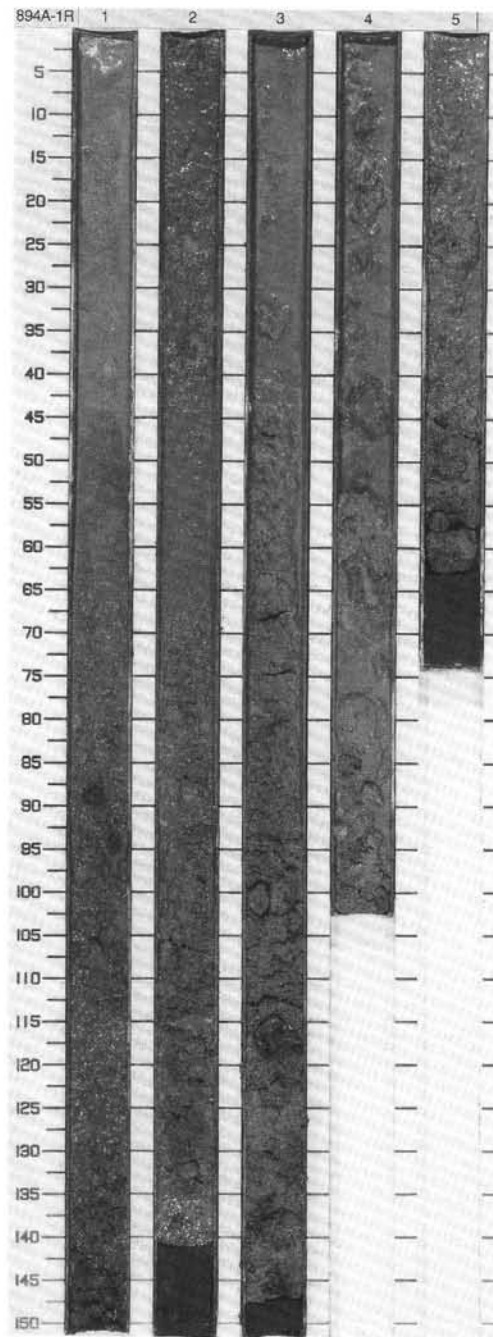


Meter	Graphic Lith.	Section	Age	Structure	Disturb	Sample	Color	Description
0.0 - 1.0	[Pattern: small dots]	1	↑ F		OOOO		10YR 6/4	FORAMINIFER-BEARING IGNEOUS LITHIC BRECCIA
1.0 - 2.0	[Pattern: larger dots]	2	↑ F		WWWW		10Y 5/1	Minor Lithology: FORAMINIFER OOZE at the top of the core contains 40% sand-sized grains with minor clay derived from altered igneous rocks. Foraminifer content increases up section.
2.0 - 3.0	[Pattern: larger dots]	2	↑ F		OOOO	T	5G 4/1	
3.0 - 4.0	[Pattern: larger dots]	3	↑ F		WWWW		10Y 5/1	General Description: Matrix supported angular clasts consist of diabase fragments up to 5 cm. Matrix consists of poorly sorted sand-, silt-, and clay-sized fragments derived from altered chloritic igneous material with minor (< 10%) foraminiferal and nannofossil ooze. There are rare fragments of fine-grained and glassy basalt. Fining upward sequences are probably induced by drilling.
4.0 - 5.0	[Pattern: larger dots]	4	↑ F		OOOO		10G 4/1	
5.0 - 6.0	[Pattern: larger dots]	4	↑ F		WWWW		2.5Y N4/0	
		5	↑ F		OOOO			
		5	↑ F		WWWW	D T		

Information on Core Description Forms, for ALL sites, represents field notes taken aboard ship. Some of this information has been refined in accord with post-cruise findings, but production schedules prohibit definitive correlation of these forms with subsequent findings. Thus, the reader should be alerted to the occasional ambiguity or discrepancy.



SITE 894 HOLE D CORE 1R

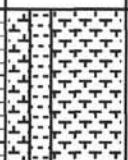
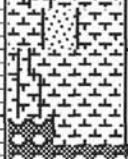
CORED 0.0 - 10.0 mbsf

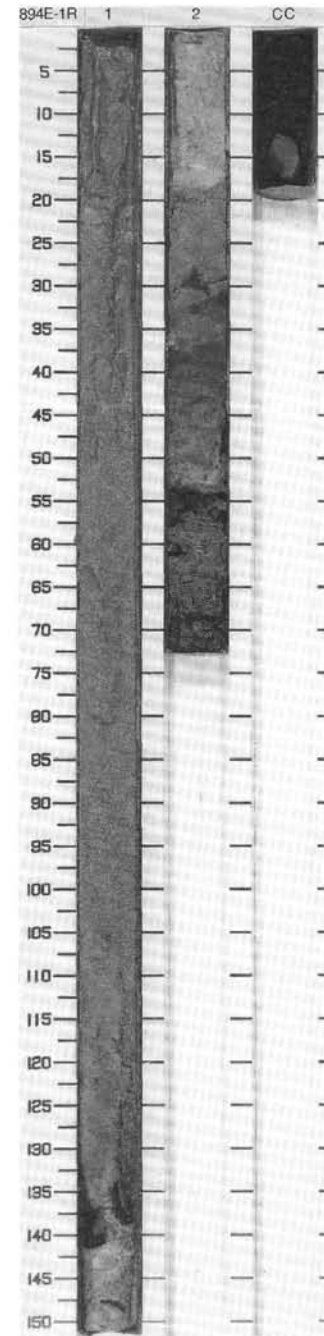
Meter	Graphic Lith.	Section	Age	Structure	Disturb	Sample	Color	Description
1		1		 			7.5YR 6/4 To 7.5YR 6/2	<p>NANNOFOSSIL FORAMINIFER SAND and CLAY-BEARING FORAMINIFERAL NANNOFOSSIL OOZE</p> <p>General Description: Medium fine foraminiferal sand layers fining upward with basaltic sand concentrated at their bases (at 30 and 132 cm). Most of the core is varicolored brown to pinkish gray calcareous ooze. Color variations reflect abundances of clays. The CaCO₃ content of brown ooze at 90–92 cm is 68.5%. An angular aphyric basalt cobble is present at 105–110 cm. The core is quite distorted by coring disturbance.</p>

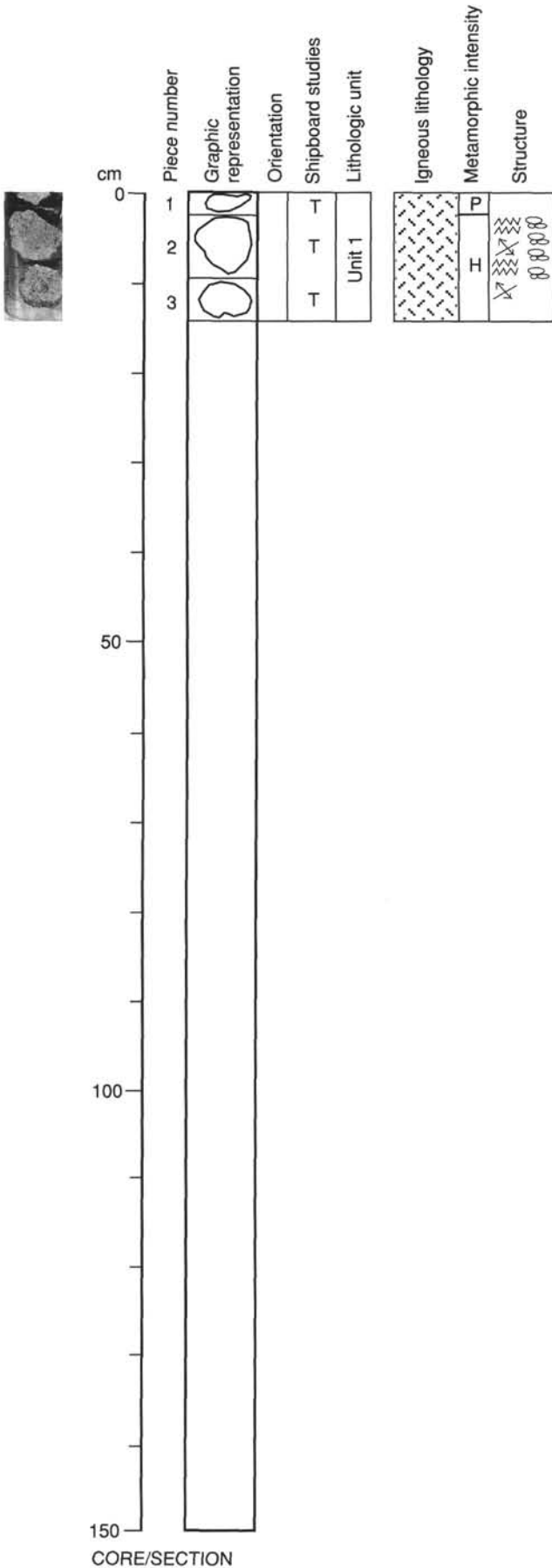


SITE 894 HOLE E CORE 1R

CORED 0.0 - 9.3 mbsf

Meter	Graphic Lith.	Section	Age	Structure	Disturb	Sample	Color	Description
1		1					10YR 5/2	<p>FORAMINIFERAL SAND, FORAMINIFERAL NANNOFOSSIL OOZE and BASALTIC SAND AND BASALTIC LITHIC BRECCIA</p> <p>General Description: 0–120 cm: Soupy, uniformly sorted foraminiferal sand, with a few % of basaltic sand grains. 120–150 cm: Highly disturbed mixed foraminiferal nannofossil ooze and basaltic sand. 150–217 cm: Mixed, interbedded, disturbed foraminifer nannofossil ooze with minor distorted lenses of basaltic sand, and interbeds of coarse basaltic lithic breccia. 217–240 cm: Coarse basaltic lithic breccia with a cobble of aphyric basalt.</p> <p>CaCO₃ content is 78% at 64–66 cm, 86% at 143–145 cm, and 80% at 173–175 cm.</p>
2		2		—			10YR 5/3 To 10G 2.5/1	





UNIT 1: GABBRO

Pieces 1-3

COLOR: Gray-green.

LAYERING: None.

DEFORMATION: Fractured with subsequent fragment rotation. Discrete cataclastic shear zones.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 1-1.5 mm.

Crystal shape: Subhedral.

Crystal orientation: Random.

Percent replacement: 70%-90%.

Pyroxene - Mode: 50%.

Crystal size: <2 mm.

Crystal shape: Anhedral.

Crystal orientation: Random.

Percent replacement: 80%-100%.

Oxides - Mode: 1%.

Crystal size: <1 mm.

Crystal shape: Anhedral.

Crystal orientation: Random.

Percent replacement: 5%.

Apatite - Mode: <<1%.

Crystal size: <<1 mm.

Crystal shape: Euhedral.

Crystal orientation: None.

Percent replacement: None.

SECONDARY MINERALOGY:

Total percent: 90%.

Texture: Coarse-grained green-yellow to blue amphibole and fibrous actinolite, oxides and clay replacing clinopyroxene. Secondary feldspar, chlorite, actinolite, and clay replacing plagioclase. Trace of epidote.

Vein material: Anastomosing actinolite and prehnite veins. Rare sulfides.

ADDITIONAL COMMENTS: Thin sections show pervasive alteration and intense grain size reduction of all phases. Deformation appears homogeneous except for discrete fine-grained cataclasite in shear zones of approximately 2 mm width. Lower (in Piece 3) the rock is somewhat less deformed with protoclasic texture.

147-894C-1M-1

UNIT 1: APHYRIC BASALT (PIECE 1); SHEARED MET-AGABBRO (PIECE 2)

Pieces 1-2

CONTACTS: None.

PHENOCRYSTS: None.

GROUNDMASS: The basalt is holocrystalline, with intergrown plagioclase and clinopyroxene now altered to amphiboles, clays, and albite.

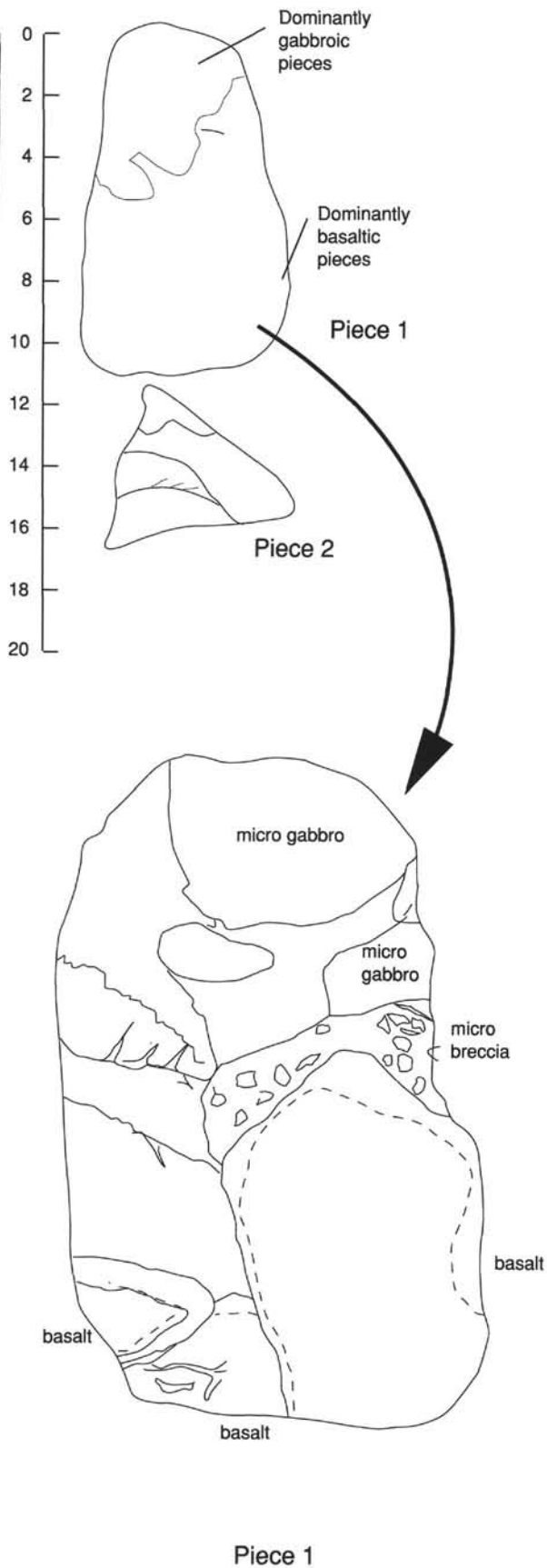
VESICLES: 0%.

COLOR: Gray.

STRUCTURE: The basalt is brecciated with pieces cut by chloritic veins.

ALTERATION: Primary minerals in the basalt are replaced by amphiboles, clays, and albite.

ADDITIONAL COMMENTS: Piece 1 is oversized, having been caught in the drill string after losing the bit and part of the bottom hole assembly when the guidebase toppled. Piece 2, much smaller, is a highly deformed (sheared) gabbro, almost entirely replaced by amphibole, albite, and chlorite. The rock is veined by a clay/chlorite assemblage and sheared.



Piece 1

147-894D-1R-CC

UNIT 1: HIGHLY PHYRIC OLIVINE BASALT (PICRITE)

Piece 1

CONTACTS: Missing.

PHENOCRYSTS:

Olivine - 15%-20%; 1-5 mm; large, euhedral. Crystals with abundant spinel inclusions, all <0.25 mm.

GROUNDMASS: Fine-grained, holocrystalline.

VESICLES: None.

Miaroles: None.

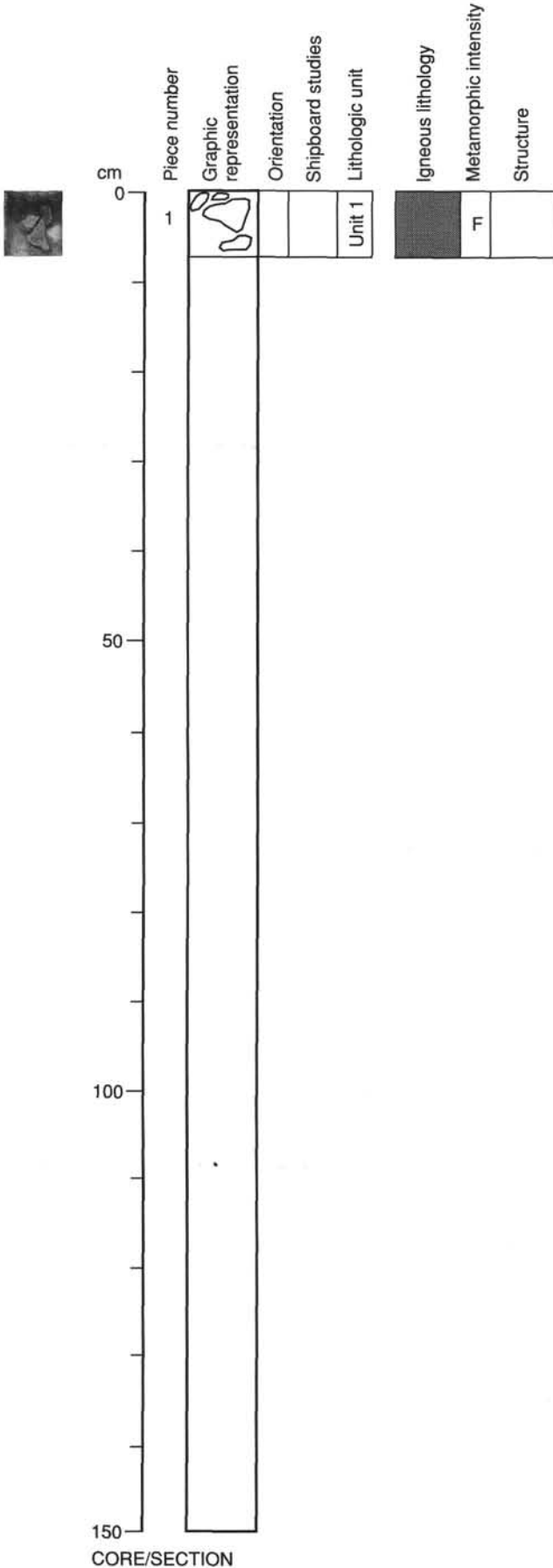
COLOR: Gray.

STRUCTURE: Massive.

ALTERATION: None is fresh.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: This is only the most conspicuous of several pebbles in an 8-cm partition of the core. A second rock type also present. This is a glassy to fine-grained sparsely plagioclase phyric basalt, massive, nonvesicular, fresh, with glassy selvage. Plagioclase phenocrysts are euhedral, to 2 mm, rarely in clumps, and comprise 1% of the rock. All basalt fragments are angular to subrounded.



147-894D-2R-1

UNIT 2: APHYRIC BASALT

Pieces 1-2

CONTACTS: Missing.

PHENOCRYSTS:

Plagioclase - <1%; 1 mm; subhedral.

GROUNDMASS: Fine-grained holocrystalline, probably clinopyroxene and plagioclase.

VESICLES: None.

Miaroles: None.

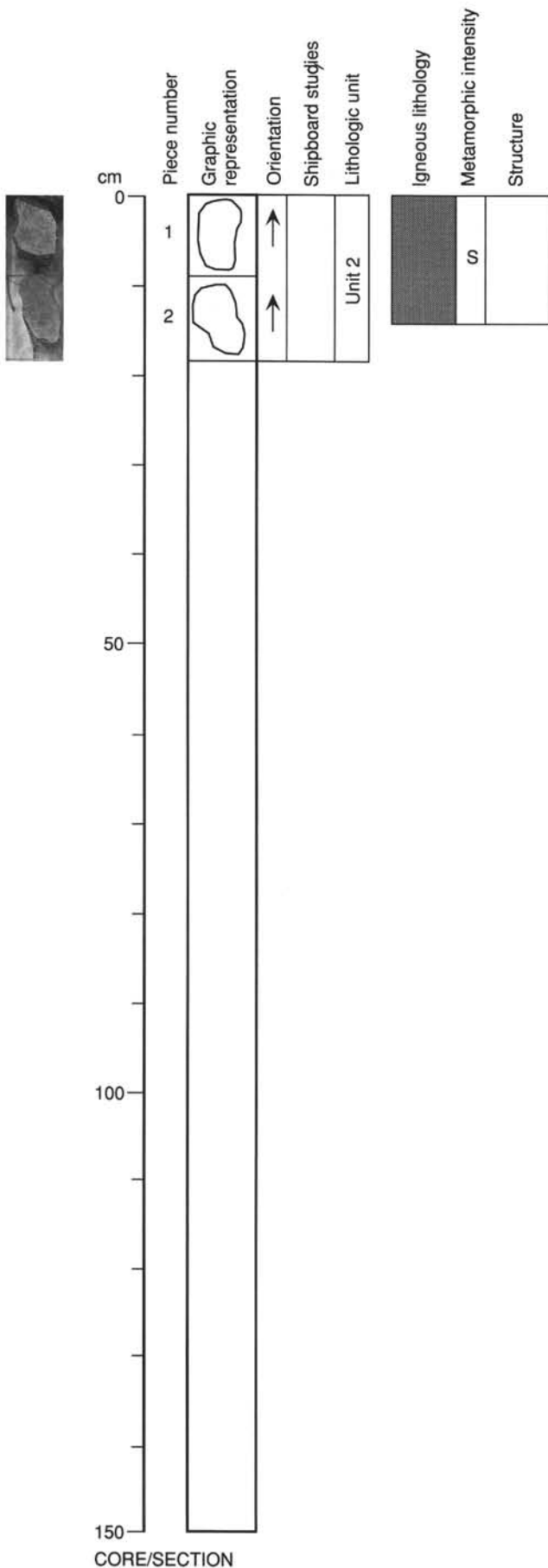
COLOR: Dark gray.

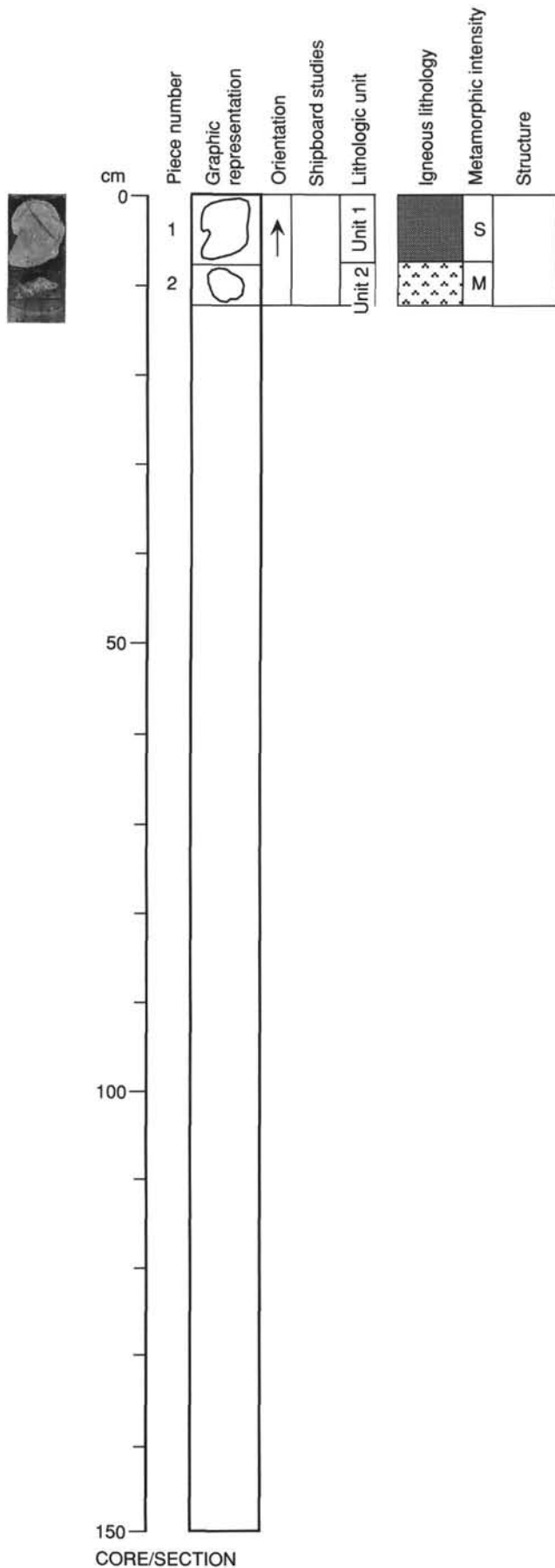
STRUCTURE: The rock is generally massive. Piece 2 exhibits variolitic texture.

ALTERATION: Very slight alteration, presumably some chlorite and clays after clinopyroxene and plagioclase. Alteration rim around Piece 1 is approximately 6 mm thick.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Piece 1 has an alteration zone of 4 to 6 mm thickness parallel to the surface of the piece, presumably chlorite replacing clinopyroxene. Pieces appear to be from pillow lava. Glassy in places.





UNIT 1: APHYRIC BASALT

Piece 1

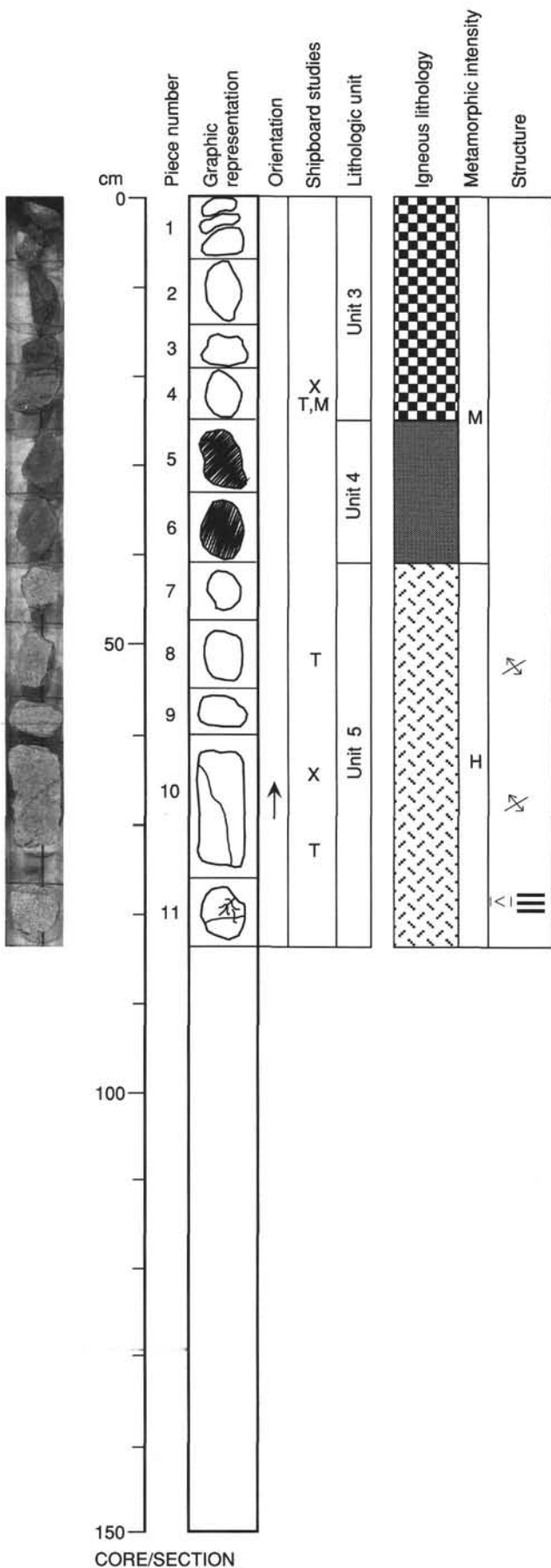
CONTACTS: Missing.
PHENOCRYSTS: N/A.
GROUNDMASS: Fine-grained, holocrystalline, presumably clinopyroxene and plagioclase.
VESICLES: None.
 Miaroles: None.
COLOR: Dark gray.
STRUCTURE: The rock is generally massive. Piece 2 exhibits variolitic texture.
ALTERATION: Up to 6 mm thick alteration rim around Piece 1 of chlorite and clays after pyroxene and plagioclase.
VEINS/FRACTURES: None.

UNIT 2: GABBRO

Piece 2

COLOR: Dark gray.
LAYERING: None.
DEFORMATION: None.
PRIMARY MINERALOGY: Fine-grained intergranular texture.
 Plagioclase - Mode: 60%.
 Crystal size: 1-2.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 45-50.
 Clinopyroxene - Mode: 35%.
 Crystal size: 1-3.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 90.
 Oxides - Mode: 3%-5%.
 Crystal size: 0.5.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 0.
SECONDARY MINERALOGY: Albite, actinolite, and chlorite replace plagioclase; actinolite, secondary clinopyroxene chlorite, and pyrite replace clinopyroxene.
 Total percent: 60%.
 Vein material: None.

147-894E-3R-1



UNIT 3: OXIDE GABBRO

Pieces 1-4

COLOR: Gray.
LAYERING: None.
DEFORMATION: Very minor, mainly development of veins.
PRIMARY MINERALOGY: Minor euhedral apatite with (magmatic?) fluid inclusions.
 Pyroxene - Mode: 45%.
 Crystal size: 5-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 70%-90%.
 Plagioclase - Mode: 45%-50%.
 Crystal size: 1-4 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 30%-40%.
 Oxides - Mode: 5%-10%.
 Crystal size: 0.5 mm.
 Crystal shape: Irregular.
 Crystal orientation: None.

SECONDARY MINERALOGY:
 Total percent: 55%.
 Texture: Secondary plagioclase, chlorite +/- amphibole and clay replacing plagioclase. Clinopyroxene pervasively altered to fine-grained brown amphibole, fibrous green amphibole and clays. Some secondary clinopyroxene. Vein material: Cut by fine chlorite veins with some prehnite. Secondary sulfides, mainly anhedral pyrite, are up to 0.5% of the rock and 0.5 mm in size.
ADDITIONAL COMMENTS: Rock is varitextured even on the scale of a thin section.

UNIT 4: APHYRIC BASALT

Pieces 5-6

CONTACTS: Missing.
PHENOCRYSTS: Overall <1% phenocrysts in rock.
 Plagioclase - <1%; 2 mm; euhedral, sparse crystals.
 Clinopyroxene - <1%; 1 mm; subhedral crystals.
GROUNDMASS: Holocrystalline, presumably plagioclase and pyroxene.
VESICLES: None.
COLOR: Dark gray.
STRUCTURE: Massive.
ALTERATION: 30%. Albite replacing plagioclase (50%) and chlorite and actinolite replacing clinopyroxene (30%).
VEINS/FRACTURES: Very sparse <<1 mm.
ADDITIONAL COMMENTS: No apparent deformation. This unit occurs between gabbro units and although extremely fine-grained, could be a dike lithology.

UNIT 5: GABBRO**Pieces 7–11****COLOR:** Light gray-green.**LAYERING:** None.**DEFORMATION:** Moderate brecciation and fracturing preserving, in part, a magmatic foliation.**PRIMARY MINERALOGY:**

Pyroxene - Mode: 45%.

Crystal size: 5–10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 60%–90%.

Plagioclase - Mode: 53%.

Crystal size: 2–8 mm.

Crystal shape: Subhedral.

Crystal orientation: Weak foliation.

Percent replacement: 50%–60%.

Oxides - Mode: 2%.

Crystal size: 1 mm.

Crystal shape: Irregular.

Crystal orientation: None.

SECONDARY MINERALOGY: Rock is strongly altered along cracks. The secondary minerals in places appear coalesced into patches. Sulfides (0.5%) occur in veins as anhedral crystals to 0.7 mm.

Total percent: 75%.

Texture: Alteration is heterogeneous. Clinopyroxene is pervasively replaced by oxides, clay, fibrous yellow-green amphibole and minor hydrothermal clinopyroxene. Minor chlorite. Plagioclase is replaced by secondary plagioclase, actinolite, and a trace of epidote.

Vein material: In Piece 11, small <1 mm veinlets combine to form 3 mm vein of prehnite, actinolite, and some sulfides. Piece 9 contains fine discontinuous chlorite veinlets. Piece 10 contains a 0.45 mm wide prehnite veinlet bounded by chlorite and a 0.16 mm wide veinlet of calcite, chlorite, and amphibole.

147-894F-1R-1

UNIT 1: GABBRO

Pieces 1-7

COLOR: Gray.
LAYERING: None.

DEFORMATION: Intensely deformed porphyroclastic shear zone, normal displacement in top three pieces (from 0-12 cm). Remainder of unit is fractured with some veins and shows incipient brecciation. The foliation is defined by anastomosing shear zones of alternating ultracataclasites. Plagioclase is intensely deformed with extensive subgrain development. Piece 1 is cut by a <1 cm wide chlorite veinlet.

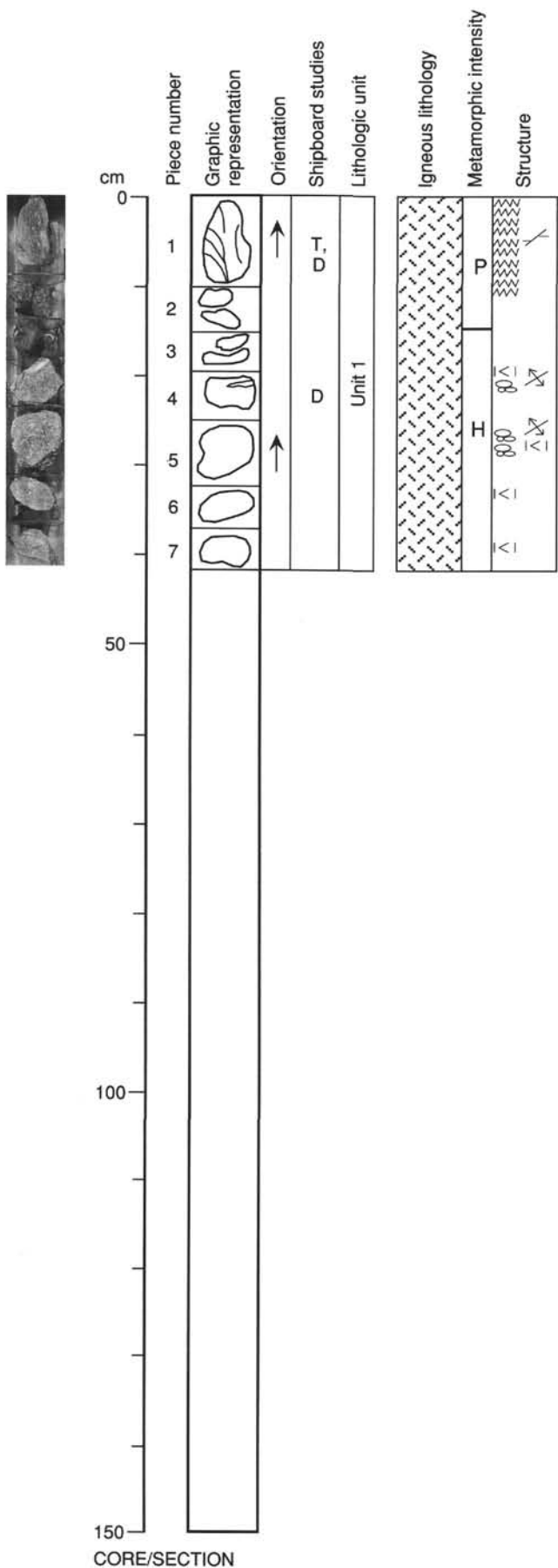
PRIMARY MINERALOGY: Possibility of some very minor amounts of a second pyroxene (hypersthene?).

- Pyroxene - Mode: 50%.
 - Crystal size: 5-10 mm.
 - Crystal shape: Anhedral.
 - Crystal orientation: None.
 - Percent replacement: 60%.
- Plagioclase - Mode: 50%.
 - Crystal size: 2-4 mm.
 - Crystal shape: Subhedral.
 - Crystal orientation: None.
 - Percent replacement: 90%.
- Oxides - Mode: 1%.
 - Crystal size: 1 mm.
 - Crystal shape: Anhedral.
 - Crystal orientation: None.

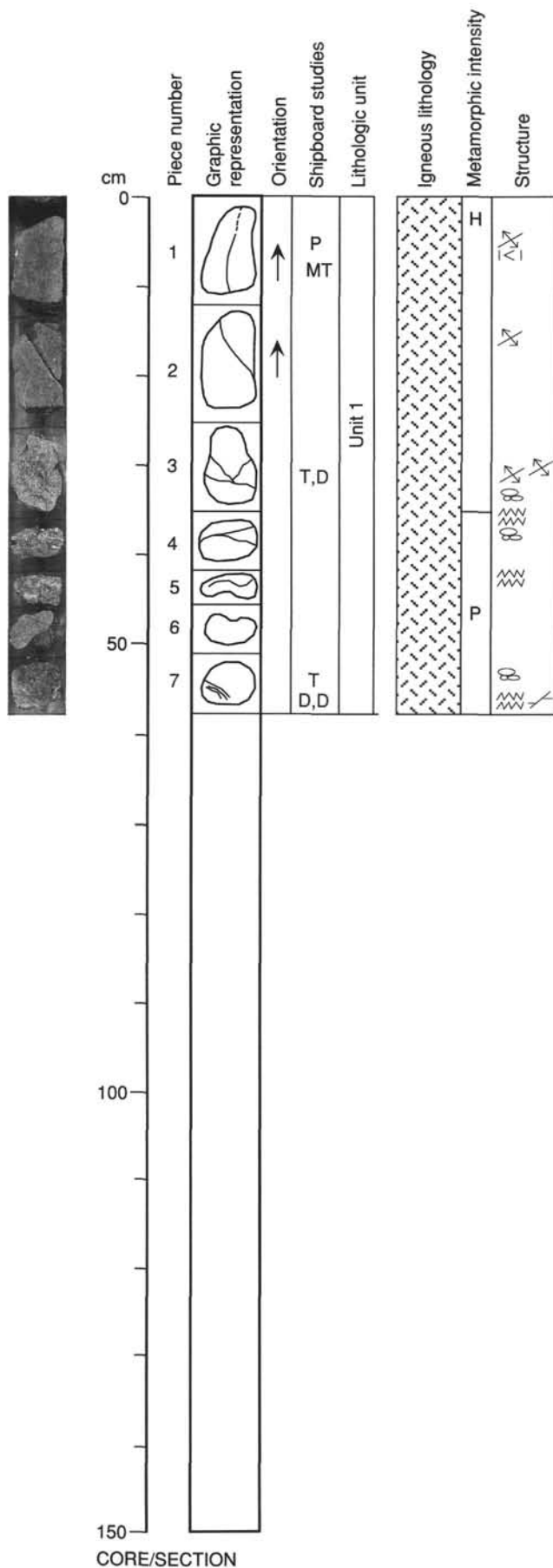
SECONDARY MINERALOGY: Felsic (albite and quartz) patches occur throughout the unit.

- Total percent: 70%-90%.
- Texture: Albite, chlorite, and abundant clays replacing plagioclase. Actinolite replacing pyroxene.
- Vein material: Very thin chlorite veins. In Piece 4, there is a chlorite vein <5 mm wide.

ADDITIONAL COMMENTS: This unit is varitextured where not disturbed by deformation. Pieces 1 and 2 are 100% metamorphic mineralogy and are highly sheared ultracataclasites. Foliation is defined by alternating anastomosing shear zones of these ultracataclasites with cataclasites. Plagioclase is intensely deformed with extensive subgrain development. Samples are pervasively altered with abundant clay in matrix.



CORE/SECTION



UNIT 1: GABBRO

Pieces 1-7

COLOR: Gray to gray-green.

LAYERING: None.

DEFORMATION: Pieces 1-2 are relatively undeformed, Pieces 3-7 are highly cataclastic and mylonitic with discrete ultracataclastic zones. Piece 3 is a cataclasite with pervasive alteration. Deformation is heterogeneous ranging from highly deformed zones defined by anastomosing networks of highly altered, fine-grained plagioclase, amphibole, and clay. Fragmented plagioclase grains exhibit highly variable grain sizes. In less deformed areas, original grain boundaries are preserved.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 2-5 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 5%.

Comments: Shape in lower pieces is subhedral. Alteration decreases downwards in unit.

Clinopyroxene - Mode: 45%-50%.

Crystal size: <10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 80%.

Comments: Alteration decreases downwards in unit.

Oxides - Mode: 2%.

Crystal size: 2 mm.

Crystal shape: Irregular.

Crystal orientation: None.

Percent replacement: ?

Comments: Oxides increase from about 1% to about 5% toward the top of the unit.

SECONDARY MINERALOGY:

Total percent: 45%-75%.

Texture: Clinopyroxene altered to brown to olive green amphibole, secondary clinopyroxene, and fibrous green actinolite. Plagioclase altered to secondary plagioclase and minor actinolite. Some rare calcite after plagioclase in Piece 7.

Vein material: Piece 1-1 mm wide actinolite vein; Piece 2-0.5 mm wide actinolite vein and 0.5 mm wide actinolite + chlorite vein. Piece 7 has 0.7 mm chloritized shear zone. Piece 3 has 0.5 mm wide actinolite zone terminated by cataclasite.

ADDITIONAL COMMENTS: Considered a continuation of Unit 1 in Section 147-894F-1R-1. Piece 3 is a cataclasite with pervasive alteration. Deformation is heterogeneous ranging from highly deformed and altered zones defined by anastomosing networks of highly altered fine-grained plagioclase, amphibole, and clay. Fragmented plagioclase grains exhibit highly variable grain sizes. In less deformed areas, the original grain boundaries are preserved.

147-894F-3R-1

UNIT 1: GABBRO AND UNIT 2: OLIVINE GABBRO

Pieces 1-19

COLOR: Gray, grayish green, pale grayish green.

LAYERING: None.

DEFORMATION: None in Pieces 1-5 and 15-19; mylonitized, veined, brecciated, and sheared in between, centered on Piece 9. Pieces 3 and 4 are cataclastic with no primary minerals left. Pieces 1-8 show increasing metamorphism, shearing, cataclastic texture and alteration. Piece 8 is a matrix-supported, rounded-clast, breccia. Down to Piece 14, in the other direction, rocks show progressively less of these brecciation features.

PRIMARY MINERALOGY: Two pyroxenes in less altered samples; proportions are difficult to determine.

Plagioclase - Mode: 45%-50%.

Crystal size: 2-5 mm.

Crystal shape: Euhedral.

Crystal orientation: None.

Pyroxenes - Mode: 45%-50%.

Crystal size: 1-4 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Oxides - Mode: 1%.

Crystal size: 0.1-1 mm.

Crystal shape: Irregular.

Crystal orientation: None.

SECONDARY MINERALOGY: Alteration and structure are closely linked. Veining and disruption of the rocks are roughly symmetrical about Piece 9. Total percent: 5%-100%.

Texture: Albite after plagioclase; amphiboles and chlorite after pyroxenes. Vein material: Locally, sometimes intensely veined with chlorite, amphibole, epidote, and prehnite. The latter two minerals are especially abundant in Piece 9.

ADDITIONAL COMMENTS: Where cored surfaces can be found, cataclasis appears to be at low rather than high angles. Pieces 17, 18, and part of 19 contain 5%-8% olivine pseudomorphs and minor fresh olivine.

UNIT 3: BASALT

Pieces 19-20

CONTACTS: Intrusive into gabbro Unit 1 above.

PHENOCRYSTS: Rock is very sparsely porphyritic.

Plagioclase - 2%; 0.5 mm; euhedral-subhedral.

Olivine - 1%; 0.5 mm; subhedral, altered.

GROUNDMASS: Fine-grained, holocrystalline.

VESICLES: 0%.

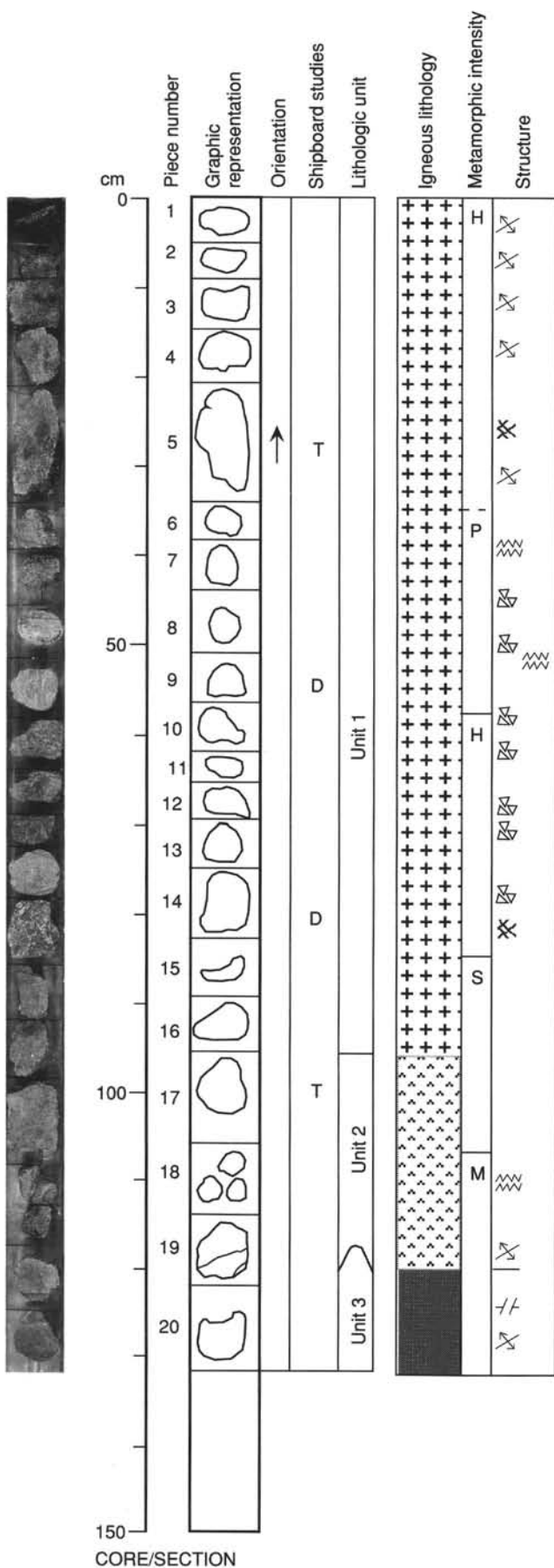
COLOR: Medium gray.

STRUCTURE: None.

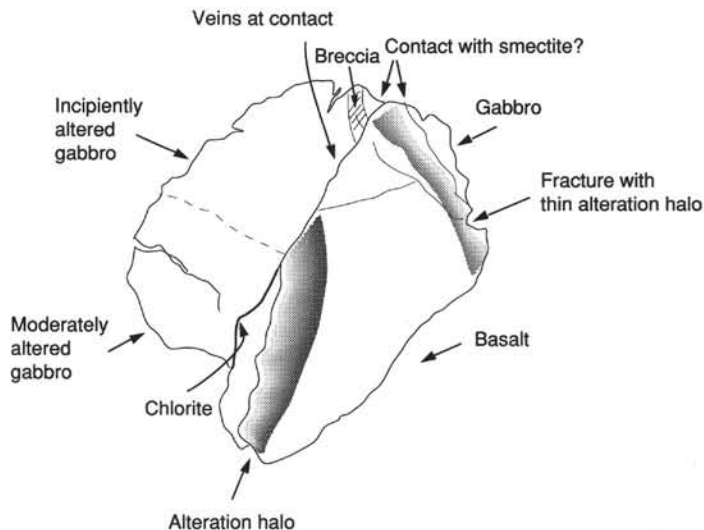
ALTERATION: Moderate, principally to green clays; two veins, epidote, chlorite, possible actinolite.

VEINS/FRACTURES: 0.5 mm wide.

ADDITIONAL COMMENTS: Intrudes olivine gabbro Unit 2 along sharp contact recovered in Piece 19.



Piece 19



UNIT 1: OLIVINE GABBRO

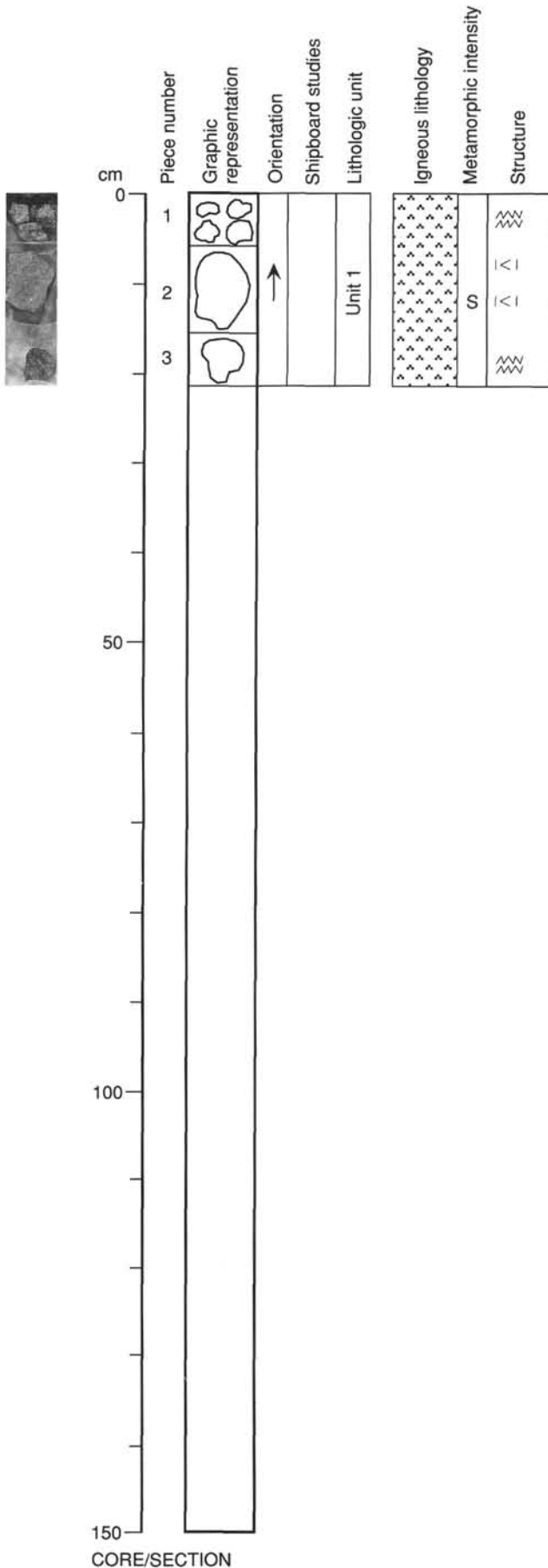
Pieces 1-3

COLOR: Light gray.
LAYERING: Moderate veining in Piece 2. Shear bands in Pieces 1 and 3.
DEFORMATION: None.

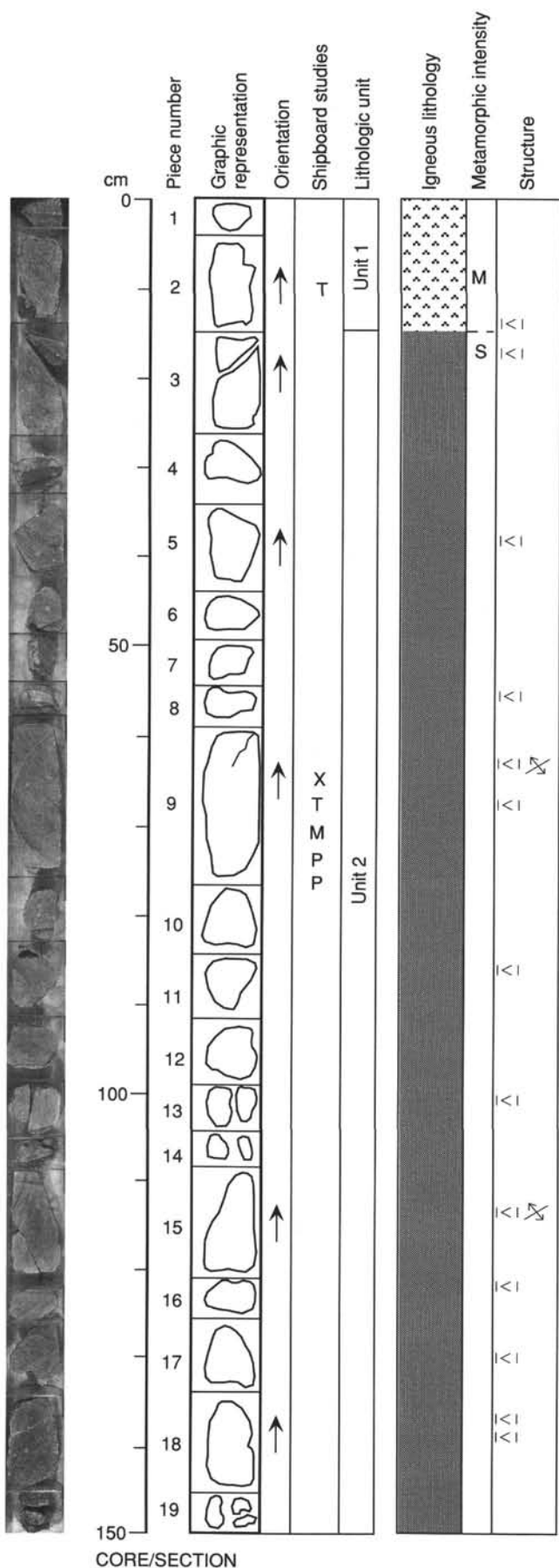
PRIMARY MINERALOGY:

- Plagioclase - Mode: 50%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
- Pyroxene - Mode: 40%-45%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 30%.
 Comments: Orthopyroxene forms up to 9%, with minor alteration to oxide and fibrous amphibole.
- Olivine - Mode: 5%-10%.
 Crystal size: 1-2 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 10%-100%.
- Oxides - Mode: 1%.
 Crystal size: <1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.

SECONDARY MINERALOGY: Secondary sulfide associated with chlorite in veins as <1 mm anhedral crystals up to 0.5%.
 Total percent: 25%.
 Texture: Secondary plagioclase after plagioclase. Chlorite, hydrothermal clinopyroxene, brown amphibole and actinolite after clinopyroxene. Mixed layer clay, iron oxide, amphibole, and chlorite form coronas on fresh olivine cores. Vein material: Prehnite-chlorite veinlets, average width of 0.5 mm in Piece 2. Irregular chlorite veinlet, average width 2.5 mm in Piece 1.



147-894G-2R-1



UNIT 1: OLIVINE GABBRO

Pieces 1-2

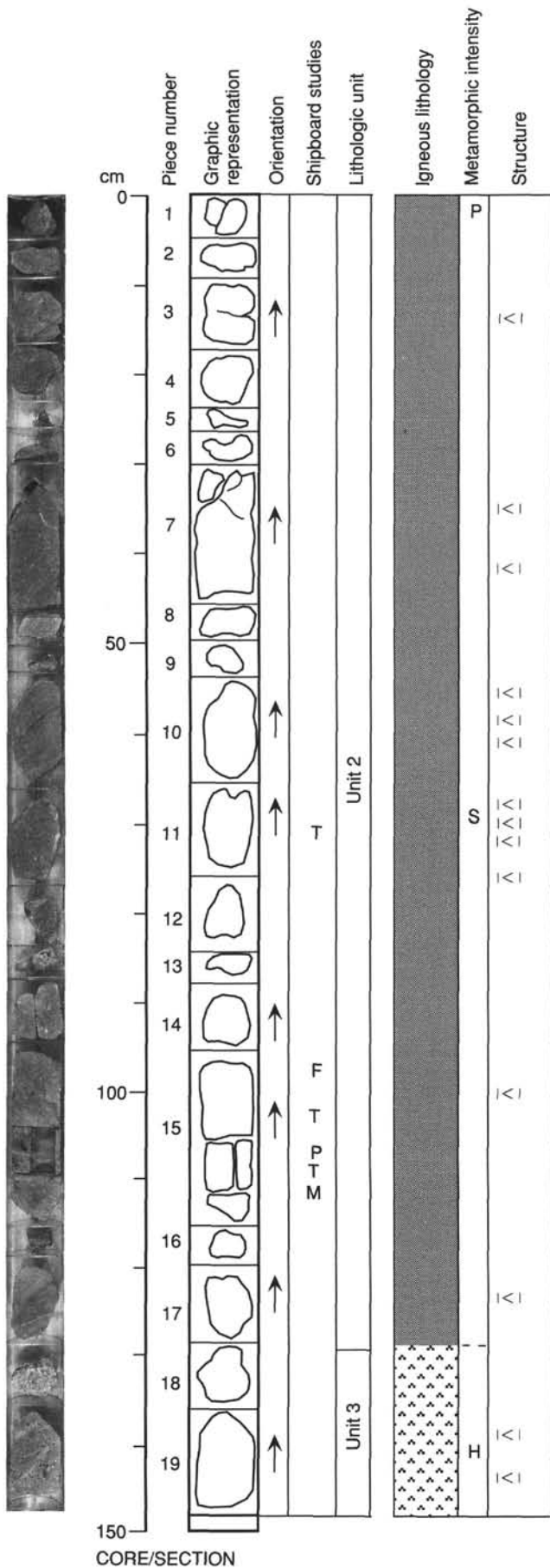
COLOR: Light gray.
LAYERING: None.
DEFORMATION: Minor veining and fracture. Some plagioclases show undulose extinction in thin section.
PRIMARY MINERALOGY: Trace apatite in small euhedral crystals as seen in thin section.
 Olivine - Mode: 5%-10%.
 Crystal size: 1-2 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 90%.
 Plagioclase - Mode: 50%.
 Crystal size: 3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 5%.
 Clinopyroxene - Mode: 30%-35%.
 Crystal size: 3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 40%.
 Oxides - Mode: 1%.
 Crystal size: <1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: ?
 Orthopyroxene - Mode: 2%-5%.
 Crystal size: 3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
SECONDARY MINERALOGY: Orthopyroxene replaced by oxide and actinolite.
 Plagioclase altered to secondary plagioclase.
 Total percent: 25%.
 Texture: Olivine altered to mixed layered clays and oxides and rimmed by amphibole and chlorite. Olivines are commonly cut by oxide filled fractures and rimmed by orthopyroxene. Some remnant cores remain. Clinopyroxene replaced by fibrous green amphibole, secondary clinopyroxene, brown amphibole, and oxide.
 Vein material: Minor veins of chlorite, clay, calcite, and (?)prehnite.

UNIT 2: PLAGIOCLASE-OLIVINE-PHYRIC BASALT

Pieces 3-19

CONTACTS: Missing but presumably intrusive into host olivine gabbro.
PHENOCRYSTS: Phenocrysts are random throughout rock, some patches are made up of smaller plagioclase phenocrysts 2 mm or less in fine matrix.
 Plagioclase - 5%-10%; up to 6 mm, average 3 mm; euhedral to subhedral, no orientation, 10% altered to secondary feldspar, cut by microveinlets of zeolites and containing abundant melt inclusions.
 Olivine - 4%; <2-3 mm; 30% altered to clays and amphibole, subhedral, random oriented crystals.
GROUNDMASS: Plagioclase and clinopyroxene as fine-grained (<<1 mm) matrix with subophitic? texture. Glassy mesostasis (15%) is altered to clays and amphiboles. Minor groundmass olivine and spinel.
VESICLES: None.
 Mirols: None.
COLOR: Gray.
STRUCTURE: Minor moderate veining and minor fracturing.
ALTERATION: Chlorite after olivine, secondary plagioclase after plagioclase and possibly actinolite after clinopyroxene.
VEINS/FRACTURES: Minor; 1 mm, 0.5 mm; 1 mm width veins are epidote filled. 0.5 mm veins of chlorite, zeolite, and calcite. There are also <0.5 mm veins of chlorite and clay.

CORE/SECTION



UNIT 2: PLAGIOCLASE-OLIVINE-PHYRIC BASALT

Pieces 1-17

CONTACTS: Missing but presumably intrusive into host olivine gabbro.

PHENOCRYSTS:

Plagioclase - 5%–10%; 5 mm; subhedral to euhedral crystals, randomly oriented and approximately 5%–10% altered.

Olivine - 1%; 1–2 mm; subhedral and 50% altered to clays.

GROUNDMASS: Plagioclase up to 45% of groundmass, <0.5 mm crystals, no orientation and approximately 5% altered. Pyroxene forming rest of groundmass with up to 3 mm crystals, average approximately 1 mm. Crystals are anhedral and up to 30% altered. Minor Cr-spinel crystals with marginal alteration to oxide.

VESICLES: None.

Miaroles: None.

COLOR: Gray.

STRUCTURE: Widespread veining of multiple generations.

ALTERATION: Secondary plagioclase after plagioclase, actinolite, and chlorite after clinopyroxene.

VEINS/FRACTURES: Many; 0.1–1 mm; Veins are filled with chlorite, green clay, and prehnite. White (zeolite) veins are later than chlorite veins.

UNIT 3: OLIVINE GABBRO

Pieces 18-19

COLOR: Light gray.

LAYERING: None.

DEFORMATION: Widespread veining of multiple generations, with minor cataclastic fabric.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 2 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 30%–50%.

Clinopyroxene - Mode: 45%.

Crystal size: 5 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 50%.

Olivine - Mode: 5%.

Crystal size: 3 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 90%.

Oxides - Mode: 3%.

Crystal size: 3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: ?

SECONDARY MINERALOGY:

Total percent: 50%.

Texture: Chlorite, talc, and Fe-oxide after olivine, secondary plagioclase and clays after plagioclase, actinolite after clinopyroxene.

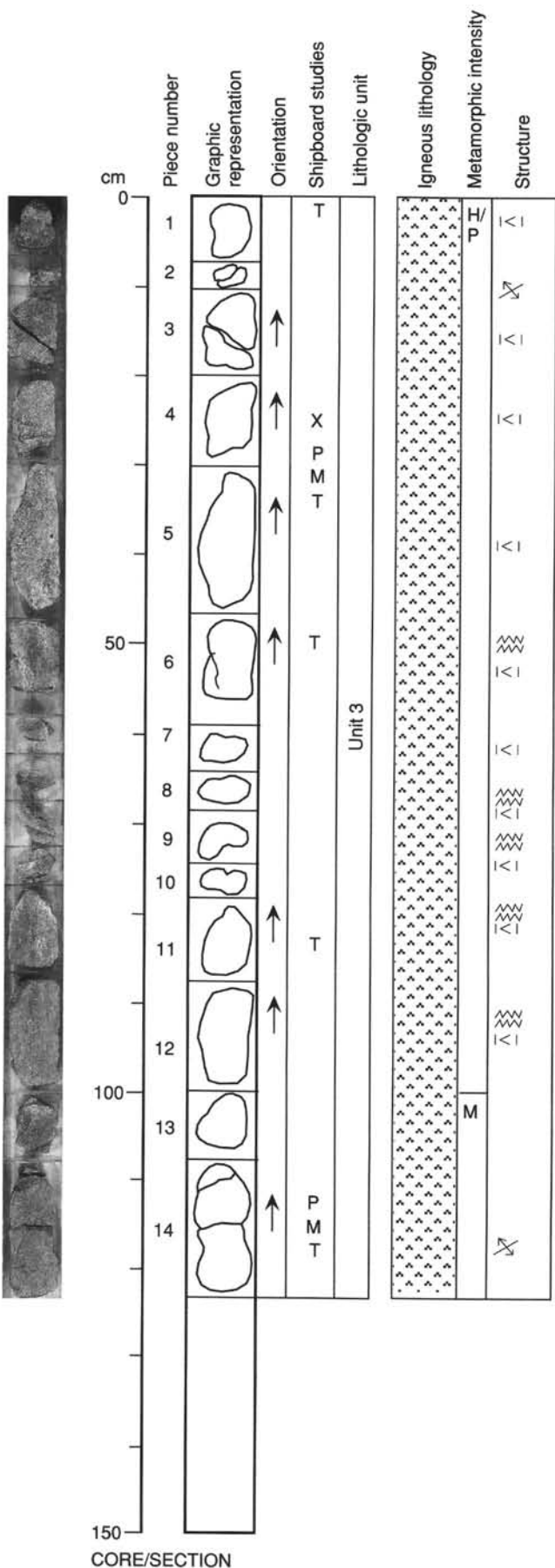
Vein material: 0.01 to 1 mm width veins and veinlets. Piece 18 is cut by a dense network of prehnite veinlets. Piece 19 is cut by subparallel composite veins of chlorite, prehnite, and brown clay with 2–6 mm alteration halos.

ADDITIONAL COMMENTS: This unit is likely the same lithological unit as Unit 1.

147-894G-2R-3

UNIT 3: OLIVINE GABBRO

Pieces 1-14



COLOR: Mottled light gray to gray green.
LAYERING: None.
DEFORMATION: Widespread veining in several generations; vertical cataclastic shear zone from 50-110 cm in Pieces 6-12.

PRIMARY MINERALOGY:
 Plagioclase - Mode: 40%-45%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral.
 Percent replacement: 20%.
 Comments: Replaced by secondary plagioclase.
 Clinopyroxene - Mode: 35%-40%.
 Crystal size: 2-3 mm.
 Crystal shape: Anhedral.
 Percent replacement: 23%.
 Comments: Replaced by green amphibole.
 Olivine - Mode: 2%-10%.
 Crystal size: 0.5-1 mm.
 Crystal shape: Anhedral, rounded.
 Percent replacement: 8%-10%.
 Oxides - Mode: 0.5%-5%.
 Crystal size: 0.6-5 mm.
 Crystal shape: Irregular.

SECONDARY MINERALOGY: There are three alteration intervals. Pieces 1-4: pyrite-sphalerite-chalcocopyrite are associated with composite chlorite-prehnite veins. Pieces 5-12: Dense veins in cataclastic/ultracataclastic shear zone. Veins are mainly prehnite crosscut by vuggy zeolite-clay veinlets. Fewer secondary sulfides. Pieces 13-14: Freshest rocks (<40% altered) with relict olivine.
 Total percent: 55%.
 Texture: Pseudomorphic in matrix with incipient brecciation locally. Highly altered with multiple generations of veins, brittle deformation, and ultracataclastic shear zones. In Pieces 4-12, vein wall rocks mostly altered to albite and amphibole. No sulfides except in Piece 2, 0.2% pyrite, 0.2 mm. Vein material: Veins contain chlorite, prehnite, clay, and zeolite.

ADDITIONAL COMMENTS: Rocks are varietextured, ophitic to subophitic.

147-894G-3R-1

UNIT 3: OLIVINE GABBRO (PIECE 2); PLAGIOCLASE-PHYRIC BASALT (PIECE 1, BREAKOUT)

Pieces 1-2

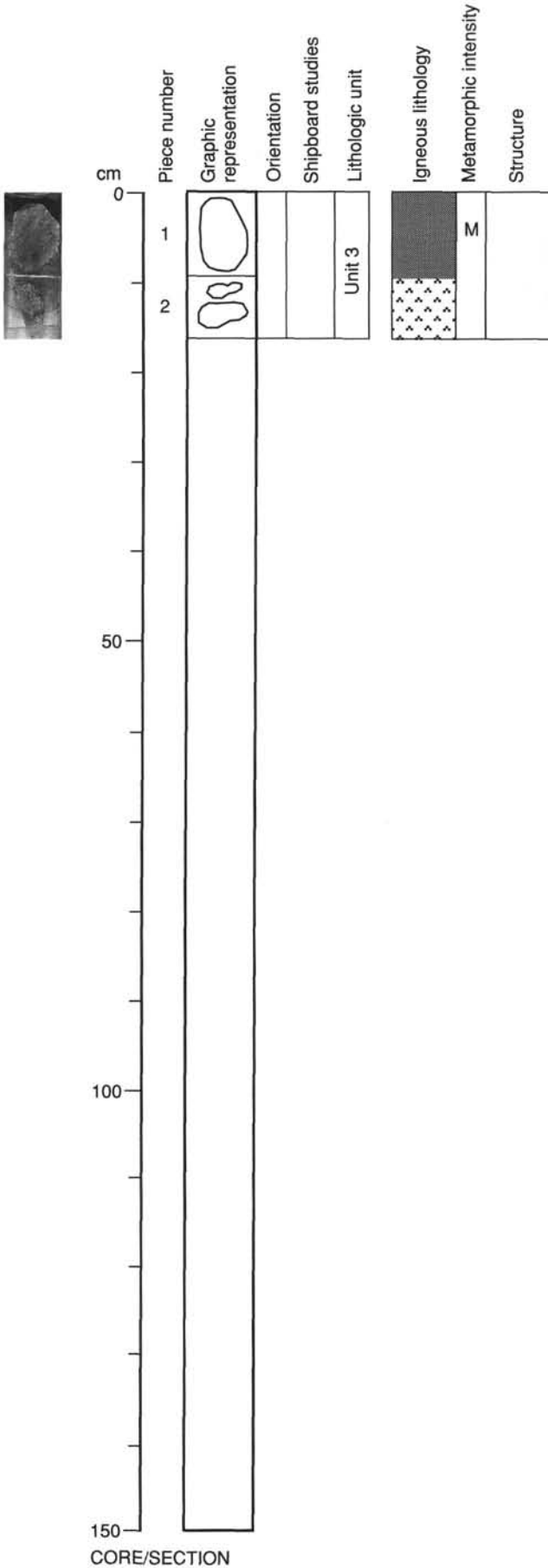
COLOR: Gabbro is gray, basalt is gray-black.

LAYERING: None.

DEFORMATION: None.

PRIMARY MINERALOGY:

ADDITIONAL COMMENTS: Piece 1 is subophitic plagioclase-phyric basalt that broke out from higher in the hole. It is not included in sequencing of lithologic units. The small pebbles making up Piece 2 are olivine gabbro similar to rocks in Core 147-894G-2R. The pieces are coated with drilling slurry and were not split, but divided evenly between archive and working halves.



147-894G-4R-1

DRILLING RUBBLE: OLIVINE GABBRO AND BASALT

Pieces 1-5

COLOR: Gabbro: mottled gray green; basalt: gray.
LAYERING: None.
DEFORMATION: None.
PRIMARY MINERALOGY:
 Plagioclase - Mode: 45%-50%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 10%.
 Comments: Replaced by secondary plagioclase.
 Clinopyroxene - Mode: 35%-40%.
 Crystal size: 3-5 mm.
 Crystal shape: Anhedral.
 Percent replacement: 33%.
 Comments: Replaced by green amphibole.
 Olivine - Mode: 5%-10%.
 Crystal size: 1-2 mm.
 Crystal shape: Anhedral.
 Percent replacement: 90%.
 Oxides - Mode: 0%-1%.
 Crystal size: <1 mm.
 Crystal shape: Irregular.
 Comments: Interstitial.

SECONDARY MINERALOGY: Piece 4 is intensely chloritized and fractured. Olivines are pervasively altered. Piece 3 is intensely altered and looks very weathered, very different from Pieces 1, 2, and 4.
 Total percent: 25%.
 Texture: Pseudomorphic.
 Vein material: Chlorite and clays.

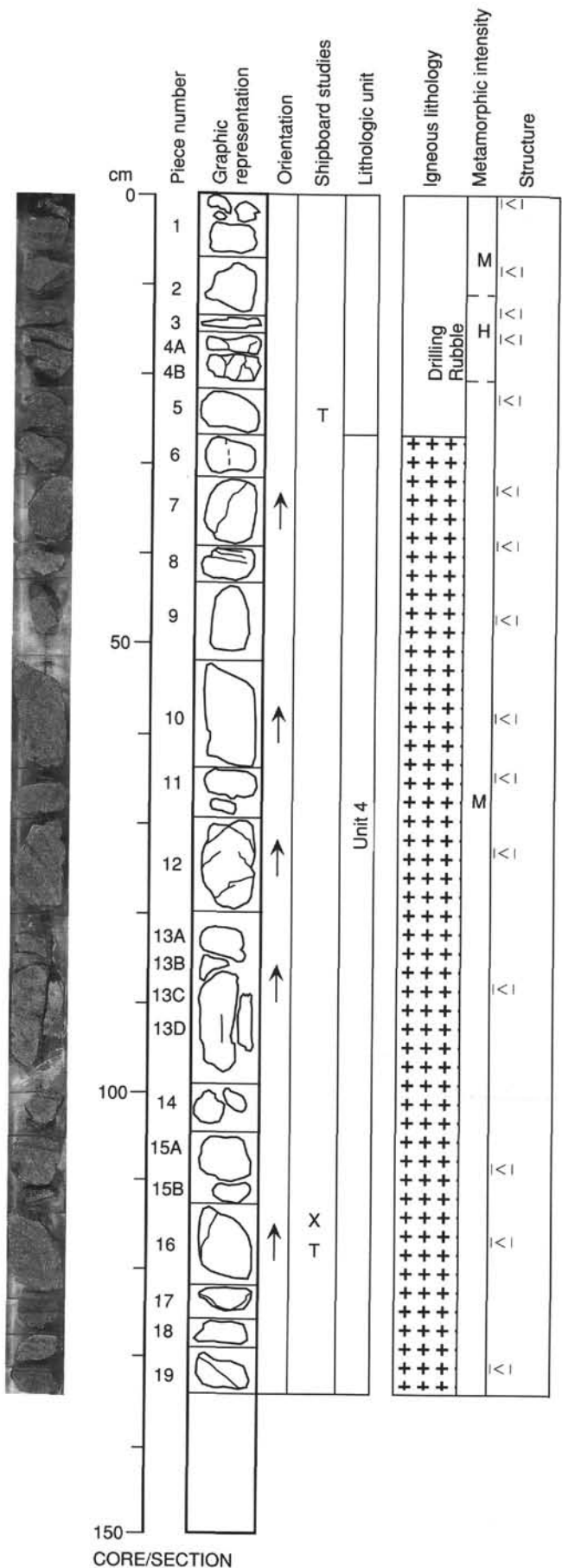
ADDITIONAL COMMENTS: Description and mineralogy apply to gabbro fragments. All five pieces are rocks that fell down the hole and were recovered at the start of coring of this core. Piece 5 is altered olivine basalt with diabasic texture and both plagioclase and altered olivine phenocrysts. Spinel is also present. The rock may have originated at the level of the basalt dike recovered in Core 147-894G-2R.

UNIT 4: GABBRO-NORITE

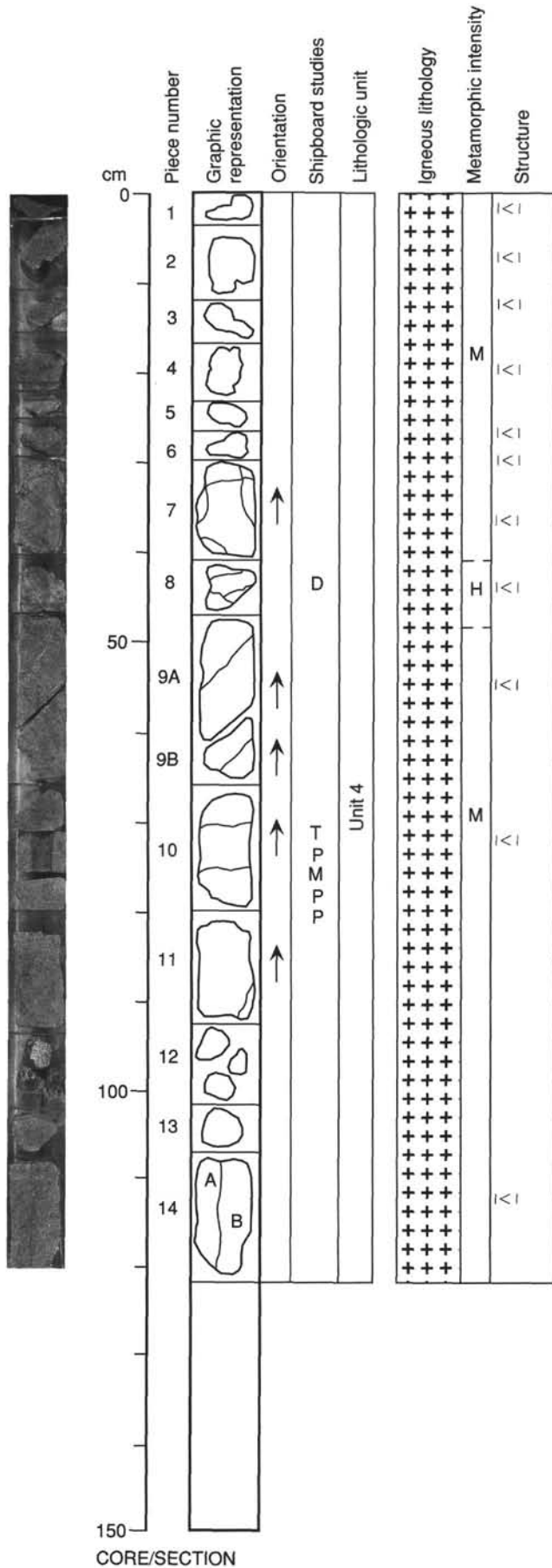
Pieces 6-19

COLOR: Gray, dappled gray, mottled gray, shaded slightly to greenish gray.
LAYERING: None.
DEFORMATION: Widespread veining.
PRIMARY MINERALOGY:
 Plagioclase - Mode: 50%.
 Crystal size: 2-3 mm.
 Crystal shape: Sub-anhedral.
 Percent replacement: 20%.
 Comments: Partly replaced by secondary plagioclase.
 Clinopyroxene - Mode: 30%.
 Crystal size: 3-5 mm.
 Crystal shape: Anhedral.
 Percent replacement: 33%.
 Comments: Replaced by green amphibole.
 Orthopyroxene - Mode: 15%.
 Crystal shape: Anhedral.
 Percent replacement: 30%.
 Olivine - Mode: 0%-5%.
 Crystal shape: Anhedral.
 Percent replacement: 90%.
 Comments: Replaced by clays, secondary oxides.
 Oxides - Mode: 1%-2%.
 Crystal size: 0.5-5 mm.
 Crystal shape: Irregular.

SECONDARY MINERALOGY: Piece 4 is intensely chloritized and fractured. Olivines are pervasively altered. Piece 3 is intensely altered and oxidized.
 Total percent: 33%.
 Texture: Pseudomorphic, pyroxenes replaced by a green amphibole/chlorite. Plagioclases are replaced by secondary plagioclase and epidote only near veins; otherwise unaltered. Vein material: Lined with chlorite and clay, possibly minor actinolite.



CORE/SECTION



UNIT 4: GABBRONORITE

Pieces 1-14

COLOR: Dappled gray, shaded to green.

LAYERING: None.

DEFORMATION: Widespread veining.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 2-10 mm.

Crystal shape: Sub-anhedral.

Percent replacement: 10%-20%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 40%.

Crystal size: 3-25 mm.

Crystal shape: Anhedral.

Percent replacement: 20%-50%.

Comments: Replaced by green amphibole.

Orthopyroxene - Mode: 5%-10%.

Crystal size: 3-25 mm.

Crystal shape: Anhedral.

Percent replacement: 60%-65%.

Comments: Oikocrysts present.

Olivine - Mode: 0%-2%.

Crystal size: 1-2 mm.

Crystal shape: Subhedral, subrounded.

Percent replacement: 75%-100%.

Oxides - Mode: 0.3%-1%.

Crystal size: 0.3-5 mm.

Crystal shape: Irregular.

Comments: Patchy.

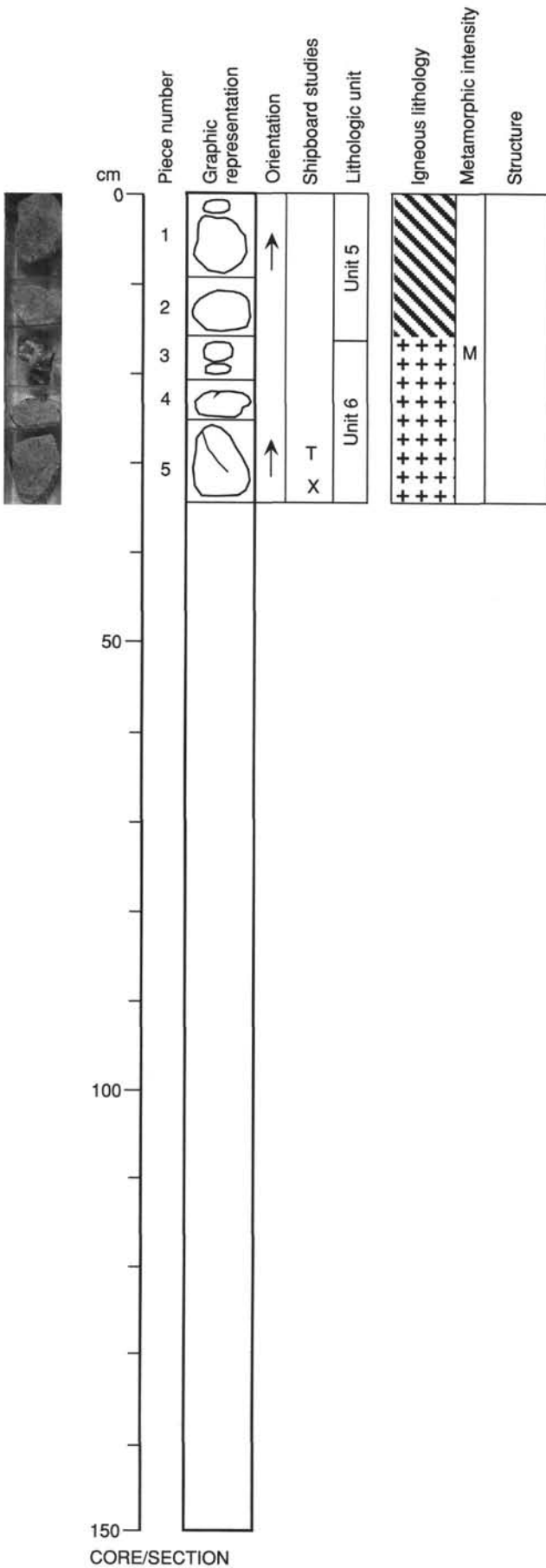
SECONDARY MINERALOGY: Moderate alteration in medium-grained gabbronorite (Pieces 1-7, up to 40%; Pieces 9-14, up to 20%). Plagioclase is less altered than pyroxenes (up to 60%-65% in orthopyroxene). Vein density and alteration are distinctly greater in coarse-grained rocks (Pieces 8 to top of 9, about 70%).

Total percent: 20%-70%.

Texture: Plagioclase replaced by secondary plagioclase, clinopyroxene by green amphibole. Orthopyroxene replaced by cummingtonite(?) and clay. Vein material: Chlorite, green clay, prehnite, zeolite, and minor actinolite.

ADDITIONAL COMMENTS: The core is a continuation from Section 147-894G-4R-1, with orthopyroxene increasing downcore. Piece 8 and the top of Piece 9 are very coarse grained (pegmatitic). Overall, the section is marked by very patchy grain size variation. A lithological contact (Unit 4/Unit 5) occurs below Piece 14 (122 cm).

147-894G-5R-1



UNIT 5: OLIVINE GABBRO-NORITE

Pieces 1 and 2

COLOR: Gray and greenish gray.
LAYERING: None.
DEFORMATION: Somewhat veined.
PRIMARY MINERALOGY:
 Plagioclase - Mode: 50%.
 Crystal size: 2-4 mm.
 Crystal shape: Sub-anhedral.
 Percent replacement: 0%.
 Clinopyroxene - Mode: 30%.
 Crystal size: 3-5 mm.
 Crystal shape: Anhedral.
 Percent replacement: 30%.
 Comments: Replaced by green amphibole.
 Orthopyroxene - Mode: 10%.
 Crystal size: 3-8 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50%.
 Olivine - Mode: 10%.
 Crystal size: 0.5-1 mm.
 Crystal shape: Anhedral, subrounded.
 Percent replacement: 50%.
 Oxides - Mode: <0.5%.
 Crystal size: <0.5 mm.
 Crystal shape: Irregular.

SECONDARY MINERALOGY:
 Total percent: 15%.
 Texture: Pseudomorphous.
 Vein material: Chlorite, clays, actinolite.

ADDITIONAL COMMENTS: A lithologic unit boundary was inserted between this and the previous core because of a major increase in olivine content in this core.

UNIT 6: GABBRO-NORITE

Pieces 3-5

COLOR: Light gray.
LAYERING: None.
DEFORMATION: Minor veining.
PRIMARY MINERALOGY: Minor oxide minerals.
 Pyroxene - Mode: 40%-45%.
 Crystal size: 4-5 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 75%.
 Plagioclase - Mode: 50%.
 Crystal size: 2 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 20%.
 Olivine - Mode: 1%-2%.
 Crystal size: 3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 60%.

SECONDARY MINERALOGY:
 Total percent: 50%.
 Texture: Chlorite, iron oxides, and actinolite after minor amounts of olivine.
 Secondary plagioclase after plagioclase. Actinolite replacing pyroxene.
 Vein material: Rare 1 mm chlorite and actinolite veins.

CORE/SECTION

UNIT 6: GABBRONORITE

Pieces 1-2

COLOR: Light gray.
LAYERING: None.
DEFORMATION: Occasional veining.
PRIMARY MINERALOGY: Less than 1% interstitial oxide much of which is likely primary.
 Pyroxene - Mode: 45%.
 Crystal size: 4 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 70%.
 Comments: Occurs as both orthopyroxene, mainly oikocrysts visible, and clinopyroxene as intergranular crystals.
 Plagioclase - Mode: 50%.
 Crystal size: 2 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 20%.
 Olivine - Mode: 2%-5%.
 Crystal size: 3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 50%.

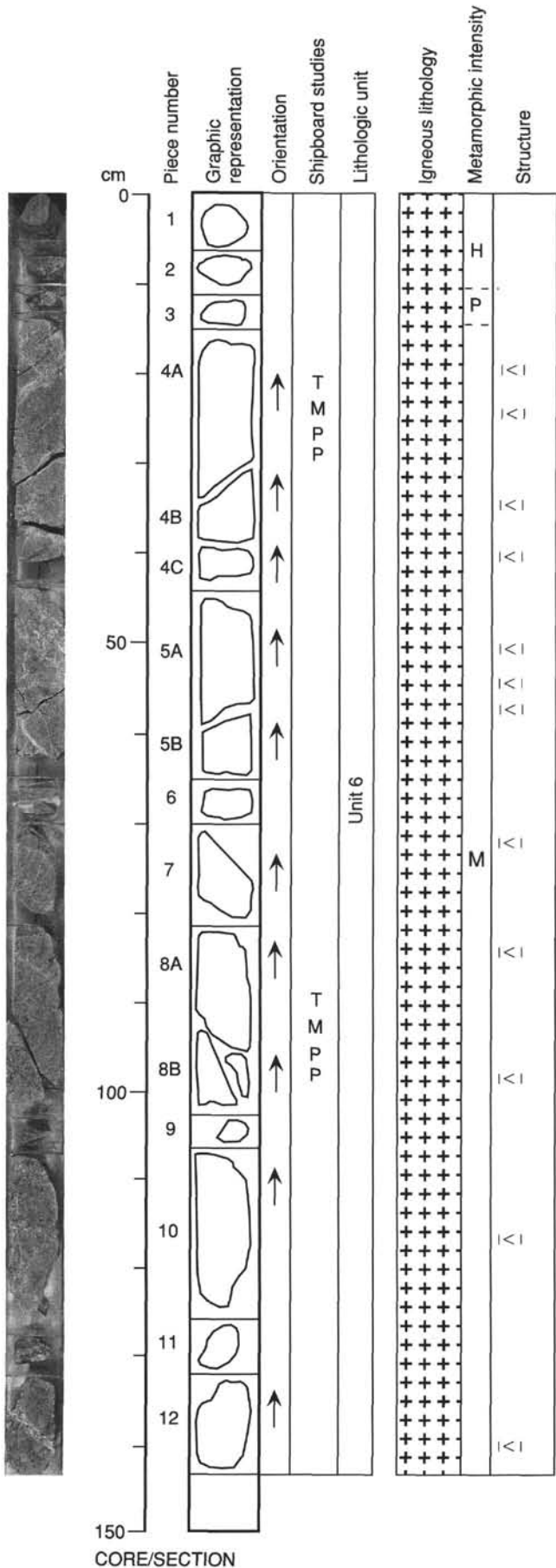
SECONDARY MINERALOGY:
 Total percent: 50%.
 Texture: Chlorite, iron oxides, and actinolite after olivine. Secondary plagioclase after plagioclase. Actinolite replacing pyroxene. 3 minor (0.3%) sulfide in chlorite-rich alteration patches.
 Vein material: 1 mm chlorite and actinolite veins and 0.1 mm clay-filled veins occur sparsely throughout unit.

UNIT 6: GABBRONORITE

Pieces 3-12

COLOR: Gray with dark gray patches.
LAYERING: None.
DEFORMATION: Dense, regular parallel veining in most pieces.
PRIMARY MINERALOGY:
 Pyroxenes - Mode: 50%.
 Crystal size: 3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 50%.
 Plagioclase - Mode: 50%.
 Crystal size: 3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 20%.
 Oxides - Mode: 1%.
 Crystal size: <2 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: Not visible.

SECONDARY MINERALOGY:
 Total percent: 30%.
 Texture: Secondary plagioclase replaces plagioclase. Actinolite replaces clinopyroxene. 0.3% secondary sulfides. Piece 4 has 5% of patches (0.5 mm) actinolite. Piece 3 has 2 cm patch of actinolite, chlorite, and clays.
 Vein material: Piece 12 has 2 mm wide vein of epidote, prehnite, sphalerite, and chlorite (rim). Other pieces have numerous mm-wide composite veins of chlorite, clays, prehnite, and sometimes actinolite, with distinct alteration halos. Very rare secondary plagioclase occurs in veins and minor calcite in veinlets.

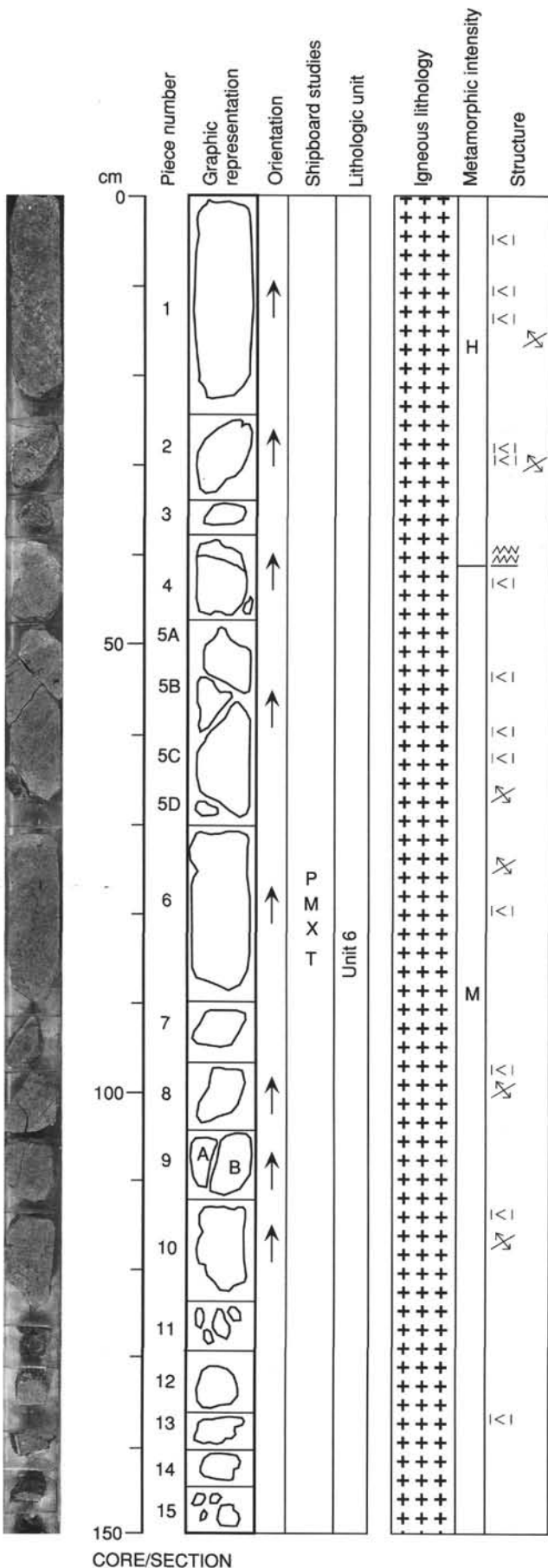


CORE/SECTION

147-894G-6R-2

UNIT 6: GABBRONORITE

Pieces 1-4



CORE/SECTION

COLOR: Gray.

LAYERING: None.

DEFORMATION: Veining, fracturing but no fragment displacement. Sheared contact at base of unit in Piece 4.

PRIMARY MINERALOGY: Primary mineral texture is generally medium grained but patches of coarse-grained material are evident. 3% oxide in the bottom third of this unit is interstitial.

Pyroxenes - Mode: 47%.

Crystal size: 6 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 60%.

Comments: Approximately 10% of the rock is likely orthopyroxene.

Plagioclase - Mode: 50%.

Crystal size: 4 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 50%.

Oxides - Mode: 2%.

Crystal size: <3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: None visible.

Olivine - Mode: 1%.

Crystal size: 1-2 mm.

Crystal shape: Euhedral.

Crystal orientation: None.

Percent replacement: 70%.

SECONDARY MINERALOGY: Locally up to 1% disseminated sulfide.

Total percent: 50%.

Texture: Chlorite and clays replace olivine. Secondary plagioclase after plagioclase. Actinolite after clinopyroxene and green amphibole after orthopyroxene. 1% sulfide disseminated.

Vein material: Chlorite, actinolite, pyrite, clays, and prehnite in 0.1 mm to 2 mm wide veins. Possible sphalerite in chlorite, prehnite vein.

147-894G-6R-2

UNIT 6: GABBRONORITE**Pieces 4–15****COLOR:** Light green gray.**LAYERING:** None.**DEFORMATION:** Veining and minor fracturing. Rock tends to break along medium to high angle late fractures.**PRIMARY MINERALOGY:** Olivine is very rare, and where present appears to be associated with orthopyroxene. However, it forms less than 1 modal percent. No olivine observed in Piece 6 in thin section.

Clinopyroxene - Mode: 30%.

Crystal size: 3 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 50%.

Orthopyroxene - Mode: 15%.

Crystal size: 3–10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 50%–75%.

Comments: Some as oikocrysts up to 1 cm diameter.

Plagioclase - Mode: 49%.

Crystal size: 3 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 10%.

Oxides - Mode: 1%.

Crystal size: 1 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: None visible.

SECONDARY MINERALOGY:

Total percent: 20%.

Texture: Chlorite and iddingsite after olivine. Secondary plagioclase after plagioclase. Actinolite after clinopyroxene and green amphibole after orthopyroxene. 0.3% secondary sulfides.

Vein material: Abundant chlorite veins. Clay filled veins less than 0.1 mm. Up to 3 mm composite veins of prehnite, locally epidote, rimmed by chlorite with 1.5 mm alteration haloes.

ADDITIONAL COMMENTS: Rock shows poikilitic texture with both plagioclase and minor olivine as chadacrysts in orthopyroxene oikocrysts.

147-894G-6R-3

UNIT 6: GABBRONORITE

Pieces 1-4

COLOR: Light gray.

LAYERING: None.

DEFORMATION: Generally structureless. Single minor vein in Piece 1.

PRIMARY MINERALOGY:

Clinopyroxene - Mode: 30%-35%.

Crystal size: 3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 60%.

Orthopyroxene - Mode: 15%.

Crystal size: <1 cm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 15%.

Comments: Occurs in large part as oikocrysts.

Plagioclase - Mode: 50%.

Crystal size: 3 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 20%.

Olivine - Mode: 2%.

Crystal size: 1 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 75%.

Oxides - Mode: 1%.

Crystal size: <1 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

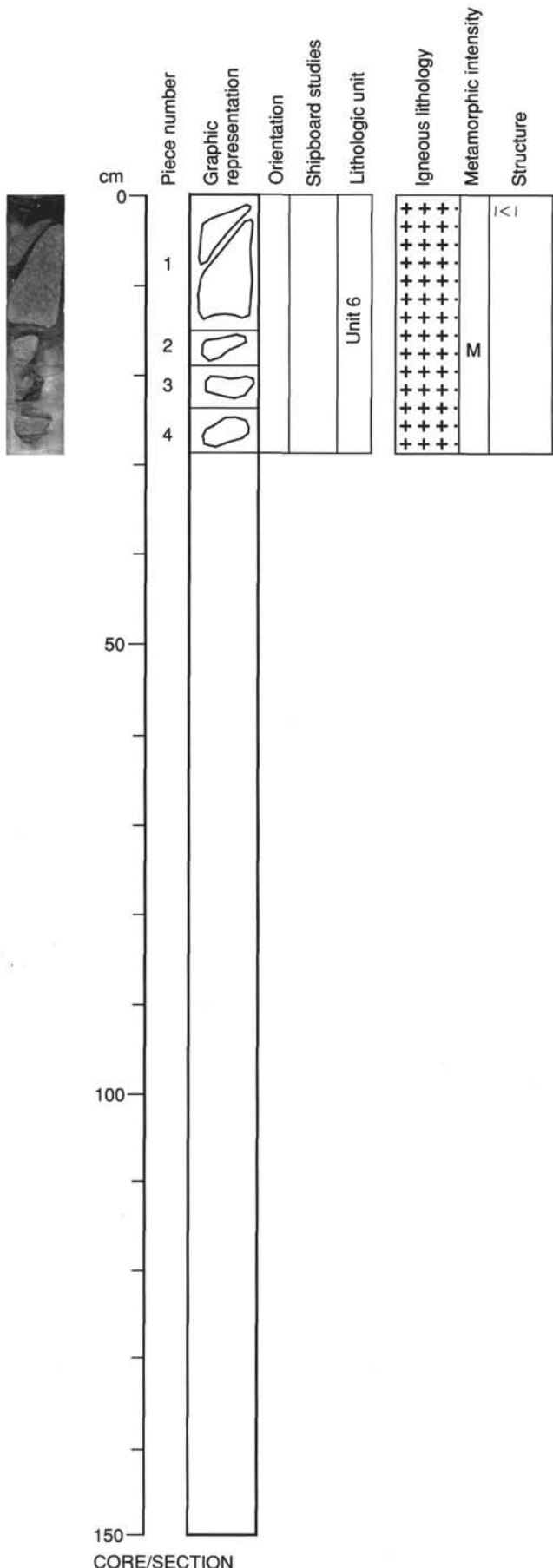
Percent replacement: None visible.

SECONDARY MINERALOGY:

Total percent: 40%.

Texture: Approximately 15% of orthopyroxene is replaced by amphibole. Clinopyroxene is replaced by actinolite and secondary plagioclase replaces plagioclase.

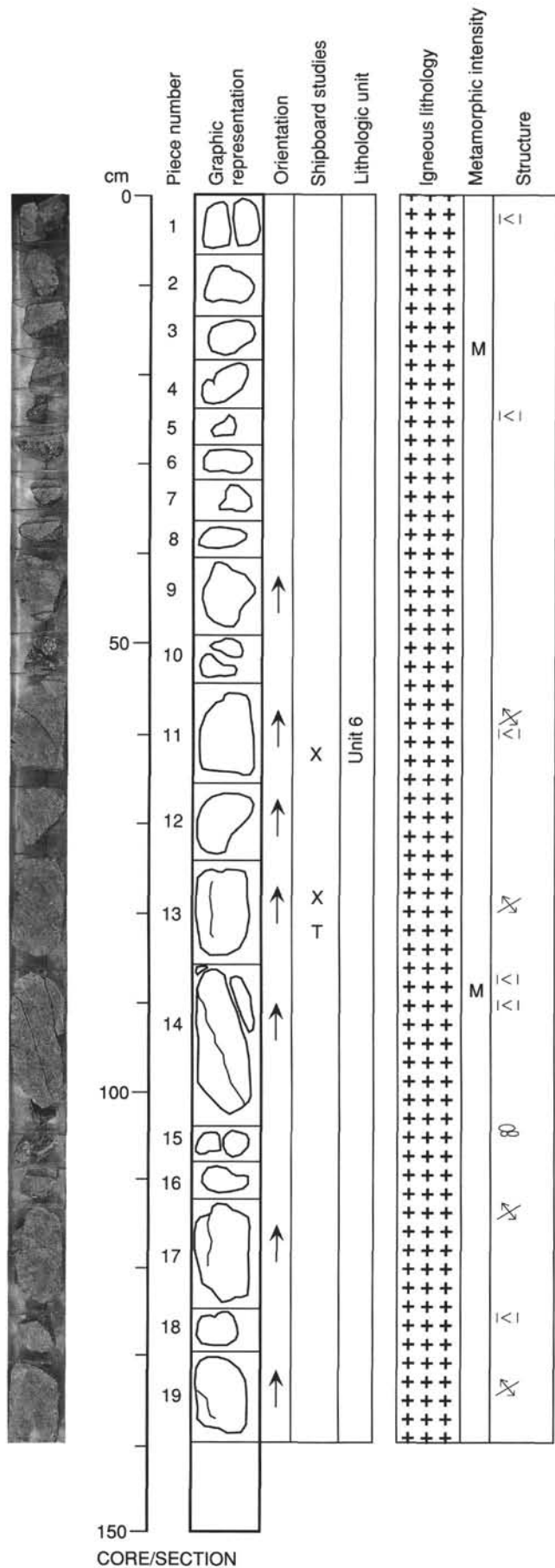
Vein material: Piece 1 has minor chlorite vein.



UNIT 6: GABBRONORITE

Pieces 1-19

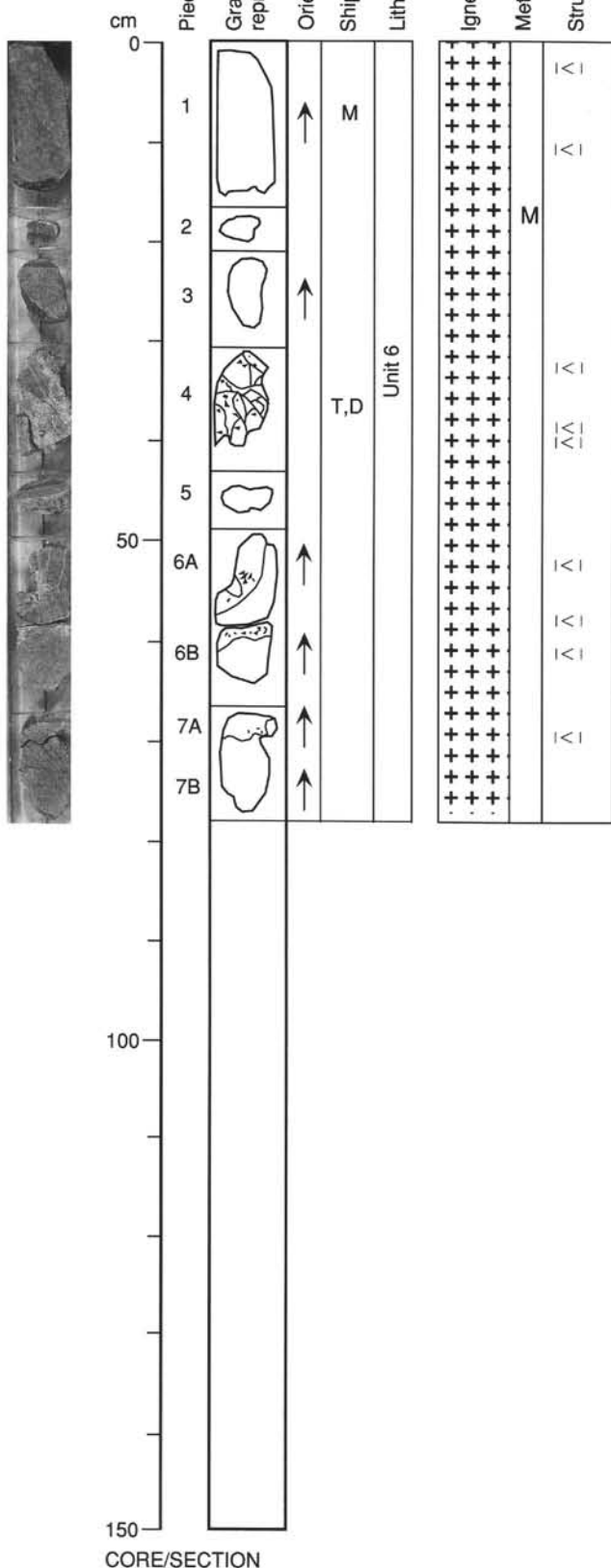
COLOR: Light gray.
LAYERING: None.
DEFORMATION: Very little. Minor veining and fracturing. Piece 15 is brecciated.
PRIMARY MINERALOGY: Grain sizes are quite variable in this part of Unit 7. Orthopyroxenes form clearly identifiable oikocrysts in the otherwise fine medium-grained gabbronorite. Elsewhere the gabbronorite becomes somewhat coarser grained. Olivine is rare to absent in many pieces.
 Clinopyroxene - Mode: 30%.
 Crystal size: 4 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 35%.
 Orthopyroxene - Mode: 15%.
 Crystal size: <15 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
 Comments: Often appear as oikocrysts of more than 1 cm diameter.
 Plagioclase - Mode: 49%.
 Crystal size: 3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
 Olivine - Mode: <1%.
 Crystal size: 1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 90%.
 Comments: Some crystals are euhedral and occur close to orthopyroxene.
 Oxides - Mode: 1%.
 Crystal size: <1 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: None visible.
SECONDARY MINERALOGY: Clinopyroxene is 10% to pervasively altered with actinolite, fine-grained oxides. Amphibole forms fine-grained intergrowths after clinopyroxene.
 Total percent: 20%.
 Texture: Olivine is replaced by iron oxides and chlorite. Plagioclase is generally fresh with minor alteration to secondary plagioclase and cut by anastomosing microveinlets of actinolite and rare chlorite. Orthopyroxene is rimmed by fibrous and bladed green amphiboles with relict cores.
 Vein material: Rare clay and chlorite + actinolite veins from 0.1 to 1 mm in width.



147-894G-7R-2

UNIT 6: GABBRONORITE

Pieces 1-7B

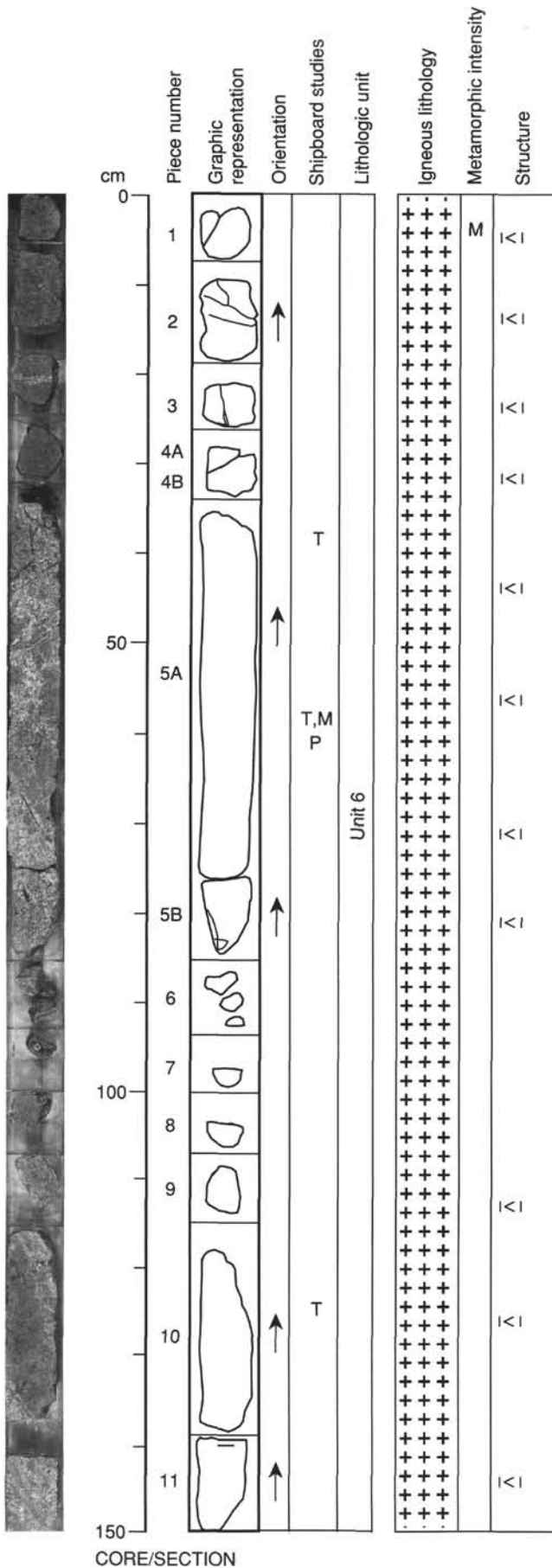


COLOR: Light gray.
LAYERING: None.
DEFORMATION: Intense veining in most pieces, especially Piece 4.
PRIMARY MINERALOGY: Rock is clearly poikilitic but texture somewhat variable with some coarser, less poikilitic patches. Olivine is rare and may be absent in some pieces.
 Clinopyroxene - Mode: 30%-35%.
 Crystal size: 4 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 40%.
 Orthopyroxene - Mode: 15%.
 Crystal size: <17 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 30%.
 Comments: Occurs as oikocrysts.
 Plagioclase - Mode: 50%-55%.
 Crystal size: 4 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
 Olivine - Mode: 0%-2%.
 Crystal size: 1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: <100%.
 Comments: Shows variable degrees of replacement.
SECONDARY MINERALOGY: Piece 4 is pervasively altered. Clinopyroxenes are replaced by secondary clinopyroxene, fine-grained oxides and amphibole. Secondary magnetite is common. Orthopyroxene forms coarse-grained laths pseudomorphed by mats of pale green cummingtonite(?). Plagioclase is pervasively altered and turbid due to clots of clays. Zeolites and albite present. Some microveinlets of actinolite and secondary plagioclase cut some grains. Total percent: 25%.
 Texture: Possible iddingsite after orthopyroxene. Secondary plagioclase replaces plagioclase. Actinolite replaces clinopyroxene.
 Vein material: Numerous veins ranging from 0.1 to 1 mm width. Most show no preferred orientation but anastomose, especially in Piece 4. Veins are filled with chlorite, green clay, pale brown zeolite, and minor actinolite.

UNIT 6: GABBRONORITE

Pieces 1-11

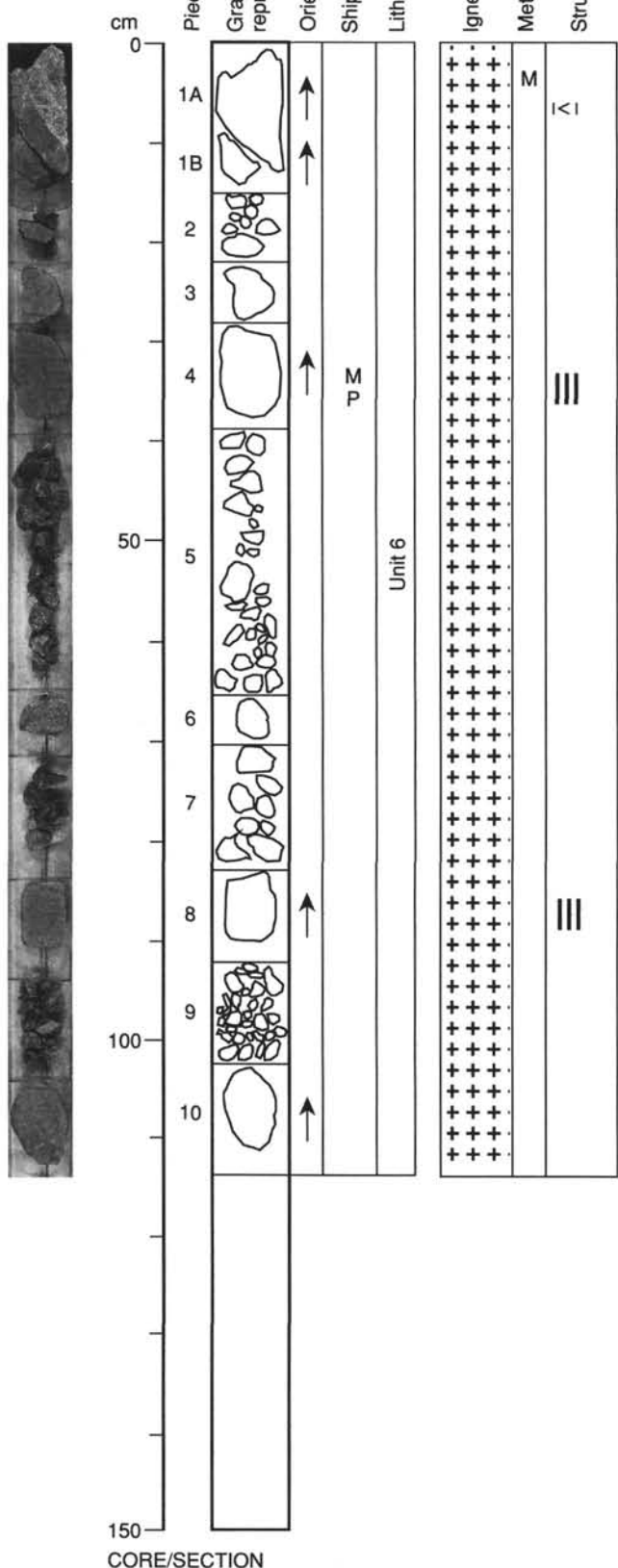
COLOR: Gray.
LAYERING: None.
DEFORMATION: Variably veined and fractured; no displacements.
PRIMARY MINERALOGY:
 Plagioclase - Mode: 45%.
 Crystal size: 1-5 mm.
 Crystal shape: Subhedral.
 Percent replacement: 2%.
 Clinopyroxene - Mode: 40%.
 Crystal size: 1-5 mm.
 Crystal shape: Anhedral-subhedral.
 Percent replacement: 50%.
 Comments: By amphibole/chlorite.
 Orthopyroxene - Mode: 15%.
 Crystal size: 1-7 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50%.
 Comments: by amphibole/chlorite.
 Oxides - Mode: 0.5%-1%.
 Crystal size: 0.03-1.5 mm.
 Crystal shape: Irregular.
 Comments: Mainly interstitial.
SECONDARY MINERALOGY: Background alteration to amphibole and chlorite pervasive; areas near veins are more altered. Plagioclase is fresh except near veins where alteration to secondary plagioclase (white) and epidote occurs. Pyroxenes are pervasively altered.
 Total percent: 30%.
 Texture: Pseudomorphous.
 Vein material: Chlorite, epidote, prehnite, clays, and actinolite.
ADDITIONAL COMMENTS: The rocks are varitextured, with no apparent or relict olivine.



147-894G-8R-2

UNIT 6: GABBRONORITE

Pieces 1A-10



COLOR: Mottled hues of gray, variegated to green and white.

LAYERING: None.

DEFORMATION: None.

PRIMARY MINERALOGY: Primary silicate mineralogy is based on the freshest piece (Piece 4). Orthopyroxene forms large (up to 7 mm) oikocrysts enclosing subhedral plagioclase and clinopyroxene laths. No apparent olivine (fresh or altered).

Plagioclase - Mode: 45%.

Crystal size: 1-5 mm.

Crystal shape: Subhedral.

Percent replacement: 20%.

Clinopyroxene - Mode: 40%.

Crystal size: 1-5 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 20%.

Comments: By amphibole/chlorite.

Orthopyroxene - Mode: 15%.

Crystal size: 1-7 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: By amphibole/chlorite.

Oxides - Mode: 0.1%-1%.

Crystal size: 0.2-1.5 mm.

Crystal shape: Irregular.

Comments: Interstitial.

SECONDARY MINERALOGY: Plagioclase is fresh except near veins where it is altered to white secondary plagioclase plus epidote. Pyroxenes are pervasively altered.

Total percent: 30%.

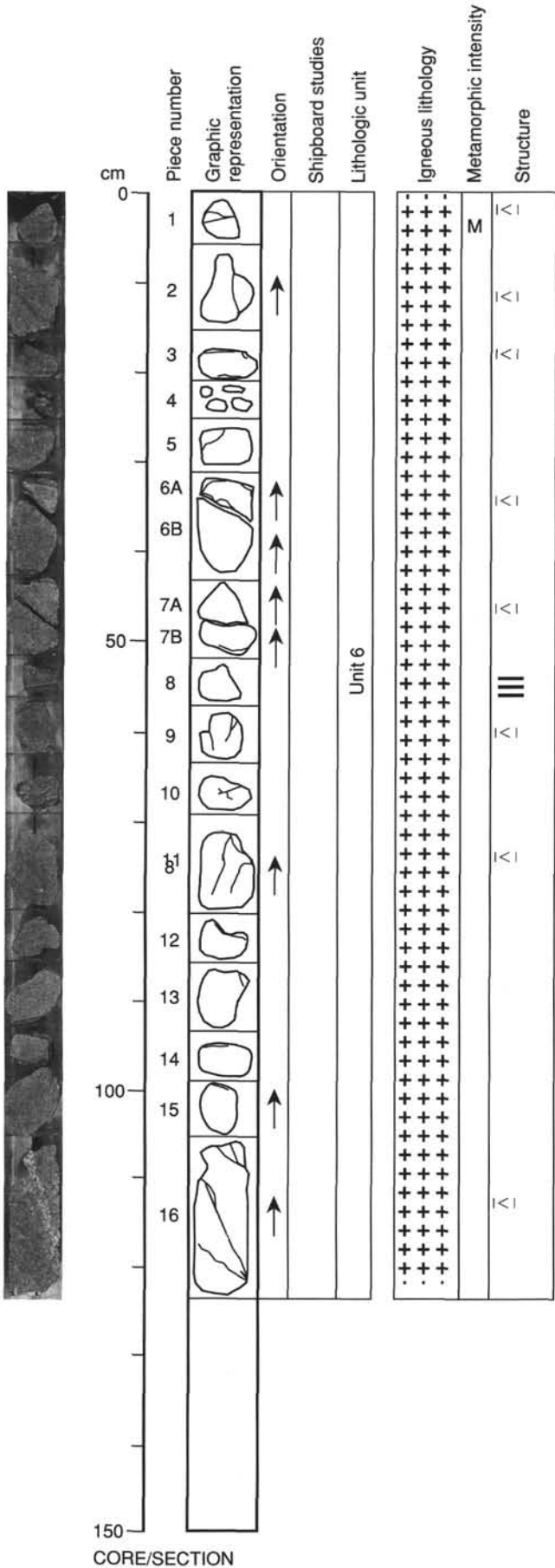
Texture: Pseudomorphous, amphibole/chlorite replacing pyroxenes.

Vein material: Actinolite, chlorite, epidote, and prehnite are vein minerals.

Composite prehnite/chlorite veins and alteration haloes are abundant in Pieces 5 and 10.

UNIT 6: GABBRONORITE

Pieces 1–16



COLOR: Variations on the themes of gray and grayish green.

LAYERING: None.

DEFORMATION: Fractures and veins, no displacement along them.

PRIMARY MINERALOGY: Olivine may be more persistent than is apparent. Only altered bits are clearly recognizable. Grain size is variable on a 10-cm scale, from medium coarse (4–6 mm) to medium (2–3 mm). Piece 4 is coarser yet. Piece 5 changes from coarse to medium coarse and back to coarse. Piece 10 is coarse. Piece 16 is medium coarse.

Plagioclase - Mode: 45%.

Crystal size: 2–5 mm.

Crystal shape: Subhedral.

Percent replacement: 5%.

Clinopyroxene - Mode: 30%–35%.

Crystal size: 2–6 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: By amphibole/chlorite.

Orthopyroxene - Mode: 20%–25%.

Crystal size: 2–40 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: By amphibole/chlorite.

Oxides - Mode: 0%–3%.

Crystal size: 2–3 mm.

Crystal shape: Irregular.

Comments: Interstitial.

Olivine - Mode: 0%–3%.

Crystal size: 2–3 mm.

Crystal shape: Euhedral-subhedral.

Percent replacement: 50%–100%.

SECONDARY MINERALOGY: Plagioclase alteration occurs near veins. Alteration is to albite and epidote. Pyroxenes are altered to green amphibole. Total percent: 30%.

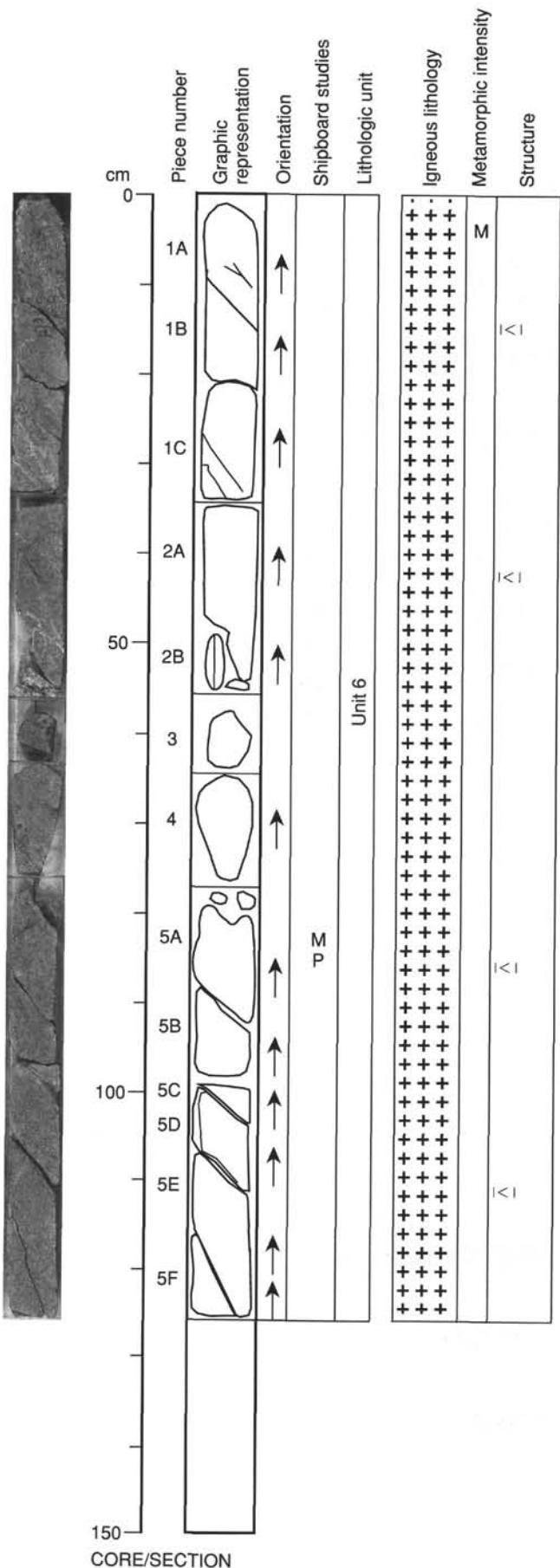
Texture: Pseudomorphic after pyroxenes. Secondary pyrite 0.1%–1.0% up to 1 mm.

Vein material: Chlorite, prehnite, actinolite.

147-894G-9R-2

UNIT 6: GABBRONORITE

Pieces 1A-5F



COLOR: Green gray with patches of white.

LAYERING: None.

DEFORMATION: The interval has a well-developed set of inclined fractures with no displacement along them.

PRIMARY MINERALOGY: Olivine abundance is variable. Where altered, it is clearly visible. Grain size is variable on a 10-cm scale, from medium coarse (4-6 mm) to medium (2-3 mm). Piece 1 varies from medium to coarse and back to medium. Pieces 2 and 3 are medium. Pieces 4 and 5 are equigranular and medium coarse.

Plagioclase - Mode: 45%.

Crystal size: 2-5 mm.

Crystal shape: Subhedral.

Percent replacement: 5%.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 2-6 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: Replaced by amphibole/chlorite.

Orthopyroxene - Mode: 20%-25%.

Crystal size: 2-40 mm.

Crystal shape: Anhedral.

Percent replacement: 40%-50%.

Comments: Replaced by amphibole/chlorite. Some large oikocrysts.

Olivine - Mode: 2%-3%.

Crystal size: 2-3 mm.

Crystal shape: Subhedral.

Percent replacement: 80%-100%.

Oxides - Mode: 0.2%-0.5%.

Crystal size: 0.5-30 mm.

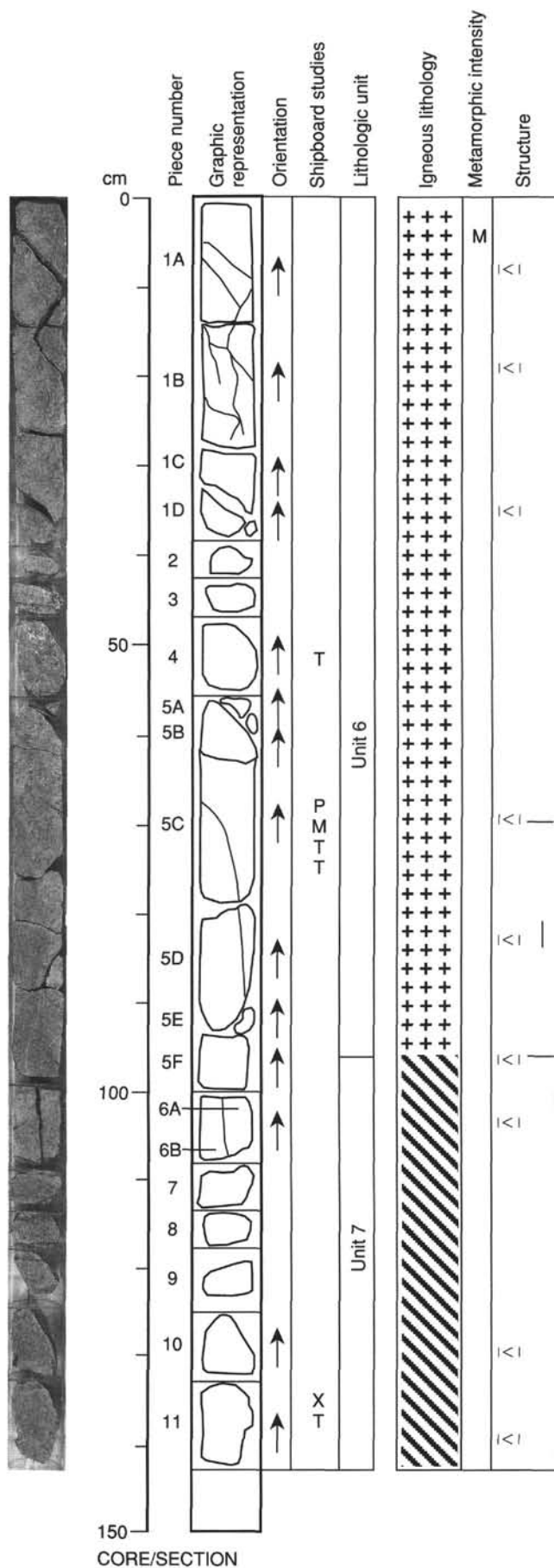
Crystal shape: Irregular, patchy.

SECONDARY MINERALOGY: Secondary plagioclase (white) occurs near veins, with epidote.

Total percent: 30%.

Texture: Pseudomorphic, amphibole, and chlorite are background secondary replacements of pyroxenes. Pyrite is also secondary, 0.1%-1.0%. up to 1 mm.

Vein material: Veins are chlorite-epidote with some actinolite.



UNIT 6: GABBRONORITE

Pieces 1A-5F

COLOR: Subtly varying shades of gray, dark gray, and greenish gray where altered.

LAYERING: None.

DEFORMATION: Moderate to high veining.

PRIMARY MINERALOGY: Olivine percentage is variable. It is easier to recognize where replaced by secondary minerals.

Plagioclase - Mode: 45%.
 Crystal size: 2-5 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 3%.

Clinopyroxene - Mode: 30%-35%.
 Crystal size: 2-6 mm.
 Crystal shape: Anhedral
 Percent replacement: 50%.
 Comments: Replaced by amphibole

Orthopyroxene - Mode: 20%-25%.
 Crystal size: 2-5 mm.
 Crystal shape: Anhedral
 Percent replacement: 50%.
 Comments: Replaced by amphibole.

Olivine - Mode: 0%-3%.
 Crystal size: 2-3 mm.
 Percent replacement: 50%.

Oxides - Mode: 0.2%-1%.
 Crystal size: 0.5-6 mm.
 Crystal shape: Irregular, patchy.

SECONDARY MINERALOGY: Background alteration is green amphibole replacing pyroxenes.

Total percent: 30%.
 Texture: Pseudomorphic, green amphibole after pyroxenes. Sulfides (pyrite) = 0.1%-1%, 0.2-0.5 mm.

Vein material: Veins made of chlorite, prehnite, clays, and actinolite. Plagioclase alteration occurs near veins; alteration is to albite and epidote.

ADDITIONAL COMMENTS: Grain size is variable on a 10-cm scale, from medium coarse (4-6 cm) to medium (2-3 cm). Piece 1 is medium grained, Piece 4 is coarse grained, Piece 5 is coarse-medium-coarse grained.

UNIT 7: OLIVINE GABBRONORITE

Pieces 5F-11

COLOR: Dull gray-green.

LAYERING: None.

DEFORMATION: Little veining.

PRIMARY MINERALOGY: Olivine seen as black pseudomorphed outlines with iron oxide staining in places, especially where the rock is generally altered.

Plagioclase - Mode: 45%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 5%.

Clinopyroxene - Mode: 35%.
 Crystal size: 2-3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 50%.

Orthopyroxene - Mode: 10%-15%.
 Crystal size: 2-3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 50%.

Olivine - Mode: 5%-10%.
 Crystal size: 2 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 75%-100%.

Oxides - Mode: 0.5%.
 Crystal size: 1 mm.
 Crystal shape: Irregular.

SECONDARY MINERALOGY:

Total percent: 35%.
 Texture: Pseudomorphic with amphibole after pyroxenes and secondary plagioclase after plagioclase to minor extent.

Vein material: Filled with chlorite, clay minerals, and actinolite. Some prehnite-chlorite composite veins with narrow halos.

147-894G-9R-4

UNIT 7: OLIVINE GABBRO-NORITE

Pieces 1-12

COLOR: Gray, shaded variably to dusky green.

LAYERING: None.

DEFORMATION: Homogeneous rock, little veined. There is some magmatic foliation (plagioclase -olivine) in Pieces 6 and 11.

PRIMARY MINERALOGY: Olivine is more easily recognized where altered.

Plagioclase - Mode: 45%.

Crystal size: 2-3 mm.

Crystal shape: Subhedral.

Percent replacement: 3%.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 2-3 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: Replaced by amphibole.

Orthopyroxene - Mode: 20%.

Crystal size: 2-3 mm.

Crystal shape: Anhedral.

Percent replacement: 50%.

Comments: Replaced by amphibole.

Olivine - Mode: 5%-10%.

Crystal size: 2-3 mm.

Crystal shape: Subhedral.

Percent replacement: 75%-100%.

Oxides - Mode: 0.5%.

Crystal size: 0.1-1 mm.

Crystal shape: Irregular.

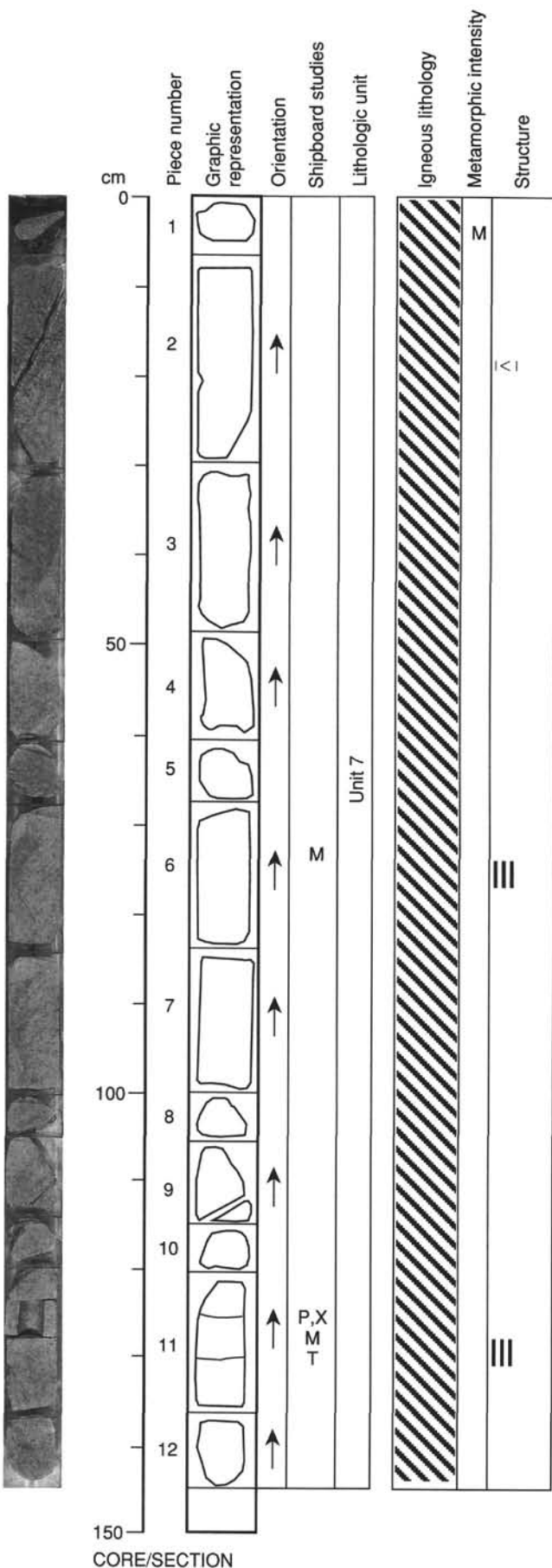
SECONDARY MINERALOGY: Plagioclase is replaced by secondary plagioclase (white) near veins.

Total percent: 30%.

Texture: Pseudomorphic, with green amphibole after pyroxenes. Sulfides <<1%.

Vein material: Veins are filled with chlorite, green clay, and actinolite. Narrow haloes 1-5 mm wide are associated with composite prehnite-chlorite veins.

ADDITIONAL COMMENTS: Most of the rock is equigranular and reasonably homogeneous in grain size. It is moderately altered, with only minor veins and zones of alteration. There is an olivine-rich horizon with up to 10% olivine, highlighted by alteration, from 15-23 cm in Piece 2.

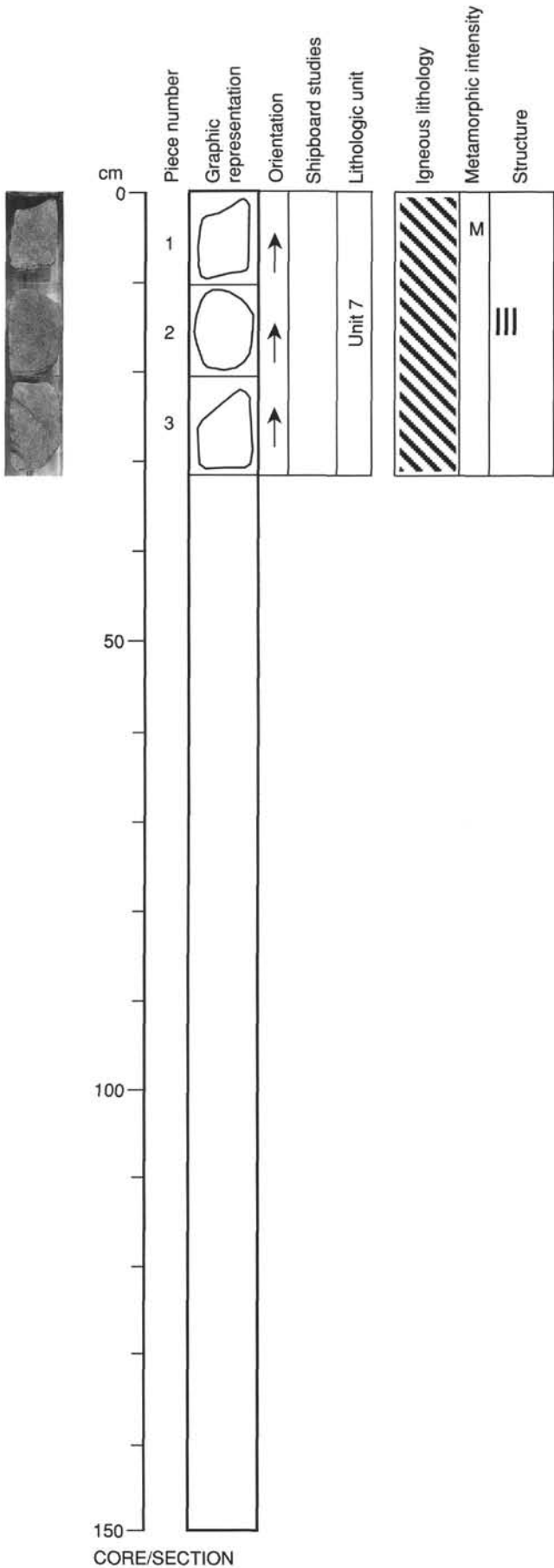


CORE/SECTION

147-894G-9R-5

UNIT 7: OLIVINE GABBRO-NORITE

Pieces 1-3

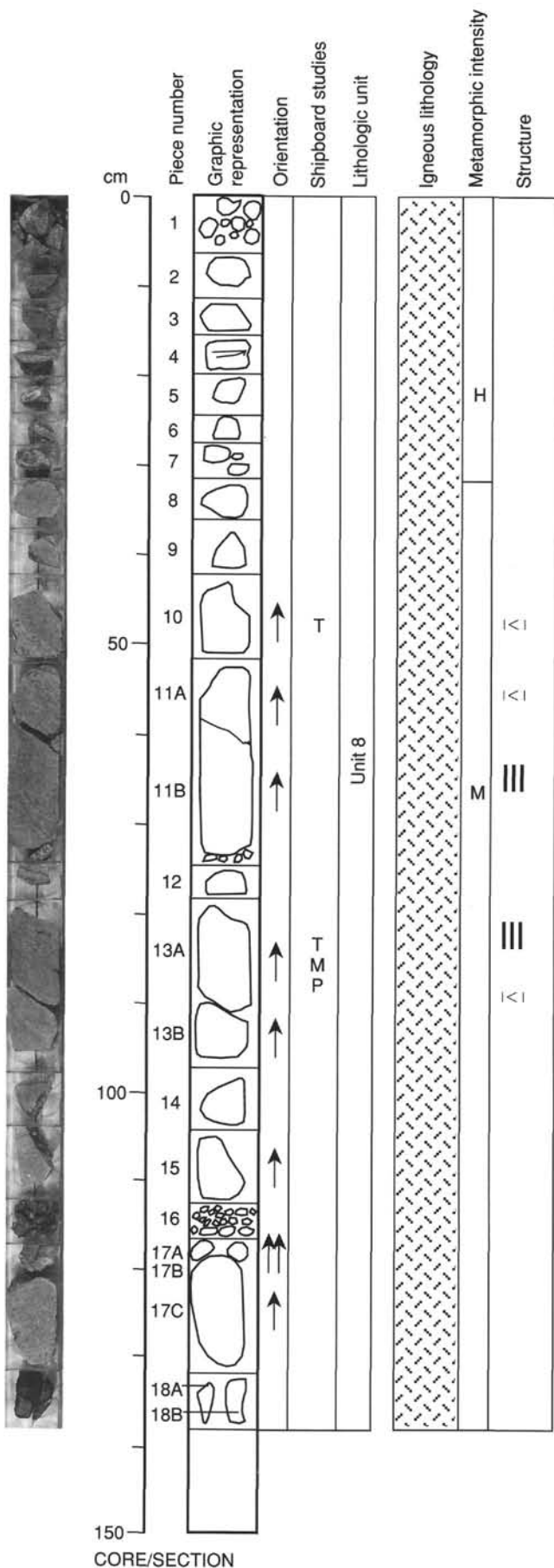


COLOR: Gray.
LAYERING: None.
DEFORMATION: No veining. Distinctive magmatic foliation, defined by plagioclase, steeply dipping, in Piece 2.
PRIMARY MINERALOGY:
 Plagioclase - Mode: 45%.
 Crystal size: 2-5 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 3%.
 Clinopyroxene - Mode: 30%-35%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 50%.
 Comments: Replaced by amphibole.
 Orthopyroxene - Mode: 15%-20%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 40%-50%.
 Comments: Replaced by amphibole.
 Olivine - Mode: 5%-10%.
 Crystal size: 2-3 mm.
 Crystal shape: Subhedral.
 Percent replacement: 50%-100%.
 Oxides - Mode: 0.3%.
 Crystal size: 1 mm.
 Crystal shape: Irregular.
SECONDARY MINERALOGY: Minor secondary plagioclase near veins.
 Total percent: 30%.
 Texture: Pseudomorphous, amphibole after pyroxenes. Sulfides (pyrite) 0.1%, to 0.1 mm.
 Vein material: Veins minor, filled with chlorite, actinolite, prehnite, and clays.
ADDITIONAL COMMENTS: Rocks are medium grained and equigranular.

147-894G-10R-1

UNIT 8: GABBRO

Pieces 1-18B



COLOR: Mottled green gray/light brown.

LAYERING: None.

DEFORMATION: Moderate veining; magmatic foliation in Pieces 11-13.

PRIMARY MINERALOGY: Olivine content is variable, as much as 10%.

Plagioclase - Mode: 55%.

Crystal size: 2-4 mm.

Crystal shape: Subhedral.

Percent replacement: 20%-40%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 40%.

Crystal size: 2-6 mm.

Crystal shape: Anhedral.

Percent replacement: 60%.

Comments: Replaced by green amphibole.

Orthopyroxene - Mode: <5%.

Crystal size: 2-6 mm.

Crystal shape: Anhedral.

Percent replacement: 50%-90%.

Comments: Replaced by amphibole and clay.

Olivine - Mode: <5%.

Crystal size: 1-2 mm.

Percent replacement: 90%-100%.

Comments: Replaced by mixed-layer clay, amphibole, chlorite, and magnetite.

Oxides - Mode: 0.3%.

Crystal size: 1-5 mm.

Crystal shape: Irregular.

SECONDARY MINERALOGY: Olivine is completely replaced by "iddingsite", mixed-layer clay, amphibole, and chlorite. Plagioclase is 20%-40% altered to secondary plagioclase in Pieces 1-7, but <10% altered in Pieces 8-18. Clinopyroxene is 60%-100% replaced by fibrous green amphibole, rare dark-green amphibole and chlorite. Orthopyroxene is up to 90% altered. Piece 3 has only about 15% alteration overall.

Total percent: 60%.

Texture: Pseudomorph.

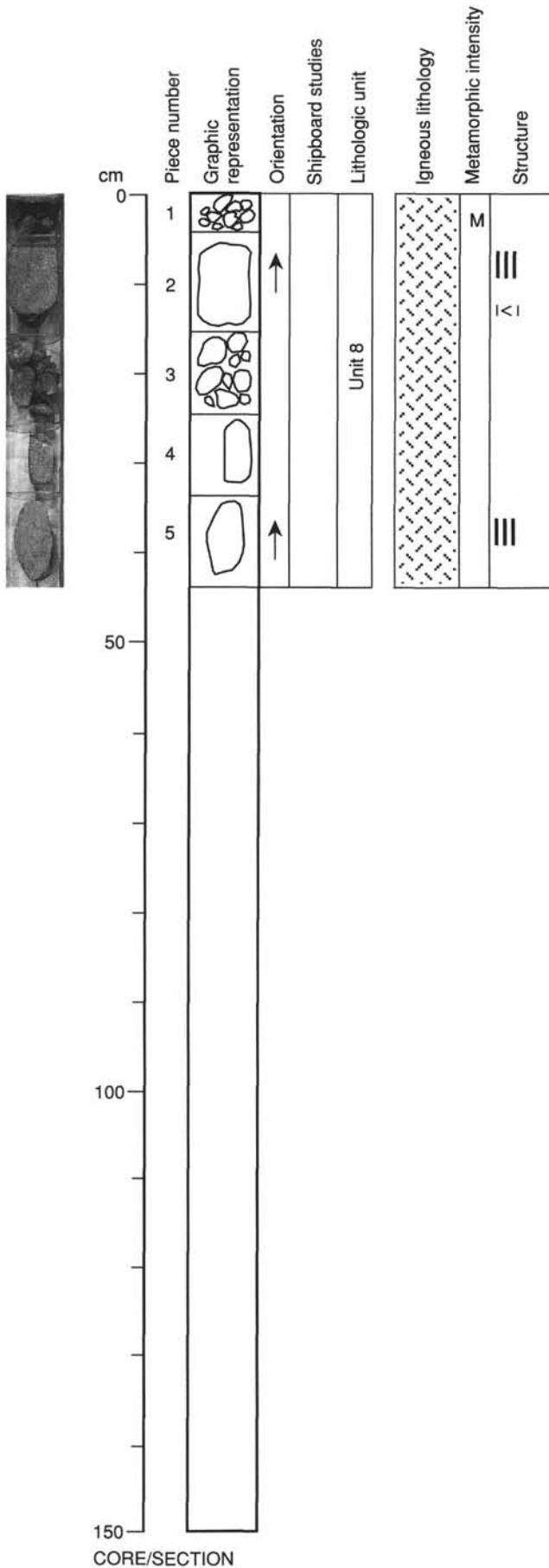
Vein material: Veins in Pieces, 4, 10, 11A, 13B, and 17C are 1) actinolite-chlorite; 2) prehnite; 3) prehnite + epidote and 4) chlorite + prehnite + actinolite. There are 1 cm alteration halos (80% alteration) to actinolite, chlorite, and secondary plagioclase.

UNIT 8: GABBRO

Pieces 1-5

COLOR: Mottled gray green.
LAYERING: None.
DEFORMATION: No veining or magmatic foliation.
PRIMARY MINERALOGY: Olivine is variable.
 Plagioclase - Mode: 55%.
 Crystal size: 2-4 mm.
 Crystal shape: Subhedral.
 Percent replacement: 10%-15%.
 Comments: Replaced by secondary plagioclase.
 Clinopyroxene - Mode: 35%-40%.
 Crystal size: 2-4 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50%-60%.
 Comments: Replaced by green amphibole.
 Orthopyroxene - Mode: <5%.
 Crystal size: 2-4 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50-60
 Comments: Replaced by amphibole/clays.
 Olivine - Mode: <5%.
 Crystal size: 1-2 mm.
 Crystal shape: Subhedral.
 Percent replacement: 80%-100%.
 Oxides - Mode: 0%-1%.
 Crystal size: 0.3-1 mm.
 Crystal shape: Irregular.

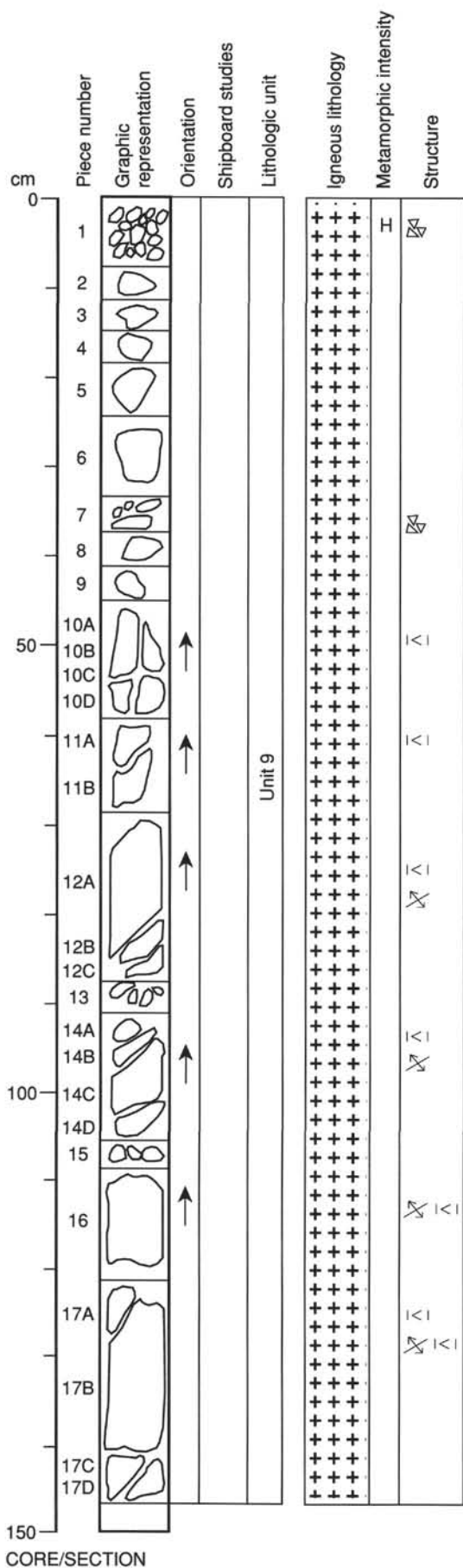
SECONDARY MINERALOGY: Plagioclase is altered 10%-15% to secondary plagioclase. Clinopyroxene 60%-70% replaced by actinolite with secondary pyrite. Orthopyroxene(?) is 40% replaced by amphibole(?). Sulfides (mainly pyrite) are <1%.
 Total percent: 25%.
 Texture: Pseudomorphic.
 Vein material: None.



147-894G-11R-1

UNIT 9: GABBRONORITE

Pieces 1-17D



CORE/SECTION

COLOR: Light gray-green.

LAYERING: None.

DEFORMATION: Upper portion essentially undeformed, except for possible fault breccia in Piece 7. Increasing density of veins and fractures towards base of section.

PRIMARY MINERALOGY: Olivine unevenly distributed with some patches of more olivine-rich material (2%-3%)

Clinopyroxene - Mode: 25%-30%.

Crystal size: 4 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: <100%.

Comments: Altered to actinolite or rarely dark green amphibole.

Orthopyroxene - Mode: 20%.

Crystal size: <1 cm

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 60%.

Comments: Occurs in part as oikocrysts. Variably altered up to 60% to fibrous amphibole giving it a gray-green schiller texture.

Plagioclase - Mode: 50%.

Crystal size: 2 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

Percent replacement: 30%-60%.

Comments: Generally fairly fresh but adjacent to veins considerably more altered to secondary plagioclase. Cut by microveins of actinolite.

Olivine - Mode: 2%.

Crystal size: 2 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 100%.

Comments: Some euhedral crystals. 100% replaced by clays, amphibole, sulfide, oxides, and chlorite. Rare talc alteration.

Oxides - Mode: <1%.

Crystal size: <2 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Comments: Primary? ilmenite and magnetite occurring interstitially.

SECONDARY MINERALOGY: Secondary sulfides up to 0.2% which alter to Hematite? Olivine commonly crosscut by oxide filled fractures. Coarse-grained zones cut by vein networks are pervasively altered close to veins. Plagioclase, orthopyroxene, and clinopyroxene up to 100% altered in these areas. More sulfides in Piece 14. Secondary talc in Piece 12.

Total percent: 70%.

Texture: Clinopyroxene pseudomorphed by actinolite with rare pyrite and very rare green amphibole. Orthopyroxene pseudomorphed by fibrous amphibole. Plagioclase replaced by secondary plagioclase and cut by veinlets of actinolite. Olivine replaced by pyrite (cores), clays and amphibole(?), iddingsite + chlorite.

Vein material: Veins in Pieces 10A, 14B, 16, and 17. In 16 and 17 anastomosing veins: Early-epidote, chlorite, actinolite, and sphalerite; Later-actinolite and chlorite.

ADDITIONAL COMMENTS: The interval is made up of medium-grained olivine-bearing gabbronorite. It is relatively homogeneous but there are some coarse-grained patches and stringers. Texture is inequigranular with ophitic enclosure of plagioclase by pyroxenes. Oxides fill intergranular spaces.

UNIT 9: GABBRONORITE

Pieces 1-14

COLOR: Light green-gray.

LAYERING: None.

DEFORMATION: Marked parallel planar veining in Piece 5. Weak foliation is likely magmatic, defined by plagioclase in Piece 13.

PRIMARY MINERALOGY: Coarse-grained material above Piece 4 is altered up to 50%. Fresher material is found in Pieces 5-14.

Plagioclase - Mode: 50%.

Crystal size: 1-1.5 mm.

Crystal shape: Subhedral.

Crystal orientation: Weak foliation in places.

Percent replacement: 10%.

Comments: Altered in part to secondary plagioclase.

Clinopyroxene - Mode: 25%.

Crystal size: 3-6 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%-90%.

Comments: Altered in part to amphibole.

Orthopyroxene - Mode: 20%.

Crystal size: 3-6 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 20%-50%.

Comments: Some oikocrysts up to 8 mm.

Olivine - Mode: 3%.

Crystal size: 1 mm.

Crystal shape: Euhedral.

Crystal orientation: None.

Percent replacement: 100%.

Comments: Some unaltered cores are still preserved.

Oxides - Mode: 1%.

Crystal size: 1 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

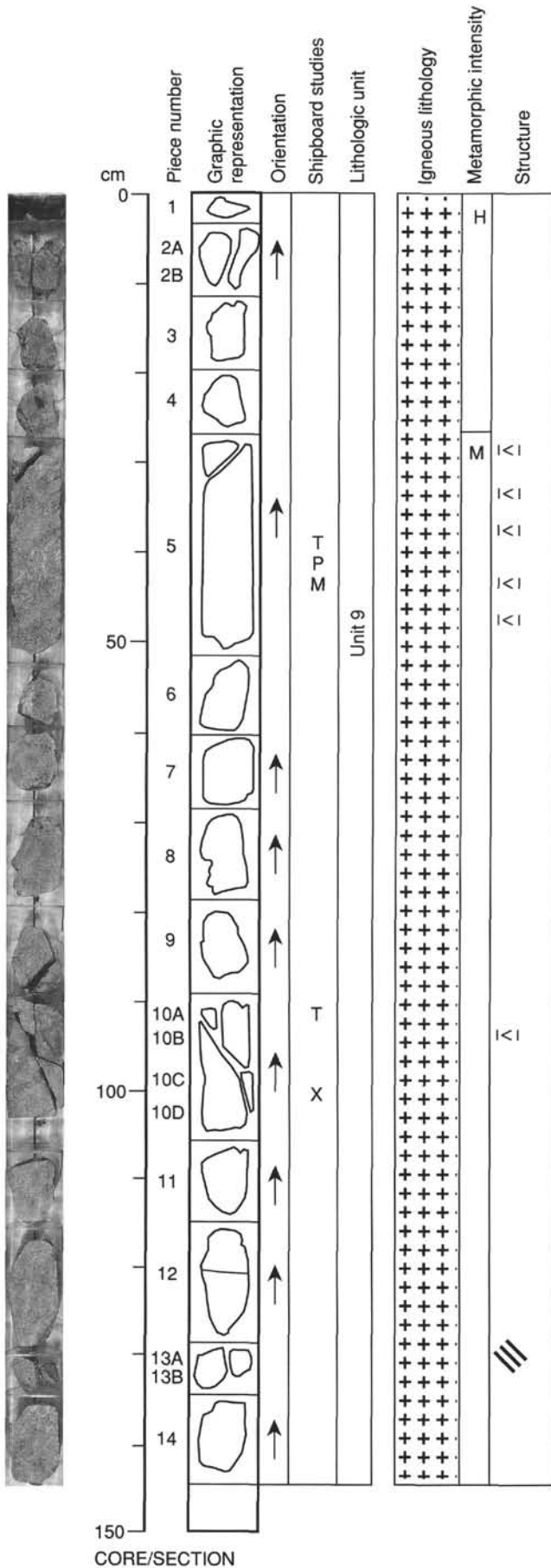
Comments: Interstitial primary magnetite.

SECONDARY MINERALOGY: Alteration mineralogy is the same throughout the section. More intense in coarser grained parts. In veined areas the degree of pervasive alteration is very high. Secondary sulfides no more than 0.1% except in one patch with 1% sulfides. Total percent: <50%.

Texture: Clinopyroxene is pervasively pseudomorphed by fibrous amphibole. Orthopyroxene is altered to amphibole +/- clays giving a pale gray green color. Plagioclase shows minor alteration to secondary plagioclase but altered up to 100% close to veins. Olivine replaced by iddingsite, oxides, clay, and chlorite.

Vein material: Isolated veins of clays and chlorite. Some with chlorite rim and prehnite core. Piece 3 has actinolite, chlorite, and prehnite; Piece 5, a dense network of actinolite, chlorite, epidote, prehnite vein mineralogies. Associations depend on primary modal composition.

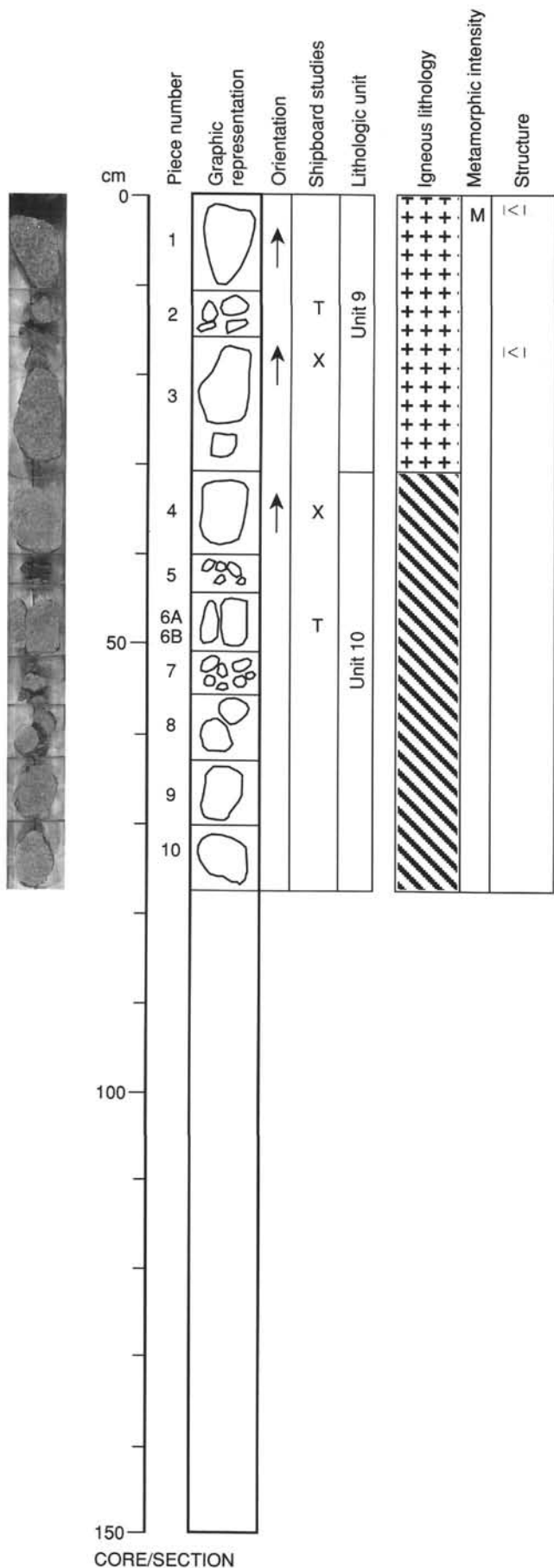
ADDITIONAL COMMENTS: Primary mineralogy and texture as in previous section. Piece 6 contains a sharp contact between very highly altered area (100% alteration) and zone altered from 60%-15%.



147-894G-11R-3

UNIT 9: GABBRONORITE

Pieces 1-3



COLOR: Light gray
LAYERING: None.
DEFORMATION: None.
PRIMARY MINERALOGY: Not much variation in grain size.

- Olivine is very rare.
- Plagioclase - Mode: 50%.
 Crystal size: 0.8-1 mm.
 Crystal shape: Euhedral-anhedral.
 Crystal orientation: None.
 Percent replacement: 10%.
- Clinopyroxene - Mode: 30%.
 Crystal size: 1-3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 35%.
- Orthopyroxene - Mode: 20%.
 Crystal size: 1-3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 35%.
- Oxides - Mode: 1%-2%.
 Crystal size: 0.2-0.5 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
- Olivine - Mode: <1%.
 Crystal size: 1 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 90%.

SECONDARY MINERALOGY: Clinopyroxenes are altered to brown amphibole, actinolite, fine-grained oxides. Pyroxenes may be completely replaced by fine-grained mats of yellow-green amphibole. Olivine with rare relict cores is altered to clays rimmed by fibrous pale green amphibole and traces of talc. Minor chlorite is present. Olivines appear to have been rimmed by orthopyroxene.
 Total percent: 30%.

Texture: Plagioclase is less than 10% altered to secondary plagioclase with minor microveinlets of actinolite and chlorite. Chadacrysts are moderately to highly altered. Alteration of orthopyroxene and clinopyroxene is heterogeneous. Orthopyroxene cores cut by oxide veinlets and rimmed by amphibole.

ADDITIONAL COMMENTS: In the lower part of Core 147-894G-11R, there are only few patches of coarser material.

147-894G-11R-3

UNIT 10: OLIVINE GABBRO-NORITE**Pieces 4–10****COLOR:** Light gray.**LAYERING:** None.**DEFORMATION:** None.**PRIMARY MINERALOGY:** Trace of primary oxide in 0.5 mm crystals.

Plagioclase - Mode: 50%.

Crystal size: 1 mm.

Crystal shape: Euhedral-anhedral.

Crystal orientation: None.

Percent replacement: 10%.

Clinopyroxene - Mode: 25%.

Crystal size: 1–3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 35%.

Orthopyroxene - Mode: 15%.

Crystal size: 1–3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 35%.

Olivine - Mode: 5%–10%.

Crystal size: 1 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 90%.

SECONDARY MINERALOGY:

Total percent: 35%.

Texture: Clinopyroxenes altered to brown amphibole, actinolite, and oxides. Olivine kernels possibly remain but generally altered to trace talc and fibrous green amphibole. Olivines may have been rimmed by orthopyroxene in reaction relationship.

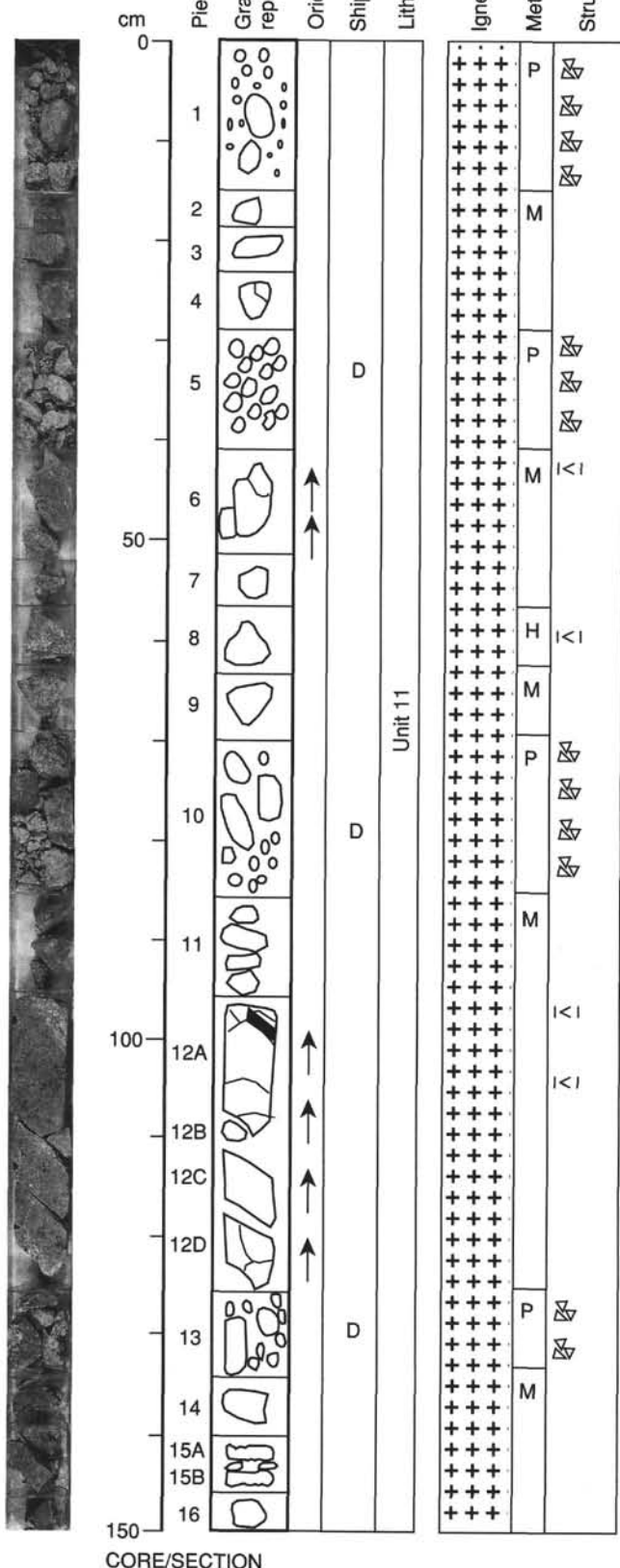
Vein material: Chlorite and actinolite in Piece 6.

ADDITIONAL COMMENTS: In the lower part of the core there are only a few coarse-grained patches.

147-894G-12R-1

UNIT 11: GABBRONORITE

Pieces 1-16



COLOR: Light gray.

LAYERING: None.

DEFORMATION: Fault breccias throughout the section. Clasts are angular with well-polished, chloritic surfaces. Other than brecciation, deformation is restricted to minor fracturing and moderate veining. Contact with Unit 10 is likely faulted.

PRIMARY MINERALOGY: From Pieces 0-10, patches of coarser grained gabbronorite in finer grained gabbronorite. Pieces 11-16 are mainly coarse grained. The finer units contain both granular orthopyroxene and oikocrysts. The coarser units have euhedral orthopyroxenes mantled by second growth pyroxene as well as smaller subhedral orthopyroxene grains.

Plagioclase - Mode: 50%.

Crystal size: 0.8-10 mm.

Crystal shape: Euhedral-anhedral.

Crystal orientation: Minor flow foliation.

Percent replacement: 10%.

Comments: In coarse intervals from 5-10 mm; in finer intervals from 0.8-1 mm grain sizes.

Clinopyroxene - Mode: 28%.

Crystal size: 1-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 60%.

Comments: In coarse intervals crystals are 5-10 mm, in fine intervals crystals are 1-3 mm.

Orthopyroxene - Mode: 20%.

Crystal size: 1-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 30%.

Comments: In coarse intervals crystals are 5-10 mm, in fine intervals crystals are 1-3 mm with some oikocrysts, but rarer than Unit 7.

Olivine - Mode: 1%.

Crystal size: 1 mm.

Crystal shape: Subhedral-anhedral.

Crystal orientation: None.

Percent replacement: 75%.

Oxides - Mode: <1%.

Crystal size: 0.2-2 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

SECONDARY MINERALOGY:

Total percent: 30%.

Texture: Background alteration looks patchy due to fibrous green amphibole +/- pyrite after clinopyroxene. Clinopyroxene is altered 60% to 100% to amphiboles in coarse patches. Orthopyroxene altered up to 100% near veins. Plagioclase is altered 10% to secondary plagioclase.

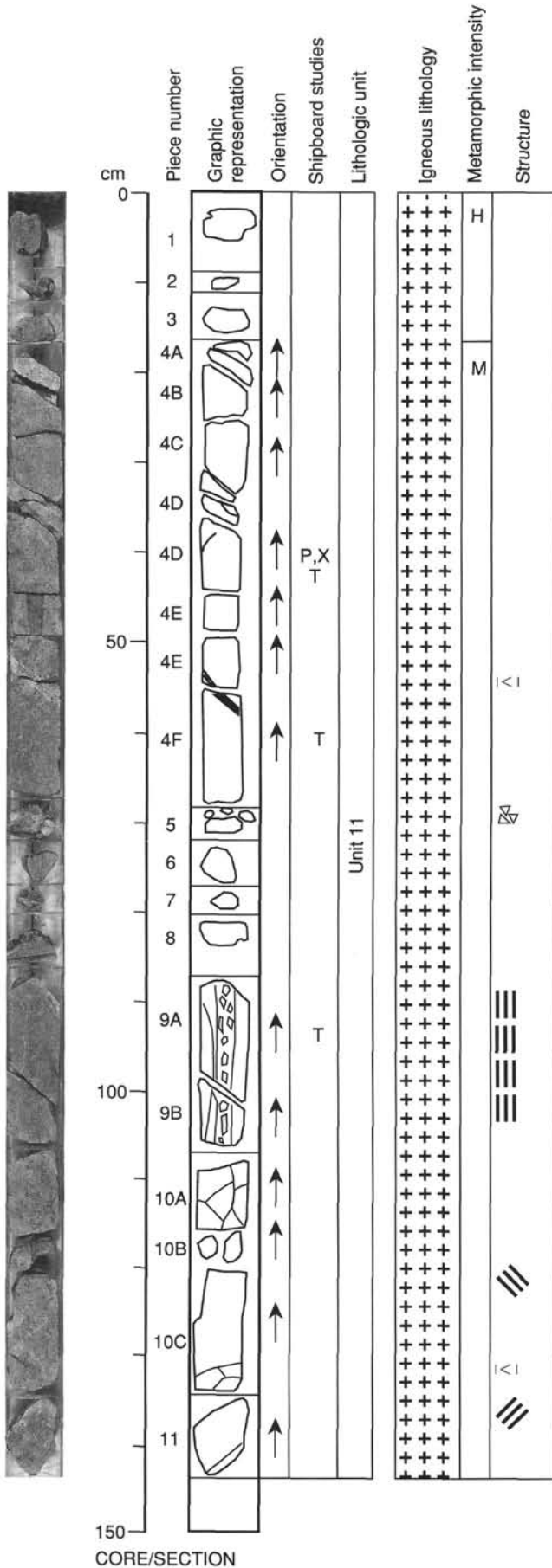
Vein material: 2-3 mm wide veins of chlorite, actinolite, quartz, and prehnite(?) developing up to 1 cm wide halo. Smaller anastomosing (0.1-0.5 mm) veins are made of actinolite, chlorite +/- prehnite.

ADDITIONAL COMMENTS:

Patches and zones of coarse-grained gabbronorite throughout. The texture of the coarse-grained zones is equigranular, while the fine-grained zones are in part poikilitic and otherwise granular. Few larger zoned or mantled, euhedral orthopyroxenes appear in the coarser units. Pieces 1, 5, 10, and 12 are fault breccia, pervasively altered and gray green in color due to abundant chlorite(?), clay, and amphibole.

UNIT 11: GABBRONORITE

Pieces 1-11



COLOR: Light gray.

LAYERING: None, although coarse and fine intervals appear regularly but relationships suggest contacts between these intervals are generally irregular but tend to be vertical or subvertical.

DEFORMATION: Minor veining. Steep mineral (magmatic) foliation defined by euhedral to subhedral tabular plagioclase, visible in Pieces 9, 10, and 11.

PRIMARY MINERALOGY: Olivine decreasing in amount in this portion of Unit 11. Large euhedral orthopyroxene are more common. Trace apatite in thin section.

Plagioclase - Mode: 55%.
 Crystal size: 0.8-5 mm.
 Crystal shape: Tabular euhedral to subhedral.
 Crystal orientation: Partly foliated.
 Percent replacement: 10% (rare)-00%.
 Comments: Grain size is 5-10 mm in coarse intervals and 0.8 to 1 mm in fine intervals.

Clinopyroxene - Mode: 20%-25%.
 Crystal size: 1-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 50%-70%.
 Comments: Grain size is 5-10 mm in coarse intervals and 1-3 mm in fine intervals.

Orthopyroxene - Mode: 15%-20%.
 Crystal size: 1-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None, except minor foliation.
 Percent replacement: 50%.
 Comments: grain size is 5-10 mm in coarser intervals and 1-3 mm in fine intervals with the exception of few <1 cm oikocrysts.

Oxides - Mode: 1%.
 Crystal size: 3-6 mm.
 Crystal shape: Anhedral
 Crystal orientation: None.

Olivine - Mode: Trace.
 Crystal size: 1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: Weak foliation in some pieces.
 Percent replacement: 75%.

SECONDARY MINERALOGY: Piece 4 contains 2-cm wide pervasively altered zone with secondary plagioclase, fibrous green amphibole after pyroxene. Magmatic vein in Piece 9 is bounded by 3 mm wide alteration zone defined by white secondary plagioclase, amphibole and chlorite. Rare (0.5%) sulfide. Orthopyroxene is in some places rimmed by cummingtonite. Piece 4 contains a 2 mm-wide prehnite + chlorite + zeolite vein with a 0.5 mm chlorite rim. Discontinuous veins of mixed layer clays also present.
 Total percent: <40%.
 Texture: Alteration is heterogeneous down core, with 5-10 fibrous amphibole after clinopyroxene. Plagioclase altered up to 100% to secondary plagioclase. Clinopyroxene up to 100% to fibrous amphibole. Orthopyroxene to fibrous pale green amphibole (40%-60%).
 Vein material: In Pieces 4C, 4D, 4E, 4F, 9, 10A, and 10C as 2-mm wide straight veins of chlorite and actinolite with aggregates of quartz and secondary plagioclase in vein centers. Sinuous isolated veins (0.1-0.3 mm) are of actinolite and chlorite, quartz and actinolite or chlorite, actinolite and prehnite.

ADDITIONAL COMMENTS: Alternation of fine and coarse gabbronorite visible in some pieces (9, 10, 11). Coarse patches are almost pegmatitic; fine patches preserve a magmatic foliation steeply dipping and in general approximately parallel to coarse-fine boundaries, which are diffuse over a few mm. In Piece 11 the boundary appears at a higher angle to the foliation

147-894G-12R-3

UNIT 11: GABBRONORITE

Pieces 1A-8B

COLOR: Light gray.

LAYERING: None.

DEFORMATION: Essentially undeformed with the exception of veining and fracturing. Veins have a consistent orientation. Steep dipping magmatic foliation developed in Pieces 2 and 8.

PRIMARY MINERALOGY: Olivine is much rarer in this section forming less than 1% of primary mode. Piece 8B shows igneous foliation and is essentially gabbroic, lacking orthopyroxene.

Plagioclase - Mode: 50%.

Crystal size: 0.8-10 mm.

Crystal shape: Tabular euhedral-anhedral.

Crystal orientation: Weak foliation in places.

Percent replacement: 5%-10%.

Comments: Grain size varies from coarse to finer intervals as in previous sections.

Clinopyroxene - Mode: 30%.

Crystal size: 1-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%-100%.

Comments: More highly altered close to veins. Grain size distribution as in previous sections.

Orthopyroxene - Mode: 20%.

Crystal size: 1-10 mm.

Crystal shape: Euhedral-anhedral.

Crystal orientation: None.

Percent replacement: 30%-50%. Close to veins-100%.

Comments: Grain size distribution as in previous sections. Euhedral mantled orthopyroxene occurs in coarser intervals. Rare oikocrysts in fine intervals. Piece 8B is virtually free of orthopyroxene where fine grained and foliated.

Oxides - Mode: <1%.

Crystal size: 0.2-2 mm.

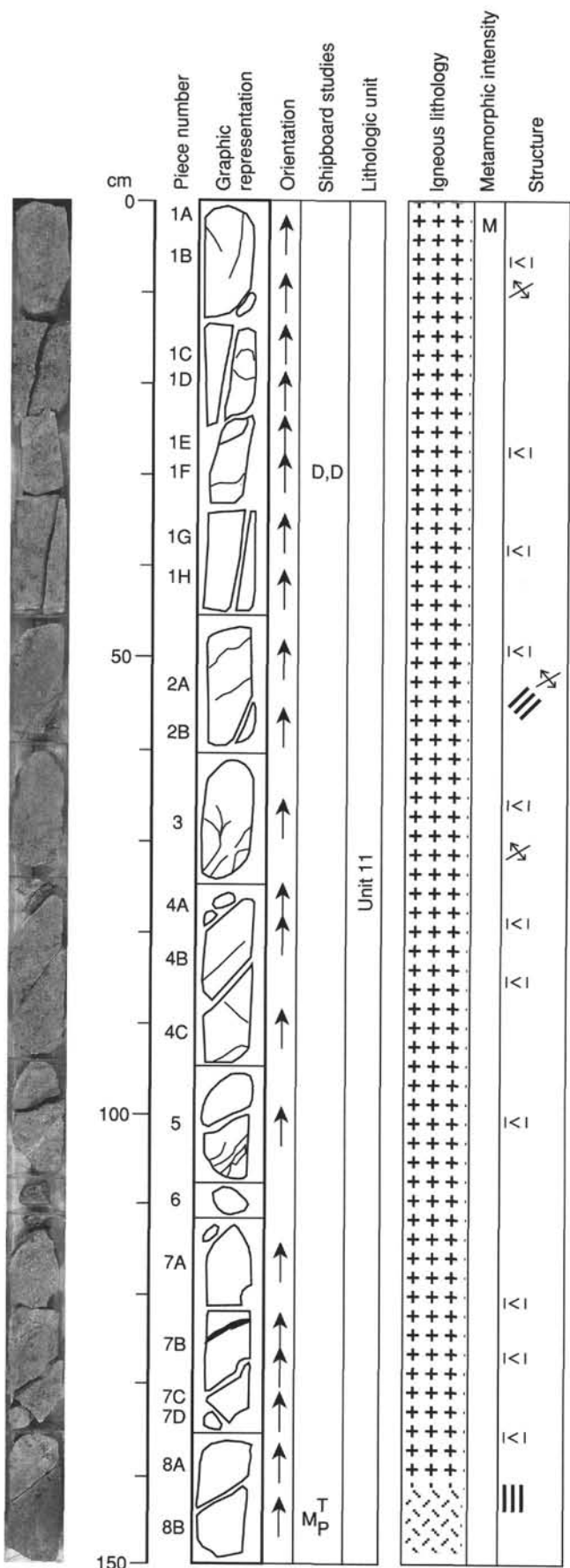
Crystal shape: Anhedral.

Crystal orientation: None.

SECONDARY MINERALOGY: Patches of dark green amphibole after clinopyroxene, approximately 0.5 mm in diameter, and predominantly associated with veins. They form up to 1% of the overall alteration. Otherwise clinopyroxene altered to secondary clinopyroxene, amphibole, and pyrite. Rare olivine altered to iddingsite, pyrite, clays, amphibole and chlorite. Total percent: 25%.

Texture: Alteration assemblage is consistent down core with alteration above 25% in Pieces 4-7 where it reaches 40%. Orthopyroxene oikocrysts are 10%-50% altered with rims of amphibole (cummingtonite?) Traces of talc and fine oxides are common. Plagioclase generally fresh with minor amphibolite microveinlets. Vein material: Veins in Pieces 1A, 1C, 1E, 1G, 1H, 2A, 3, 4B, 4C, 5, and 7. 2 mm wide veins of chlorite, actinolite, and quartz. 0.1 mm wide isolated veins can be monomineralic actinolite or prehnite.

ADDITIONAL COMMENTS: Pieces 1A-1H have coarse patches in finer lithology. Pieces 4 and 5 have a coarser grained gabbronorite that appears to be a dikelet in finer material. The lowest part of Piece 8B is essentially a gabbro.



CORE/SECTION

UNIT 11: GABBRONORITE

Pieces 1-16

COLOR: Mottled gray to gray-green.

LAYERING: None.

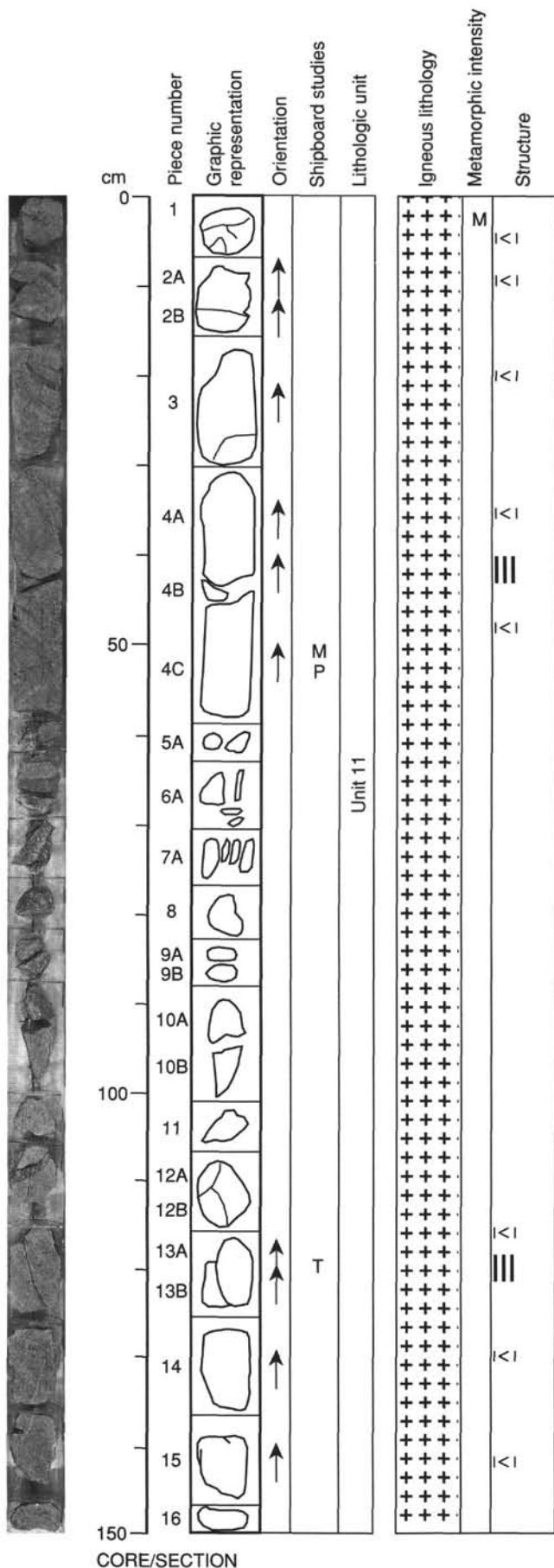
PRIMARY MINERALOGY:

- Plagioclase - Mode: 45%.
Crystal size: 2-5
Crystal shape: Subhedral-anhedral.
Crystal orientation: See comments.
Percent replacement: 2%.
Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 30%-35%.
Crystal size: 2-5 mm.
Crystal shape: Anhedral.
Percent replacement: 30%.
Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 20%.
Crystal size: 2-10 mm.
Crystal shape: Anhedral.
Percent replacement: 50%.
Comments: Some large oikocrysts; replaced by amphibole.
- Olivine - Mode: <1%-3%.
Crystal size: 1-2 mm.
Crystal shape: Subrounded.
Crystal orientation: See comments.
Percent replacement: 50%.
Comments: Altered to clays, chlorite, amphibole.
- Oxides - Mode: <0.5%.
Crystal size: 1-5 mm.
Crystal shape: Irregular.
Comments: Interstitial.

SECONDARY MINERALOGY:

Total percent: 25%.
Texture: Pseudomorphs. Orthopyroxene is 50% altered to cummingtonite/talc(?). Clinopyroxene is 30% altered to green amphibole. Sulfides = 0.3% to 1.5 mm. Mainly secondary pyrite in altered patches.
Vein material: Veins are lined with chlorite, epidote, prehnite, and lesser actinolite.

ADDITIONAL COMMENTS: Pieces 1-4: Generally equigranular plagioclase and clinopyroxene with small euhedral to subrounded iddingsitized olivine. Oikocrysts of orthopyroxene up to 10 mm across with inclusions of olivine, clinopyroxene, and plagioclase. Medium grained and slightly coarsening downward. Subophitic textures are common. Piece 5 has a coarse-medium grain-size contact, reasonably sharp. The fine-medium-grained part (approximately 1 mm equigranular) has incipient high angle foliation. Most obvious is plagioclase lath orientation. The coarse-grained patch is very thin (1 cm) then medium grained to Piece 8, which is markedly finer average grain size (about 1 mm). Grain size coarsens downward to Piece 16. The mineralogy is homogeneous except % olivine is variable.

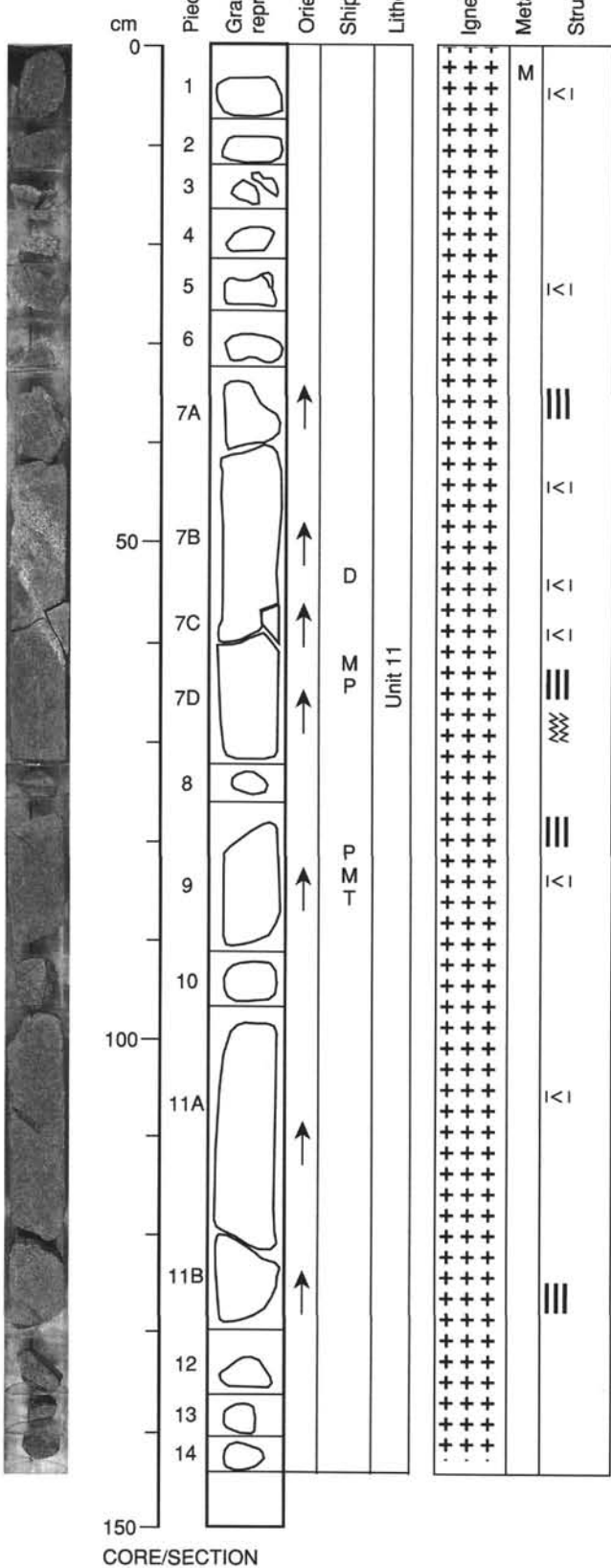


CORE/SECTION

147-894G-12R-5

UNIT 11: GABBRONORITE

Pieces 1-14



COLOR: Mottled grays.

LAYERING: None.

DEFORMATION: Regular veining. Straight veins lined with chlorite, clays, and prehnite. Steep magmatic foliation defined by feldspars occurs in Pieces 7 and 9.

PRIMARY MINERALOGY:

- Plagioclase - Mode: 45%.
Crystal size: 2-5 mm.
Crystal shape: Subhedral-anhedral.
Percent replacement: 2%.
Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 30%-35%.
Crystal size: 3-4 mm.
Crystal shape: Anhedral.
Percent replacement: 10%-20%.
Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 20%-25%.
Crystal size: 3-4 mm.
Crystal shape: Anhedral.
Percent replacement: 10%-20%.
Comments: Replaced by amphibole.
- Olivine - Mode: 0%-2%.
Crystal size: 0.5-1 mm.
Crystal shape: Subrounded.
Percent replacement: 80%-100%.
- Oxides - Mode: 1%-5%.
Crystal size: 1-3 mm.
Crystal shape: Irregular.
Comments: Patchy.

SECONDARY MINERALOGY: Background alteration 20%-25%. Sulfides, mainly secondary pyrite = 0.5% to 1.5 mm in altered patches. Total percent: 25%.

Texture: Pseudomorphic in background alteration, replacement of pyroxenes by amphibole/chlorite. Densely veined, locally brecciated between Pieces 4 and 7.

Vein material: Composite, characterized by chlorite rims and prehnite + epidote centers. Associated with pervasive secondary alteration of adjacent plagioclase to secondary plagioclase and epidote, forming distinct white zones.

ADDITIONAL COMMENTS: The upper part continues gradual coarsening upward of Section 147-894G-12R-4 to average 4-5 mm in Piece 7. Piece 9 has variable grain size 2-5 mm. Piece 11A is medium-coarse and variable within the piece. Piece 11B is medium-grained, 2-4 mm. Pieces 12-14 are medium to medium coarse grained. The lithology is constant, olivine abundance varies. There is a distinct increase in grain size from the bottom of Section 147-894G-12R-4 to the top of Section 147-894G-12R-5. Piece 1 has several large (7 mm) euhedral orthopyroxenes. Piece 7A contains jacketed, euhedral-subhedral orthopyroxene. Piece 7C has vertical fabric. Piece 8 is coarse grained. The coarse-grained interval at the top appears to be nearly free of olivine.

UNIT 11: GABBRONORITE

Pieces 1–6

COLOR: Very gray, dappled.
LAYERING: None.

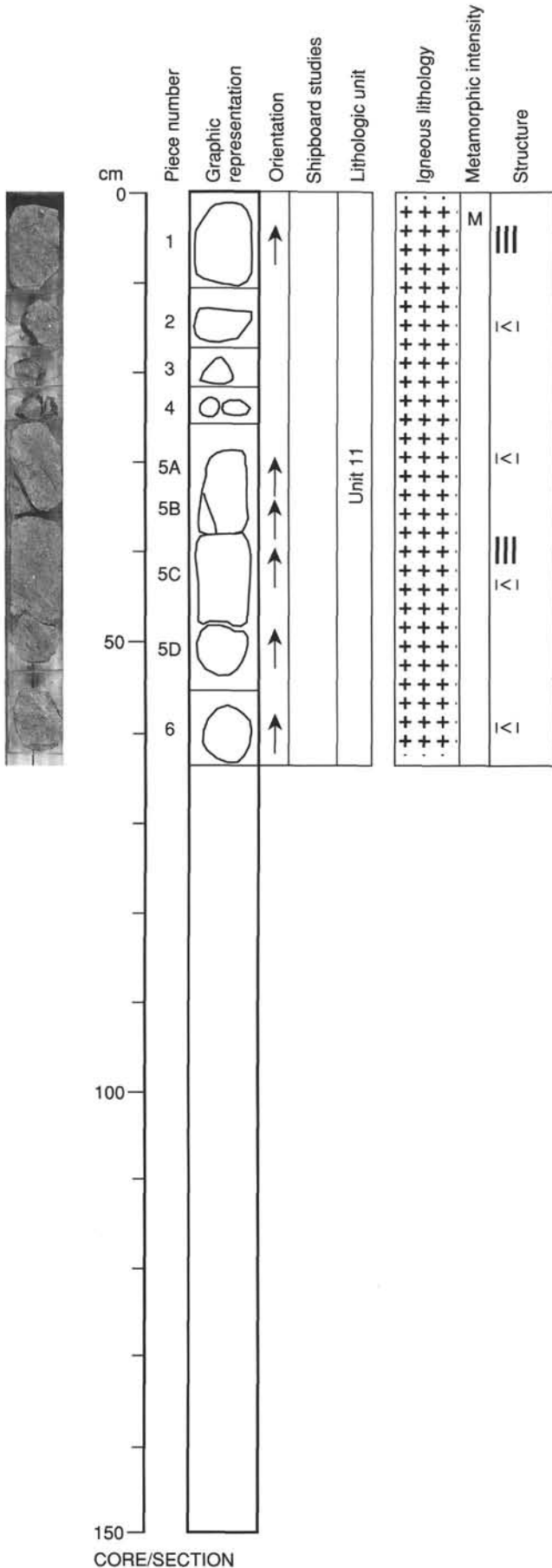
DEFORMATION: There are regular, steeply dipping veins lined with green minerals, mainly chlorite. Magmatic foliation occurs in Pieces 1 and 5.

PRIMARY MINERALOGY:

- Plagioclase - Mode: 45%.
 Crystal size: 2–4 mm.
 Crystal shape: Subhedral.
 Percent replacement: 2%.
 Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 40%.
 Crystal size: 2–6 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50%.
 Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 20%–25%.
 Crystal size: 2–10 mm.
 Crystal shape: Anhedral.
 Percent replacement: 50%.
 Comments: Some oikocrysts. Replaced by amphibole.
- Olivine - Mode: 1%–2%.
 Crystal size: 0.5–1 mm.
 Crystal shape: Subrounded.
 Percent replacement: 50%–100%.
- Oxides - Mode: 2%–4%.
 Crystal size: 4–20 mm.
 Crystal shape: Irregular.
 Comments: Patchy.

SECONDARY MINERALOGY: Sulfides (pyrite) are all secondary, 0.2%–0.5%, largest 0.8–1.5 mm.
 Total percent: 25%.
 Texture: Pseudomorphic.

Vein material: Lined with chlorite, epidote, clays, and lesser actinolite
ADDITIONAL COMMENTS: Continues the very slow, gradational coarsening upward trend from Section 147-894G-12R-5. Piece 6 is coarsest but still only an upper end of medium grain-size range. Average is 3–5 mm with large orthopyroxene oikocrysts. Piece 1 has altered olivine and very large oikocrysts of orthopyroxene, but doesn't appear to have large euhedral orthopyroxene.

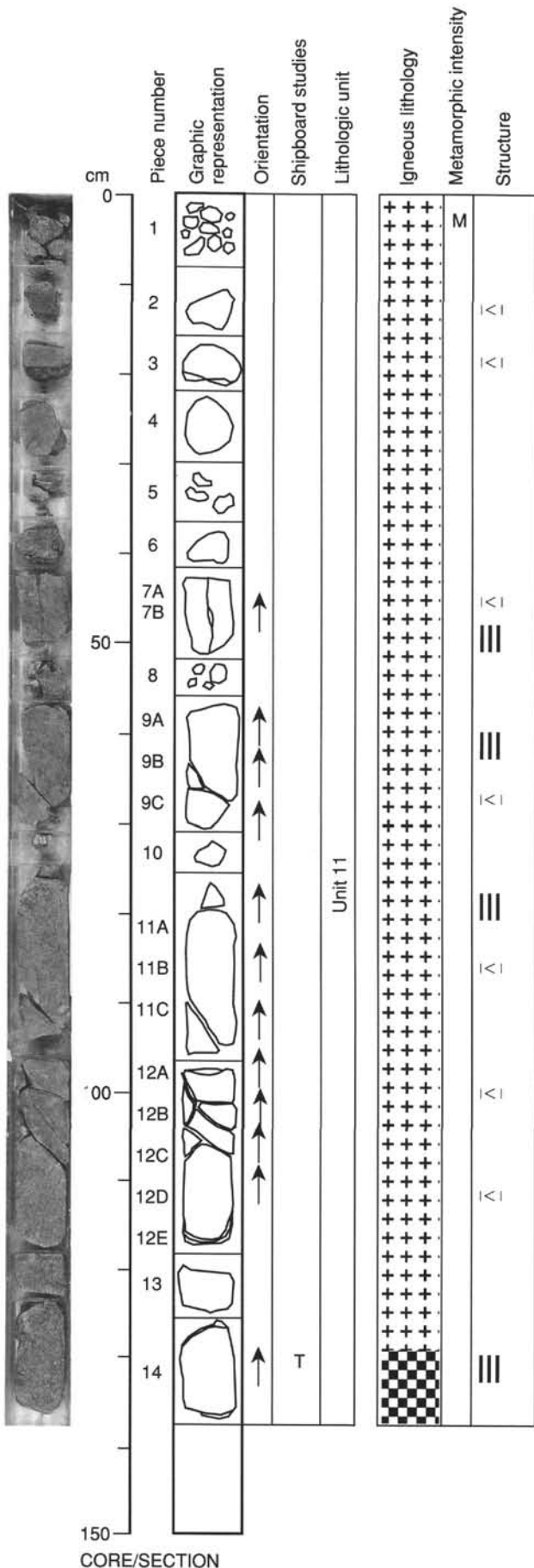


147-894G-13R-1

UNIT 11: GABBRONORITE

Pieces 1-14

COLOR: Gray.
LAYERING: A hint of layering in grain-size variations.
DEFORMATION: Regular, steep veins lined with green secondary minerals. Steep magmatic foliation present in Pieces 9 and 11.
PRIMARY MINERALOGY: Oxides reach as much as 10% in Piece 14.
 Plagioclase - Mode: 40%.
 Crystal size: 2-10 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 5%.
 Comments: Replaced by secondary plagioclase.
 Clinopyroxene - Mode: 30%-40%.
 Crystal size: 3-5 mm.
 Crystal shape: Anhedral.
 Percent replacement: 30%.
 Comments: Replaced by amphibole.
 Orthopyroxene - Mode: 20%-30%.
 Crystal size: 3-10 mm.
 Crystal shape: Anhedral.
 Percent replacement: 30%.
 Comments: Replaced by amphibole.
 Olivine - Mode: 1%-3%.
 Crystal size: 1-2 mm.
 Crystal shape: Subrounded.
 Percent replacement: 50%.
 Oxides - Mode: 0.2%-1%.
 Crystal size: 1-8 mm.
 Crystal shape: Irregular.
 Comments: Patchy.
SECONDARY MINERALOGY: Alteration is more intense in coarser grained portions of the section, to 50%. Contains secondary pyrite 0.3%-0.5% up to 1 mm in altered parts of the rock.
 Total percent: 25%.
 Texture: Pseudomorphic replacement of pyroxenes by amphiboles and secondary oxides; partial alteration of plagioclase to secondary plagioclase.
 Vein material: Veins are lined with chlorite, prehnite, epidote, and lesser actinolite.
ADDITIONAL COMMENTS: Pieces 1-5 are medium grained and roughly equigranular. Piece 6 has coarser grain size (5-7 mm). Piece 7 is coarse with an abrupt change to medium-grained 2 cm down from the top. Piece 9 has a vertical contact between coarse and medium grain size. Piece 11 has sub-vertical band of coarse-grained gabbronite between fine-grained gabbro margins. Plagioclase at the contact is foliated on both sides. Pieces 12 and 13 have patchy grain size variations. Overall, the section is gabbronite with abundant coarse euhedral orthopyroxene in medium-grained rock. Piece 14 is an oxide gabbronite, with a narrow dipping band including 10% oxide minerals.



UNIT 11: GABBRONORITE

Pieces 1A–10C

COLOR: Mottled gray.
LAYERING: None.

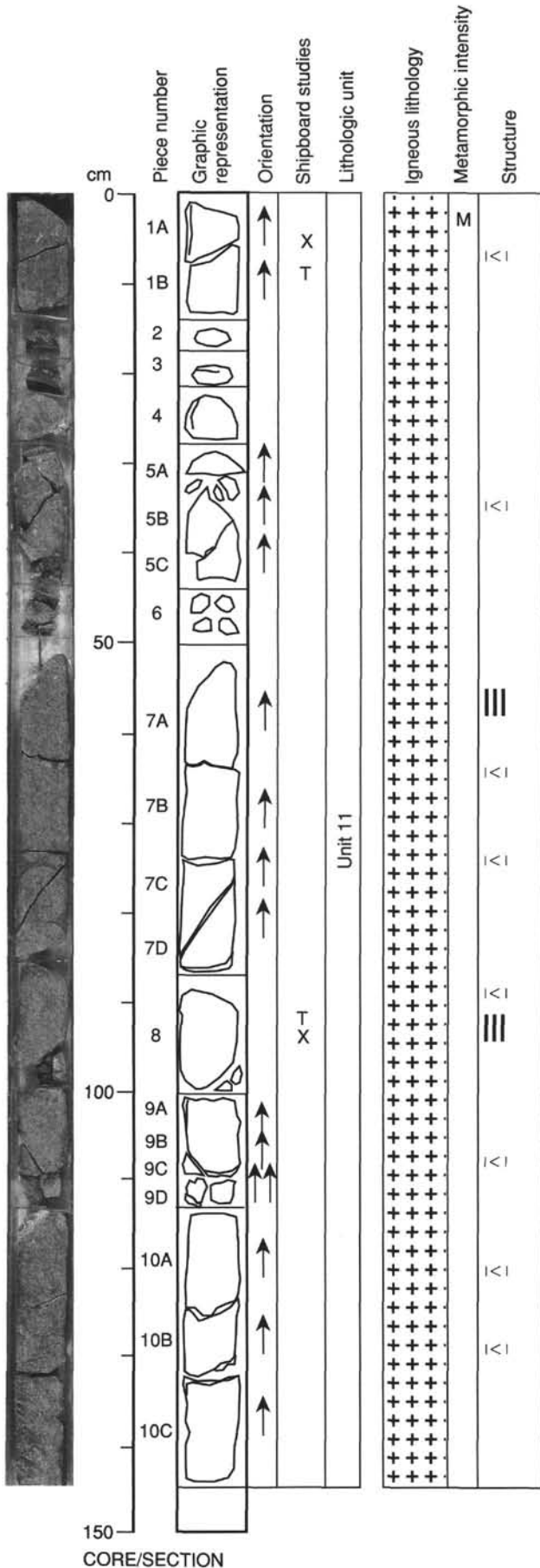
DEFORMATION: There are two sets of green veins, steep and flat relative to the core. There is steep magmatic foliation measured in Pieces 7–9.

PRIMARY MINERALOGY:

- Plagioclase - Mode: 40%.
 Crystal size: 3–6 mm.
 Crystal shape: Subhedral.
 Percent replacement: 5%.
 Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 35%.
 Crystal size: 3–12 mm.
 Crystal shape: Subhedral.
 Percent replacement: 33%.
 Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 25%.
 Crystal size: 3–17 mm.
 Crystal shape: Euhedral/anedral.
 Percent replacement: 50%.
 Comments: Replaced by amphibole.
- Oxides - Mode: <0.8%.
 Crystal size: 2–4 mm.
 Crystal shape: Irregular.
 Comments: Patchy, interstitial.

SECONDARY MINERALOGY: Sulfide 0.2%–0.7%, 0.5–1.0 mm, both primary and (mainly) secondary pyrite.
 Total percent: 25%.
 Texture: Pseudomorphic.
 Vein material: Veins are lined with chlorite, prehnite, epidote, and lesser actinolite.

ADDITIONAL COMMENTS: Medium to coarse grained. Contains large (up to 17 mm) euhedral orthopyroxene with intergranular orthopyroxene down to 28 cm (Piece 4). There is a sharp transition to medium-grained homogeneous gabbro-norite, which persists down to Piece 9D (114 cm). At 114 cm, there is a sharp transition back to coarse-grained gabbro-norite with large euhedral orthopyroxene crystals. Some plagioclase is rimmed by altered pyroxene.



147-894G-13R-3

UNIT 11: GABBRONORITE

Pieces 1A-13B

COLOR: Mottled greenish brownish gray.
DEFORMATION: Two sets of veins, steep and flat, lined with green secondary minerals. Steep magmatic foliation measured in Pieces 1 and 13.

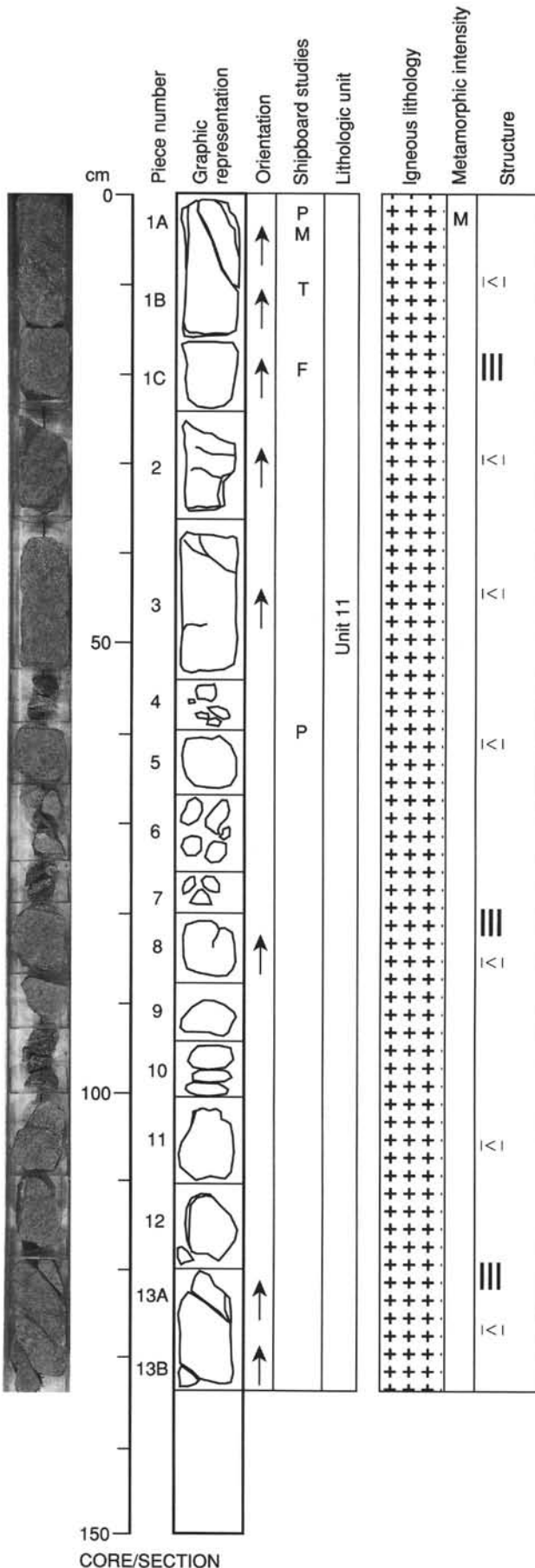
PRIMARY MINERALOGY:

- Plagioclase - Mode: 35%-40%.
 Crystal size: 5-10 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 10%.
 Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 35%-40%.
 Crystal size: 5-10 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 50%.
 Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 20%-25%.
 Crystal size: 5-15 mm.
 Crystal shape: Euhedral-subhedral.
 Percent replacement: 50%.
 Comments: Replaced by amphibole.
- Oxides - Mode: Trace-2%.
 Crystal size: 0.7-4 mm.
 Crystal shape: Irregular.
 Comments: Patchy, interstitial.

SECONDARY MINERALOGY: Sulfides (mainly secondary pyrite) 0.5%-1%, 0.4-1.5 mm. They are associated with altered pyroxenes and oxides. Total percent: 33%.

Texture: Pseudomorphic. Alteration jackets of green amphibole around large orthopyroxene phenocrysts. Vein material: Veins are lined with chlorite, epidote, prehnite, and lesser actinolite.

ADDITIONAL COMMENTS: The rock consists of 20%-25% coarse EUHEDRAL(!) cumulus orthopyroxene. This is rimmed by clinopyroxene, now altered, and is set in an equigranular medium coarse-grained plagioclase-clinopyroxene matrix, with some minor (<5%) interstitial orthopyroxene. There is also some plagioclase rimmed by pyroxene (now altered), thus there may be TWO generations of plagioclase present. The grain size gradationally decreases downsection. This is particularly evident from Piece 3 downward. Obvious mantled orthopyroxene decreases in modal % downsection as well.



CORE/SECTION

UNIT 11: GABBRONORITE

Pieces 1-11

COLOR: Gray.

DEFORMATION: Minor veining and fracturing near base of section. There is a possible fault breccia near the beginning of the section, otherwise the rocks are undeformed.

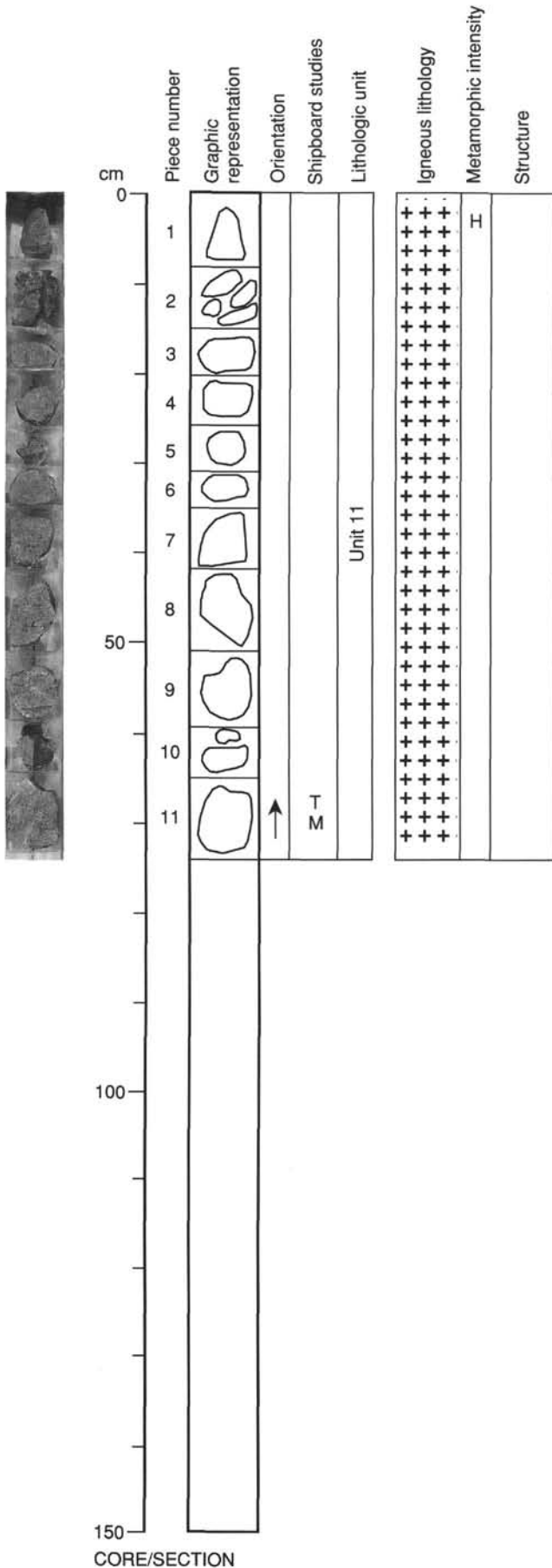
PRIMARY MINERALOGY:

- Plagioclase - Mode: 50%.
Crystal size: 1-3 mm.
Crystal shape: Subhedral.
Percent replacement: 10%-20%.
Comments: Replaced by secondary plagioclase.
- Clinopyroxene - Mode: 40%.
Crystal size: 1-3 mm.
Crystal shape: Anhedral.
Percent replacement: 50%.
Comments: Replaced by amphibole.
- Orthopyroxene - Mode: 10%.
Crystal size: 1-3 mm.
Crystal shape: Anhedral.
Percent replacement: 50%.
Comments: Replaced by amphibole.
- Olivine - Mode: 5%.
Crystal size: 0.5-1 mm.
Crystal shape: Subrounded.
Percent replacement: 50%-90%.

Oxides - Mode: <1%.

SECONDARY MINERALOGY: Patchy alteration with pale light green amphibole after orthopyroxene, dark fibrous green pods with some pyrite after clinopyroxene. Pods comprise about 2% of the core and average 4 mm in diameter. Clinopyroxene is 50%-100% altered to fibrous dark green amphibole with or without pyrite. Orthopyroxene is 40%-100% altered to pale green gray = amphibole plus clay (?). Plagioclase is 10%-20% secondary with rare white (albitic?) plagioclase.
Total percent: 40%-60%.
Texture: Pseudomorph
Vein material: Veins in Pieces 1, 7, 8, 9, and 11. Very thin veins (0.1-0.3 mm) filled with prehnite and clays. Cores of prehnite with rims of chlorite and clays in Piece 11.

ADDITIONAL COMMENTS: These rock fragments were taken from several meters of coarse drilling breccia and cannot be considered to be either in place or in sequence.

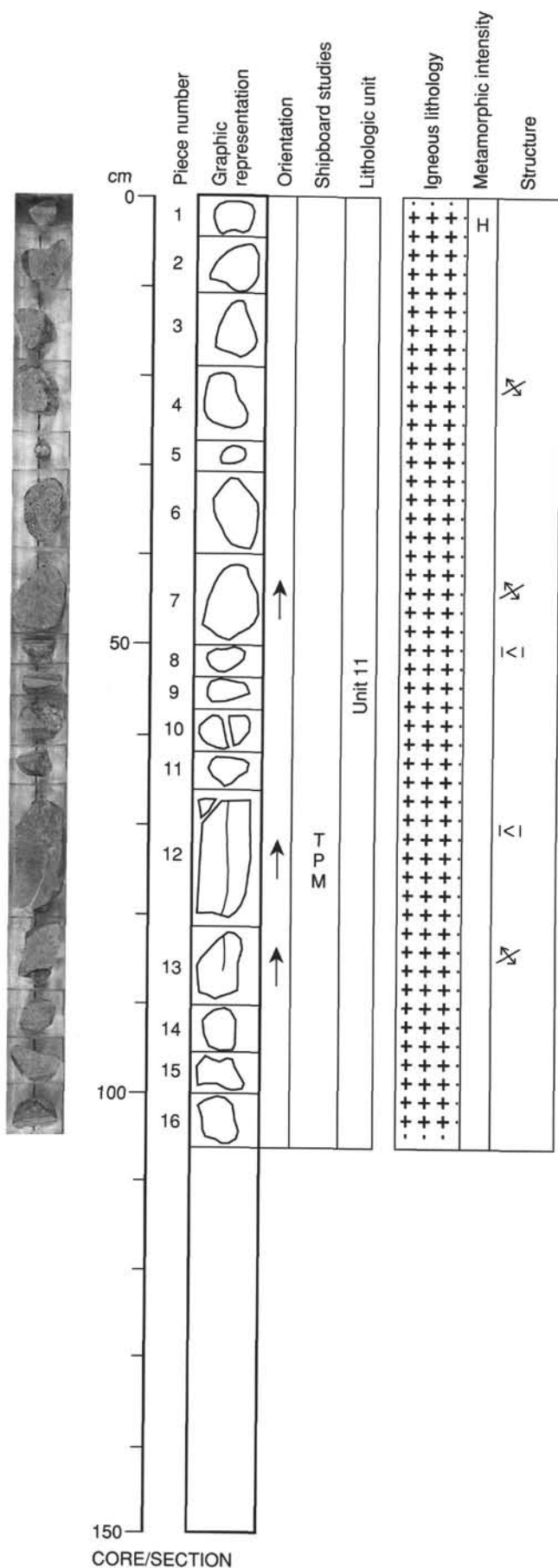


CORE/SECTION

147-894G-15R-1

UNIT 11: GABBRONORITE

Pieces 1-16



COLOR: Light Gray.

LAYERING: None.

DEFORMATION: Deformation restricted to minor veining and fracturing.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 0.5-10 mm.

Crystal shape: Subhedral-anhedral.

Crystal orientation: None.

Percent replacement: 10%-40%.

Comments: In medium-grained interval from 0.5-1.5 mm, in coarse-grained interval from 5-10 mm.

Clinopyroxene - Mode: 35%.

Crystal size: 1-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%-70%.

Comments: In medium-grained interval from 1-3 mm, in coarse-grained interval from 5-10 mm.

Orthopyroxene - Mode: 15%-20%.

Crystal size: 1-7 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 10%-40%.

Comments: In medium-grained interval from 1-3 mm, in coarse-grained interval from 3-7 mm. Rare oikocrysts in medium-grained interval.

Oxides - Mode: 1%-2%.

Crystal size: 0.2-4 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Comments: In medium-grained interval from 0.2-0.5 mm, in coarse-grained interval from 0.5-4 mm.

SECONDARY MINERALOGY: Piece 12 has altered pegmatitic patch.

Total percent: 40%-70%.

Texture: Alteration is heterogeneous downcore as well as in individual pieces. Clinopyroxene altered to fibrous green amphibole +/- pyrite. Orthopyroxene is altered to gray green amphibole. Plagioclase is altered to secondary plagioclase and cut by microveinlets of green amphibole.

Vein material: Veins in Pieces 4, 6, 7, 8, 12, 13, and 14. Thin sinuous veins of chlorite and actinolite, chlorite and clays, chlorite and prehnite, and some zeolites. Chlorite-actinolite veins seem to be systematically cut by prehnite-clay veins.

ADDITIONAL COMMENTS: Pieces 1-6 may represent redrilled rubble.

GABBRONORITE

Pieces 1-7

COLOR: Light gray green.

LAYERING: None.

DEFORMATION: Minor fracturing and veining magmatic foliation in Piece 6.

PRIMARY MINERALOGY: Primary texture is hypidiomorphic granular.

Plagioclase - Mode: 50%.

Crystal size: 4-10 mm.

Crystal shape: Subhedral-anhedral.

Crystal orientation: Minor magmatic alignment in Piece 6.

Percent replacement: 7%-15%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 28%.

Crystal size: 4-10 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 24%-28%.

Comments: Replaced by amphibole/chlorite.

Orthopyroxene - Mode: 20%.

Crystal size: 4-10 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 15%-20%.

Comments: Replaced by amphibole/chlorite.

Oxides - Mode: 2%.

Crystal size: 0.5-4 mm.

Crystal shape: Irregular.

Comments: Interstitial.

SECONDARY MINERALOGY: Secondary plagioclase is white next to veins. Al-

teration near veins is more intense but there are no well-defined halos.

Total percent: 45%-80%.

Texture: Pseudomorphic. Heterogeneous alteration down core. Orthopyrox-

ene is pervasively altered to pale gray-green amphibole, or - where cream-

colored - to amphibole and clay, and rimmed by green amphibole. Clinopy-

roxene is highly altered to fibrous dark green amphibole +/1 pyrite.

Vein material: Veins of chlorite, prehnite, zeolites, clays, and possible actin-

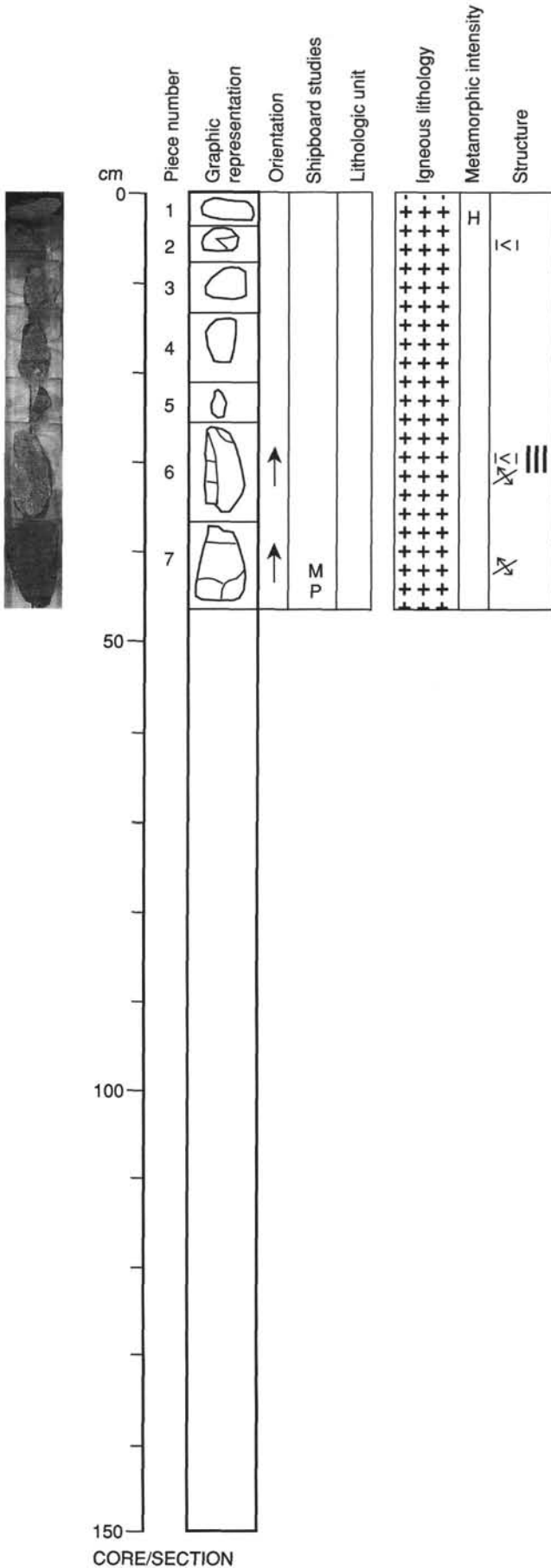
olite are in Pieces 2-4 and 6, 0.1-5 mm wide.

ADDITIONAL COMMENTS: This is a wash core of pieces presumed to have fallen

down the hole. The rocks include medium-grained and coarse-grained gab-

bronorite with hypidiomorphic granular texture. There is no preferred orien-

tation of elongate or platy minerals.

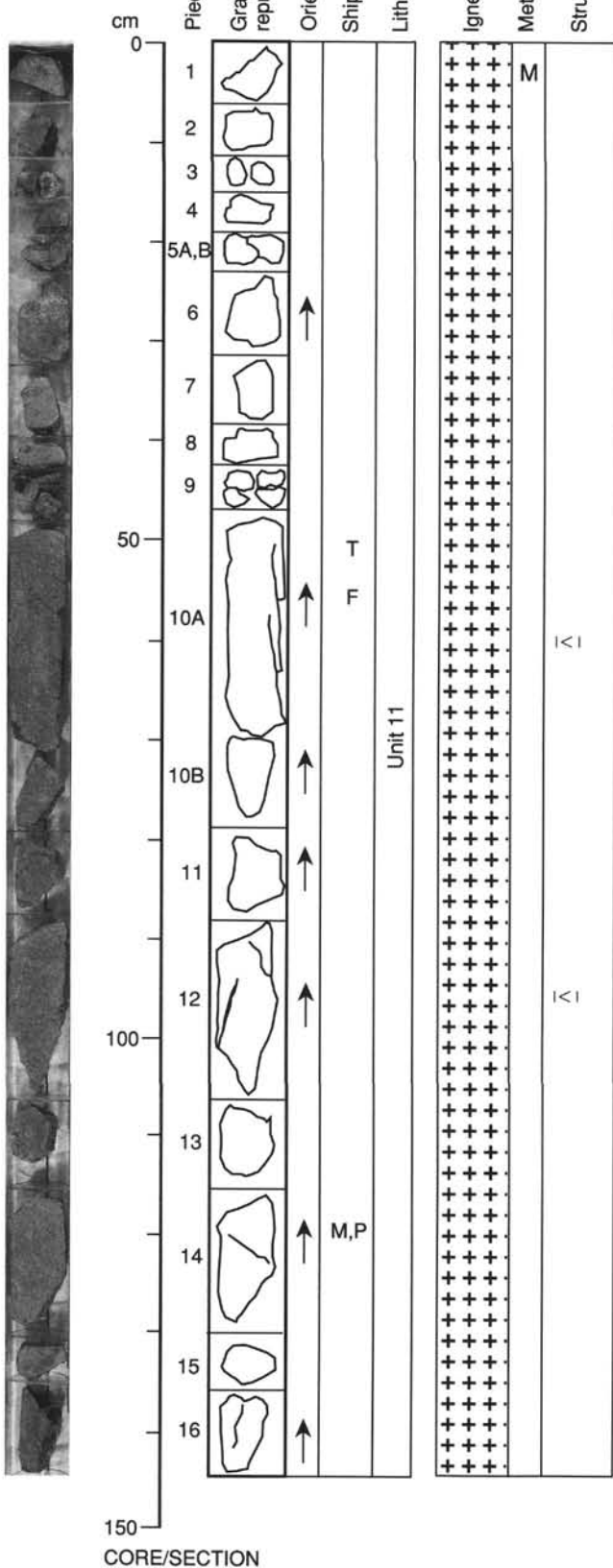


CORE/SECTION

147-894G-17R-1

UNIT 11: GABBRONORITE

Pieces 1-16



COLOR: Light Gray.
LAYERING: None.
DEFORMATION: Minor veining in some pieces.
PRIMARY MINERALOGY: Apatite is common as late stage prismatic crystals up to 1 cm long in Piece 6, with skeletal oxide and hornblende. Much apatite occurs as inclusions in orthopyroxene oikocrysts.
 Plagioclase - Mode: 50%.
 Crystal size: 0.5-1.5 mm.
 Crystal shape: subhedral-anhedral.
 Crystal orientation: None.
 Percent replacement: <10%-15%.
 Olivine - Mode: 0%-2%.
 Crystal size: 0.2-1 mm.
 Crystal shape: Euhedral-subhedral.
 Crystal orientation: None.
 Percent replacement: 80%.
 Comments: Absent in some pieces.
 Clinopyroxene - Mode: 30%-35%.
 Crystal size: 0.5-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 30%-100%.
 Orthopyroxene - Mode: 10%-15%.
 Crystal size: 0.5-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 60%-100%.
 Oxides - Mode: 1%-6%.
 Crystal size: 0.1-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Comments: Interstitial in finer grained rocks. Equant in coarser grained rocks.
SECONDARY MINERALOGY: Pieces 11 and 13 are highly altered (60%-70%).
 Rare secondary sulfides.
 Total percent: 20%-30%.
 Texture: Secondary pyroxene, actinolite + pyrite replaces clinopyroxene and amphibole, oxides and clays replace pale green to cream colored orthopyroxene. Highly altered oikocrysts of orthopyroxene form amphibole patches 0.3-0.7 mm in width. Plagioclase altered to secondary plagioclase and actinolite veins.
 Vein material: Located in Pieces 2, 6, 8, 10A, 14, 15, and 16. 0.1-1 mm isolated veins filled with clays, prehnite and clays, prehnite and chlorite, actinolite and chlorite, prehnite and in places zeolites. Hydrogrossular present in Piece 14.
ADDITIONAL COMMENTS: The core is of medium-grained gabbronorite with varying amounts of olivine. The olivine is concentrated the most in the top of this section, making the rock an olivine gabbronorite locally. The texture of the rock is inequigranular with 4-7 mm large orthopyroxene and clinopyroxene oikocrysts. Patches of coarse-grained gabbronorite are scattered throughout the core and contain subhedral pyroxenes rather than oikocrysts. Most prominent patches of coarser material are in Pieces 6, 11, and 13. Apatite is an abundant late stage magmatic mineral in Piece 6 and occurs together with prismatic hornblende and skeletal ilmenomagnetite.

UNIT 11: GABBRONORITE

Pieces 1-12

COLOR: Light gray.
LAYERING: None.
DEFORMATION: Minor fracturing and veining.
PRIMARY MINERALOGY: Olivine is less common than in Section 147-894G-17R-1.

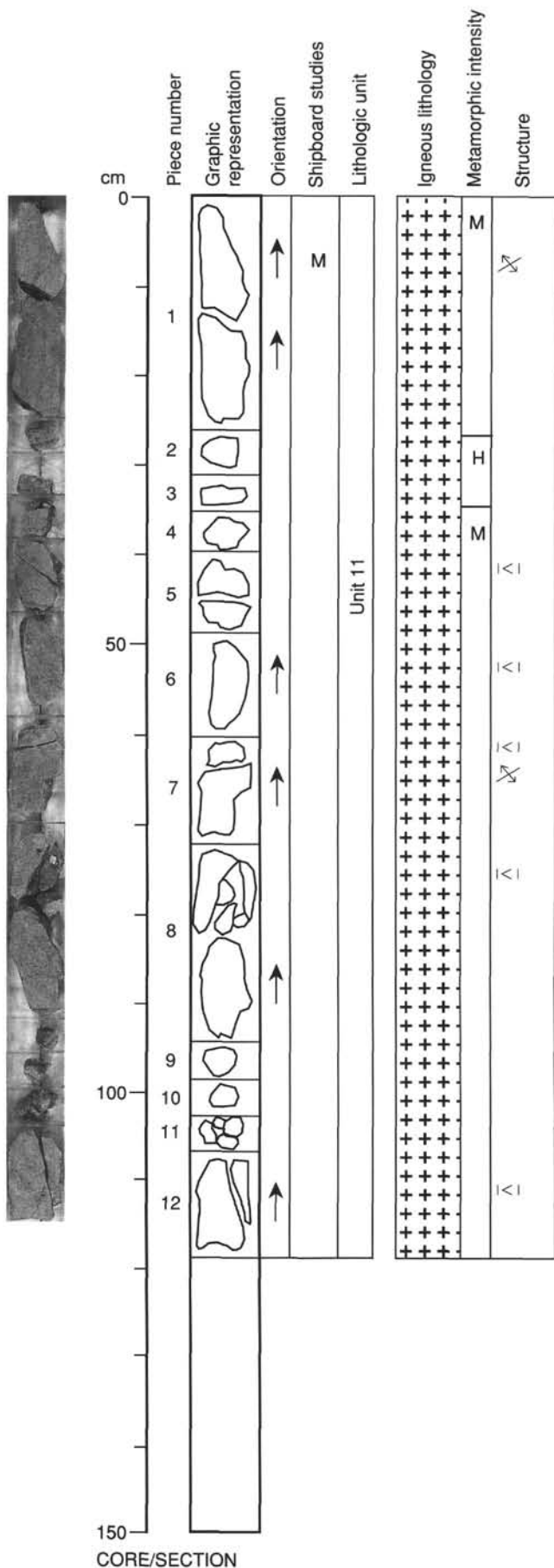
- Plagioclase - Mode: 50%.
 Crystal size: 0.5-1.5 mm.
 Crystal shape: Subhedral-anhedral.
 Crystal orientation: None.
 Percent replacement: 10%-30%.
- Clinopyroxene - Mode: 30%-35%.
 Crystal size: 0.5-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 60%-100%.
 Comments: Larger grain sizes are of oikocrysts.
- Orthopyroxenes - Mode: 10%-15%.
 Crystal size: 0.5-10 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Percent replacement: 70%-100%.
 Comments: Larger grain sizes are of oikocrysts.
- Olivine - Mode: 1%.
 Crystal size: 0.2-1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
 Percent replacement: 100%.
- Oxides - Mode: 0.5%.
 Crystal size: 0.1-0.3 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Comments: Interstitial.

SECONDARY MINERALOGY: Olivine is pervasively altered to cores of mixed layer clays, iddingsite, iron oxides, and wide rims of green amphibole and chlorite. Piece 7 contains fine, green amphibole veinlet close to which the pyroxenes are pervasively altered to amphibole. Secondary sulfide amounts to 0.2% in subrounded patches.
 Total percent: 30%-40%.

Texture: Alteration reaches as much as 70% in some pieces (2 and 3). Orthopyroxene pervasively altered to amphibole +/- clay and pale green to cream colored. Clinopyroxene is altered to dark green fibrous amphibole and pyrite. Plagioclase altered generally to 25% is altered up to 50% in Pieces 2 and 3.

Vein material: Located in Pieces 1A, 3, 6, 7A, 7B, 8B, 8D, 10, 12A, and 12B as 0.1 to 0.5 mm wide veins filled with actinolite, actinolite and chlorite, chlorite and clays, and prehnite and clays. No real vein networks formed.

ADDITIONAL COMMENTS: Similar to Section 147-894G-17R-1 except that olivine seems to be a less common primary mineral.



147-894G-18R-1

UNIT 11: GABBRONORITE

Pieces 1-14B

COLOR: Mixed grays.

LAYERING: None.

DEFORMATION: Moderate but spotty alteration associated with veins and fractures. Weak magmatic foliation in Pieces 10 and 14.

PRIMARY MINERALOGY: Orthopyroxene has amoeboid oikocrystal habit.

Plagioclase - Mode: 50%.

Crystal size: 2-4 mm.

Crystal shape: Euhedral-subhedral.

Percent replacement: 10%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 2-7 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 33%.

Comments: Replaced by amphibole.

Orthopyroxene - Mode: 15%-20%.

Crystal size: 2-7 mm.

Crystal shape: Anhedral, amoeboid.

Percent replacement: 33%.

Comments: Replaced by amphibole; some oikocrysts.

Olivine - Mode: 0%-1%.

Crystal size: 1 mm.

Crystal shape: Anhedral.

Percent replacement: 100%.

Oxides - Mode: 0.2%.

Crystal size: 0.6 mm maximum.

Crystal shape: Equant.

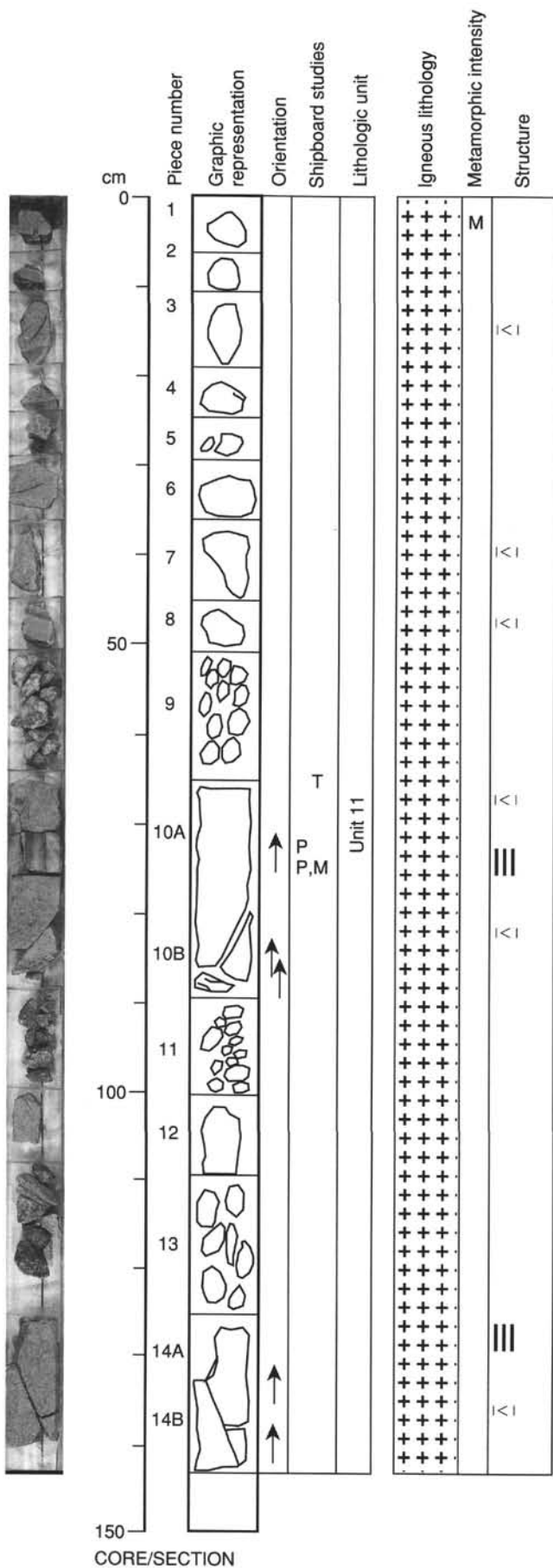
Comments: Interstitial.

SECONDARY MINERALOGY: Pieces 4 and 5 show greater alteration than the others. Dark green hornblendes locally are well developed, but green amphibole still dominates the alteration assemblage. Sulfides comprise 0.1% of the rock and are up to 1 mm in size. They are prominent in altered pyroxenes. Total percent: 20%.

Texture: Pseudomorphitic.

Vein material: Veins are lined with actinolite, chlorite, and prehnite.

ADDITIONAL COMMENTS: Rocks are phaneritic, medium grained, and have ophitic to subophitic texture.



UNIT 11: GABBRONORITE

Pieces 1–16

COLOR: Greenish gray.

LAYERING: None.

DEFORMATION: Moderate veining. Magmatic foliation is present in Piece 4, oblique to a contact with coarse-grained gabbro.

PRIMARY MINERALOGY: Orthopyroxene has amoeboid, oikocrystic habit.

Plagioclase - Mode: 50%.

Crystal size: 2–4 mm.

Crystal shape: Euhedral-subhedral.

Percent replacement: 10%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 30%–35%.

Crystal size: 2–7 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 33%.

Comments: Replaced by amphibole.

Orthopyroxene - Mode: 15%–20%.

Crystal size: 2–7 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 33%.

Comments: Replaced by amphibole.

Olivine - Mode: 1%.

Crystal size: 1 mm.

Crystal shape: Anhedral.

Percent replacement: 100%.

Oxides - Mode: 0.5%.

Crystal size: <0.7 mm.

Crystal shape: Irregular.

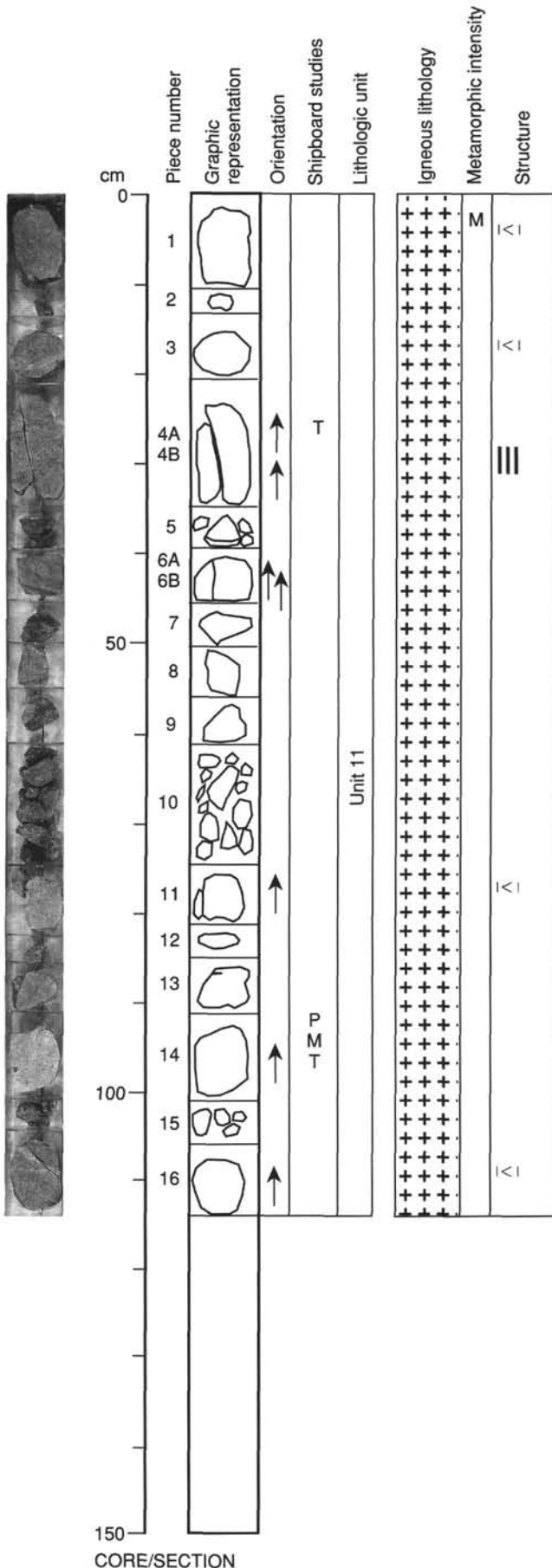
Comments: Interstitial.

SECONDARY MINERALOGY: Dark green hornblendes locally are well-developed, but green amphibole still dominates the alteration assemblage. Sulfides are up to 0.1% of the rock and as much as 1.5 mm in size. They are prominent in altered pyroxenes. Most plagioclase looks fresh. Total percent: 20%.

Texture: Pseudomorphic.

Vein material: Veins are lined with actinolite, chlorite, and prehnite. Albite occurs in Piece 14.

ADDITIONAL COMMENTS: The rocks are phaneritic and medium grained, with sparse to nonexistent olivine and ophitic to subophitic texture.



147-894G-19R-1

UNIT 11: GABBRONORITE

Pieces 1-8

COLOR: Light gray.

LAYERING: None.

DEFORMATION: Minor veining.

PRIMARY MINERALOGY: Larger pyroxene grain sizes are for clinopyroxene and orthopyroxene oikocrysts.

Plagioclase - Mode: 50%.

Crystal size: 0.5-2 mm.

Crystal shape: Subhedral-anhedral.

Crystal orientation: None.

Percent replacement: 10%.

Comments: Rarely plagioclase replaced 100%.

Olivine - Mode: 1%-2%.

Crystal size: 0.2-1 mm.

Crystal shape: Euhedral to subhedral.

Crystal orientation: None.

Percent replacement: 80%.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 0.5-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%-100%.

Orthopyroxene - Mode: 10%-15%.

Crystal size: 0.5-10 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%-100%.

Oxides - Mode: 0.2%.

Crystal size: 0.1-9 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

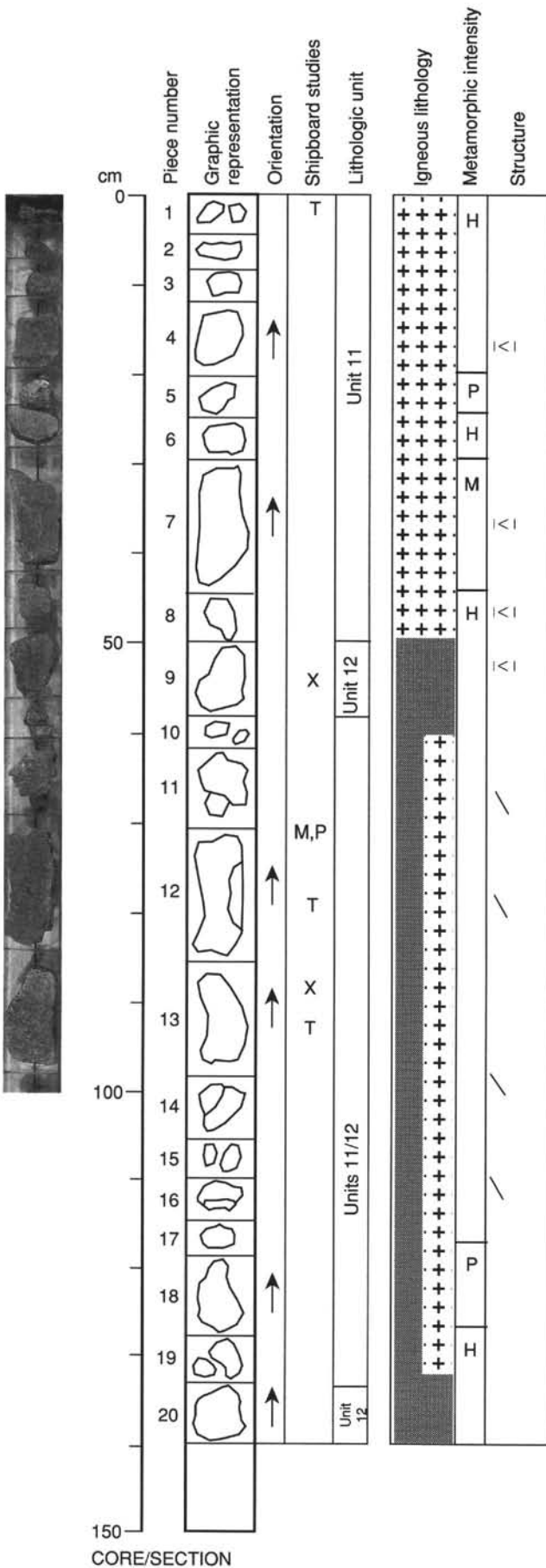
Comments: Generally less than 1 mm. Interstitial crystals.

SECONDARY MINERALOGY: In Piece 5 clay, chlorite and amphibole replace pyroxenes. Irregularly shaped amygdules (0.2 mm in size) contain white zeolite-filled cores, rimmed by chlorite. Radiating sprays of epidote are intergrown with fine prehnite and quartz(?). Rare Hematite. Up to 2% secondary sulfides in altered patches. Total percent: 30%-60%.

Texture: Heterogeneous alteration in Pieces 1-4 and 6-8. Pale to dark green patches are amphibole +/- pyrite after pyroxenes. Secondary plagioclase after plagioclase may be up to 100% in rare cases. Piece 5 is pervasively altered, plagioclase to secondary plagioclase, clay, chlorite, epidote, and zeolite.

Vein material: Located in Pieces 4, 5, 7, and 8 as 0.1-0.5 mm veins of prehnite, epidote, sulfides, chlorite, and zeolites. Piece 5 has 1 mm wide vein of epidote, clays, and rare actinolite.

ADDITIONAL COMMENTS: The texture of this medium-grained olivine-bearing gabbronorite is inequigranular with 4-7 mm orthopyroxene and clinopyroxene oikocrysts. A few patches of coarser grained material are present.



CORE/SECTION

147-894G-19R-1

UNIT 11: GABBRONORITE**Pieces 10–19****COLOR:** Light gray to green-yellow.**LAYERING:** None.**DEFORMATION:** Brecciation in Piece 18.**PRIMARY MINERALOGY:** Olivine cannot be identified with certainty. Texture is equigranular and some pyroxenes have subhedral habit.

Plagioclase - Mode: 50%.

Crystal size: 5–16 mm.

Crystal shape: Subhedral to anhedral.

Crystal orientation: None.

Percent replacement: 50%–100%.

Clinopyroxene - Mode: 30%–35%.

Crystal size: 5–8 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%–100%.

Orthopyroxene - Mode: 15%–20%.

Crystal size: 5–8 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Percent replacement: 40%–100%.

Oxides - Mode: 2%.

Crystal size: 1–4 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

SECONDARY MINERALOGY: Irregular shaped amygdules (0.2 mm) with white zeolite-filled cores, rimmed by chlorite. Radiating epidote needles intergrown with prehnite(?) and quartz(?).

Total percent: 30%–99%.

Texture: Average alteration is 70% and lacks a distinct alteration halo about the dike contact, although in some pieces amphibole and chlorite is more common. Piece 13 is pervasively altered to secondary plagioclase, clay, chlorite, epidote, and zeolite. In addition amphibole replaces pyroxenes.

Vein material: Located in Pieces 11, 12, 13, 14, and 19. 0.1–0.5 mm wide veins of prehnite, sulfides, chlorite, and zeolites. In Piece 13 prehnite occurs when vein cuts plagioclase and chlorite when cutting clinopyroxene.

UNIT 12: MODERATELY TO HIGHLY OLIVINE PLAGIOCLASE PHYRIC BASALT**Pieces 9–20****CONTACTS:** Chilled intrusive contact into host gabbronorite. Glassy margin.**PHENOCRYSTS:** Phenocrysts increase in size and abundance away from the contact. They show no preferred orientation. Spinel is in some places included within olivine. Microphenocrysts are abundant in the matrix and plagioclase microphenocrysts show higher aspect ratios (50) than the larger crystals (3–5).

Plagioclase - 5%–10%; 0.5–3 mm; euhedral. Lath-shaped crystals.

Olivine - 5%–10%; 0.5–3; euhedral to resorbed crystals.

Spinel - <1%; 0.1–0.3 mm; euhedral crystals.

Pyroxene - <<1%; 0.1–2 mm; euhedral crystals displaying cleavage. May be from wall rock.

GROUNDMASS: Fine-grained, gray matrix, glassy at contact with local microbrecciation at the contact.**VESICLES:** None.

Miaroles: None.

COLOR: Medium gray.**STRUCTURE:** Minor veining.**ALTERATION:** 50%–70% altered. Olivine pervasively altered to mixed layer clays in cores, rimmed by chlorite, iron oxide, and amphibole(?). Pyrite-filled fractures common. Rare clinopyroxene is altered to amphibole. 50%–100% alteration of plagioclase to secondary plagioclase.**VEINS/FRACTURES:** 0.1 mm; numerous veinlets filled with chlorite, prehnite, and sulfides. Chlorite-prehnite veins cut the chilled margin.**ADDITIONAL COMMENTS:** Alteration state is similar to that of the host gabbronorite.

147-894G-20R-1

UNIT 13: GABBRONORITE

Pieces 1-23

COLOR: Dappled and mottled grayish green.

LAYERING: None.

DEFORMATION: Some fractures, no displacement. Weak magmatic foliation in Piece 4.

PRIMARY MINERALOGY:

Plagioclase - Mode: 50%.

Crystal size: 1-15 mm.

Crystal shape: Euhedral-subhedral.

Percent replacement: 10%-40%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 2-10 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 30%-60%.

Comments: Replaced by amphibole.

Orthopyroxene - Mode: 20%-25%.

Crystal size: 2-15 mm.

Crystal shape: Subhedral-anhedral.

Percent replacement: 30%-60%.

Comments: Some oikocrysts.

Oxides - Mode: 0.3%-5%.

Crystal size: 1-2 mm.

Crystal shape: Irregular.

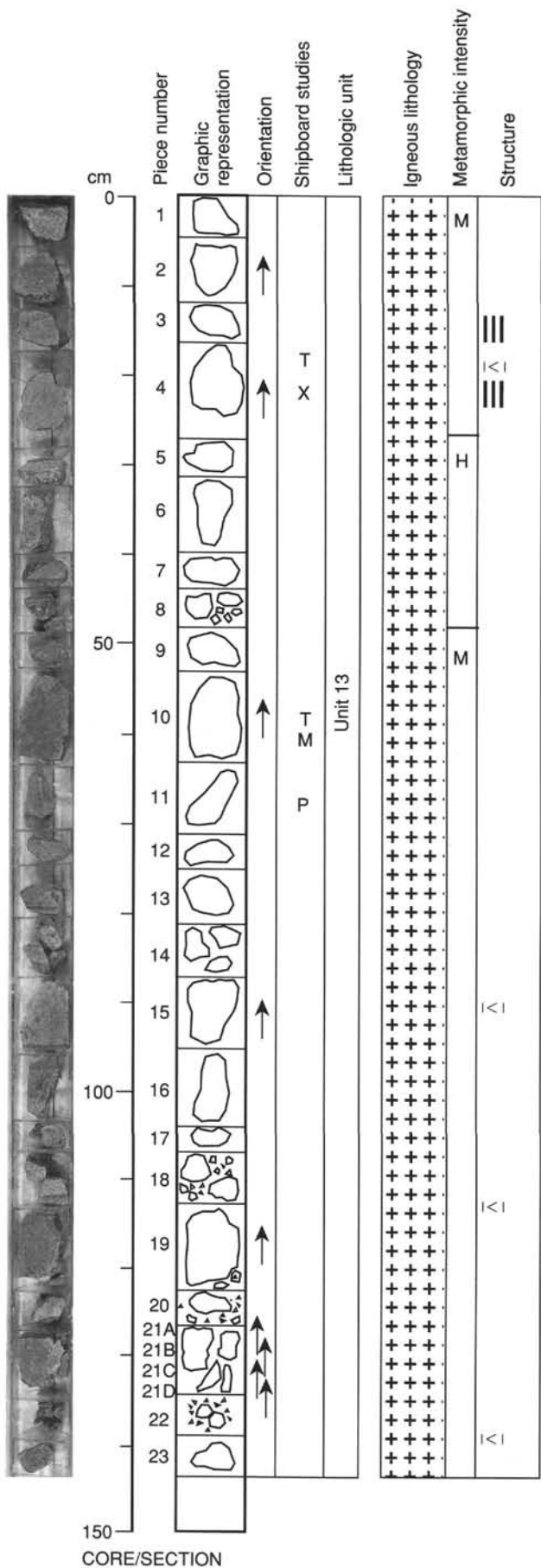
Comments: Interstitial to equant.

SECONDARY MINERALOGY: Alteration is variable. It is moderate in Pieces 1-4 and 9-23 (30%-40%). Pieces 5-8 are highly altered (to 70%) and characterized by epidote and secondary replacing primary plagioclase (up to 80%-85%). Epidote occurs locally in <0.3 mm wide patches and as a 2-cm long lens-like patch together with quartz and minor pyrite in the center of Piece 5. Another patch is in Piece 10. Quartz occurs locally and in a 1.5 cm-long elongate patch. Hydrothermal clinopyroxene occurs in Piece 5. Total percent: 30%-70%.

Texture: Pseudomorphic, pyroxenes replaced by green, blue-green amphibole + pyrite. Sulfides are 0.2% of the rock and up to 1.5 mm in size.

Vein material: Veins are lined with chlorite, green amphibole, clays, and zeolites.

ADDITIONAL COMMENTS: Pieces are fine-grained except that Pieces 2, 14, and 15 are mediumgrained, and Pieces 1 and 23 are coarse grained. There is a gradational grain size increase between Pieces 5 and 12, corresponding to a decrease in amount of orthopyroxene oikocrysts.



CORE/SECTION

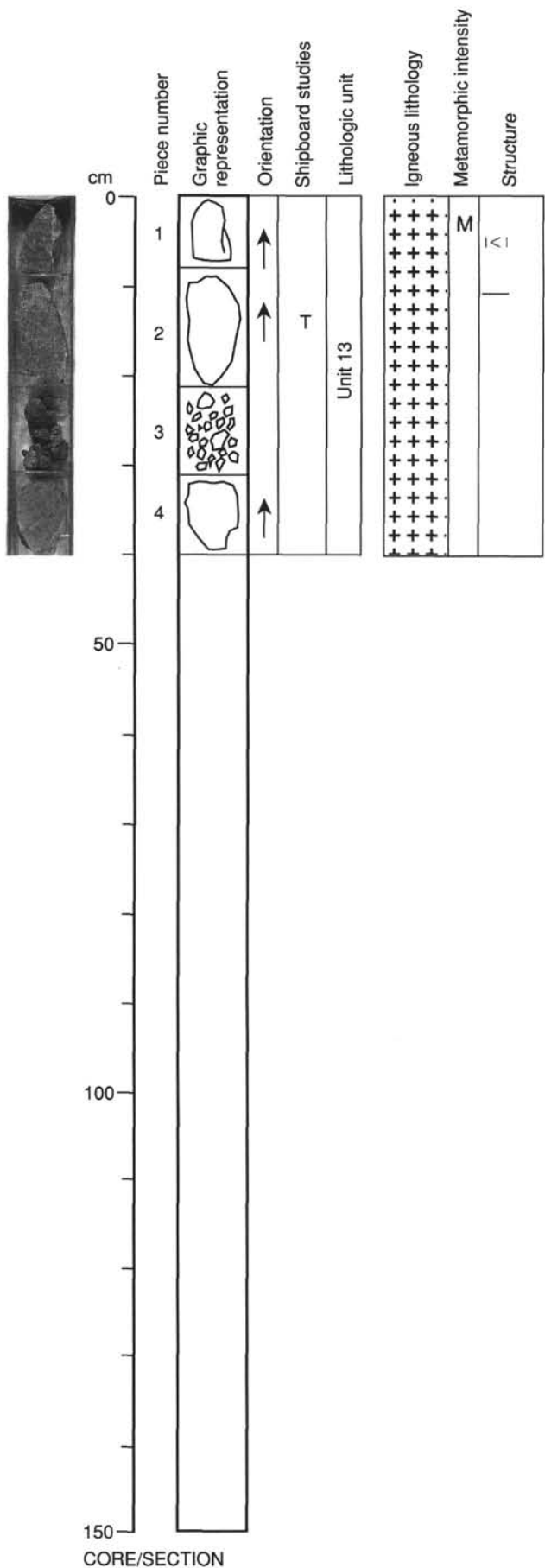
UNIT 13: GABBRONORITE

Pieces 1-4

COLOR: Gray.
LAYERING: None.
DEFORMATION: No measurements were made.
PRIMARY MINERALOGY: No olivine.
 Plagioclase - Mode: 45%-50%.
 Crystal size: 2-25 mm.
 Crystal shape: Euhedral-subhedral.
 Percent replacement: 10%.
 Comments: Replaced by secondary plagioclase
 Clinopyroxene - Mode: 30%-35%.
 Crystal size: 2-15 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 30%-40%.
 Comments: Replaced by amphibole.
 Orthopyroxene - Mode: 20%-25%.
 Crystal size: 2-15 mm.
 Crystal shape: Subhedral-anhedral.
 Percent replacement: 30%-40%.
 Comments: Replaced by amphibole.
 Oxides - Mode: 1%-2%.
 Crystal size: 1-12 mm.
 Crystal shape: Irregular, equant.
 Comments: Equant in patches.

SECONDARY MINERALOGY: Moderately altered. Hydrothermal clinopyroxene may replace some cores of primary clinopyroxene. There are local needles of black hornblende. Dark green amphibole replaces orthopyroxene and occurs along rims of altered clinopyroxene. Sulfides are 0.1% of the rock and up to 1 mm in size in altered patches.
 Total percent: 30%-35%.
 Texture: Pseudomorphous.
 Vein material: Veins are lined with green clay and chlorite.

ADDITIONAL COMMENTS: A continuation of material in Section 147-894G-20R-1. Pieces 1 and 2 are coarse grained, Piece 4 is medium grained, and Piece 3 mainly medium grained with some pegmatitic fragments. Piece 2 has a sharp contact with medium-grained gabbronorite.



147-894G-20R-3

UNIT 13: GABBRONORITE

Pieces 1-17

COLOR: Light greenish gray.

LAYERING: None.

DEFORMATION: Minor veining and fracturing throughout the section. Moderate hydrothermal brecciation in Pieces 6 and 7. Magmatic foliation developed in Piece 14.

PRIMARY MINERALOGY: Olivine is not present in Pieces 6 and 7, which are very coarse grained, with large pyroxene oikocrysts. Olivine is 1%-2% in Pieces 1-5 and 2%-10% in Pieces 8-17 (locally olivine gabbronorite). Trace apatite in Piece 4.

Plagioclase - Mode: 50%.

Crystal size: 0.5-1.5

Crystal shape: Subhedral, anhedral.

Percent replacement: 5%-40%.

Comments: Replaced by secondary plagioclase.

Clinopyroxene - Mode: 20%-35%.

Crystal size: 0.5-20 mm.

Crystal shape: Euhedral, subhedral, anhedral.

Percent replacement: 50%-100%.

Comments: Replaced by amphibole/chlorite.

Orthopyroxene - Mode: 10%-25%.

Crystal size: 0.2-20 mm.

Crystal shape: Anhedral.

Percent replacement: 50%-80%.

Comments: Replaced by amphibole/chlorite; some oikocrysts.

Olivine - Mode: 1%-2% overall.

Crystal size: 0.1-1.5 mm.

Crystal shape: Anhedral.

Percent replacement: 100%.

Comments: Mainly pseudomorphs.

Oxides - Mode: 0.3%.

Crystal size: 0.1-2 mm.

Crystal shape: Irregular

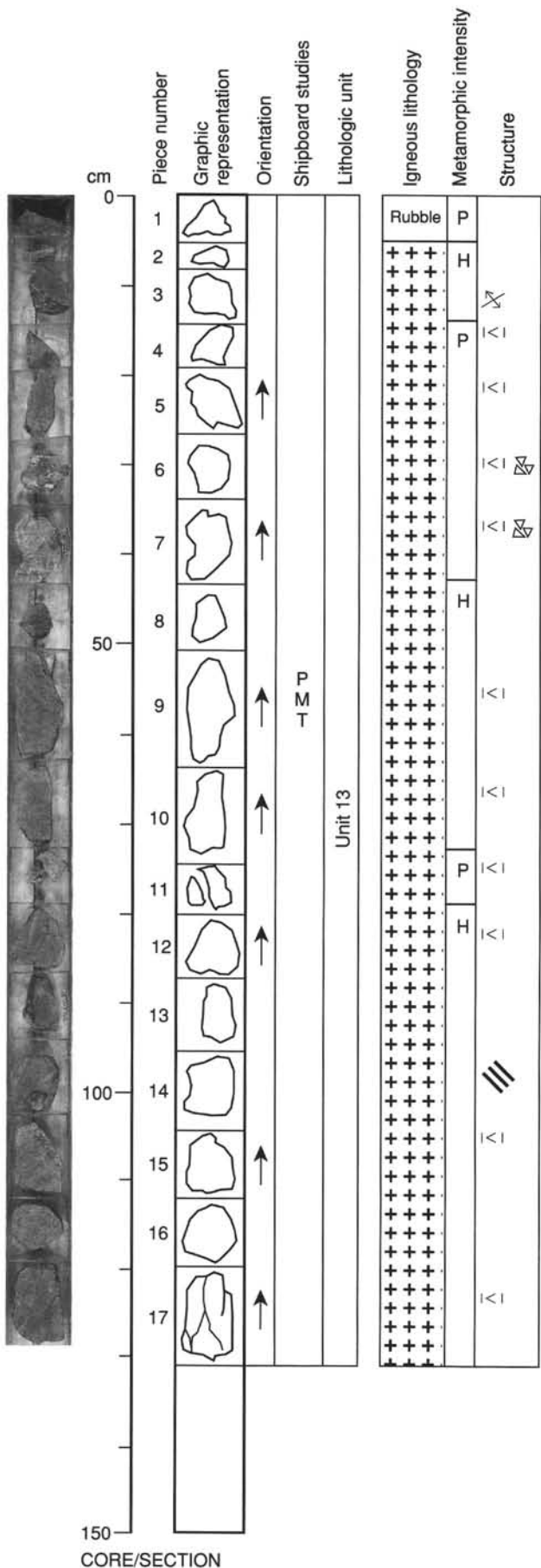
Comments: Interstitial.

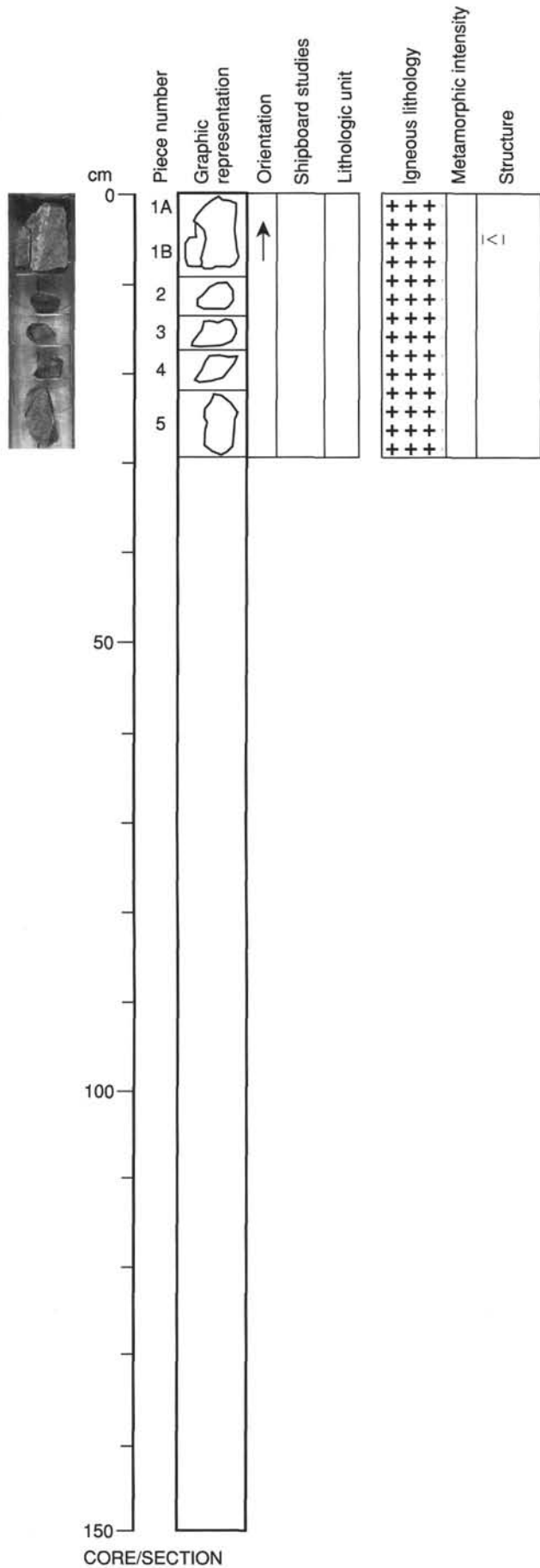
SECONDARY MINERALOGY: Very heterogeneous downhole, 50%-100%. Lots of green amphibole after clinopyroxene. Piece 9 has olivine pseudomorphed by core of mixed layer clays rimmed by oxides, amphibole, and talc. Clinopyroxene alteration varies from 20%-100% with the coarser grains being the more highly altered, to actinolite, oxides, and secondary pyroxene. Plagioclase is generally fresh, but near amphibolitized pyroxenes may be altered to actinolite. Orthopyroxene locally rims olivine. Total percent: 75%.

Texture: Pseudomorphous. Pyroxenes are replaced by amphibole and chlorite, plagioclases by secondary plagioclase. Sulfides comprise up to 0.1% and up to 0.8 mm in size in altered patches.

Vein material: Lined with amphibole, chlorite, and epidote. Local stringers of chlorite and clay.

ADDITIONAL COMMENTS: Pieces in this section were recovered by three successive retrievals of the core barrel after Sections 147-894G-20R-1 and -2 already were recovered. The rocks represent material which was cored, but never entered the core barrel because of a latch failure. The 3 retrievals represent overcoring of material present in the pipe. Some pieces at the top may have fallen down the hole (i.e. Piece 1, a basalt), and others may be out of sequence. But several pieces (5, 7, 9, 10, 12, 15, and 17) were cored and are oriented. Apart from the basalt (Piece 1, olivine-plagioclase-spinel bearing, resembling dikes higher in the hole), the rocks are medium coarse-grained gabbronorites, olivine-bearing gabbronorites, and olivine gabbronorite (Pieces 13 and 15).





GABBRONORITE

Pieces 1A-5

COLOR: Gray.

LAYERING: None.

DEFORMATION: Fractures lined with green secondary minerals in Piece 1

PRIMARY MINERALOGY: Piece 1 has plagioclase up to 5 mm in size.

Plagioclase - Mode: 50%-55%.

Crystal size: 2-6 mm.

Crystal shape: Euhedral-subhedral.

Percent replacement: 10%.

Comments: Secondary plagioclase.

Clinopyroxene - Mode: 30%-35%.

Crystal size: 2-4 mm.

Crystal shape: Anhedral.

Percent replacement: 30%.

Comments: Replaced by green amphibole.

Orthopyroxene - Mode: 5%-10%.

Crystal size: 2-8 mm.

Percent replacement: 50%.

Oxides - Mode: 5%.

Crystal size: Up to 5 mm.

Crystal shape: Irregular.

Comments: Dense concentration in archive piece.

SECONDARY MINERALOGY: Olivine in Piece 5 has partialoxidative alteration to reddish clays. The interiors have green amphibole and pyrite.

Total percent: 30%-50%.

Texture: Pseudomorphic, mainly amphiboles after pyroxenes. Vein material: Piece 1 has a high-angle vein 2 mm across with a 2.5 mm very altered rind and moderate alteration up to 1 cm away.

ADDITIONAL COMMENTS: The core is a wash core made up of pieces cored in cleaning the bottom of the hole. Piece 1 is coarse-grained gabbonorite. Pieces 2-4 are medium-grained gabbonorite. Piece 5 is medium-grained olivine gabbonorite.