3362	1.9693	97.996
6 / 5 . *	0.0103	0.0223	1.9389	1.6451	1.9937	9.7966	11.4795	0.0303	14.9518	0.0692	13.8198	0.1118	0.0079	39.8029	2.0362	97.716
6 / 6 . *	-0.0231	0.0075	1.9556	1.6769	2.0107	10.0658	11.6621	0.0158	14.7034	0.0494	13.8045	0.0629	0.0283	40.0121	1.9204	97.975
6 / 7 .	0.0894	0.0110	1.9177	1.5875	1.9565	10.0765	11.6118	0.0109	14.8004	-0.0254	13.3698	0.0919	0.0079	40.6067	2.0730	98.211
6 / 8 . *	-0.0292	0.0080	1.9572	1.6149	1.9423	10.0814	11.6419	0.0012	14.8347	-0.0204	13.7865	0.0889	0.0023	40.2094	1.7811	97.950
6 / 9 .	0.0609	-0.0009	1.9320	1.7247	2.0057	9.8991	11.6133	0.0255	14.7797	-0.0204	14.0401	0.0598	-0.0014	40.0873	1.9362	98.164
6 / 10 .	0.0992	0.0140	1.9165	1.7305	2.0088	9.8656	11.6083	0.0158	14.8414	0.0144	14.2702	0.1011	0.0302	39.9845	2.1075	98.608
7 / 1 .	0.0448	-0.0019	1.9355	1.7051	1.9239	9.7307	11.6673	0.0570	15.0979	0.0911	14.0766	0.0903	0.0523	39.9558	1.7297	98.158
7 / 2 .	0.0682	0.0005	1.9307	1.7620	1.8931	9.7219	11.5521	0.0570	15.2931	-0.0035	14.1257	0.1208	0.0504	40.0290	1.8885	98.493
7 / 3 . *	0.1201	-0.0007	1.8863	1.6981	1.9279	9.5240	11.6772	0.0449	15.1203	0.0711	14.0185	0.1545	0.0690	39.3993	2.0682	97.779
7 / 4 .	0.0399	-0.0025	1.9381	1.7400	1.8581	9.7716	11.5946	0.0582	15.2125	0.0860	13.9149	0.1423	0.0708	39.9102	1.8888	98.226
7 / 5 . *	0.0671	-0.0025	1.9193	1.7065	1.8484	9.7189	11.5918	0.0667	15.0294	0.0363	13.8684	0.1805	0.0616	39.8398	1.9318	97.866
7 / 6 .	0.0866	-0.0025	1.9233	1.6207	1.8063	10.0401	11.6965	0.0364	15.4128	-0.0134	13.9191	0.1240	0.0300	40.0762	1.8187	98.591
7 / 7 . *	0.1263	-0.0049	1.8788	1.5615	1.9003	9.6075	11.3706	0.0678	16.1615	0.0809	13.6110	0.1816	0.0392	39.5162	1.8040	97.907
7 / 8 .	0.0659	-0.0025	1.9326	1.7295	1.8886	9.7346	11.6291	0.0740	15.1420	0.0065	13.9737	0.1454	0.0282	40.1865	1.9149	98.451

9a2 Pseudotachylite amphibole
Date: 6/14/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
7 / 9 . *	0.0485	0.0070	1.9284	1.7846	1.8000	9.6645	11.4357	0.0498	15.2661	-0.0085	14.0597	0.1408	0.0486	39.8751	1.8113	97.920
7 / 10 .	0.0397	-0.0114	1.9347	1.7678	1.8651	9.8092	11.4724	0.0752	15.3237	0.0761	14.1563	0.1193	-0.0219	39.7640	1.6558	98.059
8 / 1 .	0.0621	0.0122	1.9301	1.7097	1.8947	10.1311	11.5400	0.0365	14.7673	0.0893	13.8457	0.0675	0.0454	40.1888	1.9444	98.265
8 / 2 . *	0.0597	0.0093	1.9275	1.7652	1.9090	9.8078	11.5515	0.0426	14.6087	0.0544	14.1522	0.0661	0.0212	40.0233	1.9560	97.955
8 / 3 . *	0.0633	0.0051	1.9227	1.7293	2.0165	9.9168	11.5156	0.0195	14.5789	0.1142	14.1633	0.0307	0.0045	39.8608	1.8958	97.837
8 / 4 . *	0.0374	0.0146	1.9344	1.6763	1.9343	10.0315	11.5670	0.0049	14.5885	0.1193	13.8604	0.0353	0.0324	40.1575	1.8258	97.820
8 / 5 . *	0.0584	0.0027	1.9279	1.7480	1.8319	10.0266	11.5086	0.0036	14.6106	0.0294	13.8445	0.0568	0.0622	40.1765	1.8710	97.759
8 / 6 .	0.0163	0.0003	1.9533	1.7190	1.9123	10.0731	11.5967	0.0170	14.7870	0.1493	14.1403	0.0415	0.0864	40.0297	1.6530	98.175
8 / 7 .	0.0387	0.0122	1.9390	1.7475	1.9019	10.0477	11.4566	0.0158	14.7023	0.0444	13.8472	0.0446	0.0585	40.2118	1.9560	98.024
8 / 8 . *	0.0672	0.0176	1.9226	1.7231	1.9038	10.2922	11.6304	0.0085	14.4398	0.0345	13.7977	0.0292	0.0567	40.1152	1.9116	97.950
8 / 9 . *	0.0485	-0.0015	1.9277	1.7076	1.9877	9.9471	11.5192	0.0474	14.7567	0.1043	13.8867	0.0660	0.0175	39.6842	2.1125	97.813
8 / 10 . *	0.0077	0.0051	1.9488	1.7213	1.8916	10.1275	11.4810	0.0304	14.6948	0.0794	13.8301	0.0492	0.0436	39.9033	1.9276	97.741
8 / 11 . *	0.0077	0.0110	1.9485	1.7204	1.9156	9.9484	11.6004	0.0584	14.7151	0.0145	13.8364	0.0461	0.0752	39.8850	2.0591	97.842
9 / 1 .	0.0075	0.0091	1.9608	1.7423	1.9200	9.9263	11.4853	0.0631	15.2480	0.0493	13.4332	0.0781	-0.0051	40.5690	2.0348	98.527
9 / 2 .	0.0429	0.0097	1.9443	1.7127	1.8445	10.2620	11.3551	0.0121	15.6623	0.1138	13.1420	0.0810	-0.0199	40.6748	1.8834	98.741
9 / 3 .	0.0284	-0.0004	1.9584	1.7370	1.9070	10.1054	11.4984	0.0364	15.3179	0.1488	13.3175	0.0980	-0.0292	40.7399	1.9813	98.874
9 / 4 .	-0.0208	0.0073	1.9644	1.7416	1.8118	10.2966	11.2582	0.0303	15.0712	0.1140	13.2102	0.0674	0.0004	40.8357	1.8581	98.267
9 / 5 .	-0.0295	0.0014	1.9699	1.7290	1.8422	10.1408	11.5245	0.0401	15.0321	0.0891	13.3724	0.1026	-0.0330	40.7430	1.9472	98.534
9 / 6 .	-0.0283	0.0139	1.9731	1.7469	1.8291	10.2356	11.5563	0.0121	14.8581	0.0992	13.4065	0.0675	-0.0014	41.0465	1.8520	98.697
9 / 7 .	-0.0036	0.0145	1.9665	1.7510	1.8332	10.1659	11.5015	0.0340	15.1842	0.0991	13.6133	0.0582	-0.0385	40.6939	1.6650	98.580
9 / 8 . *	-0.0085	0.0026	1.9591	1.7292	1.8952	10.1374	11.3958	0.0255	14.9137	0.0792	13.4312	0.0567	-0.0367	40.5602	1.7723	97.958
9 / 9 .	-0.0085	0.0049	1.9740	1.7381	1.8351	9.9982	11.5794	0.0170	15.1145	0.0294	13.7209	0.0506	-0.0330	40.8451	1.7823	98.689
9 / 10 .	0.0038	-0.0010	1.9557	1.7364	1.9334	9.9374	11.5390	0.0206	15.4804	0.0642	13.7884	0.0689	-0.0125	39.9792	1.7712	98.279
10 / 1 . *	0.1018	0.0164	1.8913	1.7148	2.0664	9.5636	11.4635	0.0460	15.1932	0.1366	14.0662	0.0642	0.0238	39.5903	1.8675	97.806
10 / 2 .	0.1445	0.0116	1.8791	1.7119	2.0676	9.5274	11.4635	0.0448	15.3929	0.0670	14.3515	0.0595	0.0497	39.6315	1.7930	98.196
10 / 3 .	0.1216	0.0140	1.8874	1.6571	2.2152	9.3455	11.5334	0.0375	15.3198	0.0372	14.8077	0.0672	0.0146	39.1516	1.9477	98.157
10 / 4 .	0.0763	0.0176	1.9122	1.6408	2.0763	9.4954	11.5472	0.0351	15.1738	0.0373	14.1764	0.0886	0.0942	39.9417	1.7259	98.039
10 / 5 .	0.0802	0.0081	1.9241	1.6483	2.0008	9.4617	11.4055	0.0424	15.1293	0.0571	14.0860	0.0994	0.0480	40.2909	2.1476	98.429
10 / 6 .	0.0763	0.0116	1.9242	1.7785	1.9513	9.8310	11.5125	0.0436	14.9450	0.1217	14.0429	0.1147	0.0535	40.2186	1.8153	98.441
10 / 7 .	0.0886	0.0075	1.9097	1.6888	2.0213	9.7657	11.6691	0.0145	15.0367	0.0770	14.0113	0.0550	0.0202	39.8815	1.8436	98.090
10 / 8 . *	0.0564	0.0117	1.9249	1.6983	2.0464	9.7355	11.3714	0.0109	15.1425	0.0770	14.1585	0.0596	-0.0002	39.9917	1.7263	98.011
10 / 9 .	0.0910	0.0099	1.9173	1.6221	2.0155	9.5370	11.4405	0.0484	15.2869	0.1117	14.2321	0.1146	0.0294	40.0703	2.0292	98.556
10 / 10 .	0.0723	0.0105	1.9299	1.7010	2.0464	9.6647	11.4773	0.0532	15.5355	0.0968	14.2499	0.1145	0.0719	40.0448	1.8355	98.904
10 / 11 .	0.0971	0.0069	1.9086	1.7307	2.0229	9.6094	11.5724	0.0593	15.1778	0.0571	14.3124	0.0779	0.0424	39.8578	1.7341	98.267

9a2 Pseudotachylite amphibole
Date: 6/14/2011 Wt% Oxide

	F	Cl	H2O	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	V2O3	Cr2O3	SiO2	TiO2	Total
10 / 12 .	0.0785	0.0105	1.9202	1.7388	2.0239	9.7241	11.6463	0.0472	15.2483	0.1267	14.5252	0.0703	0.0239	39.6084	1.7896	98.582

9a1 Leucogabbro plagioclase
Date: 6/14/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
1 / 1 .	5.780237	0.163221	-0.00819	9.69721	0.012456	0.044824	-0.03029	27.80982	57.07641	100.5842
1 / 2 .	6.026804	0.178949	-0.003004	9.733339	0.009962	0.012448	0.002773	27.88758	56.62058	100.4724
1 / 3 . *	5.615598	0.170643	-0.000146	10.36408	-0.026147	0.038581	0.0163	28.63798	56.18151	101.0247
1 / 4 . *	5.895471	0.156238	-0.012347	9.582203	0.036118	0.061006	0.053859	28.19816	57.31419	101.2972
1 / 5 .	5.87773	0.185234	-0.011051	9.672545	0.00249	0.082132	0.085381	27.89075	57.05742	100.8537
1 / 6 .	5.85956	0.152639	-0.012883	9.87457	0.001246	0.061015	0.107994	27.5147	57.10846	100.6802
1 / 7 . *	5.60712	0.150838	-0.017254	10.24122	0.004984	0.019926	0.056907	28.53939	57.25547	101.8759
1 / 8 . *	5.656774	0.163449	-0.017007	10.09721	0.017439	0.033617	0.118516	28.50072	56.922	101.5097
1 / 9 . *	5.456004	0.154476	-0.011288	10.693	0.002491	0.047307	0.011797	28.66677	56.10108	101.1329
1 / 10 .	5.804583	0.17999	-0.007418	9.873462	-0.01993	0.048559	0.055382	27.9254	56.58833	100.4757
2 / 1 .	5.89818	0.154978	-0.006887	9.968862	0.007453	0.085676	0.080251	27.81958	56.82925	100.8442
2 / 2 . *	5.829631	0.14536	-0.012843	9.854262	0.013675	0.065865	0.057811	28.07402	57.23357	101.2742
2 / 3 . *	6.059481	0.144727	-0.006372	9.566209	0.000013	0.053434	0.086289	27.8859	57.48558	101.2816
2 / 4 . *	6.749406	0.165845	-0.014204	8.299117	-0.022375	0.080785	0.092216	26.90757	59.04811	101.3431
2 / 5 . *	6.275213	0.131853	0.005311	9.338259	0.00746	0.074578	0.060799	27.18388	58.00466	101.082
2 / 6 . *	6.150927	0.153513	-0.000146	9.606733	-0.004973	0.082033	0.087806	28.00101	57.51344	101.5955
2 / 7 . *	6.361986	0.170517	-0.006645	9.208326	0.006218	0.054702	0.036809	27.1999	58.26551	101.304
2 / 8 . *	6.238897	0.152547	0.000113	9.216781	0.032321	0.062135	0.129746	27.53305	58.05468	101.4203
2 / 9 . *	6.251549	0.140242	-0.004821	9.286103	-0.01243	0.042247	0.123744	27.60673	58.03291	101.4835
2 / 10 . *	6.327125	0.15619	-0.001186	9.0361	0.012436	0.063406	0.056302	27.36126	58.36331	101.3761
3 / 1 . *	7.416903	0.16756	0.010871	7.478314	0.003738	0.137044	0.101154	26.25161	59.83235	101.3996
3 / 2 . *	7.157736	0.165682	0.009546	7.716405	0.013702	0.141997	0.083138	26.45514	59.43731	101.1807
3 / 3 . *	6.961531	0.150054	-0.004833	8.01498	-0.008718	0.158155	0.041107	26.63421	59.09764	101.0577
3 / 4 . *	6.939319	0.142373	0.010582	7.996044	0.003738	0.153243	0.098188	26.76141	59.17519	101.2801
3 / 5 .	6.677704	0.171832	0.125389	7.909041	0.021119	1.694346	0.156176	26.07989	57.40116	100.2367
3 / 6 .	6.890026	0.190097	0.010855	8.080694	0.026144	0.353561	0.072599	26.43521	58.77861	100.8378
3 / 7 .	6.937668	0.1539	0.010844	8.180015	0.007474	0.159433	0.063643	26.80616	58.66956	100.9887
3 / 8 . *	7.025446	0.178247	0.009281	8.098845	-0.009966	0.154459	0.069649	26.5916	59.14682	101.2743
3 / 9 . *	6.997368	0.156774	0.01581	7.998234	0.01121	0.170631	0.069634	26.66479	59.26546	101.3499
3 / 10 . *	7.005517	0.147911	0.002222	8.216371	0.003737	0.161928	0.066649	26.61836	58.94941	101.1721
4 / 1 . *	6.16522	0.108536	-0.014902	9.456099	0.002491	0.032377	0.021847	27.57697	57.652	101.0155
4 / 2 .	6.252896	0.112791	-0.008149	9.221095	-0.016192	0.075957	-0.053276	27.51304	57.68856	100.8643
4 / 3 . *	5.945343	0.113365	-0.003198	9.786007	-0.006228	0.059764	0.020346	27.95158	57.26266	101.1391
4 / 4 . *	6.043883	0.102162	-0.008657	9.613638	0.004982	0.072209	0.017336	27.63245	57.65145	101.1381
4 / 5 . *	6.157601	0.113826	-0.003463	9.349673	-0.012456	0.079694	0.030859	27.45398	57.85499	101.0406
4 / 6 .	6.288453	0.104361	-0.018563	9.260187	0.006228	0.095885	0.006818	27.18217	57.96118	100.9053

9a1 Leucogabbro plagioclase
Date: 6/14/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
4 / 7 .	6.328347	0.125137	-0.020916	9.190707	-0.013705	0.089682	0.021848	27.32789	57.79723	100.8809
4 / 8 .	6.515159	0.128052	-0.011026	8.659014	0.014947	0.112082	0.012824	27.01976	58.04416	100.506
4 / 9 . *	6.496191	0.10026	-0.011802	8.850988	0.001246	0.088437	-0.002197	27.32734	58.46732	101.3318
4 / 10 .	6.470756	0.137867	-0.015974	8.746479	-0.0137	0.082185	0.029346	26.6999	58.28618	100.4527
5 / 1 . *	7.218556	0.188314	-0.007942	7.458203	-0.022416	0.15691	0.031166	26.17239	59.9336	101.1591
5 / 2 . *	7.036198	0.174794	-0.004802	8.004568	-0.016196	0.110871	0.038697	26.71127	59.48341	101.5598
5 / 3 . *	6.920177	0.167003	-0.010796	8.122953	-0.001246	0.104632	0.007162	26.85328	59.67345	101.8486
5 / 4 . *	6.83528	0.187705	-0.00062	8.09928	-0.003736	0.158131	0.002656	26.82105	59.23688	101.341
5 / 5 . *	6.932469	0.174769	0.017402	8.019289	0.012457	0.215491	0.019172	26.79023	59.39706	101.5783
5 / 6 . *	6.638887	0.160187	-0.007141	8.59638	-0.017447	0.093446	0.058253	27.12597	58.90408	101.5772
5 / 7 . *	6.270185	0.151536	-0.007897	9.043327	-0.027402	0.099619	0.005662	27.96062	58.47039	102.0013
5 / 8 . *	6.540576	0.134125	-0.016243	8.511034	-0.031145	0.099648	0.005661	27.47121	58.75785	101.5201
5 / 9 .	6.525433	0.117499	-0.004276	8.585114	-0.004982	0.316295	0.083734	26.96404	58.2267	100.8188
5 / 10 . *	6.268457	0.138765	-0.007642	9.108309	-0.016184	0.143129	0.017671	27.4609	58.00521	101.1424
6 / 1 . *	6.103735	0.130621	-0.016858	9.573998	0.023663	0.078437	0.029818	28.28849	57.57185	101.8006
6 / 2 . *	5.940372	0.127682	-0.014759	9.73966	0.012447	0.051016	0.017791	28.14405	57.08288	101.1159
6 / 3 . *	5.986841	0.147043	-0.009583	9.744678	0.011208	0.100841	0.026816	28.00885	57.01651	101.0428
6 / 4 . *	5.877469	0.15441	-0.015539	9.736172	-0.009962	0.083403	0.004276	28.14524	57.14491	101.1459
6 / 5 . *	5.867876	0.146916	-0.010095	10.13132	0.016187	0.095841	0.002774	28.15701	57.10954	101.5275
6 / 6 .	5.742301	0.162814	-0.009305	9.621451	0.037352	0.048539	0.088394	28.18423	56.76024	100.6453
6 / 7 . *	5.546003	0.145233	-0.008532	10.84434	0.003735	0.118208	0.091445	28.61965	55.82842	101.197
6 / 8 . *	5.967819	0.146687	-0.023096	9.867931	0.023667	0.048561	0.073413	28.13692	57.19577	101.4608
6 / 9 . *	5.078094	0.109147	-0.005914	11.06766	0.058513	0.057237	0.035844	29.3012	55.39746	101.1052
6 / 10 . *	5.653692	0.160971	-0.002302	10.11908	0.044839	0.046065	0.071916	28.51365	56.66375	101.274
7 / 1 .	5.839521	0.184706	0.004404	9.262253	-0.012449	1.253906	0.096632	27.50237	56.34739	100.4912
7 / 2 . *	5.950269	0.132314	0.011667	9.708395	-0.008741	0.066155	0.053305	28.27096	57.10469	101.2978
7 / 3 . *	6.058145	0.198083	-0.011507	9.430567	-0.022458	0.10477	0.06981	28.00799	57.65069	101.5201
7 / 4 .	6.240718	0.173225	-0.001615	9.189994	-0.027459	0.062388	0.089401	27.41529	57.49868	100.6697
7 / 5 .	6.233629	0.160166	0.003858	9.104897	0.017466	0.054878	0.066786	27.762	57.46341	100.8671
7 / 6 .	6.415771	0.179604	0.002309	8.473226	-0.006233	0.744253	0.098239	26.72958	57.57697	100.22
7 / 7 . *	6.303257	0.159512	-0.010479	9.169086	0.009984	0.087336	0.021652	27.52408	57.92344	101.1983
7 / 8 . *	6.420341	0.152656	0.002038	8.785967	-0.014981	0.092365	0.036709	27.34441	58.50602	101.3405
7 / 9 . *	6.619475	0.207423	-0.002923	8.325316	-0.002496	0.150991	0.056247	26.96572	58.88275	101.2079
7 / 10 . *	6.683482	0.149513	0.000996	8.668284	-0.022472	0.052425	0.038213	27.17961	58.48925	101.2618
8 / 1 . *	8.241124	0.183008	0.005945	5.652192	0.033681	0.393091	0.085228	25.04276	62.96936	102.6064
8 / 2 . *	7.831948	0.214882	-0.002745	6.075821	0.026213	0.369592	0.014681	25.24059	62.31944	102.0932

9a1 Leucogabbro plagioclase
Date: 6/14/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
8 / 3 . *	7.816908	0.222793	0.008305	6.290144	0.036182	0.393112	0.092785	25.47658	61.56329	101.9001
8 / 4 . *	7.967605	0.216314	0.000673	6.05116	0.032453	0.31713	0.001156	25.14563	62.78535	102.5175
8 / 5 . *	5.995192	0.154018	0.085821	10.58617	0.062069	3.270413	0.134323	25.20217	55.54619	101.0364
8 / 6 . *	7.692562	0.197299	-0.009312	6.468263	0.002496	0.35577	-0.004856	25.55503	61.52574	101.7972
8 / 7 .	7.358288	0.18643	-0.006936	6.949977	0.072369	0.30449	0.01919	25.88489	60.85719	101.6328
8 / 8 .	7.119512	0.201906	0.00382	7.184915	0.042433	0.394436	0.010177	25.93917	59.50932	100.4057
8 / 9 . *	7.405581	0.208404	-0.005104	6.966488	0.051168	0.365722	0.043245	25.90493	61.02916	101.9747
8 / 10 . *	7.725155	0.197674	0.000147	6.467464	0.029955	0.36205	0.0237	25.49031	61.70287	101.9993
9 / 1 . *	8.37151	0.162742	-0.012211	5.63312	-0.007548	0.575199	0.034822	24.1417	62.51871	101.4378
9 / 2 . *	8.253096	0.238744	0.141758	5.629448	0.015087	0.830241	0.102872	24.1236	62.00996	101.3448
9 / 3 . *	8.247809	0.186911	0.051284	5.555474	0.001257	0.99853	0.048386	24.42001	62.21251	101.7222
9 / 4 . *	8.276151	0.169553	0.013921	5.578889	0.011321	0.850836	0.015135	24.37617	62.61749	101.9095
9 / 5 . *	8.08161	0.160918	-0.014582	5.774891	-0.001258	0.605399	0.039367	24.38868	62.63258	101.6834
9 / 6 . *	8.294813	0.150196	-0.014054	5.743728	-0.01384	0.412827	0.075713	24.45829	62.52484	101.6604
9 / 7 . *	8.337276	0.195629	-0.007133	5.615054	-0.015096	0.38005	0.051477	24.53871	62.32483	101.443
9 / 8 . *	8.220263	0.19573	-0.013255	5.645109	0.002517	0.460846	0.083313	24.59927	62.60868	101.8157
9 / 9 . *	8.263848	0.24138	-0.005273	5.855806	-0.002517	0.463257	0.043927	24.6115	62.49369	101.9734
9 / 10 . *	8.131499	0.201974	-0.00128	5.870623	-0.007548	0.464375	0.069654	24.77531	62.32662	101.8401
10 / 1 . *	6.608658	0.181213	-0.017629	8.436426	-0.008716	0.108306	0.042032	27.13143	59.01125	101.5193
10 / 2 . *	6.465722	0.179721	-0.01581	8.82579	-0.024912	0.082192	0.061586	27.12555	58.57459	101.3151
10 / 3 .	6.536999	0.236491	0.059702	7.552403	-0.007471	0.55047	0.025509	25.17429	58.51037	98.64623
10 / 4 .	7.25055	0.184779	-0.006194	7.510716	-0.008718	0.128277	-0.010506	25.99575	59.92474	100.9948
10 / 5 . *	7.248403	0.204335	-0.001748	7.31931	0.012459	0.09967	0.007506	26.16147	60.10794	101.1611
10 / 6 .	7.26567	0.190482	-0.008551	7.526035	-0.003738	0.093439	0.018017	25.86605	59.96286	100.9225
10 / 7 .	6.469475	0.189248	-0.015031	8.118105	-0.032406	0.095959	-0.006011	26.25635	58.89949	100.0286
10 / 8 . *	6.549592	0.171732	-0.011383	8.546651	0	0.115823	0.036046	27.09651	58.54183	101.0582
10 / 9 . *	6.459288	0.178653	-0.015024	8.849119	-0.004982	0.080947	0.036052	27.2864	58.26662	101.1571
10 / 10 . *	6.543297	0.15933	-0.006433	8.660791	-0.016186	0.133202	0.052545	26.75687	59.30614	101.6122

9a2 Shear zone plagioclase
Date: 6/14/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Fe2O3	BaO	Al2O3	SiO2	Total
1 / 1 . *	8.5435	0.2549	-0.0041	5.0140	-0.0037	0.3544	0.0000	0.1090	23.8902	63.1285	101.295
1 / 2 . *	8.6906	0.2275	-0.0036	4.8919	-0.0025	0.4141	0.0000	0.0924	23.9939	63.0468	101.357
1 / 3 . *	8.5743	0.2598	-0.0070	4.9640	-0.0062	0.4229	0.0000	0.1209	23.9565	62.8698	101.168
1 / 4 . *	8.7386	0.2979	-0.0012	4.8388	0.0175	0.4940	0.0000	0.0519	23.5692	63.0906	101.098
1 / 5 . *	8.6465	0.2709	-0.0033	4.8725	0.0100	0.5065	0.0000	0.0729	24.0373	63.3463	101.763
1 / 6 . *	8.6128	0.2755	0.0041	5.0089	0.0175	0.4667	0.0000	0.0745	23.8365	62.8956	101.192
1 / 7 . *	8.6027	0.2699	-0.0112	4.9983	0.0025	0.5062	0.0000	0.1089	23.8783	62.9547	101.322
1 / 8 . *	8.6149	0.2549	0.0057	5.0091	0.0112	0.5827	0.0000	0.0774	24.0689	63.0632	101.688
1 / 9 . *	8.7356	0.2529	-0.0136	4.9847	0.0025	0.6709	0.0000	0.0909	23.8322	63.0874	101.657
1 / 10 . *	8.5892	0.2794	-0.0041	4.8284	0.0287	0.6238	0.0000	0.1479	24.0094	63.4028	101.910
2 / 1 .	8.8779	0.2527	-0.0158	4.3886	0.0062	0.3742	0.0000	0.0565	23.1900	63.3307	100.477
2 / 2 .	8.9694	0.2515	0.0612	4.1468	-0.0075	0.4756	0.0000	0.0851	23.0935	63.9055	100.989
2 / 3 .	9.0200	0.3185	-0.0050	4.2598	0.0050	0.4131	0.0000	0.1300	23.1743	63.2252	100.546
2 / 4 .	8.7802	0.2949	0.9599	3.9373	0.0399	1.1522	0.0000	0.1044	22.3185	62.4892	100.077
2 / 5 .	9.1409	0.2863	-0.0068	4.0631	0.0324	0.4267	0.0000	0.0805	23.2024	63.3601	100.592
2 / 6 .	8.8904	0.2505	-0.0060	4.5396	0.0312	0.4280	0.0000	0.0655	23.1906	62.8655	100.261
2 / 7 . *	21.8673	0.5342	0.0749	-12.8287	0.0499	0.5048	0.0000	-0.6917	-2.6253	97.4713	104.280
2 / 8 . *	21.5367	0.5254	0.0730	-12.3712	0.0489	0.4979	0.0000	-0.6750	-1.9800	96.6247	104.206
2 / 9 . *	21.2062	0.5165	0.0712	-11.9137	0.0479	0.4911	0.0000	-0.6582	-1.3347	95.7780	104.131
2 / 10 . *	20.8757	0.5076	0.0693	-11.4562	0.0469	0.4842	0.0000	-0.6415	-0.6895	94.9314	104.057
3 / 1 . *	20.5452	0.4988	0.0675	-10.9987	0.0459	0.4773	0.0000	-0.6248	-0.0442	94.0848	103.983
3 / 2 . *	20.2147	0.4899	0.0656	-10.5413	0.0449	0.4705	0.0000	-0.6081	0.6010	93.2382	103.909
3 / 3 . *	19.8842	0.4810	0.0638	-10.0838	0.0439	0.4636	0.0000	-0.5913	1.2463	92.3916	103.834
3 / 4 . *	19.5537	0.4721	0.0619	-9.6263	0.0429	0.4567	0.0000	-0.5746	1.8915	91.5449	103.760
3 / 5 . *	19.2231	0.4633	0.0601	-9.1688	0.0419	0.4499	0.0000	-0.5579	2.5368	90.6983	103.686
3 / 6 . *	18.8926	0.4544	0.0582	-8.7113	0.0409	0.4430	0.0000	-0.5412	3.1820	89.8517	103.612
3 / 7 . *	18.5621	0.4455	0.0564	-8.2538	0.0399	0.4361	0.0000	-0.5244	3.8273	89.0051	103.537
3 / 8 . *	18.2316	0.4366	0.0545	-7.7964	0.0388	0.4292	0.0000	-0.5077	4.4725	88.1584	103.463
3 / 9 . *	17.9011	0.4278	0.0527	-7.3389	0.0378	0.4224	0.0000	-0.4910	5.1178	87.3118	103.389
3 / 10 . *	17.5706	0.4189	0.0508	-6.8814	0.0368	0.4155	0.0000	-0.4743	5.7631	86.4652	103.315
4 / 1 . *	17.2401	0.4100	0.0490	-6.4239	0.0358	0.4086	0.0000	-0.4575	6.4083	85.6186	103.241
4 / 2 . *	16.9095	0.4012	0.0471	-5.9664	0.0348	0.4018	0.0000	-0.4408	7.0536	84.7720	103.166
4 / 3 . *	16.5790	0.3923	0.0453	-5.5089	0.0338	0.3949	0.0000	-0.4241	7.6988	83.9253	103.092
4 / 4 . *	16.2485	0.3834	0.0434	-5.0515	0.0328	0.3880	0.0000	-0.4074	8.3441	83.0787	103.018
4 / 5 . *	15.9180	0.3745	0.0416	-4.5940	0.0318	0.3811	0.0000	-0.3906	8.9893	82.2321	102.944
4 / 6 . *	15.5875	0.3657	0.0397	-4.1365	0.0308	0.3743	0.0000	-0.3739	9.6346	81.3855	102.869

9a2 Shear zone plagioclase
Date: 6/14/2011 Wt% Oxide

	Na2O	K2O	MgO	CaO	MnO	FeO	Fe2O3	BaO	Al2O3	SiO2	Total
4 / 7 . *	15.2570	0.3568	0.0379	-3.6790	0.0298	0.3674	0.0000	-0.3572	10.2798	80.5388	102.795
5 / 1 . *	14.9265	0.3479	0.0360	-3.2215	0.0288	0.3605	0.0000	-0.3405	10.9251	79.6922	102.721
5 / 2 . *	14.5959	0.3390	0.0342	-2.7640	0.0278	0.3537	0.0000	-0.3237	11.5703	78.8456	102.647
5 / 3 . *	14.2654	0.3302	0.0324	-2.3066	0.0268	0.3468	0.0000	-0.3070	12.2156	77.9990	102.572
5 / 4 . *	13.9349	0.3213	0.0305	-1.8491	0.0258	0.3399	0.0000	-0.2903	12.8609	77.1523	102.498
5 / 5 . *	13.6044	0.3124	0.0287	-1.3916	0.0248	0.3331	0.0000	-0.2736	13.5061	76.3057	102.424
6 / 1 . *	13.2739	0.3036	0.0268	-0.9341	0.0237	0.3262	0.0000	-0.2568	14.1514	75.4591	102.350
6 / 2 . *	12.9434	0.2947	0.0250	-0.4766	0.0227	0.3193	0.0000	-0.2401	14.7966	74.6125	102.275
6 / 3 . *	12.6129	0.2858	0.0231	-0.0192	0.0217	0.3124	0.0000	-0.2234	15.4419	73.7659	102.201
6 / 4 . *	12.2823	0.2769	0.0213	0.4383	0.0207	0.3056	0.0000	-0.2067	16.0871	72.9192	102.127
6 / 5 . *	11.9518	0.2681	0.0194	0.8958	0.0197	0.2987	0.0000	-0.1899	16.7324	72.0726	102.053
7 / 1 . *	11.6213	0.2592	0.0176	1.3533	0.0187	0.2918	0.0000	-0.1732	17.3776	71.2260	101.978
7 / 2 . *	11.2908	0.2503	0.0157	1.8108	0.0177	0.2850	0.0000	-0.1565	18.0229	70.3794	101.904
7 / 3 . *	10.9603	0.2414	0.0139	2.2683	0.0167	0.2781	0.0000	-0.1398	18.6681	69.5327	101.830
7 / 4 . *	10.6298	0.2326	0.0120	2.7257	0.0157	0.2712	0.0000	-0.1230	19.3134	68.6861	101.756
7 / 5 . *	10.2993	0.2237	0.0102	3.1832	0.0147	0.2643	0.0000	-0.1063	19.9587	67.8395	101.682
8 / 1 . *	9.9687	0.2148	0.0083	3.6407	0.0137	0.2575	0.0000	-0.0896	20.6039	66.9929	101.607
8 / 2 . *	9.6382	0.2060	0.0065	4.0982	0.0127	0.2506	0.0000	-0.0729	21.2492	66.1463	101.533
8 / 3 . *	9.3077	0.1971	0.0046	4.5557	0.0117	0.2437	0.0000	-0.0561	21.8944	65.2996	101.459
8 / 4 . *	8.9772	0.1882	0.0028	5.0132	0.0107	0.2369	0.0000	-0.0394	22.5397	64.4530	101.385
8 / 5 . *	8.6467	0.1793	0.0009	5.4706	0.0097	0.2300	0.0000	-0.0227	23.1849	63.6064	101.310
9 / 1 . *	8.3162	0.1705	-0.0009	5.9281	0.0086	0.2231	0.0000	-0.0060	23.8302	62.7598	101.236
9 / 2 . *	7.9856	0.1616	-0.0028	6.3856	0.0076	0.2163	0.0000	0.0108	24.4754	61.9131	101.162
9 / 3 . *	7.4389	0.1489	-0.0065	7.0600	0.0112	0.1792	0.0000	-0.0163	25.6121	60.7203	101.171
9 / 4 . *	7.6661	0.1452	-0.0118	6.8202	0.0000	0.2442	0.0000	0.0467	25.4246	60.9276	101.275
9 / 5 . *	7.6752	0.1561	0.0006	6.6818	0.0100	0.2105	0.0000	0.0317	25.5358	60.8208	101.122
10 / 1 .	5.5041	0.1042	-0.0077	9.9909	0.0050	0.2031	0.0000	0.1862	28.1932	56.0102	100.197
10 / 2 .	6.6594	0.1184	-0.0172	8.4374	-0.0125	0.1334	0.0000	0.1110	26.7564	58.3188	100.535
10 / 3 .	6.0367	0.1037	-0.0145	9.5964	0.0212	0.1446	0.0000	0.1171	27.7114	56.8475	100.579
10 / 4 . *	5.3218	0.1063	-0.0082	9.0070	-0.0237	0.2044	0.0000	0.0689	31.5384	55.0478	101.295
10 / 5 .	5.6844	0.0906	-0.0234	9.9606	0.0137	0.1634	0.0000	0.1428	28.2609	56.1337	100.450

9a2 Pseudotachylite plaioclase

Date: 6/14/2011 Wt% Oxide

Formula	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
1 / 1 .	6.1032	0.2083	-0.0167	9.1872	0.0250	0.0762	-0.0187	27.5864	57.6100	100.7962
1 / 2 .*	6.1170	0.1977	-0.0191	9.3784	-0.0025	0.0662	0.0085	27.6910	57.6117	101.0705
1 / 3 .	6.1562	0.2866	0.0802	9.0316	0.0362	0.3060	-0.0247	27.3261	57.2198	100.4427
1 / 4 .	6.0729	0.2124	-0.0206	9.3904	0.0037	0.0787	0.0386	27.7800	57.3638	100.9405
1 / 5 . *	6.1291	0.2107	-0.0138	9.3684	0.0012	0.0487	-0.0051	27.7385	57.5408	101.0374
1 / 6 . *	6.1667	0.1985	-0.0206	9.3893	0.0375	0.0637	-0.0126	27.6035	57.5957	101.0549
1 / 7 .	6.0942	0.1752	-0.0157	9.2944	0.0050	0.0312	0.0311	27.7723	57.5445	100.9479
1 / 8 .	6.1680	0.1869	-0.0162	9.2524	0.0013	0.0462	-0.0262	27.3689	57.4287	100.4524
1 / 9 .	6.1953	0.1636	-0.0136	9.3901	0.0313	0.0375	-0.0322	27.6525	57.4478	100.9180
1 / 10 .	6.1466	0.2015	-0.0155	9.1580	0.0087	0.5807	0.0386	27.3374	57.2637	100.7351
2 / 1 . *	6.2844	0.1865	-0.0103	9.2247	-0.0125	0.0175	0.0481	27.3799	57.8915	101.0326
2 / 2 .	6.3033	0.2287	-0.0127	8.9072	0.0175	0.0374	0.0753	27.0955	58.2865	100.9513
2 / 3 .	6.4043	0.1849	-0.0082	8.9336	-0.0162	0.0150	-0.0331	27.1735	58.0179	100.7292
2 / 4 .	6.3138	0.1774	-0.0041	8.9173	-0.0237	0.0299	0.0647	27.2312	58.1895	100.9239
2 / 5 .	6.3881	0.1481	-0.0043	9.0970	-0.0437	-0.0037	0.0526	27.2516	57.8291	100.7667
2 / 6 .	6.3949	0.1613	-0.0056	8.9255	-0.0037	0.0187	-0.0135	27.2310	58.2675	100.9989
2 / 7 . *	6.5015	0.1825	-0.0020	8.7366	-0.0037	0.0449	0.0737	27.1505	58.6706	101.3602
2 / 8 .	6.4463	0.2009	-0.0056	8.6222	0.0087	0.0349	0.0075	26.8533	58.5136	100.6874
2 / 9 . *	6.5015	0.1889	0.0025	8.7385	-0.0250	0.0387	0.1189	26.9690	58.5443	101.1022
2 / 10 .	6.4794	0.1856	-0.0132	8.7318	-0.0112	-0.0087	0.0346	26.9467	58.2312	100.6093
3 / 1 .	4.7032	0.1527	-0.0110	11.9711	0.0163	0.0376	0.0631	29.6086	54.2594	100.8120
3 / 2 .	5.6714	0.1604	-0.0132	10.0666	-0.0163	0.0075	0.0918	28.2794	56.2755	100.5526
3 / 3 .	5.7350	0.1842	-0.0121	10.0562	0.0163	0.0326	0.0570	28.0852	56.8064	100.9729
3 / 4 .	5.2537	0.1498	-0.0077	11.0595	0.0138	0.0063	0.0979	28.9746	55.3379	100.8934
3 / 5 . *	4.5304	0.1192	-0.0009	12.2368	0.0151	0.0464	0.1267	29.9276	54.2023	101.2044
3 / 6 . *	4.6034	0.1477	-0.0147	12.1205	0.0138	0.0765	0.0767	30.0331	53.9279	100.9996
3 / 7 .	5.0133	0.1650	-0.0168	11.1110	0.0301	0.0301	0.0631	29.2259	55.2576	100.8960
3 / 8 .	4.9597	0.1576	-0.0176	11.1403	-0.0238	0.1781	0.0661	28.9484	54.8708	100.3208
3 / 9 . *	4.9127	0.1775	-0.0071	11.6133	0.0151	0.0464	0.1465	29.5399	54.7512	101.2026
3 / 10 .	4.7674	0.1606	-0.0061	11.6482	0.0050	0.0652	0.0403	29.4825	54.7381	100.9073
4 / 1 . *	7.9907	0.3206	-0.0048	6.0366	-0.0174	0.3473	0.0153	24.8343	61.7003	101.2451
4 / 2 . *	8.2031	0.3025	-0.0109	5.6840	-0.0062	0.3424	0.0513	24.4303	62.0012	101.0148

9a2 Pseudotachylite plaioclase

Date: 6/14/2011 Wt% Oxide

Formula	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
4 / 3 . *	7.8609	0.2418	-0.0093	6.3691	0.0137	0.2155	0.0528	24.8880	61.6866	101.3285
4 / 4 . *	8.2203	0.2807	-0.0077	5.7216	0.0199	0.3252	0.0573	24.5812	62.2081	101.4143
4 / 5 . *	7.9812	0.2579	-0.0096	6.3345	-0.0075	0.4245	0.0663	24.9041	61.1724	101.1408
4 / 6 . *	7.9674	0.2454	-0.0130	6.1581	-0.0100	0.3051	0.0468	25.1368	61.4800	101.3395
4 / 7 . *	8.1205	0.2413	-0.0051	5.8572	0.0037	0.3015	0.0243	24.5644	62.0351	101.1481
4 / 8 . *	8.2498	0.3098	-0.0146	6.0399	-0.0174	0.3387	0.0243	24.5197	62.2414	101.7236
4 / 9 . *	7.9393	0.2804	0.0017	6.3837	0.0199	0.3850	0.0318	25.1357	62.0443	102.2219
4 / 10 . *	8.0475	0.2553	-0.0133	6.1255	-0.0125	0.3426	0.0813	25.0902	61.8607	101.8032
5 / 1 .	5.8590	0.1561	-0.0021	9.6706	0.0124	0.0647	-0.0015	27.9036	56.5747	100.2410
5 / 2 .	5.9964	0.1859	-0.0032	9.5962	0.0137	0.1107	-0.0556	27.5590	56.7441	100.2059
5 / 3 .	5.7918	0.1932	-0.0034	9.9030	0.0274	0.0485	0.0180	27.8512	56.5124	100.3455
5 / 4 .	5.7778	0.1902	0.0192	10.0378	0.0112	0.1405	-0.0240	27.9308	56.5056	100.6131
5 / 5 . *	5.5177	0.2004	0.0282	10.3781	-0.0050	0.2339	0.0120	28.2640	56.3743	101.0086
5 / 6 .	6.0005	0.1836	-0.0073	9.5367	0.0137	0.0373	-0.0075	27.6920	57.4810	100.9448
5 / 7 . *	6.2732	0.1890	-0.0071	9.1299	0.0112	0.0560	-0.0090	27.2210	58.3269	101.2072
5 / 8 .	6.6656	0.2094	-0.0063	8.3484	-0.0125	0.0261	-0.0030	26.5501	59.0580	100.8577
5 / 9 . *	5.9318	0.1607	0.0072	9.6262	-0.0062	0.0771	-0.0195	27.8203	57.3928	101.0161
5 / 10 .	5.9948	0.1671	-0.0107	9.6354	0.0012	0.0685	-0.0285	27.7372	57.3044	100.9087
6 / 1 . *	8.3718	0.3049	0.0046	5.6329	0.0013	0.4503	0.0118	24.4564	62.4816	101.7156
6 / 2 . *	8.1981	0.2584	-0.0063	5.9560	-0.0075	0.4479	-0.0019	24.4873	62.4906	101.8383
6 / 3 . *	8.3749	0.3174	0.0003	5.4759	-0.0189	0.4128	0.0239	24.2601	62.7000	101.5652
6 / 4 .	7.8823	0.2567	0.2061	5.5718	0.0038	1.3058	-0.0034	23.7812	61.2884	100.2961
6 / 5 . *	8.3766	0.2668	0.0104	5.4333	-0.0075	0.3925	0.0390	24.1757	62.6581	101.3525
6 / 6 . *	8.0970	0.3142	0.0393	5.7229	-0.0063	0.3975	0.0708	24.4103	62.3032	101.3553
6 / 7 . *	8.4771	0.3389	-0.0074	5.3747	-0.0277	0.4418	0.0511	24.2821	62.7675	101.7331
6 / 8 . *	8.3609	0.2863	0.0008	5.6640	0.0264	0.4251	0.0193	24.4623	62.3845	101.6296
6 / 9 . *	8.4317	0.2823	-0.0082	5.5351	-0.0013	0.3940	-0.0019	24.3409	62.9966	101.9807
6 / 10 .	8.0910	0.3133	0.0136	5.7163	-0.0038	0.4464	0.0208	24.4835	61.8238	100.9087
6 / 11 . *	8.3285	0.2978	0.0062	5.6971	-0.0088	0.4013	-0.0170	24.3399	62.3614	101.4322
6 / 12 .	8.1000	0.2483	-0.0087	5.8041	-0.0063	0.5107	0.0375	24.0814	61.1412	99.9230
7 / 1 .	6.6318	0.2004	0.0067	8.4079	0.0100	0.1318	-0.0196	26.7870	58.5524	100.7281
7 / 2 . *	6.6206	0.1941	0.0012	8.5668	0.0264	0.0703	-0.0514	26.6252	58.9100	101.0144

9a2 Pseudotachylite plaioclase

Date: 6/14/2011 Wt% Oxide

Formula	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
7 / 3 . *	6.6399	0.2021	0.0017	8.4498	0.0263	0.0715	0.0213	26.6798	59.0960	101.1885
7 / 4 .	6.4190	0.1838	-0.0065	8.8243	-0.0038	0.3437	0.0606	26.9019	58.0590	100.7923
7 / 5 .	6.3528	0.1875	0.0006	8.8365	-0.0151	0.0803	0.0259	27.0630	58.3877	100.9343
7 / 6 .	6.4182	0.2060	-0.0051	8.7658	0.0239	0.1720	0.0486	27.1322	57.8659	100.6325
7 / 7 . *	6.4079	0.2177	-0.0015	8.8546	0.0126	0.0967	-0.0241	27.0978	58.4069	101.0941
7 / 8 . *	6.3966	0.2515	-0.0009	8.9640	0.0238	0.1242	-0.0135	27.1688	58.3368	101.2658
7 / 9 .	5.9644	0.2377	0.2435	8.2775	0.0338	2.0064	0.0408	26.1572	56.3490	99.3102
7 / 10 .	6.1946	0.2125	0.0040	9.2372	0.0201	0.0816	-0.0302	27.3413	57.8782	100.9694
8 / 1 . *	8.1032	0.3186	-0.0134	6.0313	-0.0124	0.5055	-0.0280	24.5052	62.3020	101.7658
8 / 2 . *	8.0979	0.2588	-0.0150	6.1675	-0.0199	0.3985	-0.0040	24.5770	61.9540	101.4538
8 / 3 . *	8.2257	0.3178	0.0061	5.8491	-0.0062	0.8389	-0.0100	24.5936	62.0386	101.8698
8 / 4 . *	8.2229	0.2934	-0.0042	5.6884	0.0062	0.4559	-0.0460	24.2535	62.3162	101.2365
8 / 5 . *	8.1659	0.2888	0.0037	5.8787	-0.0584	1.7273	-0.0788	24.2499	60.9672	101.2815
8 / 6 . *	8.0730	0.2808	-0.0076	6.0652	-0.0361	0.4110	-0.0610	24.5256	61.9508	101.3064
8 / 7 . *	8.1170	0.3153	-0.0042	5.8844	-0.0460	0.4344	-0.0714	24.5658	62.0733	101.3903
8 / 8 . *	8.0347	0.2739	-0.0032	5.8140	-0.0212	0.3899	-0.0565	24.3854	62.2098	101.1076
8 / 9 . *	8.3048	0.2750	-0.0082	5.8051	-0.0174	0.3052	-0.0085	24.1448	62.4793	101.3142
8 / 10 . *	8.7491	0.3333	-0.0098	4.8592	-0.0324	0.3550	-0.1134	23.7038	63.4566	101.4570
9 / 1 . *	7.9563	0.2716	-0.0276	6.1343	0.0013	0.3364	-0.0835	24.7629	61.7050	101.1677
9 / 2 . *	8.0187	0.2329	-0.0002	6.4662	0.0212	0.3974	-0.0699	25.0448	61.5057	101.6869
9 / 3 . *	7.8133	0.2550	-0.0107	6.4077	-0.0162	0.4050	-0.0338	25.0502	61.4327	101.3639
9 / 4 . *	8.0059	0.2396	-0.0055	6.1970	0.0050	0.3763	-0.0338	24.8482	61.5380	101.2099
9 / 5 . *	8.1351	0.2717	0.0786	5.9159	-0.0075	0.5240	-0.0669	24.5516	62.3279	101.8047
9 / 6 .	8.0296	0.2263	-0.0097	6.2999	-0.0187	0.3975	-0.0278	24.7638	61.1667	100.8839
9 / 7 . *	7.9723	0.2343	-0.0121	6.3457	-0.0063	0.2828	-0.0384	24.5791	61.6098	101.0239
9 / 8 . *	7.9658	0.2558	-0.0131	6.0972	0.0038	0.1965	-0.0745	24.9230	61.8398	101.2819
9 / 9 . *	7.9235	0.2339	-0.0250	6.3334	0.0088	0.2776	-0.0248	24.9324	61.5613	101.2708
9 / 10 . *	8.0220	0.2528	-0.0105	6.1069	0.0025	0.2413	0.0008	24.4486	62.1506	101.2255
10 / 1 . *	8.5654	0.2703	-0.0214	5.3098	-0.0075	0.3377	0.0460	24.2201	62.5627	101.3120
10 / 2 . *	8.6560	0.2528	-0.0250	5.0731	0.0025	0.3078	0.0280	23.8247	63.0519	101.1967
10 / 3 . *	8.5917	0.2712	-0.0166	5.1264	-0.0212	0.2941	0.1089	24.1126	63.4864	101.9912
10 / 4 . *	8.5652	0.2279	-0.0335	5.1154	-0.0299	0.3215	-0.0319	24.0122	63.3180	101.5602

9a2 Pseudotachylite plaioclase

Date: 6/14/2011 Wt% Oxide

Formula	Na2O	K2O	MgO	CaO	MnO	FeO	BaO	Al2O3	SiO2	Total
10 / 5 . *	8.4654	0.4758	-0.0163	5.3311	-0.0062	0.3325	0.1269	24.0975	62.5327	101.3619
10 / 6 . *	8.4981	0.2769	-0.0071	5.4144	-0.0087	0.4433	-0.0005	24.0000	62.8029	101.4355
10 / 7 . *	8.5826	0.3256	-0.0071	5.1820	0.0050	0.2989	-0.0364	24.1042	62.9701	101.4684
10 / 8 . *	8.6004	0.3513	-0.0061	5.1545	-0.0162	0.2916	-0.0199	24.0029	62.9133	101.3139
10 / 9 . *	8.5501	0.3346	-0.0274	5.1012	-0.0212	0.2679	0.0370	23.8795	62.8418	101.0122
10 / 10 . *	8.5475	0.3346	-0.0177	5.1420	-0.0112	0.2904	0.0445	23.7254	62.9883	101.0728