SITE 734 HOLE B CORE 1R CORED INTERVAL 3681.5-3691.0 mbsl; 0.0-9.5 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
HOLOCENE		NN 21						1	0.5				XRF	FORAMINIFERAL OOZE, VOLCANIC GRAVEL, and VOLCANIC SAND
								CC					XRD TS	

Major lithologies:
a. FORAMINIFERAL OOZE, light brownish gray (2.5Y 6/2) to light gray (2.5Y 7/2), very fine sand to fine sand, in Section 1, 0-4 cm. Sharp basal contact.
b. One graded bed, fining upward from VOLCANIC GRAVEL (pebbles as large as 3.5 cm) to fine-grained VOLCANIC SAND, both serpentinized peridotite, in Section 1, 4-76 cm.
c. Volcanic and metamorphic gravel of serpentinized peridotite, dark grayish brown and black (2.5Y 4/2 to 2.5Y 2/2), in CC.

Minor lithologies:
a. Alteration mineral form 10% of Section 1, 4-76 cm: carbonate minerals and zeolites, and altered gabbro(?), with some foraminiferal ooze from 4-24 cm. Serpentinite grains are angular.
b. Greenstone with ophicalcite veins, in CC.

SMEAR SLIDE SUMMARY (%):

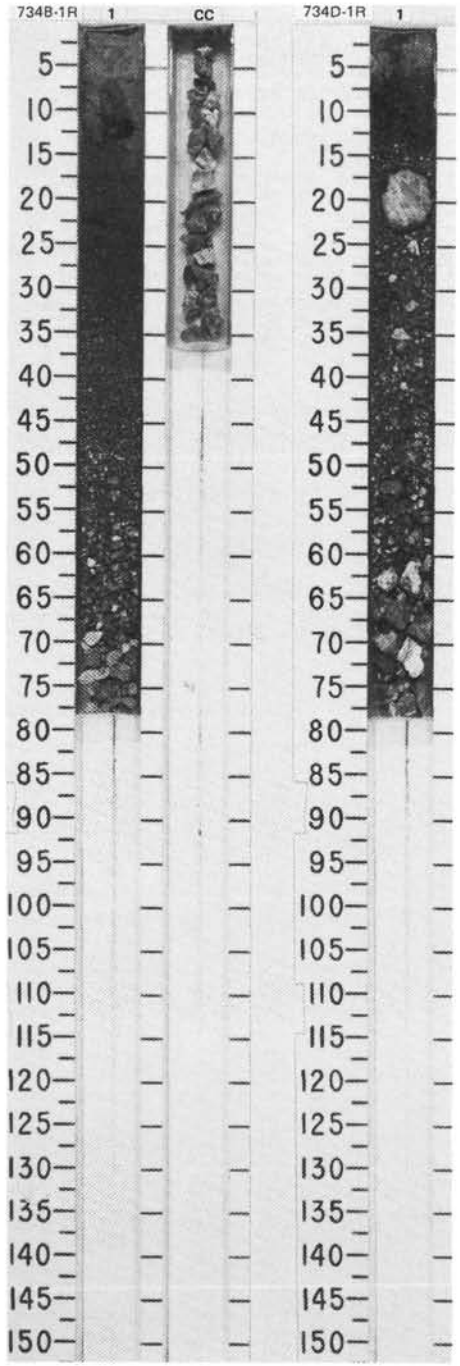
	1, 1 D	1, 2 D	1, 15 D
TEXTURE:			
Sand	90	95	100
Silt	10	5	—
COMPOSTION:			
Acc. min.	10	5	5
Feldspar	10	5	—
Foraminifers	80	80	5
Rock frag.	—	10	90

SITE 734 HOLE D CORE 1R CORED INTERVAL 3720.0-3739.5 mbsl; 0.0-19.5 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
HOLOCENE		NN 21						1	0.5				TS TS TS XRF	VOLCANIC GRAVEL and VOLCANIC SAND

Major lithology: One graded bed, fining upward from VOLCANIC GRAVEL (with pebbles as large as 4.5 cm) to medium-grained VOLCANIC SAND. Amphibolite mylonite, very dark gray to black (2.5Y 3/0 to 2.5Y 2/0), forming 80% of core. All volcanic grains are angular.

Minor lithologies:
a. Serpentinized peridotite, very dark grayish brown (2.5Y 8/0), 5% of core.
b. Calcite, white (2.5Y 8/0), 15% of core.
c. Foraminiferal ooze, light brownish gray (2.5Y 6/2), >60% of sediment in upper 5 cm.
d. Large clast of foliated serpentinized peridotite, containing porphyroblast of orthopyroxene ~0.5-1.0 cm in size, and a trace of clinopyroxene. Olivine is totally serpentinized. Veins are filled by an unidentified white mineral.



SITE 734 HOLE G CORE 3D CORED INTERVAL 3451.0-3459.5 mbsl; 22.5-31.0 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES
EARLY PLEISTOCENE		NN 19						1 2 3 4	0.5 1.0				XRF

LITHOLOGIC DESCRIPTION

VOLCANIC BRECCIA

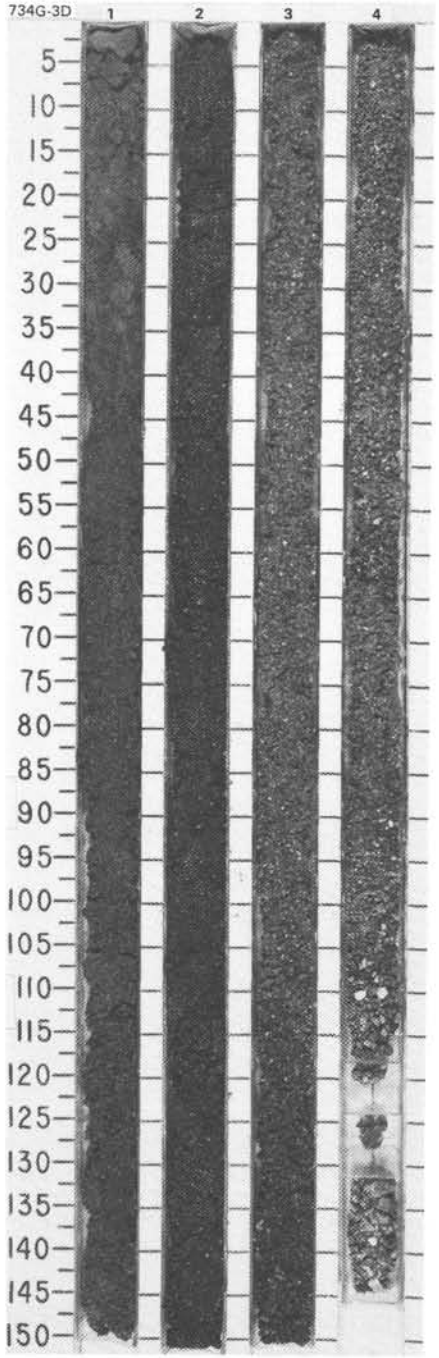
Entire core is badly deformed. Core was a slurry upon extrusion.

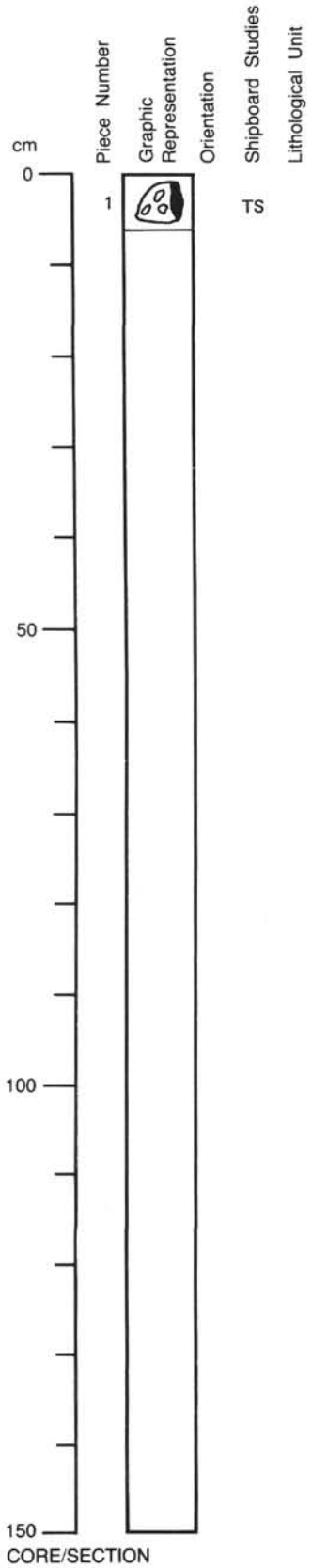
Major lithology: VOLCANIC BRECCIA, very dark grayish brown (2.5Y 3/2), with olive brown (2.5Y 4/4), white (2.5Y 8/2), and yellowish red (5YR 5/8) sand grains. Graded, *fining upward from pebble conglomerate at base of core to sandy silty clay at top.* Poorly sorted throughout. Stratification only in top 25 cm.

Minor lithologies:
a. Calcareous ooze, light olive brown (2.5Y 5/4), homogeneous, stiff, in Section 1, 0-3 cm.
b. Foraminiferal ooze, olive brown (2.5Y 4/4), intermixed with underlying breccia, in Section 1, 3-20 cm.

SMEAR SLIDE SUMMARY (%):

	1, 2 D	1, 10 D	1, 50 D	1, 120 D
TEXTURE:				
Sand	20	80	80	90
Silt	40	15	5	5
Clay	40	5	5	5
COMPOSITION:				
Acc. min.	10	33	30	22
Carbonate	80	5	5	10
Feldspar	—	20	5	—
Foraminifers	5	30	10	8
Nannofossils	5	2	—	—
Rock frag.	—	10	50	60





118-734A-1D-1

UNIT 1: SERPENTINIZED LHERZOLITE

Piece 1:

COLOR: Buff, mottled gray, dark greenish black at one edge.
LAYERING: None.
DEFORMATION: Very slight foliation in brownish matrix, parallels dark edge.
PRIMARY MINERALOGY:

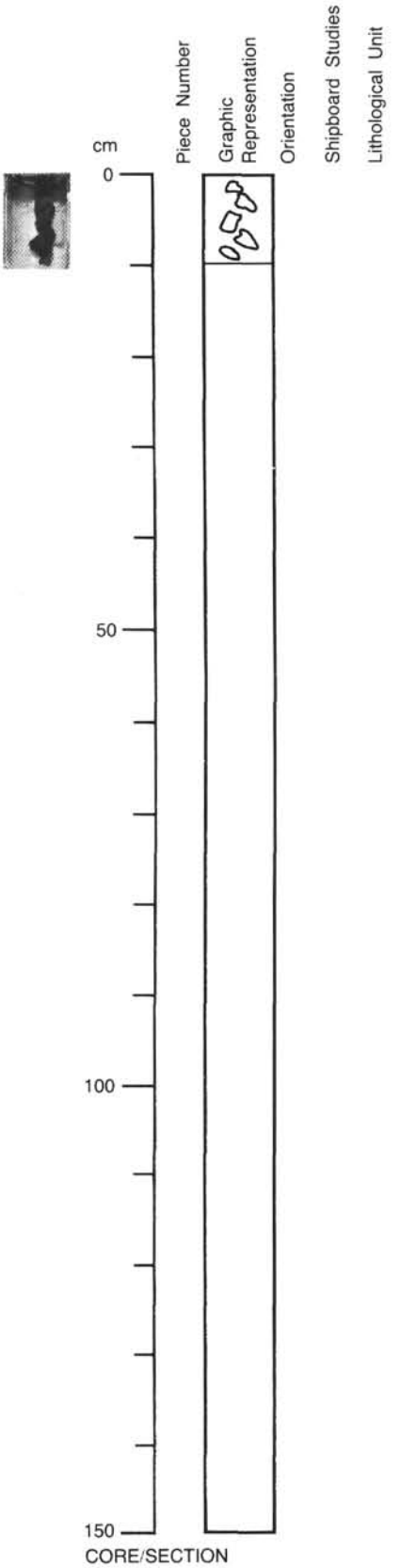
Olivine—Mode: 75%.
Crystal size: Not determined.
Crystal shape: Not determined.
Preferred orientation: Not determined.
Percent replacement: Serpentinized.

Orthopyroxene—Mode: 20%.
Crystal size: Up to 0.5 cm.
Crystal shape: Porphyroblasts.
Preferred orientation: Not determined.
Percent replacement: Largely fresh.

Clinopyroxene—Mode: 5%.
Crystal size: Individual large crystals.
Crystal shape: Most disseminated in sheared serpentinite.
Preferred orientation: Not determined.
Percent replacement: Not determined.

SECONDARY MINERALOGY:

Total percent: Not determined.
Texture: Serpentine replaces most olivine. Orthopyroxene rimmed by talc (yellowish). Archive portion has thin patina of manganese oxyhydroxides, working portion does not. Rock is apparently a pebble in the thin rubble zone above coherent rock. It was partly exposed to sea water.
Percent vein material: Not determined.
Vein material: Not determined.



118-734F-1D-1

UNIT 1: SERPENTINIZED PERIDOTITE

Piece 1

Piece 1: Serpentinized Peridotite

COLOR: Pieces have dark brownish-black external colors stained by orange iron-oxides(?).
LAYERING: None.
DEFORMATION: Foliation defined by some elongation of orthopyroxene and parallel orientation of serpentinite veins in two chips, other more massive.
PRIMARY MINERALOGY:
Olivine—Mode: 80-100%.
Crystal size: Not determined.
Crystal shape: Not determined.
Preferred orientation: Not determined.
Percent replacement: Replaced by serpentine.

Orthopyroxene—Mode: Not determined.
Crystal size: 3-4 mm.
Crystal shape: Porphyroblasts.
Preferred orientation: Crystals are elongate due to deformation.
Percent replacement: 80% replaced by serpentine and iron-oxides.
SECONDARY MINERALOGY:
Total percent: Not determined.
Texture: Serpentine and iron-oxides, form 75%-100% of the rock.
Percent vein material: Not determined.
Vein material: Serpentine veinlets generally have a consistent orientation throughout. One chip has a transverse vein, 5 mm wide which crosscuts the serpentine veinlets throughout the rest of the sample.

THIN SECTION DESCRIPTION

118-734A-1D-1 (Piece 1, 0-5 cm)

ROCK NAME: Serpentinized peridotite, spinel lherzolite

WHERE SAMPLED: Perpendicular to lineation produced by serpentinization. Rubble.

TEXTURE: Mesh, porphyroclastic

GRAIN SIZE: Fine to coarse

OBSERVER: KEM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	10	≈70(?)	0.1-0.2			Partially replaced. Mostly occurs as tiny crystals or granulated masses interspersed with serpentine. Mesh texture.
Clinopyroxene	5	≈10	1-2		Anhedral	Occurs as clusters of small, equant crystals near opx.
Spinel	Tr	Tr			Anhedral	
Orthopyroxene	3	≈20	0.1-5.0			Almost completely replaced by serpentine. Recrystallized crystals measure 0.1-0.2 mm; other crystals measure 3-5 mm.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Serpentine	71	Ol, opx, cpx	
Magnetite	11	Ol, opx	
Bastite	Tr	Opx	0.1-0.2 mm recrystallized crystals. Halos around porphyroclasts.

COMMENTS: Thin section is probably perpendicular to spinel foliation and to extensional fractures produced by serpentinization. Recrystallized opx crystals are <0.2 mm in size. Unrecrystallized crystals of opx and cpx show exsolution lamellae. Opx crystals measure 3-5 mm; cpx crystals measure 1-2 mm.

THIN SECTION DESCRIPTION

118-734B-1R-CC (Piece 3, 8-10 cm)

ROCK NAME: Serpentinized peridotite

WHERE SAMPLED:

TEXTURE: Mesh, porphyroclastic

GRAIN SIZE: Fine to coarse

OBSERVER: KEM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	8				Anhedral	
Clinopyroxene	5				Anhedral	
Spinel	1.2	2	1-4	Chromite	Anhedral	Rimmed and replaced by magnetite or ferrous chromite. Cr spinel is golden brown.
Orthopyroxene	2.7		3-5		Anhedral	

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Carbonate	7.5	Veins	Calcite in ≈1 mm wide veins which cross cut the extensional fractures by serpentinization.
Serpentine	73.8	Ol, opx, veins	Forms mesh texture. Bastite replaces opx. Vein is ≈5 mm wide.
Magnetite	1.8	Spinel	Occurs as small crystals throughout serpentine and as slightly larger equant crystals lining the sides of calcite veins.

COMMENTS: Clinopyroxene occurs as clusters of small crystals near opx and cpx porphyroclasts. Recrystallized px measures ≈0.2-0.3 mm. Unrecrystallized opx shows exsolution of cpx, and measures from 3-5 mm. Unrecrystallized cpx is 1-4 mm in size. Original mineral proportions unknown due to extensive alteration and deformation. Percentages based on 500+ point counts.

THIN SECTION DESCRIPTION

118-734B-1R-CC (Piece 2, 5-7 cm)

ROCK NAME: Anorthosite metagabbro

WHERE SAMPLED:

TEXTURE:

GRAIN SIZE: Coarse to very coarse

OBSERVER: BLM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	40	85	0.5–0.8		Subhedral	Define an original lamination.
Clinopyroxene	—	15(?)				Altered to clays, amphibole.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	20	Plag	Brown aggregates. Also filling fractures.
Actinolite	25	Plag	Fibrous aggregates replacing plag and in fractures cutting across lamination (probably prehnite?).
Amphibole	15	Cpx(?)	Anhedral, clear, nonpleochroic, optically negative crystals. Z ∧ c = 25°. Good amphibole cleavage. Interstitial to plag; looks like replacing interstitial subpoikilitic cpx.
Opaques	<1	Plag	Opaques + actinolite replacing plag.

COMMENTS: Looks like a plag orthocumulate with an original lamination. Interstitial cpx is completely replaced by high temperature amphibole and later low temperature alteration minerals. Dense network of fractures perpendicular to lamination filled with amphibole + clay. Some minor bending, breakage, and recrystallization of plag. Amphibole is optically negative, probably a Mg actinolite. Calcisilicate (2Vx = 25°) may be wollastonite.
Thin section cut from a piece of volcanic rock (in the core catcher).

THIN SECTION DESCRIPTION

118-734D-1R-1 (Piece 1, 18-24 cm)

ROCK NAME: Serpentinized harzburgite

WHERE SAMPLED:

TEXTURE: Mesh

GRAIN SIZE: Fine to coarse

OBSERVER: KEM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	4.9	(?)	0.1–0.2		Anhedral	Occurs as small clear crystals interwoven in serpentine mesh texture. Generally these areas are oxidized, darker than surrounding serpentine.
Clinopyroxene	1.2	(?)			Anhedral	
Spinel	0.5	≈1	0.05–0.30		Holly-leaf vermicular, anhedral	
Orthopyroxene	3.5	≈10	10–15		Anhedral	Elongated. Some crystals show en echelon fractures along which slip has occurred. Bastite. Average crystal width = 3–4 *mm*.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Carbonate	1.5	Veins	Calcite.
Serpentine	77	Ol, opx, veins	In veins perpendicular to lineation defined by elongate opx.
Magnetite	11.4	Ol, opx	

COMMENTS: Percentages based on 529 point counts.
One interesting symplectic intergrowth of spinel + cpx in opx.
Foliation/lineation defined by elongation of opx porphyroclasts and strings of holly-leaf shaped spinels.
Thin section parallel or subparallel to foliation.

THIN SECTION DESCRIPTION

118-734D-1R-1 (Piece 1, 59-61 cm)

ROCK NAME: Metagabbro

WHERE SAMPLED:

TEXTURE: Porphyroclastic

GRAIN SIZE: Medium to coarse

OBSERVER: BLM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	10(?)	70				Most crystals are altered. A few remnant crystals of calcic plag.
Clinopyroxene	20	30				Two large crystals: one is bent and shows granulation and recrystallization.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	30	Plag	Dark aggregates after plag. Probably nontronite.
Carbonate	2	Veins	In veins perpendicular to direction of cpx lenses.
Zeolites	10	Plag	Natrolite (composition determined by XRD).
Albite	10	Plag, veins	Veins perpendicular to cpx lenses.
Sphene	5	Cpx??	Orange-yellow crystals around cpx. Associated with opaques.
Amphibole	10	Cpx	Clear small amphibole crystals around cpx margins (clear cpx cores). Then cloudy zone of mixed cpx + amphibole. Then small amphibole crystals. Also in small patches in altered cpx.
Opaques	3	Cpx	Around edges of cpx, with sphene.

COMMENTS: High temperature alteration of gabbro was followed by low temperature alteration; plag was almost completely replaced by clays and albite, and cpx was partially replaced by amphibole. Final assemblage is cut by dense fracture network, largely perpendicular to cpx lenses (a few parallel to lenses). Some fractures are filled with albite, clay, calcite.

THIN SECTION DESCRIPTION

118-734D-1R-1 (Piece 1, 67-68 cm)

ROCK NAME: Mylonitic amphibolite

WHERE SAMPLED:

TEXTURE: Mylonitic

GRAIN SIZE: Fine to coarse

OBSERVER: KEM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	—	30(?)				Replaced by both porphyroblasts and neoblasts of plag (<0.01 mm).
Clinopyroxene	—	70(?)				

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Chlorite	1	Veins	
Amphibole	70	Cpx(?), amphibole(?)	Anhedral, colorless crystals. Occur as large porphyroclasts (2-10 mm) and as small neoblasts (<0.1 mm).
Plagioclase	29	Plag	Occurs as both porphyroclasts (2-10 mm) and as small neoblasts <0.1 mm. Undulatory extinction.

COMMENTS: Tendency for mineralogic segregation in amphibole and plag-rich layers.
Thin vein of chlorite crossing one corner of slide.
Amphibole augen with mechanical twins(?). Some recrystallization along en echelon fractures in these crystals. These fractures lengthen the augen in the plane of the foliation.

THIN SECTION DESCRIPTION

118-734D-1R-1 (Piece 1, 74-77 cm)

ROCK NAME: Foliated metabasalt (amphibolite?)

WHERE SAMPLED: Rubble

TEXTURE: Granoblastic

GRAIN SIZE: Fine

OBSERVER: CAN

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	2	3–5(?)	0.1–0.5		Euhedral	Magmatic twins. Clear preferred orientation of crystals with these twins. Maximum elongation parallel to the foliation. Locally the phenocrysts also show mechanical twins.
Opaques	Tr	Tr				
Groundmass	—	95				

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Prehenite(?)	18	Plag, veins	Replaces plag close to the cross cutting veins. Cross cutting veins of prehnite or laumontite(?).
Opaques	10		Small grains (<30 μm) in the groundmass and as larger grains (0.1 mm) elongated in the foliation. Possibly primary.
Plagioclase	30	Plag, groundmass	Recrystallized grains from the plag phenocryst ($\approx$ 40 μm) and from the basaltic groundmass ($\approx$ 20 μm).
Amphibole	40		Pale brown to pale green, polygonal grains 20–50 μm in the groundmass. Some amphibole grains larger (0.2 mm). Also in monomineralic layers, 0.5–2.0 mm wide. Probably replacing cpx microphenocrysts.

COMMENTS: 1) Plag phenocrysts with magmatic twins are relicts of the primary basalt.
2) Deformation occurred in the conditions of crystallization/recrystallization of plag + pale brown-green hbd. The origin of the amphibole layers is not clear (igneous or metamorphic?). The layers seem locally folded with the foliation defining the axial plane.
3) The thin section is perpendicular to the foliation.